

300 SERIES TRACTOR WORKSHOP MANUAL

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Volume 2

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POWER TAKE-OFF

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SINGLE-SPEED POWER TAKE-OFF (540 rpm and ground speed)

Section 9 – Part A

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SINGLE-SPEED POWER TAKE-OFF

Specification

540 rev/min PTO speed	1789 engine rev/min
Engine to PTO shaft ratio	3.31:1 (16T drives 53T)
No. of splines	6
Outside diameter	34,93 mm (1.375 in)
Ground speed ratio, rear wheel to PTO shaft	13.816:1

Distance travelled per PTO shaft revolution:

Tyre size	Tyre radius		Distance travelled	
	mm	in	mm	in
16.9-30	695	27.38	316	12.44
16.9-34	745	29.35	339	13.35
13.6-36	715	28.17	325	12.80
13.6-38	740	29.16	336	13.23

Bolt Torques

Nuts, rear seal retainer to centre housing	113-169 Nm (83-125 lbf ft)
Nuts, rear seal retainer to drawbar bracket	230-260 Nm (170-192 lbf ft)

Special Tools

MF.168	Seal and bush remover/replacer
MF.195C	Bearing remover/replacer - main tool
MF.195-5B	Needle bearing remover/replacer
MF.195-6B	Needle bearing and bush remover/replacer
MF.364A	Seal replacer
MF.474	PTO seal guide and installer
MS.550	Universal handle

General Description

Single Speed Power Take-off

540 rev/min Live and Ground Speed (Fig. 1)

540 rev/min Ground speed only (Fig.2)

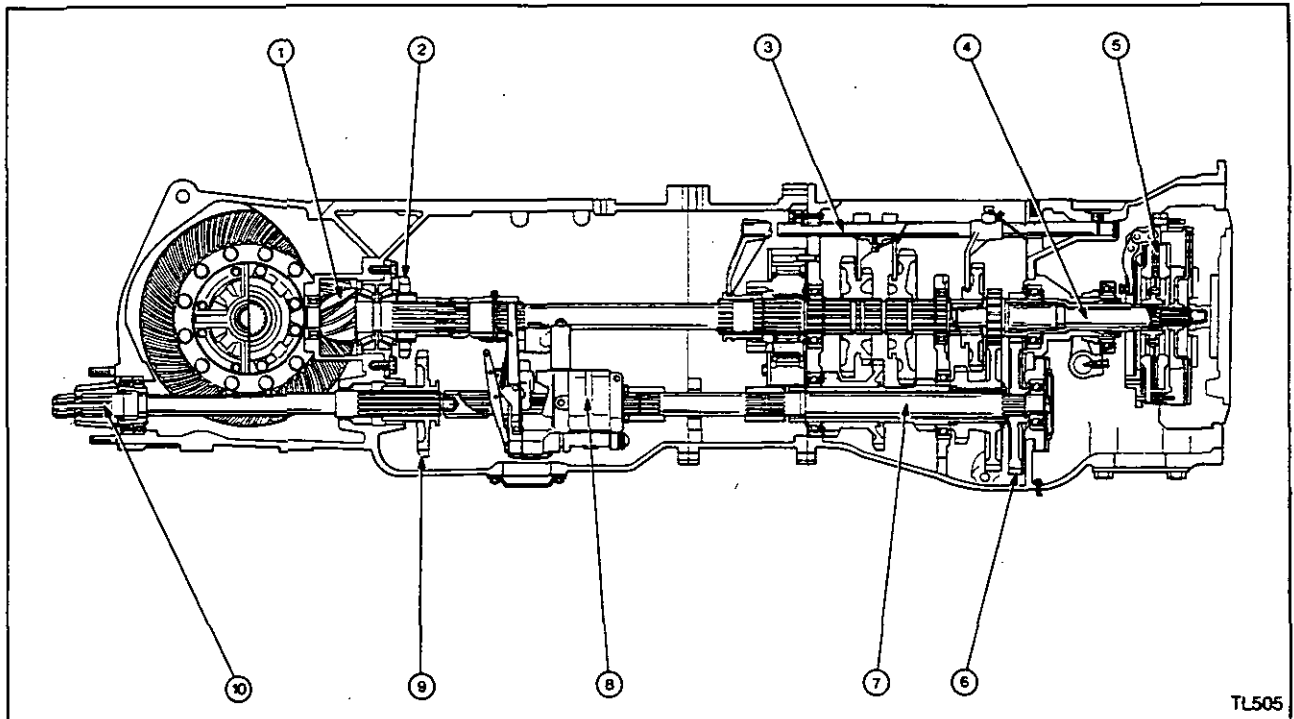
The PTO shaft projects from the rear of the tractor. It is supported at the rear by a ball bearing and at the front by a needle roller bearing housed in the end of the hydraulic pump drive shaft. Splined onto the front end of the PTO shaft is a sliding gear which is operated by three position selector lever.

When the selector lever is moved rearwards the sliding gear moves forwards and the internal splines on the gear engage with the splines on the hydraulic pump drive shaft. The PTO is then driven at a speed proportional to that of the engine, the standard shaft speed of 540 rev/min occurring at around 1789 engine rev/min for example.

When the selector lever is moved forwards the sliding gear moves rearwards and the gear teeth engage with a gear splined onto the rear axle driving pinion. The PTO shaft is now driven by the wheel drive transmission system and its speed is directly related to the ground speed of the tractor. See above chart.

When the selector lever is moved to the mid- position, the sliding gear moves to neutral and the PTO drive is disengaged.

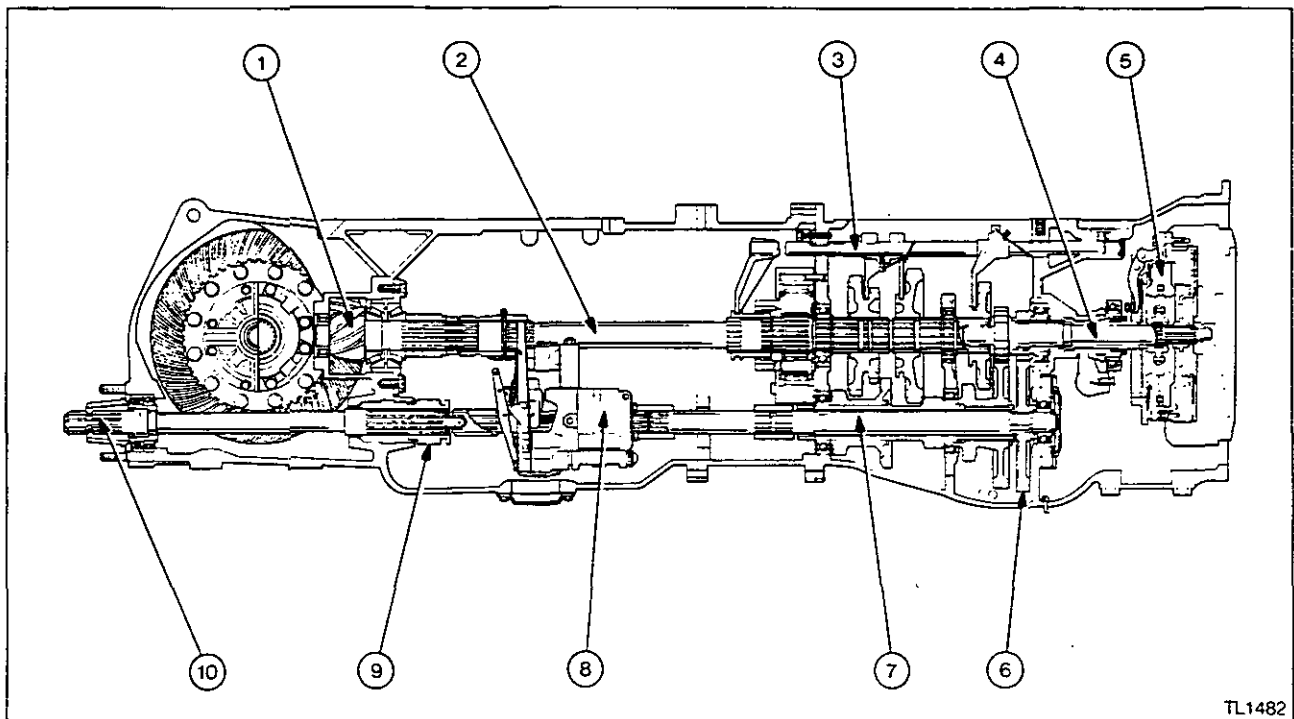
SINGLE SPEED POWER TAKE-OFF



TL505

- | | |
|----------------------|-----------------------------|
| 1. Pinion | 6. PTO constant mesh gears |
| 2. Ground speed gear | 7. PTO layshaft |
| 3. Gearbox | 8. Lift pump |
| 4. PTO input shaft | 9. Coupler gear |
| 5. PTO clutch plate | 10. PTO shaft (540 rev/min) |

Figure 1. Live and ground speed power take-off



TL1482

- | | |
|---------------------|-----------------------------|
| 1. Rear Axle | 6. PTO constant mesh gears |
| 2. Drive shaft | 7. PTO layshaft |
| 3. Gearbox | 8. Lift pump |
| 4. PTO input shaft | 9. Coupler gear |
| 5. PTO clutch plate | 10. PTO shaft (540 rev/min) |

Figure 2. Ground speed power take-off

9A-04

SINGLE SPEED POWER TAKE-OFF

PTO Shaft Oil Seal

Removal and Refitment **9A-01**

Special Tools:

MF 168	Seal Remover
MF 364	Seal Replacer
MS 550	Universal Handle

Removal

1. Drain the centre housing of transmission oil.
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the top or bottom of the control beam as necessary.
5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers and, when necessary, eight spacers.
8. Remove the control beam bracket or the check chain anchor bracket.
9. Remove the seal housing plate.
10. Withdraw the oil seal housing by screwing on the PTO cap and pulling the cap, seal housing and shaft assembly out of the centre housing.
11. Remove and discard the 'O' ring.
12. Using MF 168 and handle MS 550, remove and discard the lip seal and metal shield.

Refitment

13. Press in the new metal shield, lip curving upwards, to the full limit of its travel.
14. Using MF 364, press in the lip seal, lip curving upwards; this will ensure that the lip face of the seal is 1,78 mm (0.070 in) below the edge of the oil seal housing.
15. Fit a new 'O' ring.
16. Fit the oil seal housing so the two flats are vertical.
17. Reverse procedures 1 to 8 except: Fit the check chain anchor bracket with the larger diameter holes uppermost.

PTO Shaft

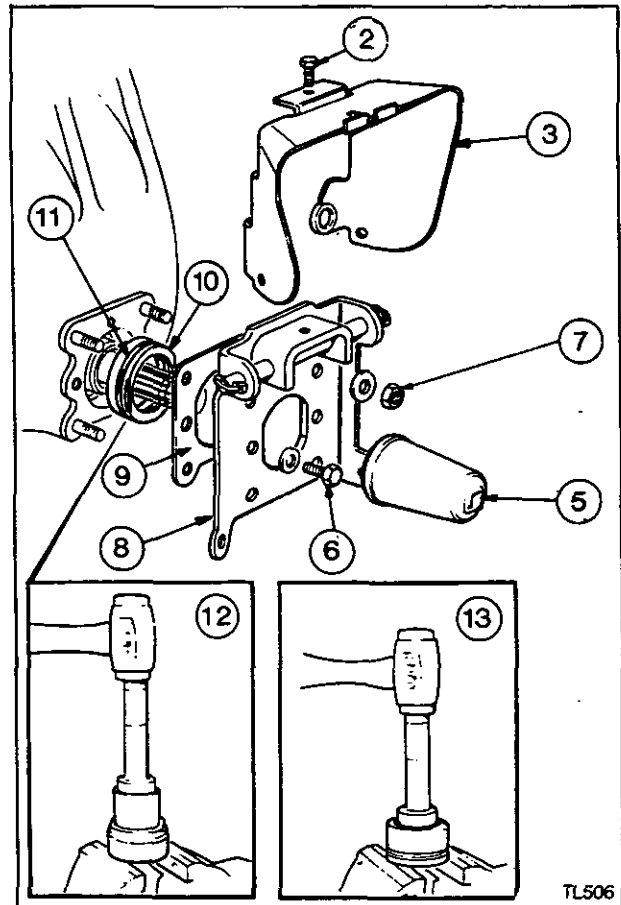
Removal and Refitment **9A-02**

Removal

1. Remove the oil seal housing, see operation 9A-01, procedures 1 to 10.
2. Withdraw the PTO shaft.

Refitment

3. Slide in the PTO shaft, taking care to align the internal splines and to keep it horizontal.
4. Refit the oil seal housing, see operation 9A-01, procedures 16 and 17.



SINGLE SPEED POWER TAKE-OFF

PTO Shaft Rear Bearing

Removal and Refitment

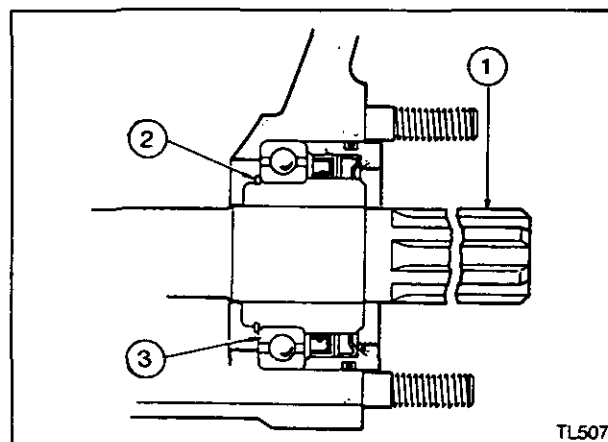
9A-03

Removal

1. Remove the PTO shaft, see operation 9A-02.
2. Remove the snap ring.
3. Using a length of 60 mm (2 3/8 in) internal diameter tube, drive the bearing off the shaft forwards.

Refitment

4. Using a hydraulic press, press the new ball bearing onto the PTO shaft.
5. Fit a new snap ring and ensure that it locates correctly in its groove.
6. Refit the PTO shaft, see operation 9A-02.



TL507

Ground Speed Gears and Bearings

Removal and Refitment

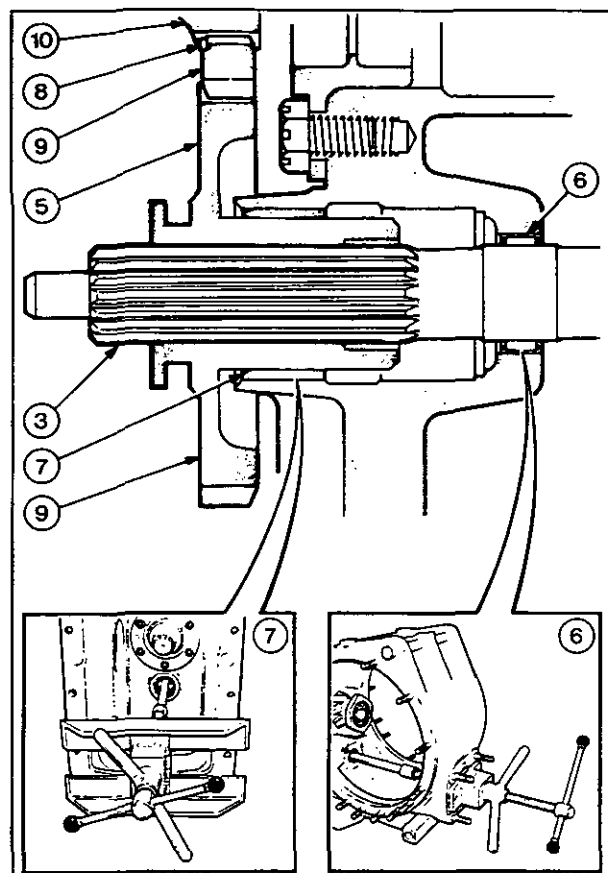
9A-04

Special Tools:

MF 195C	<i>Bearing remover/replacer</i>
MF 195-5B	<i>PTO needle bearing remover/replacer</i>
MF 195-6B	<i>Needle bearing and bush remover/replacer</i>
MF 168	<i>PTO shaft oil seal/bush replace</i>
MS 550	<i>Handle</i>

Removal

1. Split the tractor between the rear centre housing and gearbox, see operation 2A-04 or 2B-05.
2. Remove the left-hand trumpet housing and the differential unit, see operation 8A-06.
3. Remove the PTO shaft, see operation 9A-01.
4. Remove the hydraulic linkage pump, see operation 12A-12.
5. Remove the ground speed gear or coupler.
6. Using MF 195C, main puller, MF 195-5A/2, extension rod and MF 195-5B/1, collet, remove the PTO shaft support needle bearing rearwards.
7. Using MF 195C, main puller, MF 195-5A/2, extension rod, and MF 195-6A/1, collet, in conjunction with two pieces of angle bar, pull the bush out of the housing.
8. Remove the retainer ring.
9. Remove the ground speed gear, if fitted.
10. Renew the drive gear splined hub, if necessary.



TL508

Refitment

11. Reverse procedures 8 to 10 except:
 - a. Renew the retainer ring.
 - b. Ensure that the retainer ring locates correctly in its groove.
12. Using MF 168 and handle MS550, drive the new bush into its bore until it is flush with the inner end of the chamfer, 2 mm (0.080 in) in from the chamfered face.
13. Using MF 195C, main puller, MF 195-5A/2, extension rod and MF 195-5B/1, collet, in conjunction with two pieces of angle bar, pull the needle bearing into its bore until flush with the rear face.
14. Reverse procedures 1 to 5 except:
 - a. When fitting the linkage pump, ensure that the needle bearing in the rear end of the camshaft is in good condition.
 - b. Renew all 'O' rings, oil seals and gaskets.

9A-06

SINGLE SPEED POWER TAKE-OFF

Left-Hand PTO Side Cover

Removal and Refitment

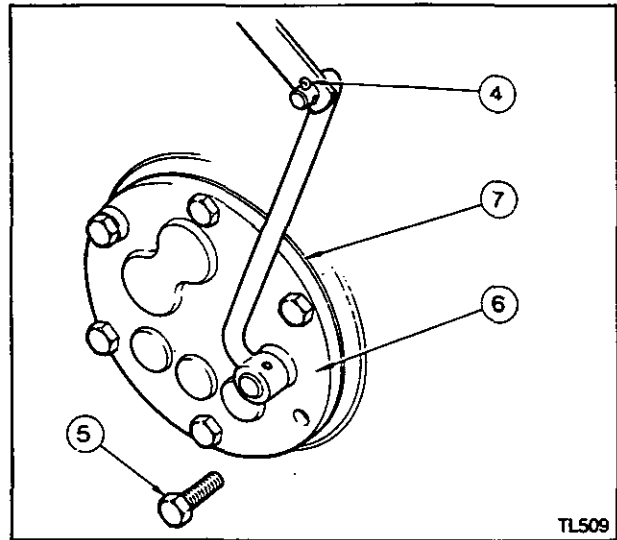
9A-05

Removal

1. Drain the transmission oil to the LOW mark on the dipstick.
2. Remove the brake actuator, see operation 8B-01.
3. Disconnect the auxiliary hydraulic pipes from the side cover, if fitted.
4. Disconnect the PTO selector rod.
5. Remove the six bolts.
6. Remove the side cover.
7. Remove and discard the gasket.

Refitment

8. Reverse procedures 1 to 4 except:
 - a. Fit a new gasket.
 - b. Locate the shift lever in the annulus of the ground speed gear or shift collar.
 - c. Seal the six bolt threads with Hylomar sealant.



Left-Hand PTO Side Cover

Overhaul

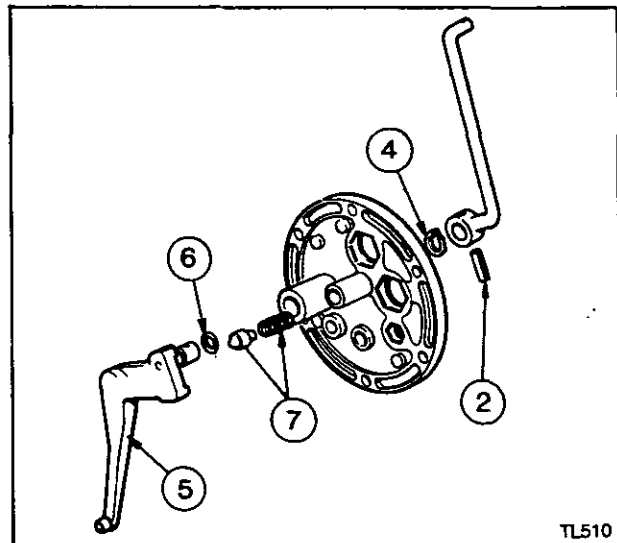
9A-06

Disassembly

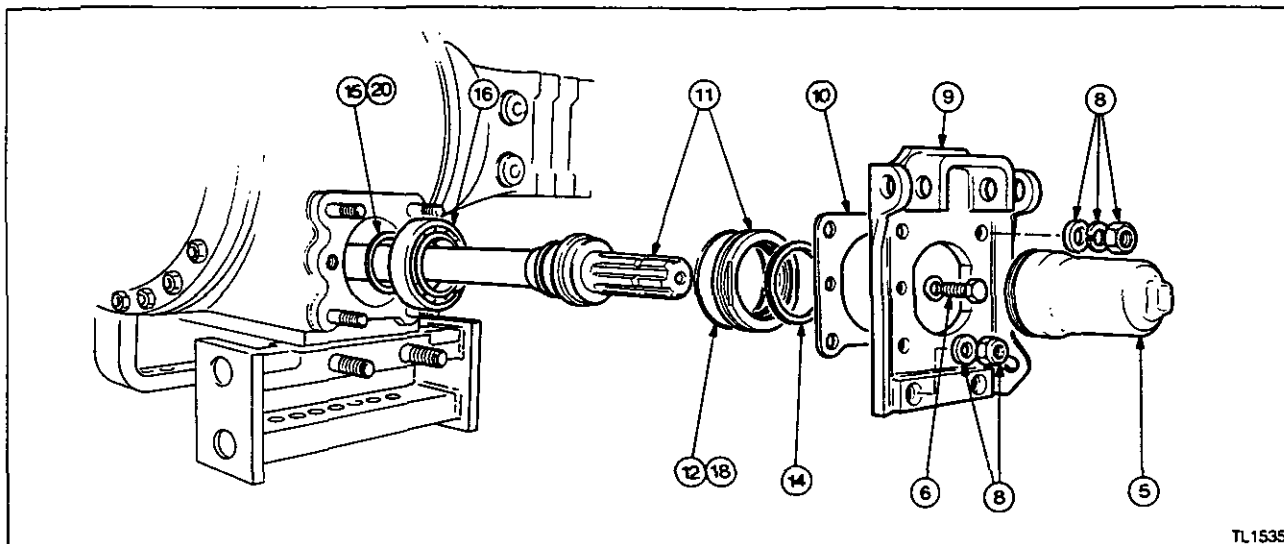
1. Remove the side cover, see operation 9A-05.
2. Drift out and discard the roll pin.
3. Remove the PTO lever.
4. Remove the circlip.
5. Remove the shift lever.
6. Remove and discard the 'O' ring.
7. Remove the detent plunger and spring.

Reassembly

8. Reverse procedures 1 to 7 except:
 - a. Fit a new 'O' ring.
 - b. Fit a new roll pin.



SINGLE SPEED POWER TAKE-OFF

**PTO Shaft, Bearing and Oil Seal****Removal and Refitment**

9A-07

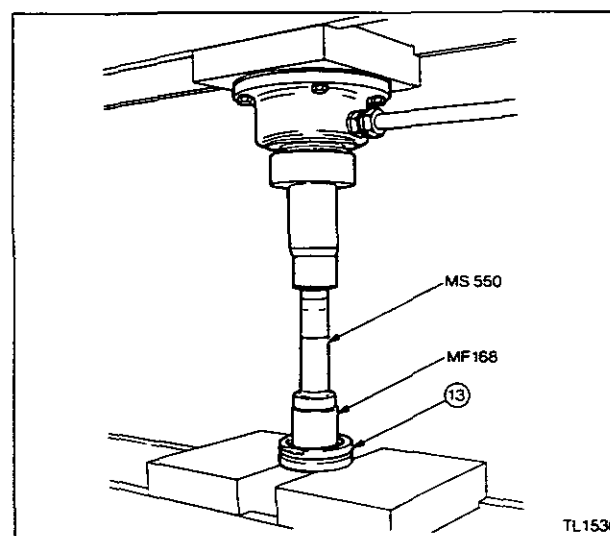
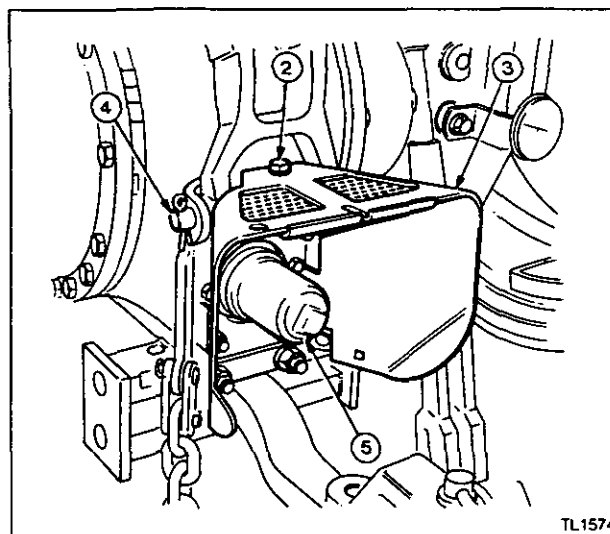
Special Tools:*MF 168 Seal remover**MF 364A Seal replacer**MF 474 PTO Seal guide and installer**MS 550 Universal handle*

Tractors serial No. P38479 onwards

Removal

Caution: To ensure leak proof installation of the rear PTO oil seal assembly, special service tools MF 364A and MF 474 MUST be used as described below.

1. Drain the transmission oil.
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the bottom of the control beam.
5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers and spacers and tab washers if fitted.
8. Remove the two nuts from drawbar bracket.
9. Remove the control beam/check chain bracket.
10. Remove the seal housing plate.
11. Remove the oil seal housing and shaft by screwing on the PTO cap and pulling the cap, withdrawing the shaft and housing from the rear axle.
12. Remove and discard the 'O' ring.
13. Using MF 168 and handle MS 550 press the lip seal out of the housing.
14. Remove the triple lip dirt seal from the shaft and discard.



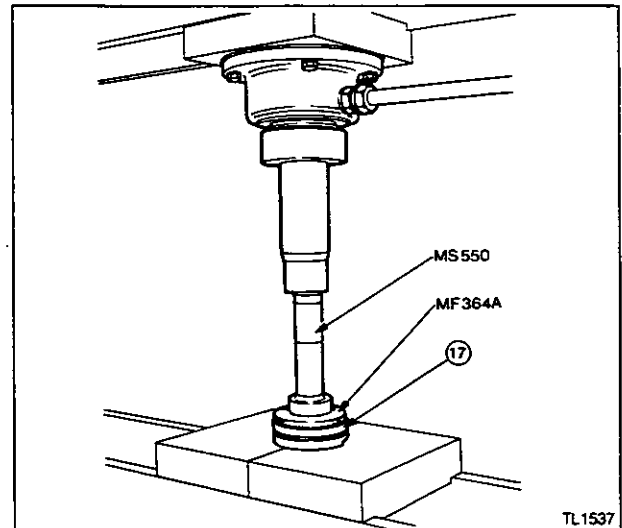
9A-08

SINGLE SPEED POWER TAKE-OFF

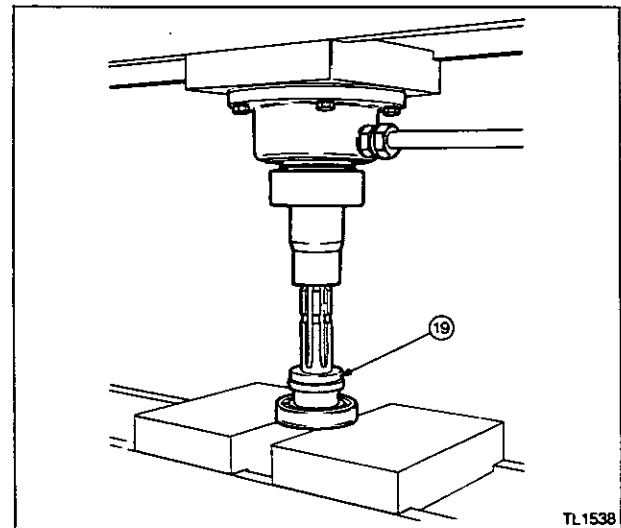
15. Remove the snap ring.
16. Using a length of 60 mm (2 3/8 in) internal diameter tube, drive the bearing off the shaft.

Refitment

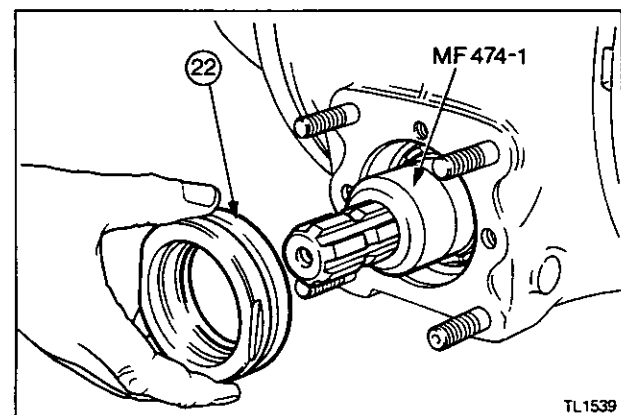
17. Using MF 364A and MS 550 press the lip seal into the oil seal housing with the lip towards the tool; this will ensure that the oil seal is 1 mm (0.039 in) below the edge of the housing.



18. Fit a new 'O' ring.
19. Using a hydraulic press, press the new ball bearing onto the PTO shaft.
20. Fit a new snap ring and ensure that it locates correctly in its groove.
21. Slide the PTO shaft into the rear axle, taking care to keep it horizontal to align the internal splines.

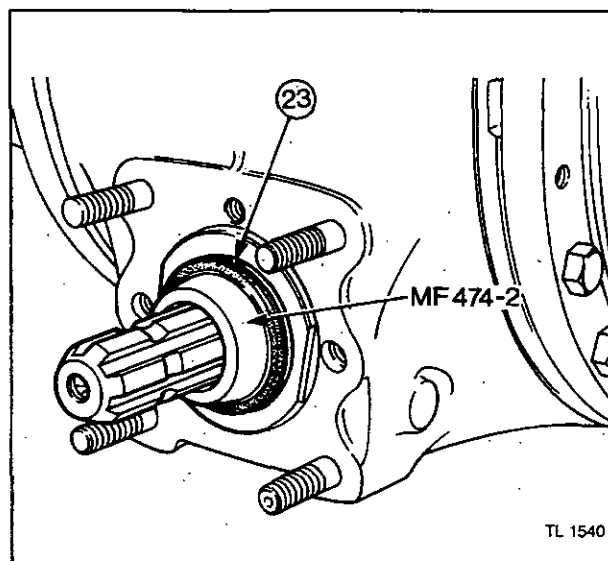


22. Place MF 474-1 seal guide onto the PTO shaft, and push the oil seal housing into the rear axle so that the two flats are vertical.

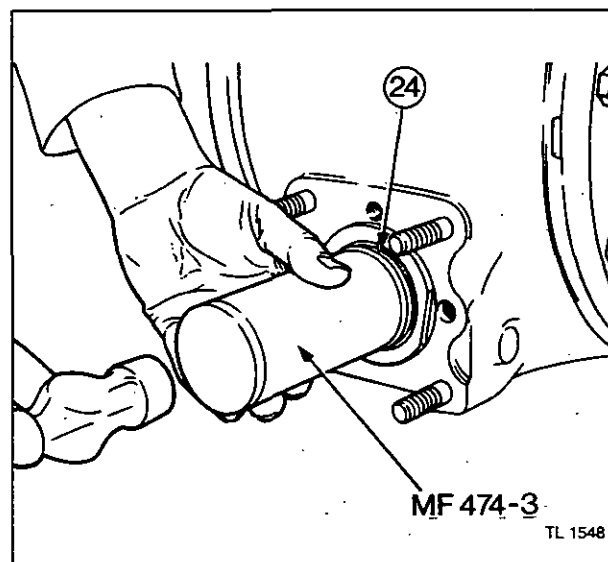


SINGLE SPEED POWER TAKE-OFF

23. Place the seal guide MF.474-2 onto the PTO shaft, coat the triple lip dirt seal liberally with general purpose grease and slide it down the PTO shaft and on to the seal guide. The internal radiused edge of the seal must lead onto the shaft.

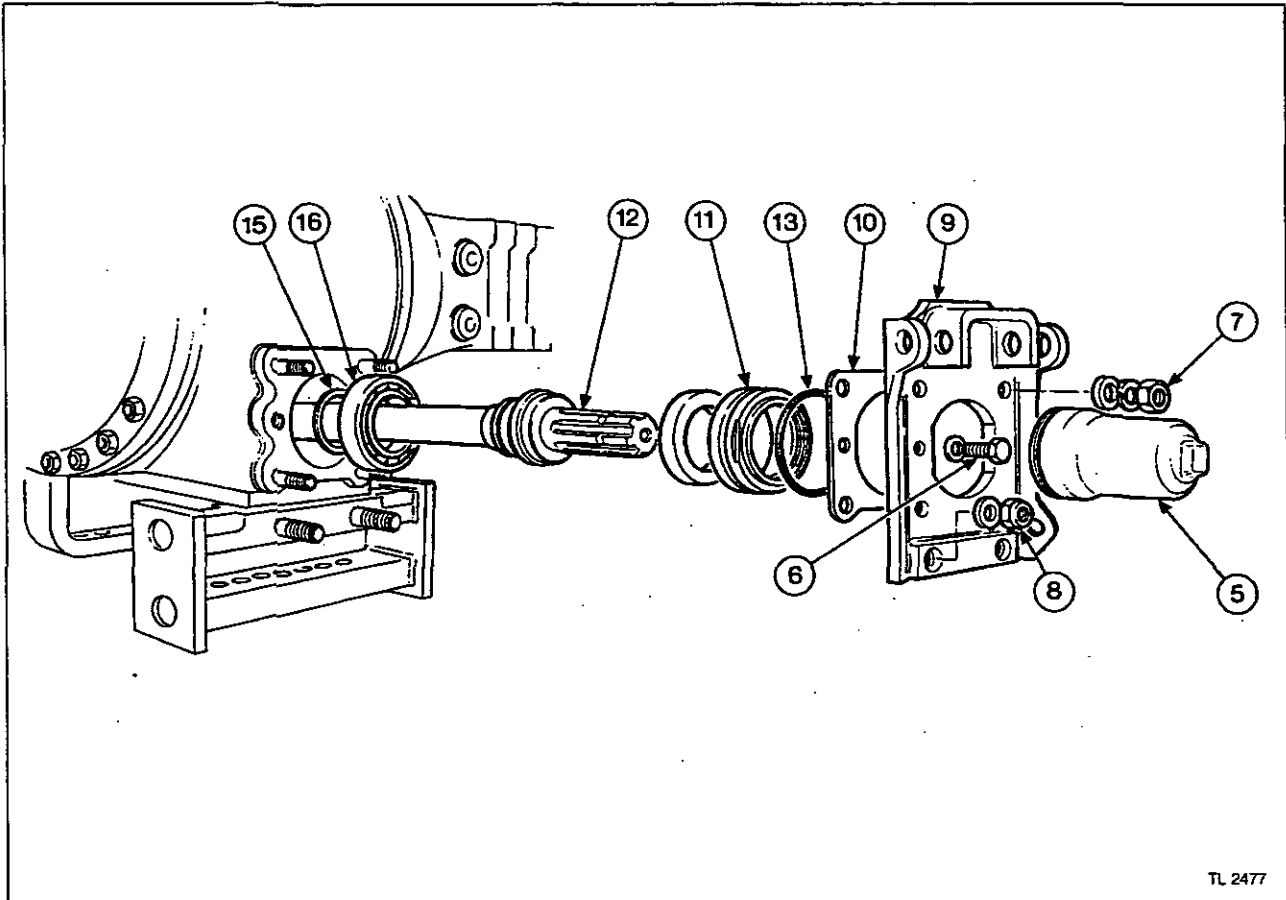


24. Drive the seal into place using MF.474-3 Seal Installer until it comes in contact with the shoulder.
25. Reverse procedures 1 to 10 except:
- Tighten the four retaining nuts with spacers to a torque of 113-169 Nm (83-125 lbf ft).
 - Tighten the two nuts retaining the drawbar bracket to the check chain bracket to a torque of 230-260 Nm (170-192 lbf ft).



9A-10

SINGLE-SPEED POWER TAKE-OFF



PTO Shaft and Cassette Oil Seal

Removal and Refitment

9A-08

Special tools:

MF.168 PTO Seal Remover

MF.484 PTO Cassette Seal Installer

MS.550 Universal Handle

The cassette-type oil seal was introduced on tractors from serial number B21005, May 1993.

Removal



CAUTION: To ensure a leak-proof installation of the rear PTO seal, special service tool MF.484 MUST be used to install the seal.

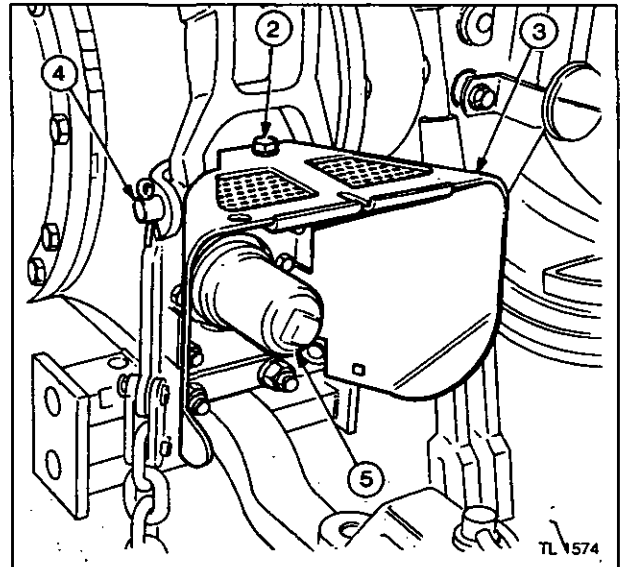
1. Drain the transmission oil.

NOTE: On tractors with a single-speed live PTO engage the PTO selector lever first.

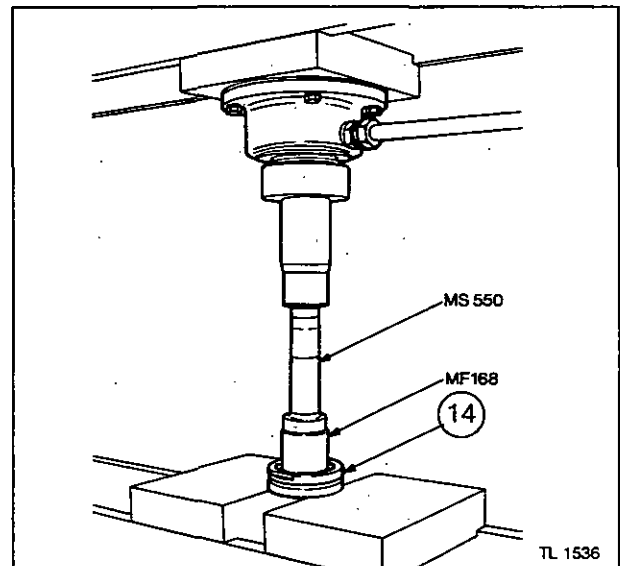
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the bottom of the control beam.

9A-11 SINGLE-SPEED POWER TAKE-OFF

5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers, spacers and tab washers if fitted.
8. Remove the two nuts from the drawbar bracket.
9. Remove the control beam/check chain bracket.
10. Remove the seal housing retainer plate.
11. Remove the oil seal housing by screwing on the PTO cap and pulling the cap, withdrawing the housing from the rear axle.
12. Remove the PTO shaft.
13. Remove and discard the 'O' ring.

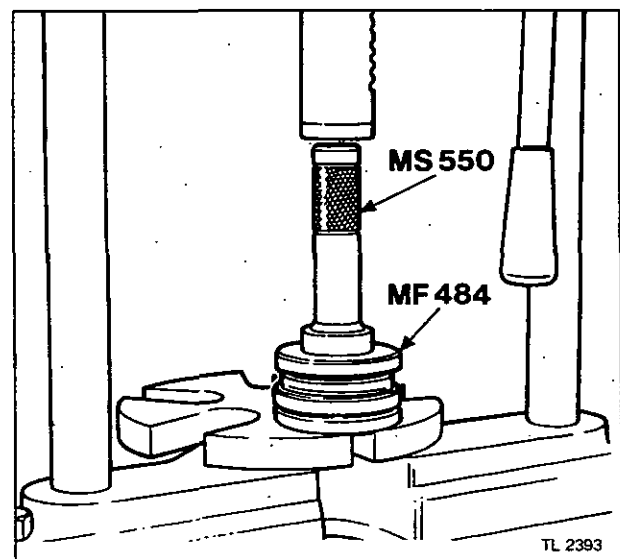


14. Using special tool MF.168 and handle MS.550 press the cassette seal out of the housing and discard.
15. Remove the snap ring.
16. Using a length of 60 mm (2 3/8 in) internal diameter tube, drive the bearing off the shaft.



Refitment

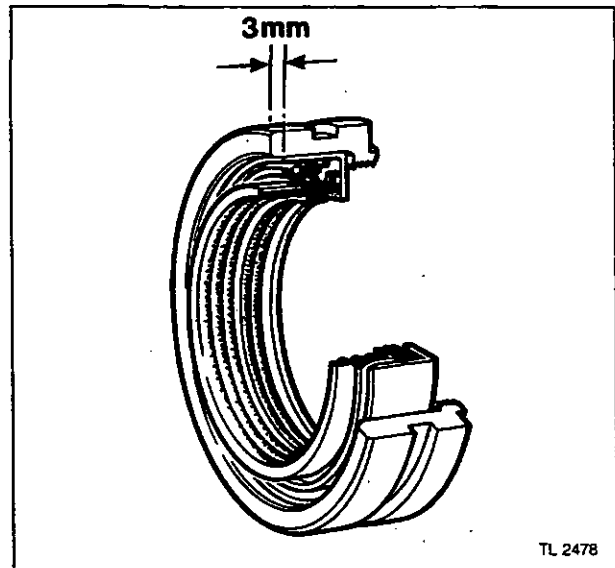
17. Using special tool MF.484 and handle MS.550 press the new cassette seal into the oil seal housing as shown in the illustration.



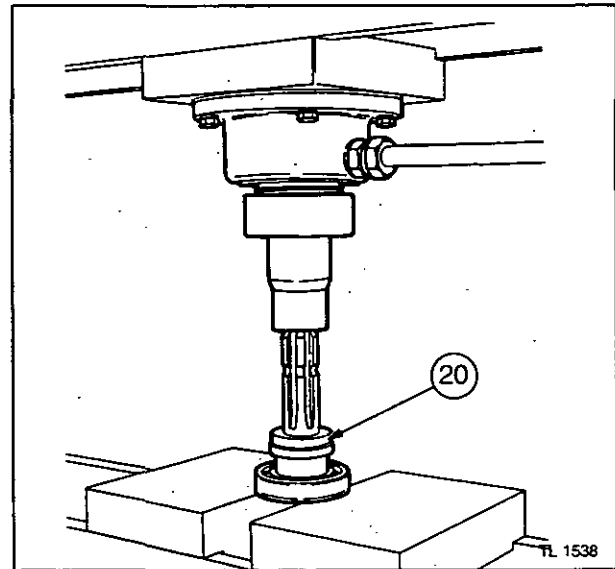
9A-12

SINGLE-SPEED POWER TAKE-OFF

18. The special tool MF.484 will press the seal into the correct depth of 3 mm.
19. Fit a new 'O' ring.



20. Using a hydraulic press, press the new ball-bearing onto the PTO shaft.
21. Fit a new snap ring and ensure that it locates correctly in its groove.
22. Slide the PTO shaft into the rear axle, taking care to keep it horizontal to align with the internal splines.
23. Liberally apply petroleum jelly to the internal ribs of the seal prior to assembly.
24. Align the oil seal housing so that the two cut-outs on each side of the housing are vertical.
25. Push the seal housing into the rear axle and onto the shaft.
26. Reverse procedures 1 to 10 except:
 - a. Tighten the four check chain bracket nuts to a torque of 140 Nm (104 lbf ft)
 - b. Tighten the two nuts retaining the drawbar bracket to the check chain bracket to a torque of 245 Nm (180 lbf ft).



TWO-SPEED POWER TAKE-OFF
(540/1000 rev/min)

Section 9 – Part B

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Specification

540 rev/min PTO speed	1893 engine rev/min
540 rev/min PTO shaft:	
No. of splines	6
Outside diameter	34,93 mm (1.375 in)
1000 rev/min PTO speed	1900 engine rev/min
Engine to PTO shaft ratio	1.9:1 (20T drives 38T)
1000 rev/min PTO shaft:	
No. of splines	21
Outside diameter	34,93 mm (1.375 in)

Bolt Torques

Nuts, rear seal retainer to centre housing	113-169 Nm (83-125 lbf ft)
Nuts, rear seal retainer to drawbar	230-260 Nm (170-192 lbf ft)

Special Tools

MF.168	Seal remover
MF.195C	Bearing remover/replacer (main tool)
MF.195-5B	PTO bearing remover/replacer
MF.195-6B	PTO needle bearing remover/replacer
MF.364A	Seal replacer
MF.474	PTO seal guide and installer
MS.550	Universal handle

General Description**Two Speed Power Take-off (Fig. 1)
(540 and 1000 rev/min Mechanical)**

The PTO shaft projects from the rear of the tractor. It is supported at the rear by a ball bearing and at the front by a needle roller bearing housed in the end of the hydraulic pump drive shaft. Two separate PTO shafts are provided, a 540 rev/min drive shaft and a 1000 rev/min drive shaft. When the 1000 rev/min shaft is fitted the splines on the front end of the shaft locate in a 1000 rev/min gear which is connected to the hydraulic pump drive shaft by a sliding coupler, operated by a selector lever.

When the 540 rev/min PTO shaft is fitted, the splines which are located further back along the shaft engage with a 540 rev/min gear situated behind the 1000 rev/min drive gear. When the sliding coupler is engaged the drive passes through the 1000 rev/min gear and a pair of idler reduction gears mounted on the rear axle pinion shaft. The reduction gears then drive the 540 rev/min gear and the PTO shaft.

To prevent oil loss when changing shafts a tube is fitted in the centre housing.

**Two Speed Power Take-off (Fig. 2)
(540 and 1000 rev/min IPTO)**

Two speed Independent Power Take-Off (IPTO) allows the operator to select 540 or 1000 rev/min PTO by changing shafts in addition to the benefits of the basic IPTO design.

The principal components of the two speed IPTO comprise a hydraulically operated multi-plate clutch, a spool type control valve and linkage operated by hand lever, a reduction idler mounted on the rear axle pinion shaft and the corresponding 540 or 1000 rev/min shafts.

The IPTO clutch is located immediately to the rear of the linkage pump and is driven from the input shaft to the high-flow linkage pump. This shaft is driven from the cover

of the split torque transmission clutch by the PTO input pinion and constant mesh gear.

The rear shaft of the linkage pump is splined into a central hub inside the IPTO clutch, seven splined plates are splined onto the hub. Seven corresponding hardened steel interplates are splined into the casing of the clutch drum. The 1000 rev/min gear is attached to the clutch drum.

The 1000 rev/min gear is in constant mesh with a reduction idler gear, mounted on needle roller bearings on the rear axle pinion, which drives the 540 rev/min gear.

If the operator wishes to use the 1000 rev/min PTO drive he inserts the 1000 rev/min shaft to engage with the 1000 rev/min gear.

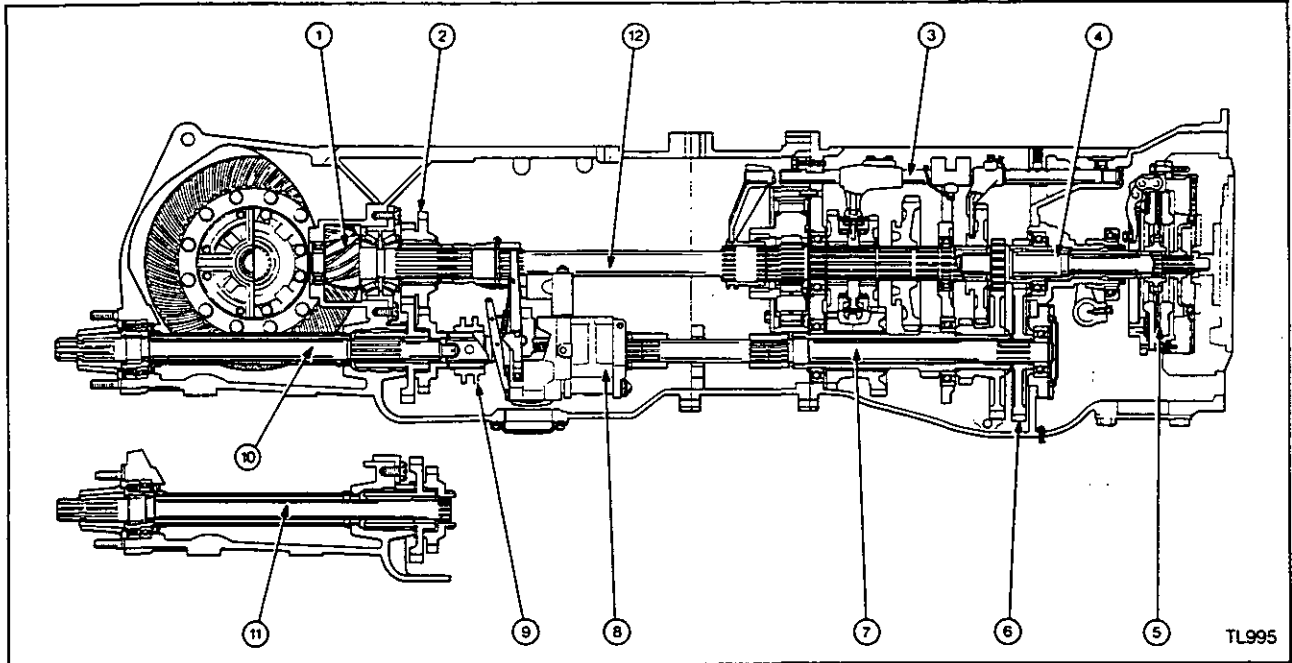
The 540 rev/min PTO is engaged by removing the 1000 speed shaft and inserting the 540 shaft which engages with the 540 gear. A tube inside the centre housing prevents loss of oil during shaft changes.

Moving the operating lever to the engaged position forces the driving and driven plates together by means of a piston assembly operated by oil from the auxiliary pump.

If the 1000 rev/min shaft is fitted, the drive is direct from the clutch. If the 540 shaft is fitted, the drive is via the reduction idler.

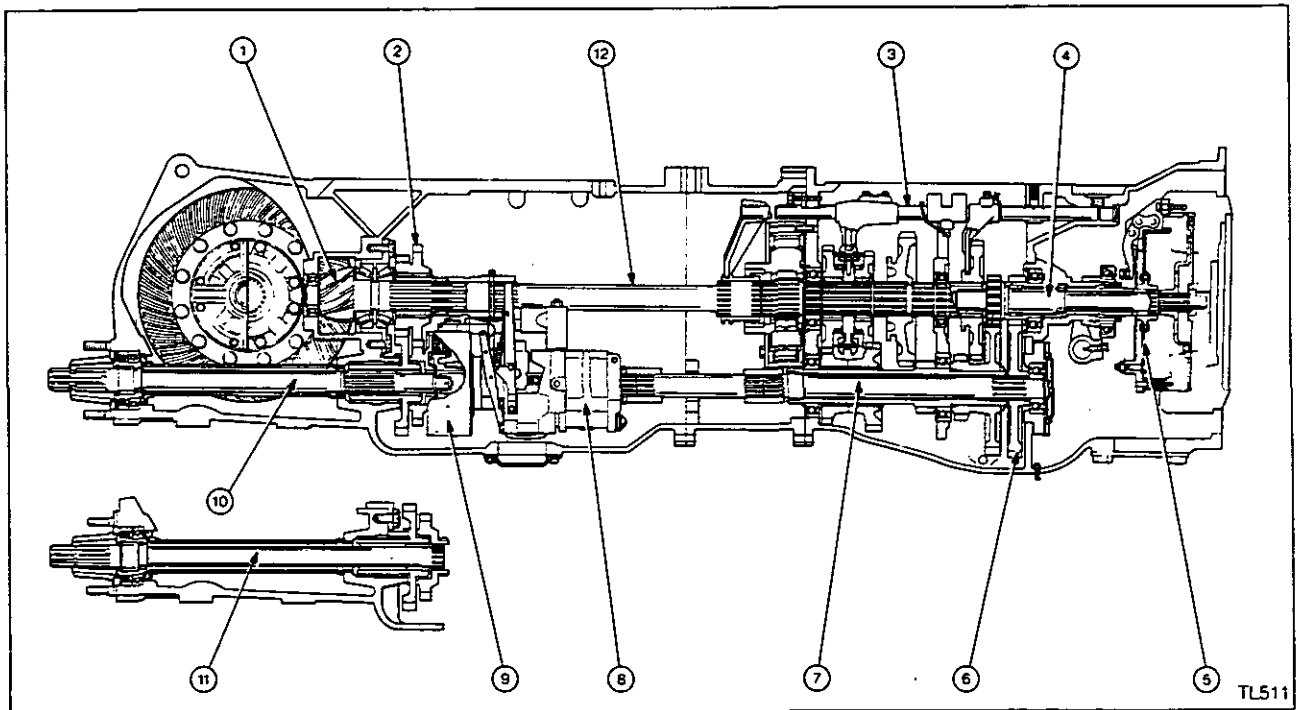
Moving the lever to the neutral position, allows the plates to disengage, and applies a brake to the outside of the clutch drum to prevent oil drag rotating the PTO shaft.

TWO SPEED POWER TAKE-OFF



- | | |
|----------------------------|------------------------------|
| 1. Pinion | 7. PTO layshaft |
| 2. Idler gears | 8. Lift pump |
| 3. Gearbox | 9. PTO coupler |
| 4. PTO input shaft | 10. PTO shaft (540 rev/min) |
| 5. PTO drive plate | 11. PTO shaft (1000 rev/min) |
| 6. PTO constant mesh gears | 12. Rear axle drive shaft |

Figure 1. Live power take-off (Two speed)



- | | |
|----------------------------|------------------------------|
| 1. Pinion | 7. PTO layshaft |
| 2. Idler gears | 8. Lift pump |
| 3. Gearbox | 9. PTO coupler |
| 4. PTO input shaft | 10. PTO shaft (540 rev/min) |
| 5. PTO drive plate | 11. PTO shaft (1000 rev/min) |
| 6. PTO constant mesh gears | 12. Rear axle drive shaft |

Figure 2. Independant power take-off (Two speed)

9B-04

TWO SPEED POWER TAKE-OFF

PTO Shaft Oil Seal

Removal and Refitment **9B-01**

Special Tools:

MF 168 Seal remover
MF 364 Seal replacer
MS 550 Universal handle

Removal

1. Drain the centre housing of transmission oil.
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the top or bottom of the control beam as necessary.
5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers and, when necessary, eight spacers.
8. Remove the control beam bracket or the check chain anchor bracket.
9. Remove the seal housing plate.
10. Withdraw the oil seal housing by screwing on the PTO cap and pulling it out of the centre housing.
11. Remove and discard the 'O' ring.
12. Using MF 168 and MS 550, remove and discard the lip seal and metal shield.

Refitment

13. Press in the new metal shield, lip curving upwards, to the full limit of its travel.
14. Using MF 364, press in the lip seal, lip curving upwards; this will ensure that the lip face of the seal is 1,78 mm (0.070 in) below the edge of the oil seal housing.
15. Fit a new 'O' ring.
16. Fit the oil seal housing with the two flats vertical.
17. Reverse procedures 1 to 8 except: Fit the check chain anchor bracket so that the larger diameter holes are uppermost.

PTO Shaft

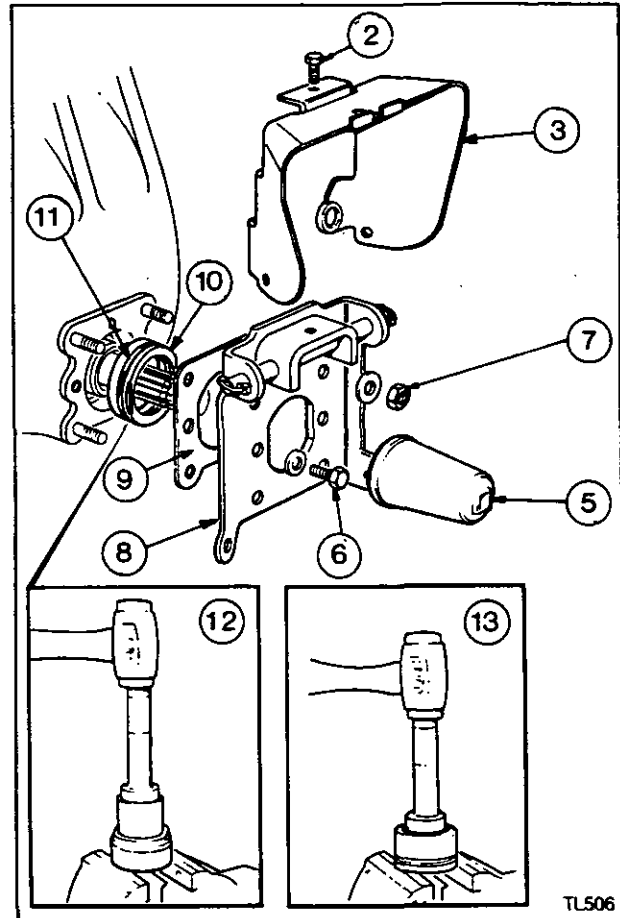
Removal and Refitment **9B-02**

Removal

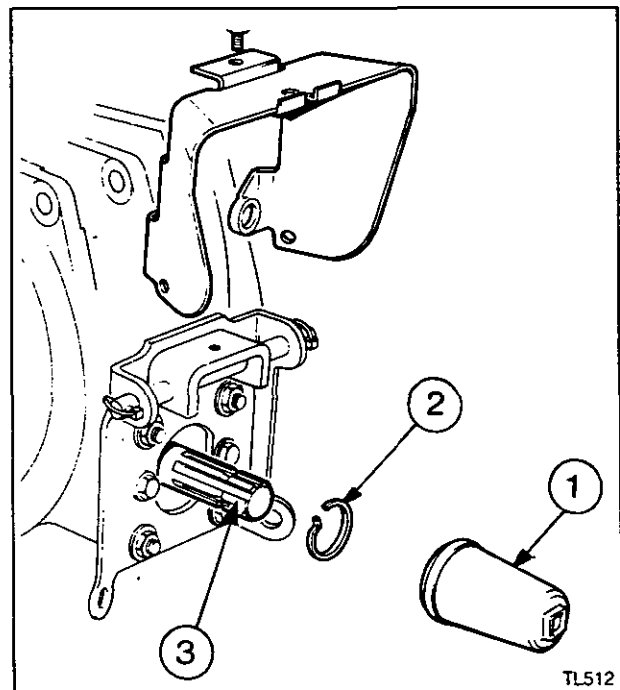
1. Unscrew the PTO cap.
2. Remove the snap ring.
3. Pull the PTO shaft carefully out of the transmission.

Refitment

4. Reverse procedures 1 to 3 except:
 - a. When refitting the PTO shaft, take care to align the splines within the transmission and keep the shaft horizontal. **DO NOT USE EXCESSIVE FORCE.**
 - b. Ensure that the snap ring locates correctly in its groove.



TL506



TL512

PTO Shaft Rear Bearing**Removal and Refitment**

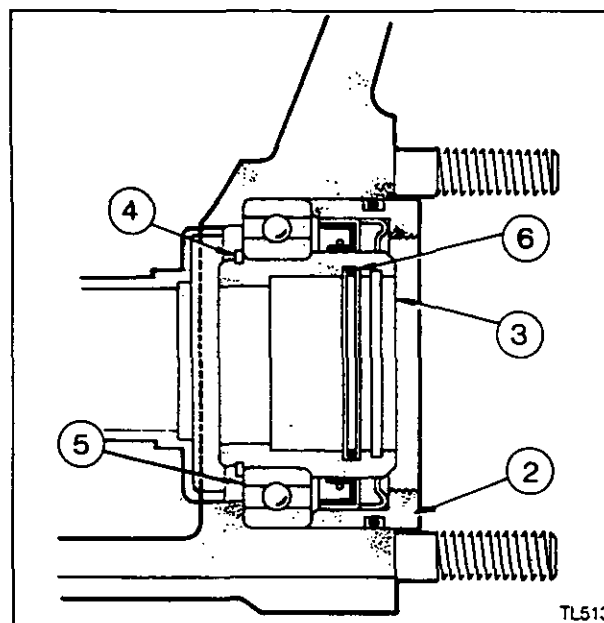
9B-03

Removal

1. Remove the PTO shaft, see operation 9B-02.
2. Remove the seal housing, see operation 9B-01.
3. Remove the bearing and sleeve.
4. Remove the snap ring.
5. Using a length of 60 mm (2 3/8 in) internal diameter tube, drive out the bearing.
6. Remove and discard the 'O' ring.

Refitment

7. Reverse procedures 1 to 6 except:
 - a. Fit a new 'O' ring.
 - b. Ensure that the snap ring locates correctly in its groove.
 - c. Fit the bearing and sleeve assembly, snap ring end first.
 - d. When feeding the PTO shaft into the centre housing, take care to align the splines and keep the shaft horizontal.

**Reduction Gears and Bearings****Removal and Refitment**

9B-04

Special Tools:

- MF 195C Bearing remover/replacer
 MF 195-5B PTO bearing remover/replacer
 MF 195-6B PTO needle bearing remover/replacer

Removal

1. Split the tractor between the rear centre housing and the spacer housing, see operation 2A-04 or 2B-05.
2. Remove the left-hand trumpet housing and differential unit, see operation 8A-06.
3. Remove the PTO shaft, see operation 9B-02.
4. Remove the hydraulic linkage pump, see operation 12A-12.

Non IPTO Tractors

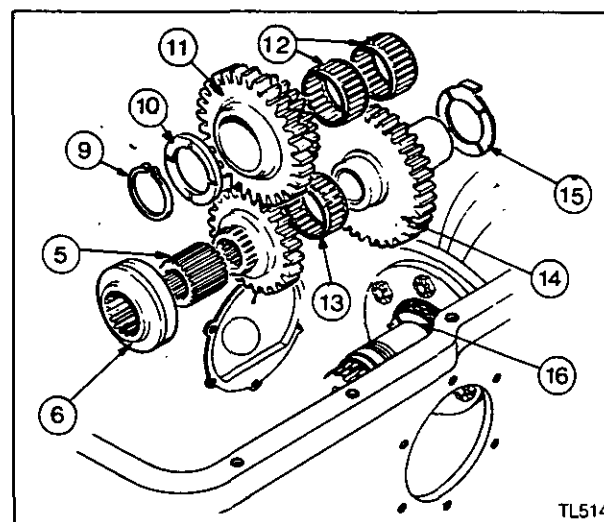
5. Remove the splined hub from the hydraulic lift pump shaft.
6. Remove the shift collar from the hydraulic lift pump shaft.
7. Remove the PTO drive gear.

Tractor with IPTO

8. Remove the IPTO clutch unit.

All Tractors

9. Remove the pinion shaft retaining ring.
10. Remove the outer thrust washer.
11. Remove the compound reduction gear.
12. Remove the two caged needle bearings.

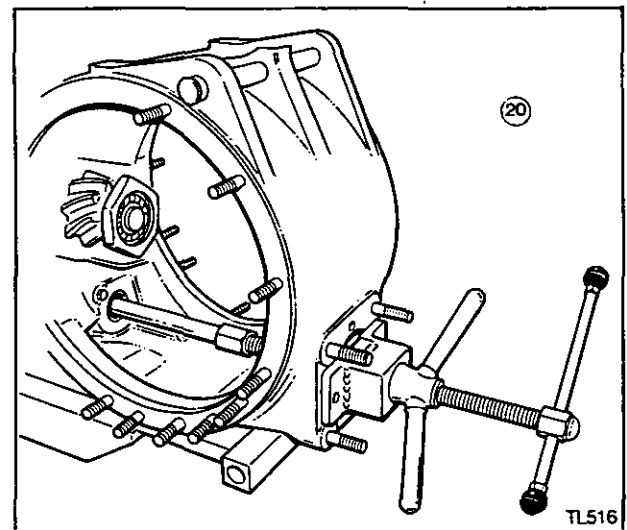
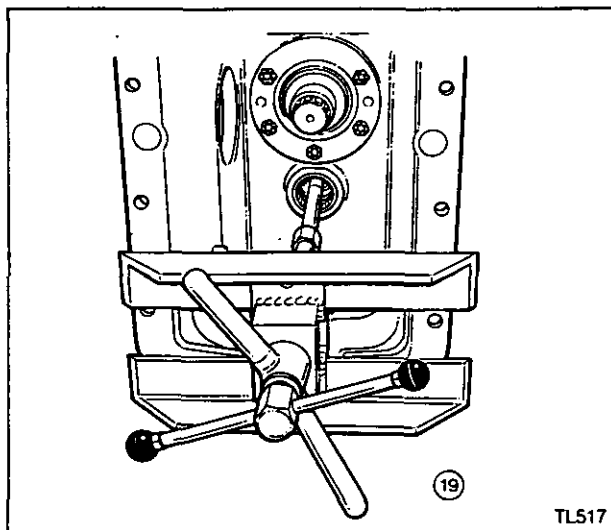
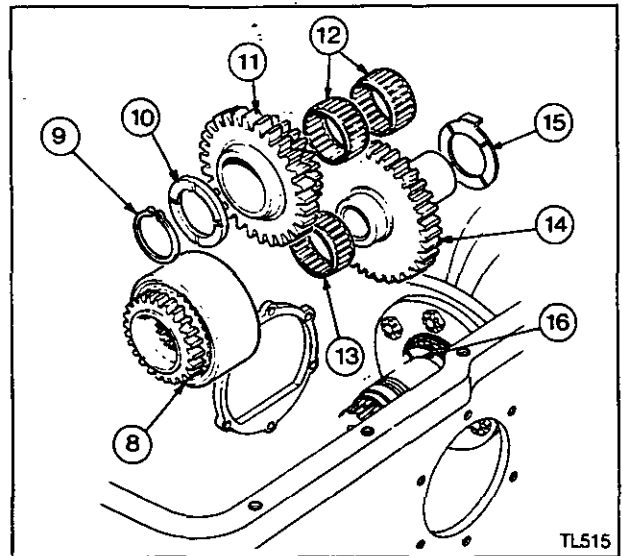


TWO SPEED POWER TAKE-OFF

13. Remove the drive PTO gear needle bearing.
14. Remove the driven PTO gear.
15. Remove the tabbed thrust washer.
16. Remove the inner thrust washer if necessary.
17. Remove the shaft bearing, see operation 9B-03.
18. Drive out the PTO shaft guide tube.
19. Using MF 195C, main puller, MF 195-5A/2, extension rod, and MF 195-6A/1, collet, in conjunction with two pieces of angle iron, pull out the two needle bearings and spacer from the centre housing.

Refitment

20. Using MF 195C, main puller, MF 195-5A/2, extension rod, and MF 195-6/4 (longer end from collar), pull in one needle bearing, NO PART NUMBER END first, up to the collar. Feed in the spacer. Reverse MF 195-6/4 (shorter end from collar) and pull in the second needle bearing; 2 mm (0.080 in) from the front face of the chamfer. This will ensure a clearance of 0,25 mm (0.010 in) between the spacer and the two needle bearings.
21. Press in the PTO shaft guide tube until its rear end is no more than 1,5 mm (0.060 in) past the shaft bearing recess.
22. Reverse procedures 1 to 17 except:
 - a. Ensure that the retaining ring locates correctly in its groove.
 - b. When fitting the linkage pump ensure that the needle roller bearing, in the rear end of the camshaft, is in good condition.



Left-Hand PTO Side Cover**Removal and Refitment**

9B-05

Removal

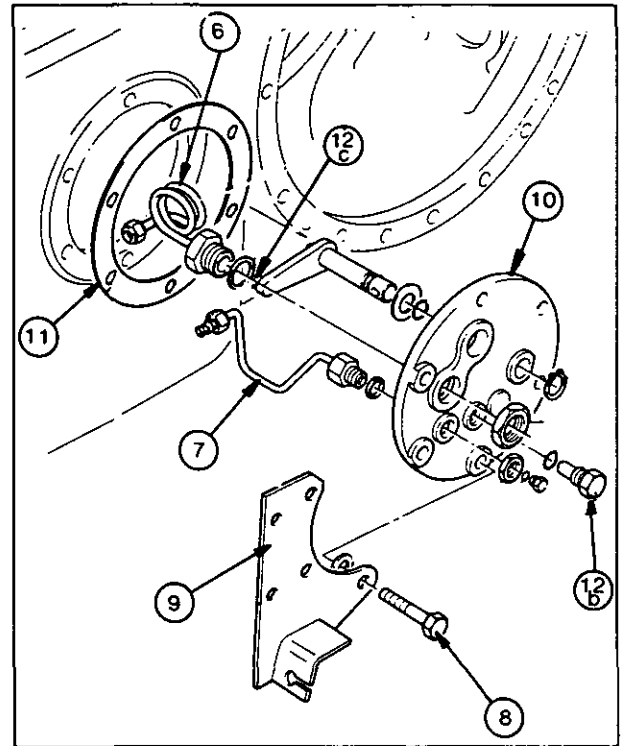
1. Drain the transmission oil to the LOW mark on the dipstick.
2. Remove the brake actuator, see operation 8B-01.
3. Remove the auxiliary hydraulic pipes from the side cover.
4. Disconnect the PTO selector rods from the PTO selector lever.

Tractors with IPTO

5. Remove the lift cover, see operation 12A-03 or 12A-04.
6. Disconnect the hydraulic feed pipe between the side cover and the IPTO clutch inside the centre housing.
7. Disconnect the pressure test pipe between the side cover and the IPTO clutch.

All Tractors

8. Remove the six bolts.
9. Remove the parking brake cable anchor plate.
10. Remove the side cover.
11. Remove and discard the gasket.

**Replacement**

12. Reverse procedures 1 to 9 except:
 - a. Fit new gaskets and sealing rings.
 - b. Ensure that the side cover dowel locates in the jaw in the IPTO control valve body.
 - c. Ensure that the selector lever locates in the cut-out in the IPTO control valve spool, or in the shift collar (mechanical PTO).
 - d. Seal the six side cover bolts with Hylomar sealant.

Left-Hand PTO Side Cover (Mechanical)**Overhaul**

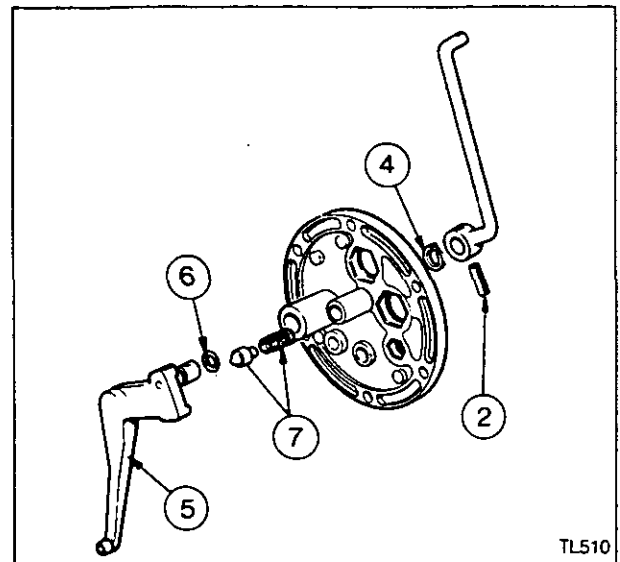
9B-06

Disassembly

1. Remove the side cover, see operation 9B-05.
2. Drift out and discard the roll pin.
3. Remove the PTO lever.
4. Remove the circlip.
5. Remove the shift lever.
6. Remove and discard the 'O' ring.
7. Remove the detent plunger and spring.

Reassembly

8. Reverse procedures 1 to 7 except:
 - a. Fit a new 'O' ring.
 - b. Fit a new roll pin.



TL510

9B-08

TWO SPEED POWER TAKE-OFF

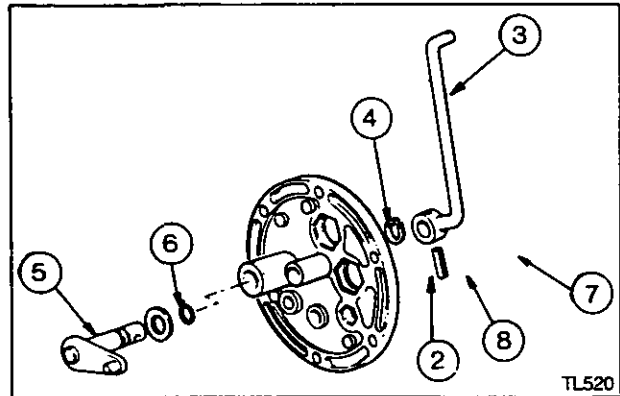
Left-Hand PTO Side Cover (IPTO)

Overhaul

9B-07

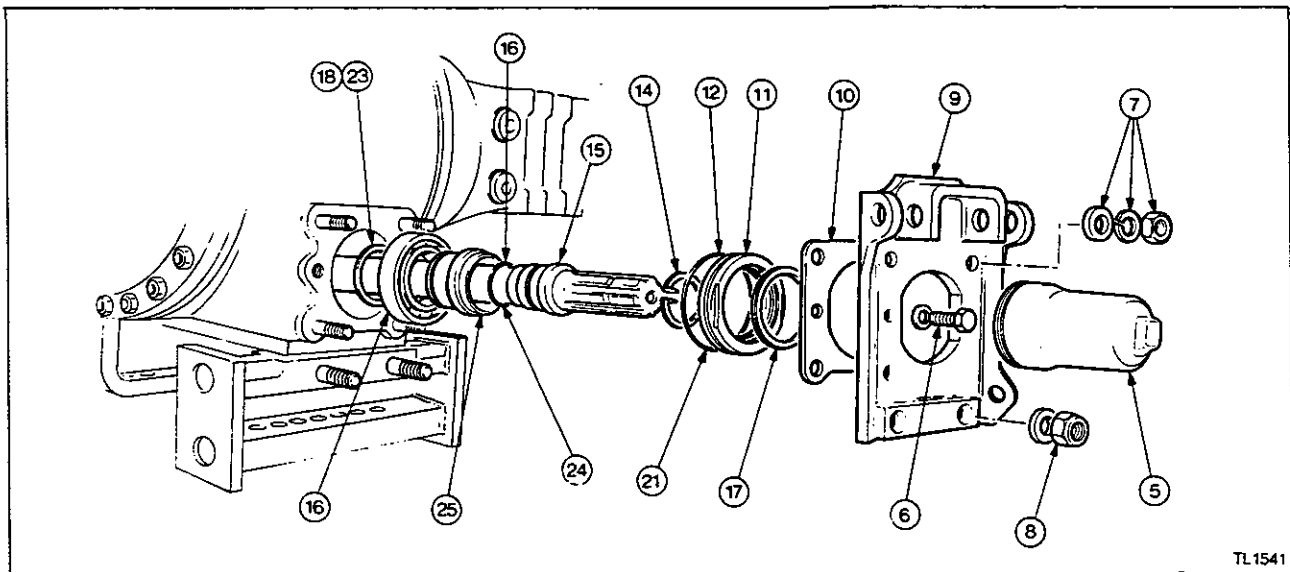
Disassembly

1. Remove the side cover, see operation 9B-05.
2. Drift out and discard the roll pin.
3. Remove the PTO lever.
4. Remove the circlip.
5. Remove the clutch IPTO actuating lever.
6. Remove and discard the 'O' ring.
7. Remove the IPTO clutch control valve locating pin.
8. Remove and discard the 'O' ring.



Reassembly

9. Reverse procedures 1 to 8 except:
 - a. Fit new 'O' rings.
 - b. Tighten the IPTO clutch control valve locating pin to a torque of 16 Nm (12 lbf ft).
 - c. Ensure that the circlip locates correctly in its groove.
 - d. Fit a new roll pin.



PTO Shaft, Bearing and Oil Seal

Removal and Refitment

9B-08

Special Tools:

MF168 Seal remover

MF364A Seal replacer

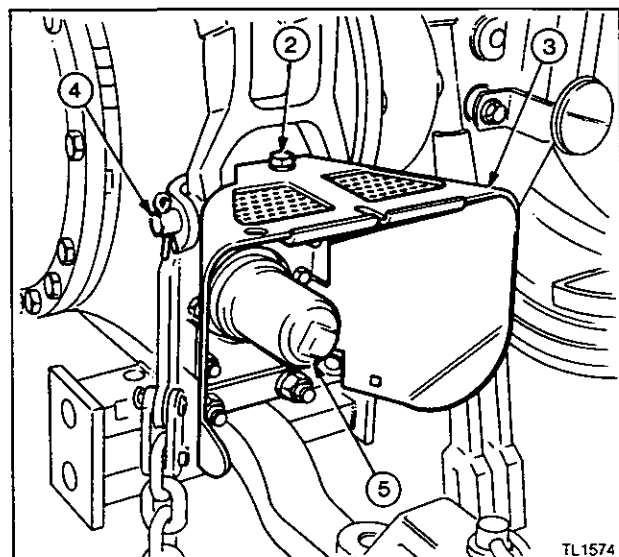
MF474 PTO Seal guide and installer

MS550 Universal handle

Tractors serial No. P38331 onwards.

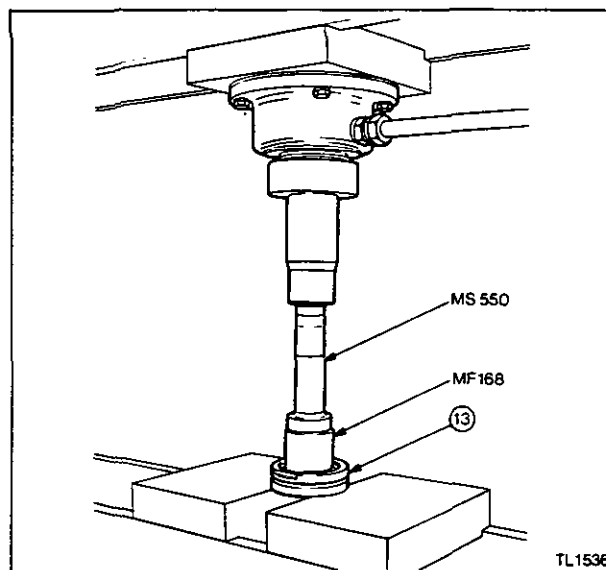
Removal

1. Place a drip tray under the rear PTO.
2. Remove the bolt.
3. Remove the PTO sheild.
4. Detach the bottom of the control beam.
5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers and spacers.
8. Remove the two nuts from the drawbar bracket.



TWO SPEED POWER TAKE-OFF

9. Remove the control beam/check chain bracket.
10. Remove the seal housing plate.
11. Remove the oil seal housing and shaft by screwing on the PTO cap and pulling the cap, withdrawing them from the centre housing.
12. Remove and discard the 'O' ring.
13. Using MF 168 and handle MS 550 press the lip seal out of the housing.
14. Remove the snap ring.
15. Withdraw the PTO shaft from the bearing sleeve.
16. Remove and discard the 'O' ring.
17. Remove the triple lip dirt seal from the bearing sleeve and discard.
18. Remove the snap ring.
19. Using a length of 60 mm (2 3/8 in) internal diameter tube, drive the bearing off the sleeve

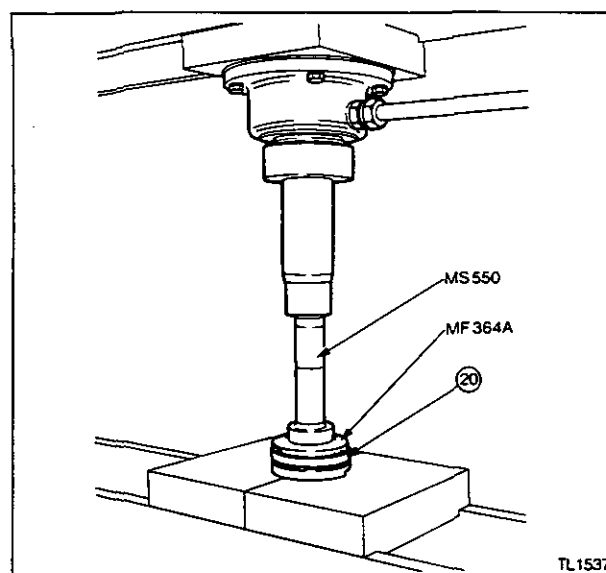


Refitment

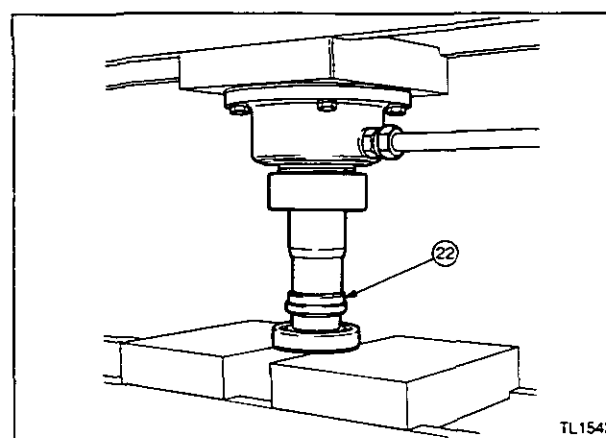


Caution: To ensure leak proof installation of the rear PTO oil seal assembly, special service tools MF 364A and MF 474 MUST be used as described below.

20. Using MF 364A and MS 550 press in the lip seal with the lip towards the tool; this will ensure that the lip face of the seal is 1 mm (0.039 in) below the edge of the oil seal housing.
21. Fit a new 'O' ring.



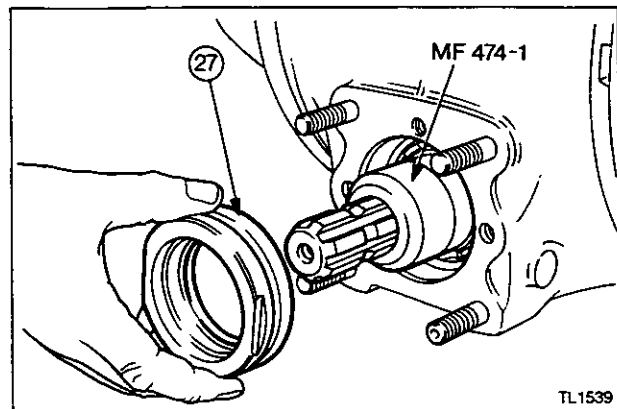
22. Using a hydraulic press, press the new ball bearing onto the bearing sleeve.
23. Fit a new snap ring and ensure that it locates correctly in its groove.
24. Fit a new 'O' ring to the PTO shaft and coat with general purpose grease.
25. Fit the PTO shaft to the bearing sleeve and replace the snap ring.
26. Slide the PTO shaft into the centre housing, taking care to keep it horizontal to align the internal splines.



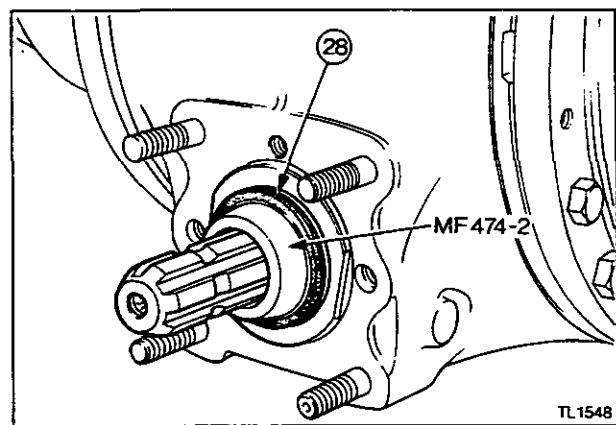
9B-10

TWO SPEED POWER TAKE-OFF

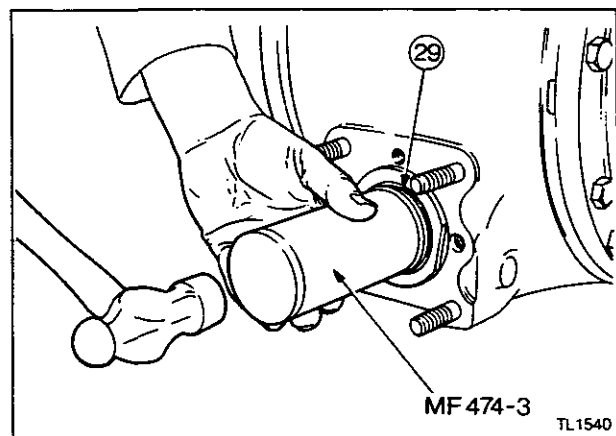
27. Place MF 474-1 seal guide on the PTO shaft, and fit the oil seal housing so the two flats are vertical.



28. Place seal guide MF 474-2 onto the PTO shaft, coat the triple lip dirt seal liberally with general purpose grease and slide it down the PTO shaft and onto the seal guide. The internal radiused edge of the seal must lead onto the shaft.



29. Drive the seal into place on the shaft using MF 474-3 seal installer until it comes in contact with the shoulder.
30. Reverse procedures 1 to 9 except:
- Tighten the four retaining nuts with spacers to a torque of 113-169 Nm (83-125 lbf ft).
 - Tighten the two nuts retaining the drawbar bracket to the check chain bracket to a torque of 230-260 Nm (170-192 lbf ft).



PTO Shaft and Cassette Oil Seal**Removal and Refitment**

9B-09

*Special tools:**MF.168 PTO Seal Remover**MF.484 PTO Cassette Seal Installer**MS.550 Universal Handle*

The cassette-type oil seal was introduced on tractors from serial number B21005, May 1993.

Removal

CAUTION: To ensure a leak-proof installation of the rear PTO seal, special service tool MF.484 **MUST** be used to install the seal.

1. Place a drip tray under the rear PTO.

Standard PTO

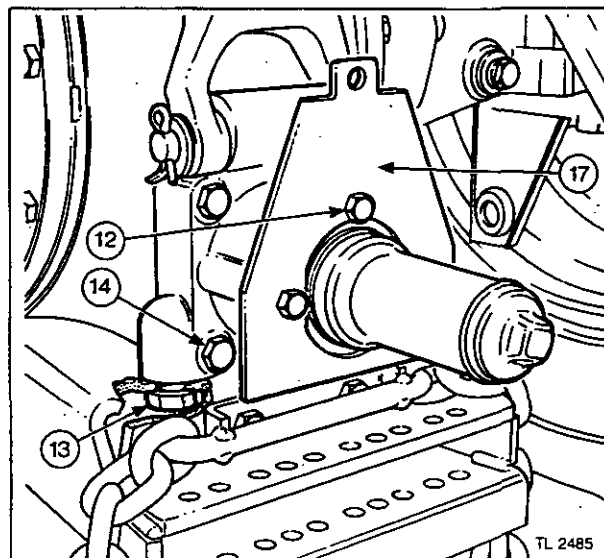
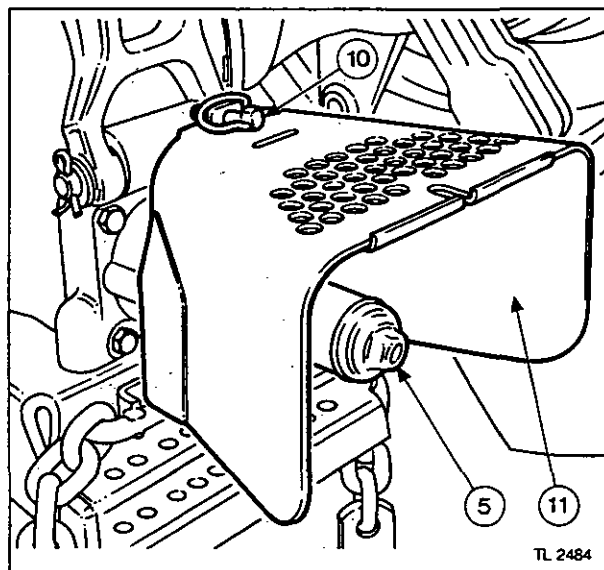
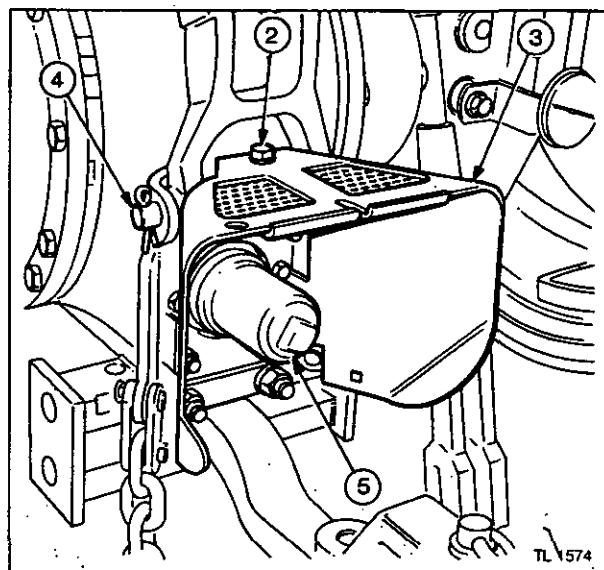
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the bottom of the control beam.
5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers, spacers and tab washers if fitted.
8. Remove the two nuts from the drawbar bracket.
9. Remove the control beam/check chain bracket.

Extended PTO

10. Remove the linchpin.
11. Remove the PTO shield.
12. Remove the three bolts.

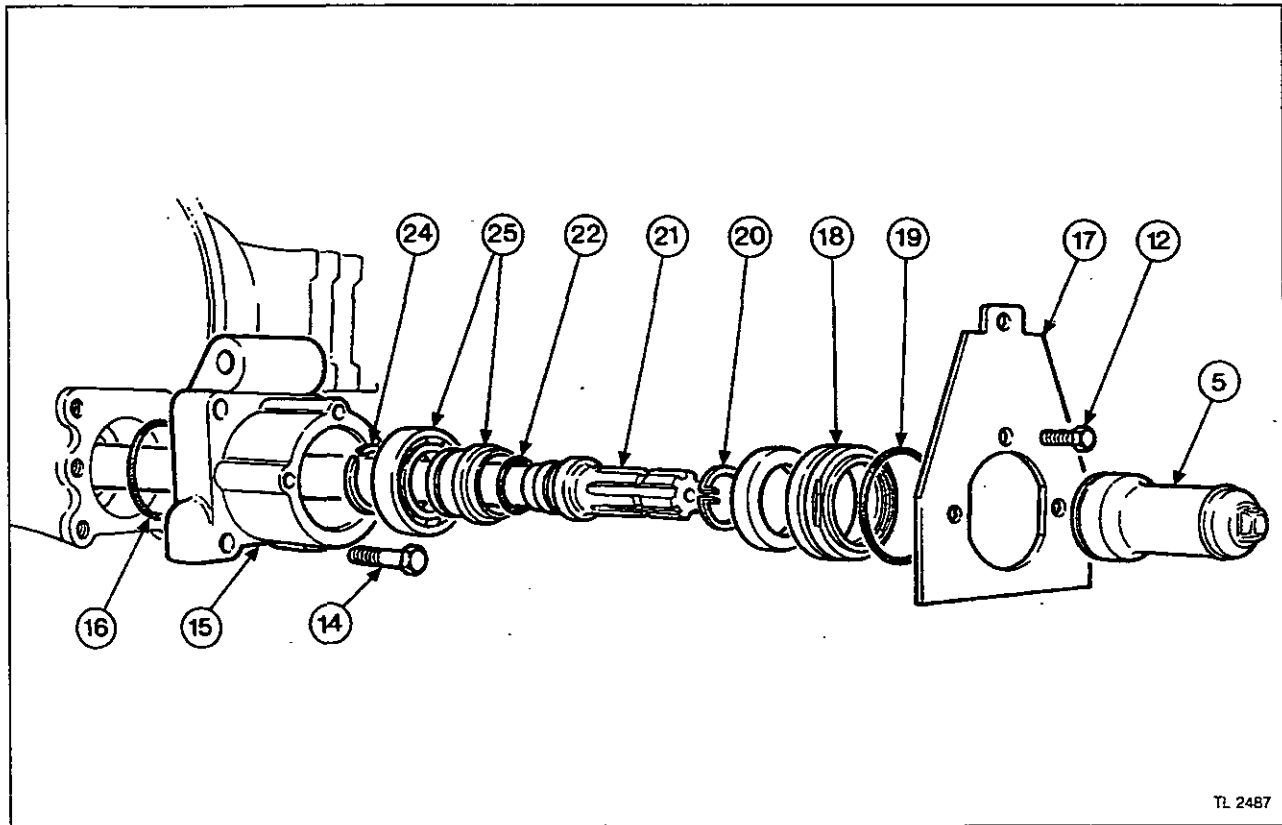
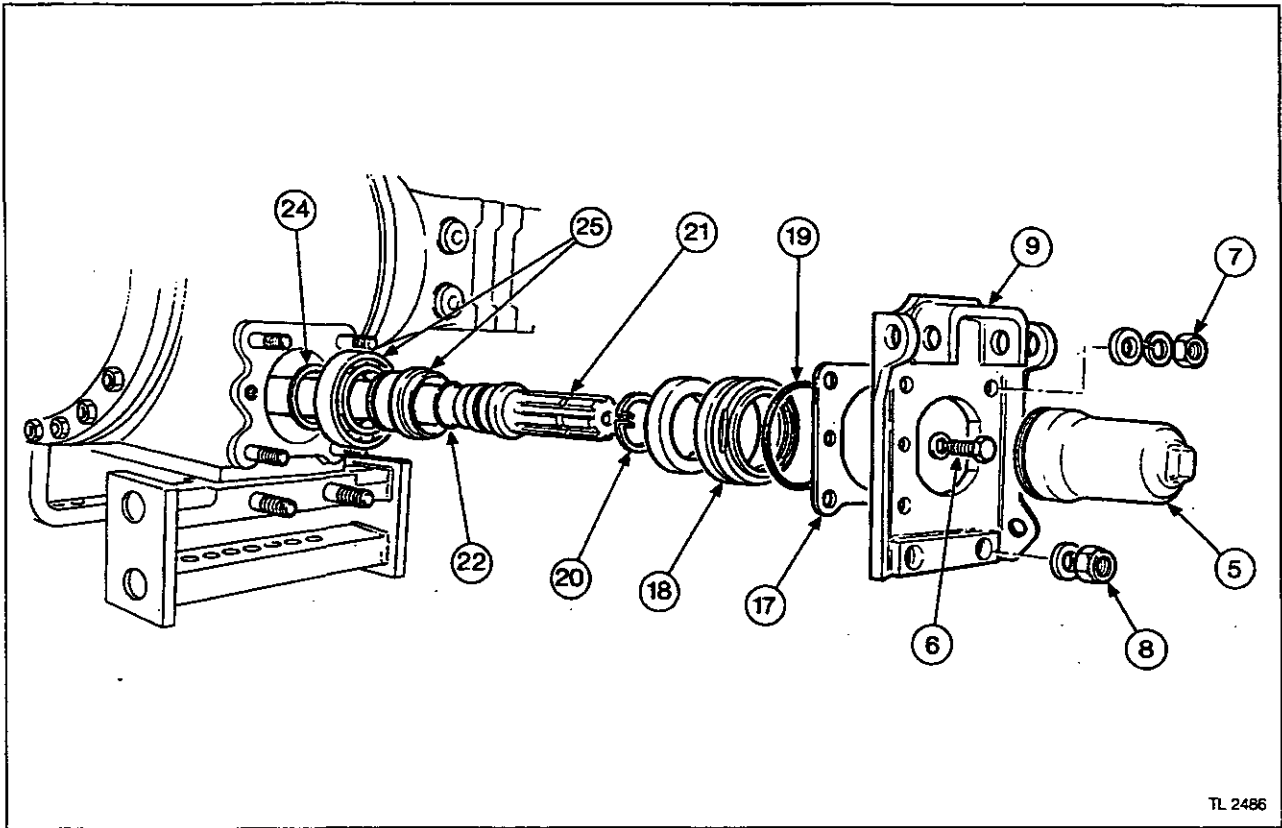
If it is necessary to remove the extension housing proceed as follows:-

13. Remove the two bolts securing the drawbar to the housing.
14. Remove the four bolts securing the housing to the rear axle.



9B-12

TWO-SPEED POWER TAKE-OFF

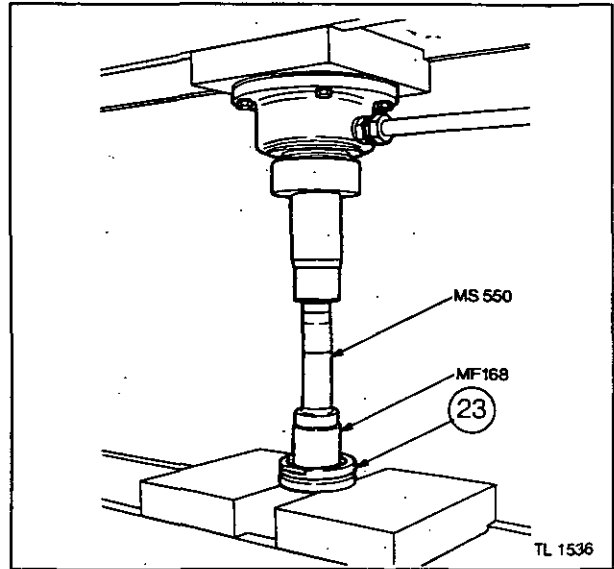


9B-13 TWO-SPEED POWER TAKE-OFF

15. Remove the extension housing.
16. Remove and discard the 'O' ring.

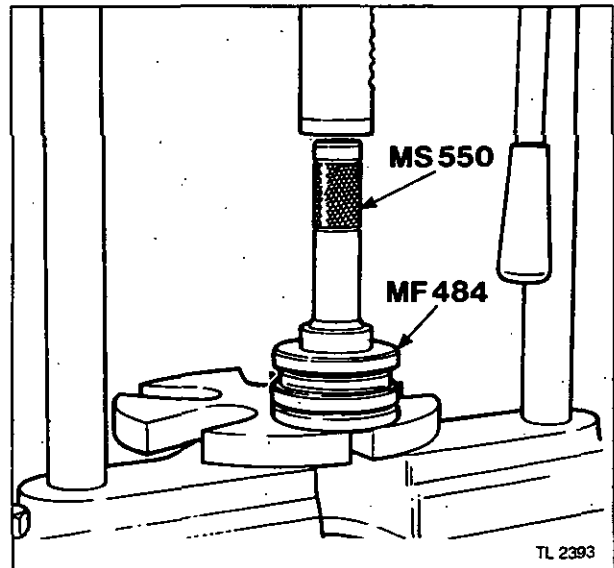
All models

17. Remove the seal housing retainer plate.
18. Remove the oil seal housing by screwing on the PTO cap and pulling the cap, withdrawing the housing from the rear axle.
19. Discard the 'O' ring.
20. Remove the snap ring.
21. Withdraw the PTO shaft from the bearing sleeve.
22. Remove and discard the 'O' ring.
23. Using special tool MF.168 and handle MS.550 press the cassette seal out of the housing and discard.
24. Remove the snap ring.
25. Using a press, push the sleeve out of the bearing.

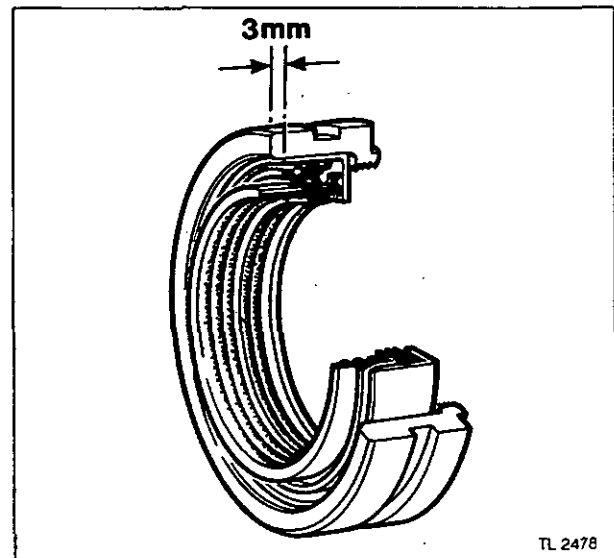


Refitment

26. Using special tool MF.484 and handle MS.550 press the new cassette seal into the oil seal housing as shown in the illustration.



27. The special tool MF.484 will press the seal into the correct depth of 3 mm.
28. Fit a new 'O' ring.



9B-14

TWO-SPEED POWER TAKE-OFF

29. Using a hydraulic press, press the new ball-bearing onto the sleeve.
30. Fit a new snap ring and ensure that it locates correctly in its groove.

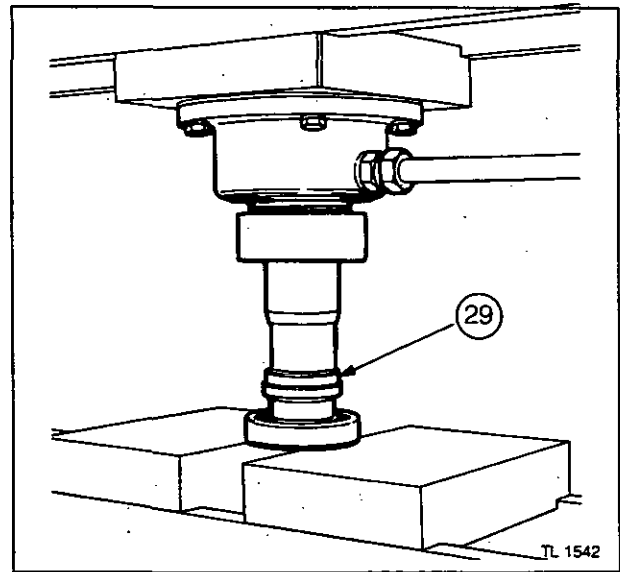
Extended PTO

If the extension housing has been removed proceed as follows:-

31. Replace the 'O' ring.
32. Refit the housing and tighten the four bolts (14) to a torque of 160 Nm (118 lbf ft).
33. Apply Massey Ferguson Lock and Seal (Loctite 242) to the two drawbar bolts (13) and tighten to a torque of 400 Nm (295 lbf ft).

Shaft and seal refitment

34. Slide the PTO bearing and sleeve into the rear axle.
35. Liberally apply petroleum jelly to the internal ribs of the seal prior to assembly.
36. Align the oil seal housing so that the two cut-outs on each side of the housing are vertical.
37. Push the seal housing into the rear axle and onto the sleeve.
38. Replace the 'O' ring on the PTO shaft.
39. Slide the PTO shaft into the rear axle, taking care to keep it horizontal to align the internal splines.
40. Replace the PTO shaft snap ring.
41. Reverse procedures 17 and 1 to 12 except:
 - a. Tighten the two nuts retaining the drawbar bracket to the check chain bracket to a torque of 245 Nm (180 lbf ft).
 - b. Tighten the four check chain retaining nuts with spacers or tab washers to a torque of 140 Nm (104 lbf ft).



INDEPENDENT POWER TAKE-OFF CLUTCH**INDEPENDENT POWER TAKE-OFF CLUTCH
(540/1000 rev/min)****Section 9 – Part C**Table of Contents

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—	General Description	2
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9C-02	IPTO Clutch unit – Removal	4
9C-03	IPTO Clutch unit – Overhaul	5
9C-04	IPTO Control Valve – Removal	6
9C-05	IPTO Control Valve – Overhaul	6
9C-06	IPTO Control Valve – Pressure Setting	7
9C-07	IPTO Brake unit – Removal	8
9C-08	IPTO Brake unit – Overhaul	8

INDEPENDENT POWER TAKE-OFF CLUTCH

Specification

Type	Multi-plate
Size	127 mm (5 in)
Operation	Hydraulic
No of Friction Discs	7
Thickness	2,41 to 2,54 mm (0.095-0.100 in)
Max permissible dish	0,127 mm (0.005 in)
Groove depth	0,152 to 0,227 mm (0.006-0.009 in)
No of Steel plates	7
Max permissible dish	0,254 mm (0.010 in)
Thickness	1,35 to 1,45 mm (0.053-0.057 in)
No of Springs	7
Type	Wavy strip
Free height	5,21 mm (0.205 in)
Tolerance	0,51 mm (0.020 in)
Retainer plate to retainer ring	
Clearance	2,54 to 3,05 mm (0.100-0.120 in)
Load	63 kgf (140 lbf)
Clutch operating pressure	
Single Speed	15.5 to 19 bar (225-275 lbf/in ²)
Two Speed	12 to 15.5 bar (175-225 lbf/in ²) (see note page 9C-03)
Engine Speed	1200 rev/min
Brake operating pressure (PMV)	
3 cylinder engines	17 bar (250 lbf/in ²)
4 cylinder engines	19 bar (275 lbf/in ²)
Sealing ring gap control valve to clutch unit	0,050 to 0,305 mm (0.002-0.012 in)

Special Tools

MF 3001 Pressure Test Kit

Bolt Torques

Brake cylinder to Control Valve 7 Nm (5 lbf ft)

**General Description
Clutch**

The principal components of the IPTO feature are a hydraulically operated multi-plate clutch, a spool type control valve and valve actuating linkage moved by a hand lever on the left side of the tractor.

The IPTO clutch is located immediately to the rear of the linkage pump and is driven from the input shaft. This shaft is driven from the cover of the split torque transmission clutch through the PTO constant mesh gears in the gearbox.

The rear shaft of the linkage pump is splined into a central hub inside the IPTO clutch, seven sintered plates are splined onto the hub. Seven corresponding hardened steel interplates are splined into the casing of the clutch drum. The 1000/rev/min gear is attached to the clutch drum and splined into the PTO shaft.

Rotation of the power take-off shaft occurs when the driving (sintered) and driven plates are forced into engagement by a piston assembly, operated by oil from the low pressure element of the dual pump.

The spool type control valve is located on the IPTO clutch and has two operating settings selected by the hand lever. Moving the lever to the engaged position allows the control valve to direct oil into the gallery around

the input shaft and seat the ball valve. Thereafter oil passes through the fixed orifice to move the piston plates. Use of the fixed orifice and Belleville spring ensures that clutch engagement occurs gradually.

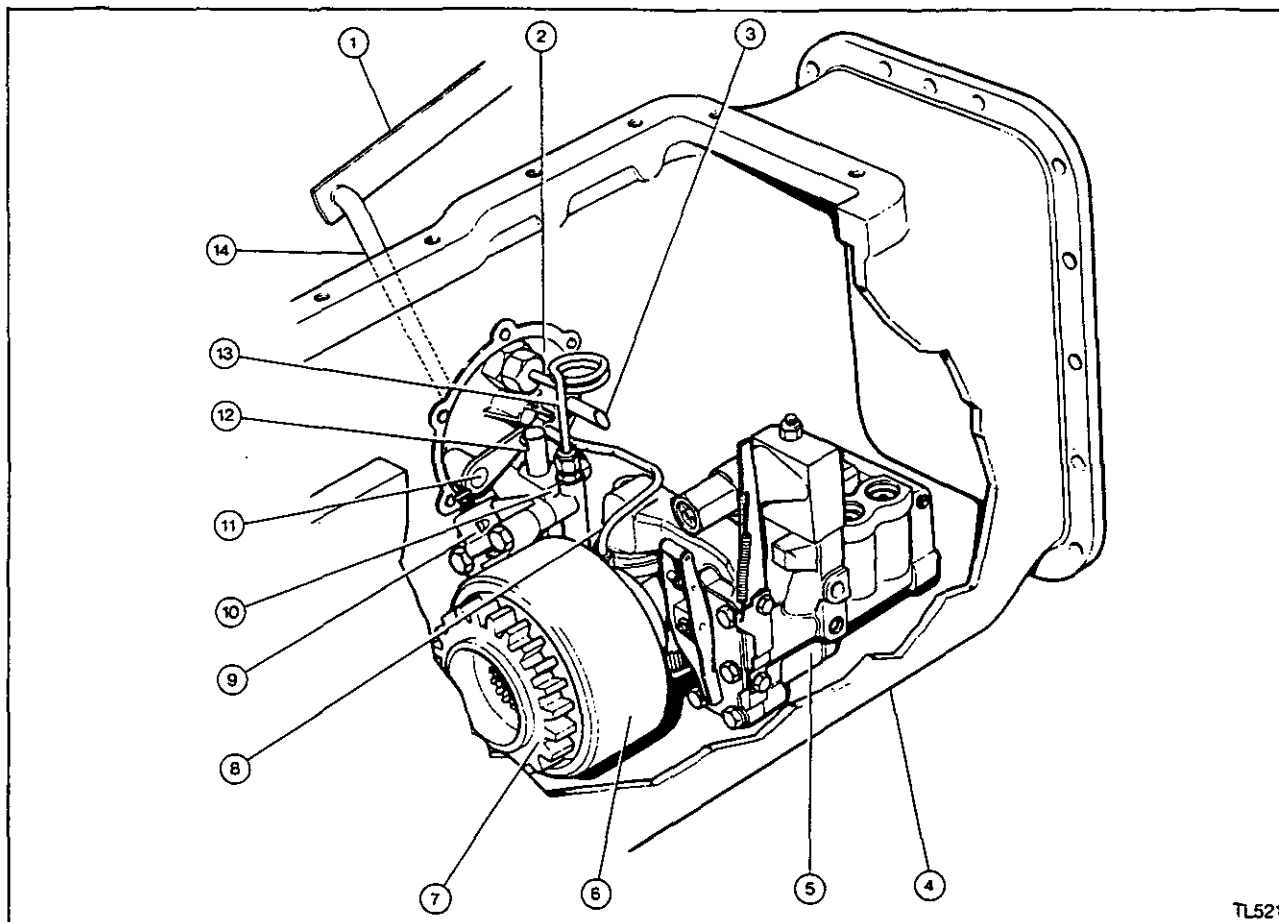
Moving the lever to neutral shifts the control valve to neutral allowing oil to return from behind the piston and thereby disengaging the clutch. The drop in pressure unseats the ball valve and the expansion of the belleville spring and other springs located between the clutch plates ensures a fast return oil flow and rapid disengagement of the clutch.

Whilst these events are taking place, oil is directed to a brake unit on the outside of the clutch casing. Within the brake the oil moves a piston to force a pad against the casing. Without this action, unwanted rotation of the power take-off shaft would occur in neutral due to slight "drag" between the clutch.

Control Valve

The function of the spool valve is to direct oil to and from the clutch and brake and to control the pressure in the clutch.

INDEPENDENT POWER TAKE-OFF CLUTCH



TL521

- | | |
|----------------------------|-----------------------------------|
| 1. Shift rod | 8. IPTO pressure test pipe |
| 2. Side cover | 9. Brake unit |
| 3. Spool valve return pipe | 10. Control valve |
| 4. Centre housing | 11. Control valve actuating lever |
| 5. Linkage pump | 12. Control valve plunger |
| 6. IPTO clutch unit | 13. Control valve feed pipe |
| 7. PTO drive shaft coupler | 14. IPTO control lever |

The spool type control valve is located on the IPTO clutch unit and has two operating positions selected by a hand lever.

In the engaged position, oil travels down the centre land of the spool and out to the clutch pack. As the pressure builds up at the clutch pack it also acts against the lower face of the spool and moves the spool up against the spring, restricting the oil flow to the clutch and thereby regulating the pressure to 12-19 bar (175-275 lbf/in²), depending upon the type of IPTO fitted.

In the engaged position, oil is also able to return from the brake through the spool and back to sump.

In the neutral position the oil travels up the centre land and out to the brake unit. Oil is able to return from the clutch, down the spool and out to sump.

Hydraulic System

The hydraulic oil for operation of the IPTO clutch is supplied from the steering system. It is regulated to a pressure of 17-19 bar (250-275 lbf/in²), depending on the

size of the tractor, by the pressure maintaining valve (PMV) mounted on the manifold in the engine compartment. This pressure is used to operate the IPTO brake.

Within the IPTO control valve spool is a pressure regulating valve which controls the pressure to the clutch pack. This regulates it to 15.5-19 bar (225-275 lbf/in²), for single speed IPTO, or 12-15.5 bar (175-225 lbf/in²), for two speed IPTO.

Note: From tractor serial No. P19080 manufactured June 1989 the pressure was increased for two speed IPTO to 13.8-17.3 bar (200-250 lbf/in²). This increase in pressure should be incorporated on early tractors when a repair to the clutch is being carried out.

Pressure test points are provided on the PMV manifold to check the main pressure and on the left-hand side cover to check the clutch pressure.

A more detailed explanation on the hydraulic system is found in section 12B.

INDEPENDENT POWER TAKE-OFF CLUTCH

Diagnosis

With the IPTO clutch there are only two types of fault, mechanical or hydraulic. If a mechanical failure occurs it will be necessary to split the tractor between the rear centre housing and the gearbox or spacer to gain access to the clutch and PTO drive assembly for repair.

Before any repairs are made, either mechanical or hydraulic, the following test must be carried out to determine the condition of the hydraulic system:

IPTO Hydraulic Pressure Test

Check 9C-01

Special Tools: MF 3001 Pressure Test Kit

Note: Before carrying out a hydraulic test, clean, fresh transmission oil of the approved grade must fill the centre housing and its temperature must be raised to 50-60°C (120-140°F) by running the hydraulic system under load; this is important as excessively cold or hot transmission oil can effect the pressure gauge readings. The test point is on the left hand side cover.

1. Remove the test point plug on the left-hand side cover.
2. Install M14 male quick release diagnostic coupling.
3. Connect up the 30 bar (400 lbf/in²) pressure gauge and pipe.
4. Start the engine and run to raise the transmission oil temperature to 50-60°C (120-140°F).
5. Engage the PTO and increase the engine speed to 1200 rev/min.
6. With the transmission oil temperature at the specified temperature the pressure gauge should read: 15.5-19 bar (225-275 lbf/in²), single speed IPTO or 12-15.5 bar (175-225 lbf/in²), two speed IPTO.

Note: See note on page 9C-03 regarding pressure of two speed IPTO.

7. Reduce engine speed to idling and disengage the PTO.
8. Stop the engine, remove the gauge and refit the plug to the test port.
9. If the pressure is low, refer to section 12B on auxiliary hydraulics for more details on testing the system.

IPTO Clutch Unit

Removal and Refitment 9C-02

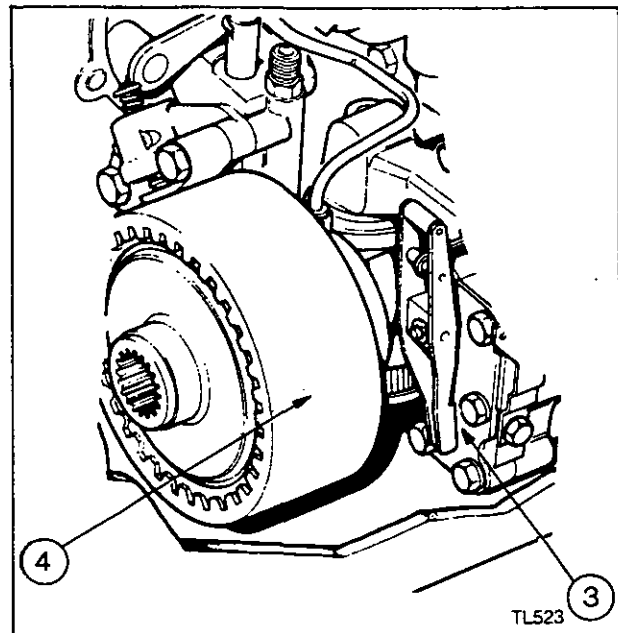
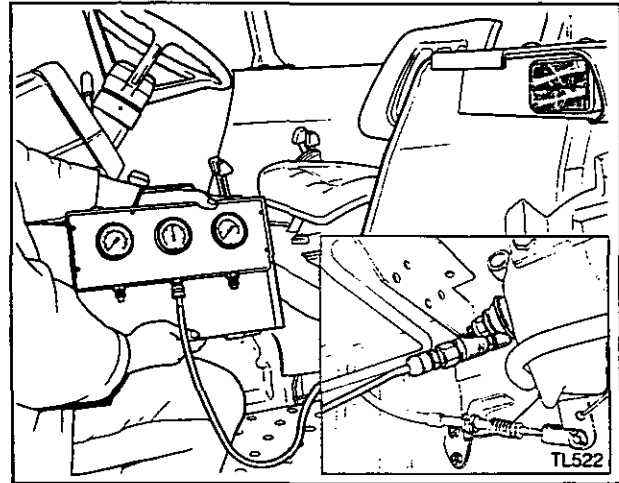
Removal

1. Split the tractor between the rear centre housing and the gearbox or spacer, see operation 2A-04 or 2B-05.
2. Remove the lift cover, see operation 12A-03 or 12A-04.
3. Remove the PTO shaft and hydraulic linkage pump, see operation 9B-02 and 12A-12.
4. Remove the IPTO clutch unit.

Refitment

5. Reverse procedures 1 to 3.

Note: When refitting the hydraulic lift pump, ensure that the needle bearing in the rear end of the camshaft is in good condition.



INDEPENDENT POWER TAKE-OFF CLUTCH

IPTO Clutch Unit

Overhaul

9C-03

Disassembly

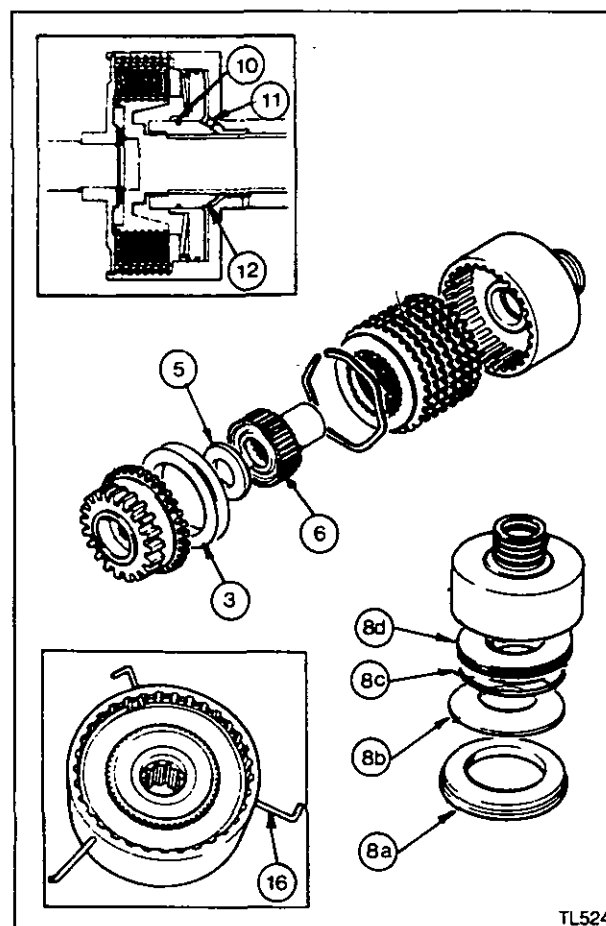
1. Remove the control valve, see operation 9C-04.
2. Remove the retaining circlip
3. Remove the retainer plate and gear.
4. Remove the shims and retain them for re-use, if fitted.
5. Remove the thrust washer.
6. Remove the clutch drive hub.
7. Remove, and keep in order, the seven wavy springs, friction discs and clutch plates.
8. Invert the clutch housing and tap out the piston front plate (8A), Belleville washer (8B), spacer (8C) and the clutch piston (8D).
9. Remove and discard the outer piston seal.
10. Remove and discard the inner piston seal.
11. Press out the check valve, if necessary.
12. Press out the restrictor valve, if necessary.

Reassembly

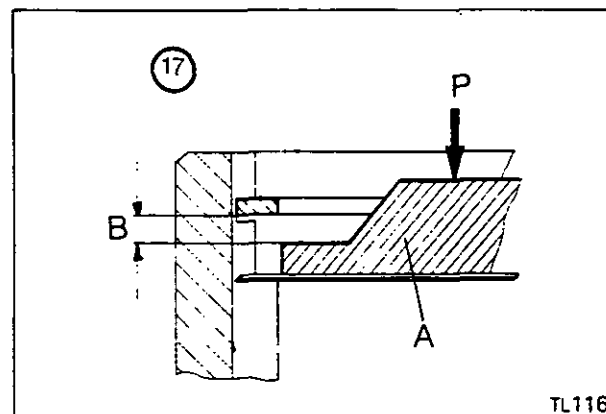
13. Reverse procedures 7 to 12 except:
 - a. Press in the restrictor valve (either end first) from the drive end of the housing.
 - b. Press in the check valve (steeper conical end first) from the drive end of the housing.
 - c. Fit new large and small piston seals.
 - d. Fit the piston, flat face first, then the spacer ring.
 - e. Fit the Belleville washer, convex face first.
 - f. Fit the piston front plate, stepped edge first.
 - g. Renew any clutch plate that is soft, blue or distorted and any friction disc where the friction material has lost its grooves.
 - h. Check the condition of the wave springs. Lay them on a flat surface. The free height should be 5,21 mm (0.205 in) and the waves must be within 0,51 mm (0.020 in) of the same height.
14. Refit the clutch drive hub.
15. Refit the seven steel plates, seven wavy springs and seven friction plates. Start with a steel plate and fit the set in the above order.

Note: If new friction plates are fitted they must be immersed in transmission oil for a minimum of 30 minutes before assembly.

16. To facilitate fitting of the clutch plates and springs, small pins can be inserted through the three vent holes in the clutch housing to hold the plates and springs compressed.
17. Check the clutch pack shimming adjustment as detailed below:
 - a. Remove the retainer plate from a discarded clutch and grind off all the castleations. This converts the plate into a tool.
 - b. Fit the modified retainer plate (ref. item 'A') on top of the sintered disc and refit the clutch retaining circlip.
 - c. Compress the retainer plate and clutch plates with a force 'P' of approximately 64 kgf (140 lbf). Be careful when applying pressure to ensure that the modified retainer plate passes over the interplate step in the clutch housing.



TL524



TL116

- d. Using a set of feeler gauges, measure the gap 'B' between the retainer circlip and tool. The distance should be 2.54 to 3.05 mm (0.100 to 0.120 in.). If the gap is greater than 3.05 mm (0.120 in.) one or more shims must be fitted between the discs and the retainer plate, depending on the gap.

Shim Thickness	Part Number
0,51mm (0.020 in)	1870 010 M1
0,76 mm (0.030 in)	1870 011 M1

18. Release the pressure, remove the retaining circlip and remove the tool.
19. Refit the thrust washer.

continued

9C-06

INDEPENDENT POWER TAKE-OFF CLUTCH

20. Fit the selected shims between the retainer plate and discs, refit the original retainer plate and retaining circlip.

Note: Ensure that the retaining circlip locates correctly in its groove.

IPTO Control Valve

Removal and Refitment

9C-04

Removal

1. Remove the IPTO clutch unit, see operation 9C-02.
2. Remove the circlip.
3. Remove the thrust washer.
4. Remove the control valve and brake unit.
5. Remove the two cast iron piston rings.

Refitment

6. Fit new piston rings and ensure that there is a piston ring gap of 0,050 to 0,305 mm (0.002 to 0.012 in).
7. Reverse procedures 1 to 5 except: Ensure that the circlip locates correctly in its groove.

IPTO Control Valve

Overhaul

9C-05

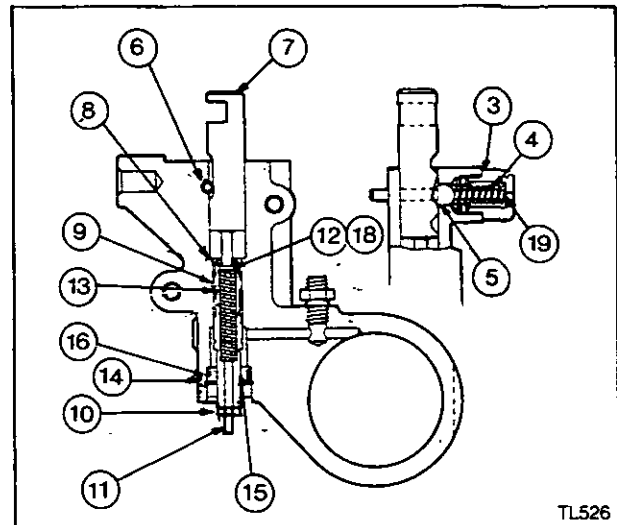
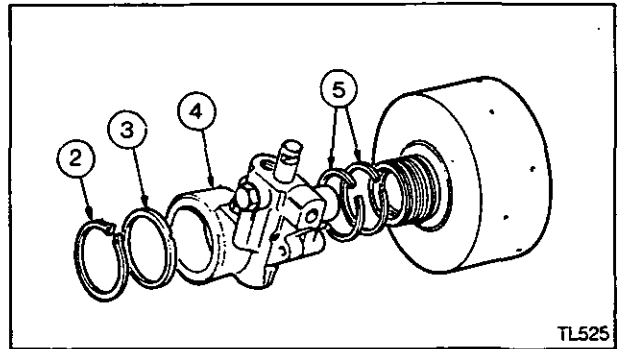
Disassembly

1. Remove the control valve, see operation 9C-04.
2. Remove the brake unit, see operation 9C-06.
3. Remove the detent plug.
4. Remove the detent spring.
5. Remove the detent ball.
6. Drift out the roll pin.
7. Remove the plunger, spool and spring assembly.
8. Remove the circlip.
9. Remove the spool.
10. Remove the retaining pin.
11. Remove the spring guide.
12. Remove and retain the shim pack for re-use.
13. Remove the spring.
14. Remove the circlip.
15. Remove the sleeve.
16. Remove and discard the 'O' ring.

Reassembly

17. Reverse procedures 1 to 16 except:
 - a. Fit a new 'O' ring.
 - b. Ensure that the circlip locates correctly in its groove.
18. Fit the shim pack above the plunger spring.
19. Ensure that the detent plug vent is unobstructed.
20. Reverse procedures 1 to 10 except:
 - a. Ensure that the circlip locates correctly in its groove.
 - b. Fit a new roll pin and position the split away from the plunger.
 - c. Tighten the detent plug to a torque of 47 Nm (35 lbf ft).

Note: Shims, Item 12, can be added to obtain the correct hydraulic pressure at the IPTO control valve, see operation 9C-06.



INDEPENDENT POWER TAKE-OFF CLUTCH

IPTO Control Valve Pressure Setting

Check 9C-06

Special Tools: MF 3001 Hydraulic Pressure Test Kit

The hydraulic pressure setting of the IPTO control valve can be checked and set in the following manner before assembly into the tractor:

1. Assemble the hydraulic control valve assembly to the clutch unit.
2. Fit the retaining washer and circlip.
3. Select a tractor fitted with Pressure Control.
4. Connect the 300 bar (4000 lbf/in²) pressure gauge in the MF 3001 pressure test kit to the trailer tipping pipe connection.
5. Start the tractor and run it at 1200 rev/min. Operate the tractor hydraulic controls as follows:
 - a. Draft lever – lever fully UP.
 - b. Position/pressure control lever – starting with the lever in the LOW position, move the lever up the quadrant until the pressure gauge registers 45-55 bar (650-800 lbf/in²).
 - c. Leaving the position/pressure control lever in this position move the draft lever to DOWN.
6. Stop the engine and disconnect the pressure gauge from the trailer coupling, then connect a hose from the trailer coupling to the inlet port of the IPTO control valve.
7. Connect the 30 bar (400 lbf/in²) gauge to the test port on the IPTO control valve.
8. Select the IPTO by pushing the control valve DOWN.
9. With the clutch assembly placed in a suitable drip tray, start the tractor, run the engine at 1200 rev/min and move the draft lever to the up position and check the operating pressure, which must be:
Single speed IPTO – 19 bar (275 lbf/in²)
2 speed IPTO – 15.5 bar (225 lbf/in²)
The pressure settings are marked on the valve body.

Note: See note on page 9C-03 regarding pressure of two speed IPTO.

10. Stop the engine and release any remaining pressure in the system.
11. If the pressure setting is incorrect it may be increased by adding shims between the spring and the head of the valve, or reduced by removing shims (part number 377 913 X1).
12. When testing the clutch assembly it will be found that there is a small amount of clutch pack leakage.

9C-08

INDEPENDENT POWER TAKE-OFF CLUTCH

IPTO Brake Unit

Removal and Refitment

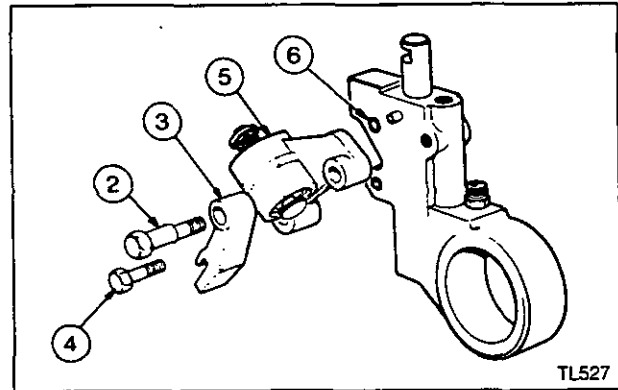
9C-07

Removal

1. Remove the IPTO clutch unit, see operation 9C-02.
2. Remove the shouldered brake pad bolt.
3. Remove the pad.
4. Remove the short bolt.
5. Remove the brake housing.
6. Remove and discard the 'O' ring.

Refitment

7. Reverse procedures 1 to 5 except:
 - a. Fit a new 'O' ring.
 - b. Fit a new shouldered brake pad bolt (888 738 M2) and a special washer (1671 886 M1).
 - c. Tighten both bolts to a torque of 6.9 Nm (5 lbf ft).
 - d. Ensure that the brake pad has complete freedom of movement. If a new shouldered brake pad bolt is not available the following procedure must be carried out.
8. Reverse procedures 4 to 6.
9. Smear the internal thread in the IPTO clutch unit with Loctite 270.
10. Refit the brake pad.
11. Refit the shouldered brake pad bolt.
12. Tighten both bolts to a torque of 6.8 Nm (5 lbf ft).
13. Ensure that the brake pad has complete freedom of movement.



IPTO Brake Unit

Overhaul

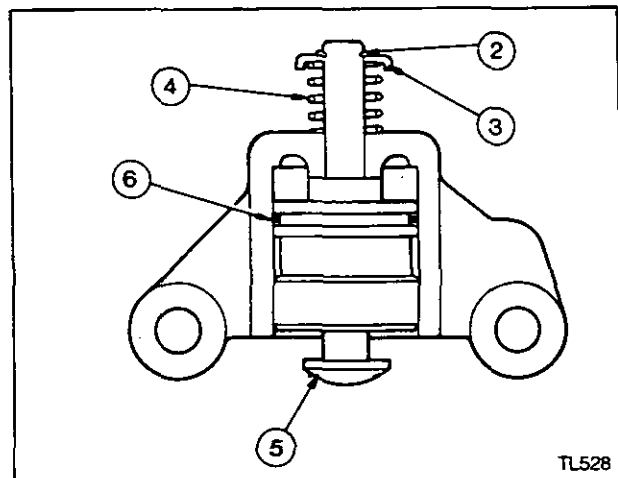
9C-08

Disassembly

1. Remove the brake unit, see operation 9C-06.
2. Remove the circlip.
3. Remove the spring retainer.
4. Remove the return spring.
5. Withdraw the piston.
6. Remove and discard the 'O' ring.

Reassembly

7. Reverse procedures 1 to 6 except:
 - a. Fit a new 'O' ring.
 - b. Ensure that the circlip locates correctly in its groove.



SHIFTABLE POWER TAKE-OFF
(540/1000 rev/min)
(Economy 540 rev/min)

Section 9 – Part D

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SHIFTABLE POWER TAKE-OFF**Specification**

Shiftable PTO:

540 rev/min PTO speed	1902 engine rev/min
1000 rev/min PTO speed	2000 engine rev/min

Economy PTO:

Standard 540 PTO	1979 engine rev/min
Economy 540 PTO	1421 engine rev/min

540 rev/min PTO shaft:

No. of splines	6
Outside diameter	34,93 mm (1.375 in)

1000 rev/min PTO shaft:

No. of splines	21
Outside diameter	34,93 mm (1.375 in)

IPTO clutch:

Type	Multi-plate
Size	127 mm (5 in)
Operation	Hydraulic

No. of friction plates:

All models except 399 tractor	5
399 tractor	7
Thickness (new)	2,41-2,54 mm (0.095-0.0100 in)
Max. permissible dish	0,127 mm (0.005 in)
Groove depth	0,152-0,227 mm (0.006-0.009 in)

No. of steel plates:

All models except 399 tractor	5
399 tractor	7
Thickness (new)	1,35-1,45 mm (0.053-0.057 in)
Max. permissible dish	0,127 mm (0.005 in)
No. of return springs	1

Type	Coil
Free length	74 mm (2.9 in)
Working length	26,7-33,8 mm (1.052-1.332 in)
Load at working length	100 kgf (45 lbf)
Clutch retainer plate clearance	3,5-4,0 mm (0.138-0.157 in)
Checking load	5 kgf (11 lbf)

Clutch pressures:

Engine speed	1500 rev/min
Oil temperature	50-60°C (120-140°F)
Clutch operating pressure	22-24 bar (319-348 lbf/in ²)
Min. permissible pressure	20,7 bar (300 lbf/in ²)

Main PTO support bearings:

Depth of first bearing	59-60 mm (2.352-2.364 in)
Depth of second bearing	1-2 mm (0.040-0.080 in)
Spacer clearance	0,25 mm (0.010 in)

Intermediate gear clearance	0,10 mm (0.004 in)
Pinion bearing pre-load	2,0-2,5 Nm (18-22 lbf in)

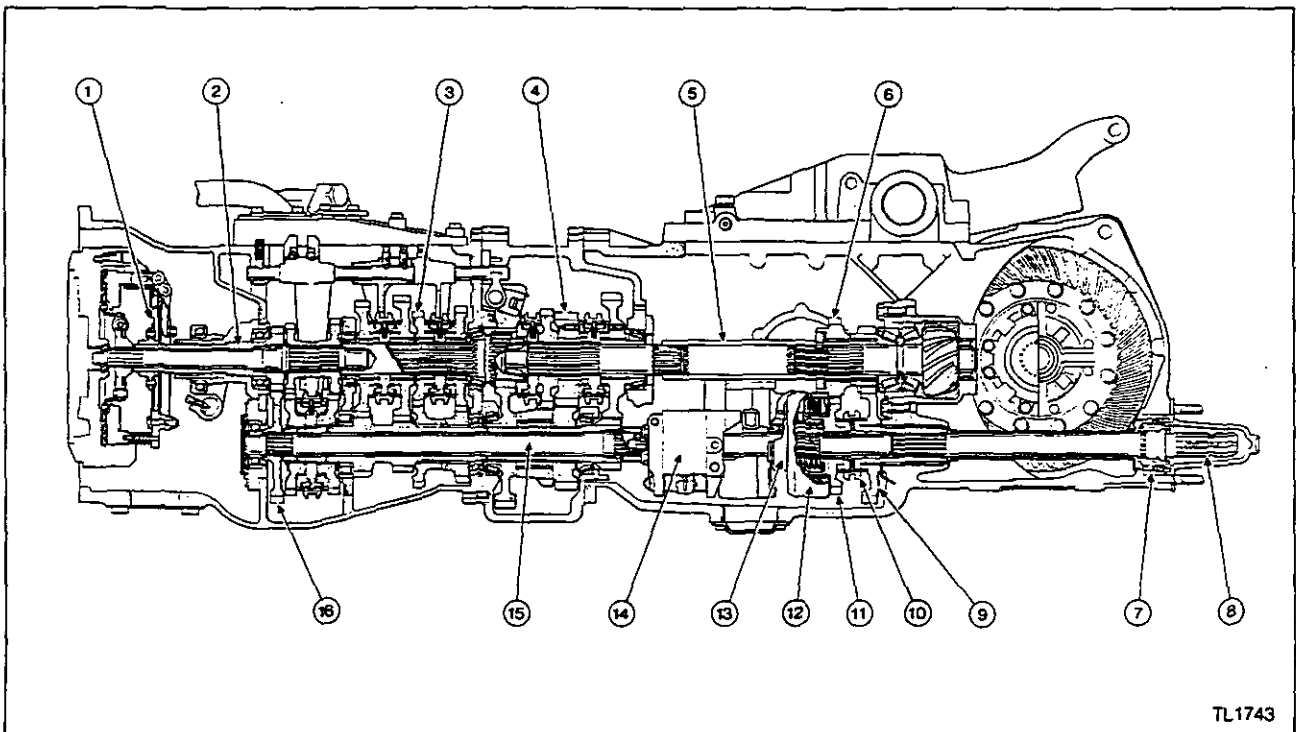
Special Tools

MF.168	Seal remover
MF.195C	Bearing remover/replacer - main tool
MF.195-5B	PTO needle bearing remover
MF.195-6B	PTO needle bearing replacer
MF.364A	Seal replacer
MF.474	PTO seal guide and installer
MS.550	Universal handle
MF.3001	Universal pressure test kit
FT.4026A	Bearing pre-load gauge

Bolt Torques

Check chain bracket nuts	113-169 Nm (83-125 lbf ft)
Drawbar bracket bolts	230-260 Nm (170-192 lbf ft)
Pinion bearing assembly bolts	108 Nm (80 lbf ft)
Selector fork bolt	30-40 Nm (22-30 lbf ft)

SHIFTABLE POWER TAKE-OFF



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- | | |
|---|-----------------------------|
| 1. PTO drive plate | 9. 540 speed driven gear |
| 2. PTO input shaft | 10. Speed selector coupler |
| 3. Main gearbox | 11. 540 speed drive gear |
| 4. Range change gearbox | 12. IPTO clutch assembly |
| 5. Rear axle drive shaft | 13. Hydraulic feed ring |
| 6. 540 intermediate gear cluster | 14. Linkage pump |
| 7. PTO rear bearing and oil seal assembly | 15. PTO layshaft |
| 8. Rear PTO shaft | 16. PTO constant mesh gears |

Independent Shiftable Power Take-off

General Description

The PTO shaft projects from the rear of the tractor. It is supported at the rear by a ball bearing and at the front by the main PTO transmission shaft which runs in a pair of needle roller bearings in the centre housing. Two separate PTO shafts are provided, one with the 540 rev/min six spline and another with the 1000 rev/min 21 spline, either shaft can be fitted. A tube in the centre housing prevents loss of oil during shaft changes.

The two speed shiftable independent power take-off (IPTO) allows the operator to select 540 or 1000 rev/min PTO from the driving position by using a simple shift lever with an additional neutral position. A second shift lever operates the hydraulic control valve which controls the IPTO clutch pack.

An alternative shaft arrangement is available (used in North America) which contains an internal lockout which prevents 1000 rev/min speed being selected when the 540 speed shaft is fitted. It comprises of a simple spring loaded pin which prevents the shift coupler being moved forward to 1000 speed position when the longer 540 speed shaft is installed.

The principal components of the two speed IPTO comprise of a hydraulically operated multi-plate clutch, a spool type control valve and linkage, a reduction intermediate gear mounted on the rear axle pinion shaft

and a selector mechanism for 540 or 1000 rev/min and linkage operated by hand lever.

The IPTO clutch is located immediately to the rear of the linkage pump and is driven from an extension of the linkage pump drive shaft. This shaft is driven from the cover of the split torque transmission clutch, through the PTO reduction gears and drive shaft to the pump.

The rear extension shaft of the linkage pump is splined into the housing of the IPTO clutch, five steel interplates are splined into the casing of the clutch. Five corresponding sintered friction plates are splined to a central hub and drive gear. A large central spring holds the clutch in the disengaged position.

The main PTO transmission shaft is splined to the rear PTO shaft and carries the selector coupler and 540 driven gear. The lower PTO shaft and linkage pump run at 1000 rev/min at approximately 2000 engine rev/min, when the selector coupler is moved forward by the selector lever the PTO shaft is directly coupled through the hydraulic clutch giving a speed of 1000 rev/min. When the selector coupler is moved rearwards it engages with the 540 driven gear giving a speed of 540 rev/min. The speed reduction is obtained by the driven gear on the clutch hub driving an intermediate reduction gear cluster on the pinion shaft, which in turn drives the 540 driven gear on the transmission shaft.

SHIFTABLE POWER TAKE-OFF

Rotation of the PTO shaft is controlled by the hydraulic clutch, it occurs when the driving (steel) plates and driven (friction) plates are forced into engagement by the piston, operated by oil pressure from the left hand side cover and auxiliary hydraulic system.

The spool type control valve is located on the outside of the left hand side cover and has two positions selected by the hand lever adjacent to the driver. Moving the lever to the engaged position allows the control valve to direct oil into the back of the piston, overcome the pressure of the return spring and engage the clutch. A small jet is positioned in the face of the piston to direct oil at 0,5 litre/min (1 pt/min) onto the friction plates, particularly at the time of engagement to cool the plates. Holes are provided in the periphery of the clutch casing to vent oil from between the plates.

Moving the lever to the disengaged position shifts the control valve allowing oil to return from behind the piston and thereby disengaging the clutch. The large return spring located behind the piston ensures a fast return oil flow and a rapid disengagement of the clutch. Return oil from behind the piston returns directly through a port to the transmission case.

The hydraulic system is fitted with a modulating valve assembly which controls the rate of engagement of the clutch, it comprises of two valves mounted in the left hand side cover. They control the flow of oil into the clutch pack so that the engagement time is approximately 1.5 seconds, this prevents the clutch taking up the drive suddenly which could result in damage to the tractor or the implement. The clutch pack pressure is controlled by the pressure maintaining valve adjacent to the engine.

Economy PTO arrangement is identical to the two speed arrangement, except that the tractor is fitted with a low speed PTO (540 rev/min) at 1979 engine rev/min and the gear ratios are different to provide economy 540 at 1421 engine rev/min. Moving the selector coupler forward selects standard 540 speed, moving the selector coupler to the rear selects economy 540 speed through the reduction gears.

IPTO Pressure TestCheck 9D-01**Special tools:**
MF3001 *Pressure test kit*

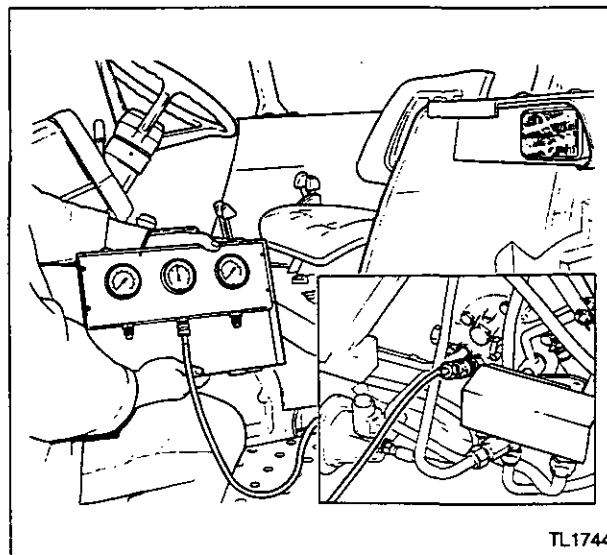
1. Before starting the test ensure that the transmission is filled with clean transmission oil of the correct grade.
2. Start the engine and warm up the transmission oil to a temperature of 50-60°C (120-140°F) by running the hydraulic system under load.
3. Stop the engine and locate the test point on the left hand transmission side cover.
4. Remove the small plug and fit the adaptor with the 5/16 in UNF male thread and M14 diagnostic male coupling contained in the MF3001 pressure test kit.
5. Connect up the 30 bar (400 lbf/in²) gauge in the test kit.
6. Restart the engine, engage the IPTO and increase the engine speed to 1500 rev/min.
7. With the transmission oil at the specified temperature the pressure reading should build up to 22-24 bar (319-348 lbf/in²) over a period of approximately 1.5 seconds, the minimum acceptable pressure is 20,7 bar (300 lbf/in²).
8. Reduce the engine speed to idling and disengage the IPTO.
9. Stop the engine, remove the gauge and refit the plug to the test port.

Note: The valves in the left hand side cover are modulating valves and control the rate of engagement of the clutch, they are NOT pressure relief valves.

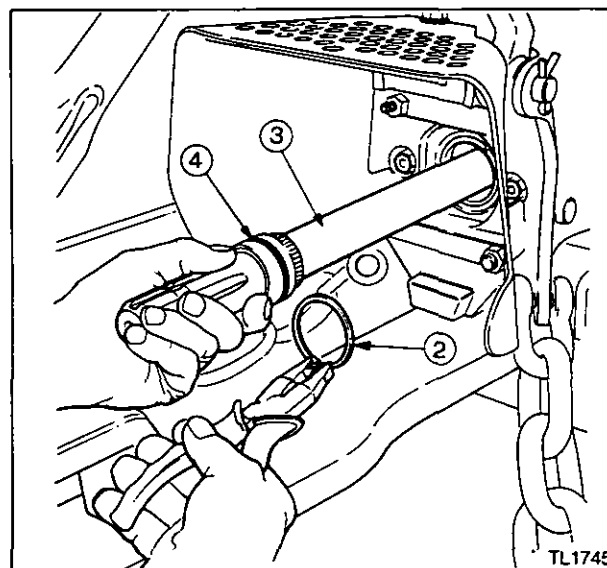
These valves are set at the factory and should not be adjusted in any way.

Diagnosis

10. In the event of the pressure reading being below that stated, the following should be investigated:
 - a. Pressure maintaining valve setting, see operation 12B-03.
 - b. Auxiliary hydraulic pump condition, see operation 12B-06.
 - c. IPTO clutch pack pressure modulating valve, see operation 9D-05.
 - d. Leaking IPTO clutch pack feed ring, see operation 9D-07.
 - e. Leaking transfer pipe between side cover and clutch pack feed ring, see operation 9D-03.
 - f. Leaking IPTO clutch pack piston seal(s), see operation 9D-07.



TL1744



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PTO Shaft**Removal and Refitment**

9D-02

Removal

Note: There may be a small loss of oil when the PTO shaft is removed.

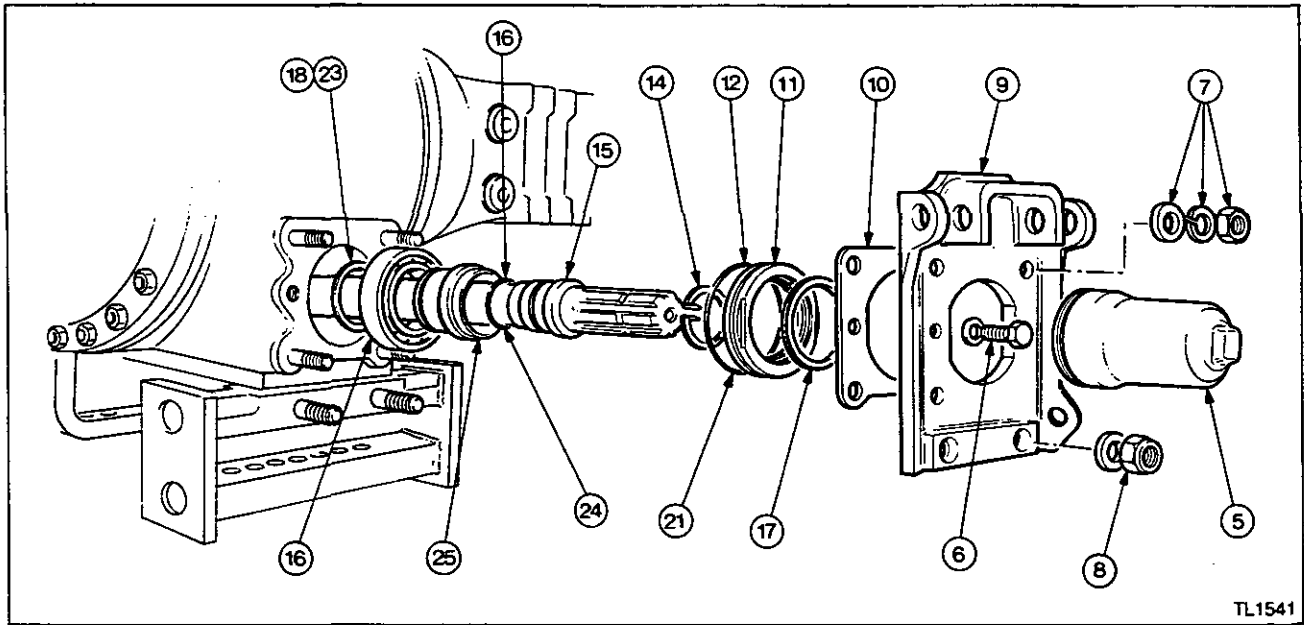
1. Remove the cap.
2. Remove the circlip securing the PTO shaft.
3. Withdraw the shaft.
4. Ensure that the 'O' ring seal on the shaft is in good condition, if not, replace with a new seal part number 3008 359 X1.

Refitment

5. Slide in the shaft required, DO NOT force the shaft in but carefully align the internal splines.
6. Refit the circlip ensuring that it locates correctly in its groove.
7. Refit the cap.

9D-6

SHIFTABLE POWER TAKE-OFF



TL1541

PTO Shaft, Bearing and Oil Seal

Removal and Refitment

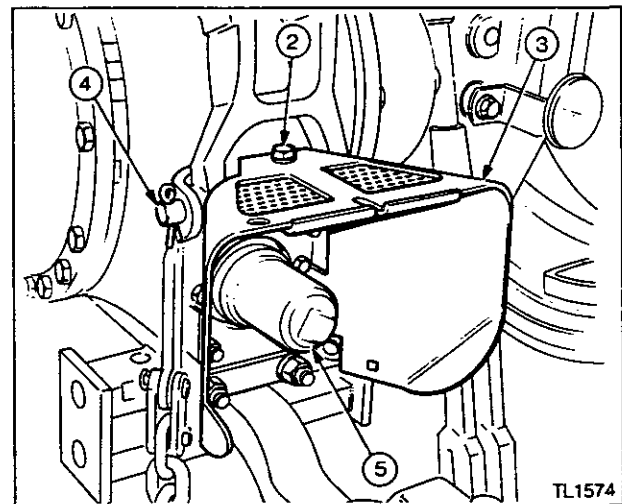
9D-03

Special Tools:

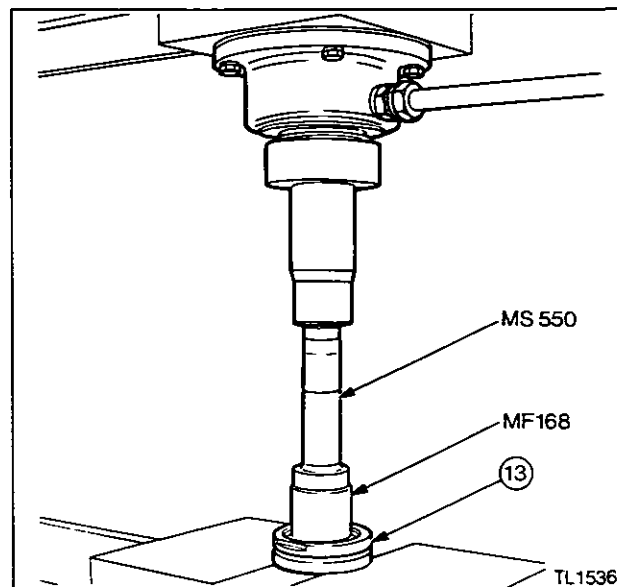
MF168	Seal remover
MF364A	Seal replacer
MF474	PTO Seal guide and installer
MS550	Universal handle

Removal

1. Place a drip tray under the rear PTO.
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the bottom of the control beam.
5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers and spacers.
8. Remove the two nuts from the drawbar bracket.
9. Remove the control beam/check chain bracket.
10. Remove the seal housing plate.
11. Remove the oil seal housing and shaft by screwing on the PTO cap and pulling the cap, withdrawing them from the centre housing.
12. Remove and discard the 'O' ring.
13. Using MF168 and handle MS550 press the lip seal out of the housing.
14. Remove the snap ring.
15. Withdraw the PTO shaft from the bearing sleeve.
16. Remove and discard the 'O' ring.
17. Remove the triple lip dirt seal from the bearing sleeve and discard.
18. Remove the snap ring.
19. Using a length of 60 mm (2 3/8 in) internal diameter tube, drive the bearing off the sleeve



TL1574

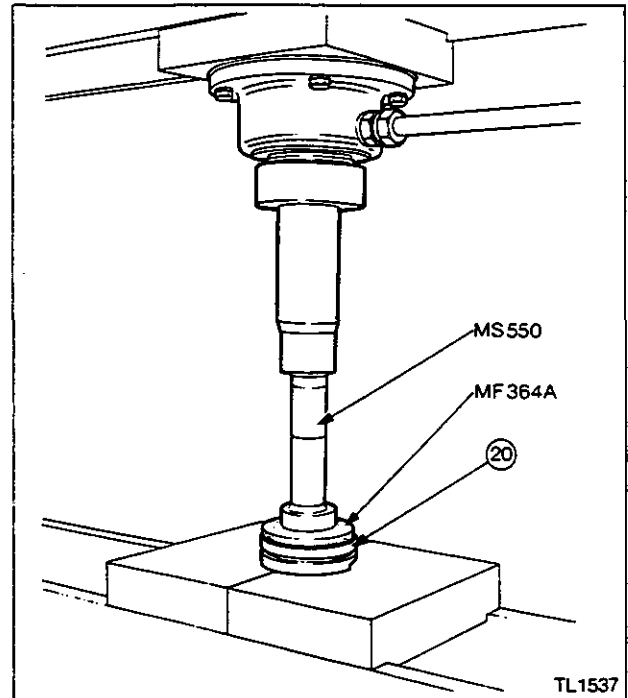


TL1536

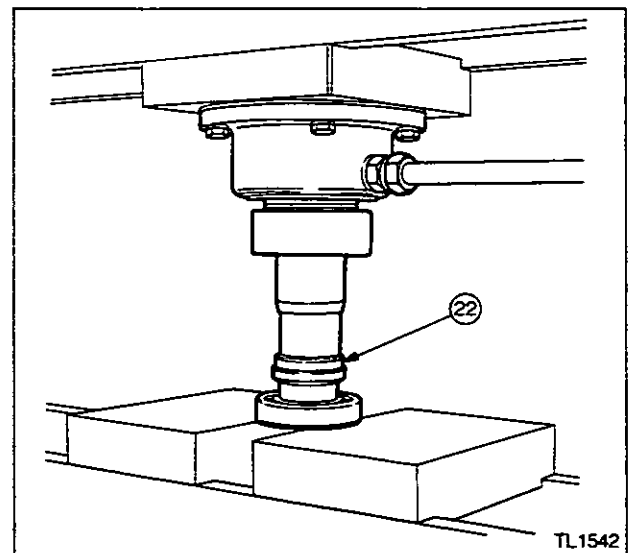
SHIFTABLE POWER TAKE-OFF

Refitment

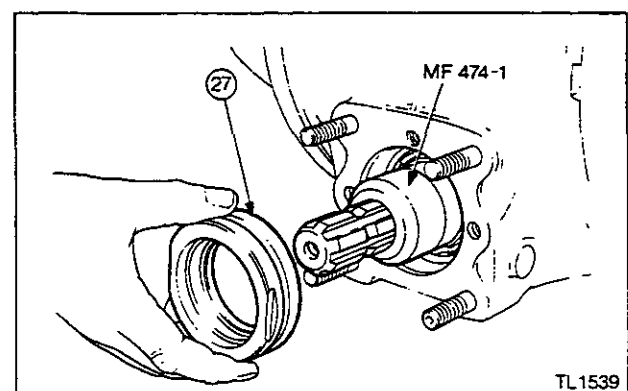
20. Using MF364A and MS550 press the seal into the housing with the lip towards the tool; this will ensure that the lip face of the seal is 1 mm (0.039 in) below the edge of the oil seal housing.
21. Fit a new 'O' ring.



22. Using a hydraulic press, press the new ball bearing onto the bearing sleeve.
23. Fit a new snap ring and ensure that it locates correctly in its groove.
24. Fit a new 'O' ring to the PTO shaft and coat with general purpose grease.
25. Fit the PTO shaft to the bearing sleeve and replace the snap ring.
26. Slide the PTO shaft into the centre housing, taking care to keep it horizontal to align the internal splines.



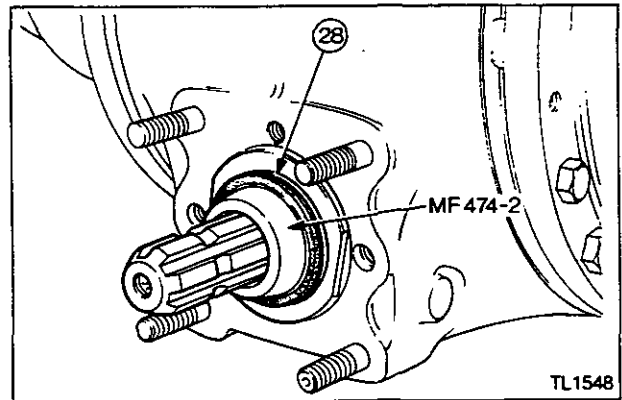
27. Place MF474-1 seal guide on the PTO shaft, and fit the oil seal housing so the two flats are vertical.



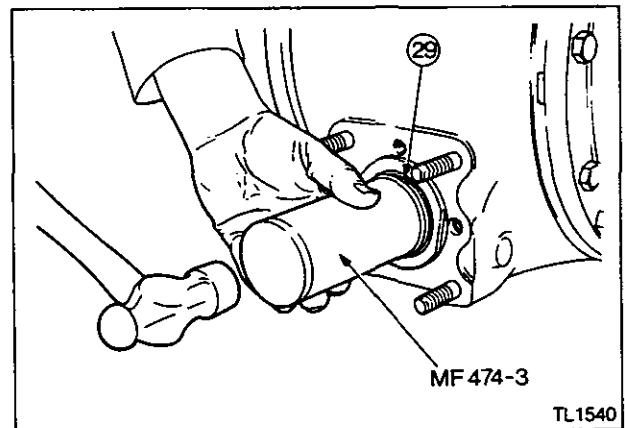
9D-8

SHIFTABLE POWER TAKE-OFF

28. Place seal guide MF474-2 onto the PTO shaft, coat the triple lip dirt seal liberally with general purpose grease and slide it down the PTO shaft and onto the seal guide. The internal radiused edge of the seal must lead onto the shaft.



29. Drive the seal into place on the shaft using MF474-3 seal installer until it comes in contact with the shoulder.
30. Reverse procedures 1 to 10 except:
- Tighten the four retaining nuts with spacers to a torque of 113-169 Nm (83-125 lbf ft).
 - Tighten the two nuts retaining the drawbar bracket to the check chain bracket to a torque of 230-260 Nm (170-192 lbf ft).



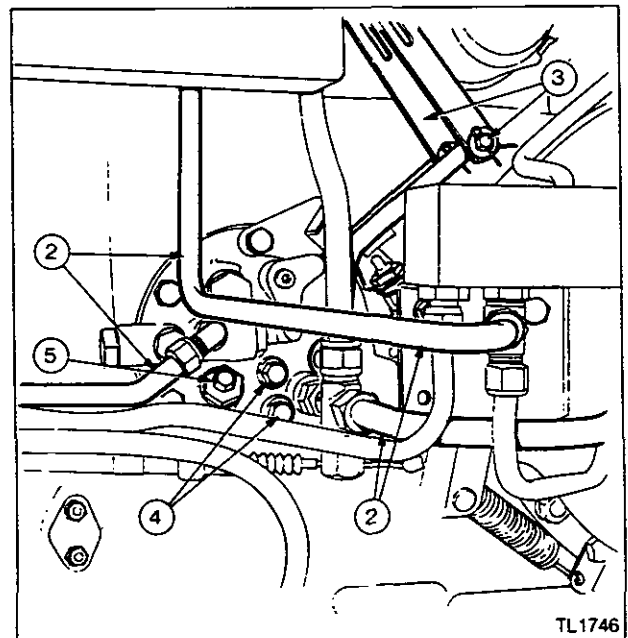
Left Hand Side Cover

Removal and Refitment

9D-04

Removal

- Drain the transmission to the LOW mark on the dipstick.
- Disconnect the auxiliary and IPTO hydraulic pipes from the side cover and remove as necessary.
- Disconnect the PTO selector rods from the operating levers.
- Remove the two bolts holding the brake and selector rail support bracket.
- Remove the test point plug.

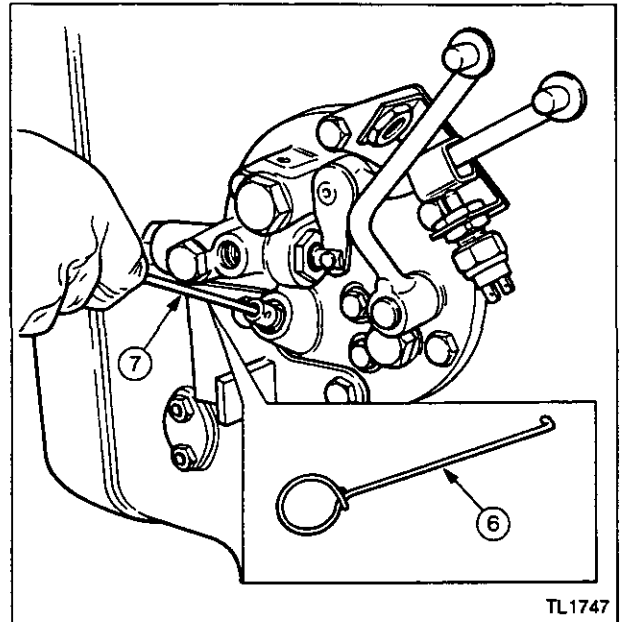


SHIFTABLE POWER TAKE-OFF

6. Make from 3mm (1/8 in) diameter wire a hook as illustrated.
7. Insert the hook into the end of the transfer pipe engaging it in the cross drilled hole, withdraw the pipe from the IPTO clutch and side cover.
8. Remove the side cover bolts.
9. Remove the PTO safety start switch bracket.
10. Remove the parking brake cable anchor bracket.
11. Remove the the side cover by lifting it vertically so that the selector arm clears the selector rail.

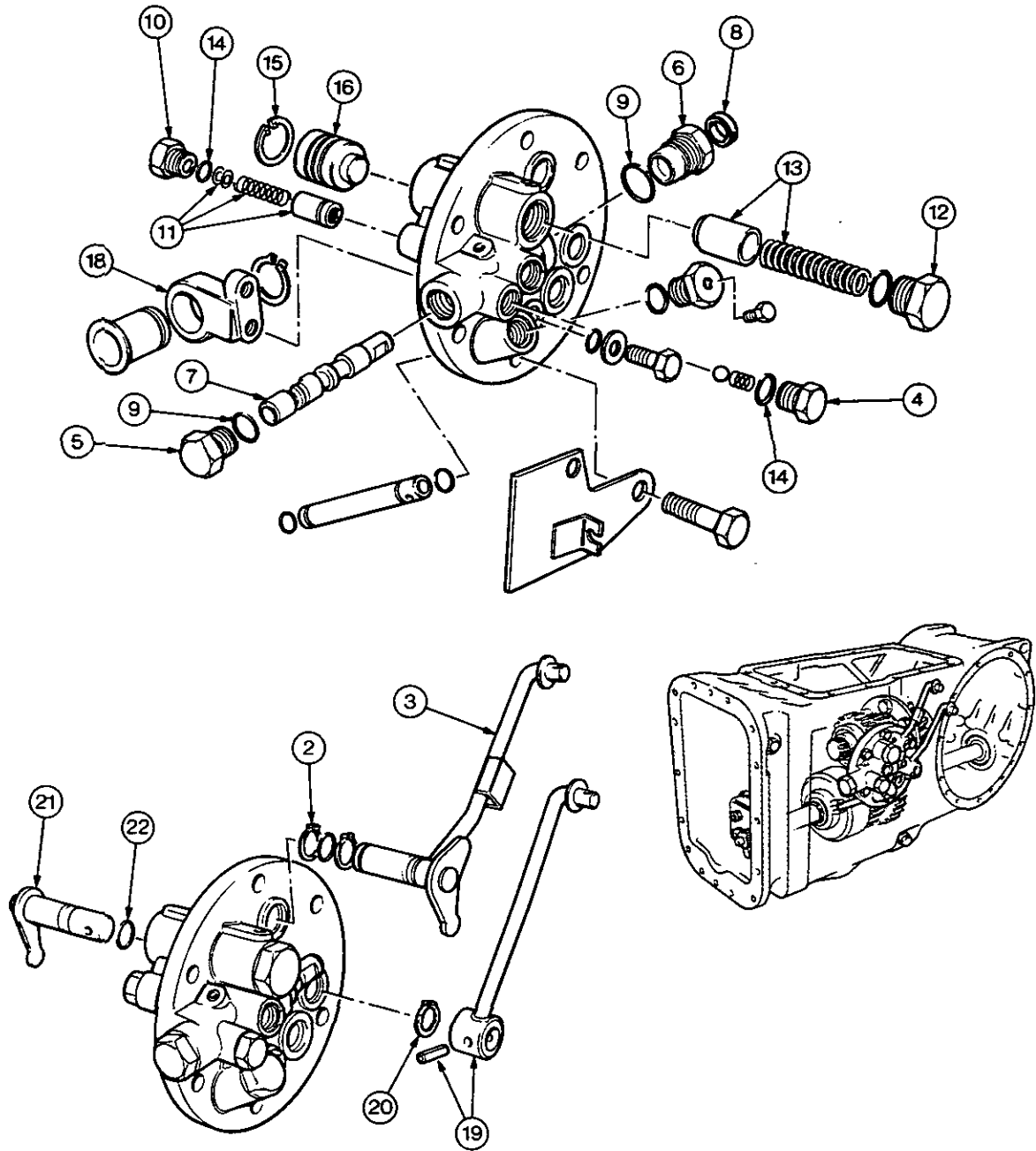
Refitment

12. Clean the mating faces between the side cover and the transmission.
13. Reverse procedures 1 to 11 except:
 - a. Replace the 'O' rings on the transfer pipe and the bolts holding the brake and selector rail bracket to the side cover.
 - b. Insert the transfer pipe with the cross drilled hole uppermost. Ensure that the pipe is pressed fully home.
 - c. Apply Loctite 515 instant gasket to the face of the side cover.
 - d. Seal the six side cover bolts with Hylomar sealant.



9D-10

SHIFTABLE POWER TAKE-OFF



TL1748

SHIFTABLE POWER TAKE-OFF**Left Hand Side Cover****Overhaul**

9D-05

Disassembly

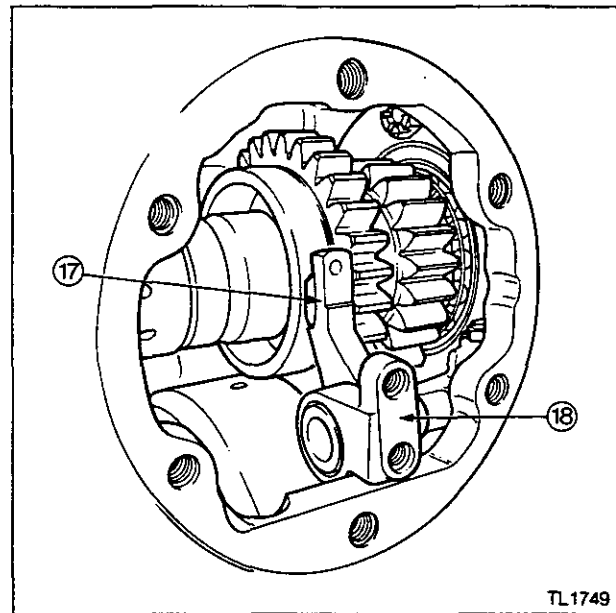
1. Remove the left hand side cover, see operation 9D-03.

Control Valve Spool

2. Remove the circlip.
3. Remove the selector lever.
4. Remove the detent ball and spring.
5. Remove the plug.
6. Remove the gland nut.
7. Withdraw the valve spool.
8. Remove the oil/dirt seal.
9. Discard all 'O' rings.

Flow Modulating Valves

10. Remove the 1st modulating valve cap.
11. Withdraw the valve, spring and shims.
12. Remove the 2nd modulating valve cap.
13. Withdraw the valve and spring.
14. Check the condition of the valves, clean the small orifice in end of the 1st modulating valve.
The modulating valves must not be adjusted, they are factory set for the correct flow. Discard all 'O' rings.



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Brake

15. Remove the circlip.
16. Withdraw the brake piston from the side cover. The brake piston has no sealing rings, it relies on a precision fit for sealing.
17. The brake shoe can be removed from inside the transmission case by sliding it off the selector rail.
18. Remove the circlip and brake shoe off the bearing assembly.
19. Remove the roll pin and speed selector lever.
20. Remove the circlip.
21. Remove the selector lever and shaft.
22. Discard the 'O' ring.

Reassembly

23. Clean all components and lightly lubricate parts with clean oil when reassembling.
24. Reverse procedures 1 to 22 except:
 - a. The spool valve seal (8) can be fitted either way round to prevent ingress of dirt or the loss of oil.
 - b. Reassemble the 1st modulating valve with the original shims removed.
25. Test the IPTO clutch pack pressure, see operation 9D-01.
26. Ensure that the pressure maintaining valve is correctly set, 22-24 bar (319-348 lbf/in²) and that there is no mechanical reason for loss of pressure before making any adjustments to the maintaining valve.

SHIFTABLE POWER TAKE-OFF

IPTO Clutch Unit

Removal and Refitment

9D-06

Removal

1. Split the tractor between the rear centre housing and the range change unit, four wheel drive drop box or spacer, see operation 2A-04 or 2B-05.
2. Remove the lift cover, see operation 12A-03 or 12A-04.
3. Remove the left hand side cover, see operation 9D-04.
4. Remove the main drive shaft.
5. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.

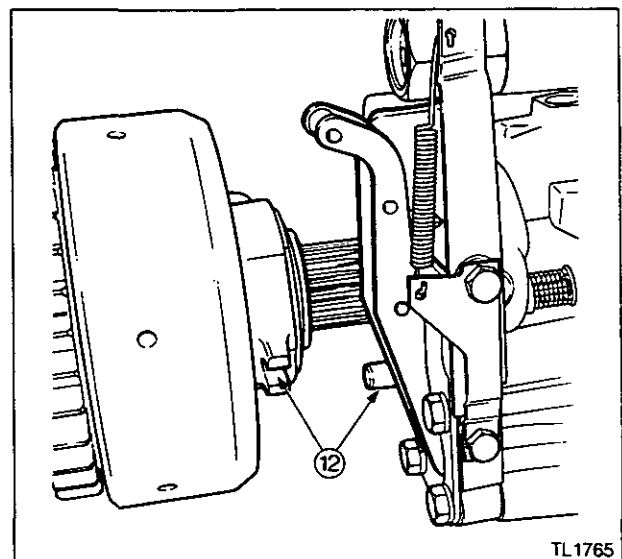
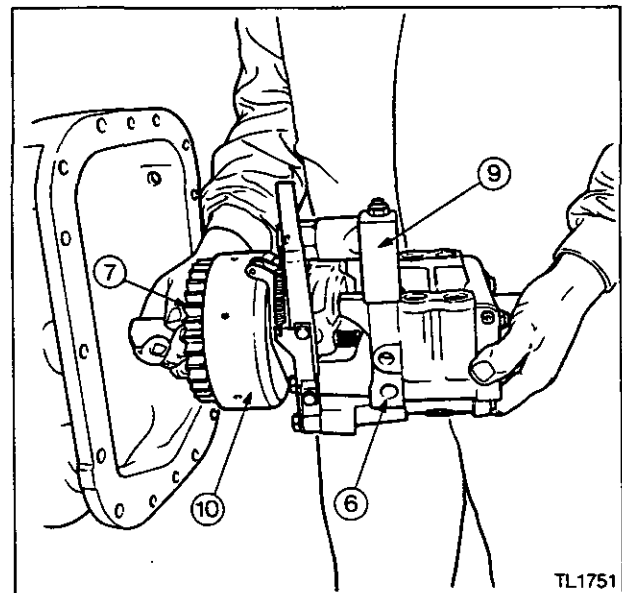
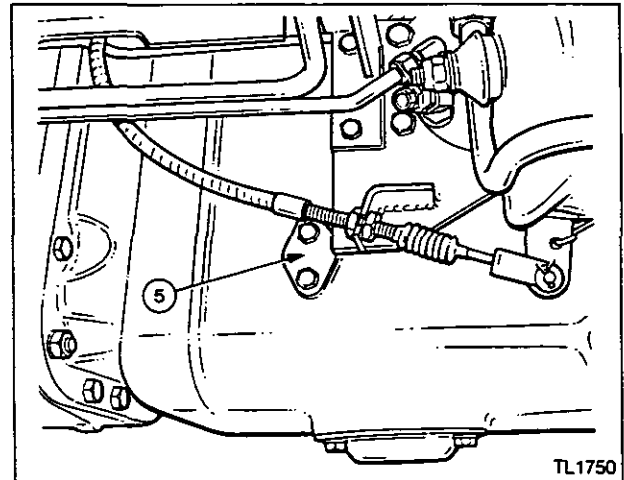
Note: The following procedure must be carefully followed otherwise extreme difficulty will be experienced in removing the pump.

6. The lift pump and IPTO clutch pack must be held together and removed as one unit.
7. The IPTO clutch pack hub and drive gear must not be allowed to move away from the clutch pack.
8. The two speed selector coupler, shaft and gears must stay at the back of the box and not allowed to come forward.
9. Carrying out the instructions in procedures 6, 7 and 8, hold the lift pump and IPTO clutch pack assembly, manoeuvre the assembly forwards out of the centre housing.
10. Slide the clutch pack assembly off the lift pump drive shaft.

Note: In the event of the linkage pump/clutch pack assembly becoming jammed in the centre housing it will be necessary to dismantle the pinion shaft assembly in position to gain the extra space for removal.

Refitment

11. Refit the clutch assembly to the lift pump
12. Ensure that the fork on the manifold is correctly engaged on the pin on the lift pump
13. Reverse procedures 1 to 10 except:
 - a. Fit new 'O' rings, gaskets and split pins.
 - b. Ensure that the IPTO clutch gear and hub does not move away from the clutch pack assembly during reassembly.
 - c. DO NOT tighten the two lift pump dowel nuts (5) until the transmission has been completely reassembled.



SHIFTABLE POWER TAKE-OFF

IPTO Clutch Unit

Overhaul

9D-07

Disassembly

1. Remove the IPTO clutch assembly, see operation 9D-06.
2. Remove the hub and drive gear.
3. Remove the thrust washer.
4. Remove the spring ring.
5. Remove the retainer plate.
6. Remove the shim plate.
7. Remove the steel plates.
8. Remove the friction plates.
9. Make up a bridge piece as shown in the illustration and place the clutch under a hydraulic press. Apply pressure to the retaining ring to compress the spring and remove the spring clip.
10. Remove the retainer ring.
11. Remove the spring.



Warning: Be very careful when using compressed air to remove the piston, DO NOT stand over the clutch assembly, face the piston and the open end of the clutch away from you, use a piece of cloth to cover the assembly to prevent the piston flying out.

12. Remove the piston, it may be necessary to use compressed air applied to the feed ring. Heed the warning, only apply enough air to move the piston out of the casing.
13. Remove the internal iron piston seal.
14. Remove the external rubber piston seal.
15. Remove the snap ring.
16. Remove the thrust washer.
17. Remove the feed ring.
18. Remove the PTFE sealing rings.
19. Remove the internal circlip and needle roller bearing, if necessary.

Examination

Check the condition of all the components for signs of wear, scoring, damage or distortion due to over heating. Check all the friction and steel plates against the following new dimensional tolerances for wear:

Friction plates:

Thickness – 2,41-2,54 mm (0.095-1.000 in)

Maximum permissible distortion – 0,127 mm (0.005 in)

Steel plates:

Thickness – 1,35-1,45 mm (0.053-0.057 in)

Maximum permissible distortion – 0,127 mm (0.005 in)

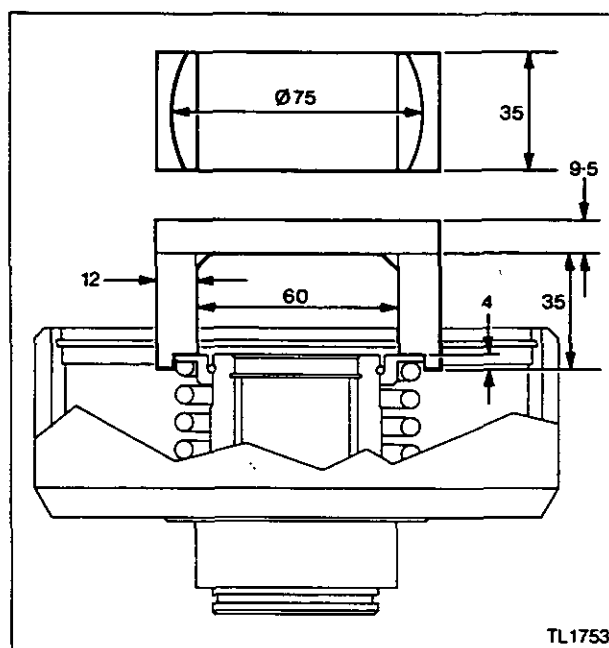
Coil spring:

Free length – 74 mm (2.9 in)

Working length – 26,7-33,8 mm (1.052-1.332 in)

Load at working length – 100 kgf (45 lbf)

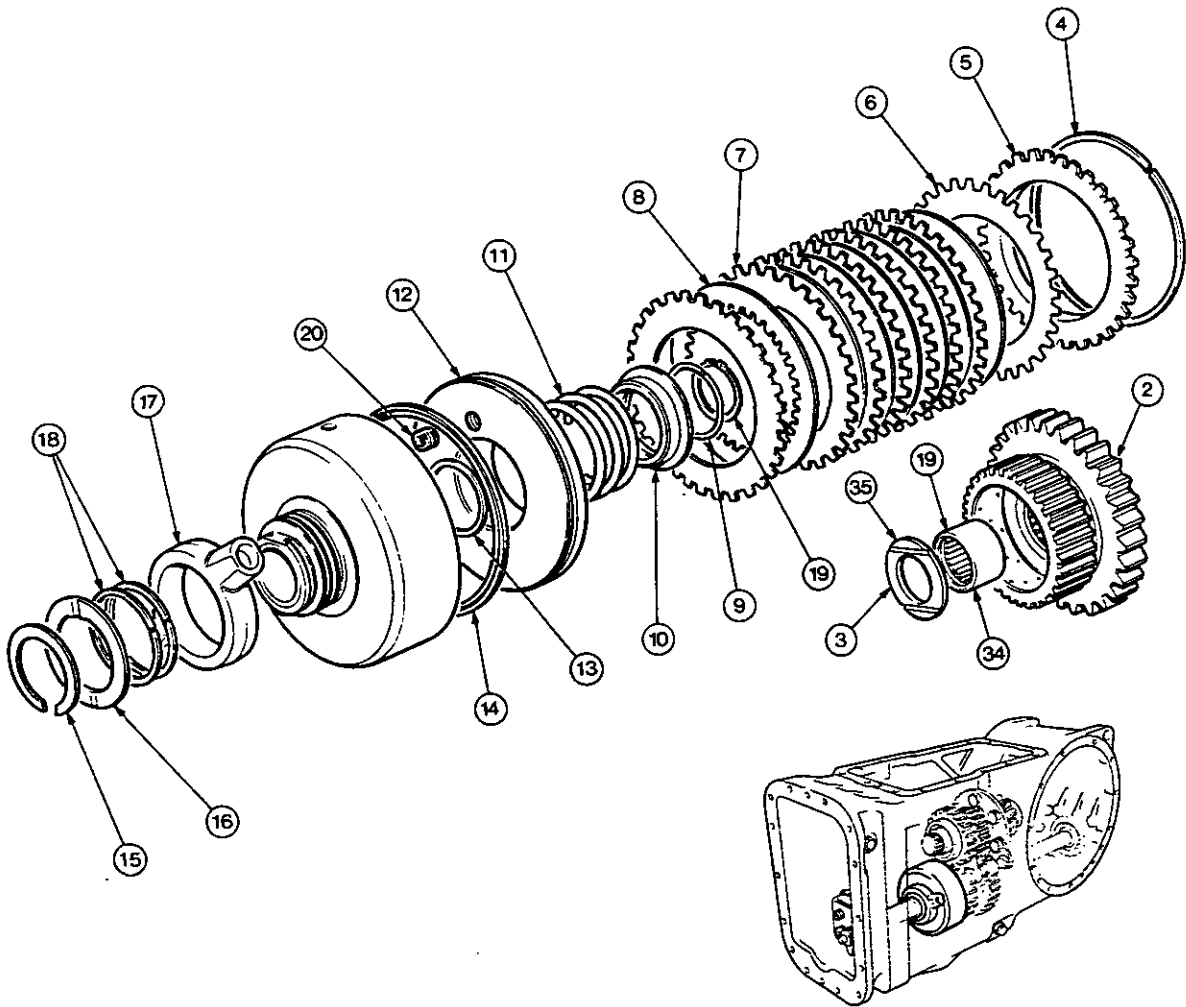
Replace any worn or damaged components as required.



to be
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9D-14

SHIFTABLE POWER TAKE-OFF



TL 1752

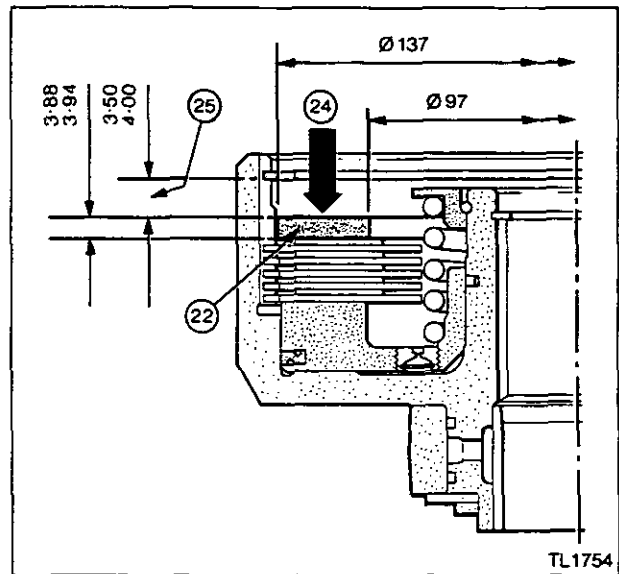
SHIFTABLE POWER TAKE-OFF

Reassembly

20. Check that the lubrication jet in the piston is not blocked, use compressed air to clear it.
21. Fit new internal and external piston rings, lubricate the piston with clean transmission oil and reassemble into the clutch housing.
22. Make a steel ring as shown in the illustration to replace the retainer plate for checking the clutch plate clearance.
23. Assemble all the clutch plates, friction and steel, into the clutch housing, fit the tool described in procedure 22 and replace the spring ring. There are five friction and five steel plates.
24. Apply a pressure of approximately 5 kgf (11 lbf) to the clutch pack to compress all the plates.
25. Using a feeler gauge measure the gap between the plate and the underside of the spring ring. The distance should be 3,50-4,00 mm (0.138-0.157 in), if the gap is not correct add one or more shims between the discs and the retainer plate depending on the gap. Shims are available in the following sizes:

Clutch shim plates		
Part No.	Metric	Imperial
1870 010 M1	0,51 mm	0.020 in
1870 011 M1	0,76 mm	0.030 in

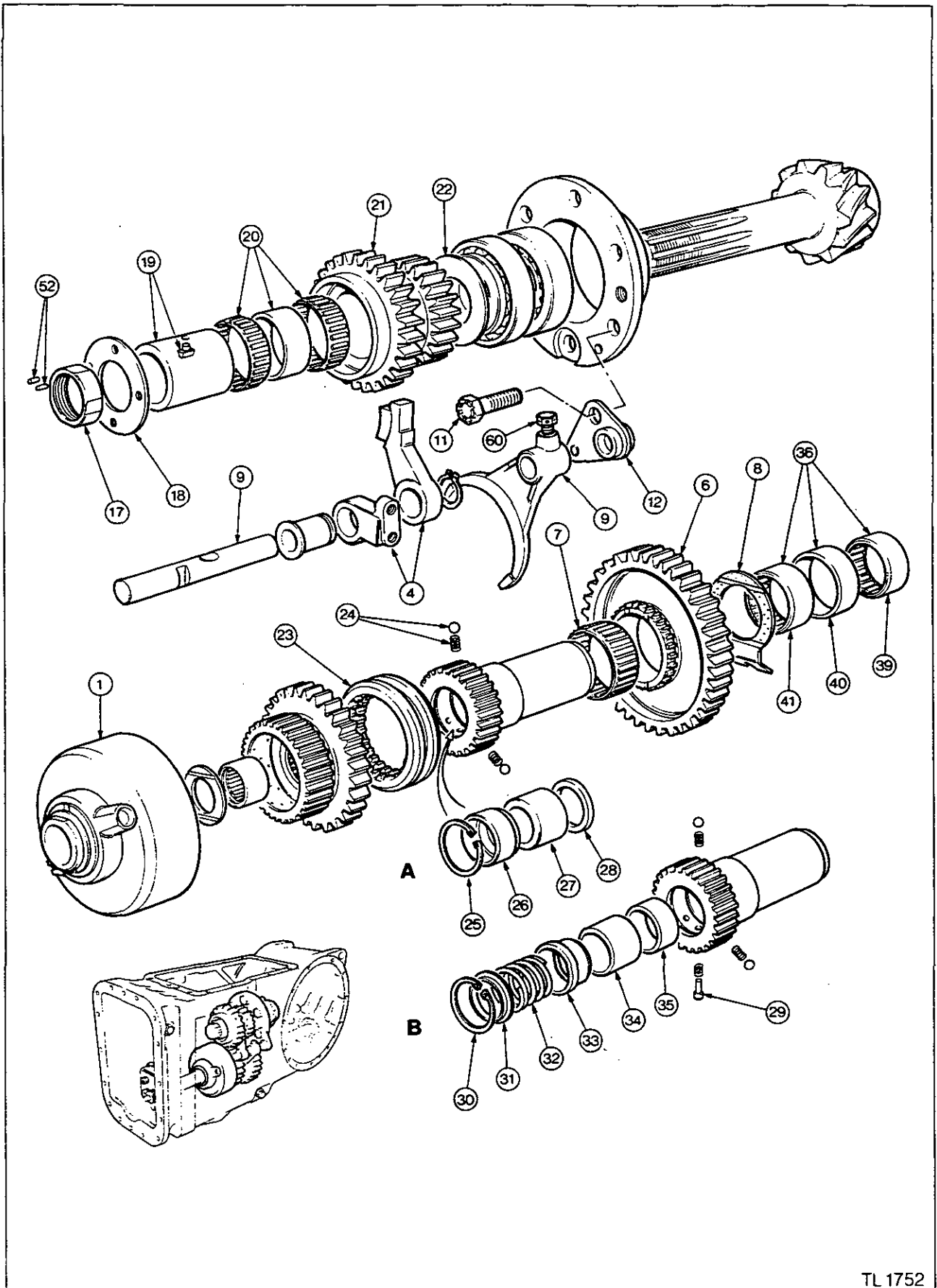
26. Remove the spring ring, checking ring and clutch plates.
27. Refit the spring and retainer ring.
28. Place the clutch assembly under a hydraulic press and using the bridge piece compress the spring and replace the snap ring.
29. If new friction plates are being used they should be soaked in clean transmission oil for a minimum period of 30 minutes before assembly.
30. Reassemble the plates starting with a steel plate, alternating with a friction plate, finally fitting the shim plate(s).
31. Refit the retainer plate and spring ring.
32. Fit new PTFE sealing rings to the feed ring.
33. Reassemble the feed ring, thrust washer and snap ring.
34. If necessary, replace the needle roller bearing in the gear hub.
35. With the aid of some petroleum jelly retain the thrust washer inside the the gear and hub.
36. Check that the spring ring (4) retaining the clutch plates is fully seated in its groove.
37. With the aid of two lengths of 3 mm (1/8 in) diameter rod carefully align and centre all the internal teeth of the friction discs.
38. With the aid of an air line pressurise the clutch pack so that all the plates are clamped tight.
39. Whilst still holding the pressure on the clutch pack insert the hub and drive gear so that it passes down through the pack of plates. When fully installed the gear will be within approximately 3 mm (1/8 in) of the clutch housing.



40. If the clutch is not being fitted immediately it is recommended that some form of security band is placed around the clutch to retain the hub and drive gear in place.
41. Refit the clutch assembly.

9D-16

SHIFTABLE POWER TAKE-OFF



TL 1752

SHIFTABLE POWER TAKE-OFF**Reduction Gears and Bearings**

Overhaul

9D-08

Special Tools:

FT4026A	Bearing pre-load gauge
MF195B	Main puller
MF195-5B	PTO needle bearing remover
MF195-6B	PTO needle bearing replacer

Disassembly

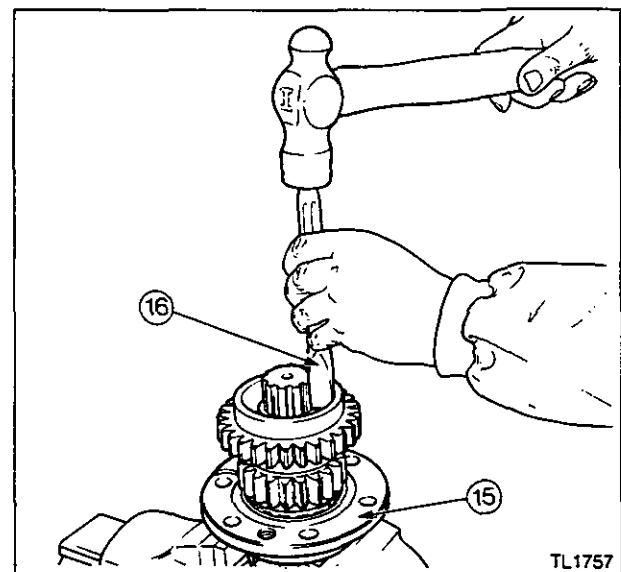
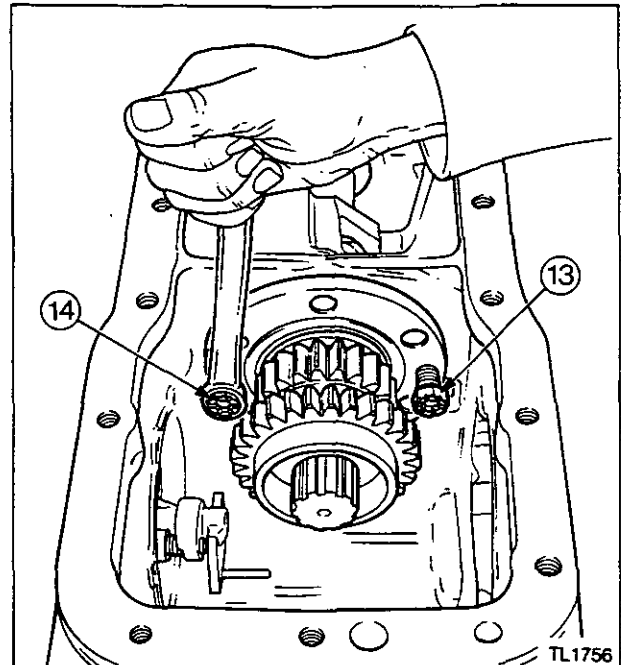
1. Remove the IPTO clutch assembly, see operation 9D-06.
2. Remove the left hand side cover assembly, see operation 9D-04.
3. Remove the PTO shaft, see operation 9D-02.
4. Remove the brake shoe and bearing assembly off the selector rail.

Lower PTO Shaft

5. Keeping the 540 driven gear (6), needle roller bearing (7) and thrust washer (8) to the rear of the box. Pull the selector coupler, shaft and selector fork assembly out of the rear casing. DO NOT allow the selector coupler to come off the shaft.
6. Remove the 540 driven gear.
7. Remove the needle roller bearing.
8. Remove the thrust washer.
9. Remove the selector fork and rail.
10. Remove the selector fork from the selector rail, if necessary.

Pinion Shaft

11. Remove the six pinion housing retaining bolts.
12. Remove the brake and selector rail support bracket.
13. Screw one of the pinion housing retaining bolts into each of the two tapped holes in the flange.
14. Tighten the bolts thus withdrawing the pinion assembly.
15. Place the pinion assembly in a vice with soft jaws holding it in a vertical position.
16. Using a cold chisel cut down through the nut adjacent to one of the flats and the two locking rollers (52).
17. A few hefty blows will fracture it enabling the rollers and nut to be removed.
18. Remove the thrust washer.
19. Remove the sleeve and sleeve keeper.
20. Remove the needle roller bearings and spacer.
21. Remove the intermediate gear cluster.
22. Remove the thrust washer.

**Selector Shaft Assembly**

Note: There are two types of selector shaft assembly used on the M-F 300 series tractor.

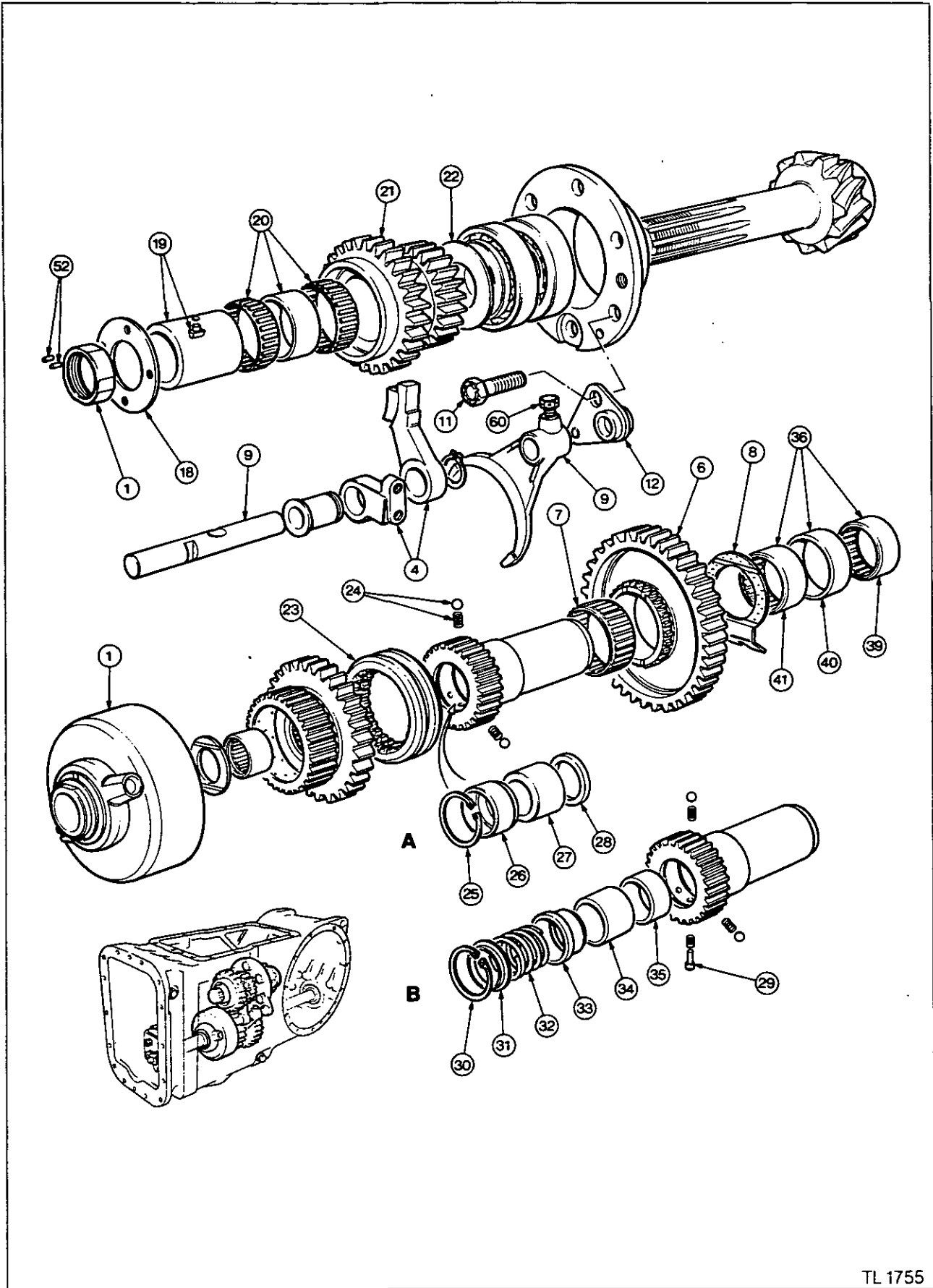
The type 'A' is fitted to all models where 540 and 1000 rev/min speed can be selected with either type of splined PTO shaft fitted (540/1000).

The type 'B' is fitted when 1000 rev/min speed can only be selected when a 1000 speed shaft is installed. There is a locking device in the front end of the PTO transmission shaft, this consisting of a spring loaded lockout pin which prevents the selector coupler being moved forwards to the 1000 speed position when the 540 shaft is in place.

23. Slide the selector coupler off the shaft.
24. Retain the three detent balls and springs.

9D-18

SHIFTABLE POWER TAKE-OFF



TL 1755

SHIFTABLE POWER TAKE-OFF

Shaft Type 'A'

25. Remove the circlip.
26. Remove the sleeve.
27. Remove the bush.
28. Remove the spacer.

Shaft Type 'B'

29. Remove the lockout pin and spring.
30. Remove the circlip.
31. Remove the washer.
32. Remove the spring.
33. Remove the retainer.
34. Remove the bush.
35. Remove the sleeve.

Support Bearings

36. To remove the two bearings and spacer in the centre housing it will be necessary to remove the PTO shaft assembly, see operation 9D-02, PTO shaft guide tube and left hand trumpet housing, see operation 8A-06.
37. Using special tool MF195B main puller, MF195-5B/2 extension rod, MF195-6/4 collet and two pieces of angle iron, pull out the two needle bearings and spacer from the centre housing.

Refitment**Support Bearings**

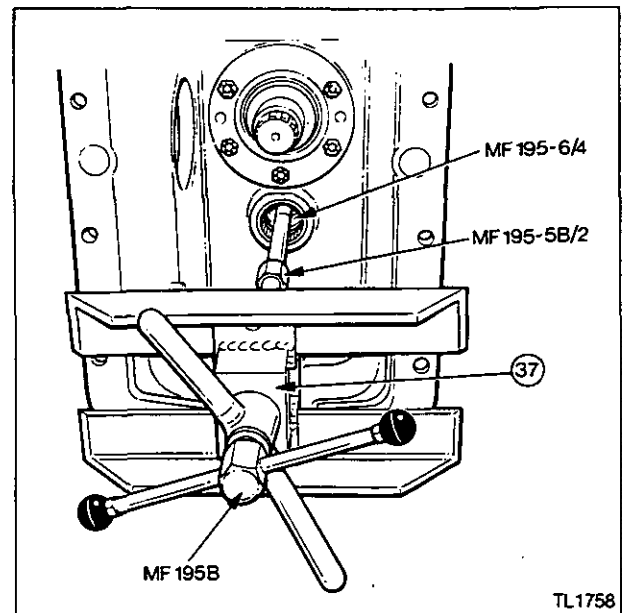
38. Special tool MF195-6/4 is not suitable for fitting the first bearing in the centre housing. Make a bearing replacer as shown in the illustration.
39. Using MF195B main puller, MF195-5B/2 extension and the tool described in procedure 38, pull the first bearing into the centre housing. The bearing must be fitted in the centre housing with the face containing the part number printed on it facing forwards. If you do not have the special tool pull the bearing into a depth of 59-60 mm (2.325-2.364 in).
40. Replace the spacer.
41. Using the short end of bearing replacer MF195-6/4 pull the second bearing into the centre housing. If you do not have the special tool there must be a clearance of 0,25 mm (0.010 in) between the spacer and bearing, the second bearing must be between 1-2 mm (0.040-0.080 in) below the front face of the centre housing.
42. Press the PTO shaft guide tube into the centre housing until its rear end is no more than 1,5 mm (0.060 in) below the shaft bearing recess.

Selector Shaft Assembly

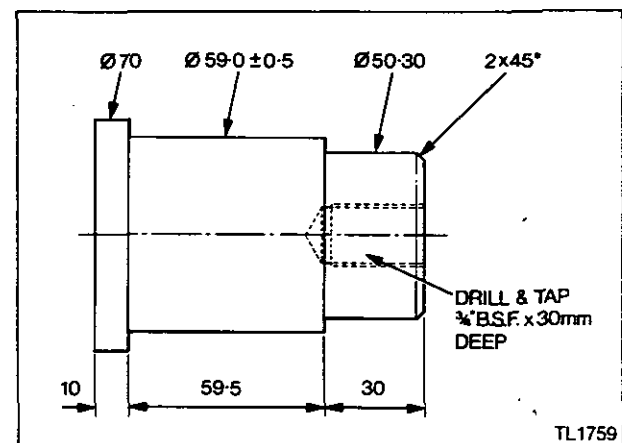
43. Reverse procedure 23 to 35.

Pinion Shaft

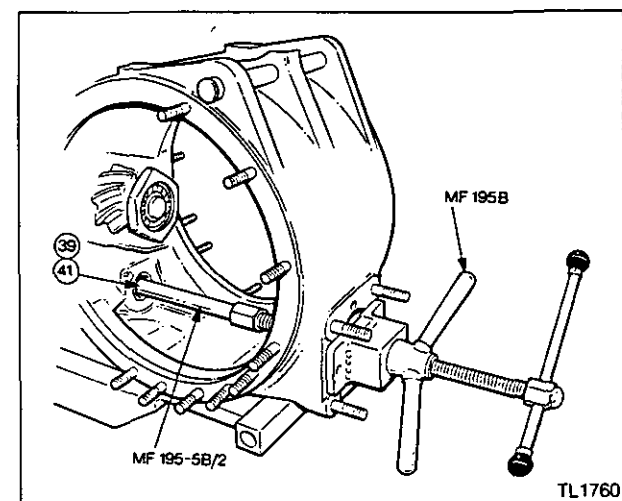
44. Reverse procedure 18 to 22 except:
 - a. Ensure that the thrust washers (18 and 22) are fitted with the oil grooves and chamfered side of the lubrication holes face towards the intermediate gear cluster.



TL1758



TL1759

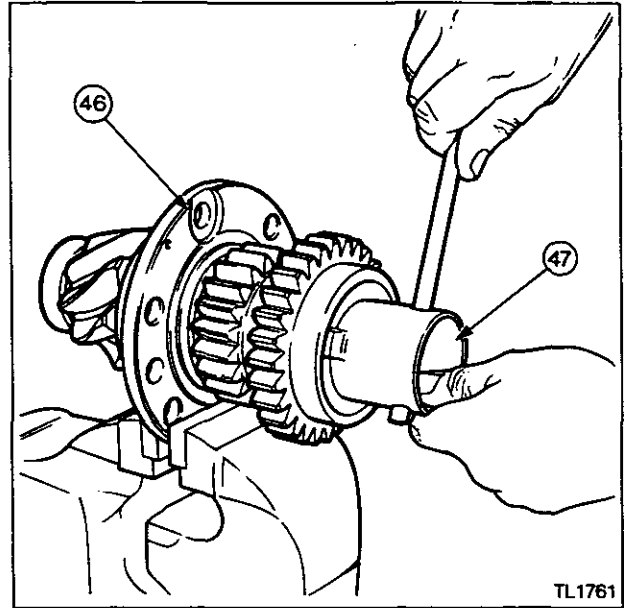


TL1760

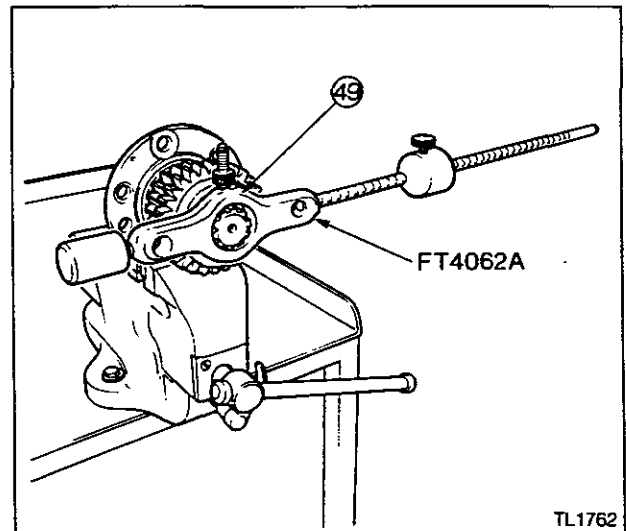
9D-20

SHIFTABLE POWER TAKE-OFF

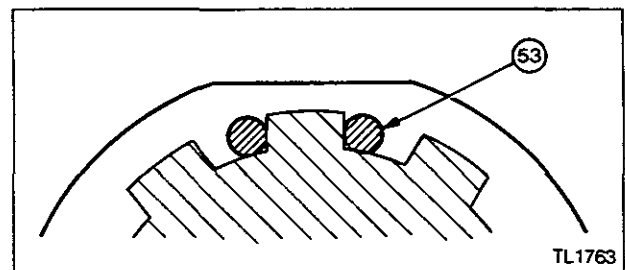
- b. DO NOT forget to fit the sleeve keeper inside the sleeve (19), engaging in one of the pinion splines.
 - c. Lightly lubricate the bearings and thrust washers with clean transmission oil.
45. Due to the pinion bearing pre-load being lost it will be necessary to reset this in the following manner:
 46. Hold the pinion housing in a vice.
 47. Make a box spanner with four flats 51 mm (2 1/16 in) A/F out of a piece of 55 mm (2 1/8 in) internal diameter tube x 80 mm (3 in) long as shown in the illustration.
 48. Tighten the new nut until some resistance is felt. The correct pre-load is 2,0-2,5 Nm (18-22 lbf in)



49. Check the pre-load by fitting gauge FT4062A to the end of the shaft. When the correct setting is obtained the gauge should just turn under its own weight when the weight is set between the 20-25 cm (18-22 in) mark on the tool.
50. If a pre-load gauge is not available, wrap some string around the pinion shaft and attach the end to a spring balance. Pull the spring balance away from the shaft, the rolling resistance must be 10-11 kgf (21-25 lbf) when the shaft is rotating.
51. Re-adjust the nut if necessary, tap the pinion firmly to centralise the bearings, then re-check the pre-load.
52. Check that the intermediate gear cluster on the pinion shaft rotates freely, there should be a 0,10 mm (0.004 in) clearance between the gear and the thrust washers.

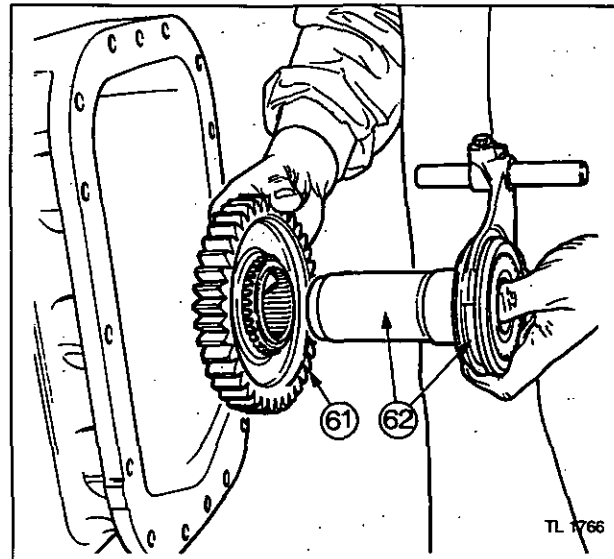
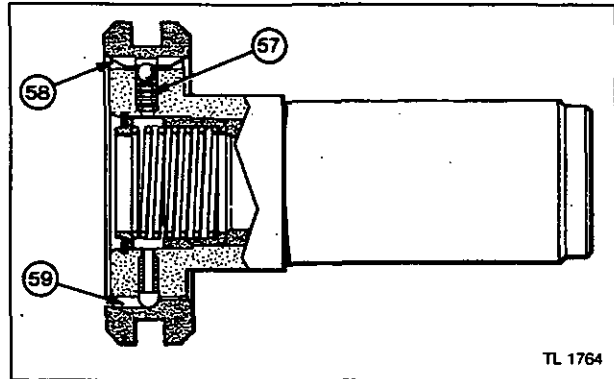


53. Secure the nut by driving a locking roller down each side of one of the pinion splines as shown in the illustration. The locking rollers must be driven flush with the locking ring.
54. Refit the pinion assembly in the centre housing ensuring that the locating pin is correctly aligned.
55. Replace the selector rail support bearing on one of the bolts locating the dowel pin in the pinion housing.
56. Tighten the six pinion housing retaining bolts to a torque of 108 Nm (80 lbf ft).



Lower PTO shaft

57. Reassemble the selector coupler to the PTO transmission shaft fitting the three detent springs and balls.
58. The selector coupler must be correctly fitted, the three detent springs and balls are equally positioned around the hub. The selector coupler has three special internal splines with 30° entry ramps to accommodate the balls. These three special splines must be assembled opposite the three balls.
59. In the case of type 'B' shaft with a 1000 speed lock-out device, it will be noted that one of the splines in the selector coupler has a cut-away tooth. This tooth must be assembled in line with the lockout pin facing the clutch.
60. Fit the selector fork to the selector rail, if removed, tighten the locking bolt to a torque of 30-40 Nm (22-30 lbf ft).
61. Hold the gear (6) with the needle roller bearing (7) and thrust washer (8) in place behind the intermediate gear cluster.
62. Fit the PTO transmission shaft through the 540 driven gear assembly into the centre housing simultaneously fitting the selector fork and rail in the selector ring and support bearing.
63. Ensure that the gear and shaft assembly goes fully back to the housing and that the thrust washer (8) is correctly located on the web in the housing.
64. Reverse procedures 1 to 4.



PTO Shift Linkage

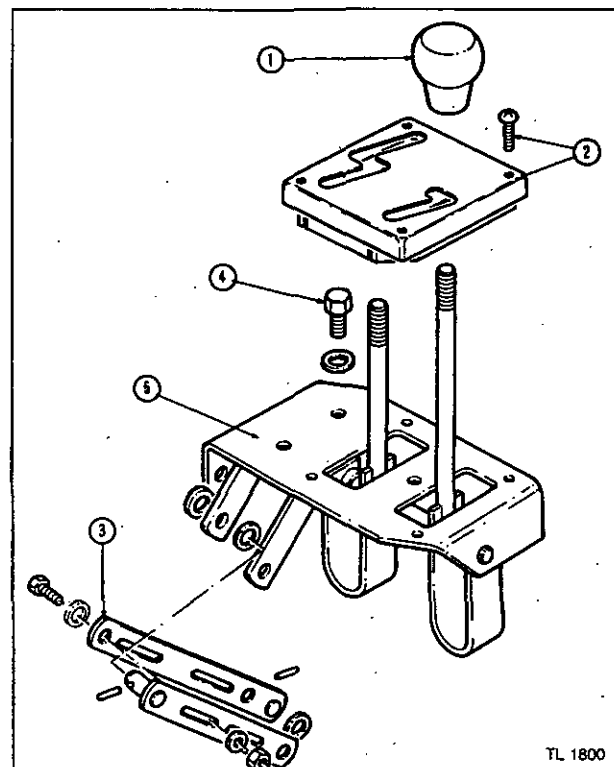
Removal and Refitment 9D-09

Removal

1. Remove the selector lever knobs.
2. Remove the four screws and the selector lever plate.
3. Disconnect the lever from the levers on the left-hand transmission side cover.
4. Remove the bolts holding the lever assembly to the seat support panel.
5. Remove the lever assembly from the underside of the seat support panel.

Refitment

6. Reverse procedure 1 to 5.



SHIFTABLE POWER TAKE-OFF

PTO Shaft and Cassette Oil Seal

Removal and Refitment 9D-10

Special tools:

- MF.168 PTO Seal Remover
- MF.484 PTO Cassette Seal Installer
- MS.550 Universal Handle

The cassette-type oil seal was introduced on tractors from serial number B21005, May 1993.

Removal



CAUTION: To ensure a leak-proof installation of the rear PTO seal, special service tool MF.484 MUST be used to install the seal.

1. Place a drip tray under the rear PTO.

Standard PTO

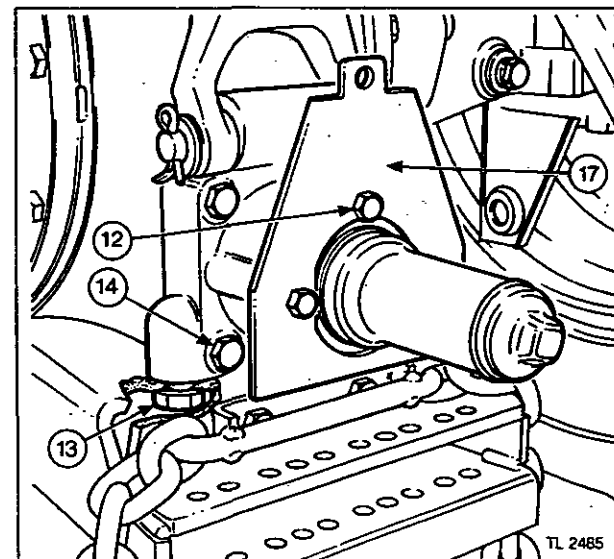
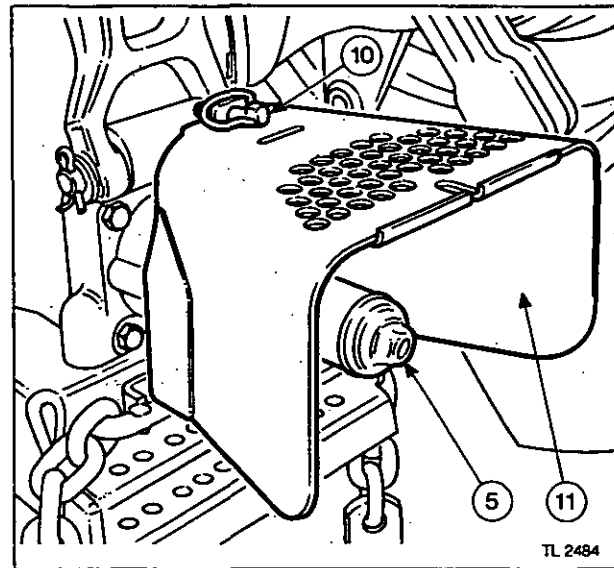
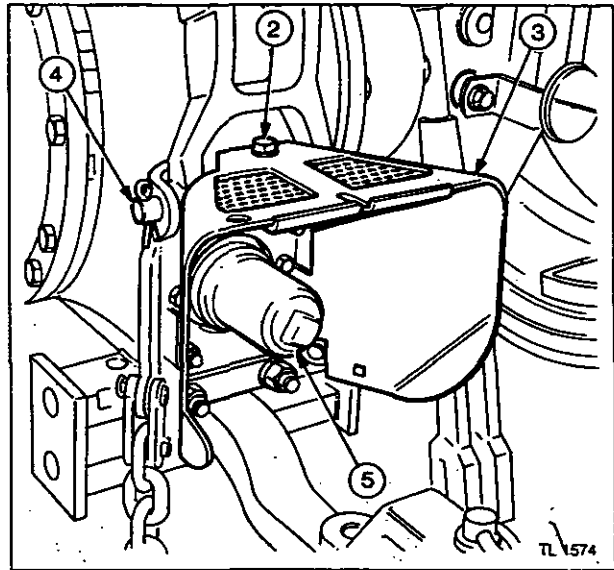
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the bottom of the control beam.
5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers, spacers and tab washers if fitted.
8. Remove the two nuts from the drawbar bracket.
9. Remove the control beam/check chain bracket.

Extended PTO

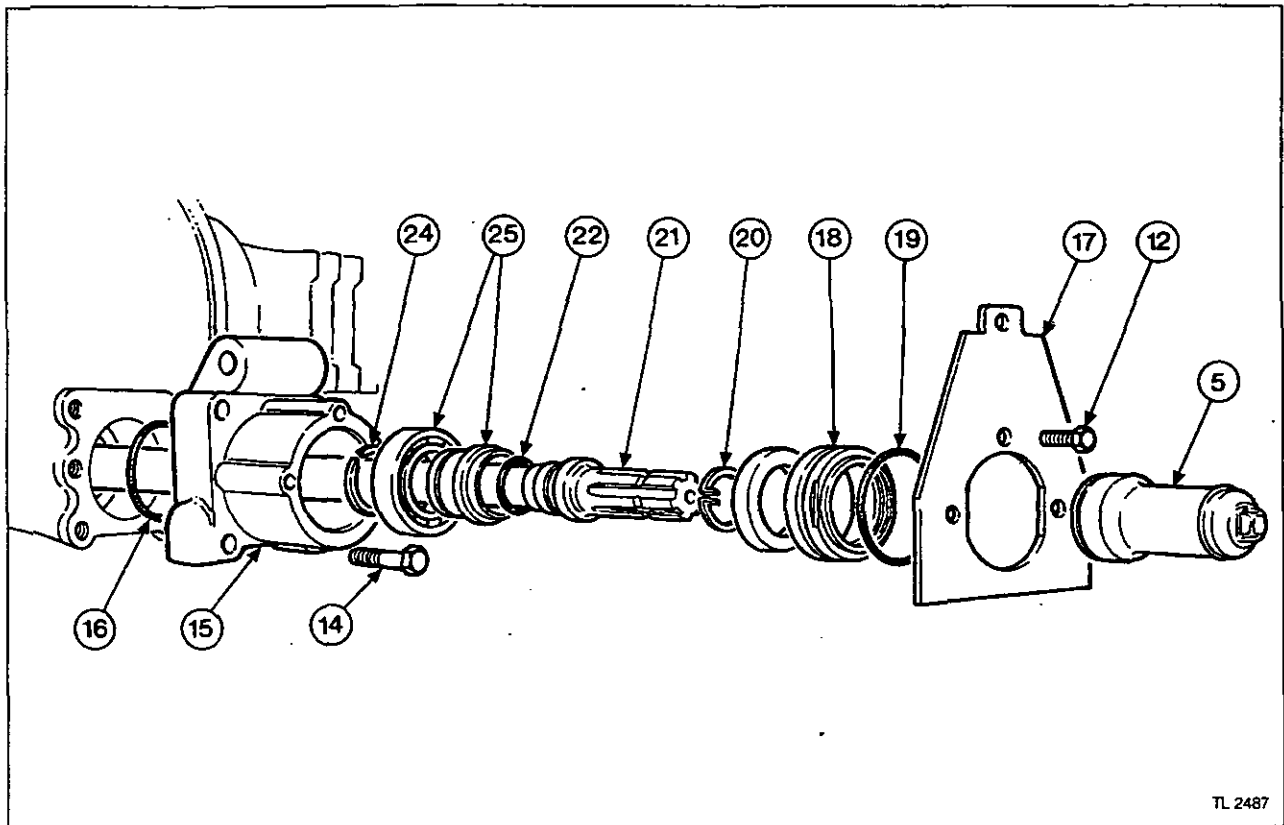
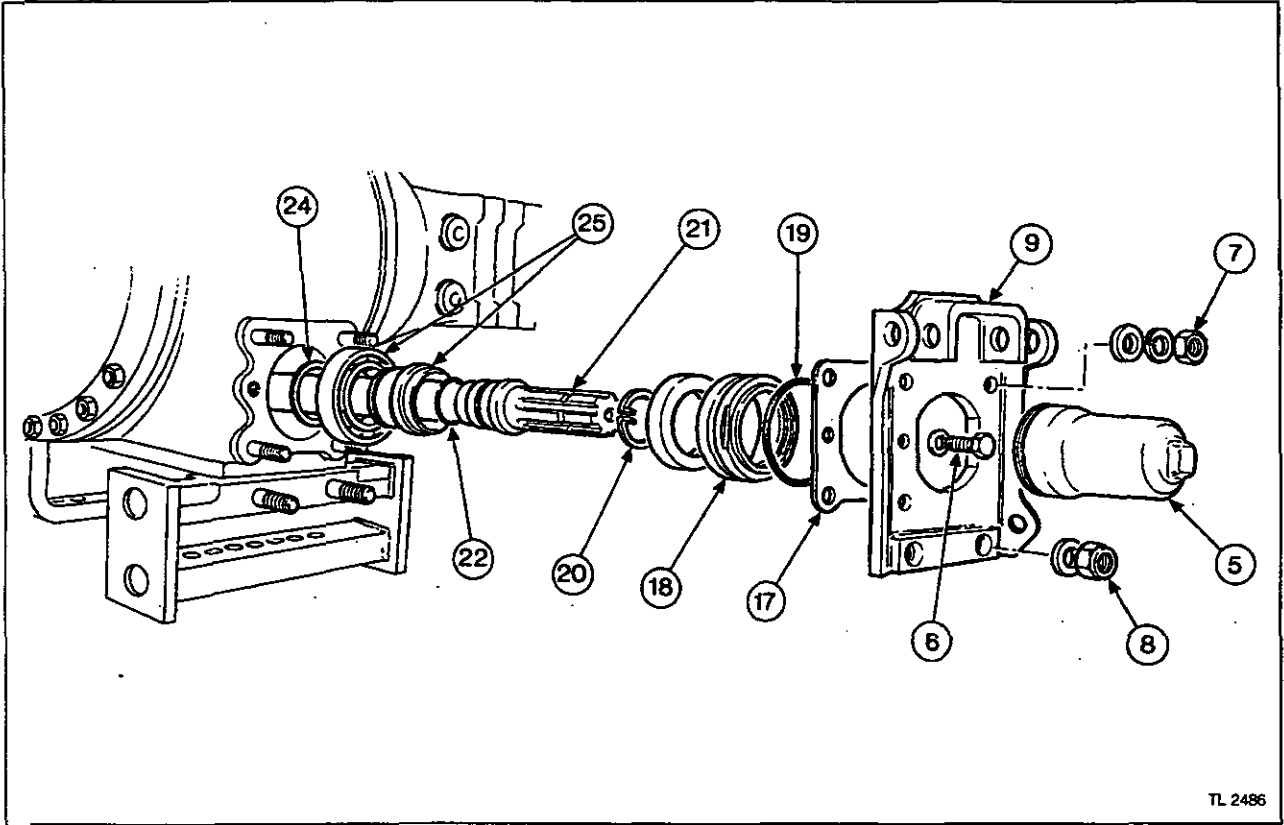
10. Remove the linchpin.
11. Remove the PTO shield.
12. Remove the three bolts.

If it is necessary to remove the extension housing proceed as follows:-

13. Remove the two bolts securing the drawbar to the housing.
14. Remove the four bolts securing the housing to the rear axle.



9D-23
SHIFTABLE POWER TAKE-OFF



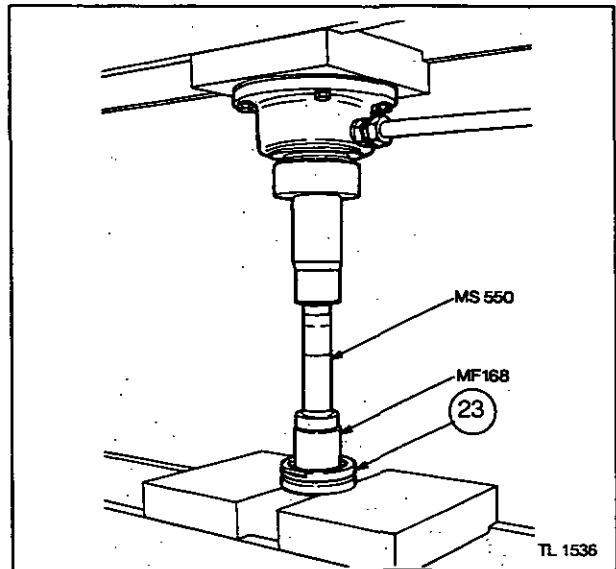
9D-24

SHIFTABLE POWER TAKE-OFF

15. Remove the extension housing.
16. Remove and discard the 'O' ring.

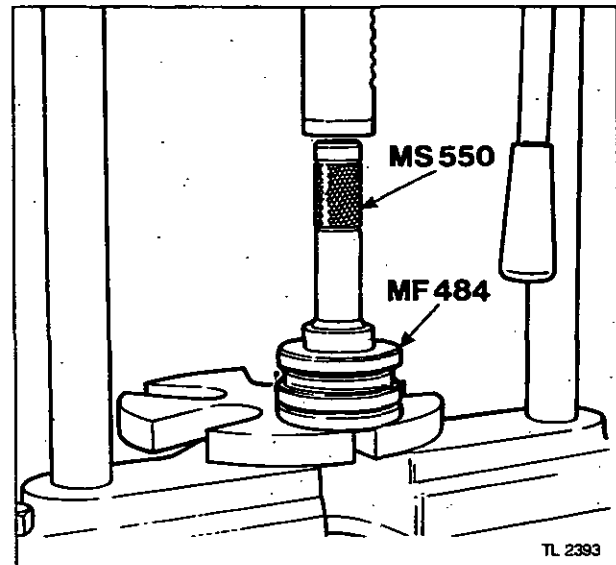
All models

17. Remove the seal housing retainer plate.
18. Remove the oil seal housing by screwing on the PTO cap and pulling the cap, withdrawing the housing from the rear axle.
19. Discard the 'O' ring.
20. Remove the snap ring.
21. Withdraw the PTO shaft from the bearing sleeve.
22. Remove and discard the 'O' ring.
23. Using special tool MF.168 and handle MS.550 press the cassette seal out of the housing and discard.
24. Remove the snap ring.
25. Using a press, push the sleeve out of the bearing.

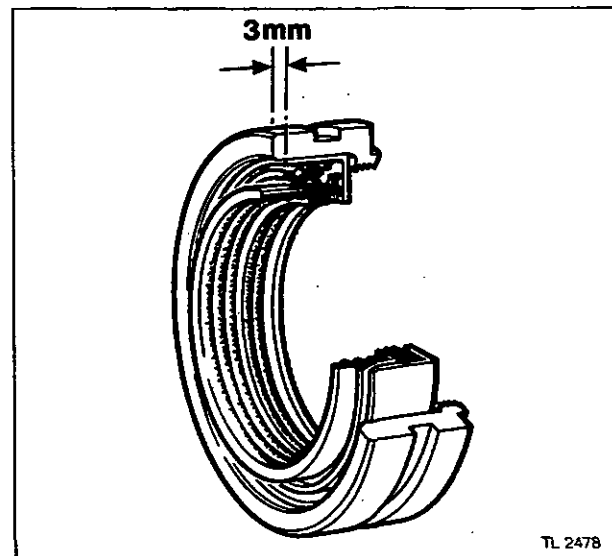


Refitment

26. Using special tool MF.484 and handle MS.550 press the new cassette seal into the oil seal housing as shown in the illustration.



27. The special tool MF.484 will press the seal into the correct depth of 3 mm.
28. Fit a new 'O' ring.



SHIFTABLE POWER TAKE-OFF

29. Using a hydraulic press, press the new ball-bearing onto the sleeve.
30. Fit a new snap ring and ensure that it locates correctly in its groove.

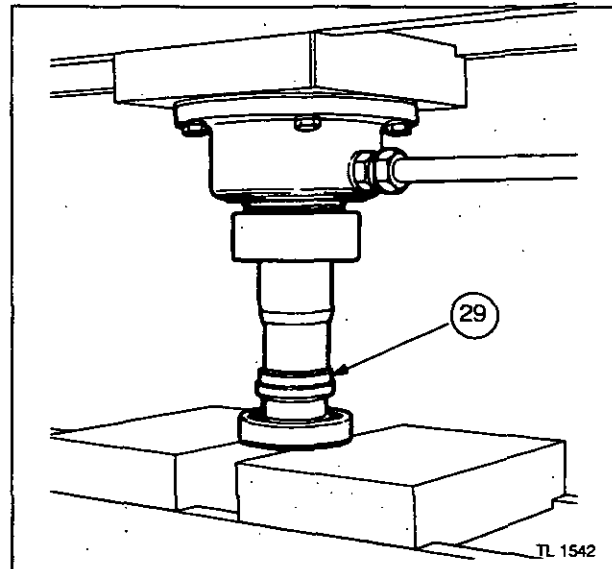
Extended PTO

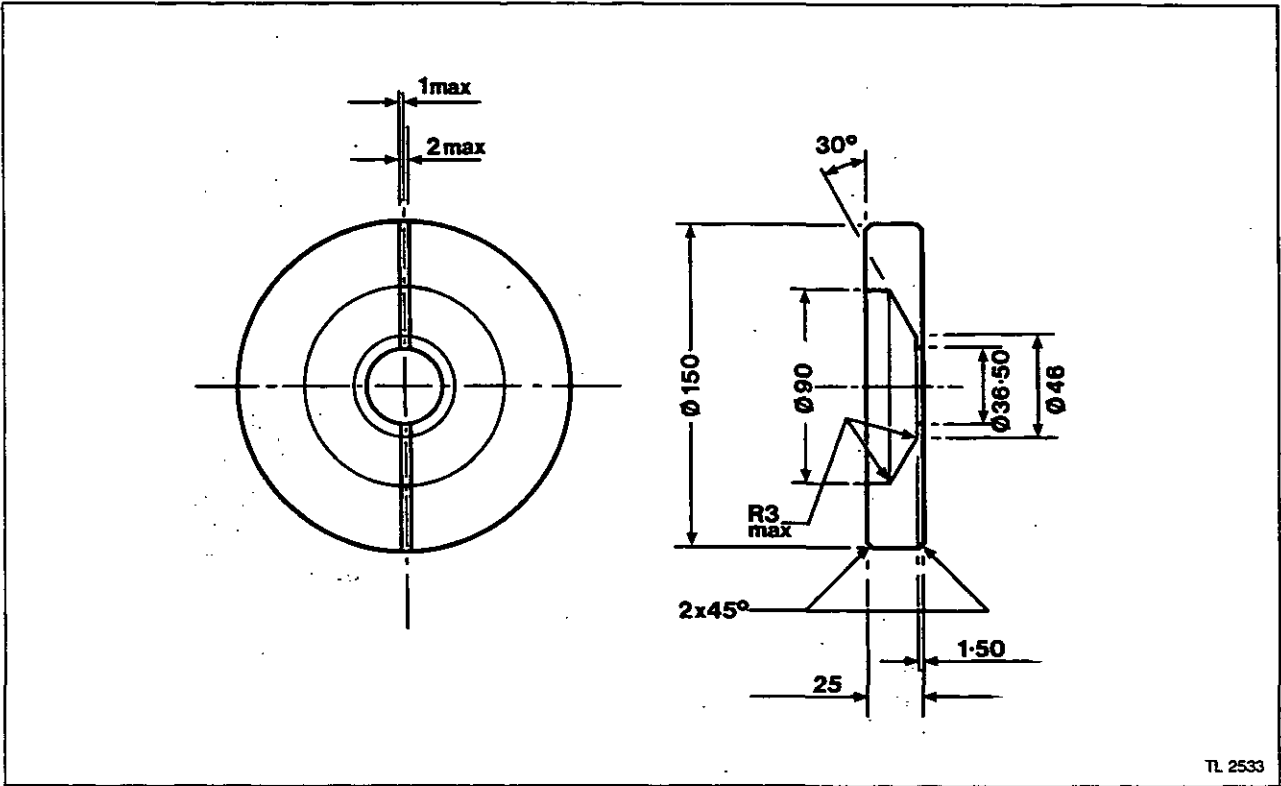
If the extension housing has been removed proceed as follows:-

31. Replace the 'O' ring.
32. Refit the housing and tighten the four bolts (14) to a torque of 160 Nm (118 lbf ft).
33. Apply Massey Ferguson Lock and Seal (Loctite 242) to the two drawbar bolts (13) and tighten to a torque of 400 Nm (295 lbf ft).

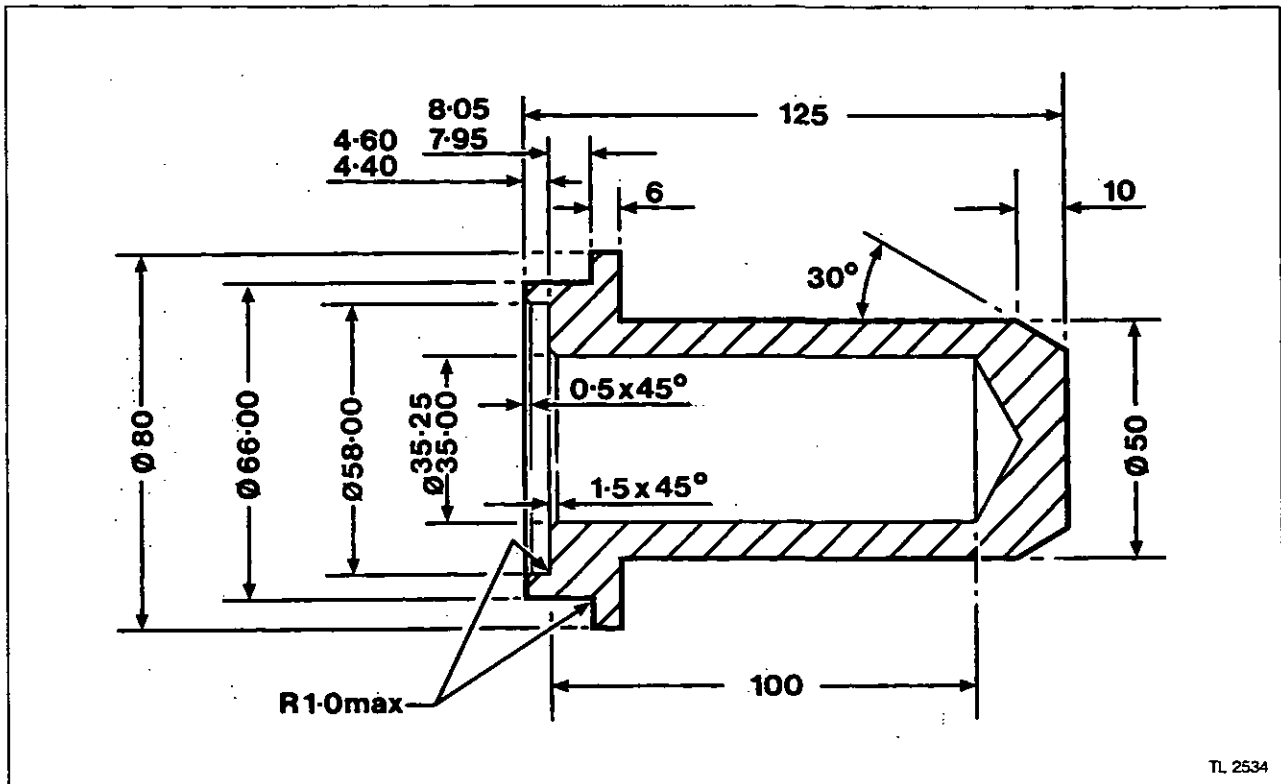
Shaft and seal refitment

34. Slide the PTO bearing and sleeve into the rear axle.
35. Liberally apply petroleum jelly to the internal ribs of the seal prior to assembly.
36. Align the oil seal housing so that the two cut-outs on each side of the housing are vertical.
37. Push the seal housing into the rear axle and onto the sleeve.
38. Replace the 'O' ring on the PTO shaft.
39. Slide the PTO shaft into the rear axle, taking care to keep it horizontal to align the internal splines.
40. Replace the PTO shaft snap ring.
41. Reverse procedures 17 and 1 to 12 except:
 - a. Tighten the two nuts retaining the drawbar bracket to the check chain bracket to a torque of 245 Nm (180 lbf ft).
 - b. Tighten the four check chain retaining nuts with spacers or tab washers to a torque of 140 Nm (104 lbf ft).

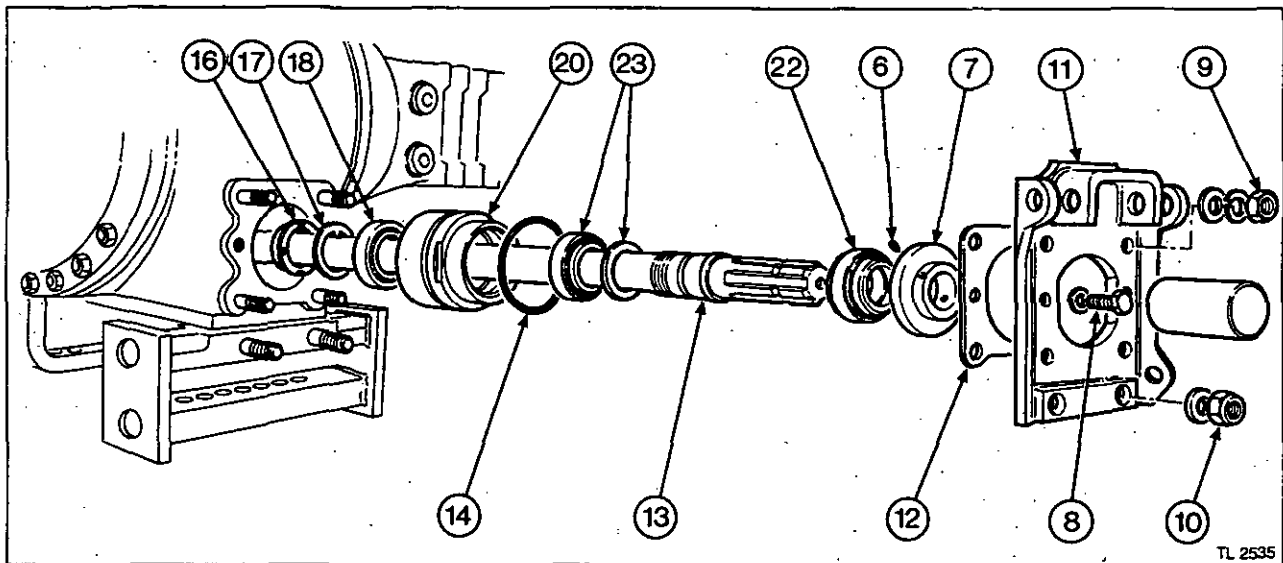




Split Ring Tool 3762 193 C01



Face Seal Installer 3759 801 C01

SHIFTABLE POWER TAKE-OFF**Heavy-duty PTO Shaft Seal**

Overhaul

9D-11

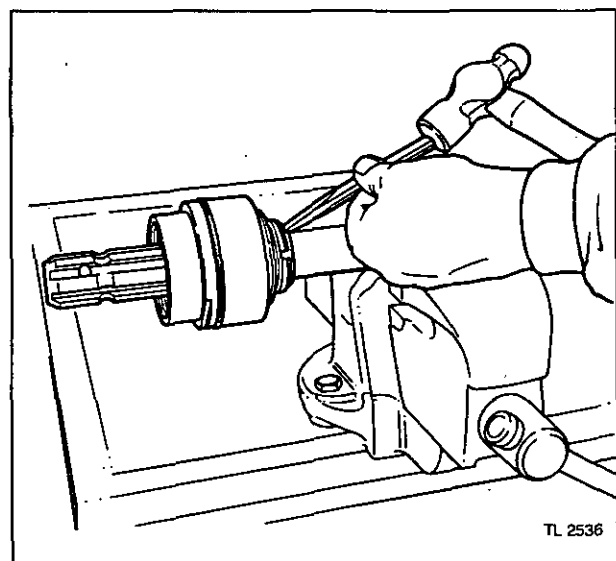
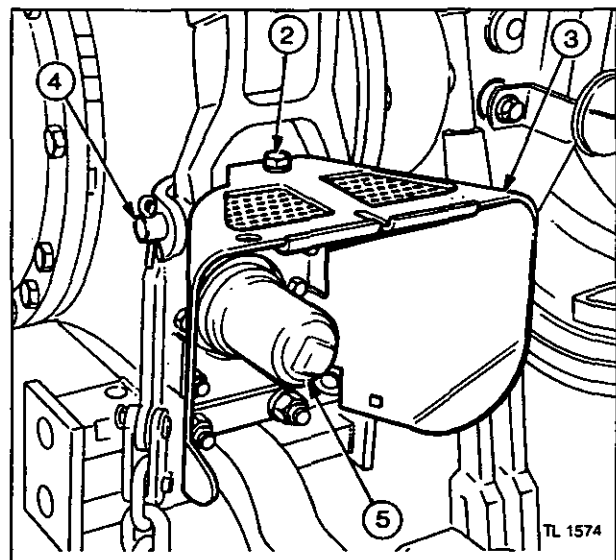
The heavy duty PTO shaft and seal is used in adverse conditions such as paddy fields. It contains two taper roller bearings for shaft support and a face-type seal to prevent the ingress of dirt into the transmission.

Special Tools

To ensure that the bearing and seal assembly is correctly dismantled and reassembled it will be necessary to manufacture the two special Massey Ferguson Tools, 3762 193 C01 Split Ring and 3759 801 C01 Face Seal Installer. These two tools are made out of mild steel to the dimensions given in the illustration.

Disassembly

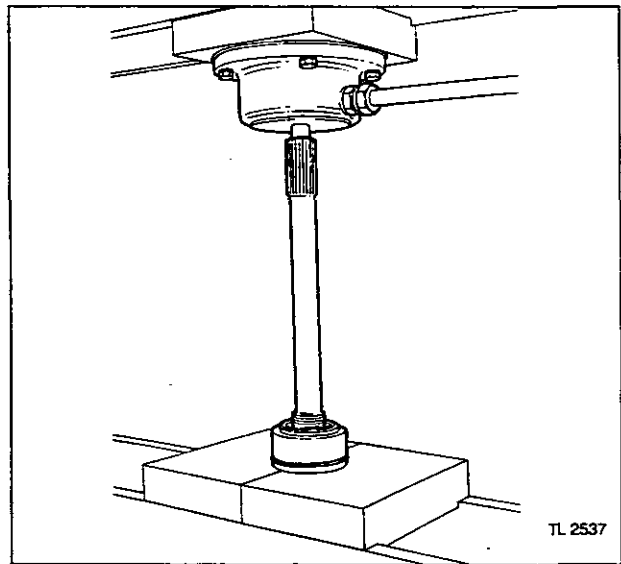
1. Place a drip tray under the rear PTO.
2. Remove the bolt.
3. Remove the PTO safety guard.
4. Detach the bottom of the control beam.
5. Remove the PTO cover.
6. Remove the two grub screws.
7. Slide the dirt shield of the PTO shaft.
8. Remove the two centre bolts and washers.
9. Remove the four nuts, washers and spacers.
10. Remove the two nuts from the drawbar bracket.
11. Remove the control beam/check chain bracket.
12. Remove the seal housing retainer plate.
13. Remove the PTO shaft and bearing assembly by screwing on a PTO cap, withdrawing them from the centre housing.
14. Remove and discard the 'O' ring.
15. Using a sharp narrow chisel, lift the staking up out of the slot.



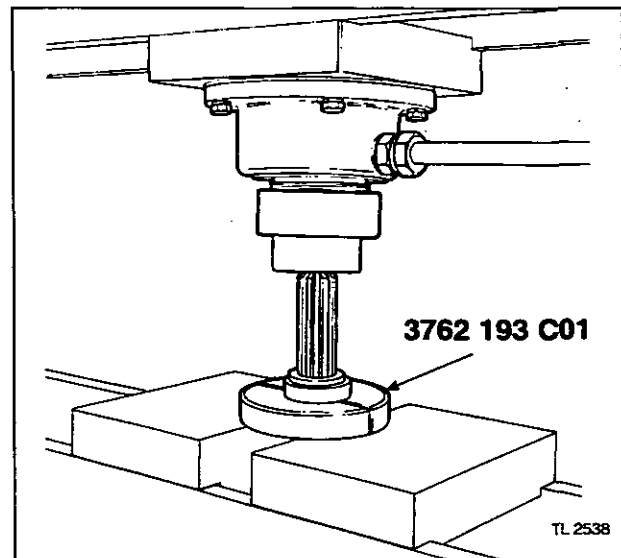
9D-28

SHIFTABLE POWER TAKE-OFF

16. Remove the retaining nut. A 50 mm (2 in) 'C' spanner will assist in the removal and refitment.
17. Remove the tab washer.
18. Remove the bearing cone.
19. Place the shaft in a press, threaded end upwards and resting on the sleeve.
20. Press the shaft and seal out of the bearing sleeve.

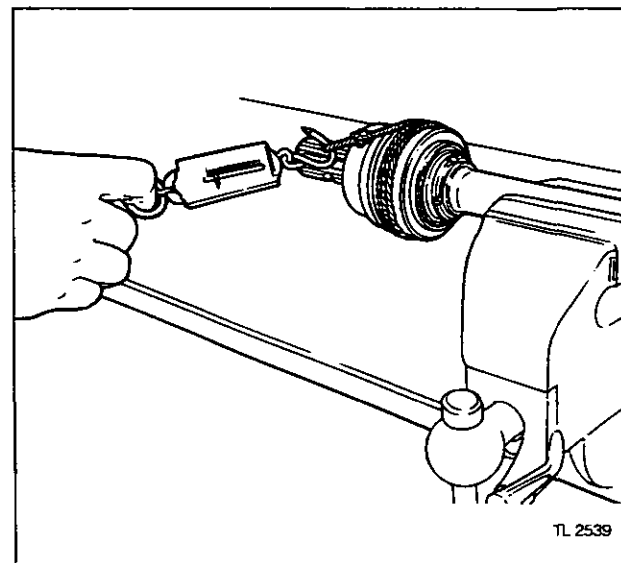


21. Slide the Split Ring Tool (3762 193 C01) between the seal and the shoulder on the shaft.
22. Place the shaft in a press and remove the seal.
23. Remove the components of the taper roller bearings and spacer if necessary.

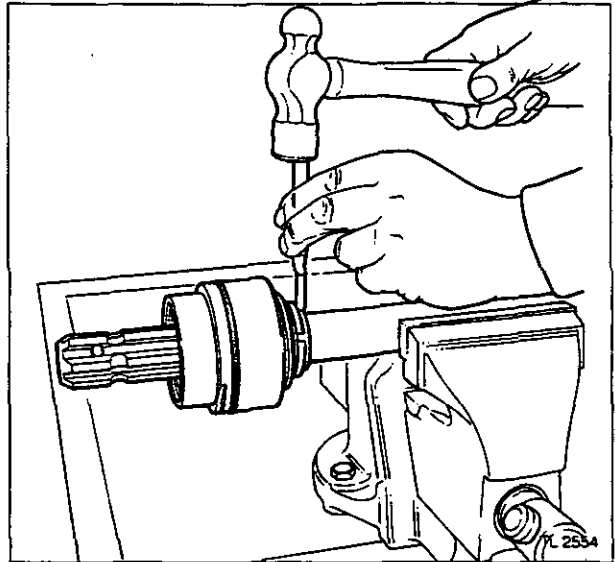


Reassembly

24. Reassemble the shaft in the bearing sleeve and reverse procedures 16 and 17.
25. Apply Massey Ferguson Lock and Seal (Loctite 242) to the thread on the shaft, screw on the nut and tighten to give a rolling torque on the bearings of 1.0-1.7 Nm (0.7-1.3 lbf ft).
26. To obtain the rolling torque, place the PTO shaft in a vice. Wrap string around the bearing sleeve and attach to a spring balance. Pull the spring balance away from the sleeve, the setting is correct when the reading on the spring balance is 3 kg (6.5 lb) when the sleeve is rotating.

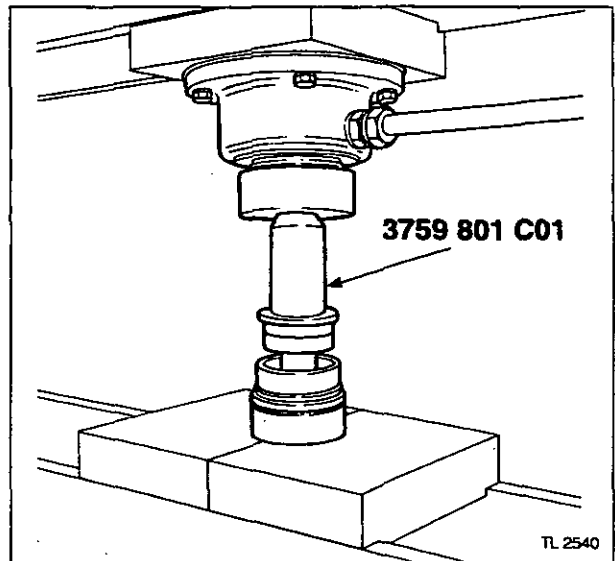


27. Firmly stake the nut into the slot.



28. Ensure that the shaft and housing are free of oil and grease in the area adjacent to the seal. Using the Face Seal Installer (3759 801 C01), press the new seal onto the shaft with the stepped end facing the tool.

IMPORTANT NOTE: The shaft, housing and seal assembly *MUST* be free of oil and grease during assembly.



29. The tool will ensure that the two parts of the metal casing are separated by 4,5 mm and the outer face of the seal is 8 mm below the end of the bearing sleeve.

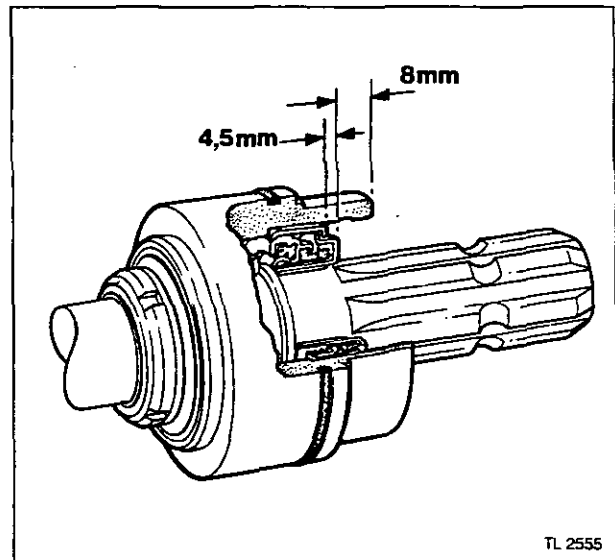
30. Slide the PTO shaft assembly into the centre housing, taking care to keep it horizontal, to align the internal splines and to keep the two flats vertical.

31. Reverse procedures 1 to 11 except:

a. Tighten the four retaining nuts to a torque of 140 Nm (104 lbf ft).

b. Tighten the two nuts retaining the drawbar to a torque of 245 Nm (180 lbf ft).

32. Slide the dirt shield along the PTO shaft until in contact with the bearing housing, then withdraw to give 1 mm approximate clearance. Tighten the two grub screws into the root of the splines. Seal the splines to prevent dirt being forced in with RTV or equivalent sealant.



SINGLE-SPEED POWER TAKE-OFF
(540 rev/min – 1993 onwards)

Section 9 – Part E

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9E-2

SINGLE-SPEED POWER TAKE-OFF

Specification:

Lift pump output:

540 rev/min PTO speed - Low flow pump	1789 engine rev/min
Hydraulic lift pump oil flow	16,7 litre/min (3.7 gal/min) (4.4 US gal/min)
540 rev/min PTO speed - High flow pump	1902 engine rev/min
Hydraulic lift pump oil flow	27,6 litre/min (6 gal/min) (7.2 US gal/min)
540 rev/min IPTO speed - Low flow pump	1789 engine rev/min
Hydraulic lift pump oil flow	27,6 litre/min (6 gal/min) (7.2 US gal/min)

Engine to PTO shaft ratio:

Low flow pump	3.313:1
High flow pump	3.522:1
IPTO - Low flow pump	3.313:1

High flow PTO intermediate gears:

Intermediate gear clearance	0,10 mm (0.004 in)
Pinion bearing pre-load	2,0-2,5 Nm (18-22 lbf)

PTO shaft:

Outside diameter	34,93 mm (1.375 in)
No. of splines	6

IPTO clutch:

Type	Multiplate
Size	127 mm (5 in)
Operation	Hydraulic
No. of friction discs	7
Thickness (new)	2,41-2,54 mm (0.95-0.100 in)
Max. permissible dish	0,127 mm (0.005 in)
Groove depth	0,152-0,227 mm (0.006-0.009 in)
No. of steel plates	7
Thickness new	1,35-1,45 mm (0.053-0.057 in)
Max. permissible dish	0,127 mm (0.005 in)
No. return springs	1
Type	Coil
Free length	74 mm (2.9 in)
Working length	26,7-33,8 mm (1.052-1.332 in)
Load at working length	100 kgf (45 lbf)
Clutch retainer plate clearance	3,5-4,0 mm (0.138-0.157 in)
Checking load	5 kgf (11 lbf)

Clutch pressures:

Engine speed	1500 rev/min
Oil temperature	50-60°C (120-140°F)
Clutch operating pressure	22-24 bar (319-348 lbf/in ²)
Minimum permissible pressure	20,7 bar (300 lbf/in ²)

PTO drive hub support bearings:

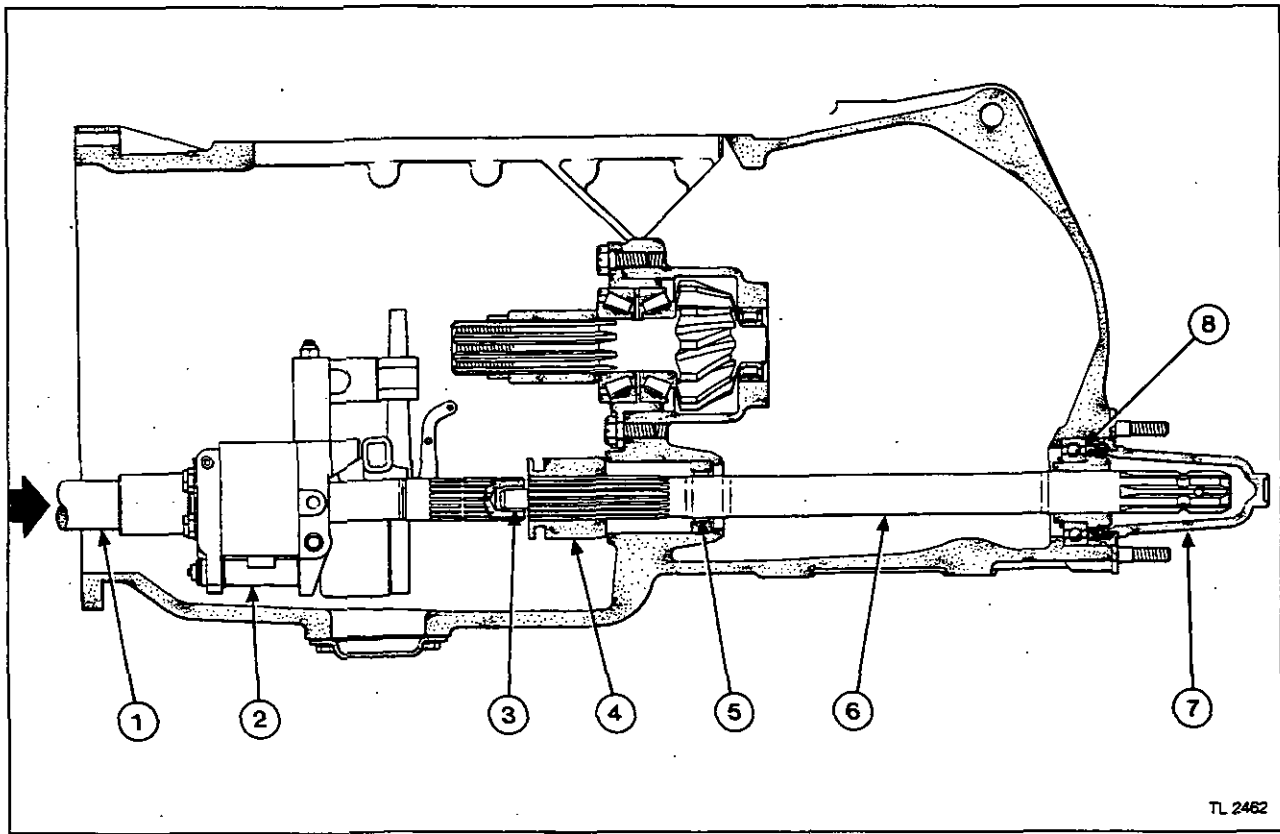
Depth of first bearing	59-60 mm (2.352-2.364 in)
Depth of second bearing	1-2 mm (0.040-0.080 in)
Spacer clearance	0,25 mm (0.010 in)

Special tools

MF.168	PTO seal remover
MF.195C	Puller main tool
MF.195-5A/2	Extension rod
MF.195-6A/1	Collet
MF.484	Cassette seal installer
MS.550	Universal handle
FT.4062A	Bearing pre-load gauge

Bolt torques

Check chain bracket nuts (Qty. 4)	140 Nm (103 lbf ft)
Drawbar bracket to check chain bracket nuts (Qty. 2)	245 Nm (180 lbf ft)
Pinion bearing assembly bolts	108 Nm (80 lbf ft)

SINGLE-SPEED POWER TAKE-OFF

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Figure 1. Single-speed PTO - Low flow pump

- | | |
|--------------------------------|----------------------------------|
| 1. PTO input from transmission | 5. PTO shaft support bearing |
| 2. Hydraulic lift pump | 6. PTO shaft |
| 3. PTO shaft spigot bearing | 7. PTO cap |
| 4. Selector sleeve | 8. PTO bearing and seal assembly |

General Description

From August 1993 a new arrangement of PTO drive was introduced comprising the following types:-

- Single-speed PTO - Low flow hydraulic lift pump
- Single-speed PTO - High flow hydraulic lift pump
- Single-speed IPTO - Low flow hydraulic lift pump

The new live PTOs were introduced at tractor serial number B33002, IPTO was introduced at tractor serial number B33007.

Single-Speed - Low Flow Pump (Fig. 1)

The PTO shaft that projects from the rear of the tractor is supported at the rear by a ball-bearing and at the front by a needle roller bearing housed in the end of the hydraulic pump drive shaft. There is an intermediate bearing to support the centre of the shaft. Splined onto the front end of the PTO shaft there is a sliding coupler which is operated by a two position selector lever.

When the selector lever on the side cover is moved rearwards the sliding coupler moves forward, the internal splines of the coupler engage with the splines on the hydraulic pump drive shaft. The PTO shaft is then driven at a speed of 540 rev/min occurring at 1789 engine rev/min.

At this speed the hydraulic lift pump will deliver 16,7 litre/min (3.7 gal/min) (4.4 US gal/min).

When the selector lever is moved forwards the coupler is disengaged. At the same time the PTO safety start switch is engaged to allow the engine to be started.

SINGLE-SPEED POWER TAKE-OFF

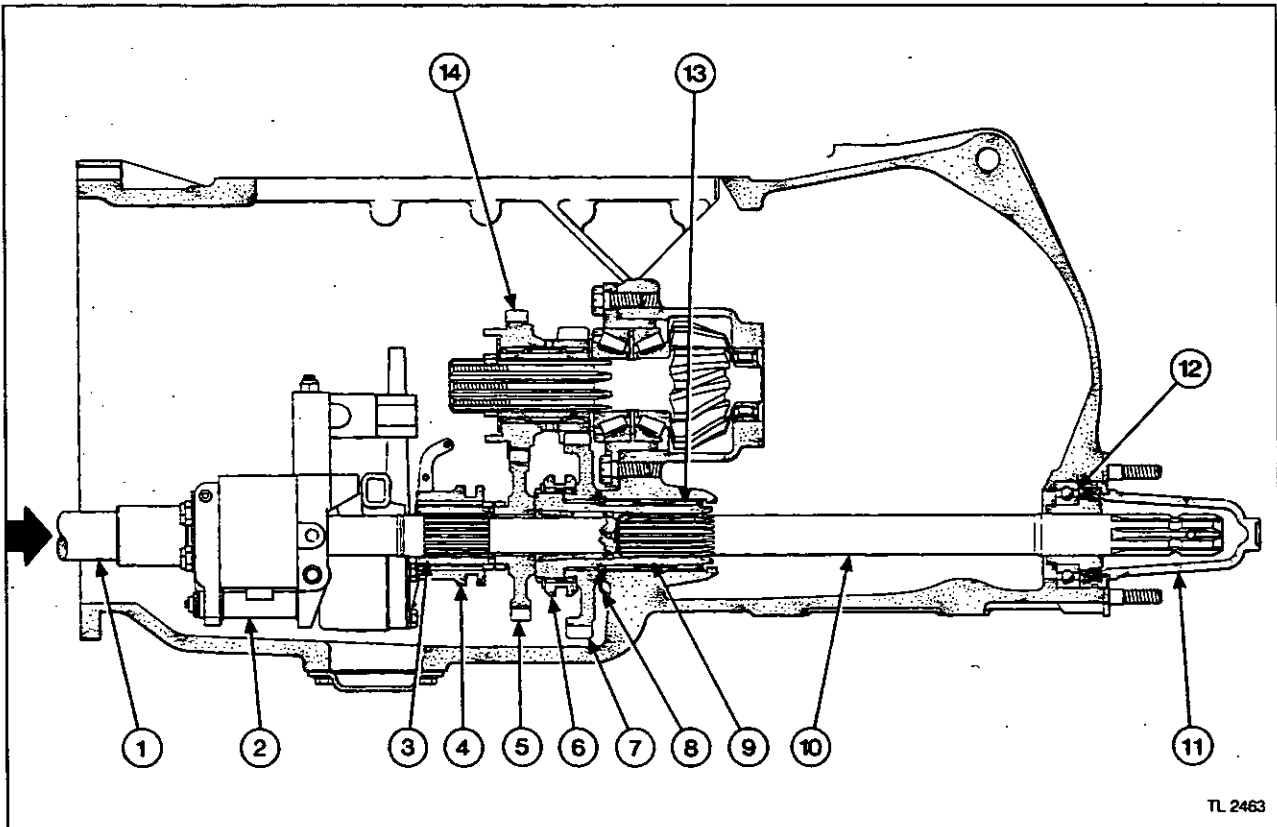


Figure 2. Single-speed PTO - High flow pump

- | | |
|--------------------------------|-----------------------------------|
| 1. PTO input from transmission | 8. Thrust washer |
| 2. Hydraulic lift pump | 9. PTO shaft drive hub |
| 3. Selector hub | 10. PTO shaft |
| 4. Selector sleeve | 11. PTO cap |
| 5. Drive gear | 12. PTO bearing and seal assembly |
| 6. Unused coupler | 13. Drive hub support bearing |
| 7. Driven gear | 14. Intermediate gear cluster |

Single-Speed – High Flow Pump (Fig. 2)

The PTO shaft which projects from the rear of the tractor is supported at the rear in a ball-bearing and seal assembly, and at the front, in a drive hub supported by needle roller bearings in the rear axle centre housing. This drive hub also supports hydraulic lift pump drive shaft in a plain support bearing.

To obtain a high oil flow 27,6 litre/min (6 gal/min) (7.2 US gal/min) from the hydraulic lift pump, the pump is driven at a higher speed of 1000 rev/min. To obtain the required PTO speed of 540 rev/min the drive is passed through a series of gears to reduce the speed.

When the selector lever on the side cover is moved forwards, a sliding coupler on the pump drive shaft moves rearward and engages with a free running drive gear. This drive gear is engaged with an intermediate gear cluster running on the main pinion shaft. The drive is then taken through the driven gear on the PTO drive hub to the PTO shaft. This gear train reduces the speed from 1000 to 540 rev/min at an engine speed of 1902 rev/min.

Single-Speed IPTO – Low Flow Pump (Fig. 3)

The PTO drive is taken from the hydraulic lift pump running at a speed of 540 rev/min giving a hydraulic flow of 16.7 litre/min (3.7 gal/min) (4.4 US gal/min) at an engine speed of 1789 rev/min.

The principal components of the single-speed IPTO comprise a hydraulically-operated multi-plate clutch, and a spool-type control valve and linkage operated by hand lever.

The IPTO clutch is located immediately to the rear of the linkage pump and is driven from an extension of the linkage pump drive shaft. This shaft is driven from the cover of the split torque transmission clutch, through the PTO reduction gears and drive shaft to the pump.

The rear extension shaft of the linkage pump is splined into the housing of the IPTO clutch. Five steel interplates are splined into the casing of the clutch. Five corresponding sintered friction plates are splined to a central hub and brake disc. A large central spring holds the clutch in the disengaged position. The main PTO shaft is splined to the drive hub and brake disc.

9E-5 SINGLE-SPEED POWER TAKE-OFF

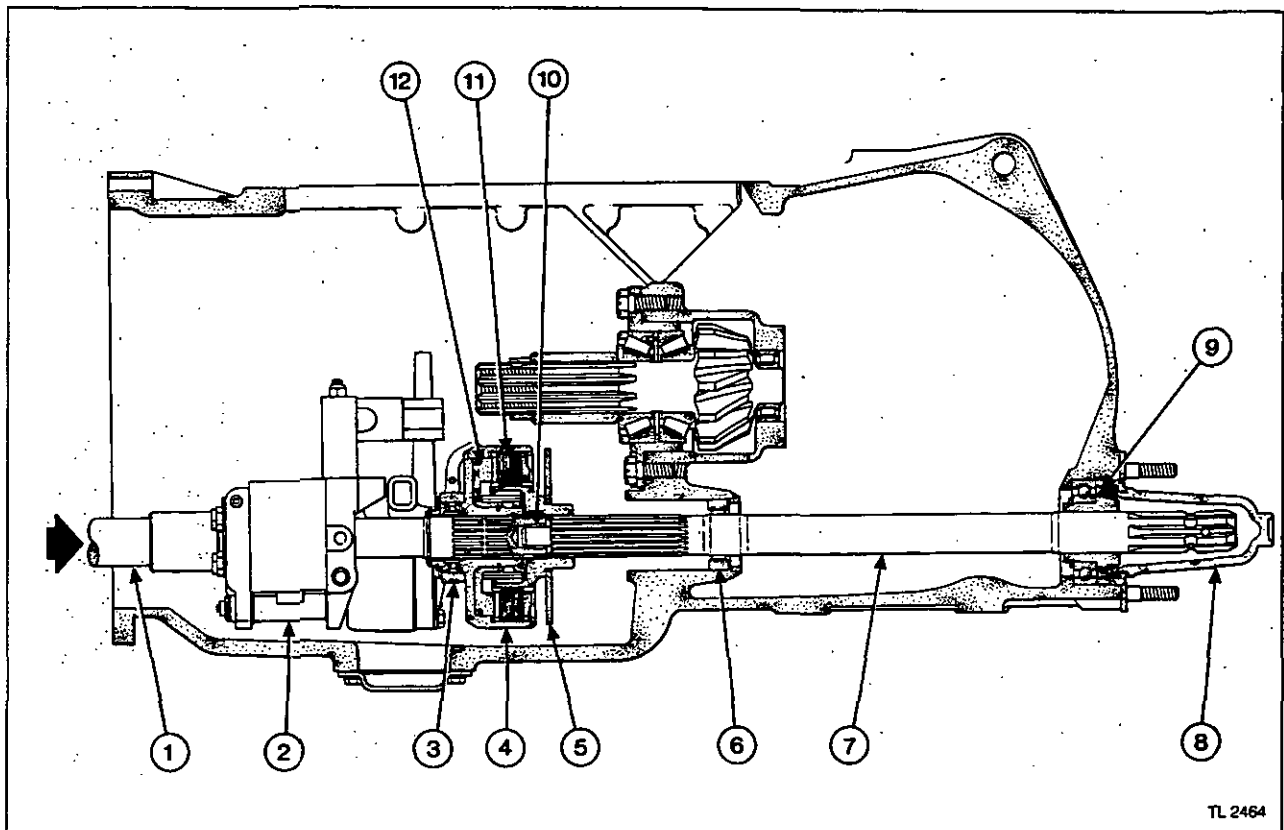


Figure 3. Single-speed IPTO - Low flow pump

- | | |
|--------------------------------|----------------------------------|
| 1. PTO input from transmission | 7. PTO shaft |
| 2. Hydraulic lift pump | 8. PTO cap |
| 3. Feed ring | 9. PTO bearing and seal assembly |
| 4. IPTO clutch | 10. PTO shaft spigot bearing |
| 5. IPTO brake disc | 11. Multi-plate clutch |
| 6. PTO shaft support bearing | 12. Piston |

Rotation of the PTO shaft is controlled by the hydraulic clutch. It occurs when the driving (steel) plates and the driven (friction) plates are forced into engagement by the piston, this is operated by oil pressure from the left-hand side cover and auxiliary hydraulic system.

The spool-type control valve is located on the outside of the left-hand side cover and has two positions selected by the hand lever adjacent to the driver. Moving the lever to the engaged position allows the control valve to direct oil into the back of the piston, overcome the pressure of the return spring and engage the clutch. A small jet is positioned in the face of the piston to direct oil at 0,5 litre/min (1 pt/min) onto the friction plates, particularly at the time of engagement, to cool the plates. Holes are provided in the periphery of the clutch casing to vent oil from between the plates.

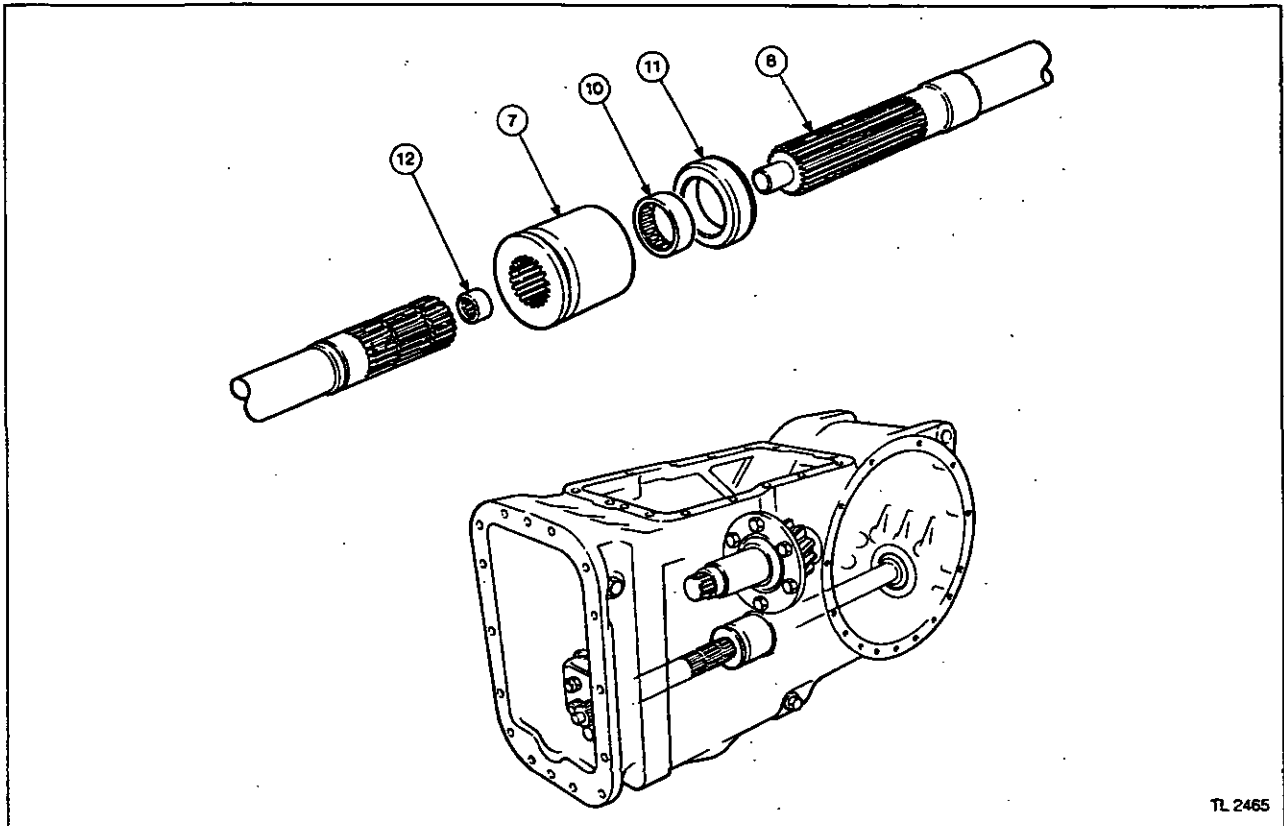
Moving the lever to the disengaged position shifts the control valve spool allowing oil to return from behind the piston and thereby disengaging the clutch. At the same time the safety start switch is engaged. The large return spring located behind the piston ensures a fast return oil flow and a rapid disengagement of the clutch. Return oil from behind the piston returns directly through a port in the side cover to the transmission case.

When the clutch is in the disengaged position, the oil pressure is directed to the brake piston. This force operates through linkage to a caliper-type brake which holds the PTO shaft stationary.

The hydraulic system is fitted with a modulating valve assembly which controls the rate of engagement of the clutch, it comprises two valves mounted in the left-hand side cover. They control the flow of oil into the clutch pack so that the engagement time is approximately 1.5 seconds, this prevents the clutch taking up the drive suddenly which could result in damage to the tractor or the implement. The clutch pack pressure is controlled by the pressure maintaining valve adjacent to the engine. A safety pressure relief valve is fitted to the larger of the modulating valves to prevent damage to the clutch pack. These valves are factory set and non-adjustable.

9E-6

SINGLE-SPEED POWER TAKE-OFF



PTO Drive and Engagement – Low Flow

Removal and Refitment 9E-01

Special tools:

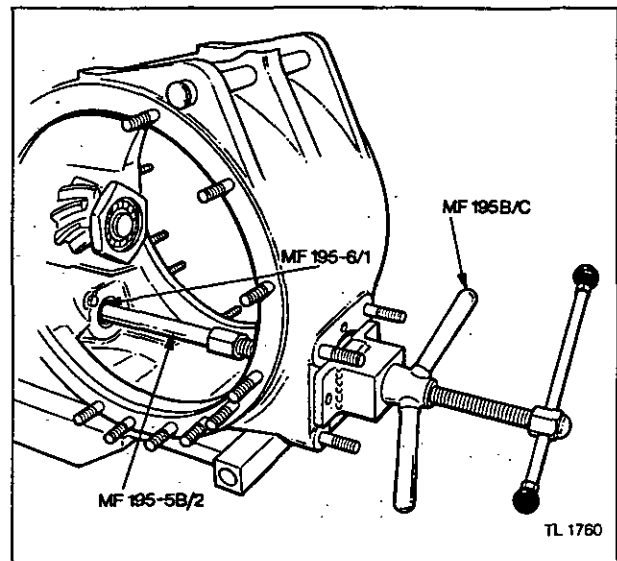
MF.195C Puller, Main Tool
MF.195-5A/2 Extension Rod
MF.195-6A/1 Collet

Removal

1. Split the tractor between the rear centre housing and gearbox, see operation 2A-04 or 2B-05.
2. Remove the left-hand side cover, see operation 9A-05.
3. Remove the access plate, the hydraulic lift pump filter and stud extension.
4. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.
5. Remove the access plate, the hydraulic lift pump filter and stud extension.
6. Remove the hydraulic lift pump, see operation 12A-12.
7. Remove the coupler from the shaft.
8. Remove the PTO shaft assembly, see operation 9A-08.

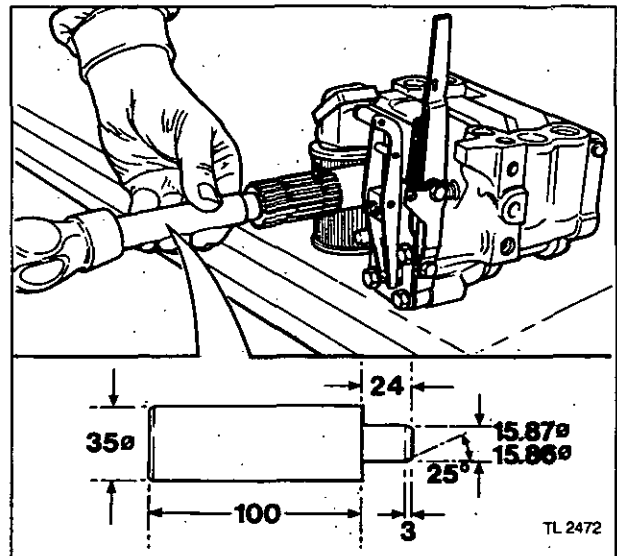
SINGLE-SPEED POWER TAKE-OFF

9. If the PTO shaft support bearing is to be replaced, remove the left-hand trumpet housing and the differential unit, see operation 8A-06.
10. Using MF.195C Main Puller, MF.195-5A/2 Extension Rod and MF.195-6A/1 Collet, remove the the PTO shaft support bearing rearwards as shown in the illustration.
11. The bearing sleeve should be retained in the housing.
12. If necessary, remove the needle roller bearing from the end of the hydraulic pump shaft using an internal bearing extractor.

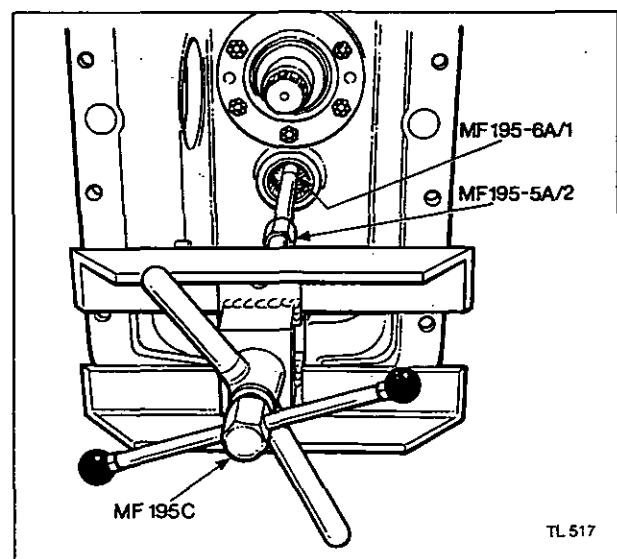


Refitment

13. Replace the needle roller bearing in the end of the hydraulic pump drive shaft. Manufacture a bearing driver as shown in the illustration. The needle roller bearing must be installed with the tool pressing on the face engraved with the manufacturer's name. This end of the bearing is designed to take the pressing forces.

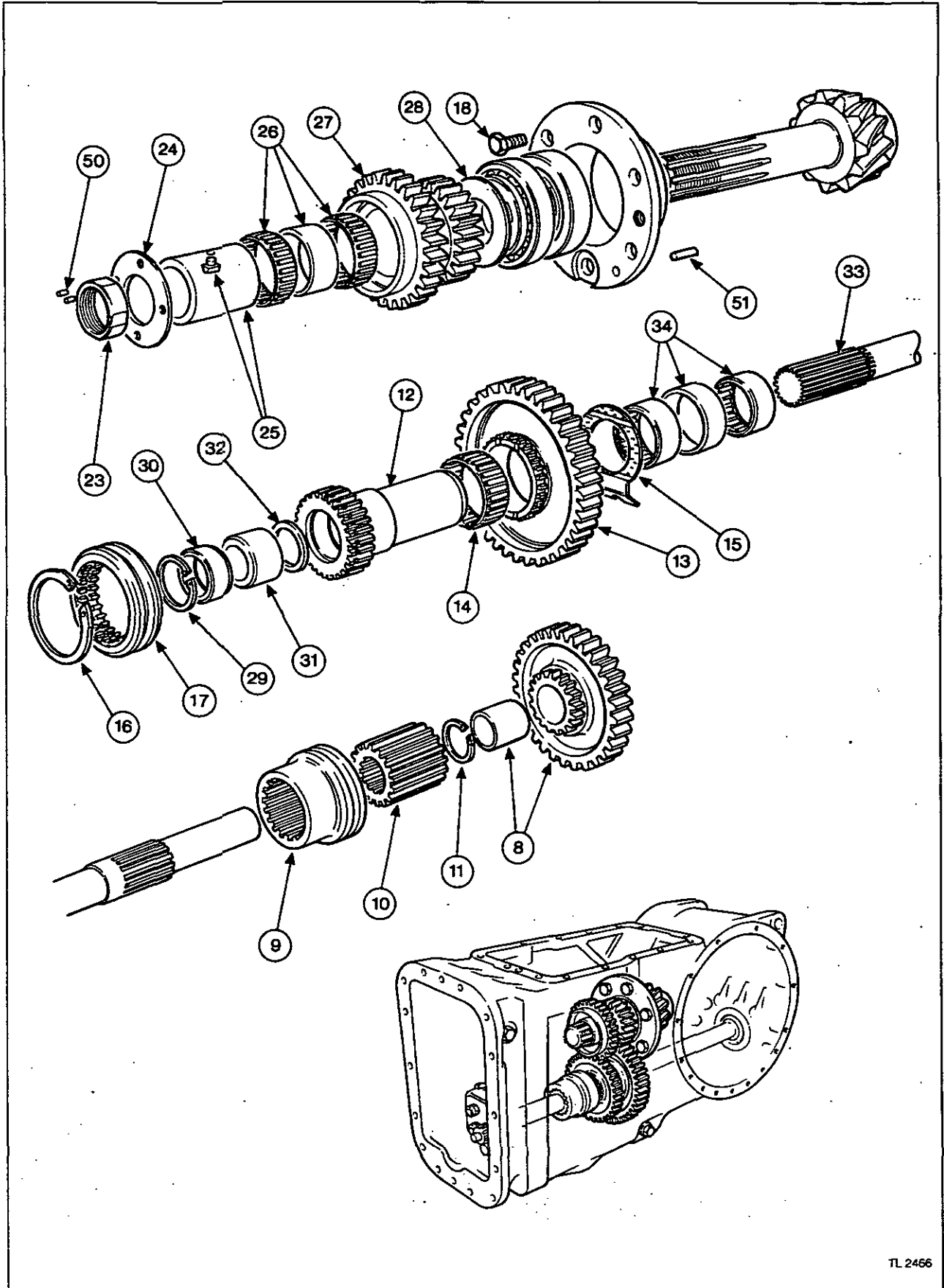


14. Replace the PTO shaft support bearing using MF.195C Main Puller, MF.195-5A/2 Extension Rod and MF.195-6A/1 Collet. Using two pieces of angle bar, as shown in the illustration, pull the needle roller bearing into position in the centre of the sleeve.
15. Reverse procedures 1 to 8 except:
 - a. Fit new oil seals, 'O' rings and gaskets.



9E-8

SINGLE-SPEED POWER TAKE-OFF



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SINGLE-SPEED POWER TAKE-OFF**PTO Drive and Engagement – High Flow
Overhaul** 9E-02*Special tools:**MF.195C Puller, Main Tool**MF.195-5A/2 Extension Rod**MF.195-6A/1 Collet**FT.4026A Bearing Pre-load Gauge***Disassembly**

1. Split the tractor between the rear centre housing and the spacer or four-wheel drive drop box, see operation 2A-04 or 2B-05.
2. Remove the lift cover, see operation 12A-03 or 12A-04.
3. Remove the left-hand side cover, see operation 9A-05.
4. Remove the main drive shaft.
5. Remove the access plate, hydraulic lift pump filter and stud extension.
6. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.

NOTE: The following procedure must be carefully followed otherwise extreme difficulty will be experienced in removing the pump.

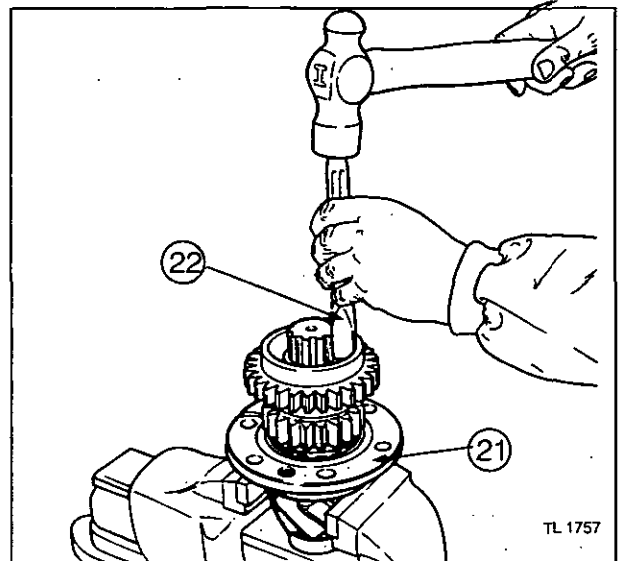
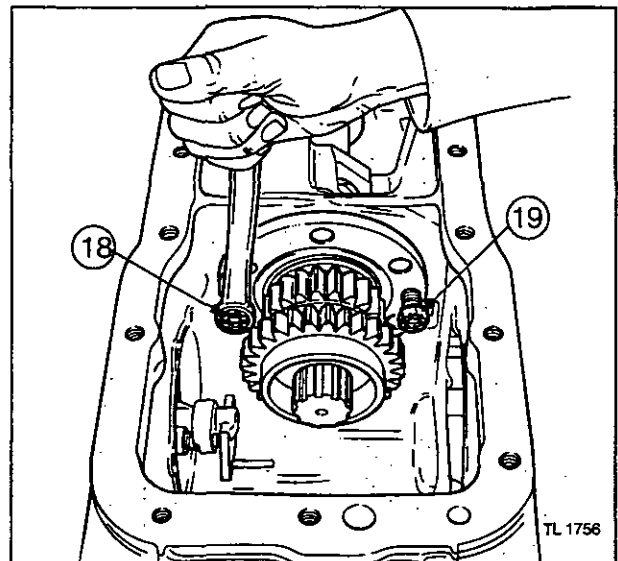
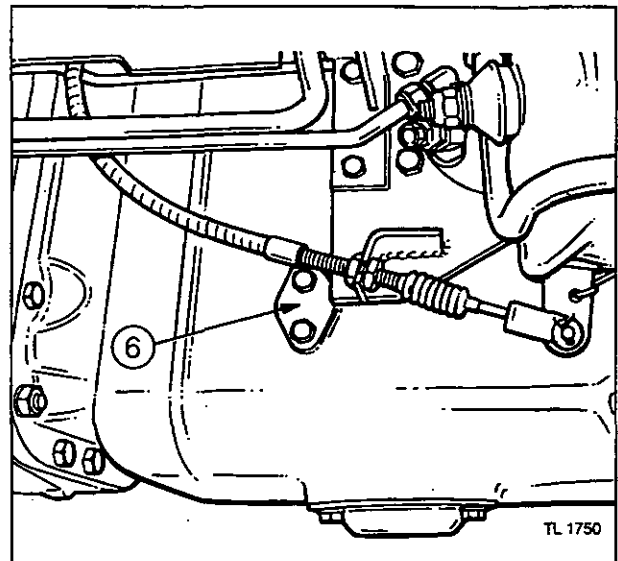
7. The lift pump, selector sleeve, selector hub and drive gear must be held together and removed as one unit. At the same time, ensure that the PTO drive gear and hub is kept back against the internal casing. This will allow the pump to be lifted clear of the gears.
8. Remove the drive gear.
9. Remove the selector hub.
10. Remove the selector sleeve.
11. Remove the internal circlip.

PTO Shaft Drive Hub

12. Keeping the PTO driven gear (13), needle roller bearing (14) and thrust washer (15) to the rear of the box, pull the unused coupler and drive hub out of the rear casing.
13. Remove the PTO driven gear.
14. Remove the needle roller bearing.
15. Remove the thrust washer.
16. Remove the circlip.
17. Remove the unused coupler.

Pinion shaft

18. Remove the six pinion housing retaining bolts.
19. Screw one of the pinion housing retaining bolts into each of the two tapped holes in the flange.
20. Tighten the bolts, withdrawing the pinion housing assembly.
21. Place the pinion housing assembly in a vice with soft jaws holding it in a vertical position.
22. Using a cold chisel cut down through the nut adjacent to one of the flats and the two locking rollers (50).



9E-10

SINGLE-SPEED POWER TAKE-OFF

23. A few hefty blows will fracture the nut enabling the rollers and nut to be removed.
24. Remove the thrust washer.
25. Remove the sleeve and sleeve keeper.
26. Remove the needle roller bearings and spacer.
27. Remove the intermediate gear cluster.
28. Remove the thrust washer.

PTO Shaft Drive Hub

29. Remove the internal circlip.
30. Remove the sleeve.
31. Remove the support bush.
32. Remove the spacer.

Drive Hub Support Bearings

33. To remove the two bearings and spacer in the centre housing it will be necessary to remove the PTO shaft assembly, see operation 9A-08. The left-hand trumpet housing, see operation 8A-06.
34. Using special tool MF.195C main puller, MF.195-5B/2 Extension Rod, MF.195-6/4 Collet, pull out the two needle roller bearings and spacer from the centre housing as shown in the illustration.

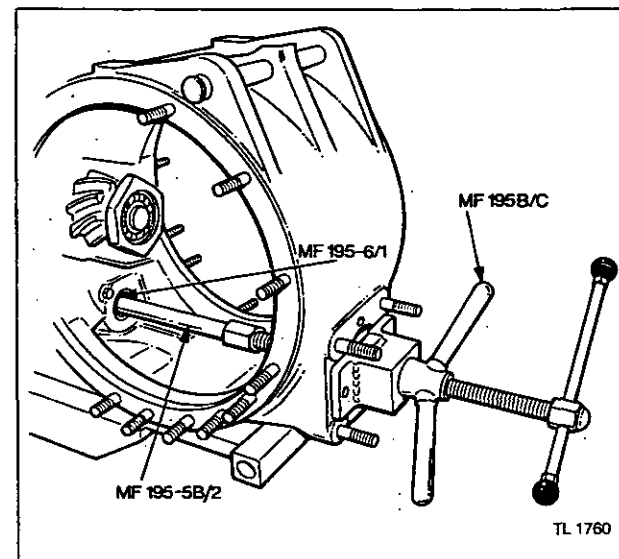
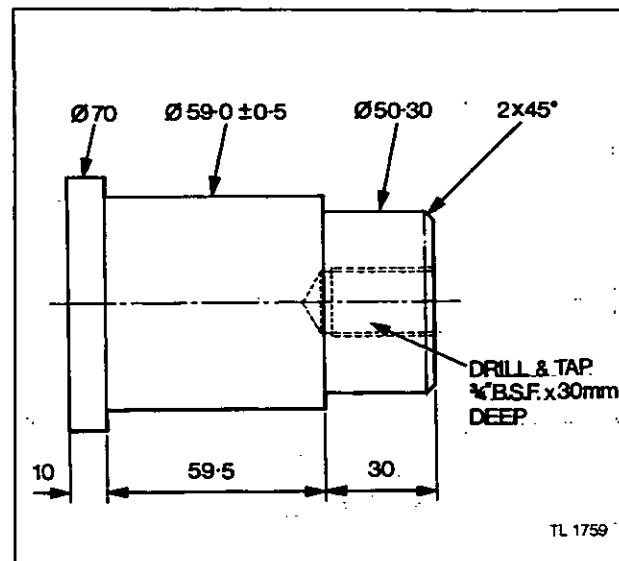
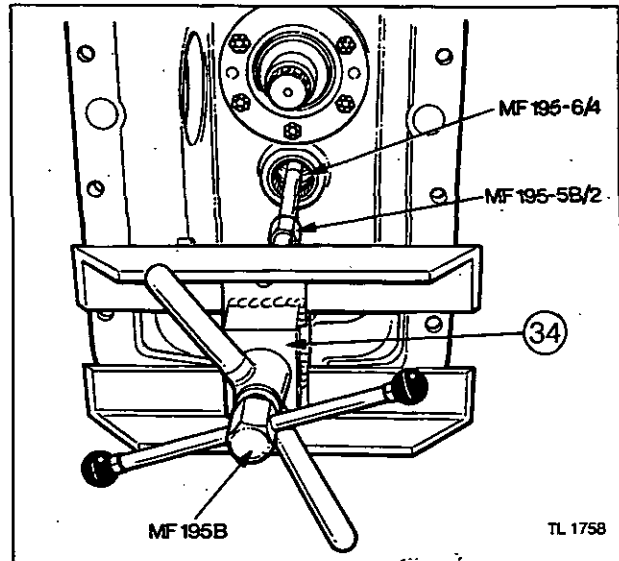
Refitment

Drive Hub Support Bearings

35. Special tool MF.195-6/4 is not suitable for fitting the first needle roller bearing in the centre housing. Manufacture a bearing replacer as shown in the illustration.
36. Using MF.195C Main Puller, MF.195-5B/2 Extension Rod and the tool described in procedure 34, pull the first bearing into the centre housing. The bearing must be fitted into the centre housing with the face containing the part number printed on it facing forwards. If you do not have the special service tool, pull the bearing into a depth of 59-60 mm (2.325-2.364 in).
37. Replace the spacer.
38. Using the short end of the bearing replacer MF.195-6/4 pull the second bearing into the centre housing. If you do not have the special service tool there must be a clearance of 0,25 mm (0.010 in) between the spacer and the bearing. The second bearing must be between 1-2 mm (0.040-0.080 in) below the front face of the centre housing.
39. Press the PTO shaft guide tube into the centre housing until its rear end is no more than 1,5 mm (0.060 in) below the shaft recess.
40. Replace the PTO shaft, see operation 9E-10.
41. Replace the trumpet housing, see operation 8A-06.

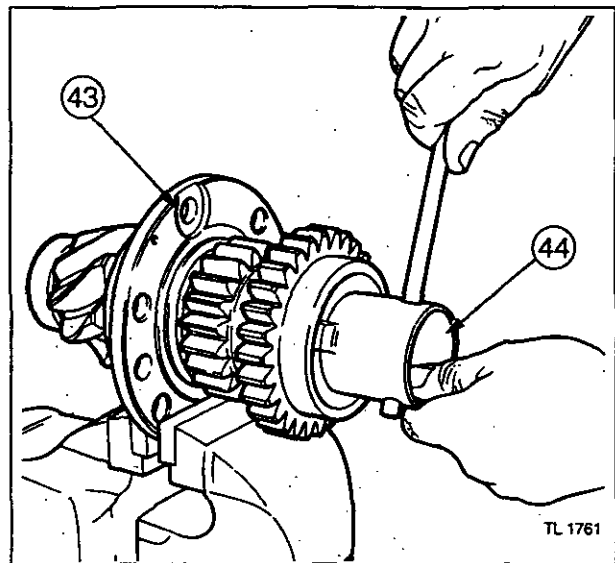
Pinion Shaft

42. Reverse procedures 18 to 28 except:
 - a. Ensure that the thrust washers (24 and 28) are fitted with the oil grooves, and the chamfered side of the lubrication holes face towards the intermediate gear cluster.

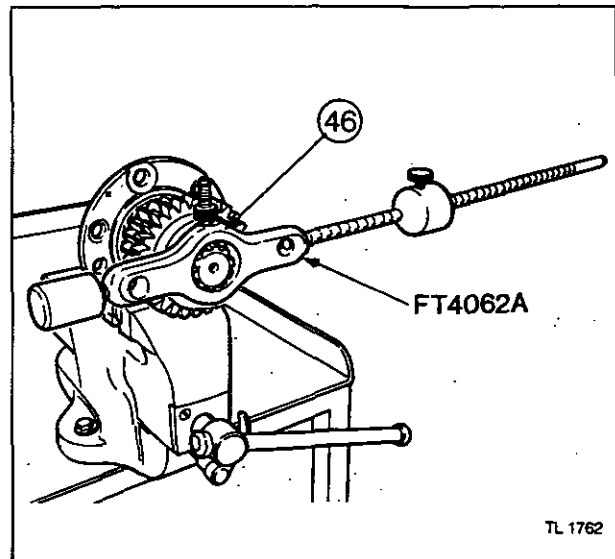


SINGLE-SPEED POWER TAKE-OFF

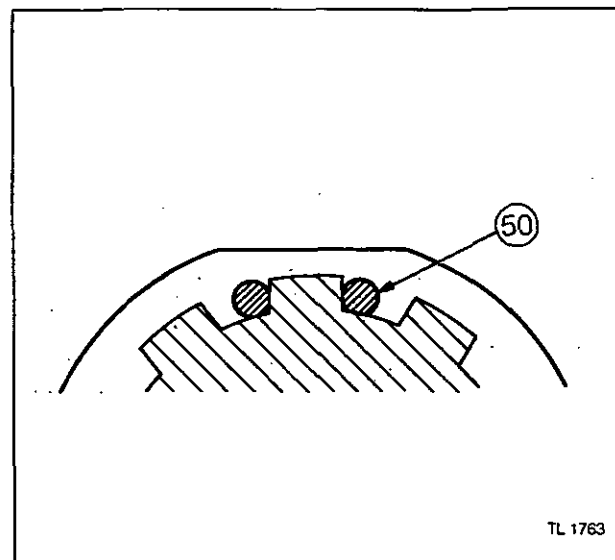
- b. DO NOT forget to fit the sleeve keeper inside the sleeve (25), engaging in one of the pinion splines.
 - c. Lightly lubricate the bearings and thrust washers with clean transmission oil during assembly.
43. To reset the pinion pre-load place the assembly in a vice.
 44. Make a box spanner with four flats 51 mm (2 1/16 in) A/F out of a piece of 55 mm (2 1/8 in) internal diameter tube x 80 mm (3 in) long. Drill a hole to take a bar as shown in the illustration.
 45. Tighten the nut until some resistance is felt. The correct pre-load is 2,0-2,5 Nm (18-22 lbf ft).



46. Check the pre-load by fitting gauge FT.4062A to the pinion shaft. When the correct setting is obtained the gauge should just turn under its own weight when the adjustable weight is set between the 20-25 cm (18-22 in) mark on the tool.
47. If the pre-load gauge is not available, wrap some string around the pinion shaft and attach the end to a spring balance. Pull the spring balance away from the shaft, the rolling resistance must be 10-11 kgf (21-25 lbf) when the shaft is rotating.
48. Readjust the nut if necessary, tap the pinion firmly on each end to centraliz the bearings, then recheck the pre-load.
49. After adjustment, check that the intermediate gear cluster on the pinion shaft rotates freely. There should be a 0,10 mm (0.004 in) clearance between the gear and the thrust washers.

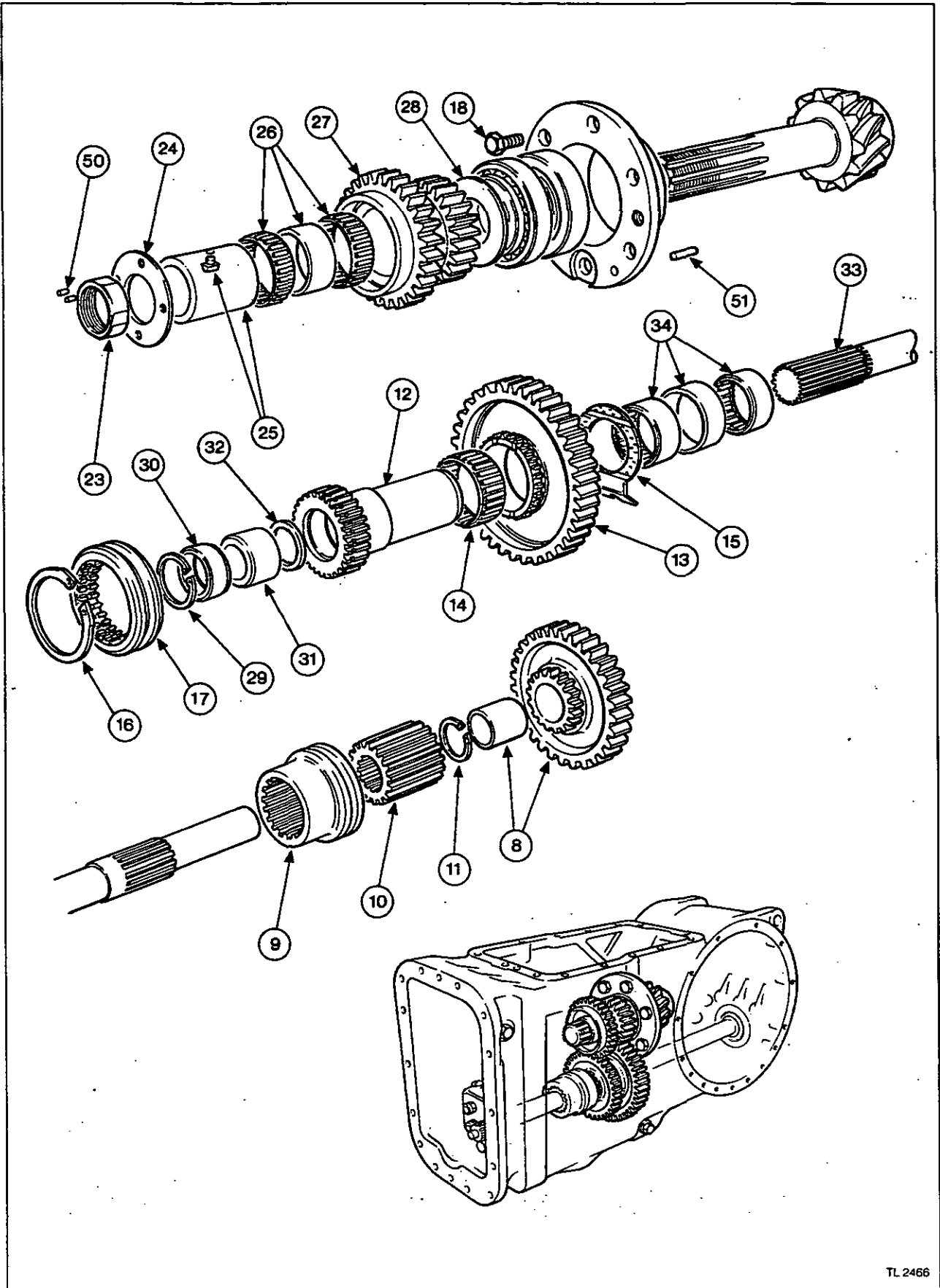


50. Secure the nut by driving a locking roller down each side of one of the pinion splines as shown in the illustration. The locking rollers must be driven flush with the locking ring.
51. Refit the pinion assembly in the centre housing ensuring that the small locating pin in the flange is correctly aligned.
52. Tighten the six pinion housing retaining bolts to a torque of 108 Nm (80 lbf ft).



9E-12

SINGLE-SPEED POWER TAKE-OFF



TL 2466

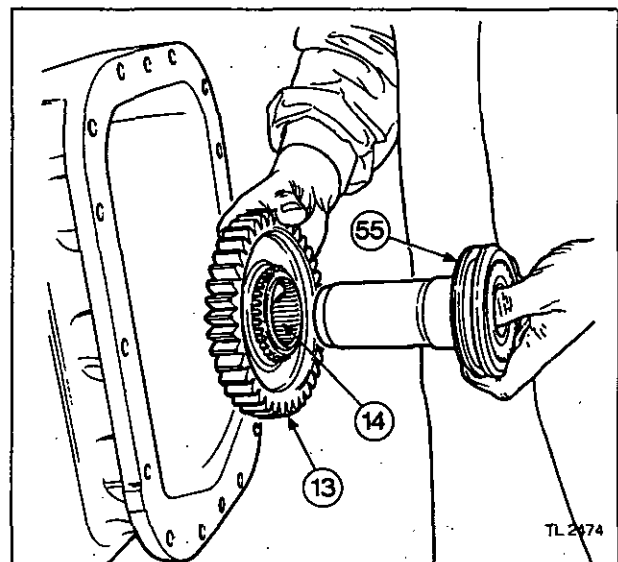
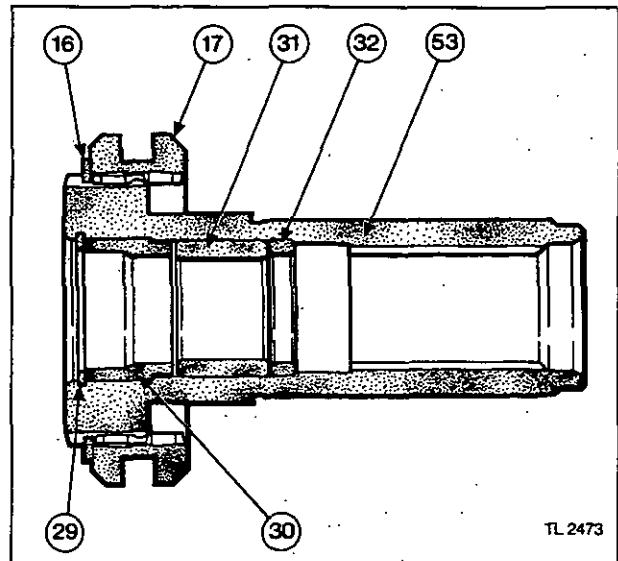
9E-13 SINGLE-SPEED POWER TAKE-OFF

PTO Shaft Drive Hub

53. Reassemble the PTO shaft drive hub fitting the internal spacer (32), support bush (31), sleeve (30) and replace the circlip (29).

PTO Drive Hub

54. Reassemble the PTO drive gear assembly. Replace the external circlip (16), fit the unused coupler (17) onto the spline.
55. Hold the PTO drive gear (13) with bearing (14) installed and thrust washer (15) in position in the centre housing. Slide the drive hub into position through the gear and thrust washer into the support bearings, align the splines of the PTO shaft.
56. Ensure that the gear and shaft assembly is fully back into the housing and that the thrust washer (15) is correctly located on the web in the housing.
57. Assemble the hydraulic lift pump with the selector sleeve (9), selector hub (10), drive gear (8) and new circlip (11).
58. Refit the hydraulic lift pump assembly.
59. Reverse procedures 1 to 6 except:
 - a. Fit new 'O' rings, gaskets and split pins.
 - b. DO NOT tighten the two lift pump dowel nuts (6) until the transmission has been completely reassembled.
 - c. Clean the hydraulic lift pump suction filter before refitting.



Left-hand PTO Side Cover

Removal and Refitment

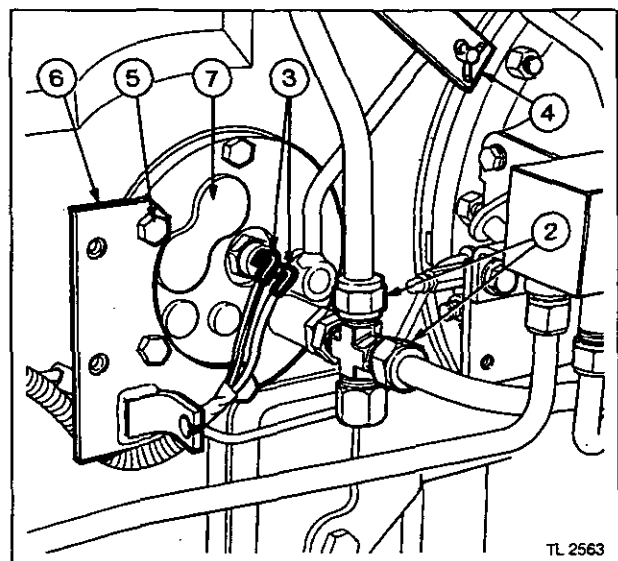
9E-03

Removal

1. Drain the transmission oil to the LOW mark on the dipstick.
2. Disconnect the auxiliary hydraulic pipes from the side cover, if fitted.
3. Disconnect the PTO safety start switch.
4. Disconnect the PTO selector rod.
5. Remove the six bolts.
6. Remove the brake cable anchor bracket.
7. Remove the side cover.
8. Remove and discard the gasket.

Refitment

9. Reverse procedures 1 to 9, except:
 - a. Fit a new gasket.
 - b. Ensure that the internal shift lever is correctly located in the annulus of the selector sleeve.
 - c. Seal the threads of the six bolts with Hylomar sealant.



9E-14

SINGLE-SPEED POWER TAKE-OFF

Left-hand PTO Side Cover

Overhaul

9E-04

Disassembly

1. Remove the side cover, see operation 9A-05.
2. With a small punch, remove and discard the control lever roll pin.
3. Remove the selector lever.
4. Remove the circlip.
5. Remove the internal shift lever and shaft.
6. Remove and discard the 'O' ring.
7. Remove the detent plunger and spring.
8. Remove the safety start switch plunger.
9. Remove the safety start switch.

Reassembly

10. Reverse procedures 1 to 9 except:
 - a. Fit a new 'O' ring.
 - b. Fit a new roll pin.

IPTO Pressure Test

Check

9E-05

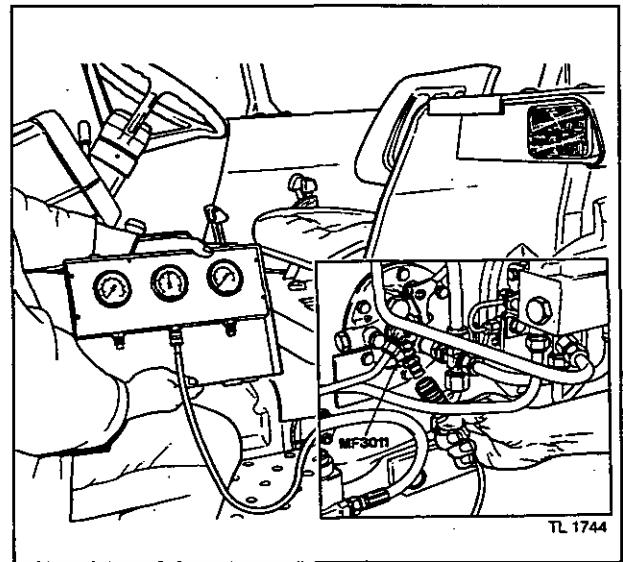
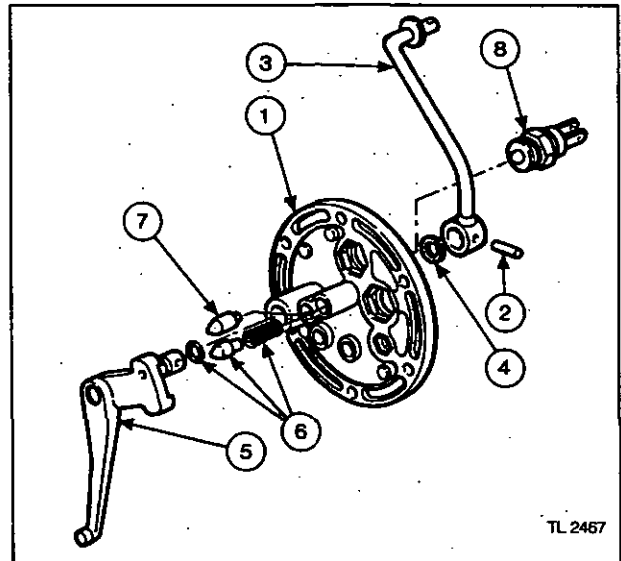
Special tools:

MF.3001 Pressure Test Kit

MF.3011 Pressure Test Point

1. Before starting the test ensure that the transmission is filled with clean transmission oil of the correct grade.
2. Start the engine and warm up the transmission oil to a temperature of 50-60°C (120-140°F) by running the hydraulic system under load.
3. Stop the engine and locate the test point on the left hand transmission side cover.
4. Remove the small plug and fit the MF.3011 Pressure Test Point.
5. Connect up the 30 bar (400 lbf/in²) gauge in the test kit.
6. Restart the engine, engage the IPTO and increase the engine speed to 1500 rev/min.
7. With the transmission oil at the specified temperature the pressure reading should build up to 22-24 bar (319-348 lbf/in²) over a period of approximately 1.5 seconds, the minimum acceptable pressure is 20,7 bar (300 lbf/in²).
8. Reduce the engine speed to idling and disengage the IPTO.
9. Stop the engine, remove the gauge and refit the plug to the test port.

NOTE: The valves fitted to the side cover are modulating valves and control the rate of engagement of the clutch, they are NOT pressure relief valves. They are set at the factory and should not be adjusted in any way.



Diagnosis

10. In the event of the pressure reading being below that stated, the following should be investigated:
 - a. Pressure maintaining valve setting, see operation 12B-30 or 12B-31.
 - b. Auxiliary hydraulic pump condition, see operation 12B-06.
 - c. IPTO clutch pack pressure modulating valve, see operation 9E-07.
 - d. Leaking IPTO clutch pack feed ring, see operation 9E-08.
 - e. Leaking transfer pipe between side cover and clutch pack feed ring, see operation 9E-08.
 - f. Leaking IPTO clutch pack piston seal(s), see operation 9E-08.

9E-15 SINGLE-SPEED POWER TAKE-OFF

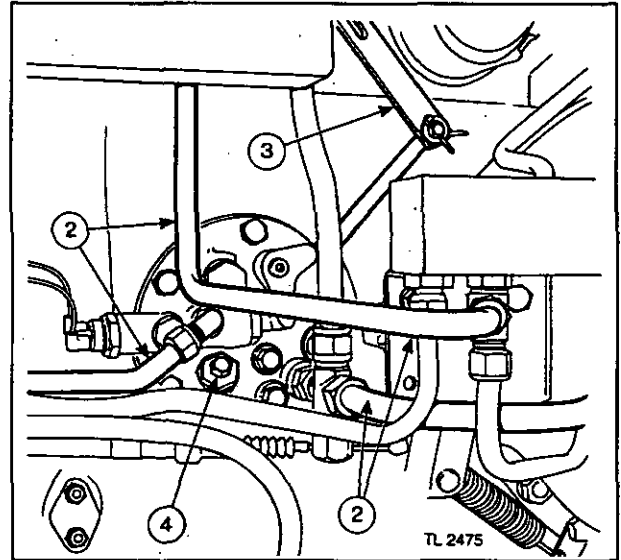
IPTO Left-hand Side Cover

Removal and Refitment

9E-06

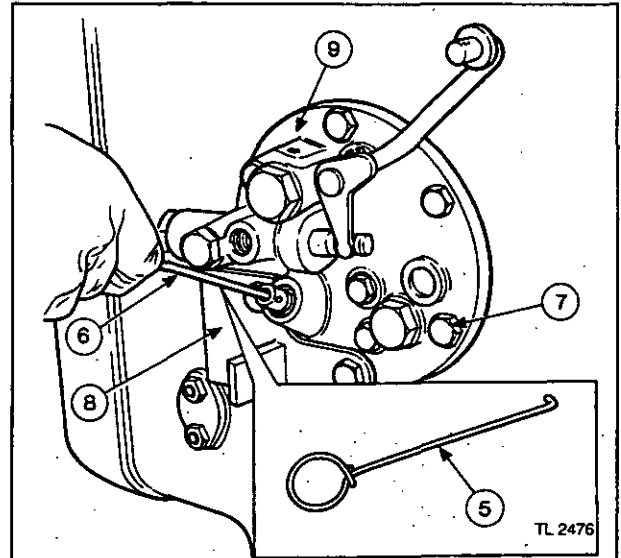
Removal

1. Drain the transmission to the LOW mark on the dipstick.
2. Disconnect the auxiliary and IPTO hydraulic pipes from the side cover and remove as necessary.
3. Disconnect the PTO selector rod from the operating lever.
4. Remove the test point plug.
5. Make from 3mm (1/8 in) diameter wire a hook as illustrated.
6. Insert the hook into the end of the transfer pipe engaging it in the cross drilled hole, withdraw the pipe from the IPTO clutch and side cover.
7. Remove the side cover bolts.
8. Remove the parking brake cable anchor bracket.
9. Remove the side cover.



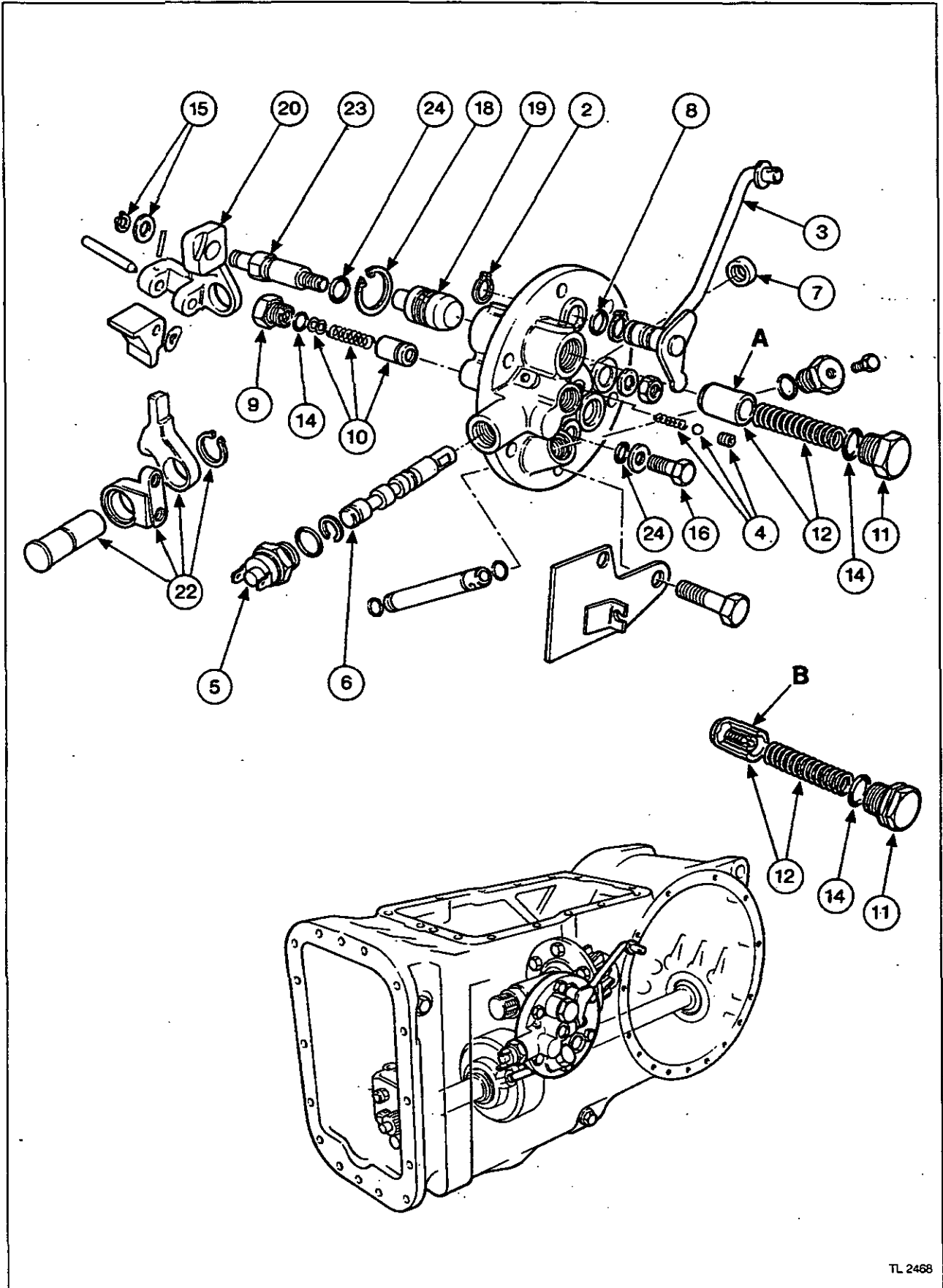
Refitment

10. Clean the mating faces between the side cover and the transmission.
11. Reverse procedures 1 to 11 except:
 - a. Replace the 'O' rings on the transfer pipe.
 - b. Insert the transfer pipe with the cross drilled hole uppermost. Ensure that the pipe is pressed fully home.
 - c. Apply Massey Ferguson Multi-Gasket (Loctite 574) to the face of the side cover.
 - d. Seal the six side cover bolts with Hylomar sealant.



9E-16

SINGLE-SPEED POWER TAKE-OFF



TL 2468

9E-17

SINGLE-SPEED POWER TAKE-OFF

IPTO Left-hand Side Cover

Overhaul

9E-07

Disassembly

1. Remove the left-hand side cover, see operation 9E-06.

Control Valve Spool

2. Remove the circlip.
3. Remove the selector lever.
4. Remove the detent ball and spring.
5. Remove the safety start switch.
6. Withdraw the valve spool.
7. Remove the oil/dirt seal.
8. Discard all 'O' rings.

Flow Modulating Valves

9. Remove the 1st modulating valve cap.
10. Withdraw the valve, spring and shims.
11. Remove the 2nd modulating valve cap.
12. Withdraw the valve and spring.

NOTE: On early tractors the valves (A) and (B) are modulating valves and control the rate of engagement of the clutch, they are NOT pressure relief valves.

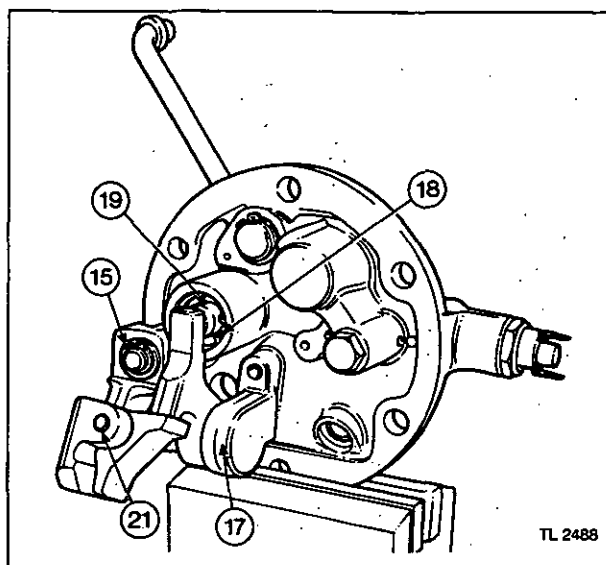
On later tractors the modulation valve (B) is fitted with a pressure relief valve to protect the system. This can be identified by a groove machined in the hexagon of the plug.

During repair if the early type valve (A) is found, it must be replaced with the later type (B).

13. Check the condition of the valves, clean the small orifice in end of the 1st modulating valve (A). The modulating valves and pressure relief valve must not be adjusted, they are factory set for the correct flow and pressure.
14. Discard all 'O' rings.

Brake

15. Remove the circlip and washer.
16. Remove the two bolts and sealing washers from the front of the cover.
17. Remove the brake assembly.
18. Remove the circlip.
19. Withdraw the brake piston from the side cover. The brake piston has no sealing rings, it relies on a precision fit for sealing.
20. Remove the brake caliper.
21. Split the brake caliper into two parts by removing the roll pin and pivot pin.
22. Remove the external circlip and brake actuating lever and shaft.
23. If necessary, remove the nut, 'O' ring and brake support shaft.
24. Remove and discard the 'O' rings.



Reassembly

25. Clean all components and lightly lubricate parts with clean oil when reassembling.
26. Reverse procedures 1 to 24 except:
 - a. Fit new 'O' rings and gaskets.
 - b. The spool valve seal (7) is fitted to prevent ingress of dirt and the loss of oil.
 - c. Reassemble the 1st modulating valve with the original shims removed.
27. Test the IPTO clutch pack pressure, see operation 9E-05.
28. Ensure that the pressure maintaining valve is correctly set, 22-24 bar (319-348 lbf/in²) and that there is no mechanical reason for loss of pressure before making any adjustments to the maintaining valve.

9E-18

SINGLE-SPEED POWER TAKE-OFF

IPTO Clutch Unit

Removal and Refitment

9E-08

Removal

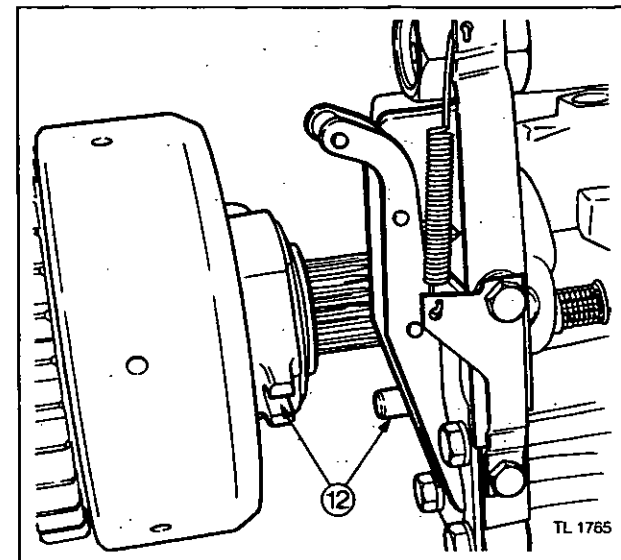
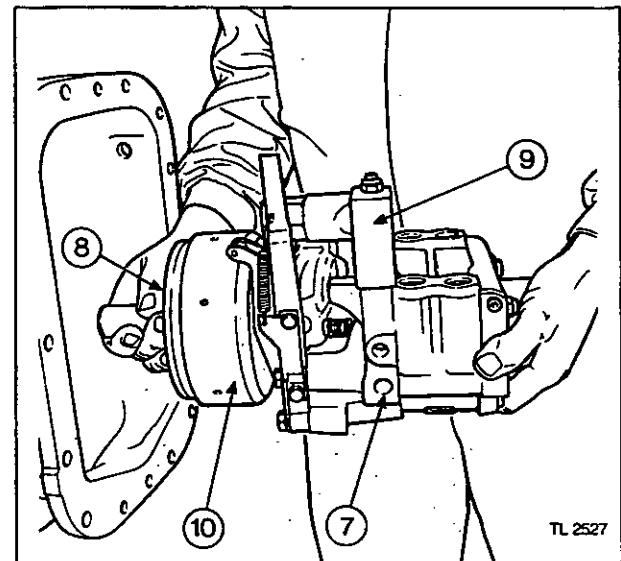
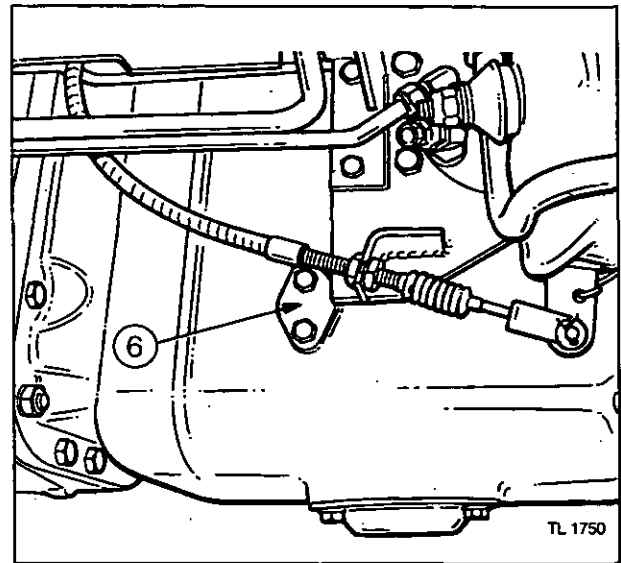
1. Split the tractor between the rear centre housing and the range change unit, four-wheel drive drop box or spacer, see operation 2A-04 or 2B-05.
2. Remove the lift cover, see operation 12A-03 or 12A-04.
3. Remove the left-hand side cover, see operation 9E-06.
4. Remove the main drive shaft.
5. Remove the access plate, the hydraulic lift pump filter and stud extension.
6. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.

NOTE: The following procedure must be carefully followed otherwise extreme difficulty will be experienced in removing the pump.

7. The lift pump and IPTO clutch pack must be held together and removed as one unit.
8. The IPTO clutch pack hub and brake disc must not be allowed to move away from the clutch pack.
9. Carrying out the instructions in procedures 7 and 8, hold the lift pump and IPTO clutch pack assembly, manoeuvre the assembly forwards out of the centre housing.
10. Slide the clutch pack assembly off the lift pump drive shaft.

Refitment

11. Refit the clutch assembly to the lift pump.
12. Ensure that the fork on the feed ring is correctly engaged on the pin on the lift pump.
13. Reverse procedures 1 to 10 except:
 - a. Fit new 'O' rings, gaskets and split pins.
 - b. Ensure that the IPTO clutch hub and brake disc does not move away from the clutch pack assembly during reassembly.
 - c. DO NOT tighten the two lift pump dowel nuts (5) until the transmission has been completely reassembled.



9E-19

SINGLE-SPEED POWER TAKE-OFF

IPTO Clutch Unit

Overhaul

9E-09

Special tools:

MF.195C Puller, Main Tool
MF.195-5A/2 Extension Rod
MF.195-6A/1 Collet

Disassembly

1. Remove the IPTO clutch assembly, see operation 9E-08.

Clutch Pack

2. Remove the hub, brake disc and internal circlip.
3. Remove the thrust washer.
4. Remove the spring ring.
5. Remove the retainer plate.
6. Remove the shim plate.
7. Remove the steel plates.
8. Remove the friction plates.
9. Make up a bridge piece as shown in the illustration and place the clutch under a hydraulic press. Apply pressure to the retaining ring to compress the spring and remove the spring clip.
10. Remove the retainer ring.
11. Remove the spring.



WARNING: Be very careful when using compressed air to remove the piston, DO NOT stand over the clutch assembly, face the piston and the open end of the clutch away from you, use a piece of cloth to cover the assembly to prevent the piston flying out.

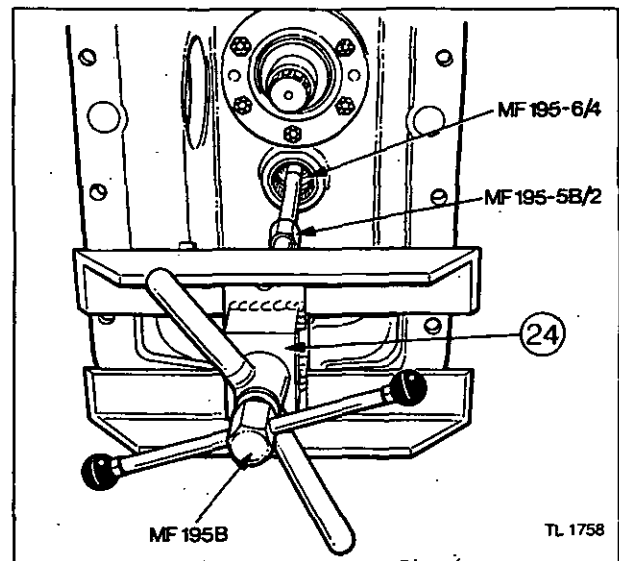
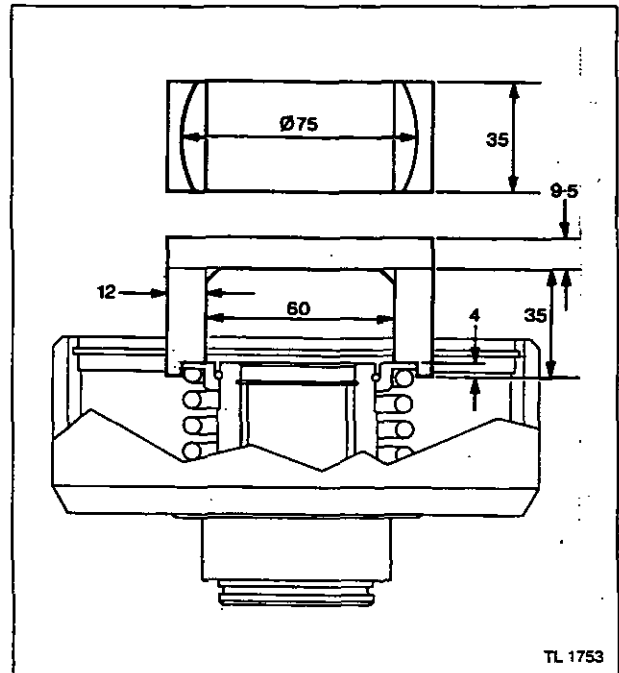
12. Remove the piston, it may be necessary to use compressed air applied to the feed ring. Heed the warning, only apply enough air to move the piston out of the casing.
13. Remove the internal iron piston seal.
14. Remove the external rubber piston seal.
15. Remove the snap ring.
16. Remove the thrust washer.
17. Remove the feed ring.
18. Remove the PTFE sealing rings.

Pump Drive Shaft

19. Remove the thrust washer.
20. Remove the external circlip.
21. If necessary, extract the needle roller bearing from the end of the hydraulic pump shaft using an internal bearing extractor.

PTO Shaft Support Bearing

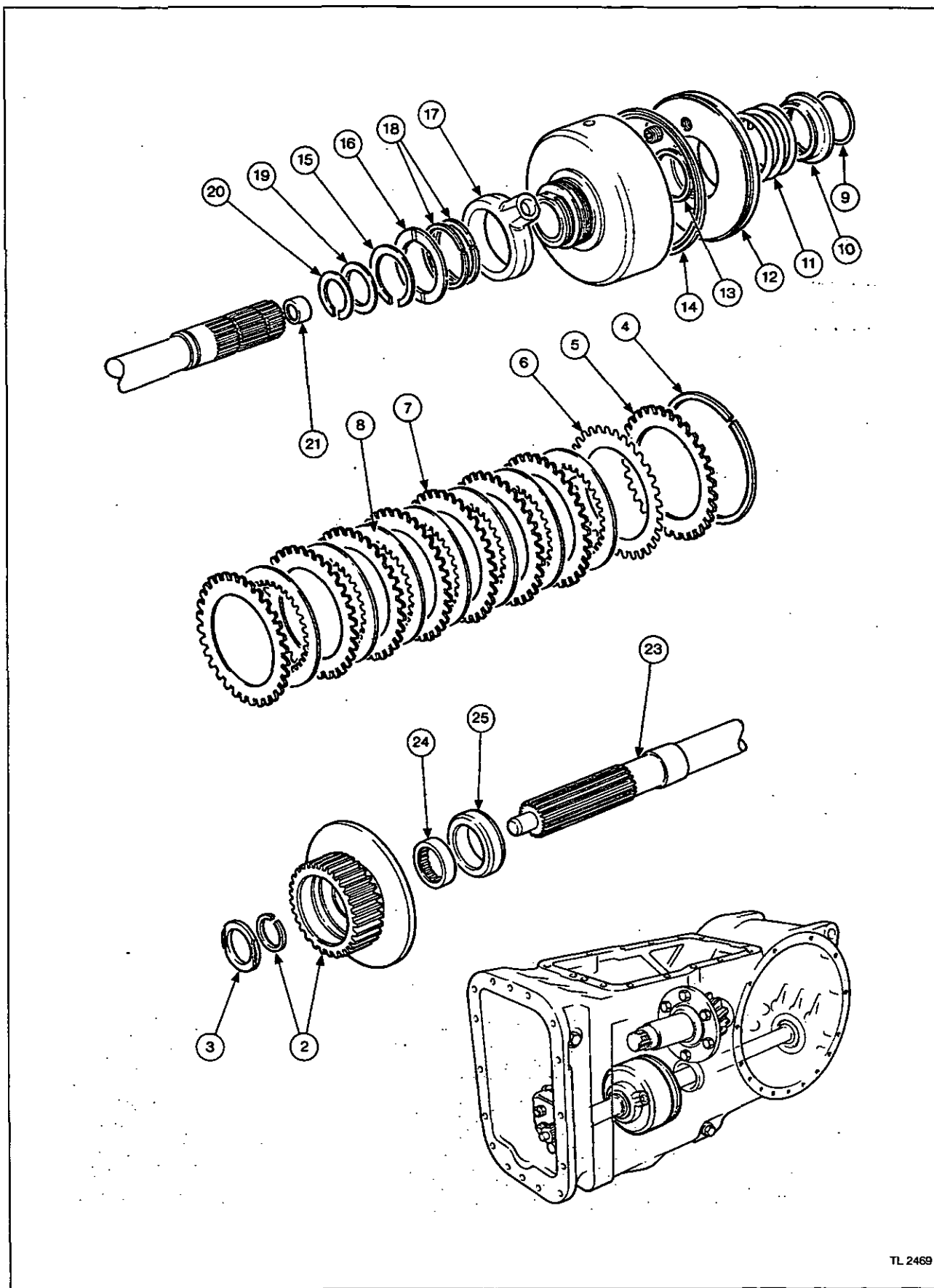
22. If the PTO shaft support bearing is to be replaced, remove the left-hand trumpet housing and the differential unit, see operation 8A-06.



23. Remove the PTO shaft assembly, see operation 9A-08.
24. Using MF.195C Main Puller, MF.195-5A/2 Extension Rod and MF.195-6A/1 Collet, remove the the PTO shaft support bearing rearwards as shown in the illustration.
25. The bearing sleeve should be retained in the housing.

9E-20

SINGLE-SPEED POWER TAKE-OFF



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9E-21

SINGLE-SPEED POWER TAKE-OFF

Examination

26. Check the condition of all the components for signs of wear, scoring, damage or distortion due to over heating. Check all the friction and steel plates against the following new dimensional tolerances for wear:

Friction plates:

Thickness - 2,41-2,54 mm (0.095-1.000 in)

Maximum permissible distortion - 0,127 mm (0.005 in)

Steel plates:

Thickness - 1,35-1,45 mm (0.053-0.057 in)

Maximum permissible distortion - 0,127 mm (0.005 in)

Coil spring:

Free length - 74 mm (2.9 in)

Working length - 26,7-33,8 mm (1.052-1.332 in)

Load at working length - 100 kgf (45 lbf)

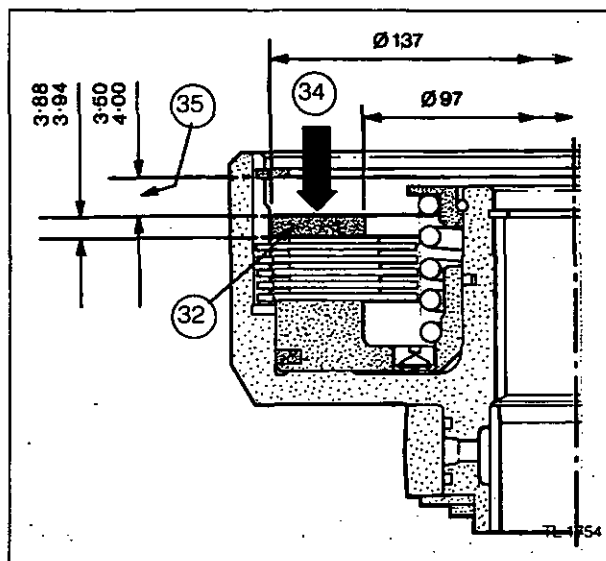
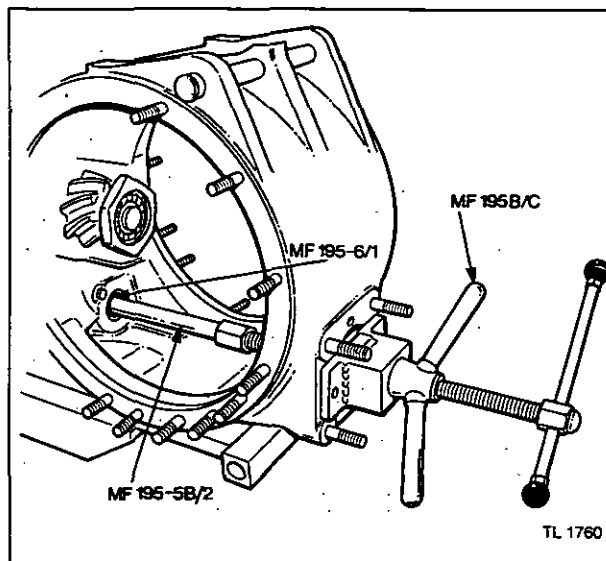
27. Replace any worn or damaged components as required.

Reassembly

28. Replace the needle roller bearing in the end of the hydraulic pump drive shaft. Manufacture a bearing driver as shown in the illustration to ensure that the bearing is not damaged during installation
29. Replace the PTO shaft support bearing using MF.195C Main Puller, MF.195-5A/2 Extension Rod and MF.195-5B/1 Collet. Using two pieces of angle bar as shown in the illustration, pull the needle roller bearing into position in the centre of the sleeve.
30. Check that the lubrication jet in the piston is not blocked, use compressed air to clear it.
31. Fit new internal and external piston rings, lubricate the piston with clean transmission oil and reassemble into the clutch housing.
32. Make a steel ring as shown in the illustration to replace the retainer plate for checking the clutch plate clearance.
33. Assemble all the clutch plates, friction and steel, into the clutch housing, fit the tool described in procedure 32 and replace the spring ring. There are seven friction and seven steel plates.
34. Apply a pressure of approximately 5 kgf (11 lbf) to the clutch pack to compress all the plates.
35. Using a feeler gauge measure the gap between the plate and the underside of the spring ring. The distance should be 3,50-4,00 mm (0.138-0.157 in), if the gap is not correct add one or more shims between the discs and the retainer plate depending on the gap.

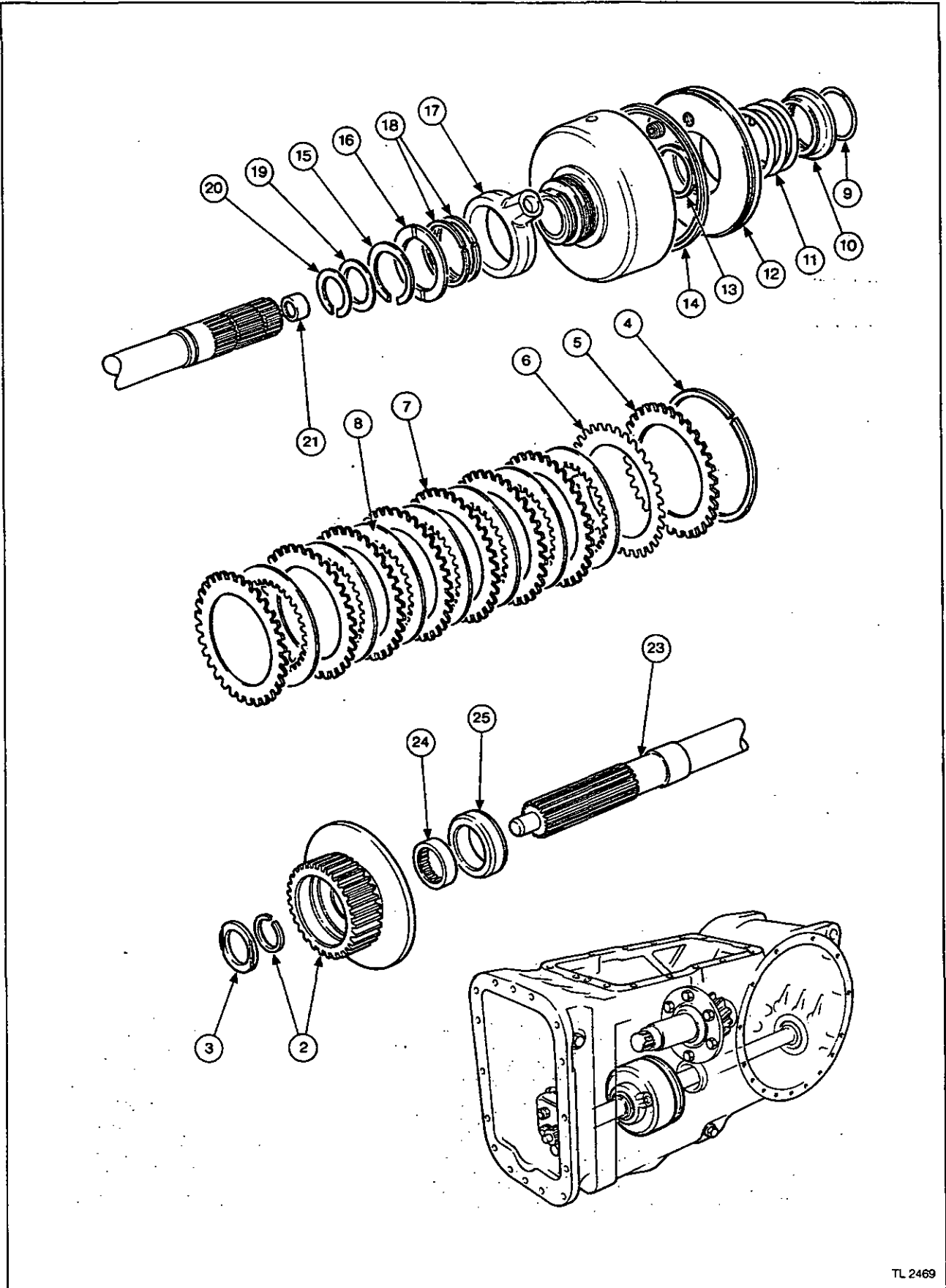
Shims are available in the following sizes:

Clutch shim plates		
Part No.	Metric	Imperial
1870 010 M1	0,51 mm	0.020 in
1870 011 M1	0,76 mm	0.030 in



9E-22

SINGLE-SPEED POWER TAKE-OFF



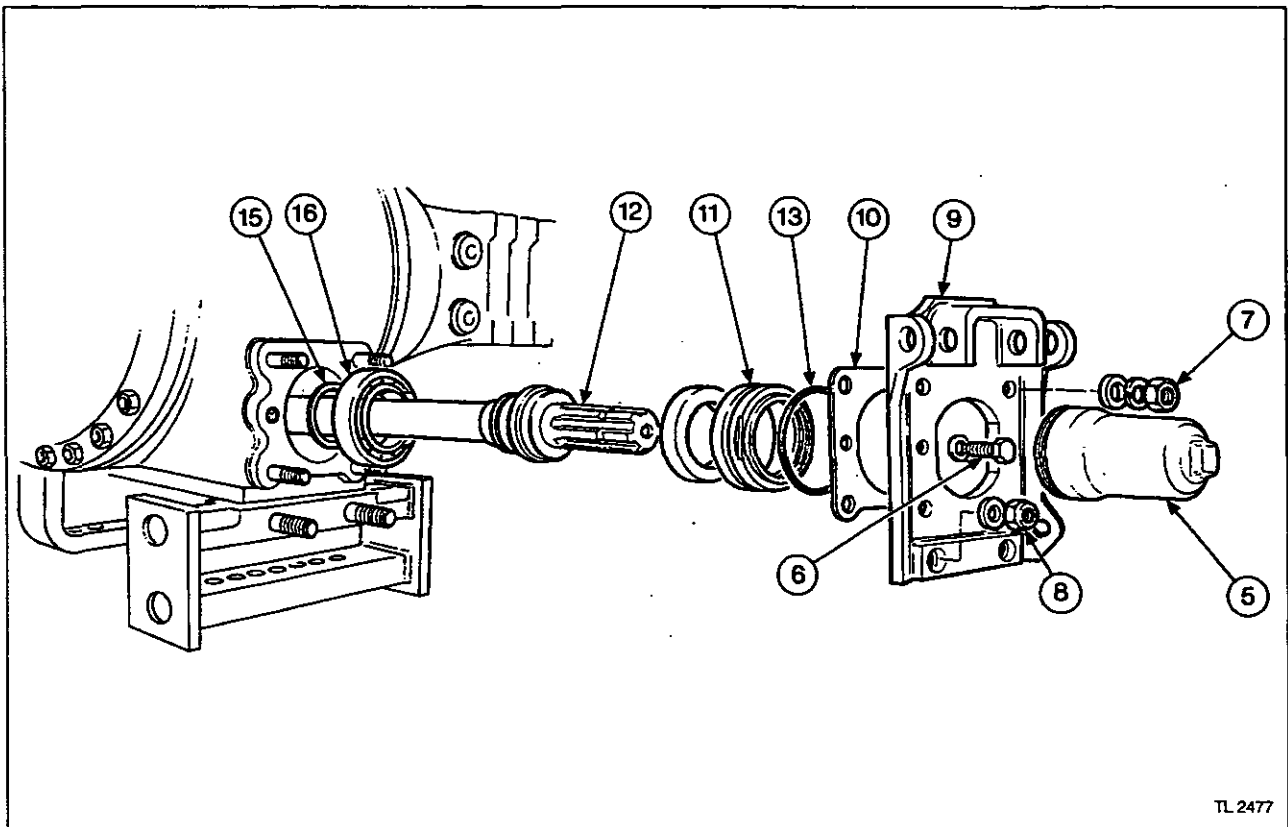
TL 2469

SINGLE-SPEED POWER TAKE-OFF

36. Remove the spring ring, checking ring and clutch plates.
37. Refit the spring and retainer ring.
38. Place the clutch assembly under a hydraulic press and using the bridge piece compress the spring and replace the snap ring.
39. If new friction plates are being used they should be soaked in clean transmission oil for a minimum period of 30 minutes before assembly.
40. Reassemble the plates starting with a steel plate, alternating with a friction plate, and finally fitting the shim plate(s).
41. Refit the retainer plate and spring ring.
42. Fit new PTFE sealing rings to the feed ring.
43. Reassemble the feed ring, thrust washer and snap ring.
44. If necessary, replace the needle roller bearing in the gear hub.
45. With the aid of some petroleum jelly retain the thrust washer inside the hub and brake disc.
46. Check that the spring ring (4), retaining the clutch plates, is fully seated in its groove.
47. With the aid of two lengths of 3 mm (1/8 in) diameter rod, carefully align and centre all the internal teeth of the friction discs.
48. With the aid of an air line pressurize the clutch pack so that all the plates are clamped tight.
49. Whilst still holding the pressure on the clutch pack insert the hub and brake disc so that it passes down through the pack of plates. When fully installed the gear will be within approximately 6 mm (1/4 in) of the clutch housing.
50. If the clutch is not being fitted immediately it is recommended that some form of security band is placed around the clutch to retain the hub and brake disc in place.
51. Refit the clutch assembly.

9E-24

SINGLE-SPEED POWER TAKE-OFF



PTO Shaft and Cassette Oil Seal Removal and Refitment 9E-10

Special tools:
MF.168 PTO Seal Remover
MF.484 PTO Cassette Seal Installer
MS.550 Universal Handle

Removal



CAUTION: To ensure a leak-proof installation of the rear PTO seal, special service tool MF.484 MUST be used to install the seal.

- This instruction is very important, failure to comply will result in components of the PTO being dismantled in the transmission.

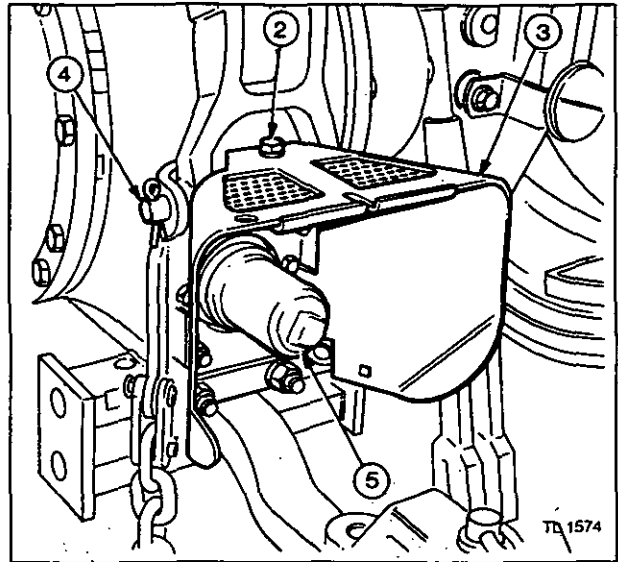
On tractors with a single-speed live PTO, low flow hydraulic pump, engage the PTO selector lever first.

On tractors with single-speed IPTO, remove the left-hand side cover. Using a suitable wedge, block the movement of the brake disc and hub to the rear of the tractor when the PTO shaft is removed. If the brake disc and hub are not held in position, the clutch plates will drop out of position and result in the tractor having to be split to rectify the fault.

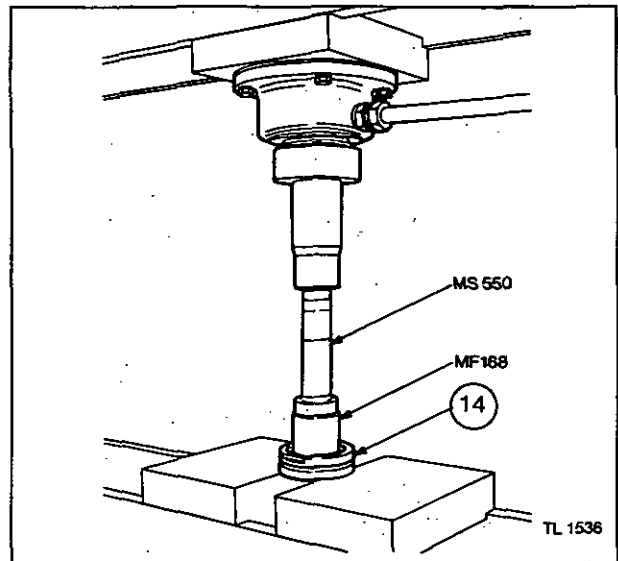
1. Drain the transmission oil.
2. Remove the bolt.
3. Remove the PTO shield.
4. Detach the bottom of the control beam.

9E-25 SINGLE-SPEED POWER TAKE-OFF

5. Unscrew the PTO cap.
6. Remove the two centre bolts and washers.
7. Remove the four nuts, washers, spacers and tab washers if fitted.
8. Remove the two nuts from the drawbar bracket.
9. Remove the control beam/check chain bracket.
10. Remove the seal housing retainer plate.
11. Remove the oil seal housing by screwing on the PTO cap and pulling the cap, withdrawing the housing from the rear axle.
12. Remove the PTO shaft.
13. Remove and discard the 'O' ring.

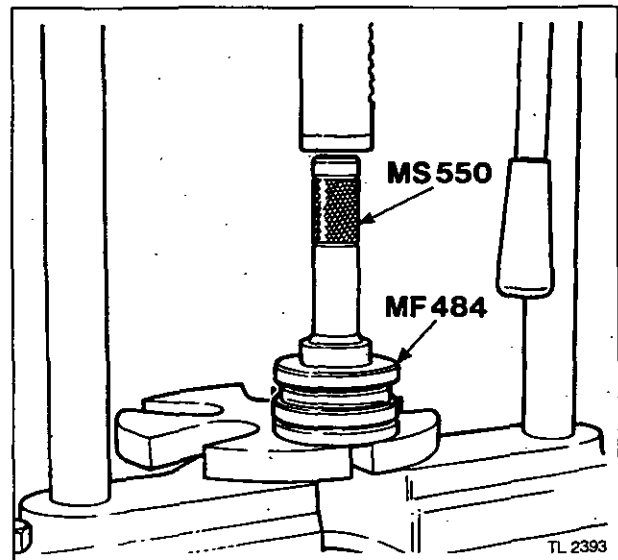


14. Using special tool MF.168 and handle MS.550 press the cassette seal out of the housing and discard.
15. Remove the snap ring.
16. Using a length of 60 mm (2 3/8 in) internal diameter tube, drive the bearing off the shaft.



Refitment

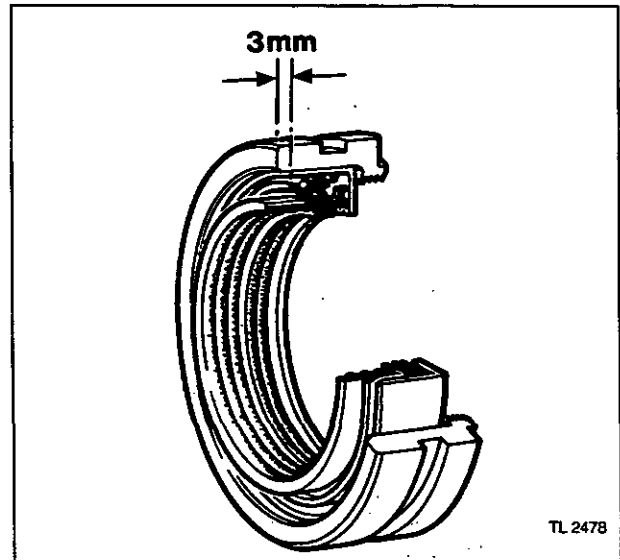
17. Using special tool MF.484 and handle MS.550 press the new cassette seal into the oil seal housing as shown in the illustration.



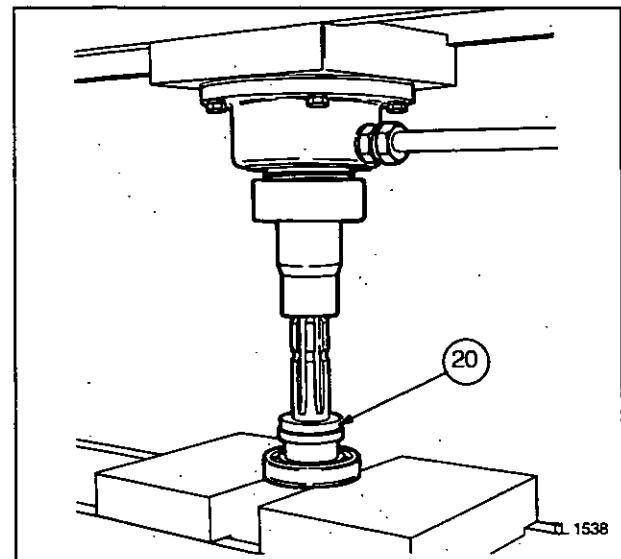
9E-26

SINGLE-SPEED POWER TAKE-OFF

18. The special tool MF.484 will press the seal into the correct depth of 3 mm.
19. Fit a new 'O' ring.



20. Using a hydraulic press, press the new ball-bearing onto the PTO shaft.
21. Fit a new snap ring and ensure that it locates correctly in its groove.
22. Slide the PTO shaft into the rear axle, taking care to keep it horizontal to align with the internal splines.
23. Liberally apply petroleum jelly to the internal ribs of the seal prior to assembly.
24. Align the oil seal housing so that the two cut-outs on each side of the housing are vertical.
25. Push the seal housing into the rear axle and onto the shaft.
26. Reverse procedures 1 to 10 except:
 - a. Tighten the two nuts retaining the drawbar bracket to the check chain bracket to a torque of 245 Nm (180 lbf ft).



PTO Shift Linkage

Removal and Refitment

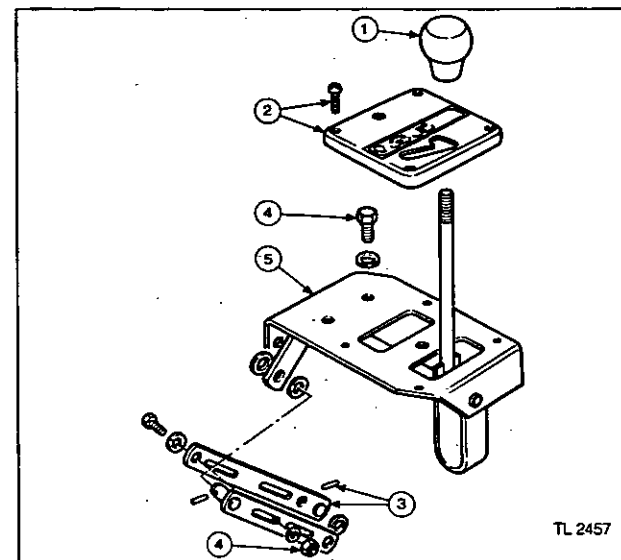
9E-11

Removal

1. Remove the selector lever knob.
2. Remove the four screws and the selector lever plate.
3. Disconnect the lever linkage from the lever on the left-hand transmission side cover.
4. Remove the bolts holding the lever assembly to the seat support panel.
5. Remove the lever assembly from the underside of the seat support panel.

Refitment

6. Reverse procedures 1 to 5 except:
 - a. Check the PTO engages correctly, make any adjustment by shortening or lengthening linkage (3).
 - b. Check the operation of the safety start switch.



FRONT AXLES

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FRONT AXLE – 2 WHEELDRIVE – 3 CYLINDER TRACTORS**FRONT AXLE – 2 WHEELDRIVE – 3 CYLINDER TRACTORS****Section 10 – Part A**Table of Contents

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10A-02

FRONT AXLE – 2 WHEELDRIVE – 3 CYLINDER TRACTORS

Specification

Track settings:

No	7
Minimum	1227 mm (48 in)
Maximum	1837 mm (72 in)
Increments	101 mm (4 in)

Wheel Camber angle

M-F 340, 350	3° 30'
M-F 355, 360, 362	5°

Wheel Castor angle

M-F 340, 350	4° 56'
M-F 355, 360, 362	4° 56'

Front wheel toe-in	0–5mm (0– $\frac{3}{16}$ in)
Axle beam to support casting clearance	0,05–0,25 mm (0.002–0.010 in)
Steering arm to spindle housing clearance	0–0,05 mm (0–0.002 in)

Special Tools

MF 263A	Bush remover – main tool
MF 263-2/2	Extractor – 38,1 mm (1.5 in) dia
MF 263-2/1	Bush replacer – 38,1 mm (1.5 in) dia
MF 263-3/1	Bush replacer – 47,6 mm (1.875 in) dia
MF 264	Bush reamer – maintool
MF 264-1/1	Bush reamer – 38,1 mm (1.5 in) dia
MF 264-2/1	Bush reamer – 47,6 mm (1.875 in) dia
MF 264-1/2	Reamer guide – 38,1 mm (1.5 in) dia
MF 264-2/2	Reamer guide – 47,6 mm (1.875 in) dia
MF 444	Axle pivot pin remover
MS 550	Handle

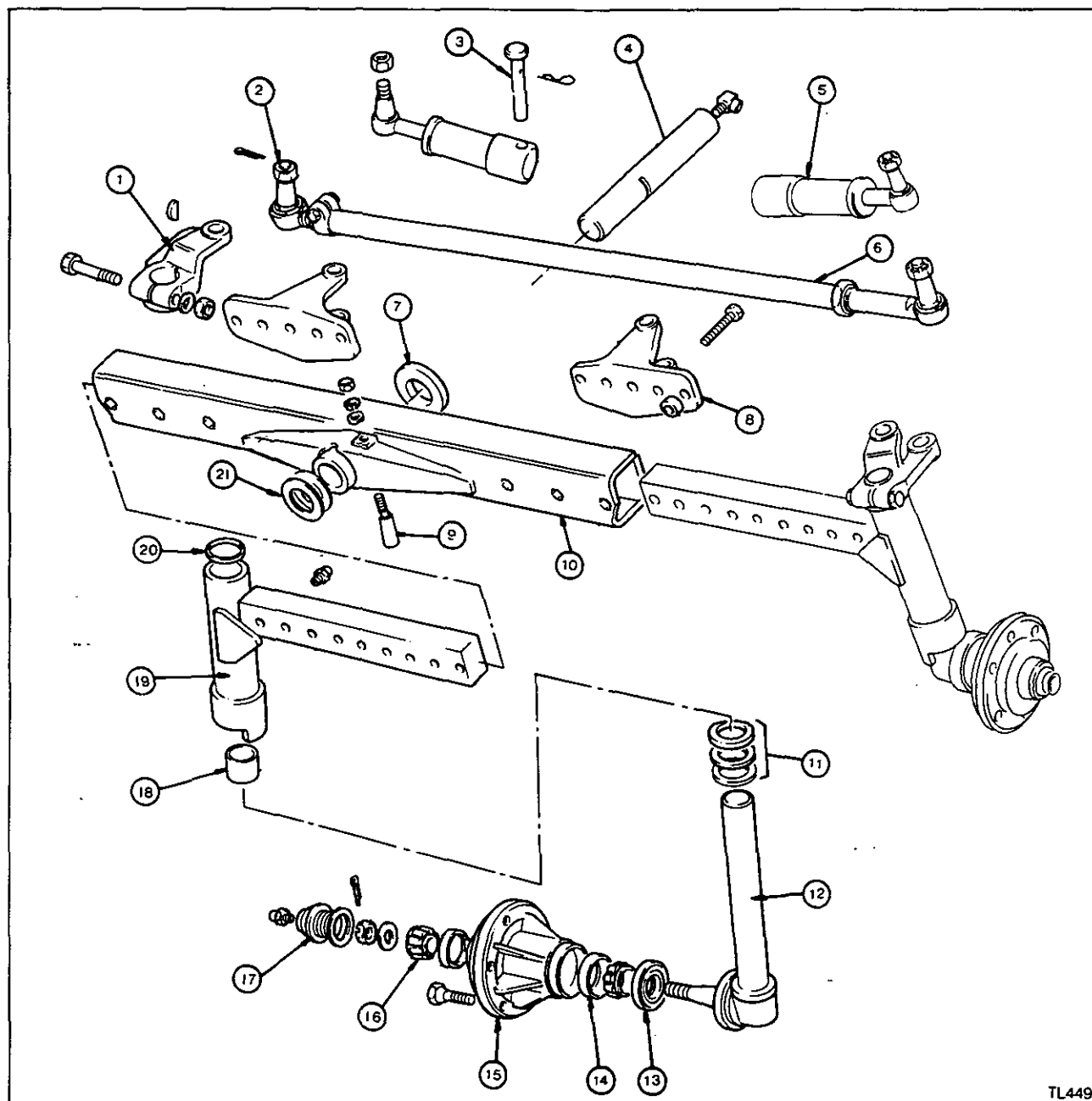
Bolt Torques

Track rod to steering arm	80–100 Nm (59–74 lbf ft)
Steering ram to steering arm	75–90 Nm (55–66 lbf ft)
Wheel hub cap bolts	20–28 Nm (15–21 lbf ft)
Wheel nuts	See Section 8D
Steering arm to spindle	125–165 Nm (92–122 lbf ft)
Track rod clamp bolts	45–55 Nm (33–41 lbf ft)
Spindle housings to axle beam	180–230 Nm (134–170 lbf ft)
Axle support casting to engine	240–320 Nm (177–236 lbf ft)

General Description

The front axle assembly consists of an axle beam and two spindle housing assemblies. The axle beam pivots on a pin which is secured to the axle beam. The spindle housing assemblies can be bolted to the axle beam in alternative positions to provide front wheel track adjustment. Figure 1 shows the general arrangement of the front axle assembly.

FRONT AXLE - 2 WHEELDRIVE - 3 CYLINDER TRACTORS



TL449

- | | |
|---------------------------|--------------------------|
| 1. Steering arm | 12. Spindle |
| 2. Ball joint | 13. Oil seal |
| 3. Steering ram pivot pin | 14. Taper roller bearing |
| 4. Pivot pin | 15. Hub |
| 5. Steering ram | 16. Taper roller bearing |
| 6. Track rod | 17. Hub cap |
| 7. Thrust washer | 18. Bush |
| 8. Steering ram bracket | 19. Spindle arm |
| 9. Taper pin | 20. Seal |
| 10. Axle beam | 21. Shims |
| 11. Thrust washers | |

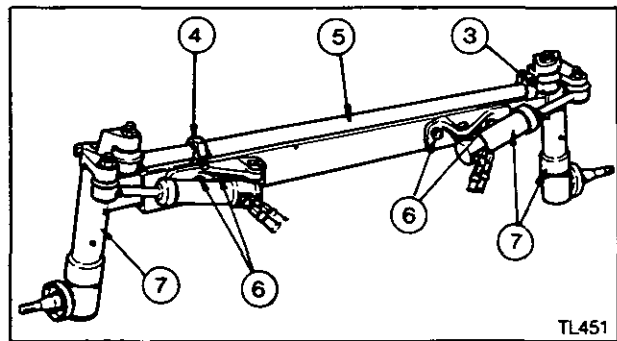
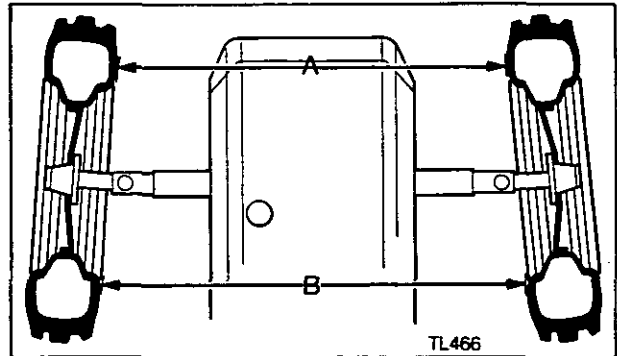
10A-04

FRONT AXLE - 2 WHEELDRIVE - 3 CYLINDER TRACTORS

Front Wheel Toe-In

Adjustment 10A-01

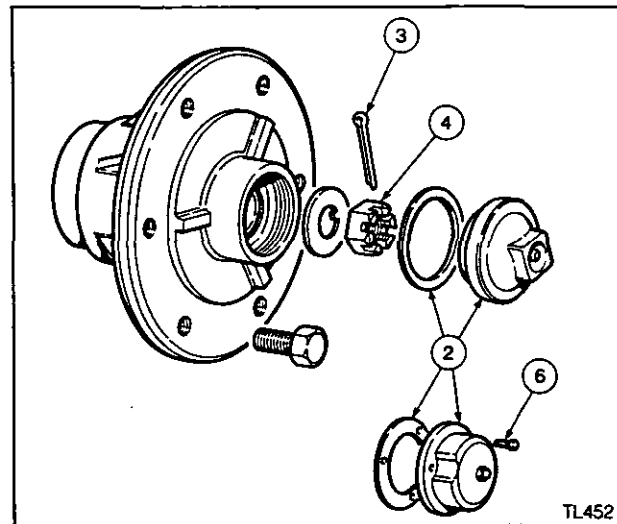
1. The tractor must be on firm level ground with the wheels facing straight ahead.
2. To check the toe-in, see illustration. Distance B must be 0 to 5mm (0- $\frac{3}{16}$ in) greater than distance A, measured on the centre line of the axle, at the wheel rim.
If adjustment is required:
3. Loosen the bolt and nut.
4. Slacken the setscrew.
5. Screw-out the track rod tube to increase toe-in.
Screw-in track rod tube to decrease toe-in.
6. Locate the setscrew in its hole and tighten to a torque of 45-55 Nm (33-41 lbf ft).
7. Retighten the nut and bolt to a torque of 45-55 Nm (33-41 lbf ft).



Front Hub

Adjust 10A-02

1. Raise the front wheel off the ground and check the wheel bearings for excessive free play. If movement is found adjust the bearing pre-load as follows:
2. Remove the hub cap.
3. Remove the split pin.
4. Tighten the slotted nut to 80 Nm (60 lb/ft) and then slacken off the nut to the nearest split pin hole to give the correct end float.
5. Fit a new split pin.
6. Refit the hub cap and torque the bolts to 20-28 Nm (15-21 lbf ft). On the M-F 350 tractors tighten the screwed cap.
7. Grease the hub until clean grease appears from the seal.



FRONT AXLE – 2 WHEELDRIVE – 3 CYLINDER TRACTORS**Front Hub****Overhaul**

10A-03

Disassembly

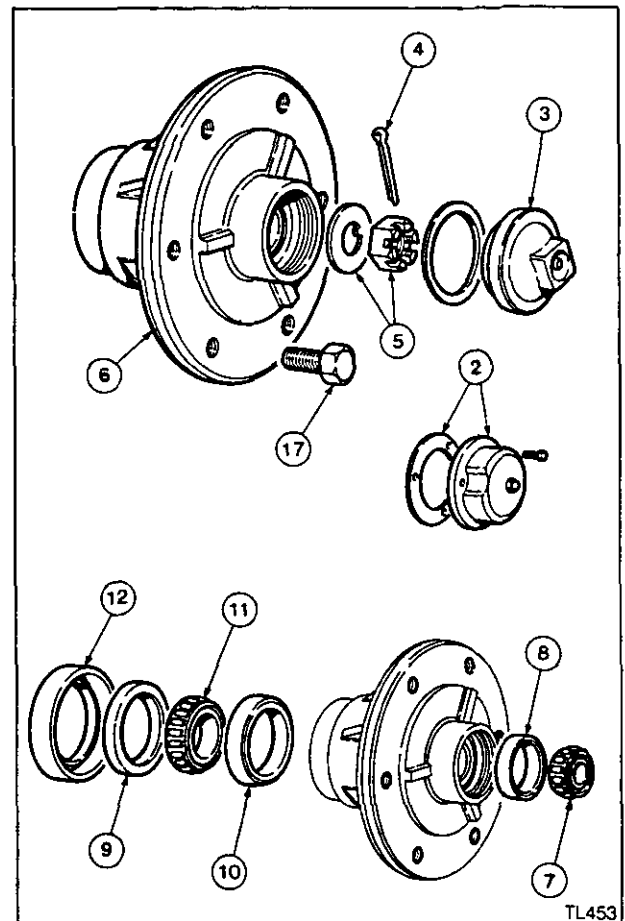
1. Raise front of tractor and remove the wheel.
2. Remove the hub cap and gasket (M-F 355 and M-F 360).
3. For M-F 350 the hub-cap is a screw thread connection. No gasket is used.
4. Remove and discard the split pin.
5. Remove the slotted nut and washer.
6. Remove the hub assembly complete with bearing and seal from the spindle housing assembly.
7. Remove the outer bearing cone.
8. Tap out the outer bearing cup.
9. Remove the seal.
10. Drive out the inner bearing cup.
11. Remove the bearing cone.
12. Remove the dust shield.

Examination

13. Completely clean the hub components using paraffin and check the condition of the hub, spindle and bearings. Any worn or damaged components should be replaced. Always fit a new seal with the lip facing outward and fit the seal right into the recess of the hub.

Reassembly

14. Reverse procedures 1 to 11.
15. Pack the bearings with an approved grease during assembly.
16. Tighten the slotted nut to 80 Nm (60 lb/ft) then slacken off the nut to the nearest pin hole to give the correct end float.
17. Refit the hub cap and torque the bolts to 20-28 Nm (15-21 lb ft). On the M-F 350 tractors tighten the screwed cap.
18. Grease the hub until grease appears from the seal inside the hub.
19. For wheel nut torques see section 8D.



10A-06

FRONT AXLE - 2 WHEELDRIVE - 3 CYLINDER TRACTORS

Spindle Shaft

Removal and Refitment

10A-04

Removal

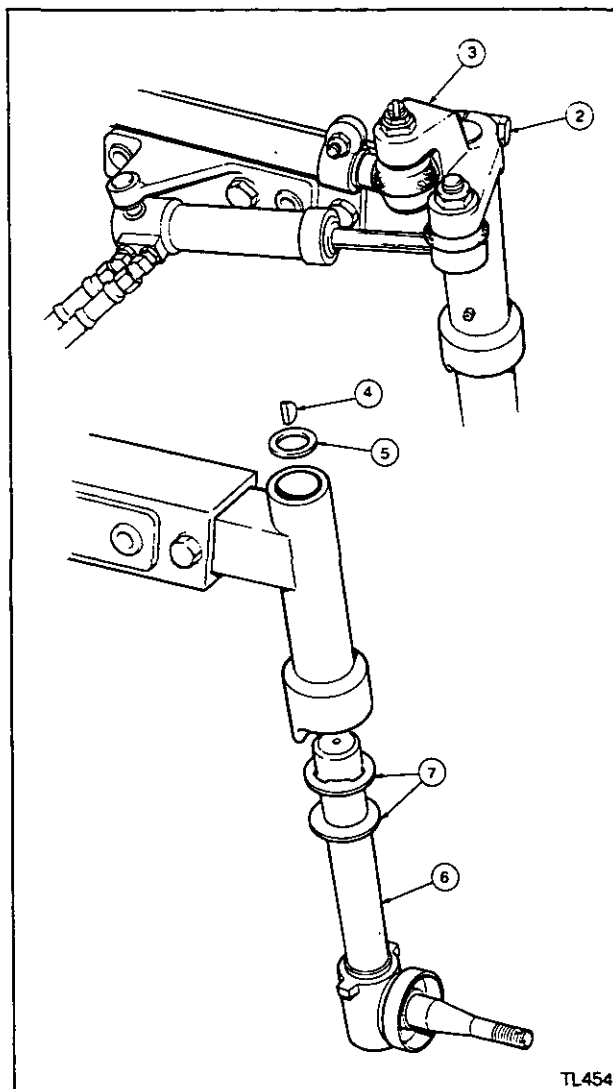
1. Remove the hub, see operation 10A-03.
2. Remove the nut and bolt.
3. Detach the steering arm.
4. Remove the key.
5. Remove the dust seal.
6. Lower the spindle shaft from the housing.
7. Remove the thrust washer and spacer from the spindle.

Examination

Examine the the spindle shaft thrust bearings for wear or damage and replace if necessary.

Refitment

8. Reverse the procedures 1-7 except:
 - a. Renew the dust seal.
 - b. Lubricate thrust bearings with an approved grease before reassembly.
 - c. Fit the spacer to the spindle shaft followed by the thrust washer with the indentations in the bronze face facing downwards in contact with the spacer.
 - d. Refit the bolt to the steering arm with the nut on the inside.
 - e. Tighten the steering arm nut to a torque of 125-165 Nm (94-122 lbf ft).
 - f. With the hub and spindle assembly held firmly against the thrust bearings, measure the gap between the steering arm and the spindle housing, using feeler gauges, the clearance between the arm and housing after assembly should be 0,05 mm (0.002 in) maximum.
 - g. Grease the spindle bearings with the wheels off the ground until grease appears at the top and the bottom of the housing.



FRONT AXLE – 2 WHEELDRIVE – 3 CYLINDER TRACTORS**Spindle Housing****Removal & Refitment**

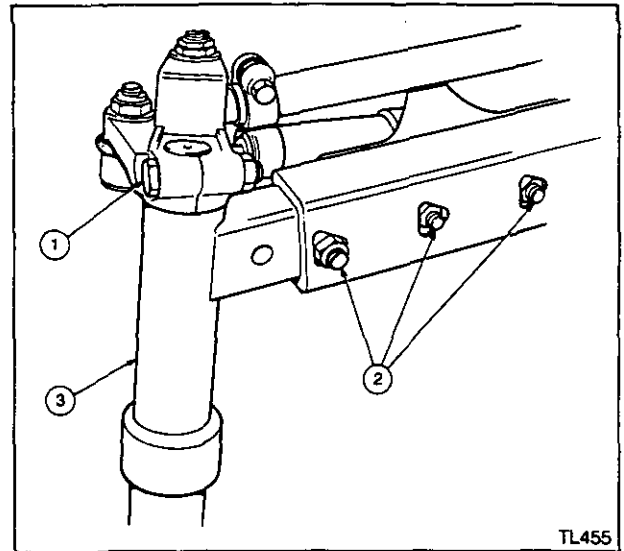
10A-05

Removal

1. Remove spindle shaft, see operation 10A-04.
2. Remove the three nuts and bolts.
3. Withdraw the spindle housing.

Refitment

4. Reverse procedures 1 to 3 except: Tighten the axle beam bolts to a torque of 180-230 Nm (133-170 lbf ft) with wheels on the ground.



10A-08

FRONT AXLE - 2 WHEELDRIVE - 3 CYLINDER TRACTORS

Spindle Housing

Overhaul 10A-06

Special Tools:

MF263	Bush Remover - main tool
MF263-2/1	Bush replacer
MF263-2/2	Extractor
MF264	Reamer Handle - main tool
MF264-1/1	Reamer
MF264-1/2	Reamer guide
MS550	Universal handle

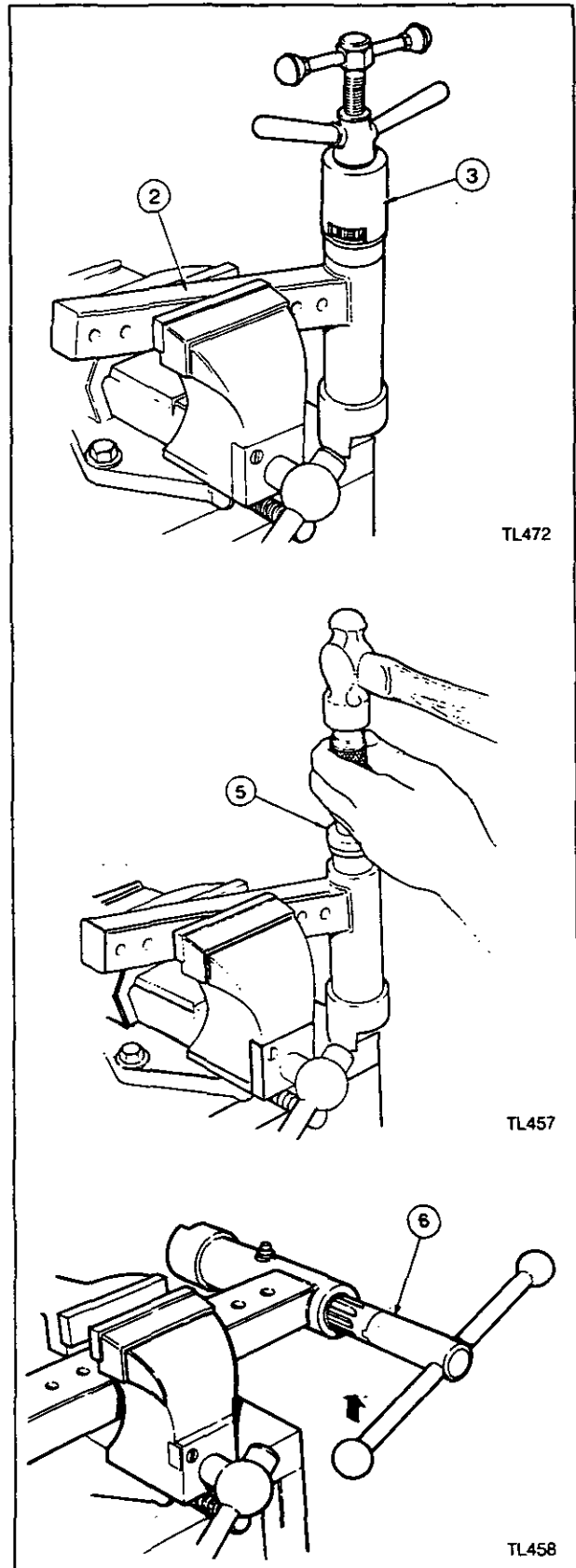
Disassembly

1. Remove the spindle shaft housing, see operation 10A-05.
2. Secure the spindle housing in a vice.
3. Using MF263 and MF263-2/2 remove the bush by screwing the threaded extractor into the bush with the upper handle. Withdraw the bush by turning the lower handle.
4. Invert the housing and remove the other bush.

Reassembly

5. Using the MS550 Handle and the MF263-2/1 replacer, drive in a new bush at each end of the housing.
6. Fit the MF264-1/1 reamer to the MF264 main tool and pass the guide bar through the housing. Fit the reamer guide MF264-1/2 on to the guide bar and into the housing. This will ensure that the bush is reamed parallel.
7. Ream the upper bush to size.
8. Turn the equipment over and ream the lower bush to size.
9. Remove all swarf from the housing and ensure the grease nipple hole is clear.
10. Refit spindle shaft, see operation 10A-05.
11. Reverse procedures 2 and 3, to tighten the axle nuts and bolts into their mounted position, then tighten the axle beam nuts and bolts to 180-220 Nm (134-162 lbf ft).

Note: Ensure all parts are suitably greased before reassembly.

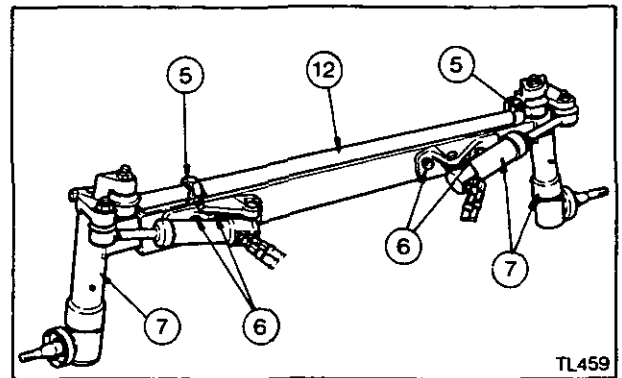


FRONT AXLE – 2 WHEELDRIVE – 3 CYLINDER TRACTORS**Axle Beam Assembly**

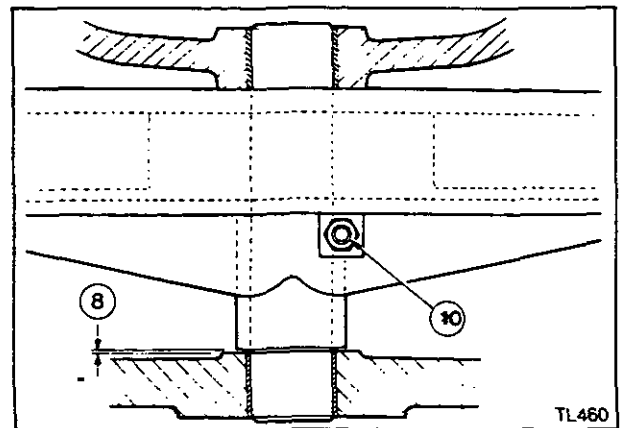
Removal and Refitment 10A-07

Special tools: MF 444 Pivot pin remover**Removal**

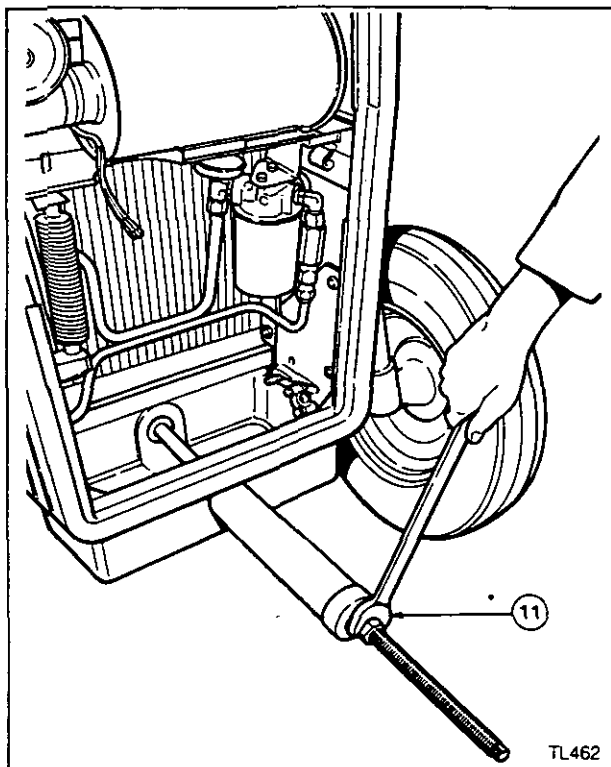
1. Remove the front weights, weight frame and guard.
2. Support the tractor under the engine sump.
3. Raise the tractor at the front.
4. Disconnect and plug the hydraulic hoses from the steering rams on each side.
5. Remove the setscrew from the track rod assembly.
6. Remove the three nuts and bolts from each end of the axle beam.
7. Withdraw the spindle housings complete with wheels and steering rams.
8. Push the axle beam back on its pivot pin against the thrust washer. Using feeler gauges check the gap between the front boss on the beam and casting. If it exceeds 0,25 mm (0.10 in) note the dimension.
9. Disconnect the remote greaser tube.
10. Remove locknut, washer and taper pin.
11. With the axle beam supported on both sides, using MF444 and the 7/16 in UNC adaptor, remove the pivot pin from the casting.
12. Lift and remove the beam, thrust washer and shims out from the side of the tractor.



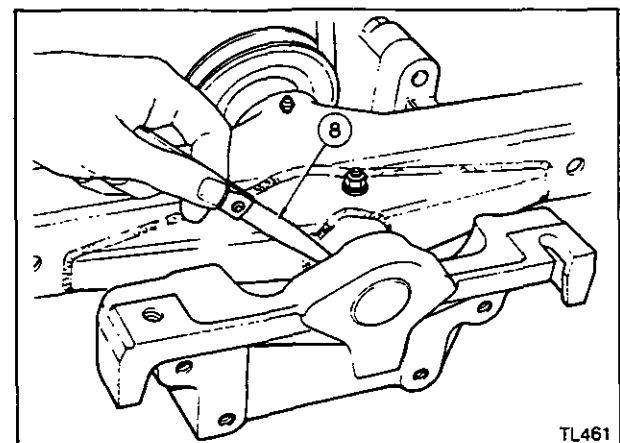
TL459



TL460



TL462



TL461

Examination

- Check the end face of the axle beam boss, the pivot pin and thrust washer for wear. Examine all surfaces for wear or damage. In the event of accident damage check the beam for bending or twisting. If the beam has been in any way deformed, it must be replaced, as steering characteristics and tyre wear can be severely affected. Also the beam may have been dangerously weakened due to straining of the welded seams.

Refitment

- Reverse procedures 1 to 12 except:
 - If gap between front boss on beam and the casting, exceeds 0,25 mm (0.010 in) suitable shims from the following chart must be selected to give a gap of 0,05 mm (0.002 in) minimum to 0,25 mm (0.010 in) maximum. Shims must be fitted to the front of the beam and thrust washer to the rear.

Part number	Shim thickness	
	mm	in
898 018 M1	0,70 to 0,76	0.028 to 0.030
898 019 M1	0,86 to 0,91	0.034 to 0.036
898 020 M1	0,99 to 1,04	0.039 to 0.041
882 868 M1	1,12 to 1,17	0.044 to 0.046
882 869 M1	1,24 to 1,30	0.049 to 0.051

- Ensure that the tapered pin is located correctly in the hole and the groove in the pivot pin, then tighten nut and lockwasher to a torque of 80-140 Nm (70-110 lbf ft).
- Tighten track rod setscrew to a torque of 45-55 Nm (33-41 lbf ft).
- Tighten bolts and nuts, securing spindle housings into the axle beam, to a torque of 180-230 Nm (133-170 lbf ft) with the wheels on the ground.

Axle Support Casting

Removal and Refitment 10A-08

Special tools: MF444 Axle pivot pin remover

Removal

- Remove the front weights and weight frame.
- Remove the front grille and disconnect the headlights.
- Remove the hood and side panels.
- Remove the air cleaner.
- Disconnect the hydraulic hoses and pipes as necessary.
- Remove the fuel tank.
- Remove the battery.
- Remove the radiator and oil cooler assembly.
- Remove the nose.
- Support the tractor under the engine.
- Support the axle beam to prevent it rolling over after removal of the pivot pin.

- Using MF444 withdraw the axle beam pivot pin.
- Lift the axle beam clear using a crane.
or
Lower the engine and support casting and wheel out the front axle and beam assembly.
- Remove the four nuts and bolts and the two nuts and studs securing the front axle support assembly to the engine.
- Take the weight of the front support casting on a trolley jack, then slide off the support casting – note the support casting is very heavy so care should be taken when handling it.

Refitment

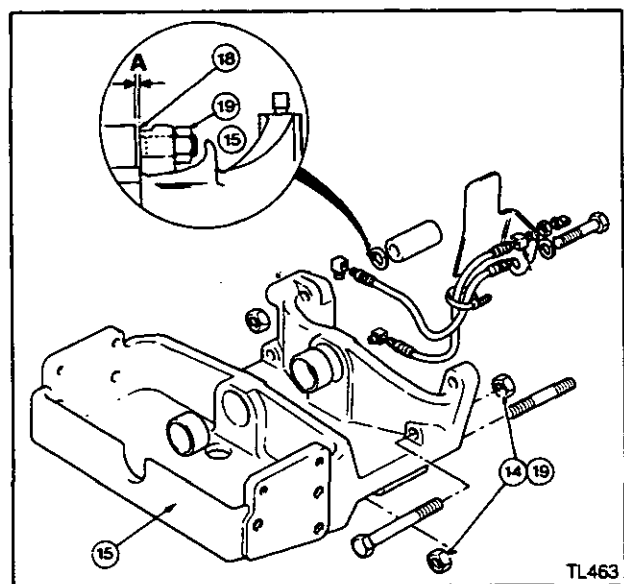
- Reverse procedures 1 to 15.

Note: When refitting the front axle support, shims are fitted between the top spacer tube and the front axle support casting on the right hand side to give 0,13 mm (0.005 in) slack preload.

- Fit the front support casting to the engine and tighten all bolts and nuts to a torque of 240-320 Nm (177-236 lbf ft) except the stud with the spacer tube.
- Measure the gap 'A' with a feeler gauge between the tube and casting. Subtract from the dimension obtained 0,13 mm (0.005 in). Remove the casting and fit shims to this thickness.

Shim Part No	Thickness (mm)	Thickness (in)
377 126 X1	0,05 mm	0.002 in
365 690 X1	0,12 mm	0.006 in
365 691 X1	0,25 mm	0.010 in
377 127 X1	0,90 mm	0.036 in

- Tighten all nuts and bolts securing the support casting to the engine to a torque of 240-320 Nm (177-236 lbf ft).



FRONT AXLE – 2 WHEELDRIVE – 3 CYLINDER TRACTORS**Front Axle Support**

Overhaul

10A-09

Special Tools:

MF 263-3/1 Bush Replacer
 MF 264 Bush reamer – maintool
 MF 264-2/1 Bush reamer
 MS 550 Handle

Removal

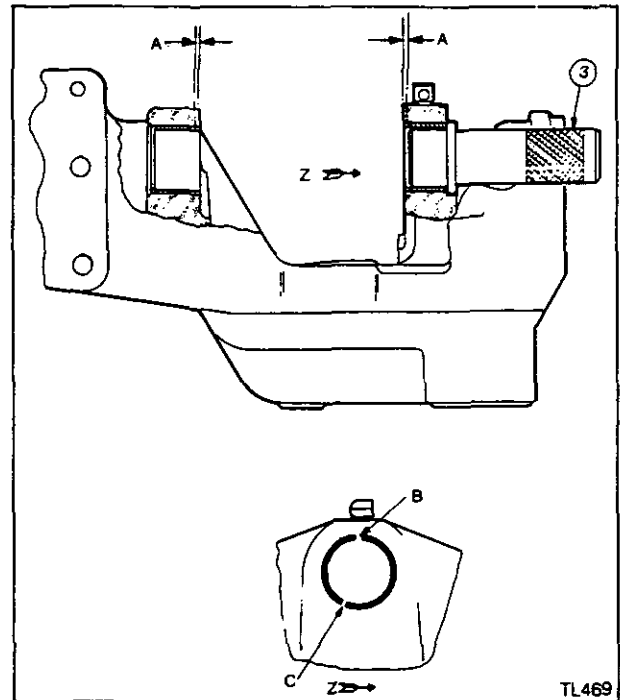
1. Remove the axle beam, see operation 10A-06.
2. Using a suitable drift, drive out the two bushes.

Refitment

3. Reverse procedures 1 and 2 except:
 - a. Using MF 263-3/1 bush replacer and MS 550 handle refit the bushes.
 - b. The bushes must be 0 to 0,50 mm (0 to 0.020 in) below the faces in the support adjacent to the axle beam 'A'.

Note: When fitting the bush, align the hole in the bush with the greaser tube opening, 'B', and the split in the bush must be as shown in the illustration 'C'.

Note: The pin must be free in the bush. If it is tight, use reamer MF264-2/1 and main tool MF264 to clean out the bush.



FRONT AXLE – 2 WHEEL DRIVE 4 & 6 CYLINDER TRACTORS

Section 10 – Part B

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10B-08	Axle beam assembly - Overhaul	9
10B-09	Front axle support casting - Removal	10

10B-2

FRONT AXLE – 2 WHEEL DRIVE

Specification

Front Track

Normal duty	1247-1857 mm (50-74 in)
Model application	M-F 365, 375, 383, 390, 390T, 393 and 396
Heavy duty	1365-1975 mm (54-78 in)
Model application	M-F 398 and 399
Rowcrop (M-F 383 only)	1829-1439 mm (72-96 in)
Increments	101 mm (4 in)
Wheel camber angle	4° 30'
Wheel caster angle	0°
Axle beam to support casting clearance	0,05-0,25 mm (0.002-0.010 in)
Steering arm to spindle housing clearance	0-0,05 mm (0-0.002 in)
Front wheel toe-in	0-5 mm (0-3/16 in)

Special Tools

MF.263A	Bush remover - main tool
MF.263-3/2	Extractor - 47,6 mm (1.875 in) dia.
MF.263-5/1	Extractor - 44,5 mm (1.77 in) dia.
MF.263-3/1	Bush replacer - 47,6 mm (1.875 in) dia.
MF.263-5/2	Bush replacer - 44,5 mm (1.77 in) dia.
MF.264	Bush reamer - main tool
MF.264-2/1	Bush reamer - 47,6 mm (1.875 in) dia.
MF.264-8/1	Bush reamer - 44,5 mm (1.77 in) dia.
MF.264-2/2	Reamer guide - 47,6 mm (1.875 in) dia.
MF.264-8/2	Reamer guide - 44,5 mm (1.77 in) dia.
MF.444	Axle pivot pin remover
MS.550	Handle

Bolt torques

Track rod to ball joint	160-200 Nm (118-148 lbf ft)
Track rod to steering arm ball joint	50-70 Nm (37-52 lbf ft) - early type axle
Ball joint clamp bolts	45 Nm (33 lbf ft) - later type axle
Wheel hub caps	20-28 Nm (15-21 lbf ft)
Wheel nuts	See section 8D
Steering arm to spindle	410 Nm (300 lbf ft) - Fit '8' grade nuts, 'V' grade bolts
Track rod to steering cylinder	120-160 Nm (90-120 lbf ft)
Spindle housing to axle beam	340-450 Nm (251-332 lbf ft)
Four cylinder engines:-	
Axle support casting to engine	230-255 Nm (170-190 lbf ft)
Six cylinder engines:-	
Support casting hexagon socket screws	340-408 Nm (250-300 lbf ft)
Adaptor blocks to engine bolts	218-245 Nm (160-180 lbf ft)

General Description

The front axle assembly consists of an axle beam and two spindle housing assemblies. The axle beam pivots on a pin which is secured to the axle support casting. The spindle housing assemblies can be bolted to the axle beam in alternative positions to provide front wheel track adjustment. Figure one shows the general arrangement of the front axle assembly

10B-3
FRONT AXLE - 2 WHEEL DRIVE

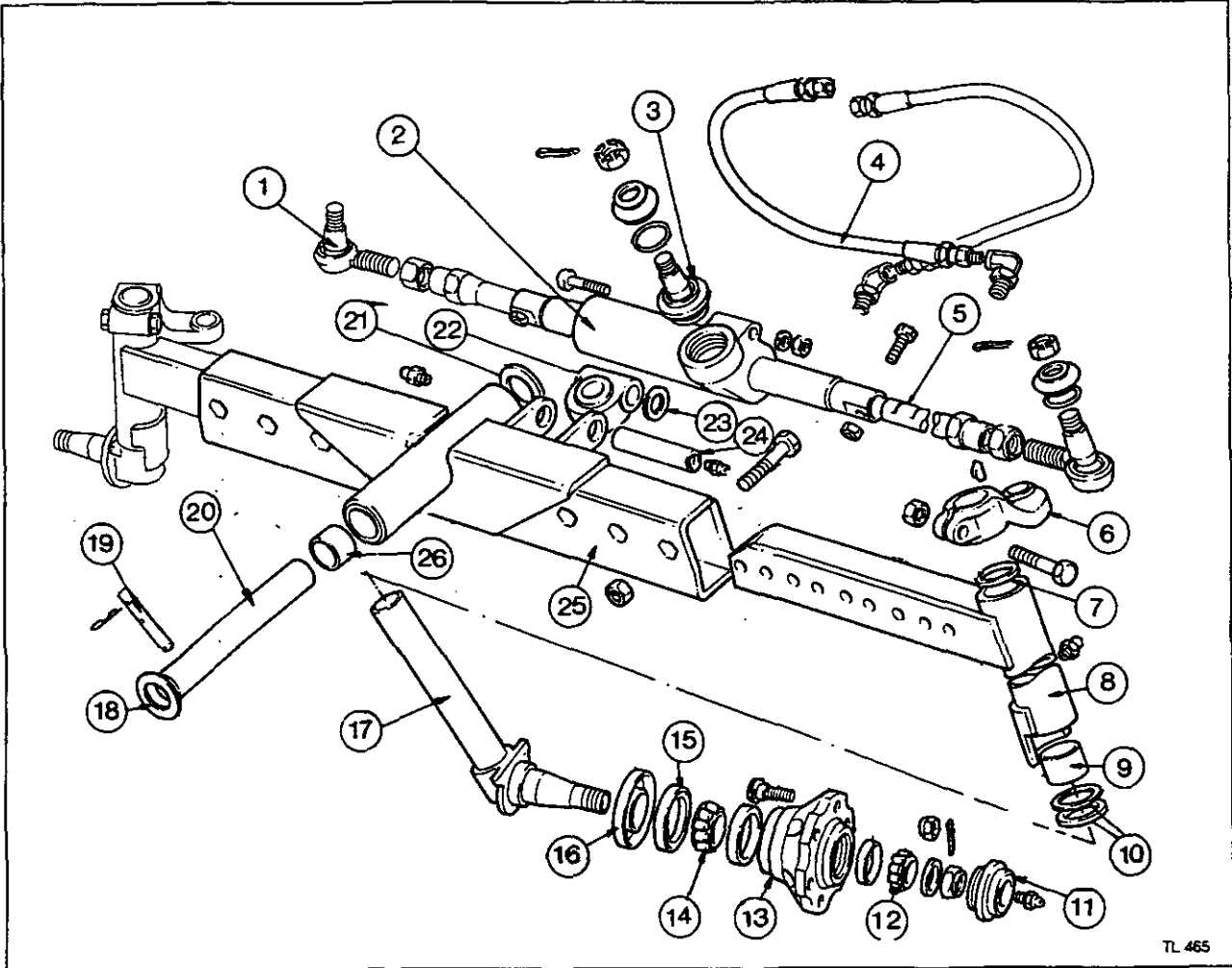


Fig.1 Front axle assembly

- | | |
|----------------------------|--------------------------|
| 1. Ball joint | 14. Taper roller bearing |
| 2. Steering arm | 15. Oil seal |
| 3. Steering ram ball joint | 16. Shield |
| 4. Hydraulic hoses | 17. Spindle |
| 5. Adjustable track rod | 18. Shims |
| 6. Steering cylinder | 19. Retaining pin |
| 7. Seal | 20. Pivot pin |
| 8. Spindle housing | 21. Thrust washer |
| 9. Bush | 22. Pivot block |
| 10. Thrust washers | 23. Shims |
| 11. Hub cap | 24. Pivot pin |
| 12. Taper roller bearing | 25. Axle beam |
| 13. Hub | 26. Bush |

10B-4

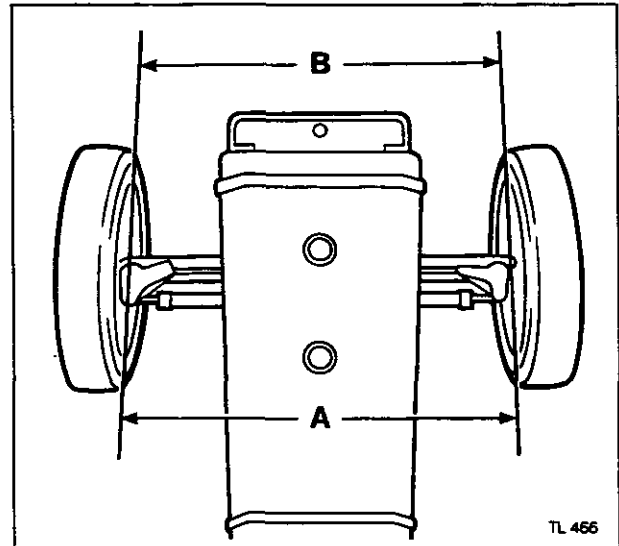
FRONT AXLE - 2 WHEEL DRIVE

Front Wheel Toe-in

Adjust

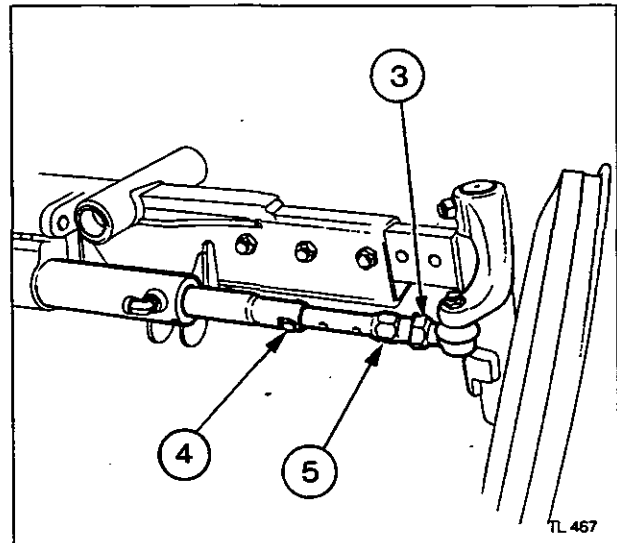
10B-01

1. Place the tractor on firm ground and put the front wheels in the straight ahead position.
2. To check the toe-in, see illustration. Distance 'B' must be 0-5 mm (0-3/16 in) greater than distance 'A' measured on the centre line of the axle at the wheel rim.
3. If adjustment is necessary proceed as follows:-



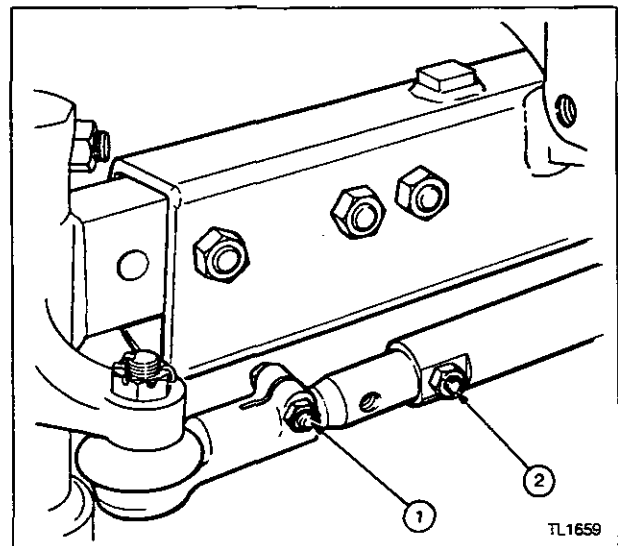
Early models

4. Remove both nuts and bolts securing the track rod.
5. Rotate the track rod at both ends by half a turn. Screw-out the track rod to increase the toe-in. Screw-in the track rod to decrease the toe-in.
6. Replace the nuts and bolts at both ends. Ensure that when refitting that both bolts are in the horizontal position. Tighten to a torque of 120-160 Nm (90-120 lbf ft).
7. Check the toe-in. If the measurement is now acceptable tighten both locknuts (3) to a torque of 160-200 Nm (118-128 lbf ft)



Later models

8. Remove both ball joint clamp bolts (1) on each end of the track rod.
9. Remove both pinch bolts (2) from each end of the steering cylinder.
10. Rotate the track rod on both sides by only half a turn at a time. It is important to keep the amount of thread in the both ball joints equal. Screwing out the track rod will increase the toe-in, screwing in will decrease the toe-in.
11. Refit the nuts and bolts (2) and tighten to a torque of 120-160 Nm (90-120 lbf ft)
12. Check the toe-in, if the measurement is now acceptable, set the bolt (2) in the horizontal position.
13. Replace and tighten the two ball joint clamp bolts (1) to a torque of 45 Nm (33 lbf ft).

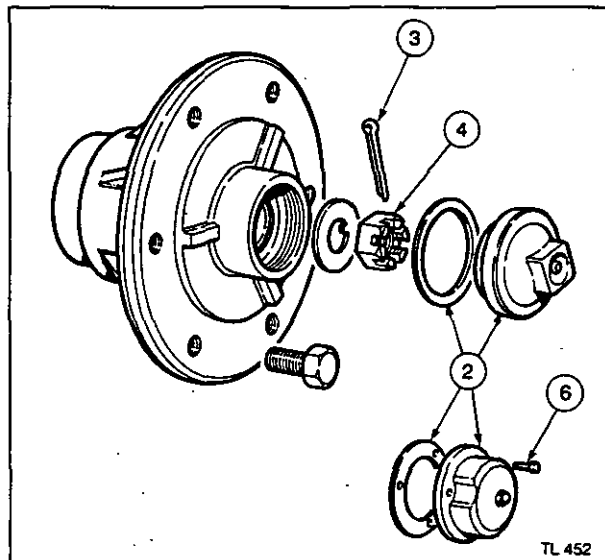


10B-5 FRONT AXLE - 2 WHEEL DRIVE

Front Hub

Adjust 10B-02

1. Raise the front wheels off the ground and check the wheel bearings for wear. If movement is found, adjust the bearing pre-load as follows:-
2. Remove the hub cap.
3. Remove the split pin.
4. Tighten the slotted nut to a torque of 80 Nm (59 lbf ft) then slacken off the nut to the nearest split pin hole to give the correct end float.
5. Fit a new split pin.
6. Refit the hub cap. Caps secured with bolts, tighten the bolts to a torque of 20-28 Nm (15-21 lbf ft).
7. Grease the hub until clean grease appears from the seal inside the hub.



Front Hub

Overhaul 10B-03

Disassembly

1. Raise the front of the tractor and remove the wheel.
2. Remove the hub cap.
3. Remove and discard the split pin.
4. Remove the nut and washer.
5. Remove the hub complete with bearing and seal from the axle spindle.
6. Remove the outer bearing cone.
7. Tap out the outer bearing cup.
8. Remove the seal.
9. Drive out the bearing cup.
10. Remove the inner cone.
11. Remove the dust shield.

Examination

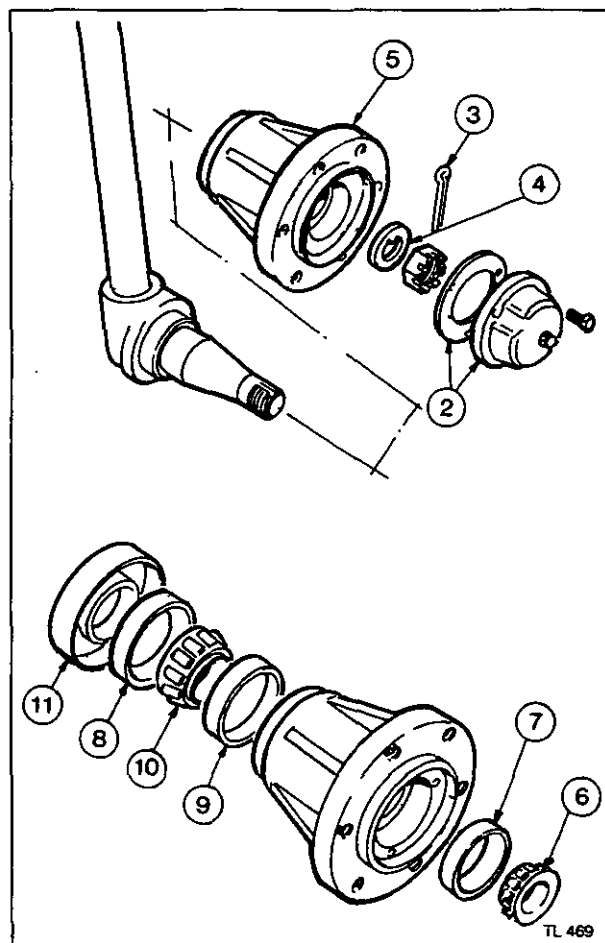
12. Thoroughly wash out the old grease or dirt from the hub components using clean paraffin, and check the condition of the hub spindle and bearings. Any worn or damaged components must be replaced. Always fit a new seal with the lip facing outwards and tap the seal right into the recess in the hub.

Reassembly

13. Reverse procedures 1 to 11.

NOTE: Pack the bearings with an approved grease during assembly.

14. Turn the wheel hub and tighten the slotted nut to a torque of 80 Nm (60 lbf ft). Back off the slotted nut to line up with the nearest pin hole to give the correct end float.
15. Torque the hub cap bolts to 20-28 Nm (15-21 lbf ft).
16. Grease the hub until clean grease appears from the seal inside the hub.
17. For wheel nut torques, see section 8D.



10B-6

FRONT AXLE - 2 WHEEL DRIVE

Spindle Shaft

Removal and Refitment

10B-04

Removal

1. Remove the front hub, see operation 10B-03.
2. Remove the nut and bolt.
3. Remove the steering arm.
4. Remove the key.
5. Remove the dust seal.
6. Lower the spindle shaft from the housing.
7. Remove the thrust washer and spacer from the spindle.

Examination

Examine the spindle thrust bearing for damage or wear and replace if necessary.

Refitment

8. Renew the dust seal.
9. Liberally lubricate the thrust bearing with an approved grease before assembly.
10. Fit the thrust washer to the spindle shaft first.
11. Assemble the thrust washer with the indentations in the bronze face facing downwards.
12. Fit the key and steering arm.
13. It is very important that the correct nut and bolt is fitted to the steering arm. The nut must be SAE 8 quality Massey Ferguson part number 373 601 X1. The bolt must be V quality, Massey Ferguson part number 3611 361 M1. Fit the bolt with the nut on the inside.
14. With the hub and spindle assembly held firmly in place against the thrust bearings, measure the gap between the steering arm and the spindle housing using feeler gauges. The gap must not exceed 0,05 mm (0.002 in).
15. When the correct setting has been obtained tighten the steering arm nut to a torque of 410 Nm (300 lbf ft).
16. Thoroughly grease the shaft before the wheel is fitted and it is lowered to the ground.
17. Refit the track rod and tighten the ball joint nut to a torque of 60 Nm (45 lbf ft).

Spindle Housing

Removal and Refitment

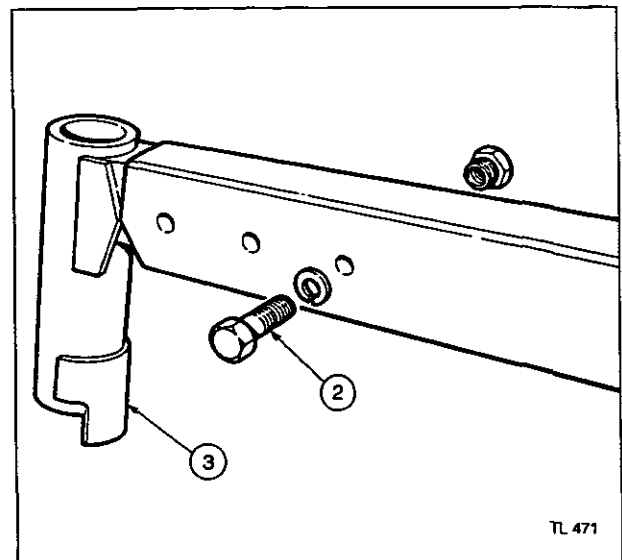
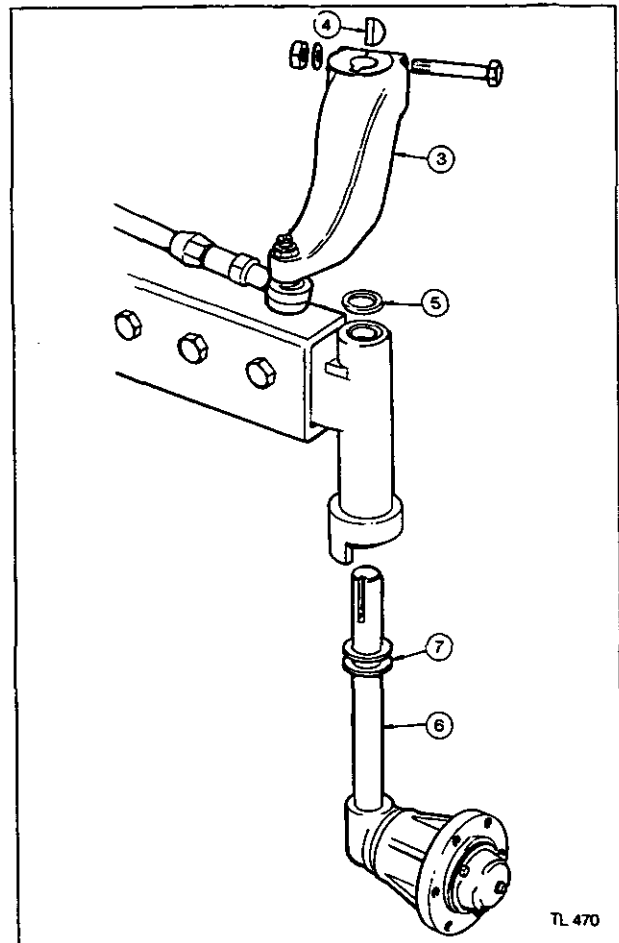
10B-05

Removal

1. Remove the spindle shaft, see operation 10B-04.
2. Remove the three nuts and bolts.
3. Withdraw the spindle housing from the axle beam.

Refitment

4. Reverse procedures 1 to 3 except:-
 - a. Tighten the axle beam bolts to a torque of 400 Nm (300 lbf ft) with the wheels on the ground.
 - b. Check the front wheel toe-in, see operation 10B-01.



Spindle Housing

Overhaul 10B-06

Special Tools:

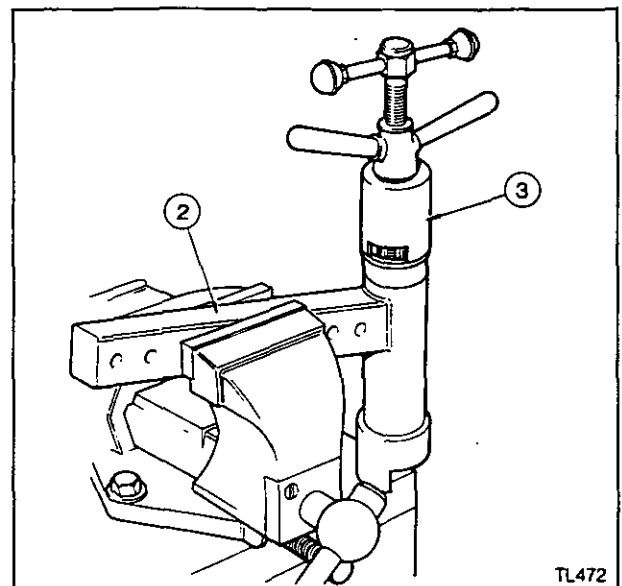
MF263	Bush remover – main tool
MF263-5/1	Extractor
MF263-5/2	Bush replacer
MF264	Reamer handle – main tool
MF264-8/2	Reamer guide
MF264-8/1	Reamer
MS550	Universal handle

Disassembly

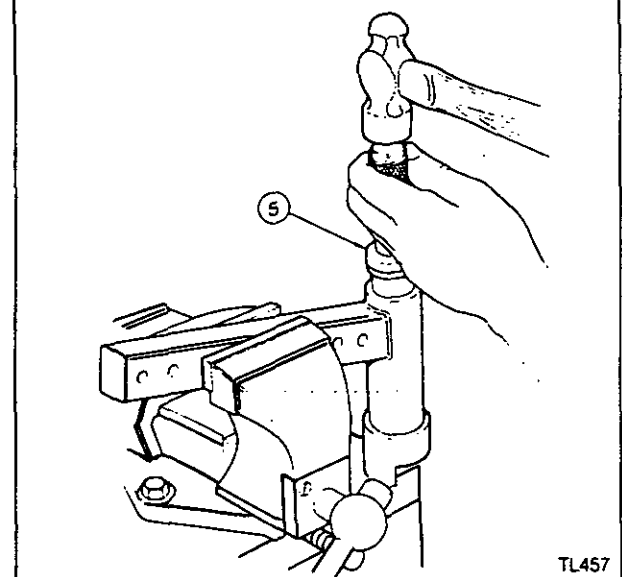
1. Remove the spindle housing, see operation 10B-05.
2. Secure the housing in a vice.
3. Using MF263 and MF263-5/1 remove the bush by screwing the threaded extractor into the bush with the upper handle. Withdraw the bush by turning the lower handle.
4. Invert the housing and remove the other bush.

Reassembly

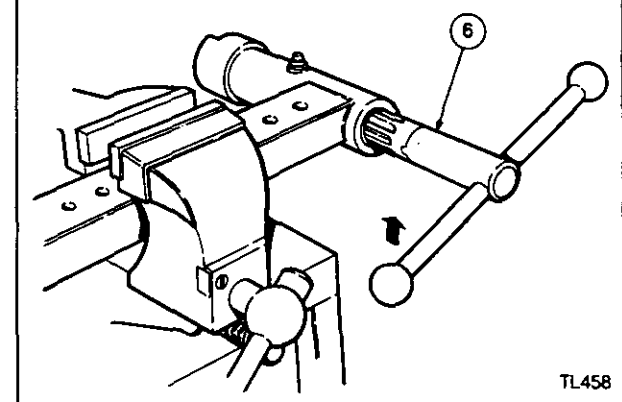
5. Using the MS550 Handle and the MF263-5/2 bush replacer drive in a new bush at each end of the arm.
6. Fit the MF264-8/1 reamer to the MF264 main tool and pass the guide bar through the housing. Fit the reamer guide MF264-8/2 on to the guide bar and into the housing. This will ensure that the bush is reamed parallel.
7. Ream the upper bush to size.
8. Turn the equipment over and ream the lower bush to size.
9. Remove all swarf from the housing and ensure the grease nipple hole is clear.
10. Refit spindle shaft, see operation 10B-04.
11. Reverse procedures 2 and 3, then tighten the axle beam nuts and bolts to 340-450 Nm (251-332 lbf ft), with the wheels on the ground.
12. Thoroughly grease all parts before assembly.



TL472



TL457



TL458

10B-08

FRONT AXLE 2 WHEELDRIVE

Axle Beam

Removal & Refitment

10B-07

Special Tools: MF 444 Axle pivot pin remover

Removal

1. Remove the front weights and weight frame.
2. Support the tractor under the engine.
3. Remove both the spindle housings with the front wheels.
4. Push the beam back on its pivot pin against the thrust washer. Using feeler gauges, check the gap between the front boss on the beam and the support casting. If it exceeds 0,25 mm (0.010 in) note the dimension.
5. Disconnect and plug the hydraulic hoses to the power steering ram.
6. Support the axle beam on a trolley jack.
7. Remove the two 'R' clips and the pivot pin retaining pin.
8. Using MF444 front axle pivot pin puller withdraw the pivot pin.
9. Lower the beam to the ground.
10. Remove the steering ram, see operation 11A.

Examination

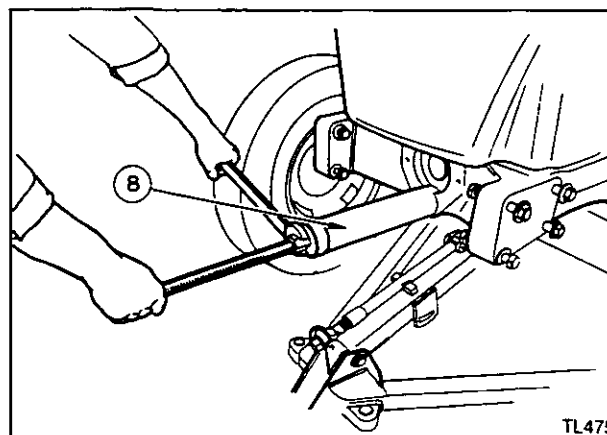
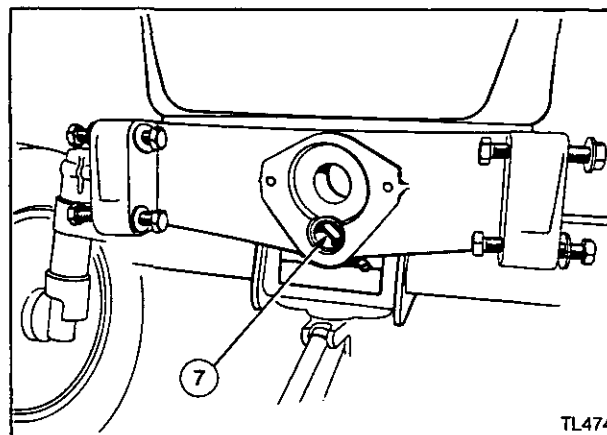
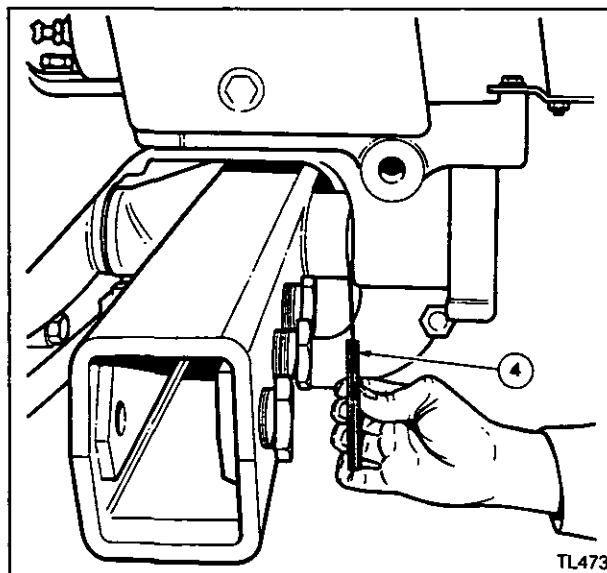
12. Check the end face of the axle beam boss, the pivot pin, shims and thrust washer for wear. Examine all bores and threads for wear or damage. In the event of accident damage check the beam for bending or twisting. If the beam has been in any way deformed, it must be replaced, as steering characteristics and tyre wear can be severely affected. Also the beam may have been dangerously weakened due to straining of the welded seams.

Refitment

11. Reverse procedures 1 to 10 except:
 - a. If gap between front boss on beam and the casting, exceeds 0,25 mm (0.010 in) suitable shims from the following chart must be selected to give a gap of 0,05 mm (0.002 in) minimum to 0,25 mm (0.010 in) maximum. Shims must be fitted to the front of the beam and the thrust washer to the rear.

Part number	Shim thickness	
	mm	in
898 018 M1	0,70 to 0,76	0.028 to 0.030
898 019 M1	0,86 to 0,91	0.034 to 0.036
898 020 M1	0,99 to 1,04	0.039 to 0.041
882 868 M1	1,12 to 1,17	0.044 to 0.046
882 869 M1	1,24 to 1,30	0.049 to 0.051

- b. Tighten nuts and bolts securing trackrod to the power steering ram, to a torque of 29-37 Nm (21-27 lbf ft).
 - c. Tighten bolts and nuts, securing spindle housings into axle beam, to a torque of 340-450 Nm (252-333 lbf ft).
13. Check the front axle toe-in, see operation 10B-01.

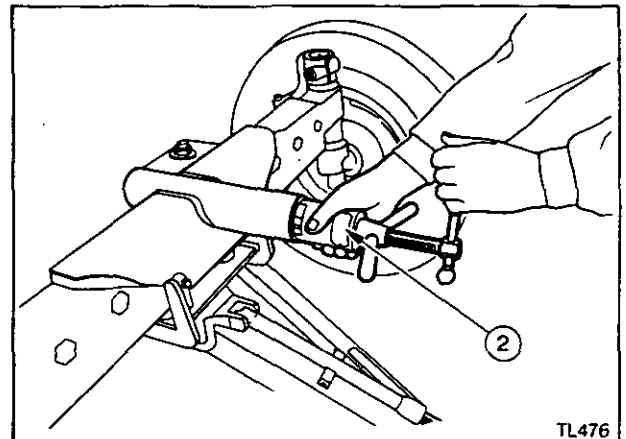


Axle Beam

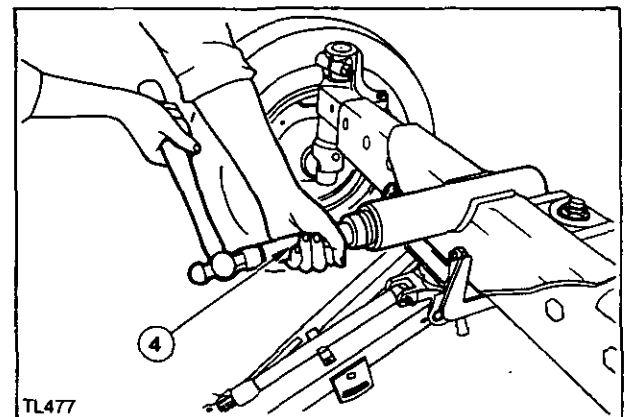
Overhaul 10B-08

Special Tools:MF 263 *Bush remover – main tool*MF 263-3/1 *Bush replacer*MF 263-3/2 *Extractor*MS 550 *Handle***Removal**

1. Remove the axle beam, see operation 10B-07.
2. Using MF 263 and MF 263-3/2, remove the bush by screwing the threaded extractor into the bush with the upper handle. Withdraw the bush by turning the lower handle.
3. Turn the beam over and remove the other bush.

**Refitment**

4. Drive in the new bush with the split positioned vertically and facing the top of the tube with the replacer MF 263-3/1 and handle MS550.
5. Turn the beam over and fit the other bush.
6. The pivot pin must turn freely in the bushes, if not, ream the bushes with MF264 and MF264-2/1.
7. Refit the beam, see operation 10B-07.
8. Check the front wheel toe-in, see operation 10B-01.



10B-10

FRONT AXLE 2 WHEELDRIVE

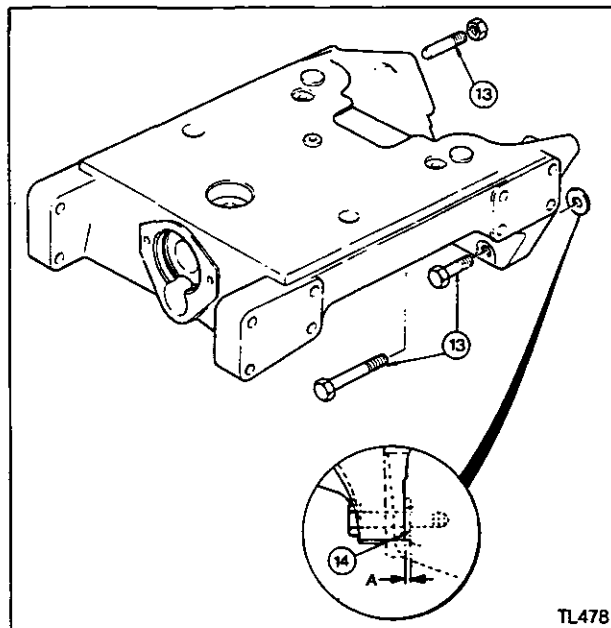
Front Axle Support Casting

Removal and Refitment

10B-09

Removal

1. Remove the front weights and weight frame.
2. Remove the fuel tank, see section 5.
3. Remove the radiator, see section 4.
4. Disconnect and plug the hydraulic hoses and pipes as necessary.
5. Remove the radiator support frame.
6. Support the tractor under the engine sump.
7. Support the front axle and remove the pivot pin, see operation 10B-07.
8. Raise the front of the tractor and wheel out the front axle assembly on its wheels with a trolley jack.
9. Take the weight of the front support casting on a small crane.
10. Remove the bolts and nuts securing the casting to the engine.
11. Slide the casting off the studs on the crane and lower it to the ground.

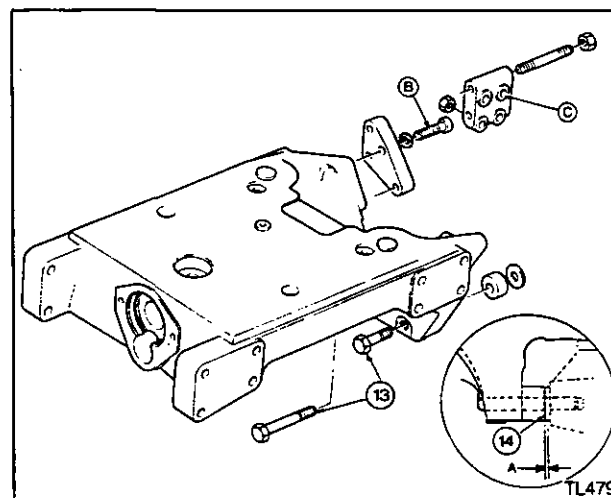


Refitment

12. Reverse procedures 1 to 11.

Note: When refitting the front axle support, shims are fitted between the support casting and the engine (see illustration) to give a 0,13 mm (0.005 in) preload.

13. Fit the front support casting to the engine without shims and tighten the two top rows of nuts and bolts to a torque of 230-255 Nm (170-190 lbf ft), except the two bottom bolts which take the shims.
14. Measure the gap 'A' on each side of the casting with a feeler gauge between the casting and engine on 4 cylinder engines, the spacer tube and engine on 6 cylinder engines. Treat each side individually. Add to the two dimensions obtained 0,13 mm (0.005 in), this is the thickness of shims to be added to each side.



Shim Part No	Thickness (mm)	Thickness (in)
1695 486 M1	0,10	0.004
1695 487 M1	0,25	0.010
1695 488 M1	0,40	0.015
1695 489 M1	0,50	0.020
1695 490 M1	1,50	0.060

Note: When selecting shims the final pack must be tight in gap 'A'.

15. Slacken all nuts and bolts, take the weight of the front support casting on a jack to aid fitting of the shims, insert the correct shim pack to the two bottom bolts on each side.
16. Remove the jack, tighten all nuts and bolts securing the support casting to a torque of 230-255 Nm (170-190 lbf ft).

Note: On tractors with 6 cylinder engines the hexagon socket cap screws 'B' are torqued to 340-408 Nm (250-300 lbf ft).

The four bolts 'C' on each side of the engine retaining the two adaptor blocks to the engine are torqued to 218-245 Nm (160-180 lbf ft).

FRONT AXLE – 4 WHEEL DRIVE

Section 10 – Part C

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10C-02

FRONT AXLE - 4 WHEEL DRIVE

Specification

Axle type

M-F 340, 350, 355, 360 and 362	NG100/SDN (Category 1 narrow)
M-F 365 and 375	NG100/SD (Category 1 wide)
M-F 390 and 390T	NG200/SD (Category 2)
M-F 398 and 399	NG250/SD (Category 2.5)

Axle part numbers

Axles with Standard differential

3428 057 M91	NG100/SDN (Category 1 narrow)	M-F 340 only
3426 356 M92	NG100/SDN (Category 1 narrow)	Sealed unit
3428 054 M91	NG100/SDN (Category 1 narrow)	Standard unit

Axles with No-spin differential

3426 358 M92	NG100/SDN (Category 1 narrow)	Sealed unit
3428 053 M91	NG100/SDN (Category 1 narrow)	Standard unit
3426 362 M92	NG100/SD (Category 1 wide)	Sealed unit
3428 058 M91	NG100/SD (Category 1 wide)	Standard unit
3426 366 M92	NG200/SD (Category 2)	Sealed unit
3428 061 M91	NG200/SD (Category 2)	Standard unit
3426 378 M92	NG250/SD (Category 2.5)	Sealed unit

Axles with Hydrolock differential

3426 942 M91	NG100/SDN (Category 1 narrow)	Sealed unit
3428 055 M91	NG100/SDN (Category 1 narrow)	Standard unit
3426 943 M91	NG100/SD (Category 1 wide)	Sealed unit
3428 060 M91	NG100/SD (Category 1 wide)	Standard unit
3426 944 M91	NG200/SD (Category 2)	Sealed unit
3428 063 M91	NG200/SD (Category 2)	Standard unit
3426 945 M91	NG250/SD (Category 2.5)	Sealed unit

Camber angle 1°

Toe-in 0°

Pinion protrusion up to tractor Serial No. N04463 (axles with two differential bearing adjusters)

NG100/SD (N)	113±0,1 mm (4,449±0,004 in)
NG200/SD	113±0,1 mm (4,449±0,004 in)
NG250/SD	118±0,1 mm (4,646±0,004 in)

Pinion protrusion tractor Serial No. N04464 on (axles with single differential bearing adjuster)

All axles	118±0,1 mm (4,646±0,004 in)
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Crownwheel and Pinion

	No of Teeth	Ratio
NG100/SD(N)	9 x 31	3,444 : 1
NG200/SD	9 x 31	3,444 : 1
NG250/SD	11 x 45	4,091 : 1

Pinion pre-load 3,2-3,3 Nm (28-29 lbf in)

Differential carrier pre-load With zero end float tighten bearing nut three notches

Crownwheel and pinion backlash 0,10-0,25 mm (0,004 to 0,010 in)

Epicyclic Reduction

	Ratio
NG100/SD(N) (M-F 340 only)	3.333 : 1
NG100/SD(N)	5.2 : 1
NG200/SD	5.2 : 1
NG250/SD	5.007 : 1

Swivel hub pre-load 0,2 mm (0,008 in)

Drive hub bearing pre-load 0,05 mm (0,002 in)

Axle pivot pin end float 0,05-0,25 mm (0,002-0,010 in)

Oil Capacities

M-F 340, 350, 355, 360, 362

Axle	5,0 litre (9 pt) (9 US pt)
Epicyclic (each side)	1,4 litre (2½ pt) (2½ US pt)

M-F 365, 375, 390, 390T

Axle	5,8 litre (10 pt) (10 US pt)
Epicyclic (each side)	1,4 litre (2½ pt) (2½ US pt)

M-F 398, 399

Axle	6,5 litre (11 pt) (11 US pt)
Epicyclic (each side)	1,8 litre (3 pt) (3 US pt)

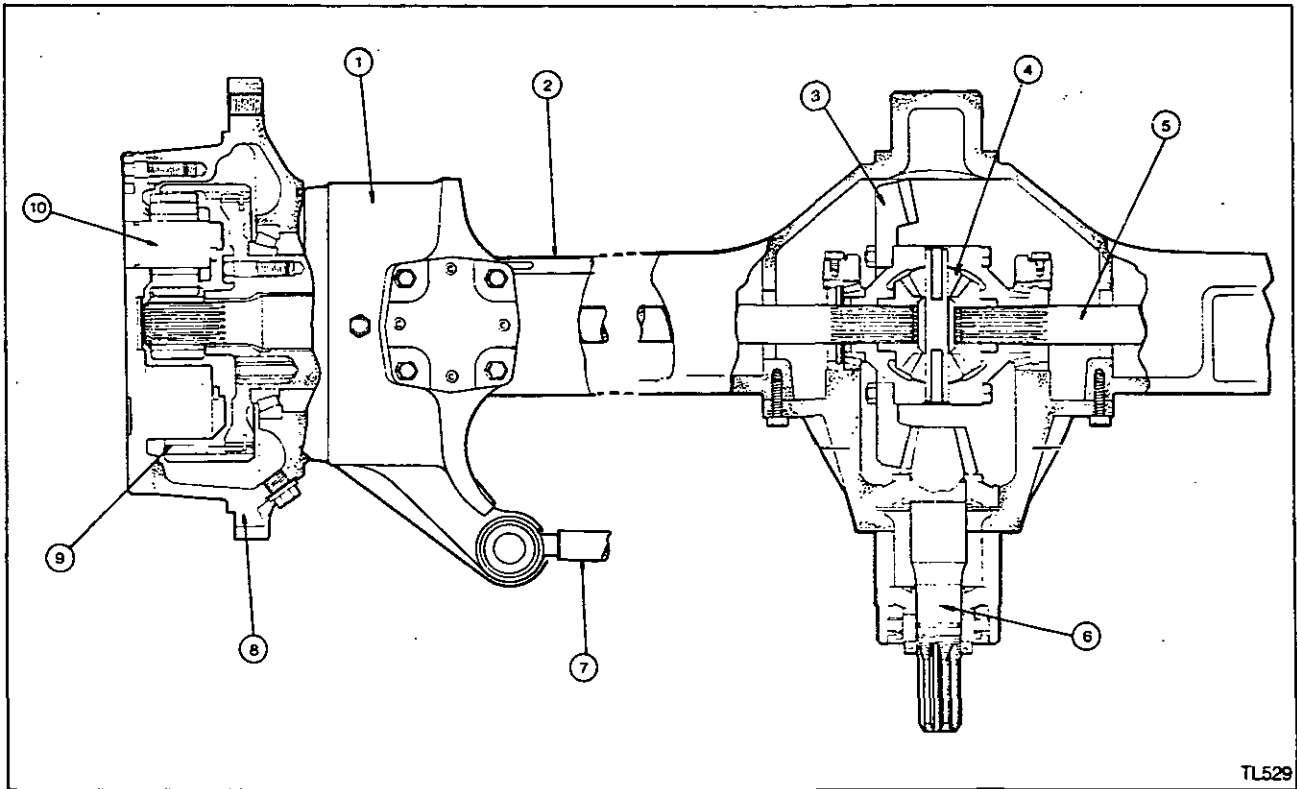
FRONT AXLE – 4 WHEEL DRIVE**Special Tools**

MF 195C	Bearing remover/replacer
MF 444	Axle pivot pin remover
MF 451A	Axle swivel pin remover
FT 4062A	Pinion pre-load gauge
MF 471	Hydralock spring compressor

Bolt Torques

Planetary carrier bolts	96-118 Nm (71-87 lbf ft)
Wheel bolts	See Section 8D
Swivel cap bolts	96-118 Nm (71-87 lbf ft)
Ring gear bolts	147 Nm (108 lbf ft)
Track rod ball joint (NG100SD and NG200SD axles).....	78-86 Nm (58-63 lbf ft)
Track rod ball joint (NG250SD axles).....	108-118 Nm (80-87 lbf ft)
Steering ram ball joint (NG100SD and NG200SD axles)	98-108 Nm (72-80 lbf ft)
Steering ram ball joint (NG250SD axles).....	177-196 Nm (130-145 lbf ft)
Pinion drive coupling bolt.....	60 Nm (44 lbf ft)
Drive shaft to coupling bolts.....	55-75 Nm (40-55 lbf ft)
Differential and crownwheel bolts	79-87 Nm (58-64 lbf ft)
Differential bearing cap screws	136-150 Nm (100-110 lbf ft)
Differential bearing lock tabs.....	16-26 Nm (12-19 lbf ft)
Differential assembly to axle casing	96-118 Nm (71-87 lbf ft)

FRONT AXLE 4 WHEEL DRIVE

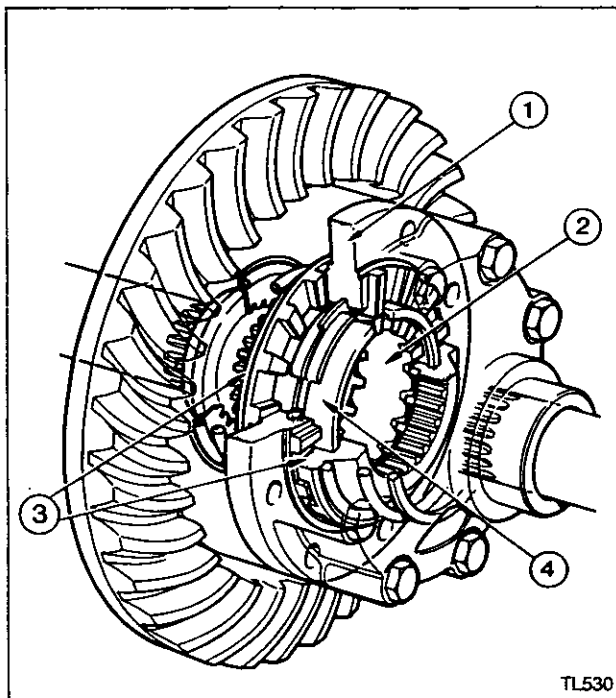


TL529

4WD Front axle

- 1. Swivel housing
- 2. Axlehousing
- 3. Crownwheel
- 4. Differential
- 5. Drive shaft

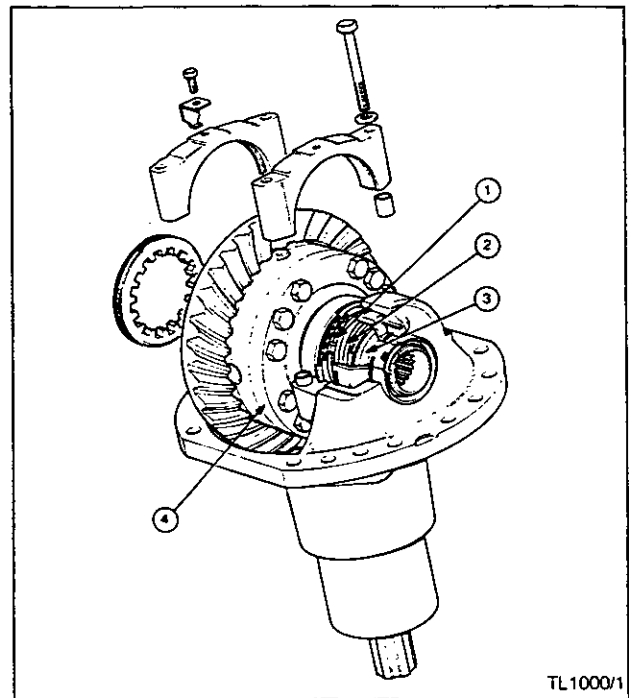
- 6. Pinion
- 7. Track rod
- 8. Wheel hub
- 9. Ring gear
- 10. Planetary gears



TL530

Autolock differential

- 1. Central driver
- 2. Centre cam
- 3. Driven clutches
- 4. Hold-out ring



TL1000/1

Hydralock differential

- 1. Dog tooth coupler
- 2. Return spring
- 3. Piston
- 4. Differential

General Description

The M-F 300 series tractors are available in either two or four wheel drive.

The four wheel drive system consists of a transfer box fitted between the gearbox and centre housing of the tractor.

It contains a train of spur gears which transfers the drive to the left-hand side of the tractor and the main drive shaft. The drive is engaged and disengaged mechanically on all models.

A driveshaft transmits along the left hand side of the engine sump to the input shaft protruding from the axle differential housing. Drive is taken through the bevel pinion which in turn drives the crownwheel and differential (Autolock, Hydralock or Standard). The crownwheel is bolted to the differential case containing the spider and differential gears, into which the inner ends of the axle shafts are splined. Final drive is then transmitted through two driveshafts, universal joints and the epicyclic reduction unit to the front wheels. The axle is attached to the front support by means of a centre pivot pin in a similar manner to the 2 wheel drive axle.

The Autolock Differential

Autolock is a positive locking differential which is used as a traction aid.

It may be fitted to all axles in place of the standard differential. Tractors fitted with an Autolock differential are identified by the letters NS stamped on the differential housing or next to the axle serial number on the right-hand side of the axle beam.

The Autolock differential has two prime functions:

1. It compensates for differences in wheel travel which occur when turning or operating on an uneven surface.
2. It prevents wheel spin and power loss when one wheel loses traction.

The Autolock differential is a speed-sensitive automatic locking differential. It consists of left and right driven clutches with square teeth. These teeth mate with similar teeth on the spider, which is clamped in the differential support case by means of four trunnions. Each clutch can slide on its special side gear, on slip-fitting splines. Cam ramps (not shown) inside the spider assembly and clutch allow a clutch to overrun the spider and disengage itself from the driveline. A spring returns the clutch to engagement with the spider.

When operating a vehicle in a straight line, the Autolock is locked and provides drive torque to both wheels. If one wheel loses traction momentarily due to poor tractive surface conditions, the opposite wheel continues to drive the vehicle until traction is regained by both wheels.

During a turn or when a wheel passes over an obstruction, the outside wheel or the wheel passing over the obstruction must rotate faster than the other wheel. When this occurs, the Autolock automatically allows for difference in wheel speed.

The faster turning wheel will overrun, being ground driven until the two wheels synchronise their respective speeds. At this time the Autolock automatically re-engages to a fully locked operating position.

The Hydralock Differential

Hydralock is a positive locking differential which is used as a traction aid on the four wheel drive front axle, operating in conjunction with the rear wheel differential. It is identified externally by the hydraulic hose feeding the actuating piston.

The hydraulic differential has two prime functions:

1. It compensates for differences in wheel travel which occur when turning or operating on an uneven surface.
2. It prevents wheel spin and power loss when one wheel loses traction.

The hydralock differential operates in the four wheel drive front axle, in conjunction with the rear differential lock pedal. The operation of the rear differential lock pedal operates the rear differential warning light switch. The switch in turn illuminates the warning light on the dashboard and energises the solenoid valve to engage the front differential lock dog tooth coupler.

The oil supply to the solenoid valve comes from the distribution block and when energised, the valve supplies a flow of oil at pressure maintaining valve pressure to the hydralock differential. This pressure acts against a piston which is attached to the moving half of a dog tooth coupler. The hydralock pressure overcomes the resistance of a coil spring and engages the dog tooth coupler. When the rear differential lock is disengaged, the warning light going out triggers the de-energising of the solenoid valve. This in turn cuts off the oil supply from the distribution valve and opens up the hydraulic line to dump. The coil spring disengages the dog tooth coupler and returns oil behind the piston to dump.

Introduced at tractor serial No. NO4464 onwards.

Product changes

After the introduction of the Hydralock differential, the other differentials, Standard and Autolock were brought into line at tractor serial number NO4464. The major change was the standardisation of the method of adjusting the crown wheel backlash by shims, this can be identified by the use of only one differential bearing pre-load adjuster ring, the other side being retained by a retainer ring and shims. The previous models had an adjuster ring each side.

The other changes were the introduction of a standard depth of pinion bearing of 118 mm on all axles, and the increase in the nut torque on the ball joints fitted to the track rod and steering ram ends.

10C-06

FRONT AXLE – 4 WHEEL DRIVE

Front Axle 4 Wheel Drive

Removal and Refitment 10C-01

Special tools: MF 444 Axle pivot pin remover

Removal

1. Secure the tractor rear wheels and apply the parking brake.
2. Disconnect the drive shaft guard and drive shaft.
3. Disconnect the steering ram hoses and plug the hose and ram connections to prevent dirt ingress.
4. Disconnect the remote greaser tube from the front axle pivot pin and the mounting bracket.
5. Place a trolley jack in position under the tractor sump and adjust to take the weight of the tractor.
6. Remove the front weights.
7. Supporting the front weight frame remove the eight bolts securing it to the front support casting and remove the weight frame.
8. Withdraw the front axle pivot pin using special tool MF444 and remove the two thrust washers and shims. Check them for wear. If they are worn, replace them with new thrust washers.
9. Support the front axle under the differential with a second trolley jack.
10. Raise the jack under the engine sump until the axle can be rolled forward from its mounted position, on its wheels.



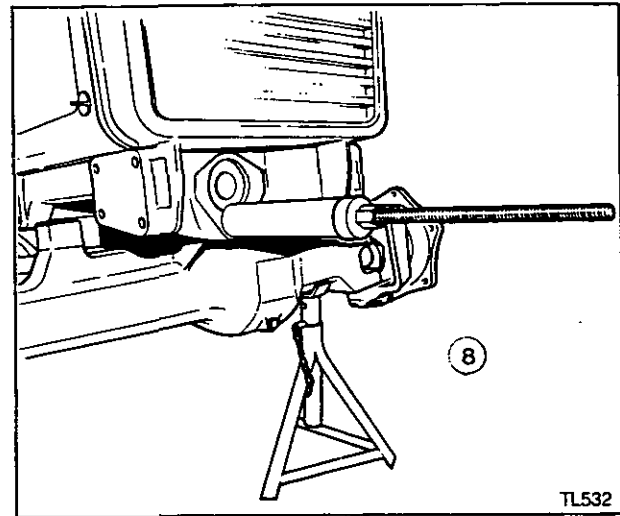
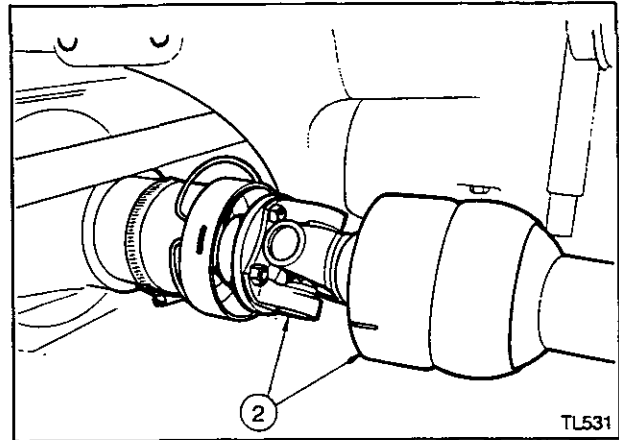
Caution: Prevent the axle from tilting when removing the front axle.

11. Place the axle securely on two axle stands. Check the pivot pin and bushes for wear or damage, if they are worn, replace them with new bushes.

Refitment

12. Reverse procedures 1 to 10 except:
 - a. Grease the pivot when the axle refitment has been completed.
 - b. Fit the shims to the front of the axle and the spacer to the rear.
 - c. Check the axle end float which must be 0,05-0,25 mm (0.002-0.010 in). Fit the appropriate shims from the chart.

Part number	Shim thickness	
	mm	in
898 018 M1	0,70 to 0,76	0.028 to 0.030
898 019 M1	0,86 to 0,91	0.034 to 0.036
898 020 M1	0,99 to 1,04	0.039 to 0.041
882 868 M1	1,12 to 1,17	0.044 to 0.046
882 896 M1	1,24 to 1,30	0.049 to 0.051

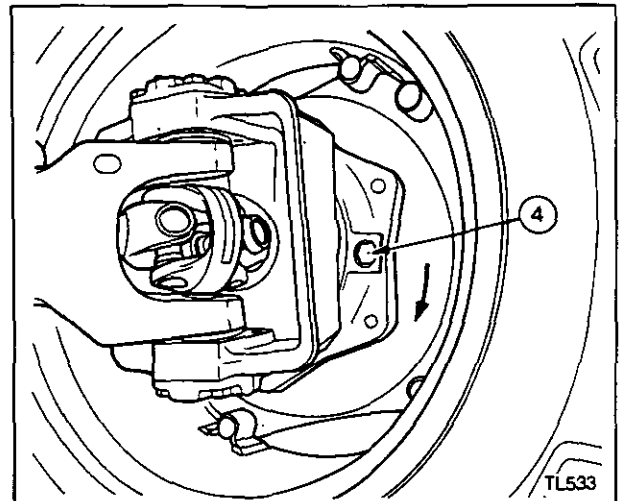


Planetary Carrier**Removal and Refitment**

10C-02

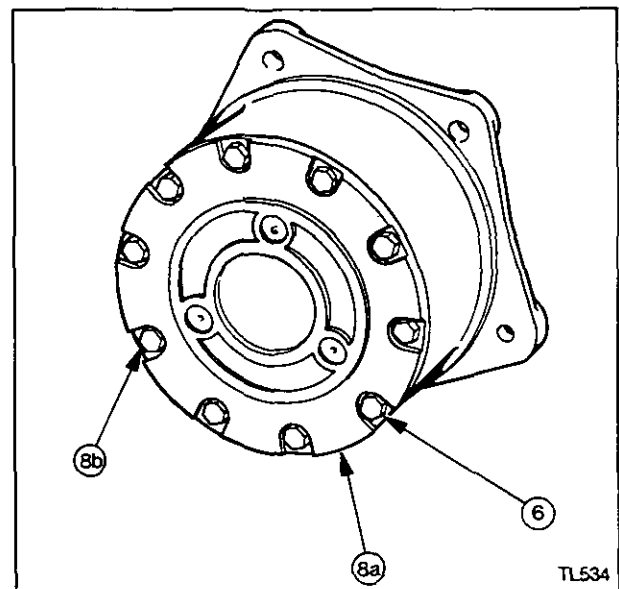
Removal

1. Apply the parking brake and secure the rear wheels.
2. Raise the tractor under the side of the axle to be worked on, then support the axle on an axle stand.
3. Remove the wheel.
4. Rotate the hub until the plug is at the bottom, remove the plug and drain the oil from the hub.
5. Mark the position of the planetary carrier to hub to assist alignment during refitment.
6. Remove the ten bolts securing the carrier.
7. Withdraw the planetary carrier.

**Refitment**

8. Reverse procedures 1 to 6 except:
 - a. Apply Loctite 515 Instant Gasket to the face of the hub.
 - b. Apply a light coating of lubricating oil to the planetary carrier bolts and tighten to a torque of 96-118 Nm (71-87 lbf ft)
 - c. Rotate the wheel so that the plug is horizontal, then fill the hub to this level with an approved oil and refit the plug.
 - d. For wheel nuts torques see section 8D.

Note: Lubricate the wheel bolts before re-assembly.



10C-08

FRONT AXLE - 4 WHEEL DRIVE

Planetary Carrier

Overhaul

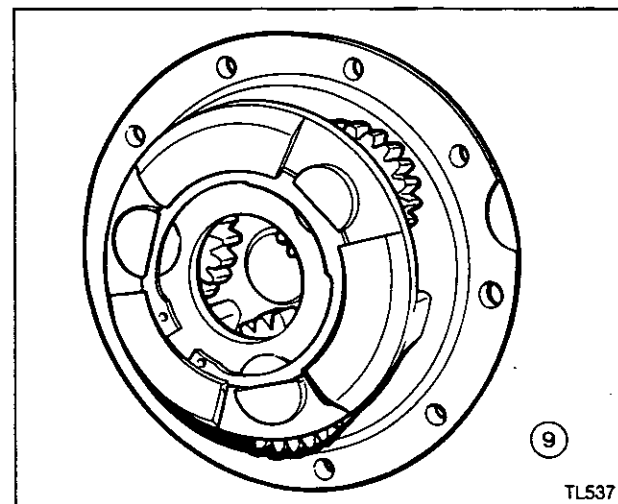
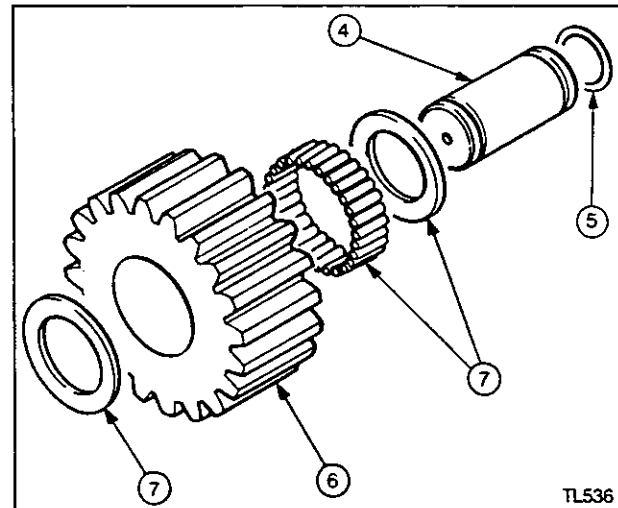
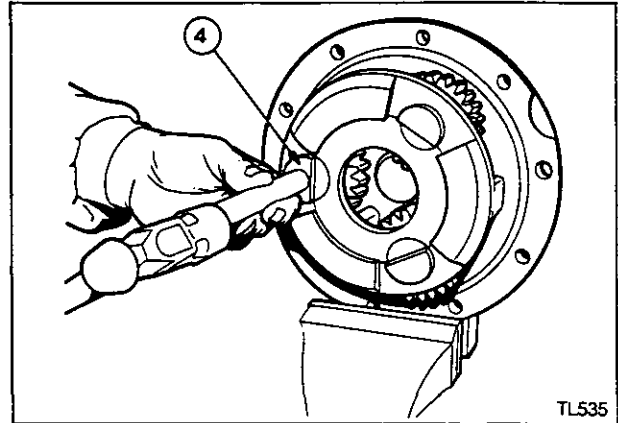
10C-03

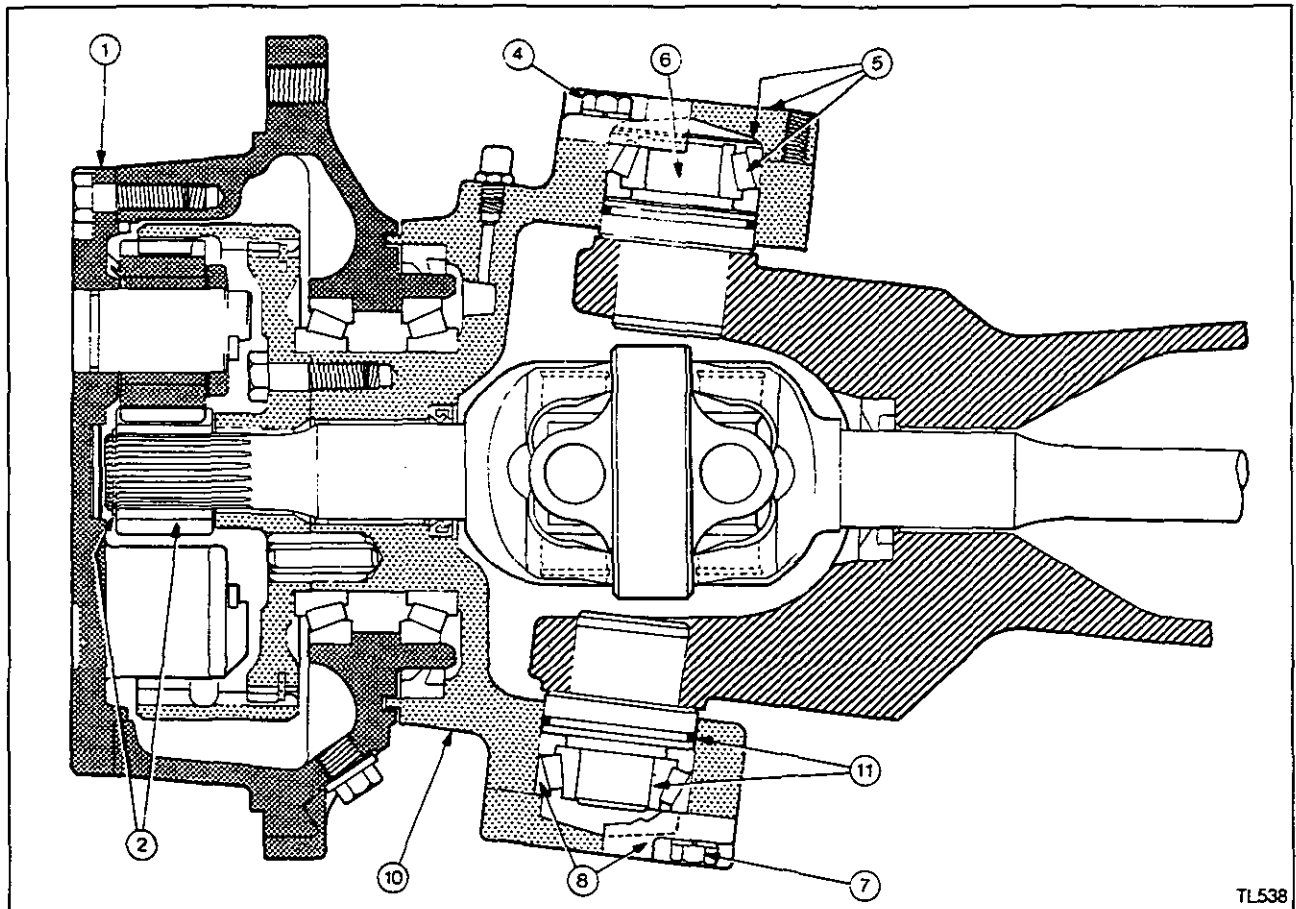
Disassembly

1. Remove the planetary carrier, see operation 10C-02.
2. Place the planetary carrier in a vice.
3. Remove the circlip.
4. Carefully tap out the planetary gear shaft.
5. Remove the 'O' ring.
6. Remove the planetary gear and thrust washers taking care not to dislodge the needle rollers.
7. Remove the needle rollers and the spacer.
8. Repeat procedures 4 to 6 for the remaining two planetary gears. Thoroughly clean and inspect all components and replace any that are worn or damaged.

Reassembly

9. Reverse procedures 1 to 8 except:
 - a. Using petroleum jelly, refit the needle rollers and thrust washers.
 - b. Note the position of the circlip, which should have its open end facing one of the three blocks.





Front Axle Swivel Housing

Overhaul 10C-04

Special Tools:

MF 451A 4 Wheel Drive Axle pivot pin
remover
MF 195C Bearing remover and replacer

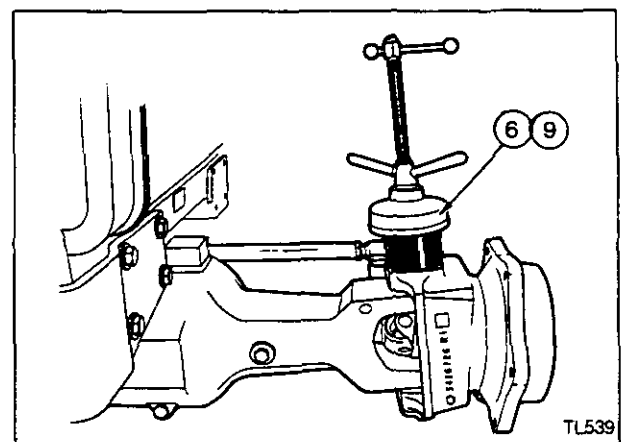
Disassembly

1. Remove the planetary carrier, see operation 10C-02.
2. Remove the circlip and sun gear.
3. Release the track rod and steering cylinder.
4. Remove the four bolts securing the top cover.
5. Remove the upper cap, shims and bearing cup.



Caution: The hub is heavy. Ensure that it is well supported before you attempt to remove the upper and lower pivot pins.

6. Using the MF 451A pivot pin remover and puller MF 195C, extract the upper pivot pin.
7. Remove the four bolts securing the bottom cap.
8. Remove the lower bearing cap and cup.



9. Using the puller, remove the lower pivot pin.
10. Remove the pivot housing.
11. Remove the bearing cones and 'O' rings from the pivot pins.

Examination

Thoroughly inspect all parts for signs of wear or damage and replace if necessary.

10C-10

FRONT AXLE - 4 WHEEL DRIVE

Reassembly

12. Fit the bearing cones and 'O' rings to the pivot pins.
 13. Position the upper pivot pin, so that it locates the swivel bearing in line.
 14. Refit the lower pivot pin, bearing cup, cap and bolts.
 15. Tighten two opposed bolts evenly and in sequence to press the lower pivot pin into the housing. Tighten all four bolts to a torque of 96-118 Nm (71-87 lbf ft).
 16. Fit the upper pivot pin bearing cup, shims, cap and bolts and tighten two opposed bolts evenly and in sequence to draw the pivot pin into the housing.
 17. Check that both pivot pins are fully seated in the axle beam.
 18. Remove the upper pivot pin cap and remove the shims.
 19. Replace the cap and tighten the four bolts to a torque of 96-118 Nm (71-87 lbf ft).
 20. Using a dial indicator gauge as shown in the illustration and a lever, determine the end float of the hub to axle beam.
- Note:** Work the lever from the side opposite to the dial indicator gauge so as not to affect the readings.
21. Select the required shims by the following method:

Shims required = End float + Pre-load.

Pre-load required is 0,2 mm (0.008 in).

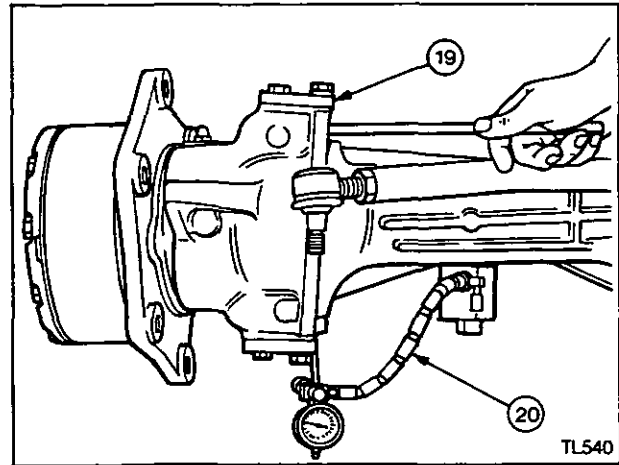
Select shims from one of the following charts:

For axle type NG100SD(N) and NG200SD.

Part Number	Thickness	
	mm	in
3426 230 M1	1,00	0.039
3426 231 M1	0,50	0.020
3426 232 M1	0,20	0.008
3426 233 M1	0,15	0.006
3426 234 M1	0,10	0.004

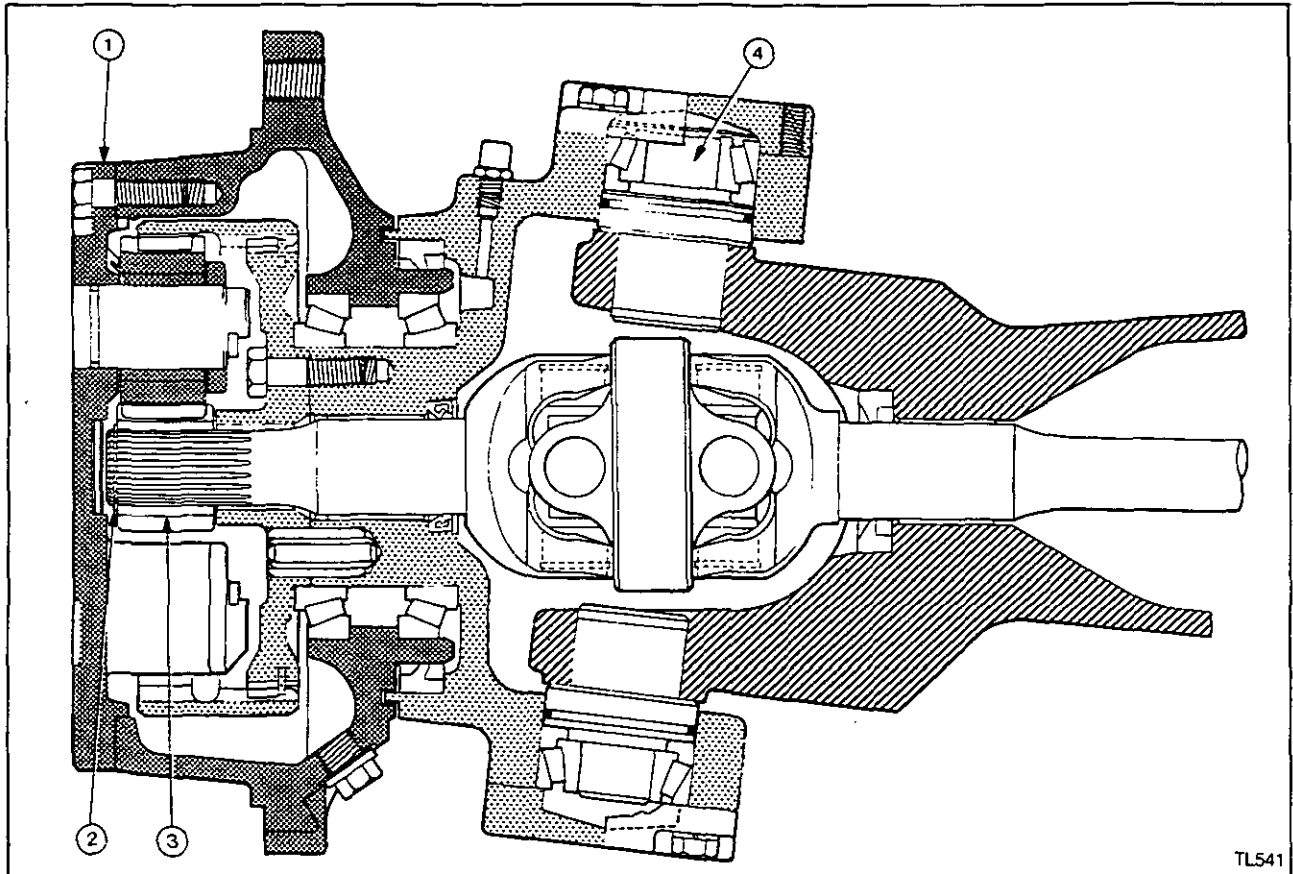
For axle type NG250SD

Part Number	Thickness	
	mm	in
3426 146 M1	1,00	0.039
3426 147 M1	0,50	0.020
3426 148 M1	0,20	0.008
3426 149 M1	0,15	0.006
3426 150 M1	0,10	0.004



22. Remove the upper cap and bearing cup. Fill the bearing with grease, replace the bearing cup and add the correct number of shims.
 23. Apply lubricating oil to the cap bolts and tighten to a torque of 96-118 Nm (71-87 lbf ft).
 24. Remove the lower bearing cap and fill the bearing with grease. Apply Loctite and torque the cap bolts.
- Note:** Shims are fitted only to the upper bearing.
25. Apply lubricating oil to the nuts of the track rod ball joint and tighten to a torque of:
 - NG100SD and NG200SD axes: 78-86 Nm (58-63 lbf ft)
 - NG250SD axes: 108-118 Nm (80-87 lbf ft).
 26. Apply lubricating oil to the nuts of the steering ram rod ball joint and tighten to a torque of:
 - NG100SD and NG200SD axes: 98-108 Nm (72-80 lbf ft)
 - NG250SD axes: 177-196 Nm (130-145 lbf ft).

10C-11 FRONT AXLE - 4 WHEEL DRIVE



Ring Gear, Bearings and Oil Seals

Overhaul

10C-05

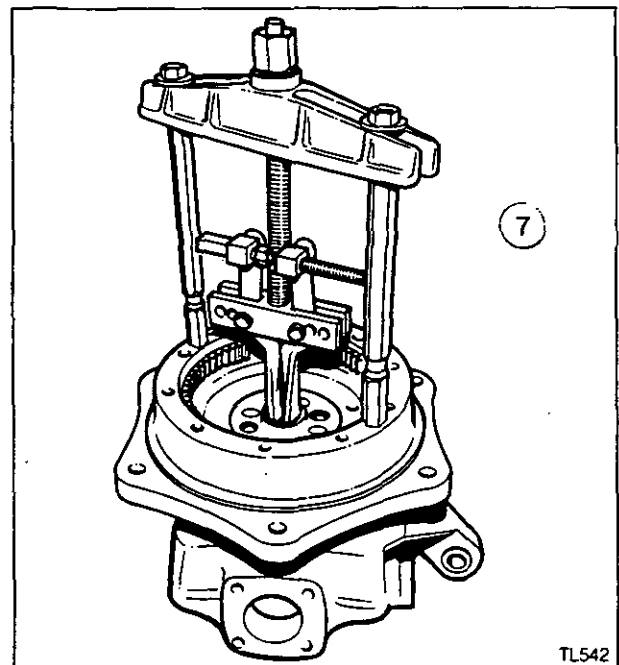
Disassembly

1. Remove the planetary carrier, see operation 10C-02.
2. Remove the circlip.
3. Remove the sun gear.
4. Remove the axle pivot pins, see operation 10C-04.
5. Carefully withdraw the hub assembly from the universal drive shaft.



Caution: The hub is heavy and awkward to handle. Take care when removing and refitting it.

6. Place the hub assembly on a work bench and remove the six bolts securing the ring gear.
7. Using an internal bearing puller, withdraw the ring gear from the two sets of roll pins.
Alternatively, use a hammer and punch through the oil filler hole to remove the ring gear.
8. Remove the hub, bearings, shims and oil seals as necessary.
9. If the oil seals only are being replaced, do not remove the two sets of roll pins.



10C-12

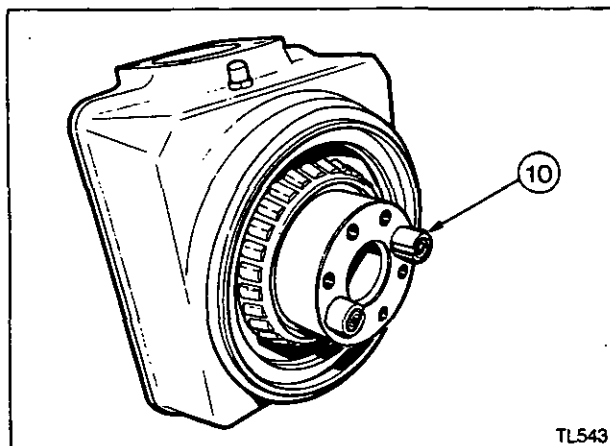
FRONT AXLE – 4 WHEEL DRIVE

10. Only remove the dowel pins if necessary.

Note: On later models of front axle the sets of three split tension pins were replaced with solid dowel pins.

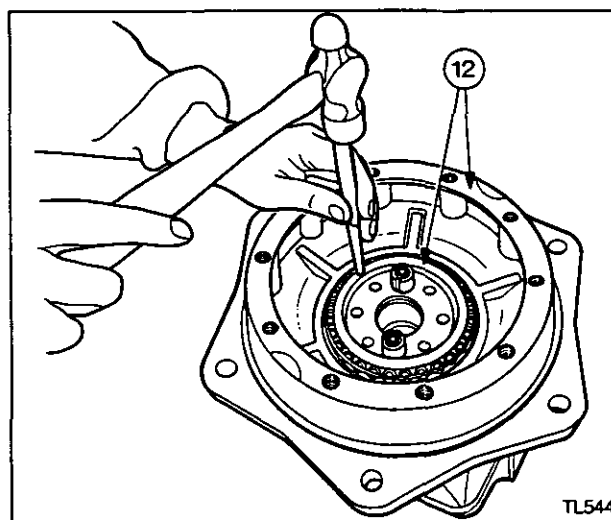
Examination

Pay particular attention to the ring gear teeth and the bearing. Inspect all components and replace any which show signs of wear or damage.

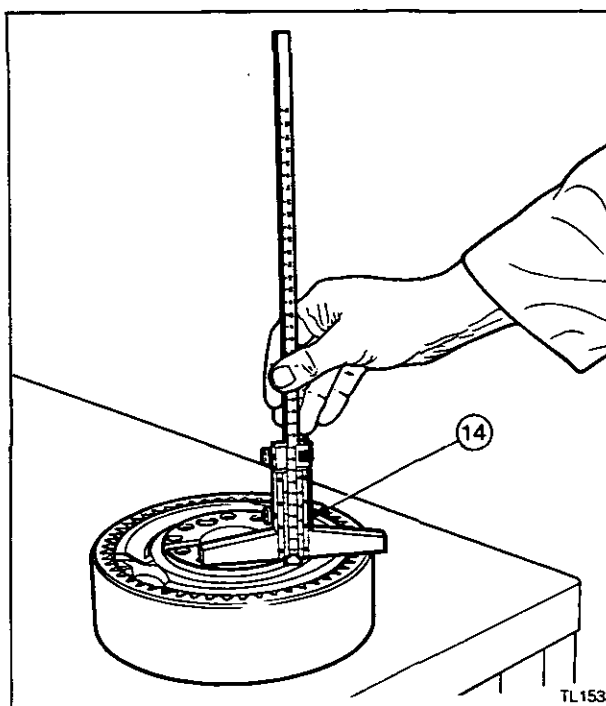


Reassembly

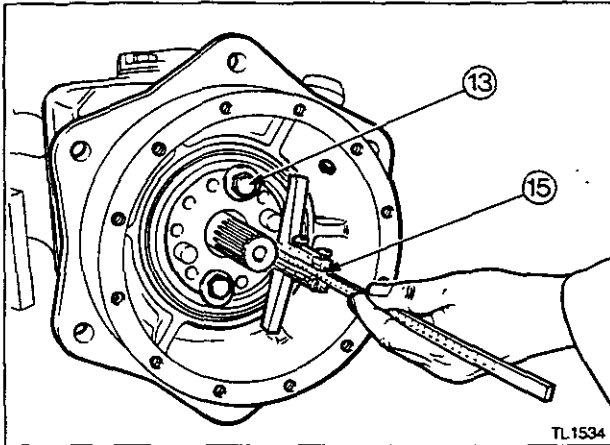
11. Setting the wheel hub bearing adjustment involves calculating the dimension of the shims (dimension A) to be inserted between the ring gear and the taper roller bearing.
12. Replace the hub and bearings.



13. Fit two temporary bolts and washers to hold the bearing and hub in place.
14. Measure the projection of the hub on the ring gear (dimension B).
15. Using a depth gauge, measure the projection of the bearing (dimension C) from the central hub.
16. The total shim thickness (dimension A) is the difference between the two values (B - C) plus the bearing pre-load of 0,05 mm (0.002 in) that must be applied. Use the following formula:
Shim thickness $A = (B - C) + 0,05$ mm
e.g.
Shim thickness $A = (8,1 - 6,2) + 0,05 = 1,95$ mm



FRONT AXLE - 4 WHEEL DRIVE

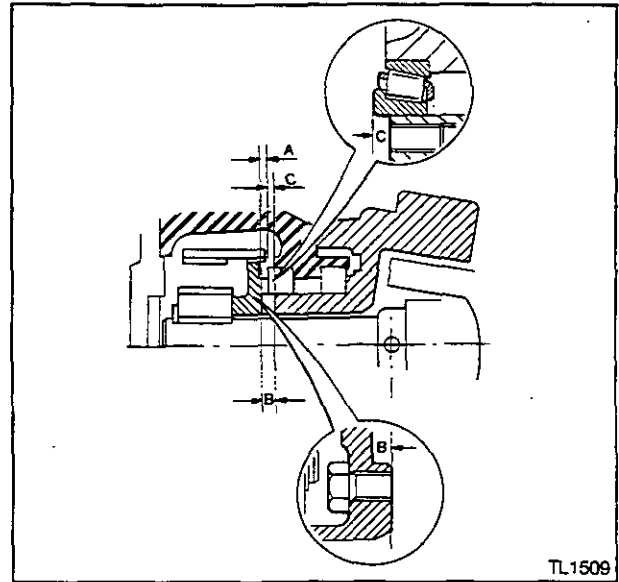


TL1534

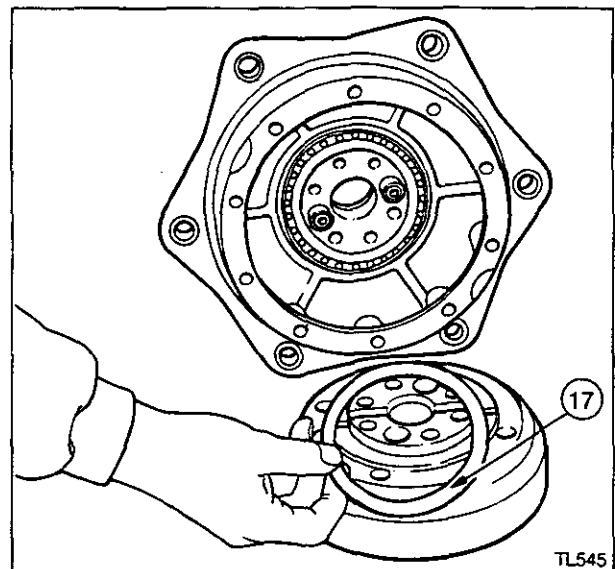
17. Select the shims required from the chart below and insert between the ring gear and hub.

Axle Type NG100SD(N) and NG200/SD		
Part No	Thickness mm	Thickness in
3426 646 M1	0,10	0.004
3426 511 M1	0,15	0.006
3426 512 M1	0,30	0.012
3426 513 M1	0,50	0.020
3426 514 M1	0,70	0.028
3426 515 M1	1,00	0.040
Axle Type NG250/SD		
3426 647 M1	0,10	0.004
3426 300 M1	0,15	0.006
3426 301 M1	0,30	0.012
3426 302 M1	0,50	0.020
3426 303 M1	0,70	0.028
3426 304 M1	1,00	0.040

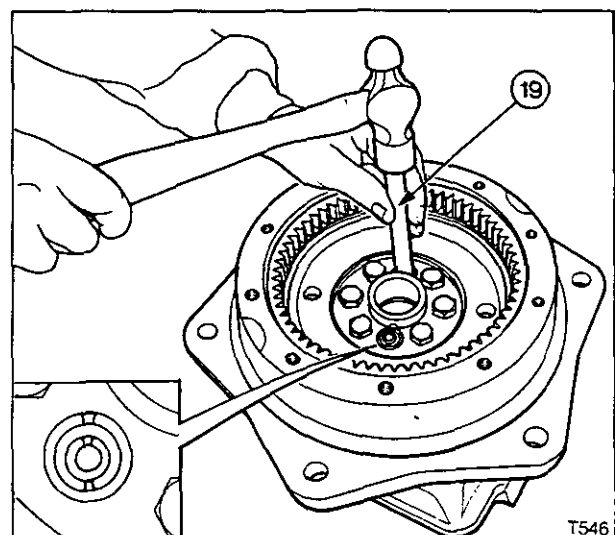
18. On early axles with tension pin dowels, install the ring gear and shims and loosely refit the six bolts.
19. If necessary, drive the large roll pins first, then the intermediate, and finally the small pin. Ensure that the split in the roll pin is 180° from the split in the adjacent pin.
20. Renew the six bolts, apply Loctite 270 and tighten to a torque of 147 Nm (108 lbf ft).
21. Reverse procedures 1 to 4 except:
- Take care when refitting the universal drive shaft support bushes to ensure that they are correctly fitted and to size.
 - Oil seals must be fully seated in their recesses.
 - Take care when refitting the large hub oil seal not to distort it. It may be necessary to grind a small lead onto the outer casing to enable the seal to enter the hub.



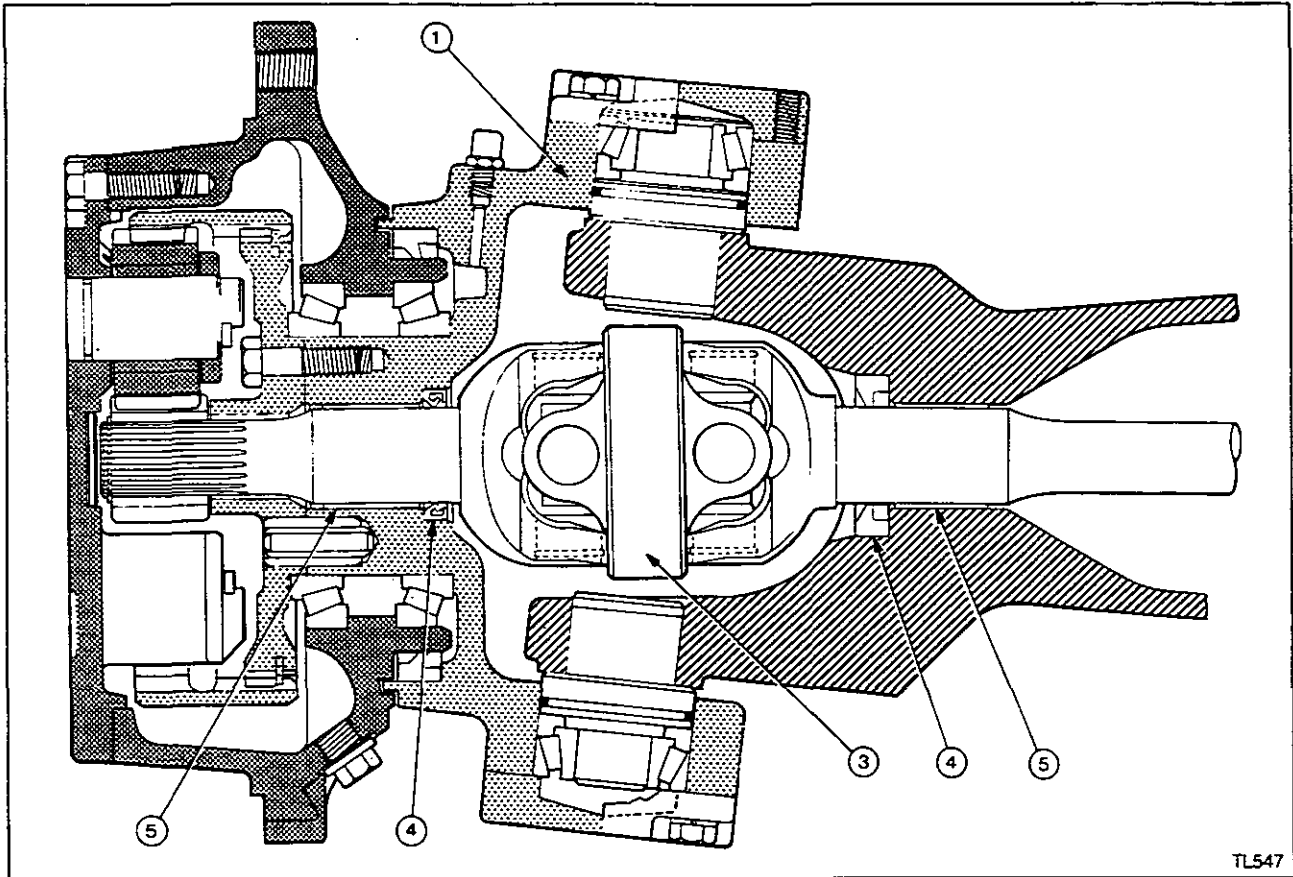
TL1509



TL545



T546

**Universal Drive Shaft****Removal and Refitment****10C-06****Removal**

1. Remove the pivot housing, see operation 10C-04.
2. Place a drain tank of at least 12 litres (20 pts) capacity under the front axle and drain sufficient oil to bring the level below the drive shaft bearings. Refit the drain plug.
3. Pull the drive shaft out of the housing.
4. Lever the oil seals out of the housings.
5. If the drive shaft bushes in the housings need replacing, an internal bearing puller will be required to remove them.

Refitment

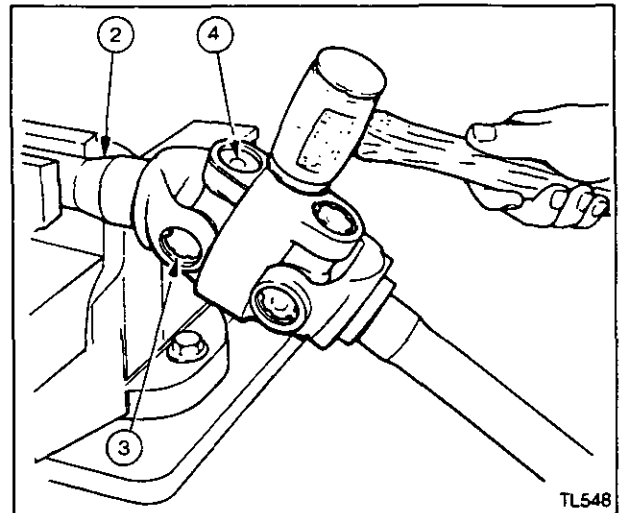
6. Reverse procedures 1 to 5 except:
 - a. Fit the shaft oil seals with the lips facing inwards.
 - b. Refill the front axle to the correct level with an approved oil.

Universal Drive Shaft**Overhaul**

10C-07

Disassembly

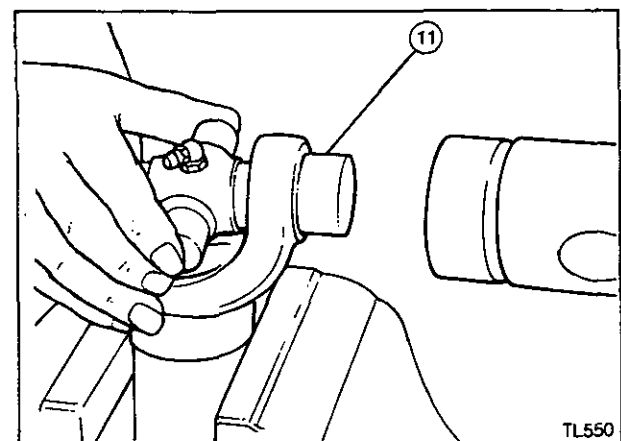
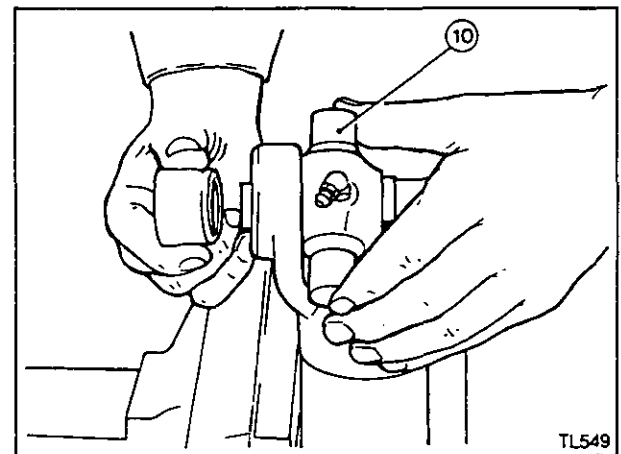
1. Remove the drive shaft, see operation 10C-06.
2. Hold the inner section of the drive shaft in a soft-faced vice.
3. Remove the four circlips from each end of the universal joint.
4. Using a soft-faced hammer, drive the central yoke downwards until the bearing sleeve protrudes.
5. Clamp the bearing sleeve in a vice and tap the central yoke from the bearing.
6. Remove the opposing bearing sleeve in the same manner and remove the outer section of the shaft.
7. Turn the shaft assembly through 90°, then repeat items 4 to 6 to free the universal joint from the shaft.
8. Grip the outer section of the drive shaft in the vice and repeat items 2 to 7.

**Examination**

Pay particular attention to the axle shaft splines. Inspect all components and replace any which show signs of wear or damage. Always replace the universal joint as an assembly including the joint, bearings, caps, circlips and seals.

Reassembly

9. Apply grease to the needle rollers and ensure that all the needle rollers are in the bearing sleeves.
10. Position the universal joint within the yoke and move it sideways as far as possible to provide a guide for the needle rollers of the bearing sleeve being installed.
11. Drive the bearing sleeve into the yoke deep enough to permit insertion of the circlip.
12. Assemble the remaining bearing sleeves and universal joints in a similar method.
13. Thoroughly lubricate the universal joints after completing assembly of the drive shaft and before fitting to the axle.
14. Refit the drive shaft to the axle.



10C-16

FRONT AXLE - 4 WHEEL DRIVE

Differential Input Shaft Oil Seal

Removal and Refitment

10C-08

Removal

1. Apply the tractor parking brake.
2. Place a drain tank under the front axle and drain the oil from the axle.
3. Disconnect the drive shaft guard at the differential end.
4. Disconnect the drive shaft at the differential coupling.
5. Remove the central bolt and drive coupling.
6. With a small chisel, unstake the nut securing the splined shaft.
7. Mark the splined shaft where it was staked for refitment.
8. Remove the nut from the shaft.
9. Pull out the oil seal sleeve.
10. Lever out the oil seal.
11. Remove the shaft 'O' ring.

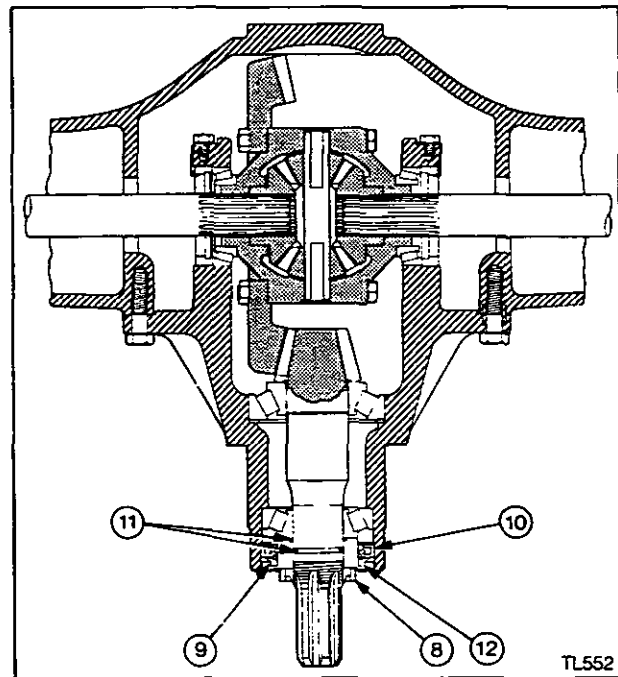
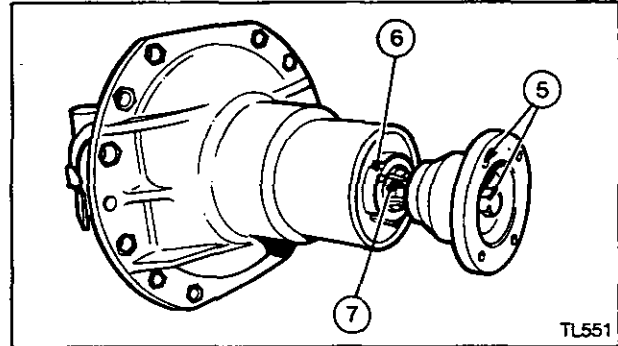
Note: On type NG100/SD(N) and NG200/SD axles, the 'O' ring is fitted to the outside of the shaft at the bottom of the seal sleeve.

On Type NG250/SD axles, the 'O' ring is fitted in a groove in the pinion shaft.

12. Remove the face type wiper seal from the sleeve.

Refitment

13. Fit a new 'O' ring to the pinion shaft.
14. Carefully fit a new seal with the lip facing inwards.
15. Fit a new wiper seal to the sleeve.
16. Oil the 'O' ring and seals.
17. Grease the face type wiper seal.
18. Fit the sleeve and wiper seal to the shaft.
19. Replace the nut and tighten until the staked mark on the nut lines up with the mark made on the splined shaft. The pinion pre-load will now be set to its original setting.
20. Stake the nut to the shaft in a new position.
21. Reverse procedures 1 to 5 except:
 - a. Apply Loctite 270 to the threads of the coupling bolt and tighten it to a torque of 60 Nm (44 lbf ft).
 - b. Apply Loctite 270 to the threads of the drive shaft bolts and tighten the nuts to a torque of 55-75 Nm (40-55 lbf ft).



Differential Assembly**Removal and Refitment**

10C-09

Removal

1. Apply the tractor parking brake.
2. Jack up the front of the tractor and support both sides of the axle on axle stands.
3. Remove both front wheels.
4. Drain the oil from the axle and both hubs.
5. Remove both pivot housings, see operation 10C-04.
6. Withdraw both universal drive shafts.
7. Disconnect the drive shaft guard at the front end.
8. Disconnect the drive shaft.
9. Remove the bolts holding the differential case to the axle housing.

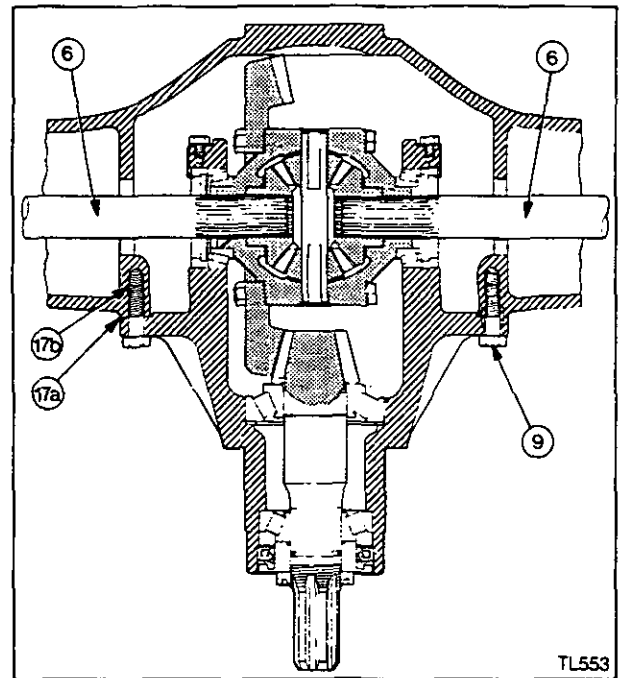


Caution: The differential unit is heavy and awkward to handle. Take care when removing and refitting it.

10. The differential case is located by dowels in the axle housing. Carefully prise the case away from the housing, supporting it on a trolley jack.

Refitment

11. Reverse procedure 1 to 10 except:
 - a. Apply Loctite 515 Instant Gasket to the joint face of the differential case.
 - b. Apply lubricating oil to the differential case securing bolts and tighten them to a torque of 96-118 Nm (71-87 lbf ft).
 - c. Apply Loctite 270 to the threads of the coupling bolt and tighten it to a torque of 60 Nm (44 lbf ft).
 - d. Apply Loctite 270 to the threads of the drive shaft bolts and tighten them to a torque of 55-75 Nm (40-55 lbf ft).



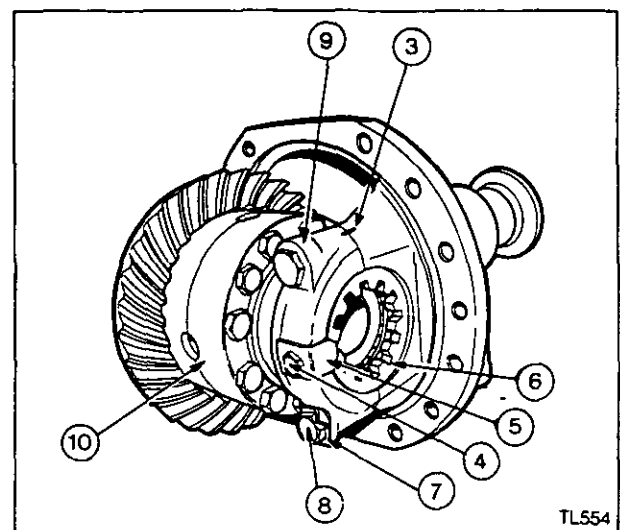
TL553

Differential**Overhaul**

10C-10

Disassembly

1. Remove the differential assembly, see operation 10C-09.
2. Hold the differential in a soft faced vice.
3. Mark the end caps and casting to aid reassembly.
4. Remove the securing bolts.
5. Remove the locking tabs.
6. Unscrew and remove the two bearing adjustment ring nuts.
7. Release the four tab locking washers (if fitted).
8. Remove the four bolts.
9. Remove the end caps.
10. Remove the differential unit complete with the bearing cones.



TL554

10C-18

FRONT AXLE - 4 WHEEL DRIVE

11. Remove the bearing cups.

Note: Keep the two bearing cups separate and identify them to ensure that they are refitted in their original position.

12. Using a universal extractor remove the two bearing cones, if necessary.

13. Remove the crownwheel and differential case securing bolts.

Note: If the crownwheel is to be refitted, mark it in relation to the differential carrier to ensure correct assembly. Mark the two halves of the differential carrier to assist correct assembly.

Two of the bolts are special dowel bolts and are fitted to the holes marked with an arrow. Keep these bolts separate and make a note of the holes in the crownwheel and differential case.

14. Split the differential carrier and remove the differential cross shaft, gears and thrust washers.

Examination

Thoroughly clean and inspect all components. Any parts showing signs of wear must be replaced.

Reassembly

15. Reverse procedures 1 to 14 except:

- Fit the thrust washers with their oil grooves towards the differential gears.
- Coat the planetary pinion thrust washers with petroleum jelly, then locate them in their respective recesses in their differential case.
- Place the planetary pinions directly opposite to each other then roll them into position on the thrust washers.
- Ensure that the hole in the planetary pinion shaft aligns with that of the differential case.
- Align all marks when reassembling the crownwheel and differential carrier. Fit the dowel bolts to the correct holes.
- Apply Loctite 270 to the threads of the crownwheel and differential case bolts and tighten to a torque of 79-87 Nm (58-64 lbf ft).

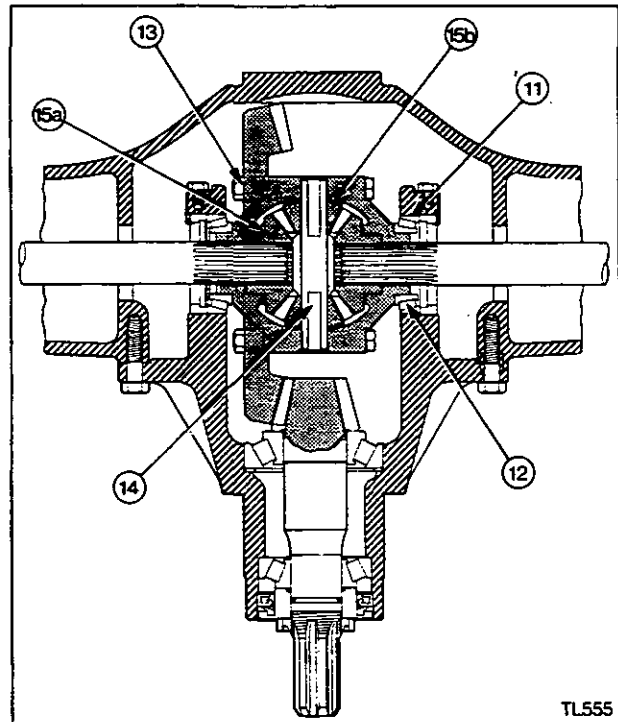
17. Lightly tighten the bearing caps and lubricate the carrier bearings.

Differentials with two adjuster rings

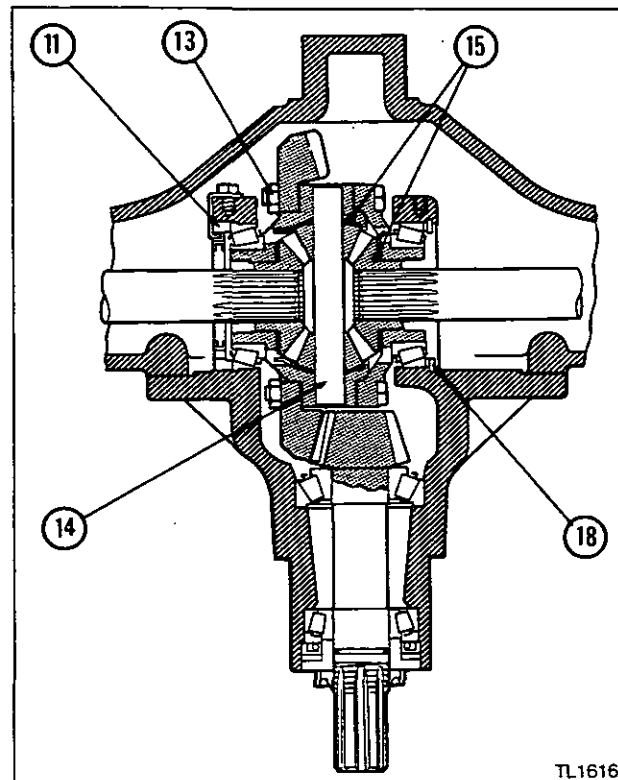
18. Tighten the left and right-hand adjuster rings to ensure that the end float is eliminated. Then apply a pre-load by turning one of the adjuster rings a further three notches until the slot is aligned with the locking plate.

Differentials with one adjuster ring and shims

- Reinstall the same thickness value of shims as removed from between the bearing and the retainer ring on the right hand side of the differential.
- Tighten the bearing cap bolts.
- Tighten the adjuster ring to take up the backlash between the taper roller bearings.



TL555



TL1616

21. Finally, turn the adjuster ring a further three notches until the slot is aligned with the locking plate to apply the correct pre-load.

All models

22. With a dial gauge check the backlash between the crown wheel and pinion teeth which should be from 0,10 to 0,25 mm (0.004 to 0.010 in).
23. If the backlash reading is high, the shim thickness must be reduced between the bearing cup and the retainer ring on the right hand side. If low, the shim thickness must be increased until an acceptable backlash is obtained. On early models, readjust the position of the crown wheel using the two adjuster rings but still retaining the bearing preload.

Shims are available in the following sizes:

Shim part number	Thickness mm	Thickness in
3427 281 M1	0,10	0.004
3427 282 M1	0,15	0.006
3427 283 M1	0,30	0.012
3427 284 M1	0,50	0.020
3427 285 M1	0,70	0.028
3427 286 M1	1,00	0,039

24. Check the rotational torque of the differential assembly at the rear end of the pinion to ensure that the bearings are not too tight. This should be 3,2-3,3 Nm (2.4 lbf ft) which corresponds to the rotation obtained when the 1 kg (2 lb) weight on tool FT4062A is set at a distance of 32 to 33 cm (13.5 to 13.8 in) from the centre of the pinion. This includes the pinion pre-load.
25. If the pre-load is too tight or loose, make adjustment to the differential bearing adjuster ring, still retaining the crown wheel and pinion backlash.
26. Remove each bearing cap bolt in turn, apply Loctite 270 to the thread and lighten to a torque of 136-150 Nm (100-110 lbf ft).
27. Apply Loctite 270 and refit the two ring nut locking tabs and bolts and tighten to a torque of 16-26 Nm (12-19 lbf ft).
28. Refit the differential assembly, see operation 10C-09.

Autolock Differential

Overhaul

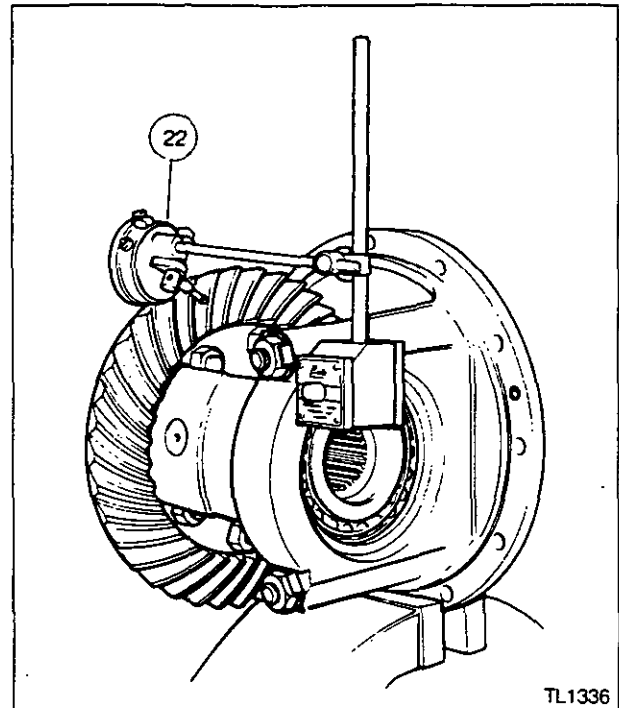
10C-11

Disassembly

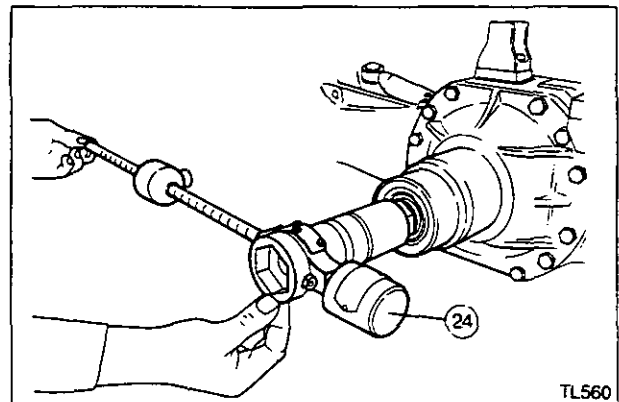
1. Remove and dismantle the differential as described in operation 10C-10 except:
 - a. Before removing the differential carrier bolts, insert a retaining bolt washers and wing nut as shown in the illustration to contain the spring pressure within the differential.
 - b. The outside diameter of the washer must be smaller than dimension A yet greater than dimension B.

Caution: The two halves of the differential carrier are under spring pressure. If a retaining bolt and washer assembly is not available, place the assembly under a press before removing the bolts.

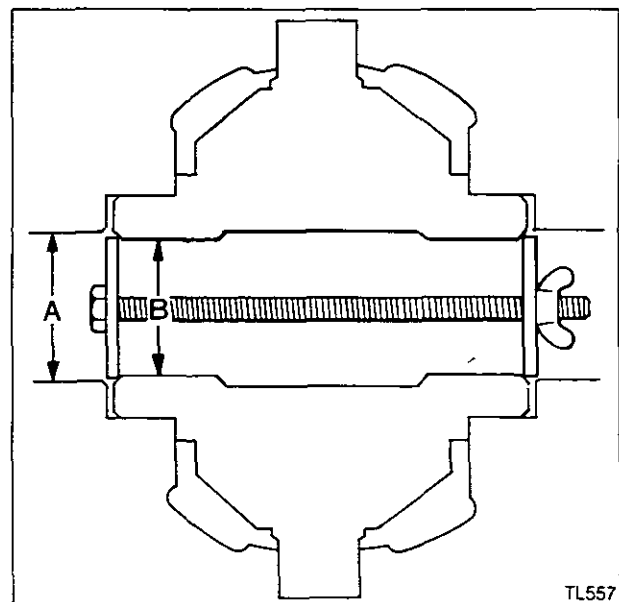
2. Mark the two halves of the differential case in order to assist reassembly.
3. Remove the crownwheel and differential case retaining bolts.



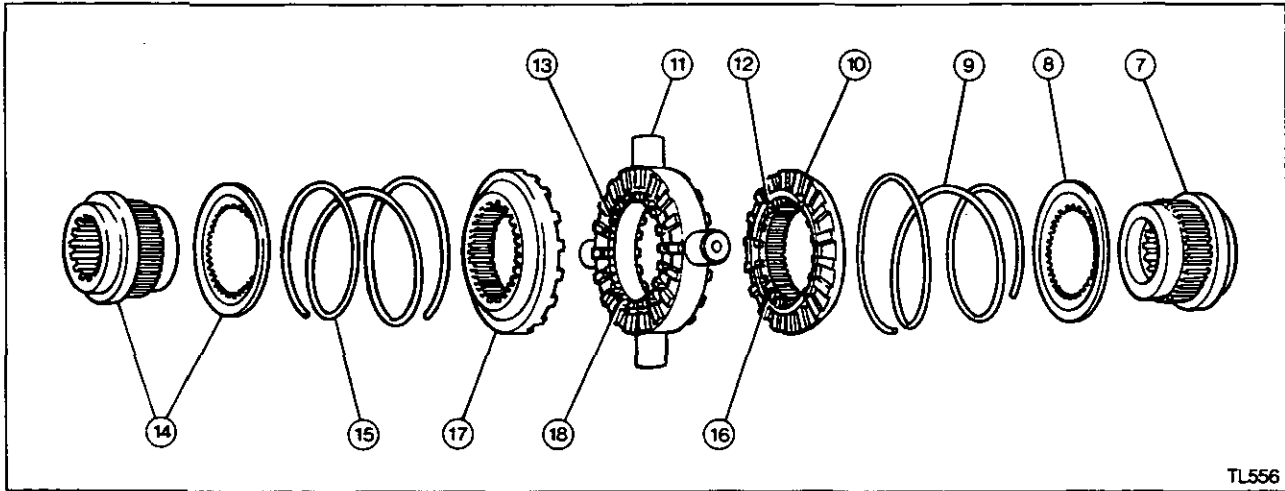
TL1336



TL560



TL557



TL556

Note: Two of the bolts are special dowel bolts and are fitted to the holes marked with an arrow. Keep these bolts separate and make note of the holes in the crownwheel and differential case.

4. Remove the differential case cover.
5. Lift out the Autolock differential lock assembly from the main differential case.
6. Carefully release the retaining bolt and washer assembly.

Note: If the Autolock differential is not being replaced, all components MUST be fitted back in the same position. Mark all parts for refitment.

7. Remove the side gears.
8. Remove the spring retainers.
9. Remove the springs.
10. Remove the driven clutches.
11. Remove the central driver and centre cam assembly.
12. Remove the holdout rings by expanding with circlip pliers.
13. If the centre cam from the central driver has to be removed, expand the snap ring into the central driver using three suitable levers and withdraw the centre cam.

Note: Wash all parts thoroughly with a cleaning solvent. Inspect the bearing surfaces for signs of wear or metal pickup. Check the driven clutches and spider assembly for chipping or excessive wear of the teeth.

The centre cam must be able to rotate freely within the limits of the key in the central driver. Check the side gear splines for wear.

The components of the Autolock differential are not available as replacement parts. If any wear has taken place, the whole assembly must be replaced.

Reassembly

14. Fit a spring retainer over the side gear splines and locate the cupped section of the retainer on the side gear flange with the cupped section facing upwards.

15. Fit one conical spring over the side gear and locate the spring retainer seat.

Note: The smaller diameter spring end fits against the spring retainer.

16. Assemble the driven clutch by refitting the holdout ring into the groove.
17. Place the driven clutch into position on top of the coil spring.
18. Refit the centre cam to the central driver by expanding the snap ring into the driver using three suitable levers. Lower the centre cam into place with the narrow gap on the centre cam aligning to the key tooth of the central driver.
19. Place the central driver centre cam assembly onto the driven clutch.

Note: The slot in the hold out ring must mate properly with the central driven key.

20. Follow procedure 14 to 19 for assembly of the other side of the Autolock differential lock assembly.
21. Place the retainer bolt inside the side gear and differential lock assembly.
22. Compress the Autolock differential assembly and fit the second washer and wing nut.

Note: The wing nut is to be finger tight against the washer. Ensure that the splines on the side gears mate to the splines in the driven clutches.

23. Place the Autolock differential assembly into the main differential case.
24. Fit the differential case cover, aligning the two halves with marks previously made. Refit the dowel bolts to the correct holes.
25. Apply Loctite 270 to the crownwheel and differential case retaining bolts and tighten to a torque of 79-87 Nm (58-64 lbf ft).
26. Remove the retaining bolt, wing nut and washers.
27. Set the crownwheel bearing adjustment and pinion backlash, see operation 10C-10.

Crownwheel and Pinion

Overhaul 10C-12

Special Tools: FT 4062A Pinion pre-load gauge

Disassembly

1. Remove and dismantle the differential assembly, see operation 10C-10 or 11.
2. Remove the pinion nut.
3. Press the pinion out of the case complete with the bearings.
4. Remove the oil seal.
5. Remove the inner and outer bearing cups.
6. Press the inner bearing cone off the pinion shaft.
7. Clean and inspect all parts.

Note: The crownwheel and pinion are only available as matched sets.

Reassembly
Pinion Protrusion

It is necessary to carry out a series of measurements and calculations to establish the exact position of the pinion in relation to the crown wheel.

The height of the pinion is adjusted by shims under the taper roller bearing to obtain dimension 'A'. The shims required are calculated in accordance with the following formula:

$$Sp = 'A' - 118$$

Where:

Sp = Adjustment shims.

A = Dimension to be measured using depth gauge.

118 = Fixed design dimension which must always be adhered to for fitting. This value may vary, if there is a number preceded by an + (add) or - (subtract) sign stamped on the pinion head this must be either added or subtracted from the 118 dimension in order to arrive at the correct dimension.

Note: On early NG100 and NG200 axles with two adjuster rings to adjust the differential bearing pre-load, the dimension 'A' to be used with these axles is 'A' = 113 mm.

8. To calculate the shims required, place the complete bearing cup and cone into the housing without the pinion or shims.
9. Using a depth gauge measure the distance 'A' between the top of the bearing and the cap face.

Example:

$$\text{Distance 'A'} = 119,5 \text{ mm}$$

10. Check to see if a number is stamped on the pinion head, if there is, calculate the new dimension in place of 118 mm.

Example A:

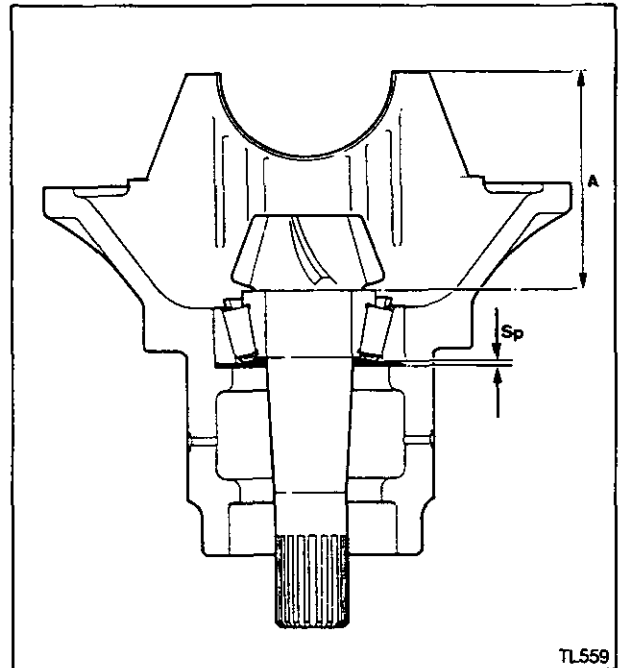
If +0,20 is stamped on the pinion, correct the dimension as follows:

$$118 + 0,20 = 118,20 \text{ mm which is the new fixed dimension 'A'}$$

Example B:

If -0,35 is stamped on the pinion, correct the dimension as follows:

$$118 - 0,35 = 117,65 \text{ mm which is the new fixed dimension 'A'}$$



11. Calculate the difference between dimension 'A' in paragraph 9 and the fixed dimension in paragraph 10 to find the correct amount of shims to be fitted:

Example A:

$$\begin{aligned} Sp &= (A - 118,20) \\ &= 119,5 - 118,2 \\ &= 1,3 \text{ mm thickness of shims to be fitted} \end{aligned}$$

Example B:

$$\begin{aligned} Sp &= (A - 117,65) \\ &= 119,5 - 117,65 \\ &= 1,85 \text{ mm thickness of shims to be fitted.} \end{aligned}$$

It may be necessary to round off to the nearest value that can be made into a shim pack, shims are available in the following sizes:

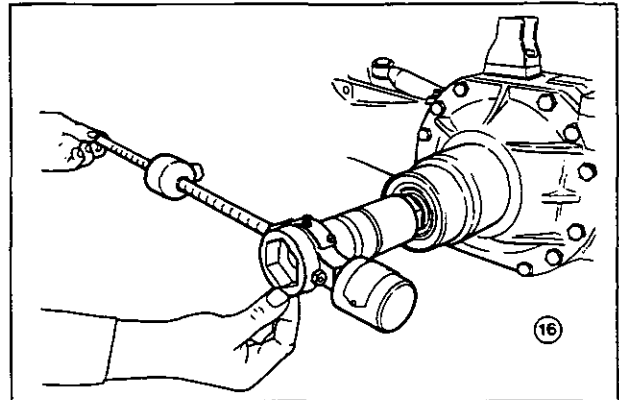
Axle Type NG100SD(N) and NG200/SD		
Part No	Thickness mm	Thickness in
3426 968 M1	0,10	0.004
3426 464 M1	0,15	0.006
3426 465 M1	0,30	0.012
3426 466 M1	0,50	0.020
3426 467 M1	0,70	0.028
3426 468 M1	1,00	0.040
Axle Type NG250/SD		
3426 289 M1	0,10	0.004
3426 290 M1	0,15	0.006
3426 291 M1	0,30	0.012
3426 292 M1	0,50	0.020
3426 293 M1	0,70	0.028
3426 294 M1	1,00	0.040

12. Remove the bearing, insert the shim pack and refit the bearing again. Recheck that the fixed dimension now corresponds to the value in paragraph 10 example A or B. If it does not correspond, remove or add shims to obtain the established fixed dimension 'A'.
13. Refit the outer bearing, oil seal, sleeve and nut, see operation 10C-08 paragraphs 13 to 18.

Note: A new pinion nut must always be used.

Pinion bearing pre-load

14. Tap the pinion in both directions to ensure that the bearings are fully seated.
15. Lubricate the bearings and rotate the pinion until it rotates freely.
16. Tighten the nut in order obtain a rotational torque of 2,0-2,5 Nm, this corresponds to the rotation obtained when the 1 kg (2 lb) weight of tool FT4062A is positioned 20 to 25 cm (8 to 10 in) from the centre of the pinion.
17. Each time the nut is tightened, reseal the bearings and ensure that the pinion rotates freely or an incorrect reading will be obtained.
18. Stake the nut in position with a hammer and punch ensuring that the lip of the nut is well down into the spline.



Crown wheel and differential assembly

19. Reassemble and install the crown wheel and differential assembly, see operation 10C-10.

Hydralock Differential

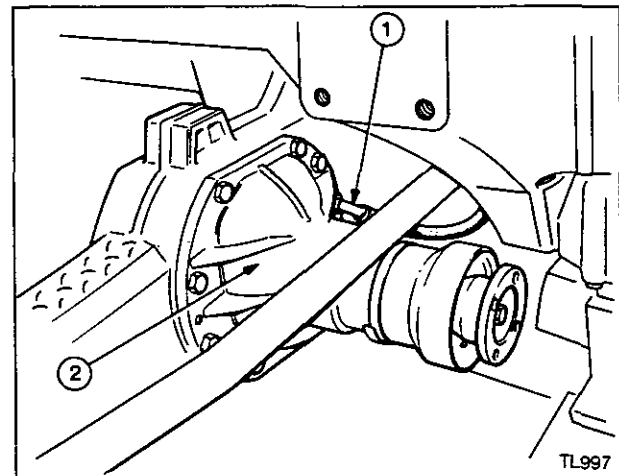
Overhaul 10C-13

Special Tool:
MF471 Hydralock spring compressor

Tractor serial No. NO4464 onwards

Disassembly

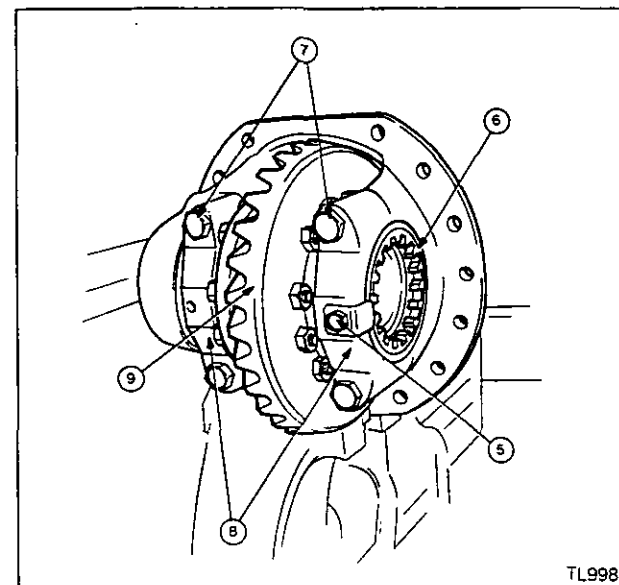
1. Disconnect the hydraulic feed hose. Cover the hose end and port connector in the housing to prevent the ingress of dirt etc.
2. Remove the differential assembly from the tractor, see operation 10C-09.
3. Hold the differential in a soft faced vice.
4. Mark the end caps and casting to aid reassembly.
5. Remove the securing bolt and locking tabwasher.
6. Unscrew and remove the bearing adjustment ring nut.
7. Remove the four bolts holding the two bearing end caps in position
8. Remove the two bearing end caps.



Warning: Remove the bearing cap adjacent to the differential lock with care. **SPRING UNDER COMPRESSION.** Ensure that the spring retaining ring remains in the differential case.

9. Remove the crownwheel and differential unit complete with the bearing cones.
10. Remove the two bearing cups and shims.

Note: Keep the two bearing cups separate and identify them to ensure that they are refitted in their original position. For overhaul of the differential assembly see operation 10C-10.



FRONT AXLE - 4 WHEEL DRIVE

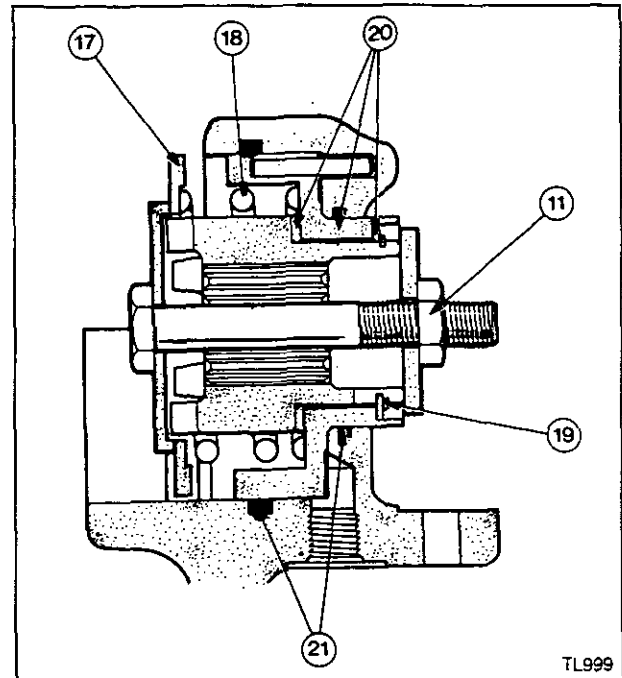
11. Fit the hyallock spring compressor MF471, carefully centralise the two washers.
12. Tighten the spring compressor until all the spring tension has been taken off the retaining ring.
13. Remove the retaining ring from the housing.
14. Tap the unit out of the housing exposing the two oil seals.
15. The hyallock unit can now be disassembled by carefully loosening the spring compressor.
16. Completely remove the spring compressor from the hyallock assembly.
17. Remove the spring guide plate.
18. Remove the coil spring.
19. Remove the piston retaining circlip.
20. Remove the piston from the coupler and the two thrust washers.
21. Remove the two seals from the housing.

Examination

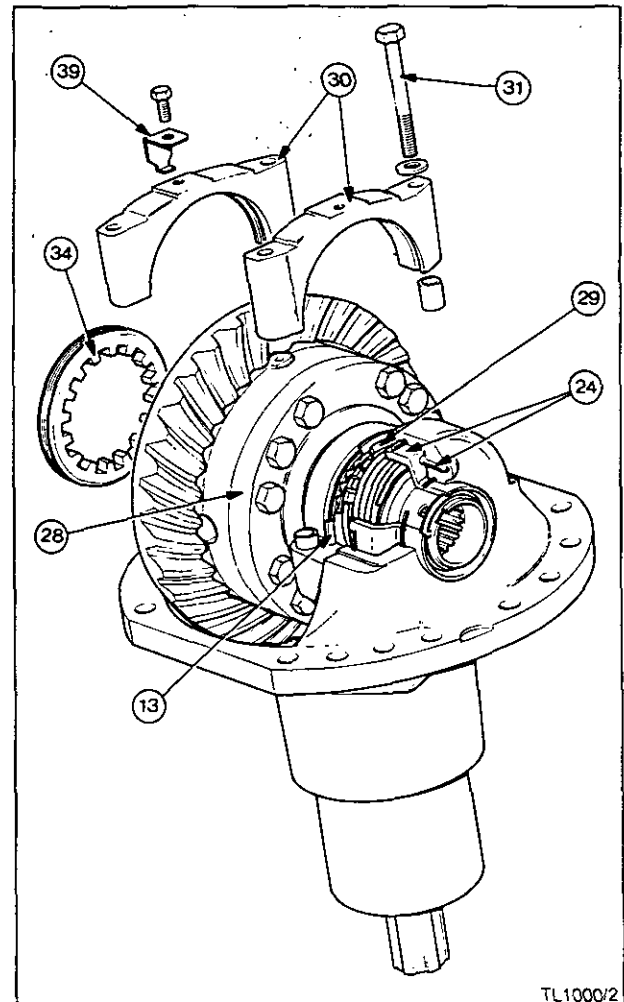
Thoroughly clean and inspect all the components. Any parts showing signs of wear or damage must be replaced.

Reassembly

22. Reassemble the piston and coupler assembly with the two thrust washers and circlip.
23. Before inserting the piston assembly into the housing ensure that both oil seals are correctly positioned and well lubricated.
24. Tap the position and coupler assembly into the housing ensuring that the locating peg is in the correct radial position.
25. Refit the spring, guide plate and tool MF471.
26. Tighten the spring compressor until the retaining ring can be inserted into its groove.
27. Slowly release the spring compressor and remove it completely from the assembly.
28. Refit the crownwheel and differeential assembly ensuring that the crownwheel is to the left-hand side
29. Refit the shims between the retaining ring and the bearing cup.
30. Refit the two bearing caps making sure that marks are made under procedure 4 correspond.
31. Lightly tighten the bearing cap bolts.
32. Lubricate the carrier bearings before inserting them into the housing. Hold the differential in a vice and place a dial gauge so that the stylus is at right angles to the rear face of the crownwheel.
33. With the aid of a pry bar, move the crown wheel assembly back against the pressure of the hyallock spring, tighten the adjustment ring until there is no movement on the dial gauge. At this point there should be no preload, no clearance, only the force exerted by the hyallock spring.
34. Apply the carrier bearing preload by turning the adjustment ring at a further three notches for the correct load. At this point, the crownwheel assembly will be tight to turn.
35. Check the backlash between the teeth of the crownwheel and the pinion by positioning a dial gauge on a crownwheel tooth.



TL999



TL1000/2

10C-24

FRONT AXLE - 4 WHEEL DRIVE

36. Take three readings at different positions around the crownwheel approximately 120 degrees apart. Take the average reading which must be:

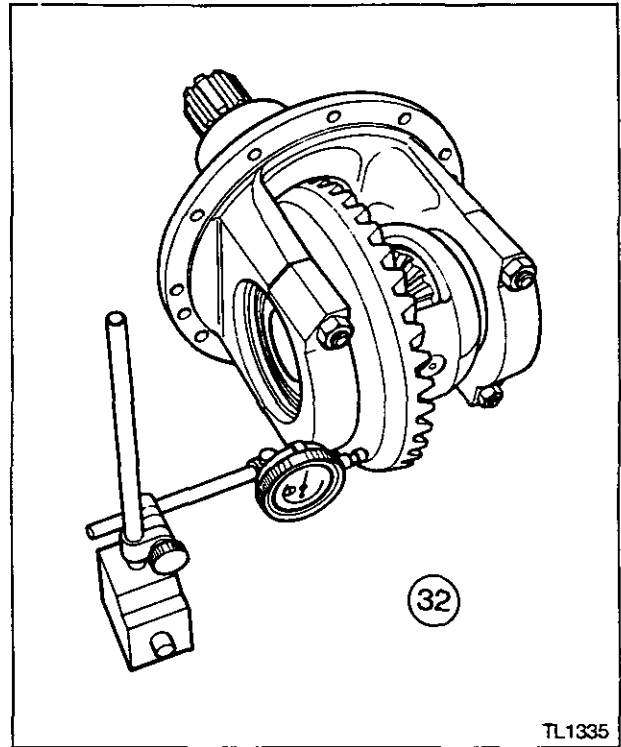
0,10 to 0,25 mm (0.004 to 0.010 in)

37. If the readings are high, shims thickness must be reduced between the bearing cup and the retainer ring on the differential lock side. If low, shims must be added until an acceptable backlash reading is obtained.

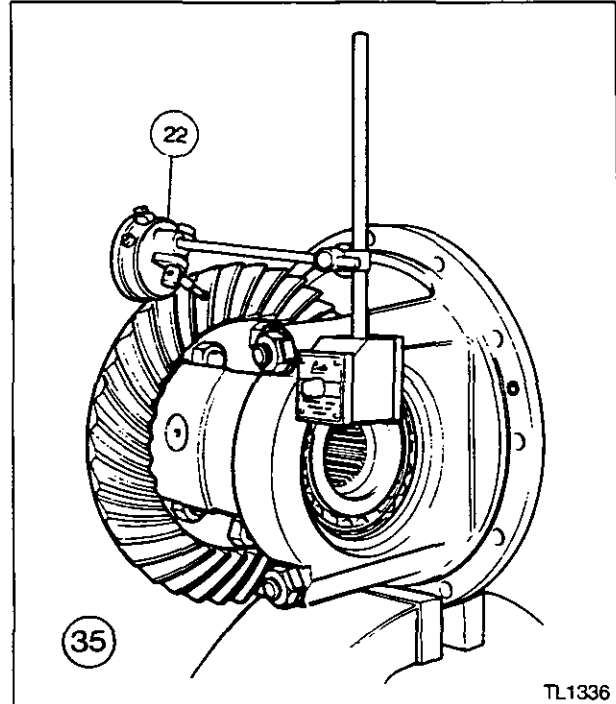
Shims are available in the following sizes:

Shim number	Thickness mm	Thickness in
3427 281 M1	0,10	0.004
3427 282 M1	0,15	0.006
3427 283 M1	0,30	0.012
3427 284 M1	0,50	0.020
3427 285 M1	0,70	0.028
3427 286 M1	1,00	0.040

38. Remove the bearing cap bolts one at a time and apply Loctite 270 to the threads and tighten to a torque of 136-150 Nm (100-110 lbf ft).
39. Apply Loctite 270 and refit the tabwasher and bolt. Tighten to a torque of 16-26 Nm (12-19 lbf ft).
40. Refit the differential assembly to the tractor, see operation 10C-09.
41. Remove the dirt cover from the hydraulic port and feed hose before reconnecting the oil feed to the axle.



TL1335



TL1336

FRONT AXLE (NARROW) – 4 WHEEL DRIVE**FRONT AXLE (NARROW) – 4 WHEEL DRIVE****Section 10 – Part D**Table of Contents

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10D-2

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

Specification – front axle

Axle type:	
342 and 352	AG 65 SD.
362, 372 and 382	AG 66 SD.
Camber angle	1°
Toe-in	0-5 mm (0-3/16 in).
Axle reduction ratio	No. of teeth Ratio
Crownwheel and pinion	13 x 36 2.7692:1
Pinion setting dimension	91 mm.
Pinion bearing pre-load	2 Nm (1.5 lbf ft).
Differential bearing pre-load	With zero end float tighten bearing nut three notches.
Crownwheel and pinion back-lash:	
AG 65 axle	0,13-0,18 mm (0.005-0.007 in).
AG 66 axle	0,15-0,20 mm (0.006-0.008 in).
Epicyclic reduction ratio	4.1538:1.
Swivel pin pre-load	0,15-0,25 mm (0.006-0.010 in).
Oil capacity - Hub	0,8 litre (1.5 pt) each side.
Oil capacity - Axle	5,5 litre (1.2 gal)(1.5 US gal).
Special tools:	
MF.195C	Bearing remover/replacer.
MF.451B	Axle swivel pin remover.
MF.471	Hydralock spring compressor.
MF.480	Pinion nut wrench.
MF.481	Hub nut wrench.
MF.482	Steering ram wrench.
MF.483	Hub nut wrench.
MF.485	Pivot pin seal installer.
MF.488	Four-wheel drive hub puller.
MF.493	Hub seal installer.
MF.495	Planetary ring gear replacer
MF.496	Wear ring installer.
FT.4062A	Pinion pre-load gauge.
Bolt torques:	
Track rod lock-nuts	135 Nm (100 lbf ft).
Steering cylinder ball joints	135 Nm (100 lbf ft).
Ball joint nuts	103 Nm (76 lbf ft).
Wheel nuts	270 Nm (200 lbf ft).
Planetary carrier cap screws	78 Nm (57 lbf ft).
Hub retaining nuts	380 Nm (280 lbf ft).
Pivot pin cap bolts	78 Nm (57 lbf ft).
Pinion nut	238 Nm (175 lbf ft).
Differential case bolts	140 Nm (103 lbf ft).
Crownwheel bolts	86 Nm (63 lbf ft).
Differential bearing cap bolts	140 Nm (103 lbf ft).
Steering ram cap screws	118 Nm (87 lbf ft).
Pivot pin retaining bolt	230 Nm (170 lbf ft).

General Description – front axle

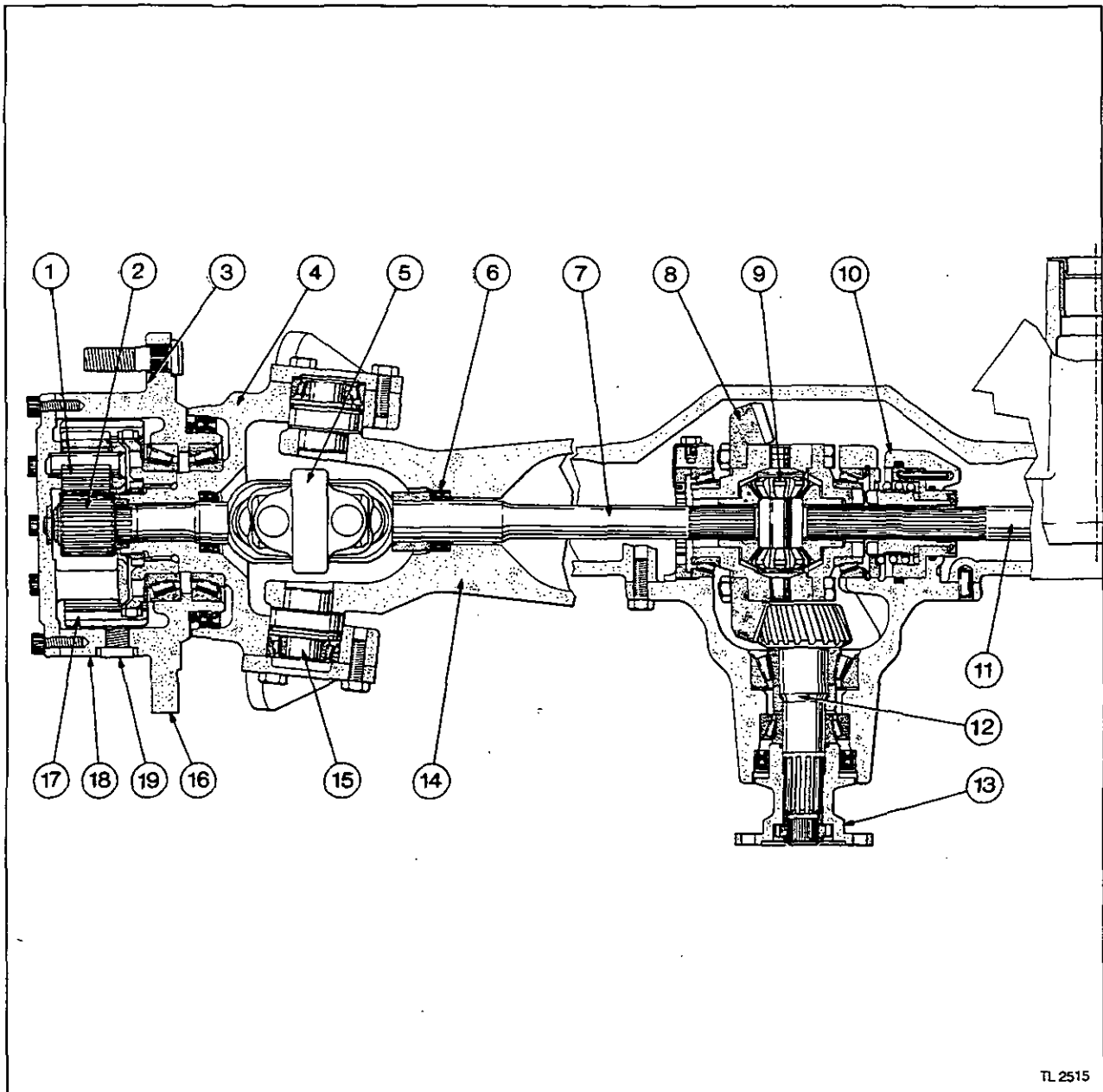
The Massey Ferguson four-wheel drive front axle is driven by a drive shaft along the left-hand side of the tractor from a transfer gearbox bolted between the gearbox and centre housing. The transfer gearbox contains the reduction gears and clutch to control the engagement and disengagement of the front axle.

The front axle has the crownwheel and pinion and differential mounted on the left-hand side of the axle to align with the drive shaft making it a side-drive arrangement. The drive is taken through a standard crownwheel and pinion and differential arrangement. The crownwheel is mounted on the left-hand side of the differential. The differential contains a cross with four differential bevel gears, these mesh with two side bevel

gears to which the inner ends of the drive shafts are splined.

A hydraulic differential lock can be fitted, called Hydralock, which provides a method of locking the right-hand drive shaft to the differential case thus rendering the differential action inoperative. The locking mechanism is a simple hydraulic cylinder operating a tooth-type clutch with a spring return. The clutch is operated by hydraulic pressure through a control valve from the tractor hydraulics.

The drive shafts transmit the power through double universal joints at the steering pivot to the epicyclic reduction units in the front wheels. The front axle is attached to the front support casting by means of a centre pivot pin in a similar manner to the two-wheel drive axle.

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

TL 2515

AG 65/AG 66 4WD Hydralock front axle

- | | | | |
|---------------------|-----------------------------|---------------------|----------------------------|
| 1. Planetary gears. | 6. Oil seal. | 11. Drive shaft. | 16. Wheel hub. |
| 2. Sun gear. | 7. Drive shaft. | 12. Pinion. | 17. Ring gear. |
| 3. Wheel studs. | 8. Crownwheel. | 13. Drive coupling. | 18. Planetary carrier. |
| 4. Pivot housing. | 9. Differential unit. | 14. Axle housing. | 19. Oil filter/drain plug. |
| 5. Universal joint. | 10. Hydralock differential. | 15. Pivot pin. | |

10D-4

FRONT AXLE (NARROW) - 4 WHEEL DRIVE

Wheel Alignment and Steering Stops

Adjust 10D-01

Procedure

Wheel alignment

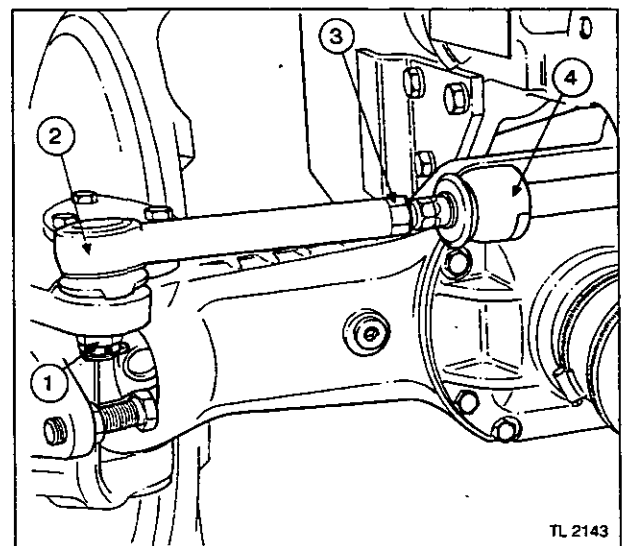
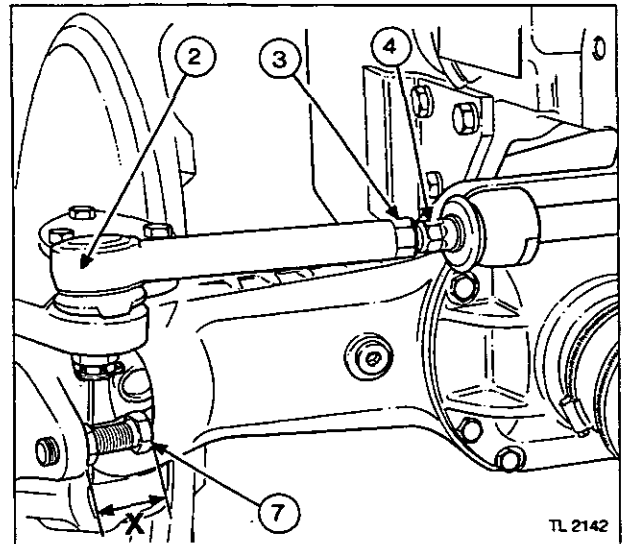
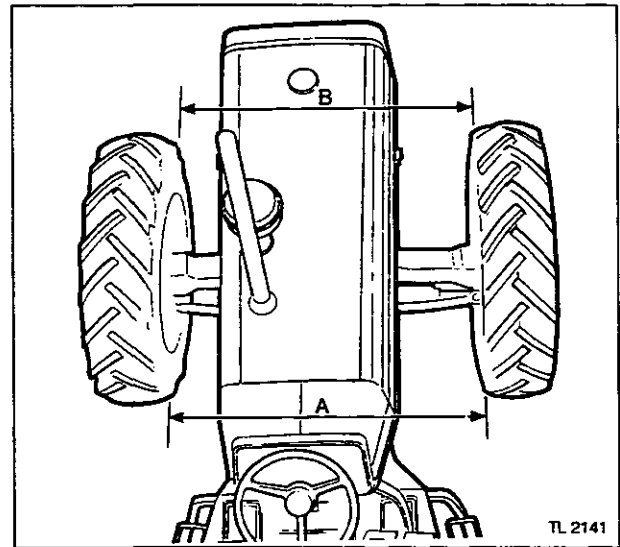
1. Drive the tractor onto firm level ground and put the front wheels in the straight ahead position.
2. Check the wheel toe-in measured on the centre line of the axle at the wheel rim. Distance 'A' must be 0-5 mm (0-3/16 in) greater than distance 'B'.
3. If adjustment is necessary, slacken the lock-nut on the track rods on one side.
4. Rotate the inner steering ball joint to either increase or decrease the track rod length to obtain the correct setting.
5. Apply Massey Ferguson Studlock (Loctite 270 and tighten the track rod lock-nut to a torque of 135 Nm (100 lbf ft). Ensure that both track rods are the same length.

Steering stops



CAUTION: At the smaller track settings, a foul condition may occur between the tyre and tractor or loader, if fitted, when the wheels are turned to the full lock position. To avoid this condition you must check by turning the wheels to full lock and adjusting the steering stops as necessary.

6. Place the jack under the engine sump and raise the tractor enough to allow the axle to swing from one stop to the other.
7. Turn the front wheels to full lock and check that the inside edge of the tyre does not foul the tractor.
8. Carry out the same check on the other lock.
9. If necessary, adjust the length of the steering stops (distance 'X') on both sides so that a foul condition will not occur. Tighten the lock-nuts after adjustment.



Track Rod and Ball Joint

Removal and Refitment 10D-02

Removal

1. Remove the split pin and nut from the ball joint.
2. Remove the ball joint from the housing by using an extractor or by striking the housing with a hammer adjacent to the ball joint to release the taper.
3. Slacken the lock-nut and unscrew the ball joint from the track rod.
4. To remove the inner joint, hold the end of the steering ram piston rod with a spanner and unscrew the joint.

10D-5

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

Refitment

5. Reverse procedures 1 to 4 except:
 - a. Ensure that both track rods are the same length.
 - b. Apply Massey Ferguson Studlock (Loctite 270) to the threads of inner joint and screw it into the end of the steering ram piston rod.
 - c. Set the wheel alignment as described in operation 10D-01.
 - d. Tighten the track rod lock-nut to a torque of 135 Nm (100 lbf ft).
 - e. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 103 Nm (76 lbf ft). Then tighten further as required to align the nut for the split pin (maximum torque 130 Nm (96 lbf ft)). Renew the split pin.

Front Axle

Removal and Refitment 10D-03

Special tools:

MF.485 Pivot Pin Seal Installer

Removal

1. Place a trolley jack under the engine sump and take the weight of the front of the tractor. DO NOT lift the front wheels off the ground.
2. Remove the front weights, if fitted.
3. Remove the front weight frame.
4. Disconnect the steering ram hoses at the cylinder end. Cap the ends of the pipes and hoses to prevent the ingress of dirt.
5. Disconnect the front axle drive shaft guard and drive shaft.
6. Remove the bolt securing the axle pivot pin to the front support casting.
7. Remove the axle pivot pin. If difficulty is experienced in removal, there is an 18 mm tapped hole in the end of the pin for extraction purposes.



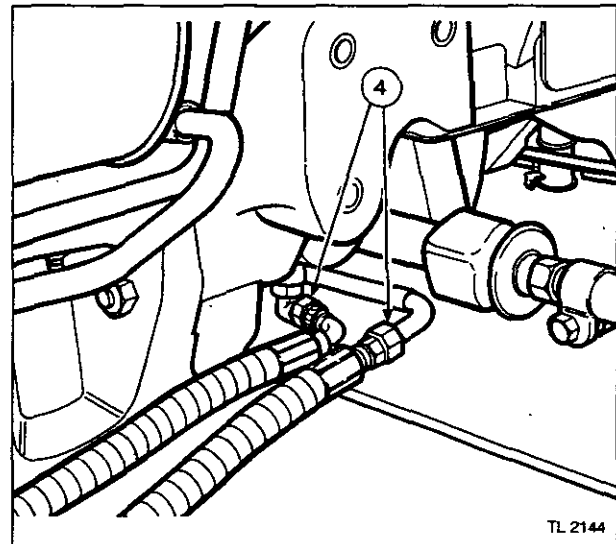
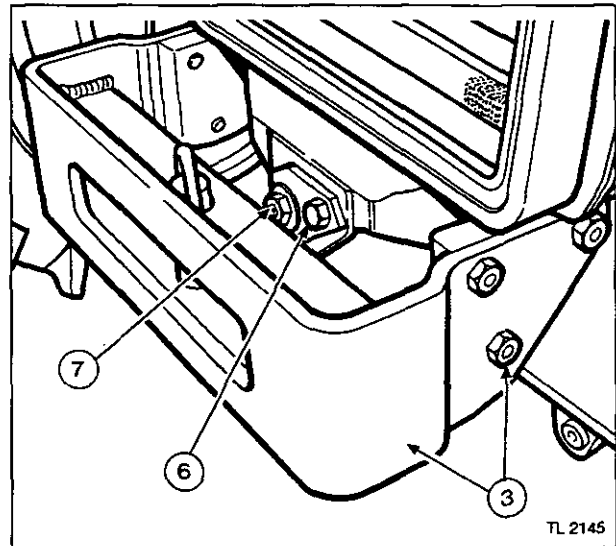
WARNING: Prevent the axle from tilting or rotating about the wheels if the axle is wheeled from under the tractor on its wheels. It could cause injury if precautions are not taken.

8. Jack up the front of the tractor so that the axle can be wheeled out from under the tractor.

or

Remove the wheels, and with the aid of a crane sling the axle on ropes and lift out from under the tractor.

9. Recover the two seals and thrust washers located each side of the axle pivot.
10. Place the axle on two axle stands and remove the wheels.

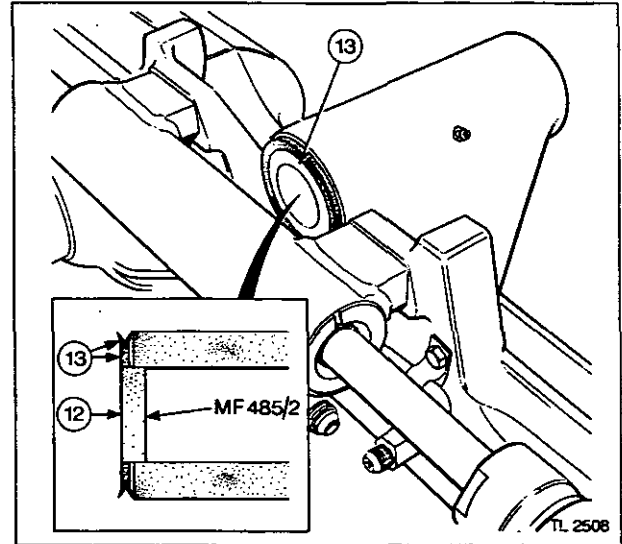


10D-6

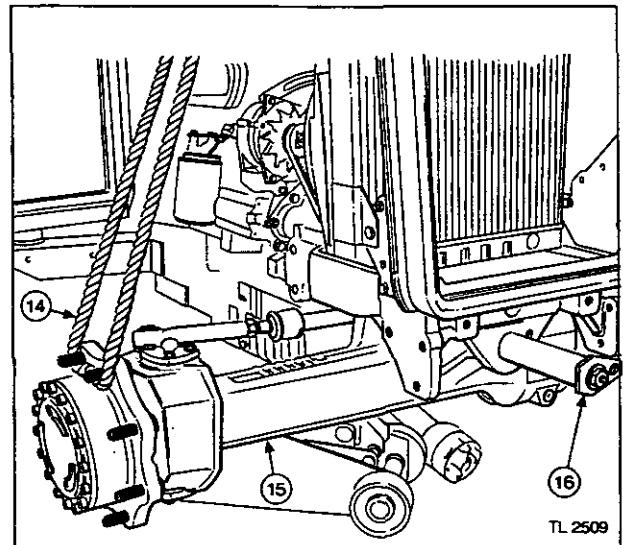
FRONT AXLE (NARROW) – 4 WHEEL DRIVE

Refitment

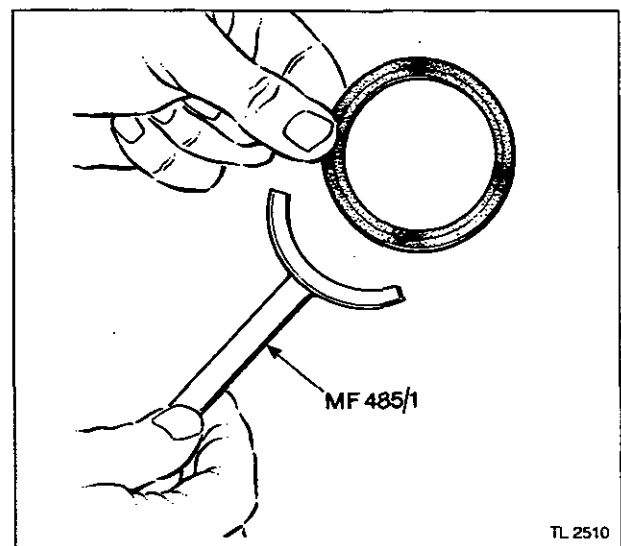
11. The axle pivot pin is fitted with two dirt seals at the front and back between the axle and the support casting.
12. Place the plastic plug supplied with special tool MF.485 into the rear pivot pin hole on the axle. Alternatively, one can be made from plastic bar or tube 47 mm (1.7/8 in) diameter x approximately 8 mm (5/16 in) long. Position the plug so that it protrudes a sufficient amount to support the rear seal and washer.
13. Place on the plug the inner steel washer and one of the seals. Apply a coating of grease to hold the seal and washer in place against the face of the axle. Do not have the plug protruding beyond the washer.



14. With the aid of an overhead crane sling the axle so that it is horizontal in both directions. Place the axle under the front support casting.
15. Carefully lift the front axle up into position under the tractor. DO NOT damage or move the seal assembly fitted to the rear pivot pin hole.
16. Align the pivot pin hole. Part fit the pivot pin as shown in the illustration. DO NOT push the pivot pin right in.

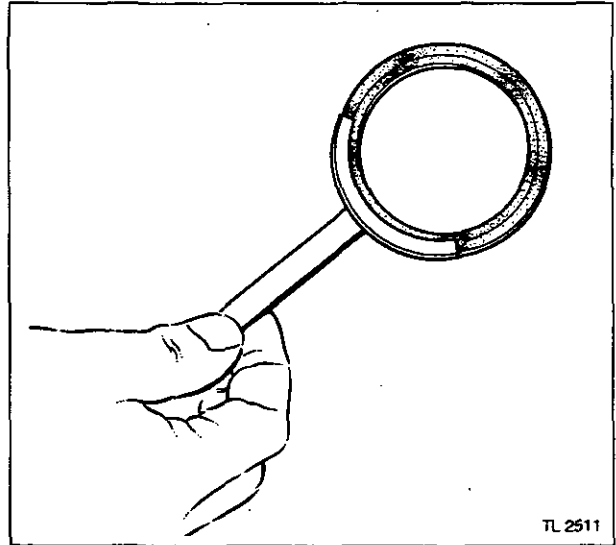


17. Take the second seal and assembly tool MF.485 Pivot Pin Seal Installer.

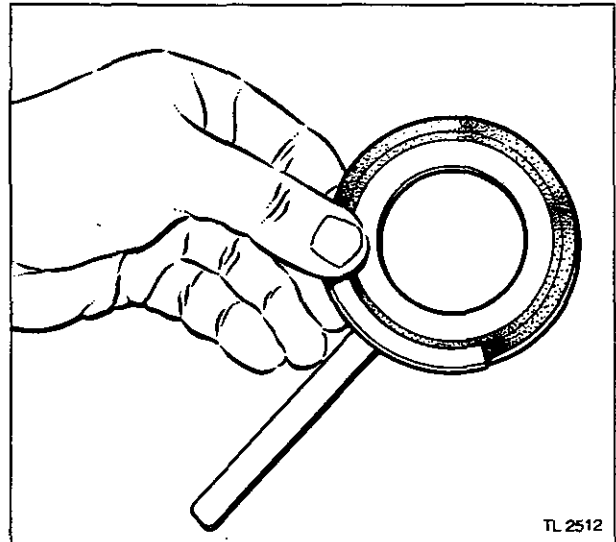


FRONT AXLE (NARROW) – 4 WHEEL DRIVE

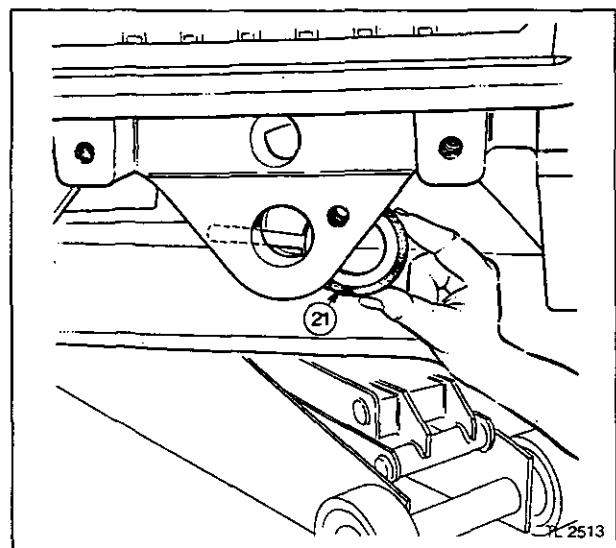
18. Squeeze the lips of the seal together and carefully fit it into the groove in the seal installer.



19. Install the steel washer inside the seal holding it in place with a little grease.



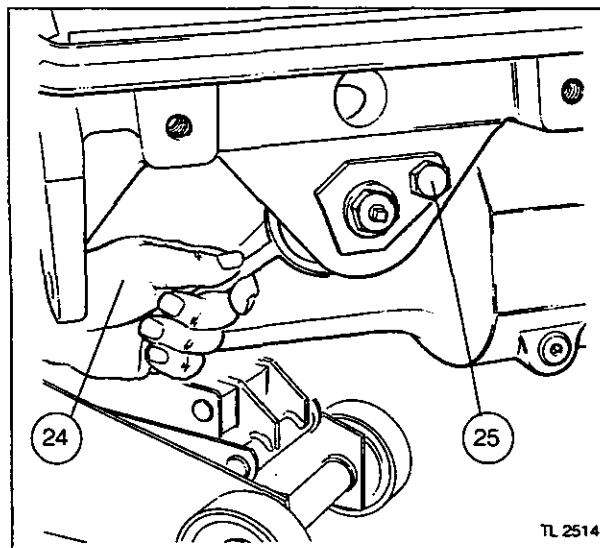
20. Holding the axle in place so that it does not move, remove the pivot pin.
21. Slide the seal, washer and tool assembly into position from right to left leading with the handle as shown in the illustration. DO NOT use the handle to pull it into place.
22. When the hole in the seal and washer assembly, axle and front support casting are in line, replace the pivot pin.
23. Push the pivot pin right in, this will push out the rear plastic plug used to hold the rear seal assembly in place.



10D-8

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

24. When the pivot pin has been installed remove the tool by pulling it away from the seal with the handle.
25. Apply Massey Ferguson Screwlock (Loctite 242) to the threads of the pivot pin retaining bolt and tighten to a torque of 230 Nm (170 lbf ft).
26. Reverse procedures 1 to 8 except:
 - a. Grease the axle pivot pin.
 - b. Check steering function to ensure that the hydraulic hoses to the steering ram have been correctly connected up.
 - c. Check that the steering hoses are correctly routed to prevent chaffing on sharp edges.
 - d. Check the power steering pump oil level, if fitted to this tractor, and remove air from the system, see operation 11A-04.



FRONT AXLE (NARROW) - 4 WHEEL DRIVE

Planetary Carrier

Removal and Refitment

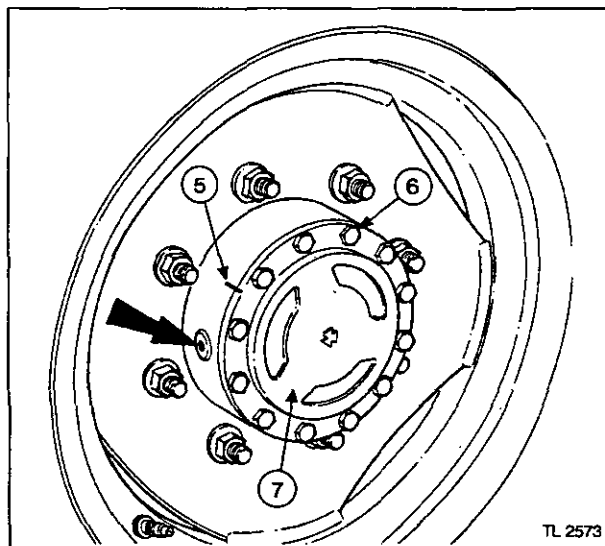
10D-04

Removal

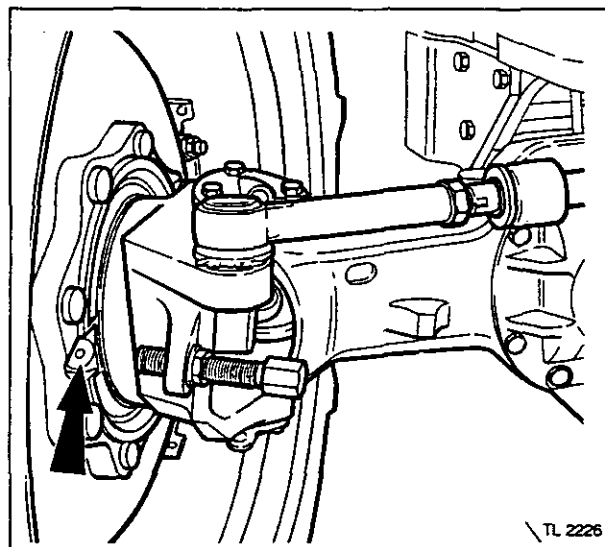
1. Apply the parking brake and secure the rear wheels.
2. Raise the tractor under the side of the axle to be worked on, then support the axle on an axle stand.
3. Remove the wheel.
4. Rotate the hub until the plug is at the bottom. Remove the plug (8 mm hexagon key will be required) and drain the oil from the hub.
5. Mark the position of the planetary carrier in relation to hub to assist alignment during refitment.
6. Remove the twelve bolts on the AG 65 axles, or the 16 cap screws (8 mm hexagon key will be required) on the AG 66 axles, in the cover plate.
7. Remove the planetary cover plate.

Refitment

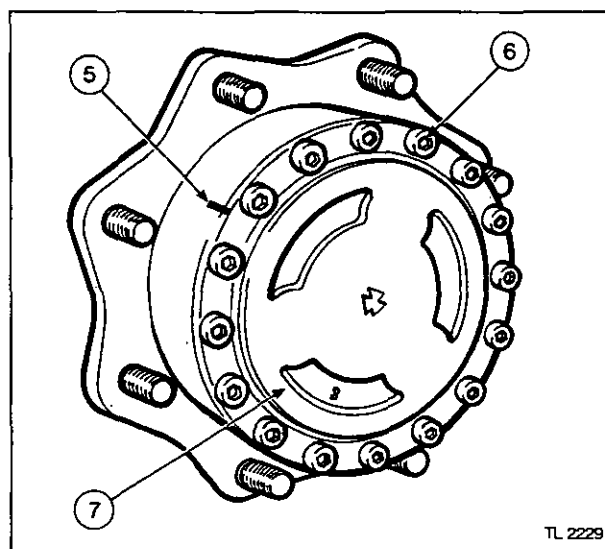
8. Reverse procedures 1 to 7 except:
 - a. Apply Massey Ferguson Instant Gasket (Loctite 515) to the hub face.
 - b. Apply a light coating of lubricating oil to the planetary carrier bolts or cap screws and tighten the bolts to a torque of 78 Nm (57 lbf ft).
 - c. Rotate the wheel so that the plug is horizontal. Fill the hub to this level with an approved oil and refit the plug.
 - d. Tighten the wheel nuts to a torque of 270 Nm (200 lbf ft).



AG 65 axle



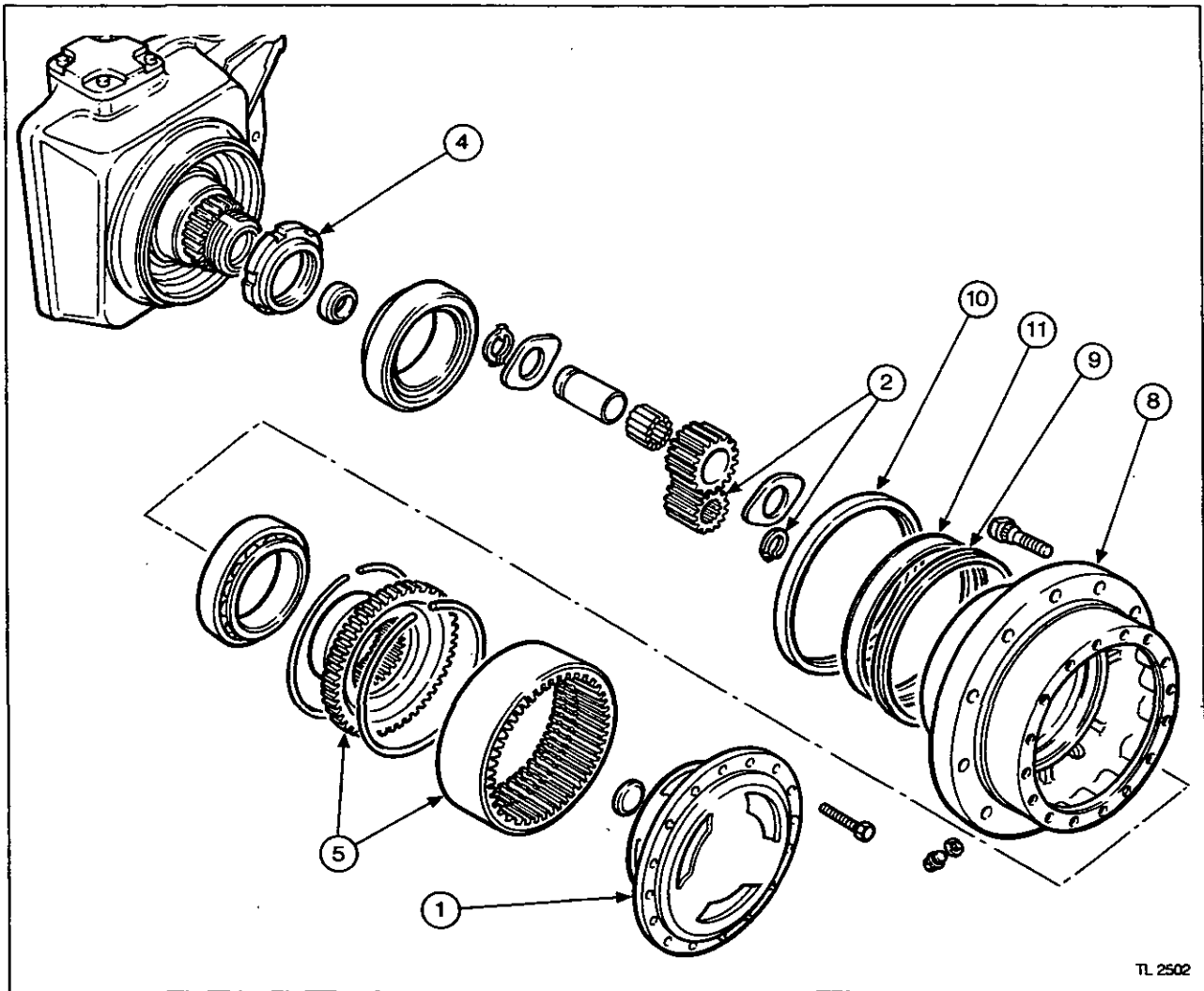
AG 66 axle



TL 2229

10D-10

FRONT AXLE (NARROW) -- 4 WHEEL DRIVE



TL 2502

Hub Oil Seal

Removal and Refitment

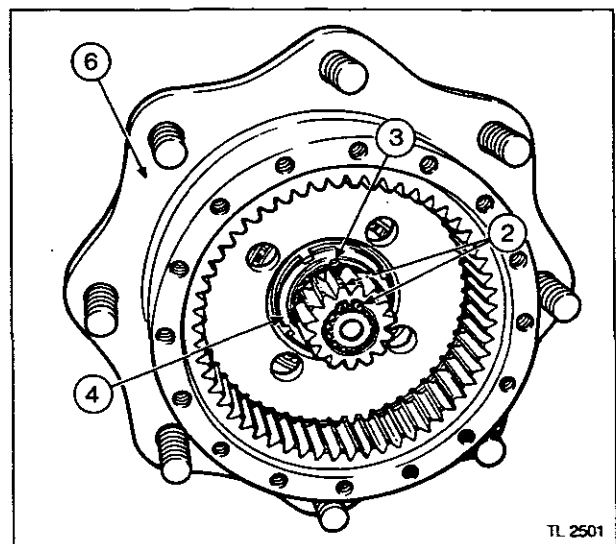
10D-05

Special tools:

MF.481	Hub Nut Wrench (AG65)
MF.483	Hub Nut Wrench (AG66)
MF.488	Hub Puller
MF.493	Hub Seal Installer
MF.495	Planetary Ring Gear Replacer
MF.496	Wear Ring Installer

Removal

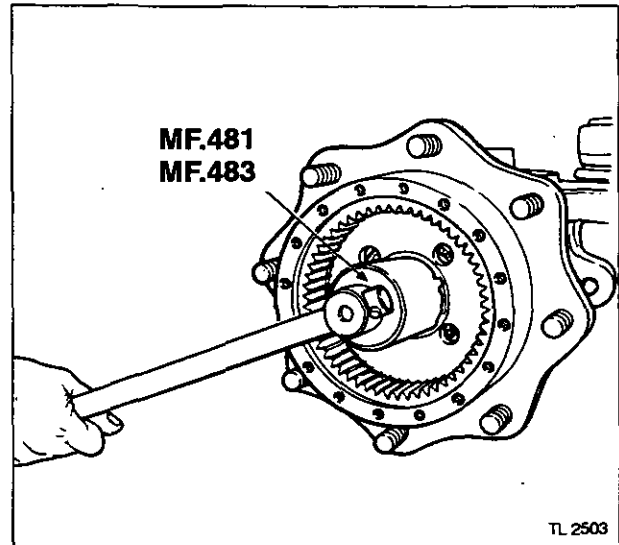
1. Remove the planetary carrier, see operation 10D-04.
2. Remove the circlip and sun gear.
3. With a narrow cold chisel and hammer carefully unstack the hub retaining nut where the lip has been driven down into the slot.



TL 2501

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

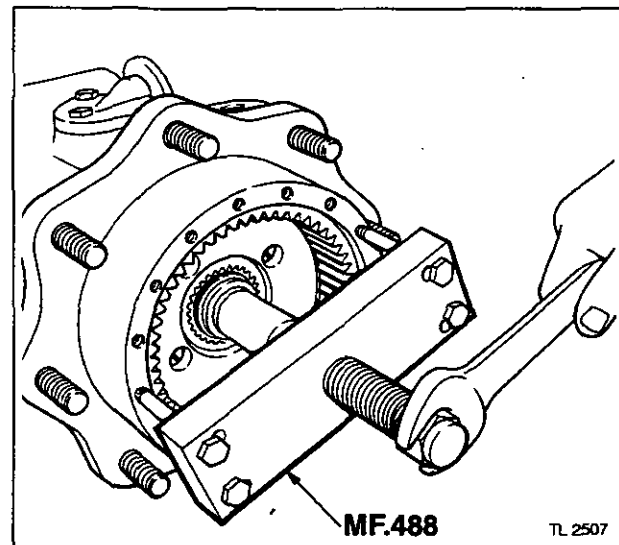
4. Using special tool MF.481 (AG65 axles) or MF.483 (AG66 axles) Hub Nut Wrench, unscrew the retaining nut.



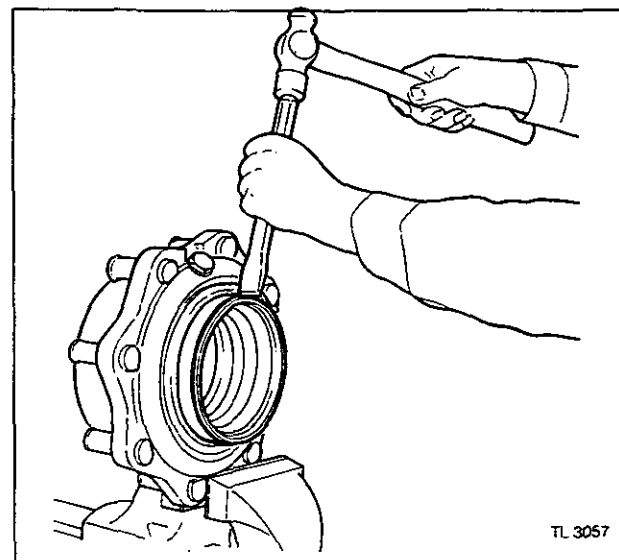
5. With the aid of the special tool MF.488 Hub Puller remove the planetary ring gear and hub.
6. Place the cap over the end of the drive shaft. Bolt MF.488 across the face of the hub so that the forcing screw locates in the dimple in the cap. Adjust the length of the bolts so that they are all of equal length.

IMPORTANT: Lubricate all the threads of the forcing screw.

7. Tighten the screw so that the hub and ring gear are drawn off the shaft.
8. Remove the wheel hub and ring gear from the tool.
9. Remove the dirt seal from the back of the hub.
10. With a cold chisel split the large oil seal and remove from the housing. Be careful not to damage the taper roller bearing.



11. If necessary, remove the the oil seal wear ring. With a cold chisel split the ring on the hub and remove.
12. Clean all components for reassembly.

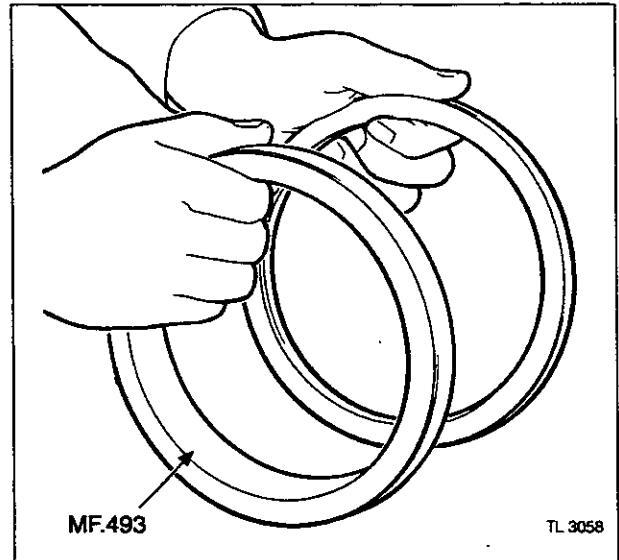


10D-12

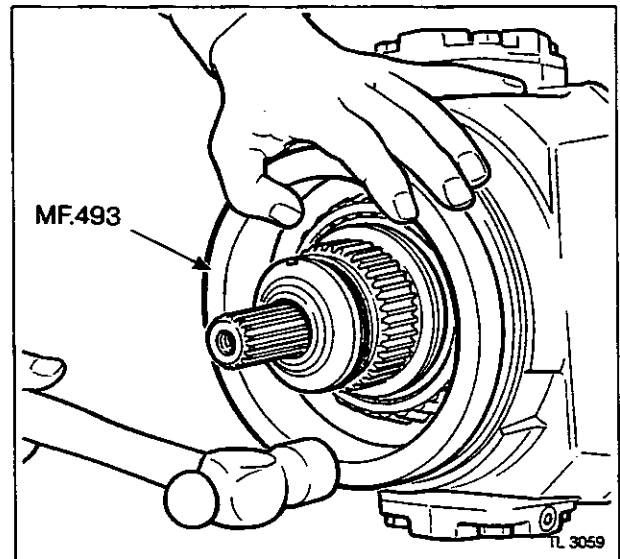
FRONT AXLE (NARROW) – 4 WHEEL DRIVE

Refitment

- Using special tool MF.493 Hub Seal Installer fit a new oil seal. Place the seal on the tool with the lip facing outwards.



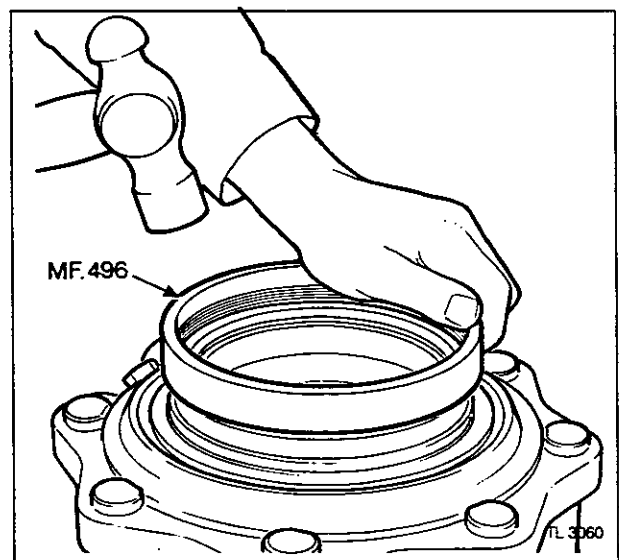
- Offer the seal and tool assembly up to the swivel housing, with a hammer, gently drive the seal into the housing. Work around the seal driving in a small part at a time until it is fully home.



- Fit the a new oil seal wear ring using special tool MF.496 Wear Ring Installer and a light hammer. Drive the wear ring down onto the hub using the same method when fitting the oil seal.

NOTE: The radius edge of the wear ring must face outwards.

- Renew the dirt lip seal on the back of the hub.
- Fill the space between the dirt seal and the lip seal with general purpose grease. It must be 30 to 50% full. Also apply generous application grease to the lips of the seal.
- Replace the hub.

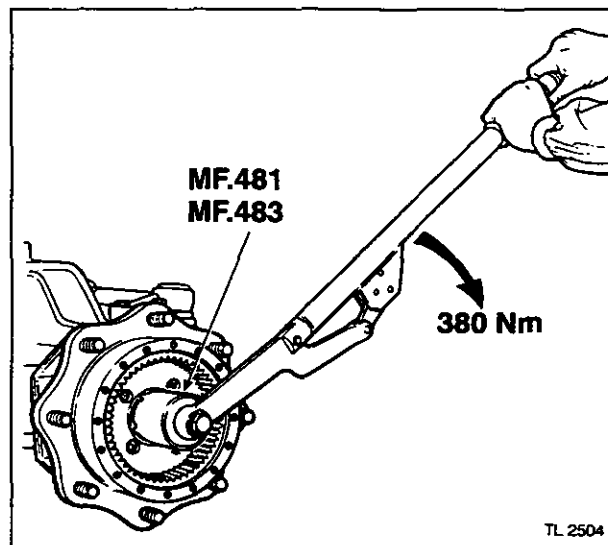
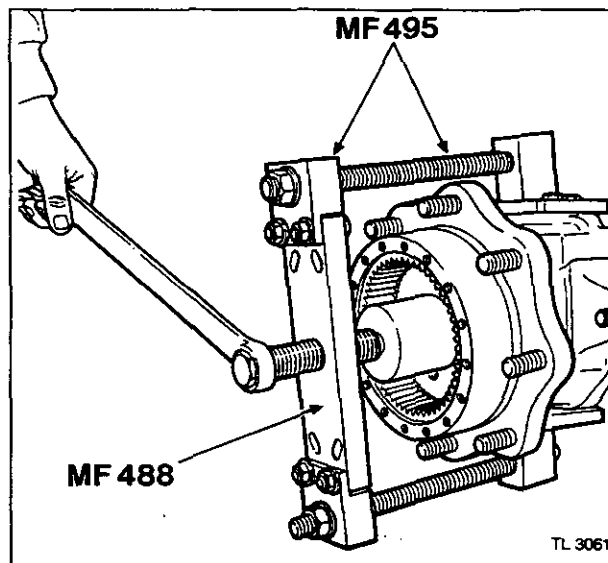


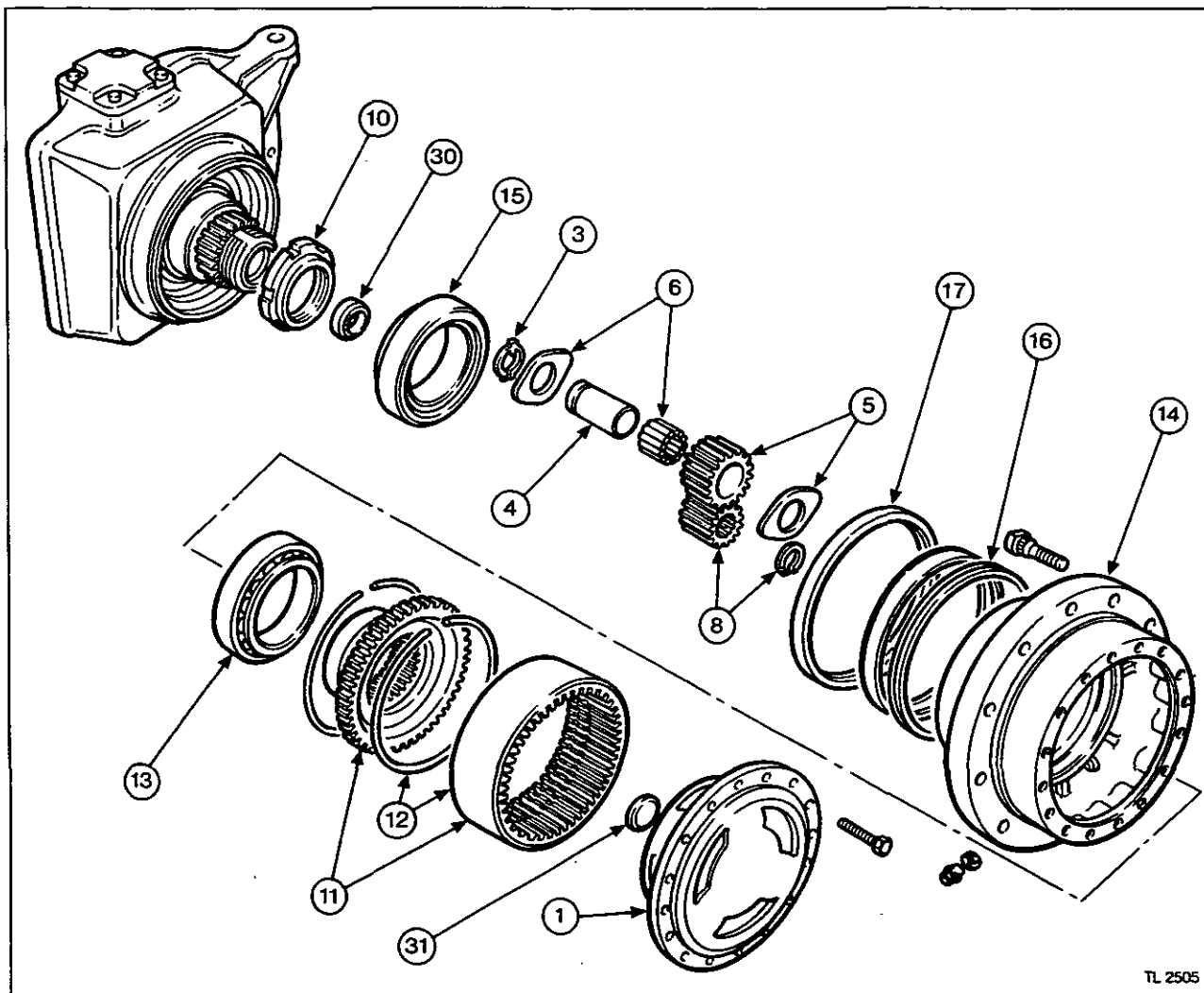
FRONT AXLE (NARROW) – 4 WHEEL DRIVE

19. Replace the planetary ring gear carrier using special tool MF.495 Planetary Ring Gear Replacer.
20. To special tool MF.488 add the two extensions (part of MF.495) ensuring that the bolts are tight as shown in the illustration. It is important that they are fitted with the overlapping part to the outside.
21. Remove the top and bottom swivel pin caps and fit the two blocks complete with the threaded studs.
22. Suspend MF.488 on the studs and fit the nuts and washers.
23. Position the ring gear carrier so that the splines are in alignment. Place the cap over the end of the shaft and locate the forcing screw in the end of the cap.

IMPORTANT: Lubricate all the threads of the forcing screw.

24. Lubricate the forcing screw, then tighten the screw until the carrier is pressed full home. DO NOT put excessive loads on the tool. Check by turning the hub to determine when the fitting has been completed.
25. Remove the special tool and replace the caps ensuring that the one with the shims is fitted on the top.
26. Renew the ring gear retaining nut and tighten to a torque of 380 Nm (280 lbf ft) using special tool MF.481 on AG65 axles and MF.483 on AG66 axles.
27. Hammer the lip of the nut down into the slot.
28. Replace the sun gear and circlip.
29. Replace the planetary carrier.





TL 2505

Planetary Carrier and Hub

Overhaul

10D-06

Special tools:

MF.481 Hub Nut Wrench (AG65)

MF.483 Hub Nut Wrench (AG66)

MF.488 Hub Puller

Disassembly

1. Remove the planetary carrier, see operation 10D-04.
2. Place the planetary carrier in a vice.
3. Remove the circlips.
4. Screw an 8 mm bolt (one of the cover cap screws) into the end of the shaft and withdraw the planetary gear shaft.
5. Carefully remove the planetary gear and thrust washers taking care not to dislodge the needle roller bearings.
6. Remove the needle rollers and thrust washers by emptying them into a clean container.
7. Repeat procedures 3 to 6 for the remaining two planetary gears.
8. Remove the circlip and sun gear.
9. With a narrow cold chisel and hammer carefully unstick the hub retaining nut where the lip has been driven down into the slot.
10. Using special tool MF.481 (AG65 axles) or MF.483 (AG66 axles) Hub Nut Wrench, unscrew the retaining nut.
11. With the aid of MF.488 Hub Puller, remove the ring gear and hub from the splined shaft complete with bearing (see operation 10D-05 procedures 5 to 8).
12. If necessary, remove the circlips and the ring gear.
13. Remove the planetary ring gear taper roller bearing cone with a hammer and punch through the holes in the flange.
14. Remove the wheel hub.
15. If necessary, remove the two bearing cones.
16. If necessary, remove the dirt lip seal from the back of the hub.
17. If necessary, remove the large inner seal from the housing.

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

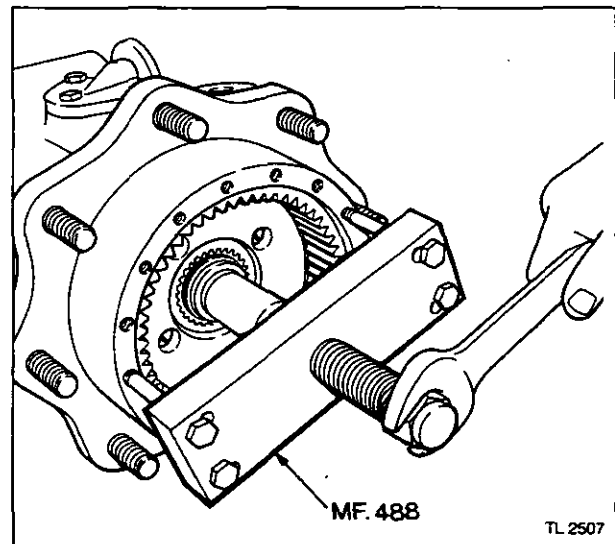
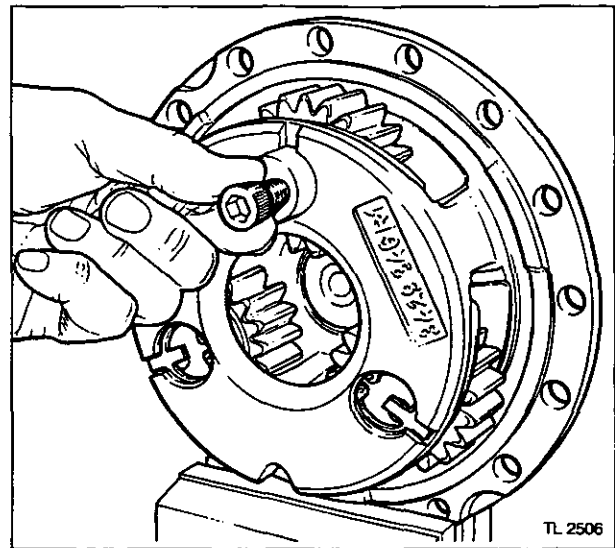
18. Remove the inner bearing cone. If this is necessary the cage will have to be broken, and the rollers removed. To remove the inner track, heat it with a gas torch until it expands and can be removed with a pry bar.

Examination

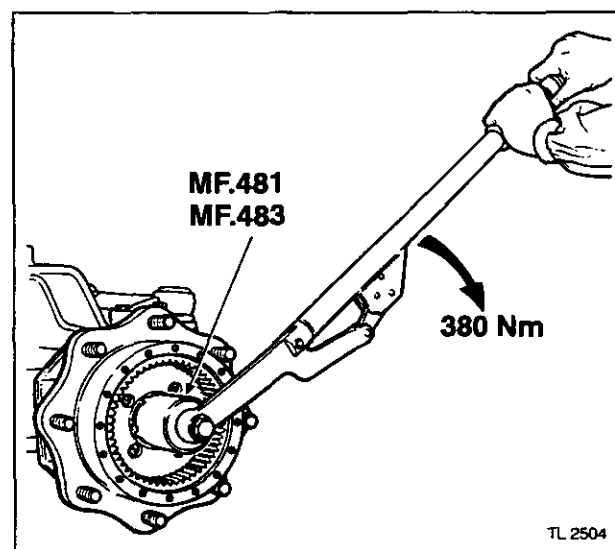
Thoroughly clean and inspect all components and renew any that are worn or damaged. Renew all 'O' rings and seals.

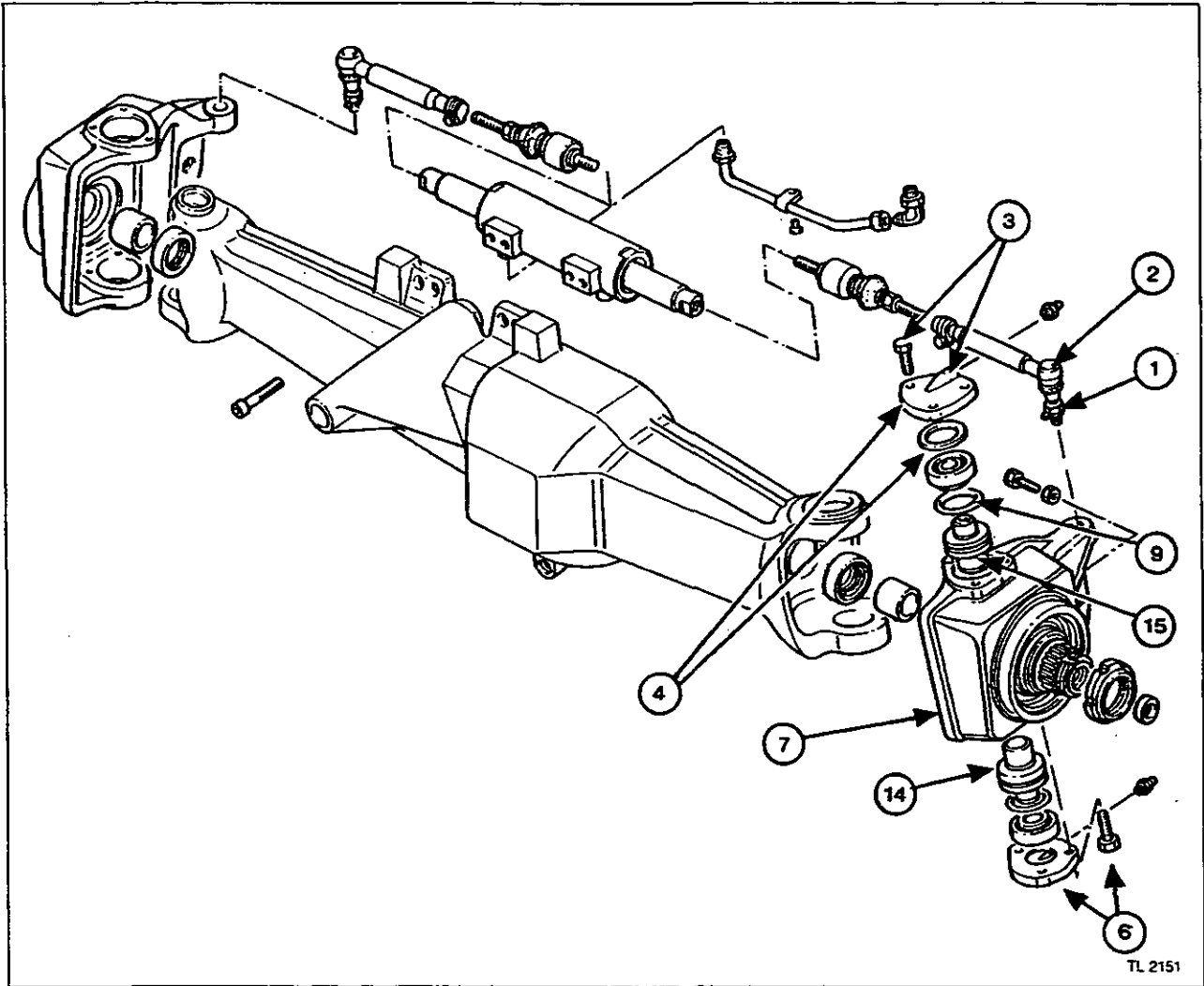
Reassembly

19. Fit the inner taper roller bearing cone.
20. Fit a new lip seal (10) into the housing. See operation 10D-05 procedures 13 and 14.
21. Fit the two taper roller bearing cups to the hub.
22. Renew the dirt lip seal on the back of the hub.
23. Fit the taper roller bearing cone to the planetary ring gear.
24. Reassemble the ring gear, fitting the two circlips and gear.
25. Fill the space between the dirt seal and the lip seal with general purpose grease. It must be 30 to 50% full. Also apply grease to the lips of the seal.
26. Replace the hub.
27. Replace the planetary ring gear. See operation 10D-05 procedures 19 to 25.



28. Renew the ring gear retaining nut and tighten dry to a torque of 380 Nm (280 lbf ft) using special tool MF.481 (AG65 axles) or MF.483 (AG66 axles) Hub Nut Wrench.
29. Hammer the lip of the nut down into the slot.
30. If the thrust ring has been removed it is retained in the housing with Massey Ferguson Studlock (Loctite 270).
31. If the drive shaft thrust pad has been removed it is retained in the cover with Massey Ferguson Studlock (Loctite 270).
32. Refit the sun gear and circlip.
33. Reassemble the planet gears. Use petroleum jelly, NOT grease, to hold the needle rollers and thrust washers in place during assembly. Each planetary gear contains 19 needle rollers.
34. Refit the gears to the planetary carrier using new circlips to hold the shafts in place.
35. Refit the planetary carrier.





Swivel Housing and Pins

Removal and Refitment 10D-07

Special tools:

- MF.195C Bearing Puller - Main Tool
- MF.451B Steering Pin Bearing Remover

Removal

1. Remove the split pin and steering ball joint nut.
2. Release the steering ball joint from the housing.
3. Remove the three bolts and the upper cap.
4. Remove the shims and bearing cup.
5. Using special tool MF.195C Bearing Puller - Main Tool and MF.451B Steering Pin Bearing Remover, extract the upper pivot pin. Screw the 14 mm adaptor into the pin and onto the main puller. Remove the pin from the housing.

IMPORTANT: Lubricate all the threads of the forcing screw.

6. Remove the three bolts and cap from the lower bearing and repeat the extraction of the pivot pin.

7. The housing can now be removed from the axle complete with the drive shaft.

8. This operation can now be repeated on the other side if the crownwheel and pinion assembly is to be removed.

Examination

Thoroughly clean and inspect all components and renew any that are worn or damaged. Renew all 'O' rings and seals.

Refitment

9. Renew the seals on the pivot pins.
10. Fit the bearing cones to the pivot pins. DO NOT grease the bearings at this stage.
11. Coat the pivot pins and holes with a light application of grease.

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

12. Hold the housing in position and partly fit the upper pivot pin to locate the assembly.
13. Refit the lower pivot pin, bearing cup, cap and bolts. NO shims are fitted to the lower cap.
14. Tighten the bolts evenly and in a clockwise sequence to pull the lower pivot pin into the housing. Tighten the three bolts to a torque of 78 Nm (57 lbf ft).
15. Fit the upper bearing cup, shims, cap and bolts. Add additional shims to ensure that the pivot pins are seated on the axle casing. Tighten the bolts evenly and in a clockwise sequence to press the pivot pin into the housing.
16. Check that both pivot pins are fully seated onto the axle casing.
17. Remove the upper cap and shims.
18. Replace the cap and tighten the three bolts to torque of 78 Nm (57 lbf ft).
19. Using a dial indicator gauge and lever as shown in the illustration, determine the end float of the two pivot bearings.

When lifting the housing up and down with the lever ensure that you get the maximum reading on the dial indicator gauge. The correct bearing pre-load is 0,15–0,25 mm (0.006–0.010 in).

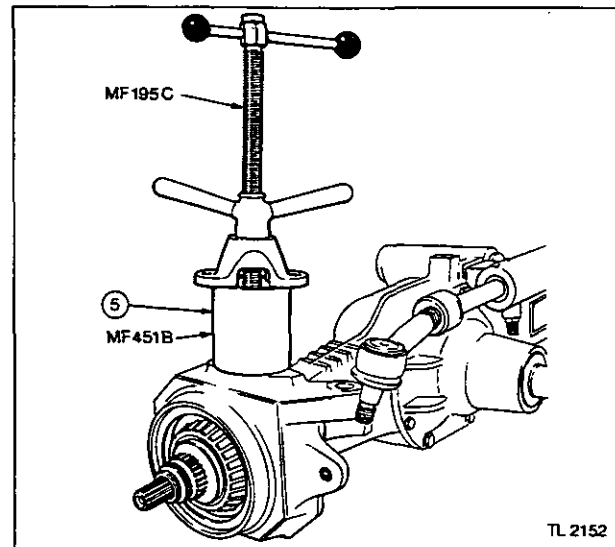
20. Select the required shims by the following method:

Shims required = End float + Pre-load

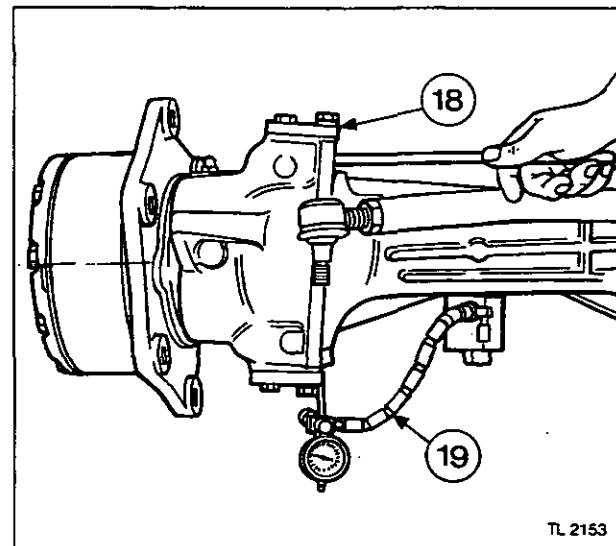
Select shims from the following chart:

Part number	Thickness	
	mm	inch
3427 190 M1	0,10	0.004
3427 191 M1	0,15	0.006
3427 192 M1	0,30	0.012
3427 193 M1	0,50	0.020
3427 194 M1	0,70	0.028
3427 195 M1	1,00	0.040

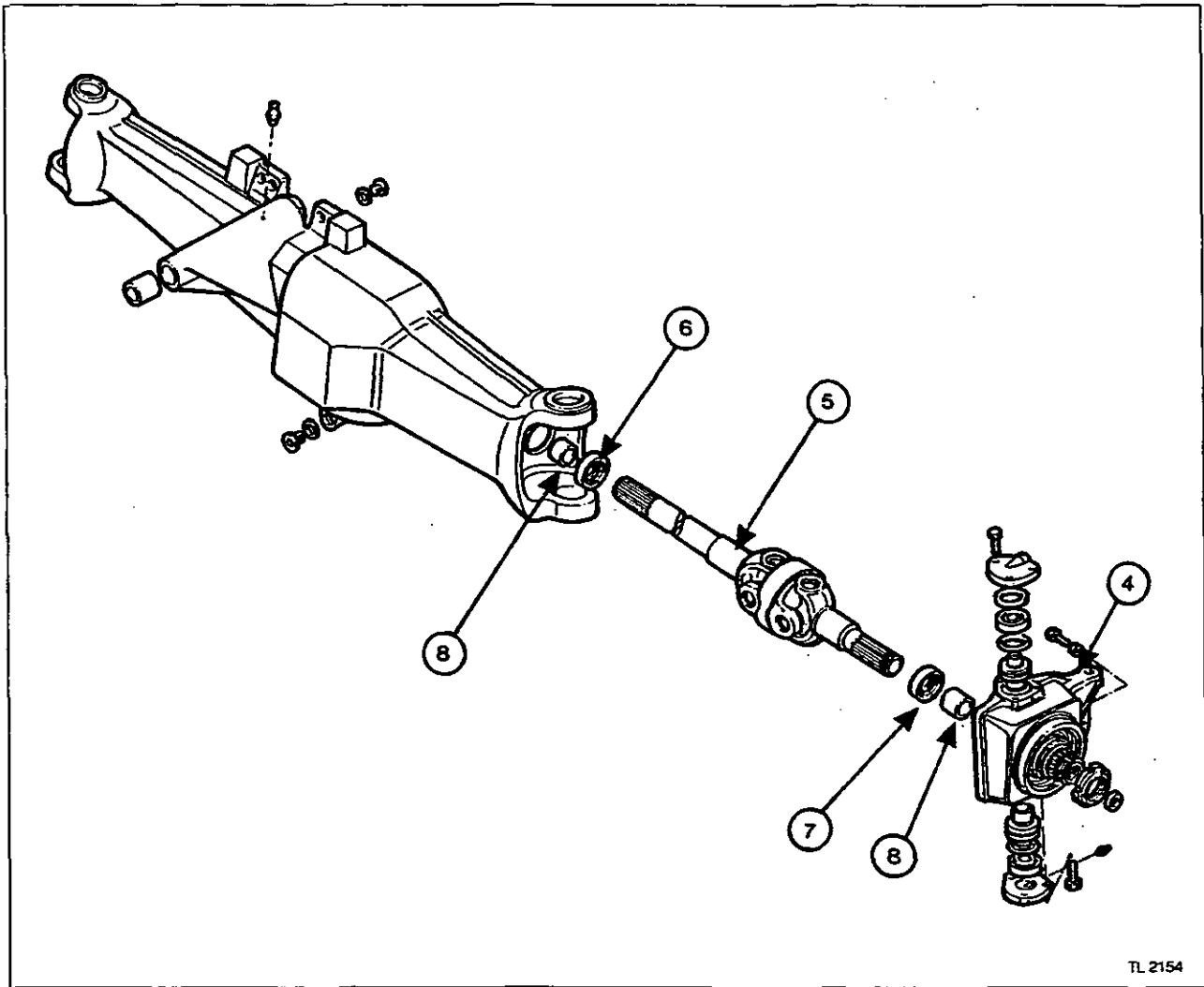
21. Remove the upper cap and bearing cup. Fill the bearing with grease, fit the correct number of shims, replace the cap.
22. Apply lubricating oil to the threads of the bolts and tighten to a torque of 78 Nm (57 lbf ft).
23. Remove the lower bearing cap and cup and fill the bearing with grease. Tighten the bolts as described in procedure 22.
24. Grease both bearings with a grease gun to ensure that they are full.
25. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 103 Nm (76 lbf ft). Then tighten further as required to align the nut for the split pin (maximum torque 130 Nm (96 lbf ft)). Renew the split pin.



TL 2152



TL 2153

**Drive Shaft and Oil Seals****Removal and Refitment** **10D-08****Removal**

1. Drain some of the oil from the axle casing.
2. Remove the planetary carrier, see operation 10D-04.
3. Remove the circlip and sun gear.
4. Remove the swivel housing, see operation 10D-07.
5. Remove the drive shaft from axle casing.
6. Lever the seal out of the axle casing.
7. Lever the seal out of the pivot housing.
8. Using an internal bearing puller, extract the bushes in the axle casing and swivel housing.

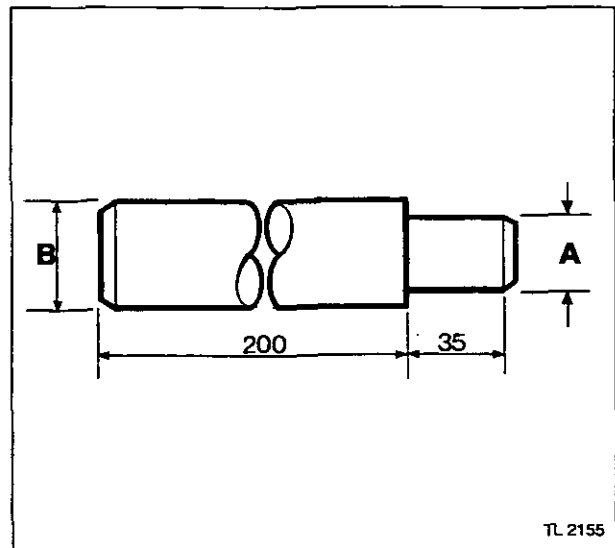
Examination

Carefully inspect the universal joints in the drive shaft, if there is any sign of wear renew the joints or fit new shafts. Inspect the condition of the drive shaft bushes, renew if necessary.

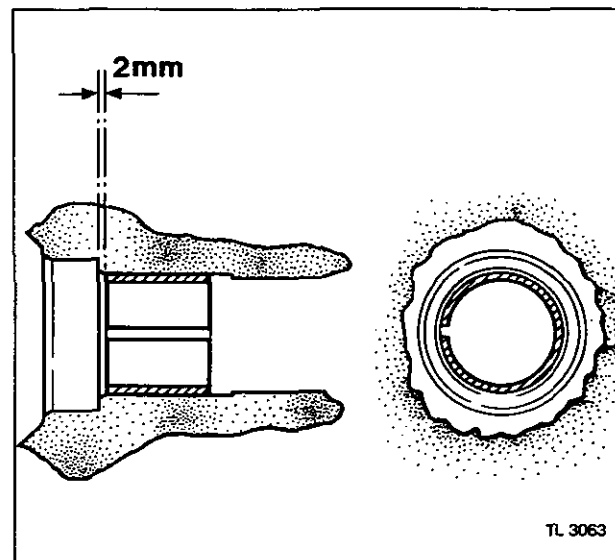
FRONT AXLE (NARROW) – 4 WHEEL DRIVE**Refitment**

9. To install new bushes and oil seals it will be necessary to make two service tools. This will ensure that the components are correctly fitted.
10. Manufacture the tools as shown in the illustration to the dimensions given in the following chart.

Component	Dimension 'A'	Dimension 'B'
Oil seal tool	35 mm dia. +0,000 -0,033	50 mm dia.
Bush tool	35 mm dia. +0,000 -0,033	45 mm dia.



11. Place the bush on the special tool and drive it into the housing. The bushes must be fitted with the split line at three o'clock, see illustration, and installed to a depth of 2 mm (0.080 in) behind the oil seal facing.
12. Place the oil seal on the special tool with the lip of the seal facing the inside of the casing or swivel housing. Drive the seal to the bottom of the recess.
13. Fill the seal cavity with a general purpose grease.
14. Fit a new dust seal to the crownwheel and pinion side of the drive shaft.
15. Refit the drive shaft into the axle casing taking care not to damage the oil seal when locating the splines.
16. Refit the swivel housings and planetaries.
17. Refill both the axle and planetary carrier to the correct level with an approved oil.
18. Grease the drive shafts and swivel bearing caps.



10D-20

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

Drive Shaft

Overhaul

10D-09

Disassembly

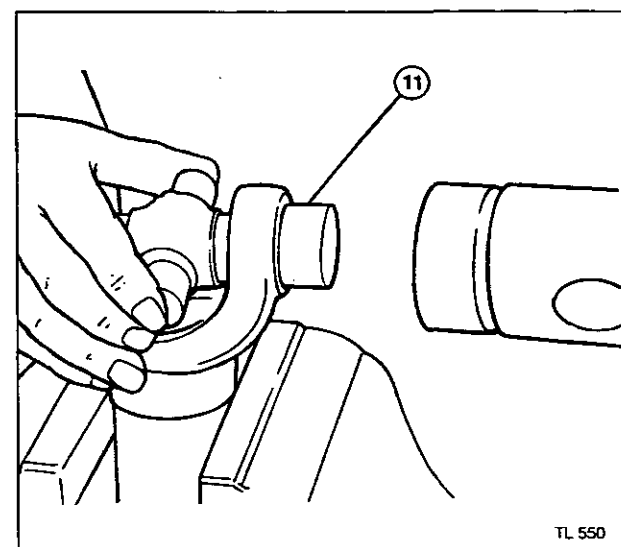
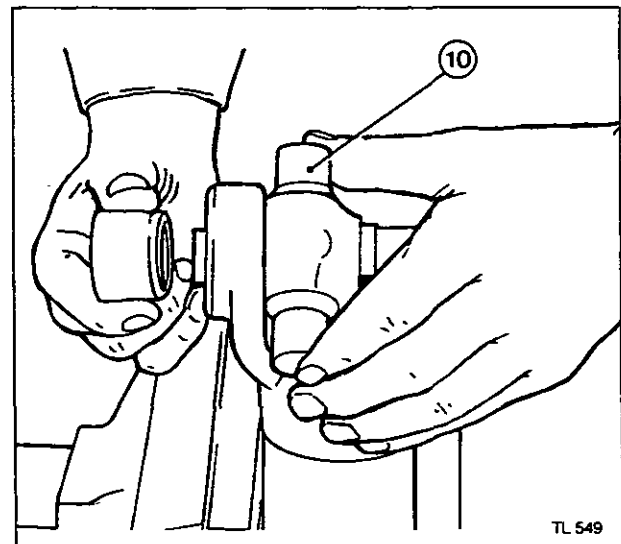
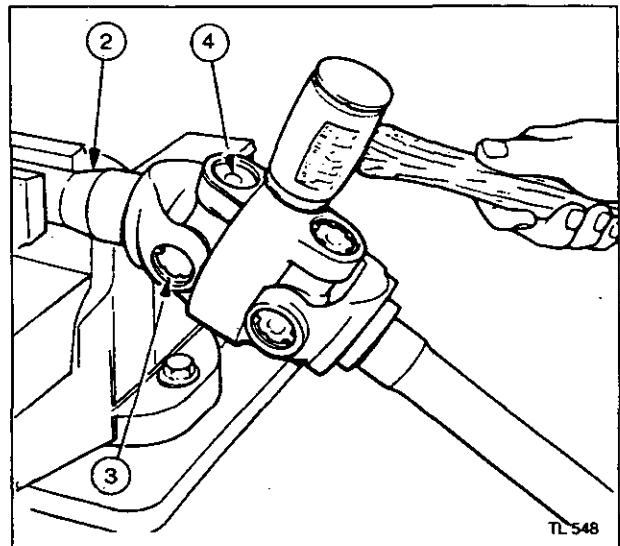
1. Remove the drive shaft, see operation 10D-08.
2. Hold the inner section of the drive shaft in a soft faced vice.
3. Remove the four circlips from each end of the universal joint.
4. Using a hammer, drive the central yoke downwards until the bearing sleeve protrudes.
5. Clamp the bearing sleeve in a vice and tap the central yoke from the bearing.
6. Remove the opposing bearing sleeve in the same way and remove the outer section of the shaft.
7. Turn the shaft assembly through 90°, then repeat procedures 4 to 6 to free the other universal joint from the shaft.
8. Grip the outer section of the drive shaft in a vice and repeat procedures 2 to 7.

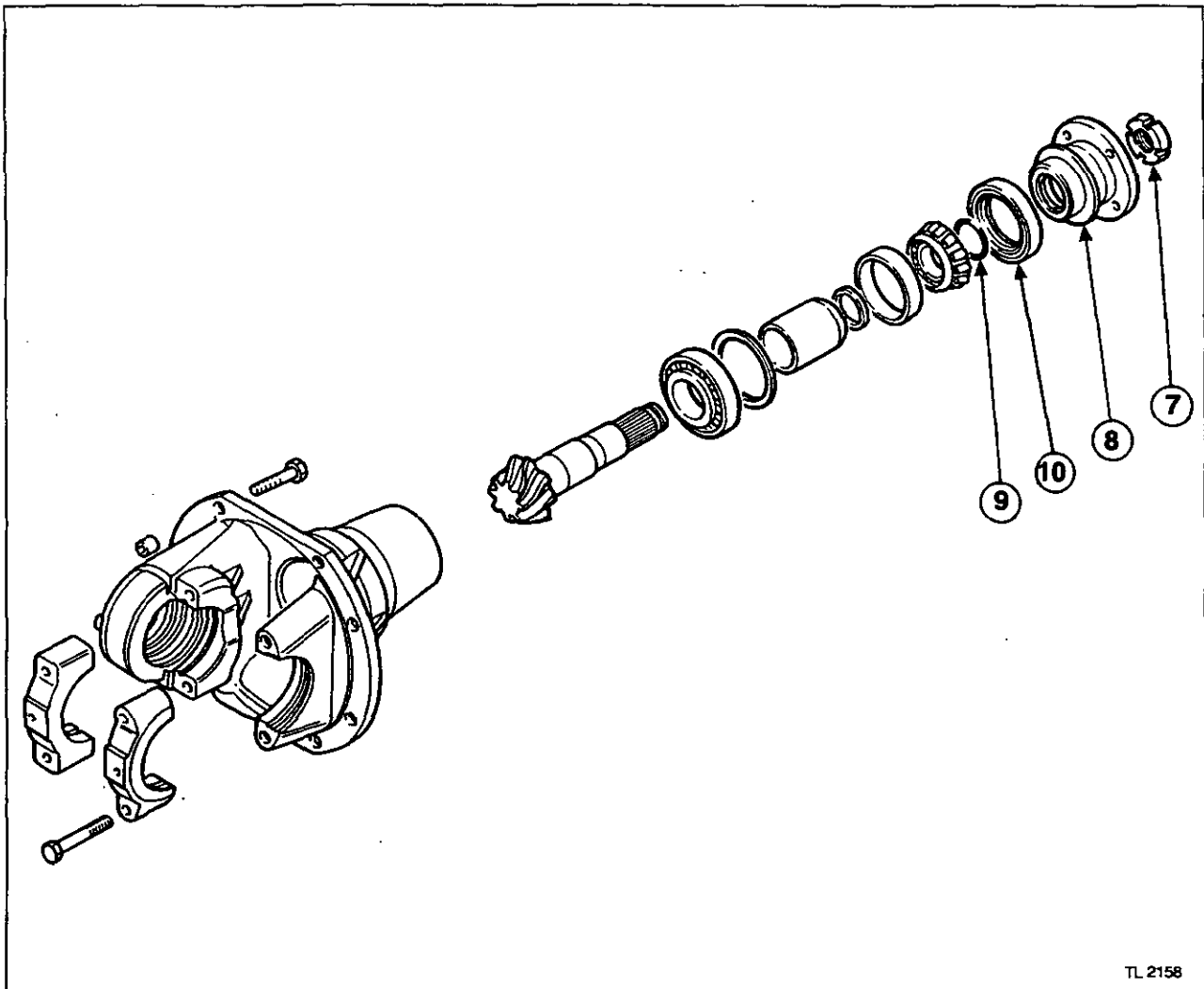
Examination

Pay particular attention to the axle shaft splines. Inspect all components and renew any which show signs of wear or damage. Always renew the universal joint as an assembly including the joint, bearings, caps, circlips and seals.

Reassembly

9. Ensure that the needle rollers are held in place with a little grease in the bearing sleeve.
10. Position the cross within the yoke and move it sideways as far as possible to provide a guide for the needle rollers in the bearing sleeve when being refitted.
11. Slide the bearing sleeve onto the cross and drive the bearing into the yoke deep enough to permit the insertion of the circlip.
12. Assemble the remaining sleeves and universal joint in a similar method.
13. Thoroughly lubricate the universal joint with a grease gun after completing assembly and before fitting to the axle.
14. Refit the drive shaft to the axle.



FRONT AXLE (NARROW) – 4 WHEEL DRIVE

TL 2158

Pinion Oil Seal**Removal and Refitment**

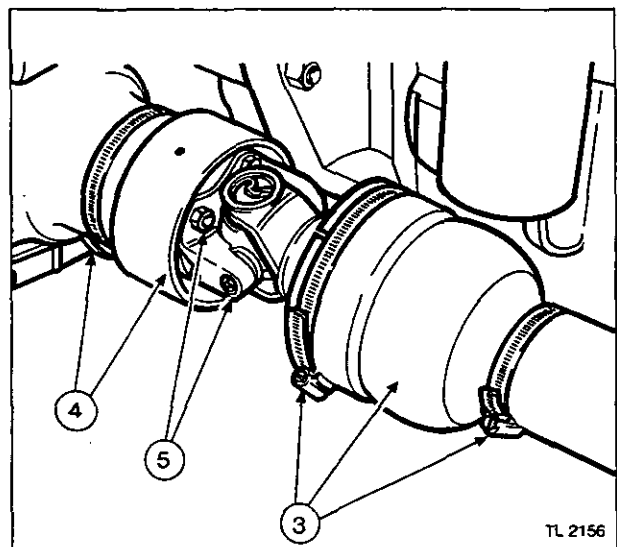
10D-10

Special tools:

MF.480 Pinion Nut Wrench

Removal

1. Apply the tractor parking brake.
2. Place a container under the axle and drain some of the oil from the casing.
3. Slacken the two hose clips and slide back the drive shaft guard.
4. Slacken the front guard hose clip and slide the guard forward.
5. Remove the four bolts and disconnect the universal joint.
6. With a small hammer and cold chisel carefully chisel away the lip of the pinion nut which has been driven down into the slot.



TL 2156

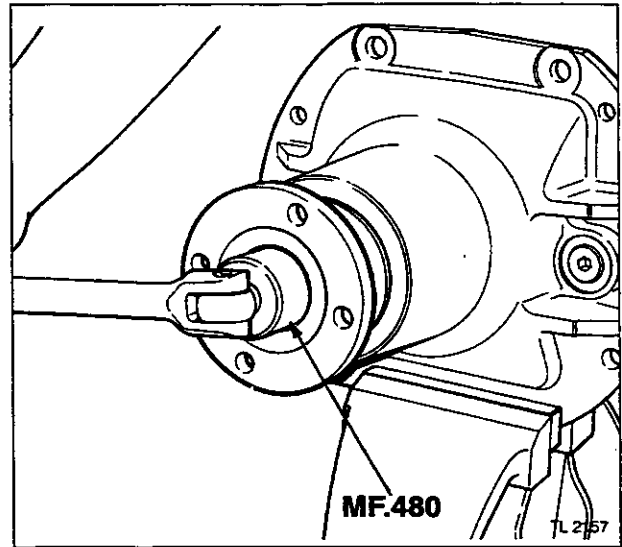
10D-22

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

- Using special tool MF.480 Pinion Nut Wrench, remove the pinion nut.
- Remove the drive coupling.
- Remove the 'O' ring and discard.
- Lever the oil seal out of the casing

Refitment

- Make the special seal tool as shown in the illustration.
- Renew the oil seal.
- Renew the shaft 'O' ring.
- Apply general purpose grease to the cavity of the oil seal.
- Replace the drive coupling.
- Renew the pinion nut and tighten dry to a torque of 238 Nm (175 lbf ft) using special tool MF.480.
- With the aid of a hammer and punch, drive the lip of the nut into the slot on the shaft to lock it.
- Reconnect the drive shaft and guard.
- Refill the axle case with an approved oil to the correct level.



Differential Assembly

Removal and Refitment 10D-11

Removal

- Secure the tractor by applying the parking brake.
- Jack up the front of the tractor and support under the engine.
- Slide back the drive shaft guard and disconnect the drive shaft.
- Remove the axle from the tractor, see operation 10D-03.
- Remove both front wheels.
- Drain the oil from the axle casing.
- Remove both swivel housings, see operation 10D-07. It is not necessary to dismantle the planetary hubs.
- Remove the steering ram, see operation 10D-14.
- Remove the eight bolts holding the differential case to the axle casing.

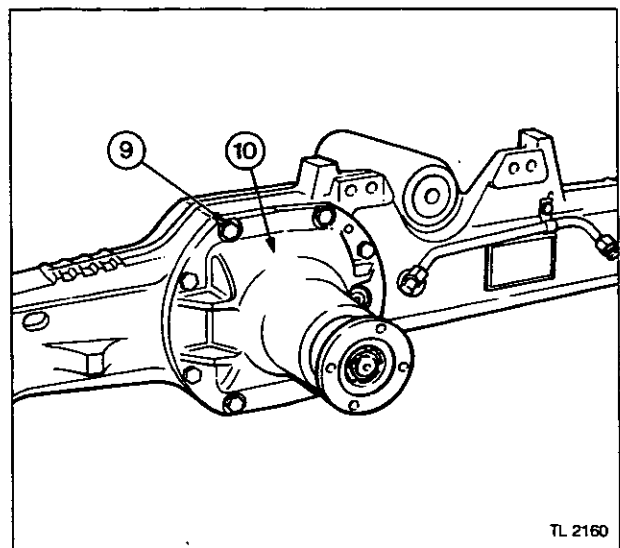
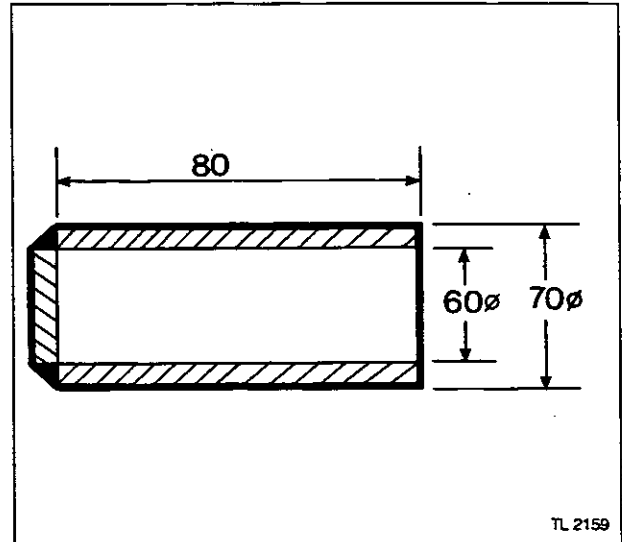


WARNING: Take care when removing the differential assembly, it is awkward and heavy to handle.

- The differential is located by dowels in the axle casing. Carefully prise it away from the casing supporting the weight at all times.

Refitment

- Reverse procedures 1 to 10 except:
 - Apply Massey Ferguson Instant Gasket (Loctite 515) to the joint face of the differential case.
 - Apply lubricating oil to the differential case bolts and tighten them to a torque of 140 Nm (103 lbf ft).



FRONT AXLE (NARROW) – 4 WHEEL DRIVE**Differential Assembly**

Overhaul

10D-12

Special tools:

MF.471 Hydraulic Spring Compressor

Disassembly

These instructions cover two types of differential, the standard type and Hydralock. The Hydralock type is a hydraulic method of locking the differential.

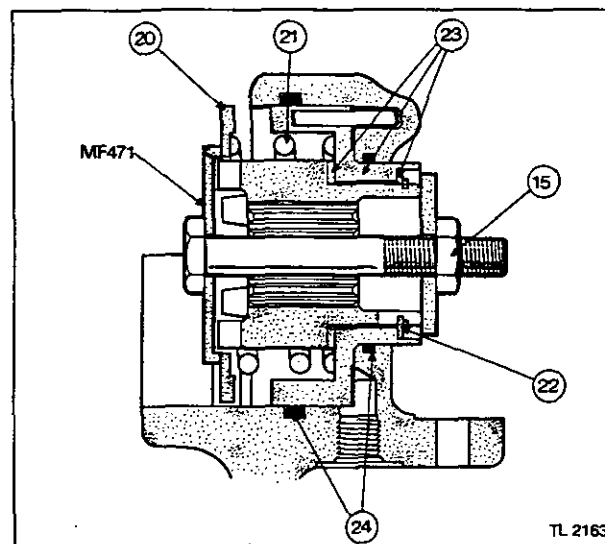
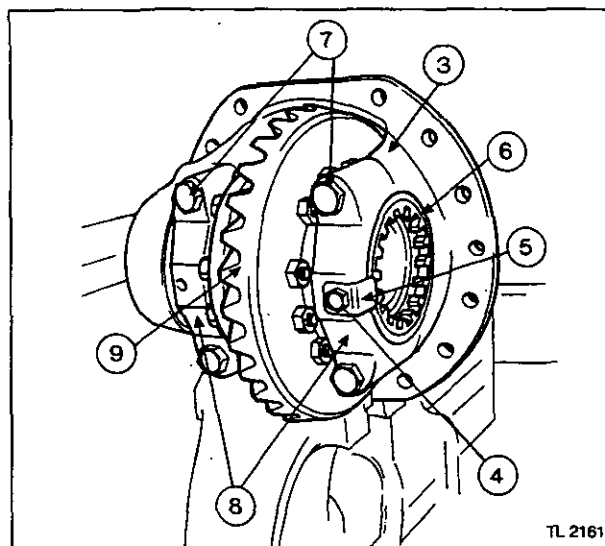
The Hydralock assembly may be fitted to the axle but not used, a plug will be fitted in place of the hydraulic connection.

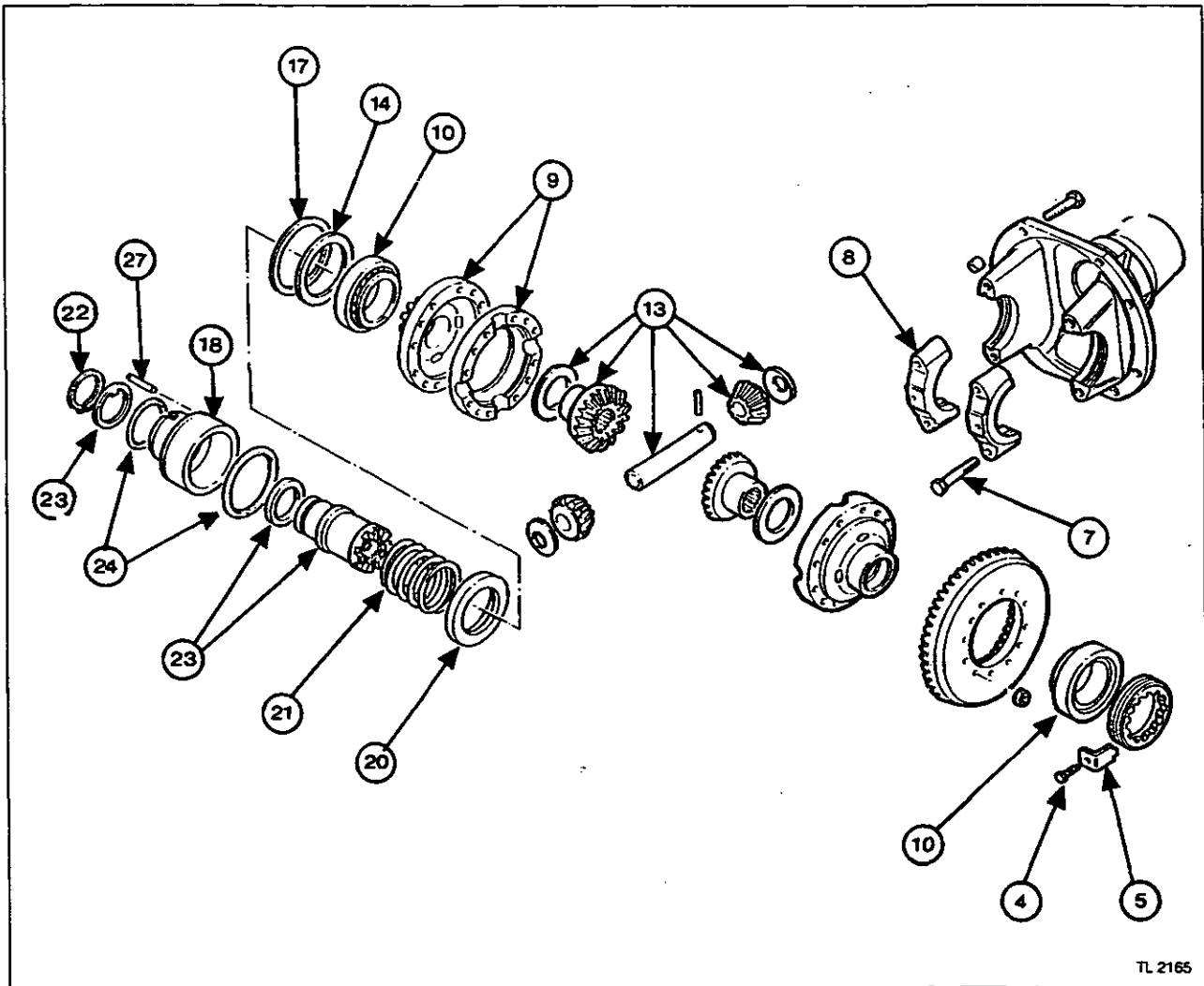
1. Remove the differential assembly, see operation 10D-11.
2. Hold the differential assembly in the jaws of a vice.
3. Mark the end caps and casting to aid reassembly.
4. Remove the securing bolts.
5. Remove the locking tabs.
6. Unscrew the bearing adjustment ring nut.
7. Remove the cap bolts.
8. Remove the end caps.
9. Lift the differential assembly out of the casing.
10. Remove the bearing cups.
11. Mark the two halves of the differential case and the crownwheel to aid reassembly.
12. Place the crownwheel and differential unit in the vice and remove the eight nuts and bolts.
13. Split the differential case and remove the differential gears, cross and thrust washers.



WARNING: Spring under compression, use special tool MF.471 to prevent injury.

14. Remove the bearing shims and retain for reassembly.
15. Fit the Hydralock Spring Compressor MF.471. Carefully centralize the two washers.
16. Tighten the spring compressor until the spring tension has been taken off the retaining ring.
17. Remove the retaining ring.
18. Slide the hydralock assembly out of the housing. It may need a tap with a hammer if the seals are tight.
19. Dismantle the hydralock unit by loosening and then removing the spring compressor.
20. Remove the spring guide plate.
21. Remove the coil spring.
22. Remove the circlip.
23. Remove the piston and two thrust washers.
24. Remove the two seals from the housing.





Examination

Thoroughly clean and inspect all components. Any parts showing signs of wear or damage must be renewed. Renew all 'O' rings, seals and circlips.

Reassembly

25. Reassemble the piston and coupler with the two thrust washers and circlip.
26. Fit two new seals into the housing ensuring that they are both correctly positioned and well lubricated.
27. Tap the piston and coupler assembly into the housing ensuring that it locates on the internal peg.
28. Refit the spring, guide plate and special tool MF.471.
29. Tighten the spring compressor until the retaining clip can be inserted into its groove.
30. Slowly release the spring compressor and remove it.
31. Refit the removed shims.

Crownwheel and differential

32. Refit or renew the taper roller bearing cones if they have been removed.
33. Refit the differential gears, cross and thrust washers to the case.

34. Align the previously made marks on the case and the crownwheel if the original wheel is being re-used. Refit the eight bolts, apply Massey Ferguson Studlock (Loctite 270) to the threads and tighten to a torque of 86 Nm (63 lbf ft).

35. Refit the bearing cups and refit the crownwheel and differential assembly. The crownwheel is mounted on the left side of the differential.

36. Refit the bearing caps and lightly tighten the bolts.

Bearing pre-load

37. Tighten the adjuster ring to take up the backlash between the taper roller bearings.
38. Finally, turn the adjuster ring a further three notches until the slot is aligned with the locking plate to apply the correct pre-load.

FRONT AXLE (NARROW) – 4 WHEEL DRIVE**Crownwheel and pinion backlash**

39. With a dial indicator gauge check the backlash between the crownwheel and the pinion. Fit the indicator gauge as shown in the illustration, the clearance should be:

AG 65 axle - from 0,13 to 0,18 mm (0.005 to 0.007 in).

AG 66 axle - from 0,15 to 0,20 mm (0.006 to 0.008 in).

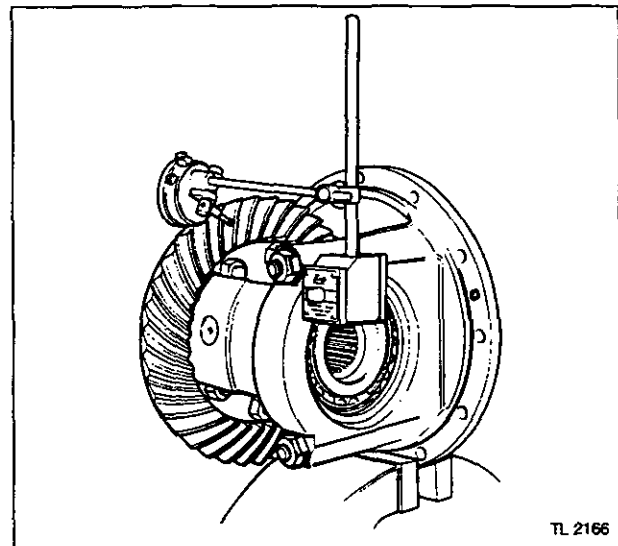
40. If the reading is too high or too low it will be necessary to remove the crownwheel and differential assembly and adjust the thickness of the shim pack in the right-hand bearing. Reduce the thickness of the shim pack if the clearance is too high, add if the clearance is low. Shims are available in the following sizes:

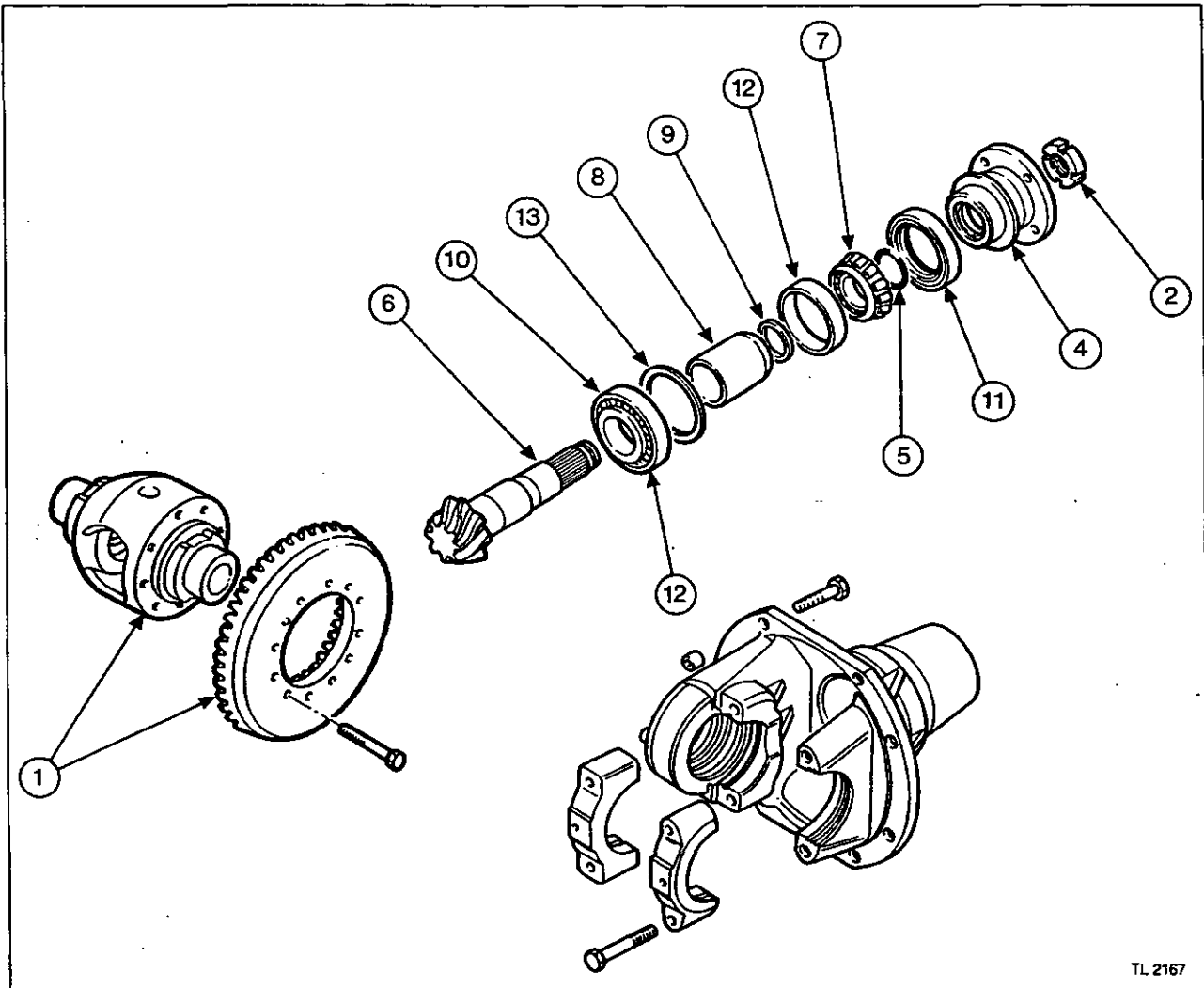
Part number	Thickness	
	mm	inch
3427 747 M1	0,10	0.004
3427 748 M1	0,15	0.006
3427 749 M1	0,30	0.012
3427 750 M1	0,50	0.020
3427 751 M1	0,70	0.028
3427 752 M1	1,00	0.040

Check the thickness of the pack with a micrometer.

Both types of differential

41. When the setting is correct remove each cap bolt in turn and apply Massey Ferguson Studlock (Loctite 270) to the thread. Tighten the bolts to a torque of 140 Nm (103 lbf ft).
42. Replace the locking tab, apply Massey Ferguson Studlock (Loctite 270) and tighten the bolt to a torque of 21 Nm (15 lbf ft).
43. Check the rotation of the crownwheel and pinion to ensure satisfactory operation.
44. Refit the differential unit to the axle casing.





Crownwheel and Pinion

Overhaul

10D-13

Special tools:

MF.480 Pinion Nut Wrench

FT.4062A Pinion Pre-load Gauge

Disassembly

1. Remove and dismantle the crownwheel and differential assembly, see operation 10D-12.
2. With a narrow cold chisel and hammer carefully unstack the pinion nut securing it to the pinion shaft.
3. Using special tool MF.480 Pinion Nut Wrench, remove the pinion nut.
4. Remove the drive coupling.
5. Remove the 'O' ring and discard.
6. With the aid of a soft faced hammer or press remove the pinion with bearings from the case.
7. Remove the outer bearing cone.
8. Remove the spacer.
9. Remove the bearing pre-load shims and retain for reassembly.

10. Remove the inner bearing cone with a bearing separator plate and press.

11. Remove the oil seal.

12. Remove the inner and outer bearing cups.

13. Remove the pinion depth of mesh shims.

Examination

Thoroughly clean and inspect all components. Any parts showing signs of wear or damage must be renewed. Renew all 'O' rings, seals and circlips. Ensure that all parts are free from dents or damage.

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

Reassembly

The crownwheel and pinion are only available as a matched set.

If the crownwheel and pinion are not to be replaced the following instructions on setting the pinion may be disregarded. The two sets of shims must be retained for reassembly.

It is necessary to carry out a series of measurements and calculations and procedures to establish the exact position of the pinion in relation to the crownwheel and the pinion bearing pre-load. It is recommended that you work in the metric system for ease of calculation.

Pinion settings – depth of mesh

14. The height of the pinion is adjusted by shims under the taper roller bearing to obtain dimension 'A'. The shims required are calculated in accordance with the following formula:

$$Sp = A - (D \pm R)$$

Sp = Shim thickness.

A = Actual dimension from centre line of crownwheel to the top of the taper roller bearing without shims.

D = Nominal dimension of 91 mm.

R = Actual tolerance of dimension 'D' etched on the bevel pinion. This value may be a positive (+) or a negative (-) to be added or subtracted from the nominal dimension 'D'.

For the next series of operations you will require a precession depth gauge.

15. Fit the upper taper roller bearing cup and cone into the housing without shims.
16. Place the housing in the vertical position on the bench. Place a straight edge across the bearing cap faces and measure from the top of the straight edge to the top of the bearing. Subtract the width of the straight edge from your reading and record dimension 'A'.
17. Dimension 'D' is a fixed dimension of 91 mm which must always be adhered to.
18. Inspect the end of the pinion and record tolerance 'R', plus or minus.
19. Using the figures you have obtained above and the formula calculate the shim thickness required.

Example:

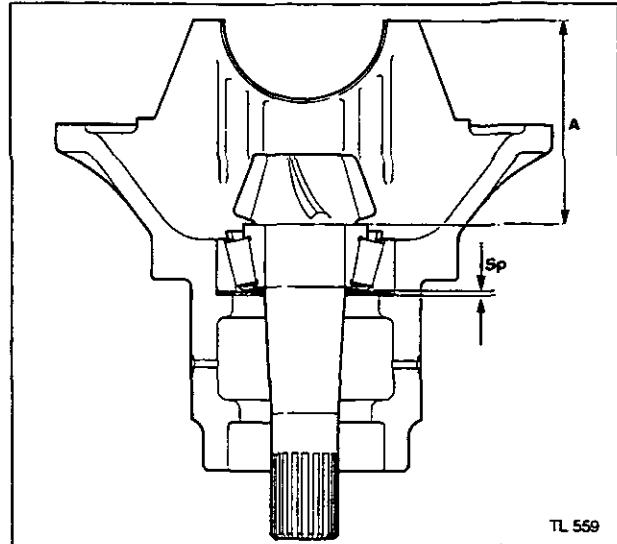
Where A = 91,96 mm (measured).
 D = 91 mm (nominal).
 R = + 0,010 mm (tolerance).

$$Sp = 91,96 \text{ less } (91 \text{ plus } 0,010).$$

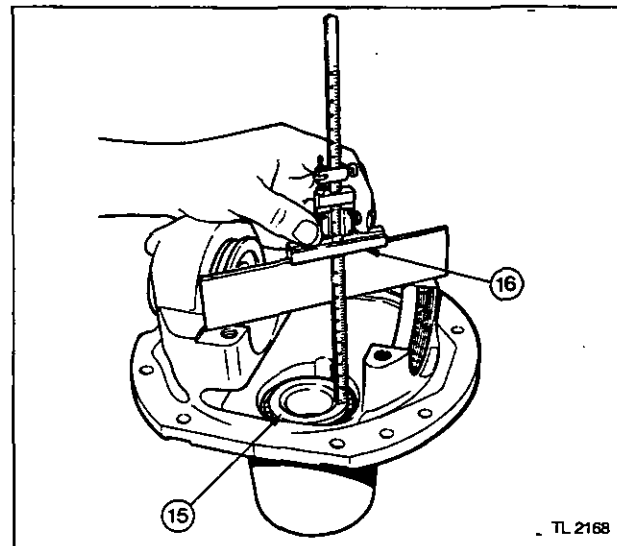
$$Sp = 0,95 \text{ mm.}$$

Shims required:- 1 x 0,15, 1 x 0,3 and 1 x 0,5.

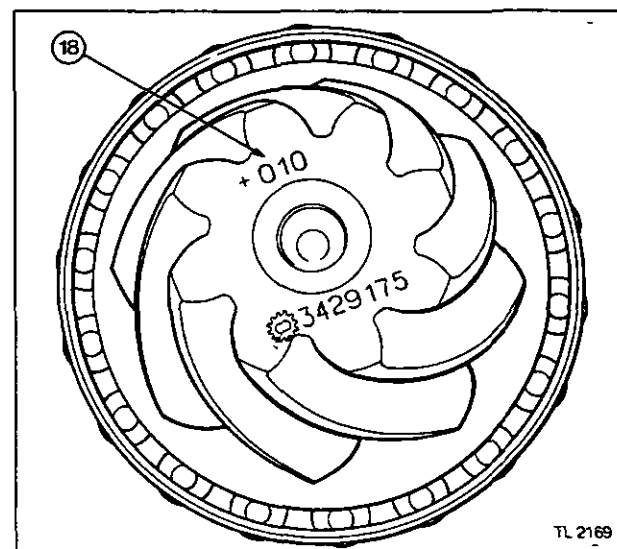
Check the thickness of the pack with a micrometer. It may be necessary to round-off to the nearest value that can be made into a shim pack. Select the higher value if new bearings are being fitted. Shims are available in the following sizes:



TL 559



TL 2168



TL 2169

10D-28

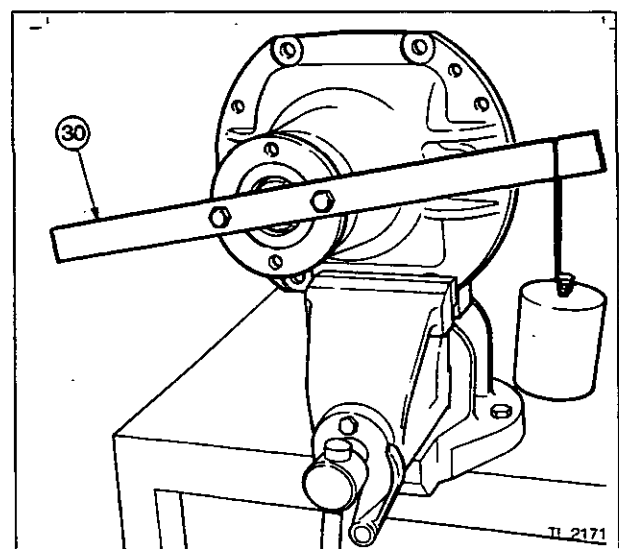
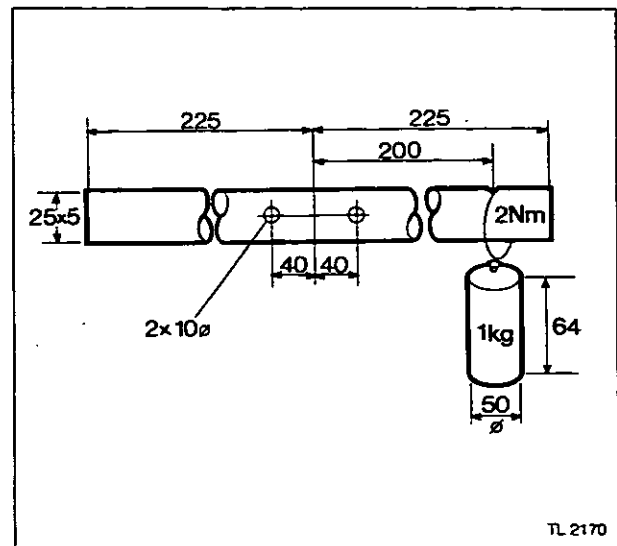
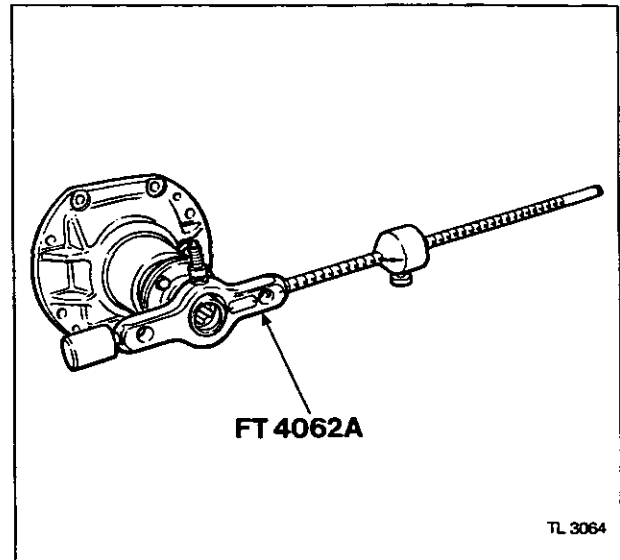
FRONT AXLE (NARROW) – 4 WHEEL DRIVE

Part number	Thickness	
	mm	inch
3428 722 M1	0,10	0.004
3428 723 M1	0,15	0.006
3428 724 M1	0,30	0.012
3428 725 M1	0,50	0.020
3428 726 M1	0,70	0.028
3428 727 M1	1,00	0.040

20. Remove the bearing, place the shim pack into the housing and fit the inner taper roller bearing cup.
21. Fit the outer taper roller bearing.
22. Press the inner taper roller bearing cone on to the pinion.
23. Replace the bearing spacer with the chamfered end facing the drive coupling.
24. Replace the shims that were removed on disassembly as a starting point, then the bearing cone, coupling and a new nut. DO NOT fit the oil seal.
25. Tighten the nut dry to a torque of 238 Nm (175 lbf ft). Tap the pinion in both directions to ensure that the bearings are fully seated.
26. Lightly lubricate the bearings.

Pinion bearing pre-load

27. It is now necessary to set the taper roller bearing pre-load by selecting the correct shims to be placed between the spacer and outer bearing. The correct rotational torque is 2 Nm (1.5 lbf ft). This can be determined by using special service tool FT.4062A or making a special gauge as shown in the illustration.
28. Special service tool FT.4062A is calibrated in pounds force inches (lbf in.). Moving the 2 lb weight to the 18 in. mark on the rod represents 2 Nm.
29. Alternatively, select a length of flat bar and cut off 450 mm. Drill two 10 mm diameter holes 80 mm apart in the centre of the bar. Cut a notch 200 mm from the centre in the top of the bar. Obtain a weight of 1 kg, if this is not available, cut a 63 mm length of 50 mm diameter steel bar and attach a length of cord to the top.
30. Attach special tool FT.4062A, or bolt the tool you have made to the drive coupling with two bolts. With the bar horizontal hang the weight from the notch, this is equal to a rotational torque of 2 Nm.
31. The setting is correct when you touch the weight end of the bar or tool and it slowly rotates from the horizontal to the vertical position.

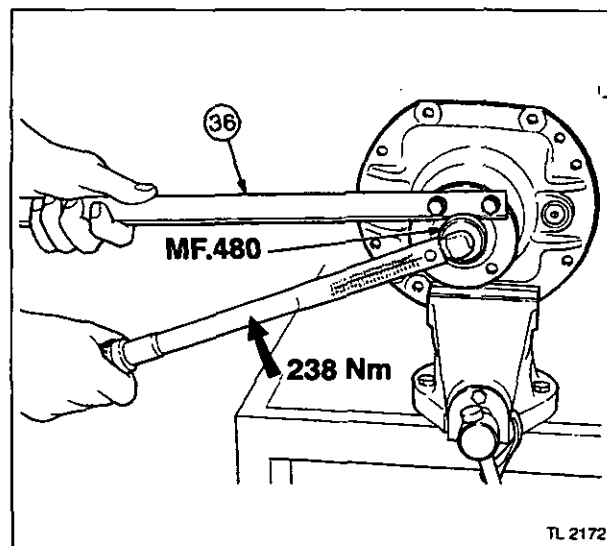


FRONT AXLE (NARROW) – 4 WHEEL DRIVE

To obtain this condition it may be necessary to adjust the shim thickness several times. Shims are available in the following thicknesses:

Part number	Thickness	
	mm	inch
3428 253 M1	0,10	0.004
3428 254 M1	0,15	0.006
3428 255 M1	0,30	0.012
3428 256 M1	0,50	0.020
3428 257 M1	0,70	0.028
3428 258 M1	1,00	0.040

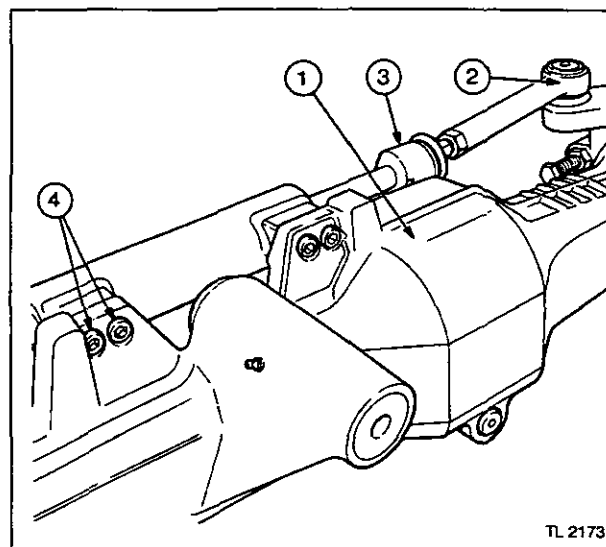
32. Renew the oil seal using the special tool described in section 10D-15.
33. Renew the shaft 'O' ring.
34. Apply general purpose grease to the cavity of the oil seal.
35. Replace the drive coupling.
36. Replace the pinion nut. Make up a suitable holding tool and tighten the nut to a torque of 238 Nm (175 lbf ft) using special tool MF.480.
37. With the aid of a hammer and punch, drive the lip of the nut into two opposite slots on the shaft to lock it.
38. Replace the crownwheel and differential assembly setting the clearance as described in operation 10D-12.
39. Rebuild the axle and refit to the tractor.

**Steering Ram****Removal and Refitment 10D-14****Removal.**

1. Remove the front axle assembly, see operation 10D-03.
2. Remove the split pins and disconnect both steering ball joints.
3. Holding the ends of the steering ram piston rod with a spanner unscrew both track rods.
4. Remove the four hexagon cap screws (8 mm hexagon wrench will be required) and the steering ram.

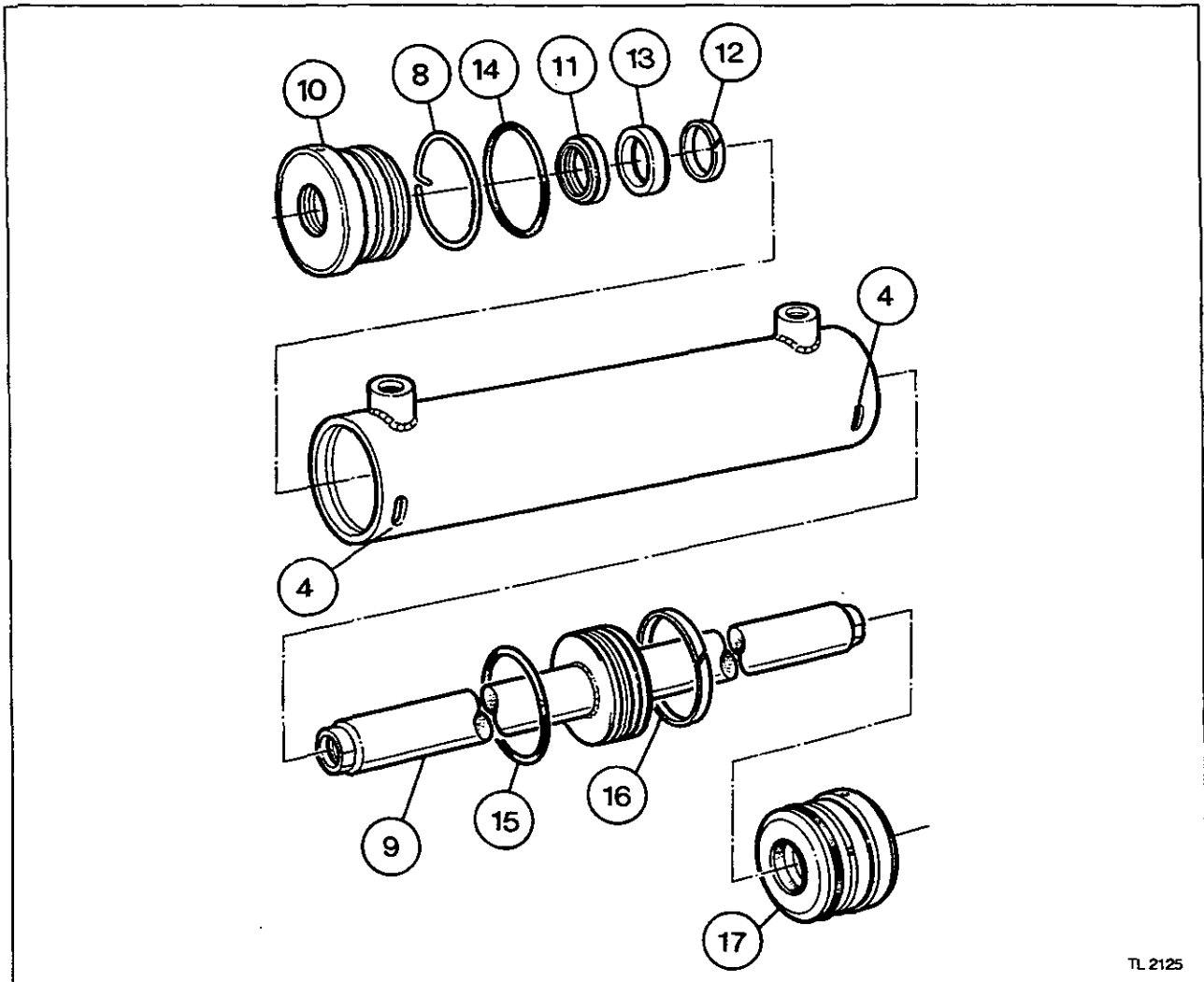
Refitment

5. Reverse procedure except:
 - a. Apply Massey Ferguson studlock (Loctite 270) to the threads and tighten the four cap screws to a torque of 118 Nm (87 lbf ft)
 - b. Tighten the steering rod ball joints to a torque of 135 Nm (100 lbf ft).
 - c. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 103 Nm (76 lbf ft). Then tighten further as required to align the nut for the split pin (maximum torque 130 Nm (96 lbf ft)). Renew the split pin.
 - d. Check the wheel alignment, see operation 10D-01.
 - e. Use new split pins when refitting the steering ball joints.



10D-30

FRONT AXLE (NARROW) – 4 WHEEL DRIVE



TL 2125

Steering Ram

Overhaul

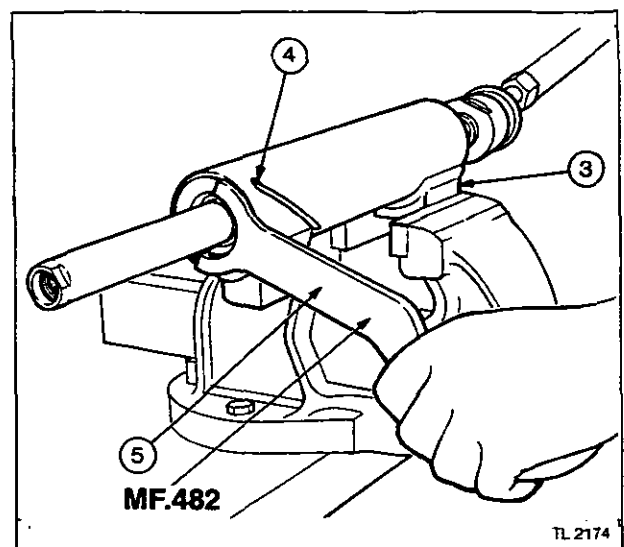
10D-15

Special tools:

MF.482 Steering Ram Wrench

Disassembly

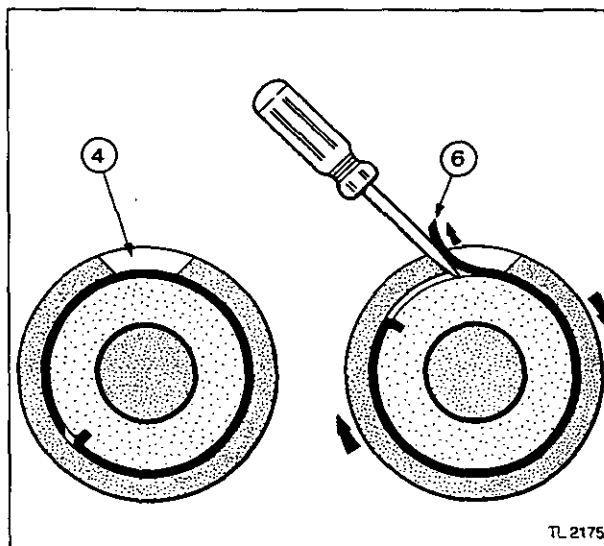
1. Remove the steering ram, see operation 10D-14.
2. Remove any sealing plugs and drain out any oil in the ram cylinder by moving the piston from one end of the cylinder to the other. Hold the cylinder over a container during this operation.
3. Hold the ram cylinder in a vice by one of the mounting bosses.
4. Remove the sealing compound in the elongated holes at each end of the cylinder.
5. Using special tool MF.482 Steering Ram Wrench, engage the small end of the wrench in the two slots in the cap. Rotate the cap until the chamfered end of the retaining wire can be seen in the elongated hole.



TL 2174

FRONT AXLE (NARROW) – 4 WHEEL DRIVE

6. With the aid of a screwdriver, turn the end cap and prise the end of the wire up out of the hole.
7. Continue turning the cap and wind the rest of the wire out through the hole.
8. The end of the wire has a right angle bend which locates in a hole in the groove of the end cap, remove the wire from the ram cylinder.
9. Withdraw the piston assembly from the ram cylinder with the end cap.
10. Remove the end cap.
11. Remove the wiper seal.
12. Remove the wear ring.
13. Remove the pressure seal.
14. Remove the 'O' ring.
15. Remove the piston seal.
16. Remove the piston wear ring.
17. Remove the end cap from the other end of the ram cylinder following procedures 5 to 14.



TL 2175

Examination

Clean and inspect all parts, renew any that are worn or damaged. Renew all seats, wear rings and 'O' rings.

Reassembly

18. Fit a new set of seals in one of the end caps and lubricate them with transmission oil.
19. Renew the seal and wear ring on the piston and lubricate.
20. Refit the piston to the ram cylinder and slide the cap down into the cylinder.
21. Using special tool MF.482 Steering Ram Wrench, rotate the end cap until the hole in the wire groove is visible through the hole in the side of the ram cylinder.
22. Insert a new wire so that the bent end locates in the hole in the end cap. Ensure that the two grooves in the ram cylinder and end cap are in line.
23. Rotate the end cap so that it draws the wire round the end cap inside the ram cylinder. Rotate until all the wire is in the cylinder.
24. Seal the elongated hole in the ram cylinder with a non-setting type sealing compound. This sealing operation is important to prevent the ingress of water and the resultant rusting of the end cap and retaining wire.
25. Repeat the operations 20 to 24 for the other end cap.
26. Check that the piston rod moves up and down the ram cylinder correctly.
27. Refit the steering ram to the tractor.

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

Section 10 – Part E

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10E-2

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

Specification – front axle

Axle type:-		
365 and 375	AG 75 SD.	
383, 390, 390T, 393 and 396	AG 85 SD.	
398 and 399	AG 105 SD	
Camber angle	1°	
Toe-in	0-5 mm (0-3/16 in).	
Type differential lock:-		
Tractors with auxiliary hydraulic pump	Hydralock	
Tractors without auxiliary hydraulic pump	Autolock	
Axle reduction ratio:-		
Crownwheel and pinion	No. of teeth	Ratio
AG 75 and 85 axle	9 x 35	3.88 : 1
AG 105 axle	8 x 36	4.50 : 1
Epicyclic reduction ratio:-		
AG 75, 85 and 105 axle	4.6 : 1	
Overall reduction ratio:-		
AG 75 and 85 axle	17.888 : 1	
AG 105 axle	20.700 : 1	
Pinion setting dimension – all axles	118 ± 0,10 mm.	
Pinion bearing pre-load	2-4 Nm (1.5-3 lbf ft).	
Differential bearing pre-load	With zero end float tighten bearing nut three notches.	
Crownwheel and pinion back-lash:-		
AG 75, 85 and 105 axle	0,18-0,23 mm (0.005-0.007 in).	
Swivel pin pre-load	0,15-0,25 mm (0.006-0.010 in).	
Oil capacity:-		
Hub each side:-		
AG 75	1 litre (1.8 pt) (1.8 US pt)	
AG 85	1 litre (1.8 pt) (1.8 US pt)	
AG 105	1,2 litre (2 pt) (2 US pt)	
Axle:-		
AG 75	5,6 litre (1.2 gal) (1.5 US gal)	
AG 85	5,6 litre (1.2 gal) (1.5 US gal)	
AG 105	7,6 litre (1.7 gal) (2 US gal)	
Special tools:		
MF.195C	Bearing remover/replacer.	
MF.444	Axle pivot pin remover	
MF.451B	Axle swivel pin remover.	
MF.471	Hydralock spring compressor.	
MF.486	Pinion nut wrench.	
MF.482	Steering ram wrench.	
MF.487	Hub nut wrench.	
MF.485	Pivot pin seal installer.	
MF.488	Four-wheel drive hub puller.	
MF.494	Hub seal installer.	
MF.497	Wear ring installer.	
MF.498	Planetary ring gear replacer.	
FT.4062A	Pinion pre-load gauge.	
Bolt torques:		
Track rod lock-nuts	135 Nm (100 lbf ft).	
Steering cylinder ball joints	135 Nm (100 lbf ft).	
Ball joint nuts	125 Nm (90 lbf ft) max torque 160 Nm (118 lbf ft)	
Wheel nuts	270 Nm (200 lbf ft).	
Planetary carrier cap screws	80 Nm (60 lbf ft).	
Hub retaining nuts	425 Nm (315 lbf ft).	
Pivot pin cap bolts	130 Nm (95 lbf ft).	
Pinion nut	380 Nm (280 lbf ft).	
Differential case bolts	135 Nm (100 lbf ft).	
Crownwheel bolts	85 Nm (65 lbf ft).	
Differential bearing cap bolts	120 Nm (90 lbf ft).	
Steering ram cap screws	190 Nm (140 lbf ft).	
Bearing lock tab bolt	20 Nm (15 lbf ft)	

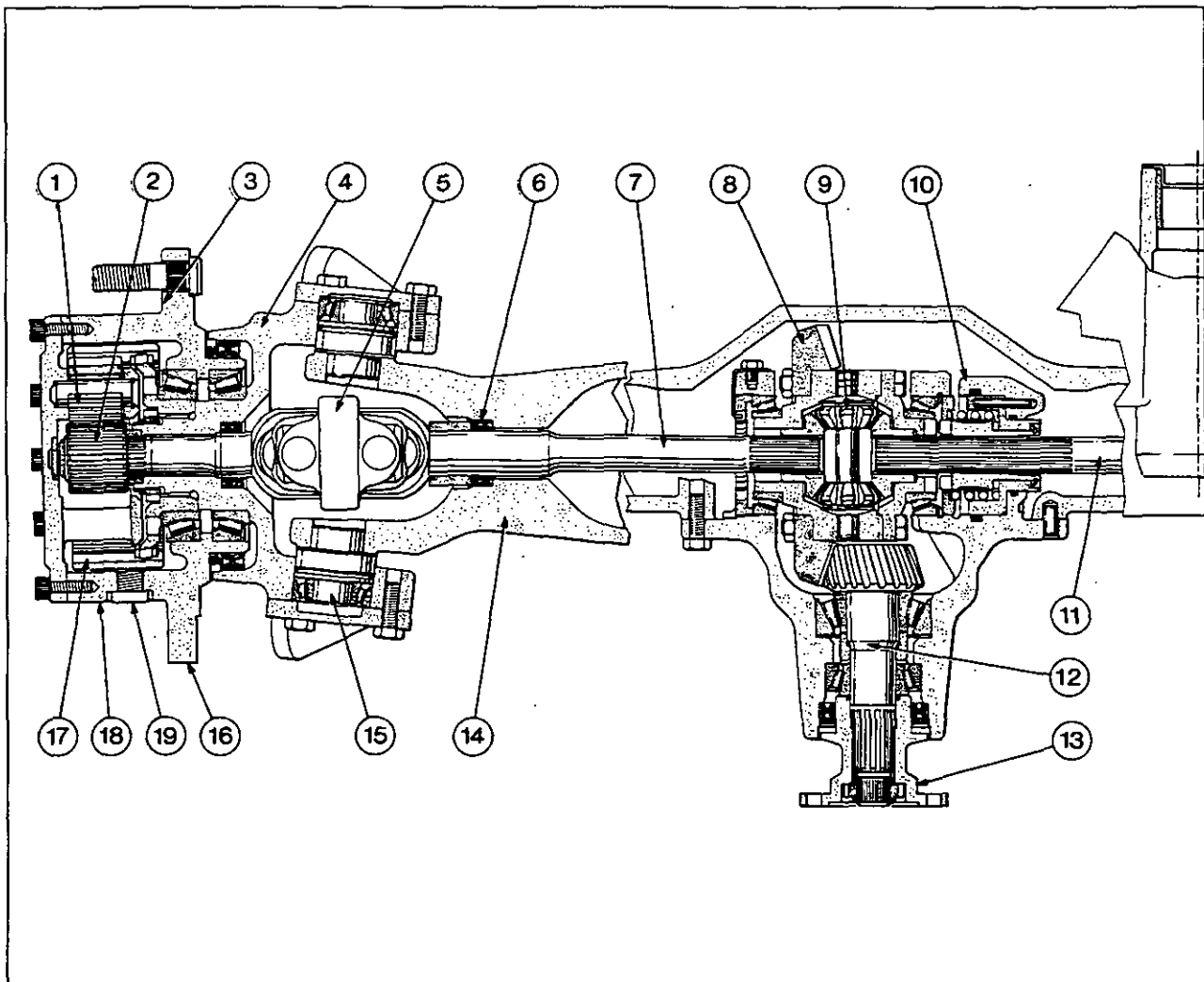
FRONT AXLE (AG SERIES) - 4 WHEEL DRIVE

Fig.1 Four Wheel Drive Hydralock Front Axle

TL 2515

- | | | | |
|---------------------|-----------------------------|---------------------|----------------------------|
| 1. Planetary gears. | 6. Oil seal. | 11. Drive shaft. | 16. Wheel hub. |
| 2. Sun gear. | 7. Drive shaft. | 12. Pinion. | 17. Ring gear. |
| 3. Wheel studs. | 8. Crownwheel. | 13. Drive coupling. | 18. Planetary carrier. |
| 4. Pivot housing. | 9. Differential unit. | 14. Axle housing. | 19. Oil filler/drain plug. |
| 5. Universal joint. | 10. Hydralock differential. | 15. Pivot pin. | |

General Description

The Massey Ferguson AG Series of front four-wheel drive front axles (Fig.1) were introduced in November 1994. The front axle is driven by a drive shaft along the left-hand side of the tractor from a transfer gearbox bolted between the gearbox and centre housing, or from a pod bolted to the side of the Range Change Unit in the case of 12 Speed Shuttle and 18 Speedshift gearboxes. The transfer gearbox or pod contains the reduction gears and clutch to control the engagement and disengagement of the front axle.

The front axle has the crownwheel and pinion and differential mounted on the left-hand side of the axle to align with the drive shaft making it a Side-Drive (SD) arrangement. The drive is taken through a standard crownwheel and pinion and differential arrangement. The crownwheel is mounted on the left-hand side of the differential. The differential contains a cross with four differential bevel gears, these mesh with two side bevel gears to which the inner ends of the drive shafts are splined.

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

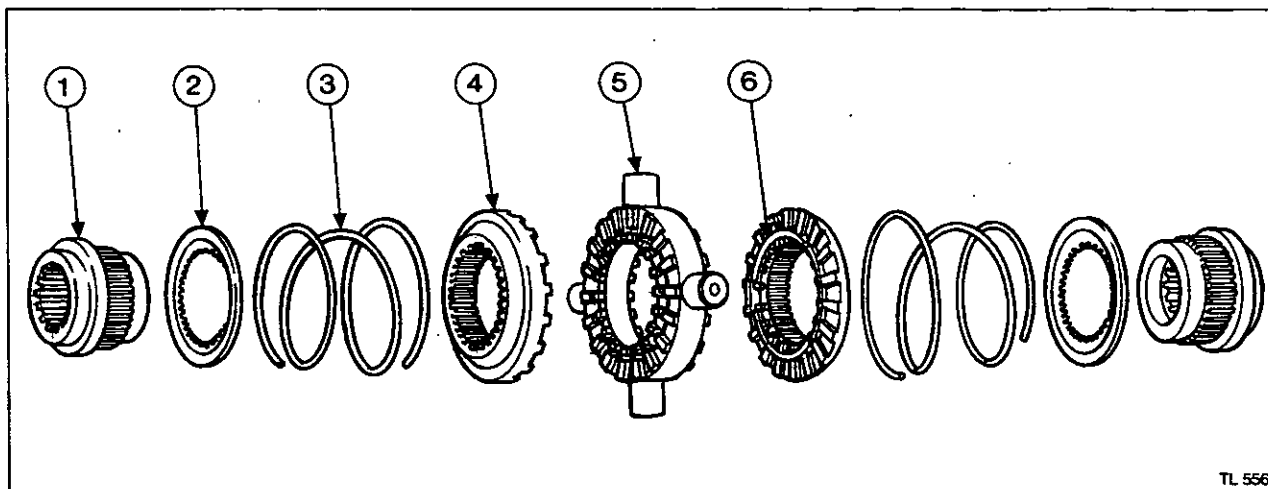


Fig.2 - Autolock (No-Spin) Differential

- | | | |
|--------------|---------------------------|---------------------|
| 1. Gear. | 3. Spring. | 5. Spider assembly. |
| 2. Retainer. | 4. Clutch & holdout ring. | 6. Cam ramps. |

A hydraulic differential lock is fitted, called Hydralock (Fig.3), when the tractor is fitted with an auxiliary hydraulic pump. This provides a method of locking the right-hand drive shaft to the differential case thus rendering the differential action inoperative. The locking mechanism is a simple hydraulic cylinder operating a tooth-type clutch with a spring return. The clutch is operated by hydraulic pressure through a control valve from the tractor hydraulics.

On tractors without an auxiliary pump a mechanical means of locking the front axle is used called Autolock (Fig.2). This is a No-Spin differential which is speed-sensitive and with automatic locking. It consists of left and right-hand driven clutches with square teeth. These teeth mate with similar teeth on the spider, which is clamped in the differential support case by means of four trunnions. Each clutch can slide on its special side gear, on slip-fitting splines. Cam ramps inside the spider assembly and clutch allow a clutch to overrun the spider and disengage itself from the driveline. A spring returns the clutch to engagement with the spider.

When the tractor is operated in a straight forward direction the differential is locked and provides drive to both wheels. If one wheel loses traction momentarily due to a poor tractive surface condition, the opposite wheel continues to drive the tractor until traction is regained by both wheels.

During a turn or when a wheel passes over an obstruction, the outside wheel or the wheel passing over the obstruction must rotate faster than the other wheel. When this occurs the Autolock automatically allows for the difference in wheel speed.

The faster turning wheel will overrun, being ground driven until the two wheels synchronize their respective speeds. At this time the clutch automatically re-engages to a fully locked operating position.

The internal drive shafts transmit the power through double universal joints at the steering pivot to the epicyclic reduction units in the front wheels. The front axle is attached to the front support casting by means of a centre pivot pin in a similar manner to the two-wheel drive axle.

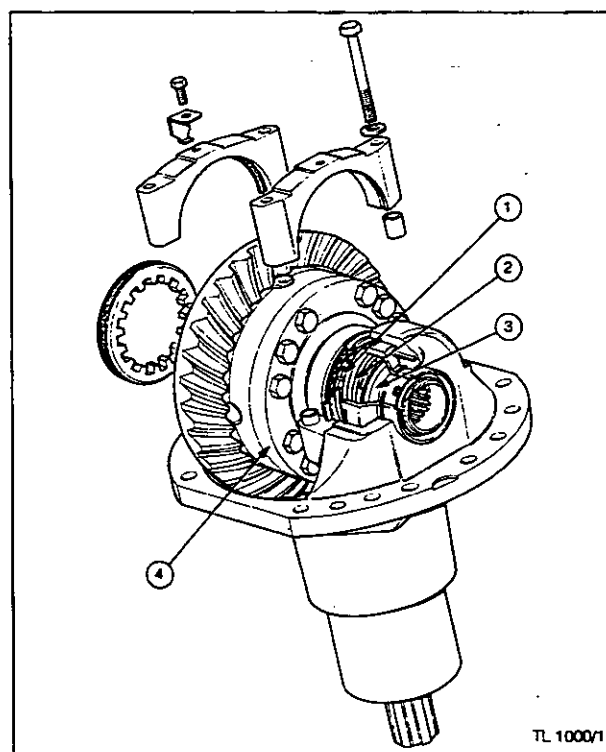


Fig.3 - Hydralock Differential

- | | |
|----------------------|-----------------|
| 1. Tooth type clutch | 3. Piston |
| 2. Return spring | 4. Differential |

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

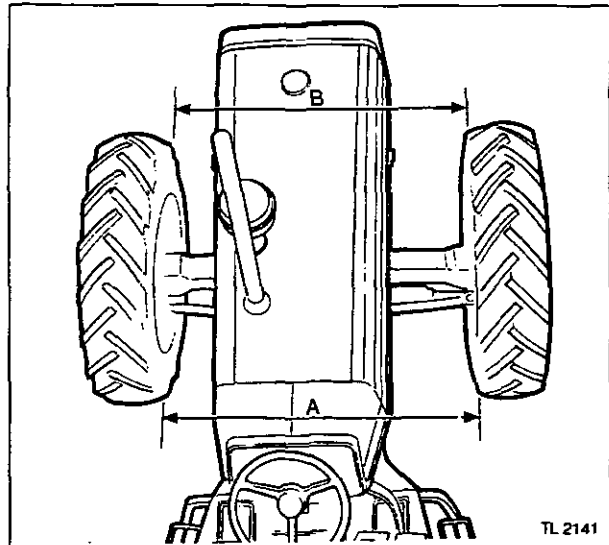
Wheel Alignment and Steering Stops

Adjust 10E-01

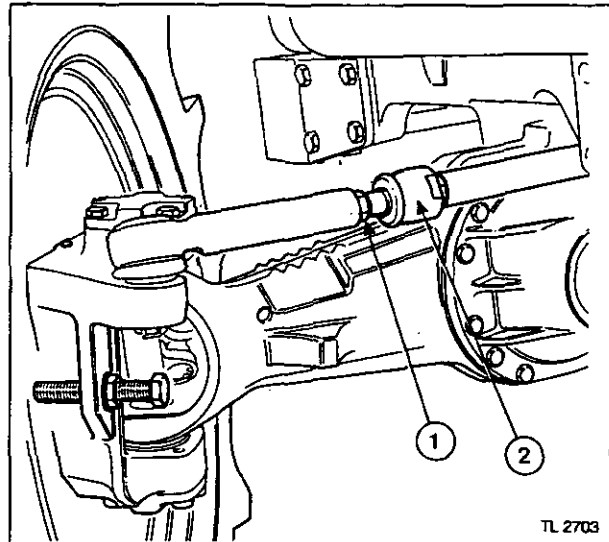
Procedure

Wheel alignment

1. Drive the tractor onto firm level ground and put the front wheels in the straight ahead position.
2. Check the wheel toe-in measured on the centre line of the axle at the wheel rim. Distance 'A' must be 0-5 mm (0-3/16 in) greater than distance 'B'.



3. If adjustment is necessary, slacken the lock-nut (1) on the track rod on one side.
4. Rotate the inner steering ball joint (2) to either increase or decrease the track rod length to obtain the correct setting.
5. Apply Massey Ferguson Studlock (Loctite 270) and tighten the track rod lock-nut to a torque of 135 Nm (100 lbf ft). Ensure that both track rods are the same length.

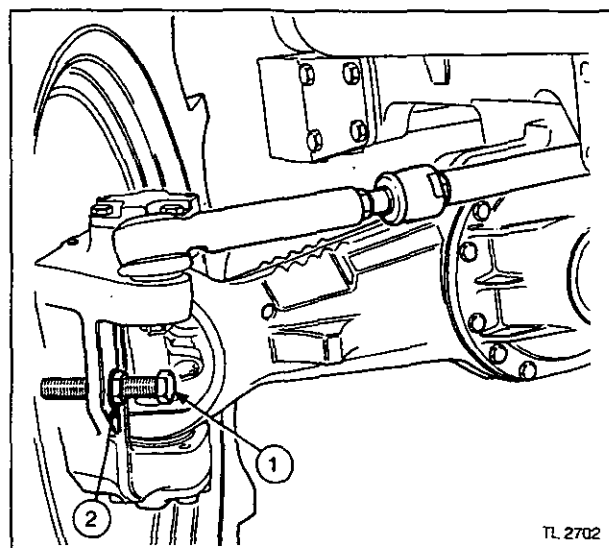


Steering stops



CAUTION: At the smaller track settings, a foul condition may occur between the tyre and tractor or loader, if fitted, when the wheels are turned to the full lock position. To avoid this condition you must check by turning the wheels to full lock and adjusting the steering stops as necessary.

6. Place the jack under the engine sump and raise the tractor enough to allow the axle to swing from one stop to the other.
7. Turn the front wheels to full lock and check that the inside edge of the tyre does not foul the tractor.
8. Carry out the same check on the other lock.
9. If necessary, adjust the length of the steering stops (1) on both sides so that a foul condition will not occur. Tighten the lock-nuts (2) after adjustment.



10E-6

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

Track Rod and Ball Joint

Removal and Refitment 10E-02

Removal

1. Remove the split pin and nut from the ball joint.
2. Remove the ball joint from the housing by using an extractor or by striking the housing with a hammer adjacent to the ball joint to release the taper.
3. Slacken the lock-nut and unscrew the ball joint from the track rod.
4. To remove the inner joint, hold the end of the steering ram piston rod with a spanner and unscrew the joint.

Refitment

5. Reverse procedures 1 to 4 except:
 - a. Ensure that both track rods are the same length.
 - b. Apply Massey Ferguson Studlock (Loctite 270) to the threads of inner joint and screw it into the end of the steering ram piston rod.
 - c. Set the wheel alignment as described in operation 10E-01.
 - d. Tighten the track rod lock-nut to a torque of 135 Nm (100 lbf ft).
 - e. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 125 Nm (90 lbf ft). Then tighten further as required to align the nut for the split pin (maximum torque 160 Nm (118 lbf ft)). Renew the split pin.

Front Axle

Removal and Refitment 10E-03

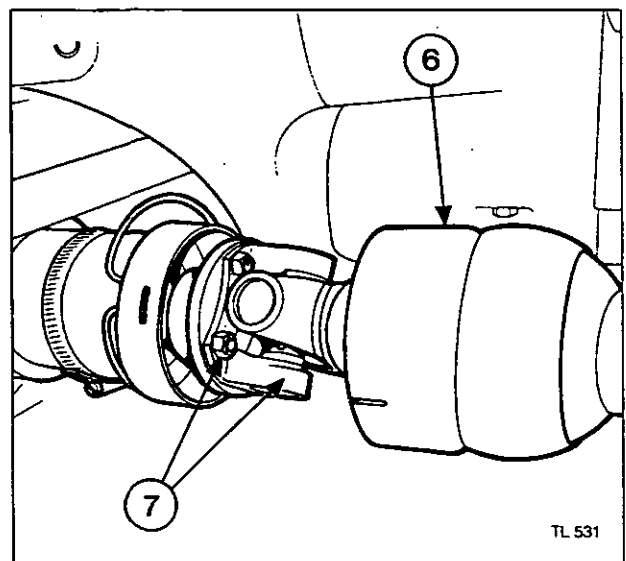
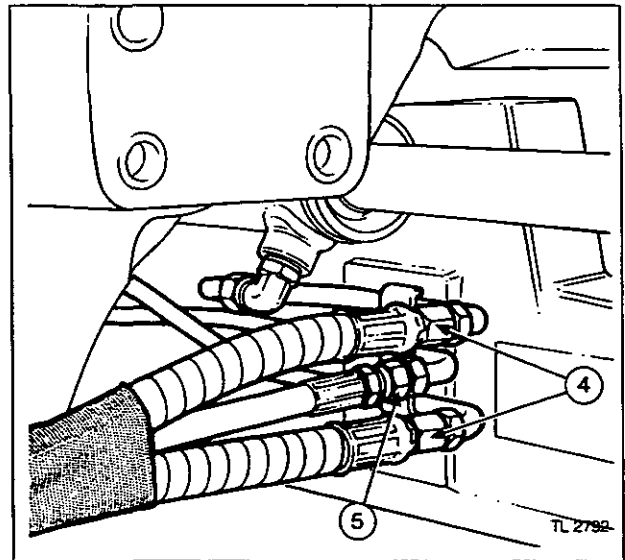
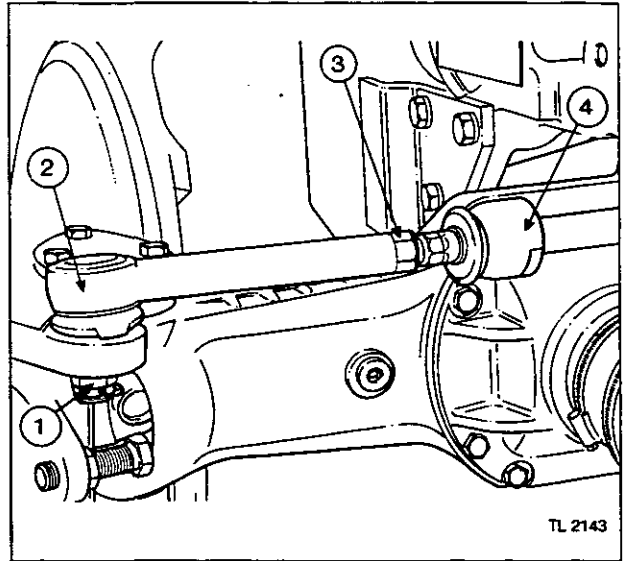
Special tools:

MF.485 Pivot Pin Seal Installer

MF.444 Axle pivot pin remover

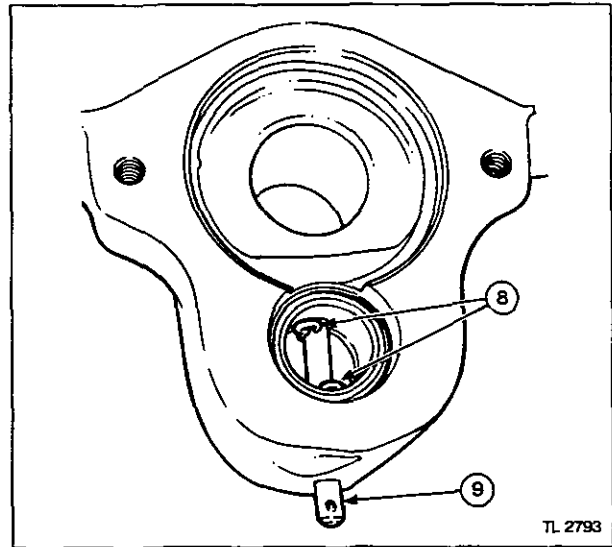
Removal

1. Place a trolley jack under the engine sump and take the weight of the front of the tractor. DO NOT lift the front wheels off the ground.
2. Remove the front weights, if fitted.
3. Remove the front weight frame.
4. Disconnect the steering ram hoses at the cylinder end. Cap the ends of the pipes and hoses to prevent the ingress of dirt.
5. Disconnect the Hydralock pipe, if fitted, and cap the end.
6. Disconnect the front axle drive shaft guard.
7. Disconnect the drive shaft.



FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

8. Remove the two 'R' clips inside the pivot pin.
9. Remove the pivot pin retaining pin.



10. Remove the axle pivot pin. If difficulty is experienced in removal, use special tool MF.444 to extract the pin from the front support.



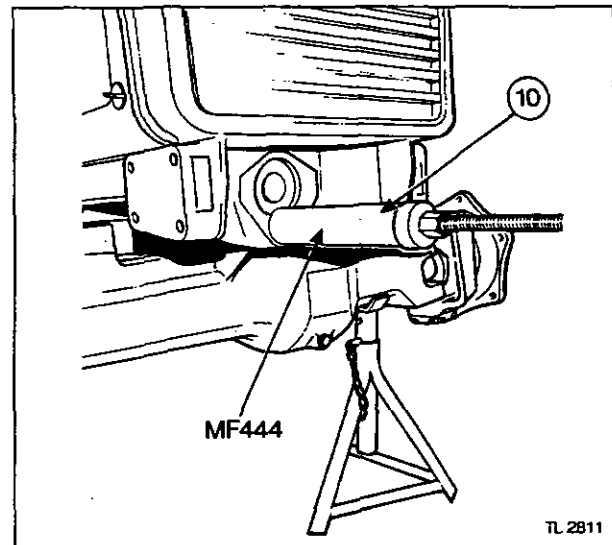
WARNING: Prevent the axle from tilting or rotating about the wheels if the axle is wheeled from under the tractor on its wheels. It could cause injury if precautions are not taken.

11. Jack up the front of the tractor so that the axle can be wheeled out from under the tractor.

or

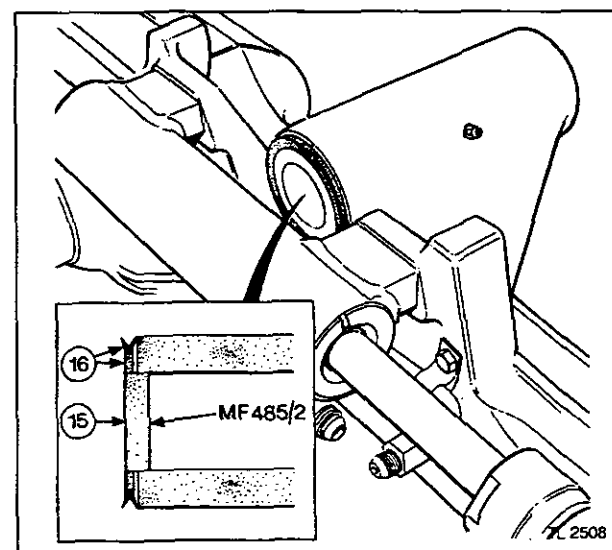
Remove the wheels, and with the aid of a crane, sling the axle on ropes and lift out from under the tractor.

12. Recover the two seals and thrust washers located each side of the axle pivot.
13. Place the axle on two axle stands and remove the wheels.



Refitment

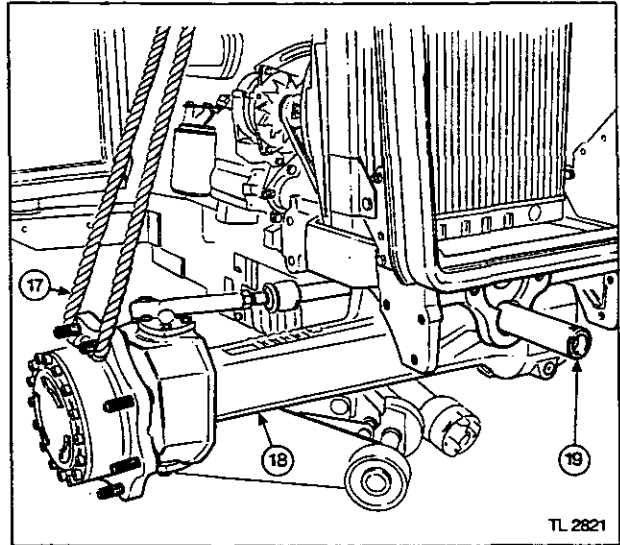
14. The axle pivot pin is fitted with two dirt seals at the front and back between the axle and the support casting.
15. Place the plastic plug supplied with special tool MF.485 into the rear pivot pin hole on the axle. Alternatively, one can be made from plastic bar or tube 47 mm (1.7/8 in) diameter x approximately 8 mm (5/16 in) long. Position the plug so that it protrudes a sufficient amount to support the rear seal and washer.
16. Place on the plug the inner steel washer and one of the seals. Apply a coating of grease to hold the seal and washer in place against the face of the axle. Do not have the plug protruding beyond the washer.



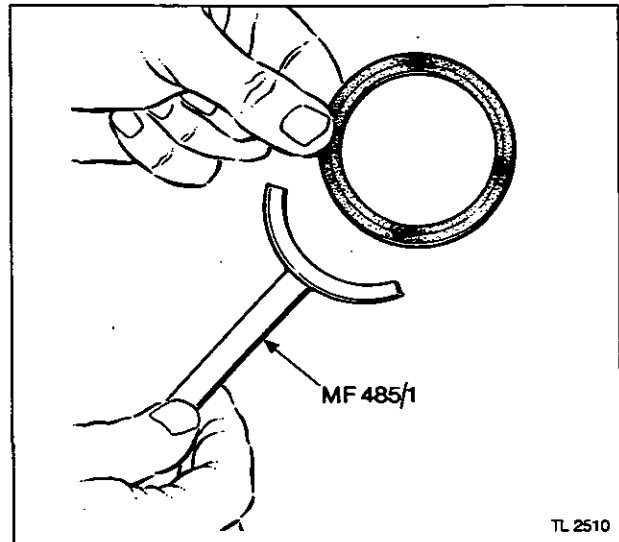
10E-8

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

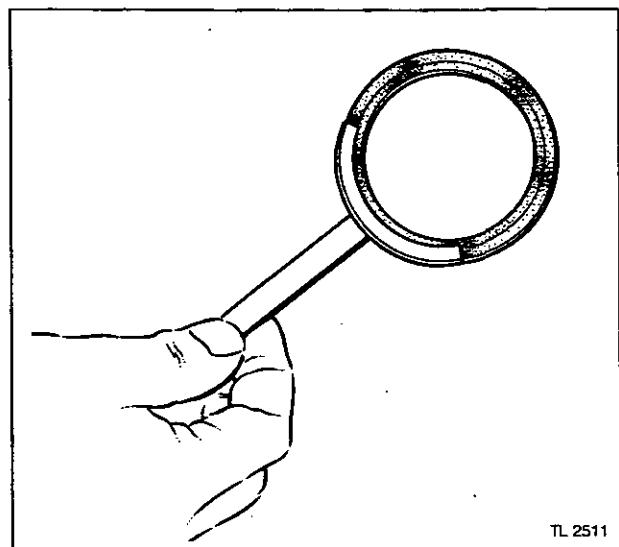
17. With the aid of an overhead crane sling the axle so that it is horizontal in both directions. Place the axle under the front support casting.
18. Carefully lift the front axle up into position under the tractor. DO NOT damage or move the seal assembly fitted to the rear pivot pin hole.
19. Align the pivot pin hole. Part fit the pivot pin as shown in the illustration. DO NOT push the pivot pin right in.



20. Take the second seal and assembly tool MF.485 Pivot Pin Seal Installer.

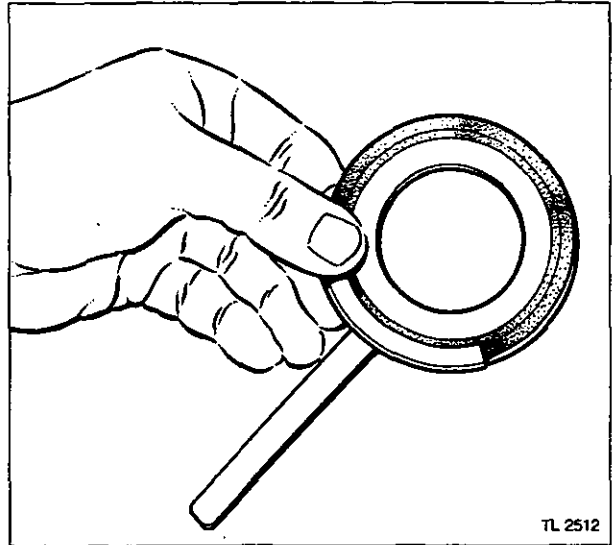


21. Squeeze the lips of the seal together and carefully fit it into the groove in the seal installer.

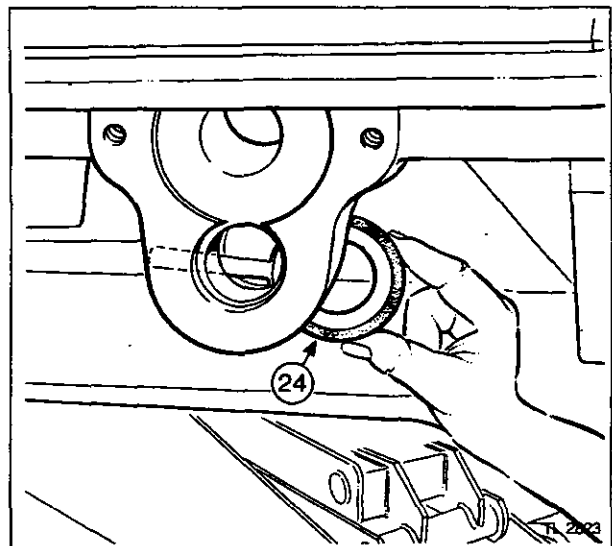


FRONT AXLE (AG SERIES) - 4 WHEEL DRIVE

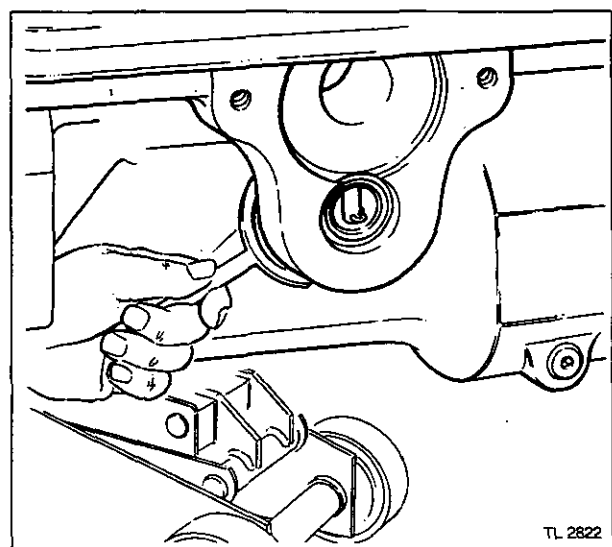
22. Install the steel washer inside the seal holding it in place with a little grease.



23. Holding the axle in place so that it does not move, remove the pivot pin.
24. Slide the seal, washer and tool assembly into position from right to left leading with the handle as shown in the illustration. **DO NOT** use the handle to pull it into place.
25. When the hole in the seal and washer assembly, axle and front support casting are in line, replace the pivot pin.
26. Push the pivot pin right in, this will push out the rear plastic plug used to hold the rear seal assembly in place.



27. When the pivot pin has been installed remove the tool by pulling it away from the seal with the handle.
28. Reverse procedures 1 to 8 except:
- Grease the axle pivot pin.
 - Check steering function to ensure that the hydraulic hoses to the steering ram have been correctly connected up.
 - Check that the steering hoses are correctly routed to prevent chaffing on sharp edges.
 - Check the power steering pump oil level, if fitted to this tractor, and remove air from the system, see operation 11A-04.



10E-10

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

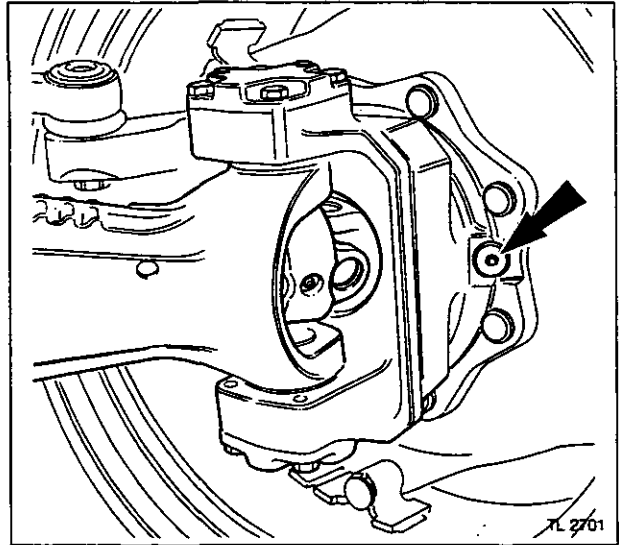
Planetary Carrier

Removal and Refitment

10E-04

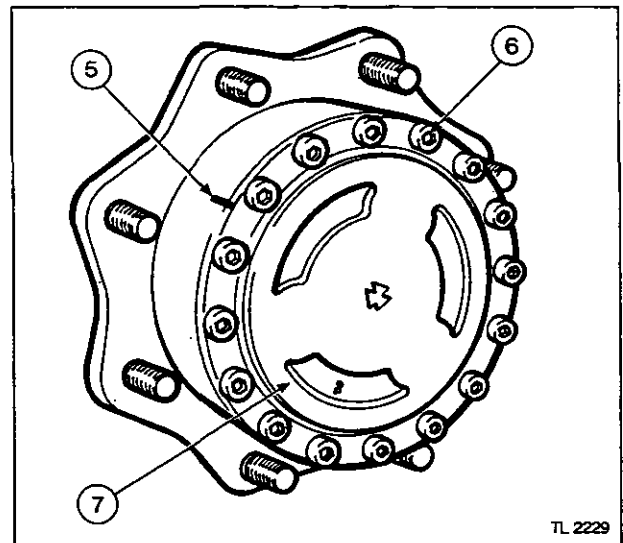
Removal

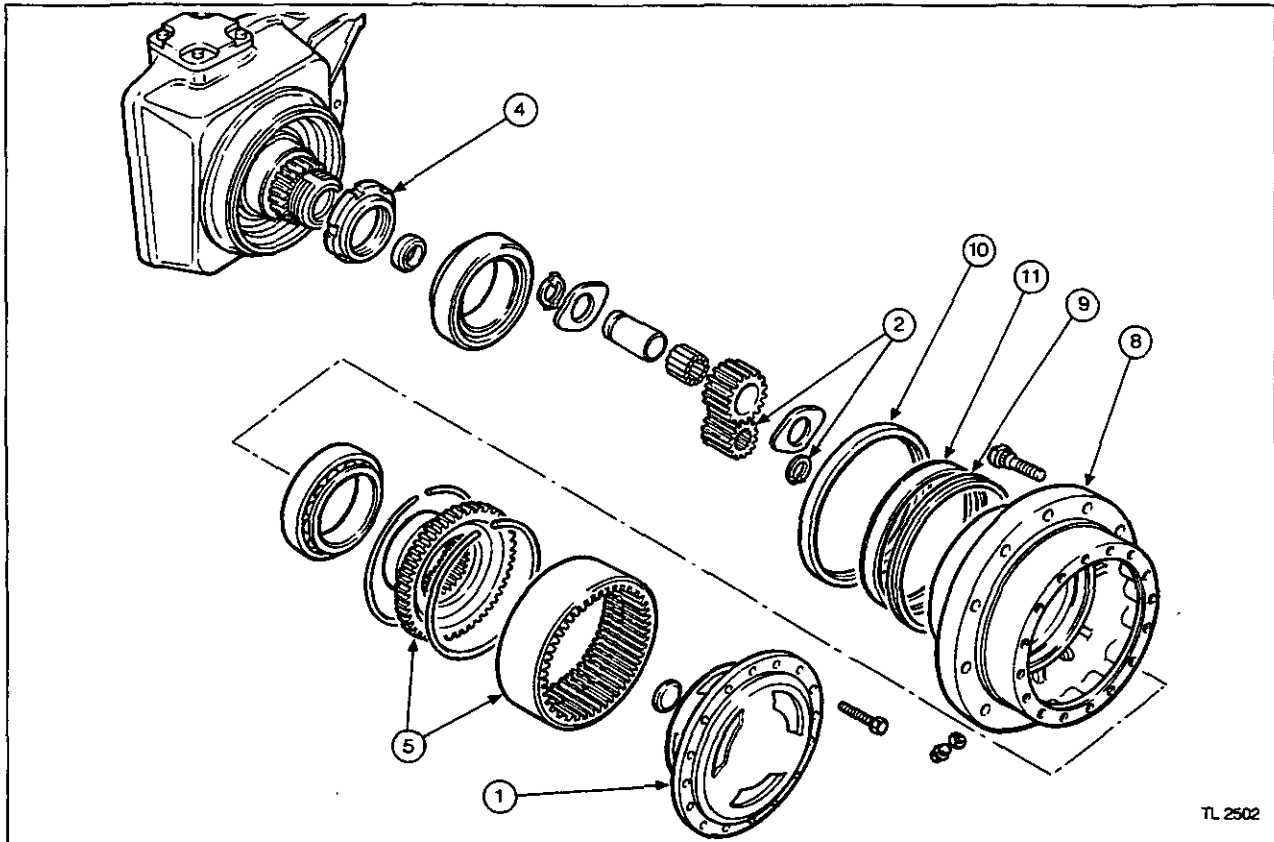
1. Apply the parking brake and secure the rear wheels.
2. Raise the tractor under the side of the axle to be worked on, then support the axle on an axle stand.
3. On all cab tractors, and footstep tractors with hydraulic four-wheel drive engagement, disconnect the drive shaft.
4. Rotate the hub until the plug is at the bottom. Remove the wheel and the plug (8 mm hexagon key will be required) and drain the oil from the hub.
5. Mark the position of the planetary carrier in relation to hub to assist alignment during refitment.
6. Remove the 16 cap screws (8 mm hexagon key will be required) in the cover plate.
7. Remove the planetary cover plate.



Refitment

8. Reverse procedures 1 to 7 except:
 - a. Apply Massey Ferguson Instant Gasket (Loctite 515) to the hub face.
 - b. Apply a light coating of lubricating oil to the planetary carrier bolts or cap screws. Tighten the bolts to a torque of 80 Nm (60 lbf ft).
 - c. Rotate the wheel so that the plug is horizontal. Fill the hub to this level with an approved oil and refit the plug.
 - d. Tighten the wheel nuts to a torque of 270 Nm (200 lbf ft).
 - e. Reconnect the drive shaft.



FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE**Hub Oil Seal****Removal and Refitment**

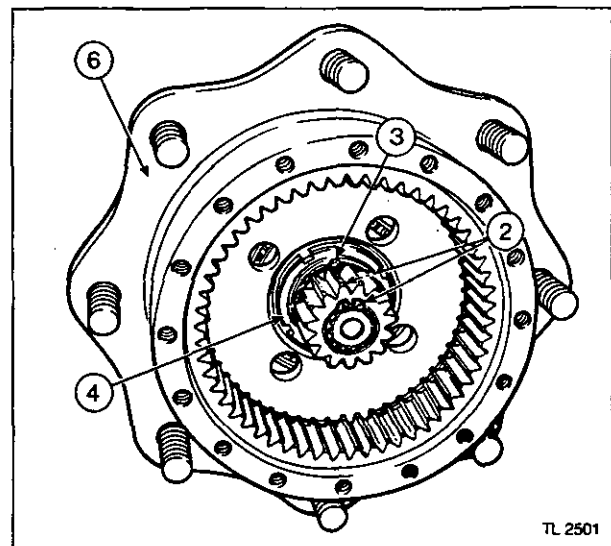
10E-05

Special tools:

MF.487	Hub Nut Wrench
MF.488	Hub Puller
MF.494	Hub Seal Installer
MF.498	Planetary Ring Gear Replacer
MF.497	Wear Ring Installer

Removal

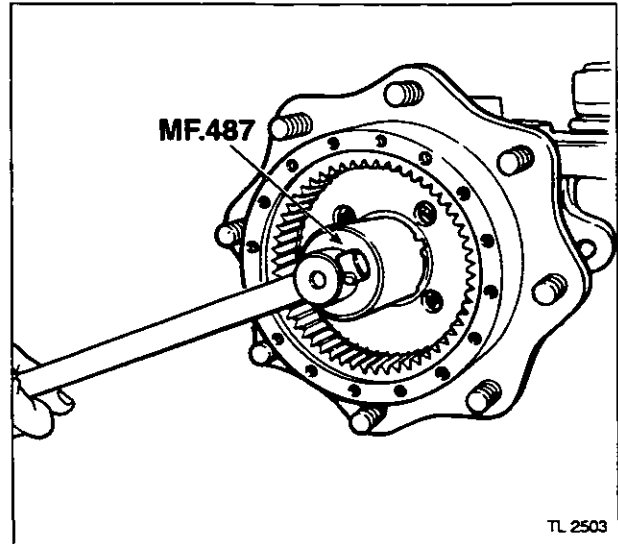
1. Remove the planetary carrier, see operation 10E-04.
2. Remove the circlip and sun gear.
3. With a narrow cold chisel and hammer carefully unstake the hub retaining nut where the lip has been driven down into the slot.



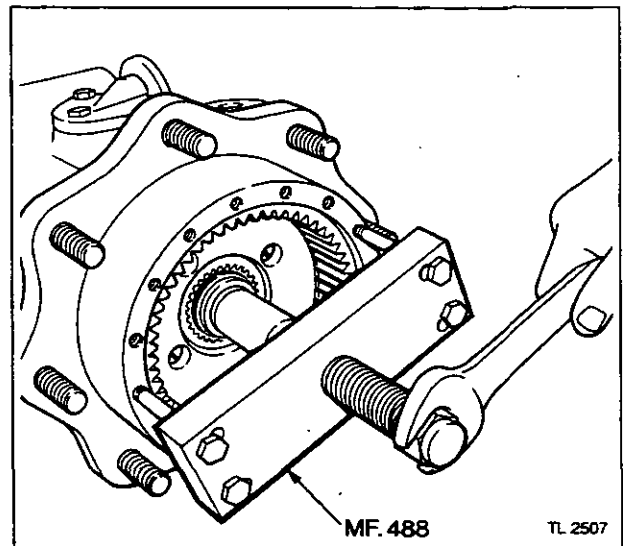
10E-12

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

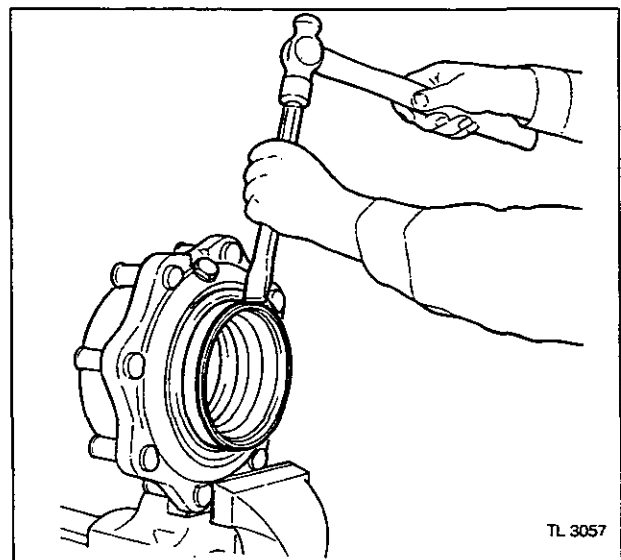
- Using special tool MF.487 Hub Nut Wrench, unscrew the retaining nut.



- With the aid of the special tool MF.488 pull the planetary ring gear and hub.
- Place the cap over the end of the drive shaft. Bolt MF.488 across the face of the hub so that the forcing screw locates in the dimple in the cap. Adjust the length of the bolts so that they are all of equal length.
- Lubricate the forcing screw, then tighten the screw so that the hub and ring gear are drawn off the shaft.
- Remove the wheel hub and ring gear from the tool.
- Remove the dirt seal from the back of the hub.
- With a cold chisel split the large oil seal and remove from the housing. Be careful not to damage the taper roller bearing.

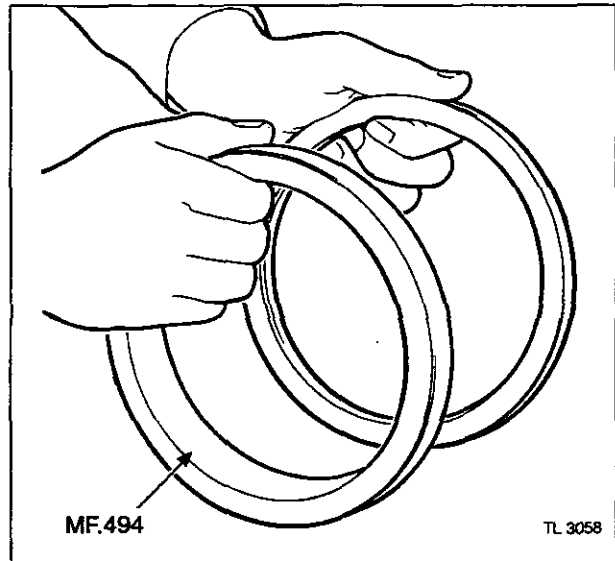


- If necessary, remove the oil seal wear ring. With a cold chisel split the ring on the hub and remove.
- Clean all components for reassembly.

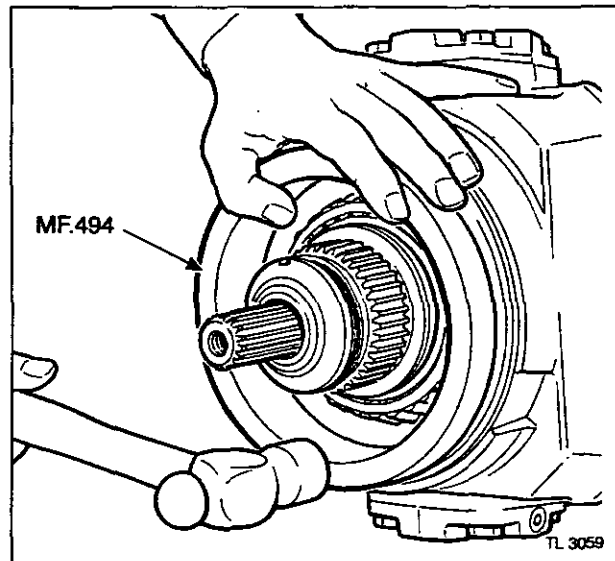


FRONT AXLE (AG SERIES) - 4 WHEEL DRIVE**Refitment**

13. Using special tool MF.494 Hub Seal Installer fit a new oil seal. Place the seal on the tool with the lip facing outwards.



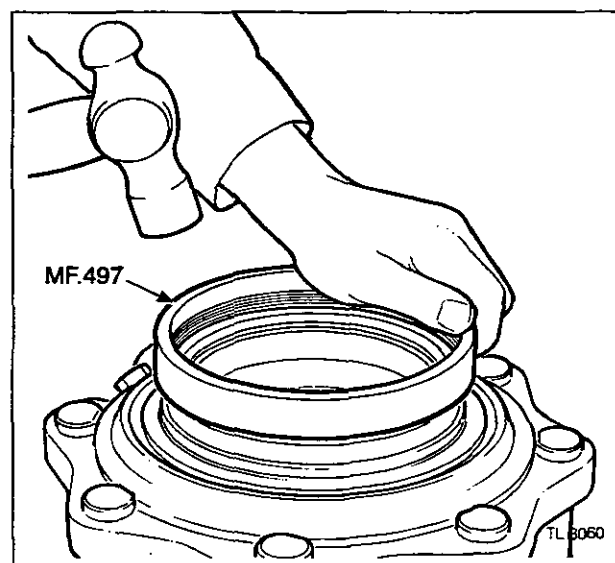
14. Offer the seal and tool assembly up to the swivel housing, with a hammer, gently drive the seal into the housing. Work around the seal driving in a small part at a time until it is fully home.



15. Fit the a new oil seal wear ring using special tool MF.497 Wear Ring Installer and a light hammer. Drive the wear ring down onto the hub using the same method when fitting the oil seal.

NOTE: The radius edge of the wear ring must face outwards.

16. Renew the dirt lip seal on the back of the hub.
17. Fill the space between the dirt seal and the lip seal with general purpose grease. It must be 30 to 50% full. Also apply generous application grease to the lips of the seal.
18. Replace the hub.



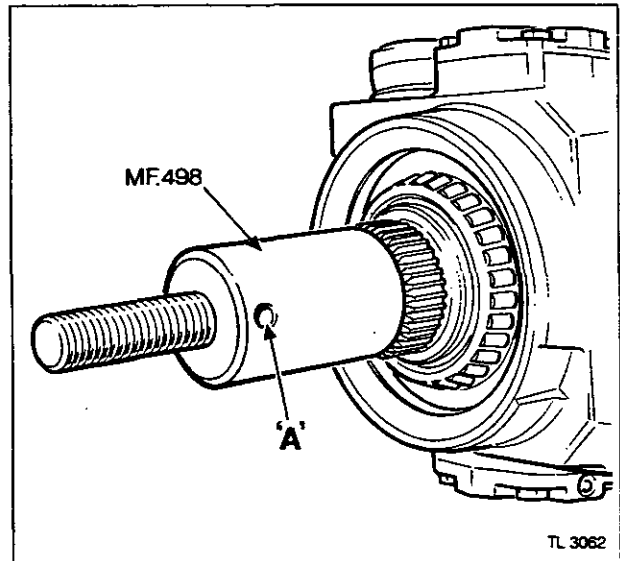
10E-14

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

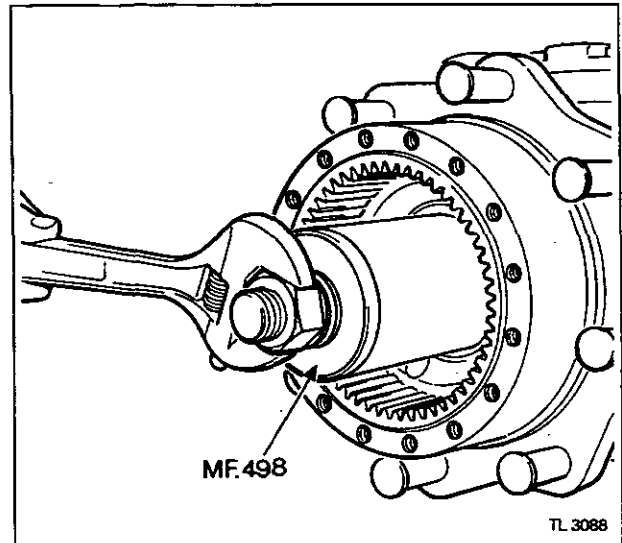
19. Replace the planetary ring gear carrier using special tool MF.498 Planetary Ring Gear Replacer.
20. Screw the main part of the tool onto the thread of the stub axle. DO NOT tighten.
21. Slide the wheel hub and planetary ring gear carrier assembly into position.
22. Push the wheel hub into the oil seal.

IMPORTANT: Lubricate all the threads of the forcing screw.

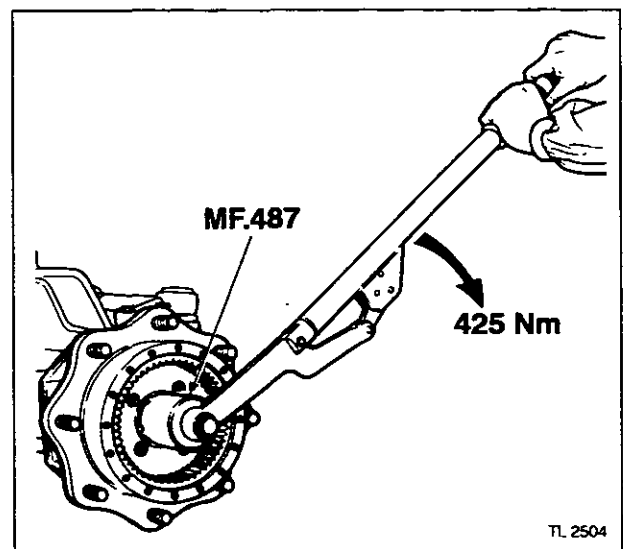
23. Fit the tube, cap, thrust bearing and nut.



24. Locate the splines in the carrier with the spline on the stub shaft.
25. With a 46 mm A/F spanner tighten the forcing nut until the carrier is pressed full home. DO NOT put excessive loads on the tool. Check by turning the hub to determine when the fitting has been completed.
26. Remove the special tool, a 12 mm (1/2 in) diameter hole (A) is provided in the body of the tool to aid in removal.

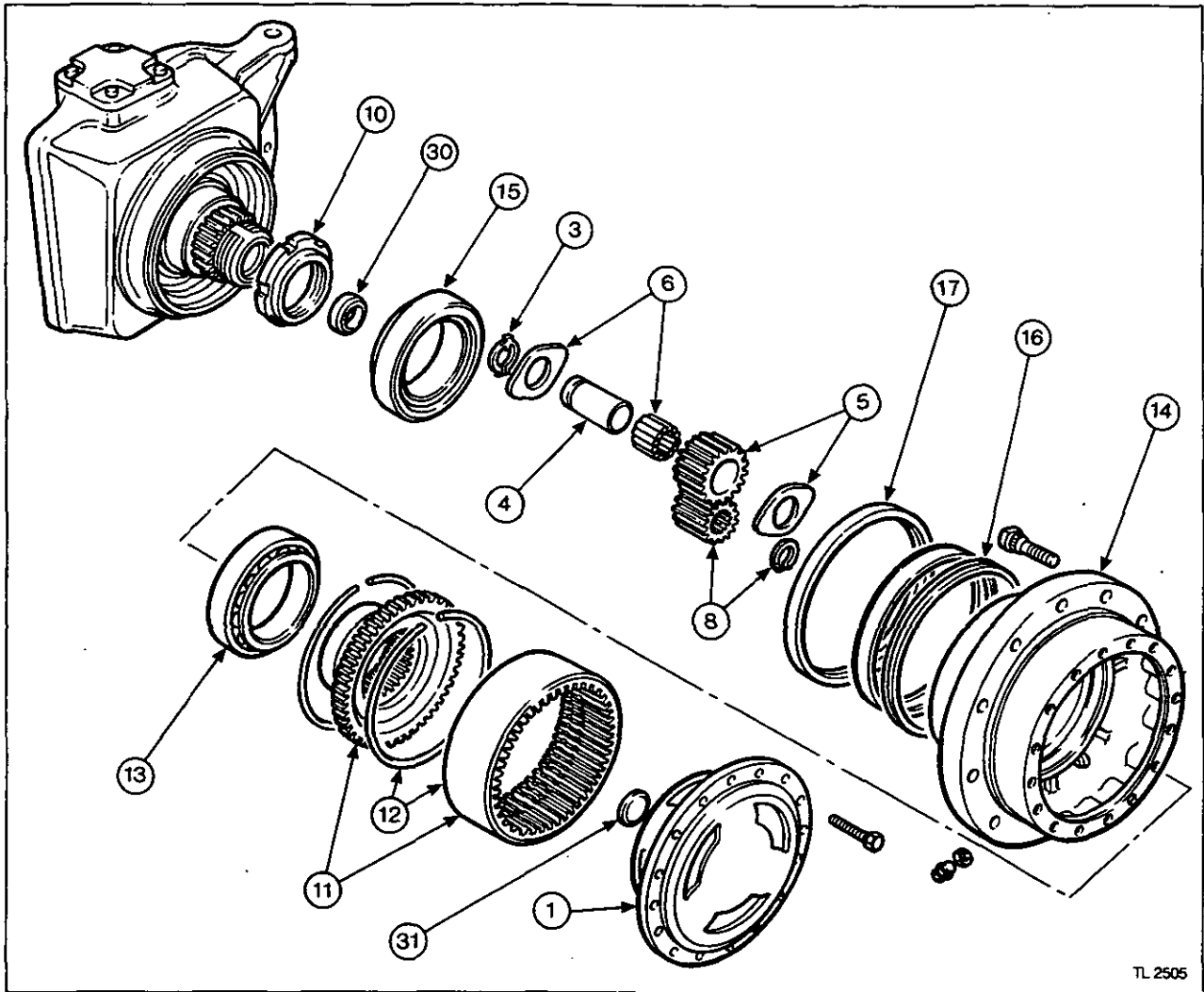


27. Renew the ring gear retaining nut and tighten dry to a torque of 425 Nm (315 lbf ft) using special tool MF.487.
28. Hammer the lip of the nut down into the slot.
29. Replace the sun gear and circlip.
30. Replace the planetary carrier.



10E-15

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE



TL 2505

Planetary Carrier and Hub

Overhaul

10E-06

Special tools:

- MF.487 Hub Nut Wrench
 MF.488 Hub Puller
 MF.497 Planetary Ring Gear Replacer

Disassembly

1. Remove the planetary carrier, see operation 10E-04.
2. Place the planetary carrier in a vice.
3. Remove the circlips.
4. Screw an 8 mm bolt (one of the cover cap screws) into the end of the shaft and withdraw the planetary gear shaft.
5. Carefully remove the planetary gear and thrust washers taking care not to dislodge the needle roller bearings.
6. Remove the needle rollers and thrust washers by emptying them into a clean container.
7. Repeat procedures 3 to 6 for the remaining two planetary gears.
8. Remove the circlip and sun gear.
9. With a narrow cold chisel and hammer carefully unstack the hub retaining nut where the lip has been driven down into the slot.
10. Using special tool MF.487 Hub Nut Wrench, unscrew the retaining nut.
11. With the aid of MF.488 Hub Puller, remove the ring gear and hub from the splined shaft complete with bearing (see operation 10E-05 procedures 5 to 8).
12. If necessary, remove the circlips and the ring gear.
13. Remove the planetary ring gear taper roller bearing cone with a hammer and punch through the holes in the flange.
14. Remove the wheel hub.
15. If necessary, remove the two bearing cones.
16. If necessary, remove the dirt lip seal from the back of the hub.
17. If necessary, remove the large inner seal from the housing.

10E-16

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

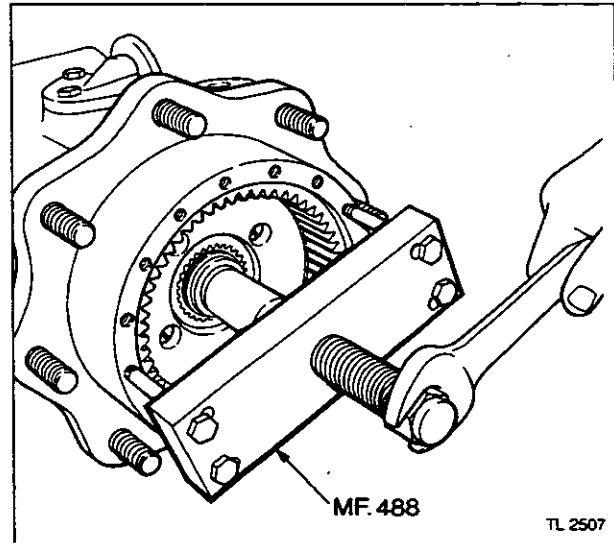
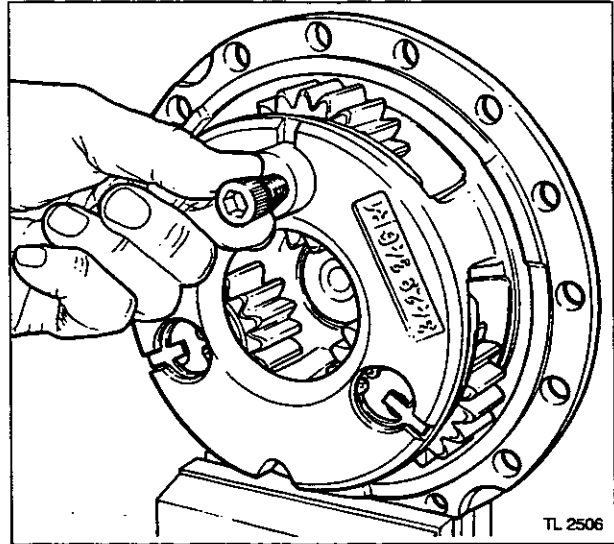
18. Remove the inner bearing cone. If this is necessary the cage will have to be broken, and the rollers removed. To remove the inner track, heat it with a gas torch until it expands and can be removed with a pry bar.

Examination

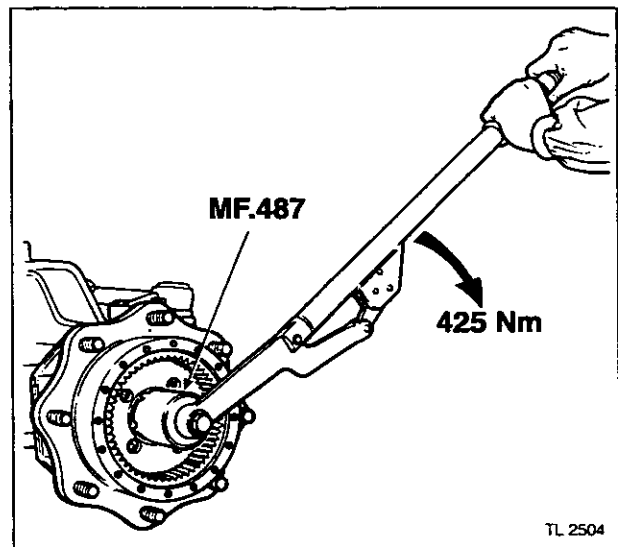
Thoroughly clean and inspect all components and renew any that are worn or damaged. Renew all 'O' rings and seals.

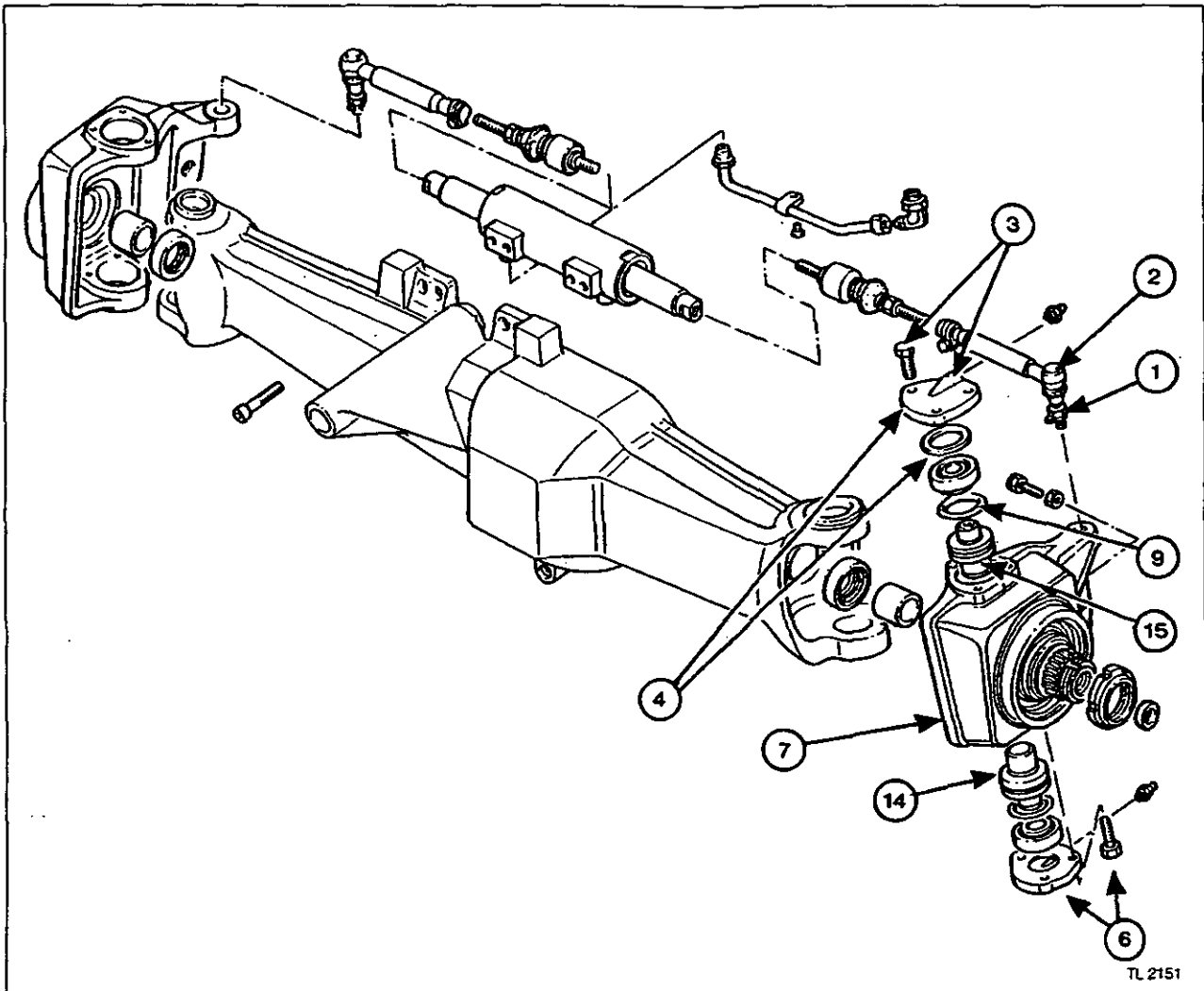
Reassembly

19. Fit the inner taper roller bearing cone.
20. Fit a new lip seal (10) into the housing. See operation 10E-05 procedures 13 and 14.
21. Fit the two taper roller bearing cups to the hub.
22. Renew the dirt lip seal on the back of the hub.
23. Fit the taper roller bearing cone to the planetary ring gear.
24. Reassemble the ring gear, fitting the two circlips and gear.
25. Fill the space between the dirt seal and the lip seal with general purpose grease. It must be 30 to 50% full. Also apply grease to the lips of the seal.
26. Replace the hub.
27. Replace the planetary ring gear. See operation 10E-05 procedures 19 to 25.



28. Renew the ring gear retaining nut and tighten dry to a torque of 425 Nm (315 lbf ft) using special tool MF.487 Hub Nut Wrench.
29. Hammer the lip of the nut down into the slot.
30. If the thrust ring has been removed it is retained in the housing with Massey Ferguson Studlock (Loctite 270).
31. If the drive shaft thrust pad has been removed it is retained in the cover with Massey Ferguson Studlock (Loctite 270).
32. Refit the sun gear and circlip.
33. Reassemble the planet gears. Use petroleum jelly, NOT grease, to hold the needle rollers and thrust washers in place during assembly. Each planetary gear contains 19 needle rollers.
34. Refit the gears to the planetary carrier using new circlips to hold the shafts in place.
35. Refit the planetary carrier.



FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE**Swivel Housing and Pins****Removal and Refitment**

10E-07

Special tools:

MF.195C Bearing Puller - Main Tool

MF.451B Steering Pin Bearing Remover

Removal

1. Remove the split pin and steering ball joint nut.
2. Release the steering ball joint from the housing.
3. Remove the four bolts and the upper cap.
4. Remove the shims and bearing cup.
5. Using special tool MF.195C Bearing Puller - Main Tool and MF.451B Steering Pin Bearing Remover, extract the upper pivot pin. Screw the 14 mm adaptor into the pin and onto the main puller. Remove the pin from the housing.

IMPORTANT: Lubricate all the threads of the forcing screw.

6. Remove the four bolts and cap from the lower bearing and repeat the extraction of the pivot pin.

7. The housing can now be removed from the axle complete with the drive shaft.

8. This operation can now be repeated on the other side if the crownwheel and pinion assembly is to be removed.

Examination

Thoroughly clean and inspect all components and renew any that are worn or damaged. Renew all 'O' rings and seals.

Refitment

9. Renew the seals on the pivot pins.
10. Fit the bearing cones to the pivot pins. DO NOT grease the bearings at this stage.
11. Coat the pivot pins and holes with a light application of grease.

10E-18

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

12. Hold the housing in position and partly fit the upper pivot pin to locate the assembly.
13. Refit the lower pivot pin, bearing cup, cap and bolts. NO shims are fitted to the lower cap.
14. Tighten two opposing bolts evenly and in sequence to pull the lower pivot pin into the housing. Tighten the four bolts to a torque of 130 Nm (95 lbf ft).
15. Fit the upper bearing cup, shims, cap and bolts. Add additional shims to ensure that the pivot pins are seated on the axle casing. Tighten two opposing bolts evenly and in sequence to press the pivot pin into the housing.
16. Check that both pivot pins are fully seated onto the axle casing.
17. Remove the upper cap and shims.
18. Replace the cap and tighten the four bolts to torque of 130 Nm (95 lbf ft).
19. Using a dial indicator gauge and lever as shown in the illustration, determine the end float of the two pivot bearings.

When lifting the housing up and down with the lever ensure that you get the maximum reading on the dial indicator gauge. The correct bearing pre-load is 0,15-0,25 mm (0.006-0.010 in).

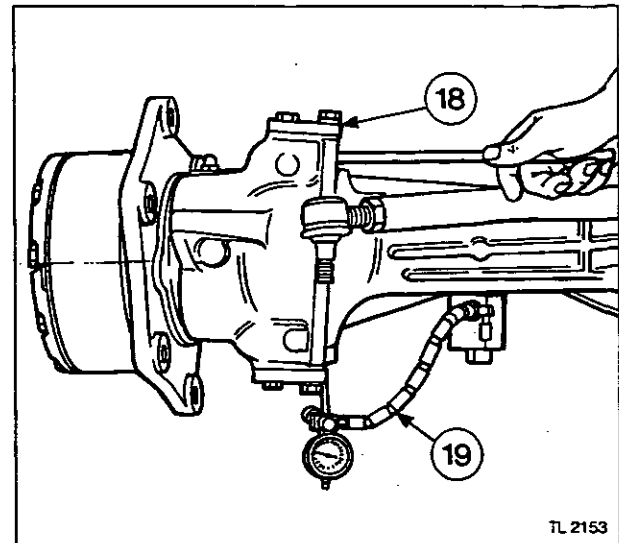
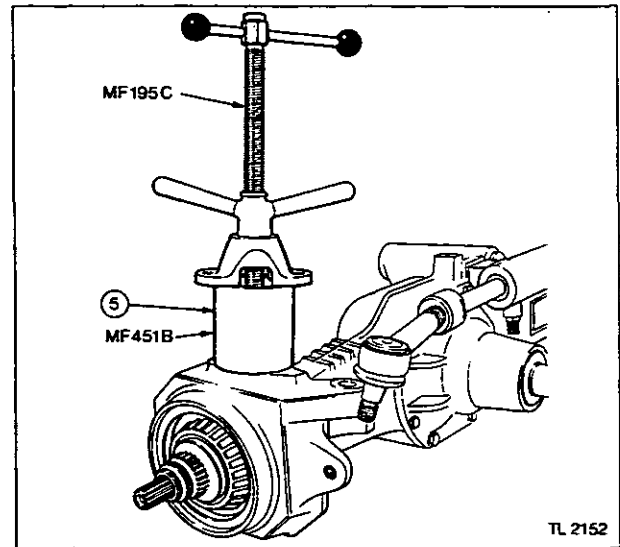
20. Select the required shims by the following method:

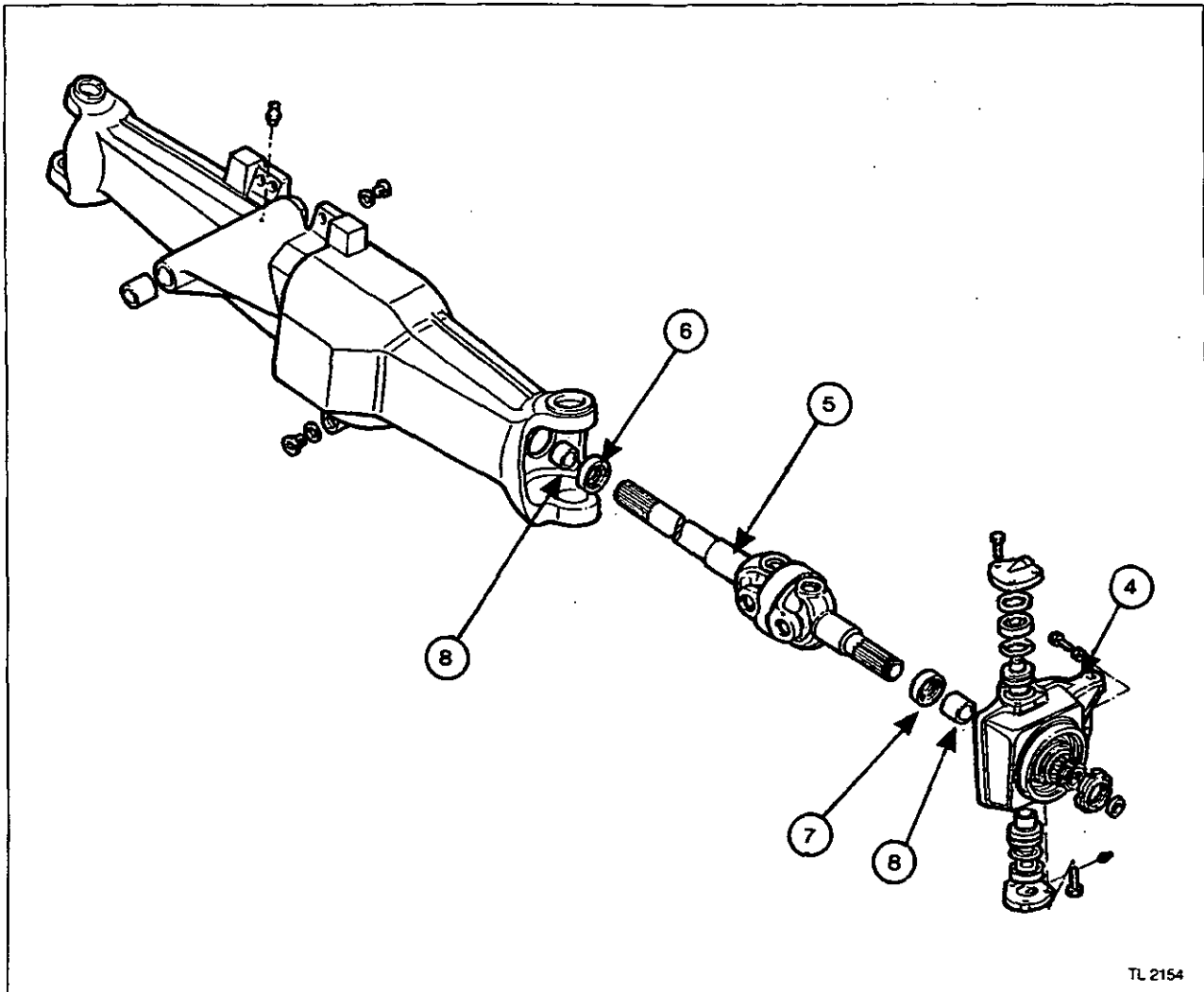
Shims required = End float + Pre-load

Select shims from the following chart:

Part number	Thickness	
	mm	inch
3426 234 M1	0,10	0.004
3426 233 M1	0,15	0.006
3426 232 M1	0,30	0.012
3426 231 M1	0,50	0.020
3426 230 M1	1,00	0.040

21. Remove the upper cap and bearing cup. Fill the bearing with grease, fit the correct number of shims, replace the cap.
22. Apply lubricating oil to the threads of the bolts and tighten to a torque of 130 Nm (95 lbf ft).
23. Remove the lower bearing cap and cup and fill the bearing with grease. Tighten the bolts as described in procedure 22.
24. Grease both bearings with a grease gun to ensure that they are full.
25. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 125 Nm (90 lbf ft). Then tighten further as required to align the nut for the split pin (maximum torque 160 Nm (118 lbf ft)). Renew the split pin.



FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE**Drive Shaft and Oil Seals****Removal and Refitment** 10E-08**Removal**

1. Drain some of the oil from the axle casing.
2. Remove the planetary carrier, see operation 10E-04.
3. Remove the circlip and sun gear.
4. Remove the swivel housing, see operation 10E-07.
5. Remove the drive shaft from axle casing.
6. Lever the seal out of the axle casing.
7. Lever the seal out of the pivot housing.
8. Using an internal bearing puller, extract the bushes in the axle casing and swivel housing.

Examination

Carefully inspect the universal joints in the drive shaft, if there is any sign of wear renew the joints or fit new shafts. Inspect the condition of the drive shaft bushes, renew if necessary.

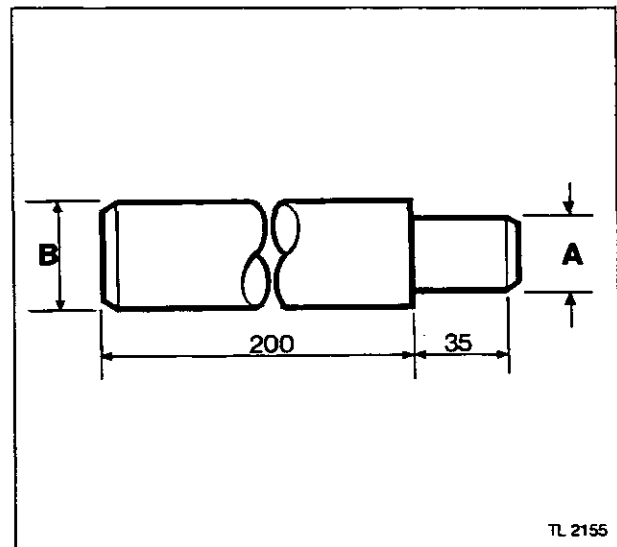
10E-20

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

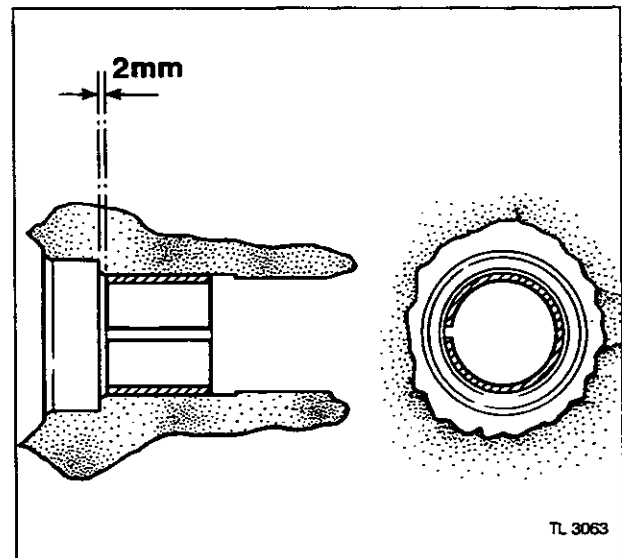
Refitment

9. To install new bushes and oil seals it will be necessary to make two service tools. This will ensure that the components are correctly fitted.
10. Manufacture the tools as shown in the illustration to the dimensions given in the following chart.

Component	Dimension 'A'	Dimension 'B'
Oil seal tool	35 mm dia. +0,000 -0,033	50 mm dia.
Bush tool	35 mm dia. +0,000 -0,033	45 mm dia.



11. Place the bush on the special tool and drive it into the housing. The bushes must be fitted with the split line at three o'clock, see illustration, and installed to a depth of 2 mm (0.080 in) behind the oil seal facing.
12. Place the oil seal on the special tool with the lip of the seal facing the inside of the casing or swivel housing. Drive the seal to the bottom of the recess.
13. Fill the seal cavity with a general purpose grease.
14. Fit a new dust seal to the crownwheel and pinion side of the drive shaft.
15. Refit the drive shaft into the axle casing taking care not to damage the oil seal when locating the splines.
16. Refit the swivel housings and planetaries.
17. Refill both the axle and planetary carrier to the correct level with an approved oil.
18. Grease the drive shafts and swivel bearing caps.



FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE**Drive Shaft****Overhaul**

10E-09

Disassembly

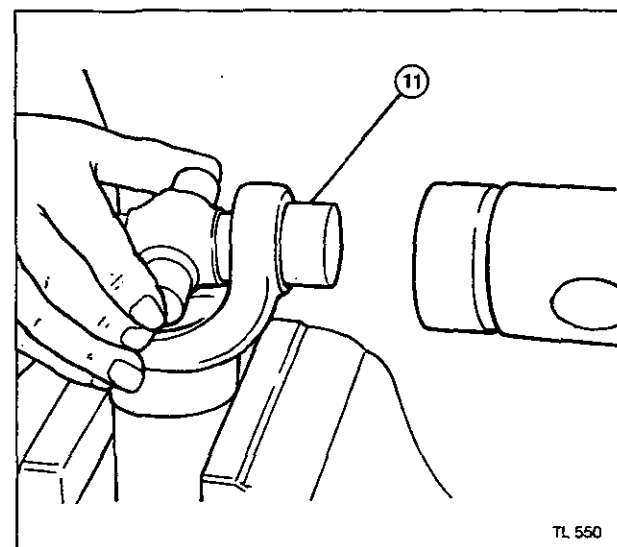
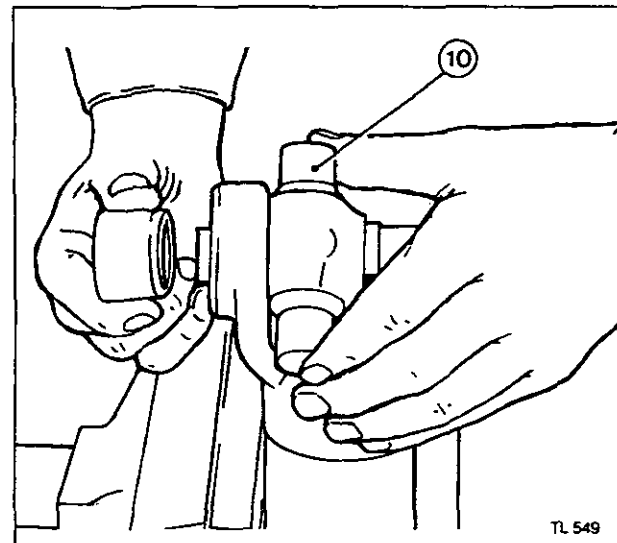
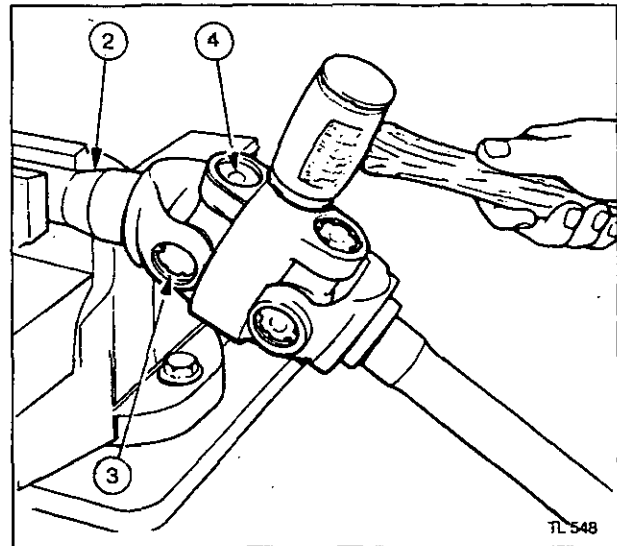
1. Remove the drive shaft, see operation 10E-08.
2. Hold the inner section of the drive shaft in a soft faced vice.
3. Remove the four circlips from each end of the universal joint.
4. Using a hammer, drive the central yoke downwards until the bearing sleeve protrudes.
5. Clamp the bearing sleeve in a vice and tap the central yoke from the bearing.
6. Remove the opposing bearing sleeve in the same way and remove the outer section of the shaft.
7. Turn the shaft assembly through 90°, then repeat procedures 4 to 6 to free the other universal joint from the shaft.
8. Grip the outer section of the drive shaft in a vice and repeat procedures 2 to 7.

Examination

Pay particular attention to the axle shaft splines. Inspect all components and renew any which show signs of wear or damage. Always renew the universal joint as an assembly including the joint, bearings, caps, circlips and seals.

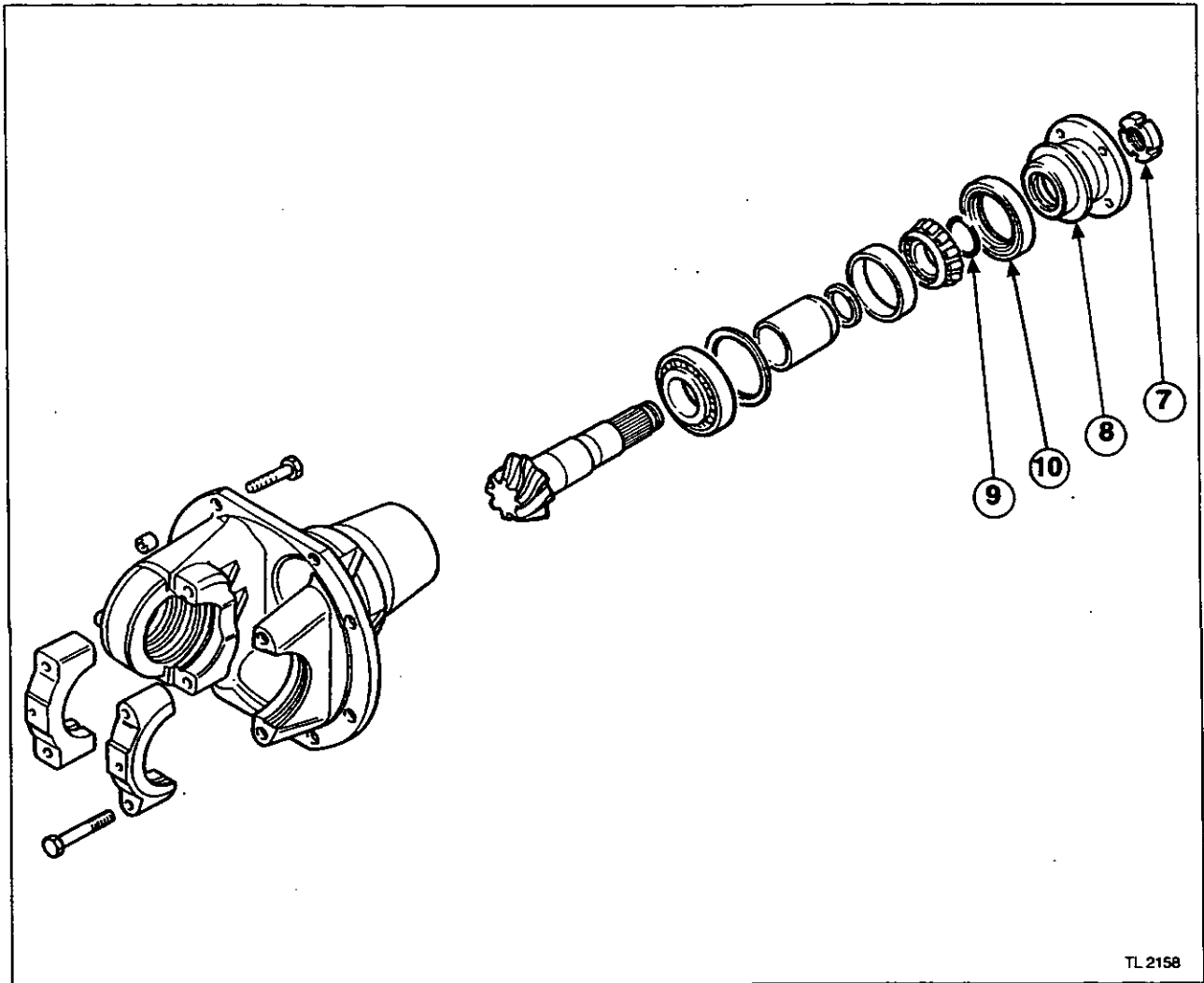
Reassembly

9. Ensure that the needle rollers are held in place with a little grease in the bearing sleeve.
10. Position the cross within the yoke and move it sideways as far as possible to provide a guide for the needle rollers in the bearing sleeve when being refitted.
11. Slide the bearing sleeve onto the cross and drive the bearing into the yoke deep enough to permit the insertion of the circlip.
12. Assemble the remaining sleeves and universal joint in a similar method.
13. Thoroughly lubricate the universal joint with a grease gun after completing assembly and before fitting to the axle.
14. Refit the drive shaft to the axle.



10E-22

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE



Pinion Oil Seal

Removal and Refitment

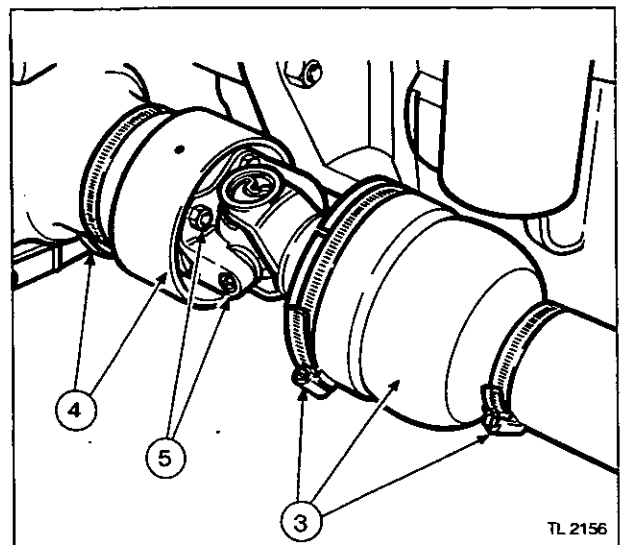
10E-10

Special tools:

MF.486 Pinion Nut Wrench

Removal

1. Apply the tractor parking brake.
2. Place a container under the axle and drain some of the oil from the casing.
3. Slacken the two hose clips and slide back the drive shaft guard.
4. Slacken the front guard hose clip and slide the guard forward.
5. Remove the four bolts and disconnect the universal joint.
6. With a small hammer and cold chisel carefully chisel away the lip of the pinion nut which has been driven down into the slot.

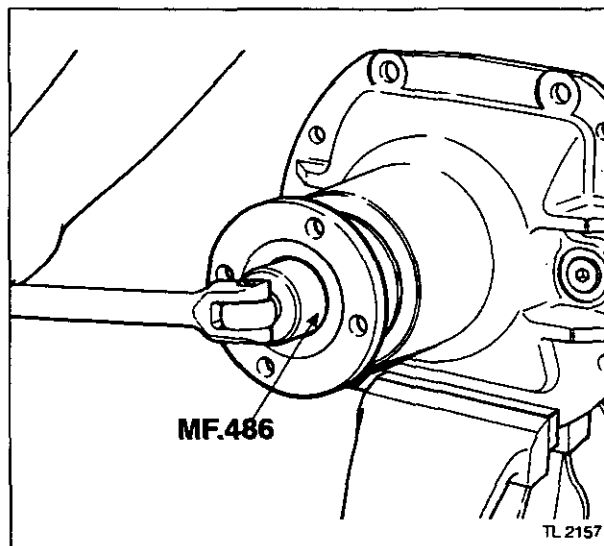


FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

7. Using special tool MF.486 Pinion Nut Wrench, remove the pinion nut.
8. Remove the drive coupling.
9. Remove the 'O' ring and discard.
10. Lever the oil seal out of the casing

Refitment

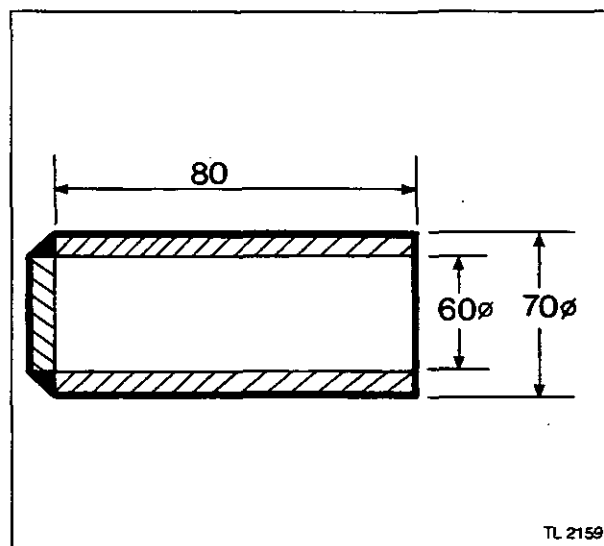
11. Make the special seal tool as shown in the illustration.
12. Renew the oil seal.
13. Renew the shaft 'O' ring.
14. Apply general purpose grease to the cavity of the oil seal.
15. Replace the drive coupling.
16. Renew the pinion nut and tighten dry to a torque of 380 Nm (280 lbf ft) using special tool MF.486.
17. With the aid of a hammer and punch, drive the lip of the nut into the slot on the shaft to lock it.
18. Reconnect the drive shaft and guard.
19. Refill the axle case with an approved oil to the correct level.

**Differential Assembly****Removal and Refitment**

10E-11

Removal

1. Secure the tractor by applying the parking brake.
2. Jack up the front of the tractor and support under the engine.
3. Slide back the drive shaft guard and disconnect the drive shaft.
4. Remove the axle from the tractor, see operation 10E-03.
5. Remove both front wheels.
6. Drain the oil from the axle casing.
7. Remove both swivel housings, see operation 10E-07. It is not necessary to dismantle the planetary hubs.
8. Remove the steering ram, see operation 10E-14.
9. Remove the eight bolts holding the differential case to the axle casing.

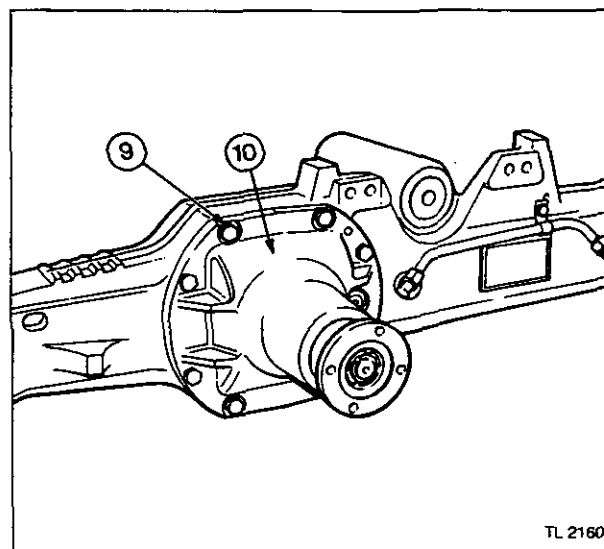


WARNING: Take care when removing the differential assembly, it is awkward and heavy to handle.

10. The differential is located by dowels in the axle casing. Carefully prise it away from the casing supporting the weight at all times.

Refitment

11. Reverse procedures 1 to 10 except:
 - a. Apply Massey Ferguson Instant Gasket (Loctite 515) to the joint face of the differential case.
 - b. Apply lubricating oil to the differential case bolts and tighten them to a torque of 135 Nm (100 lbf ft).



10E-24

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

Differential Assembly

Overhaul

10E-12

Special tools:

MF.471 Hydraulic Spring Compressor

Disassembly

These instructions cover two types of differential, the Autolock type and Hydralock. The Hydralock type is a hydraulic method of locking the differential.

The Autolock is a mechanical means of automatically locking the differential when a hydraulic system is not provided..

1. Remove the differential assembly, see operation 10E-11.
2. Hold the differential assembly in the jaws of a vice.
3. Mark the end caps and casing to aid reassembly.
4. Remove the securing bolts.
5. Remove the locking tab.
6. Unscrew the bearing adjustment ring nut.
7. Remove the cap bolts.
8. Remove the end caps.
9. Lift the differential assembly out of the casing.
10. Remove the bearing cups.
11. Remove the shims and retain for reassembly.

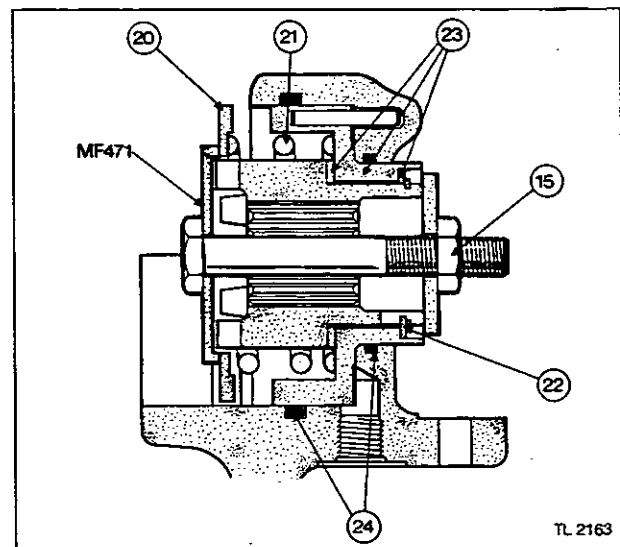
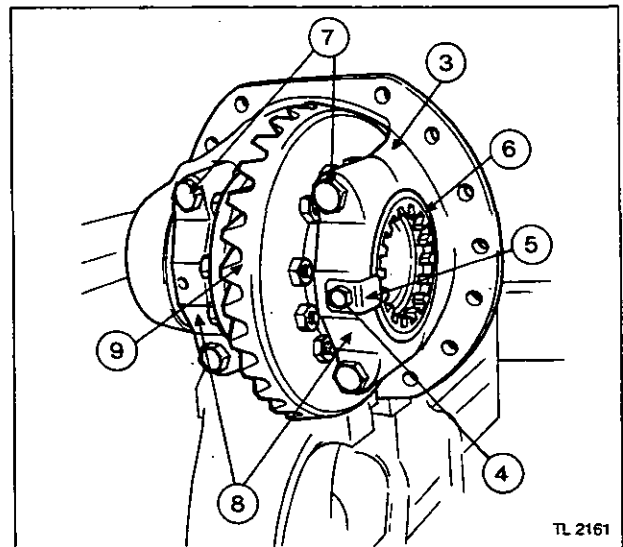
Hydralock Differential

12. Mark the two halves of the differential case and the crownwheel to aid reassembly.
13. Place the crownwheel and differential unit in the vice and remove the 12 nuts and bolts.
14. Split the differential case and remove the differential gears, cross and thrust washers.

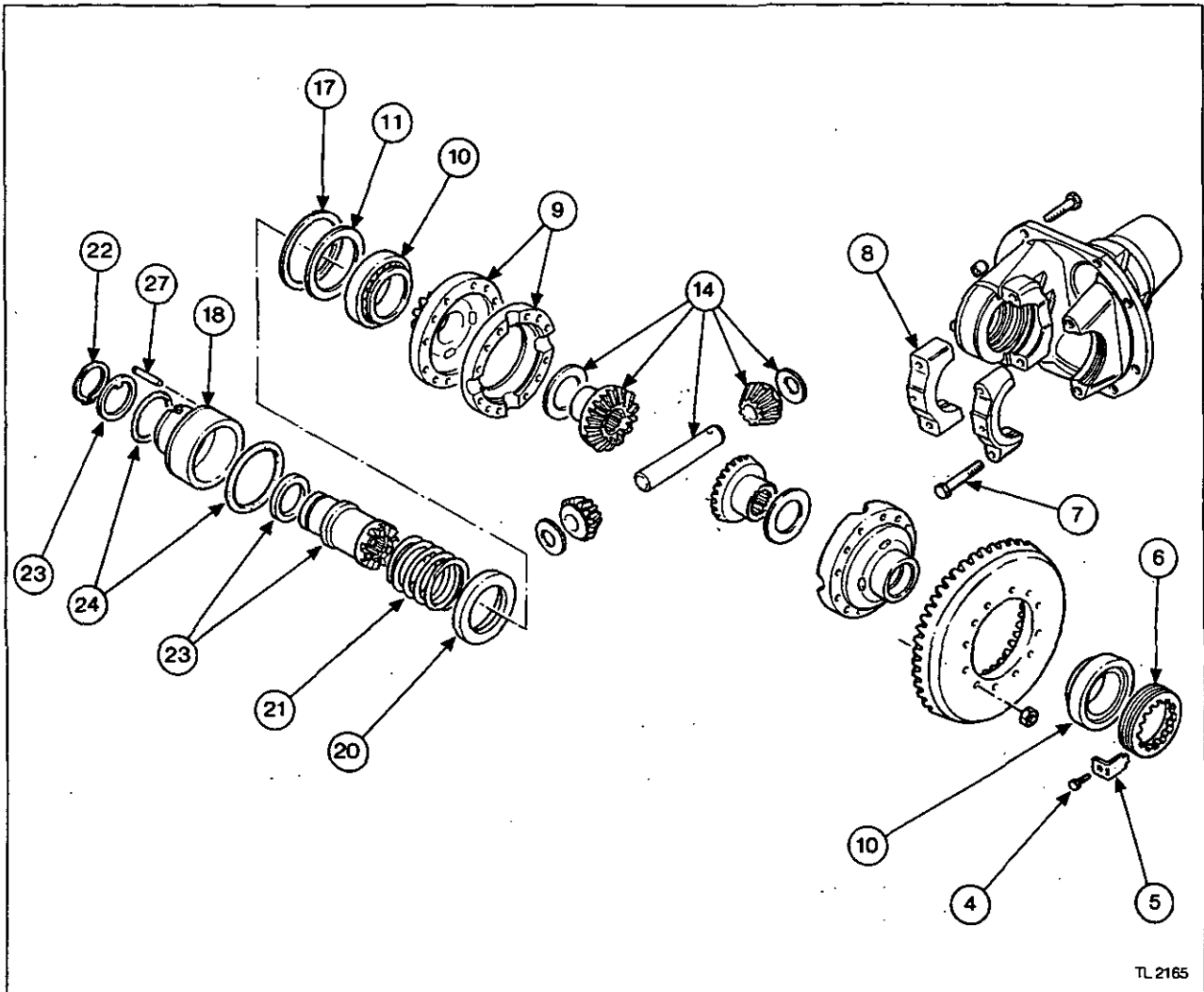


WARNING: Spring under compression, use special tool MF.471. Failure to use the special tool or some other restraining means when removing the Hydralock assembly can cause injury.

15. Fit the Hydralock Spring Compressor MF.471. Carefully centralize the two washers.
16. Tighten the spring compressor until the spring tension has been taken off the retaining ring.
17. Remove the retaining ring.
18. Slide the hydralock assembly out of the housing. It may need a tap with a hammer if the seals are tight.
19. Dismantle the hydralock unit by loosening and then removing the spring compressor.
20. Remove the spring guide plate.
21. Remove the coil spring.



FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE



22. Remove the circlip.
23. Remove the piston and two thrust washers.
24. Remove the two seals from the housing.

Examination

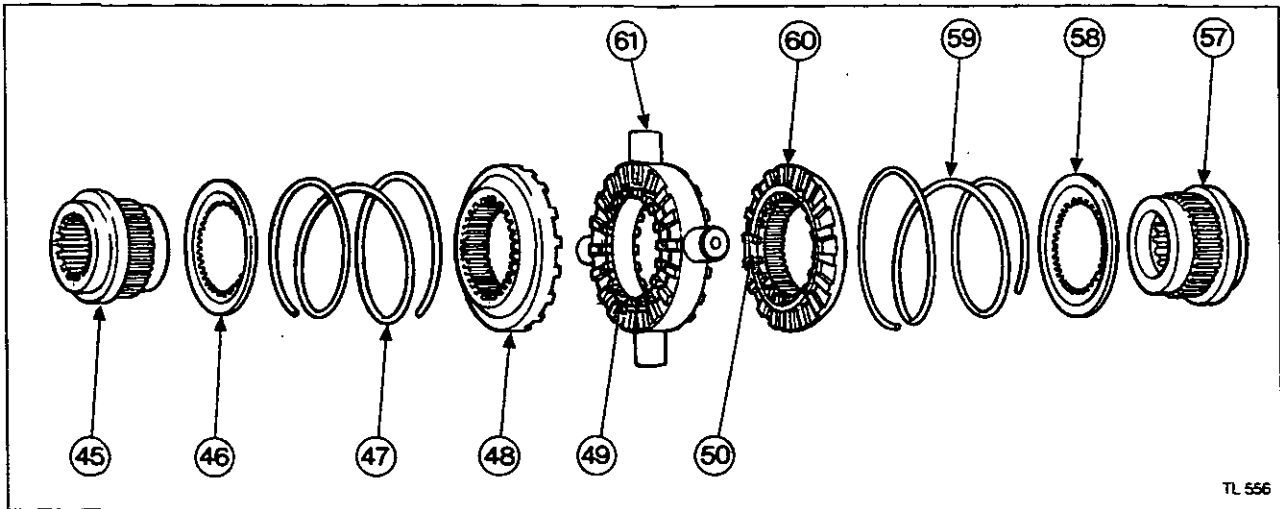
25. Thoroughly clean and inspect all components. Any parts showing signs of wear or damage must be renewed. Renew all 'O' rings, seals and circlips.

Reassembly of the Hydralock Differential

26. Reassemble the piston and coupler with the two thrust washers and circlip.
27. Fit two new seals into the housing ensuring that they are both correctly positioned and well lubricated.
28. Tap the piston and coupler assembly into the housing ensuring that it locates on the internal peg.
29. Refit the spring, guide plate and special tool MF.471.
30. Tighten the spring compressor until the retaining clip can be inserted into its groove.
31. Slowly release the spring compressor and remove it.
32. Refit the removed shims.
33. Refit or renew the taper roller bearing cones if they have been removed.
34. Refit the differential gears, cross and thrust washers to the case.
35. Align the previously made marks on the case and the crownwheel if the original wheel is being re-used. Refit the 12 bolts, apply Massey Ferguson Studlock (Loctite 270) to the threads and tighten to a torque of 85 Nm (65 lbf ft).

10E-26

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE



TL 556

Autolock Differential

Inside the Autolock differential there are two large springs, these need containing before the differential assembly is dismantled.

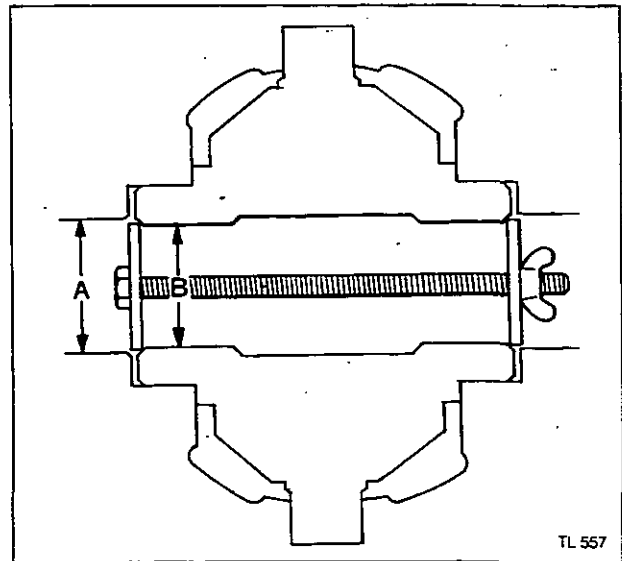


WARNING: Failure to use a compression bolt or some other restraining means when separating the differential case halves can cause injury.

36. Make up a special compression bolt by machining two heavy-duty washers in which the out side diameter is smaller than dimension 'A' yet greater than dimension 'B'.
37. Take a length of studding or a long bolt which will pass through the differential, the two washers and retained by nuts or a wing nut as shown in the illustration. The studding will need to be longer than the differential to allow for the release of the spring inside.
38. Lightly tighten the nut or wing nut.
39. Mark both differential case halves so they can be re-assembled in their original position when the repair has been completed. Also mark with an arrow on the differential case halves, the direction of rotation when the tractor travels in the forward direction.
40. Remove the crownwheel and differential case retaining bolts.
41. Remove the crownwheel.
42. Separate the case halves and remove the Autolock differential assembly.

NOTE: If you are not going to repair the Autolock, do not remove the compression bolt. If dismantled, all the components **MUST** be fitted back in the same position.

43. Mark all components for refitment.
44. Release the compression bolt and washer assembly while firmly holding the Autolock differential to absorb the spring pressure.



TL 557

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

45. Remove the side gears.
46. Remove the spring retainers.
47. Remove the springs.
48. Remove the driven clutches.
49. Remove the central driver assembly.
50. Remove the hold-out rings from the clutches.

Examination

51. Wash all parts thoroughly, rinse and dry.
52. Inspect the splines on the driven clutches. remove any burrs or small chips with an abrasive stone.

Inspect the teeth on the driven clutches for wear or chipping.

Check the hold-out rings for fractures and chipping or excessive wear of the teeth.

53. Inspect the splines on the side gears. Remove any burrs or small chips. Ensure that the splines are not broken or badly chipped, or if hub walls are fractured.

Inspect the side gear splines fit on it's mating axle shaft. Be sure the splines do not bind.

54. Carefully examine the differential case. If worn or scored, the case should be replaced.
55. Examine the bearings, crownwheel and pinion, nuts and bolts. Replace if necessary with new parts.

NOTE: If any damage is noticed, it is advised that a new Autolock Differential is installed. Determine the cause of damage and remedy before fitting the new assembly. Use of worn or damaged components can lead to a recurrence of the original problem.

Reassembly of Autolock Differential

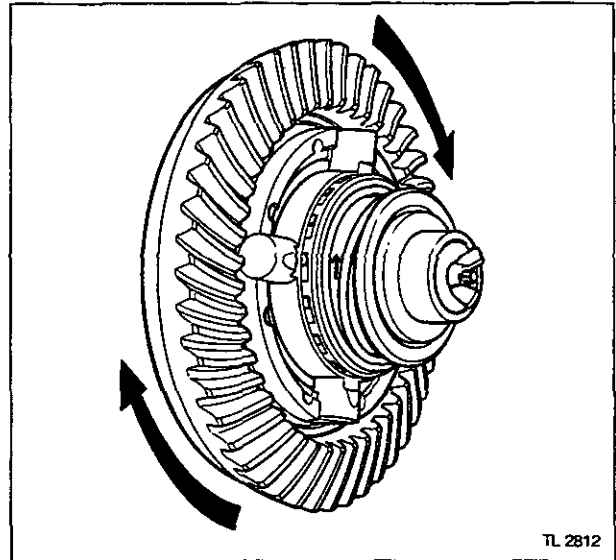
56. Lay the crownwheel and the flanged half of the differential case on the bench with the bearing end of the case hub down and the inner case facing upwards.
57. Place the ground hub of the Autolock side gear into the bore of the case. Check that the side gear will rotate freely in the case.
58. Assemble the spring retainer over the side gear splines with the retainer lip pointed up. It should seat against the side gear shoulder.
59. Place the spring over the side gear splines and against the retainer lip with the smaller diameter of the spring against the retainer.

NOTE: Verify that the spring is functioning freely. Be sure the spring is not binding, that the coils do not overlap and that there is good contact between the coil and the spring retainer.

60. Assemble the two clutch assemblies fitting the hold-out rings.
61. Assemble the two clutches to the spider/cross.

Important:

- a. The direction of arrows on each clutch must correspond to the arrow on the spider/cross.
- b. Ensure that the direction arrows on the differential correspond to the direction of rotation of the crownwheel.
- c. Ensure that the slot in each hold-out ring is properly aligned over the long tooth of the spider/cross.



62. Position the spider/cross and clutch sub-assembly on top of the spring.
63. Assemble the other retainer, spring and side gear as previously indicated.
64. Mount the other half of the differential case over the side gear and compress the springs. Ensure that the side gear splines are completely meshed with the driven clutch splines.
65. Hold the case halves firmly together with the punch marks aligned. Install the case bolts



WARNING: DO NOT release hand pressure until two or more bolts are in place and spring pressure has been overcome. Failure to heed this warning can cause injury.

66. Apply Massey Ferguson Studlock (Loctite 270) to the case bolts and tighten to a torque of 85 Nm (65 lbf ft). Check that there is a snug fit between the two case halves at all points and between the trunnion mounts in the case and the spider trunnions.

10E-28

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

Both types of differential

67. Refit the bearing cups and refit the crownwheel and differential assembly. The crownwheel is mounted on the left side of the differential.
68. Refit the bearing caps and lightly tighten the bolts.

Bearing pre-load

69. Tighten the adjuster ring to take up the backlash between the taper roller bearings.
70. Finally, turn the adjuster ring a further three notches until the slot is aligned with the locking plate to apply the correct pre-load.

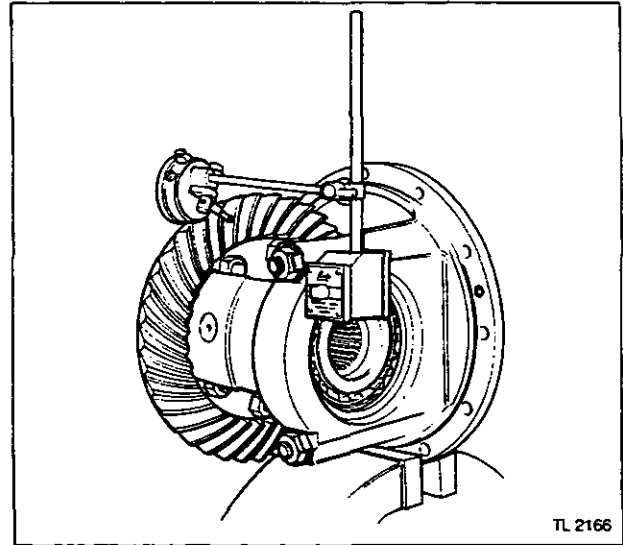
Crownwheel and pinion backlash

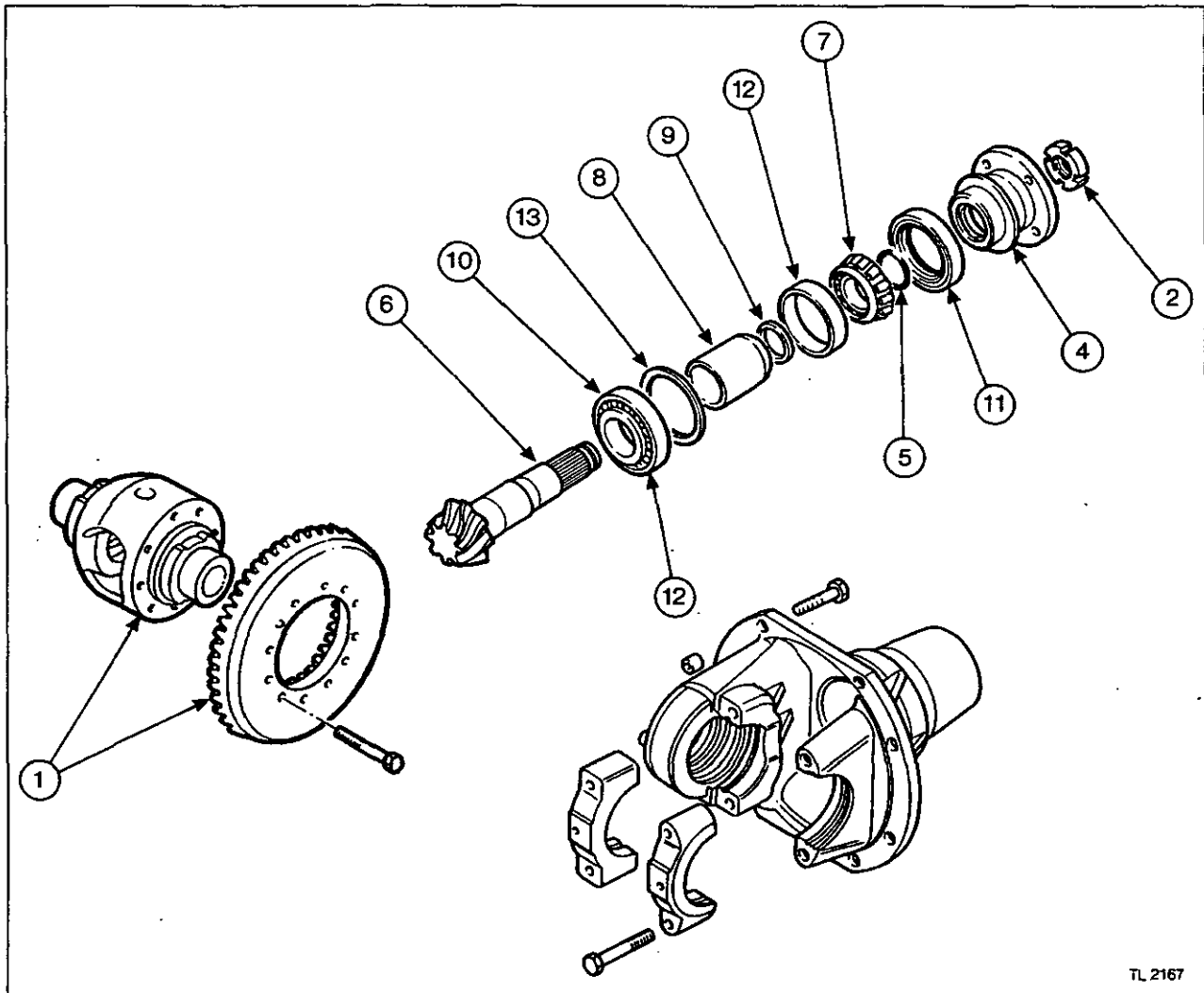
71. With a dial indicator gauge check the backlash between the crownwheel and the pinion. Fit the indicator gauge as shown in the illustration, the clearance should be from 0,18 to 0,23 mm (0.005 to 0.007 in).
72. If the reading is too high or too low it will be necessary to remove the crownwheel and differential assembly and adjust the thickness of the shim pack in the right-hand bearing. Reduce the thickness of the shim pack if the clearance is too high, add if the clearance is low. Shims are available in the following sizes:

Part number	Thickness	
	mm	inch
3427 281 M1	0,10	0.004
3427 282 M1	0,15	0.006
3427 283 M1	0,30	0.012
3427 284 M1	0,50	0.020
3427 285 M1	0,70	0.028
3427 286 M1	1,00	0.040

Check the thickness of the pack with a micrometer.

73. When the setting is correct remove each cap bolt in turn and apply Massey Ferguson Studlock (Loctite 270) to the thread. Tighten the bolts to a torque of 120 Nm (90 lbf ft).
74. Replace the locking tab, apply Massey Ferguson Studlock (Loctite 270) and tighten the bolt to a torque of 20 Nm (15 lbf ft).
75. Check the rotation of the crownwheel and pinion to ensure satisfactory operation.
76. Refit the differential unit to the axle casing.



FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE**Crownwheel and Pinion****Overhaul****10E-13****Special tools:**

MF.486 Pinion Nut Wrench

FT.4062A Pinion Pre-load Gauge

Disassembly

1. Remove and dismantle the crownwheel and differential assembly, see operation 10E-12.
2. With a narrow cold chisel and hammer carefully unstake the pinion nut securing it to the pinion shaft.
3. Using special tool MF.486 Pinion Nut Wrench, remove the pinion nut.
4. Remove the drive coupling.
5. Remove the 'O' ring and discard.
6. With the aid of a soft faced hammer or press remove the pinion with bearings from the case.
7. Remove the outer bearing cone.
8. Remove the spacer.
9. Remove the bearing pre-load shims and retain for reassembly.
10. Remove the inner bearing cone with a bearing separator plate and press.
11. Remove the oil seal.
12. Remove the inner and outer bearing cups.
13. Remove the pinion depth of mesh shims.

Examination

Thoroughly clean and inspect all components. Any parts showing signs of wear or damage must be renewed. Renew all 'O' rings, seals and circlips. Ensure that all parts are free from dents or damage.

10E-30

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

Reassembly

The crownwheel and pinion are only available as a matched set.

If the crownwheel and pinion are not to be replaced the following instructions on setting the pinion may be disregarded. The two sets of shims must be retained for reassembly.

It is necessary to carry out a series of measurements and calculations and procedures to establish the exact position of the pinion in relation to the crownwheel and the pinion bearing pre-load. It is recommended that you work in the metric system for ease of calculation.

Pinion settings – depth of mesh

14. The height of the pinion is adjusted by shims under the taper roller bearing to obtain dimension 'A'. The shims required are calculated in accordance with the following formula:

$$Sp = A - (D \pm R)$$

Sp = Shim thickness.

A = Actual dimension from centre line of crownwheel to the top of the taper roller bearing without shims.

D = Nominal dimension of 118 mm.

R = Actual tolerance of dimension 'D' etched on the bevel pinion. This value may be a positive (+) or a negative (-) to be added or subtracted from the nominal dimension 'D'.

For the next series of operations you will require a precession depth gauge.

15. Fit the upper taper roller bearing cup and cone into the housing without shims.
16. Place the housing in the vertical position on the bench. Place a straight edge across the bearing cap faces and measure from the top of the straight edge to the top of the bearing. Subtract the width of the straight edge from your reading and record dimension 'A'.
17. Dimension 'D' is a fixed dimension of 118 mm which must always be adhered to.
18. Inspect the end of the pinion and record tolerance 'R', plus or minus.
19. Using the figures you have obtained above and the formula calculate the shim thickness required.

Example:

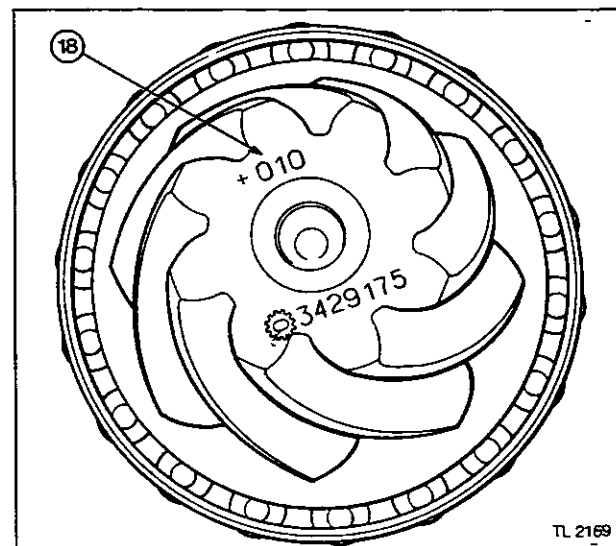
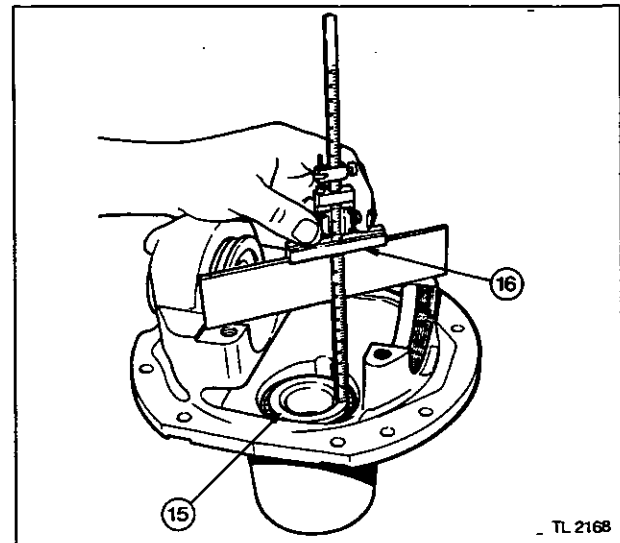
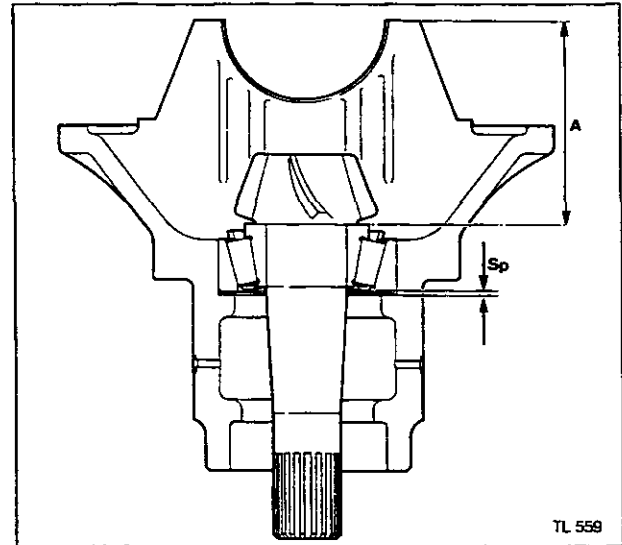
Where A = 118,86 mm (measured).
D = 118 mm (nominal).
R = + 0,010 mm (tolerance).

$$Sp = 118,86 - (118 \text{ plus } 0,010).$$

$$Sp = 0,85 \text{ mm.}$$

Shims required: - 1 x 0,15 and 1 x 0,7.

Check the thickness of the pack with a micrometer. It may be necessary to round-off to the nearest value that can be made into a shim pack. Select the higher value if new bearings are being fitted. Shims are available in the following sizes:



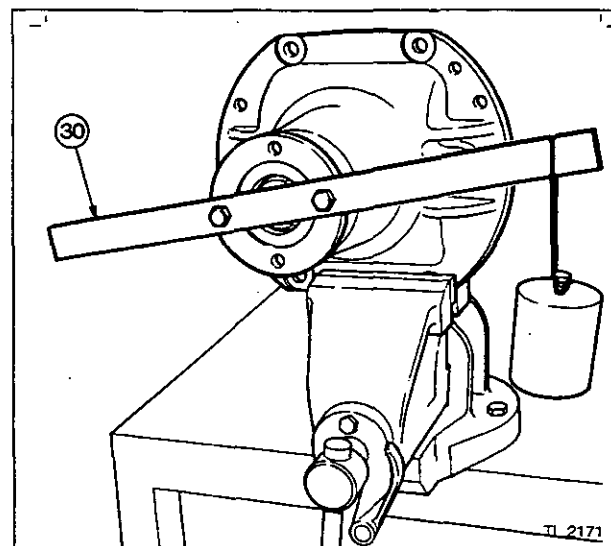
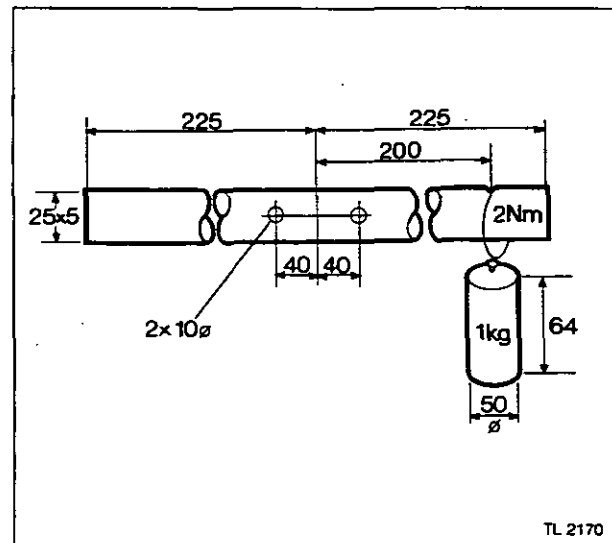
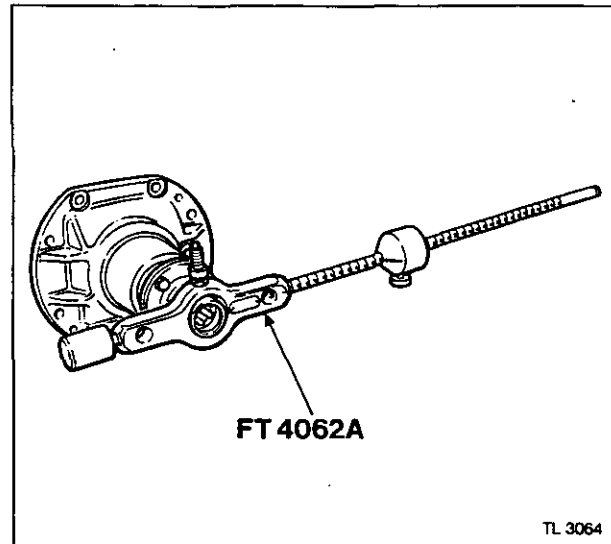
FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

Part number	Thickness	
	mm	inch
3428 077 M1	0,10	0.004
3428 078 M1	0,15	0.006
3428 079 M1	0,30	0.012
3428 080 M1	0,50	0.020
3428 081 M1	0,70	0.028
3428 082 M1	1,00	0.040

20. Remove the bearing, place the shim pack into the housing and fit the inner taper roller bearing cup.
21. Fit the outer taper roller bearing cup.
22. Press the inner taper roller bearing cone on to the pinion.
23. Replace the bearing spacer with the chamfered end facing the drive coupling.
24. Replace the shims that were removed on disassembly as a starting point, then the bearing cone, coupling and a new nut. DO NOT fit the oil seal.
25. Tighten the nut dry to a torque of 380 Nm (280 lbf ft). Tap the pinion in both directions to ensure that the bearings are fully seated.
26. Lightly lubricate the bearings.

Pinion bearing pre-load

27. It is now necessary to set the taper roller bearing pre-load by selecting the correct shims to be placed between the spacer and outer bearing. The correct rotational torque is 2-4 Nm (1.5-3 lbf ft). This can be determined by using special service tool FT.4062A or making a special gauge as shown in the illustration.
28. Special service tool FT.4062A is calibrated in pounds force inches (lbf in.). Moving the 2 lb weight to the 18 in. mark on the rod represents 2 Nm.
29. Alternatively, select a length of flat bar and cut off 450 mm. Drill two 10 mm diameter holes 80 mm apart in the centre of the bar. Cut a notch 200 mm from the centre in the top of the bar. Obtain a weight of 1 kg, if this is not available, cut a 63 mm length of 50 mm diameter steel bar and attach a length of cord to the top.
30. Attach special tool FT.4062A, or bolt the tool you have made to the drive coupling with two bolts. With the bar horizontal hang the weight from the notch, this is equal to a rotational torque of 2 Nm.
31. The setting is correct when you touch the weight end of the bar or tool and it slowly rotates from the horizontal to the vertical position.



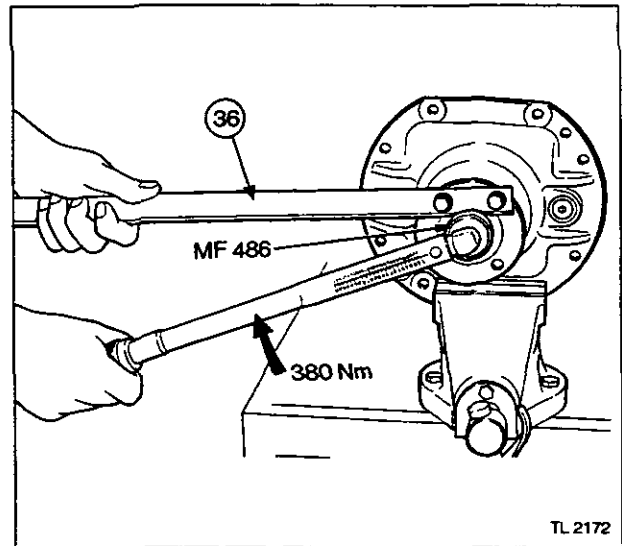
10E-32

FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

To obtain this condition it may be necessary to adjust the shim thickness several times. Shims are available in the following thicknesses:

Part number	Thickness	
	mm	inch
3428 253 M1	0,10	0.004
3428 254 M1	0,15	0.006
3428 255 M1	0,30	0.012
3428 256 M1	0,50	0.020
3428 257 M1	0,70	0.028
3428 258 M1	1,00	0.040

32. Renew the oil seal using the special tool described in section 10E-15.
33. Renew the shaft 'O' ring.
34. Apply general purpose grease to the cavity of the oil seal.
35. Replace the drive coupling.
36. Replace the pinion nut. Make up a suitable holding tool and tighten the nut to a torque of 380 Nm (280 lbf ft) using special tool MF.486.
37. With the aid of a hammer and punch, drive the lip of the nut into two opposite slots on the shaft to lock it.
38. Replace the crownwheel and differential assembly setting the clearance as described in operation 10E-12.
39. Rebuild the axle and refit to the tractor.



Steering Ram

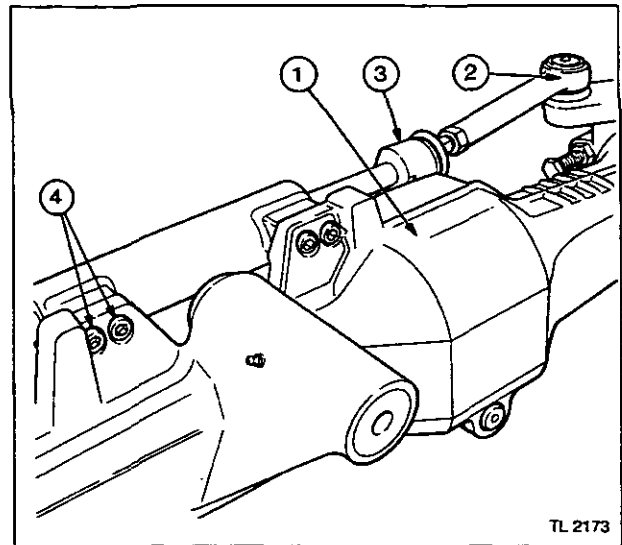
Removal and Refitment 10E-14

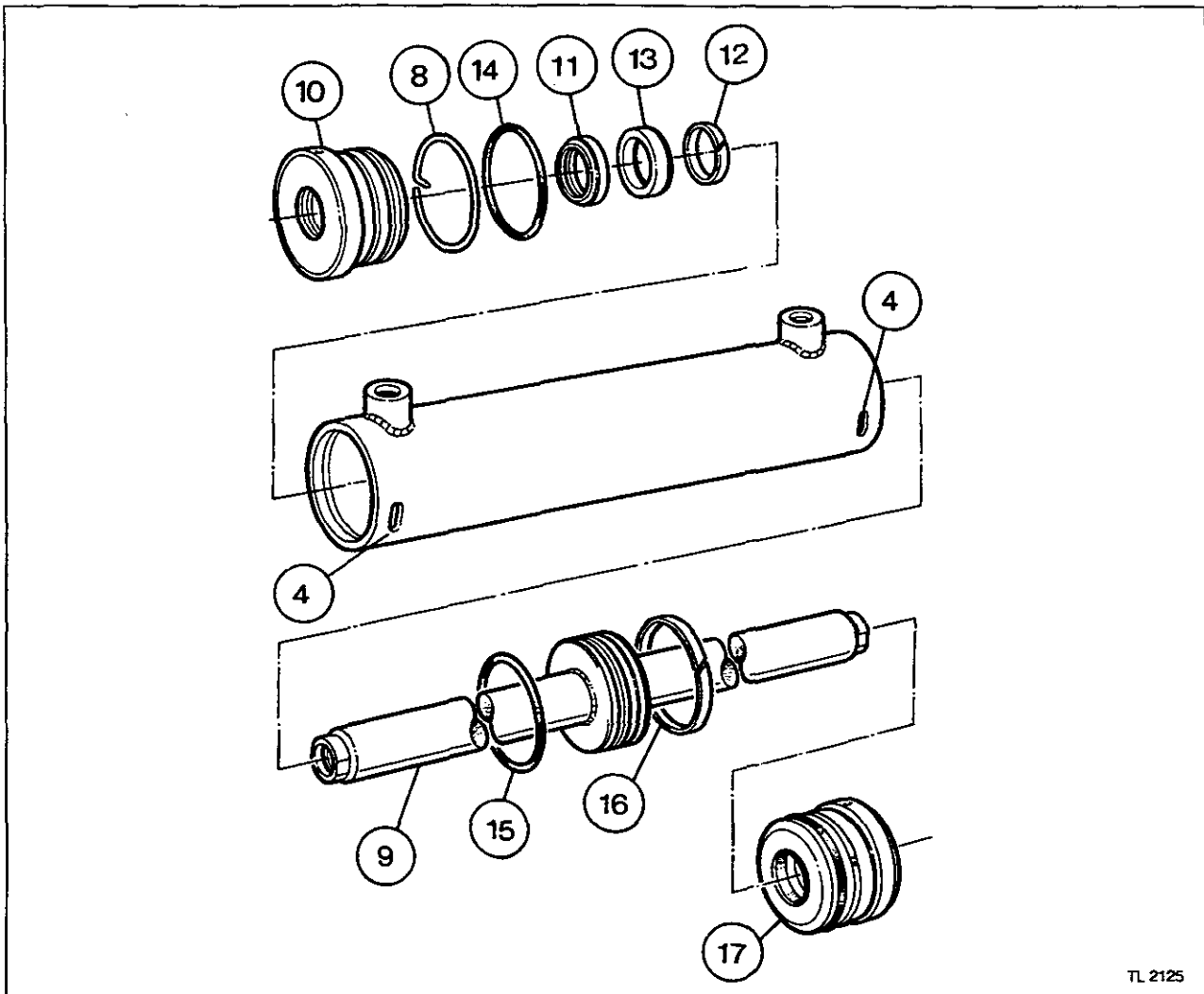
Removal.

1. Remove the front axle assembly, see operation 10E-03.
2. Remove the split pins and disconnect both steering ball joints.
3. Holding the ends of the steering ram piston rod with a spanner unscrew both track rods.
4. Remove the four hexagon cap screws (8 mm hexagon wrench will be required) and the steering ram.

Refitment

5. Reverse procedure except:
 - a. Apply Massey Ferguson studlock (Loctite 270) to the threads and tighten the four cap screws to a torque of 190 Nm (140 lbf ft)
 - b. Tighten the steering rod ball joints to a torque of 135 Nm (100 lbf ft).
 - c. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 125 Nm (90 lbf ft). Then tighten further as required to align the nut for the split pin (maximum torque 160 Nm (118 lbf ft)). Renew the split pin.
 - d. Check the wheel alignment, see operation 10E-01.
 - e. Use new split pins when refitting the steering ball joints.



FRONT AXLE (AG SERIES) - 4 WHEEL DRIVE

TL 2125

Steering Ram**Overhaul**

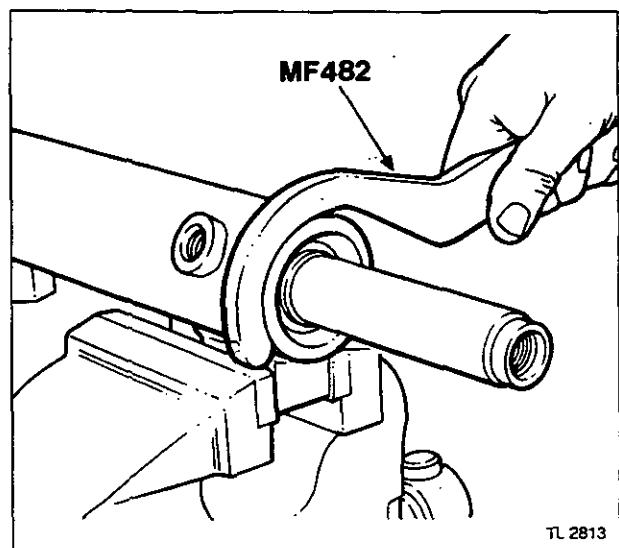
10E-15

Special tools:

MF.482 Steering Ram Wrench

Disassembly

1. Remove the steering ram, see operation 10E-14.
2. Remove any sealing plugs and drain out any oil in the ram cylinder by moving the piston from one end of the cylinder to the other. Hold the cylinder over a container during this operation.
3. Hold the ram cylinder in a vice by one of the mounting bosses.
4. Remove the sealing compound in the elongated holes at each end of the cylinder.
5. Using special tool MF.482 Steering Ram Wrench, engage the small end of the wrench in the two slots in the cap. Rotate the cap until the chamfered end of the retaining wire can be seen in the elongated hole.

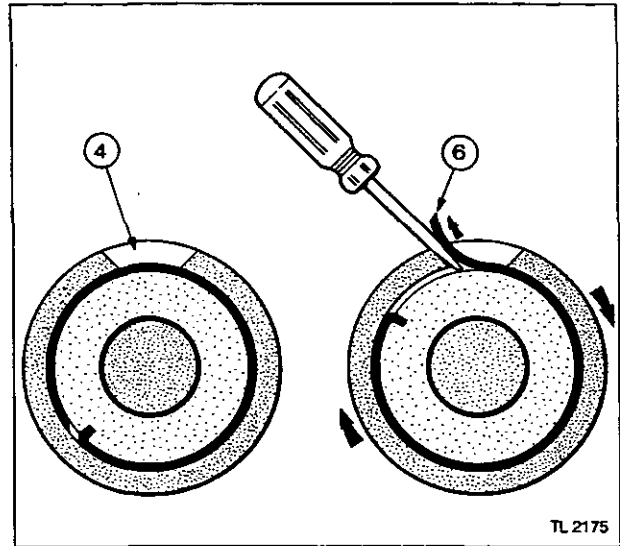


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FRONT AXLE (AG SERIES) – 4 WHEEL DRIVE

6. With the aid of a screwdriver, turn the end cap and prise the end of the wire up out of the hole.
7. Continue turning the cap and wind the rest of the wire out through the hole.
8. The end of the wire has a right angle bend which locates in a hole in the groove of the end cap, remove the wire from the ram cylinder.
9. Withdraw the piston assembly from the ram cylinder with the end cap.
10. Remove the end cap.
11. Remove the wiper seal.
12. Remove the wear ring.
13. Remove the pressure seal.
14. Remove the 'O' ring.
15. Remove the piston seal.
16. Remove the piston wear ring.
17. Remove the end cap from the other end of the ram cylinder following procedures 5 to 14.



Examination

Clean and inspect all parts, renew any that are worn or damaged. Renew all seals, wear rings and 'O' rings.

Reassembly

18. Fit a new set of seals in one of the end caps and lubricate them with transmission oil.
19. Renew the seal and wear ring on the piston and lubricate.
20. Refit the piston to the ram cylinder and slide the cap down into the cylinder.
21. Using special tool MF.482 Steering Ram Wrench, rotate the end cap until the hole in the wire groove is visible through the hole in the side of the ram cylinder.
22. Insert a new wire so that the bent end locates in the hole in the end cap. Ensure that the two grooves in the ram cylinder and end cap are in line.
23. Rotate the end cap so that it draws the wire round the end cap inside the ram cylinder. Rotate until all the wire is in the cylinder.
24. Seal the elongated hole in the ram cylinder with a non-setting type sealing compound. This sealing operation is important to prevent the ingress of water and the resultant rusting of the end cap and retaining wire.
25. Repeat the operations 20 to 24 for the other end cap.
26. Check that the piston rod moves up and down the ram cylinder correctly.
27. Refit the steering ram to the tractor.

STEERING

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11A STEERING

STEERING

Section 11 – Part A

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STEERING

Specifications

Orbitrol steering unit

Make	Danfoss
Type Code	
2 wheel drive	OSPC100.
4 wheel drive	OSPC100 tractors without auxiliary hydraulics
4 wheel drive	OSPC125 tractors with auxiliary hydraulics

Relief valve pressure setting at 1200 engine rev/min:

3 cyl. engine tractors	140 bar (2030 lbf/in ²)
4 and 6 cyl. engine tractors	170 bar (2466 lbf/in ²)

Shock valve pressure setting:

3 cyl. engine tractors	200 bar (2900 lbf/in ²)
4 and 6 cyl. engine tractors	220 bar (3190 lbf/in ²)

4WD Steering ram setting length – closed

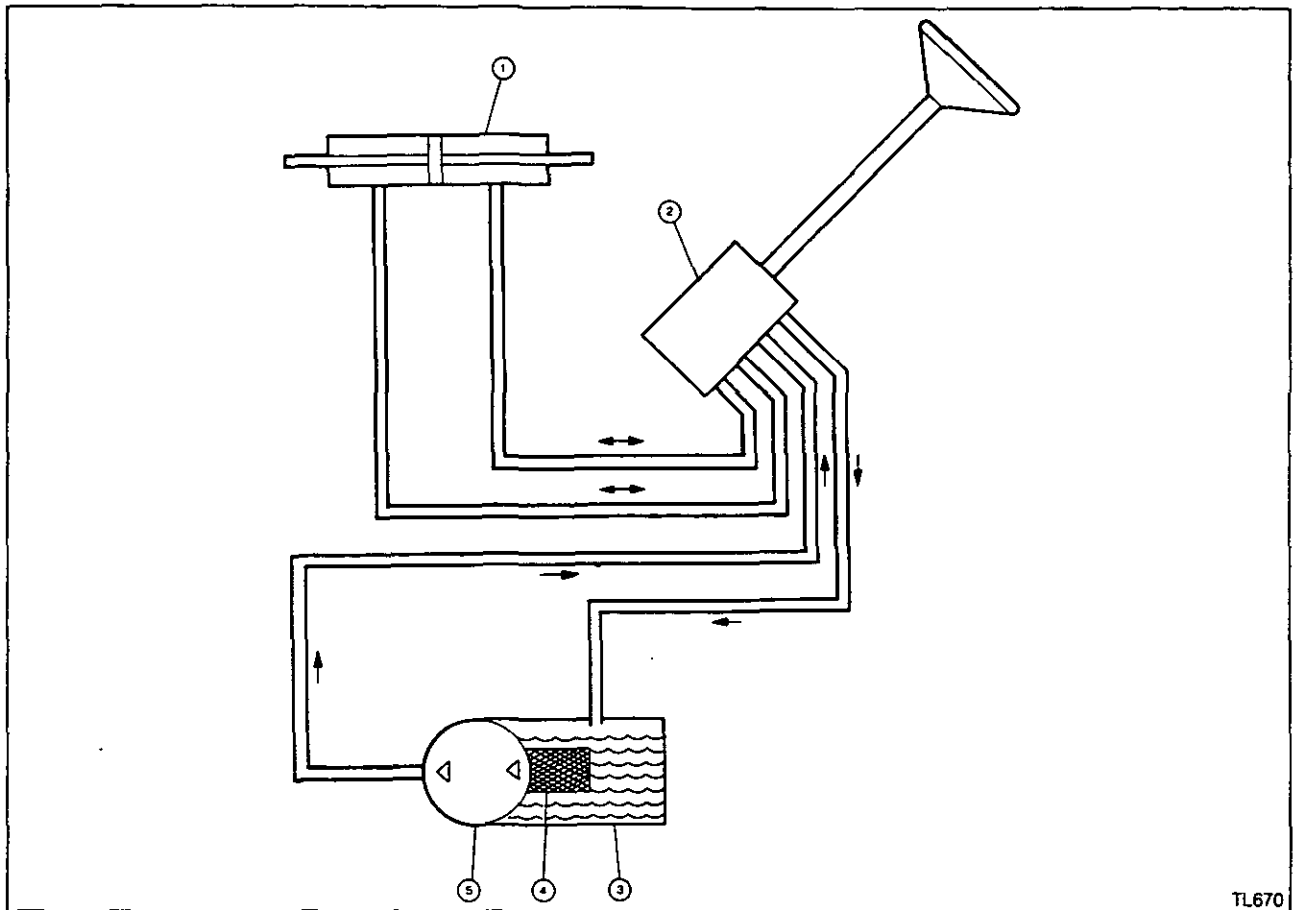
NG100/SDN axle	418mm (16.469in)
NG100/SD axle	436mm (17.178in)
NG200/SD axle	436mm (17.178in)
NG250/SD axle	462mm (18.203in)

Special Tools

M-F 332	Hydraulic pump oil seal protector
M-F 454A	Steering ram end cap remover/replacer
M-F 472	Steering wheel puller
M-F 3001	Pressure test kit
M-F 3002	Flow test hose kit
MS62A	Kin-ring fitting tool
MS63	Centering spring fitting tool

Bolt Torques

Steering unit mounting plate bolts	34-47Nm (25-35 lbf ft)
Steering wheel nut	34-47Nm (25-35 lbf ft)
Steering unit bolts	25-35Nm (19-26 lbf ft)
Steering unit relief valve plug	50 Nm (37 lbf ft)
Steering pump drive gear nut	40-45Nm (30-33 lbf ft)
Pump to timing case bolts	31-42Nm (23-31 lbf ft)
Steering ram ball joint nut 3 cyl.tractors	75-90Nm (55-66 lbf ft)
Steering ram ball joint nut 4&6 cyl.tractors	80-140Nm (60-103 lbf ft)
Track rod to piston rod bolts 4&6 cyl.tractors	29-37Nm (21-27 lbf ft)
Steering ram ball joint nut 4 wheel drive	98-108 Nm (72-80 lbf ft)
Steering ram ball joint retaining ring	80-90Nm (59-66 lbf ft)
Steering ram ball joint clamping bolt.....	100-130Nm (74-96 lbf ft)
Steering ball joint - 4&6 cyl.tractors	50- 70 Nm (37-52 lbf ft)
Track rod ball joint nut 4 wheel drive	78-86 Nm (58-63 lbf ft)
Steering column to support from nuts	15-20 Nm (11-15 lbf ft)
Steering column flexible coupling bolt	25-35 Nm (18-26 lbf ft)



TL670

Figure 1. Steering circuit (Schematic)

1. Steering cylinder
2. Orbitrol steering unit
3. Reservoir
4. Oil filter
5. Pump

General description

All 300 series tractors employ an open centre hydrostatic power steering system. Hydrostatic steering is a full power steering system with no mechanical connection between the steering wheel and tractor wheels. Oil is delivered from the steering pump to the hydrostatic steering control unit, which when the steering wheel is turned, directs the required oil flow to the appropriate side of the steering ram. When the wheel is stationary the unit allows the supply oil to pass on to the next service in the circuit. As no mechanical linkages are used in this arrangement the steering unit is given the ability to act as a steering wheel operated hand pump to maintain steering control should, for instance, the engine run out of fuel and oil supply from the hydrostatic pump cease.

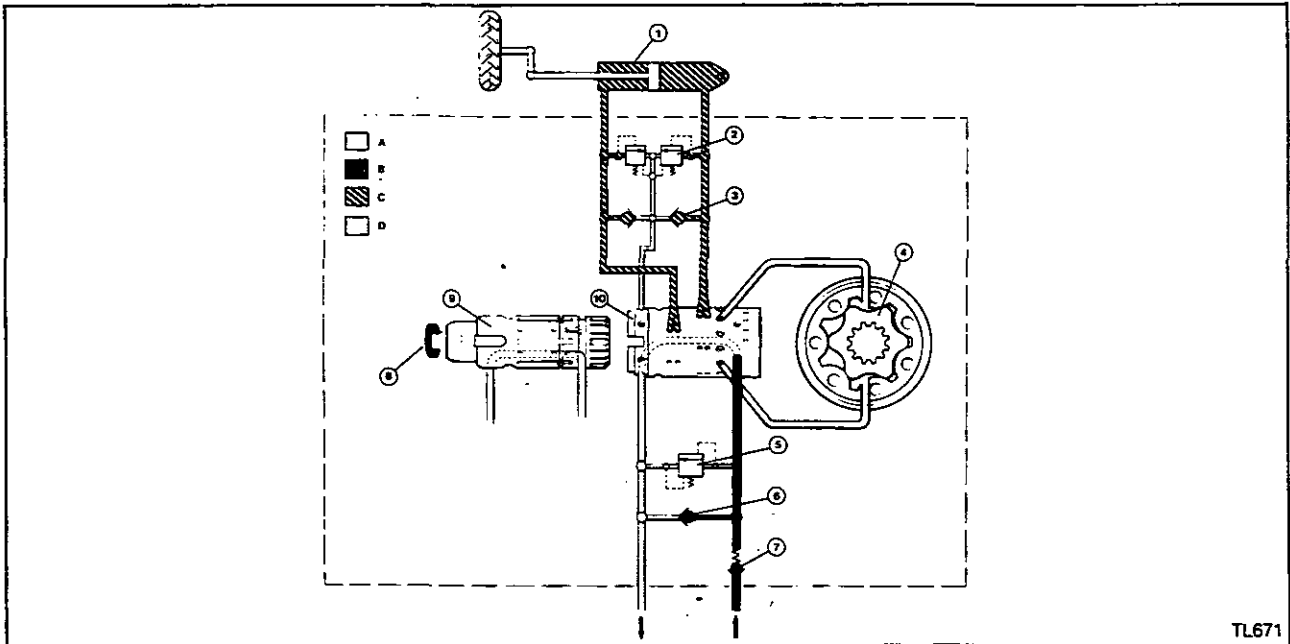
On systems where a dual pump and auxiliary hydraulics are employed a full description of the system will be found in section 12B of this manual.

The alternative steering system (Figure 1) is supplied with oil from a gear type pump bolted to the engine timing case and driven from the timing gears. The reservoir contains a micronic filter and is attached to the rear of the pump.

The orbitrol steering unit is splined onto the end of the steering column. Hydraulic pipes connect the unit to the steering ram and the gear pump.

Oil is pumped from the reservoir via the micronic filter to the steering unit. Oil from the steering unit is fed to the appropriate side of the steering ram, determined by the steering wheel movement. The hydraulic force turns the the road wheels in the direction required, excess oil from the steering ram and steering unit is returned to the reservoir.

The orbitrol steering unit contains the system pressure relief valve and shock valve to protect the system.



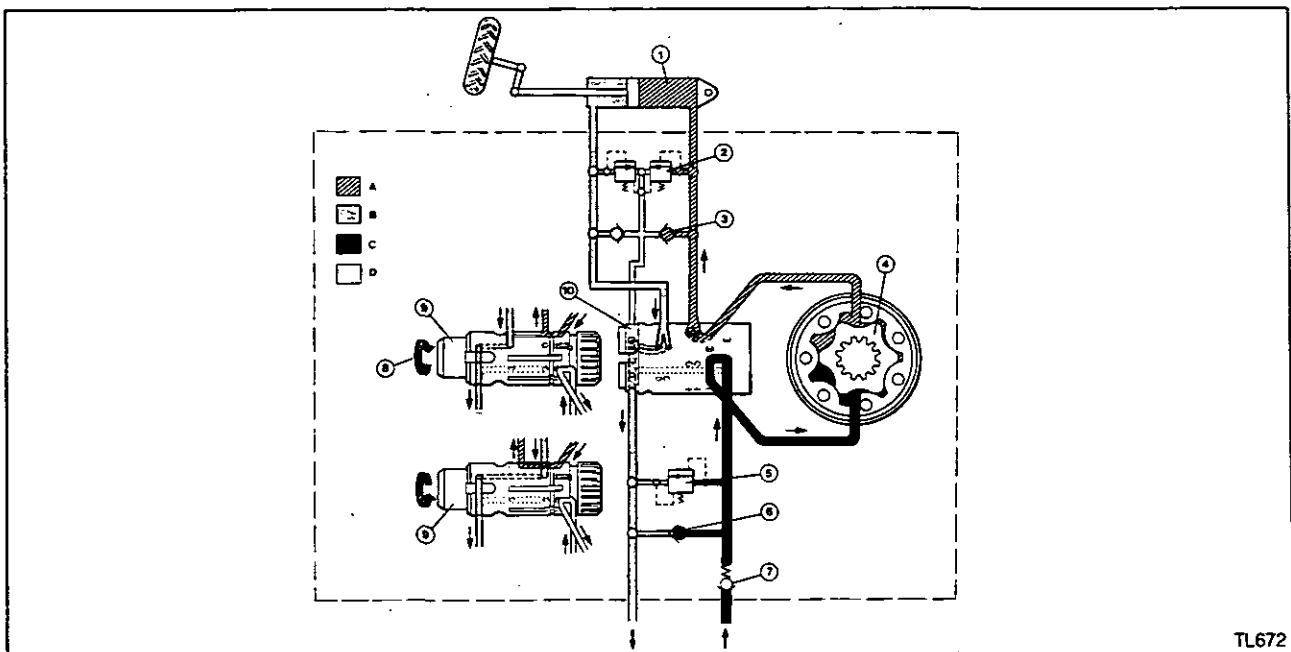
TL671

Figure 2. Orbitrol steering unit circuit - Neutral flow

- 1. Steering cylinder
- 2. Shock valves
- 3. Suction valves
- 4. Metering valve
- 5. Relief valve
- 6. Non-return valve
- 7. Check valve

- 8. Steering wheel connection
- 9. Spool valve
- 10. Sleeve valve

- A. Metering valve - static oil
- B. Pressure line
- C. Steering line - static oil
- D. Return oil



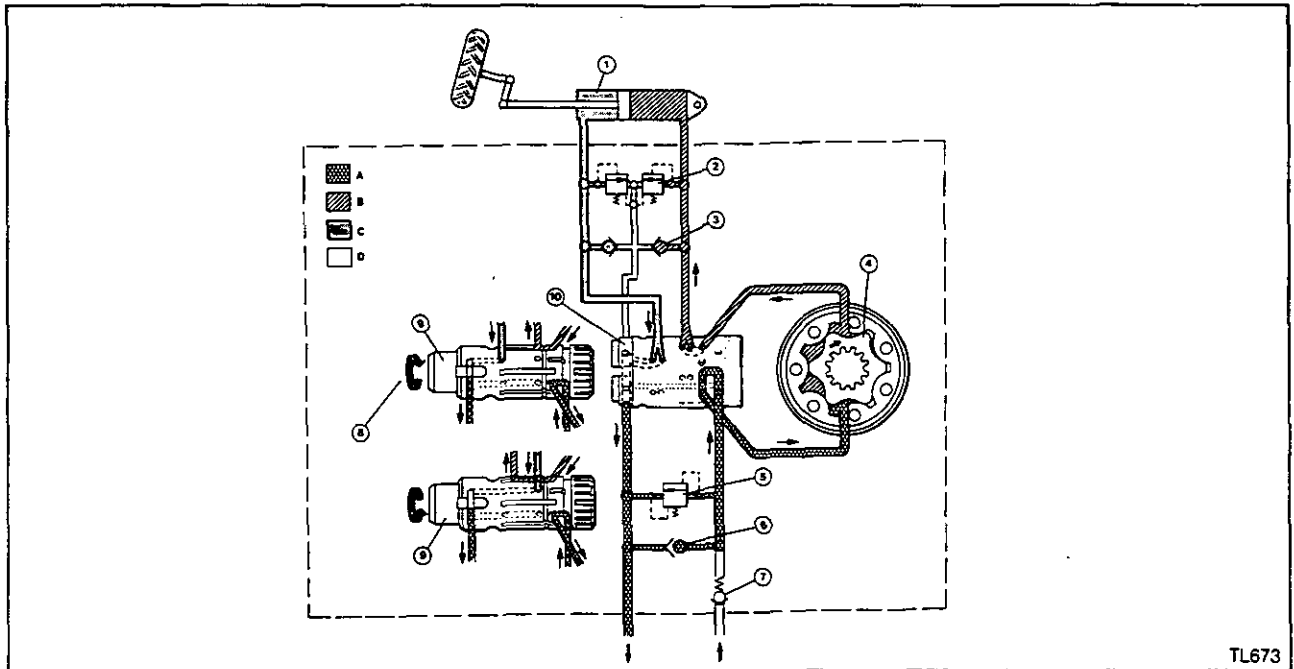
TL672

Figure 3. Orbitrol steering unit circuit - wheel turning with engine running

- 1. Steering cylinder
- 2. Shock valves
- 3. Suction Valves
- 4. Metering valve
- 5. Relief valve
- 6. Non-return valve
- 7. Check valve

- 8. Steering wheel connection
- 9. Spool valve
- 10. Sleeve valve

- A. Suction line
- B. Steering line
- C. Return oil
- D. Return oil



TL673

Figure 4. Orbitrol steering unit – wheel turning with engine stopped.

- | | |
|----------------------|------------------------------|
| 1. Steering cylinder | 8. Steering wheel connection |
| 2. Shock valves | 9. Spool valve |
| 3. Suction valves | 10. Sleeve valve |
| 4. Metering valve | A. Suction line |
| 5. Relief valve | B. Steering line |
| 6. Non-return valve | C. Return oil |
| 7. Check valve | D. Return oil |

Orbitrol Steering Unit Neutral Flow. Figure 2.

In the neutral position oil flows from the hydraulic pump to the steering unit. The holes in the spool align with holes in the sleeve to direct the oil through the centre of the valve into the return flow circuit. The hydraulic lines to the ram cylinder are isolated.

Two shock valves and two suction valves are fitted internally to the left and right outlet ports. The shock valve will protect the system between the ram and the orbitrol unit. The suction valve will then allow the other side of the system to compensate for any lack of oil.

Wheel Turning with Engine Running. Figure 3.

First movement of the steering wheel moves the spool against the leaf springs. This opens the closed centre pressure port and aligns slots in the spool with holes in the sleeve, allowing oil to pass to the hand pump. Further movement of the steering wheel continues to turn the wheel, sleeve and hand pump. Simultaneously the hand pump meters the oil flow and directs it back into the sleeve and spool. The oil re-entering is then directed by slots in the spool which align with the holes in the sleeve, to direct oil to the headside or roadside of the steering ram (the direction is controlled by steering wheel movement). The oil returning from the steering cylinder is directed, (by the slots in the spool valve aligning with holes in the sleeve) into the return line.

In the line between the inlet and the spool valve situated internally in the orbitrol unit, is a relief valve. Its function is to protect the pump from excessive pressures. For example, when on full lock, or when the road wheels are against an obstruction.

A check valve is fitted in the orbitrol unit in the path of the oil entering from the pump. This is a one way valve preventing induced peak pressure generated from the road wheels returning to the main pump when steering.

Wheel Turning with Engine Stopped. Figure 4.

Should the pressure from the hydraulic pump cease, it is important that steering should still be maintained. For this reason a by-pass valve is situated between the inlet and return galleries inside the orbitrol assembly.

When the hydraulic pump is functioning normally, the by-pass valve is held on its seat by the oil pressure, allowing the oil to pass into the spool valve.

When the pressure from the hydraulic pump drops, the oil returning from the steering cylinder is allowed to pass the by-pass valve to the inlet side of the spool valve, enabling oil to be passed from one side of the steering cylinder to the other. In this way steering control is maintained at all times.

11A-06

STEERING

Steering system pressure test

Check 11A-01

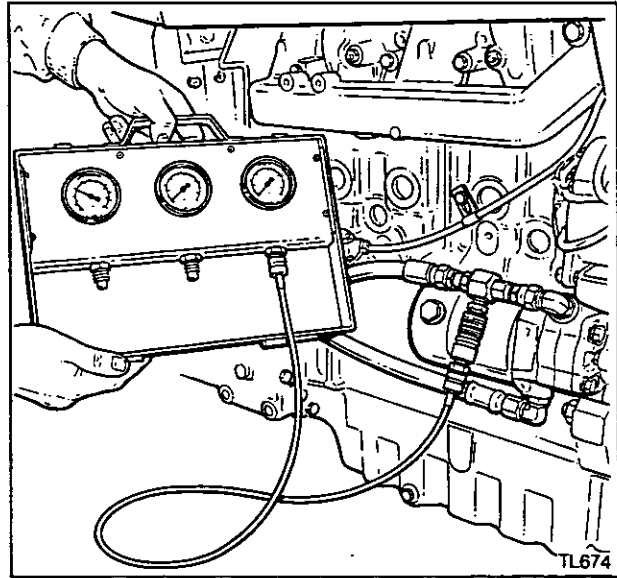
Special tools:

MF3001 Pressure test kit
MF3002 Flow test kit

Procedure

Note: This procedure is for tractors fitted with a combined steering pump and reservoir only. For tractors with dual pumps (steering and auxiliary) see operation 12B-01.

1. Disconnect the pressure hose from steering pump to steering unit at the pump.
2. From the MF3001 pressure test kit select the 9/16in J.I.C. Tee. From the MF3002 flow test kit select the two adaptors 9/16 x 3/4in J.I.C.
3. Connect in-line the tee piece and connect up the 300 bar (4000 lbf/in²) pressure gauge in the MF3001 pressure test kit.
4. Start up the engine and warm up the hydraulic systems. The oil temperature must be 50-60°C (122-140°F).
5. Set the engine speed to 1200rev/min.
6. Turn the steering to full lock, relief valve open.
7. Note the pressure reading on the gauge.
8. The system pressure should be:
3 cylinder engine tractors 140 bar (2030 lbf/in²).
4 cylinder engine tractors 170 bar (2466 lbf/in²).



Diagnosis

Symptom – Steering pressure LOW		
Cause	Action	Operation No.
1. Steering pump performance down	Replace Pump	11A-06 11A-07
2. Worn orbitrol Steering Unit	Overhaul Steering Unit	11A-03
3. Relief Valve in Steering Unit faulty	Overhaul Steering Unit	11A-03
4. Shock valves in Steering Unit faulty	Overhaul Steering Unit	11A-03
5. Leakage across Steering ram Seals	Overhaul Steering Ram	11A-11 to 11A-13

Orbitrol Steering Unit

Removal and Refitment

11A-02

Removal

1. Split the tractor between the engine and the gearbox, see operation 2A-03, 2B-03 or 2B-06.

NOTE: On footstep tractors the orbitrol steering unit can be removed without splitting the tractor. It will just pass between the engine and instrument panel bulkhead. On cab tractors, due to the bulkhead installation, the clearance is very restricted.

2. Remove the guard, covers or fuse box at the base of the steering column.
3. With a hexagon socket wrench remove the four countersunk screws through the steering unit mounting plate. On later tractors bolts are fitted.
4. Disconnect the steering hoses and fit plugs to prevent the ingress of dirt. DO NOT apply side (bending) load on the unit, keep the column closely in line with the unit axis at all times.
5. Pull the unit downwards disengaging it with the steering column flexible joint.

Product Improvement

6. An improved method of retaining the steering unit to the mounting bracket was introduced in 1991. This consisted of two straps fitted under the bolt heads 'A' to prevent the steering unit coming away from the steering column in the event of a rubber bush failure. If these two straps are not fitted, order quantity two Massey Ferguson part number 3698 999 M1, see illustration.

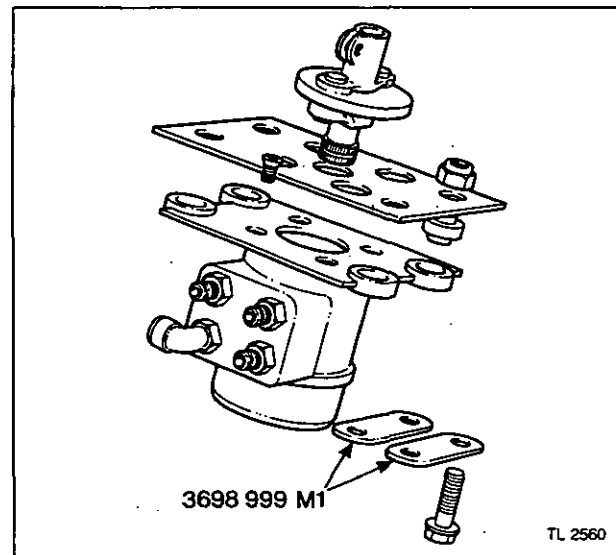
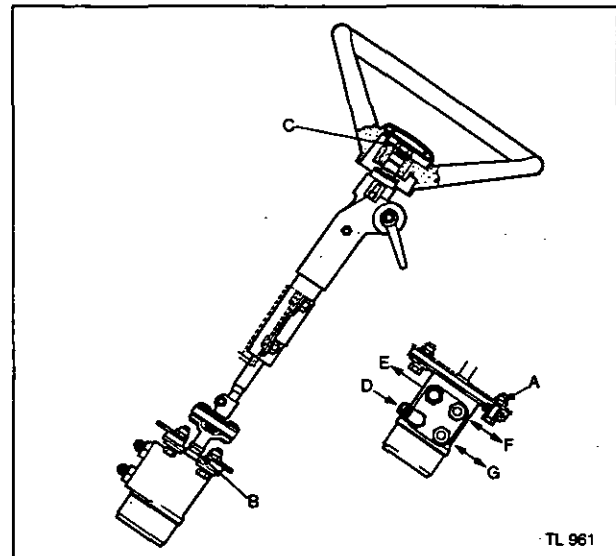
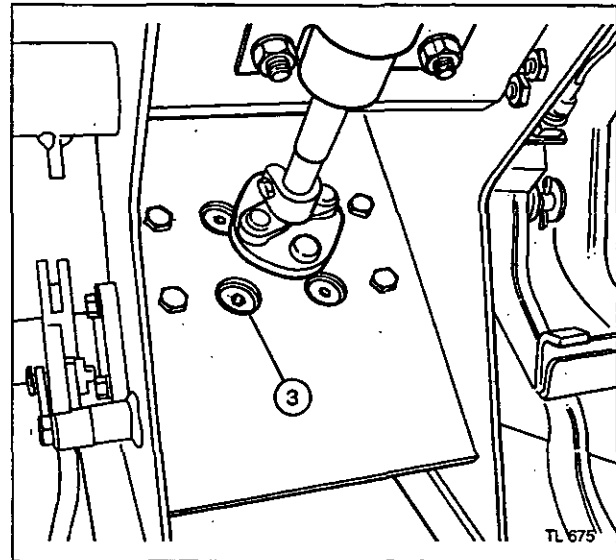
Reassembly

7. Reverse procedures 1 to 4 except:
 - a. If the steering unit mounting plate is removed tighten the four mounting bolts 'A' to a torque of 40 Nm (30 lbf ft).
 - b. If the steering column flexible joint is removed set the groove in the spline end 'B' level with the top of the steering unit drive shaft.
 - c. If the steering wheel is removed, tighten the securing nut 'C' to a torque of 40 Nm (30 lbf ft).
 - d. See detail 'Z' for hose connections to the orbitrol steering unit as follows:

- D - From steering pump
- E - To steering pump or oil cooler
- F - To steering cylinder - Left
- G - To steering cylinder - Right

Start-up Procedure

8. The orbitrol steering unit will not tolerate dirt ingress under operational conditions. It is necessary to flush the system to remove any impurities before the unit is turned.
9. Change the auxiliary hydraulic filter element, see operation 12B-12.
10. After installing the steering unit, start the engine and under no circumstances turn the steering wheel for 10 minutes.



11A-8

STEERING

11. Run the engine at a good throttle opening to ensure a high flow of hydraulic oil through the steering unit and associated pipe work to effect a good flushing action.
12. Commence the steering action after this 10 minute warm-up taking the steering wheel to full lock in each direction. Complete at least 10 operations of the steering wheel to ensure the cylinder and cylinder lines are flushed.
13. A further two operations should then be undertaken taking the steering cylinder to its fullest extent and holding the steering wheel a full minute in this position so that flow occurs under full relief valve pressure.
14. On completion, check the steering wheel takes up the neutral position, check that the steering wheel neither motors to the left or right in the hands-off position.

Orbitrol Steering Unit

Overhaul

11A-03

Special tools:

MS.62A Kin-ring Fitting Tool

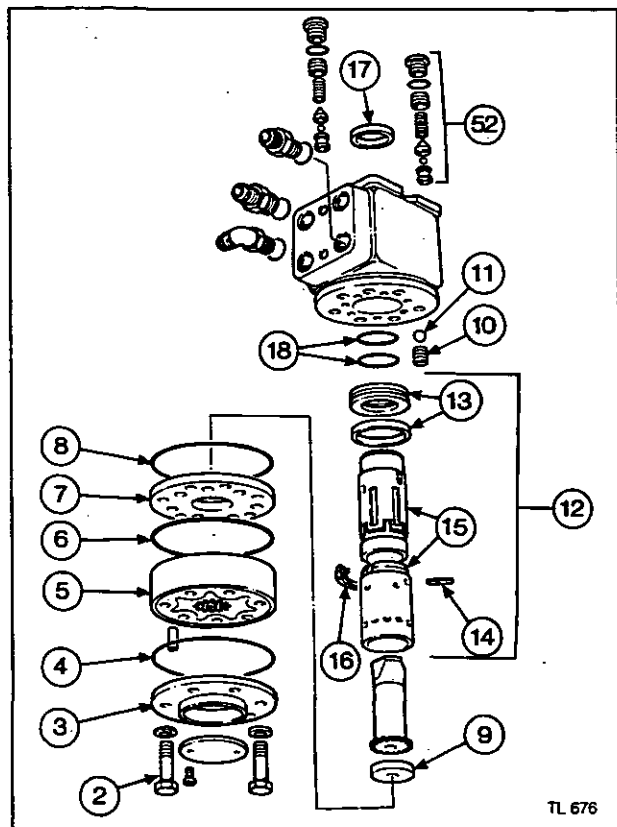
MS.63 Centring Spring Fitting Tool

Disassembly

1. Remove the orbitrol steering unit, see operation 11A-02.
 2. Remove the seven screws.
 3. Lift off the end plate.
 4. Remove the 'O' ring.
 5. Lift off the stator and rotor.
 6. Remove the 'O' ring.
 7. Remove the distributor plate.
 8. Remove the 'O' ring.
 9. Remove the drive shaft and spacer.
 10. Unscrew and remove the threaded bushing in the bore of the check valve.
 11. Shake out the ball check valve.
 12. Remove the outer and inner spools with rings, bearing races and needle bearings from the housing. This is achieved by pressing the inner spool from the steering column end.
- NOTE: The cross pin (14) in the sleeve and spool must be kept horizontal. The pin can be seen through the open end of the inner spool.**
13. Remove the ring, bearing race and needle bearing from the spool and sleeve.
 14. Press out the cross pin using the screws with a rolled pin (from end cover).
 15. Carefully press the inner spool out of the outer sleeve.
 16. Press the neutral position springs out of their slot in the inner spool.
 17. Lever out the dust seal.
 18. Remove the 'O' ring and Kin-ring.

Examination

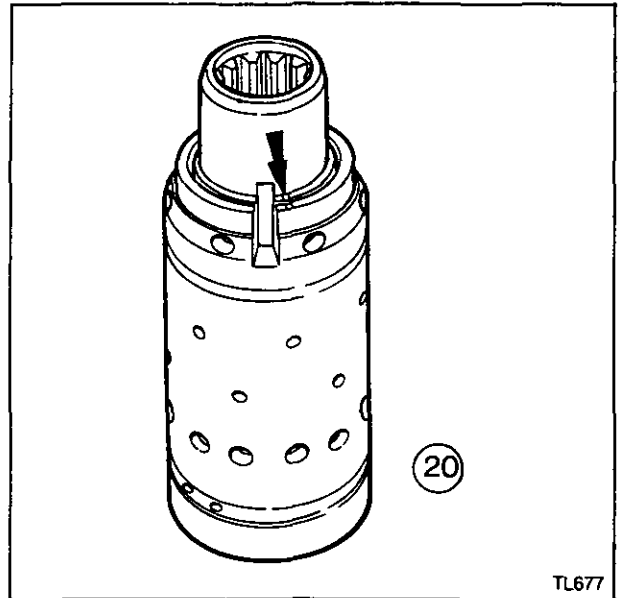
19. Check all parts carefully and replace parts as necessary.
 - a. All seals, washers and neutral position springs must be replaced.
 - b. Clean all parts before assembly, lubricate all items in hydraulic oil.



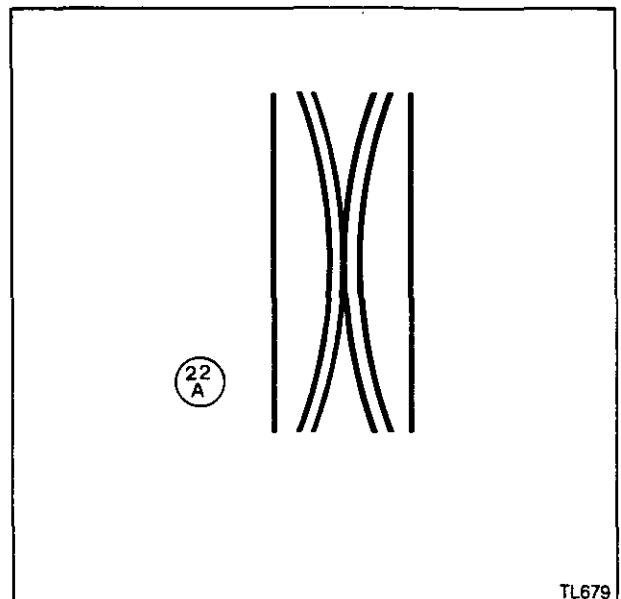
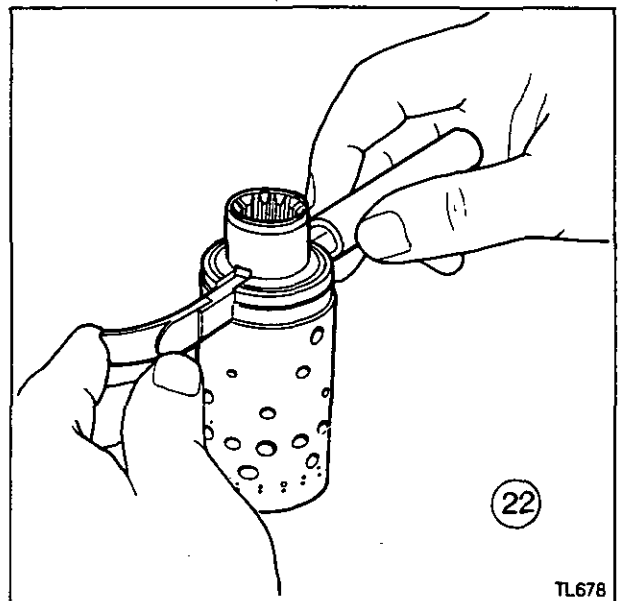
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Reassembly

20. Carefully slide the inner spool into the sleeve with the two marks aligned as shown and that the slots for the neutral position springs are opposite each other.



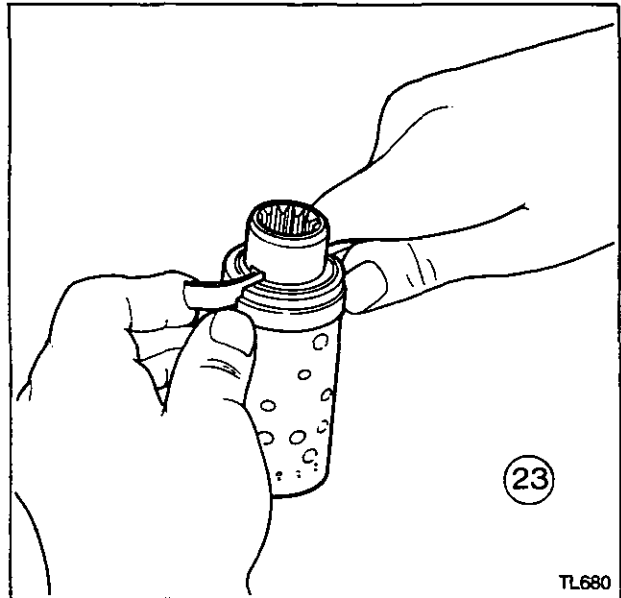
- 21. Push the assembly tool MS63 for the neutral position springs right through the slot.
- 22. Place the springs in the tool in the order shown in illustration 22A.



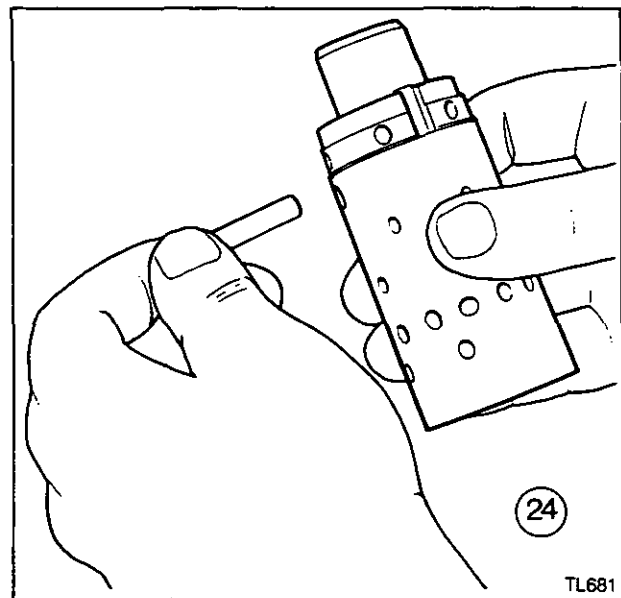
11A-10

STEERING

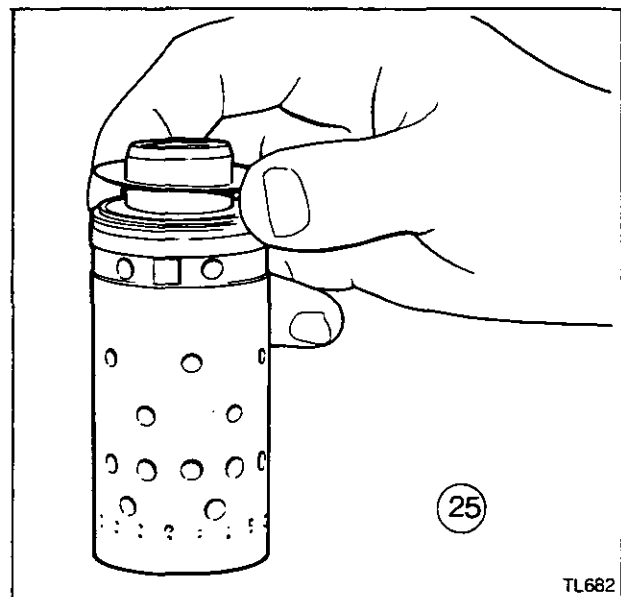
23. Press the neutral position springs together and push them into place, remove the assembly tool.



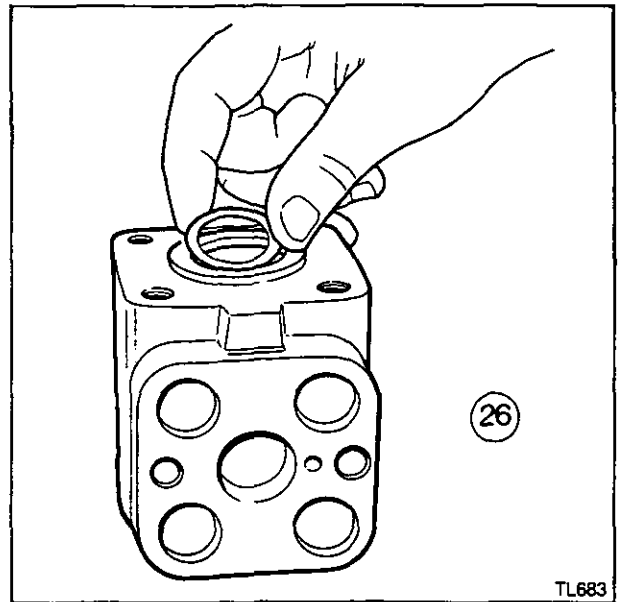
24. Insert the cross pin.



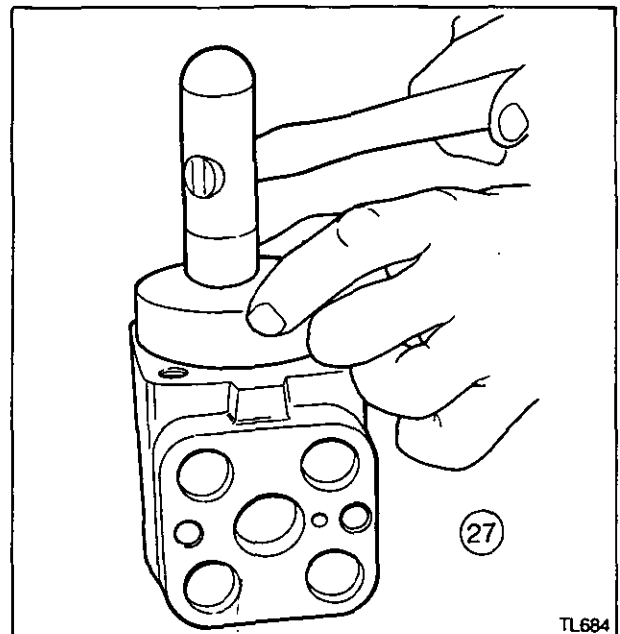
25. Fit the ring, rear bearing race, needle bearing and front bearing race in that order. The chamfer on the rear washer must be facing away from the needle bearing.



26. Place the dust seal in the groove of the housing.



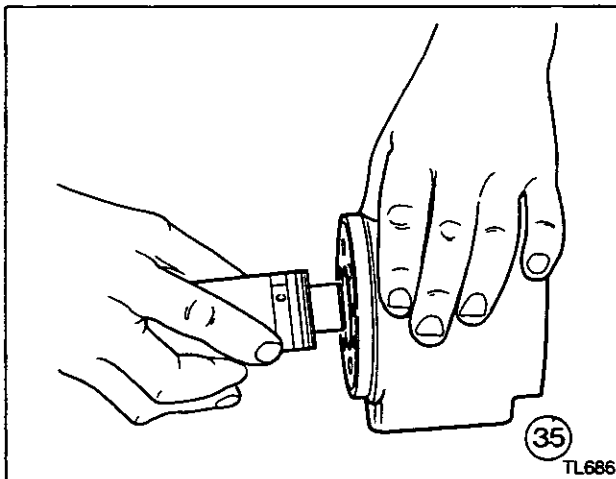
27. Place a flat steel block over the seal and hammering it lightly drive it into place.



11A-12

STEERING

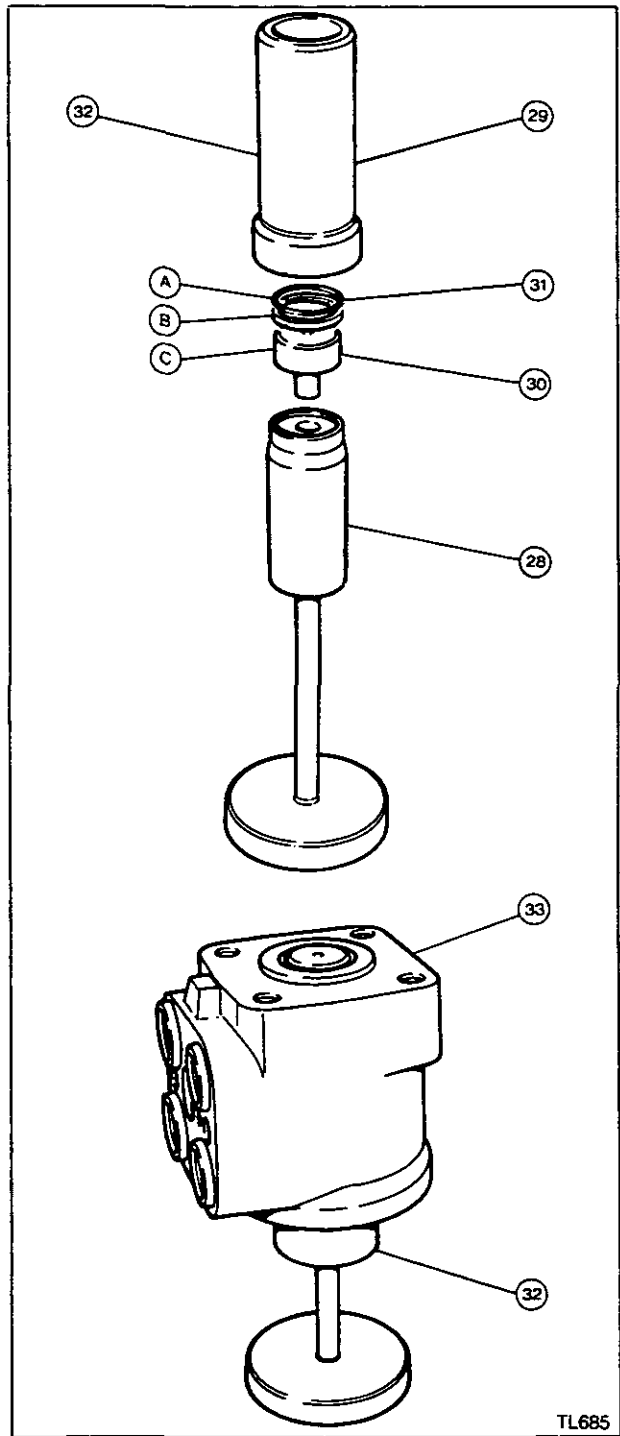
28. Stand special tool MS62A on the bench.
29. Remove the outer sleeve.
30. Fit the nylon spigot into the plungers.
31. Fit the 'O' ring 'A' with the kin-ring 'B' over the nylon spigot 'C'.
32. Place the outer sleeve of the special tool into the bore of the steering unit.
33. Place the housing and inner sleeve over the inner assembly tool (28) and carefully guide it down until a firm resistance is felt.
34. Withdraw the inner and outer parts of the assembly tool from the bore of the steering unit, leaving the nylon spigot and seals in place.



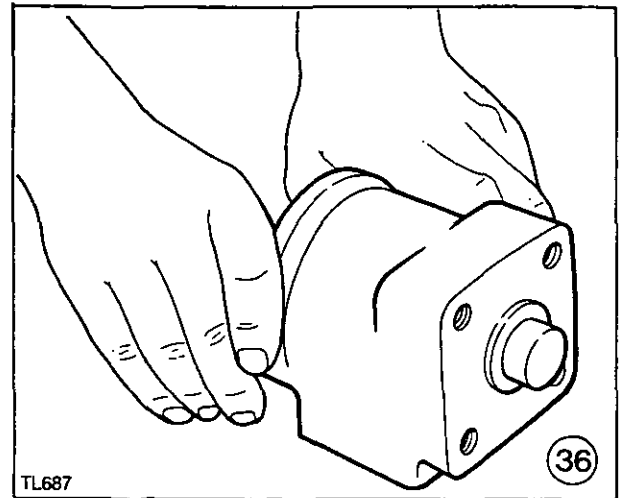
35. Guide the spool and sleeve assembly into the bore with light turning movements.

Note.

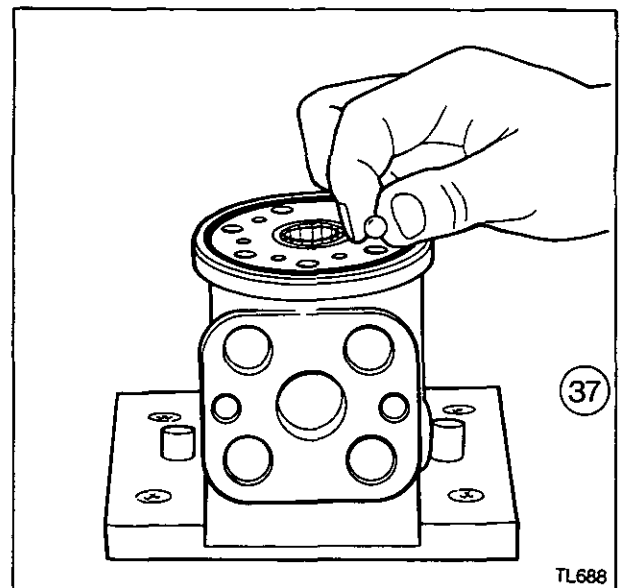
Fit the spool and sleeve in the bore in such a way that the cross pin is kept horizontal.



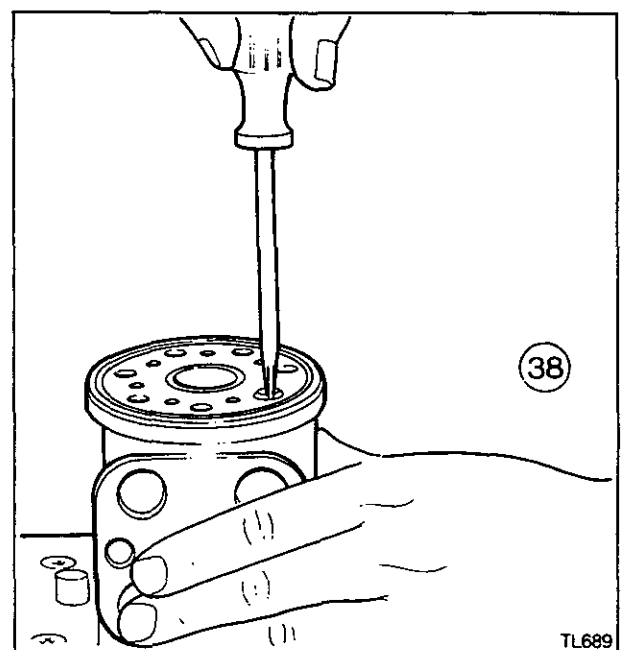
36. Push the spool and sleeve assembly so that it ejects the nylon spigot out of the housing leaving the 'O' ring and kin-ring in place.



37. Place the ball check valve in the hole shown (11).



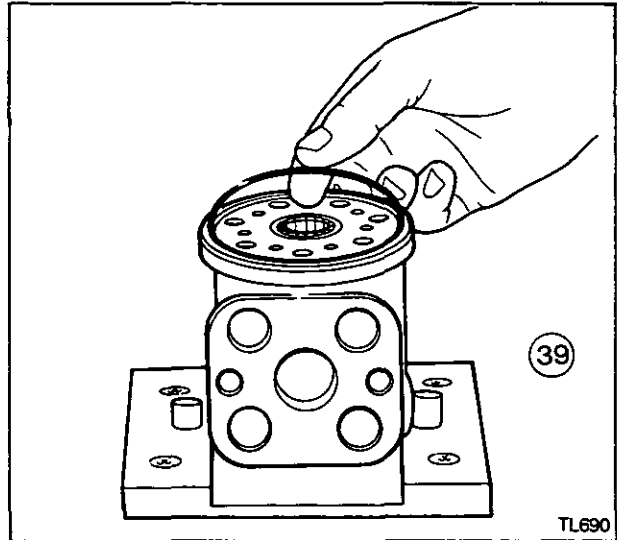
38. Lightly screw in the threaded bushing in the check valve (10).



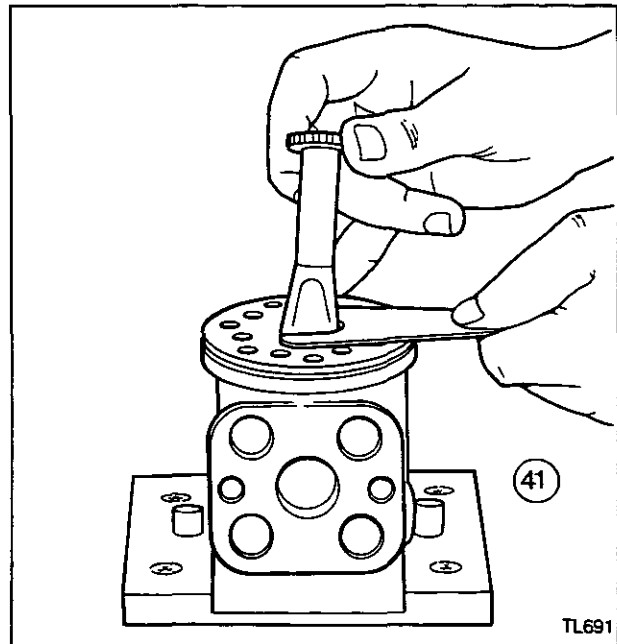
11A-14

STEERING

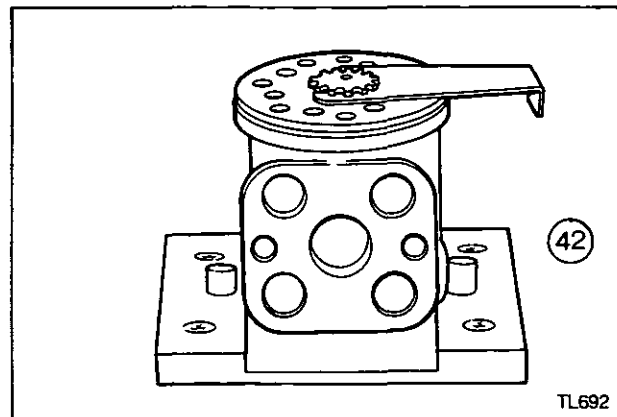
- 39. Grease the 'O' ring (8) with petroleum jelly and place it in its groove.
- 40. Place the distributor plate (7) in such a way that the channel holes match the corresponding holes in the housing.



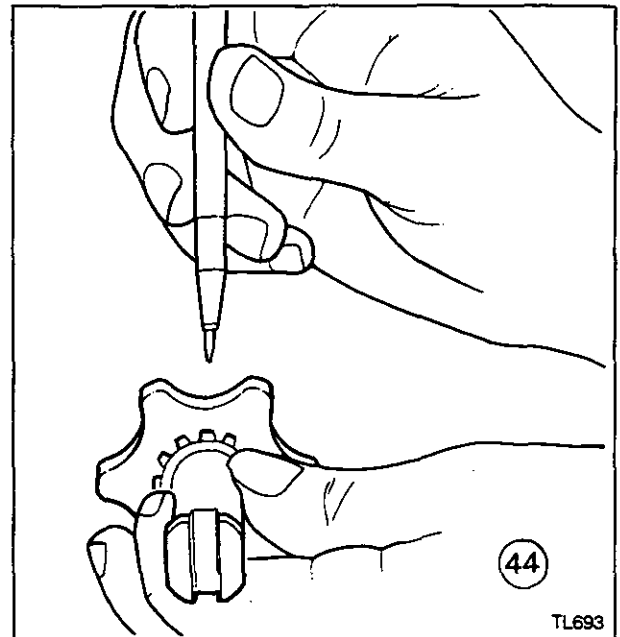
- 41. Fit the drive shaft (9) down into the bore so that the slot is parallel with the connecting flange.



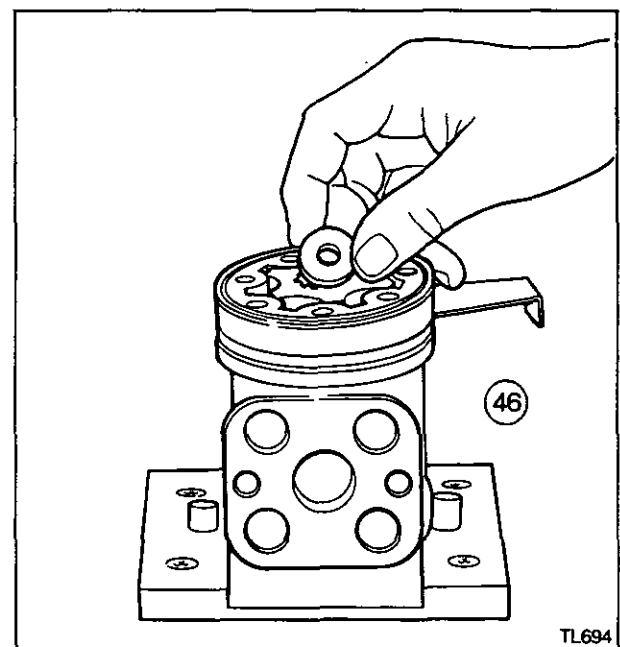
- 42. Position the drive shaft as shown, make up a thin mounting fork as shown to hold it in position.



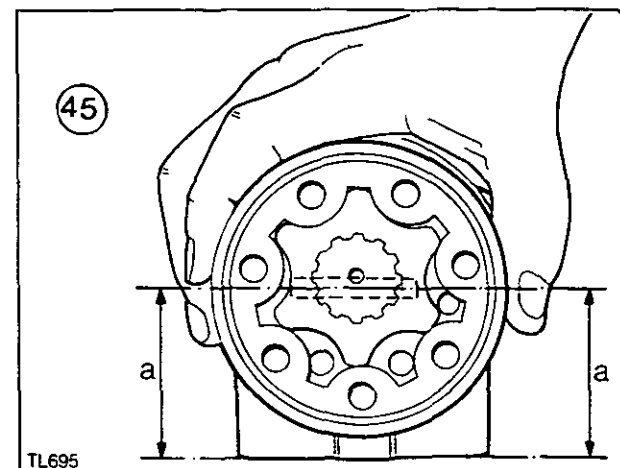
- 43. Fit the 'O' ring (6 and 4) on both sides of the gear rim (5).
- 44. The gearwheel of the rotor and the drive shaft must be assembled, in such a way that the tooth base in the rotor is positioned in relation to the slot in the drive shaft as shown.



- 45. Turn the gear rim (Stator) in such a way that the seven holes for the screws match the corresponding seven holes in the housing. Rotor and pin must be in the position shown in relation to each other. The centre line of the pin 'a' is below the centre line of the shaft.



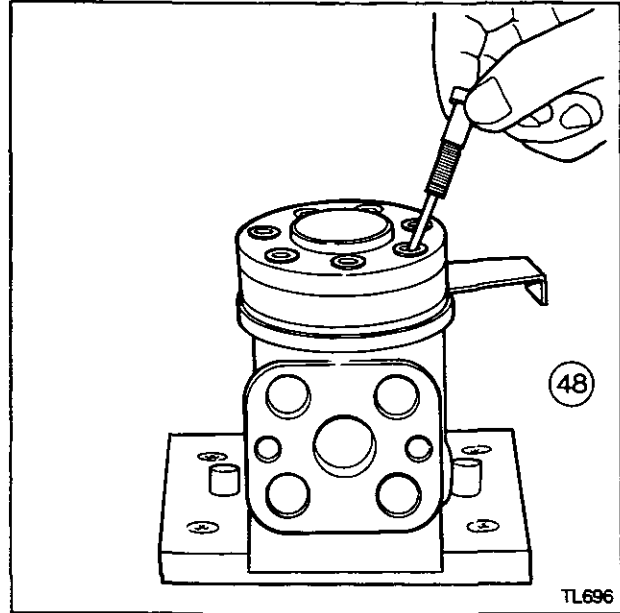
- 46. Fit the spacer.
- 47. Fit the end cover (3).



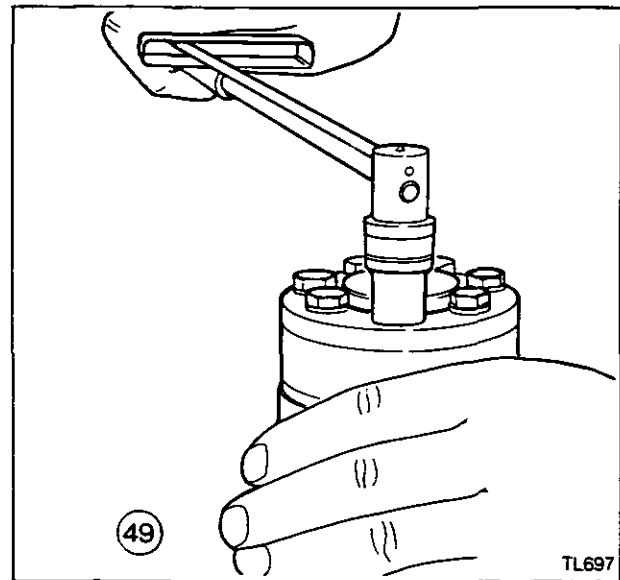
11A-16

STEERING

48. Put the washer on the screw with the roll pin and fit into the hole with the threaded bushing and check valve.



49. Put the washers on the remaining six screws and fit them. Withdraw the drive shaft holding tool and tighten the seven screws to a torque of 25-35 Nm (19-26 lbf ft).
50. The non return valve fitted to the inlet port which should not require servicing.
51. Two shock valves are fitted to each steering ram port. These should not be removed unless absolutely necessary. Special hydraulic equipment is required to reset the pressure settings of the valves.
52. On the top of the steering unit port face is the pressure relief valve. Adjustment is effected by removing the 8mm hexagon plug and sealing washer. To obtain the correct pressure of:
3 cylinder engine tractors 130-150 bar (1800-2000 lbf/in²)
4 and 6 cylinder engine tractors 160-180 bar (2300-2600 lbf/in²)
Turn the internal 8mm setting screw inwards to increase or outwards to decrease the pressure setting. Refit the valve cover plug and sealing washer and tighten to a torque of 50 Nm (37 lbf ft).



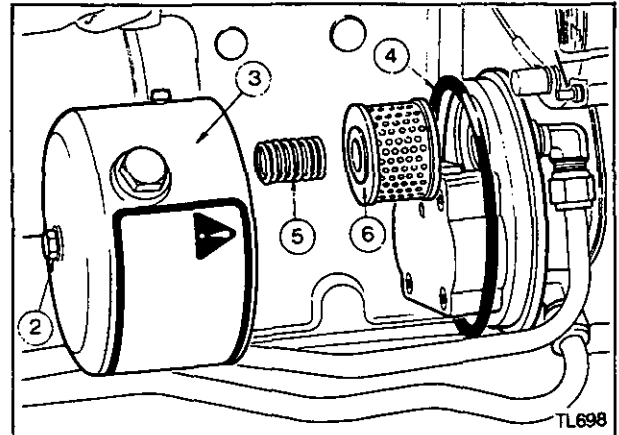
3 Cylinder Engine Steering Pump.

Servicing

11A-04

Procedure.

1. Place a suitable receptacle beneath the pump reservoir.
2. Remove the reservoir retaining bolt and sealing washer.
3. Remove the reservoir.
4. Remove the 'O' ring.
5. Remove the filter retaining spring.
6. Remove and discard the element.
7. Clean the reservoir and pump housing.
8. Fit a new element (6).
9. Ensuring that the reservoir sealing ring (4) is undamaged, refit the spring (5), reservoir (3) and retaining bolt and washer (2).
10. Set the reservoir so that the breather is at the top. Tighten the retaining bolt.
11. Fill the reservoir to the level plug with transmission oil.
12. Start the engine and run at 750-1000 rev/min.
13. Refill the reservoir to the level plug.



14. Turn the steering wheel from lock to lock at least twice. If the system is empty due to other work being carried out the level will fall rapidly during this operation. The reservoir may need refilling in order to reach both extreme locks.
15. To achieve correct oil level on four-wheel drive Tractors. Position the steering wheel one turn to the right-hand lock. On two wheel drive tractors the steering wheel position is unimportant.
16. Ensure that the oil in the reservoir is air free.
17. Refill the reservoir to its level with the plug and refit the plug.
18. Check the steering system for leaks.

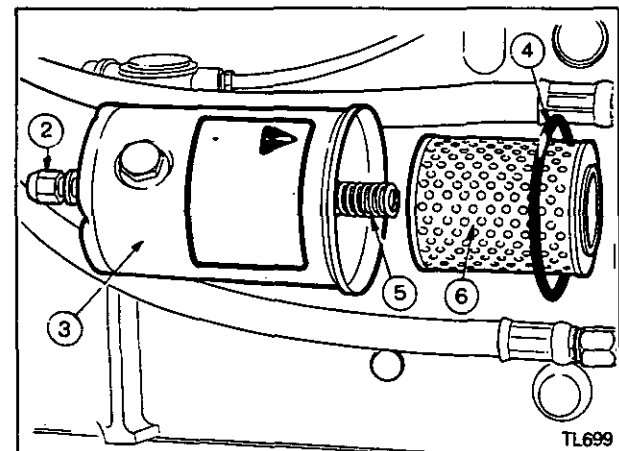
4 Cylinder Engine Steering Pump

Servicing

11A-05

Procedure.

1. Place a suitable receptacle beneath the pump reservoir.
2. Remove the reservoir retaining bolt and sealing washer.
3. Remove the reservoir.
4. Remove the 'O' ring.
5. Remove the filter retaining spring.
6. Remove and discard the element.
7. Clean the reservoir and pump housing.
8. Fit a new element (6).
9. Ensuring that the reservoir sealing ring (4) is undamaged, refit the spring (5), reservoir (3) and retaining bolt and washer (2).
10. Set the reservoir so that the breather is at the top. Tighten the retaining bolt.
11. Fill the reservoir to the level plug with transmission oil.
12. Start the engine and run at 750-1000 rev/min.
13. Refill the reservoir to the level plug.



14. Turn the steering wheel from lock to lock at least twice. If the system is empty due to other work being carried out the level will fall rapidly during this operation. The reservoir may need refilling in order to reach both extreme locks.
15. To achieve correct oil level on four-wheel drive Tractors. Position the steering wheel one turn to the right-hand lock. On two wheel drive tractors the steering wheel position is unimportant.
16. Ensure that the oil in the reservoir is air free.
17. Refill the reservoir to its level with the plug and refit the plug.
18. Check the steering system for leaks.

11A-18

STEERING

3 Cylinder Engine Steering Pump

Removal and Refitment

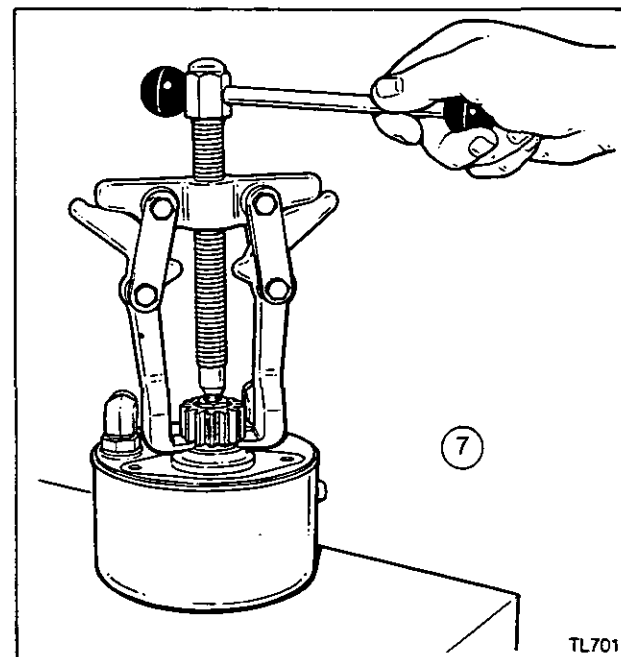
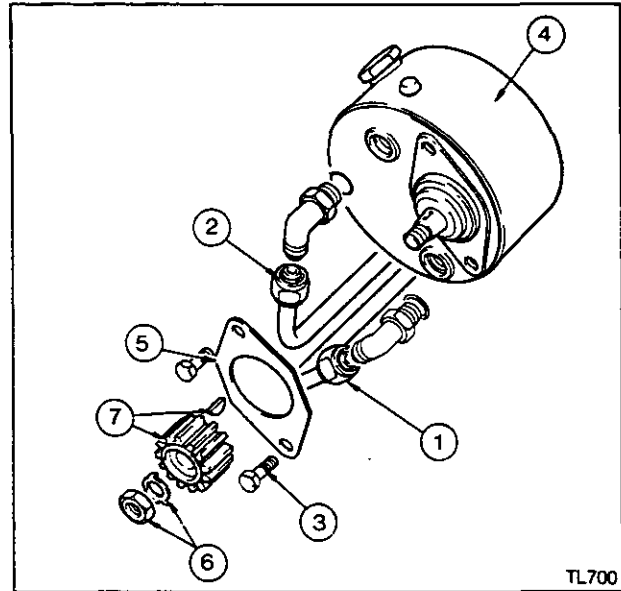
11A-06

Removal

1. Disconnect the hydraulic pipe to the steering unit.
2. Disconnect the hydraulic pipe return to pump.
3. Remove the two bolts securing the pump to the engine timing case.
4. Withdraw the pump assembly from the engine.
5. Remove and discard the gasket.
6. Remove the drive gear lock nut and tab washer.
7. A mechanical puller **MUST** be used to remove the drive gear and key from the pump drive shaft.

Refitment.

8. Reverse procedure 1 to 7 except:
 - a. Tighten the drive gear retaining nut (6) to a torque of 40-45 Nm (30-33 lbf ft).
 - b. Replace the gasket (5).
 - c. Tighten two pump mounting bolts to a torque of 31-42 Nm (23-31 lbf ft).
9. Refill the reservoir with transmission oil and prime the system as described in operation 11A-04.



4 Cylinder Engine Steering Pump

Removal and Refitment

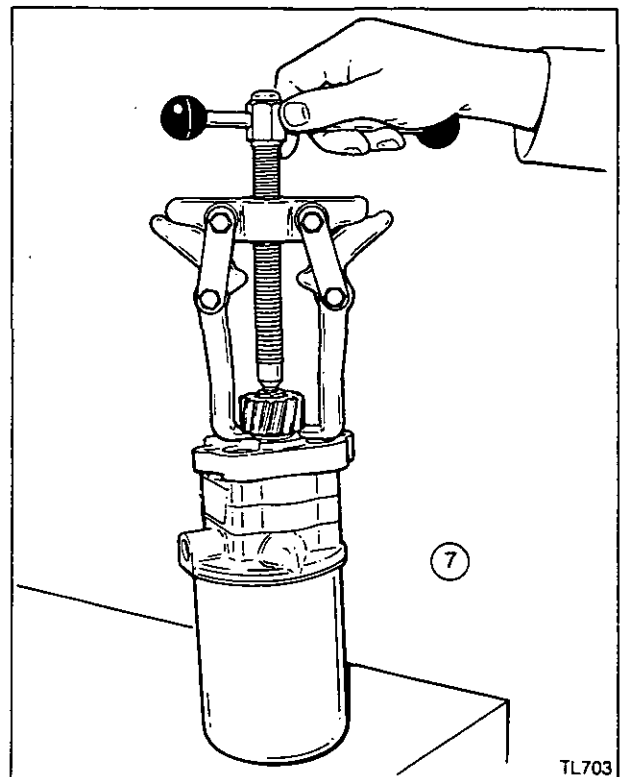
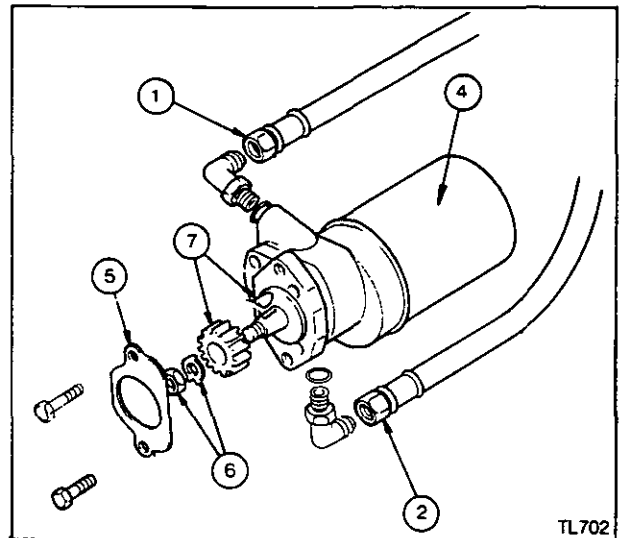
11A-07

Removal

1. Disconnect the hydraulic pipe to the steering unit.
2. Disconnect the hydraulic pipe return to pump.
3. Remove the two bolts securing the pump to the engine timing case.
4. Withdraw the pump assembly from the engine.
5. Remove and discard the gasket.
6. Remove the drive gear lock nut and tab washer.
7. A mechanical puller **MUST** be used to remove the drive gear and key from the pump drive shaft.

Refitment.

8. Reverse procedure 1 to 7 except:
 - a. Tighten the drive gear retaining nut (6) to a torque of 40-45 Nm (30-33 lbf ft).
 - b. Replace the gasket (5).
 - c. Tighten two pump mounting bolts to a torque of 31-42 Nm (23-31 lbf ft).
9. Refill the reservoir with transmission oil and prime the system as described in operation 11A-05.



11A-20

STEERING

3 Cylinder Engine Steering Ram

Removal and Refitment

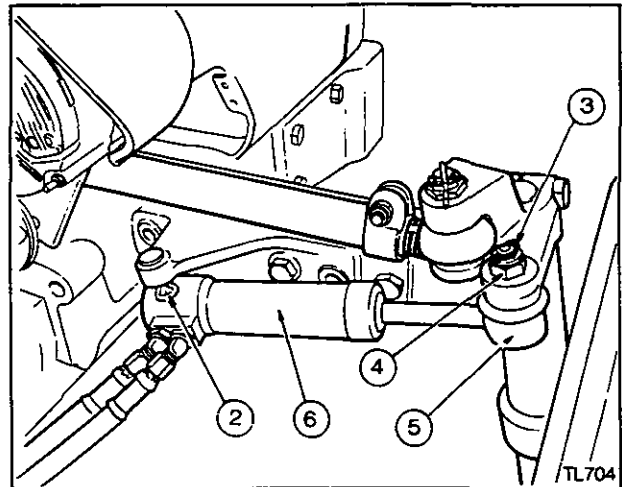
11A-08

Removal

1. Disconnect both hydraulic pipes to the steering ram.
2. Remove the 'R' clip from the inner pivot pin.
3. Remove the split pin.
4. Remove the slotted nut.
5. Drive the ball joint taper out of the steering arm.
6. Remove the steering ram assembly.

Refitment.

7. Reverse procedure 1 to 5 except:
 - a. Tighten the ball joint nut (4) to a torque of 75-90 Nm (55-66 lbf ft).



TL704

4 and 6 Cylinder Engine Steering Ram

Removal and Refitment

11A-09

Removal

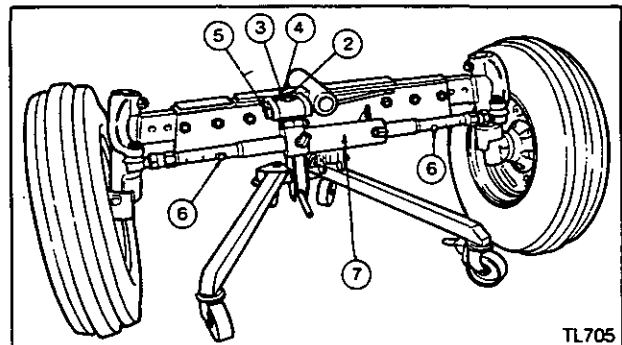
1. Remove the front axle assembly, see operation 10B-08.



Caution.

Ensure that the axle is adequately supported.

2. Remove the split pin.
3. Remove the slotted nut.
4. Drive the ball joint taper out of the pivot bracket.
5. Remove the pivot pin.
6. Remove the two nuts and bolts from the piston rod ends.
7. By turning the wheels about their spindles remove the steering ram assembly from the track rod ends.



TL705

Note:

- a. The nuts and bolts (6) when installed must be horizontal.
- b. The hydraulic hoses to the steering ram have a tapered thread, they must be resealed with Loctite 542 or PTFE tape.

Refitment

8. Reverse procedure 1 to 7 except:
 - a. Tighten the slotted nut (3) to a torque of 80-140 Nm (60-103 lbf ft).
 - b. Check the end float of the pivot bracket in the axle beam. The end float must be 0-0,2mm (0-0.008in), select shims from the chart to obtain this setting.

Part No.	Shim Thickness	
	mm	in
1695 040 M1	1,0	0.039
1695 041 M1	0,9	0.035
1695 042 M1	0,8	0.032
1695 043 M1	0,7	0.028
1695 044 M1	0,6	0.024

- c. Tighten the track rod to piston rod end nuts and bolts to a torque of 29-37 Nm (21-27 lbf ft).
- d. Tighten the ball joint nut to a torque of 50-70 Nm (37-52 lbf ft).

4 Wheel Drive Steering Ram

Removal and Refitment

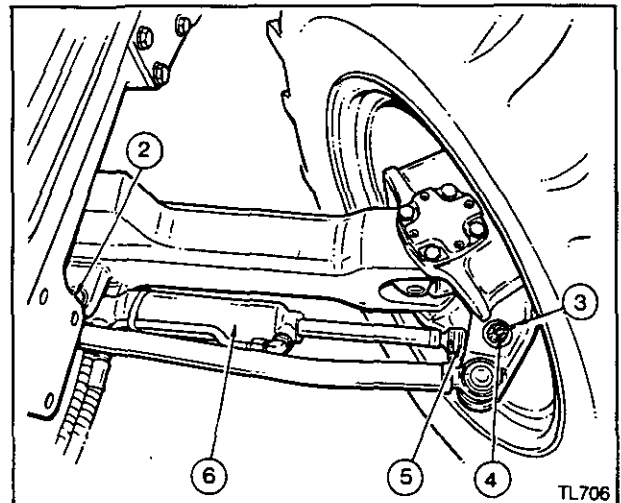
11A-10

Removal

1. Disconnect the hydraulic pipes.
2. Remove the split pin and inner pivot pin.
3. Remove the split pin.
4. Remove the slotted nut.
5. Drive the ball joint taper out of the steering arm.
6. Remove the steering ram assembly.

Refitment.

7. Reverse the procedure 1 to 6 except:
 - a. Tighten the ball joint nut (4) to a torque of 98-108 Nm (72-80 lbf ft).



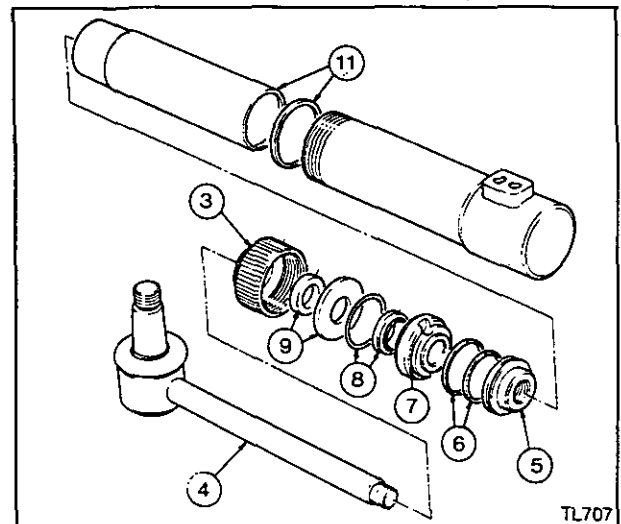
3 Cylinder Engine Steering Ram

Overhaul

11A-11

Disassembly.

1. Remove the steering ram assembly, see operation 11A-08.
2. Place the steering ram in a vice.
3. Unscrew the end cap.
4. Withdraw piston assembly from the cylinder.
5. Unscrew the piston from the rod.
6. Remove the sealing ring and 'O' ring from the piston.
7. Remove the end housing from the rod.
8. Remove the pressure seal and 'O' ring.
9. Remove the washer and dust seal.
10. Remove the end cap (3).
11. Remove the cylinder and sealing ring from the ram tube.



Examination.

12. Clean and inspect all parts. Replace all seals. Lubricate all parts with transmission oil.

Reassembly.

13. Reverse procedure 1 to 11 except:
 - a. Apply Loctite 270 to the thread on the end of the piston rod.
 - b. Tighten the piston to the rod and use a centre punch to strike the thread to prevent it unscrewing.

11A-22

STEERING

4 and 6 Cylinder Engine Steering Ram

Overhaul 11A-12

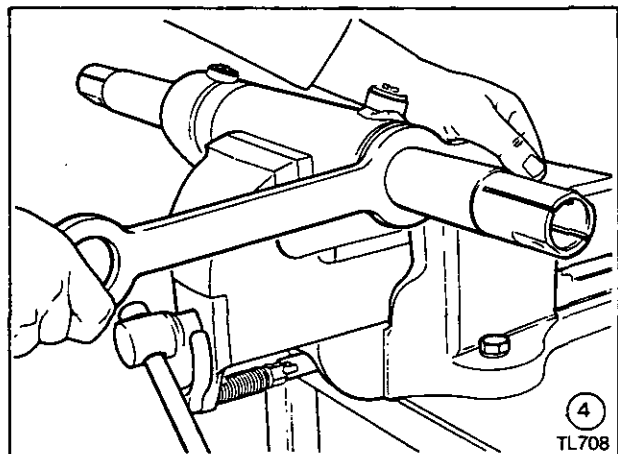
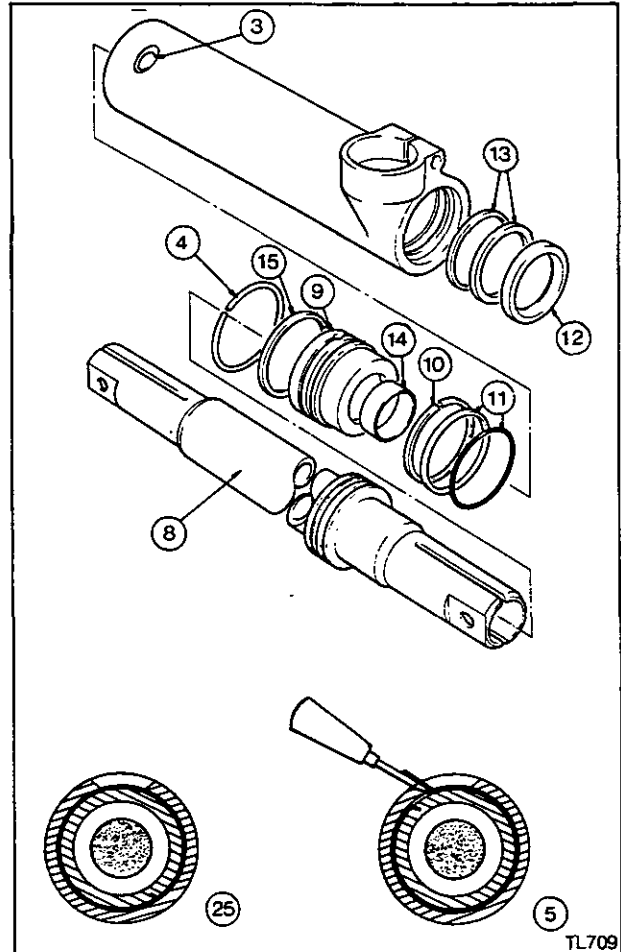
Special Tools:
MF454A Steering ram end cap remover/
replacer

Disassembly.

1. Remove the steering ram assembly, see operation 11A-09.
2. Place the steering ram in a vice.
3. Remove the sealing compound in the elongated hole at the end of the cylinder tube.
4. With MF454A steering ram and cap remover, place the two pins in the slots of the end cap and rotate the cap until the chamfered end of the retaining wire is seen in the elongated hole.
5. With the aid of a screwdriver and turning the end cap prise the end of the wire up out of the hole.
6. Turn the end cap and wind the rest of the wire out through the hole.
7. The end of the wire has a right angle bend which locates in the end cap, remove the wire from the cylinder.
8. Withdraw the piston assembly from the cylinder with the end cap assembly. Catch the oil in the cylinder in a suitable receptacle.
9. Remove the end cap assembly from the piston rod.
10. Remove the wear ring from the piston.
11. Remove the seal ring and 'O' ring from the piston.
12. Remove the dust seal from the cylinder and end cap.
13. Remove the seal and 'O' ring from the cylinder.
14. Remove the wear ring from the cylinder and end cap.
15. Remove the 'O' ring from the outside of the end cap.
16. If necessary the ball joint assembly can be removed for servicing.
17. Remove the nut and bolt.
18. Unscrew the retaining nut.
19. Remove the ball joint assembly.

Examination.

20. Clean and inspect all parts. Replace all seals and wear rings. Lubricate all parts with transmission oil.



Reassembly.

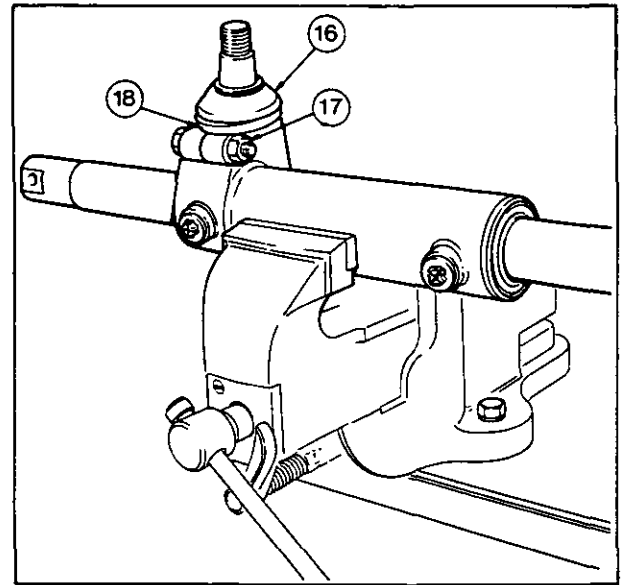
21. With seals and wear rings assembled insert the piston rod into the cylinder.
22. Slide the end cap down the piston rod into the cylinder.
23. Using tool MF454A rotate the end cap until the wire hole in groove is seen through the hole in the side of the cylinder tube.
24. Insert a new wire so that the bent end locates in the hole in end cap.
25. Rotate the end cap so that it draws the wire round the end cap in the cylinder tube.
26. Rotate until all the wire is in the cylinder.
27. Seal the elongated hole in the cylinder with a non-setting type of sealing compound.

Note: This sealing is important to prevent ingress of water and rusting of the end cap and retaining wire.

28. If the ball joint has been removed apply Loctite 270 to the thread and tighten to a torque of 80-90 Nm (59-66 lbf ft).
29. Tighten the ball joint clamping nut and bolt to a torque of 120-160 Nm (88-96 lbf ft).
30. Refit the steering ram to the axle.
31. When fitting the new hoses, particular attention must be given to the setting angles of the elbow fittings on the steering cylinder, to which the steering hoses connect.

The following procedure must be followed:

- a. When fitting the steering hoses, adjust the angular position of the two elbows so that the hoses are set clear of the bottom of the front support casting, and are not drooping down below the axle beam.
- b. Jack up the front of the tractor and move the axle to full tilt in both directions. At all angles of tilt, the hoses must be clear of the front support casting and not drooping down below the axle beam. If necessary, adjust the position of the elbows to achieve this condition.



11A-24

STEERING

4 Wheel Drive Steering Ram

Overhaul

11A-13

Special Tools:

MF454A, Steering ram end cap remover/replacer

Disassembly.

1. Remove the steering ram assembly, see operation 11A-10.
2. Place the steering ram in a vice.
3. Remove the sealing compound in the elongated hole at the end of the cylinder tube.
4. Using a large wrench across the end cap rotate the cap until the chamfered end of the retaining wire is seen in the elongated hole.
On later models of steering ram the end cap is provided with two holes, use MF454A steering ram and cap remover.
5. With the aid of a screwdriver and turning the end cap prise the end of the wire up out of the hole.
6. Turn the end cap and wind the rest of the wire out through the hole.
7. The end of the wire has a right angle bend which locates in the end cap, remove the wire from the cylinder.
8. Withdraw the piston assembly from the cylinder with the end cap assembly. Catch the oil in the cylinder in a suitable receptical.
9. Remove either the ball joint or the piston retaining nut and piston.
Note: Before removing the ball joint measure the distance from the centre of the ball joint to the end of the piston rod. Note this dimension for reassembly.
10. Slide the end cap off the piston rod.
11. Remove the piston seals.
12. Remove the end cap dust seal and pressure seal.
13. Remove the outer 'O' ring.

Examination.

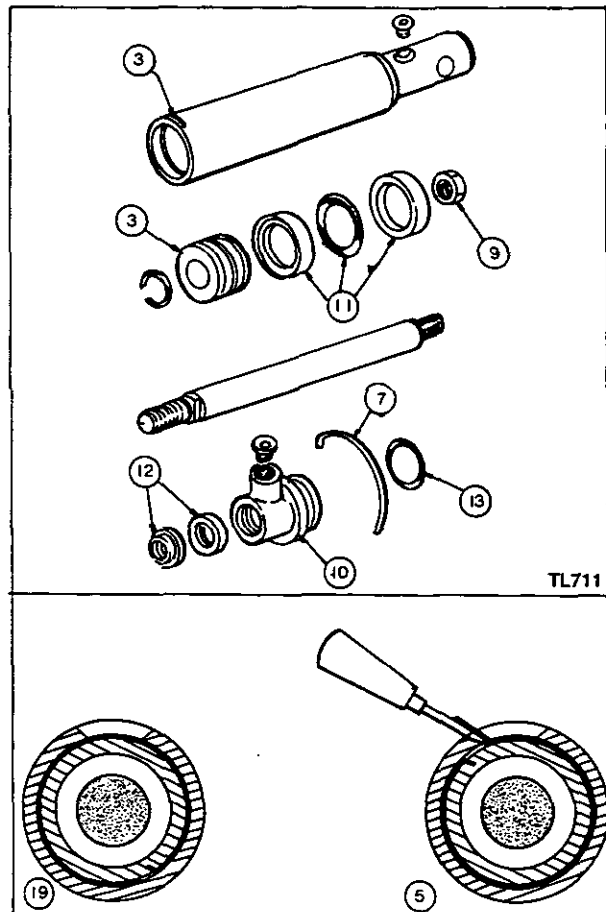
14. Clean and inspect all parts. Replace all seals. Lubricate all parts with transmission oil.

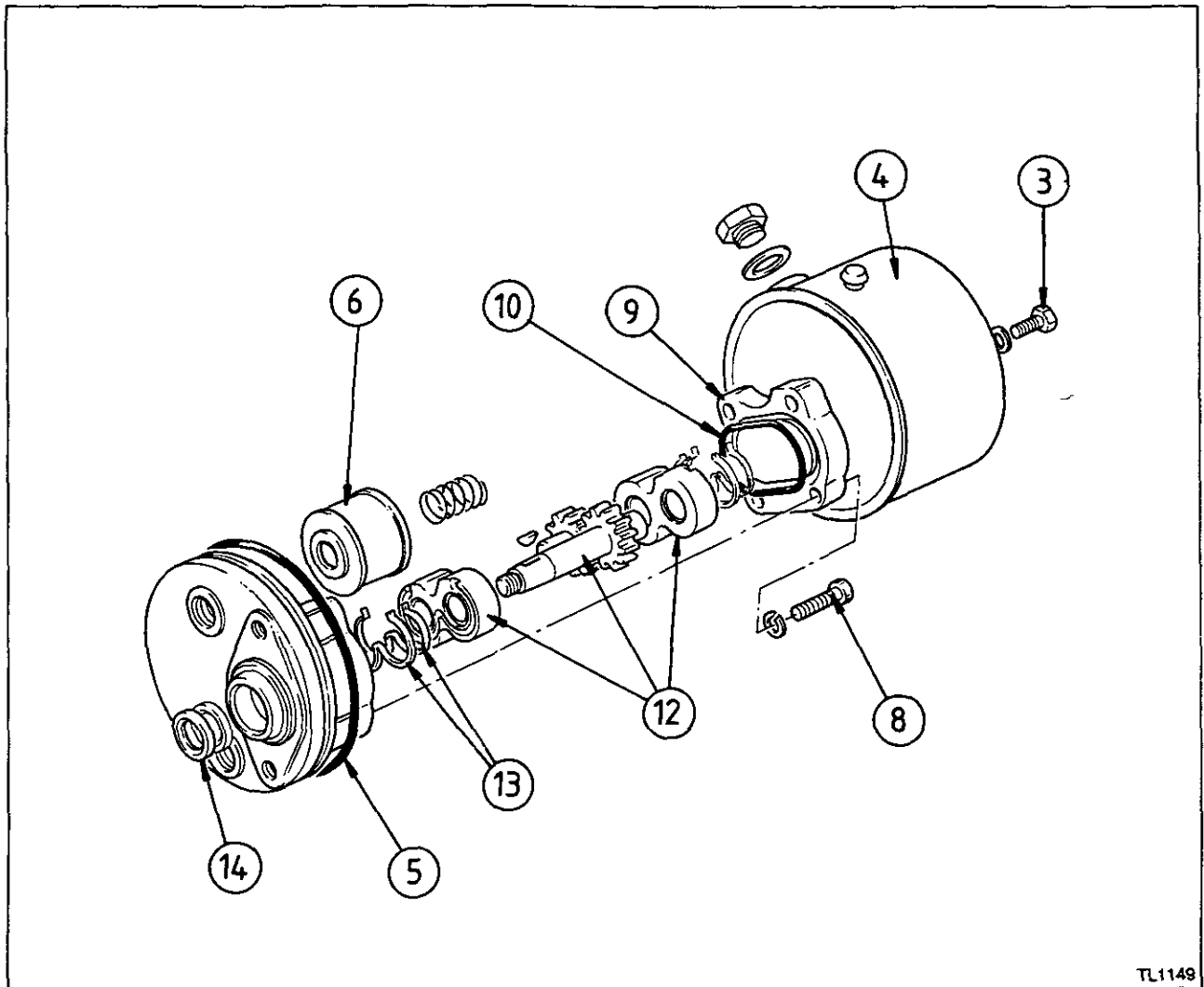
Reassembly.

15. With seals installed on the piston and end cap push the piston into the cylinder.
16. Slide the end cap down the piston rod into the cylinder.
17. Using the wrench rotate the end cap until the hole in the wire groove is visible through the hole in the side of the cylinder. On later models use MF454A.
18. Insert a new wire so that the bent end locates in the hole in the end cap.
19. Rotate the end cap so that it draws the wire round the end cap in the cylinder.
20. Rotate until all the wire is in the cylinder.
21. Seal the elongated hole in the cylinder with a non-setting type of sealing compound.

Note. This sealing is important to prevent ingress of water and rusting of the end cap and retaining wire.

See specifications for the closed length of the steering ram from the centre of the ball joint to the centre of the pivot pin.





TL1149

3 Cylinder Engine Steering Pump.

Overhaul

11A-14

Special Tools:

MF332 Hydraulic pump oil seal protector

Manufacturer: Sundstrand

Disassembly

1. Remove the steering pump, gear and key, see operation 11A-06.
2. Thoroughly clean the pump exterior.



Caution: When repairing, maximum cleanliness is essential. The work bench must be kept free from dirt and metal swarf etc. When dismantling, also ensure that the seals, bushings and gears are not jammed or knocked. The removed parts must be protected from any kind of damage.

3. Remove the reservoir retaining bolt.
4. Pull off the reservoir over an empty container to catch the oil.

5. Discard the large 'O' ring seal.
6. Discard the filter element.
7. Mark the pump body and end plate to facilitate their correct refitment.
8. Remove the four bolts and washers.
9. Separate the end plate from the main body.
10. Discard the 'O' ring seal.
11. Carefully mark the bearings with a felt tip pen with permanent ink, noting their positions relative to the pump body for reassembly.
12. Remove the bearing block and pump gear assembly by carefully pushing the drive shaft.
13. Remove the pressure loading seal and backing ring from both bearing blocks.
14. Extract the two shaft seals.

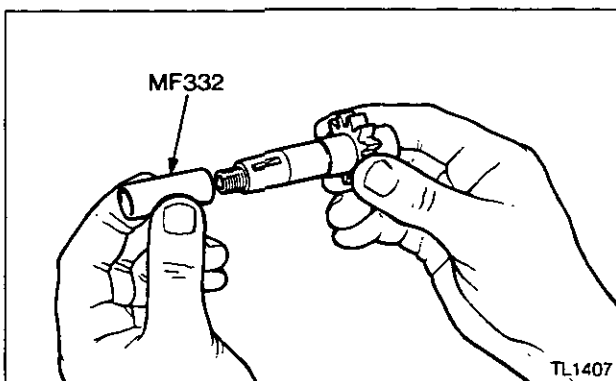
Examination

15. Clean all parts in a clean washing agent (do not use trichlorethylene or similar, this can damage the seals) and dry with compressed air. Lightly oil machine components.

16. Examine the casing, gears and bearings for wear or damage. The wear track on the inlet side of the pump body interior should be free from scoring and not deeper than 0,064 mm (0.0025 in).
17. The pump gears should not be scored or pitted.
18. Inspect the bearing blocks for signs of seizure or scoring. Light scoring on the side can be removed by careful light lapping on a surface plate using 400 grade wet/dry emery paper and paraffin (kerosene), ensure that such parts are thoroughly washed and dried prior to reassembly. Should wear be excessive install new bearing blocks.

Reassembly

19. Reverse procedure 1 to 13 except:
 - a. Renew all 'O' rings, seals and shaft seals.
 - b. Press in the first shaft seal squarely with a little grease and the spring side inner most. Press in the second seal with the spring side facing out, pack grease between the lips of the two seals.
 - c. Fit the pressure loading seal and the backing rings to the bearing blocks. A little grease in the grooves will help retain them.
 - d. Ensure correct installation of the bearing blocks and gears (observe markings). The bearings are assembled with the recesses against the gear faces and the seal ends on the inlet side of the pump.
 - e. Fit the sealing ring to the end plate with a little grease.
 - f. Lightly oil the four bolts and tighten evenly to a torque of 45-50 Nm (33-37 lbf ft).
 - g. Pour a small quantity of clean oil into the pump for internal lubrication and ensure the pump drive gear can be turned by hand.
 - h. Renew the filter element.
 - i. Assemble the reservoir with the breather at the top and tighten the bolt to a torque of 15-20 Nm (11-15 lbf ft). Tighten the filler plug to a torque of 13-20 Nm (10-15 lbf ft).
 - j. Refit the pump, see operation 11A-06 and refill and prime the system, see operation 11A-04.



4 Cylinder Engine Steering Pump

Overhaul

11A-15

Special Tools:

MF332 Hydraulic pump oil seal protector

Manufacturer: Sundstrand

Disassembly

1. Remove the steering pump, gear and key, see operation 11A-07.
2. Thoroughly clean the pump exterior.

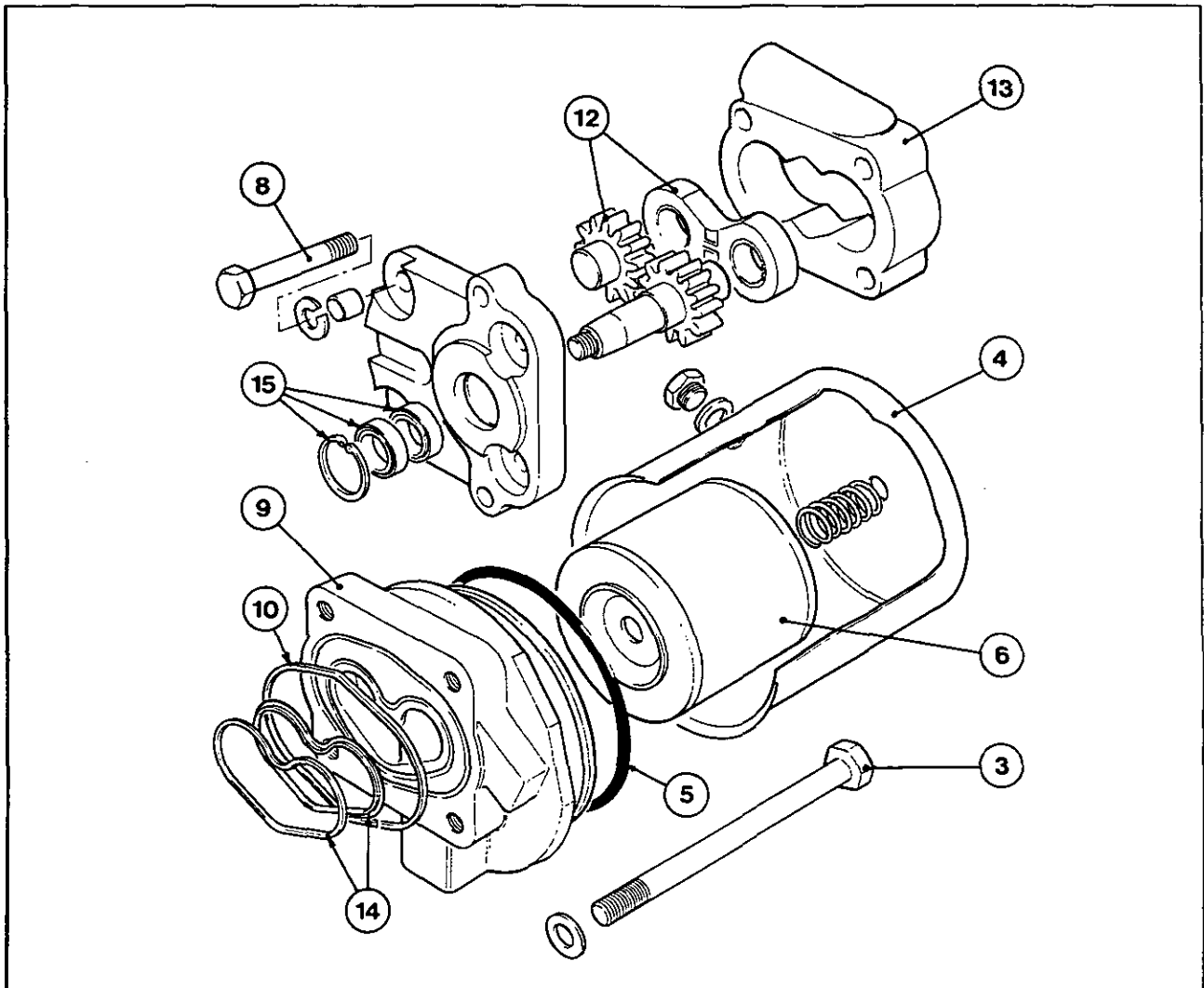


Caution: When repairing, maximum cleanliness is essential. The work bench must be kept free from dirt and metal swarf etc. When dismantling, also ensure that the seals, bushings and gears are not jammed or knocked. The removed parts must be protected from any kind of damage.

3. Remove the reservoir retaining bolt.
4. Pull off the reservoir over an empty container to catch the oil.
5. Discard the large 'O' ring seal.
6. Discard the filter element.
7. Mark the pump body and end plate to facilitate their correct refitment.
8. Remove the four bolts and washers.
9. Separate the end plate from the main body.
10. Discard the 'O' ring seal.
11. Carefully mark the bearings with a felt tip pen with permanent ink, noting their positions relative to the pump body for reassembly.
12. Remove the bearing block and pump gear assembly by carefully pushing the drive shaft.
13. Remove pump body.
14. Remove the pressure loading seal backing rings.
15. Remove the circlip and extract the two shaft seals.

Examination

16. Clean all parts in a clean washing agent (do not use trichlorethylene or similar, this can damage the seals) and dry with compressed air. Lightly oil machine components.



17. Examine the casing, gears and bearings for wear or damage. The wear track on the inlet side of the pump body interior should be free from scoring and not deeper than 0.064 mm (0.0025 in).
18. The pump gears should not be scored or pitted.
19. Inspect the bearing blocks for signs of seizure or scoring. Light scoring on the side can be removed by careful light lapping on a surface plate using 400 grade wet/dry emery paper and paraffin (kerosene), ensure that such parts are thoroughly washed and dried prior to reassembly. Should wear be excessive install new bearing blocks.

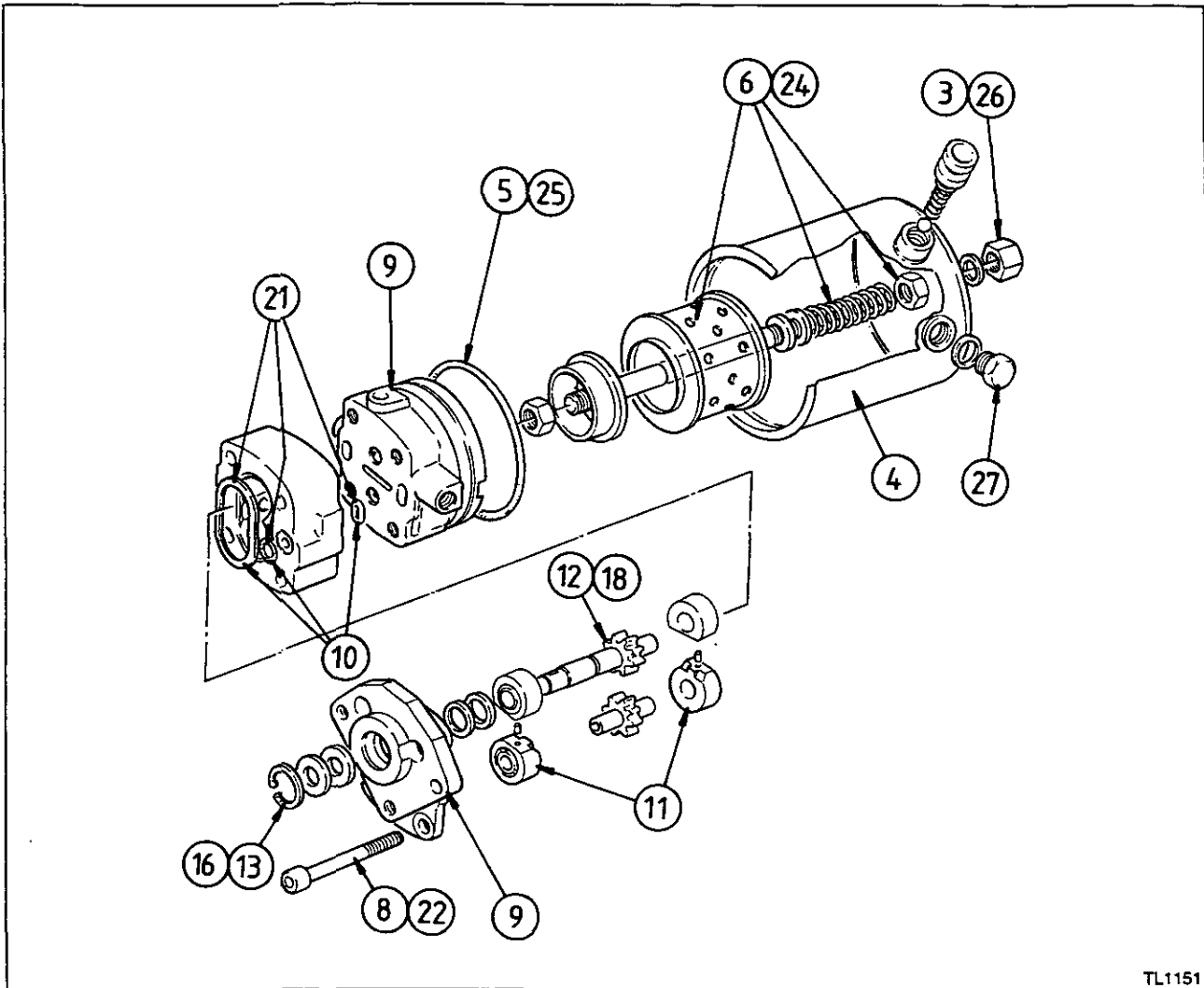
Reassembly

20. Reverse procedure 1 to 13 except:
 - a. Renew all 'O' rings, seals and shaft seals.
 - b. Press in the first shaft seal squarely with a little grease and the spring side inner most. Press in the second seal with the spring side facing out, pack grease between the lips of the two seals.
 - c. Fit the pressure loading seal and the backing rings to the bearing blocks. A little grease in the grooves will help retain them.

- d. Ensure correct installation of the bearing blocks and gears (observe markings). The bearings are assembled with the recesses against the gear faces and the relieved radii on the outlet side of the pump.
- e. Fit the sealing ring to the end plate with a little grease.
- f. Lightly oil the four bolts and tighten evenly to a torque of 48-54 Nm (35-40 lbf ft).
- g. Pour a small quantity of clean oil into the pump for internal lubrication and ensure the pump drive gear can be turned by hand.
- h. Renew the filter element.
- i. Assemble the reservoir with the breather at the top and tighten the bolt to a torque of 2,7-4,1 Nm (2-3 lbf ft). Tighten the filler plug to a torque of 13-20 Nm (10-15 lbf ft).
- j. Refit the pump, see operation 11A-07 and refill and prime the system, see operation 11A-05.

11A-28

STEERING



TL1151

4 Cylinder Engine Steering Pump

Overhaul 11A-16

Special Tools:
MF332 Hydraulic pump oil seal protector

Manufacturer: Bendix (Hydraquip)

Disassembly

1. Remove the steering pump, gear and key, see operation 11A-07.
2. Thoroughly clean the pump exterior.



Caution: When repairing, maximum cleanliness is essential. The work bench must be kept free from dirt and metal swarf etc. When dismantling, also ensure that the seals, bushings and gears are not jammed or knocked. The removed parts must be protected from any kind of damage.

3. Remove the reservoir retaining bolt.
4. Pull off the reservoir over an empty container to catch the oil.

5. Discard the large 'O' ring seal.
6. Remove the inner nut and spring and discard the filter element.
7. Mark the pump body and end plate to facilitate their correct refitment.
8. Remove the cap screws.
9. Separate the end plate from the main body by tapping gently with a plastic hammer.
10. Discard the seals.
11. Carefully mark the four bearings with a felt tip pen with permanent ink, noting their positions relative to the pump body for reassembly.
12. Remove the bearings and pump gears.
13. Remove the circlip and extract the spacer and shaft seal.

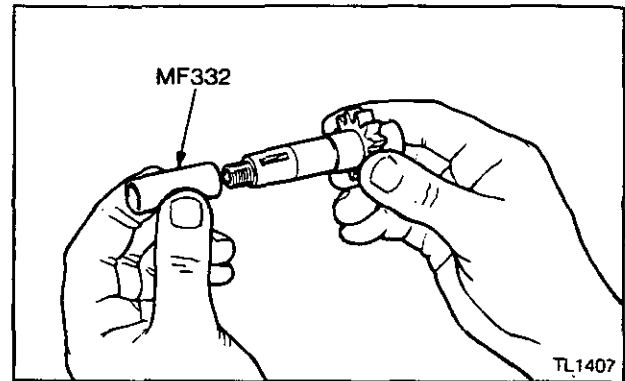
Examination

14. Clean all parts in a clean washing agent (do not use trichlorethylene or similar, this can damage the seals) and dry with compressed air. Lightly oil machine components.

15. Examine the casing, gears and bearings for wear or damage. The pump gears should not be scored or pitted. Inspect the bearing blocks for signs of seizure or scoring. Light scoring on the side can be removed by careful lapping on a surface plate using 400 grade wet/dry emery paper and paraffin (kerosene), ensure that such parts are thoroughly washed and dried prior to reassembly. Should wear be excessive install new bearing blocks.

Reassembly

16. Replace the shaft oil seal in the end plate with a new seal.
17. Refit the bearings in the centre housing retaining them as a unit with the locating dowels and with their machined faces towards the gears.
18. Place the two gear shafts into the already fitted bearings.
19. Loctate the two other bearings over the gear shafts.
20. Fit a seal and spacer onto the drive shaft gear.
21. Fit the sealing 'O' rings between the three elements comprising the pump body and then carefully assemble.
22. Fit and tighten the four cap screws.
23. Check the pump for free rotation.
24. Fit a new filter element, then fit the washers, spring and nut.
25. Fit a new 'O' ring and then refit the reservoir to the pump body.
26. Fit the outer seal, flat washer and nut to the reservoir, and gently tighten the nut to a torque of 3 Nm (2 lbf ft).
27. Tighten the filler plug to a torque of 13-20 Nm (10-15 lbf ft).
28. Refit the pump, see operation 11A-07 and refill and prime the system, see operation 11A-05.



11A-30

STEERING

Steering Column

Removal and Refitment

11A-17

Special Tools:

MF472 Steering wheel puller

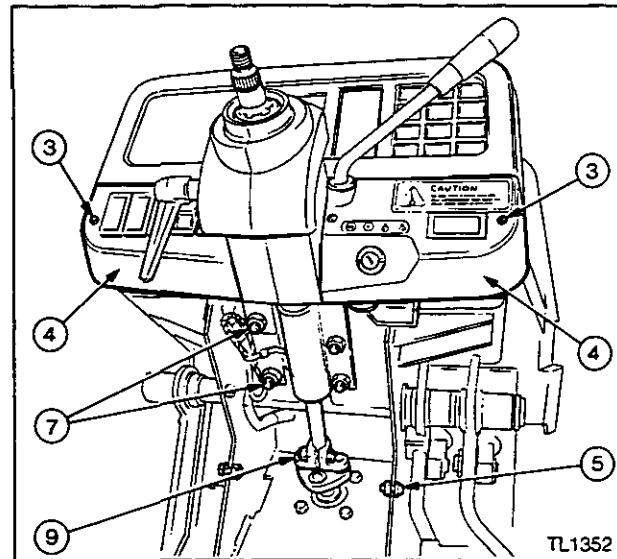
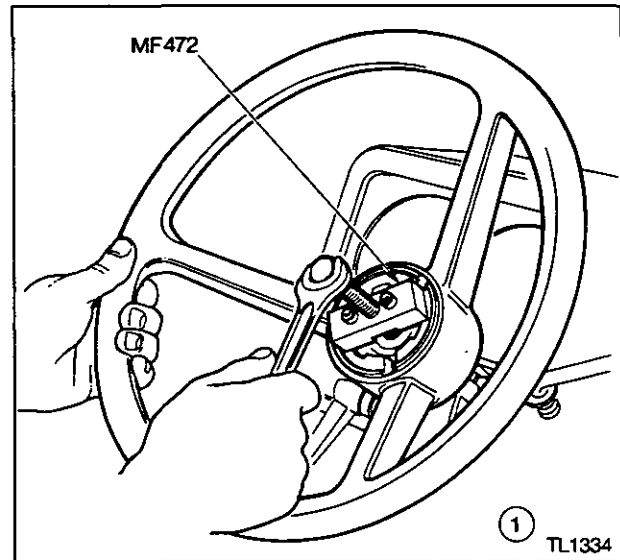
Removal

1. Using special tool MF472 remove the steering wheel from the column.
2. Remove both instrument panel side covers.
3. Remove the five screws from both switch panels each side of the steering column.
4. Move the switch panels to one side to give clearance around the column.
5. Remove the four screws and the fuse panel, the fuse holders complete with wires can be removed from the panel. (This applies to cab tractors only).
On footstep tractors remove the panel only.
6. Remove the two bolts on each side of the lower instrument panel. Lower the panel, there is no need to disconnect any of the controls.
7. Remove the four nuts holding the steering column to the instrument panel support frame.
8. Lift out the steering column assembly.

Note: The flexible coupling at the base of the column is not secured to the steering unit. If it is found to be tight on the shaft, care must be exercised in disconnecting it so as not to damage the steering unit.

Refitment

9. Reverse procedure 1 to 8 except:
 - a. Check the setting of the flexible coupling as given in operation 11A-02 page 11A-07.
 - b. Check that the plastic guards are correctly fitted before tightening any screws.
 - c. Tighten the steering column to support frame nuts to 15-20 Nm (11-15 lbf ft).
 - d. Tighten the flexible coupling bolt to 25-35 Nm (18-26 lbf ft).
 - e. Tighten the steering wheel nut to 34-47 Nm (25-35 lbf ft).



Steering Column – Tilt Type

Overhaul

11A-18

Disassembly

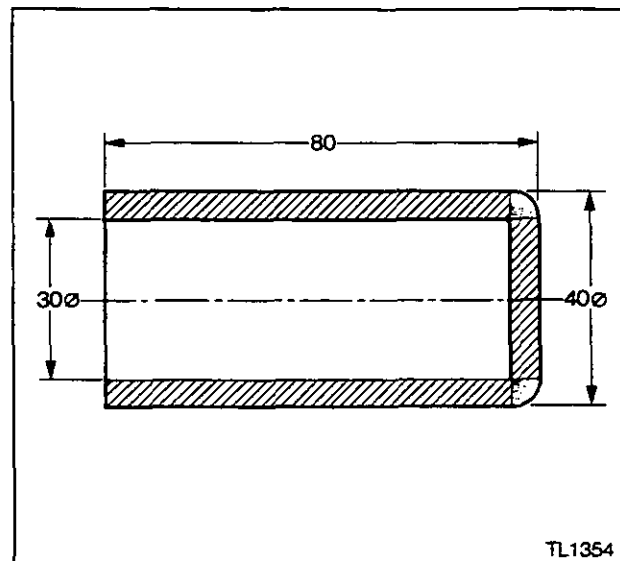
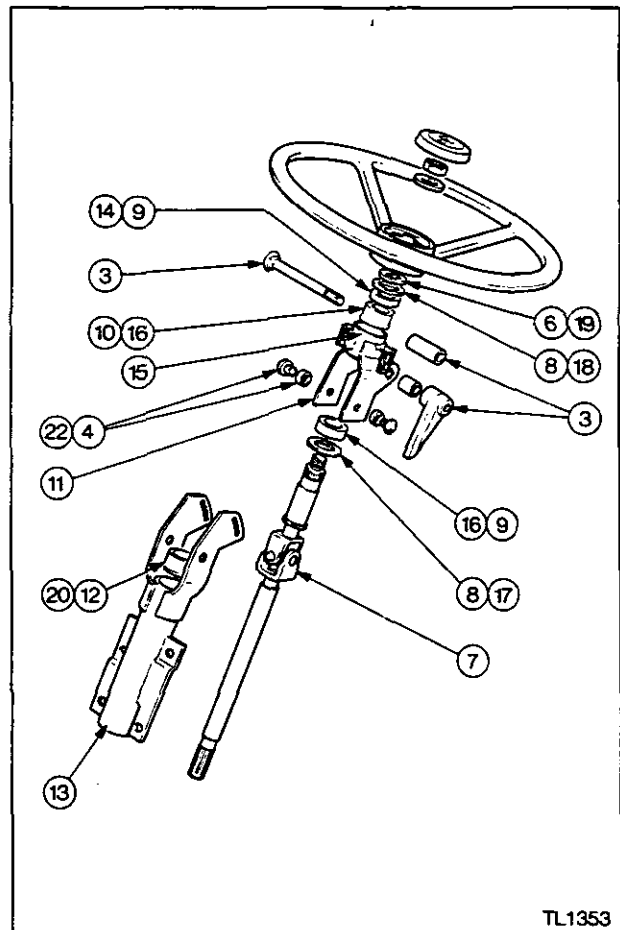
1. Remove the steering column assembly, see operation 11A-17.
2. Remove the two screws and the plastic covers.
3. Remove the handle, spacers and bolt.
4. Remove the two bolts and spacers, discard the two spacers.
5. Withdraw the top assembly out of the bottom tube.
6. Remove the retainer and discard.
7. Remove the shaft assembly and inspect. Renew the shaft assembly if any wear or damage has taken place.
8. Remove and discard both thrust washers.
9. Remove and discard both bearings.
10. Remove and discard the spacer, if fitted.
11. Check the condition of the housing assembly. If the housing is worn or damaged and requires replacement, fit a complete new tilt steering column assembly.
12. Remove and discard the bush.
13. Check the condition of the tube assembly. If the tube assembly is worn or damaged and requires replacement, fit a complete new tilt steering column assembly.

Reassembly

14. Fit a new top bearing into the housing assembly.
15. Fill the area inside the housing between the bearings with a general purpose grease.
16. Fit a new spacer and bottom bearing into the housing assembly.
17. Fit the lower thrust washer onto the shaft, then insert the top half of the shaft through the bearings and spacer in the housing.
18. Fit the new upper thrust washer onto the shaft.
19. Carefully fit a new retainer onto the shaft, using a suitable tool as shown in the illustration, until the shaft end float is 0,2 mm (0.008 in) MAXIMUM.

Note: The maximum pre-load on the bearings must not exceed a rotational torque of the shaft of 2 Nm (1.5 lbf ft).

20. Fit the new bush into the lower tube assembly.
21. Reassemble the two halves of the steering column assembly, secure with two new spacers and bolts.
22. Refit the bolt spacer and handle.
23. Refit the complete tilt steering column assembly onto the tractor.



HYDRAULICS

INDEX

12A	LIFT HYDRAULICS
12B	AUXILIARY HYDRAULICS

LIFT HYDRAULICS

Section 12 – Part A

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Specification**Hydraulic pump:**

Model	Mk. 3
Type	Four cylinder, scotch yoke, driven from the PTO drive line.

Output:

Standard flow	16,7 litres/min (3.7 Imp gal/min) (4.4 US gal/min)
Intermediate flow (Economy PTO)	19,4 litres/min (4.3 Imp gal/min) (5.1 US gal/min)
High flow	27.6 litres/min (6.1 Imp gal/min) (7.3 US gal/min)

Pressure relief valve setting at 1200/1250 engine rev/min 221-231 bar (3200-3350 lbf/in²)

Functions	Draft Control Position Control Response Control Constant Pumping
-----------------	---

Lift cylinder size:

MF340	79 mm (3.113 in)
MF350 to 399	93.6 mm (3.688 in)

Selector valve:

Shock valve pressure setting	260-275 bar (3800-4000 lbf/in ²)
------------------------------------	--

Settings Required

Draft control rod clearance	5,8 mm (0.230 in)
Vertical lever load	1,3 kg (3 lbf)
Vertical lever setting angle	90°
Response lever clearance	6 mm (0.25 in)
Linkage load for running adjustments	400 kgf (900 lbf) minimum
Lift arm rotation - Transport setting	6 mm (0.25 in)

Special Tools

MF.163	Spring retainer wrench
MF.272	Ram arm gauge
MF.273	Control lever setting gauge
MF.333	Draft control rod gauge
MF.349	Valve facing cutter and coining tool set
MF.350	Valve chamber circlip replacer
MF.351	Valve camber plug remover
MF.352	Control valve spring retainer clip
MF.353	Control valve body 'O' ring guide
MF.354	Control valve body replacer
MF.356C	Position and Draft control setting gauge
MF418A	Lift cover remover/replacer
MF.420	Hydraulic piston seal replacer
MF.453	Hydraulic piston seal replacer
MF.445	Ram arm gauge - intermix
MF455	Pressure relief valve test capsule
MF.3001	Pressure test kit

Bolt Torques

Control spring screw	7 Nm (5 lbf ft)
Lift cover bolts	88 Nm (65 lbf ft)
Front lift cylinder nuts	200-240 Nm (148-177 lbf ft)
Rear lift cylinder nuts	280-330 Nm (207-243 lbf ft)
Pump body retainer nuts	40 Nm (30 lbf ft)
Vertical lever end plate bolts	20 Nm (15 lbf ft)
Pressure relief valve assembly (Adjustable type)	100-120 Nm (74-89 lbf ft)
Selector valve retaining bolts	34-54 Nm (20-40 lbf ft)
Pressure relief valve assembly (Non-adjustable type)	20-30 Nm (15-22 lbf ft)

General Description

General

Figure 1. The Ferguson hydraulic system comprises a four cylinder scotch yoke type pump (1) which delivers oil, through a vertical pipe (2) to the cylinder (3).

A connecting rod (4) from the cylinder piston (5) engages in the ram arm (6) which is splined on to the lift shaft (7) which carries the linkage lift arms.

When oil, under pressure from the pump is delivered to the ram cylinder (3), the piston is forced rearwards and pushes the ram arm upwards, causing the lift shaft to rotate and raise the lift arms.

Conversely, when the oil is allowed out of the cylinder, the piston moves back under the load of the lift arms.

The hydraulic pump is drive by the PTO drive from the main clutch, via the gearbox constant mesh gears and the PTO drive shaft. It is therefore rotating whenever the forward part of the PTO system is being driven.

Oil flow from the pump is controlled by an integral control valve on the suction side of the pump.

The pump control valve is moved by the quadrant levers, forces down the top link, or the cam on the cross shaft.

The speed of movement of the valve into discharge (lower) is controlled by the Response unit.

Hydraulic Linkage Pump. (Figure 2)

All M-F 300 series tractors are fitted with a linkage pump (as shown). The linkage pump is driven by its own drive shaft which forms part of the PTO drive line.

Linkage pumps are available as standard flow 16,7 litres (3.67 gal/min), (4.4 US gal/min) or high flow 27,6 litres (6.08 gal/min), (7.3 US gal/min) specification. The pump does not change in design to give the different flows, these being obtained by driving the pump at two different speeds. The speed at which the pump is driven will be determined by the PTO system a particular tractor has.

All pumps operate at the same relief valve pressure of 221 bar (3200 lbf/in²). The relief valve can be adjusted without removing the pump from the tractor by either accessing through the centre housing side covers or by removing the lift cover. The valve is screw adjustable.

The pump consists of two piston yokes (1) which ride on cam blocks located on eccentrics on a camshaft (2). The pistons reciprocate in opposed valve chambers (3), each housing two inlet (4) and outlet valves (5) and springs. A sealing plug and snap ring secure the valves in the chambers.

Front and rear pump body castings incorporate the oil galleries connecting the valve chambers, and house the control valve (6) and the oscillator.

Attached to the rear body is the Response control (7) and strainer housing (8) and also the pressure relief valve (9).

The pressure relief valve is adjustable and is connected to the outlet port of the pump to the lift cylinder.

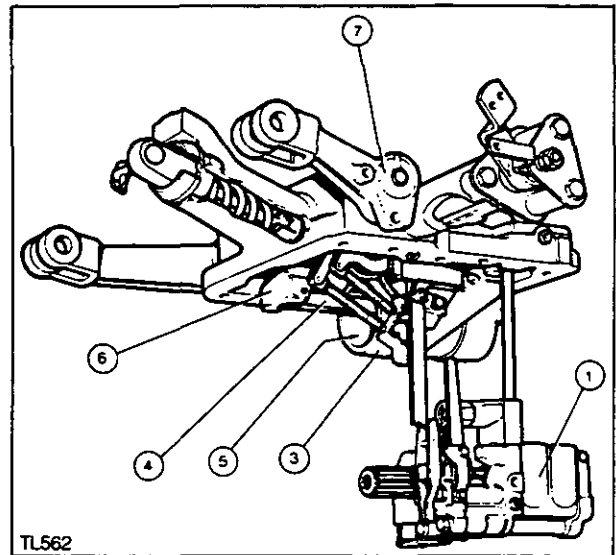


Figure 1

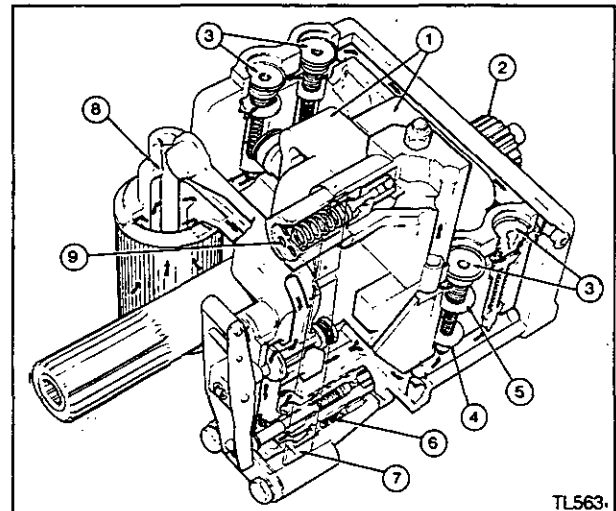


Figure 2

LIFT HYDRAULICS

As each of the pump pistons moves in its cylinder it creates suction which lifts the inlet valve from its seat and draws in oil past the control valve (if open) along the intake gallery into the cylinder. During this inlet stroke the outlet valve is held closed by the spring acting on it. When the piston reaches the end of its inlet stroke, the suction ceases with the cylinder now full of oil, allowing the inlet valve to be closed by the inlet valve spring.

As the piston begins its compression stroke, the resultant pressure in the oil keeps the inlet valve closed and lifts the outlet valve, forcing the oil past the outlet valve into the high pressure gallery and up the stand pipe to the ram cylinder.

Pump Control Valve. (Figures 3, 4 and 5).

The function of the control valve is to control the oil flow to and from the hydraulic system. In order to carry out this function, it has 3 positions: "Intake" (raise), "Neutral" (stationary) and "Discharge" (lower).

The main advantage of the Ferguson system is that the pump gives a variable flow by controlling the degree of opening of the intake and discharge slots in the control valve assembly giving complete controllability across the full range.

The control valve has intake and discharge slots at either end and is moved into its various operating positions by a vertical lever controlled by the linkage arrangements within the top cover assembly. It is spring loaded to the intake position. The valve is oscillated to prevent it sticking and slides within a sleeve which has ports leading to the intake and pressure sides of the pump.

In Figure 3, the vertical lever has moved to allow the valve to move to the intake position under the influence of the spring. This allows oil to be drawn through the intake slots into the pump. In this position, the lift arms would be rising.

Figure 4 shows the valve in its neutral position, the intake and discharge slots being outside the ports in the sleeve. In this position, the lift arms would be stationary.

In Figure 5, the valve is in its discharge position. The discharge slots are open to the pressure chamber allowing oil to flow from the ram cylinder back to sump. In this position, the lift arms would be lowering.

Response Control. (Figure 6).

The principle components of the Response control mechanism are a non-return valve within the pump intake gallery and an oil discharge orifice, the effective size of which is varied by a slide valve.

Whenever the pump control valve moves to the discharge position it displaces oil from the intake gallery (1). The oil is prevented from returning through the intake filter by the non-return valve (2) and is therefore forced to escape through the orifice (3). Altering the response control setting moves the slide valve (4) which varies the size of the orifice and consequently the rate of oil discharge from the gallery. This, in turn, determines the speed at which the control valve moves to discharge and the rate at which the implement lowers.

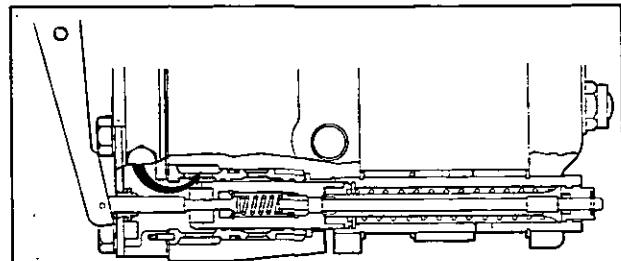


Figure 3

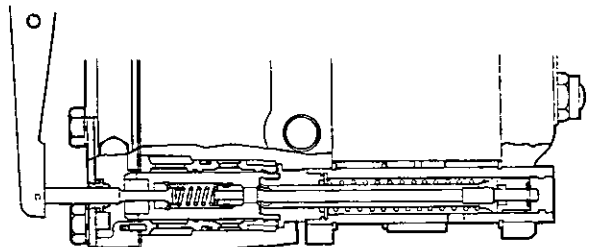


Figure 4

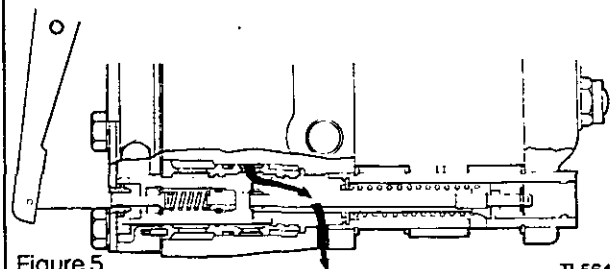


Figure 5

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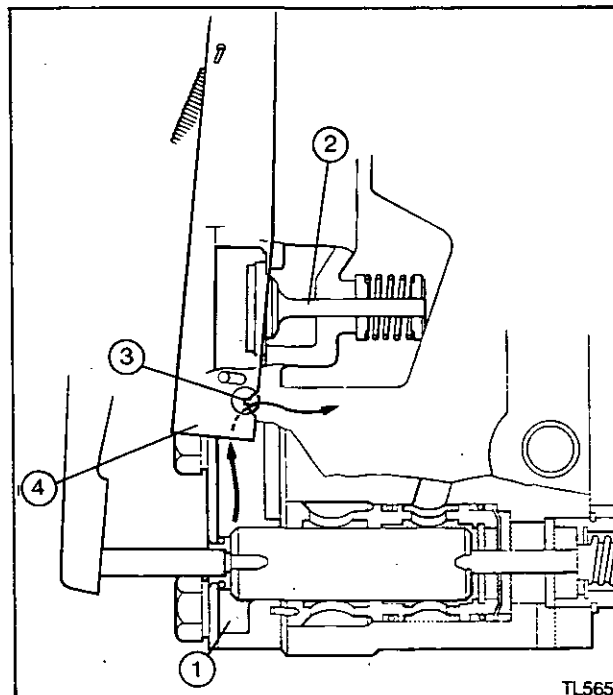
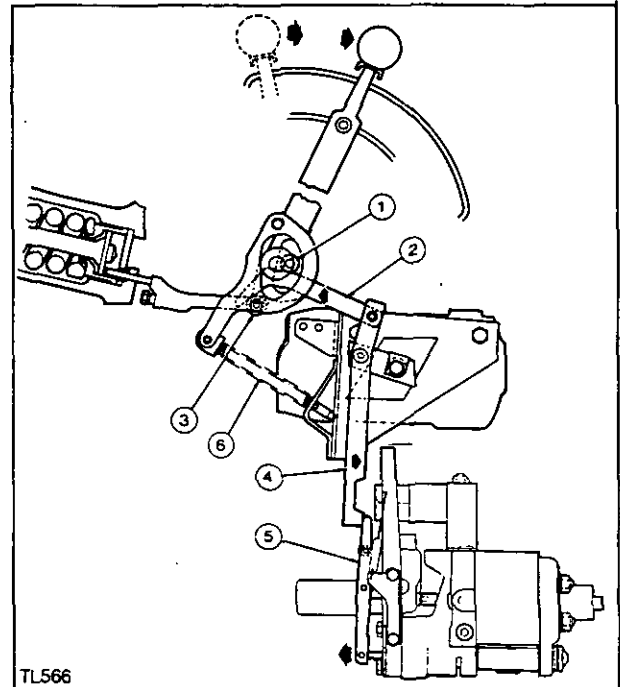


Figure 6

TL565

Operation**Draft control – Implement Lowering. (Figure 7).**

To lower the implement, place the Position Control lever in the TRANSPORT position, and move the Draft Control lever down the quadrant. This action presses the eccentric roller (1), on the end of the Draft Control lever shaft, down onto the upper cam face of the Draft Control cam (2), causing the lower face of the cam (2) to be forced downwards into contact with the roller (3) on the Draft Control linkage. The cam (2) is then moved rearward causing the vertical lever (4) to pivot and move the pump control valve, via the lever (5), into the discharge position against the influence of the control valve spring. The Draft Control linkage will move because the force from the control valve is less than the breakout spring (6) force.



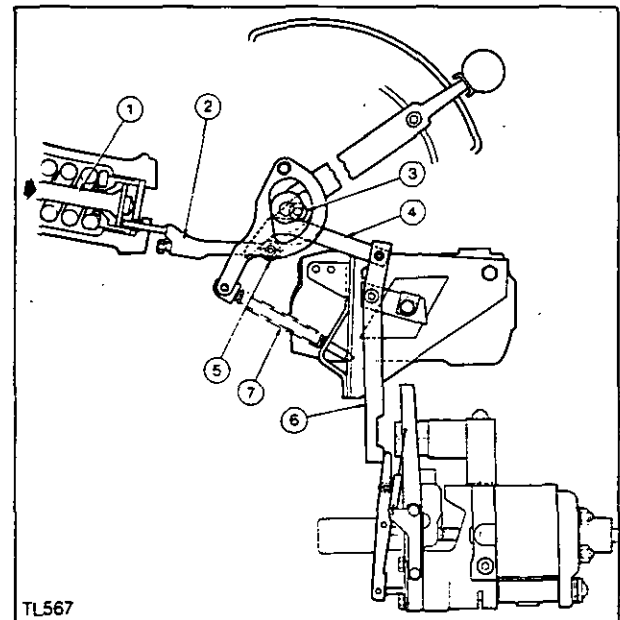
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Figure 7

Draft Control – Compression Force in the Top Link. (Figure 8).

When the control valve is in the full discharge position, and with further downward movement of the Draft Control lever, the eccentric roller (3) acting on the upper cam face of the Draft Control cam (4), forces the lower cam face of the Draft Control cam (4) to move the roller (5) forwards. Forward movement of the roller (5) leaves a gap between the Draft Control rod (2) and the Draft Control spring plunger and simultaneously compresses the spring on the guide rod (7).

Forward movement of the tractor will cause an implement to gain depth (as the control valve is in the discharge position), until resultant implement draft reaction compression forces, applied through the top link, deflect the control spring and cause the Draft Control spring plunger to contact the Draft Control rod (2), and move the Draft Control linkage forwards, acting under the influence of the control valve spring and limited by the position of the roller (5), until the control valve reaches the neutral position.



TL567

Figure 8

LIFT HYDRAULICS

Draft Control – Tension Force in the Top Link. (Figure 9).

Variations in ground conditions will cause fluctuations in the draft force in the top link. If the draft force decreases, the compression force in the control spring decreases.

The Draft Control linkage follows the control spring plunger under the influence of the spring in the guide rod (7), and moves the Draft Control link rearwards. The vertical lever (4) pivots and moves the pump control valve, via the lever (5), towards discharge. When the correct depth is obtained, the valve is restored to neutral. An increase of draft force in the top link will have an opposite effect.

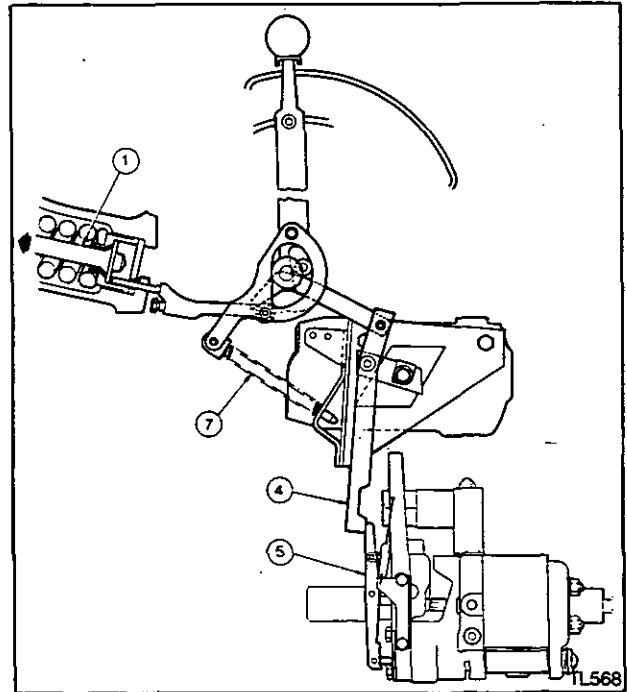


Figure 9

Position Control – Implement Lowering. (Figure 10).

With the Draft control in the fully UP position downward movement of the Position Control lever causes the eccentric roller (2) to force the cam (3) downwards. The breakout spring pushes the Position Control link (1) to maintain contact between the roller (8) and the eccentric cam on the cross shaft (9), and the front roller (6) moves the cam (3) rearwards, causing the vertical lever to pivot and move the pump control valve, via the lever (5) into the discharge position.

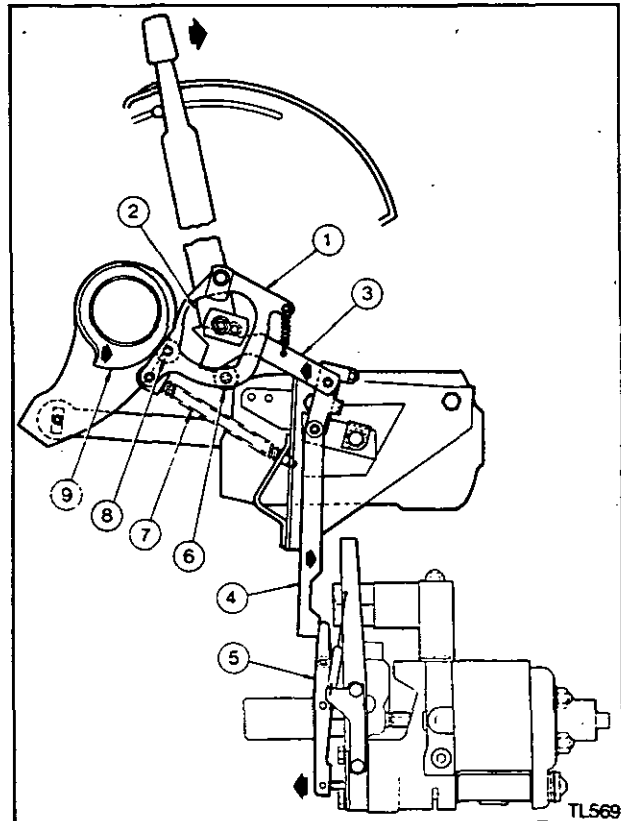


Figure 10

**Position Control – Implement Raising.
(Figure 11).**

Release of oil from the ram cylinder allows the eccentric cam on the cross shaft (5) to rotate and force the rear roller (4), mounted on the Position Control link (1), forward. This action allows the pump control valve spring to move the Position Control cam (2), which is in contact with the front roller (3), forward, until the control valve reaches the neutral position, which has been determined by the Position Control lever.

For every position that the Position Control lever is moved to, there is a position where the cam moves the control valve to neutral.

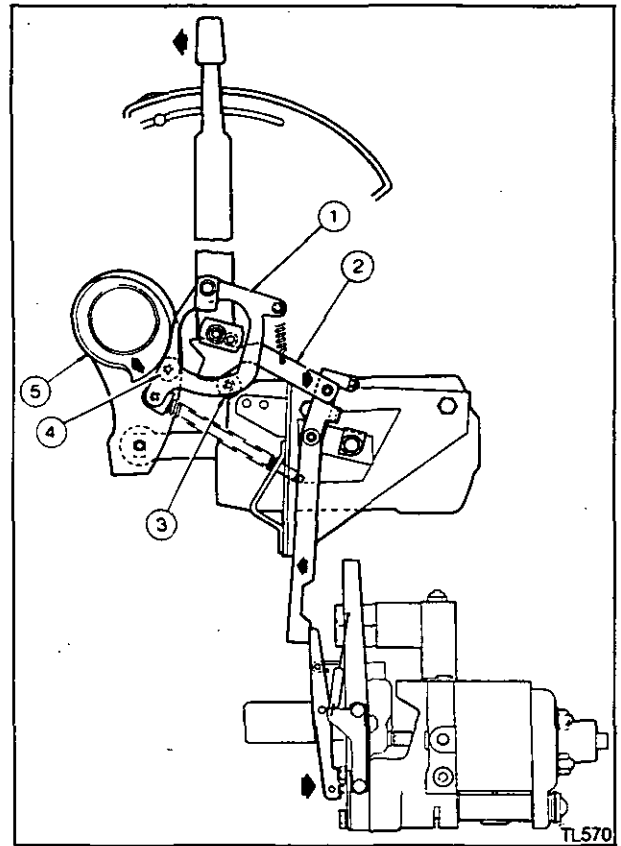


Figure 11

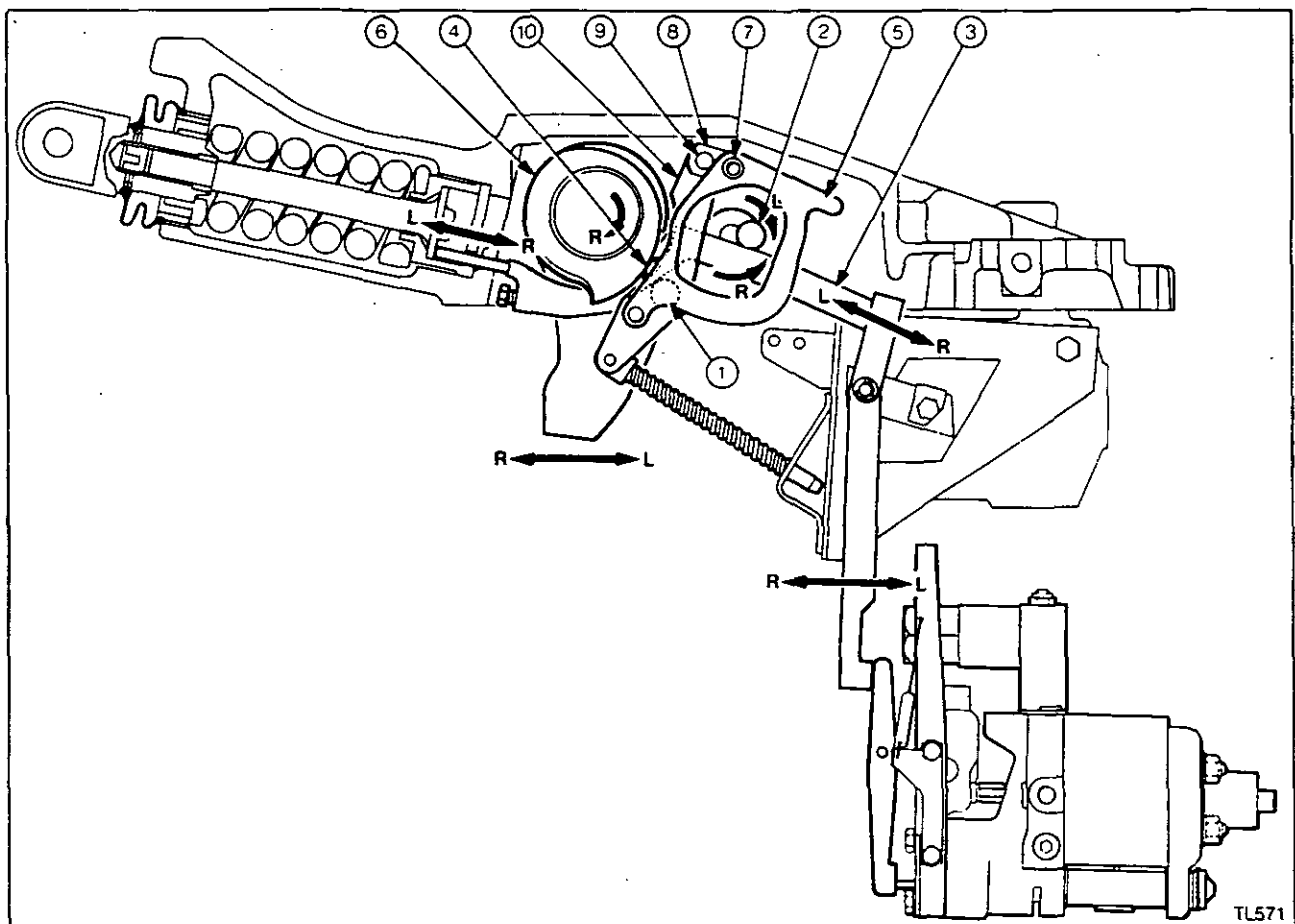


Figure 12

Intermix. (Figure 12).

As the size of tractor and implement increases, a system of Draft Control that relies only on changes in draft force for its reactions, can have limitations, in its ability to provide adequate control. Large changes in draft force will result in excessive linkage movement, a problem often associated with very wide (heavy draft) shallow cultivating implements or implements working soils with bands of different consistency.

For these reasons, the M-F 398 and M-F 399 tractors are fitted with an intermix system. The result of this is that the linkage will move less for the same change in draft force allowing a closer control of depth to be attained.

The intermix feature has been achieved by altering the pivot position for the internal draft linkage. The Draft linkage is attached to the Position linkage by a connecting link. As the cross shaft rotates, the Position linkage moves and so also will the Draft linkage. This means that the Draft linkage and therefore pump control valve can be affected by the movement of the cross-shaft. This results in reduced cross-shaft rotation as the pump control valve remains in an intake or discharge position for less time. The linkage arrangement causes the pump to be quickly brought back to the neutral position.

The draft lever sets the depth of implement draft required.

This alters the distance between the roller (1) and roller (2), this sets the Draft Control cam (3) in a given position. The control valve is now in the central position, allowing the lift arms to be lowered.

As the lift arms lower, the cam roller (4) on the position-control link (5) rolls along the cam on the cross shaft (which rotates anti-clockwise). The Position Control link (5) (also rotates anti-clockwise) about the pivot point (7).

The connecting link (8) which is fixed to the Position Control link (5) also rotates anti-clockwise, about pivot point (7).

As the other end of the link (8) forms the pivot point (9) of the Draft Control link (10) the Draft Control link moves to the right.

When the Draft Control cam (3) is moved to the right, by a bias spring (not shown), the control valve moves into the "raise" position, limiting the maximum depth the implement penetrates.

The minimum depth of implement penetration is controlled, as the lift arms rise, the roller (4) on the Position Control link (5) follows the cross shaft (6). The Position-Control link (5) moves to the left, causing the Draft Control link (10) to move upwards. This moves the Draft Control cam (3) to the left, the control spool moves to the lower position, to maintain a minimum implement depth.

Auxiliary Hydraulics from the Linkage Pump

The M-F 300 series range of tractors can be fitted with various arrangements that can supply hydraulic power for external use from the linkage pump as follows:

1. Figure 13. Oil direct from the linkage pump (1) via a trailer tipping pipe (2) – single acting cylinders only. The lower links will raise or fall with the operation of the trailer unless restrained.

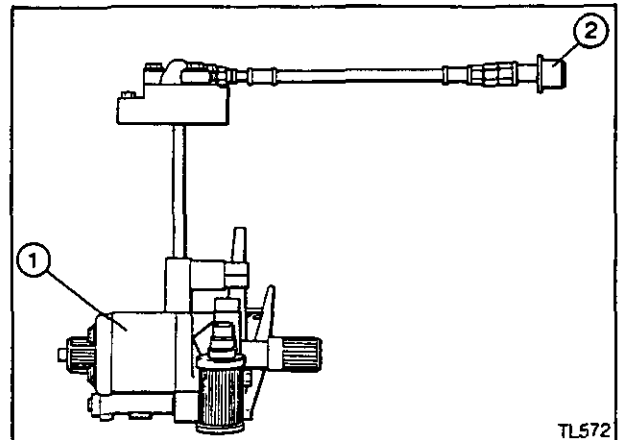


Figure 13

2. Figure 14. Oil from the linkage pump (1) via a selector valve (2) and trailer tipping pipe (3) – single acting cylinders only. The lower links will be locked when the Selector valve is moved to the external position.

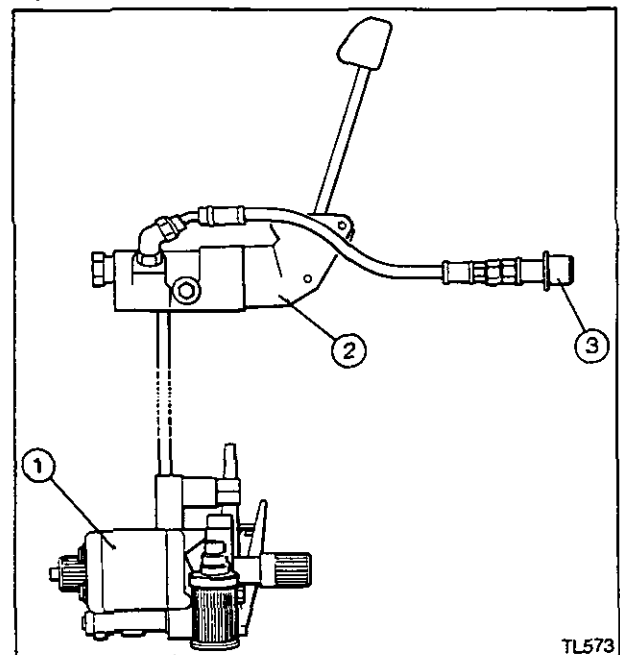


Figure 14

3. Figure 15. Oil from the linkage pump (1) via a selector valve (2) and spool valves (3) – single or double acting cylinders. The lower links will be locked when the Selector Valve is moved to the external position.

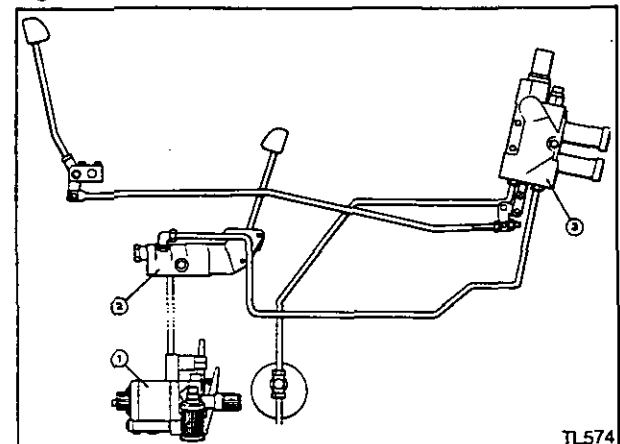


Figure 15

4. Figure 16. Oil from the linkage pump (1) via a selector valve (2), combined with the flow from an engine mounted pump to the spool valves (3). This is known as combined flow – single or double acting cylinders. The lower links will be locked when the Selector Valve is moved to the external position.

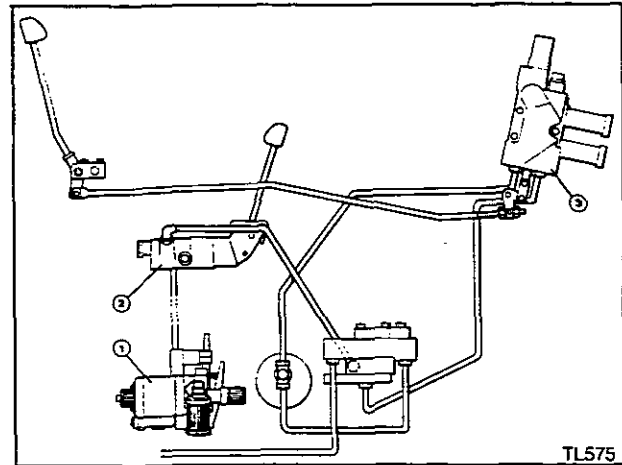


Figure 16.

Selector Valve. (Figure 17).

This valve can be used on its own or in conjunction with a mechanical linkage which automatically places the linkage pump to "Constant Pumping", to supply oil for external use in conjunction with the spool valves.

When the valve is used on its own without the "Constant Pumping" facility, the oil supply to the valve is governed by the use of the tractor's Position and Draft Control levers. The only function of the valve is to divert oil to the rear linkage system or, alternatively, to an external service. In order to do this, the valve incorporates a spool (1) having two alternative positions. In one position, it diverts the linkage pump flow to the linkage ram cylinder (2) in the other position, to an external supply port (3). Also housed in the valve block is a relief valve (4) which protects the ram cylinder from damage by shock pressures, when the oil flow to an external service is selected, since in this situation, the cylinder is isolated from the pump relief valve. Due to the design of the valve and the zero-leak seal fitted to the ram cylinder piston, there is no appreciable oil leakage past the piston or through the valve and any form of compensating feature is therefore unnecessary. The valve is operated directly by means of a lever.

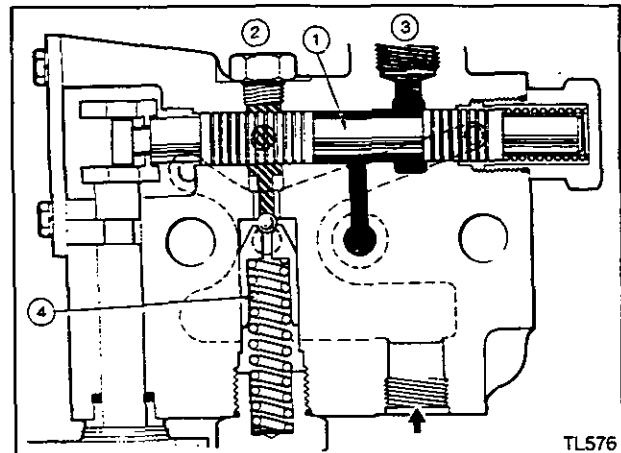


Figure 17.

The Selector Valve with Constant Pumping Facility

Tractors may use this arrangement to supply oil to spool valves from the linkage pump only, or in combination with the flow from the auxiliary pump.

The valve works in exactly the same way as already described but a linkage mechanism automatically places the linkage pump into "Constant Pumping", whenever the operating lever is moved to the external position. This is achieved by means of a bell crank connected to the valve's operating shaft. Attached to this is a linkage running down to the R.H. centre housing side cover. This, in turn, moves the linkage pump control valve to move into full intake. As a result, maximum pump output is automatically supplied to the spool valves via the

Selector Valve whenever its operating lever is placed in the external position. This action makes the tractor Draft and Position Control levers inoperative since they have no influence over the position of the pump control valve until the operating lever of the valve is returned to the linkage position.

When the Selector Valve is used to supply oil to a spool valve, returning oil is fed to a return port on the L.H. PTO side cover.

The use of spool valves is particularly valuable in achieving precise and easy independent operation of single and double acting rams.

Oil from Linkage and Auxiliary Pump Supplied to Spool Valves (Combined Flow).

This combines the output of the linkage and auxiliary pump and therefore provides the maximum oil delivery. The arrangement is particularly valuable for driving hydraulic motors and for speeding up the operation of loaders. Furthermore, the higher maximum working pressure of the linkage pump is available to increase ram performance beyond that obtained when using the auxiliary pump alone.

Oil from the linkage pump is delivered to the auxiliary manifold where it is combined with oil from the auxiliary pump. For further details see 'Auxiliary Hydraulics', section 12B.

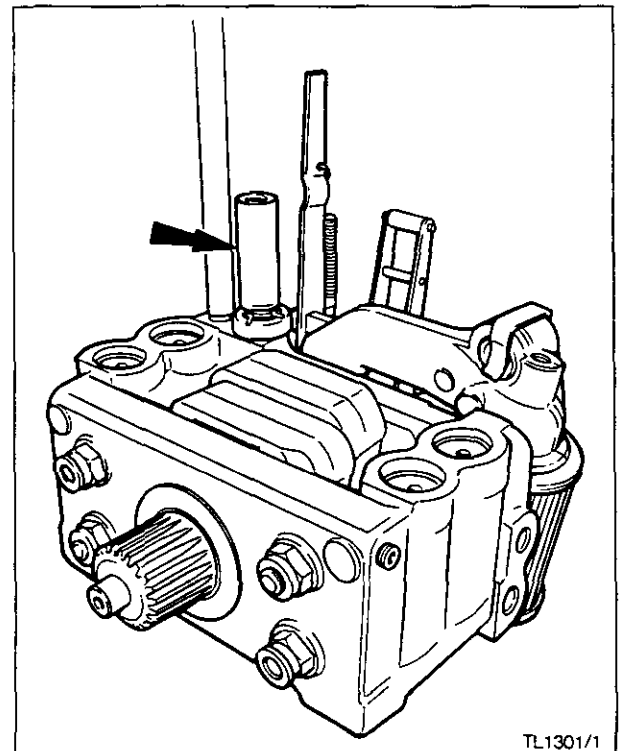
Product changes

Pressure relief valve assembly (Figure 18)

On M-F 350, 355, 365, 375, 383, and 390 tractors with low flow hydraulic pump only, the relief valve assembly has been replaced with a new unit which is screwed vertically direct into the pump rear body. This new valve was introduced from tractor serial number N42314 manufactured 18th November 1988.

This change does away with the existing relief valve manifold, the short standpipe is replaced with a long one.

The relief valve is non-adjustable, in the event of a failure it must be replaced with a new unit. A valve of the correct pressure setting must be fitted, this can be identified by a black paint stripe on the body. It is also fitted with a grey spring. The pressure setting remains the same at 221-231 bar (3200-3350 lbf/in²).



TL1301/1

Figure 18.

12A-12

LIFT HYDRAULICS

Control Spring Assembly

Removal and Refitment 12A-01

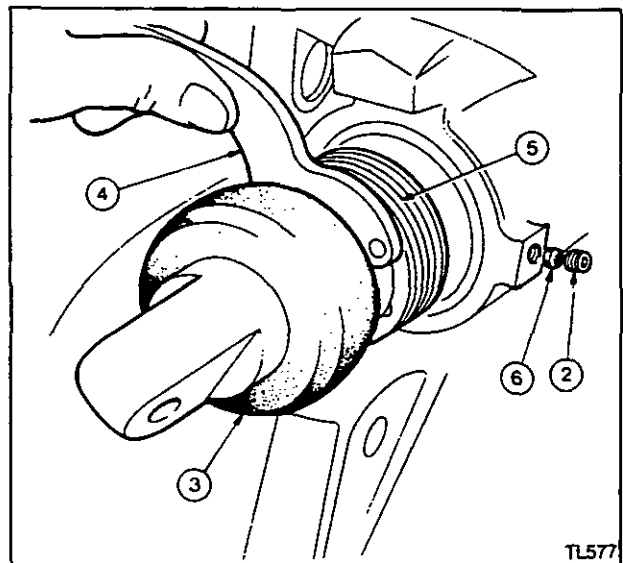
Special Tools: MF163 Wrench

Removal

1. Remove the control beam.
2. Remove the hexagon socket screw.
3. Pull back the rubber boot.
4. Using MF163, unscrew the retainer from the lift cover.
5. Withdraw the control spring assembly from the lift cover.
6. Remove and discard the nylon plug.

Refitment

7. Reverse procedures 1 to 6, except:
 - a. With the Draft Control lever in the fully Down position, tighten the retainer, until the end float is eliminated. Do not over-tighten otherwise the end float will reappear.
 - b. Fit a new nylon plug.
 - c. Tighten the hexagon socket screw to a torque of 7 Nm (5 lbf ft).



Control Spring Assembly

Overhaul 12A-02

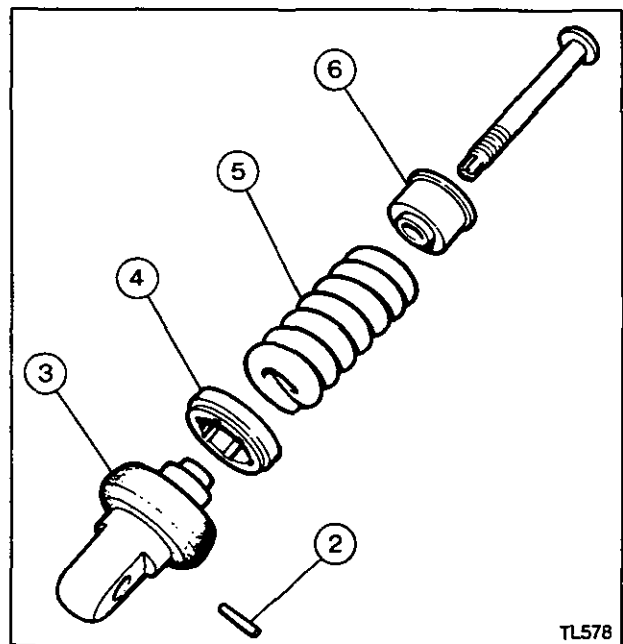
Special Tools: MF163 Wrench

Disassembly

1. Remove the control spring assembly, see operation 12A-01.
2. Drive out the pin.
3. Unscrew the head using MF163 wrench.
4. Remove the retainer.
5. Remove the spring.
6. Remove the spring seat.

Reassembly

7. Reverse procedures 1 to 6, except:
 - a. Screw the plunger into the head until the end float is eliminated and the spring is tight to turn by hand.
 - b. Fit a new pin.



Hydraulic Lift Cover – Footstep Models**Removal and Refitment**

12A-03

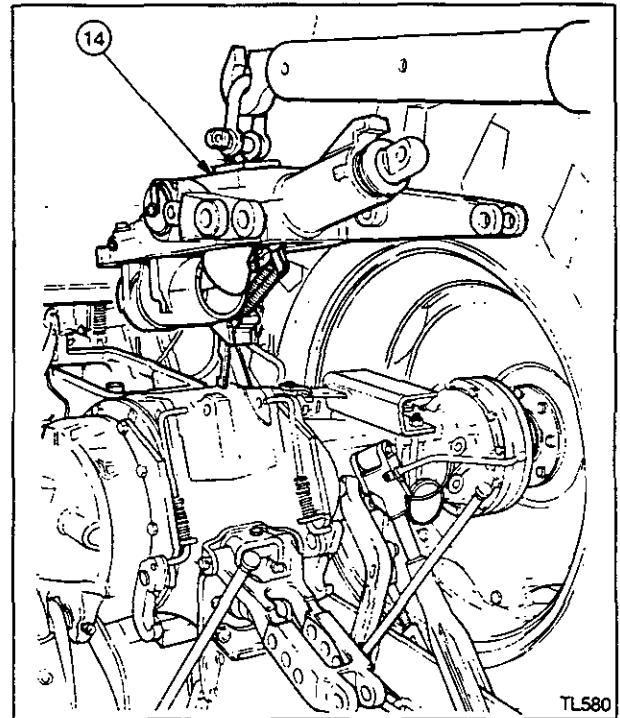
Special Tools:**MF418A Lift cover remover/replacer****Removal**

NOTE: The quadrant control levers on the lift cover can be locked in the Transport position for the Position Control lever and Sector position for the Draft Control lever. This will prevent the hydraulic setting being disturbed during removal and refitment. Use two M6-16 bolts (M-F part no. 339560X1) and two plain washers (M-F part no. 390971X1) through the levers into the mounting bracket.

1. Disconnect the lift rods from the lift arms.
2. Remove the control beam.
3. Disconnect the hydraulic pipes to and from the spool valve block.
4. Disconnect the spool valve control rods at the spool valve end.
5. Remove the spool valve assembly.
6. Disconnect the PTO control rod to the L.H. side cover.
7. Remove the four-wheel-drive control lever, if fitted.
8. Disconnect the Response Control rod to the R.H. side cover.
9. Disconnect the selector valve control lever and rod to the R.H. side cover, if fitted.
10. Disconnect both the Draft and Position Control rods from the control levers. Note which of the two holes they are fitted into.
11. Unclip the wiring harness under the seat panel.
12. Remove the bolts securing the seat panel to the fenders and the front vertical panel.
13. Loosen the fenders to axle bolts.
14. Lift out the seat panel complete with the seat and control levers.
15. Remove the transfer cap and the stand pipe or selector valve and stand pipe if fitted.
16. Place the Draft Control lever in the fully Up position and the Position Control lever in the Transport position and lock in position.
17. Remove the lift cover bolts.
18. Using two removed bolts from the cap or selector valve secure MF418A to the top of the lift cover with the off set eye bolt to the rear. With a bar, break the joint between the lift cover and the centre housing, with a portable crane linked to the eye bolt, carefully hoist the lift cover vertically until all components are clear then pull the crane rearwards.

Refitment

19. If any work has been carried out on the lift cover the static adjustments will have to be made before the lift cover is refitted see operation 12A-09.
20. Clean the surfaces of the centre housing and lift cover.
21. Make up two guide studs from two long bolts 7/16 in. UNC to aid refitment of the lift cover.



22. Reverse procedures 1 to 18 except:
 - a. Coat the face of the centre housing and lift cover with Loctite 515.
 - b. Take care, when refitting the lift cover that the vertical lever does not foul any of the internal components.
 - c. Remove the two guide studs.
 - d. Do not forget to fit the stand pipe and cap or selector valve.
 - e. Tighten the lift cover bolts to 88 Nm (65 lbf/ft).
23. Carry out external (running) adjustments, see operation 12A-10.

12A-14

LIFT HYDRAULICS

Hydraulic Lift Cover – Cab Models

Removal and Refitment

12A-04

Special Tools:

MF418A Lift cover remover/replacer

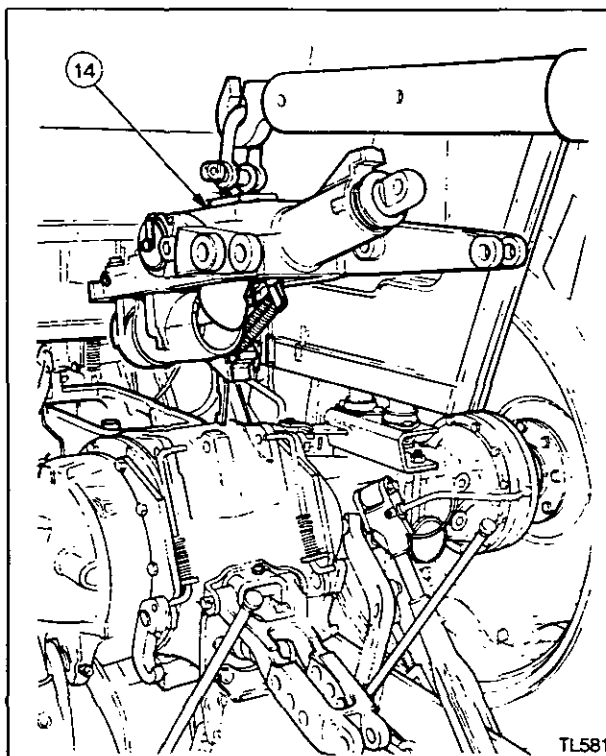
Removal

NOTE: The quadrant control levers on the lift cover can be locked in the Transport position for the Position Control lever and Sector position for the Draft Control lever. This will prevent the hydraulic setting being disturbed during removal and refitment. Use two M6-16 bolts (M-F part no. 339560X1) and two plain washers (M-F part no. 390971X1) through the levers into the mounting bracket.

1. Disconnect the lift rods from the lift arms.
2. Remove the control beam.
3. Disconnect the hydraulic pipes to and from the spool valve block.
4. Disconnect the spool valve control rods at the front end.
5. Remove the spool valve assembly.
6. Remove the seat panel from the cab complete with the seat.
7. Remove the Selector Valve control lever, if fitted.
8. Disconnect the Selector Valve control rod to the R.H. side cover, if fitted.
9. Remove the transfer cap or selector valve and internal stand pipe.
10. Disconnect the Draft and Position Control rods, from the levers on the lift cover. Note which of the two holes they are fitted to.
11. Disconnect the remote Position Control lever.
12. Remove the return pipe from the spool valve.
13. Disconnect the hydraulic hose to assister ram if fitted.
14. Remove the lift cover bolts.
15. Using two bolts removed from the cap or selector valve secure MF418A to the top of the lift cover with the off-set eye bolt to the rear. With a portable crane linked to the eye bolt, carefully hoist the lift cover vertically until all components are clear then pull the crane rearwards.

Refitment

16. If any work has been carried out on the lift cover, carry out the static adjustments before refitment. See operation 12A-09.



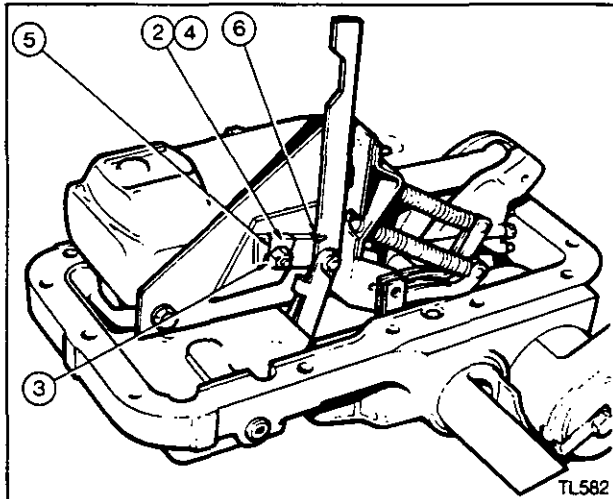
17. Clean the surfaces of the centre housing and lift cover.
18. Make up two guide studs from two long bolts 7/16 in.UNC to aid refitment of the lift cover.
19. Reverse procedures 1 to 15 except:
 - a. Coat the face of the centre housing and lift cover with Loctite 515.
 - b. Take care, when refitting the lift cover that the vertical lever does not foul any of the internal components.
 - c. Remove the two guide studs.
 - d. Do not forget to fit the stand pipe and transfer cap, or Selector Valve.
 - e. Tighten the lift cover bolts to 88 Nm (65 lbf ft).
20. Carry out external adjustments, See operation 12A-10.

Hydraulic Lift Cover**Overhaul**

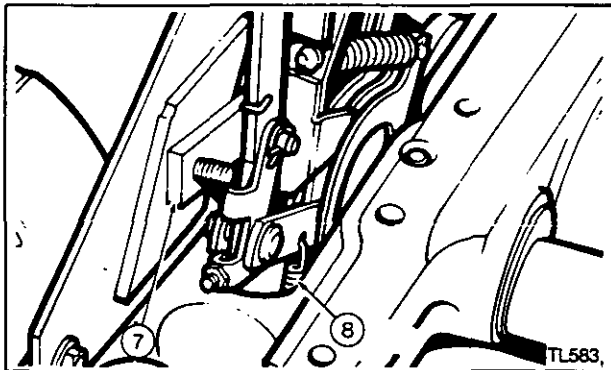
12A-05

Disassembly

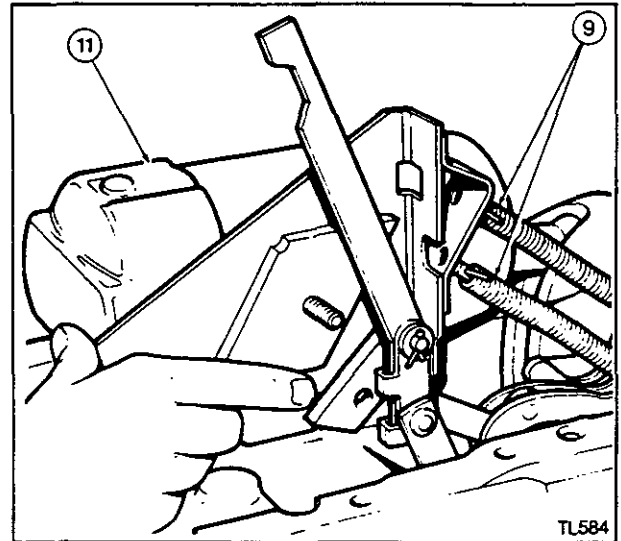
1. Remove the lift cover, See operation 12A-03 or 12A-04.



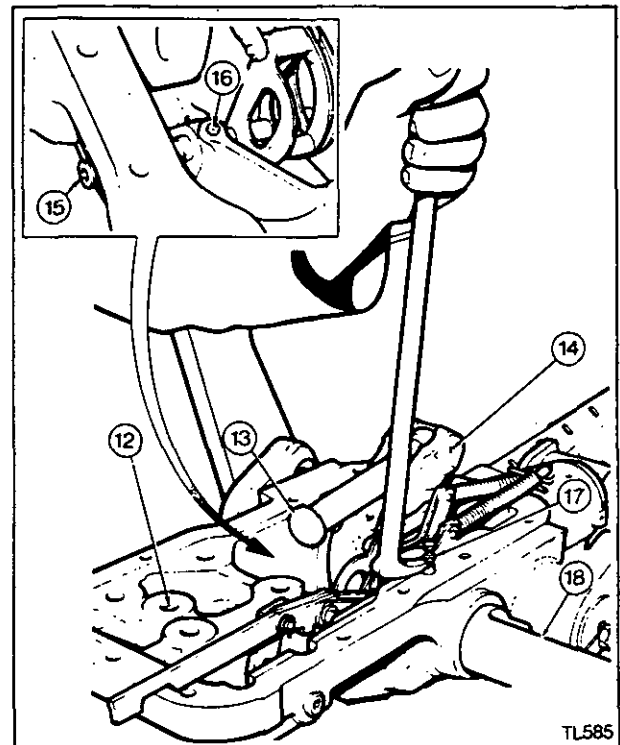
2. Release the tabwasher.
3. Remove the nut.
4. Remove the tabwasher.
5. Remove the spacer.
6. Release the spring.



7. Release the slide pivot from the bolt.
8. Remove the spring.



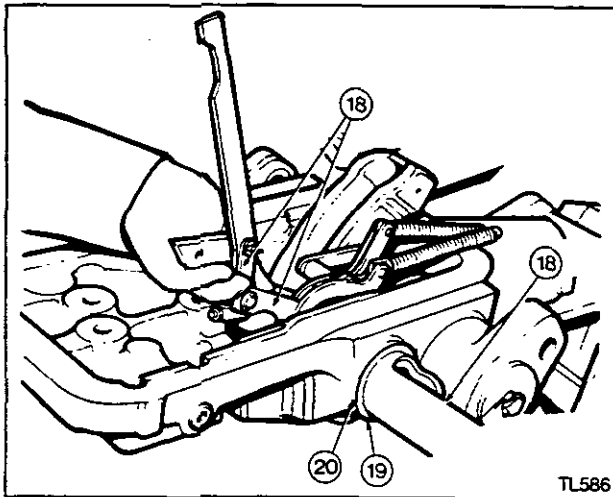
9. Fit a pair of pins to retain the springs.
10. Remove the four nuts securing the ram cylinder to the lift cover.
11. Lift off the ram cylinder.



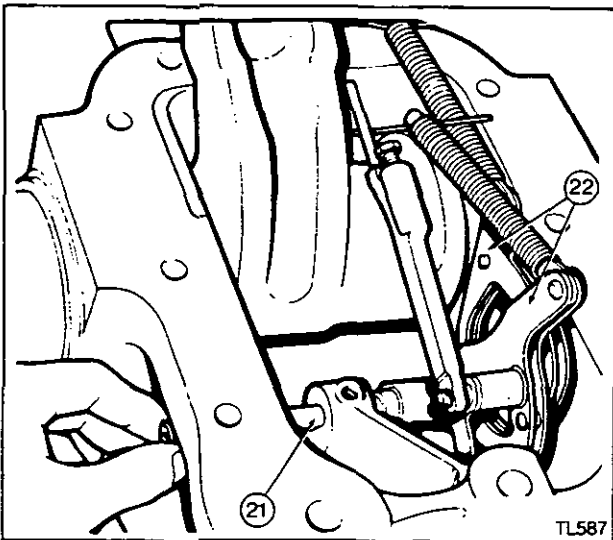
12. Remove and discard the 'O' ring.
13. Remove the connecting rod.
14. Remove the hexagon socket screw.
15. Remove the hexagon socket plug.
16. Remove the screw.
17. Screw a Number 10-32 UNF bolt into the pin and remove the pin.
18. Withdraw the quadrant control support assembly, simultaneously lifting out the vertical lever and the cams.

12A-16

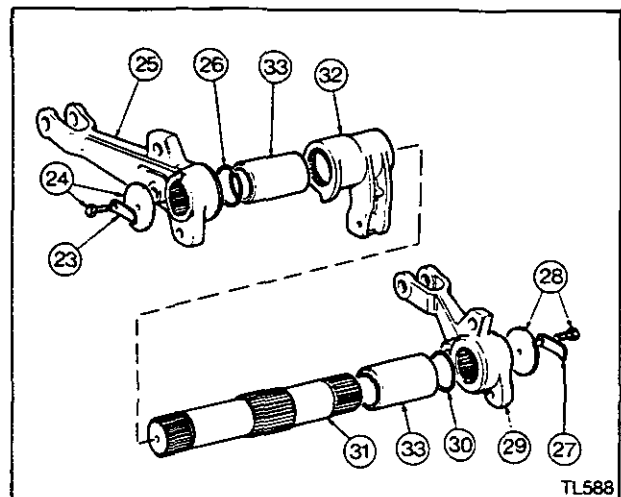
LIFT HYDRAULICS



19. Remove the shim(s), if fitted.
20. Remove the Belleville washer.



20. Withdraw the pivot shaft.
22. Lift out the links.



23. Release the tabwasher.
24. Remove the bolt and washer.
25. Slide off the lift arm.
26. Remove and discard the 'O' ring.
27. Release the tabwasher.
28. Remove the bolt and washer.
29. Slide off the lift arm.
30. Remove the 'O' ring.
31. Drive the lift shaft out of the lift cover.
32. Remove the ram arm.
33. Remove the two bushes.

Reassembly

Reverse procedures 1 to 33, except:

- a. Fit new bushes if necessary.
 - b. Fit new 'O' rings and tabwashers.
 - c. Align the master spline when refitting the shaft and the two lift arms.
 - d. Fit the Belleville washer with the concave side towards the lift cover.
 - e. Ensure that the pivot shaft is fully located against the side of the lift cover before tightening the hexagon socket screw.
 - f. When refitting the connecting rod hexagon socket screw, apply a drop of Loctite 542 to the threads, and screw the hexagon socket screw into the ram arm until the screw bottoms on the annular groove in the connecting rod, then back it off 1/4 turn.
 - g. When refitting the ram cylinder, locate the connecting rod in the piston and the two rods in the holes in the bracket.
 - h. Tighten the front ram cylinder retaining nuts to a torque of 200-240 Nm (148-177 lbf ft) and the rear retaining bolts to a torque of 280-330 Nm (207-243 lbf ft).
34. Carry out hydraulic static adjustments, See operation 12A-09.

Hydraulic Lift Cylinder

Overhaul 12A-06

Special Tools:

MF453 Piston seal replacer

MF420 Piston seal replacer

Disassembly

1. Remove the lift cylinder assembly, See operation 12A-05, procedures 1 to 11.
2. Remove the two bolts.
3. Remove the support bracket.
4. Withdraw the piston from the cylinder.
5. Remove the piston seal and 'O' ring if necessary.

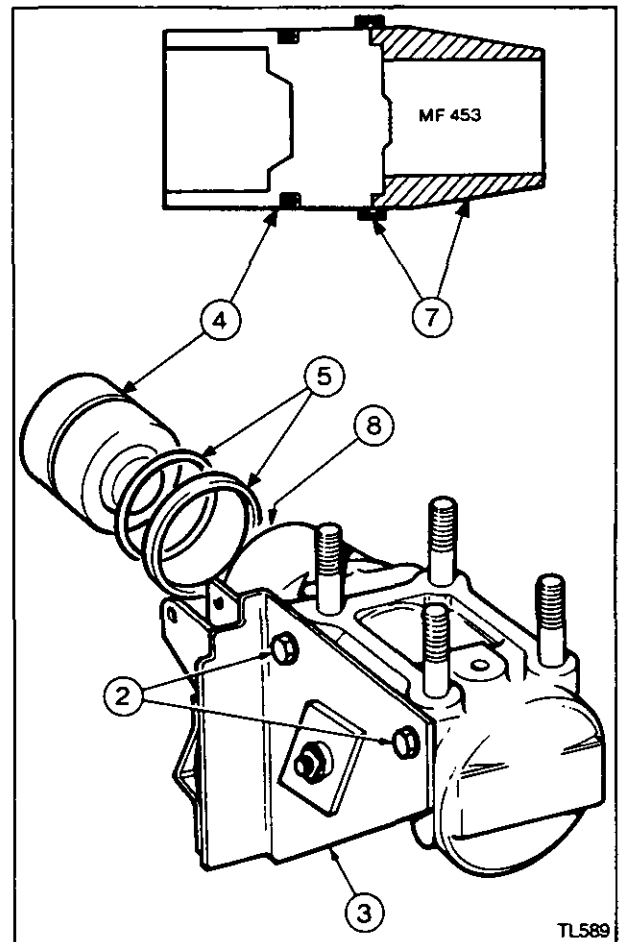
Examination

Examine all components for wear or damage, replacing any defective components.

Reassembly

6. If piston seals have been removed apply transmission oil to 'O' ring part of seal and fit it into the piston groove.
7. Lubricate the outside of the tapered guide of MF 453 with mineral oil. Place the guide on a firm, flat surface. Locate the seal on the guide and very carefully push the seal down the taper of the guide until it protrudes beyond the end. Locate the lip of the seal on the piston at the closed end. Push the seal off the guide onto the piston and into the groove on top of the 'O' ring.
8. Push the piston into the wide bore end of the sizing ring of MF 453, push it through until it protrudes approximately 12 mm (0.5 in) from the end of the ring.
9. Lubricate the bore of the cylinder with transmission oil, then locate the protruding portion of the piston in the mouth of the cylinder bore. Push the piston through the sizing ring and into the cylinder.
10. Reverse procedures 1 to 11 in operation 12A-05.

Note: On M-F 340 tractors use piston seal replacer MF420.



12A-18

LIFT HYDRAULICS

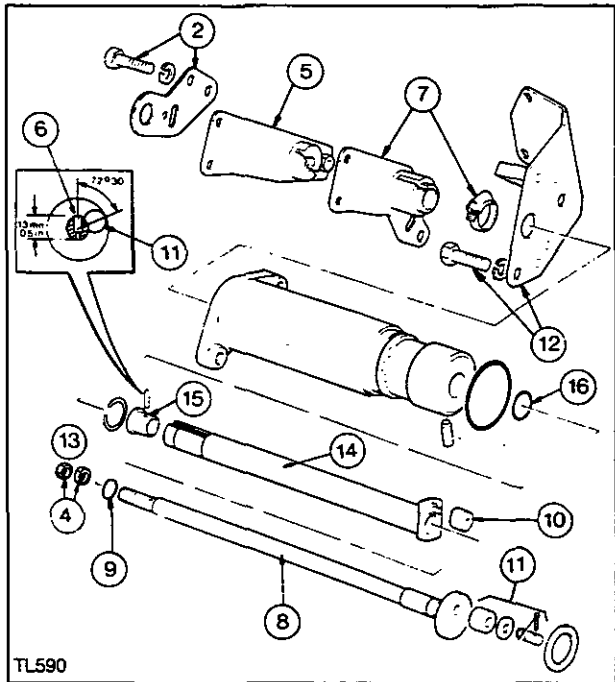
Quadrant Control Shaft Support

Overhaul

12A-07

Disassembly

1. Remove the internal linkage from the lift cover. See operation 12A-05, procedures 1 to 12 and 17 to 20.
2. Remove the two bolts and the plate.
3. Align the two rollers and scribe a line across the draft and position levers for reassembly.
4. Remove the locknut and nut from the end of the shaft.
5. Remove the Draft Control lever.
6. Drive out the pin.
7. Remove the Position Control lever and hose clip.
8. Withdraw the Draft Control shaft.
9. Remove and discard the 'O' ring.
10. Remove the roller.
11. If necessary, remove the split pin, washer and roller.
12. Remove the bolts and the back plate.
13. Remove the snap ring.
14. Withdraw the Position Control shaft.
15. If necessary, remove the bush.
16. Remove and discard the internal 'O' ring.



Reassembly

17. Reverse procedures 1 to 16 except:
 - a. Fit new 'O' rings and split pin.
 - b. Instal pin (item 6) to a height of 13 mm (0.5 in), as shown in the illustration.
 - c. Do not overtighten the Draft Control shaft nut and locknut (Item 4).
 - d. Lubricate all 'O' rings and bushes on assembly.
 - e. Check that all parts and rollers rotate freely.

Hydraulic Quadrant Assembly

Overhaul

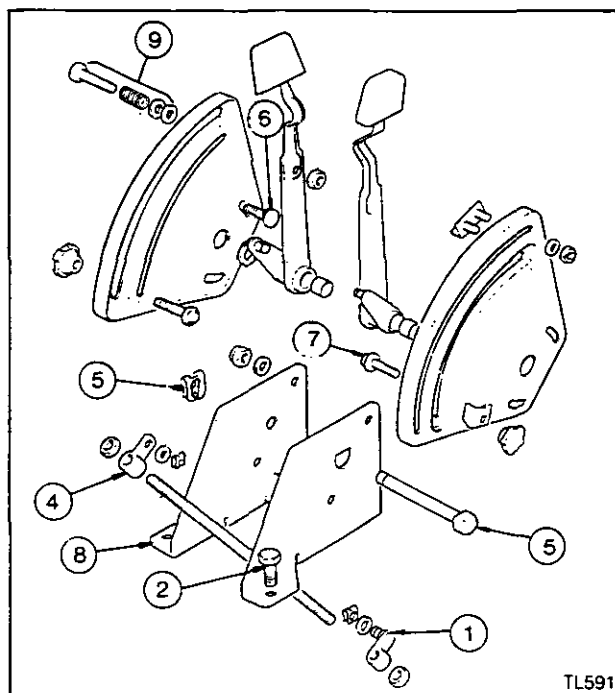
12A-08

Disassembly

1. Disconnect the control rods at the cross shaft levers. Note which holes the rods are fitted in.
2. Remove the three bolts securing the quadrant to the support plate.
3. Remove the quadrant assembly from the tractor.
4. Disconnect the two links from the levers.
5. Remove the clip and lever pivot.
6. Remove the two bolts, washers and nuts securing the draft control quadrant to the base.
7. Remove the two bolts, washer and nuts securing the Position Control quadrant to the base.
8. Remove the assembly from the base.
9. Remove the screws, springs, washers and nuts from the draft and Position Control levers and separate.

Reassembly

10. Reverse procedures 1 to 9 clamping the quadrants in the middle of their slots.
11. Carry out external (running) adjustment. See operation 12A-10.

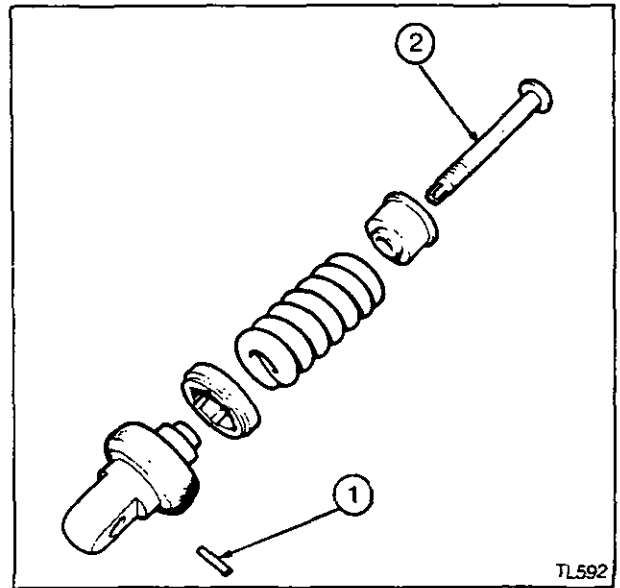


Hydraulic Static AdjustmentsAdjust 12A-09**Special Tools:**

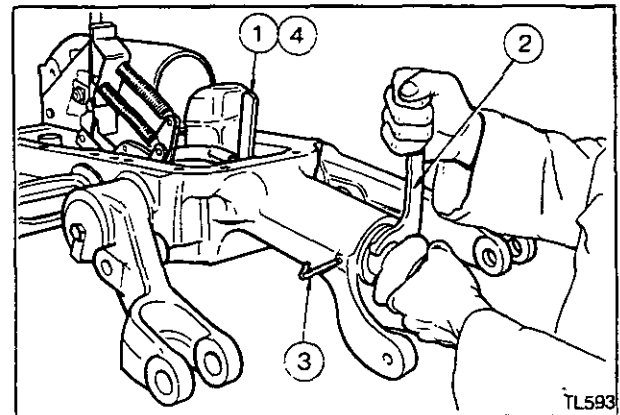
MF163	Spring retainer nut wrench
MF272	Ram arm gauge
MF273	Control lever setting gauge arm
MF333	Draft control rod gauge
MF356C	Position and Draft Control setting gauge
MF445	Ram arm gauge – intermix

Control Spring Internal End Float

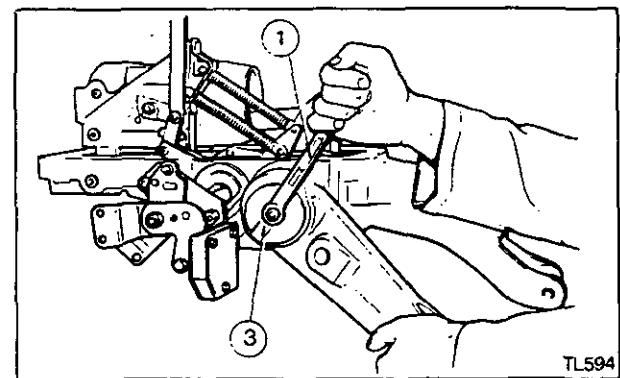
1. Remove the locking pin.
2. Screw the plunger into the yoke until all the end float has been removed and the spring is tight to turn by hand.

**Control Spring External End Float**

1. Ensure that the Draft Control rod cannot obstruct the control spring plunger by fitting a suitable wedge between the draft rod adjusting bolt and the lift cover casting. If the lift cover is fitted, move the Draft Control lever to the fully lowered position.
2. Refit the spring assembly into the lift cover housing and using MF163, tighten the retaining nut until the end float in the spring assembly has been removed. Do not over tighten as this will compress the spring and cause the end float to return.
3. Tighten the hexagon socket screw to a torque of 7Nm (5 lbf ft).
4. Remove the wedge.

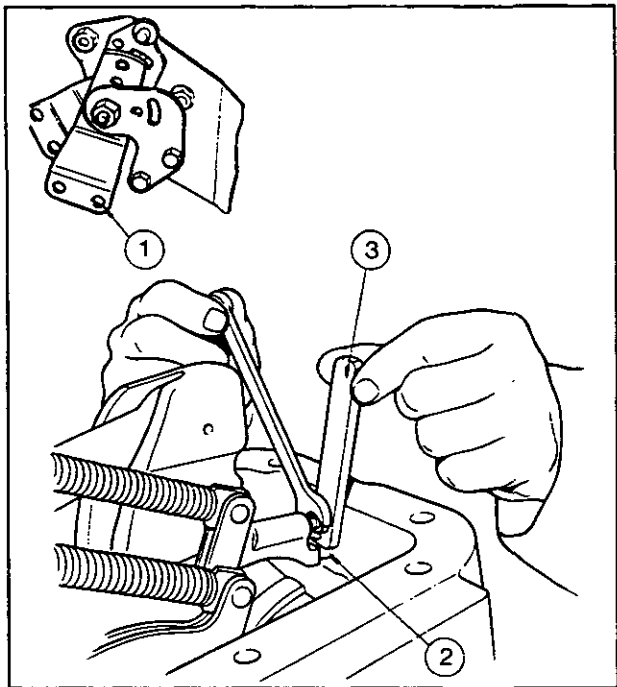
**Lift Shaft Adjustment**

1. Fully tighten set screw on the R.H. side lift arm retaining plate and secure the lock tab.
2. Tighten the L.H set screw until the lift arms are fairly stiff to move by hand but drop freely with lift rods and lower links attached.
3. Secure the bolt with the tabwasher.



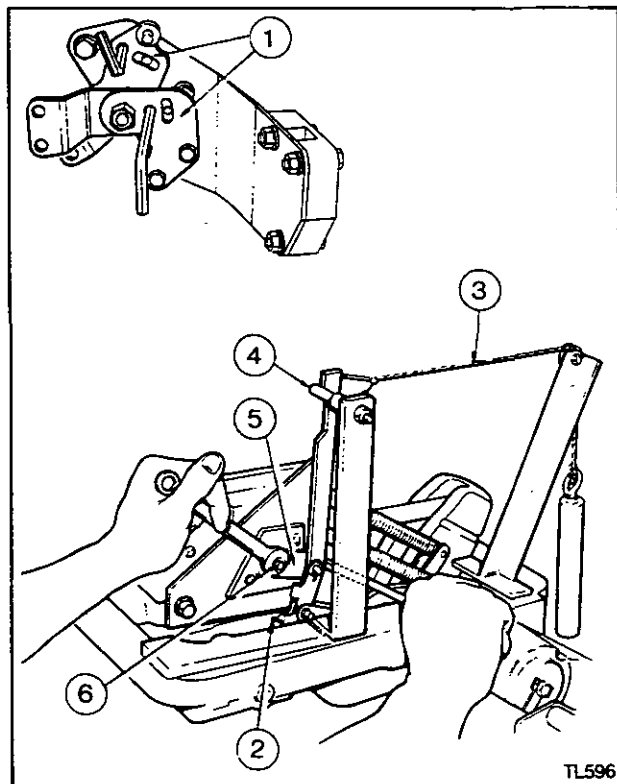
Draft Control Rod Adjustment

1. Set the Draft Control link to the fully raised position.
2. Ensure that the Draft Control rod is held against the control spring plunger under the influence of the linkage return spring.
3. Adjust the set screw on the Draft Control rod to obtain a clearance of 5,8 mm (0.230 in) between the set screw and the lift cover casting using MF333 gauge.



Draft Control Neutral Setting – Non-Intermix

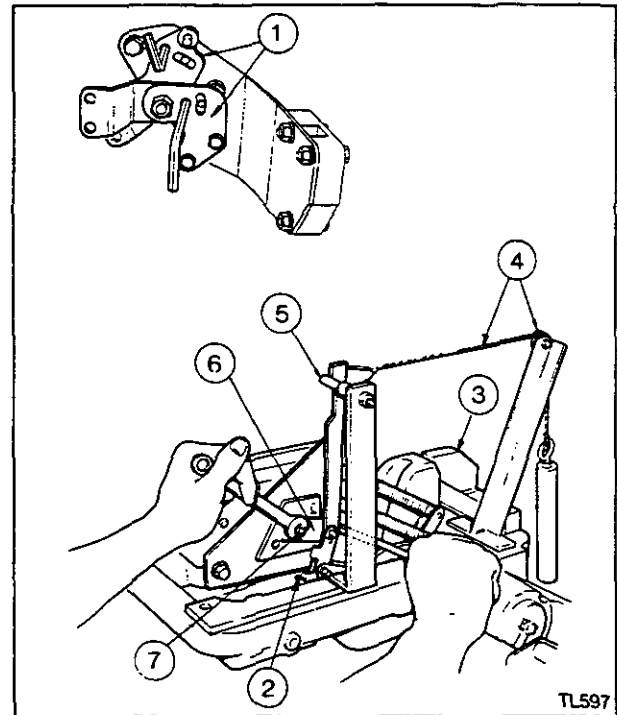
1. Set the Draft Control link to the Sector position and the Position Control link to the Transport position using a 6,4 mm (1/4 in) diameter locating pin in each hole.
2. Slacken the hexagon socket screw and locknut on the vertical lever to the end of its thread. This will ensure that no interference from the Position Control linkage takes place.
3. Using tool MF273, apply a load of 1,3 kg (3 lb) to the end of the vertical lever. This simulates the force of the linkage pump control spring (a spring balance can be used if no tool is available).
4. The vertical lever must now be set to its correct position, when the lift cover is installed and Draft and Position levers are set in the Sector marks and Transport positions respectively. The control valve in the linkage pump will then be in neutral. This is achieved by using special tool MF356C.
5. With the tool installed, adjust the position of the vertical lever pivot pin until the lever just contacts the horizontal pin on MF356C.
6. Tighten the pivot pin bracket nut.
7. Re-check the vertical lever and then secure the nut with the locking tab.



TL596

Draft Control Neutral Setting – Intermix (Intermix Tractors M-F398 and 399)

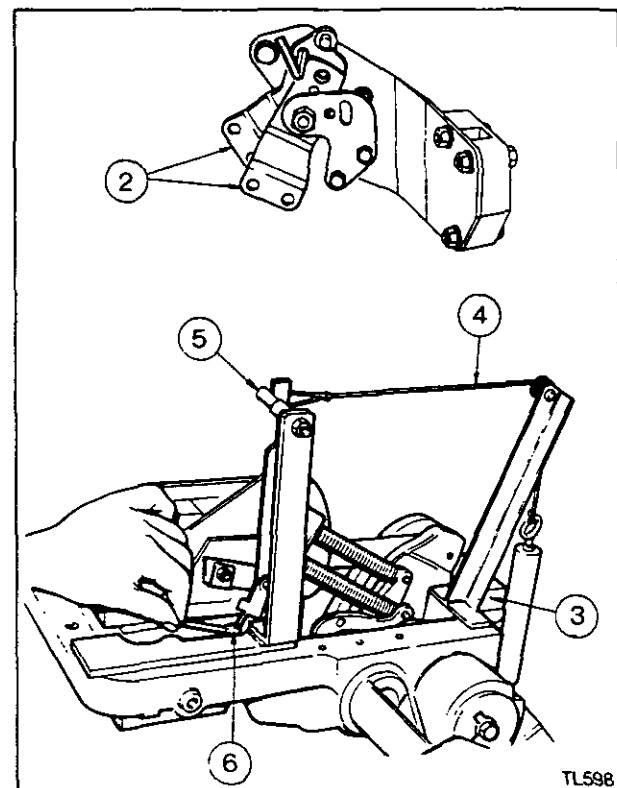
1. Set the Draft Control link to the sector position and the Position Control link to the Transport position using a 6,4 mm (1/4 in) diameter locating pin in each hole.
2. Slacken the hexagon socket screw and locknut on the vertical lever to the end of its thread. This will ensure that no interference from the Position Control linkage takes place.
3. The lift arms and therefore the cam ram arm, must now be set. This can be achieved by using tool MF445 or by lining up two marks which are placed on the lift cover and lift arm of the tractor, whilst it is being built in the factory. If the latter is used, tighten one of the retaining plate bolts at the end of the cross shaft to hold the lift arm in the required position.
4. Using tool MF273, apply a load of 1,3 kg (3 lb) to the end of the vertical lever. This simulates the force of the linkage pump control spring (a spring balance can be used if no tool is available).
5. The vertical lever must now be set to its correct position, when the lift cover is installed and Draft and Position levers are set in the Sector marks and Transport positions respectively. The control valve in the linkage pump will then be in neutral. This can be achieved by using special tool MF356C.
6. With the tool installed, adjust the position of the vertical lever pivot pin until the lever just contacts the horizontal pin on MF356C.
7. Tighten the pivot pin bracket nut. Re-check the vertical lever and then secure the nut with the locking tab.



TL597

Position Control Neutral (Transport) Setting

1. This procedure is applicable to both intermix and non intermix tractors.
2. Set the Draft Control link to the fully up position, as shown (no pin hole is available for this position). Set the Position Control link to the Transport position with a locating pin as shown.
3. Locate the cam ram arm against MF272. This will simulate the Transport position on the eccentric cam on the cam ram arm. If no tool is available, scribe a line from the lift cover to the lift arm. Scribe a second line 6 mm (0.25 in) back from the first line. Hold the lift arms so the first line on the lift arm joins with the second line on the lift cover (lock the cross shaft by tightening the bolts of the retaining plate if required). This will simulate the condition the special tool would have provided.
4. Apply a load of 1,3 kg (3 lb) to the end of the vertical lever using MF273, or a spring balance.
5. Fit MF356C and adjust the vertical lever hexagon screw until the lever just contacts the near horizontal pin on the special tool.
6. Tighten the locknut and re-check the positions of the vertical lever.



TL598

12A-22

LIFT HYDRAULICS

Hydraulic External Adjustments

Adjust

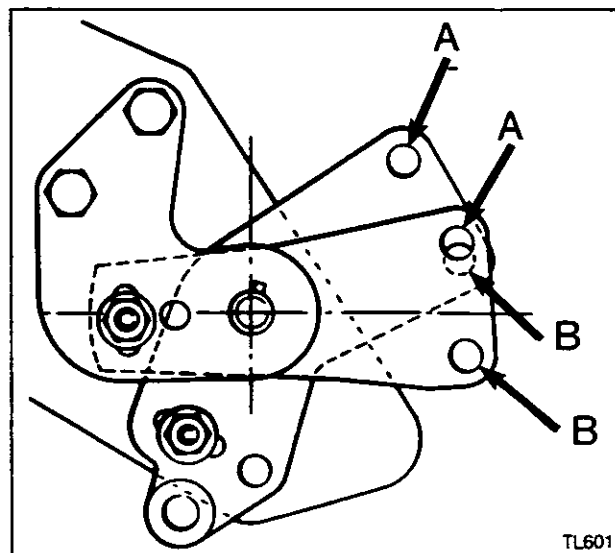
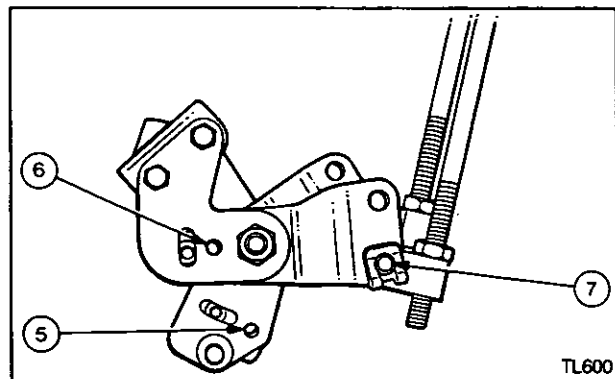
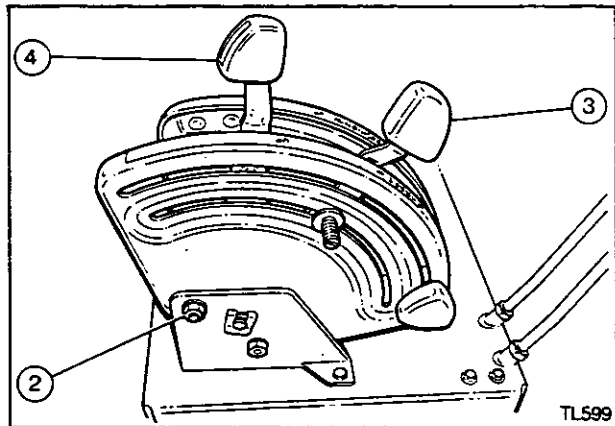
12A-10

Pre-conditions

1. Refit the lift cover, hydraulic unions, pipes etc. Refill the tractor with oil to the correct grade.
2. Loosen the quadrant mounting bolts and place the Draft and Position Control quadrants in the centre of their elongated holes. Re-tighten the bolts.
3. Place the Draft Control lever between the sector marks.
4. Place the Position Control lever in the transport position.
5. Locate the lift cover Position lever in the Transport position using a 6,5 mm (1/4 in) diameter locating pin.
6. Locate the lift cover Draft lever in the Sector position using a 6,5 mm (1/4 in) diameter locating pin.
7. Connect the control rods from the quadrants to the operating levers on the lift cover. Adjust length of control rods if required.

Note: Different holes are used for tractors with or without spacer castings between the gearbox and the centre housing. Use the upper holes for tractors without spacers 'A', the lower holes for tractors with spacer or 4WD transfer gearbox 'B'.

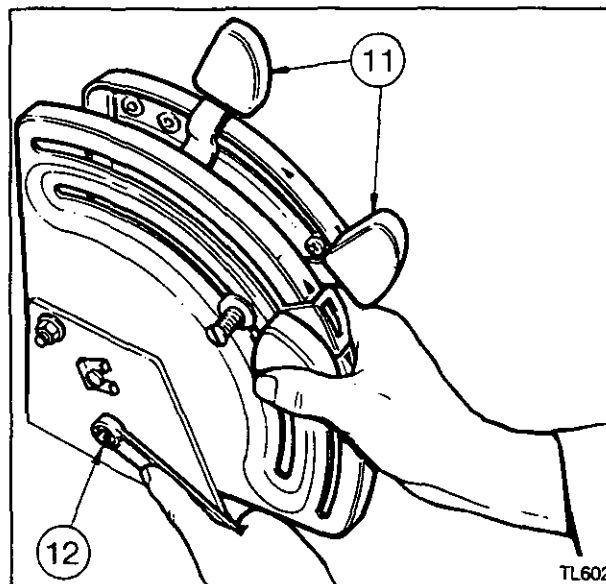
8. Attach a weight of at least 400 kg (900 lb) to the lower links.
9. Start engine and expel any air in the hydraulic system by operating the linkage at least six times throughout its Position range.
10. All the following adjustments must be carried out at 1200 engine rev/min and a transmission oil temperature of 50-60°C (122-140°F).



Draft Control Lever Neutral Setting (Intermix and Non-Intermix)

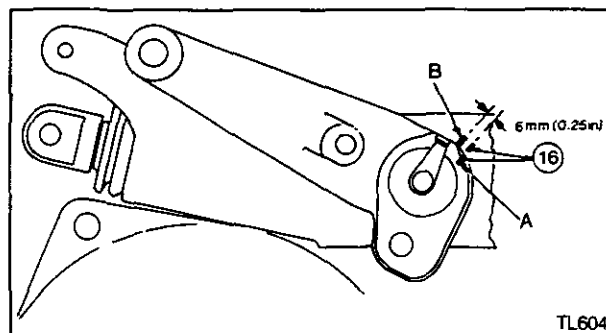
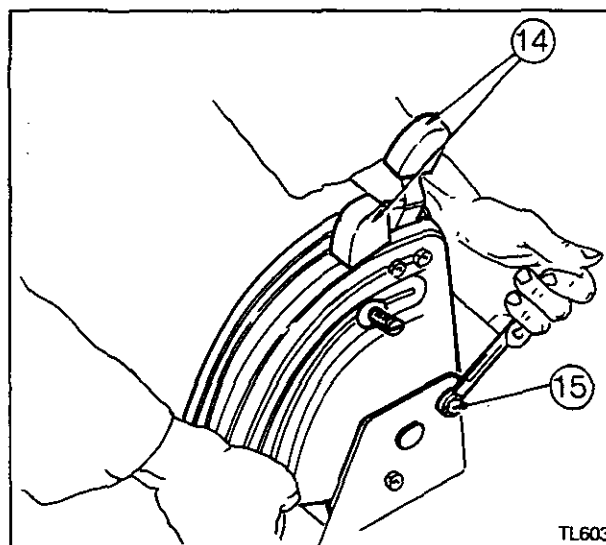
11. Place the Position Control lever in the Transport position and the Draft Control lever between the Sector marks.
12. Slacken the Draft Control quadrant mounting bolts and rotate the Draft Control quadrant and lever until the lower links are held in the horizontal position.
13. Tighten the quadrant mounting bolts and re-check the neutral setting.

Note: The top link must not be attached when carrying out this adjustment.



Position Control Lever (Transport) Setting

14. Place the Draft Control lever in the fully up position and the Position Control lever in Transport.
15. Loosen the Position Control quadrant mounting bolts and rotate the Position Control quadrant and lever until the rear linkage reaches maximum travel (the linkage pump relief valve will open at this point).
16. Scribe a line 'A' from the lift cover to the lift arm, scribe a second line 'B' 6 mm (0.25 in) back from the first line on the lift cover.
17. Rotate the Position Control quadrant and lever until the line 'A' on the lift arm joins with the second line 'B' on the lift cover.
18. Tighten the quadrant mounting bolts.
19. Re-check the setting.

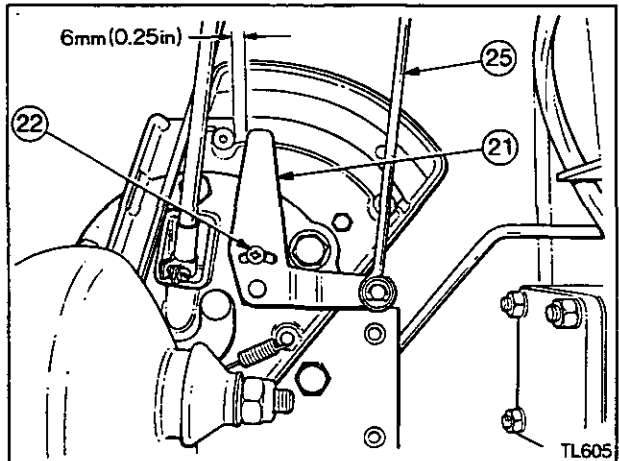


12A-24

LIFT HYDRAULICS

Response Control Setting

20. Refit the side cover to the centre housing.
21. Place the response lever so that it is 6 mm (0.25 in) from the Slow position.
22. Slacken the screw.
23. Rotate the inner cam clockwise by moving the locking screw until it just contacts the Response lever on the hydraulic pump.
24. Tighten the locking screw.
25. Re-connect the operating rod.
26. Finally, check the operation of the Response Control system.



Hydraulic Pressure Test

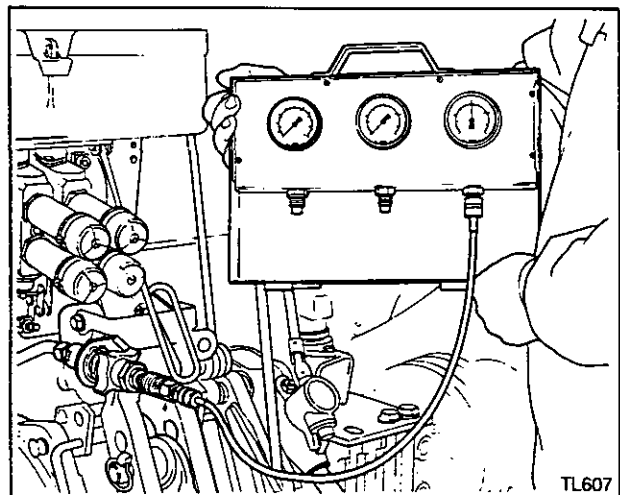
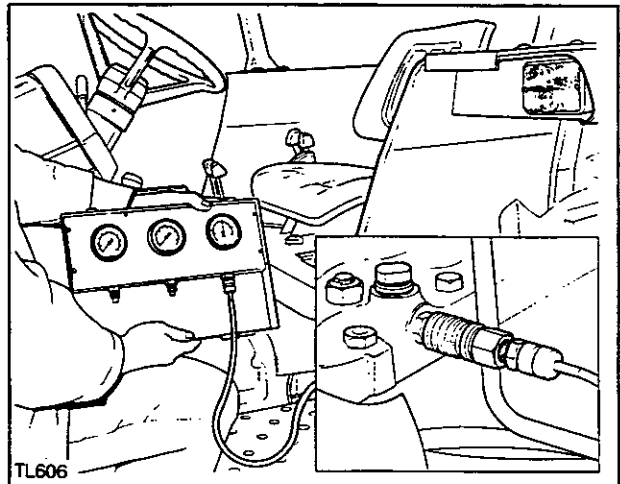
Check

12A-11

Special Tools:
MF3001 Pressure test kit

Procedure

1. Remove the plug from the side of the lift cover and install the 3/8 in NPT adaptor and quick diagnostic coupling from the MF3001 pressure testing kit. or, Connect into the system through the trailer tipping pipe self sealing coupling.
2. Use the 300 bar (4000 lbf/in²) gauge in the test kit.
3. If a selector valve is fitted move the control lever to "Linkage" if the gauge is fitted to the side of the lift cover. Move the control lever to "External" if the gauge is fitted to the trailer pipe.
4. Move the Draft Control lever to Up and the Position Control lever to Transport.
5. Start the engine and run at 1200 rev/min. The transmission oil must be at 50-60°C (122-140°F).
6. Move the Position Control lever to Constant Pumping.
7. The system pressure should be 221-231 bar (3200-3350 lbf/in²).
8. If the pressure setting is incorrect, the relief valve is accessible through the R.H. centre housing side cover. See operation 12A-17.



Hydraulic Lift Pump**Removal and Refitment**

12A-12

Removal

Tractors fitted with single speed (540 rev/min) ground speed PTO only.

1. Remove the lift cover. See operation 12A-03 or 12A-04.
2. Drain the transmission oil.
3. Remove the L.H. side cover. See operation 9A-05 or 9B-05.
4. Remove the R.H. side cover. See operation 12A-18.
5. Remove the shear tube split pin and discard it.
6. Remove the shear tube and the rear drive shaft.
7. Remove the PTO shaft. See operation 9A-02.
8. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.
9. Manoeuvre the lift pump out of the top of the centre housing.
10. Remove the coupler.

Refitment

11. Reverse procedures 1 to 10 except:
 - a. Fit new split pins, 'O' rings and gaskets.
 - b. Fit new shear tube split pin to give 0,38 to 2,54 mm (0.015 to 0.100 in) end float.

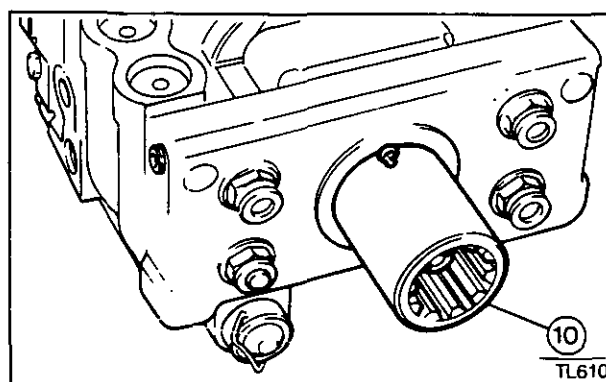
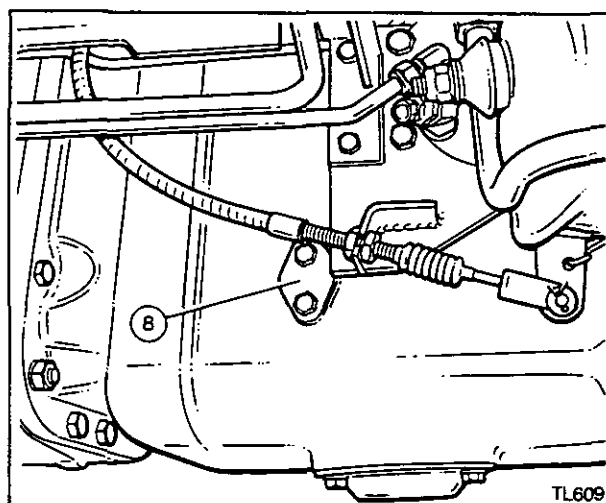
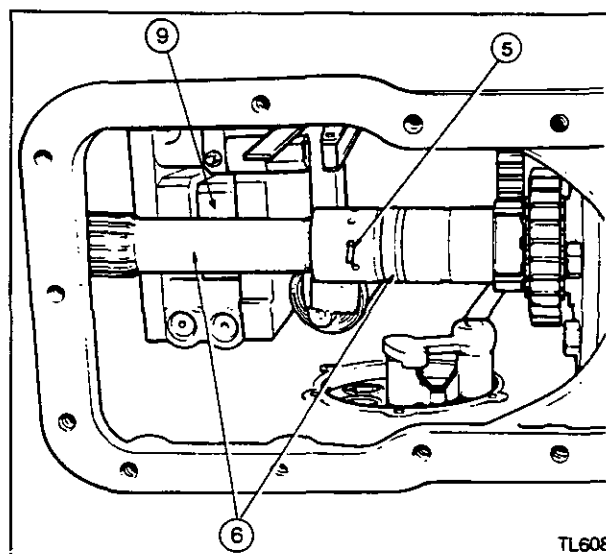
Tractors fitted with two speed (540/1000 rev/min) and Independent PTO.

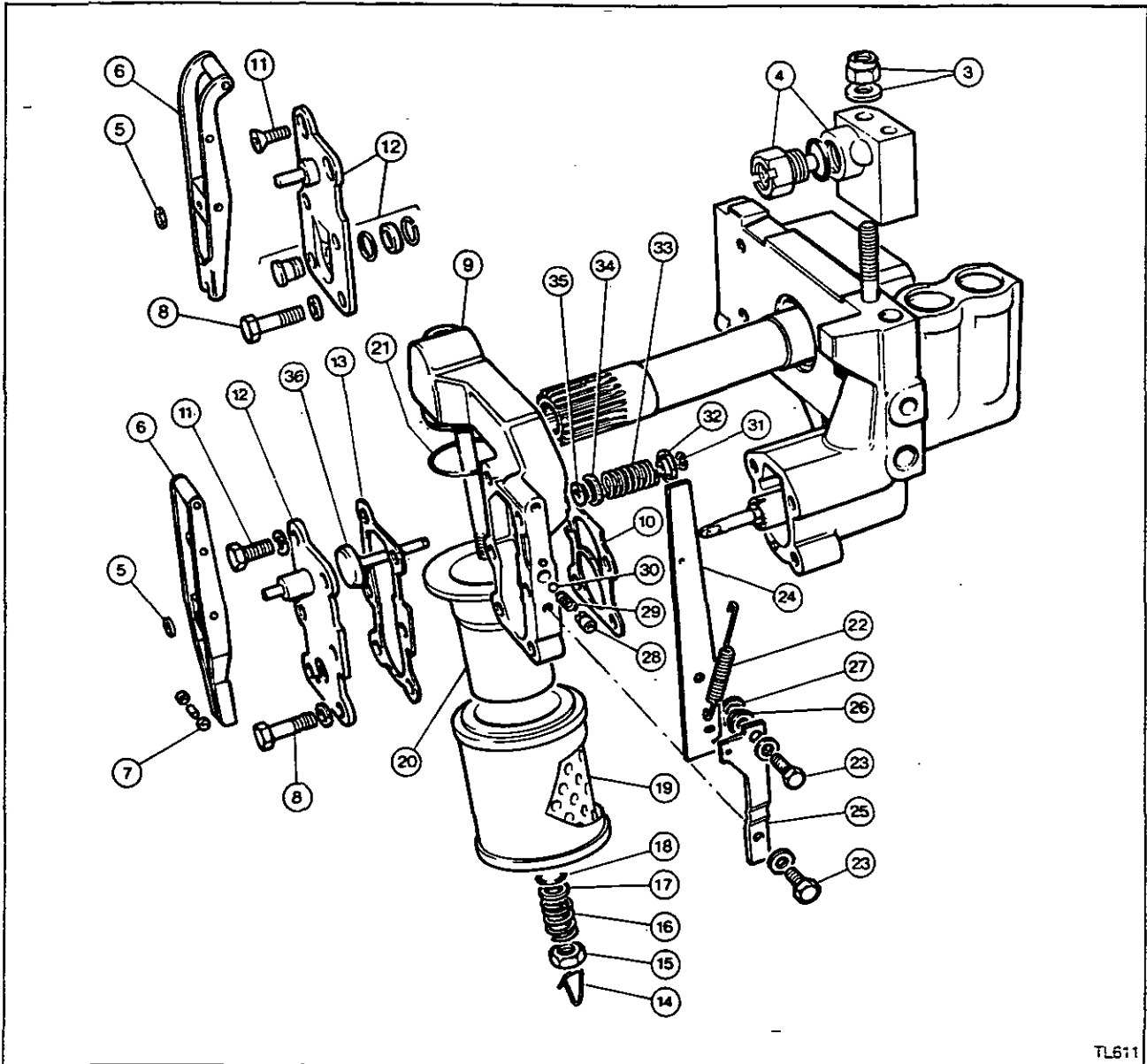
Removal

1. Remove the lift cover. See operation 12A-03 or 12A-04.
2. Drain the transmission oil.
3. Split the tractor between the centre housing and the gearbox, spacer or transfer gearbox. See operation 2A-04 or 2B-05.
4. Remove the R.H. side cover. See operation 12A-18.
5. Remove the two nuts and dowel pins each side of the transmission case holding the lift pump.
6. Withdraw the lift pump from the front of the centre housing.

Refitment

7. Reverse procedure 1 to 6 except:
 - a. Locate the lift pump on to the IPTO clutch if fitted.
 - b. Fit new split pins, 'O' rings and gaskets.
 - c. Refit the right hand dowel pin (8) and tighten the two nuts. Fit the left hand dowel and leave the nuts loose. After reassembly of the tractor turn the transmission over on the starter motor (Stop control out). Fully tighten the left hand dowel nuts. This procedure is to ensure that PTO and pump shafts are in line.





TL611

Hydraulic Lift Pump

Overhaul

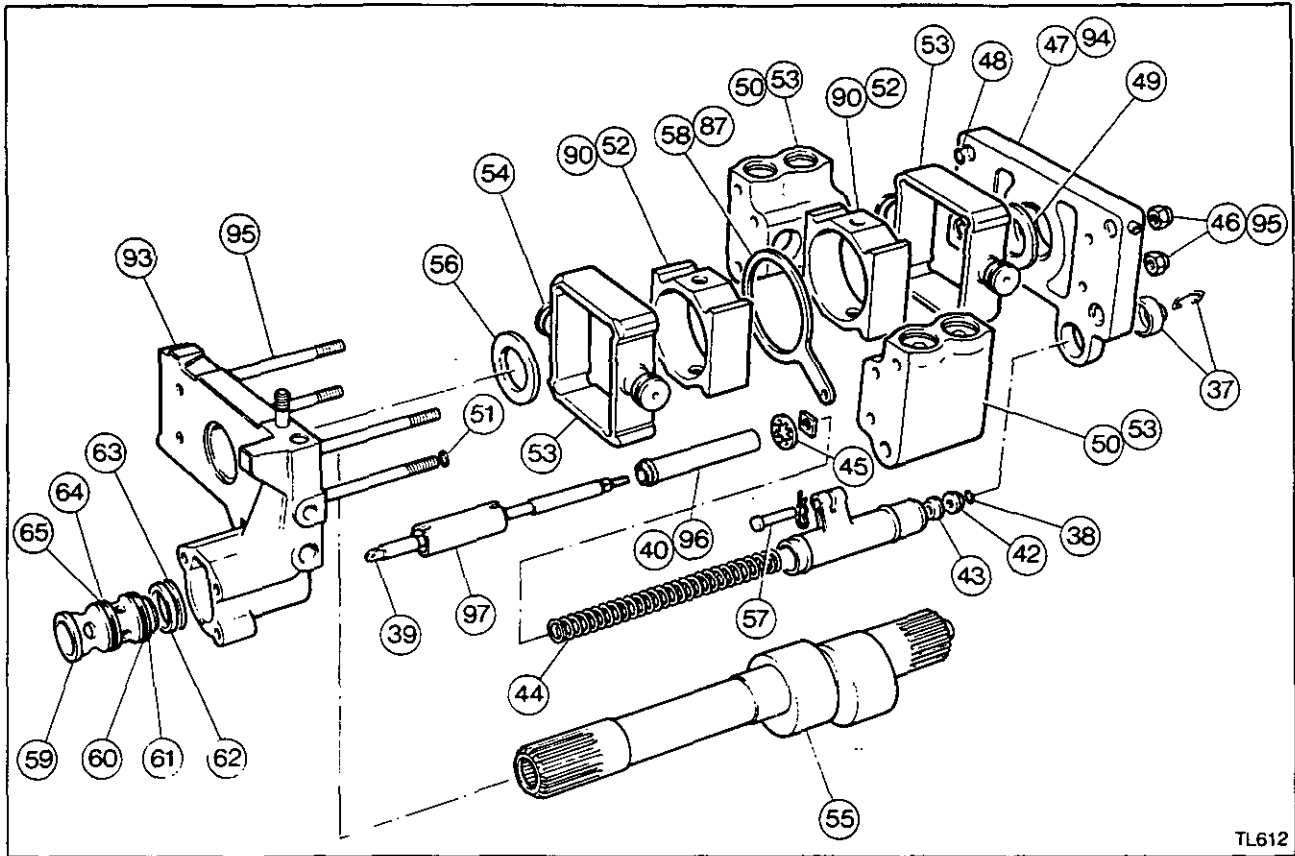
12A-13

Special Tools:

- MF349 Valve seat forming tool
- MF350 Valve circlip replacer
- MF351 Valve plug remover/replacer
- MF352 Control valve spring retainer
- MF353 Control valve body 'O' ring guide
- MF354 Control valve body replacer

Disassembly

1. Remove the hydraulic pump. See operation 12A-12.
2. Clean the outside of the pump.
3. Remove the nut and washer.
4. Remove the pressure relief valve assembly.
5. Remove the clip.
6. Remove the lever.
7. Remove the two rollers and the pin.
8. Remove the four lower bolts and washers.
9. Remove the strainer housing.
10. Remove the gasket and discard it.
11. Remove the two upper bolts and washers.
12. Remove the end plate.
13. Remove the gasket and discard it.
14. Remove the safety clip.
15. Remove the nut.
16. Remove the spring.
17. Remove the washer.
18. Remove the 'O' ring and discard it.
19. Remove the strainer.
20. Remove the strainer inner shroud.
21. Remove the 'O' ring and discard it.
22. Remove the spring.
23. Remove the two bolts and washers.



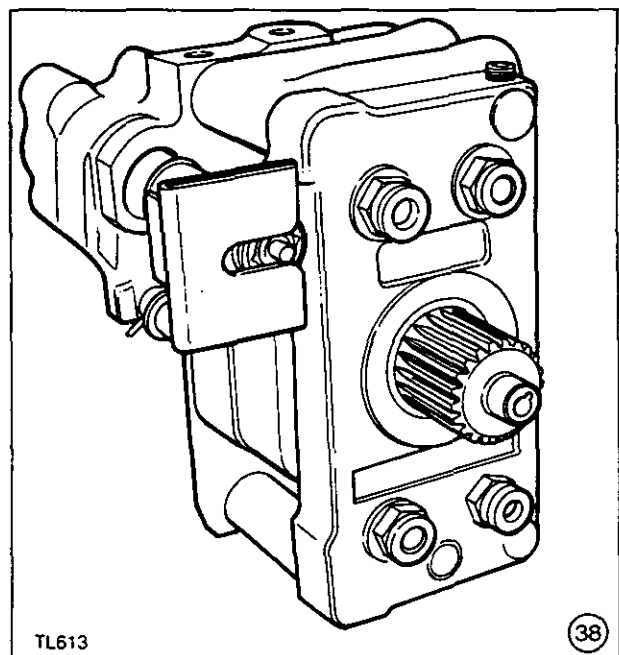
TL612

24. Remove the Response Control lever.
25. Remove the retainer.
26. Remove the bush.
27. Remove the washer.
28. Remove the bush.
29. Remove the spring.
30. Remove the ball.
31. Remove the circlip.
32. Remove the cap.
33. Remove the spring.
34. Remove the retainer.
35. Remove the seal and discard it.
36. Remove the valve.
37. Remove the cap.
38. Using MF352 control valve spring retainer clip, slide it into position to hold back the spring tension. Remove and discard the retaining ring.
39. Withdraw the control valve.
40. Remove the balancer tube.



Caution: Spring under compression, do not stand over the pump when removing the spring. Cover with a cloth to protect your face.

41. Taking care that the spring is not ejected, remove MF 352 retainer clip.



TL613

38

42. Remove the collar.
43. Remove the guide.
44. Remove the spring.
45. Remove the square disc.

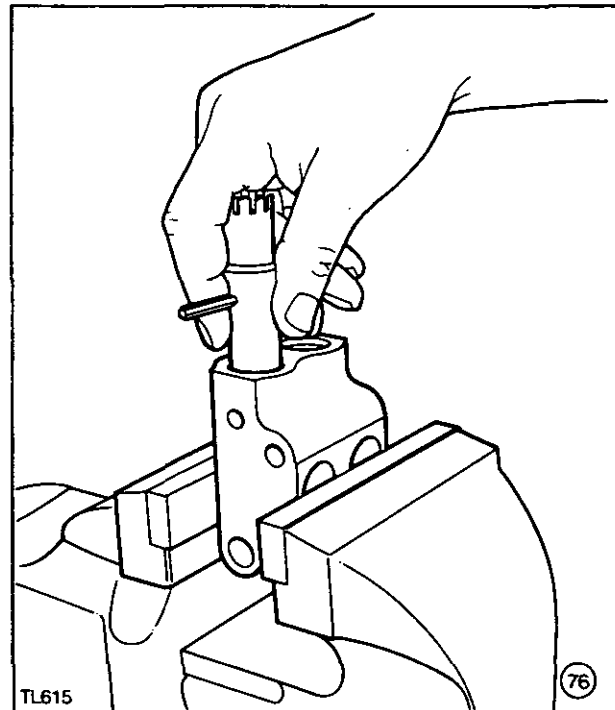
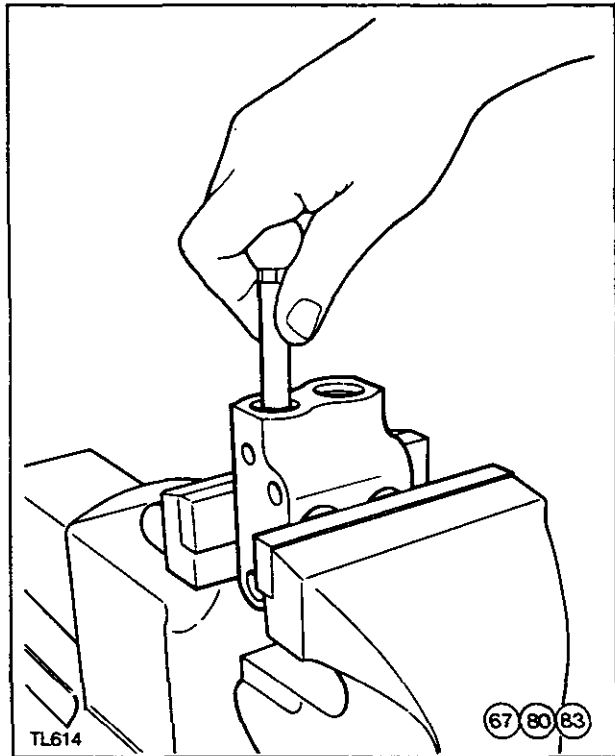
46. Remove the four main pump body nuts.
47. Detach the front body.
48. Remove and discard the 'O' rings.
49. Remove the thrust washer.
50. Withdraw the two valve chambers from the rear body, complete with the cam blocks, pistons, cam follower and oscillator tube as an assembly.
51. Remove and discard the 'O' rings.
52. Remove the cam blocks from the pistons.
53. Separate the valve chambers from the pistons.
54. Remove the piston rings, if necessary.
55. Withdraw the camshaft from the rear body and the thrust washer.
56. Remove the thrust washer.
57. Remove the pin and retainer clip.
58. Remove the cam follower from the oscillator tube.
59. Carefully drive out the control valve body from the end housing.
60. Remove and discard the 'O' ring.
61. Remove and discard the back-up washer.
62. Remove the sleeve.
63. Remove the washer.
64. Remove and discard the 'O' ring.
65. Remove and discard the back-up washer.
66. Remove and discard the circlip.
67. Using MF351 valve chamber plug remover/replacer, screw it into the plug and pull it out of the housing.
68. Remove and discard the back-up washer.
69. Remove and discard the 'O' ring.
70. Remove the spring.
71. Remove the valve.
72. Remove the spring.
73. Remove the valve.
74. Repeat procedures 66 to 73 for the other three valves.

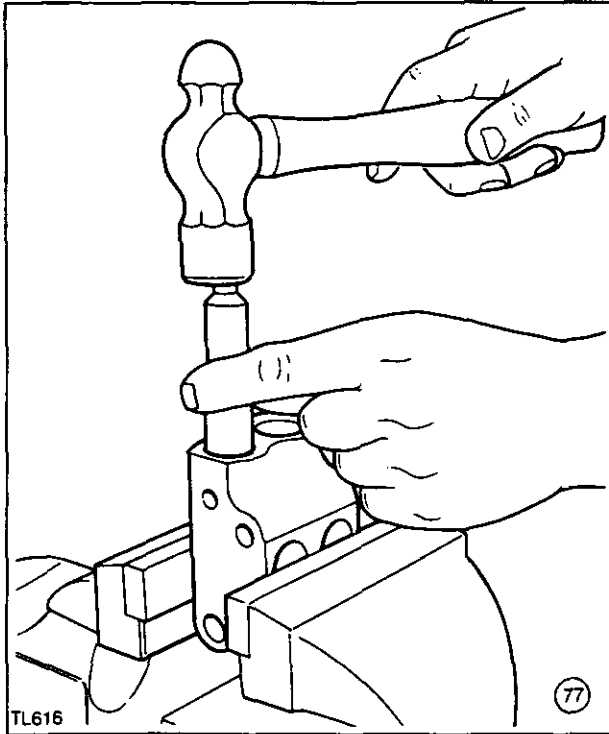
Examination

Check the condition of all components for wear or damage, replacing any defective components. Always replace 'O' rings, back-up washer, gaskets and circlips. Lubricate the 'O' rings with oil before fitting.

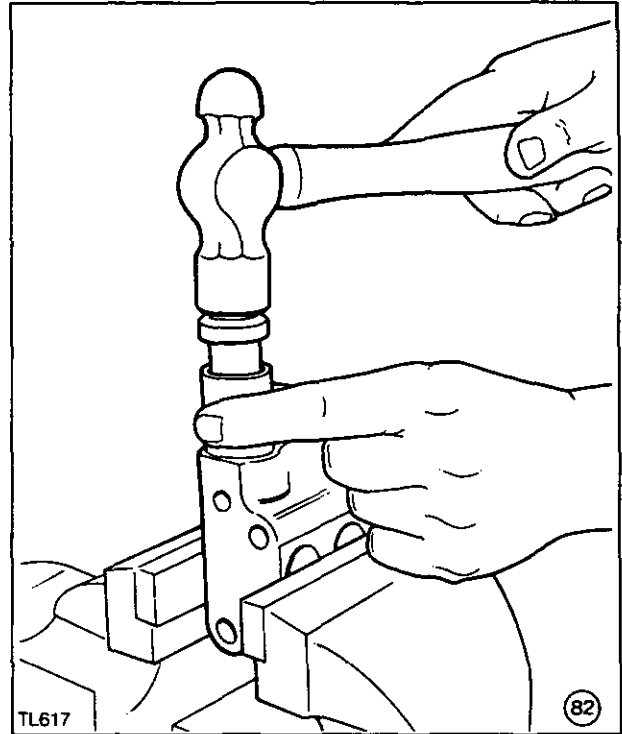
Reassembly

75. If necessary, form new valve seats, using MF349 Valve facing cutter and coining tool in the following sequence:
 - a. Cut the top seat in the valve chamber using the large end of the cutter and tommy bar provided.
 - b. When a satisfactory seat has been formed remove the tool and fit the sleeve to the small end of the cutter.
 - c. Insert the small end and carefully rotate the cutter to remove the burr around the top seat.
 - d. Remove the cutter and sleeve; reinsert and cut the bottom seat until a satisfactory result has been obtained. The cutter has been designed to ensure the correct depth of the bottom seat.

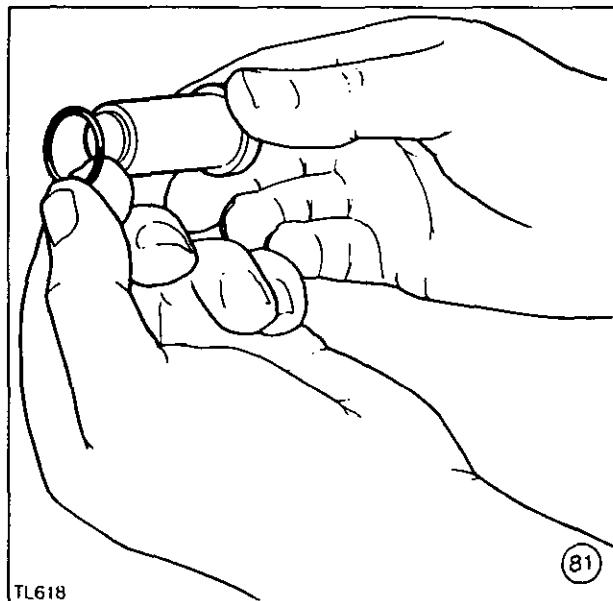




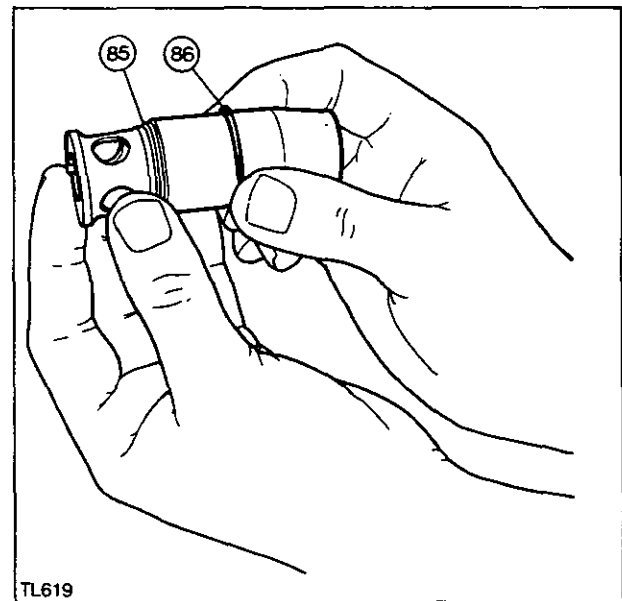
77. Using the seat forming tool, form a new bottom seat by tapping the tool with a hammer, invert the tool and form a new top seat in the same manner.
 78. Thoroughly clean all the valve chambers.
 79. Reverse procedures 68 to 73.



82. Using MF350, fit the circlip.
 83. Using MF351, pull the plug back against the circlip.
 84. Repeat procedures 79 to 83 for the other three valves.



80. Using MF351, push the plug into the valve chamber until the circlip groove can just be seen.
 81. Position a new circlip in MF350 Valve chamber circlip replacer.



85. Using MF353 Control valve body 'O'ring guide, fit a new back-up washer to the control valve body.
 86. Using MF353, fit a new 'O' ring to the control valve body.

12A-30

LIFT HYDRAULICS

87. Refit the sleeve and washer to the control valve housing.
88. Using MF354 control valve body replacer, carefully drive the control valve body into the front of the housing, aligning the pin at six o'clock.
89. Reverse procedures 51, 53, 54, 57 and 58.
90. Place the cam follower between the pistons.
91. Fit the two cam blocks to the camshaft.
92. Replace the front and rear thrust washers.
93. Refit the rear body.
94. Refit the front body.
95. Lubricate the studs with transmission oil, and refit the four nuts and tighten them to a torque of 40 Nm (30 lbf ft) ensuring at all times that the pistons move freely.

Note: The special nuts must be fitted to the top R.H. and the bottom L.H. studs.

96. Refit the balancer tube to the control valve.
97. Lubricate the control valve with oil and slide it into the rear body.
98. Reverse procedures 1 to 38 and 41 to 45 except:
 - a. Tighten the pressure relief valve manifold nut (3) to a torque of 27 Nm (20 lbf ft).
 - b. Lubricate the vertical lever/strainer end plate bolts (8 and 11) with oil and tighten to a torque of 20 Nm (15 lbf ft), checking at all times that the control valve continues to move freely.

Note: When refitting the retaining clip to pin (57) bend end of clip over.

Hydraulic Relief Valve

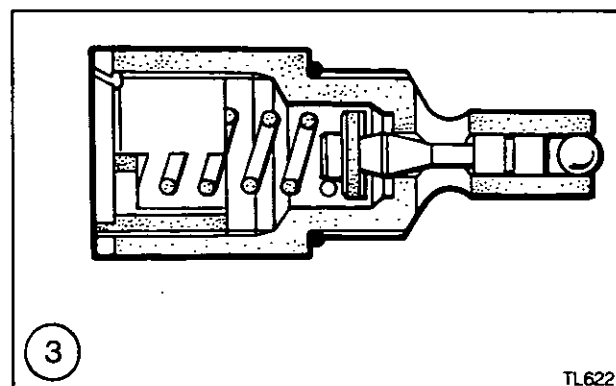
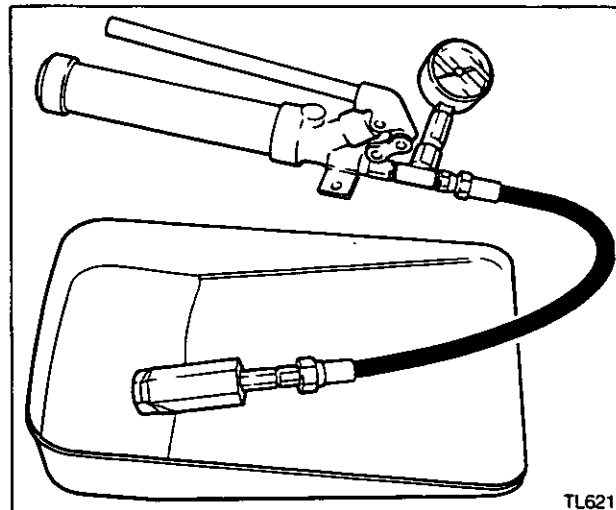
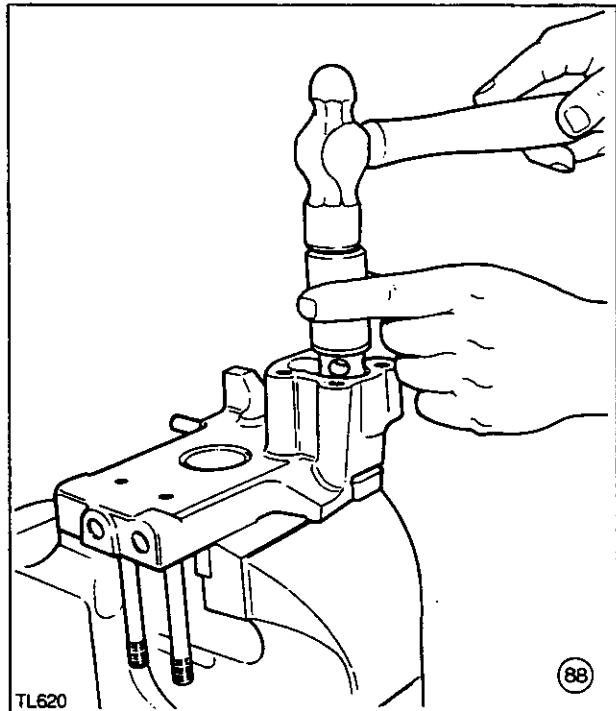
Adjust 12A-14

Special Tools:
MF455 Pressure relief valve test capsule

Adjust

Note: The relief valve can be serviced when the hydraulic lift pump is removed or through the R.H. side cover, See operation 12A-18.

1. Remove the relief valve from the manifold and fit it to MF455 Pressure relief valve test capsule.
2. Connect the capsule up to an injector tester or hydraulic pump, the thread size is M14-1.5. Pressurise the relief valve and check the pressure which should be 221-231 bar (3200-3350 lbf/in²).
3. If the pressure is incorrect, release the staking of the end cap, then adjust by screwing in the end cap to increase the pressure, or screwing out to decrease the pressure setting.
4. Lock the cap after adjustment by staking the edge of the cap into one of the slots in the body.
5. Replace the valve and torque to 100-120 Nm (74-89 lbf ft).



Selector Valve

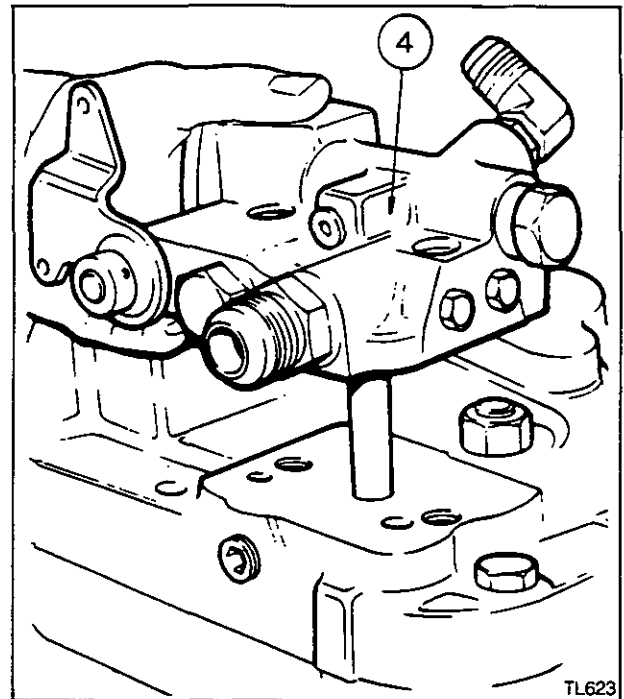
Removal and Refitment 12A-15

Removal

1. Disconnect the control rod from the selector valve lever.
2. Disconnect the pipes.
3. Remove the socket screws securing the selector valve to the lift cover.
4. Lift the valve clear, discard gasket and 'O' ring.

Refitment

5. Reverse procedures 1 to 4 except:
 - a. Replace the 'O' ring and gasket in the recess in the base, with a new one.
 - b. Check that the stand pipe is located in the hydraulic pump.
 - c. Tighten both socket screws to a torque of 34-54 Nm (20-40 lbf ft).

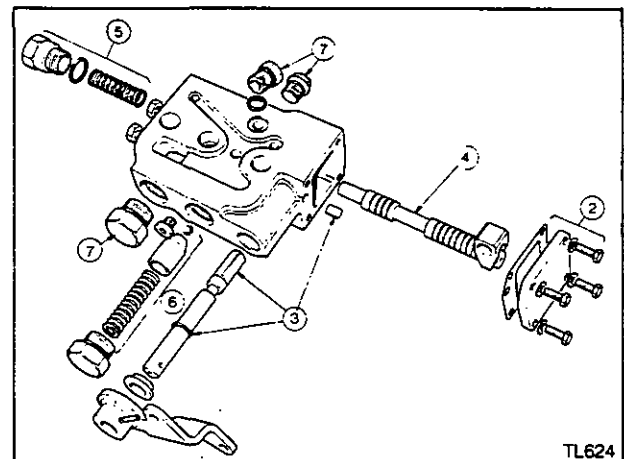


Selector Valve

Overhaul 12A-16

Disassembly

1. Remove the selector valve. See operation 12A-15 and the control linkage from the support plate.
2. Remove the four screws and lock washers securing the support plate and gasket. Remove the plate and discard the gasket.
3. Remove the dowel and pull the operating lever and spindle assembly, out of the bore. Discard the 'O' ring and remove the shift fork.
4. Remove the spool valve assembly from the aperture.
5. Remove the plug and spring from the opposite end of the spool valve aperture. Discard the 'O' ring.
6. Remove plug, spring, plunger and steel ball from the relief valve aperture. Discard the 'O' ring.
7. Remove the remaining adaptors and plugs. Discard the 'O' rings.
8. Thoroughly clean all components using an air line to clear the oil galleries.
9. Fit all new 'O' rings.



12A-32

LIFT HYDRAULICS

Reassembly

10. Reverse procedures 1 to 9.

Note: The relief valve (6) can be adjusted – a hydraulic pump and test gauge will be required. The relief valve is set to 262-276 bar (3800-4000 lbf/in²).

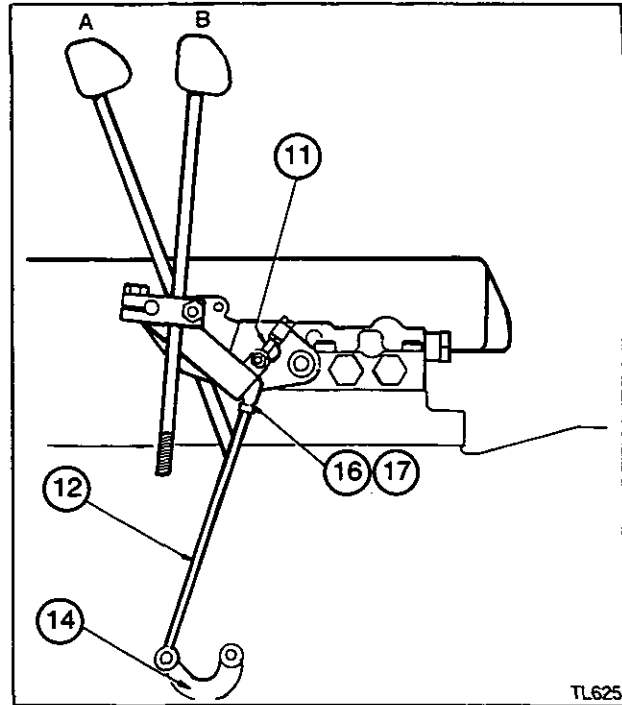
To adjust the relief valve pressure, fit shims (item 12) under the spring in the end plug (item 13). A shim of 0,25 mm (0.010 in) will increase the pressure setting by approximately 7 bar (100 lbf/in²).

Shims are available in the following sizes:

Part No.	Thickness
1679 210 M1	0,25 mm (0.010 in)
1679 211 M1	0,50 mm (0.020 in)
1679 212 M1	1,00 mm (0.040 in)

11. Adjust the link between the control lever and the selector valve so that it has a 'snap action' into the external position 'A'. It is important that the lever rests against the lower stop when in the linkage position 'B'.
12. Adjust the length of the rod between the selector valve and the side cover as follows.
13. Place both quadrant control levers in the fully down position.
14. Rotate the side cover lever clockwise until internal resistance is felt.
15. Rotate the selector valve lever fully clockwise to the linkage position 'B'.
16. Adjust the rod clevis until the pin fits freely.
17. Remove the pin and unscrew the clevis one turn to lengthen the rod. Refit the pin.

NOTE: Reposition the Quadrant lever in the Up position - do not attempt to operate the Selector Lever with the Quadrant levers in the Down position.



TL625

R.H. Side Cover

Removal and Refitment

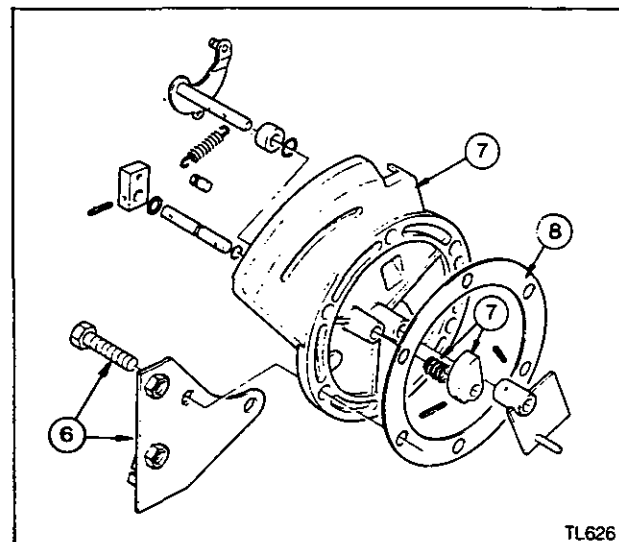
12A-17

Removal

1. Drain the transmission oil to the LOW mark on the dipstick.
2. Remove the brake actuator. See operation 8B-01.
3. Remove the remote dipstick, if fitted.
4. Disconnect the Response Control rod.
5. Disconnect the Constant Pumping control rod, if fitted.
6. Remove the six bolts and parking brake cable support plate.
7. Remove the side cover.
8. Remove and discard the gasket.

Refitment

9. Reverse procedure 1 to 8 except:
 - a. Fit a new gasket.
 - b. Locate the response and constant pumping control levers to the hydraulic pump.
 - c. Seal the six bolts with Hylomar sealant.



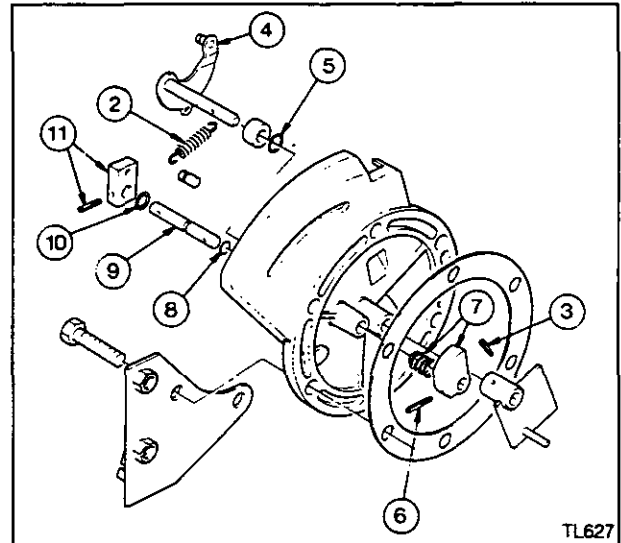
TL626

Right-hand Side Cover**Overhaul**

12A-18

Disassembly

1. Remove the R.H. side cover. See operation 12A-17.
2. Remove the tension spring.
3. Drive out and discard the roll pin.
4. Remove the Constant Pumping lever.
5. Remove and discard the 'O' ring.
6. Drive out and discard the roll pin.
7. Remove the Response Control cam and spring.
8. Remove the spring clip.
9. Remove the Response Control shaft.
10. Remove and discard the 'O' ring.
11. If necessary, dismantle the operating lever.



TL627

Reassembly

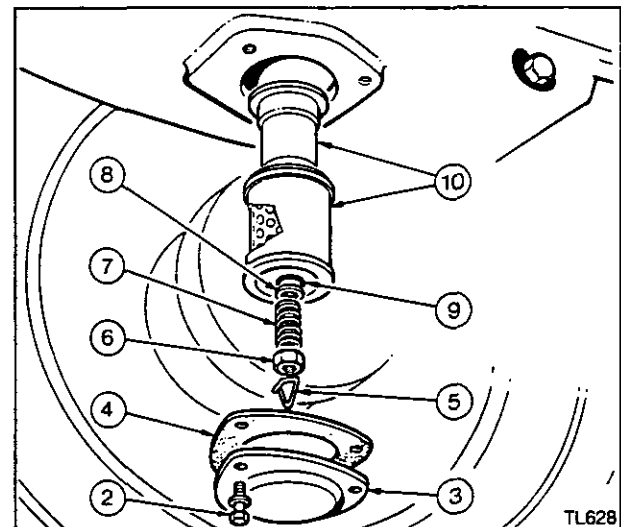
12. Reverse procedures 1 to 11 except:
 - a. Fit new 'O' rings.
 - b. Fit new roll pins.
 - c. Adjust the Response Control, See operation 12A-10.
 - d. Adjust the Constant Pumping control rod, if fitted. See operation 12A-16.

Hydraulic Pump Oil Strainer**Servicing**

12A-19

Disassembly

1. Drain the oil.
2. Remove the three bolts and washer securing the cover plate to the bottom of the centre housing.
3. Remove the cover plate.
4. Remove and discard the gasket.
5. Remove the clip.
6. Remove the nut.
7. Remove the spring.
8. Remove the washer.
9. Remove the 'O' ring.
10. Pull out the strainer and the shroud.
11. Thoroughly clean the strainer in paraffin.



TL628

Reassembly

12. Reverse procedures 1 to 9 except:
 - a. Fit new 'O' ring.
 - b. Fit new cover plate gasket.

12A-34

LIFT HYDRAULICS

Hydraulic Assister Ram

Overhaul

12A-20

Disassembly

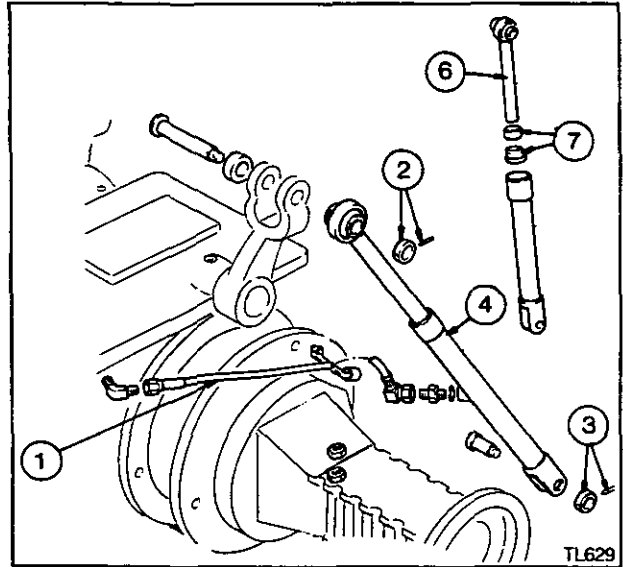
1. Disconnect the hydraulic hose.
2. Remove the upper collar and pin.
3. Remove the lower collar, pin and pivot pin.
4. Remove the hydraulic ram.
5. Clean the outside of the ram.
6. Pull the piston rod out of the cylinder.
7. Remove the two seals from the top of the cylinder and discard.

Examination

Inspect the piston rod for scoring, dents or damage. Clean all components.

Reassembly

8. Reverse procedures 1 to 7 except:
 - a. Fit new seals.
 - b. Lubricate the parts with clean oil on assembly.



Hydraulic Relief Valve

Removal and Refitment

12A-21

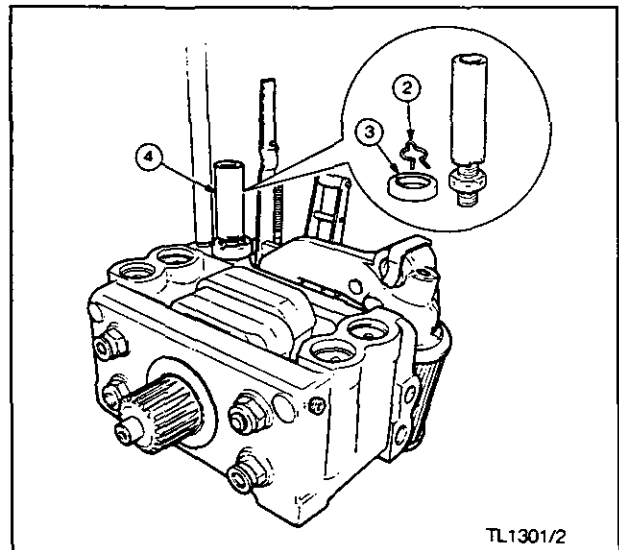
Tractor Serial No. N42314 on.

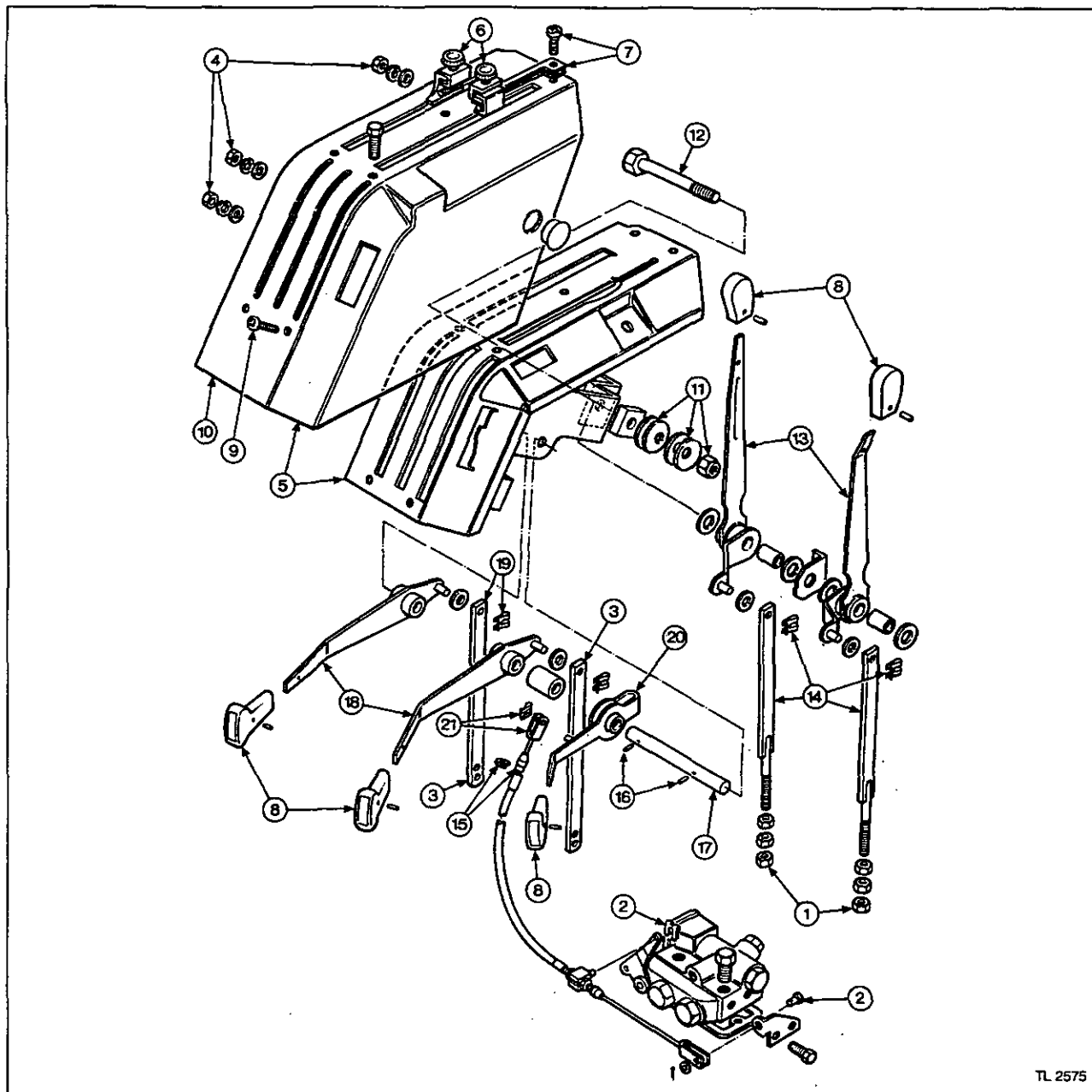
Removal

1. Remove the right hand side cover, see operation 12A-17.
2. Remove the spring clip.
3. Remove the shield.
4. Unscrew the relief valve assembly from the lift pump.

Refitment

5. Reverse procedure 1 to 4 except:
 - a. Tighten the relief valve to a torque of 20-30 Nm (15-22 lbf ft).
 - b. Ensure that the shroud is held down so as to cover the hexagon part of the valve.
6. Pressure test the system to ensure satisfactory operation, see operation 12A-11.





TL 2575

Hydraulic Quadrant Assembly

Overhaul

12A-22

Disassembly

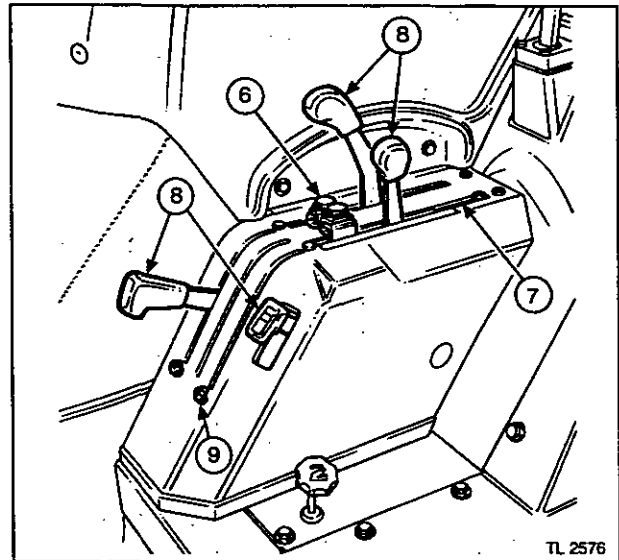
1. Disconnect the control rods at the cross shaft levers.
2. Disconnect the selector valve control cable at the selector valve end. Release the inner cable from the bracket, the outer cable support from the lever.
3. Disconnect the hydraulic control valve rods at the cross shaft.
4. Remove the three nuts and washers inside the right-hand wheel arch.
5. Lift the entire hydraulic quadrant assembly out of the tractor.
6. Remove the two control lever stops.
7. Remove the lever stop.
8. Remove the control lever knobs. The knobs are retained by small pins passing through the side of the lever and knob.
9. Remove the six large screws.
10. Remove the plastic cover.

Lift Control Levers

11. Remove the nut and Belleville washers. Note the position of the various spacers and friction washers.
12. Remove the pivot bolt.
13. Remove the two control levers.
14. Remove the two spring clips and the control rods.

Hydraulic and Selector Control Levers

15. Slide back the cable seal and release the selector control cable.
16. Remove the two roll pins.
17. Slide the shaft out of the frame. Note the position of the various spacers and washers.
18. Remove the hydraulic control levers.
19. Remove the spring clips and control rods.
20. Remove the selector control lever.
21. Remove the spring clip and the selector control cable.



Examination

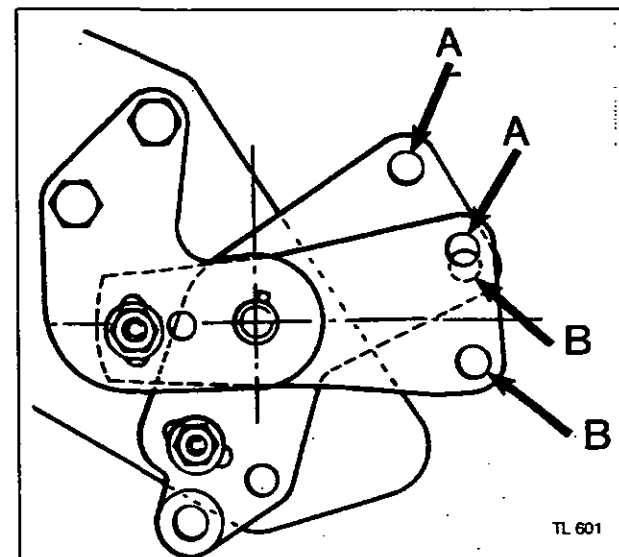
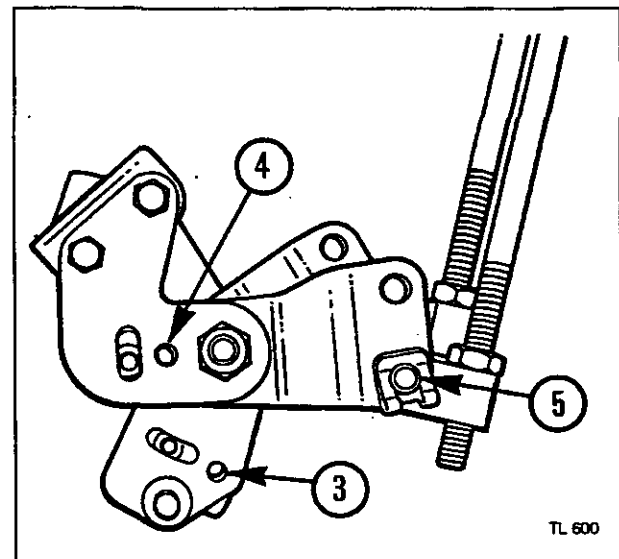
Examine all parts, replacing any worn bushes or pivot pins. Replace spring clips and roll pins, ensure that all parts work freely.

Reassembly

22. Reverse procedures 1 to 20 except:
 - a. Tighten the lift control lever pivot pin nut so that there is sufficient tension to ensure that the levers will be retained in their set position.
 - b. DO NOT lubricate the parts, this is to prevent dust adhering to the components and causing wear and poor operation.

Adjustment

23. Set the lift control rod length by placing the Draft Control between the sector marks and the Position Control in the Transport Position.
24. Position the two levers on the lift cover so that 1/4 in. diameter locating pins can be placed in the holes to set the Position lever (3) and the Draft lever (4) in their correct position.
25. Connect the control rods (5) from the quadrant to the operating levers on the lift cover. Adjust the length of the control rod as necessary. The control rods are fitted to the lower set of holes 'B' in both levers.
26. Attach a weight of at least 400 Kg (900 lb) to the lower links.
27. Start the engine and raise and lower the linkage. Check the Draft lever position, between the sector marks the lift arms should be level. If not, adjust the length of the control rod.
28. Check the Position lever, when moved to constant pumping from Transport the lift arms should move up to the maximum position. If not, adjust the length of the control rod.



AUXILIARY HYDRAULICS

Section 12 – Part B

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AUXILIARY HYDRAULICS

Specification

Steering 4WD and Power Take-off Systems

Pump type	Tandem gear type
Flow at 2000 engine rev/min at 138 bar (2000 lbf/in ²):	
New pump	22 litre/min (4.8 Imp gal/min) (5.8 US gal/min)
Minimum	18 litre/min (4 Imp gal/min) (4.8 US gal/min)
Steering Pressure:	
3 cyl. engine tractors	130-150 bar (1900-2200 lbf/in ²)
4 and 6 cyl. engine tractors	160-180 bar (2300-2600 lbf/in ²)
Pressure Maintaining Valve (PMV) pressure at 1200/1250 engine rev/min:	
3 cyl. engine tractors	17 bar (250 lbf/in ²)
4 and 6 cyl. engine tractors	19 bar (275 lbf/in ²)
Warning pressure switch	16.2 bar ± 10% (210-260 lbf/in ²)
Independent Power Take-Off (IPTO) pressure at 1200/1250 engine rev/min:	
Single speed PTO	15.5-19 bar (225-275 lbf/in ²)
Two speed PTO	12-15.5 bar (175-225 lbf/in ²)
Orbitrol steering unit:	
Make	Danfoss
Type code:	
2 wheel drive	OSPC100
4 wheel drive (tractors without auxiliary hydraulics)	OSPC100
4 wheel drive (tractors with auxiliary hydraulics)	OSPC125
Relief valve pressure setting at 1200/1250 engine rev/min:	
3 cyl. engine tractors	140 bar (2030 lbf/in ²)
4 and 6 cyl. engine tractors	170 bar (2466 lbf/in ²)
Shock valve pressure setting:	
3 cyl. engine tractors	200 bar (2900 lbf/in ²)
4 and 6 cyl. engine tractors	220 bar (3190 lbf/in ²)
Oil cooler:	
Location	In front of engine radiator
By-pass valve setting (4 and 6 cyl. engines only)	10 bar (145 lbf/in ²) Early models only
Oil filter:	
Type	20 micron replaceable
By-pass valve setting	2.5 bar (36 lbf/in ²)
Warning light pressure switch setting	2-3 bar (29-44 lbf/in ²)
Temperature sensor:	
Open	37°C (99°F)
Close	44-50°C (111-122°F)
Suction strainer:	
Type	140 micron washable
Location	Right-hand side of transmission case

NOTE: See page 12B-44 for further details on steering, 4WD and PTO pump pressures and flows.

Auxiliary Hydraulics MF340 Tractor

Auxiliary pump type	Gear type with two sections for auxiliary and IPTO hydraulics
Pump output at 2000 engine rev/min:	
Auxiliary	38 litre/min (8.3 Imp gal/min) (10 US gal/min)
IPTO	15 litre/min (3.3 Imp gal/min) (4 US gal/min)
Relief valve setting at 2000 engine rev/min:	
Auxiliary	193 bar (2800 lbf/in ²)
IPTO	69 bar (1000 lbf/in ²)
Filter	40 micron serving lift pump and auxiliary pump - washable
Auxiliary pump drive	Plated drive gear train from lift pump

Auxiliary Pump CircuitFlow at 2000 engine rev/min at 138 bar (2000 lbf/in²):

3 cyl engine tractors	
New pump	31 litre/min (6.8 Imp gal/min) (8.2 US gal/min)
Minimum	27 litre/min (6 Imp gal/min) (7.1 US gal/min)
4 and 6 cylinder engine tractors	
New pump	32 litre/min (7 Imp gal/min) (8.4 US gal/min)
Minimum	28 litre/min (6.1 Imp gal/min) (7.4 US gal/min)
System Pressure	170-190 bar (2500-2750 lbf/in ²)
(Auxiliary Manifold at 1200 engine rev/min)	

Trailer Brake Valve

Make	Bosch
Pressure Ratio	4:1
Piston Diameter	12 mm
Location	Top of Auxiliary Manifold
Oil Supply	First priority from auxiliary pump
Maximum braking pressure	100-150 bar (1450-2175 lbf/in ²)
Maximum flow to trailer brake	15 litre/min (3.3 Imp gal/min) (4 US gal/min)

Auxiliary Spool Valves

Make	Kontak
Type	Open centre
Number of Sections	1, 2 or *3
Type of Sections	Spring return to neutral (Standard) Detented with pressure kickout *Detent with kickout plus float *Motor

*Dealer fit Kit

Flow at quick release coupling at 2000 engine rev/min

Standard	
3 cylinder engine tractors	35.0 litre/min (7.7 Imp gal/min) (9.24 US gal/min)
4 and 6 cylinder engine tractors	36.0 litre/min (7.92 Imp gal/min) (9.5 US gal/min)
Combined Flow – Standard Flow Pump (Single Speed PTO)	
3 cylinder engine tractors	52.0 litre/min (11.4 Imp gal/min) (13.7 US gal/min)
4 and 6 cylinder engine tractors	52.6 litre/min (11.57 Imp gal/min) (13.9 US gal/min)
Combined Flow – High Flow Pump (Two Speed PTO)	
3 cylinder engine tractors	63.0 litre/min (13.86 Imp gal/min) (16.6 US gal/min)
4 and 6 cylinder engine tractors	63.6 litre/min (13.99 Imp gal/min) (16.8 US gal/min)

Pressure at Quick Release Couplings at 1200 engine rev/min

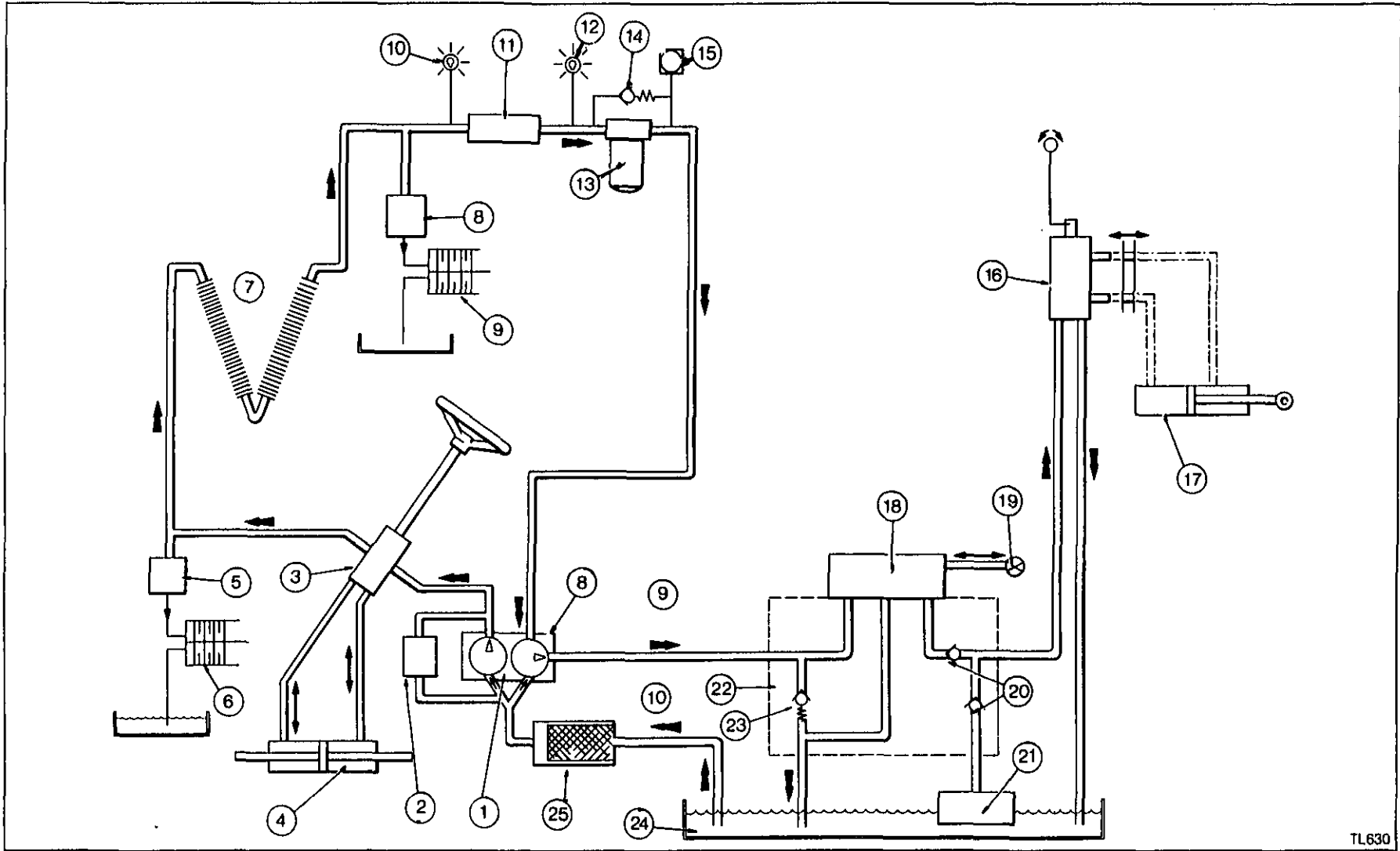
Standard	170-190 bar (2500-2750 lbf/in ²)
Combined flow	214-240 bar (3100-3500 lbf/in ²)

Special Tools

MF332	Hydraulic Pump Oil Seal Protector
MF3001	Universal Pressure Test Kit
MF3002	Universal Flow Test Hose Kit
MF3003	Hydraulic Flow Meter

Bolt Torques

Hydraulic pump drive coupling 6 cylinder engine	50-55 Nm (37-41 lbf ft)
Hydraulic pump drive gear 3 and 4 cylinder engines	40-45 Nm (30-33 lbf ft)
Auxiliary relief valve to manifold	70-100 Nm (52-74 lbf ft)
Hydraulic pump 3 cylinder engines-Cessna	
Body cap screws	37-40 Nm (27-30 lbf ft)
Hydraulic pump 4 cylinder engines-Bosch	
M8 cap screws	17-23 Nm (13-17 lbf ft)
M10 cap screws	35-46 Nm (26-34 lbf ft)
Hydraulic pump 4/6 cylinder engines-Sundstrand	
4 cylinder body cap screws	54-61 Nm (40-45 lbf ft)
6 cylinder body cap screws	61-68 Nm (45-50 lbf ft)
Plated drive to auxiliary pump	
Bolts	30 Nm (22 lbf ft)
Socket head cap screws	27 Nm (20 lbf ft)
Auxiliary pump cover bolts (M-F 340)	45 Nm (33 lbf ft)
Plated drive nuts	27 Nm (20 lbf ft)
Hydraulic control valve tie rods	20 Nm (15 lbf ft)
Hydraulic control valve screws	7 Nm (5 lbf ft)



TL630

Figure 1. Schematic Circuit

- | | | | |
|----------------------------|----------------------------------|---------------------------------|------------------------|
| 1. Pump | 8. Multi-power solenoid | 15. Oil temperature sensor | 22. Auxiliary manifold |
| 2. Starting by-pass valve | 9. Multi-power clutch | 16. Spool valve | 23. Relief Valve |
| 3. Orbitrol steering valve | 10. Low pressure warning light | 17. External hydraulic cylinder | 24. Transmission oil |
| 4. Steering cylinder | 11. Pressure maintaining valve | 18. Trailer braking valve | 25. Hydraulic strainer |
| 5. IPTO control valve | 12. Blocked filter warning light | 19. Trailer braking connection | |
| 6. IPTO Clutch | 13. Hydraulic filter | 20. Non-return valves | |
| 7. Oil cooler | 14. Filter by-pass valve | 21. Ferguson lift pump | |

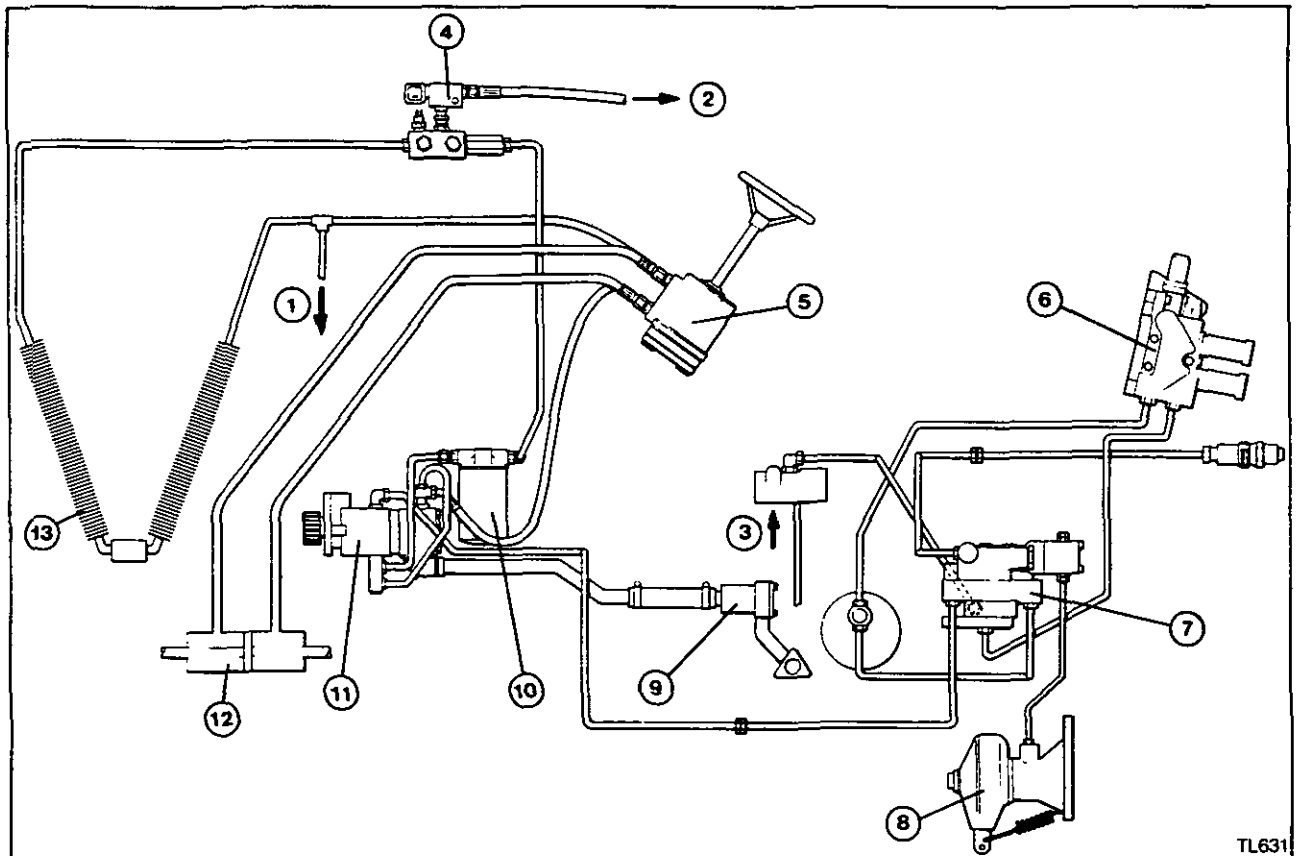


Figure 2. General Circuit

- | | | |
|-------------------------------|-----------------------|-----------------------|
| 1. To IPTO clutch | 6. Spool valve | 11. Hydraulic pump |
| 2. To Multi-power clutch | 7. Auxiliary manifold | 12. Steering cylinder |
| 3. From lift pump | 8. Brake cylinder | 13. Oil cooler |
| 4. Pressure maintaining valve | 9. Oil strainer | |
| 5. Orbitrol steering unit | 10. Oil filter | |

General Description

The auxiliary hydraulic system (Figures 1 and 2) is of the open centre type. A dual element gear type pump is mounted externally and driven from the engine timing gears. It supplies oil to the steering and auxiliary circuits.

The gearbox and centre housing form a common reservoir for all the hydraulic services, one grade of oil being used throughout for simplified maintenance.

The schematic diagram places the hydraulic services in groups according to their oil feed arrangement from the two elements of the dual element pump.

The steering element of the pump supplies oil to the following services in series:

- *Steering
- * Multi-Power
- * Independent P.T.O

The auxiliary element of the pump supplies oil to the following services in series:

- * Trailer Brake Valve
- * Spool Valves

On tractors fitted with combined flow the oil from the Ferguson Lift pump can be combined with the oil from the auxiliary system to give increased flow to the spool valves.

Dual Hydraulic Pump

The Dual Hydraulic pump is fitted to the R.H. side of the engine and driven by the engine timing gears on 3 and 4 cylinder engine tractors. On 6 cylinder engine tractors it is driven off auxiliary drive shaft on the right hand side of the engine.

It receives its oil supply from the tractor centre housing on the right-hand side through a 140 micron in-line strainer. Oil is supplied to a "common" port on the pump which feeds both sections of the pump through an internal port.

The pump provides oil for two circuits, Steering, Independent PTO and Multi-Power from one section and auxiliary hydraulics from the other. Return oil from the steering system is fed into the inlet port of the auxiliary section.

Pressure test points are provided on the outlet port of the steering pump, PMV manifold, auxiliary manifold and L.H. side cover for IPTO to check the system pressures.

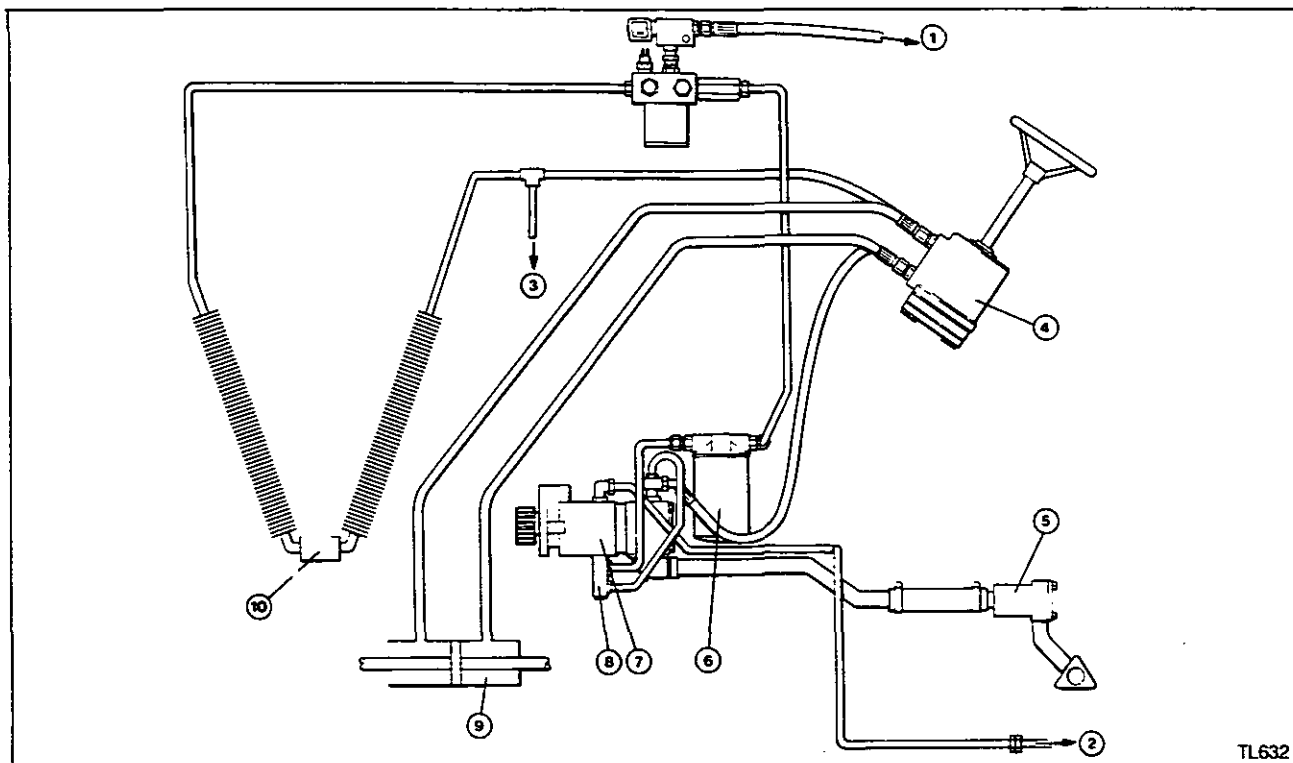


Figure 3. Steering Circuit

- | | | |
|---------------------------|----------------------|--|
| 1. To Multi-Power clutch | 5. Oil strainer | |
| 2. To auxiliary circuit | 6. Oil filter | |
| 3. To IPTO clutch | 7. Hydraulic pump | |
| 4. Orbitrol steering unit | 8. Cold start valve | |
| | 9. Steering cylinder | |
| | 10. Oil cooler | |

Steering Pump Circuit. (Figure 3).

The steering pump receives its oil from the tractor transmission case through a 140 micron in-line strainer.

The flow of oil leaves the pump and is supplied to the Orbitrol steering unit, when the steering is employed, a proportion of the oil is diverted to the steering ram. Excess oil not required for steering passes through an oil cooler and into a manifold which contains a pressure maintaining valve (PMV). The PMV creates a pressure on the manifold for use in the Multi-Power and Independent PTO clutch packs. Excess oil passes on through the PMV to the inlet side of the auxiliary pump after passing through a 20 micron in-line filter.

For tractors not fitted with Multi-Power or IPTO the excess oil from the Orbitrol steering unit is returned directly via the filter to the auxiliary pump.

Orbitrol Steering Unit

All M-F 300 Series tractors employ an open centre hydrostatic steering system. Hydrostatic steering is a full power steering system with no mechanical connection between the steering wheel and the tractor wheels.

The Orbitrol steering unit controls the amount of oil supplied to either side on the steering ram depending on the direction and the amount of rotation of the steering wheel.

When the steering wheel is stationary the Orbitrol unit allows oil to pass on to the next service in the circuit. As no mechanical linkages are used in this arrangement the steering unit can also act as a steering wheel operated hand pump, to maintain steering control, even if the engine is stopped.

The steering unit is fitted with a relief valve between the inlet and outlet port to regulate the operating pressure. It is also equipped with two shock valves between both pressure lines to the power steering ram(s) and the steering unit outlet port. The function of these two valves is to protect the unit from excessive pressures created in the steering ram should the wheels strike a solid object.

A one-way check valve is fitted to the steering unit in the inlet port to prevent peak pressures generated in the unit returning to the pump and to prevent kick back on the steering wheel.

On 4 and 6 cylinder tractors, a cold start by-pass valve is fitted, to relieve the steering system of pressure when starting the engine, at low ambient temperatures.

Details on the operation of the Orbitrol steering unit will be found in Section 11.

Multi-Power and Independent Power Take-off. (Figure 4).

The Multi-Power and independent power take-off (IPTO) utilise a working pressure achieved by a pressure maintaining valve (PMV).

Oil supply to the IPTO clutch assembly is taken from between the orbitrol steering unit and the oil cooler. The return flow from the Orbitrol then passes on through the oil cooler to the manifold block mounted above the engine.

A drilling runs through the manifold block and the PMV is screwed into the outlet side. Oil passing through the PMV is returned via a micronic filter to the auxiliary pump. The manifold block contains three other ports, these feed Multi-Power (when fitted), the pressure switch for low hydraulic oil pressure warning light on the instrument panel and a M14 test point for pressure testing the system.

The IPTO supply taken off before the cooler, supplies pressure to the IPTO control valve and into the clutch pack in the rear axle centre housing.

Oil is supplied to the Multi-Power clutch via a solenoid valve screwed into one of the ports of the manifold block. Multi-Power is electrically engaged by a switch located on the tractor instrument panel.

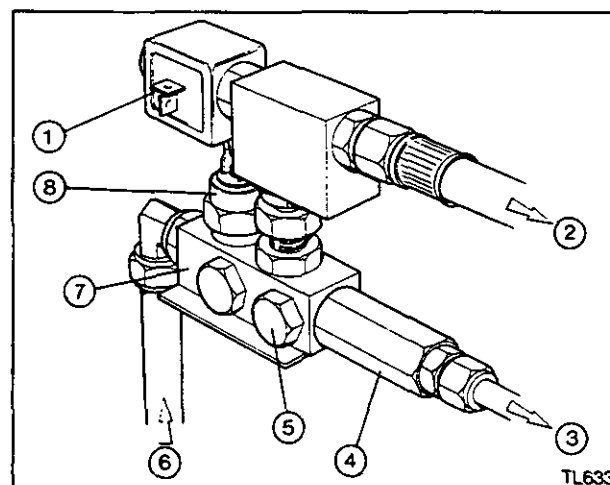


Figure 4. Pressure Maintaining Valve and Multi-Power Solenoid

1. Multi-power solenoid switch
2. To multi-power
3. To auxiliary pump
4. Pressure maintaining valve
5. Pressure test point
6. From steering system
7. Manifold block
8. Low pressure switch

Pressure Maintaining Valve. (Figure 5).

The pressure maintaining valve (PMV) is fitted only to tractors with IPTO or Multi-Power and is used to create sufficient line pressure to operate these services.

The required line pressure is produced by the action of a spring loaded piston which remains seated until the required pressure is reached. There are two sizes of valve fitted depending upon the type of engine fitted to the tractor.

3 cylinder engine tractors 17-20 bar (250-290 lbf/in²)

4 and 6 cylinder engine tractors
19-22 bar (275-325 lbf/in²)

The pressure at which the valve regulates is stamped on the valve body.

To prevent seat damage and noise due to excessive oscillation of the valve piston, a damping arrangement is incorporated in the design. This takes the form of a drilling on the pressure side fed through a restrictor. This arrangement gives improved oil filling of the area around the damping shuttle to further retard valve oscillations.

The damping action occurs when oil around the shuttle is expelled through the small orifice by movement of the piston. During this process, back pressure created by flow restriction through the orifice bears against the rear face of the piston, and damps the pistons movement. Oil flow through the orifice in the head of the piston also has a retarding effect on the valve particularly when low flows and small pressure changes are encountered.

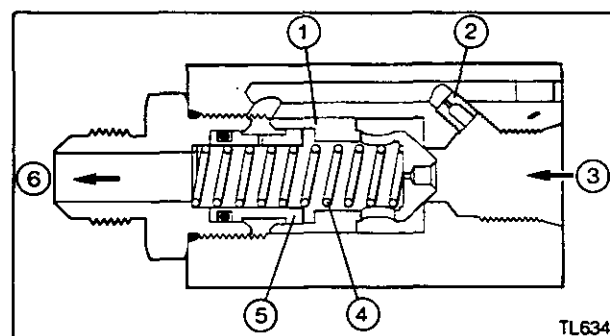
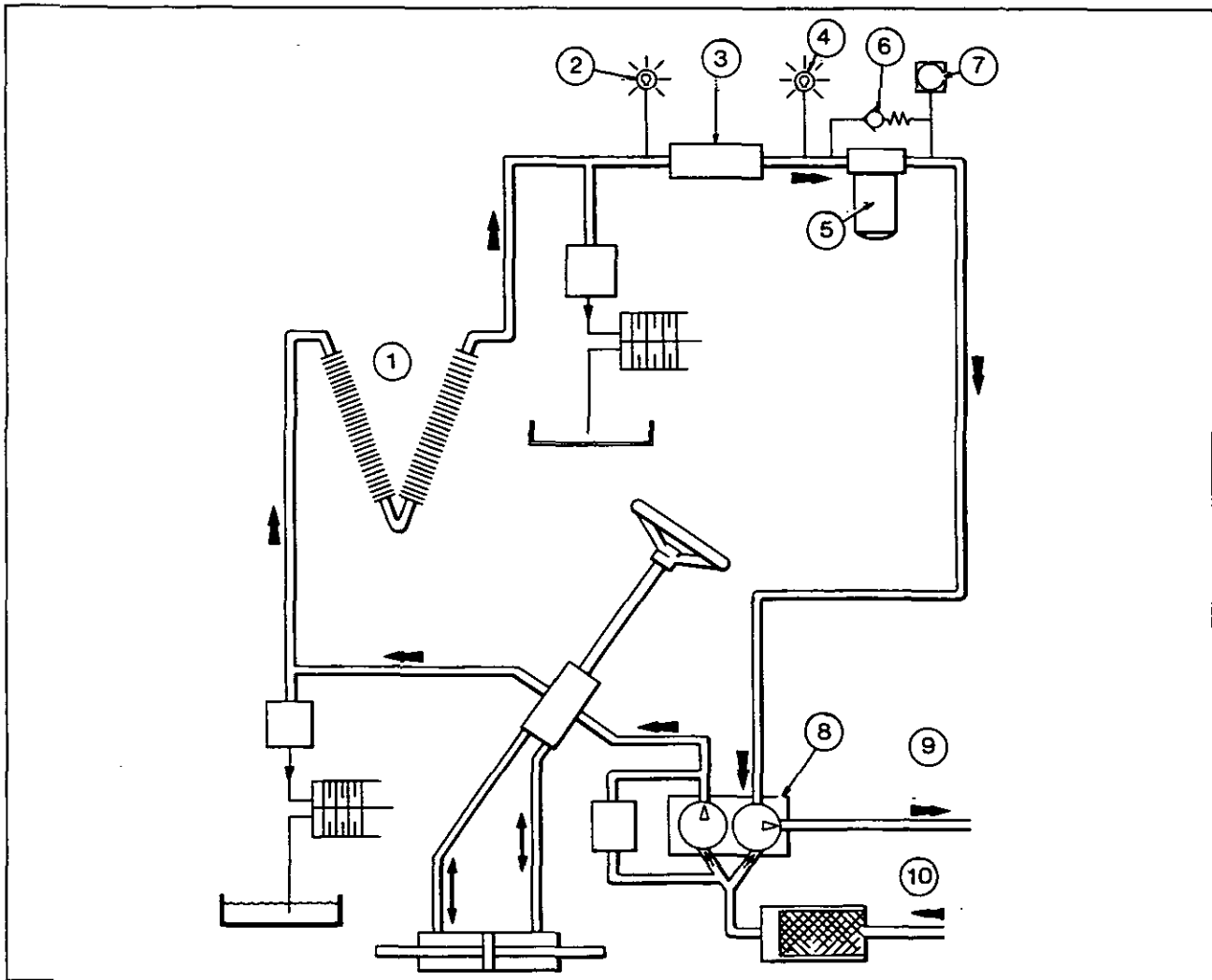


Figure 5. Pressure Maintaining Valve (PMV)

1. Poppet
2. Restrictor
3. From oil cooler
4. Spring
5. Dampening shuttle
6. To auxiliary pump



Oil Cooler and Filter. (Figure 6).

The oil cooler is mounted in front of the engine cooling system radiator. A by-pass valve is fitted to protect the oil cooler from damage, due to excessive pressure caused by cold oil. The by-pass valve is set to open at a differential pressure of 10 bar (145 lbf/in²) and is only fitted to early production tractors with 4 and 6 cylinder engines.

A 20 micron spin-on type filter (5) is fitted between the outlet side of the PMV (3) and the inlet side of the auxiliary pump (6). This filter removes any fine dirt from the system and ensures that the oil is clean at all times. In the event of a blockage or excessive line pressures due to cold oil, it is protected by a by-pass valve (6). This valve is set to open at differential pressures exceeding 2.5 bar (36 lbf/in²) across the filter.

Should the differential line pressure between the inlet and outlet port of the filter increase above 2-3 bar (29-44 lbf/in²), the pressure switch fitted to the filter head will operate a warning light (4) on the instrument panel. To prevent the light coming on, on initial start-up due to cold oil with a high viscosity the pressure switch is wired in series to a temperature sensor (7) mounted on a filter head. The temperature sensor prevents illumination of the warning light until the oil temperature has reached an operating temperature of 44-50°C (111-122°F).

Figure 6. Oil Cooler and Filter

1. Oil cooler
2. Low pressure warning light
3. Pressure maintaining valve
4. Blocked filter warning light
5. Hydraulic filter
6. Filter by-pass valve
7. Oil temperature sensor
8. Hydraulic pump
9. To auxiliary hydraulics
10. From transmission

In the event of a drop in system pressure a low pressure switch (2) fitted to the manifold block will illuminate a warning light on the instrument panel. This switch is set to operate if the pressure falls below 13,8-15 bar (200-220 lbf/in²).

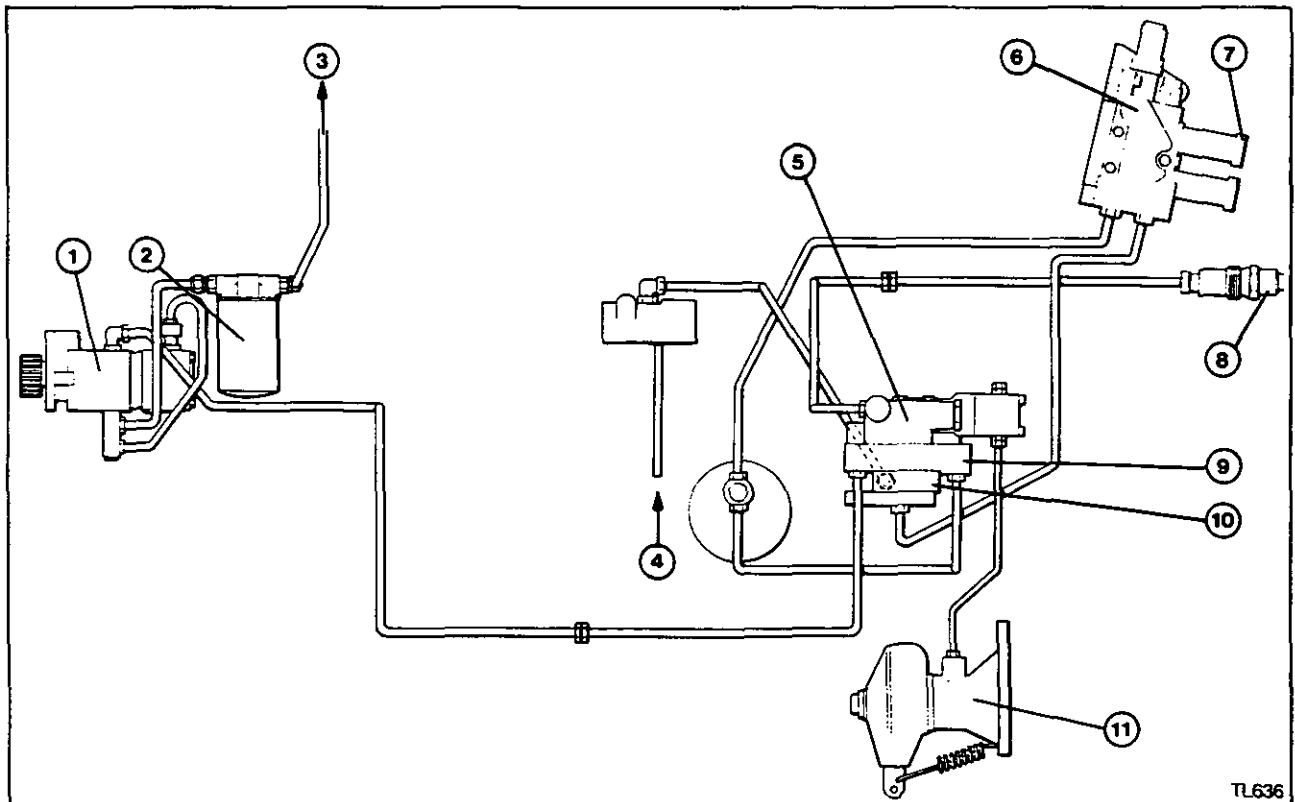


Figure 7. Auxiliary Circuit

1. Hydraulic pump
2. Oil filter
3. From steering circuit
4. From lift pump

5. Trailer braking valve
6. Spool valve
7. Auxiliary couplings
8. Trailer brake coupling

9. Auxiliary relief valve manifold
10. Non-return valve manifold
11. Brake cylinder

Auxiliary Pump Circuit. (Figure 7).

The auxiliary section of the dual pump receives its oil supply mainly from the steering circuit return flow, but this is supplemented via an internal suction passage.

Oil leaves the pump and is directed to the auxiliary manifold which is mounted on the L.H. side of the tractor in front of the rear trumpet-housing. The manifold contains the circuit relief valve, non-return valves, (on tractors with combined flow) and the trailer brake valve, if fitted.

The manifold directs the oil supply through the trailer brake valve and on to the spool valves, or direct to the spool valves if the trailer brake valve is not fitted. On tractors with combined flow the oil supply from the Ferguson lift pump joins the auxiliary pump feed through non-return valves in a housing, before being directed to the spool valves.

Return oil from the manifold relief valve, spool valves and trailer brake valve is returned to the centre housing through the L.H. side cover. The side cover is provided with a blanked-off 3/4"-16 UNF JIC male connector for the direct return of hydraulic oil; e.g. from a hydraulic motor.

Auxiliary Manifold. (Figure 8).

The auxiliary manifold is fitted to all tractors with an auxiliary pump and Spool Valves or Trailer Brake Valve. It contains the pressure relief valve, hydraulic pressure test point and ports to the spool valve and return to the side cover and sump. The manifold also houses an automatic bleed valve to aid priming the of the pumps.

If a trailer brake valve is fitted this is bolted directly to the top of the main section and utilises face to face 'O' ring seals providing the hydraulic connection and return to sump. If it is not fitted a transfer cap is bolted in its place.

A third or lower section may be fitted if the tractor has combined flow. This contains the two non-return valves and the ports for the supply from the Ferguson lift pump, and to the spool valves. The non-return valves prevent back pressures damaging either the lift pump or the auxiliary pump. If this section is not fitted then the supply to the spool valves is taken directly from the manifold. When the Non-return valve block is not fitted the middle is bolted directly to the mounting bracket.

Trailer Brake Valve. (Figures 9 and 10).

The trailer brake valve has priority on the oil supply from the auxiliary system and consists of the following main components:

1. Flow Control Valve – to regulate oil flow to the trailer brake.
2. Control Spool – to change the position of the flow control valve and regulate the trailer brake pressure.
3. Pressure Relief Cartridge – to limit the maximum brake pressure.
4. Control Head with Servo Piston – to operate the control spool via a sensing line from the tractor brake system.
5. Check Valve – to prevent back flow of oil from the trailer brake.

1. Trailer Brake Released. (Figure 9).

When the trailer brake is released pressure is dissipated in the sensing line. Residual pressure in the brake line acts on the head of the control spool to move it to the right allowing brake oil to dump to sump through the spool centre and sleeve. A pilot flow of oil from the pump approximately 0.6 l/min (0.13 Imp gal/min) (0.16 US gal/min) flows through the restrictor, orifice and gallery 'A' to sump. Consequently, there is a pressure drop at the R.H. end of the valve allowing it to be held fully open by the incoming oil so opening the outlet gallery.

2. Initial Brake Operation. (Figure 9).

When the pedal is depressed slightly, pressure is transmitted through the sensing line to the control head. The servo piston within the head pushes the control spool to the left isolating the brake return port and gallery 'A' from the reservoir. The flow control valve is now moved to the left by its spring because the pilot oil gallery is blanked off. A metered amount of oil, 15 litre/min (3.3 Imp gal/min) (3.96 US gal/min) is therefore allowed through the restrictor in the valve, past the check valve and out to the trailer brake.

Pressure builds up in the brake line, and acts on the control spool piston surface, 'B'.

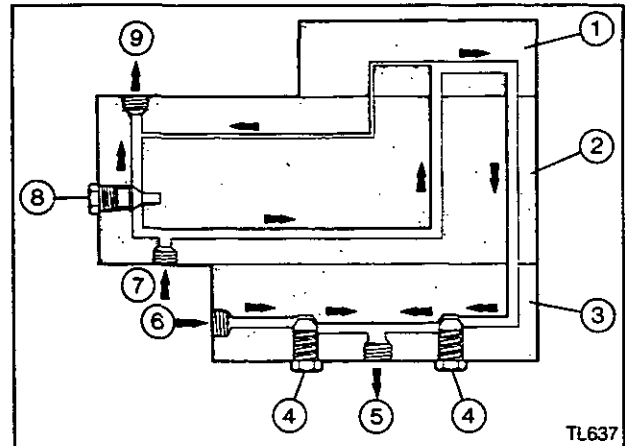


Figure 8. Auxiliary Manifold (Schematic)

1. Trailer brake valve or cap
2. Auxiliary relief valve manifold
3. Non-return valve manifold
4. Non-return valve
5. To spool valve
6. From lift pump
7. From auxiliary pump
8. Auxiliary relief valve
9. Return to transmission case

3. Partial Braking. (Figure 10).

If a moderate pressure is being applied to the pedal, the pressure build-up on the head of the control spool, mentioned in 2, equalises with the sensing line pressure acting on the servo piston. Consequently the spool moves to the right slightly to a position where the brake return port is cut off and gallery 'A' is open to sump. The flow control valve can now move to the right and ceases to regulate the flow.

4. Maximum Braking Effort. (Figure 10).

If the operator applies the brake pedal fully, pressure in the trailer brake line will build up to a maximum of 100-150 bar (1450-2175 lbf/in²). This pressure is controlled by the pressure relief cartridge. If the pressure in the sensing line rises above the maximum, the relief cartridge will be pushed to the left against its springs, without affecting the spool position.

Note: With the engine running and brake pedal(s) depressed rhythmic oscillation of the pedal may be felt. This is due to pressure equalisation in the valve and is quite normal.

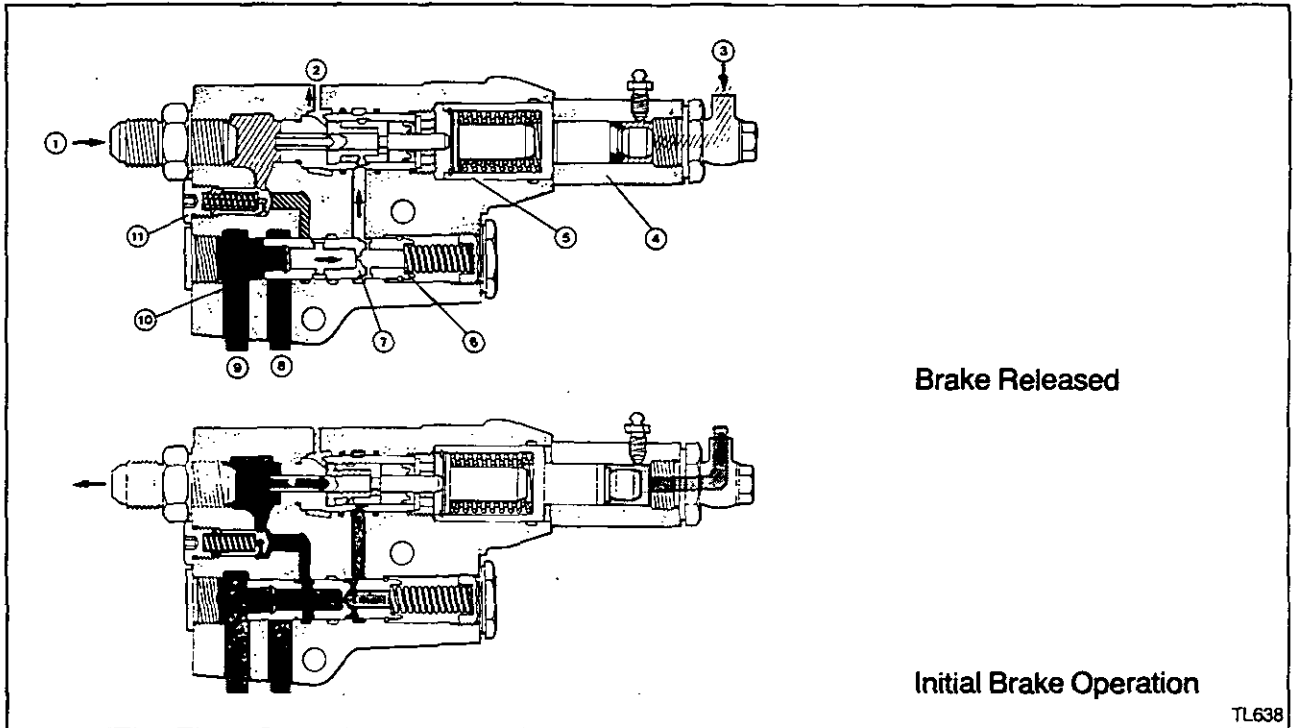


Figure 9. Trailer Brake Valve

- | | | |
|--|--------------------------------|--------------------------|
| 1. From trailer brake | 5. Pressure relief cartridge | 9. Auxiliary pump supply |
| 2. Return to transmission case | 6. Flow control valve | 10. Restrictor |
| 3. Sensing line from tractor brake circuit | 7. Orifice | 11. Check valve |
| 4. Control head with servo-piston | 8. Return to transmission case | |

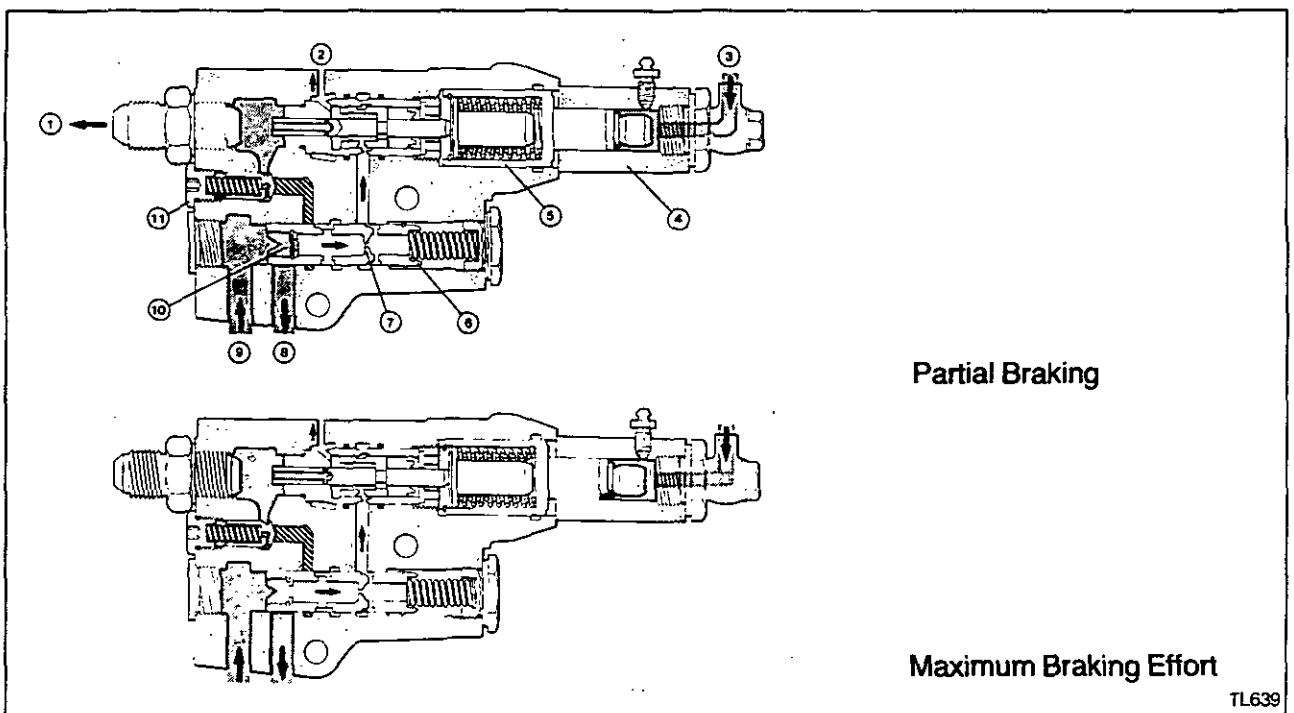


Figure 10. Trailer Brake Valve

- | | | |
|--|--------------------------------|--------------------------|
| 1. To trailer brake | 5. Pressure relief cartridge | 9. Auxiliary pump supply |
| 2. Return to transmission case | 6. Flow control valve | 10. Restrictor |
| 3. Sensing line from tractor brake circuit | 7. Orifice | 11. Check valve |
| 4. Control head with servo-piston | 8. Return to transmission case | |

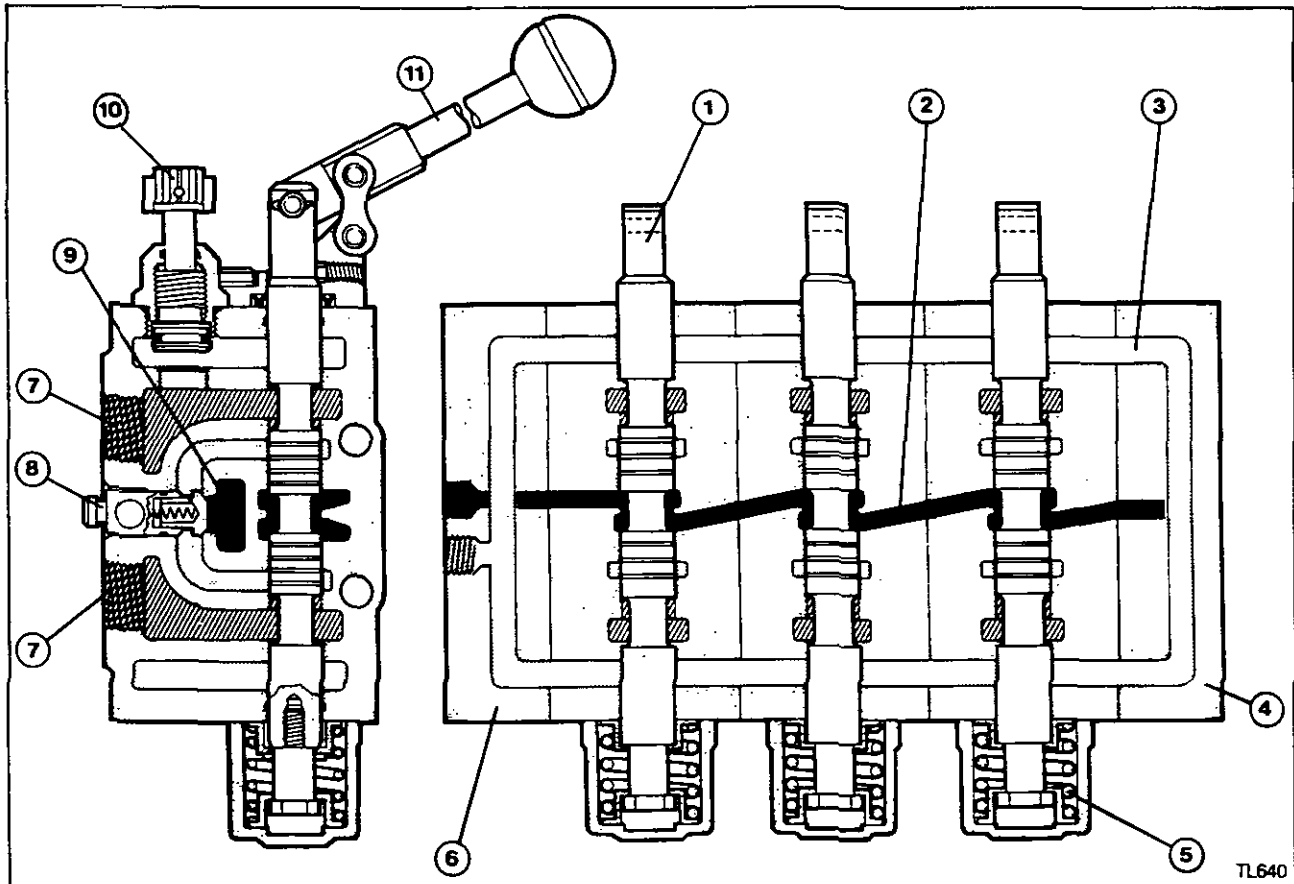


Figure 11. Spool Valve

- | | | |
|--------------------------------|-----------------------------|-----------------------|
| 1. Spool | 5. Spool return spring | 9. Pressure gallery |
| 2. Open centre | 6. End cap | 10. Change over valve |
| 3. Return to transmission case | 7. Quick coupler connection | 11. Control lever |
| 4. End cap | 8. Check valve | |

Auxiliary Spool Valves. (Figure 11).

The M-F 300 series range of tractors use Kontak Unit 18 spool valves. Two spools are normally fitted, but a single or three spool arrangement is possible. The control levers are located on the R.H. side in front of the quadrant controls. Operation is through a mechanical linkage.

The following specifications of spool valves are available:

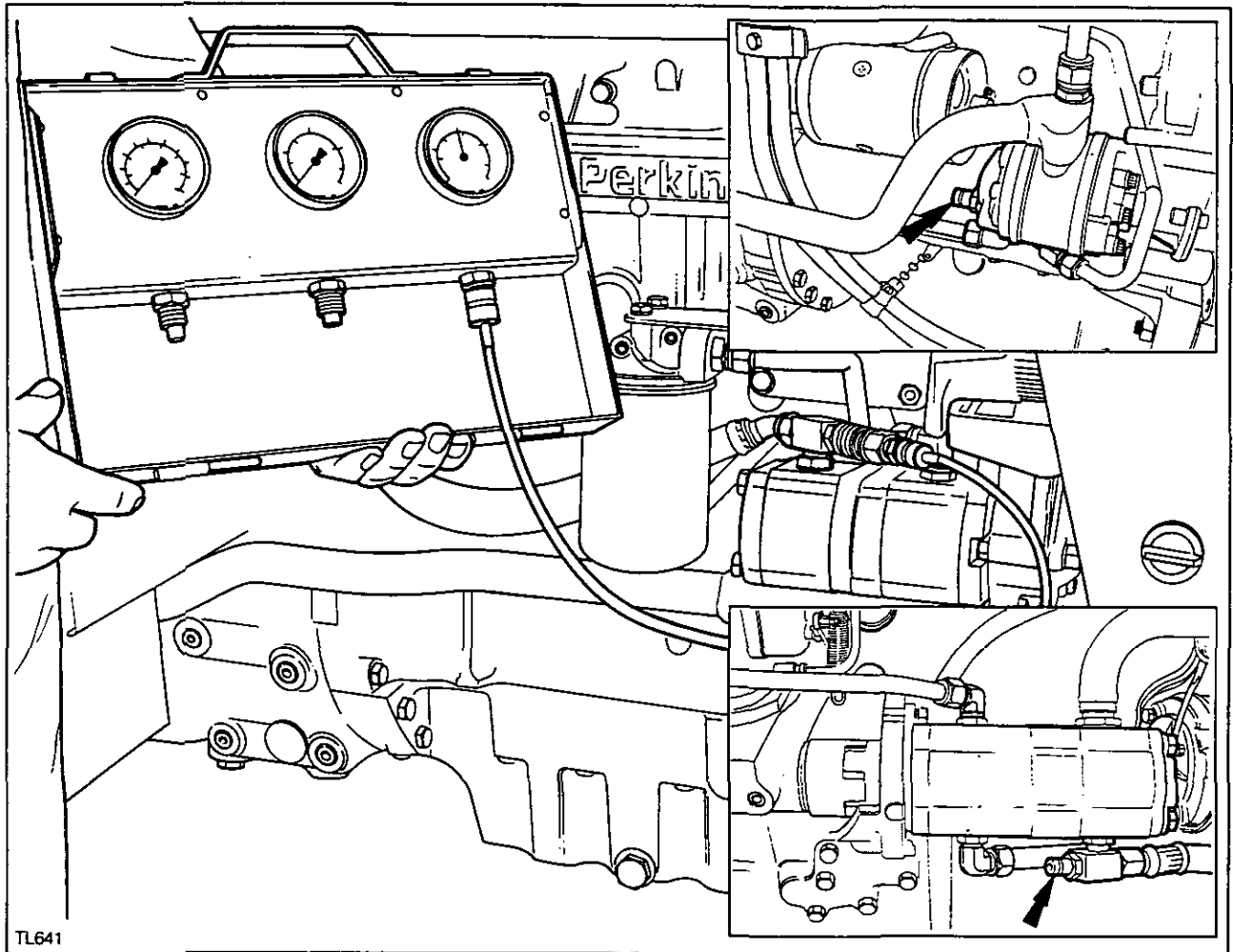
1. Spring return to neutral.
2. Detented with pressure kickout.
3. Four position with detent and kickout plus float position.

Optional Accessories

1. Motor spool for applications involving use of hydraulic motors.
2. Detent kit to lock spool in either raise or lower (no kickout).

All the spools are of the open centre type and are fitted with a change over valve situated on the bottom of each valve slice to convert from single to double acting. To operate a single acting ram the changeover valve must be screwed fully out.

A check valve is provided within the valve on the pressure side from the pump, which will not open until the pump pressure is greater than the ram pressure. This prevents an external ram from dropping before lifting. It also prevents the ram dropping if the spool valve is moved to the lift position with the engine stopped.



TL641

Steering System Pressure Test

Check 12B-01

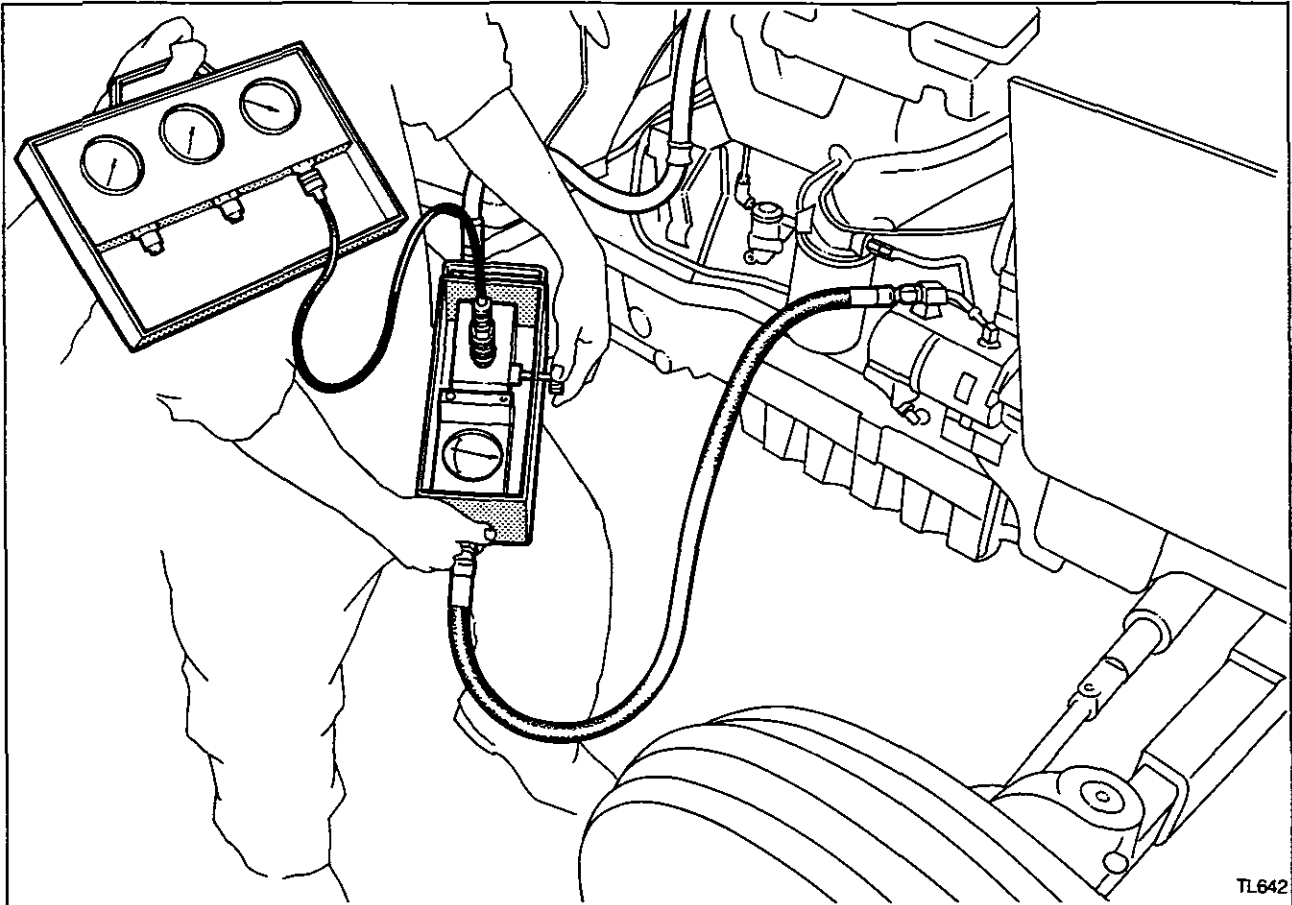
Special Tools:
M-F3001 Pressure Test Kit

Procedure

1. Remove the test point plug on the steering section of the pump and install the M14 male quick release diagnostic coupling.
2. Connect up the 300 bar (4000 lbf/in²) pressure gauge in the MF3001 pressure test kit.
3. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
4. Set the engine speed to 1200 rev/min.
5. Note the back pressure on the gauge.
6. Turn the steering to full lock, to lift the relief valve.
7. Note the pressure reading on the gauge.
8. Calculate the relief valve pressure as follows:
 System pressure = Reading on gauge – Circuit back pressure
9. System pressure should be:
 3 cylinder engine tractors 130-150 bar (1900-2200 lbf/in²)
 4 and 6 cylinder engine tractors 160-180 bar (2300-2600 lbf/in²)

Diagnosis

Symptom – Steering pressure LOW		
Cause	Action	Operation No.
1. Steering pump performance down	Flow Test Pump	12B-02
2. Cold Start Valve faulty	Overhaul or replace valve	12B-17
3. Worn Orbitrol Steering Unit	Overhaul Steering Unit	11A-03
4. Relief valve in Steering Unit faulty	Overhaul Steering Unit	11A-03
5. Shock valves in Steering Unit faulty	Overhaul Steering Unit	11A-03
6. Leakage across Steering ram Seals	Overhaul Steering Ram	11A-11 11A-13



Steering System Flow Test

Check 12B-02

Special Tools:

- MF3001 Pressure Test Kit
- MF3002 Flow Test Hose Kit
- MF3003 Flow Meter

Procedure

1. Connect up the MF3003 Hydraulic flow meter using the hoses in the MF3002 kit as shown in the illustration. Connect the 300 bar (4000 lbf/in²) gauge onto the pressure test point of the flow meter.
2. Ensure that the restrictor valve on the flow meter is fully OPEN.
3. Ensure that the IPTO lever is in the disengaged position.
4. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
5. Set the engine speed to 2000 rev/min.
6. Screw in the flow meter restrictor valve until a pressure of 138bar (2000 lbf/in²) is obtained.

Note:

- a. Care must be taken when applying the back pressure because the pump has no relief valve.
- b. Do not operate the steering with the back pressure applied because damage will occur to the pump.

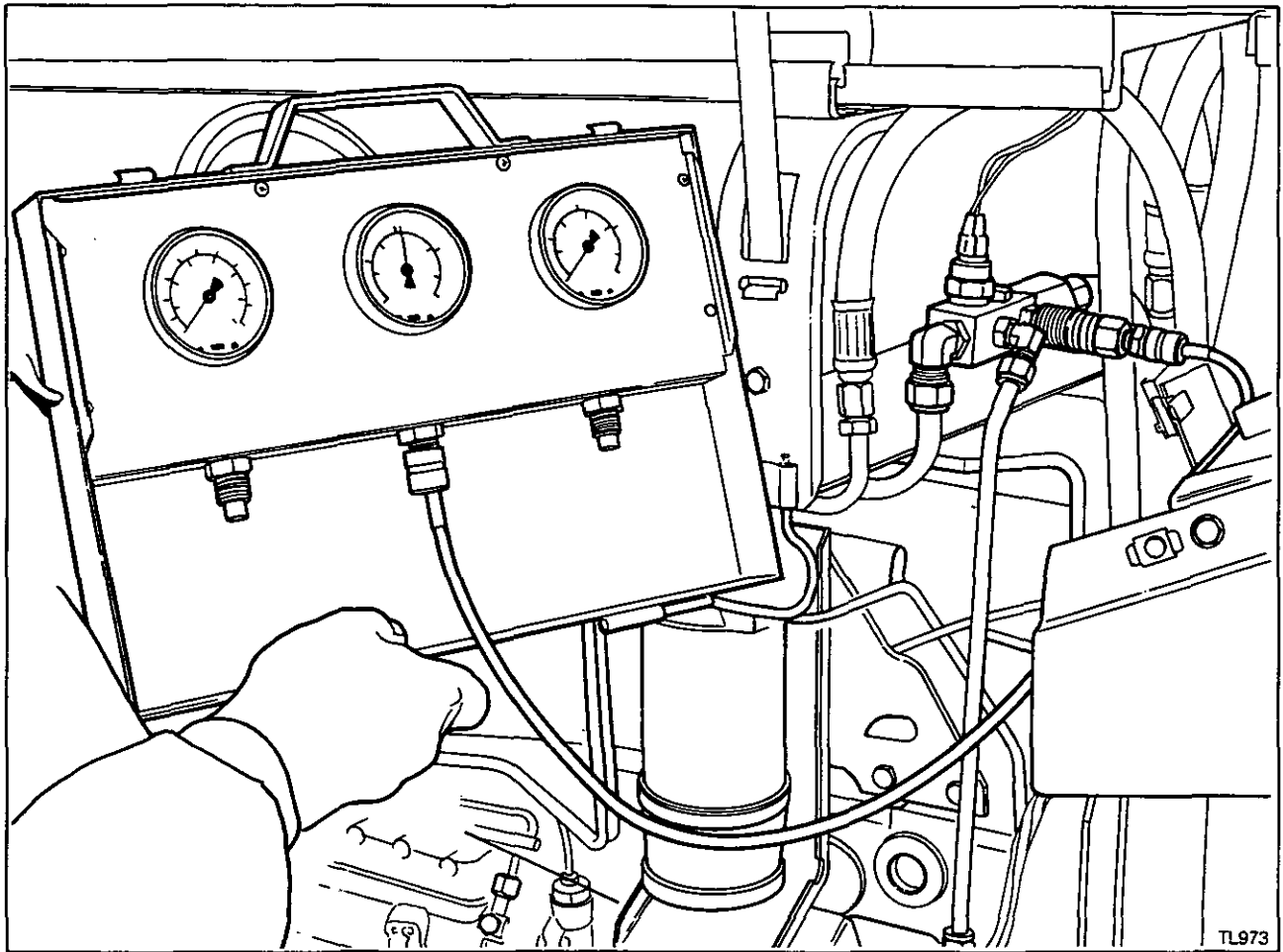
7. Limits for readings taken are as follows:

- New Pump 22 litres/min (4.8 Imp gal/min)
(5.8 US gal/min)
- Flow to give minimum acceptable performance 18 litres/min (4 Imp gal/min)
(4.8 US gal/min)

Note: for tractors fitted with combined power steering pump and reservoir only (no auxiliary pump) see Steering Section 11.

Diagnosis

Symptom – Steering pump flow LOW		
Cause	Action	Operation No.
1. Steering pump worn	Replace pump	12B-09 12B-10 12B-11
2. Cold Start Valve faulty	Overhaul or replace valve	12B-17
3. Suction strainer blocked	Clean strainer	12B-08
4. Hydraulic filter blocked	Replace spin-off filter element	12B-12
5. Insufficient oil in transmission	Fill to level	—



TL973

Pressure Maintaining Valve Pressure Test

Check 12B-03

Special Tools:
MF3001 Pressure Test Kit

Procedure

1. Remove the Test point plug on the manifold block and install the M14 male quick release coupling.
2. Connect up the 30 bar (400 lbf/in²) gauge in the MF3001 pressure test kit.
3. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
4. Set the engine speed to 1200 rev/min.
5. The system pressure should be:
 3 cylinder engine tractors 17-20 bar (250-290 lbf/in²)
 4 and 6 cylinder engine tractors 19-22 bar (275-320 lbf/in²)

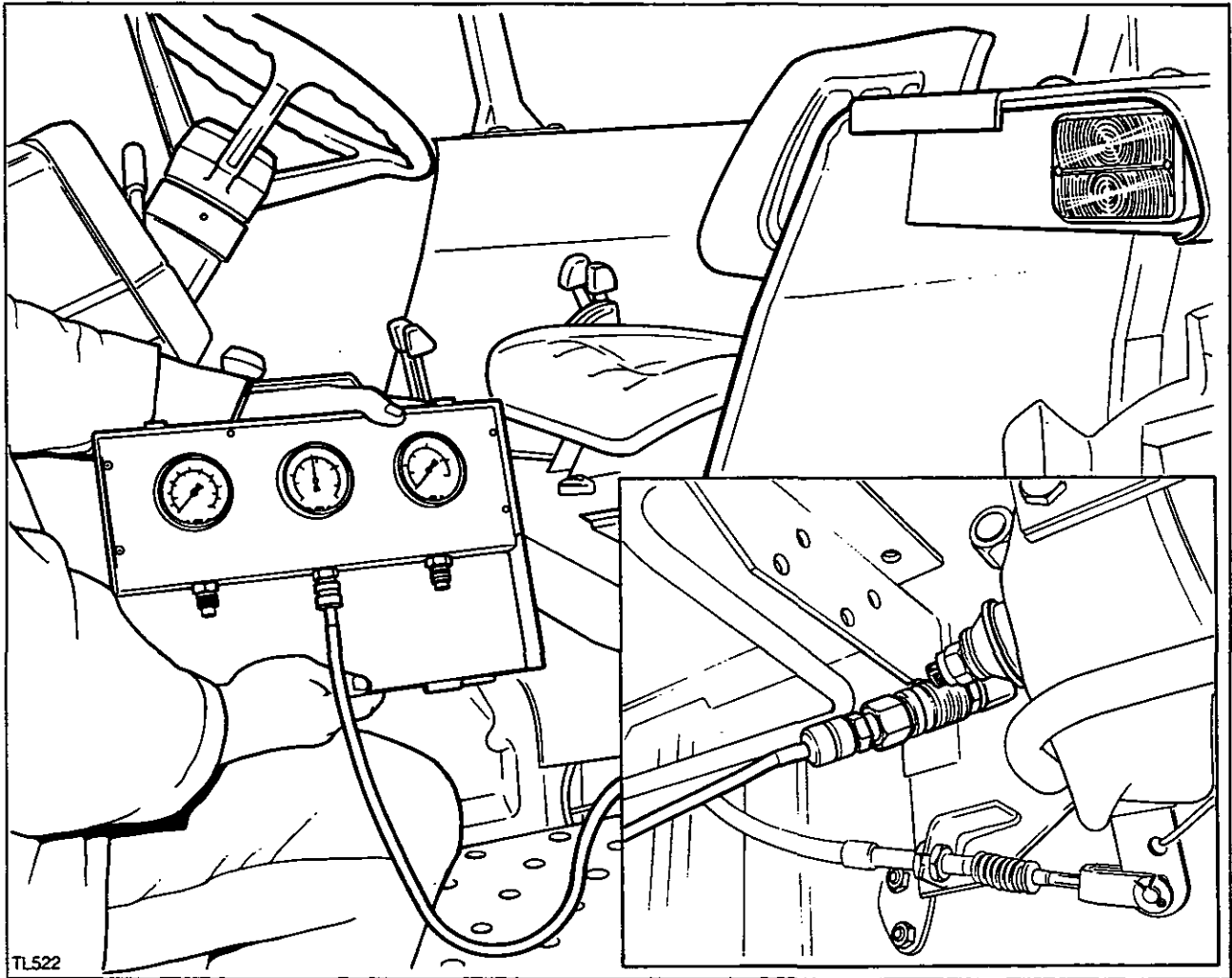
Note: System pressure readings are affected by the condition of the 20 micron spin-on hydraulic filter. If the filter has been in service for any length of time replace it before carrying out any tests.

Diagnosis

Symptom – PMV Pressure LOW		
1. PMV faulty	Replace Valve	12B-13
2. Steering pump worn	Flow check pump	12B-02
3. Leaking pipe to IPTO clutch	Replace pipe or tighten connection	—
4. IPTO brake cylinder leaking (if fitted)	Overhaul brake assembly	9C-07
5. Leaking Multi-Power Clutch Pack	Check pressure in M.P. Hi/Low to confirm	12B-04
Symptom – PMV Pressure HIGH		
1. Blocked hydraulic filter	Replace spin-on filter element	12B-12

12B-16

AUXILIARY HYDRAULICS



Independent PTO Pressure Test

Check 12B-04

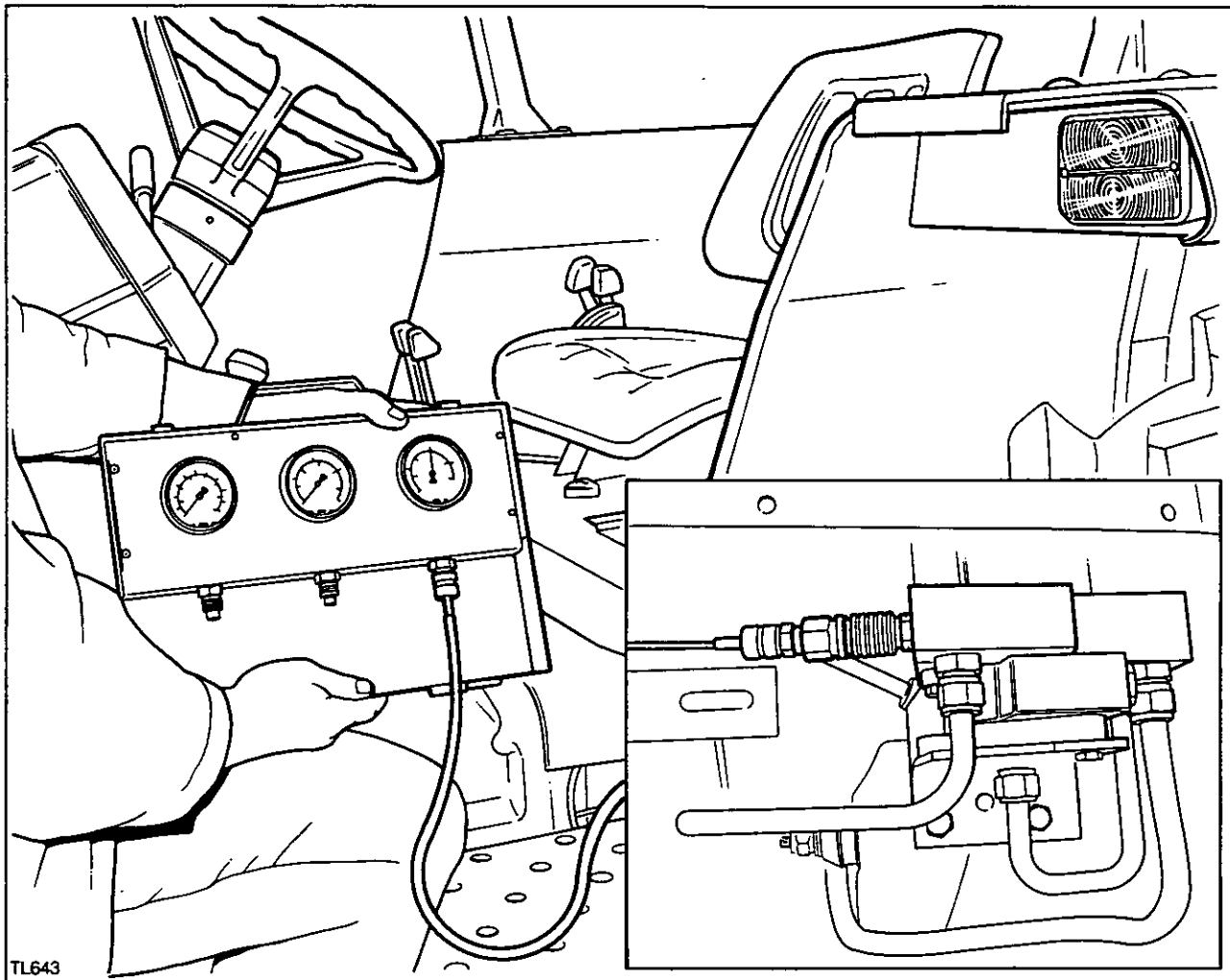
Special Tools:
MF3001 Pressure Test Kit

Procedure

1. Remove the test point plug on the L.H. transmission side cover and install the M14 male quick release diagnostic coupling.
2. Connect up the 30 bar (400 lbf/in²) gauge in the MF3001 pressure test kit.
3. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
4. Set the engine speed to 1200 rev/min.
5. Ensure Multi-Power is in LOW (if fitted).
6. With the independent PTO lever in the disengaged position the pressure reading must be ZERO.
7. With the independent PTO lever engaged the pressure should be:
Single Speed IPTO 15,5-19 bar (225-275 lbf/in²)
Two Speed IPTO 12-15,5 bar (175-225 lbf/in²)

Diagnosis

Symptom – IPTO pressure LOW		
Cause	Action	Operation No.
1. PMV faulty	Replace valve	12B-13
2. Steering pump worn	Flow check pump	12B-02
3. Leaking pipe to IPTO clutch	Replace pipe or tighten connection	—
4. Internal leakage in IPTO clutch pack	Overhaul clutch unit	9C-03



TL643

Auxiliary Circuit Pressure Test

Check 12B-05

Special Tools:
MF3001 Pressure Test Kit

Procedure

1. Remove the test port plug on the manifold block in front of the L.H. rear trumpet housing and install the M14 male quick release coupling.
2. Connect up the 300 bar (4000 lbf/in²) gauge in the MF3001 pressure test kit.
3. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
4. Set the engine speed to 1200 rev/min.
5. On tractors with combined flow, ensure that the selector valve is in the Linkage position.
6. Pull back to the lift position one of the auxiliary control valve spools and note the pressure reading.
7. The system pressure should be 170-190 bar (2500-2750 lbf/in²).

Diagnosis

Symptom – Auxiliary pressure LOW		
Cause	Action	Operation No.
1. Auxiliary pump worn	Flow check pump	12B-06
2. Relief valve faulty	Replace or reset Relief valve	12B-15
3. Internal leakage across trailer brake valve	Overhaul brake valve	8B-10
4. Internal leakage across spool valves	Overhaul spool valves	12B-16

12B-18

AUXILIARY HYDRAULICS

Auxiliary Circuit Flow Test

Check 12B-06

Special Tools:

- | | |
|--------|--------------------|
| MF3001 | Pressure Test Kit |
| MF3002 | Flow Test Hose Kit |
| MF3003 | Flow Meter |

Procedure

1. Remove the hydraulic hose from the outlet port of the auxiliary pump and install the MF3003 Flow meter using the pipes from the MF3002 kit.
2. The return pipe from the flow meter is to be fed directly to the sump through the transmission filler plug or tube. Secure the pipe so that it will not come out.
3. Connect up the 300 bar (4000 lbf/in²) gauge in the MF3001 pressure test kit to the flow meter.
4. Ensure that the restrictor valve on the flow meter is fully open.
5. Ensure that IPTO lever is in the OFF position.
6. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
7. Set the engine speed to 2000 rev/min.
8. Screw in the flow meter restrictor valve until a back pressure of 138 bar (2000 lbf/in²) is obtained.

9. Limits for readings taken are as follows:

3 cylinder engine tractors:

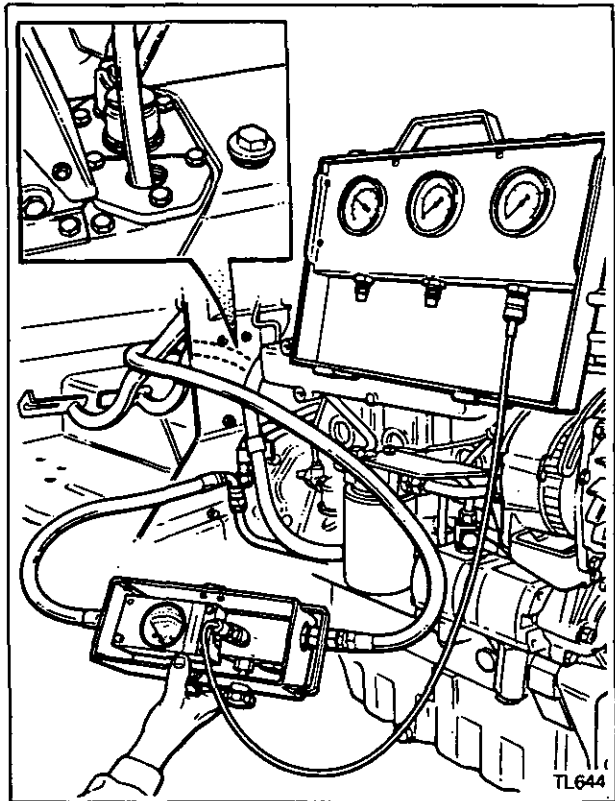
New Pump..... 31 litres/min (6.8 Imp gal/min)
 (8.2 US gal/min)

Flow to give minimum acceptable performance 27 litres/min (6 Imp gal/min)
 (7.1 US gal/min)

4 and 6 cylinder engine tractors:

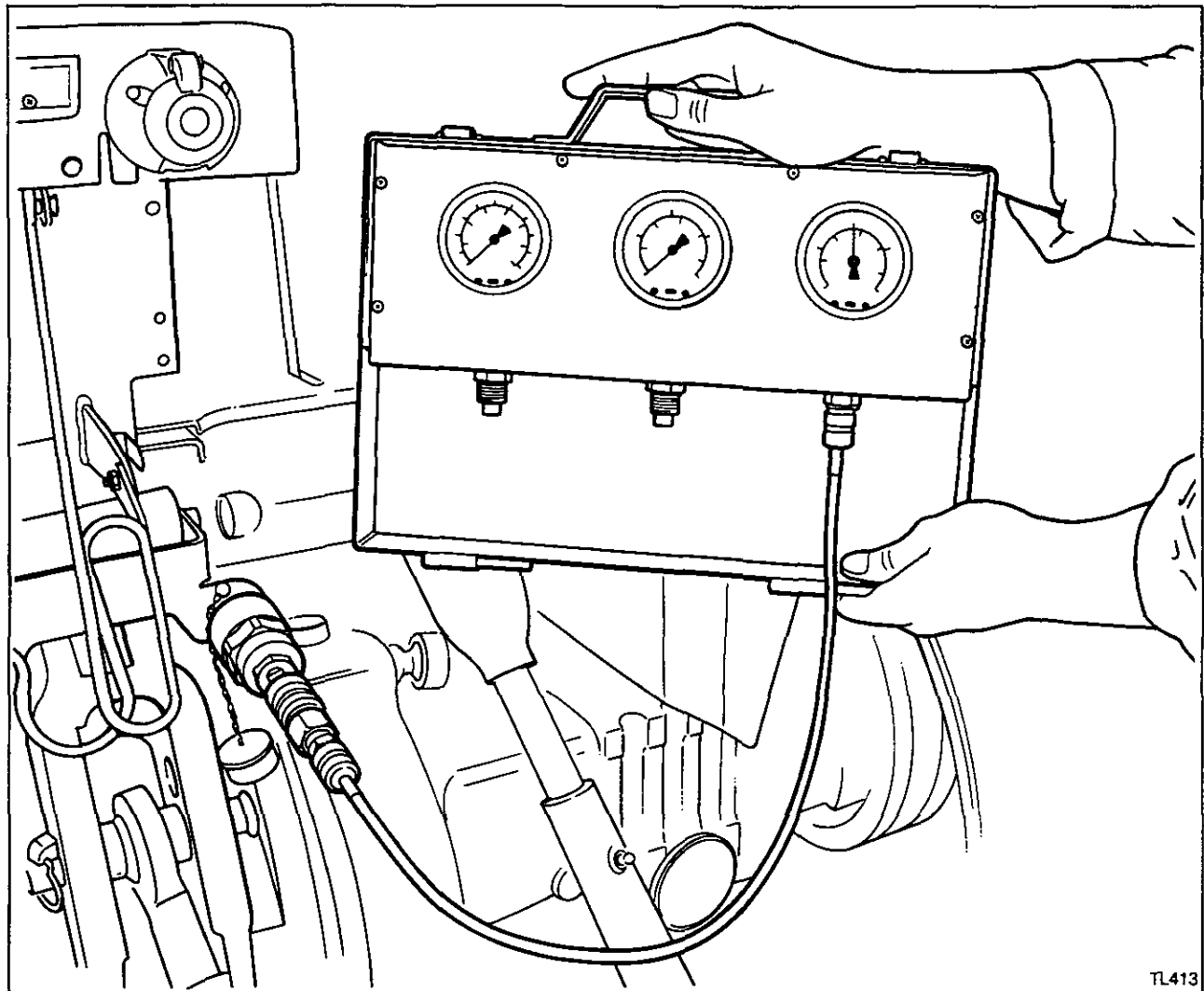
New pump..... 32 litres/min (7 Imp gal/min)
 (8.4 US gal/min)

Flow to give minimum acceptable performance ... 28 litres/min (6.1 Imp gal/min)
 (7.4 US gal/min)



Diagnosis

Symptom – Auxiliary Pump Flow LOW		
Cause	Action	Operation No.
1. Auxiliary pump worn	Replace pump	12B-02
2. Suction strainer blocked	Clean strainer	12B-08
3. Insufficient oil	Fill to level	—



TL413

Trailer Brake Pressure Test

Check 12B-07

Special Tools:
MF3001 Pressure Test Kit

Procedure

1. Connect the 300 bar (4000 lbf/in²) pressure gauge in the MF3001 pressure test kit to a trailer brake female quick coupling.
2. Connect the test equipment up to the trailer brake coupling on the rear of the tractor.
3. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
4. Set the engine speed to 1200 rev/min.
5. Unlatch the foot brakes and press down on the L.H. brake pedal.
6. The system pressure should build up progressively to: 100-150 bar (1450 -2175 lbf/in²).

Note: A rhythmic oscillation of the pedal may be felt. This is due to pressure equalisation of the valve and is quite normal.

7. Latch the two brake pedals together and test the system again. If the same pressure reading is not obtained, balance the brake adjustment. See operation 8B-08.

Diagnosis

Symptom – Trailer Brake Pressure LOW		
Cause	Action	Operation No.
1. Relief valve pressure setting incorrect	Adjust pressure setting	12B-15
2. Auxiliary pump worn	Flow check pump	12B-06
3. Brake adjustment incorrect	Adjust brakes and balance	8B-08
4. Trailer brake faulty	Overhaul brake valve	8B-10

12B-20

AUXILIARY HYDRAULICS

Hydraulic Oil Strainer

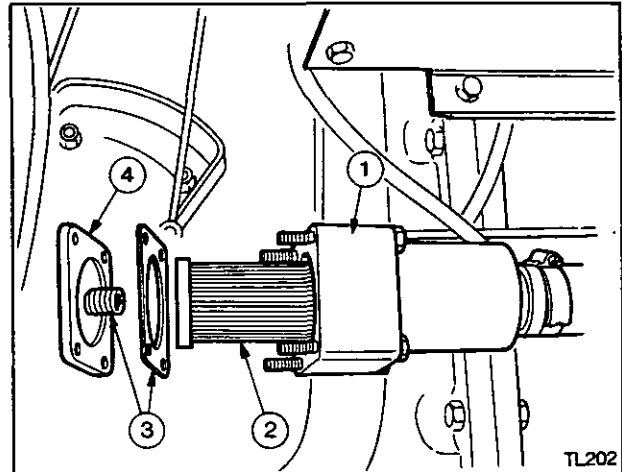
Servicing

12B-08

Procedure

1. If not changing the transmission oil is not being drained, to avoid oil spillage when removing the oil strainer, drain off 10 litres (2 gal) of oil via the drain plugs or jack up the R.H. rear wheel.
2. Remove the four nuts securing the cover plate (4) to the strainer body (1).
3. Remove the cover plate which has a spring attached and the gasket (3).
4. Withdraw the strainer (2).
5. Thoroughly clean the strainer.
6. Refit the strainer.
7. Check that the gasket is in good condition otherwise fit a new one.
8. Refit the cover plate and secure it with the four nuts.
9. Refit the two drain plugs (if removed). Tighten them securely.
10. Refill the transmission with an approved oil up to the normal or maximum mark on the dipstick.

Note: Use gasket part number 1696 548 M2 between the filter housing and the transmission case, to prevent oil leaks.



TL202

Hydraulic Pump 3 Cylinder Engines

Removal and Refitment

12B-09

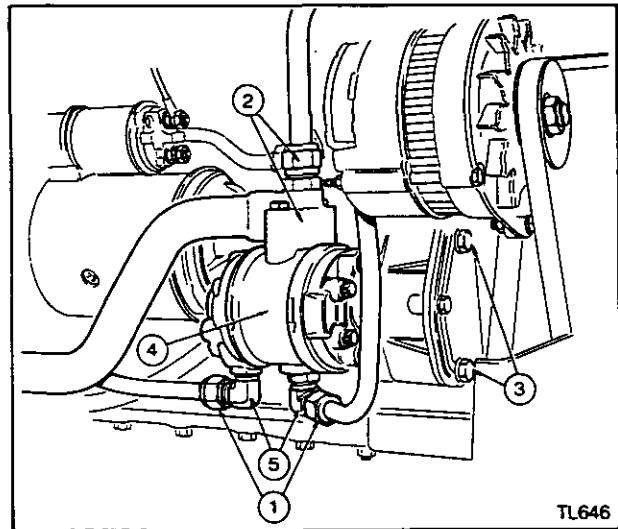
Removal

1. Disconnect the outlet pipes on the pump.
2. Disconnect the inlet pipes on the pump.
3. Remove the pump mounting bolts.
4. Withdraw the pump assembly from the tractor.
5. Remove the hydraulic fittings from the pump.
6. Remove the gear from the pump.

Note: A universal puller must be used to remove the gear from the pump. Do not apply any end thrust to the pump shaft.

Refitment

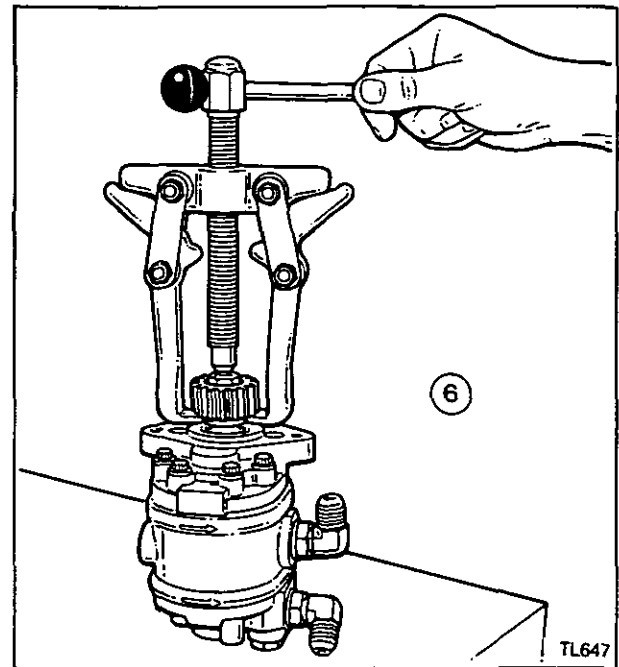
7. Reverse procedure 1-6 except:
 - a. Torque the drive gear retaining nut to 40-45 Nm (30-33 lbf ft).
 - b. Replace the gasket between the pump and timing case.
 - c. Torque the two pump mounting bolts to 30-40 Nm (25-30 lbf ft).
 - d. Clean the hydraulic strainer. See operation 12B-08.
 - e. Replace the spin-on hydraulic filter. See operation 12B-12.



TL646

Priming Procedure

8. Ensure all the circuit connections are tight.
9. Ensure that the transmission oil level is between the maximum and minimum marks on the dipstick.
10. Start engine and run at 750-1000 rev/min. Do not increase speed until the pump has primed. Priming will be achieved when the front wheels respond to turning the steering wheel, if no response is registered within 30 seconds, stop the engine. Check the suction line and all connections and components in the steering circuit for air leaks.
11. When pump priming is achieved, turn the steering wheel from full lock to full lock at least twice – ensure that the wheels respond smoothly.
12. Check all circuit connections for leaks.
13. If no pressure is obtained within 30 seconds, stop the engine, check the suction line and all connections and components of air leaks. Also check that blanking caps have been removed if new components have been fitted.



12B-22

AUXILIARY HYDRAULICS

Hydraulic Pump 4 Cylinder Engines

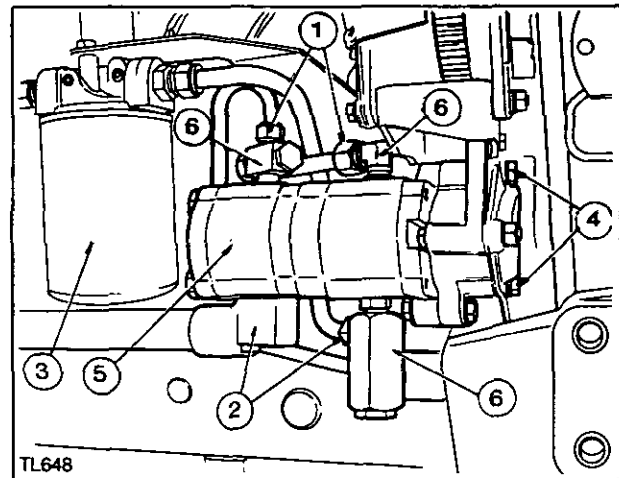
Removal and Refitment

12B-10

Removal

1. Disconnect the outlet pipes on the pump.
2. Disconnect the inlet pipes on the pump.
3. Remove the spin-on filter element.
4. Remove the pump mounting bolts.
5. Withdraw the pump assembly from the tractor.
6. Remove the hydraulic fittings and cold start valve from the pump.
7. Remove the gear from the pump.

Note: A universal puller must be used to remove the gear from the pump. Do not apply any end thrust to the pump shaft.

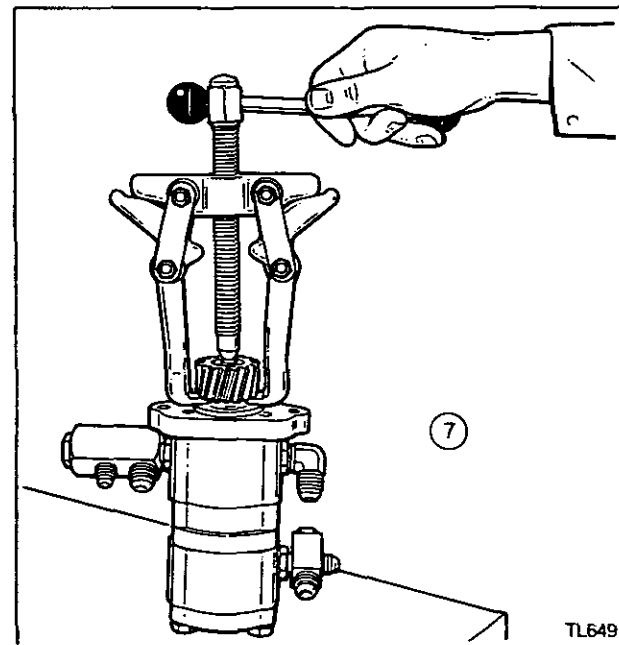


Refitment

8. Reverse procedure 1-7 except:
 - a. Torque the drive gear retaining nut to 40-45 Nm (30-33 lbf ft).
 - b. Replace the gasket between the pump and timing case.
 - c. Torque the two pump mounting bolts to 30-40 Nm (25-30 lbf ft).
 - d. Clean the hydraulic strainer. See operation 12B-08.
 - e. Replace the spin-on hydraulic filter. See operation 12B-12.

Priming Procedure

9. Ensure all the circuit connections are tight.
10. Ensure that the transmission oil level is between the maximum and minimum marks on the dipstick.
11. Start engine and run at 750-1000 rev/min. Do not increase speed until the pump has primed. Priming will be achieved when the front wheels respond to turning the steering wheel, if no response is registered within 30 seconds, stop the engine. Check the suction line and all connections and components in the steering circuit for air leaks.
12. When pump priming is achieved, turn the steering wheel from full lock to full lock at least twice – ensure that the wheels respond smoothly.
13. Check all circuit connections for leaks.
14. If no pressure is obtained within 30 seconds, stop the engine, check the suction line and all connections and components of air leaks. Also check that blanking caps have been removed if new components have been fitted.



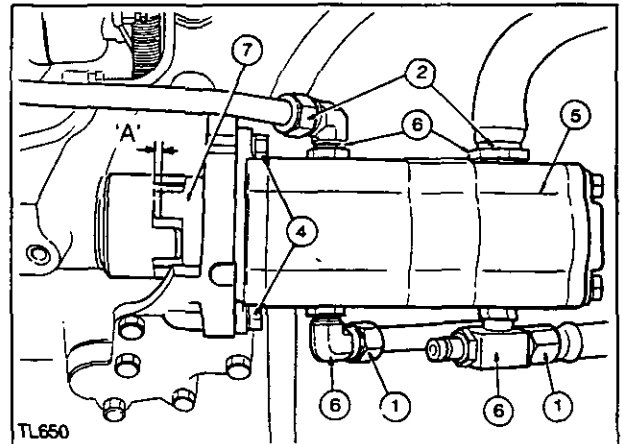
Hydraulic Pump 6 Cylinder Engines**Removal and Refitment**

12B-11

Removal

1. Disconnect the outlet pipes on the pump.
2. Disconnect the inlet pipes on the pump.
3. Remove the pump coupling guard.
4. Remove the pump mounting bolts.
5. Withdraw the pump assembly from the tractor.
6. Remove the hydraulic fittings and cold start valve from the pump.
7. Remove the drive coupling from the pump.

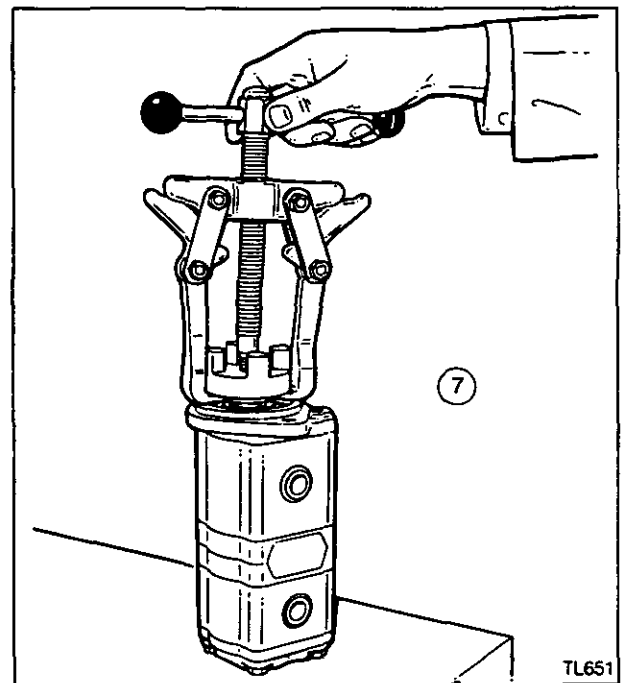
Note: A universal puller must be used to remove the drive coupling from the pump. Do not apply any end thrust to the pump shaft.

**Refitment**

8. Reverse procedures 1-7 except:
 - a. Torque the drive coupling retaining nut to 50-55 Nm (37-45 lbf ft).
 - b. Check the clearance 'A' between the two drive coupling halves. This must be 2,5 mm (0.100 in). Slacken the L.H. coupler retaining grub screw and move the coupler if adjustment is required.
 - c. Clean the hydraulic strainer. See operation 12B-08.
 - d. Replace the spin-on hydraulic filter. See operation 12B-12.

Priming Procedure

9. Ensure all circuit connections are tight.
10. Ensure that the transmission oil level is between the maximum and minimum marks on the dipstick.
11. Start the engine and run at 750-1000 rev/min. Do not increase speed until the pump has primed. Priming will be achieved when the front wheels respond to turning the steering wheel. If no response is registered within 30 seconds, stop the engine. Check the suction line and all connections and components in steering circuit for air leaks.
12. When pump priming is achieved, turn the steering wheel from full lock to full lock at least twice – ensure that the wheels respond smoothly.
13. Check all circuit connections for leaks.
14. If no pressure is obtained within 30 seconds, stop the engine, check the suction line and all connections and components of air leaks. Also check that blanking caps have been removed if new components have been fitted.



12B-24

AUXILIARY HYDRAULICS

Hydraulic Oil Filter

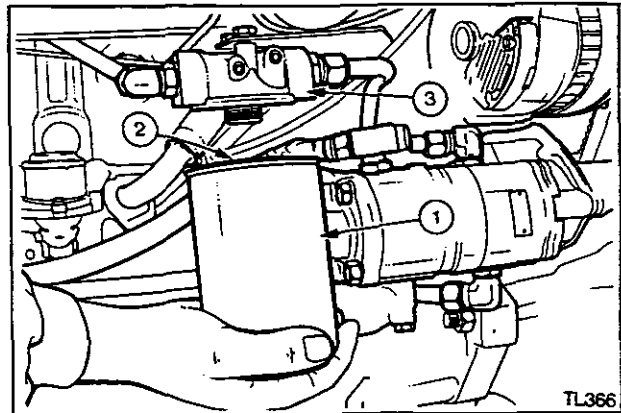
Servicing

12B-12

Procedure

1. Unscrew and discard the filter.
2. Smear a few drops of clean engine oil on the sealing ring of a new filter.
3. Screw the new filter in until the sealing ring just contacts the filter head, then tighten a further half turn by hand only. Do not overtighten.

Note: After changing the oil and filter, run the engine and check for leaks, then recheck the dipstick oil level and if necessary, top up.



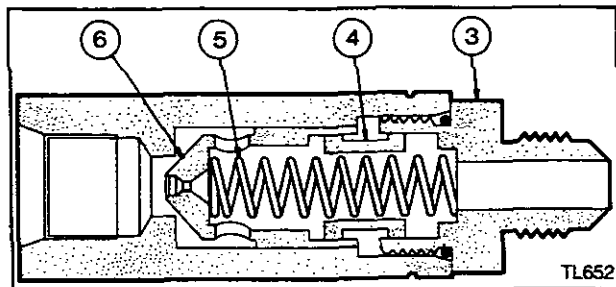
Pressure Maintaining Valve

Overhaul

12B-13

Disassembly

1. Disconnect the pipe to the hydraulic oil filter.
2. Unscrew the valve from the manifold block.
3. Unscrew the adapter from the end of the valve.
4. Remove the sleeve.
5. Remove the spring.
6. Remove the poppet.
7. Discard the 'O' ring.
8. Examine the poppet and seal, ensure that all parts slide freely in the valve body.



Reassembly

9. Reverse procedures 1-7 except:
 - a. Refit the sleeve with a new 'O' ring.
 - b. Replace the adapter seal.
 - c. Check PMV pressure when refitted to tractor. See operation 12B-03.

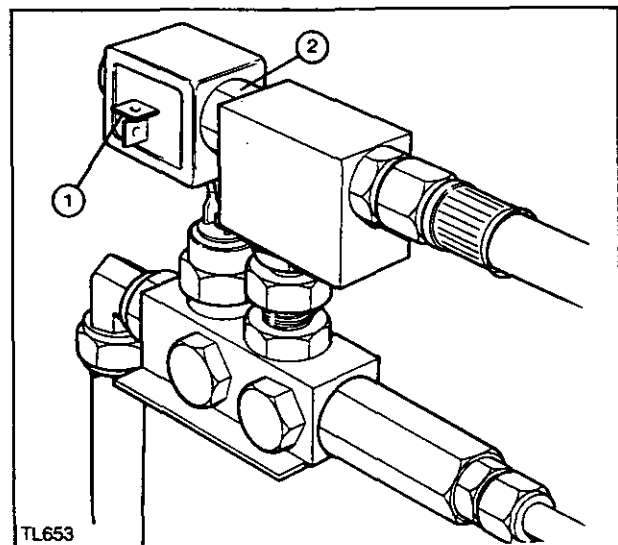
Multi-Power Solenoid Valve

Removal and Refitment

12B-14

Removal

1. Disconnect the wires from the solenoid valve.
2. Ensure there is no hydraulic pressure in the system.
3. Unscrew the solenoid valve assembly and replace with a new unit.

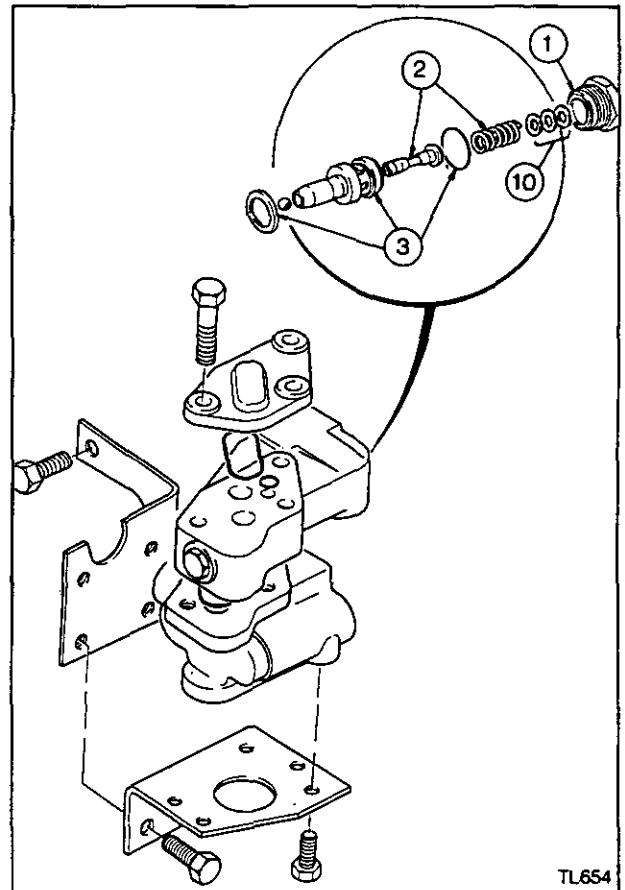


Auxiliary Pressure Relief Valve**Adjust**

12B-15

Special tools:**MF3001 Pressure test kit****Adjust**

1. Unscrew the plug.
2. Remove the spring and poppet valve.
3. Remove the valve seat assembly and sealing rings.
4. Check and clean all components.
5. Refit the parts with new sealing rings.
6. Position the sealing rings as shown in the illustration.
7. Tighten the plug to 70-100 Nm (52-74 lbf ft).
8. Connect the 300 bar (4000 lbf/in²) pressure gauge to the test point using the quick release diagnostic coupling.
9. Start the engine and check the auxiliary relief valve pressure. See operation 12B-05.
10. If adjustment of pressure setting is required, fit shims to raise the pressure, or remove shims to lower the pressure.
11. The shims must be fitted between the plug and the spring.

**Spool Valves****Overhaul**

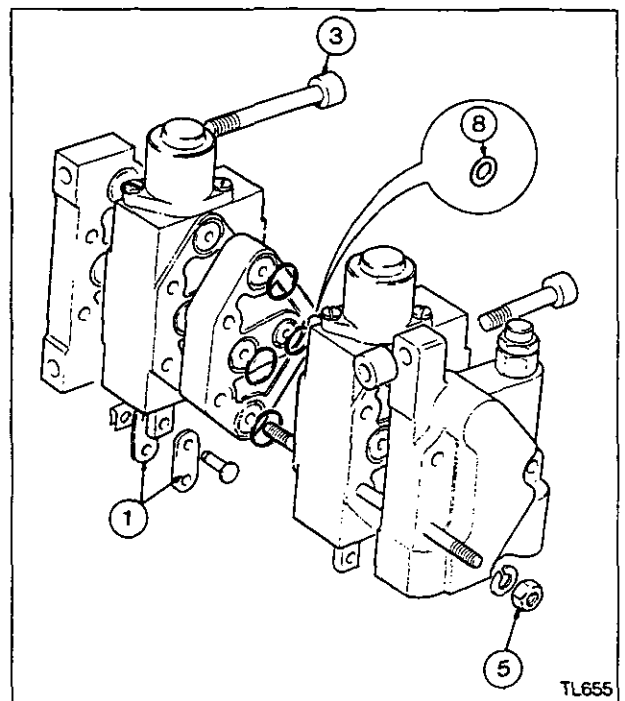
12B-16

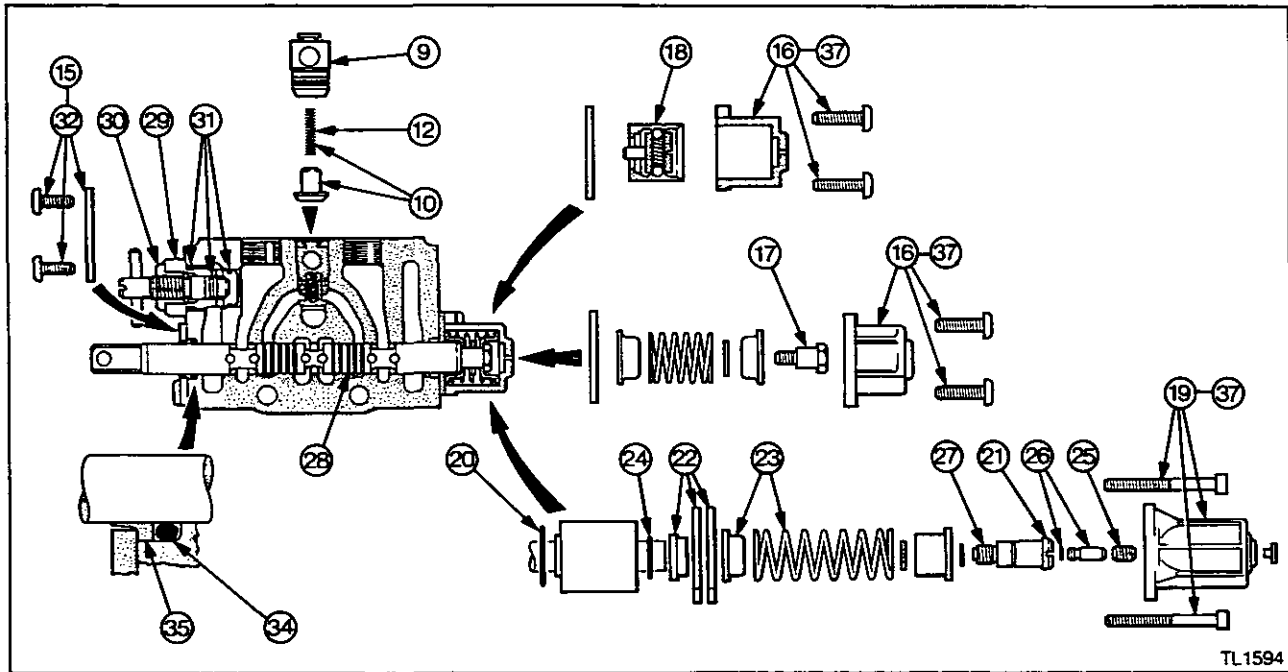
Disassembly

1. Disconnect the control rods from the valve assembly.
2. Disconnect the supply and return hydraulic pipes.
3. Unscrew the retaining bolts and remove the valve assembly.
4. Mask off all ports and clean the external surfaces so that they are free of all loose dirt, paint etc.
5. Stand the valve on its feet, loosen but do not remove the three tie rod nuts at the inlet/outlet cover end of the valve.
6. Stand the valve on its plain cover (right hand end) so that the tie rods are vertical and remove the three loosened tie rod nuts (in this position the intersection 'O' rings will be uppermost on each section).
7. Note the order in which the sections and spacers are fitted and remove them in turn from the tie rods.
8. Remove and discard all inter section 'O' rings, and the green shim washers on the top tie rod between sections.

Load check valve

9. Use a large flat bladed screwdriver to lever under the flanged head of the check valve guide and withdraw it from the body.
10. Remove the spring and poppet from the body with a pair of long nosed pliers.
11. Inspect all components for signs of deterioration or damage. The poppet and seat should show signs of an even ring around its ground conical seat, any damage will not allow the check valve to function correctly.





TL 1594

12. The spring should be undamaged and be approximately 20 mm (0.8 in) long.

Note: If the check valve is to be removed with the valve in position the top tie rod must be removed first.

Spool 'O' rings

13. Remove any lever mechanism still attached to the valve.
14. Hold the valve in a vice with the adequate jaw guards and grip around the area of the bottom stud holes so that the intersection sealing areas are not damaged.
15. Remove the two Posidrive screws from the front of the valve and remove the seal plate.
16. Remove the two Posidrive screws from the rear of the valve and remove the end cap.

Spring return cap

17. Using a socket and a bar through the spool hole to prevent rotation, loosen and remove the shoulder bolt from the rear of the spool to release the spring, cups and seal plate.

Three position detent cap

18. After removal of the end cap use a large flat bladed screwdriver to remove the detent assembly and seal plate from the spool. Do not dismantle the detent assembly.

Detent with kickout & float

19. Remove the two socket head cap screws and the cap, withdraw the spool from the rear of the body ensuring that the detent mechanism stays in the neutral position.
20. Remove the 'O' ring between the detent housing and the body.
21. Hold the spool with the spade end down, support the detent housing to prevent movement and with a wide bladed screwdriver remove the shoulder screw in the end of the spool.

22. Remove the two retainer plates and alloy retaining ring.
23. Remove the spring cup and spring.
24. Move the detent housing backwards and forwards by a small amount to ease out the 'O' ring in the end of the housing.
25. Remove the grub screw from the end of the shoulder bolt.
26. Remove the piston and discard the 'O' ring.
27. Remove all traces of Loctite from the thread of the shoulder bolt.

Spool seals



Caution: Valve assemblies are manufactured with spools and bodies as matched sets to control internal leakage. Do not mix bodies and spools.

28. Pull the spool out of the bore. When pulled out one 'O' ring and wiper seal should come with the spool. Remove these and the other 'O' ring and wiper seal which would still be in position in the valve and discarded.

Change over valve

29. Unscrew the change over valve assembly.
30. Unscrew the end cap and withdraw the valve.
31. Remove and discard the 'O' rings.

Examination and cleaning

Clean all components and check their condition, replace all seals and ensure that all 'O' ring grooves are clean and their mating faces are free from any damage. Lubricate parts with clean transmission oil when refitting.

Reassembly

Kick-out detent spools

32. Reverse procedures 19 to 26 except:
 - a. Apply Loctite 542 Lock and Seal to the thread of the shoulder bolt.
 - b. Tighten the shoulder bolt to a torque of 7 Nm (5 lbf ft).
 - c. When the valve is refitted to the tractor reset the kick-out pressure setting, see operation 12B-29

All models

33. Refit the spool to the body and position it in the neutral position.
34. Onto each end of the spool fit a new 'O' ring seal.
35. Fit a new wiper seal.
36. Using a seal plate fitted over the spool, push the 'O' ring and wiper seal home in turn.

Note: Take great care to ensure that the spool remains in the neutral position. If it moves either way too far then a land edge on the spool could pass over the 'O' ring and cause damage which may result in a leakage.

37. Refit the action mechanism and seal plate, ensure that the threads of the screws and holes are clean and dry, apply two or three drops of Loctite 222 Screwlock and torque to 7 Nm (5 lbf ft).
38. Reverse procedures 17 to 20, 22 to 24 and 9 to 12 except:
 - a. Tighten the change over valve assembly to a torque of 22 Nm (17 lbf ft).

Cold Start Valve

Overhaul

12B-17.

Disassembly

1. Disconnect the pipe from the steering section.
2. Disconnect the pipe from the oil filter.
3. Slacken the locknut.
4. Unscrew the valve from the pump body.
5. Clean the outside of the valve.
6. Place the valve body in a vice and unscrew the bottom plug.
7. Withdraw the valve poppet.
8. Remove the spring.

Examination.

9. Clean all the components, check that the valve seat is in good condition, the valve and body are not scored, check that the valve moves freely in the body. If there is any damage replace the cold start valve assembly.

Reassembly.

- Reverse procedure 1 to 8 except:
- a. Replace all 'O' rings.
 - b. Align pipe connections before tightening locknut (item 3).

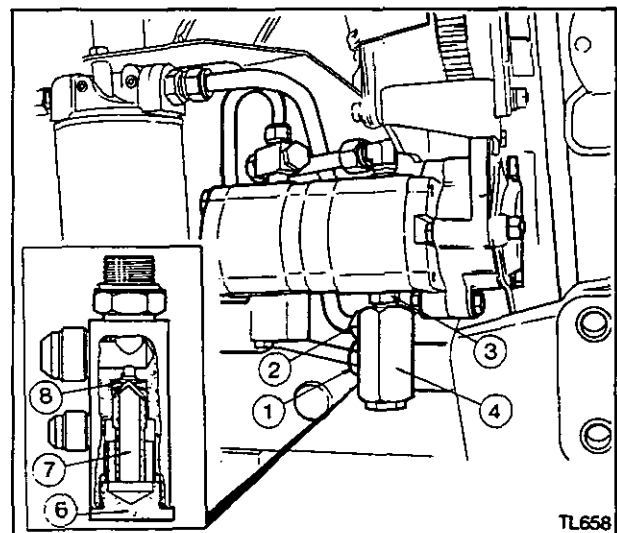
39. With the nuts and washers fitted to one end of the tie rods, fit the tie rods through the plain end cover and stand on end so that the tie rods are vertical.

Note: From September 1989 production a green shim washer was introduced between each section to prevent distortion of the valve and a tightening of the spool. This washer will be found to be part of the inter section 'O' ring kit, it should be fitted between each section on the top tie rod that passes through the check valve bodies.

40. Fit new 'O' rings to the end cover and slide on the next section over the tie rods and down onto the cover.

Note: Take great care to ensure there is no contaminant on the underside of the section and that the 'O' rings are fitted completely in their grooves otherwise they may become trapped or damaged.

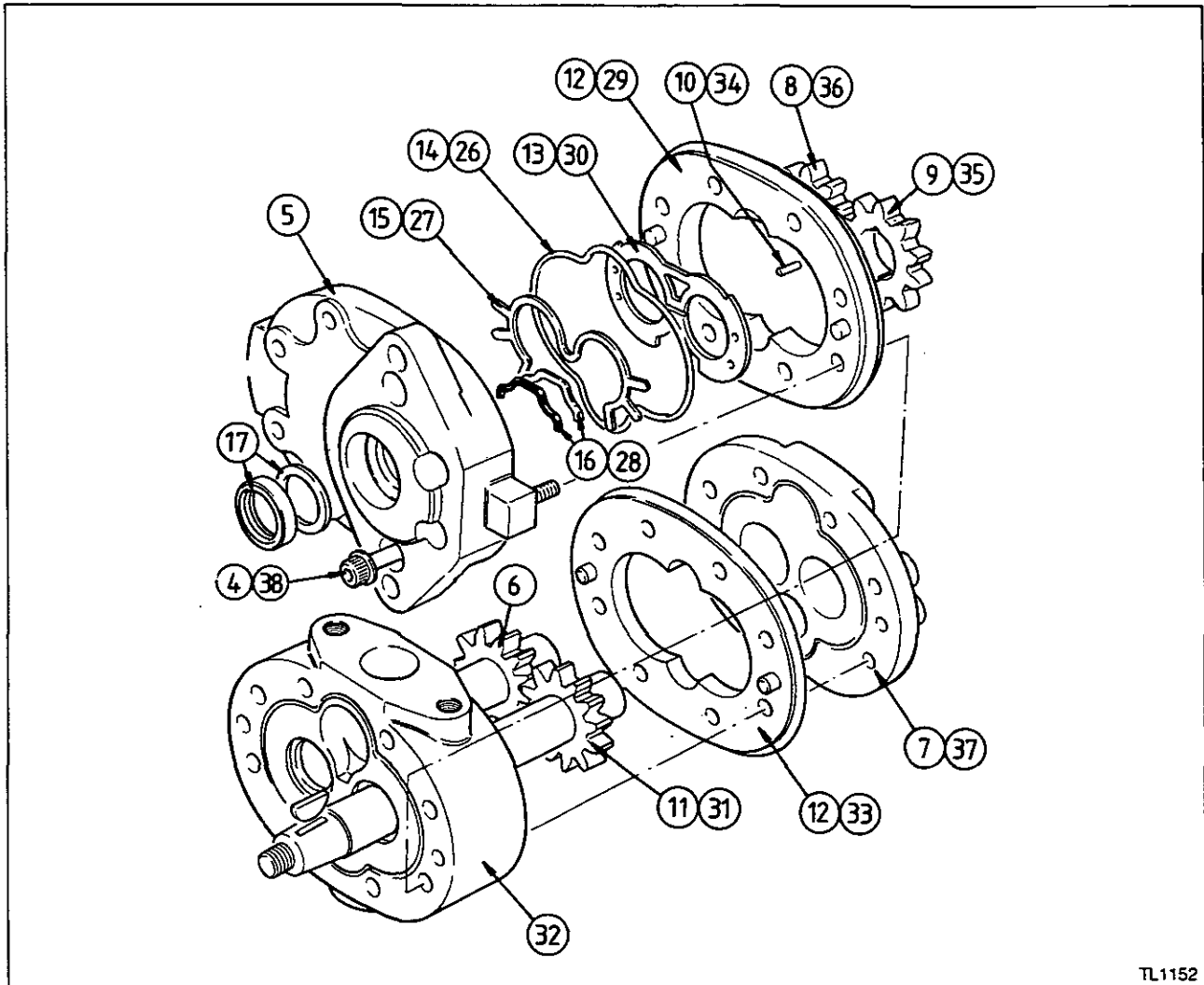
41. Fit the 'O' rings to this section and so on until all sections are fitted.
42. Fit the inlet/outlet cover and the three washers and nuts which should be lightly tightened with the valve still in this position.
43. Return the valve to stand on its mounting feet and ensure that the feet are sitting flat on a flat surface.
44. Evenly tighten the three tie rod nuts finishing with a torque of 20 Nm (15 lbf ft).
45. Refit the valve to the tractor.



Note: The cold start valve was incorporated inside the hydraulic pump on M-F 365 to 398 tractors from Serial No. NO4148, on M-F 399 tractors from Serial No. NO2146. From these numbers the external valve and pipes were deleted.

12B-28

AUXILIARY HYDRAULICS



TL1152

Hydraulic Pump 3 Cylinder Engines

Overhaul 12B-18

Special Tools:
MF 332 Hydraulic pump oil seal protector

Manufacturer: Cessna

Disassembly

1. Remove the hydraulic pump, gear and key, see operation 12B-09
2. Thoroughly clean the outside of the pump.



Caution: When repairing, maximum cleanliness is essential. The work bench must be kept free from dirt and metal swarf etc. When dismantling, also ensure that the seals, bushings and gears are not jammed or knocked. The removed parts must be protected from any kind of damage.

3. Use a sharp tool to scribe a mark across all sections of the pump. This will assure proper reassembly.
4. Clamp the pump in a vice, shaft up and remove the cap screws.

5. Remove the pump from the vice, hold the pump in your hands and bump the shaft against a wooden block to separate the front section.
6. Remove the idler gear.
7. Remove the backplate from the body by tapping on the backplate with a plastic hammer or rawhide mallet.
8. Remove the idler gear.
9. Remove the slipfit gear.
10. Remove the key.
11. Remove the drive gear assembly.
12. Place the drive gear assembly in the bushing and tap the protruding end with a plastic hammer or rawhide mallet to remove the bodies from plates they may have remained with.
13. Remove the wear plates.
14. Remove the 'O' rings.
15. Remove the back-up gasket.

AUXILIARY HYDRAULICS

16. Remove the bearing seal and moulded 'O' ring by prying out with a sharp tool.
17. Remove the shaft seal from the front plate by prying out with a screwdriver.

Examination

18. Clean and dry all parts.
19. Check all parts for wear, scoring and rough surfaces. Replace any faulty parts.
20. If the shaft measures less than 19 mm (0.748 in) in the bushing area, the gear assembly should be replaced.
21. If the gear widths are below the following figures the gear assembly should be replaced.

Front section	12,95 mm (0.510 in)
(Auxiliary hydraulics)	
Rear section	9,75 mm (0.384 in)
(Steering)	
22. If the internal diameter of the bushings in the front plate, back plate or adaptor plate exceed 19,177 mm (0.755 in) the front, back or adaptor plate should be replaced. (Bushings are not available as separate items).
23. The body should be replaced if the internal diameter of the gear pockets exceed 43,51 mm (1.713 in).
24. It is important that the relationship of the backplate, body, wear plate and front plate is correct. You will note two half moon cavities in the body which must face away from the front plate.

Note: The smaller half moon port cavity must be on the pressure side of the pump.

The side of the thrust plate and wear plate with the mid section cut-out must be on the suction side of the pump.

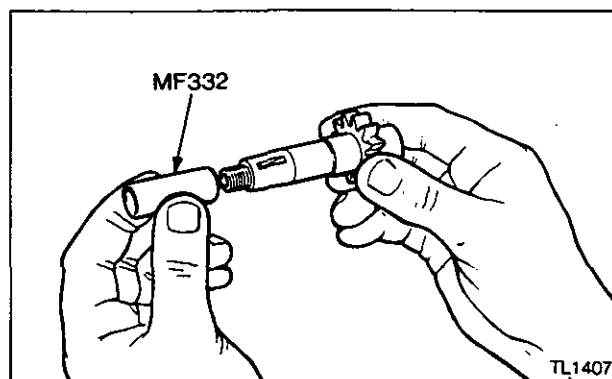
The suction side of the backplate is always the side with the larger port boss.

Reassembly

25. Wear plates, bearing seals, moulded 'O' rings, back-up gaskets, shaft seal and 'O' rings must be replaced with new parts.
26. Install the 'O' rings in the groove of the front plate, adaptor plate and back plate with a small amount of grease to hold.
27. Tuck the back-up gasket into the front plate and the adaptor plate with the open part of the 'V' section down.
28. Place the moulded 'O' ring in the groove in the front plate adaptor plate. Place the bearing seal over the moulded 'O' ring, groove side down.
29. Apply a thin coat of heavy grease to both faces of the central body. Position the body onto the front plate, the half-moon port cavities must face away from the front plate.

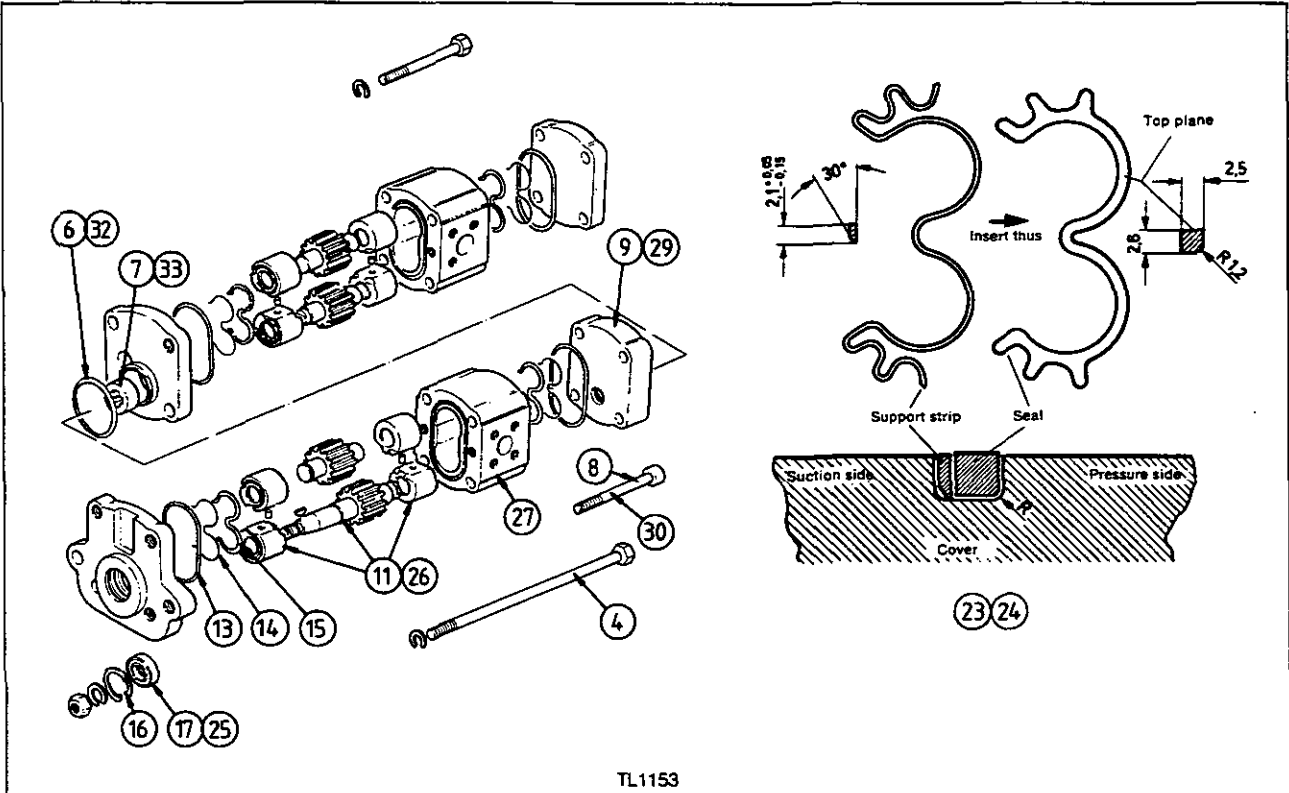
Note: The small half-moon port cavity must be on the pressure side of the pump.

30. Place the wear plate on top of the back-up gasket with the bronze face up. The side with the middle section cut away must be on the suction side of the pump.
31. Dip the drive gear and idler gear into oil, install both gear assemblies into the gear pocket of the body and into the front plate.
32. Install the adaptor plate on the front body, checking the positioning mark on all sections.
33. Install the second body on to the adaptor plate and install the wear plate.
34. Install the key in the slot of the drive gear.
35. Dip the slip fit gear in oil and fit to the drive shaft into the gear pocket of the body. Check the key for correct location.
36. Dip the idler gear into oil and install in the gear pocket of the body.
37. Position the back plate over the shafts until the dowel pins in the body are engaged.
38. Install the cap screws. Tighten evenly to a torque of 37-40 Nm (27-30 lbf ft).
39. Install the washer, lubricate the seal and work the shaft seal over the drive gear shaft, being careful not to cut the rubber sealing lip. Place a 33 mm (1.3125 in) sleeve over the shaft and press in the seal until it is 0,5-1,0 mm (0.020-0.40 in) below the front face of the front plate.
40. Refit the pump, see operation 12B-09.
41. If new body, gear set and bearings have been fitted it will be necessary to run-in the pump before subjecting it to full load, see operation 12B-21.



12B-30

AUXILIARY HYDRAULICS



TL1153

Hydraulic Pump 4 Cylinder Engines

Overhaul 12B-19

Special Tools:
MF 332 Hydraulic pump oil seal protector

Manufacturer: Bosch

Disassembly

1. Remove the hydraulic pump, gear and key, see operation 12B-10.
2. Thoroughly clean the outside of the pump.



Caution: When repairing, maximum cleanliness is essential. The work bench must be kept free from dirt and metal swarf etc. When dismantling, also ensure that the seals, bushings and gears are not jammed or knocked. The removed parts must be protected from any kind of damage.

3. Use a sharp tool to scribe a mark across all sections of the pump. This will assure proper reassembly.
4. Clamp the pump in a vice, end cover up and remove the two cap screws.

5. Remove the steering section of the pump.
6. Remove the 'O' ring.
7. Remove the coupling.

Note: Both pump sections can be repaired separately as follows:

8. Remove the two cap screws.
9. Remove the end cover.
10. Carefully mark the bearings with a felt tip pen with permanent ink, noting their positions relative to the pump body for reassembly.



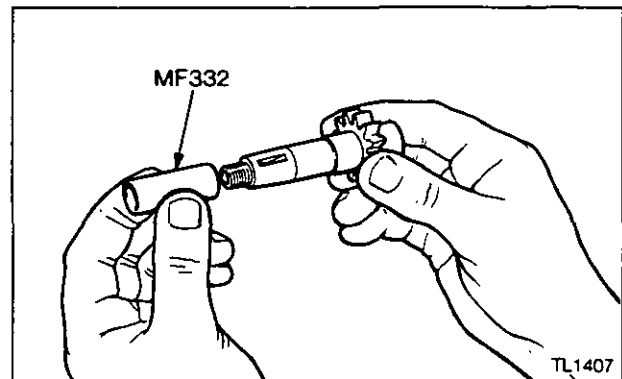
Caution: Under no circumstances may a hammer (not even a plastic hammer) be used to strike the gear shaft ends or on the housing in order to dismantle tight bushings with gears, use gentle pressure.

11. Remove the upper and lower pair of bearings with the gears.
12. Mark the lower pair of bearings.
13. Remove the sealing ring from the body.
14. Remove the support strip.

15. Remove the seal ring.
16. Remove the circlip.
17. Remove the shaft seal.

Examination

18. Wash all parts in a clean washing agent (use no trichlorethylene or similar for cleaning as this can damage seal elements) and dry with compressed air.
19. Examine casing visually for damage. Check bushings and gears for wear.
20. The face of the bearings must be smooth without scores.
21. On the suction side (large inlet hole) run-in grooves in the body up to 0,3 mm (0.012 in) deep across the width of the tooth are permissible.



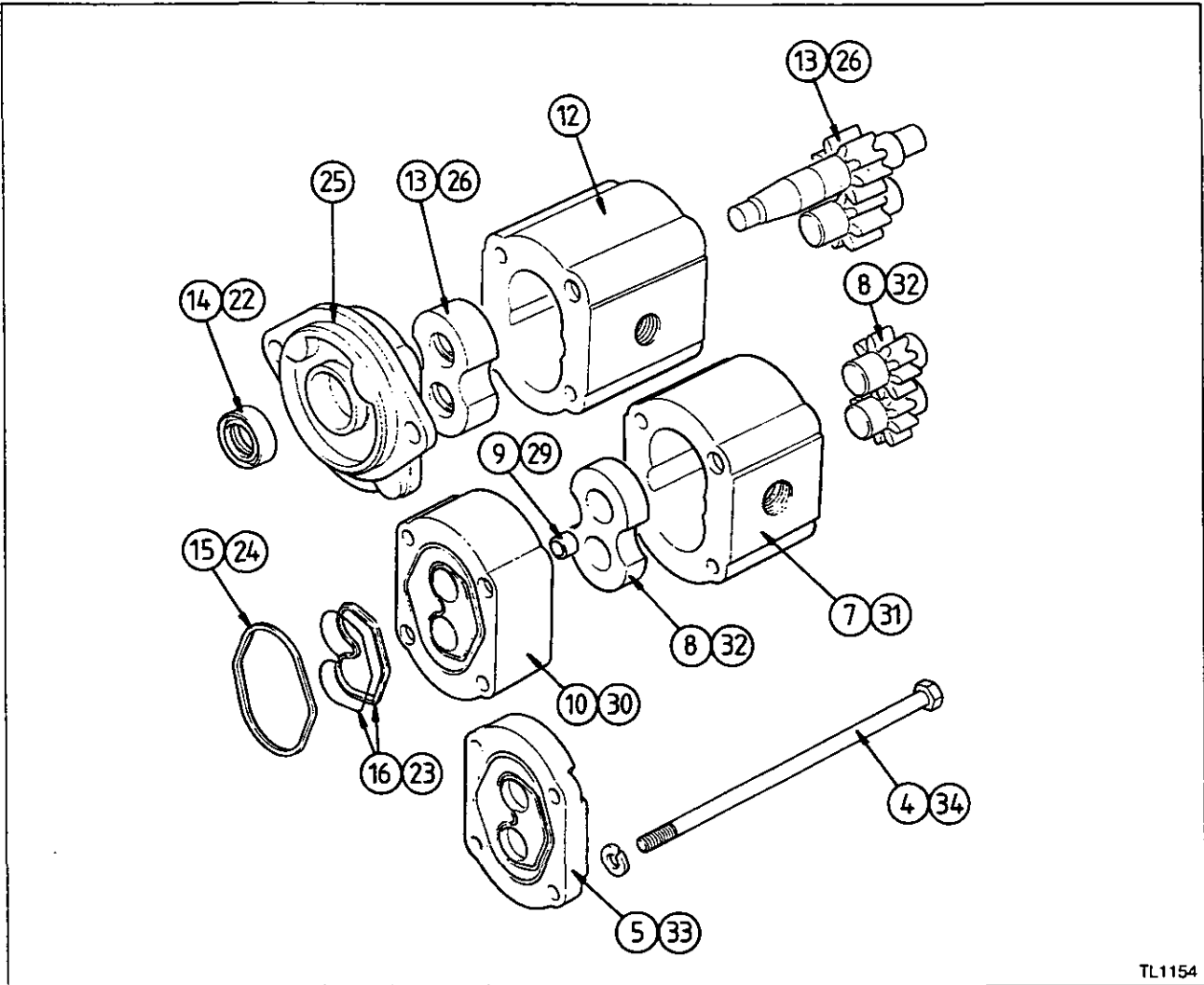
Reassembly

22. Replace all seals.
23. Using a micrometer measure the height of the support strip. Do not press, do not deform. The height must be:

$$2,1 \begin{matrix} -0,15 \\ +0,05 \end{matrix} \text{ mm } (0,083 \begin{matrix} -0,006 \\ +0,002 \end{matrix} \text{ in})$$

Support strips which are too high must be placed upside down in a cover and rubbed down on a piece of emery cloth.

24. Insert the support strip and sealing ring together into the cover groove as shown such that the radius (R) of the seal lies in the radius of the cover groove.
25. Install the shaft seal in the front plate and refit the circlip. Fill the recess with grease.
26. Assemble the bushings with the gears, observing the markings.
27. Fit the gear assembly to the body and mount on the front plate.
28. Lubricate the gears with oil.
29. Fit the end cover, observing the marking. The seal with the supporting strip is always open towards the suction side.
30. Refit the two cap screws and lightly tighten, check for smooth rotation of the pump.
31. Tighten the cap screws to the specified torque:
 - M8 cap screws 17-23 Nm (13-17 lbf ft)
 - M10 cap screws 35-46 Nm (26-34 lbf ft)
33. Replace the coupling.
34. Reassemble the two sections of the hydraulic pump, tighten the cap screws to the specified torque.
35. Refit the pump, see operation 12B-10.
36. If new body, gear set and bearings have been fitted it will be necessary to run-in the pump before subjecting it to full load, see operation 12B-21.



TL1154

Hydraulic Pump 4/6 Cylinder Engines

Overhaul 12B-20

Special Tools:
MF 332 Hydraulic pump oil seal protector

Manufacturer: Sundstrand

Disassembly

1. Remove the hydraulic pump, gear and key, see operation 12B-10 or 12B-11.
2. Thoroughly clean the outside of the pump.



Caution: When repairing, maximum cleanliness is essential. The work bench must be kept free from dirt and metal swarf etc. When dismantling, also ensure that the seals, bushings and gears are not jammed or knocked. The removed parts must be protected from any kind of damage.

3. Use a sharp tool to scribe a mark across all sections of the pump. This will assure proper reassembly.
4. Clamp the pump in a vice, end cover up and remove the four cap screws.
5. Remove the end cover.

6. Carefully mark the bearings with a felt tip pen with permanent ink, noting their positions relative to the pump body for reassembly.
7. Carefully split the pump between the body and the centre section.

Note: The sections of the pump are doweled together with two tubular dowels at each joint, excluding the rear cover. The dowels are located on the through bolts.

8. Remove the steering pump gear set and bearings.
9. Remove the coupling.
10. Remove the centre section.
11. Mark the second set of bearings for reassembly.
12. Remove the auxiliary pump section body.
13. Remove the pump gear set and bearings.

Note: On pumps fitted to tractors with four cylinder engines the bush in the bearing adjacent to the front cover is extended into the front cover.

14. Remove the front shaft seal.

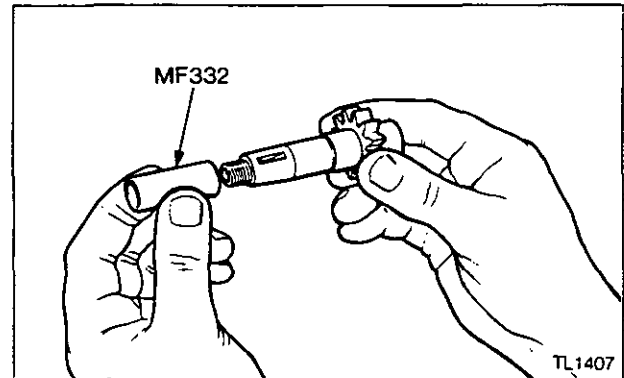
15. Remove the sealing rings.
16. Remove the pressure loading seal and backing ring.

Examination

17. Wash all parts in a clean washing agent (use no trichlorethylene or similar for cleaning as this can damage seal elements) and dry with compressed air.
18. Examine casing visually for damage. Check bushings and gears for wear.
19. The face of the bearings must be smooth without scores.
20. On the suction side small run-in grooves in the body across the width of the tooth are permissible.

Reassembly

21. Replace all seals.
22. Fit a new shaft seal to the front cover, press in squarely. Pack between the lips of the seal with grease.
23. Fit the pressure loading seal and the backing ring to the front cover, centre section and rear cover. A little grease in the grooves will help to retain them.
24. Refit the sealing rings with a little grease.
25. Hold the front cover in the vice with the sealing rings facing upwards and assemble the auxiliary section body. Ensure that your marks are in line.
26. Assemble the gear/backing pack separately. It is important to ensure that the bearing face recesses are adjacent to the gear faces.
27. Fit a protective sleeve to the gear shaft or cover the keyway sharp edges with thin tape.
28. Lightly lubricate the body bore and bearing lobes then push the gear/bearing pack into the body. Remove the tape or sleeve.
29. Refit the coupling.
30. Fit the centre section.
31. Fit the steering section body.
32. Refit the second set of gears and bearings ensuring that they are fitted in the correct position.
33. Fit the end cover.
34. Assemble the bolts and washers, lightly lubricate the threads and tighten evenly to a torque of:
 - Pumps fitted to tractors with four cylinder engines
54-61 Nm (40-45 lbf ft)
 - Pumps fitted to tractors with six cylinder engines
61-68 Nm (45-50 lbf ft)
35. Check the pump for free rotation.
36. Refit the pump, see operation 12B-10 or 12B-11.
37. If new body, gear set and bearings have been fitted it will be necessary to run-in the pump before subjecting it to full load, see operation 12B-21.

**Hydraulic Pump Run-in****Check**

12B-21

Procedure

1. Clean the hydraulic oil suction strainer, see operation 12B-08.
2. Refit the pump to the tractor.
3. Check the level of oil in the transmission, top-up if necessary.
4. Start the engine and run at 1200 rev/min at zero hydraulic pressure for three minutes.
5. Operate the auxiliary control valve intermittently for three minutes to build up pressure.
6. Turn the steering to full lock intermittently for three minutes to build up pressure in the system.
7. Increase the engine to full speed intermittently for three minutes and build up the pressure in both systems, as described above.
8. Idle the engine and check for leaks.
9. Change the hydraulic oil filter, see operation 12B-12.
10. Check the transmission oil level.

Product Changes

Since the introduction of the Massey-Ferguson 300 series tractor there have been three changes to the auxiliary hydraulic system as follows:

Auxiliary Relief Valve Manifold

A new type of relief valve manifold was introduced in December 1987 at tractor serial number V47353.

There are two types of manifold, one for tractors with a trailer brake valve (Fig. 1) and one without (Fig. 2).

The manifold contains the pressure relief valve, the same design as the previous valve, and two non-return valves when combined flow is incorporated.

The manifold used with the trailer brake valve is fitted with a low pressure relief valve which allows oil to return to the transmission case when cranking the engine for starting.

The pressure test port fitted to the early type manifold is not now fitted, pressure tests must be carried out at the quick release couplings at the rear of the tractor.

Cold Start Valve

M-F 365 to 399 tractors with four and six cylinder engines, were fitted with a cold start valve (see operation 12B-17) under hydraulic pump to assist in cold starting.

A new pump was introduced incorporating this valve in the body of the pump at the following serial numbers:

- M-F 365 to 398 – NO4148 February 1988
- M-F 399 – NO2146 February 1988

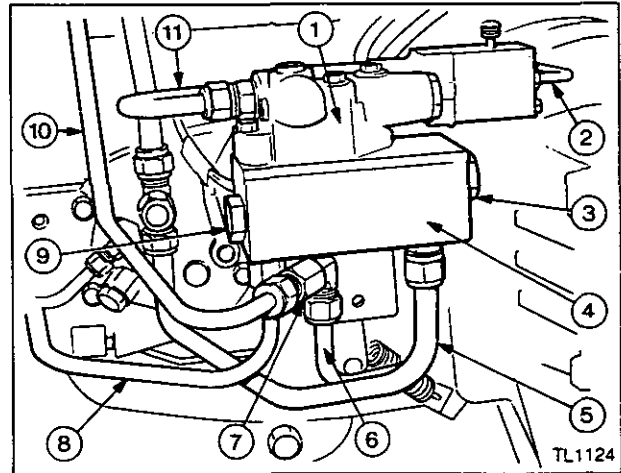


Figure 1

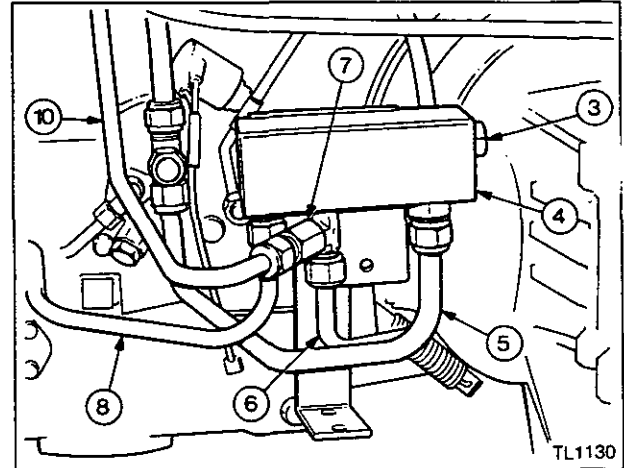


Figure 2

1. Trailer brake valve
2. Pipe – Brake to trailer brake valve
3. Pressure relief valve
4. Auxiliary relief valve manifold
5. Pipe – Return to transmission case
6. Pipe – To auxiliary control valve
7. Non-return valve
8. Pipe – Pump to manifold
9. Low pressure relief valve
10. Pipe – Lift system to auxiliary (combined flow)
11. Pipe – trailer brake valve to trailer

Key to figures 1 and 2

AUXILIARY HYDRAULICS

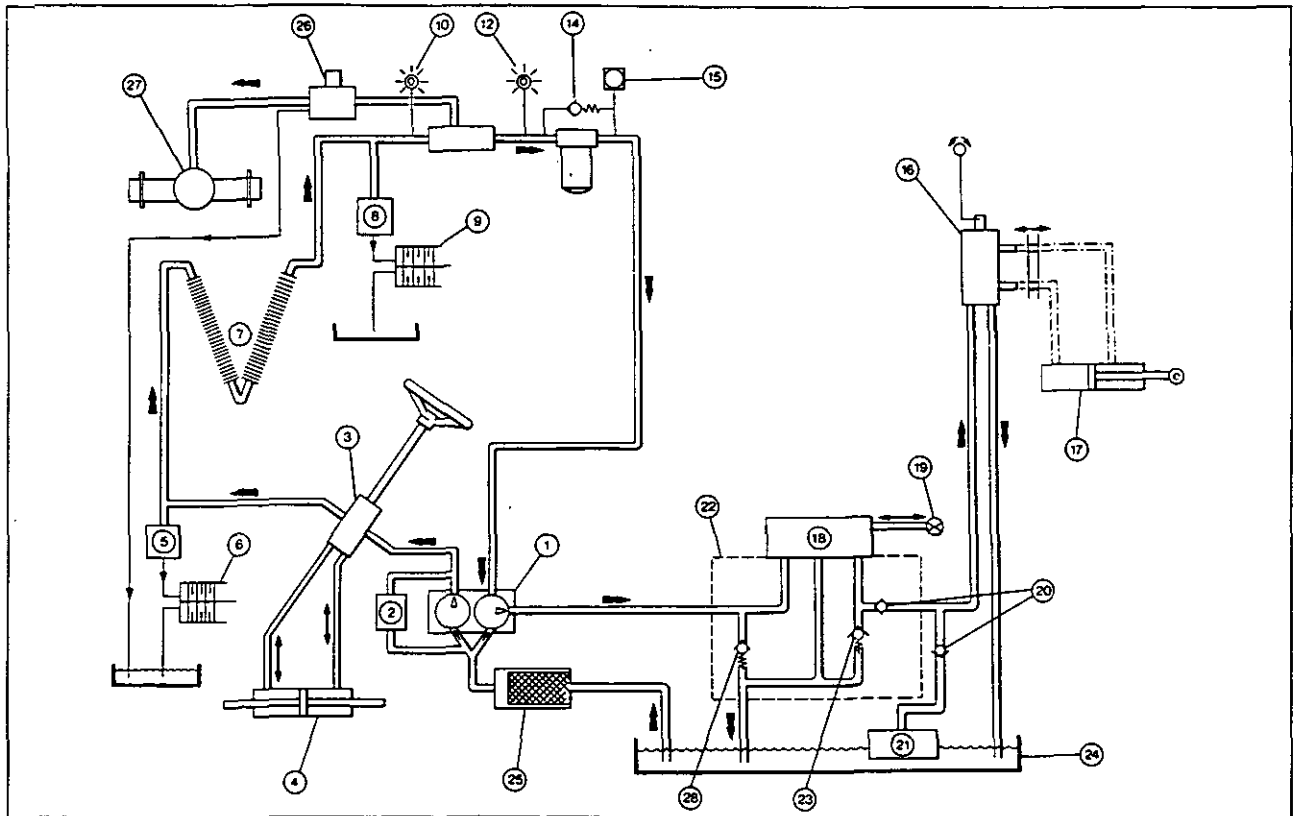


Figure 3. Schematic Circuit

- | | | |
|--------------------------------|----------------------------------|-------------------------------|
| 1. Pump | 11. Pressure maintaining valve | 20. Non-return valves |
| 2. Starting by-pass valve | 12. Blocked filter warning light | 21. Ferguson lift pump |
| 3. Orbitrol steering valve | 13. Hydraulic filter | 22. Auxiliary manifold |
| 4. Steering cylinder | 14. Filter by-pass valve | 23. Relief Valve |
| 5. IPTO control valve | 15. Oil temperature sensor | 24. Transmission oil |
| 6. IPTO Clutch | 16. Spool valve | 25. Hydraulic strainer |
| 7. Oil cooler | 17. External hydraulic cylinder | 26. 4WD solenoid valve |
| 8. Multi-power solenoid | 18. Trailer braking valve | 27. 4WD axle |
| 9. Multi-power clutch | 19. Trailer braking connection | 28. Low pressure relief valve |
| 10. Low pressure warning light | | |

Hydralock 4WD Differential

A hydraulic operated front axle differential lock was introduced in February 1988 at serial number NO4464. This introduction involved an addition to the hydraulic circuit as shown in the figure 3. Oil is supplied to the differential lock via an electric solenoid valve mounted adjacent to the pressure maintaining valve and supplied from the pressure maintaining valve port block (Fig. 4).

Return oil when the solenoid valve is closed and the lock disengages is returned direct to the transmission case.

The 4WD differential lock is electrically engaged by the warning light switch on the rear right hand trumpet housing actuated by the engagement of the rear differential lock.

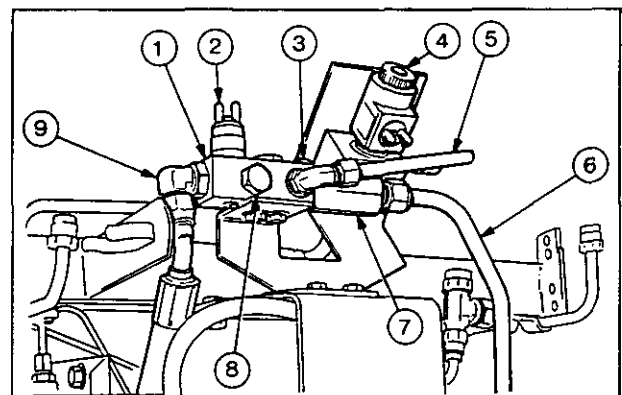
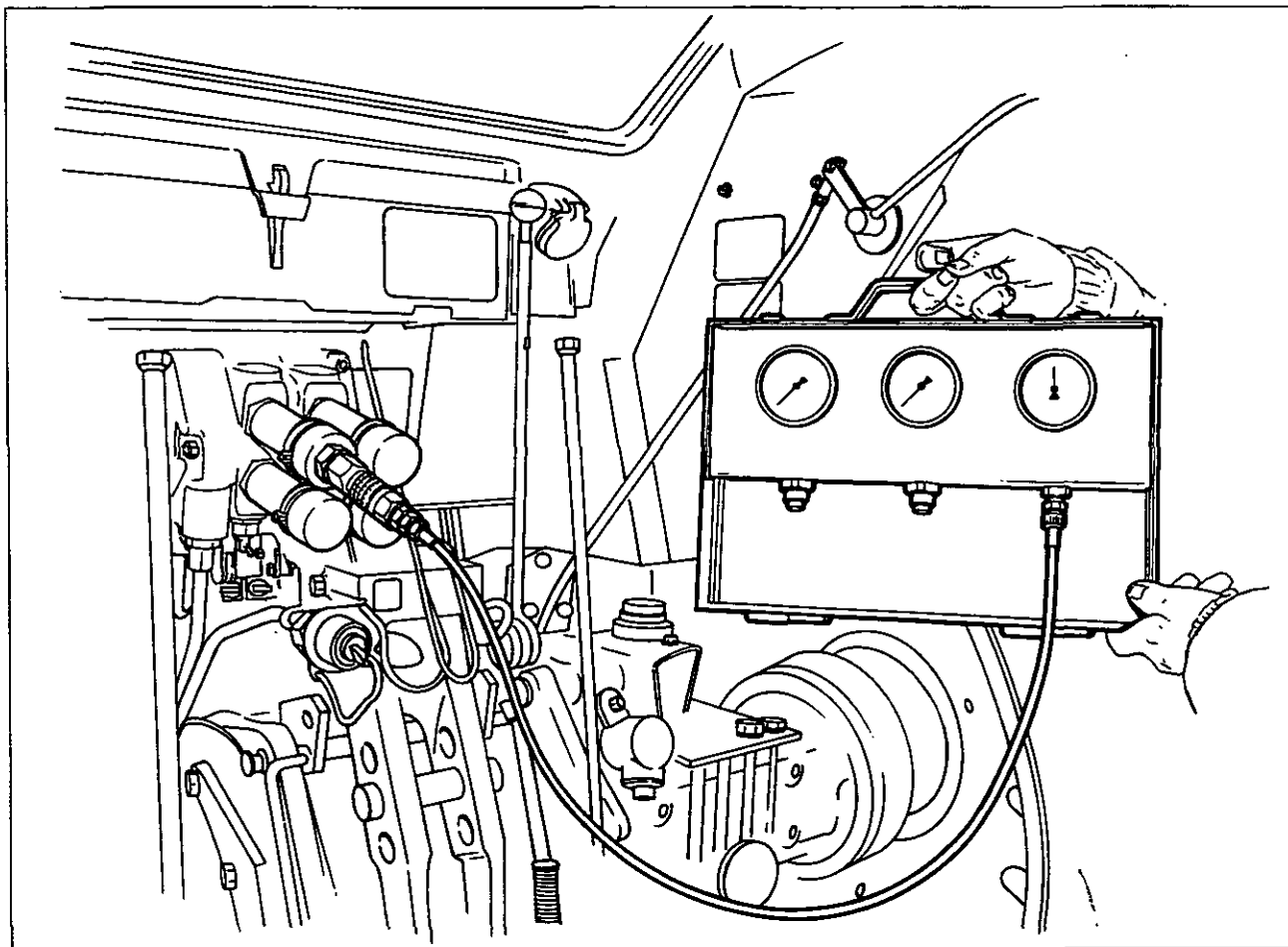


Figure 4

1. PMV port block
2. Low pressure warning switch
3. Pipe - Solenoid valve to 4WDD axle
4. Solenoid valve
5. Pipe - PMV port block to solenoid valve
6. Pipe - PMV to filter
7. Pressure maintaining valve (PMV)
8. Pressure test point
9. Pipe oil cooler to PMV



Auxiliary Circuit Pressure Test

Check 12B-23

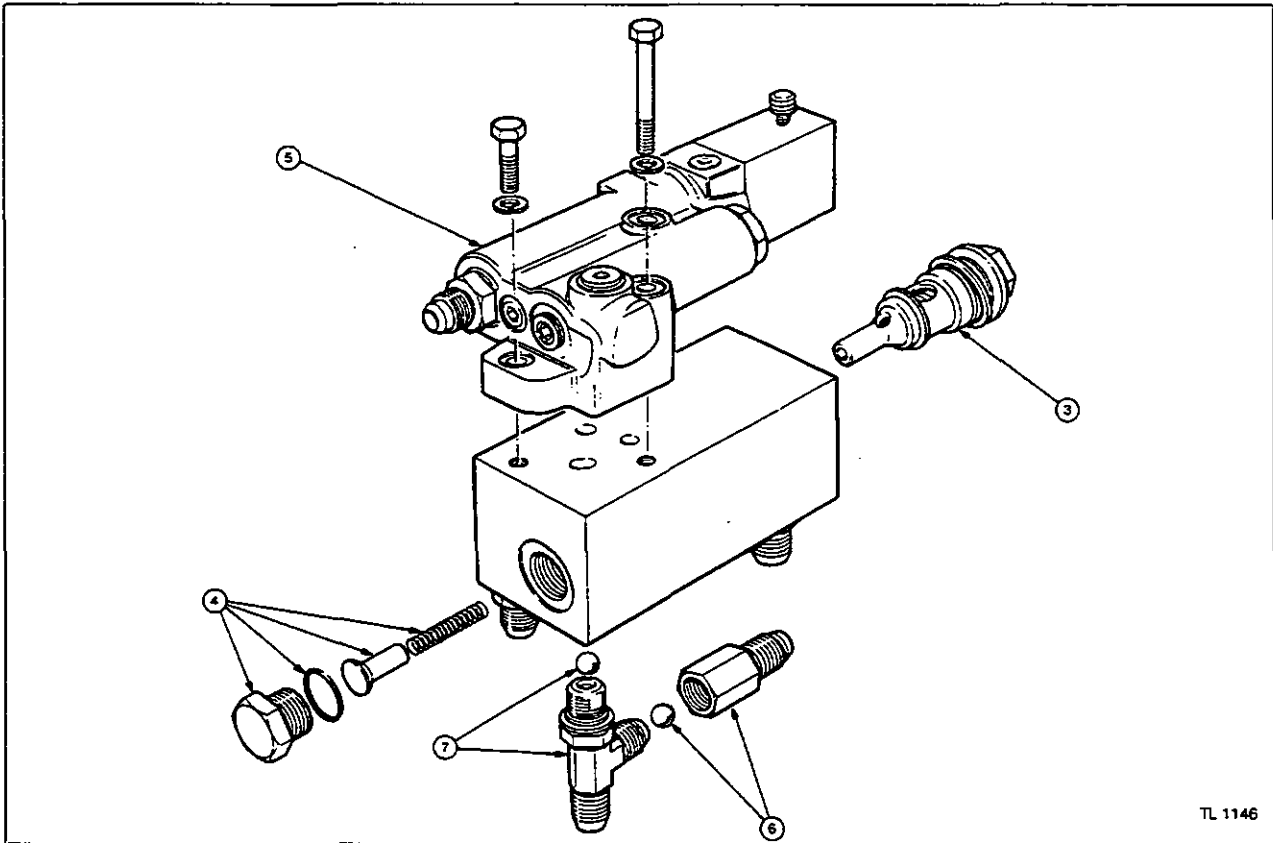
Special tools:
MF3001 Pressure Test Kit

Procedure

1. Obtain a quick release coupling (M-F part No. 1684 473 M1), and fit to it the adaptor and the M14 male quick release coupling in the kit.
2. Connect up the 300 bar (4000 lbf/in²) gauge in the MF3001 pressure test kit.
3. Connect the gauge into the top left hand connector on the auxiliary control valve.
4. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (122-140°F).
5. Set the engine speed to 1200 rev/min.
6. On tractors with combined flow, ensure that the selector valve is in the linkage position.
7. Pull back to the lift position on the first auxiliary control valve lever and note the pressure reading.
8. The system pressure should be 170-190 bar (2500-2750 lbf/in²).

Diagnosis

Sympton - Auxiliary pressure LOW		
Cause	Action	Operation No.
1. Auxiliary pump worn	Flow check pump	12B-06
2. Relief value faulty	Replace or reset relief valve	12B-15 12B-23
3. Internal leakage across trailer brake valve	Overhaul brake valve	8B-10
4. Internal leakage across spool valves	Overhaul spool	12B-16



Auxiliary Pressure Relief Valve Manifold
Overhaul **12B-23**

Disassembly

1. Disconnect the hydraulic pipes connected to the valve.
2. Remove the valve from the brake bracket.
3. Unscrew the main pressure relief valve assembly.

Manifold with trailer brake valve

4. Unscrew and remove the low pressure relief valve and spring.
5. Remove the trailer brake valve.

Valves with combined flow

6. Remove the linkage pump non-return valve.
7. Remove the tee and auxiliary pump non-return valve.

Examination

8. Clean all parts in a suitable solvent and air dry.
9. Inspect all components for damage or wear, especially the valve seats. Renew any faulty parts.

Reassembly

10. Reverse procedures 1 to 9 except:
 - a. Apply Massey Ferguson Stud Lock (Loctite 270) to the threads of the linkage pump non-return valve body.
 - b. Refer to operation 12B-15 for auxiliary relief valve setting.

Hydralock Differential Solenoid Valve

Overhaul

12B-24

Disassembly**Solenoid coil replacement**

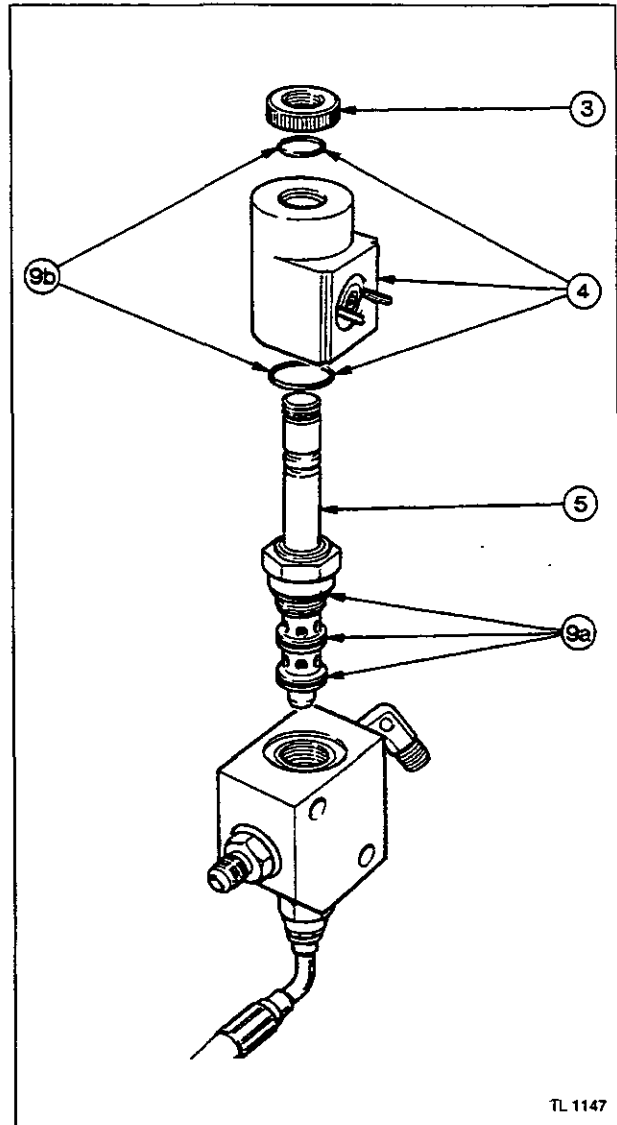
1. Lift up the hood side panels.
2. Disconnect the two wires to the solenoid coil.
3. Unscrew the retaining nut.
4. Remove the coil and the two 'O' rings.

Solenoid valve replacement

5. Unscrew the valve assembly.
6. Discard the 'O' rings.
7. Disconnect the pipes and remove the valve block if necessary.

Reassembly

8. Clean the components in a clean solvent and air dry.
9. Reverse procedures 1 to 7, except:
 - a. Replace the three 'O' rings on the valve. Refit the two 'O' rings each side of the coil.
 - b. Apply Massey Ferguson Screw Lock (Loctite 222) to the knurled nut and tighten only finger tight.
 - c. Tighten the solenoid valve body to a torque of 10 Nm (7 lbf ft). This is to prevent distortion of the valve body.
 - d. When installing a new coil, apply a drop of Massey Ferguson Screw Lock (Loctite 222) to the nut (3) to prevent it vibrating loose and tighten only finger tight.



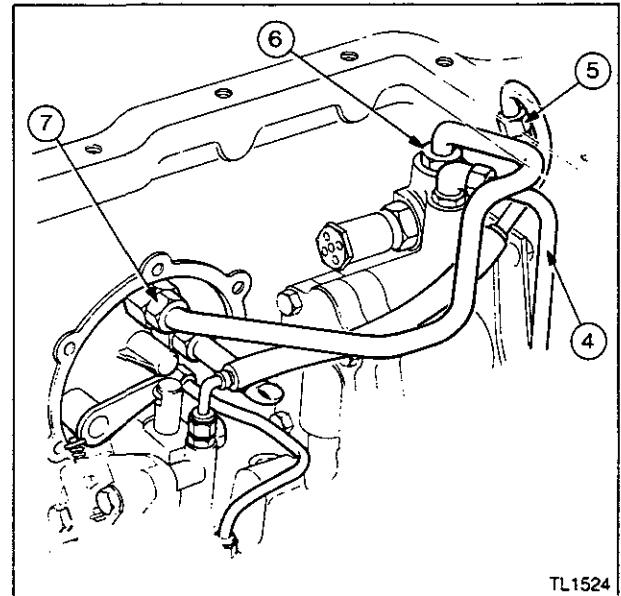
TL 1147

Auxiliary Pump and Plated Drive**Removal and Refitment**

12B-25

Removal

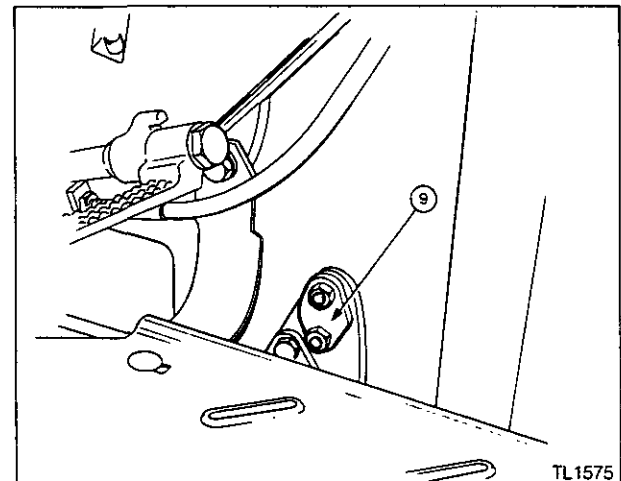
1. Remove the lift cover, see operation 12A-04.
2. Drain the transmission oil.
3. Split the tractor between the four wheel drive dropbox and the centre housing, see operation 2B-04 or 2B-05.
4. Disconnect and remove the pipe passing forward through the gearbox.
5. Disconnect the flexible pipe supplying the IPTO clutch.
6. Disconnect the pipe to the side cover.
7. Disconnect the pipe at the side cover and remove.
8. Remove the hydraulic lift and auxiliary pump filter, see operation 12B-28.
9. Remove the two nuts and the dowel pins each side of the transmission case holding the lift pump.
10. Withdraw the hydraulic lift pump complete with plated drive and auxiliary pump from the front of the centre housing.



TL1524

Auxiliary Pump

11. Place the lift pump, plated drive and auxiliary pump assembly on a bench; remove the external circlip holding the pump gear in place.
12. Remove the socket head setscrew.
13. Remove the two bolts and spacers.
14. Remove the auxiliary pump.
15. Remove the elbow between the auxiliary pump and the filter manifold.
16. Remove the auxiliary pump drive gear.



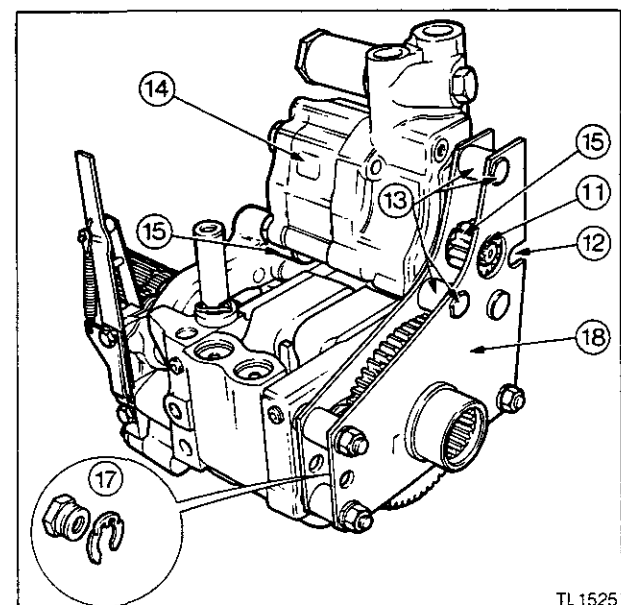
TL1575

Plated Drive

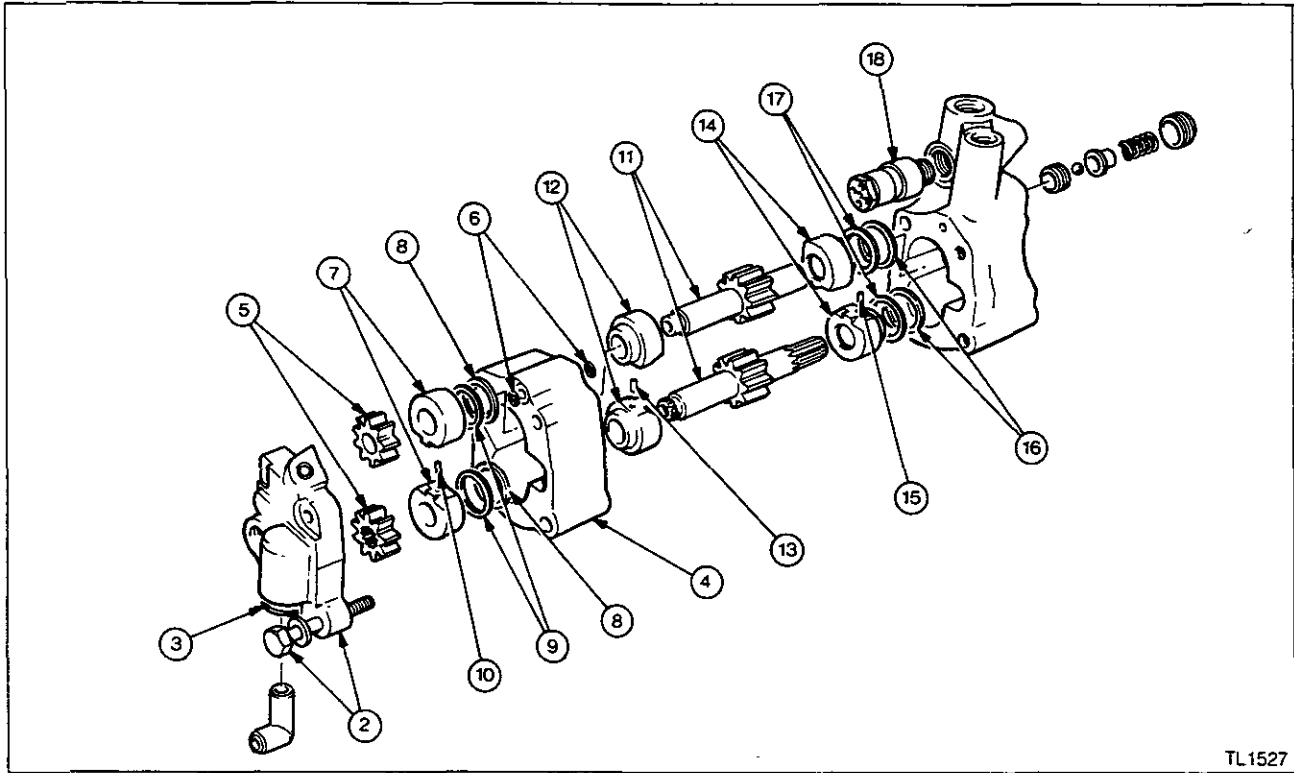
17. Remove the two 'C' clips holding the plated drive to the hydraulic lift pump.
18. Withdraw the drive off the pump drive shaft.

Reassembly

19. Reverse procedures 1 to 17 except:
 - a. Do not forget the elbow between the auxiliary pump and the filter manifold.
 - b. Tighten the two bolts and spacers to a torque of 30 Nm (22 lbf ft), plated drive to pump.
 - c. Tighten the socket head capscrew to a torque of 27 Nm (20 lbf ft), plated drive to pump.
 - d. Check the total backlash between the three gears, it must be between 0,05 and 0,41 mm (0.002 and 0.016 in).
 - e. Refit the two 'C' clips holding the plated drive to the bottom left and top right nuts on the lift pump body.



TL1525



TL1527

Auxiliary Hydraulic Pump

Overhaul

12B-26

Disassembly

1. Remove the auxiliary pump, see operation 12B-25.
2. Remove the four securing bolts and remove the end cover.
3. Remove the 'O' ring.
4. Withdraw the centre body section complete with gears off the drive shafts.
5. Remove the gears.
6. Remove the two 'O' rings.
7. Carefully, with finger pressure only remove the centre section bearings, mark their position with a felt tip pen so they can be refitted in the original position.
8. Remove the seal support rings.
9. Remove the seals.
10. Separate the centre section bearings and remove the dowel pin.
11. Withdraw both shafts complete with bearings from the front body. DO NOT USE FORCE. Mark the bearings with a felt tip pen for refitment.
12. Remove the centre section bearings from the shafts.
13. Separate the bearings and remove the dowel pin.
14. Remove the bearings from the front body, see procedure 7.
15. Separate the bearings and remove the dowel pin.
16. Remove the seal support washers.
17. Remove the seals.
18. Remove the main relief valve, if necessary.

Examination

Bearings

Examine the bearings for wear on their faces and in their bores. During a major overhaul the bearings should be renewed, but if not badly worn they can be salvaged as follows:

Place a sheet of '0' grade emery paper, lubricated with paraffin on a true flat surface, e.g. a surface plate, or plate glass, then polish the bearing face, using a light rotary motion.

Bodies

Inspect the front and centre bodies for external damage and cracks. Examine the bodies for wear and damage. The gears will always cut a light track on the inlet side of the body bores. The depth of this track must not exceed 0,05 mm (0.002 in). The depth of the track can be very difficult to measure with such accuracy. If in doubt replace the body.

Gears

Examine the gears for scored or worn faces or journals, damaged teeth and surface cracks. Always fit replacement gears as a pair and never individually.

Bearing Seals and 'O' Rings

Always fit new seals and 'O' rings on reassembly.

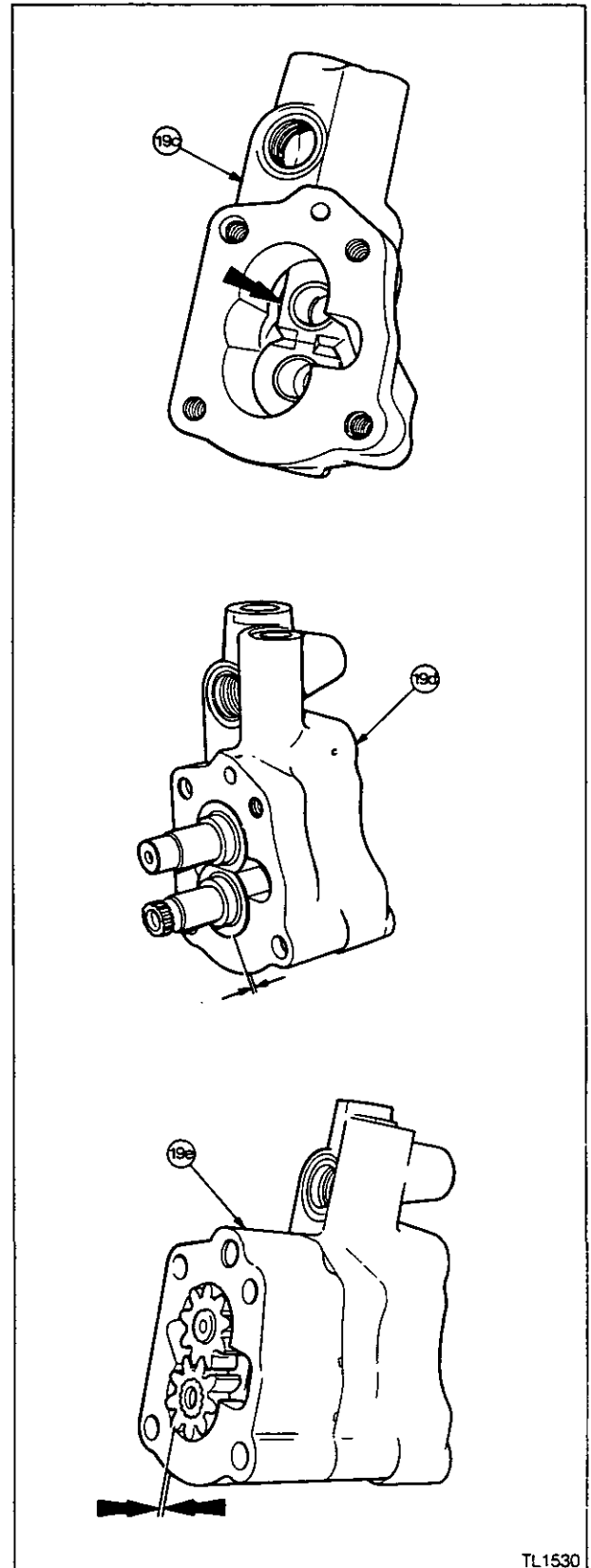
Relief Valves

The two pressure relief valves are factory preset units, if the valve is suspect it is recommended that the entire unit is replaced.

Reassembly

19. Reverse procedure 1 to 18 except:

- a. Retighten the main relief valve to a torque of 50 Nm (37 lbf ft).
- b. When rebuilding the pump DO NOT use unnecessary force, e.g. a hammer and drift. Using hand pressure only, gently ease the bearings into the bores until they have seated onto their seals.
- c. When replacing the front body bearings ensure that the uppermost bearing is fitted with its relieved face adjacent to the outlet port.
- d. Measure the protrusion of the bearings above the joint face of the body. This dimension must lie between 0 to 0,5 mm (0 to 0.019 in) MAXIMUM. If the dimension falls below zero and the bearings become recessed renew the seals. If this dimension is above 0,5 mm (0.019 in) then the bearings have not seated correctly because of a slight seizure in the bores.
- e. Measure the protrusion of the gear wheels from the centre body face. If the protrusion is not correct take action as detailed in the above paragraph.
- f. Retighten the end cover bolts to a torque of 45 Nm (33 lbf ft).
- g. The drive shaft will be difficult to turn by hand when the pump is reassembled. This condition is quite normal. Check for rotation by temporarily assembling a drive gear to the shaft and turn using a cloth wrapped around the gear.



TL1530

12B-42

AUXILIARY HYDRAULICS

Plated Drive

Overhaul

12B-27

Disassembly

1. Remove the plated drive, see operation 12B-25.
2. Remove the nuts and washers.
3. Remove the plate and spacers.
4. Lift out the drive gear and bushes.
5. Remove the idler gear, thrust washers and needle rollers.
6. Push the idler shaft complete with its circlip out of the side plate.

Examination

Check the gear teeth for wear, chipping, or other damage. Examine the bores of the gears, bushes and needle rollers for wear. Check the idler shaft and thrust washers for wear, scoring, or pitting.

Replace any defective components.

Reassembly

7. Refit the idler shaft to the rear plate complete with circlip.
8. Fit a thrust washer to the idler shaft.
9. Replace the 22 rollers inside the idler gear using petroleum jelly; fit the gear and second thrust washer.
10. Refit the drive gear and bushes, ensure that the flats on the bush locate against the lugs on the plates to prevent rotation.
11. Refit the spacers, plate and nuts. Tighten the nuts progressively to 27 Nm (20 lbf ft).
12. Refit the lift pump, plated drive and auxiliary pump assembly, see operation 12B-25. Check that the flat on the end of the idler gear shaft locates correctly to the bottom of the auxiliary pump.

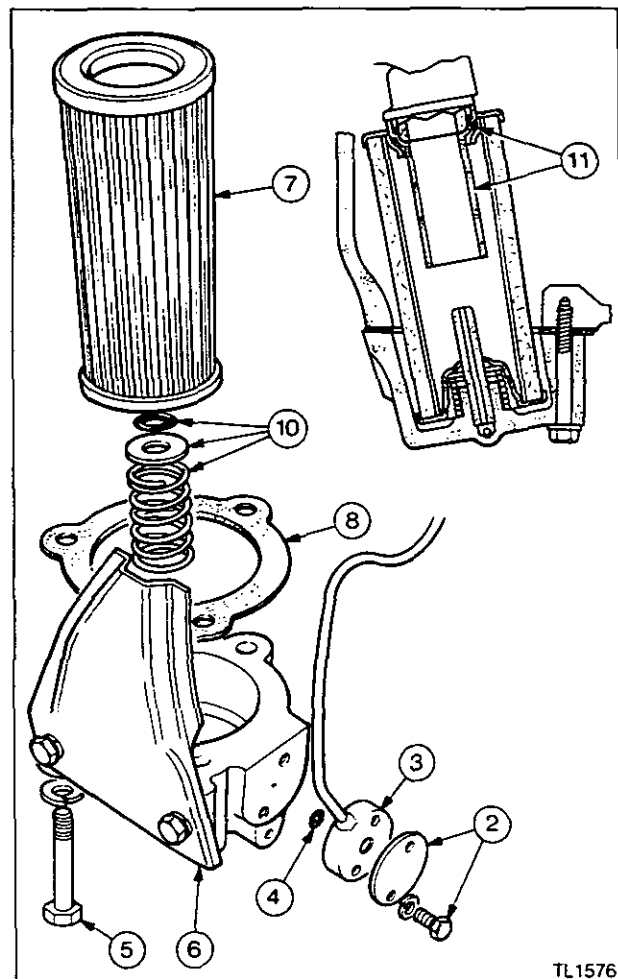
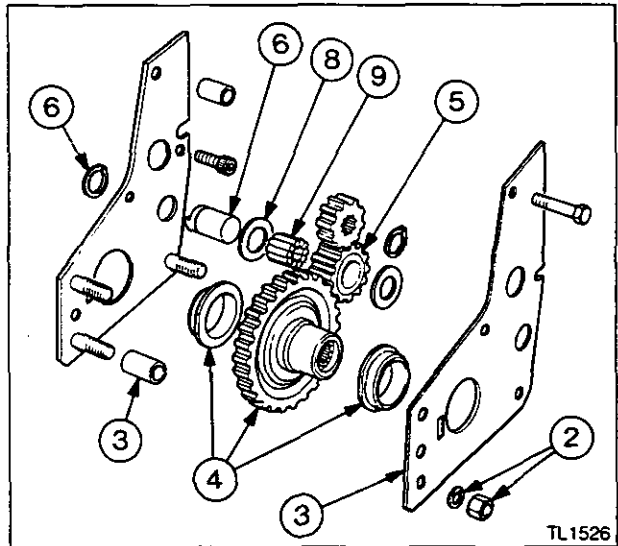
Hydraulic Lift and Auxiliary Pump Filter

Servicing

12B-28

Procedure

1. Drain the transmission oil.
2. Remove the two bolts and plate from the vacuum tube connector.
3. Ease the connector away from the filter base about 6 mm (1/4 in) to assist in removal.
4. Remove the connector 'O' ring.
5. Remove the three bolts and washers.
6. Remove the filter base with the shield still attached.



7. Remove the filter element.
8. Remove and discard the gasket.
9. To clean the filter element, brush the mesh with a stiff bristle brush to remove all the particles between the pleats of the filter. Swill the filter around in clean solvent, finally apply compressed air to the inside of the element to remove any remaining dirt particles.

Inspect the filter under a strong light, if it is not clean replace with a new unit.

10. If necessary, remove the spring, stop plate and 'O' ring from the central post inside the filter base.
11. If necessary, remove the suction tube and two 'O' rings from the pump manifold by gently pulling it down.
12. Replace the filter element in the reverse order except:
 - a. Fit the filter with the wider end uppermost.
 - b. Place the filter in the base and position it in the centre housing. Replace the bolts, DO NOT attempt to pull the filter base up to the centre housing using the securing bolts.

Control Valve Kick-out Detent Relief Valve

Adjust 12B-29

Special tools:

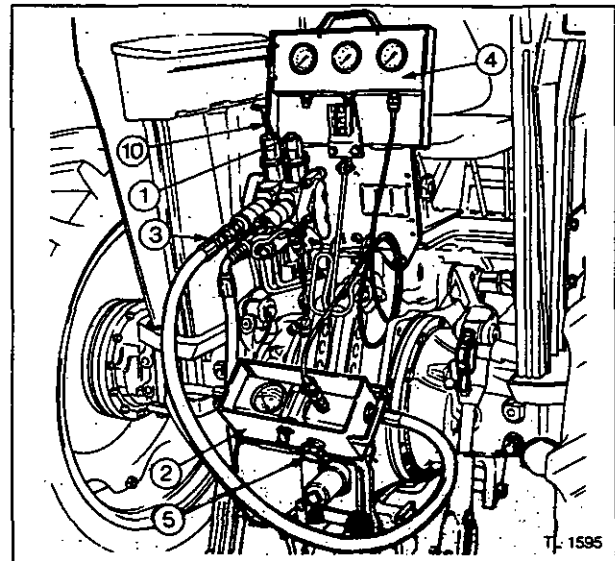
MF.3001 Pressure Test Kit

MF.3002 Hose Kit

MF.3003 Hydraulic Flow Meter

Procedure

1. Remove the plastic bung from the end of the spring cap for access to the relief valve adjusting screw.
2. Fit the MF.3002 Hose Kit to the MF.3003 Hydraulic Flow Meter and fit two auxiliary quick release male couplings to each end of the hoses.
3. Connect the outlet side of the flow meter to the top port and the inlet to port 2 on the control valve.
4. Connect the high reading gauge in the MF.3001 Pressure Test Kit to the flow meter.
5. Open fully the control valve on the flow meter.
6. Start the engine and run at 2000 rev/min, move the hydraulic control lever marked '1' and '2' forward into the locked position.
7. Slowly close the control valve on the flow meter in order to raise the pressure on the service port. The pressure gauge will register the pressure on that service port.
8. The kick-out pressure can be read from the pressure gauge at the moment of kick-out, this should be at 172 bar (25000 lbf/in²).



9. If the mechanism will not hold in detent, kick-out at a very low pressure, or it will not kick-out at all, then it is likely that the relief valve setting needs adjusting.
10. Using a 5/32 in A/F hexagon socket key through the hole in the spring cap the adjusting screw can be located. Turn the screw clockwise to increase pressure, anti-clockwise to decrease. DO NOT turn more than 1/4 turn without rechecking the setting.

NOTE: Each 10° turn of the screw will change the pressure setting by approximately 2 bar (30 lbf/in²)

11. When the setting is achieved, recheck the setting using the control valve on the flow meter five times to check repeatability.
12. Replace the plastic plug in the end cap and remove the hydraulic test equipment.

New introductions

There have been a number of changes to the auxiliary hydraulic circuit, hydraulic pump output and steering pressure, plus the introduction of new pressure maintaining valves. The dates of these introductions are as follows:-

- New pressure maintaining valve. Designed to give improved pressure control. Introduced from tractor serial number B33002, manufactured August 1993.
- Steering pressure reduced from 170 bar to 140 bar, to reduce steering unit leakage. Introduced from tractor serial number C09167 - tractors with four cylinder engines. C09040 - tractors with six cylinder engines, all manufactured March 1994.
- Steering pump flow increased from 22 to 26 litre/min, to increase steering performance. Introduced from tractor serial number C09167 - tractors with four cylinder engines. C09040 - tractors with six cylinder engines, all manufactured March 1994.
- Introduction of a new pressure maintaining and control valve for the 18 Speedshift transmission. Introduced from tractor serial number C00022, manufactured June 1994.

New specifications

Steering pressure at 1200/1250 engine rev/min:

3, 4 and 6 cylinder engine tractors 130-150 bar (1886-2175 lbf/in²)

Pressure maintaining valve (PMV) at 1200/1250 engine rev/min:

3 cylinder engine footstep tractors 16-19 bar (232-276 lbf/in²)

3 cylinder engine cab tractors 22-24 bar (319-348 lbf/in²)

4 and 6 cylinder engine tractors 22-24 bar (319-348 lbf/in²)

Pressure adjustment Variable thickness shims

Auxiliary pressure at 1200/1250 engine rev/min:

3, 4 and 6 cylinder engine tractors 170-190 bar (2466-2756 lbf/in²)

Steering pump section, flow at 140 bar (2000 lbf/in²) 2000 engine rev/min:

3 cylinder engines - new pump 22 litre/min (5 Imp gal/min) (5.8 US gal/min)

3 cylinder engines - minimum 18 litre/min (4 Imp gal/min) (4.8 US gal/min)

4 and 6 cylinder engines - new pump 26 litre/min (5.7 Imp gal/min) (6.9 US gal/min)

4 and 6 cylinder engines - minimum 18 litre/min (4 Imp gal/min) (4.8 US gal/min)

Auxiliary hydraulic pump section, flow at 140 bar (2000 lbf/in²) 2000 engine rev/min:

3 cylinder engines:

New pump 31 litre/min (6.8 Imp gal/min) (8.2 US gal/min)

Minimum 27 litre/min (6 Imp gal/min) (7 US gal/min)

4 and 6 cylinder engines:

New pump 32 litre/min (7 Imp gal/min) (8.4 US gal/min)

Minimum 28 litre/min (6 Imp gal/min) (7 US gal/min)

18 Speedshift Pressure Maintaining Valve

General Description

The pressure maintaining valve for 18 Speedshift tractors is mounted above and to the rear of the engine on tractor models 365 and above. On tractor models 362, 372 and 382 with the fuel tank over the engine, the valve is mounted on the left-hand side of the engine.

The illustration (Fig. 1) shows the installation of the valve over the engine. The major components are as follows:-

1. Low hydraulic pressure warning light switch.
2. Differential lock solenoid.
3. Speedshift solenoid.
4. Speedshift hydraulic accumulator.
5. Pressure test point.

This pressure maintaining valve is similar in operation to the valve fitted to the other tractors. The oil flow from the hydraulic pump and orbitrol steering unit, passes through an oil cooler in front of the engine radiator and into the pressure maintaining valve block.

The spring-loaded pressure maintaining valve controls the pressure to 23 bar (334 lbf/in²), excess oil passing through the valve to the oil filter and back to the pump. A port in the side of the valve block directs oil at the pre-set pressure to the independent power take-off clutch and the four-wheel drive disengagement solenoid.

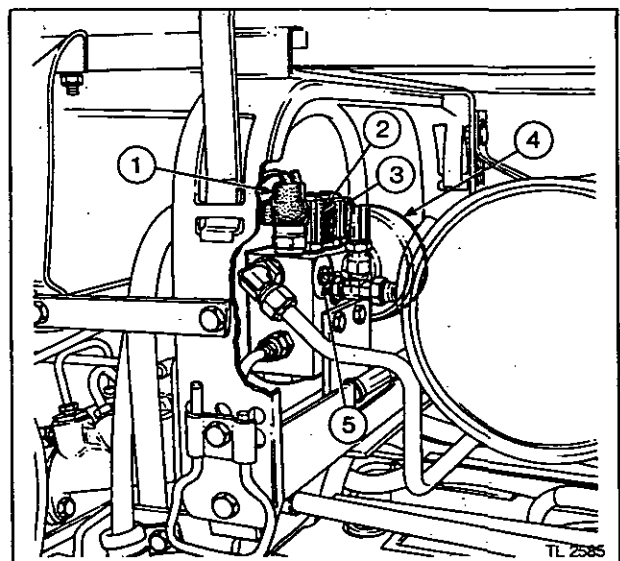


Fig.1

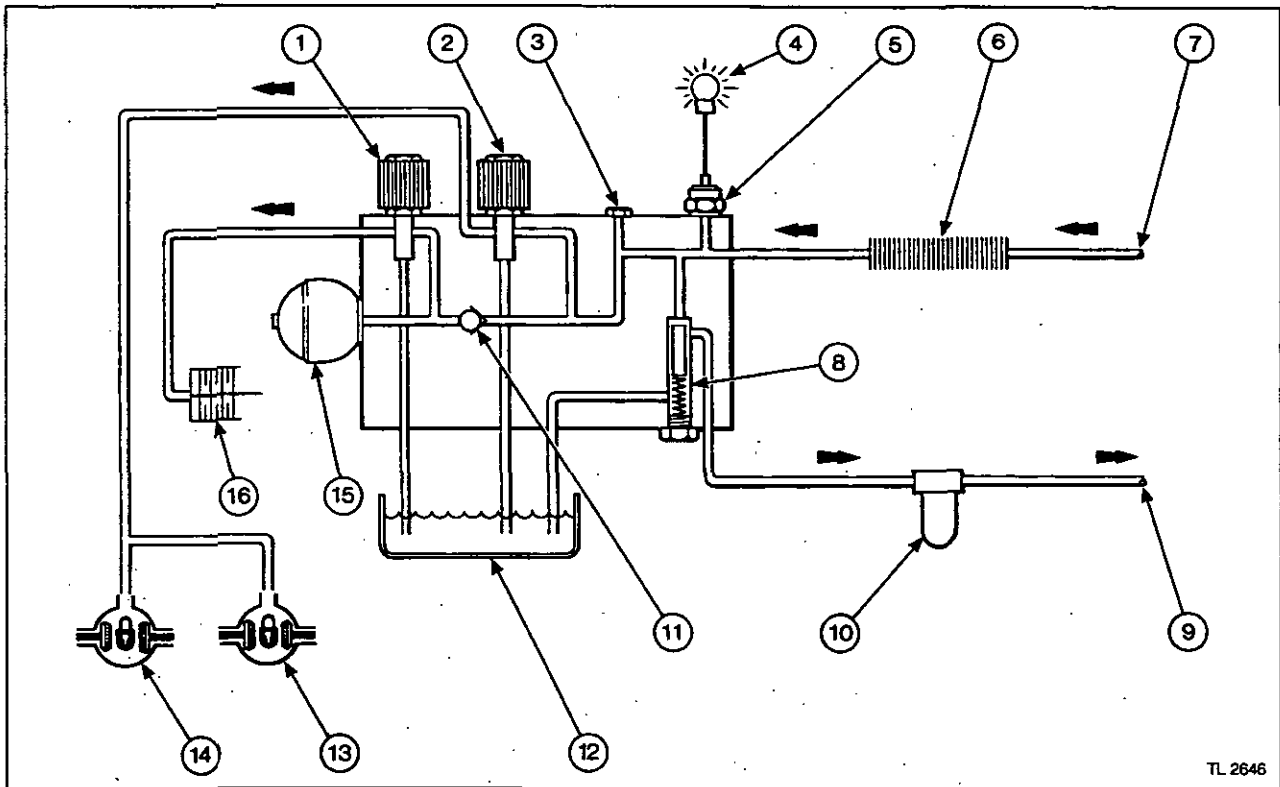


Fig.2

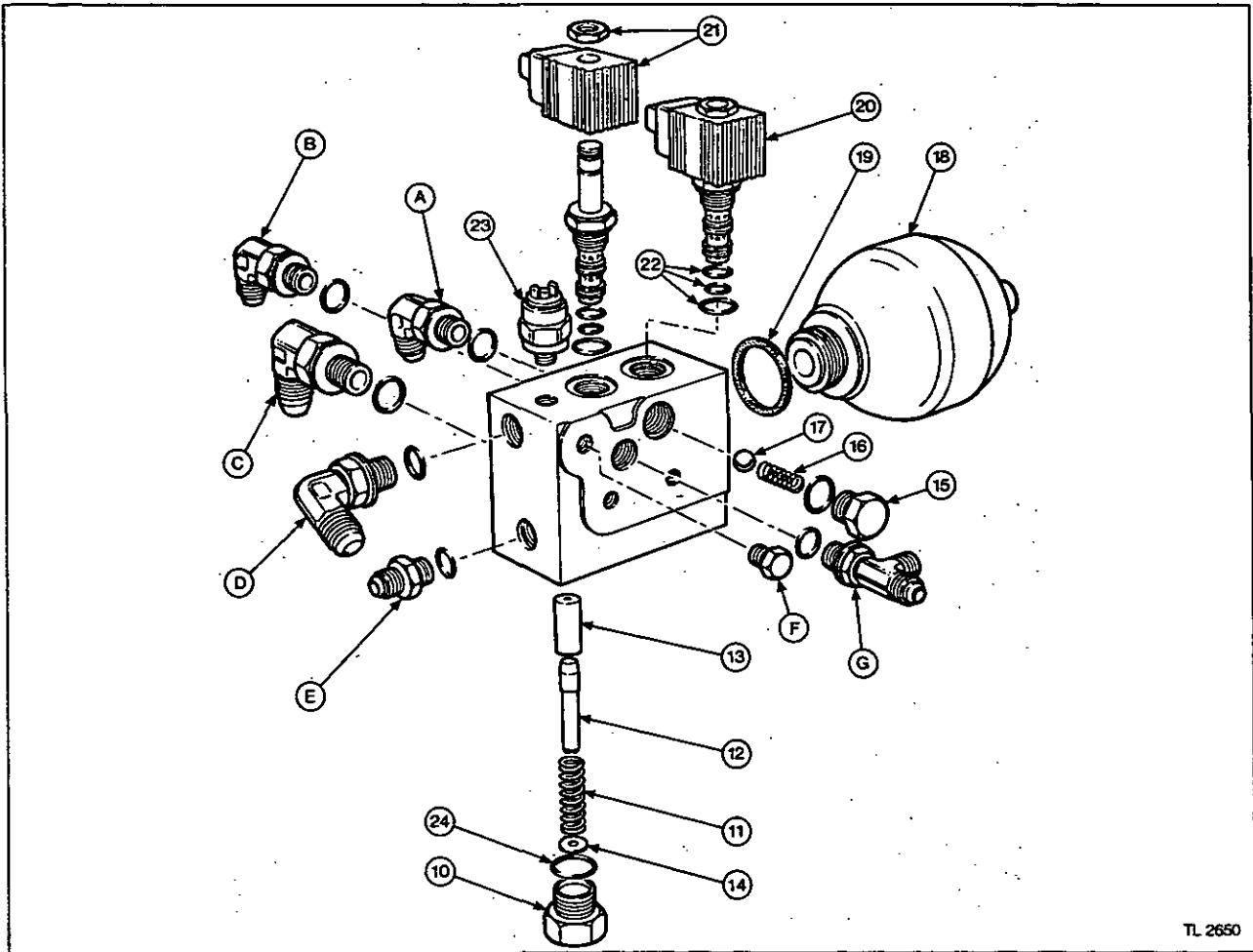
Figure 2 Schematic hydraulic circuit

- | | |
|--|----------------------------------|
| 1. Speedshift solenoid | 9. Return oil to hydraulic pumps |
| 2. Differential lock solenoid | 10. Hydraulic oil filter |
| 3. Pressure test point | 11. Check valve |
| 4. Low hydraulic oil pressure warning light | 12. Transmission case |
| 5. Low hydraulic oil pressure warning light switch | 13. Rear differential lock |
| 6. Oil cooler | 14. Front differential lock |
| 7. Oil from orbitrol steering unit | 15. Hydraulic accumulator |
| 8. Pressure maintaining valve | 16. Speedshift clutch |

A solenoid valve on top of the valve block controls oil pressure to the differential locks, front and back, operated by a switch under the driver's control.

The 18 Speedshift gearbox is controlled by a second solenoid valve on top of the valve block. The oil supply flows through a simple spring-loaded, ball-type, check valve into a gallery between the check valve and solenoid valve. Into this gallery is connected a hydraulic accumulator which holds a reserve of hydraulic pressure should the speedshift be operated when the pressure on the other side of the check valve is low. This low pressure could be due to the simultaneous operation of another service, e.g. engagement of the differential lock. This reserve of hydraulic power ensures correct operation of the clutch, reduced slippage and smooth operation.

The speedshift clutch is normally in 'Fast' speed and pressurized into 'Slow' speed. When the clutch is de-pressurized the oil behind the clutch piston is exhausted through the solenoid valve and back into the transmission case through a return pipe.



TL 2650

Speedshift Pressure Maintaining Valve

Overhaul 12B-30

Special tools:

MF.3001 Pressure Test Kit

MF.3011 Pressure Test Point

Disassembly



WARNING: Before working on the hydraulic system, exhaust the pressure from the hydraulic accumulator. Hydraulic oil pressure could cause personal injury.

1. Stop the engine.
2. With the ignition turned 'ON' operate the Speedshift button three times to exhaust any hydraulic pressure between the accumulator and the solenoid valve.
3. Turn 'OFF' the tractor ignition switch.
4. Disconnect the pressure switch wiring.
5. Disconnect the solenoid wiring.

6. Disconnect the hydraulic pipes.
7. Disconnect the hydraulic hoses.
8. Remove the two retaining bolts.
9. Remove and place the valve in a vice.
10. Unscrew the plug on the under side of the valve.
11. Remove the spring.
12. Remove the spool.
13. Remove the regulating valve.
14. Remove the shims.

Check valve

15. Remove the plug.
16. Remove the spring.
17. Remove the check valve ball.

Accumulator

18. Unscrew the accumulator.
19. Remove the sealing ring from the valve block.

Solenoid valve

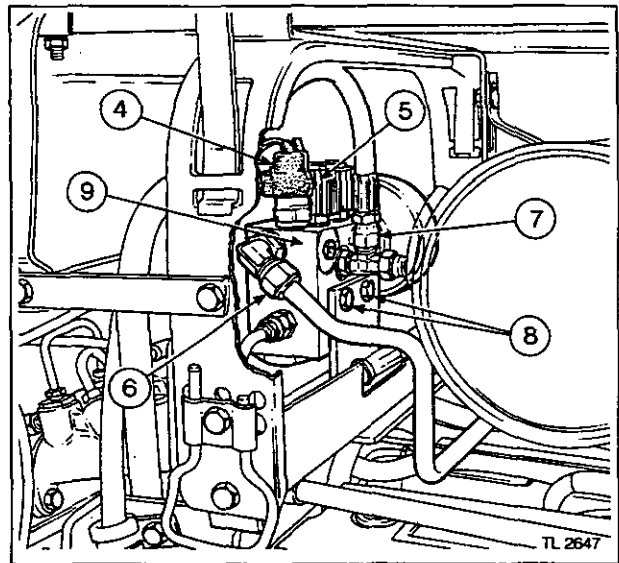
20. Unscrew the solenoid valve from the valve block.
21. The solenoid coil can be removed by unscrewing the nut and lifting it off the valve.
22. Discard the 'O' rings.

Pressure switch

23. Remove the pressure switch.

General

24. Discard any used 'O' rings.
25. Examine the regulating valve, spool and body. Ensure that all parts slide freely in the valve body and that the valve seat is undamaged.
26. Clean the check valve ball and housing, check for a damaged seat.
27. Clean the valve body, blowing out all passageways with compressed air.

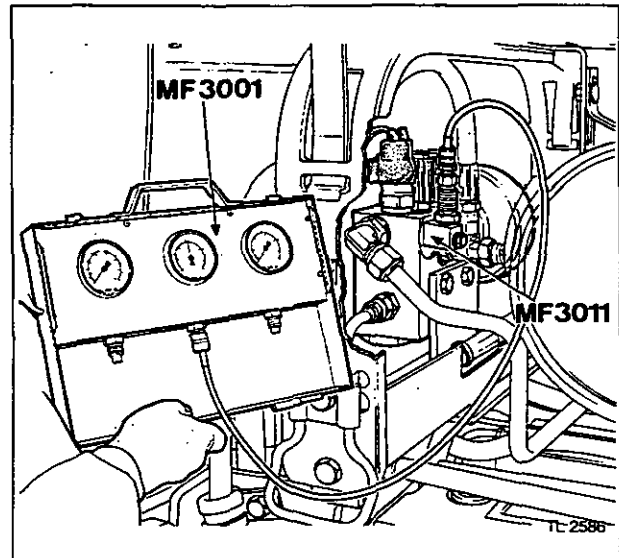


Reassembly

28. Reverse procedures 1 to 23 except:
 - a. Renew all 'O' rings.
 - b. Before fitting the accumulator fit a new sealing ring into the valve body.
 - c. Replace the pressure maintaining valve shims removed.
 - d. Tighten the solenoid valve body to a torque of 10 Nm (7 lbf ft). This is to prevent distortion of the valve body.
 - e. When installing a new coil, apply a drop of Massey ferguson Screw Lock (Loctite 222) to the nut (3) to prevent it vibrating loose and tighten only finger tight.
29. The various hydraulic pipes are connected to the valve as follows: -
 - A - 18 Speedshift gearbox (Marked 18 SP).
 - B - Four-wheel drive and PTO.
 - C - Hydraulic oil filter (Marked FILTER).
 - D - Oil cooler (supply in).
 - E - Return to transmission case (Marked TANK).
 - F - Test point.
 - G - Differential lock (Marked D/L).
30. Adjustment of the hydraulic pressure is made by the addition or removal of shims. The shims are available in the following thickness:

Pressure adjustment shims		
Part No.	Metric	Imperial
1679 210 M1	0,25 mm	0.010 in
1679 211 M1	0,50 mm	0.020 in
1679 212 M1	1,00 mm	0.039 in

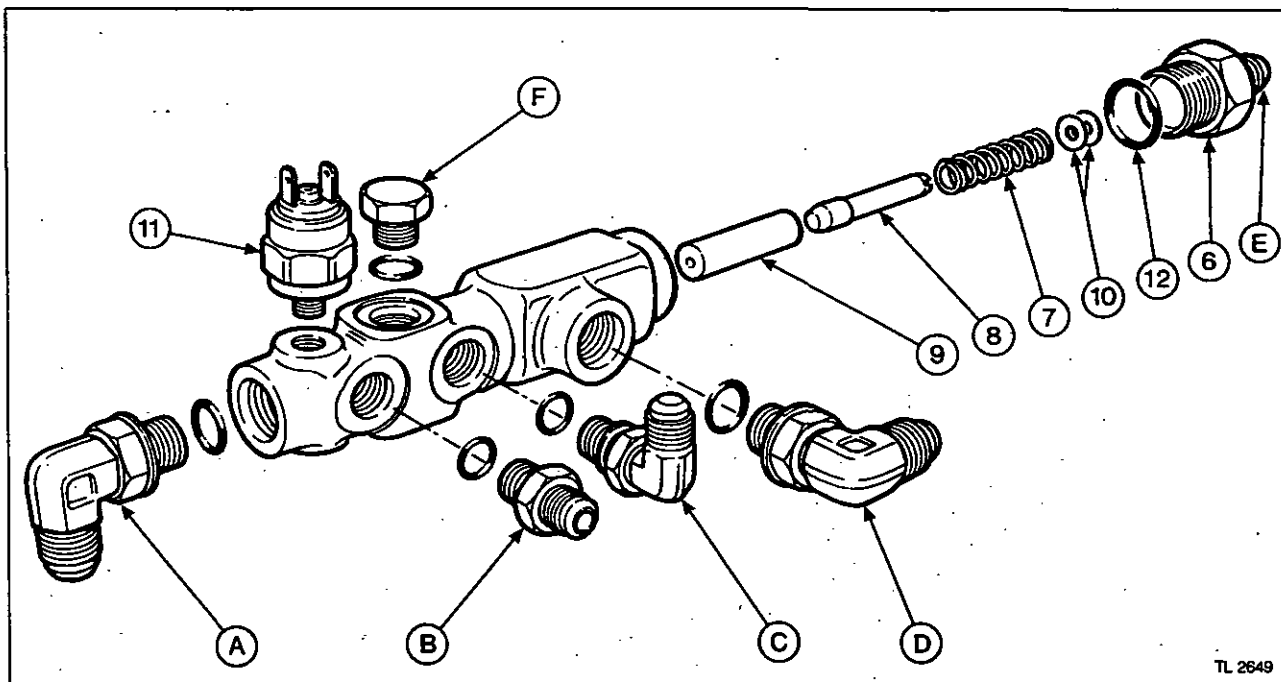
31. To check the pressure maintaining valve hydraulic pressure, install the MF.3001 Pressure Test Kit using the MF.3011 Pressure Test Point as shown in the illustration.
32. Start the engine and warm up the hydraulic oil by operating the auxiliary hydraulic controls until an oil temperature of 50-60°C (122-140°F) is attained.



33. Set the engine speed to 1200 rev/min.
34. The system pressure should be 22-24 bar (319-334 lbf/in²). **DO NOT EXCEED THIS SETTING.**
35. If the pressure does not meet the specification add or remove shims. See operation 7L-01 Speedshift Tests for further information.

12B-48

AUXILIARY HYDRAULICS



TL 2649

Pressure Maintaining Valve

Overhaul

12B-31

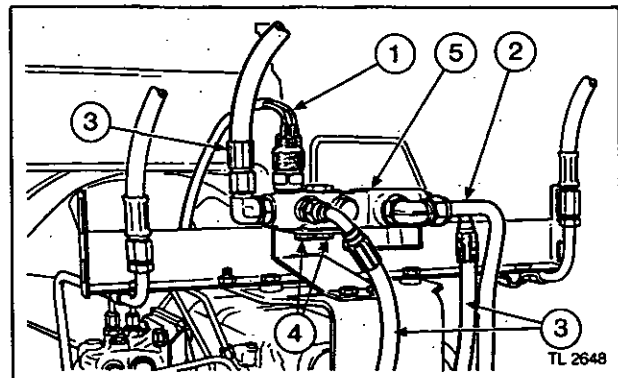
This pressure maintaining valve is fitted to all tractors excluding 18 Speedshift gearbox.

Disassembly

1. Disconnect the pressure switch wiring.
2. Disconnect the hydraulic pipes.
3. Disconnect the hydraulic hoses.
4. Remove the two retaining bolts.
5. Remove and place the valve in a vice.
6. Unscrew the adaptor from the end of the valve.
7. Remove the spring.
8. Remove the spool.
9. Remove the regulating valve.
10. Remove the shims.
11. Remove the pressure switch.
12. Discard any used 'O' rings.
13. Examine the regulating valve, spool and body. Ensure that all parts slide freely in the valve body and that the valve seat is undamaged.
14. Clean the valve body, blowing out all passageways with compressed air.

Reassembly

15. Reverse procedures 1 to 11 except:
 - a. Renew all 'O' rings.
 - b. Replace the shims removed.
 - c. Check the pressure maintaining valve pressure when fitted to the tractor, see operation 12B-03.



TL 2648

16. The various hydraulic pipes are connected to the valve as follows:-

- A - Steering unit (oil supply in).
- B - Power take-off and four-wheel drive.
- C - Differential lock(s).
- D - Hydraulic oil filter (oil supply out).
- E - Return to transmission case.
- F - Test point.

17. Pressure adjustment shims are available in the following thickness:

Pressure adjustment shims		
Part No.	Metric	Imperial
1679 210 M1	0,25 mm	0.010 in
1679 211 M1	0,50 mm	0.020 in
1679 212 M1	1,00 mm	0.039 in

18. Adjustment to the pressure is made by adding, subtracting or substituting shims. DO NOT exceed the recommended operating pressure of 16-19 bar (232-276 lbf/in²) for tractors with 3 cylinder engines and 22-24 bar (319-334 lbf/in²) for tractors with 4 and 6 cylinder engines.

DRAWBAR AND LINKAGE

INDEX

13A DRAWBAR AND LINKAGE

DRAWBAR AND LINKAGE

Section 13 – Part A

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DRAWBAR AND LINKAGE

Specifications

Linkage

Linkage types:

MF 340, 342, 350, 352, 355, 360, 362	Interchangeable ball ends category 1 and 2
MF 365, 372, 375, 382, 390	Interchangeable ball ends category 1 and 2
MF 362, 372, 375, 382, 390, 390T, 398, 399	Fixed ball ends category 2
MF 365, 375, 390, 390T, 398, 399	Hook ends category 2
MF 365, 375, 383, 390, 390T, 393, 396	Wrist action ends category 2
MF 398, 399	Telescopic ends category 2

Lift capacity at link ends with links horizontal:

Interchangeable ball ends category 1 and 2	2145 kgf (4729 lbf)
Interchangeable with one assistor ram	2529 kgf (5575 lbf)
Fixed ball and hook ends category 2	2586 kgf (5701 lbf)
Fixed ball and hook ends with one assistor ram	3059 kgf (6744 lbf)
High tear-out hook ends with two assistor rams	3678 kgf (8108 lbf)
Wrist action ends category 2	2454 kgf (5410 lbf)
Telescopic ends category 2	2498 kgf (5507 lbf)

Assistor lift rams:

MF 340, 342, 350, 352, 355, 360, 362	Not to be fitted
MF 365, 372, 375, 382, 390, 390T	One, optional equipment
MF 398	One, standard linkage
MF 398, 399	Two, high tear-out linkage

Drawbars

Drawbar (Auto Hitch Type):

Swinging drawbar static load:	
Outer position	1179 kgf (2599 lbf)
Inner position	1633 kgf (3600 lbf)
Swing drawbar distance to PTO shaft:	
Outer position	356 mm (14 in)
Inner position	254 mm (10 in)

Drawbar (Fixed Trailer Hitch)

Swinging drawbar static load:	
Inner position	1000 kgf (2205 lbf)
Centre position	775 kgf (1710 lbf)
Outer position	775 kgf (1710 lbf)
Swing drawbar distance to PTO shaft:	
Inner position	241 mm (9.5 in)
Centre position	355 mm (14 in)
Outer position	400 mm (16 in)

Telescopic Draw bar static load:

Retracted position	Hook	Drawbar clevis
Intermediate position	2718 kgf (5992 lbf)	2265 kgf (4993 lbf)
Extended position	2265 kgf (4993 lbf)	2265 kgf (4993 lbf)
Maximum horizontal pull	2265 kgf (4993 lbf)	Not recommended
	6795 kgf (14980 lbf)	

Telescopic Drawbar distance to PTO shaft

Retracted position	Hook	Drawbar clevis
Intermediate position	150 mm (6 in)	235 mm (9.1/4 in)
Extended position	315 mm (11.1/2 in)	400 mm (15.3/4 in)
	400 mm (14.3/4 in)	Not recommended

Automatic Hitch:

Maximum static load	2265 kgf (4993 lbf)
---------------------	---------------------

Bolt Torques

Drawbar frame to centre housing	420 Nm (310 lbf ft)
Drawbar side supports to trumpet housing bolts	110 Nm (80 lbf ft)
Drawbar frame to Control beam frame	245 Nm (180 lbf ft)

General Description

The three point linkage controls the vertical movement of the mounted and semi-mounted implements. (See figure 1).

The linkage consists of:

1. Top link
2. Two lower links
3. Two lift rods
4. Two check chains
5. Control beam
6. Interchangeable ball ends
7. Levelling box
8. Stabiliser chains

Top Link (1)

The top link transmits the draft reaction forces from the soil engaging implements to the control spring and plunger assembly in the lift cover.

The top link consists of three main components:

Top ball end
Turnbuckle barrel and spring locking clip
Bottom ball end (Implement end)

The top link is adjustable for length, seven rings are machined on each ball end shank; the centre or wider marker ring indicates its normal length. The turnbuckle is prevented from rotating by the spring locking clip at its top end.

Lift Rods (2)

The two lift rods connect the lift arms to the lower links having a knuckle type joint at the top end with the link arms and a swivelling bolt at the bottom end with the lower links.

The left-hand lift rod consists of three main components, knuckle joint, yoke section and lower fork. The lift rod is set to length and should not be changed.

The right-hand lift rod is similarly constructed but the yoke section incorporates a bevel gear levelling box, thus the length can be adjusted for attachment to the implement. By rotating the handle of the levelling box, the yoke shank is screwed out of or into the lower fork.

The lower fork section of both lift rods may have an alternative elongated lower link attachment hole. This will permit lift rod float when working with wide implements. In this instance one lift rod is detached from the lower link and rotated 180° and refitted using the elongated hole. The lubricator will point downwards.

The two lower links can be fitted with various types of ends as follows:

Interchangeable ball Category 1 or 2 (illustrated).
Fixed ball category 2.
Telescopic category 2.
Wrist action category 2.
Hook category 2.

Two holes are provided in the lower link so that the height of lift can be varied. On the M-F398 and M-F399 tractors the lower links can be fitted with a hump which gives a high Tear-out when the implement is in the ground.

A spring clip is fitted to the outer end of the lower link toward the implement for stowage of the linch pin when not in use.

DRAWBAR AND LINKAGE

Check Chains (4)

The two check chains restrict the sideways movement of the lower links to prevent them or the implement fouling the inside walls of the rear tyres.

The check chains are fitted between the bottom end of the control beam bracket and the inner face of each lower link using the lift rod bolts.

The check chains are set longer for Category 2 implements.

Control Beam (5)

The control beam connects the top link to the control spring rod of the tractor hydraulic system when the draft control is in use and thus governs the action of the implement.

Figure 1 Three Point Linkage

Interchangeable Ball Ends (6)

Interchangeable ball ends are fitted to the rear ends of the two lower links, thus Category 1 and 2 implements can be used.

Normally Category 1 ball ends are stowed.

The ball ends are changed by pulling up a spring wire clip, laying the ball ends flat and aligning the cut out of the ball end with the slot in the lower link and sliding it out. The replacement ball is fitted by reversing the removal procedure.

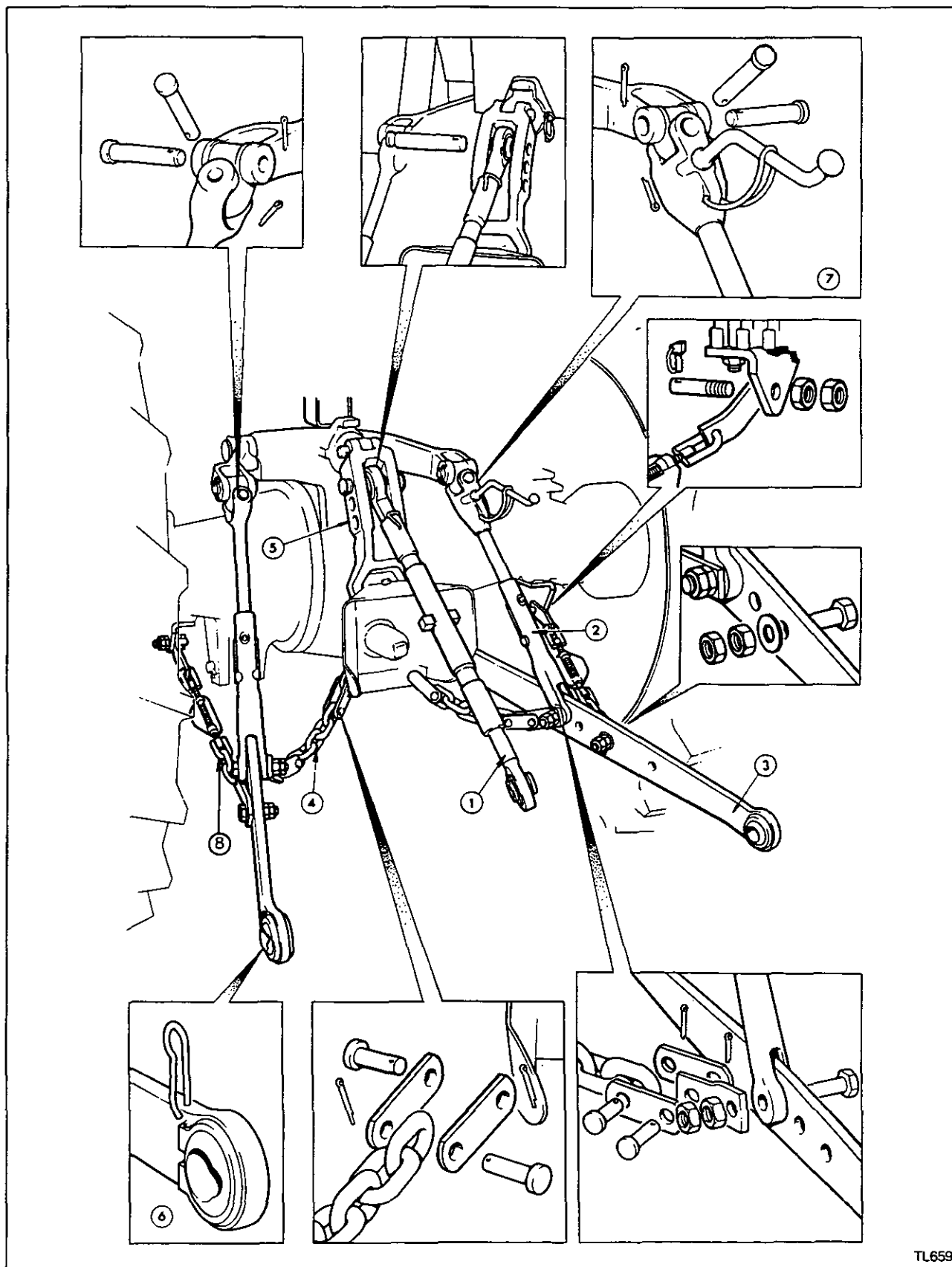
Levelling Box (7)

The levelling box is used to adjust the length of the right-hand lift rod, to assist in hitching the implement and to adjust the implement for level.

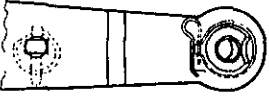
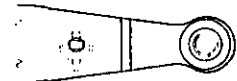
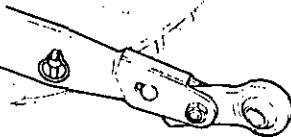
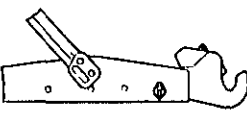
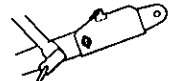
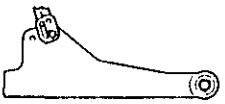
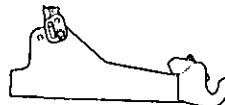
Stabiliser Chains (8)

The two stabiliser chains are adjustable for length using the turnbuckles. They must be adjusted to give implement sideswing when fully raised in the transport position.

DRAWBAR AND LINKAGE



TL659

Linkage Type	LIFT ROD LENGTHS									
	Model									
	340, 350	355	360, 362	365	375	383	390, 390T	398	399	
Interchangeable 	620 mm 24.5 in	620 mm 24.5 in	620 mm 24.5 in	620 mm 24.5 in	620 mm 24.5 in	— —	— —	— —	— —	Standard Tractor
Fixed 	— —	— —	— —	638 mm 27 in	638 mm 27 in	683 mm 27 in	683 mm 27 in	683 mm 27 in	— —	Standard Tractor
Wrist Action 	— —	— —	— —	— —	666 mm 26.25 in	666 mm 26.25 in	666 mm 26.25 in	— —	— —	Standard Tractor
	— —	— —	— —	— —	635 mm 25 in	635 mm 25 in	635 mm 25 in	— —	— —	Low-Profile Tractor
Hook 	— —	— —	— —	683 mm 27 in	683 mm 27 in	— —	683 mm 27 in	683 mm 27 in	— —	Standard Tractor
Telescopic 	— —	— —	— —	— —	— —	— —	— —	683 mm 27 in	683 mm 27 in	Standard Tractor
Fixed 	— —	— —	— —	— —	— —	— —	— —	441 mm 17.4 in	441 mm 17.4 in	High Tear Out Linkage
Hook 	— —	— —	— —	— —	— —	— —	— —	441 mm 17.4 in	441 mm 17.4 in	High Tear Out Linkage

L.H. Lift Rod**Removal and Refitment**

13A-01

Removal

1. Place the position control lever in the lowered position.
2. Unscrew the two locking nuts.
3. Remove the lift rod link arm bolt.
4. Remove the split pin.
5. Remove the lift rod to lift arm pin.

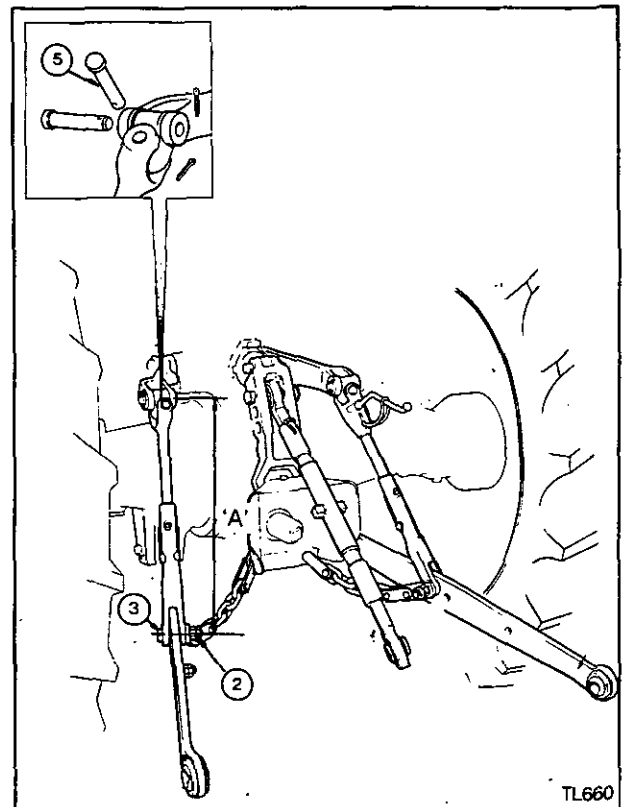
Note: Where an assistor ram is fitted, the collar and retaining roll pin will have to be removed before removing the lift rod to lift arm pin.

6. Lift the lift rod from its mounted position.

Refitment

7. Reverse procedures 1 to 6.

Note: When refitting the lift rod length 'A' it must be set to one of the following dimensions shown in the chart on page 13A-06.

**Right-Hand Lift Rod and Levelling Box****Removal and Refitment**

13A-02

Removal

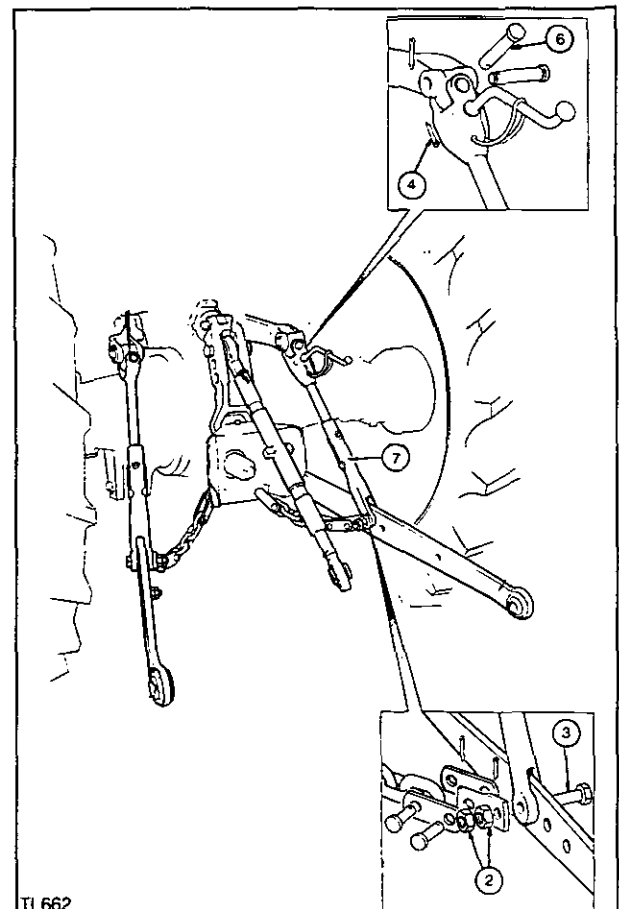
1. Place the position control linkage in the lower position.
2. Unscrew the two locking nuts on the lift rod bolt.
3. Remove the link arm to lift rod bolt.
4. Remove the split pin.
5. Slacken the pickup hitch arm retaining bolt to aid lift rod to lift arm pin removal and refitment if fitted.

Note: Where an assistor ram is fitted, the collar and retaining roll pin will have to be removed before removing the lift rod to lift arm pin.

6. Remove the lift rod to lift arm pin.
7. Lift the lift rod assembly from its mounted position.

Refitment

8. Reverse procedures 1 to 7.



13A-08

DRAWBAR AND LINKAGE

Levelling Box

Overhaul

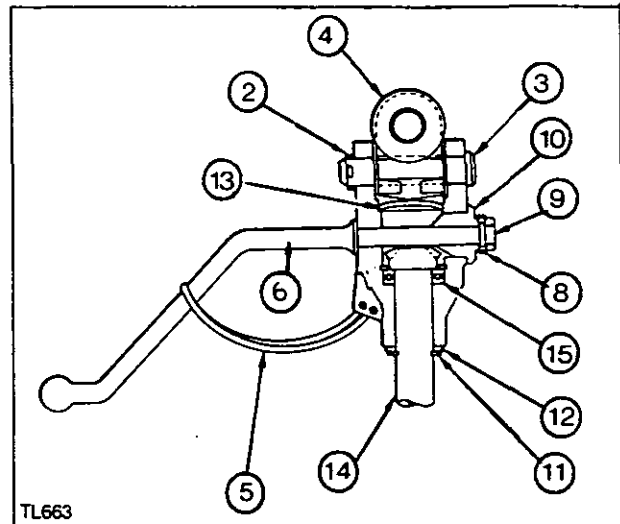
13A-03

Disassembly

1. Remove the right-hand lift rod, see operation 13A-02.
2. Discard the split pin.
3. Remove the knuckle clevis pin.
4. Remove the knuckle.
5. Release, spring apart and remove the spring clip.
6. Rotate the handle.
7. Lay aside the lower fork.
8. Drill off the head and eject the handle rivet.
9. Withdraw the handle shaft.
10. Withdraw the bevel gear.
11. Remove the circlip.
12. Remove the thrust washer.
13. Collapse and remove the domed plug.
14. Remove the levelling gear shaft.
15. Remove the roller bearing.

Reassembly

16. Reverse procedure 1 to 15 except:
 - a. Position the roller bearing within the levelling box, casing face first.
 - b. Fit the domed plug concave face first and, using a large diameter drift, flatten the convex face sufficiently for the domed plug to grip the bore.
 - c. Renew the handle rivet.
 - d. Renew the split pin.



Right-Hand Lift Rod and Levelling Box with Cab Control

Removal and Refitment

13A-04

Removal

1. Place the position control linkage in the lowered position.
2. Unscrew the two locking nuts on the lower lift rod bolt to lower link.
3. Remove the lower link to lift rod bolt.
4. Remove the split pin from the upper pivot pin.
5. Slacken the pick up hitch arm retaining bolt, if fitted, to aid lift rod to lift arm removal and refitment.

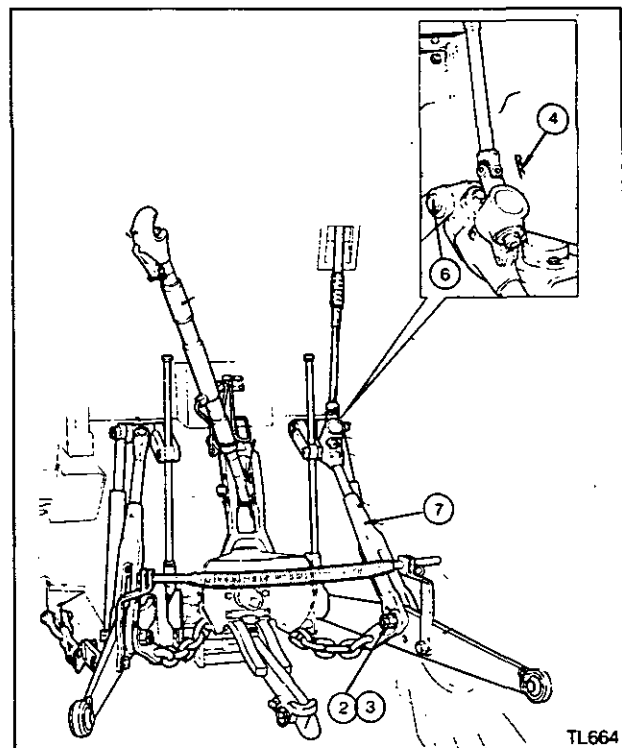
Note: Where an assistor ram is fitted, the collar and retaining pin will have to be removed before removing the lift rod to lift arm pin.

6. Remove the lift rod to lift arm pin.
7. Lift the lift rod assembly from its mounted position withdrawing the drive shaft from the cab control.

Refitment

8. Reverse procedures 1 to 7.

Note: Do not over-tighten the inner locknut on the lower lift rod bolt to lower link. It must be free to rotate.



Levelling Box with Cab Control**Overhaul**

13A-05

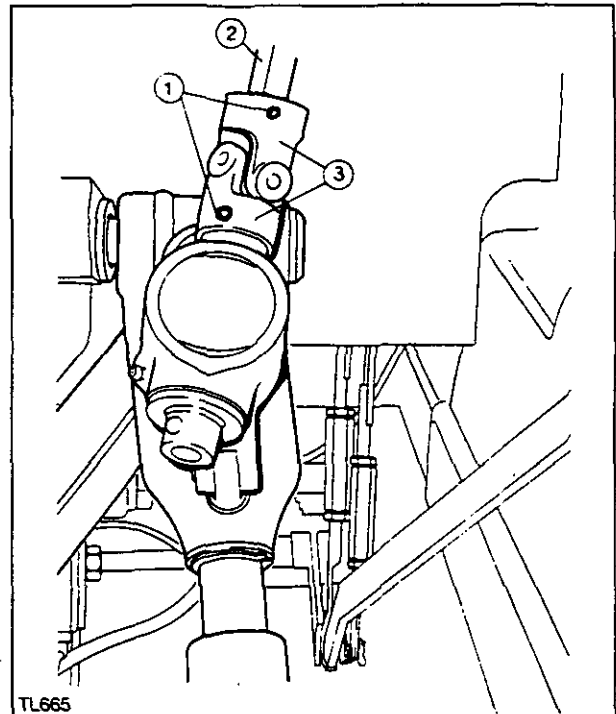
Disassembly

1. Remove the roll pins.
2. Remove the telescopic shaft.
3. Remove the universal joint.
4. Drill out the two pivots.
5. Remove the nut, washer and bolt.
6. Drive out the roll pin.
7. Remove the level gear.
8. Lift off the levelling box remote gearbox.
9. Remove the level gear.
10. Lift out the shaft.
11. Lightly tap the level gear and shaft to dislodge the domed washer.
12. Remove the domed washer.
13. Remove level gear and shaft.
14. Unscrew the lower lift rod section.
15. Remove the circlip.
16. Remove the washer.
17. Lightly tap the lift rod shaft to dislodge the domed washer.
18. Remove the domed washer.
19. Lift out the lift rod shaft from the levelling box casting.
20. Remove the bearing assembly from the levelling box casting.
21. Inspect the levelling box casting for wear or damage.

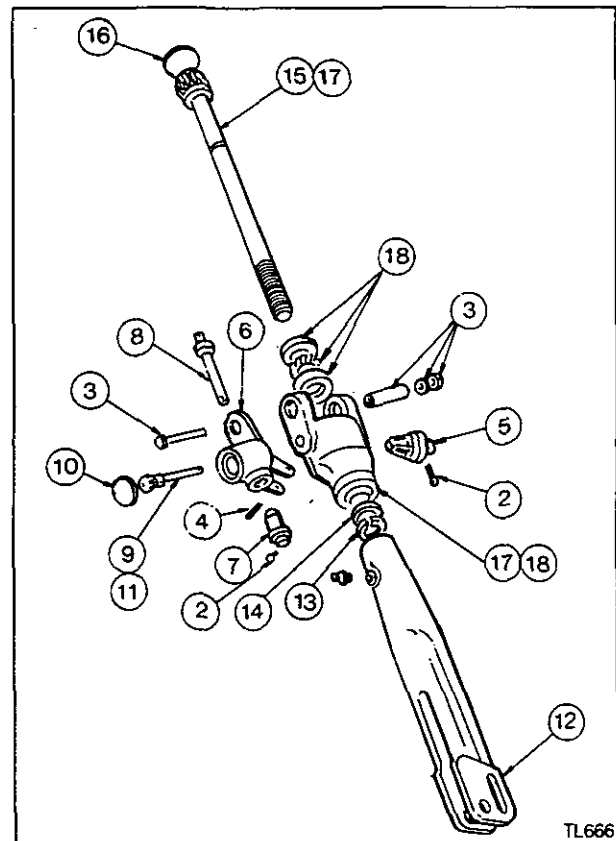
Assembly

20. Reverse procedures 1 to 21.

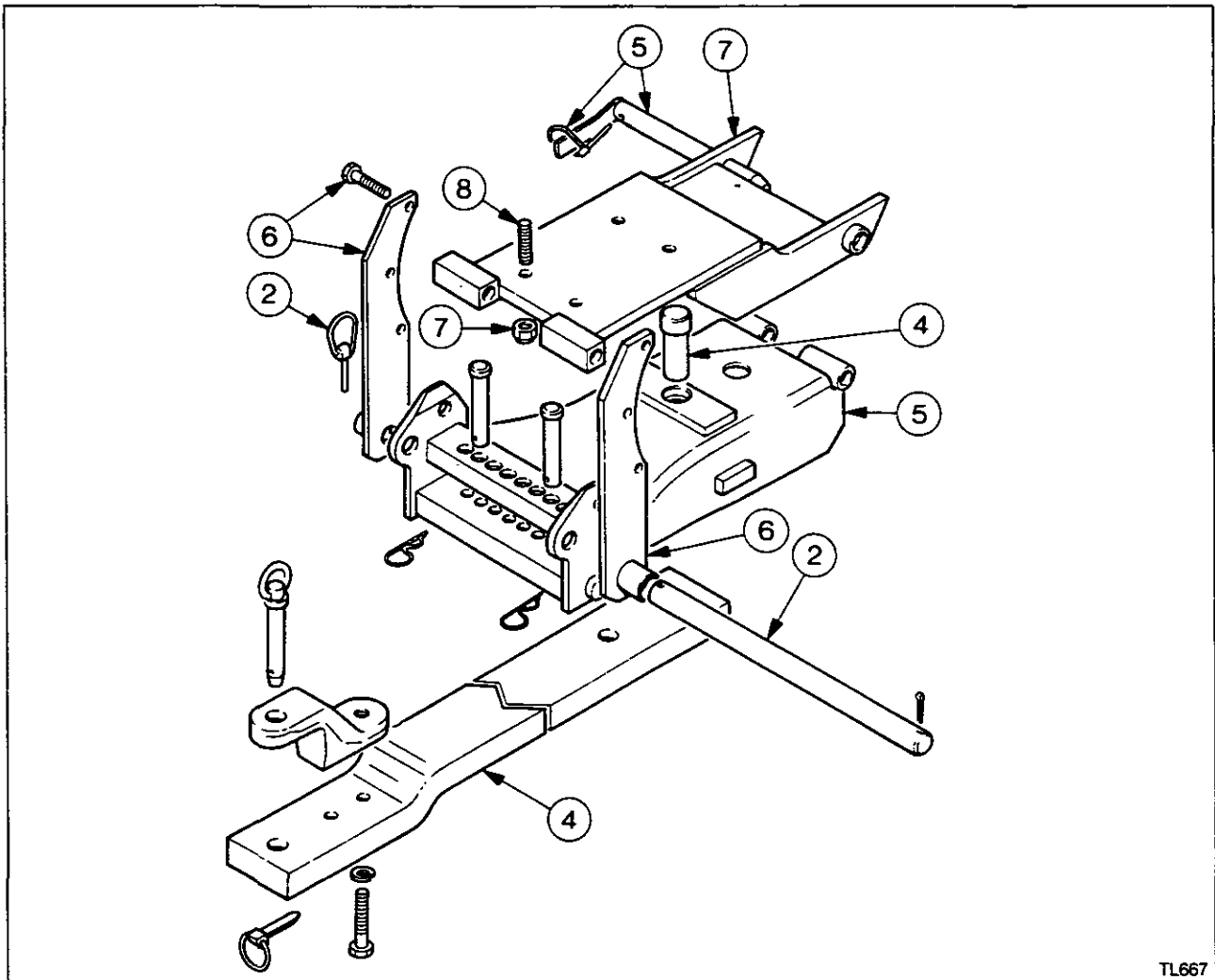
Note: Pack grease into the levelling box and remote gearbox. Replace all roll pins, split pins, pivots and circlips with new items upon reassembly.



TL665



TL666



TL667

Swinging Drawbar**Removal and Refitment**

13A-06

Removal

1. Support the drawbar with a suitable adjustable jack.
2. Remove the linch pin and withdraw the shaft on both normal and heavy duty drawbars.
3. Lower the drawbar and carrier.
4. Remove the retaining pin, support the drawbar carrier, and withdraw the drawbar from the carrier.
5. While supporting the drawbar carrier remove the linch pin and withdraw the rear shaft. Lift the drawbar carrier clear of its mounted position.
6. On heavy duty drawbar assemblies, remove the three bolts on each side, retaining the support brackets to the rear centre case, and remove the support brackets.

7. Remove the four locking nuts retaining the base plate to the axle centre case, and lower base plate from its mounted position.
8. Remove the four studs from the centre case.
9. Check all parts for wear or damage and replace if worn or damaged with new parts.

Refitment

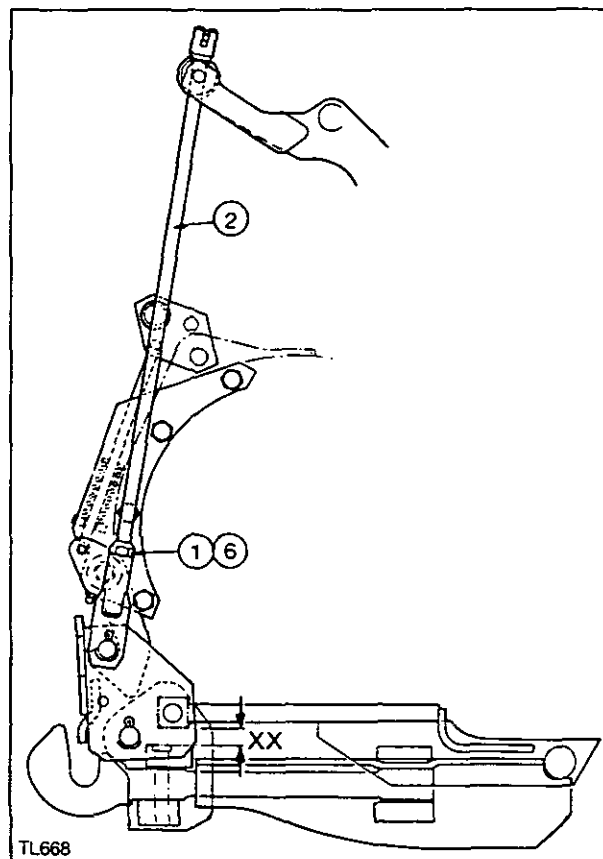
10. Reverse procedures 1 to 9 except:
 - a. Use new carrier plate retaining locking nuts.
 - b. Tighten the carrier plate retaining locking nuts to a torque of 271 Nm (200 lbf ft).

Auto Hitch**Adjust****13A-07****Procedure**

1. Fully slacken the lower locknuts.
2. Unscrew the Lift Rods out of the lower strap leaving 20 mm (3/4 in) of thread engagement.
3. With the tractor engine running, move the Position Control lever to Constant Pumping.
4. Adjust the Lift Rod finger tight to just take up the clearance at gap 'XX'.
5. Tighten the Lift Rods by two complete turns.
6. Tighten the lower locknuts.

NOTE: Check the clearance of the Check Chain clevis pins and lift shaft. Reverse pins if necessary.

When the Position Control Lever is in the Transport position the hitch should be resting on the latch hooks.



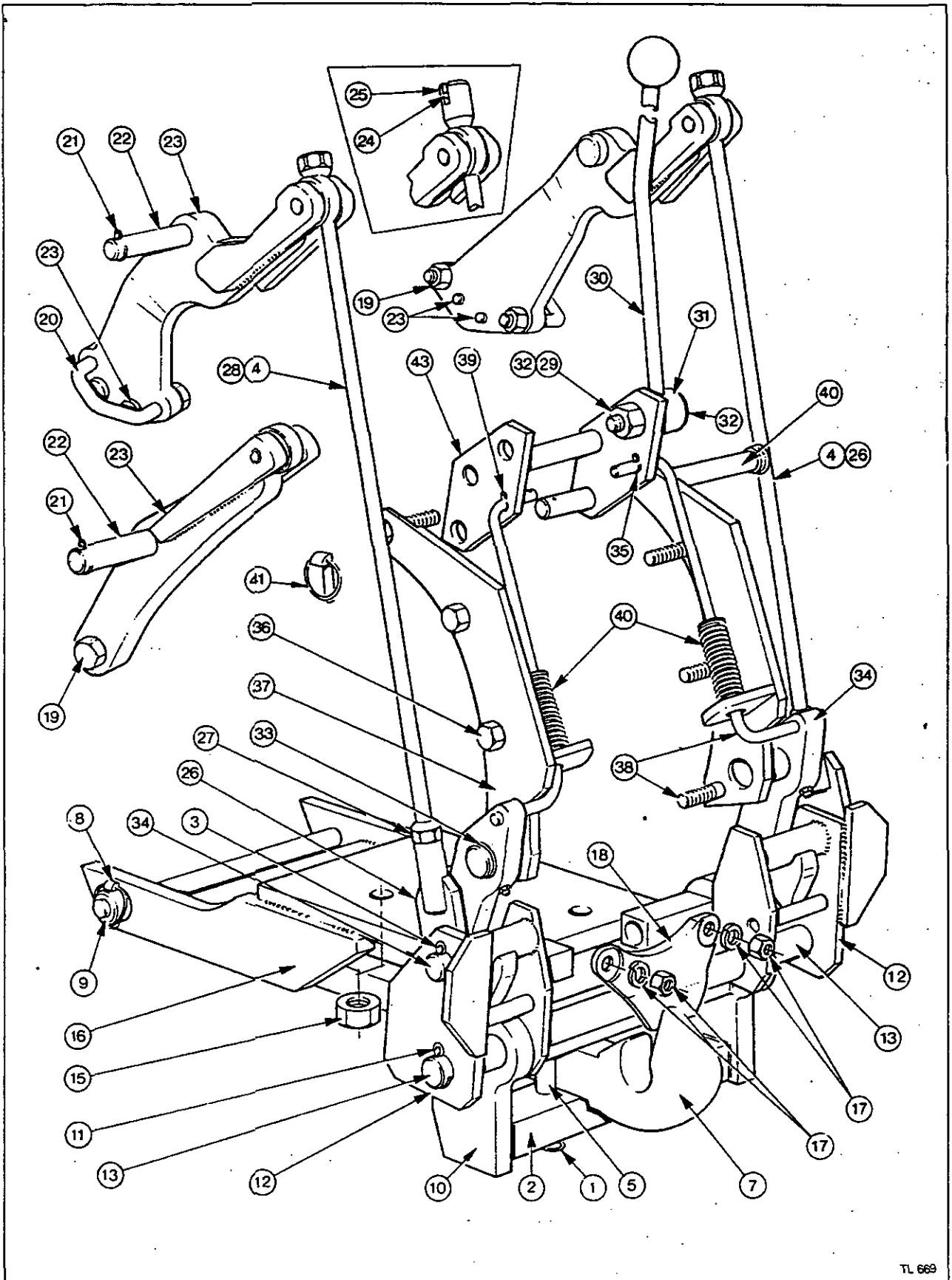
Auto-Hitch**Removal and Refitment****13A-08****Removal**

1. Remove the two hair pins.
2. Lower the auto-hitch onto a trolley jack.
3. Discard the two lift rod split pins.
4. Detach the lift rods.
5. Remove the two locating pins.
6. Remove the pivot pin.
7. Remove the hitch hook.
8. Remove the front linch pin.
9. Remove the support pin.
10. Remove the mounting frame on a trolley jack.
11. Discard the two split pins.
12. Match mark and remove the two catches.
13. Remove the lift shaft.
14. Support the attachment bracket with the trolley jack.
15. Remove the four locking nuts.
16. Remove the attachment bracket with the trolley jack.
17. Remove the two bottom control beam nuts and washers.
18. Match mark and remove the hook stop.
19. Remove the four locking nuts or two bolts and lockwashers.
20. Normal duty auto-hitch only, remove the two 'U' bolts.
21. Discard the two split pins.
22. Remove the two clevis pins.
23. Remove the two lift arm extensions, or the four lift arm extension adjuster buttons and lift rod assemblies.
24. N/A.
25. N/A.
26. Remove the two straps.
27. Remove the lock nuts.
28. Remove the two lift rods.
29. Slacken off the handle trunnion nut.
30. Withdraw the handle.
31. Remove the trunnion tube.
32. Remove the trunnion nut and trunnion.
33. Remove the two snap rings.
34. Match mark and remove the two latches.
35. Discard the two inner push rod split pins.
36. Remove the eight support bracket bolts.
37. Remove the two support brackets.
38. Remove the two push rods.
39. Discard the two outer push rod split pins.
40. Remove the two springs.
41. Remove the linch pin.
42. Remove the long pin.
43. Match mark and remove the pivot bracket.

Refitment

44. Reverse procedures 1 to 43 except:
 - a. The pivot assembly is fitted welded bar upwards and forwards.
 - b. The bottom ends of the two push rod and spring assemblies are trapped under the cut outs in the support brackets.
 - c. Tighten the eight support bracket bolts to a torque of 110 Nm (80 lbf.ft).
 - d. Fit new split pins.
 - e. The two latches are fitted open face rearwards.
 - f. Ensure that the two snap rings locate correctly in their grooves.
 - g. The handle is normally fitted to the right hand plate of the pivot assembly.
 - h. The lift rod nuts are fitted unslotted end first.
 - i. The fitting of the lift rod roll pins is delayed until after the auto-hitch has been adjusted.
 - j. The heads of the two extension arm clevis pins are positioned on the extension arm side.
 - k. Normal duty auto-hitch only, after the top 'U' bolts have been fitted to the lift arms and extensions, size the four adjuster buttons by rotating the two flats in each protruding threaded shank to touch the lift arm before finally tightening the four locking nuts.

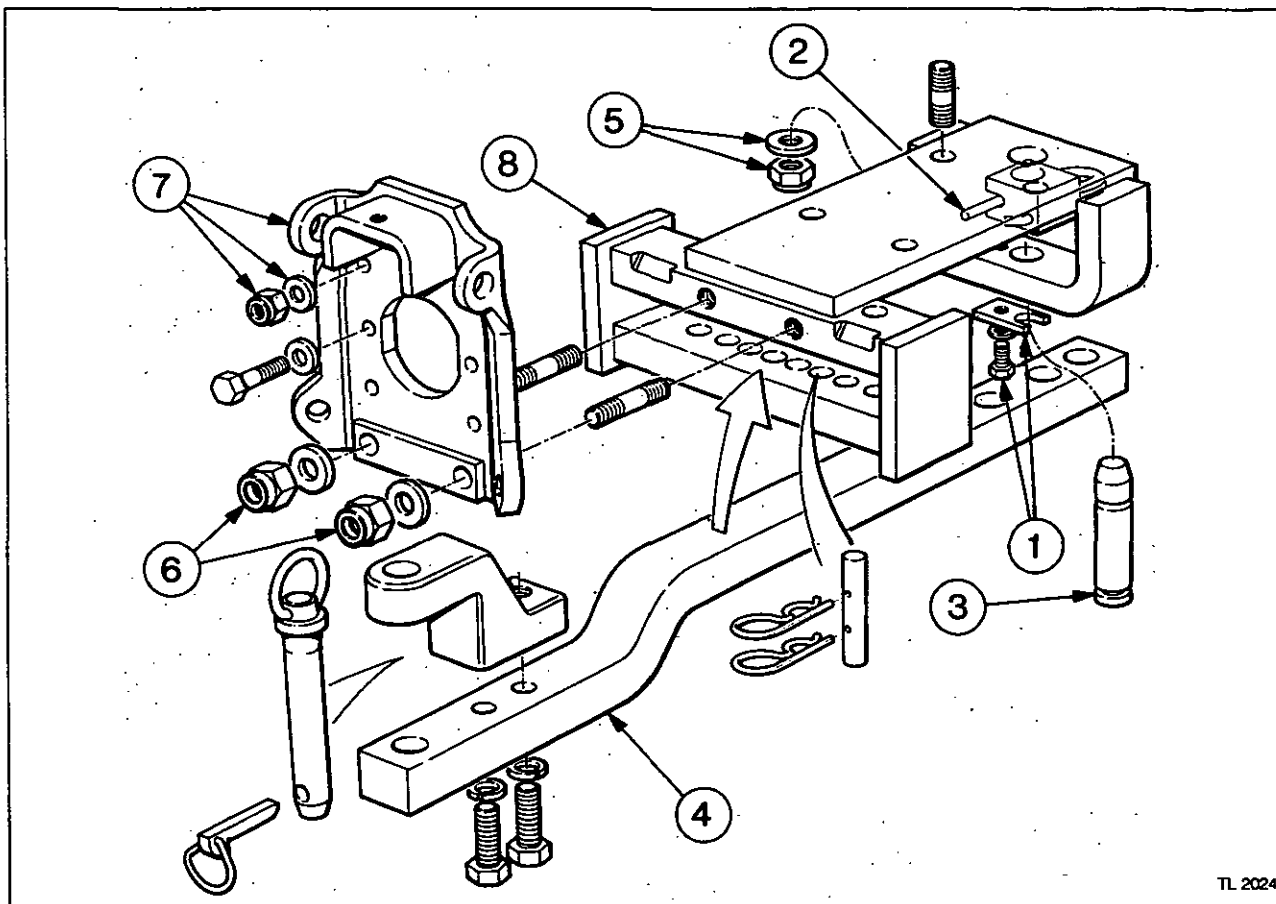
13A-13
DRAWBAR AND LINKAGE



TL 669

13A-14

DRAWBAR AND LINKAGE



Swinging Drawbar for Fixed Trailer Hitch

Removal and Refitment

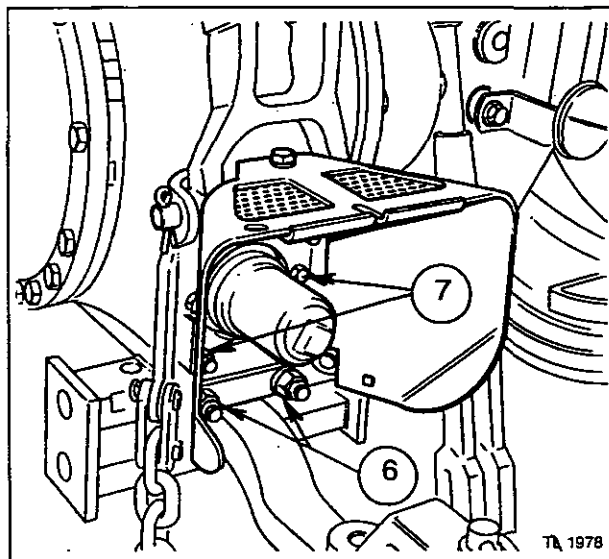
13A-09

Removal

1. Remove the locking plate, bolt and lockwasher.
2. Pull the pin retaining spring to the left to release the pin.
3. Remove the drawbar pivot pin.
4. Withdraw the drawbar rearwards from the drawbar frame.
5. Remove the four self-locking nuts and washers holding the frame to the bottom of the axle centre housing.
6. Remove the two self-locking nuts and washers holding the frame to the rear control beam bracket fitted to the rear of the axle centre housing.
7. Remove the four self-locking nuts and two hex head bolts holding the control beam bracket to the tractor. Remove the control beam bracket.
8. Remove the drawbar frame.
9. Check all parts for wear or damage and replace any worn or damaged parts with new parts.

Refitment

10. Reverse procedures 1 to 8 except:
 - a. Use new locking nuts or apply Massey Ferguson Studlock (Loctite 270) if new locking nuts are not available.



- b. If any studs are being replaced refit using Massey Ferguson Studlock (Loctite 270).
- c. Tighten the two lock-nuts (6) to a torque of 245 Nm (180 lbf ft).
- d. Tighten the four lock-nuts (5) to a torque of 420 Nm (310 lbf ft).
- e. Tighten the four lock-nuts (7) to a torque of 140 Nm (103 lbf ft).

ELECTRICS

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14B	WIRING DIAGRAMS
14C	FOOTSTEP WIRING DIAGRAMS
14E	CAB WIRING DIAGRAMS

ELECTRICAL SYSTEM

Section 14 – Part A

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14A-2

ELECTRICAL SYSTEM

Specifications

Battery:	
Make	Massey Ferguson maintenance free
Type	372 (14 plate)
Cold start performance	420 amps IEC
	590 amps SAE
Reserve capacity at 25 amp	130 mins.
Voltage	12 volts
Bench charging rate	7 amps
Maximum charging voltage	15 volts
Acid capacity	3,5 litre (6 pt)
Weight	19,5 kg (43 lb)
Size	175 wide, 271 long, 205 mm high
Terminals	Standard post
Model application	See page 14A-07
Type	665 (14 plate)
Cold start performance	570 amps IEC
	610 amps SAE
Reserve capacity at 25 amp	220 mins.
Voltage	12 volts
Bench charging rate	9 amps
Maximum charging voltage	15 volts
Acid capacity	6,5 litre (1.4 gal)
Weight	29,5 kg (65 lb)
Size	173 wide, 345 long, 233 mm high
Terminals	Standard post
Model application	See page 14A-07
Alternator:	
Make	Lucas or Magneti Marelli
Type - Footstep tractors	A127-45
Type - Cab tractors	A127-70
Maximum output - Footstep tractors	45 amp
Maximum output - Cab tractors	70 amp
Regulator	Machine sensed
Regulating voltage	14.2± 0.2 volts
Belt tension:	
3 and 4 cyl. engine tractors	19 mm (3/4 in)
6 cyl. engine tractors	10 mm (3/8 in)
Starter motor:	
Make	Lucas or Magneti Marelli
Model:	
MF 340, 342, 350, 352, 355, 360,	M113 (Normal duty) 1.8 Kw
MF 340, 342, 350, 352, 355, 360	M127 (Cold climate) 2.2 Kw
All other models	M127 2.2 Kw
Voltage	12 volt
Type	Pre-engaged

ELECTRICAL SYSTEM

Fuses

Type Flat blade – 5,10,15 or 25 amp

For tractors up to Serial No. V52267

Main fuse box – world wide – Cab and footstep

Fuse No.	Application	Colour	Rating
1	Side and rearlights, Number plate, Switches, Instrument panel	Red	10A
2	Cigar lighter	Blue	15A
3	Headlights dipped	Red	10A
4	Headlights main	Red	10A
5	Horn and worklights	Red	10A
6	Hazard warning lights	Red	10A
Single	Direction indicator, parking brake, Speedometer (when fitted)	Blue	15A

Main fuse box – North America – footstep

Fuse No.	Application	Colour	Rating
1	Rear Work light and horn	Red	10A
2	Headlight, Front Work light, side and rear lights, Switches and Instruments	Blue	15A
3	Idle speed light and differential lock	Brown	5A
4	Cigar lighter	Blue	15A
5	Multi-Power	Brown	5A
6	Spare	—	—
Single	Multi-Power	Brown	5A

Cab fuse box – World wide

Fuse No.	Application	Colour	Rating
1	Windscreen wiper	Red	10A
2	Heater blower motor	Blue	15A
3	Interior light	Brown	5A
4	Spare	—	—
5	Spare	—	—
6	Spare	—	—

For tractors Serial No. V52268 on see page 14A-06

Light bulbs

Voltage 12 volt

Application	Watts	Cap	Type	M-F Powerpart Number
Headlight white	45/40	P45t	UEC	961 866 M1
Headlight yellow	45/40	P45t	UEC	965 465 M1
Worklight	55	PK22s	H3	1628 494 M1
Plough light	55	PK22s	H3	1628 494 M1
Direction Indicator	21	BA15s	SCC	621 235 M1
Stop and rear light	5/21	BAY15d	SBC index	908 543 M1
Side – footstep	5	BA15s	SCC	1420 037 M1
Side – Cab	5	SU8,5.8	Festoon	621 234 M1
Number plate footstep	5	SU8,5.8	Festoon	621 234 M1
Number-plate – cab	5	BA15s	SCC	1420 037 M1
Interior light	5	SU8,5.8	Festoon	621 234 M1
Idle speed indicator	3	W2.1 x 9,5d	Wedge base	1048 302 M1
Alternator charge light			(capless)	
Instrument panel	2.6	—	Special	3476 232 M1
Warning lights	2	—	Special	3476 234 M1
Switch lights	1.2	W2 x 4,6d	Wedge base	3045 185 M1
			(capless)	
Rear red light	5	BA15s	SCC	1420 037 M1
Double sided flashing indicator	21	BA15d	SBC	1889 735 M1

Type code:

- SBC – Small bayonet cap
- SCC – Single centre contact
- UEC – Unified European contact
- H3 – Tungsten Halogen

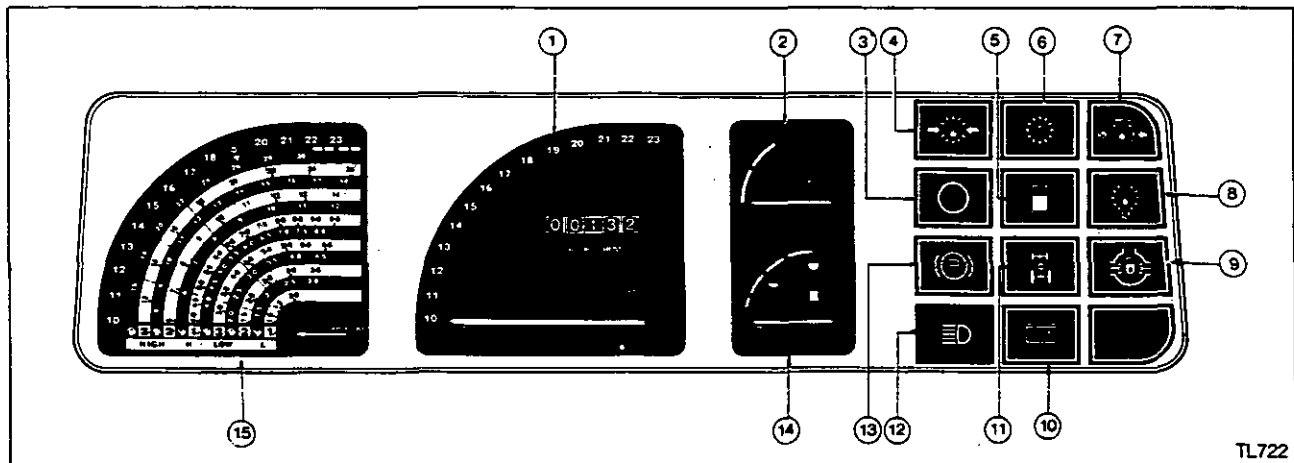


Figure 1

TL722

Electrical System

General

The electrical system of the M-F 300 Series tractors comprises a 12 volt negative system, charged by a 45 ampere alternator. The alternator has an integral rectifier and regulator and the charging control is machine sensed. An additional terminal is provided on the back of the alternator to power the electronic engine tachometer. The alternator is mounted on the right hand side of the engine and is driven by a V-belt from the crankshaft pulley. Adjustment of the V-belt tension is provided for with a slotted link and clamp bolts on the alternator.

The starter motor is a pre-engaged type mounted on the left hand side of the engine for 4 and 6 cylinder engines and on the right hand side of 3 cylinder engines. A neutral safety start switch is fitted on the top of the transmission and on the PTO control lever. This renders the starter motor inoperative until the dual range selector lever is in the neutral position and the PTO lever in the disengaged position. A relay controls the supply to the starter solenoid to prevent voltage drop.

On tractors with 3 cylinder engines a single 12 volt 420 CCA battery is mounted behind the front grill of the tractor. On 4 and 6 cylinder engine tractors two 12 volt 420 CCA batteries are mounted under the footsteps on the left hand and right hand side of the tractor.

The console is of a similar layout on all M-F 300 series tractors comprising of an integral instrument panel and warning lights. Switches are provided below the panel for all electrical services.

Instrument panel (Figure 1)

The instrument panel console is supplied from a variety of senders. The senders are all basically electrical in design, therefore the panel receives no mechanical inputs.

The tachometer is driven electrically from the alternator. The tachometer senses the variable frequency given off by the alternating current side of the alternator as the engine speed varies, hence the extra connection on the back of the alternator.

Alternators on 3 cylinder compared to 4/6 cylinder engines are driven at differing crankshaft pulley/ alternator pulley ratios, therefore two designs of tachometer are required.

The tachometer starts to display engine speed at 1000 rev/min, the idle speed of the engine is 750 rev/min. To enable the idle speed to be set a small bulb is situated behind the left hand instrument side panel. To set the idle speed watch the bulb while adjusting the full pump throttle stop. At engine speeds below 750 rev/min, the bulb will be brightly lit. At 750 rev/min (+/- 25 rev/min) the light will glow. At higher engine speeds, the light will go out completely.

The engine water temperature and fuel level gauges work off conventional variable resistance type senders.

If a speedometer is fitted, a magnetic pick-up sensor is fitted inside the tractor centre housing. The magnetic sensor is located adjacent to a notched wheel attached to the final drive pinion. The magnetic pulses drive the speedometer through an electronic interface which can be arranged to suit the transmission and wheel configuration of the tractor to give accurate ground speed.

The instrument panel has several displays and warning lights which are as follows:

1. Tachometer – showing engine revolutions and hour meter.
2. Temperature gauge – showing engine water temperature.
3. Air cleaner blocked warning light (dry type cleaner only).
4. Hydraulic low pressure warning light – steering, Multi-power and IPTO.
5. Low fuel warning light.
6. Hydraulic oil filter blocked indicator.
7. Low engine oil pressure warning light.
8. High torque converter oil temperature warning light (Industrial tractors only).
9. Differential Lock engaged.
10. Alternator charging warning light.

11. Four wheel drive engaged.
12. Headlight main beam warning light.
13. Parking brake applied warning light.
14. Fuel gauge – showing diesel fuel level in the tank.
15. Speed chart – enables the operator to calculate the tractors forward speed by matching the engine rev/min to the gear selected. It also indicates PTO speed of 540 or 1000 rev/min.
16. Speedometer (Figure 2) – When fitted – indicates the forward speed of the tractor and distance in Kilometers.

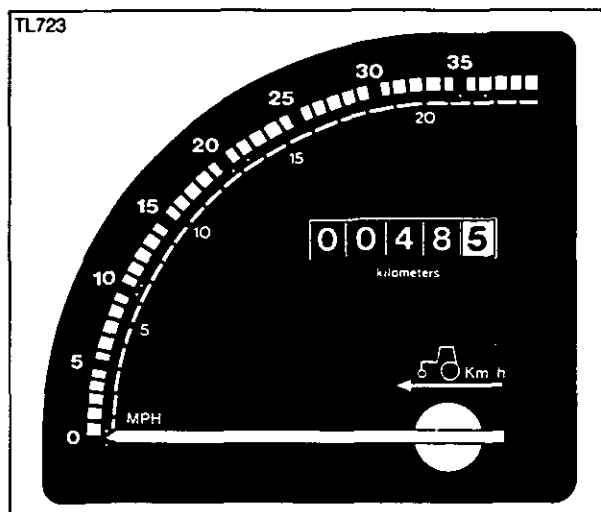


Figure 2

Switches (Figure 3)

Switches are provided for the following services:

World wide, footstep and cab.

1. Multi-power switch.
2. Head light dip switch.
3. Head light and side light switch.
4. Plough light switch.
5. Hazard warning switch.
6. Direction indicator warning light.
7. Direction indicator switch.
8. Starter switch.
9. Work light switch front.
10. Roof flashing beacon switch.
11. Rear window wiper switch.
12. Windscreen washer and wiper switch.
13. Horn push.
14. Cab heater blower switch.

North America only.

3. Headlights dipped, flashing lights, worklights and rearlight switch.
4. Flashing lights off, rear worklights "On" switch.
8. Starter switch.
13. Horn push.

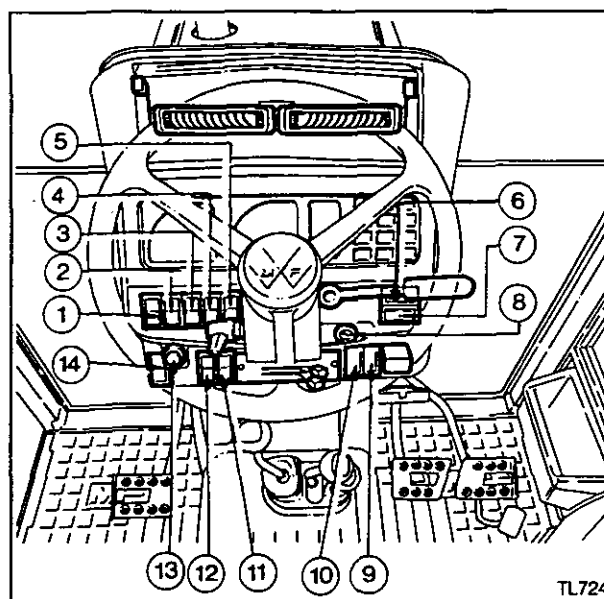


Figure 3

ELECTRICAL SYSTEM

Fuses (Figures 4 and 5)

On footstep tractors the single fuse box (1) is situated behind the right hand instrument panel side cover (Fig. 4).

Spare fuses (3) and decals showing the circuits that have fuses and their value in amps are fixed on the back of the left hand instrument panel side cover.

A fuse extractor (tweezers) (4) is provided in the spare fuse rack on the left hand side cover.

Three line fuses (5) (not North American Footstep) are located behind the left hand side cover. For application see chart below.

On cab tractors the fuses are housed in two fuse boxes situated below the instrument panel behind the gear levers, (Fig. 5.) The top fuse box is for tractor electrics, the bottom fuse box is for the cab electrics. Three line fuses are situated behind the left-hand side cover plate with the spare fuses.

The bulb (2 Fig. 4) is the engine idling speed setting light. This is used when setting the fuel pump on the tractor engine.

For tractors serial number V52268, manufactured February 1988 onwards:

Main fuse box-Cab and footstep-World wide
Cab only-North America

Fuse No.	Rating	Colour	Circuit
1	10A	Red	Side and rear, number plate, switches and instrument panel.
2	15A	Blue	Cigar lighter
3	10A	Red	Headlights dipped
4	10A	Red	Headlights main
5	10A	Red	Horn
6	10A	Red	Hazard warning

Single line fuses

Fuse No.	Rating	Colour	Circuit
1	15A	Blue	Direction indicator and speedometer
2	5A	Brown	Front wheel drive
3	5A	Brown	Multi-Power

Main fuse box - North America - Footstep

Fuse No.	Rating	Colour	Circuit
1	25A	Clear	Main circuit, horn and light switches
2	15A	Blue	Cigar lighter and instruments
3	5A	Brown	Front wheel drive and speedometer
4	10A	Red	Lights
5	5A	Brown	Multi-Power

Cab fuses--World wide

Fuse No.	Rating	Colour	Circuit
1	10A	Red	Windscreen wiper and washer
2	15A	Blue	Heater blower motor
3	5A	Blue	Interior light
4	5A	Brown	Flashing beacon
5			Spare
6			Spare

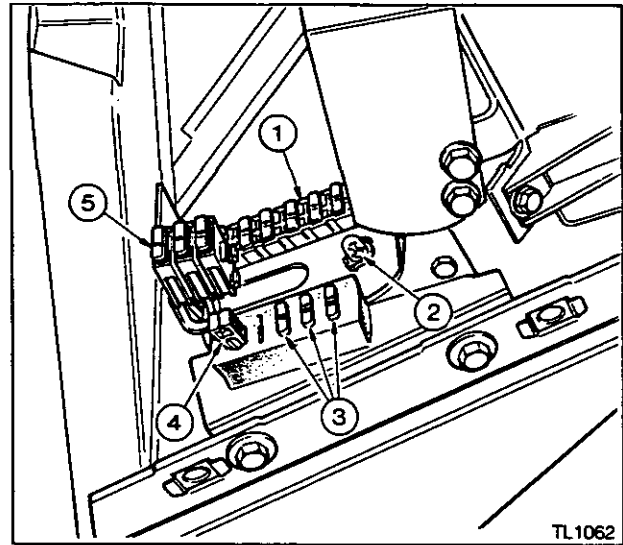


Figure 4

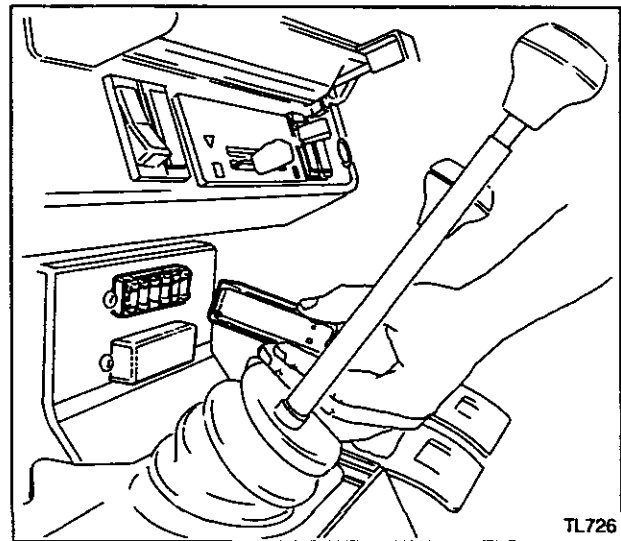


Figure 5

Cab fuses-North America only

Fuse No.	Rating	Colour	Circuit
1	10A	Red	Windscreen wiper and washer
2	15A	Blue	Heater blower motor
3	5A	Brown	Interior light
4	10A	Red	Hi-way warning
5			Spare
6	10A	Red	Multi-Power

Wiring System

The wiring to all electrical services is an insulated earth return system, the earth wire (-) is colour coded black. Only the starter motor, alternator, thermostat, engine oil pressure and engine temperature sender units use the chassis as earth return. The battery earth (-) strap is grounded to the chassis for these services.

Sections 14B, 14C and 14D show the variations of wiring diagram depending upon the build of tractor and its age.

NOTE: When diagnosing electrical faults always check for both power supply to the unit and that there is not a break in the negative (-) return.

The electrical circuit is a conventicle automotive type with the exception of the negative (-) return wire.

A dimmer unit is fitted to early tractors in the circuit to reduce the glare of the low fuel, four wheel drive engaged and differential lock engaged warning lights when the side lights or headlights are switched on.

All accessory switches are fitted with indicator lights which illuminate when the switch is on.

Product Changes**Wiring system**

From tractor serial number V52268, manufactured February 1988 onwards, changes were made to the wiring system resulting in new wiring looms. (see wiring diagrams in section 14B, pages 14B-9 to 14B-15).

The wiring in respect of Cab tractors only, including North America, was again changed in June 1989 from tractor serial number P22200 onwards. This change was necessary because of their introduction of the fresh air ventilating system (see wiring diagrams in section 14B, pages 14B-17 to 14B-37).

The next major changes occurred in July 1992, footstep tractors, and April 1993, cab tractors. Further details will be found on page 14A-36.

Batteries

For all footstep tractors from first production, and black cab tractors up to serial number N12069, one size of battery was fitted as follows:

Tractor model and application	Battery		
	Qty.	Model	Size
M-F 340, 350, 355 and 360 footstep and cab	1	372	420CCA
M-F 365, 375, 383, 390, 398 and 399 footstep and cab	2	372	420CCA

The introduction of the single high capacity battery for temperate climate production was on tractors with low profile silver cabs only, it occurred at serial number N12070, manufactured April 1988 onwards. Also on tractors with HiLine cabs from first production, serial number N11006, manufactured April 1988 onwards.

No change being made to the M-F 340, 350, 355 and 360 tractors footstep or cab with a single battery.

The model application is as follows:-

Tractor model and application	Battery		
	Qty.	Model	Size
M-F 342, 352 Temperate climate	1	372	420CCA
M-F 342, 352 Cold climate	1	665	570CCA
M-F 362, 372, 382 Temperate climate	1	665	570CCA
M-F 362, 372, 382 Cold climate	2	372	420CCA
M-F 362, 365, 375, 390 & 390T Cold climate, Low profile cab	2	372	420CCA
M-F 362, 365, 375, 390 & 390T Temperate climate, Low profile cab	1	665	570CCA
M-F 375 & 390 Cold climate HiLine cab	2	372	420CCA
M-F 375, 390, & 390T Temperate climate HiLine cab	1	665	570CCA
M-F 398 Temperate & cold climate Low profile cab	2	372	420CCA
M-F 398 & 399 Temperate & cold climate HiLine cab	2	372	420CCA
North American market Footstep and cab M-F 360	1	372	420CCA
M-F 375, 383, 390, 393, 396, 398, & 399	2	372	420CCA

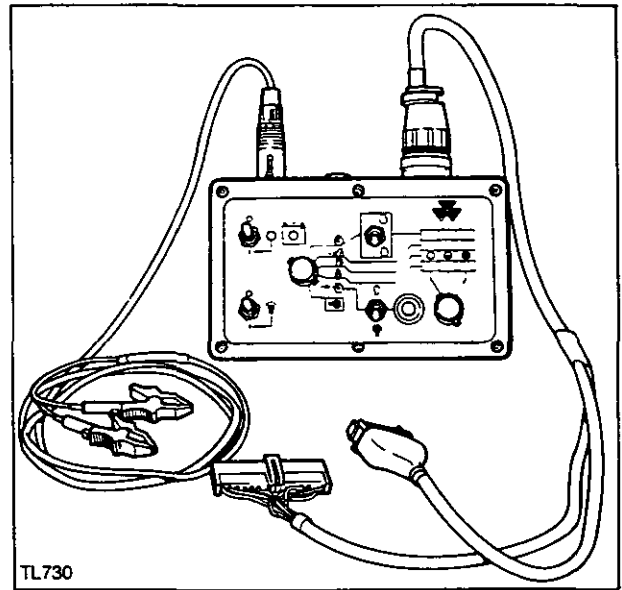
ELECTRICAL SYSTEM

Fault Diagnosis

Fault diagnosis is the method of locating faults while the electrical equipment is still in position. In the interests of efficiency and economy, the diagnosis must be accurate and must be carried out in the shortest possible time using the minimum amount of equipment.

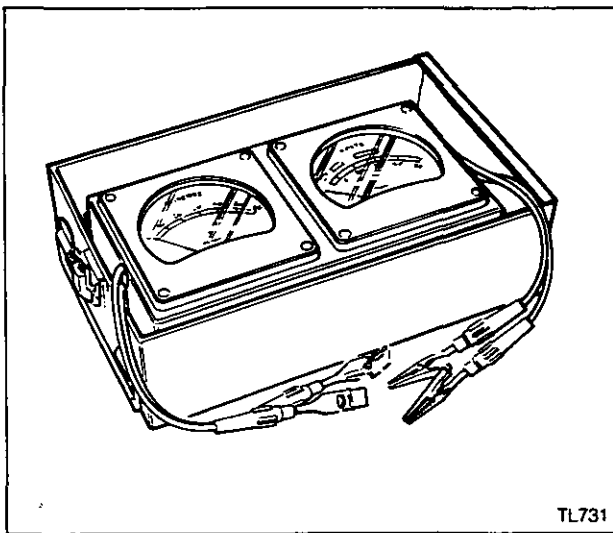
The following is the minimum equipment necessary to carry out this full diagnosis:

1. MF3004 Instrument panel test unit. (Figure 6)
2. D.C. Voltmeter (moving coil) Scale 0-50 volts. (Figure 7)
3. D.C. Ammeter (moving coil) Scale 10-0-100 amp. (Figure 7)
4. Hydrometer. (Figure 8)
5. Heavy duty battery discharge tester. (Figure 9)
6. Ohmmeter scale 0-50,000 ohms. (Figure 10)



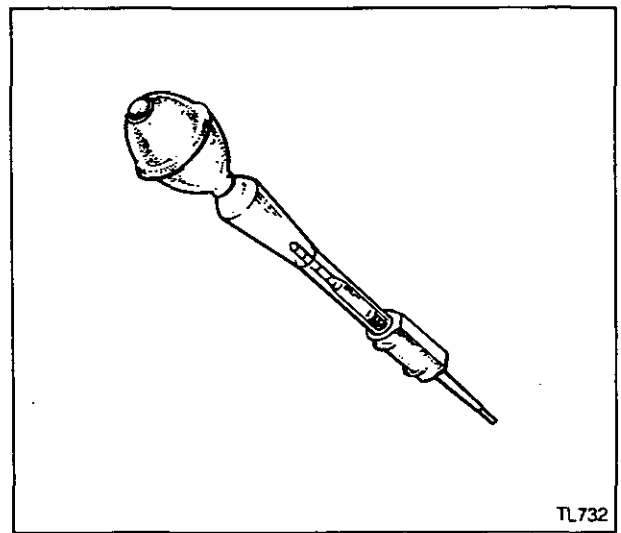
TL730

Figure 6



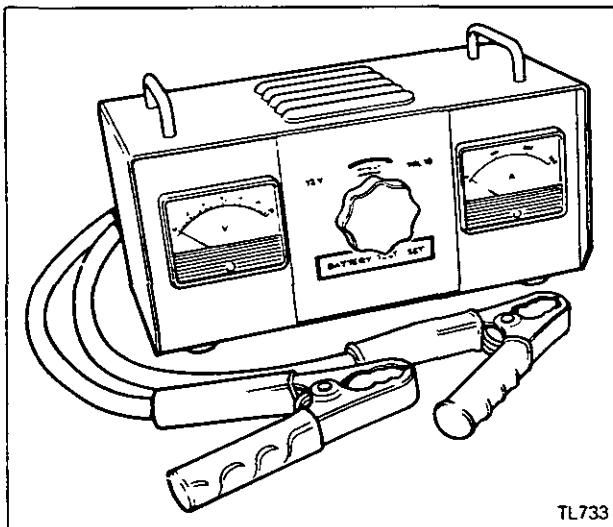
TL731

Figure 7



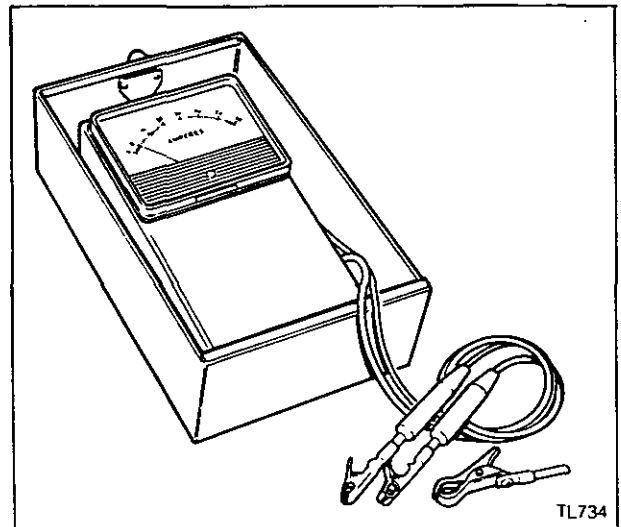
TL732

Figure 8



TL733

Figure 9



TL734

Figure 10

Instrument Panel

Check 14A-01

Special tools:
MF3004 instrument panel test unit

Procedure.

1. Remove both left hand and right hand instrument panel side covers.

Cab tractors.

2. Remove the cab heater duct and controls above the instrument panel.
3. Loosen the two top nuts and remove the two side instrument panel retaining bolts.
4. Gently lift the panel up to free the two top studs, then pull the panel back to gain access to the two plugs at the back of the panel.

Note: On footstep tractors it is not necessary to remove the instrument panel from the tractor to test it.

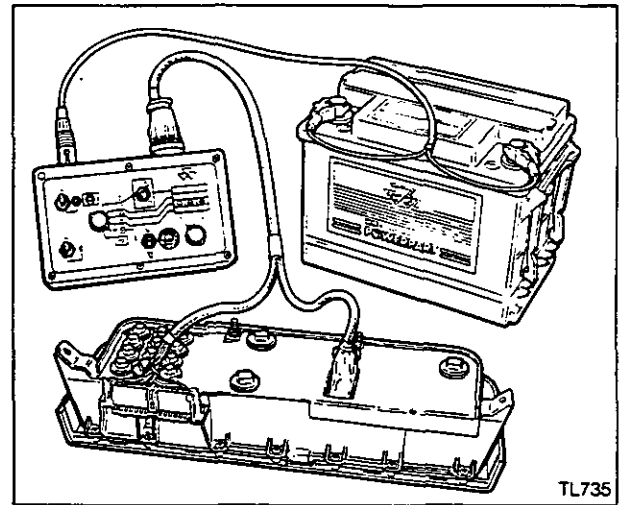


Figure 1

All models.

5. On each plug squeeze together the two retaining hooks and pull the plugs out of the panel.
6. Plug the two leads of the MF3004 Test Unit into the instrument panel (Figure 1).
7. Connect the other two leads to the tractor battery. Red to positive (+), black to negative (-).
8. Switch the unit on (1), (Figure 2).
9. The red light (2) will indicate that the power is on.
10. The green light (3) 'ON' indicates that there is sufficient power in the battery to power the unit. No green light, try another battery.

TEST 1 Checking the Tachometer (Figures 2 and 3).

1. Turn the function selector switch (4) to the first position.
2. Move the Engine Type switch (5) to either 3 cylinder engine (up) or 4 and 6 cylinder engine (down) depending upon the tractor being tested.

Note: for M-F 362 tractors select the 3 cylinder engine (up) position.

3. Turn the Range Selector switch (6) to the 1100rev/min position. The pointer on the tachometer should move to the 11 position on the dial between the two small dots.

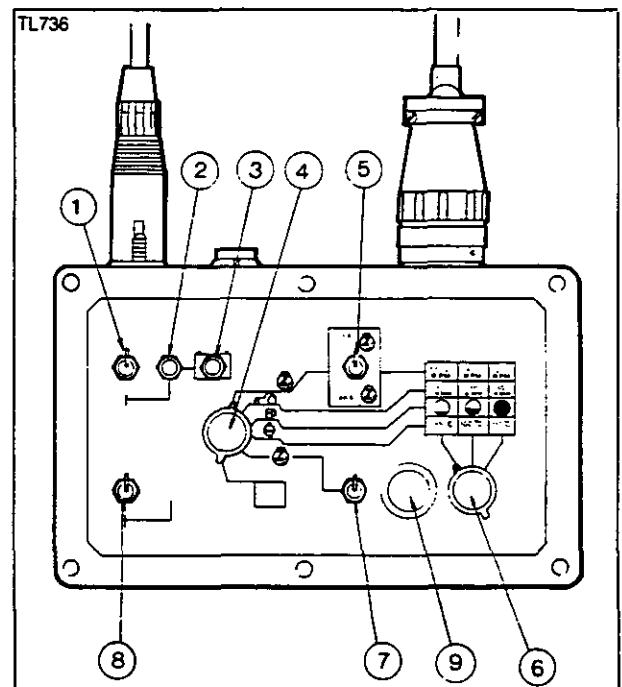


Figure 2

14A-10

ELECTRICAL SYSTEM

4. Turn the Range Selector switch (6) to the 1800rev/min position. This position enables you to check the accuracy of the service meter. The pointer should move to the 18 position on the dial.
5. Turn the Range Selector switch (6) to the 2000rev/min position. The position on the tachometer should move to the 20 position on the dial between the two outer small dots.

Diagnosis

Result	Action
Tachometer does not respond.	<ol style="list-style-type: none"> 1. Check connections of test unit 2. Tachometer faulty, replace.
Tachometer satisfactory	<ol style="list-style-type: none"> 1. Check wiring from terminal 7 on the 12 contact plug to the alternator. 2. Check alternator output.

The following additional checks should be made for an inoperative tachometer:

6. Check the battery voltage. 12.3 volts minimum.
7. Check the fan belt tension.
8. Check the alternator output (regulated voltage) 13.6 to 14.4 volts. See Test 6 page 14A-41.
9. Check alternator phase voltage to tachometer. See Test 7 page 14A-41.
10. Check alternator phase frequency to tachometer. See Test 7 page 14A-41.
11. Check in-line fuse to instrument panel, fuse No. 1, 10 Amp, in main fuse box.

TEST 2 Checking the speedometer (Figures 2 and 4).

1. Turn the Function Selector switch (4) to the second position.
2. Turn the Range Selector switch (6) to the 10 km/h position. The pointer on the speedometer should move to the 10 km/h position on the dial between the two small dots.
3. Turn the Range Selector switch (4) to the 20 km/h position. The pointer should move to the 20 km/h position between the two small dots.
4. Finally check the 30km/h position.

Diagnosis

Result	Action
Speedometer does not respond	<ol style="list-style-type: none"> 1. Check connections of test unit. 2. Speedometer faulty, replace.
Speedometer satisfactory	<ol style="list-style-type: none"> 1. Check wiring from terminal 1 on the 12 contact plug to the interface unit. 2. Check wiring to sender unit in transmission. 3. Check sender unit. 4. Fit replacement interface unit.

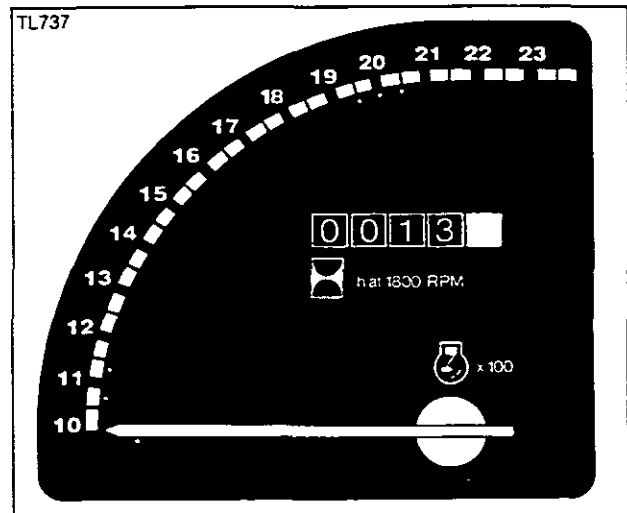


Figure 3

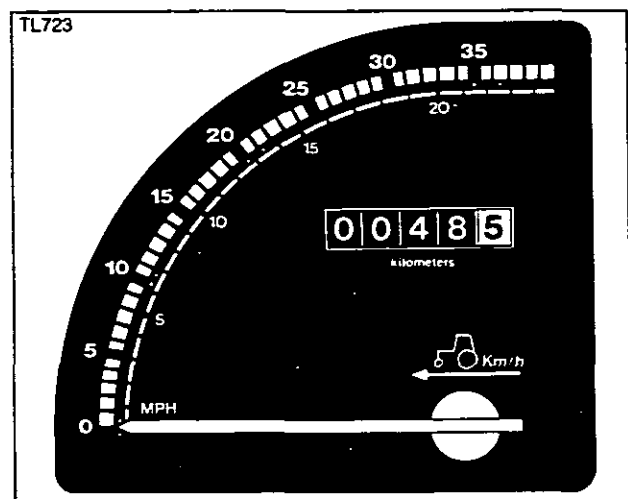


Figure 4

TEST 3 Checking the fuel gauge (Figures 2 and 5).

1. Turn the Function Selector switch (4) to the third position:
2. Turn the Range Selector switch (6) to the right (full) position

Note: Fuel gauge checks must be made on a descending scale.

3. The fuel gauge should read full between the two outer dots below the scale.
4. Turn the Range Selector switch (6) to half full, the pointer should read between the two orange sectors and the two dots below the scale.
5. With the Range Selector switch (6) set to quarter full the pointer should move to the top of the red selector.

Diagnosis

Result	Action
Fuel gauge does not respond	<ol style="list-style-type: none"> 1. Check connections of test unit. 2. Fuel gauge faulty, replace.
Fuel gauge satisfactory.	<ol style="list-style-type: none"> 1. Check wiring from terminal 10 on the 12 contact plug to the tank sender unit. 2. Check sender unit, replace if faulty.

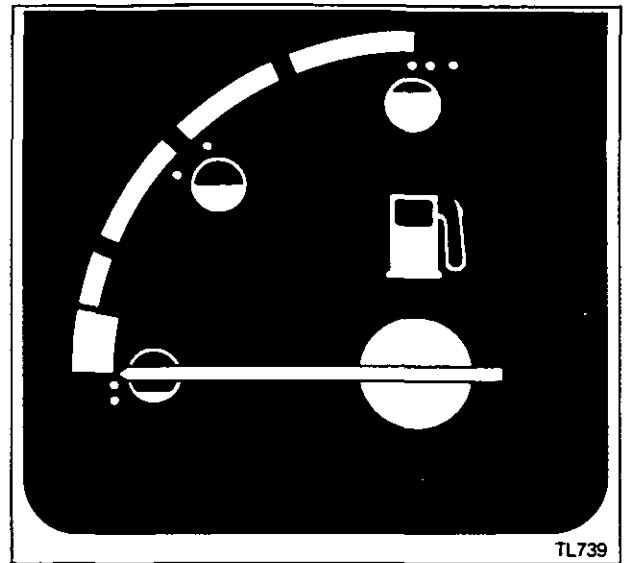


Figure 5

TEST 4 Checking the Water temperature gauge (Figures 2 and 6).

1. Turn the Function Selector switch (4) to the fourth position.
2. Turn the range Selector switch (6) to the 85°C position. the pointer should move to the position between the two green sectors and the two outer dots below the scale.
3. Turn the Range Selector switch (6) to the 100°C position. The pointer should move to the very small 'V' mark in the upper green sector.
4. Finally turn the Range Selector switch (6) to the 110°C position. The pointer should be between the two outer dots under the red sector.

Diagnosis

Result	Action
Temperature gauge does not respond	<ol style="list-style-type: none"> 1. Check connections of test unit. 2. Temperature gauge faulty, replace.
Temperature gauge satisfactory.	<ol style="list-style-type: none"> 1. Check wiring from terminal 11 on the 12 contact plug to the temperature sender unit. 2. Check sender unit, replace if faulty.

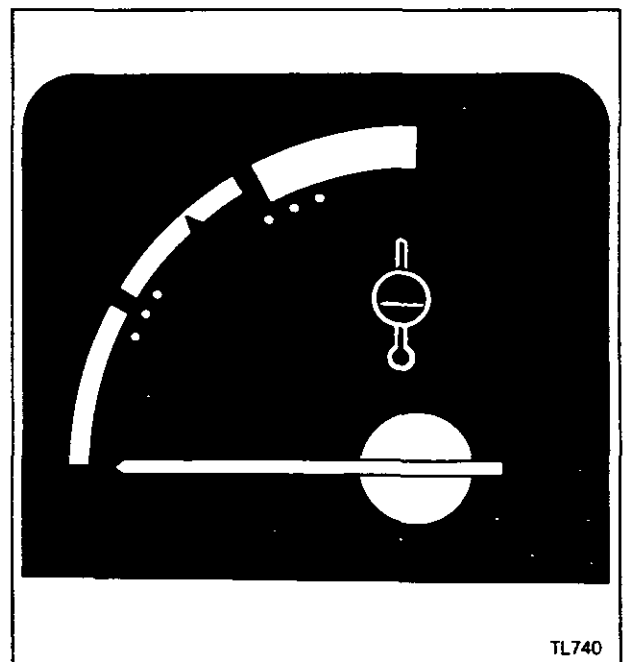


Figure 6

ELECTRICAL SYSTEM

TEST 5 Checking the idle speed indicator light (Figure 2).

Note: the idle speed indicator light was discontinued in 1989 and the tachometer was re-calibrated to indicate the 750 rev/min idle speed.

1. Turn the Function Selector switch (4) to the fifth position.
2. Ensure that the Engine type switch (5) is correctly set to 3 or 4 and 6 cylinder engines.
3. Move the idle speed switch (7) down and the light (9) should be on.
4. Move the idle speed switch (7) up and the light should go out or be dim.

This test checks that the Tachometer is putting out the correct signal for the adjustment of the low idle speed of the engine.

TEST 7 Checking the instrument panel illumination lights (Figure 2)

1. Operation of switch (8) will switch on the instrument panel illumination lights.
2. Any faulty bulbs can be replaced. Check for poor connections.

Note: The bulb holes must never be left open to the atmosphere for any length of time, damage may occur to the unit.

Diagnosis

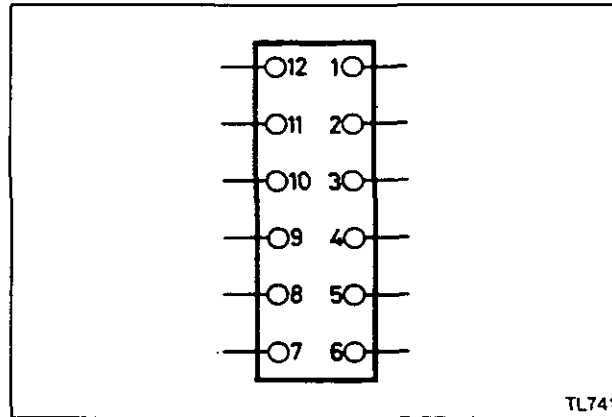
Result	Action
Light does not go out.	<ol style="list-style-type: none"> 1. Check connections of test unit. 2. Tachometer faulty, replace.
Light does not come on.	<ol style="list-style-type: none"> 1. Check connections of test unit. 2. Tachometer faulty.
Light satisfactory.	<ol style="list-style-type: none"> 1. Check wiring from terminal 12 on the 12 contact plug to the alternator. 2. Bulb faulty, replace. 3. Check bulb earth connections.

TEST 6 Checking the warning light (Figure 2).

1. Turn the Function Selector switch (4) to the sixth position.
2. The test unit will automatically illuminate each warning light in turn. It will then illuminate all the lights together. The sequence will then be repeated.
3. Any faulty bulbs can then be replaced. Check for poor connections.

Note:

- a. The bulb holes must never be left open to the atmosphere for any length of time, damage may occur to the unit. A spare bulb is provided in the bottom right hand row.
- b. The low fuel, 4WD engaged and differential lock engaged warning lights are are wired through the dimmer unit to their respective switches.



TL741

Figure 7. Detail of instrument socket.

Instrument connections to instrument panel (Figure 7).

The connections to the 12 contact plug mounted behind the main instruments are as follows:

Instrument panel 12 contact plug and socket connections		
Pin No.	Harness Connections	Panel Circuit
1	Speedometer sender unit	Speedometer
2	Spare	Spare
3	Spare	Spare
4	B (+)	B (+) supply to illuminate lights
5	B (-)	B (-) supply to illuminate lights and speedometer
6	B (+) start switch	B (+) supply to speedometer
7	Alternator (Tachometer connection)	Tachometer
8	B (-)	B (-) to illuminate lights, main beam and gauges
9	B (+)	B (+) supply to illuminate lights
10	Fuel sender unit	Fuel gauge
11	Water temperature sender unit	Temperature gauge
12	Idle speed light	Tachometer circuit

Warning lights

- A. Engine oil pressure
- B. Hydraulic filter blocked
- C. Low hydraulic pressure
- D. Torque converter temperature
- E. Low fuel level
- F. Air cleaner blocked
- G. Differential lock engaged
- H. 4WD engaged
- J. Parking brake applied
- K. Spare
- L. Alternator charging
- M. Main beam

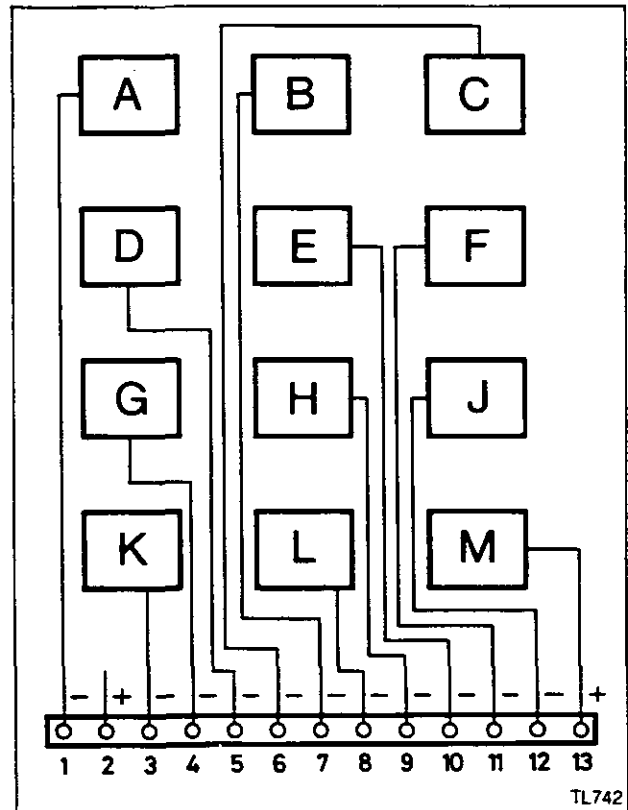


Figure 8 rear view of panel warning lights and sockets

Warning light connections to instrument panel (Figure 8).

The warning lights are supplied through the 13 contact plug mounted below the warning lights. The supply connections are as follows:

Instrument panel 13 contact plug and socket connections		
Pin No.	Harness Connections	Panel Circuit
1	Oil pressure switch	Oil warning light and bulb check
2	B (+) Start switch	B (+) Supply to all warning lights except main beam
3	Spare	Spare
4	Differential lock switch	Differential warning light
5	Torque converter temperature switch	Torque converter temperature warning light
6	Low hydraulic pressure switch	Low hydraulic pressure warning light
7	Hydraulic filter blocked switch	Hydraulic filter blocked warning light
8	Alternator IND Connection	Alternator charging warning light
9	4WD engaged switch	4WD engaged warning light switch
10	Low fuel level switch	Low fuel level warning light
11	Air cleaner blocked switch	Air cleaner blocked warning light
12	Parking brake switch	Parking brake warning light
13	Main beam switch	Main beam warning light

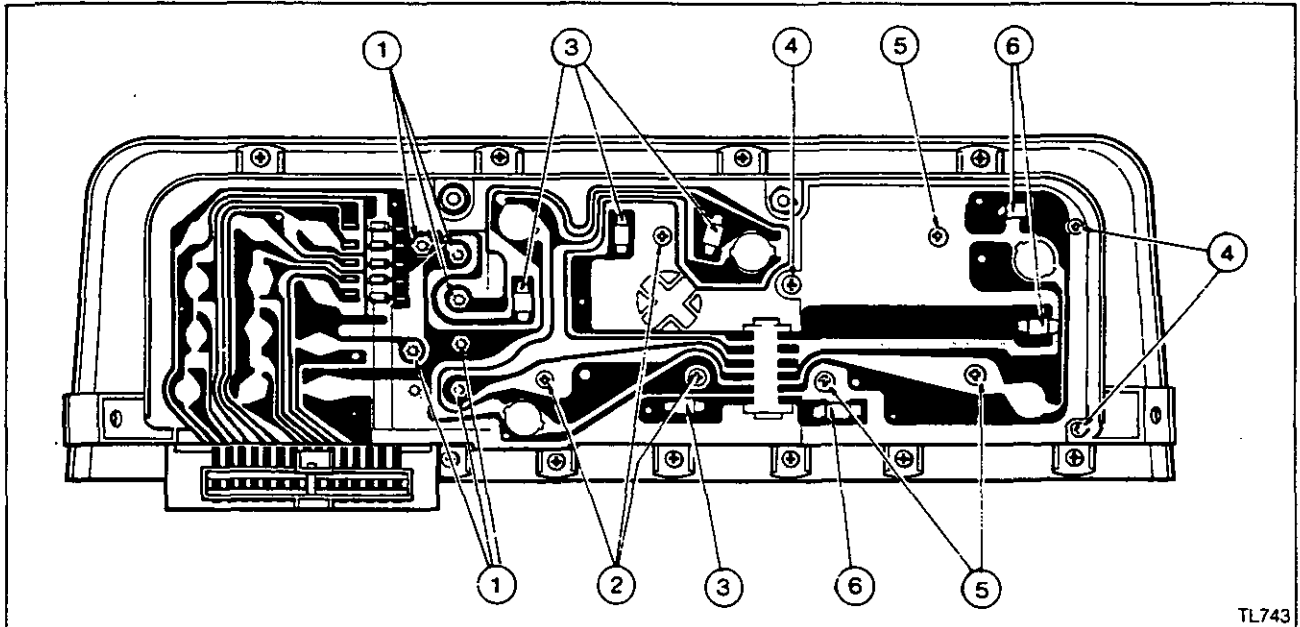


Figure 1

Instrument Panel

Overhaul

14A-02

Special Tools:

MF3004 Instrument panel test unit

General

The dismantling of the instrument panel must be carried out in a clean dry environment. It is suggested that this is done in the workshop office.



Note: The components of the instrument panel are static electric sensitive and must be handled with care. Do not use any tools which are magnetised. Do not touch or handle the electronic components on the back of the speedometer or tachometer.

Disassembly

1. Remove the instrument panel from the tractor, see operation 14A-01.
2. Clean off any dust or dirt, use a soft brush and low pressure air line.
3. Connect the MF3004 instrument panel test unit to the panel and a battery, check that there is a fault with the unit and confirm which unit needs replacing.

Note: Do not dismantle the instrument panel unless absolutely necessary.

4. Remove the warning and panel lights as necessary.

5. If the speed chart or speedometer needs changing it is only necessary to peel back the seal to expose the three retaining screws on the left hand side of the panel. If the tachometer or fuel/coolant gauges are to be replaced remove the entire back seal.
6. Remove the 13 screws holding the back moulding to the fascia.
7. With the panel face down a flat surface, lift away the back moulding.

Note: If this operation is performed carefully then the front glass and gasket will not be disturbed and can be re-used.

8. To replace the units proceed as follows:

14A-16

ELECTRICAL SYSTEM

Fuel and Temperature Gauge (Figures 1 and 2).

1. Remove the plastic bridge piece and the 6 nuts and washers (1 Fig. 1) retaining the fuel and temperature gauge to the panel.
2. Remove the gauge assembly (Fig. 2) from the front of the panel.
3. Replace the gauge, assemble and refit the 6 nuts and washers as indicated in the illustration. Do not overtighten.
4. Replace the plastic bridge piece.

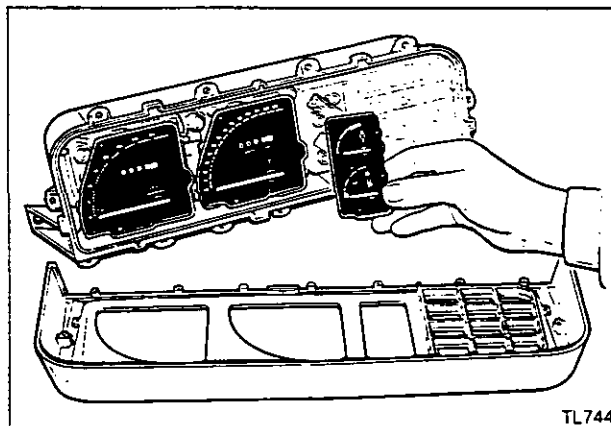


Figure 2

TL744

Tachometer. (Figure 1 and 3)

1. Remove the 3 screws (2 Fig. 1) holding the tachometer in place on the back moulding.
2. Remove the tachometer through the front (Fig. 3).



Note: Hold the tachometer by the edge of the dial only, static electricity may damage the unit.

3. Disconnect the inter connecting wire to the speedometer if fitted.
4. If it is necessary to remove the printed circuit proceed as follows:
5. Remove the 4 clips (3 Fig. 1).
6. Remove the fuel and temperature gauge (Fig. 2).
7. Remove the printed circuit board
8. To reassemble reverse the procedures 1 to 7.

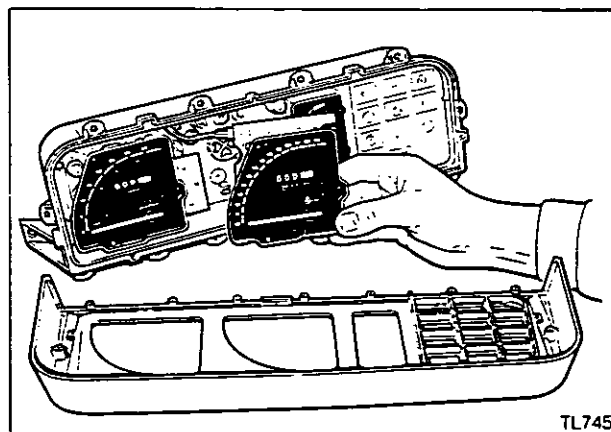


Figure 3

TL745

Speedometer. (Figures 1 and 4)

1. Do not remove the front facia.
2. Remove the screws (4 Fig.1) holding the small back panel.
3. Withdraw the speedometer assembly from the back of the panel (Fig.4).
4. Remove the interconnecting wire to the tachometer at the three pin plug.
5. Remove the 3 screws (5 Fig.1) holding the speedometer to the back plate and remove the unit.
6. If it is necessary to remove the printed circuit proceed as follows:
7. Remove the 3 clips (6 Fig.1).
8. Remove the printed circuit board.
9. To reassemble reverse the procedures 1 to 8.

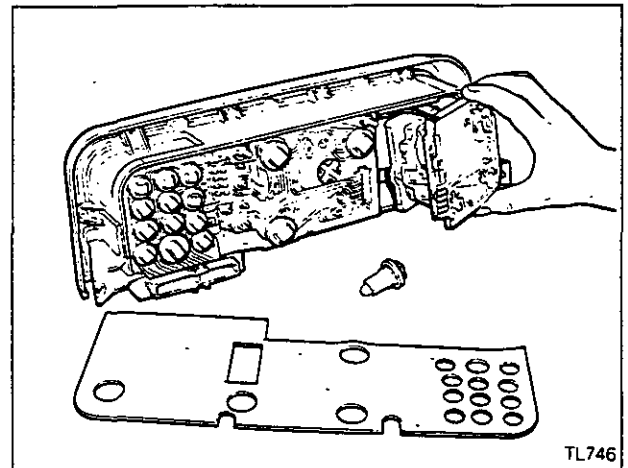


Figure 4

Speed Chart.

1. Do not remove the front facia.
2. Remove the 3 screws (4 Fig.1) holding the small back panel.
3. Withdraw the speed chart assembly from the back (Fig.5).
4. Remove the 3 screws holding the chart.
5. Remove the chart and printed circuit.
6. To reassemble reverse the procedures 1 to 5.

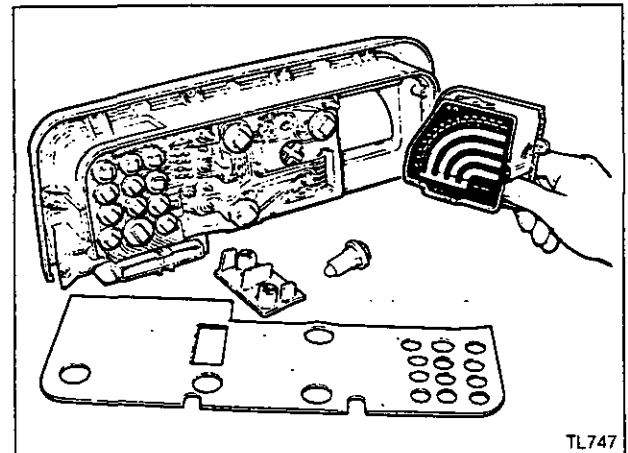


Figure 5

Reassembly

Note: It is essential that the instrument panel is sealed against dust, dirt and water ingress, and that the printed circuit boards are not damaged in any way. Due to the very sticky nature of the back sealing strip to the circuit boards may be damaged when the back panel is removed. Any damaged circuit board must be replaced when fitting new instruments. A new sealing strip must always be used.

1. Clean off as much of the glue as possible from the instrument panel casing. Use M-F Powerpart Superclean Solvent part no. 3405 359 M1. Do not spray the solvent into the internal components of the panel. Apply the solvent to a suitable cleaning cloth and use before evaporation takes place.



Warning: Superclean Solvent if swallowed or breathed-in is very harmful. Avoid contact with eyes. Do not smoke.

2. Ensure that the printed circuit boards are located on the small moulded locating pins.
3. Ensure that the spring clips are located properly and making contact with the printed circuit.
4. Fit all the warning and panel lights.

Note: Take care not to damage any of the instrument pointers or scratch the dials.

5. Connect up the MF3004 Instrument panel test unit and check that all instruments and lights are working correctly.
6. If the test is satisfactory, refit the facia and glass tightening the screws in sequence, starting in the centre and working outwards.

7. Remove all the lights and check that the circuit board is positioned correctly.
8. Peel off one third of the backing paper from a new sealing strip and cut off the backing paper.
9. Carefully locate the two thirds of the sealing strip which still has the backing paper on in position over the small moulded pins on the panel, holding the sticky part clear of the panel.
10. Roll down into position the sticky part of the sealing strip.
11. Lift up the remaining two thirds, remove the backing paper and roll down into position.

Note: Ensure that the seal is fitted without any wrinkles and that it is pressed down over the entire length of the panel.

12. Refit all the lights and make a final test of the unit.
13. Mark the back of the case indicating that the unit is for 3 cylinder or 4/6 cylinder engine tractors.

Note: The sealing strip on later tractor models will be supplied in three parts making it easier to fit.

14A-18

ELECTRICAL SYSTEM

Batteries

Introduction 14A-03

Test Equipment:

Hydrometer

Heavy Duty battery discharge tester

MF3005 digital multimeter

The batteries fitted to the M-F 300 series tractors are specified as maintenance-free, but are not "maintenance impossible" as there is an access panel in the top cover which can be removed for:

1. The addition of acid in the case of dry charged batteries.
2. "Topping up," due to evaporation caused by an overcharging fault occurring.

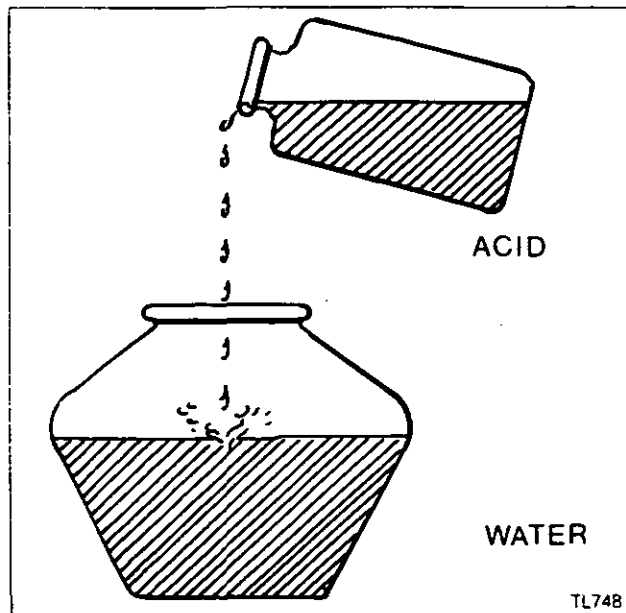
Maintenance-free batteries are rated to a standard specified by the International Electrotechnical Commission, which demands that a certain ampere output is available at a temperature of (-)180°C for a period of one minute under continuous cranking conditions. This output is defined as the Cold Cranking Ampere (CCA) capacity of the battery.

The M-F 300 series tractor is fitted with either a 420 or 570 CCA rated battery, see page 14A-07.



Safety Precautions

1. Take care when fitting batteries as they contain sulphuric acid. If splashed on skin or eyes, wash the affected parts immediately in water.



2. When mixing acid always ADD ACID TO WATER SLOWLY, NOT WATER TO ACID.
3. Explosive gases are given off when charging the battery. Keep the top well ventilated and away from flames or sparks.
4. Switch off the charger before disconnecting the charger leads.

5. When putting the battery into service on a tractor, connect the earth lead (-) last and when removing the battery, disconnect the earth lead (-) first.
6. Keep the battery away from children.
7. Do not smoke when handling or checking batteries.

Routine Maintenance.

Routine maintenance is limited to the following points:

1. Keep the top of the battery clean and dry, wipe away spillage during filling.
2. If the battery requires topping-up because of loss of electrolyte due to overcharging, use only distilled or ionised water.
3. Coat the terminals with petroleum jelly, to prevent corrosion.
4. Do not allow the battery to fall below 70% state of charge.
5. Do not store a battery in a discharged state.
6. Ensure the battery is stowed correctly in the tractor.

Battery charging

The boost charging of batteries is not advised at any time, but recharging as necessary should be carried out at a specific current, and a determined period of time according to the model and the tested voltage of the battery.

The ideal method of charging batteries is to use an automatic charger designed for the charging of low maintenance batteries and charged one at a time. If this equipment is not available the following instructions should be observed:

1. Where more than one battery is to be charged at the same time the batteries must be:
 - a. Separated by model - do not mix 372 and 665 models.
 - b. Separated by tested voltage - use the voltage bands in Table 1.
 - c. Batteries must be connected in series.

Note: The mixing of battery types, sizes and voltage bands will result in a number of the batteries not being fully charged.

2. Test the battery with a voltmeter and note the reading.
3. Connect up the battery or batteries in series.
4. Switch on the battery charger.
5. Set the battery charger output in amps according to the size of the battery being charged. Nothing will be gained by putting up the charge rate, only a damaged battery.

The out-put voltage of the charger should not exceed 15 volts across any one 12 volt battery.

Massey-Ferguson battery model 372 charge rate 7 amps

Massey-Ferguson battery model 665 charge rate 9 amps

6. Charge the battery for the period of time listed in Table 1 according to its voltage reading.

Battery voltage	Length of charge
Above 12.6 volts	4 Hours
12.4 to 12.59 volts	6 Hours
12.2 to 12.39 volts	10 Hours
12.19 & Below	16 Hours

Table 1. Battery charging times.

ELECTRICAL SYSTEM

7. Check the charger reading after 15 minutes and adjust the amperage if necessary.
8. Check and reset the charger after 2 hours.
9. Leave until the end of the charge period.
10. Switch off.
11. Leave the battery for 8 hours, then check the voltage which should be:
 - 12.7 volts or more for new batteries
 - 12.5 volts or more for batteries which have been in service

Commissioning dry charged batteries

To prevent battery failure in early life the following commissioning procedure should be adopted:

1. Remove the cell covers and fill each cell with dilute sulphuric acid to the correct specific gravity for your climate given in the Table 2.

In a climate with an air temperature	Specific gravities of acid at 25°C (77°F)	
	For filling new cells	At end of charge
Normally below 32°C (90°F) Frequently above 32°C (90°F)	1.270 1.240	1.270 - 1.290 1.240 - 1.260
Maximum permissible temperature of electrolyte during charge	40°C (104°F)	

Table 2. Specific gravity and temperature of acid.

Temperature correction

If the acid temperature is higher or lower than 25°C (77°F) it will be necessary to make a correction to the specific gravity readings of the acid.

To correct to 25°C (77°F):

- for every 10°C (50°F) higher subtract 0.007;
- for every 10°C (50°C) lower add 0.007

e.g. Acid temperature 15°C (59°F)

2. The temperature of both acid and the battery should preferably be between 15°C and 25°C (59°F and 77°F).



Caution: DO NOT fill dry charged batteries initially with distilled water.

3. The level of acid above the separators should be as given in the Table 3.

Battery model	Acid capacity	Acid level
372	3,54 litres (6.2 pt)	8 mm (5/16 in)
665	6,5 litres. (11.4 pt)	16 mm (5/8 in)

Table 3. Acid capacity and levels.

4. Stand the battery for 10 to 15 minutes, after the initial filling the level of acid will fall, this should then be restored by adding more acid until the levels are again restored as in paragraph 2.
5. The battery must then be immediately placed on a commissioning charge as detailed in "Battery charging" for a period of 4 hours. This is in order to ensure that the acid is sufficiently mixed within the battery.

Note: The time between filling with acid and commencing charging must not exceed ONE HOUR.

6. After the charge period REMEMBER to switch off the charger before disconnecting the leads, otherwise the resultant spark may cause an explosion.
7. Re-check the acid levels and adjust where necessary by addition of distilled water.
8. Check the voltage and recharge if below 12.7 volts.
9. Replace the cell covers.

Putting into service

When fitting the battery to the tractor ensure that it is properly secured by the hold down devices, and that the terminals and cables are clean and correctly and securely connected to the battery terminals. The connectors and terminals should be lightly smeared with petroleum jelly after they have been fitted.

Battery storage

The dry charged battery has a storage life of approximately two years providing it is removed from the tractor and stored in a cool, clean, dry environment protected from the floor on an even surface.

The storage life of a new charged battery providing it is maintained in accordance with the following instructions is approximately 18 months.

Wet charged batteries in storage or installed on tractors waiting to be sold should be fully charged and inspected every month by testing with an accurate digital voltmeter.

If the voltage is above 12.4 volts - No action

If voltage is below 12.39 volts - Remove and recharge

It is important that the battery receives a freshening charge every 12 weeks (8 weeks in tropical climates).

Prior to delivery of a new unit the voltage should be over 12.59 volts, if not, remove and recharge.

Battery Testing (Multimeter)

In order to obtain the best results from the battery, it must be maintained in the highest possible state of charge. This is best checked by measuring the open circuit voltage:

- 12.7+ Fully charged
- 12.4 50% charged
- 12.0 Discharged

The voltage should be measured with a digital voltmeter such as the MF 3005.

ELECTRICAL SYSTEM

Battery Testing (Hydrometer)

Testing must commence at the source of supply, the battery itself. If the battery is discharged or unserviceable the readings in other tests will be affected.

TEST 1 Battery testing – Hydrometer. (Figure 1)

There is a relationship between the state of the battery charge and the strength of the electrolyte. As the battery becomes discharged, the specific gravity (S.G.) of the electrolyte becomes lower. The S.G. of the electrolyte is measured by means of an hydrometer.

From the specific gravity (S.G.) readings, a fairly accurate indication of the state of the battery charge can be obtained.

State of charge	Specific Gravity Readings	
	Climates normally below 25°C (77°F)	Climates normally above 25°C (77°F)
Fully charged	1.270 – 1.290	1.210 – 1.230
70% charged	1.230 – 1.250	1.170 – 1.190
Discharged	1.110 – 1.130	1.050 – 1.070

Note: The hydrometer readings should not be taken if the battery has only just been topped up. It should be charged for 1 to 2 hours before taking any reading.

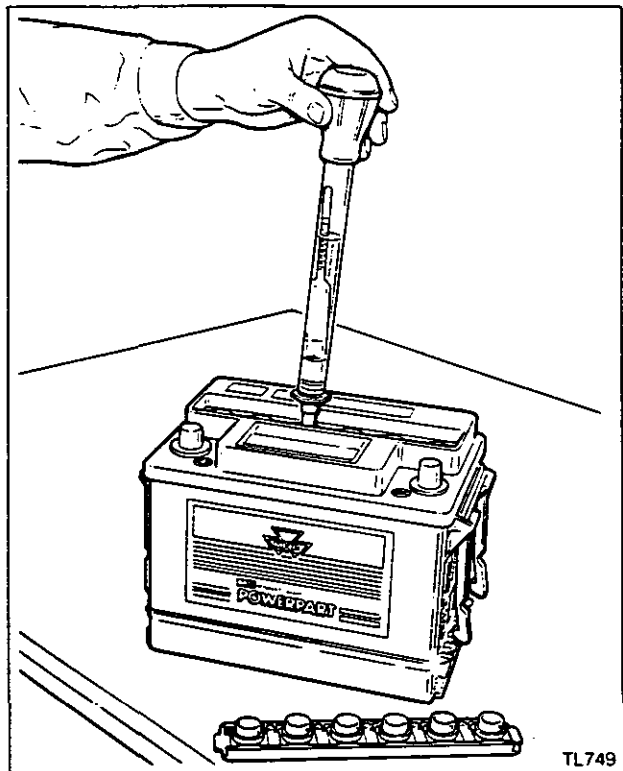


Figure 1

TEST 2 Battery testing – Heavy discharge test. (Figure 2)

This test should be carried out as a further check on battery condition. A heavy discharge tester should be connected to the battery terminals as shown in figure 2. The test ensures that the battery is capable of supplying the heavy currents required by the starter at the moment of starting the engine.

Connect the tester to the battery with the load 'OFF'.

Note the battery voltage, the load to be applied is dependant on the voltage in the battery, see chart below:

Battery Voltage	Load to be applied
12.6 to 12.90	400 amps
12.4 to 12.55	300 amps
12.2 to 12.30	180 amps

Apply the appropriate load given in the chart above and note the voltage reading. The voltage reading should not fall below 9 volts.

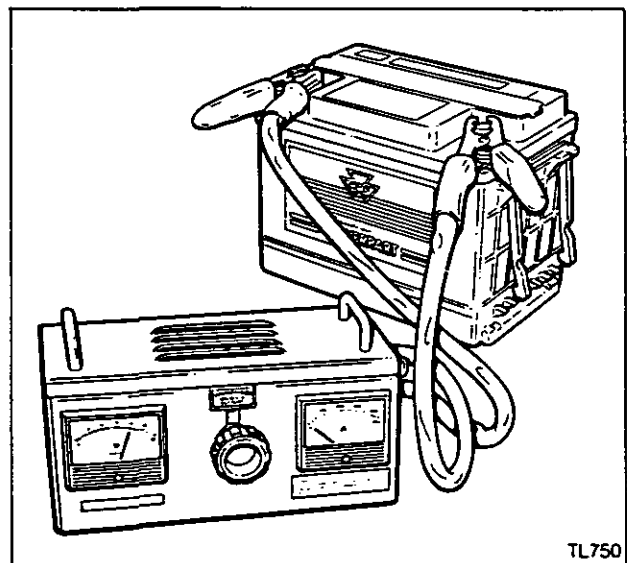


Figure 2

Starter Motor

Test **14A-04**

The starter is a motor which converts electrical energy, supplied by the battery, into mechanical energy for the purpose of cranking the engine.

The M-F 300 series of tractors uses the pre-engaged type which is fitted with a solenoid which engages the starter pinion with the flywheel ring gear before the starter is energised. After engagement the pinion is retained in mesh for as long as is necessary to start the engine. When the engine is firing and the pinion is being driven at high speed by the flywheel, the armature is protected against over speeding by the flywheel action of an inbuilt clutch.

In the event of a problem with the starter motor or circuit the following procedure should be adopted:

TEST 1. Checking battery condition (Fig. 1)

Take the hydrometer reading of the battery cells to establish the state of charge (Fig. 1A)

Diagnosis

Result	Action
Reading below 1.230	Recharge battery or replace and retest
Reading 1.230 - 1.290	Proceed to test 2

Alternative test

Measure the open circuit voltage of the battery with the MF.3004 Digital Multimeter to establish the state of charge (Fig. 1B).

Diagnosis

Result	Action
12.0 volts	Discharged battery recharge or replace
12.4 volts	50% charged recharge
12.7 + volts	Fully charged

TEST 2. Checking Connections

Check all battery, earth, starter motor and solenoid connections are clean and tight.

Diagnosis

Result	Action
Loose and/or dirty	Rectify
Satisfactory	Proceed to test 3

Test 3. Checking Battery Voltage on Load (Fig. 2)

Connect a voltmeter across the terminals of the battery, as shown in Fig.2, stop control out, operate the starter switch.

Diagnosis

Result	Action
Reading below 9.0 volts	Remove starter motor for bench testing
Reading above 9.0 volts	Proceed to test 4

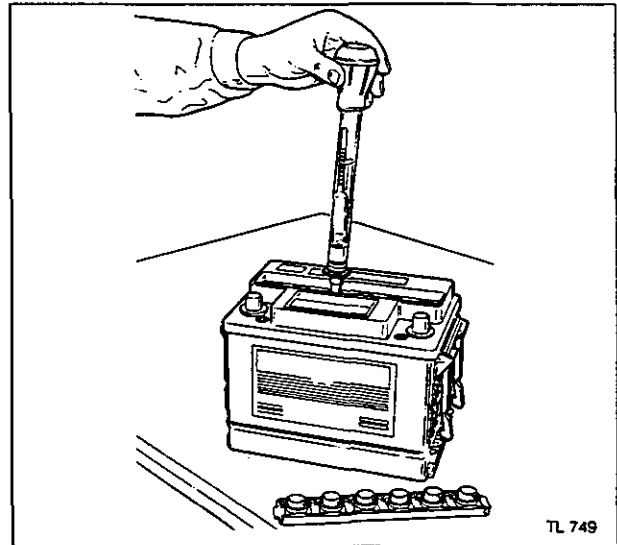


Fig.1A

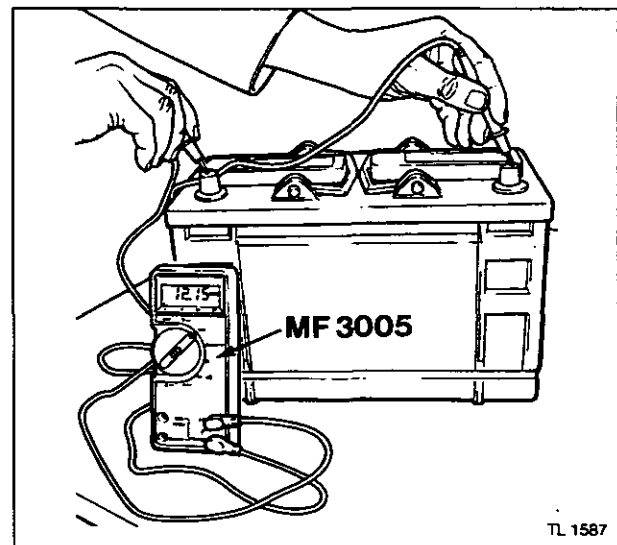


Fig.1B

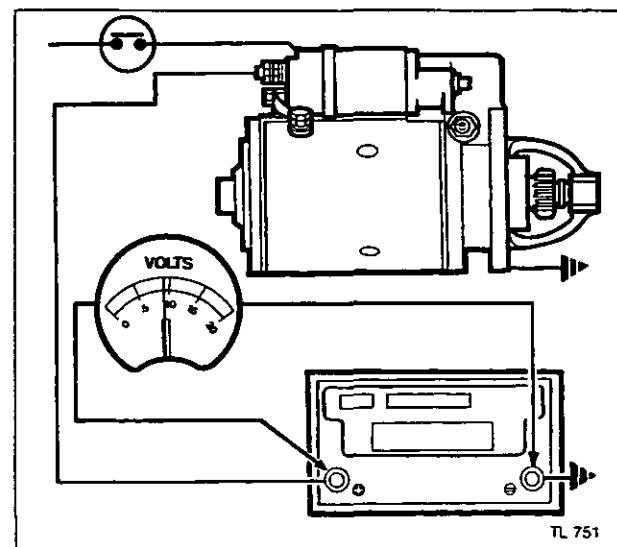


Fig.2

Note: If the solenoid operates intermittently during the test or the engine is cranked at a low or irregular speed, there may be insufficient voltage at the solenoid operating winding terminal or the solenoid is faulty, also check the relay.

To check the circuit for high resistance (poor connections) connect the voltmeter between the solenoid operating terminal and earth (commutator end bracket) as shown in figure 3. When the switch contacts are closed, the reading on the voltmeter should be slightly less than the reading in the first part of test 1. A satisfactory reading indicates a negligible voltage drop in the circuit and consequently the fault may be in the solenoid.

Note: The relay shown in figure 3 was discontinued from tractor serial number V52268, February 1988, with the introduction of the new wiring looms.

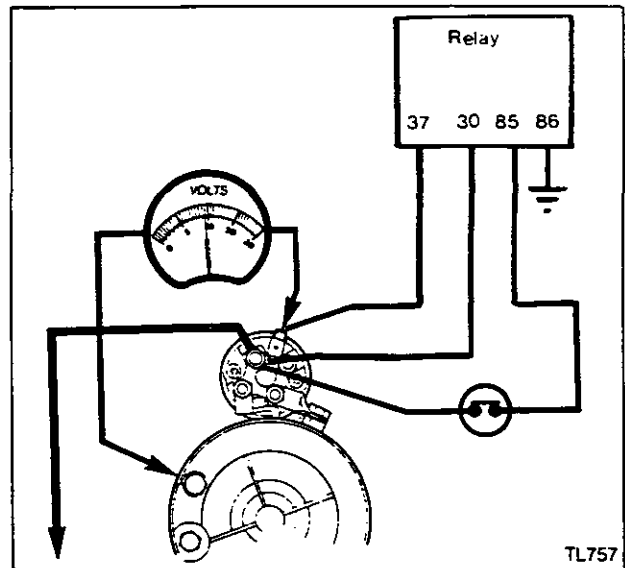


Figure 3

TEST 4. Checking the starter terminal voltage under load conditions. (Figure 4)

Connect a voltmeter between the starter input terminal and earth (commutator end bracket) as shown in figure 4, stop control out, operate the starter switch.

Diagnosis

Result	Action
Difference in reading taken in Test 3 0.5 volts.	Check all connections
Same as in test 3.	Proceed to test 5.

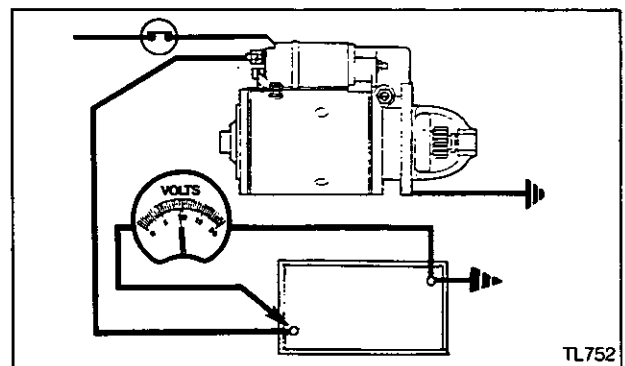


Figure 4

TEST 5. Checking the voltage drop on the insulated line. (Figure 5)

Connect the voltmeter between the starter input terminal and the battery positive (+) terminal as shown in figure 5.

When the starter switch is open the voltmeter should register battery voltage. Stop control out, operate the starter switch.

Diagnosis

Result	Action
High voltage reading.	Rectify faulty or dirty connections.
Voltage reading practically zero.	Proceed to test 6.

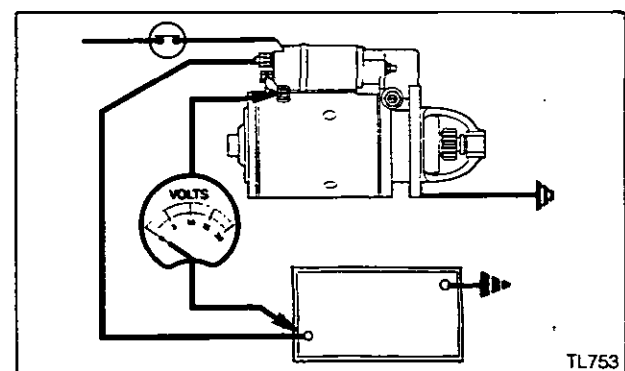


Figure 5

TEST 6. Checking the voltage drop across the solenoid contacts. (Figure 6)

Connect the voltmeter between the two main solenoid terminals as shown in figure 6. When the starter switch is open the voltmeter should register battery voltage. Stop control out, operate the starter switch.

Diagnosis

Result	Action
High voltage reading (similar to test 5).	Faulty solenoid, replace.
Voltage reading practically zero.	Solenoid satisfactory.

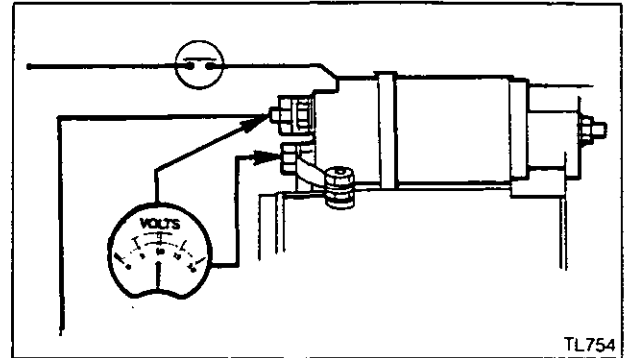


Figure 6

TEST 7. Checking the voltage drop on the earth line. (Figure 7)

Finally check the voltage drop on the earth line. Connect the voltmeter between the battery earth terminal, as shown in figure 7, at the following points:

1. Starter commutator end bracket.
2. Starter body.
3. Engine.
4. Battery connection to earth.

With the stop control out, operate the starter switch.

Diagnosis

Result	Action
Above 0.5 volt.	Check all earth connections between starter and battery.
Approximately zero voltage.	Earth lines satisfactory.

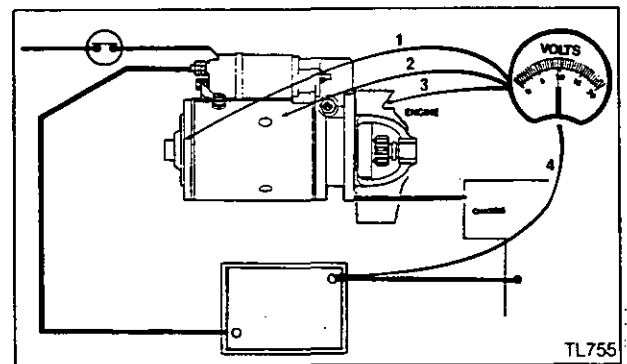


Figure 7

14A-24

ELECTRICAL SYSTEM

Alternator

Introduction

14A-05

The alternator produces alternating current which is converted to direct current before being connected to the tractor electrical system. The alternator is provided to supply a source of electrical power used to charge the battery after starting and to operate all the tractors electrical services whilst the tractor is running.

Routine maintenance.

Routine maintenance is limited to wiping away any oil or dirt from around the apertures on the alternator and cleaning any dust or chaff that has accumulated internally with a soft brush or air line.

Precautions in service.

Various precautions should be taken to avoid damage to the semi-conductor components within the alternator.

1. Do not connect or disconnect any part of the charging circuit, including the battery, while the engine is running.
2. When using a slave battery, or battery charger always observe correct polarity (positive to positive, negative to negative).

Alternator testing.

The following test will check for normal operation of the alternator by taking voltage and ampere readings at selected points in the circuit.

The alternator back cover has a plastic plug and socket supplying the charging circuit and a single terminal supplying the engine tachometer on the tractor instrument panel. See figure 1.

The plug and socket has three terminals. The small terminal is the indicator (IND) connection from the charging warning light on the instrument panel. The two remaining terminals are the positive (+) connections to the battery, two are provided to reduce the load through the connectors and wiring.

TEST 1. Battery Test. (Figure 2)

Using the hydrometer, check that the battery is at least 70% charged and in good condition. See figure 2.

Diagnosis

Result	Action
Reading below 1.230	Recharge battery or replace and retest.
Reading 1.230 – 1.290	Proceed to test 2 and 3.

A battery fault can have an adverse effect on the charging system.

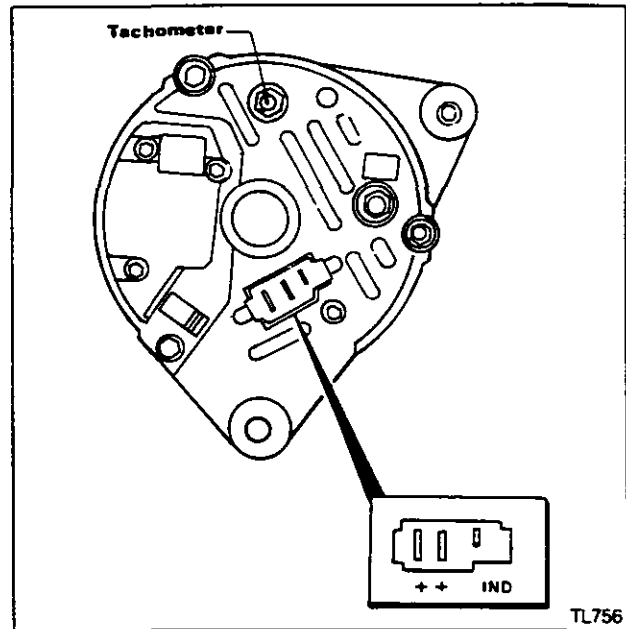


Figure 1

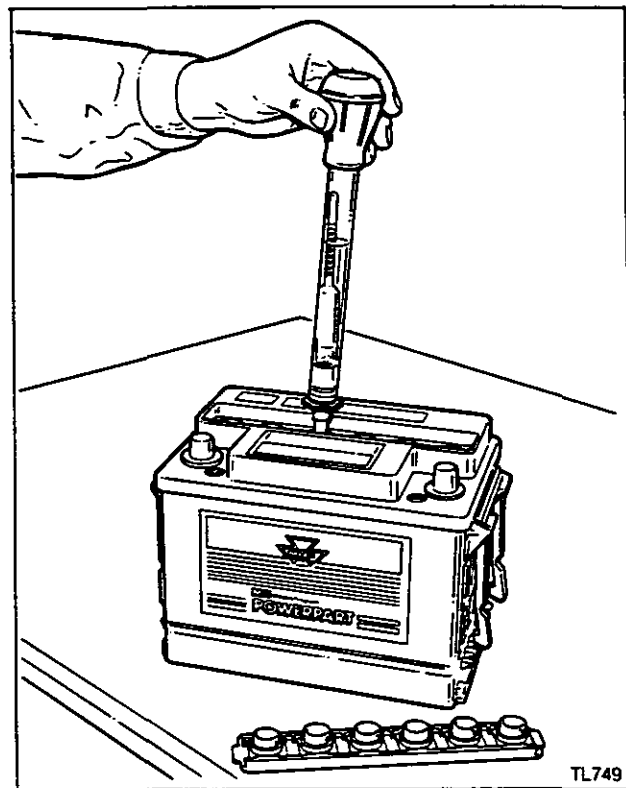


Figure 2

TEST 2. Drive belt tension. (Figure 3)

Allow 19 mm (0.75 in) deflection on 3 and 4 cylinder engines, 10 mm (0.375 in) on 6 cylinder engines, when moderate finger pressure is applied to the longest run at the belt, see 'A' figure 3.

The alternator will not charge the battery if the belt is too slack. On the other hand, an excessively tight belt may damage the bearings.

If the belt is worn or oily, it must be replaced with a new M-F belt.

Diagnosis

Result	Action
Belt slack.	Adjust.
Belt worn.	Replace and adjust.
Belt satisfactory.	Proceed to test 3.

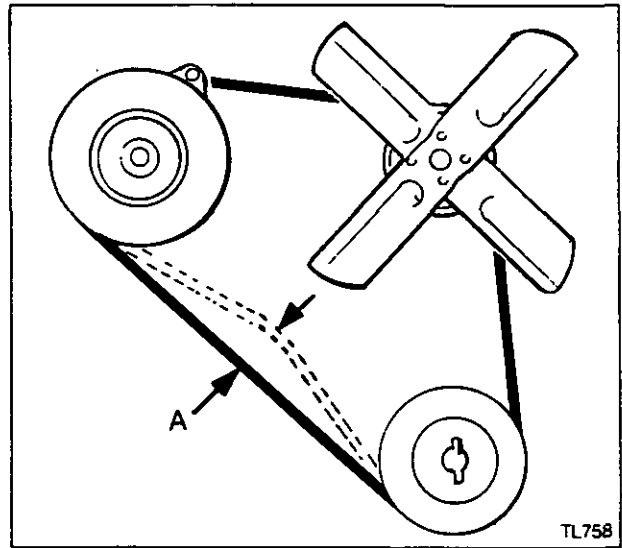


Figure 3

TEST 3. Wiring connections and continuity. (Figure 4)

Ensure that all wires are in position and that connections are clean and tight.

Remove the plastic three pin plug from the alternator and connect the negative lead of the voltmeter to the battery earth, then connect the other lead to each terminal in the plug in turn. When testing the small terminal (IND) the starter switch must be ON (NOT engine cranking).

The voltmeter should read battery voltage, if a zero reading is obtained on the small terminal (IND) check for faulty bulb in the alternator charging indicator light in the instrument panel, centre bottom row.

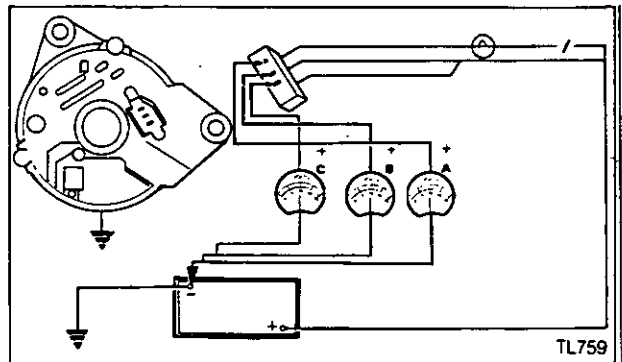


Figure 4

Diagnosis

Result	Action
Readings below battery voltage.	Check all wiring and connections.
Readings of battery voltage.	Proceed to test 4.

TEST 4. Checking alternator maximum output. (Figure 5)

The alternator should be run for a few minutes to ensure that the tests are carried out at the normal operating temperature. Then stop the engine.

1. Switch on all lights and cab blower motor (except wipers) to create a load and discharge the battery for 1 minute.
2. Disconnect the battery earth cable.
3. Disconnect the plug on the back of the alternator.
4. Connect a test link (jump lead) between the small terminal (IND) on the alternator and the plug.
5. Connect the ammeter between one of the large terminals on the alternator and the plug.

Note. The clips or test probes on the ammeter **MUST NOT** touch the alternator casing before or during the test. A short circuit will result which will damage the alternator.

6. Re-connect the battery earth cable
7. Switch on, check that the warning light comes on
8. Start the engine and slowly increase to maximum rated speed, the ammeter reading should equal the maximum rated output of the alternator of 40-45 amps.

Note. As the state of charge of the battery increases so the output of the alternator will decrease. The rated output of the alternator should be checked quickly.

Diagnosis

Result	Action
Ammeter reading low.	Replace or repair alternator.
Ammeter reading 40-45 amp.	Proceed to test 5.

TEST 5. Checking voltage drop in charging circuit. (Figure 6)

Use a voltmeter to check for high resistance (poor connections) in the charging circuit, see figure 6.

1. Connect a voltmeter between the battery insulated (+) terminal and the alternator main output terminal.
2. Switch on all lights to create a load. Start the engine and increase to maximum rated speed. The voltmeter reading should not exceed 0.5 volts.
3. Transfer the voltmeter connections to the battery earth (-) terminal and the alternator body.
4. Start and run the engine as in (2). The voltmeter reading should not exceed 0.25 volts.

Diagnosis

Result	Action
2. Reading above 0.5 volts.	Check all wiring for loose connections.
4. Reading above 0.35 volts.	
Readings below 0.5 volts.	Satisfactory Proceed to test 6.

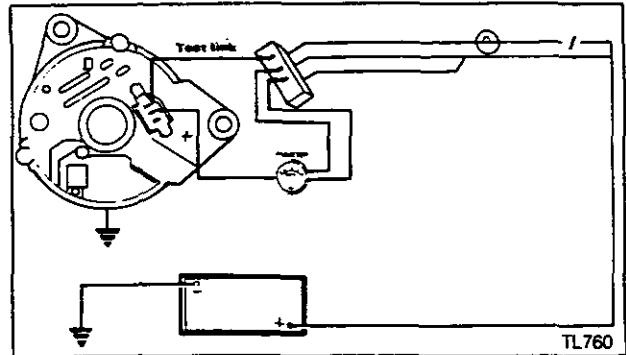


Figure 5

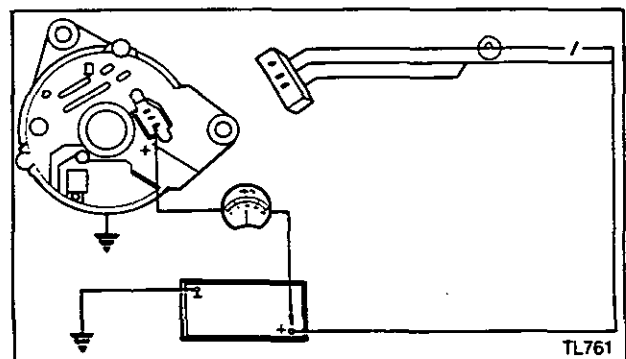


Figure 6

TEST 6. Checking voltage regulator setting. (Figure 7)

Before checking the voltage regulator setting, it is essential that a battery in a well charged condition is fitted to the tractor.

1. Disconnect the battery earth (-) cable.
2. Connect an ammeter between the starter solenoid terminal and the alternator main output cable.
3. Connect a voltmeter across the battery terminals. See figure 7.
4. Reconnect the battery earth cable.
5. Start the engine and increase the speed until the ammeter reading is less than 10 amperes.

The voltmeter reading should be within the limits of 13.6-14.4 volts

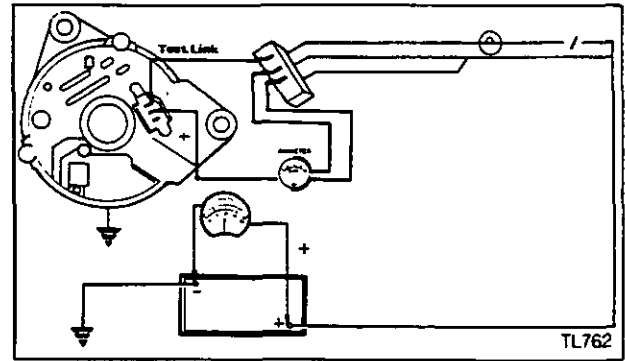


Figure 7

Diagnosis

Result	Action
Reading is unstable or outside specified limits.	Voltage regulator faulty, replace.
Reading 13.6 – 14.4 volts.	Regulator satisfactory.

TEST 7. Checking tachometer phase voltage and frequency (Figure 8)

Use a volt meter with an alternating current (AC) setting.

1. Disconnect the tachometer cable from the back of the alternator.
2. Set the voltmeter to the AC setting.
3. Connect the voltmeter across the tachometer terminal and earth. See figure 8.
4. Start the engine and increase speed to 2000 rev/min.
5. The voltmeter should read approximately 8.4 to 8.8 volts using the Massey-Ferguson MF3005 Digital Multimeter.

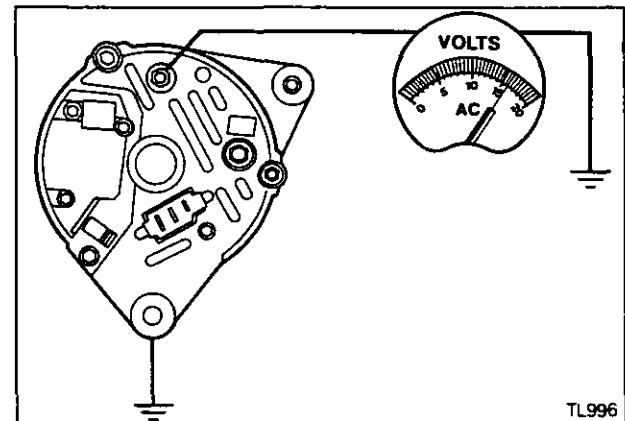


Figure 8

Diagnosis

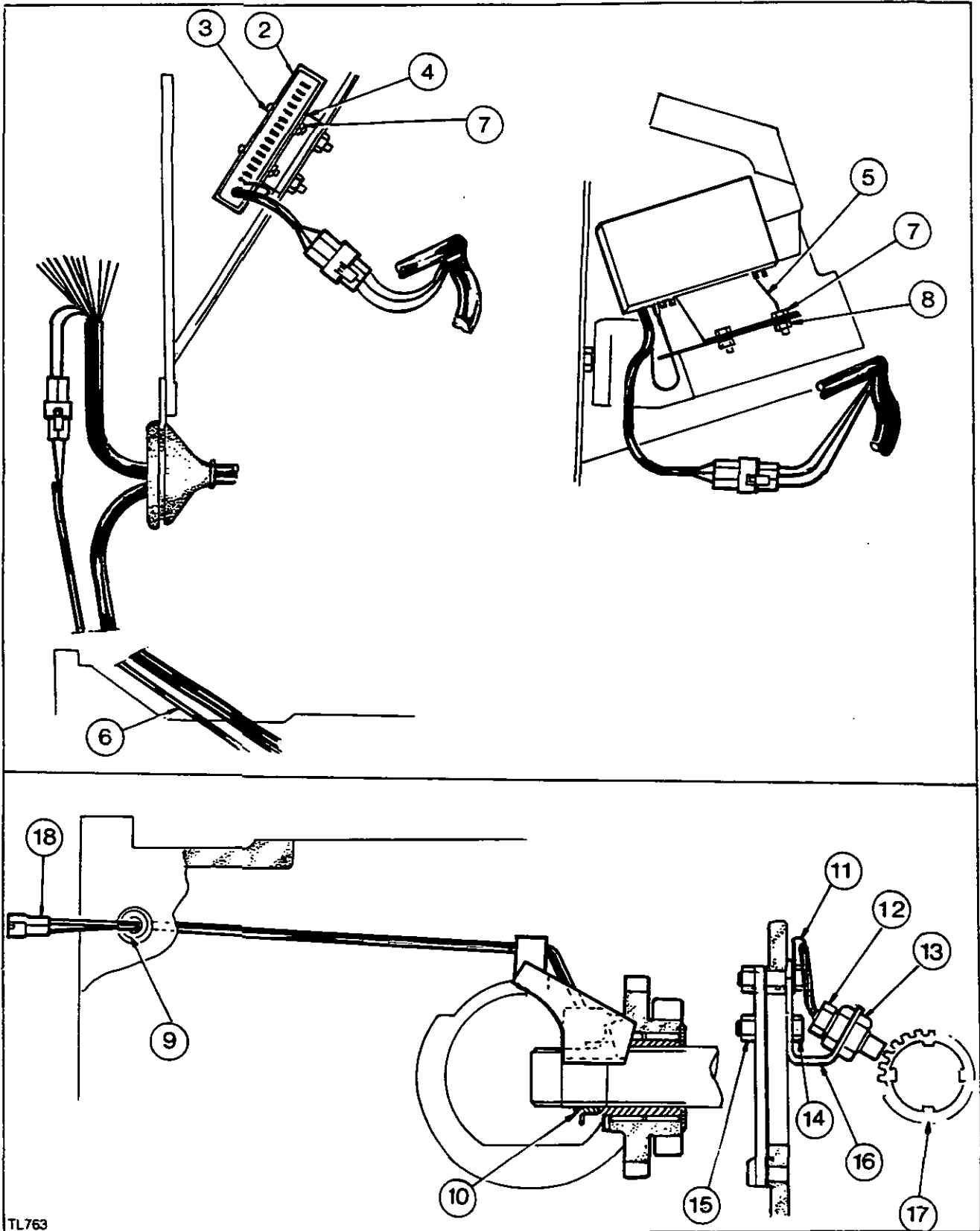
Result	Action
No reading Reading below Battery Voltage	Replace or repair alternator
Reading above Battery voltage	Satisfactory, check all wiring and tachometer

If a Frequency Counter is available:

6. Check the phase frequency at the tachometer terminal on the alternator, the frequency is dependent on alternator speed as follows:

M-F 340, 350, 355, 360 and 362
 2000 engine rev/min ± 50 444 Hz
 M-F 365 to 399
 2000 engine rev/min ± 50 554 Hz

7. Connect the test instrument between the alternator terminal and earth.
8. Start and run the engine at 2000 rev/min.
9. Check that the reading conforms to the above frequency.



TL763

Key	Part No.	Description	Quantity	
			Footstep	Cab
1	1810 895 M91	Speedo module comprising Speedometer (1) Gasket (1) Screw (3)	1	1
2	3596 251 M1	Interface unit	1	1
3	3009 535 X1	Screw	2	2
4	3596 315 G1	Bracket – Footstep	1	–
5	3596 316 G1	Bracket – Cab	–	1
6	1696 700 M91	Speedo harness	1	1
7	339 560 X1	Bolt	2	2
8	339 030 X1	Nut	2	2
8	339 375 X1	Washer	2	2
9	3596 253 M1	Grommet	1	1
10	1442 512 X1	Circlip	1	1
11	377 433 X1	Clip	1	1
12	3596 268 M1	Magnetic pick-up	1	1
13	339 183 X1	Nut	2	2
14	353 703 X1	Bolt	2	2
15	370 873 X1	Nut	2	2
16	1696 779 M1	Bracket	1	1
17	3596 254 M1	Pulse wheel	1	1
18	3596 270 M1	Pin moulding	1	1

Speedometer

Kit fitment

14A-06

Special Tools:

MF3001 Instrument Panel test unit.

General

The speedometer kit comprises a speedometer for the instrument panel, electronic interface unit and speed sensor for the rear axle pinion shaft. Wiring brackets and hardware are provided for the attachment. The parts listed above are required for footstep and cab tractors:

Installation

1. Remove the instrument panel from the tractor.
 2. Remove the sealing strip from the rear of the panel.
 3. Remove the three retaining screws.
 4. Remove the speed chart assembly from the rear of the panel.
 5. Remove the front facia and the three screws holding the tachometer to the panel.
 6. Remove the tachometer.
 7. Connect the speedometer to the tachometer with the small interconnecting lead and the three pin plug.
- Note:** The tachometer is fitted from the front of the panel, the speedometer from the rear.
8. Install the tachometer and speedometer assembly, ensure that the printed circuits are installed correctly and that the spring clips are in place.
 9. Replace the two sets of three retaining screws.
 10. Install the MF3004 Instrument panel tester unit and check that the speedometer and tachometer is operating correctly.
 11. Replace the front facia.
 12. Replace the rear seal and ensure that it is fitted correctly.

13. Refit the instrument panel to the tractor.
14. Mount the electronic interface unit (2) to its mounting bracket (4) or (5) and install it in the following positions as shown in the drawing:

Footstep tractors, on the centre strut between the instrument panel and bulkhead.

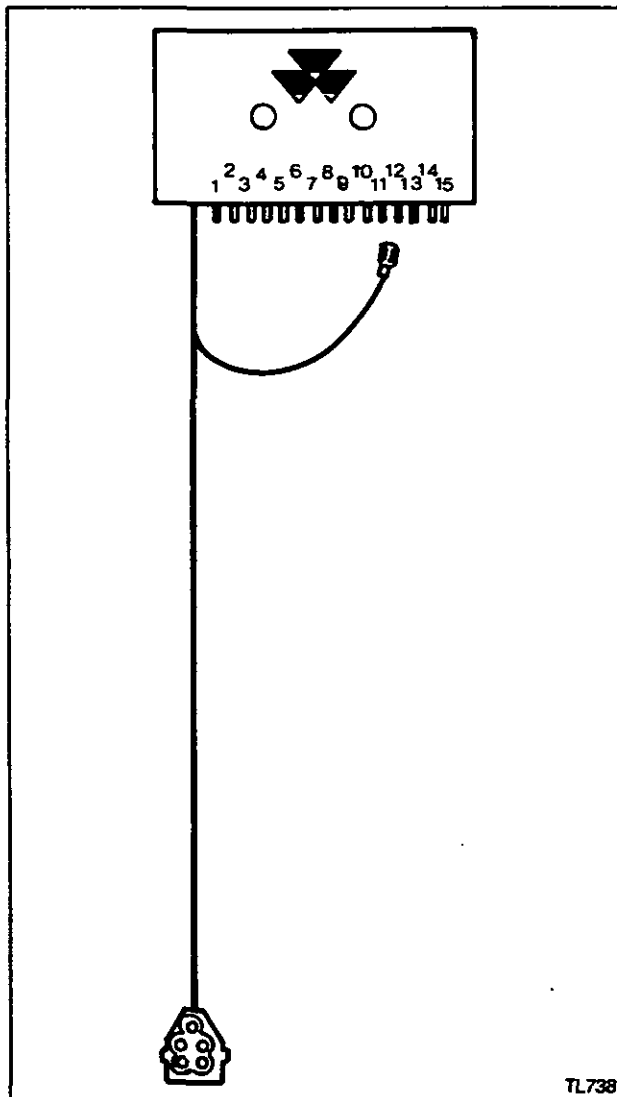
Cab tractors, on the side strut, left hand side in front of the idle speed light.

15. On the tractor wiring harness adjacent to the mounting position there is a five pin plug, connect this to the interface unit.
16. Remove the hydraulic Lift cover assembly.
17. Remove the split pin from the shear tube.
18. Slide the shear tube away from the pinion towards the gearbox.
19. Fit the pulse wheel (17) to the pinion shaft.
20. Fit the circlip (10).
21. Replace the shear tube and split pin.
22. Remove the two bolts from the left hand side cover at the top centre and one hole to the right.
23. Fit the magnetic pick-up unit (12) to the bracket (16) using the two nuts (13).
24. Bolt the bracket to the inside of the transmission case as shown in the illustration, fitting the cable clip (11) to the top centre bolt.
25. Fit the two nuts (15) to the outside of the left hand side cover to retain it.
26. Remove the plug from the top hole on the left hand side of the transmission case.
27. Fit the rubber grommet (9) and pull the wire through it.
28. Adjust the position of the magnetic pick-up in relation to the pulse wheel, the clearance must be 1,5mm (0.060 in). Ensure that the locknuts are tight.
29. Replace the Hydraulic Lift cover assembly.

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ELECTRICAL SYSTEM

30. Clip the wire from the magnetic pick-up in place along the left hand side of the chassis up to the front of the bulkhead behind the engine.
31. Connect the wire into the tractor wiring harness.
32. The electronic interface unit has 15 connectors for selection of the correct frequency depending upon model of tractor and tyre size to ensure accurate speedometer operation.
33. From the chart select the correct pin number and fit the single lead coming out of the interface unit to it.
34. Road test the tractor to ensure correct operation.



Note: When fitting the pulse wheel to the pinion shaft it may be necessary to fit a new pinion nut 3596 252 M1 with slots for the pulse wheel.

Range Pin Number	Tractor Model	Tyre size (ISO RR mm)
1	355, 360	16.9 × 34 (745)
	365, 375	16.9 × 34 (745) 13.6 × 38 (740) 15.5 × 38 (745)
	383, 390	13.6 × 38 (740) 15.5 × 38 (745) 16.9 × 34 (745)
2	383, 390	18.4 × 34 (770) 18.4 × 34 (770) [40 KPH]
3	Unassigned	
4	Unassigned	
5	Unassigned	
6	350	12.4 × 28 (590) 14.9 × 24 (590)
	355, 360	14.9 × 28 (590)
	398, 399	18.4 × 26 (670)
7	350	13.6 × 28 (610) 16.9 × 24 (610)
	355, 360	13.6 × 28 (610)
	365, 375, 383, 390	16.9 × 24 (620)
		16.9 × 24 (620)
8	350	14.9 × 28 (640) 12.4 × 32 (640)
	355, 360	14.9 × 28 (640) 12.4 × 32 (640)
	398, 399	18.4 × 30 (720)
9	398, 399	13.6 × 38 (740)
10	350	16.9 × 28 (670)
	365, 375	16.9 × 28 (670) 18.4 × 26 (670)
	383, 390	16.9 × 28 (670) 18.4 × 26 (670)
	398, 399	18.4 × 34 (770)
11	355, 360	16.9 × 30 (695)
	365, 375	16.9 × 30 (695)
	383, 390	16.9 × 30 (695)
	398	16.9 × 38 (795)
	399	16.9 × 38 (795)
12	355, 360	13.6 × 36 (715)
	365, 375	13.6 × 36 (715) 18.4 × 30 (720)
	383, 390	18.4 × 30 (720)
13	350	18.4 × 16.1 (520)
	355, 360	18.4 × 16.1 (520)
	365, 375	18.4 × 16.1 (520)
14	Unassigned	
15	Unassigned	

Head Light Adjustment

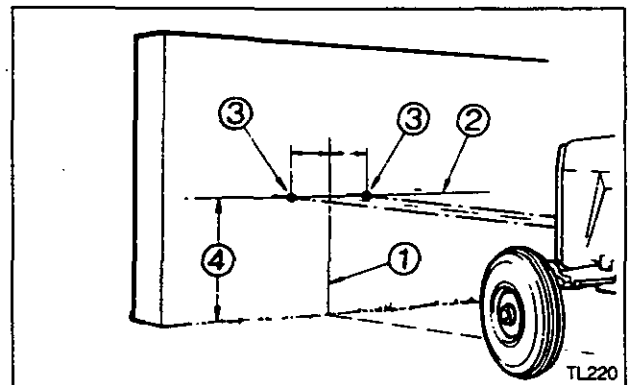
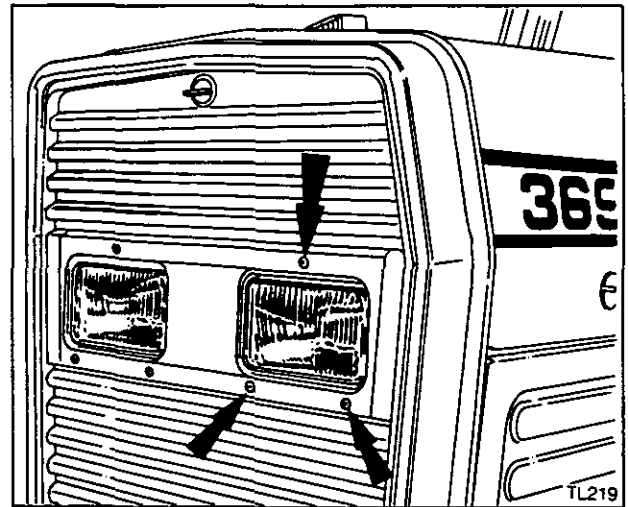
Adjust

14A-07

To adjust the headlights, screw the three screws in or out as required, this will deflect the beam up, down or sideways.

To adjust the beam:

1. Position the tractor facing a wall or screen, 2m (6 ft) away.
2. Mark a point on the wall or screen by sighting down the hood centre line.
3. Draw a vertical line (1) through the point.
4. Draw a horizontal line (2) through the vertical line (1) at headlight height (4).
5. Mark two points (3) on the horizontal line representing the distance between the two headlights, spaced equally either side of the vertical line (1).
6. Adjust each headlight individually by obscuring the other, so that the points (3) marked on the wall or screen are in the centre of the beam. The centre of the headlight beam may be found by marking the extremities of the beam both vertically and horizontally, and dividing by two.



Headlight Bulb

Removal and Refitment

14A-08

Removal

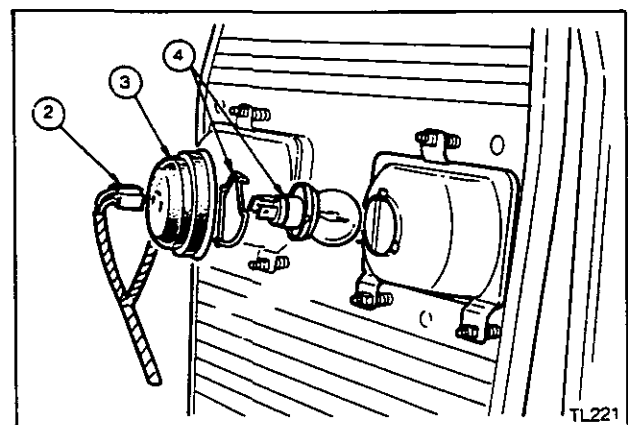
1. Switch off all light switches.
2. Remove the front grille.
3. Remove the headlight wiring plug (2).
4. Remove the rubber surround (3).
5. Release the spring clip and remove the failed bulb (4).

Refitment

6. Fit anew bulb and reassemble the light unit and test.



Caution:Headlights can have halogen bulbs. Never touch a halogen bulb with the fingers. Natural moisture in the skin will cause the bulb to burn out when the light is switched on. Always use a clean cloth or tissue when handling halogen bulbs.



Instrument and Warning Light Bulbs

Removal and Refitment

14A-09

Removal

On footstep tractors the instrument panel lights are accessible by removing the two side panels. On cab tractors fitted with a heater, it will be necessary to release the instrument panel and gently pull it rearwards to gain access as follows:

1. Remove the instrument panel side covers.
2. Remove the two heater control lever knobs (1).
3. Remove the four bolts (2) holding the top heater duct (3).
4. Remove the two side bolts (4), slacken the two top nuts (5), ease the panel (6) up and to the rear.
5. Turn the failed bulb and its holder and remove it from the panel. Then remove the capless bulb. (Instrument panel illumination lights only).

'A' Instrument panel illumination lights.

'B' Warning lights.

Refitment

6. Fit a new bulb in its holder, then push the bulb holder into the panel and turn to secure.
7. Replace the instrument panel if removed.
8. Refit the instrument panel side cover.

Note: The bottom right-hand light (C) is not used but has a bulb fitted which can be used as a replacement.



Caution: When replacing a failed bulb in the instrument panel never leave the bulb hole open, always put in a new bulb immediately and if using the spare, blank off the spare hole with the old bulb or with adhesive tape until another replacement bulb is obtained.

Interior Light Bulb

Removal and Refitment

14A-10

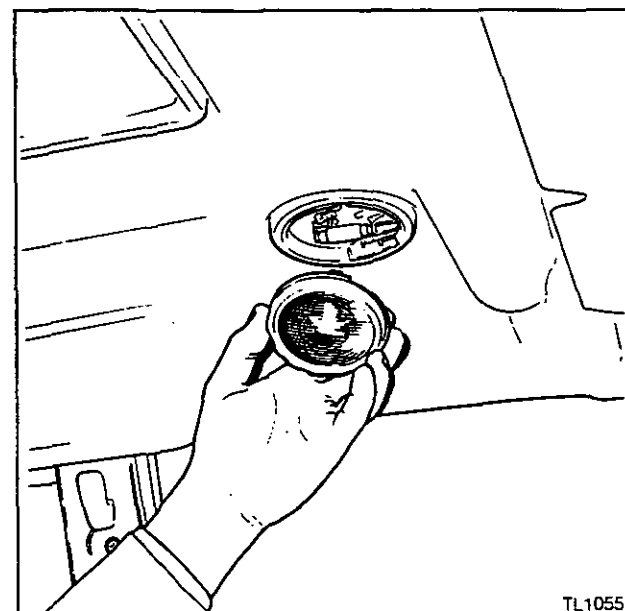
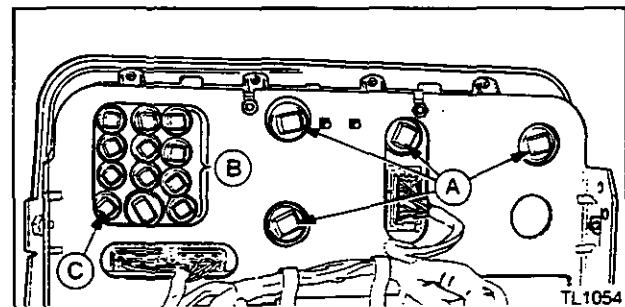
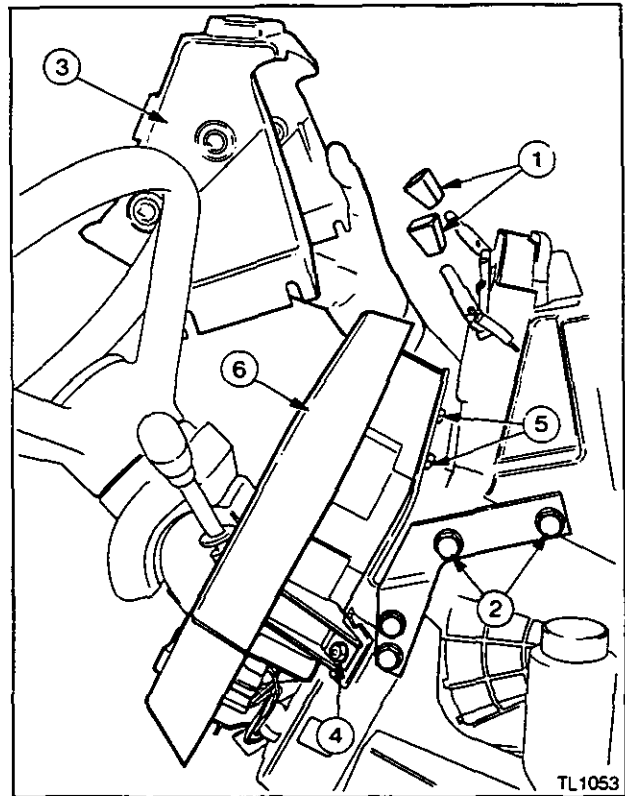
Removal

To replace the interior light bulb:

1. Remove the lens by turning it fully anti-clockwise to the off position, push up and turn until free.
2. Remove the lens.

Refitment

3. Fit a new bulb, test and replace the lens.



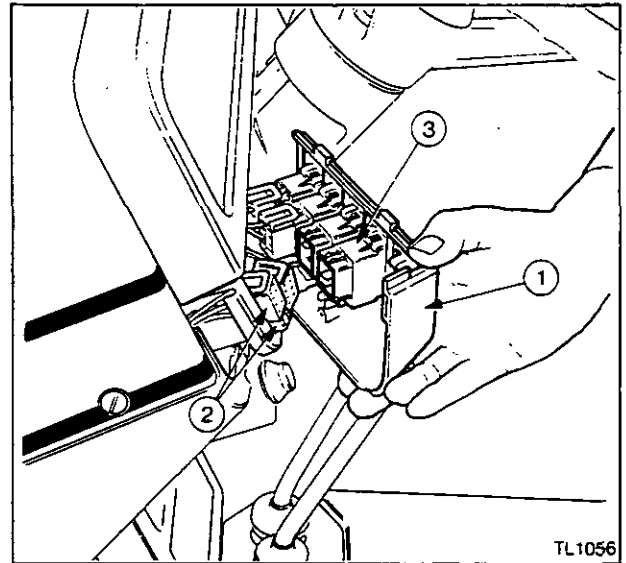
Rocker Switch Bulbs

Removal and Refitment 14A-11

Removal

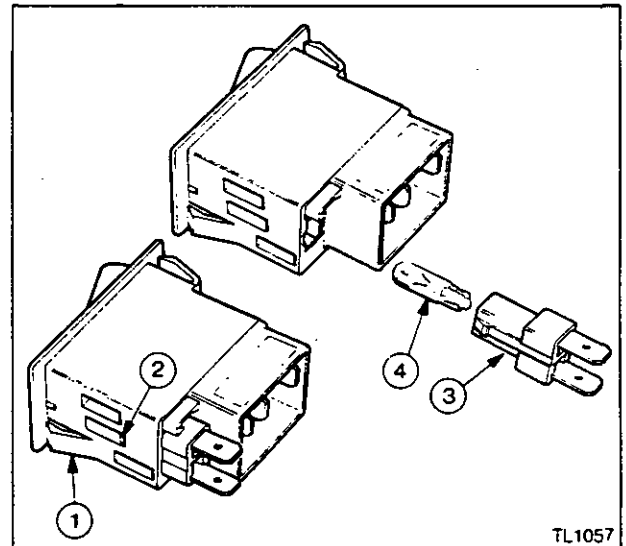
The rocker switches are internally illuminated, the bulbs being removable from the rear of the switch assembly.

1. Remove the screws retaining the switch panel (1).
2. Remove the wiring plugs (2) from the switch (3) with the faulty bulb.
3. The switch is retained by a sprung tag (1) at either end. Press in the tags and remove the switch assembly.
4. To change the bulb, press in tag (2) using a small screwdriver and pull the bulb retainer (3) from the back of the switch.



Refitment

5. The bulb (4) is of the capless type, and is a push fit in the retainer.
6. After changing the bulb, push the retainer into the back of the switch until the tag locates in the aperture.
7. Replace the switch, plugs and panel.



Direction Indicator Warning Light Bulbs

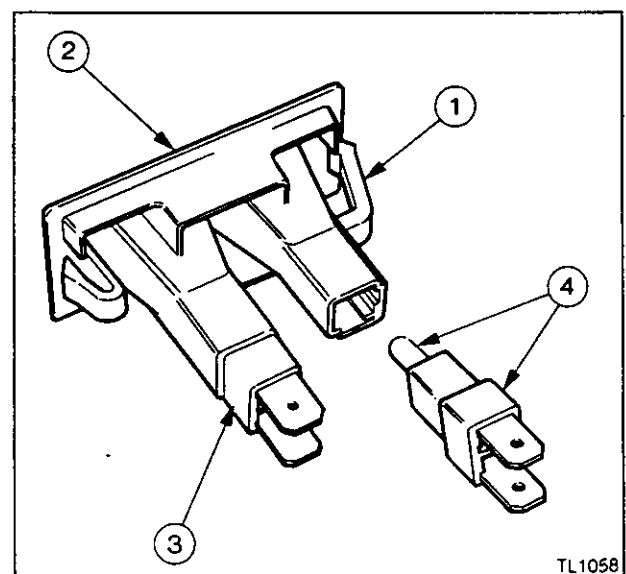
Removal and Refitment 14A-12

Removal

1. Remove the right hand lower instrument panel, see operation 14A-11.
2. Remove the two plugs.
3. Press in the two tags (1) to remove the light (2) from the panel.
4. Ease the bulb holder (3) to the right and pull.

Refitment

5. The bulb (4) is of a capless type, and is a push fit in the retainer.
6. After changing the bulb, push the retainer into the back of the switch until the tag locates in the internal groove.
7. Replace the light holder, plugs and panel.



14A-34

ELECTRICAL SYSTEM

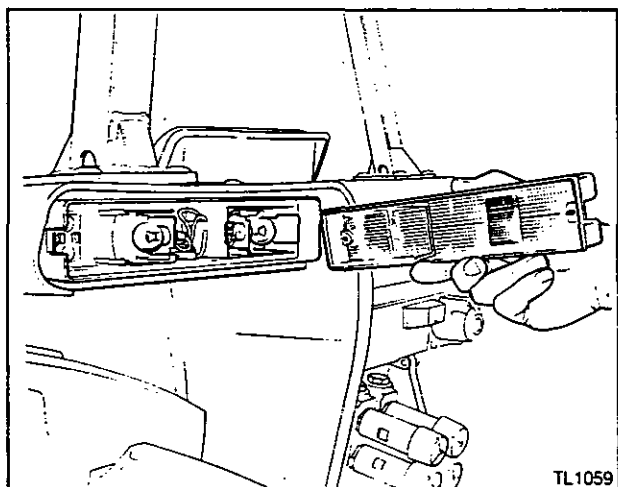


Figure 1.

TL1059

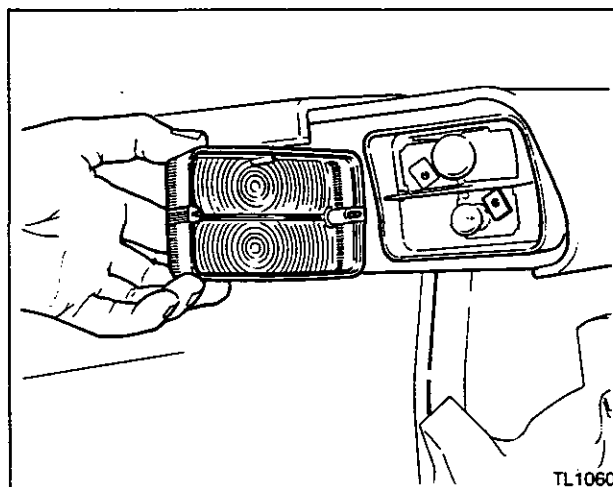


Figure 2.

TL1060

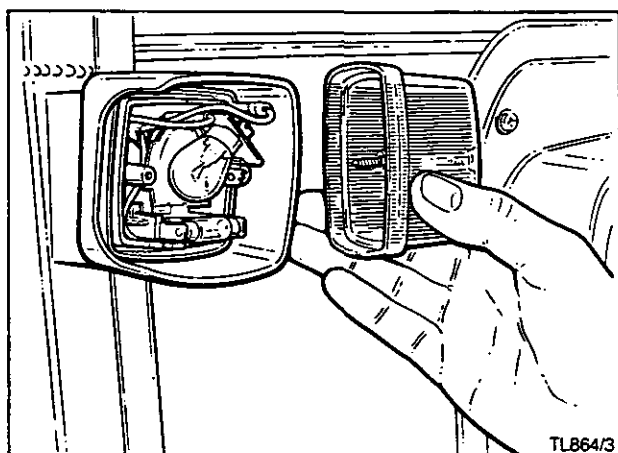


Figure 3.

TL864/3

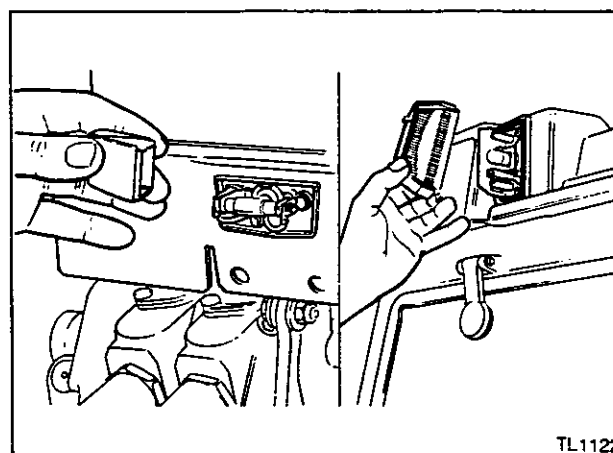


Figure 4.

TL1122

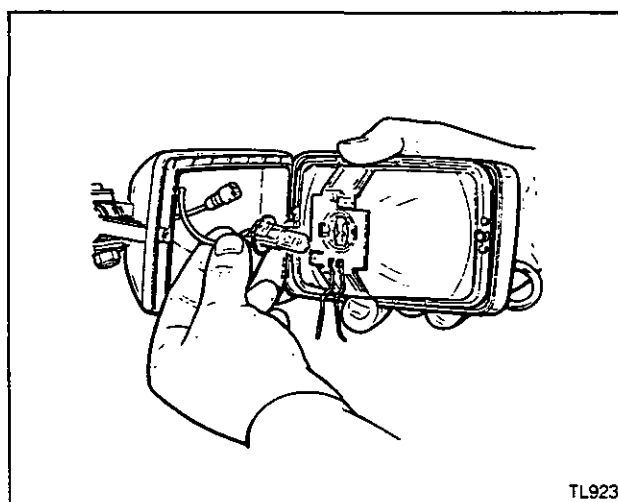


Figure 5.

TL923

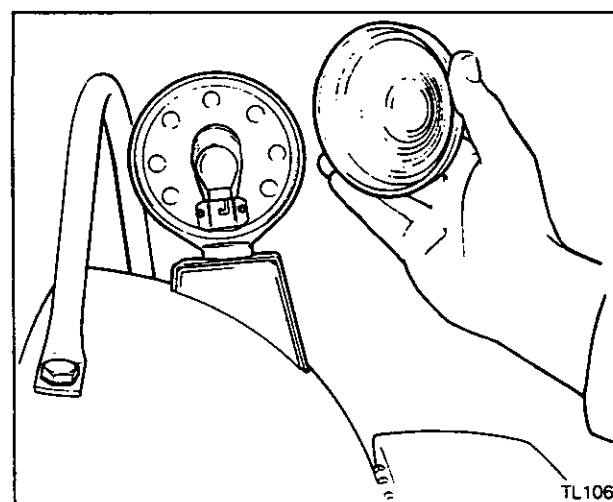


Figure 6.

TL1061

Driving and Work Lights

Removal and Refitment	14A-13
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Figures one to six illustrate the replacement of the driving and working light bulbs.

Figure 1. Rear and direction indicator light or highway warning and rear light.

Figure 2. Side and direction indicator light - Footstep tractors.

Figure 3. Side and direction indicator light - Cab tractors.

Figure 4. Number plate light.

Figure 5. Working or plough light.

Figure 6. Highway warning light.

Removal

1. Switch off the light.
2. Loosen the screws and remove the cover or lens.
3. Remove the bulb from its fitting.

Refitment

4. Fit a new bulb, refit the cover or lens and tighten the screws.
5. Test the operation of the light.



CAUTION: Work lights can have halogen bulbs. Never touch a halogen bulb with the fingers. Natural moisture in the skin will cause the bulb to burn out when the light is switched on. Always use a clean cloth or tissue when handling halogen bulbs.

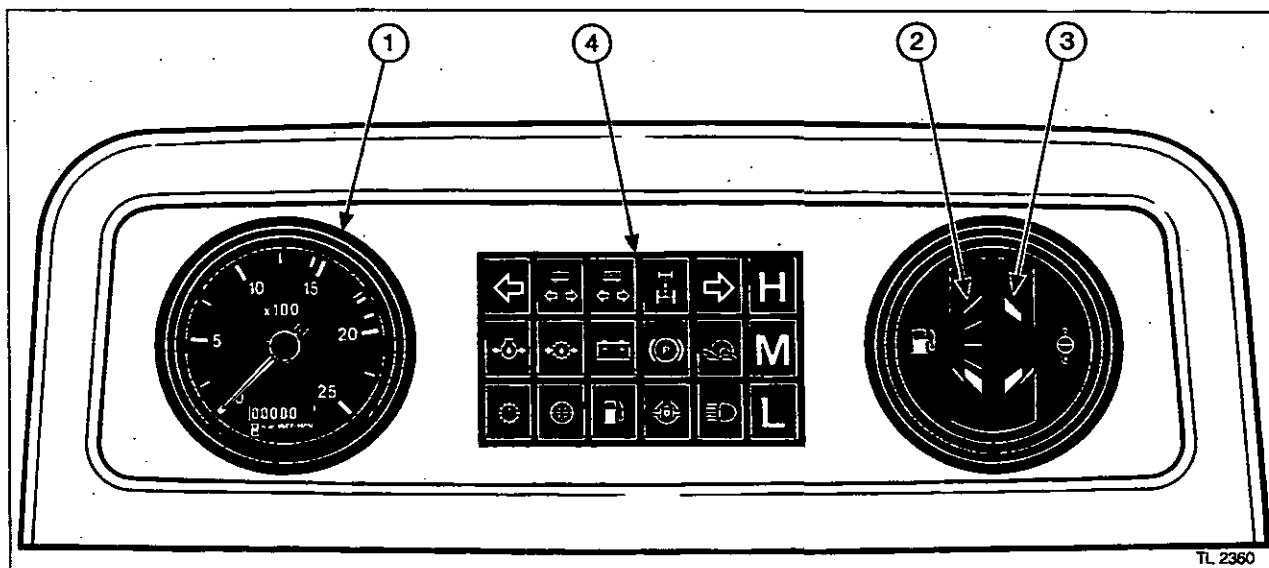


Fig.1 - Instrument Panel

- 1. Tachometer
- 2. Fuel gauge
- 3. Water temperature gauge
- 4. Warning lights

General description

From July 1992 for footstep tractors and April 1993 for cab tractors a new instrument panel (see Fig.1), fuse box and wiring loom was introduced. On footstep tractors with four cylinder engines the instrument panel is fitted with a mechanical tachometer driven from the engine by a flexible drive cable. On footstep tractors with six cylinder engines and all cab tractors they are fitted with electronic tachometers.

The new wiring loom is heavily protected against chafing with split plastic tubing. It also introduces the use of fusible links as a final protection to the wiring loom in the event of a circuit failure. The fusible links protect the circuits between the power source and the fuse box.

They are situated in the power cables adjacent to the starter motor, and protect the alternator, key switch, fuse box (auxiliary unswitched supply), head, side and plough/work lights. In the event of a failure, the cause will be a fault in the wiring loom; not one of the components, these are protected by the fuses in the main fuse box. Massey Ferguson recommended that the wiring loom is replaced if the fuse links are blown. For further details see page 14A-55.

See section 14B, onwards for the wiring diagrams.

Auxiliary circuits

Provision has been made for two auxiliary electrical circuits in the wiring loom. The connections for footstep tractors are behind the instrument panel (see Fig.2), cab tractors, behind the lower switch panel (see Fig.3). The supply is 12 volt with a maximum rating of 15 amps.

Circuit 1

Auxiliary power (1), starter switch controlled, black terminal moulding.
Positive (+) connect to white/green wire.
Negative earth (-) connect to black wire.
Light switch illumination bulb connect to red/yellow wire.
Fuse B1 in fuse box.

Circuit 2

Auxiliary power (2), non-switch controlled, red terminal moulding.
Positive (+) connect to purple wire.
Negative earth (-) connect to black wire.
Light switch illumination bulb connect to red/yellow wire.
Fuse C3 in fuse box.

A metre long cable is available from your Massey Ferguson Dealer for connection to these plugs.

Black plug - part number 3760 035 M1
Red plug - part number 3760 036 M1

A single pole light switch can be obtained to insert into one of the blank switch positions on the instrument panel.
Order switch part number 1694 363 M1 and switch lens part number 1694 369 M1.

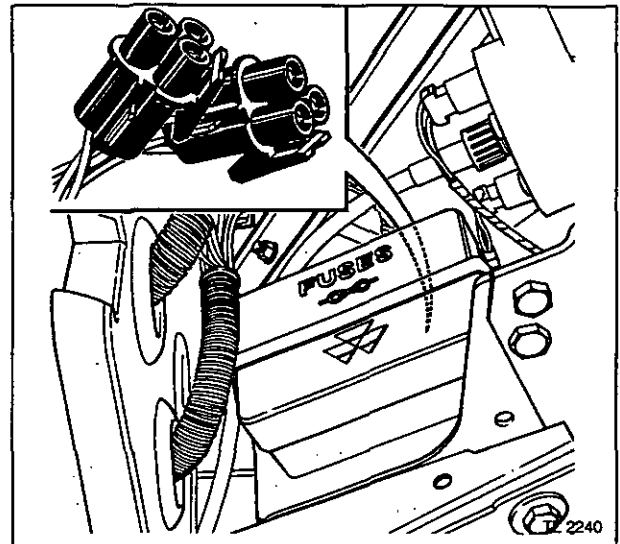


Fig.2

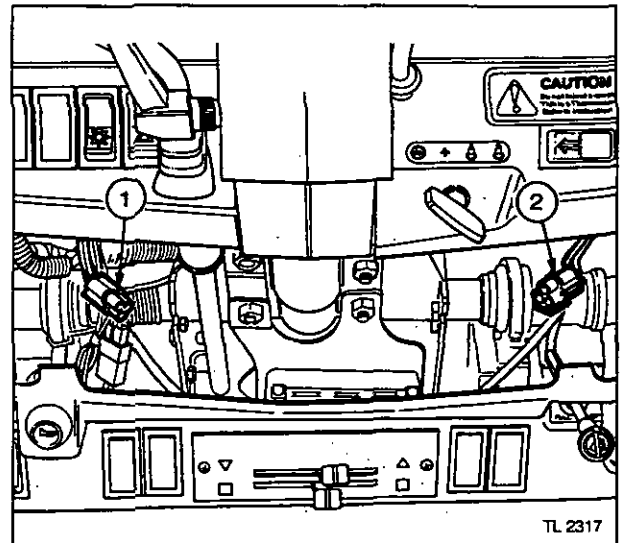


Fig.3

Power Sockets

Two power sockets situated on the rear left-hand side of the cab. The smaller single pole socket (1 Fig.4) is for use with a rotating beacon and is controlled by the switch on the panel in the cab roof. It is protected by a 7.5 amp (brown) fuse in fuse box. A plug is available part number 3760 031 M1

The larger three-pin socket (2) is a 25 amp auxiliary power supply for use with implements requiring a power source. It is protected by fuse C8 (25 amp clear) in the main tractor fuse box. A plug is available part number 3760 032 M1.

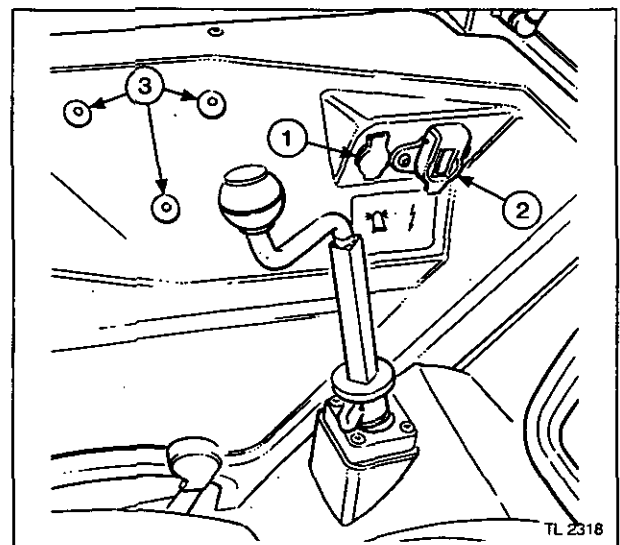


Fig.4

14A-38

ELECTRICAL SYSTEM

Control Box Mounting Points

A cab tractor is equipped with two mounting points for an implement control box (1 Fig.5), and a joy stick (2). The dimensions of these two mounting points are given on the illustration. The threaded holes in the mounting plates under the trim are M10.

Instrument Panel

Check 14A-14

Special tools:

MF.3004A Instrument Panel Test Unit

MF.3004/3 Test Lead

Procedure

1. Remove both the left- and right-hand instrument panel side covers.

Cab tractors

2. Remove the instrument panel from the tractor, see operation 14A-15.

Footstep tractors

3. It is not necessary to remove the instrument panel from the tractor to carry out this series of tests.

All models

4. Disconnect the instrument panel from the wiring loom.
5. Connect the test lead MF.3004/3 from the MF.3004A Instrument Panel Tester to the four plugs on the back of the panel (see Fig.6). If an electronic tachometer is fitted, ensure that the correct labelled lead is connected to the tachometer.

There are two tachometer leads, one for three and four cylinder engines (1). One for six cylinder engines (2). This can be identified by the electronic conversion circuit board in the lead. Ensure that the correct one is connected.

6. Connect the test lead plugs (3) to the warning lights.
7. Connect the test lead to the fuel/water temperature gauges (4).
8. Connect the battery lead from the tester to the tractor battery. Red to the positive (+), black to the negative (-) terminals.
9. Switch 'ON' the unit (1 Fig.7).
10. The red light (2) will indicate that the power is on.
11. The green light (3) 'ON' indicates that there is sufficient power in the battery to operate the tester. If the green light does not illuminate try another battery.

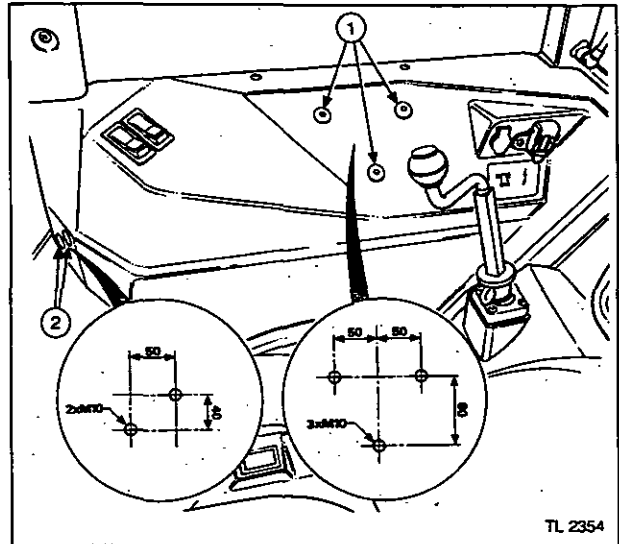


Fig.5

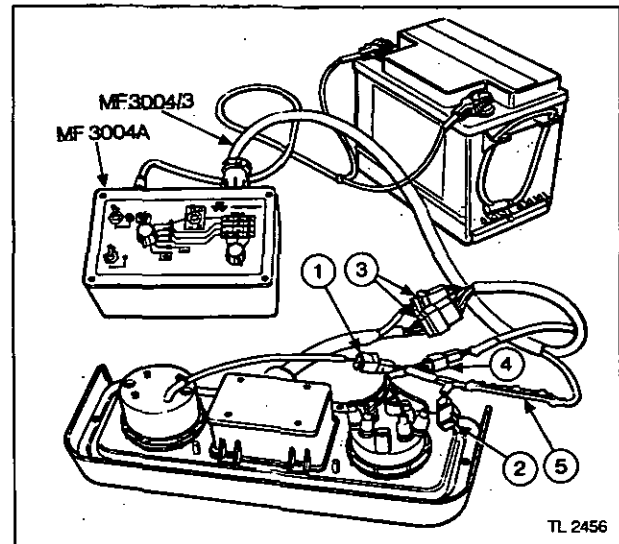


Fig.6

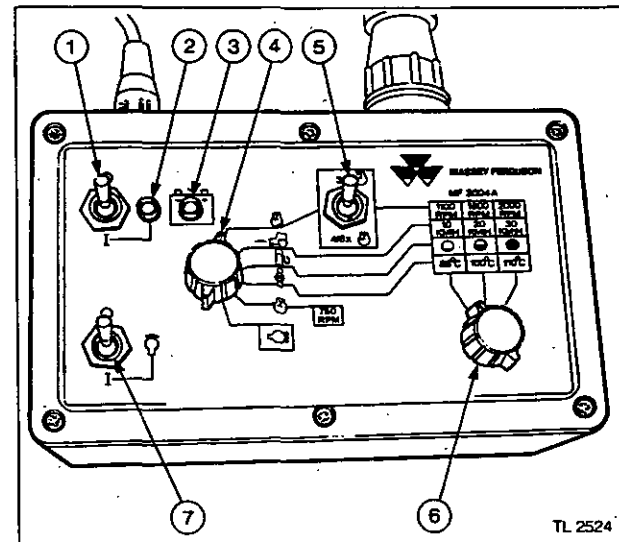


Fig.7

**TEST 1 Checking the tachometer (Figs. 7 and 8)
(Electronic tachometer only)**

1. Turn the selector (4) to the first position.
2. Move the engine type switch (5) to either a three cylinder engine (up) or four and six cylinder engines (down) depending upon the type of tractor being tested.
3. Turn the range selector switch (6) to the 1100 rev/min position. The pointer on the tachometer should move to the 11 position on the dial.
4. Next, turn the range selector switch to the 1800 and then the 2000 rev/min position. The pointer should then move to the 18 and 20 position. The 18 (1800 rev/min) position can be used to check the operation of the engine hour meter built into the tachometer.

Diagnosis

Result	Action
Tachometer does not respond	<ol style="list-style-type: none"> 1. Check connections between the tester and the tachometer 2. Tachometer faulty, replace
Tachometer satisfactory	<ol style="list-style-type: none"> 1. Check wiring from the instrument plug to the alternator or the flywheel sensor in the case of MF 396 and 399 tractors. 2. Check fuse C7 (5A Tan) 3. Check the alternator output (see check list). 4. Check the flywheel sensor.

5. The following additional checks should be made for an inoperative tachometer:-
 - a. Check the battery voltage, 12.3 volts minimum. See Test 1 page 14A-21.
 - b. Check that the alternator warning light is operative. See Test 4 and operation 14A-16.
 - c. Check the fan belt tension. See Test 2 page 14A-25.
 - d. Check the alternator output (regulated voltage) 13.6 to 14.4 volts. See Test 6 page 14A-27.
 - e. Check alternator phase voltage to tachometer. See Test 7 page 14A-27.
 - f. Check the alternator phase frequency to tachometer. See Test 7 page 14A-27.
 - g. Check the main fuse B1 (15A blue).
 - h. Tractors with six cylinder engines. Check that the flywheel sensor is correctly set and test for open circuit. See operation 14A-22.

SPEEDOMETER

Second position on the function selector switch (4 Fig.7). This test is not applicable to this instrument panel.

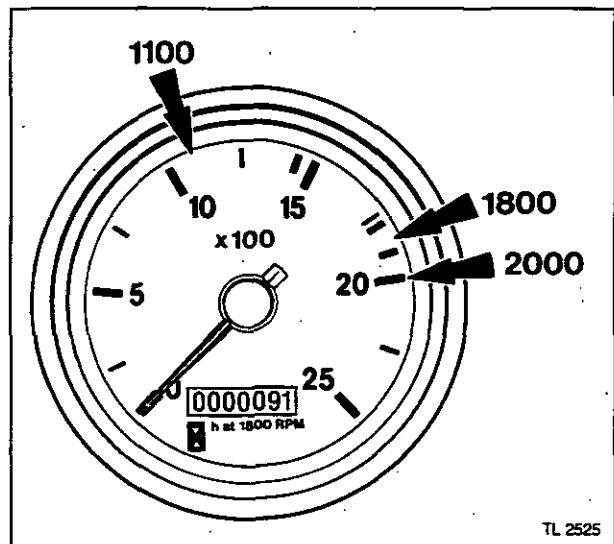


Fig.8

TEST 2 Checking the fuel gauge (Figs.7 and 9)

The combined illustration of the water temperature gauge and fuel contents gauge clearly shows the approximate position of the pointer when carrying out the three following tests.

1. Turn the function selector switch (4) to the third position.
2. Turn the range selector switch (6) to the right (full) position.

NOTE: Fuel gauge checks should be made on a descending scale.

3. The fuel gauge should read 'Full'.
4. Turn the range selector switch (6) to 'Half Full' and the pointer should register this.
5. With the range selector switch (6) set to 'Quarter Full' the pointer should now move to the top of the red sector.

Diagnosis

Result	Action
Fuel gauge does not respond	1. Check the connections between the tester and the gauge unit. 2. Fuel gauge faulty, replace.
Fuel gauge satisfactory	1. Check the wiring from the terminal 3 on the connector (black/brown wire) to the tank sender unit. 2. Check the sender unit, replace if faulty. See test 6. 3. Check fuse C7 (5A tan).

6. The instrument plug connections are featured on page 14A-41.

TEST 3 Checking the water temperature gauge (Figs. 7 and 9).

The combined illustration of the water temperature gauge and fuel contents gauge clearly shows the approximate position of the pointer when carrying out the three following tests.

1. Turn the function selector switch (4) to the fourth position.
2. Turn the range selector switch (6) to the 85°C position. The pointer should move to a position between the two sector marks in the green section.
3. Turn the range selector switch (6) to the 100°C position. The pointer should move to the very small mark in the upper green sector.
4. Finally turn the range selector switch (6) to the 110°C position. The pointer should be in the red sector.

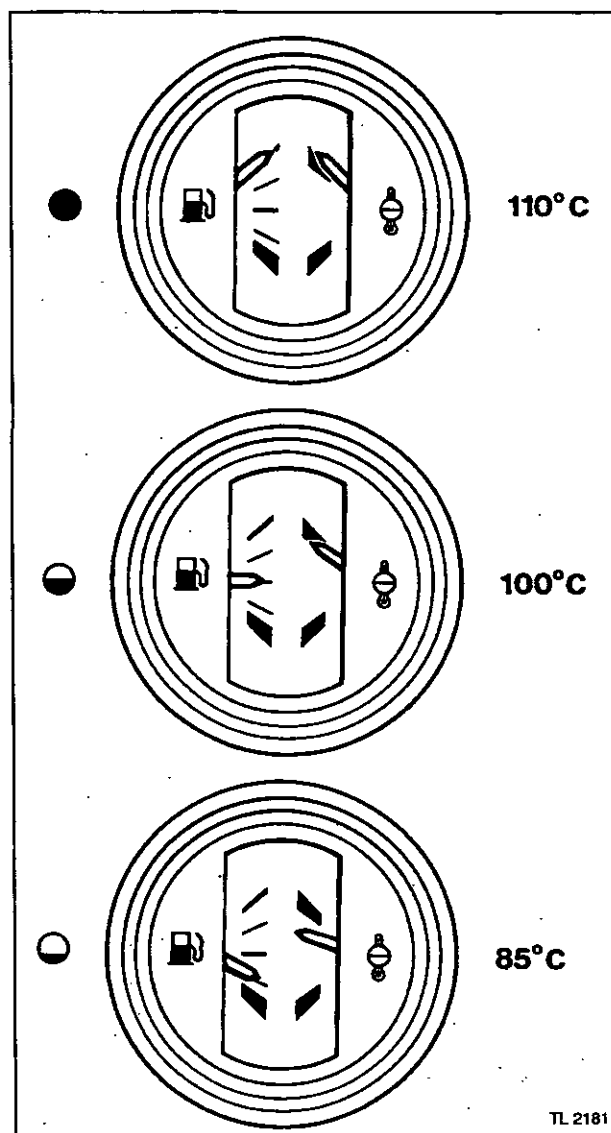


Fig.9

Diagnosis

Result	Action
Temperature gauge does not respond.	1. Check the connections between the gauge and the tester. 2. Temperature gauge faulty, replace.
Temperature gauge satisfactory.	1. Check wiring from terminal 1 (black/blue wire) to the sender unit. 2. Check sender unit, replace if faulty. 3. Check fuse C7 (5A tan)

5. The instrument plug connections are featured on page 14A-41.

TEST 4 Checking the warning lights (Fig. 7)

1. Turn the function selector switch (4) to the sixth position.
2. The tester will automatically illuminate the warning lights in groups of two, then all the lights together. Any faulty light bulb can be traced and replaced, see operation 14A-16.

TEST 5 Checking the instrument panel lights (Fig. 7)

This operation and switch (7) are not applicable to this instrument panel.

TEST 6 Checking the fuel tank sender unit (Fig. 10)

1. Disconnect the wiring from the fuel tank sender unit.
2. Connect the MF.3005 Multimeter between the white (A) and earth (B) terminal. The red terminal (C) is the connection for the 'low fuel' warning light.
3. Check the contents of the fuel tank.
4. The approximate resistance reading should be as follows:-

Tank contents	Meter reading
Full	1 - 16 ohms
Half full	102 - 132 ohms
Empty	310 - 345 ohms

5. This test will give an indication if there is a fault with the sender unit.

INSTRUMENT PANEL CONNECTIONS

The instrument panel connections viewed from the face of the plug attached to the instruments are as follows:-

Electronic Tachometer (Fig.11)

Position	Function	Wire colour
1	Magnetic sensor pick-up (Six cylinder engines)	Brown
1	Alternator connection (Three and four cylinder engines)	Brown
2	Positive (+) 12V supply	Red
3	Not used	
4	Negative (-) Earth	Black

Fuel/water temperature gauge (Fig.11)

1	Water temperature sender	Black/blue
2	Earth	Black
3	Fuel tank sender	Black/brown
4	Positive (+) 12V supply	Green

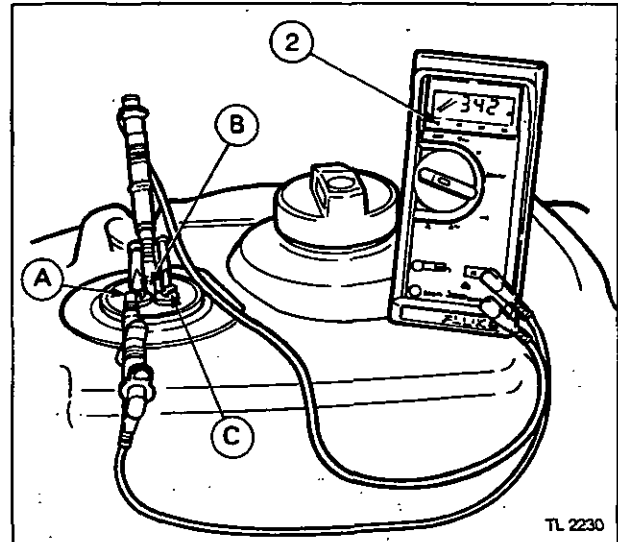


Fig.10

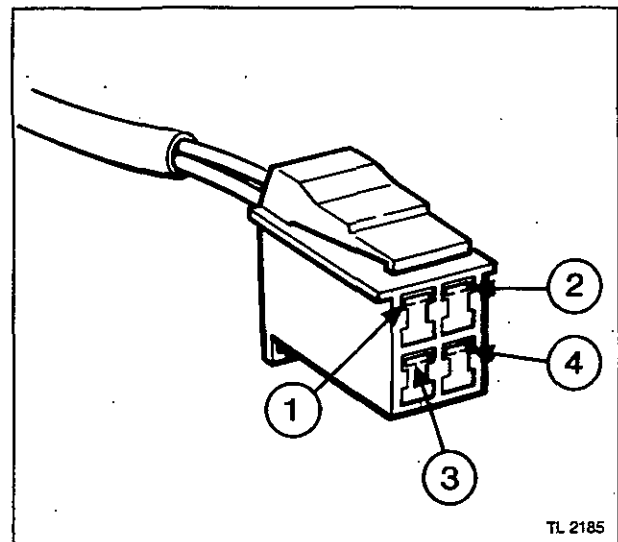


Fig.11

14A-42

ELECTRICAL SYSTEM

Range indicator lights (Fig.12)

The warning lights are supplied by two plugs as shown in figures 12 and 13 as follows:-

Position	Function	Wire colour
1	Low range	White/yellow
2	Medium range	Red/yellow
3	Creeper range	Blue
4	High range	White/blue
5	Positive (+) 12V supply	Red

Warning lights (Fig. 13)

Position	Function	Wire colour
1	Trailer 2	Grey
2	Transmission filter blocked	Dark brown
3	Engine oil pressure	White
4	Transmission oil pressure	Orange
5	Alternator	Yellow
6	Parking brake	Red/green
7	Main beam	White/green
8	Positive (+) 12V supply	Red
9	Engine air filter blocked	Red/black
10	Low fuel	White/black
11	Differential lock	White/red
12	Negative (-) earth	Black
13	Right turn	Green
14	Trailer 1	Pink
15	Four-wheel drive	Violet
16	Left turn	Light brown

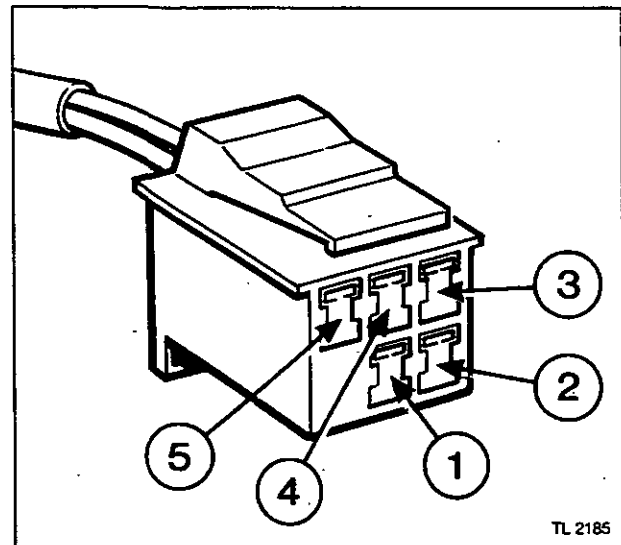


Fig.12

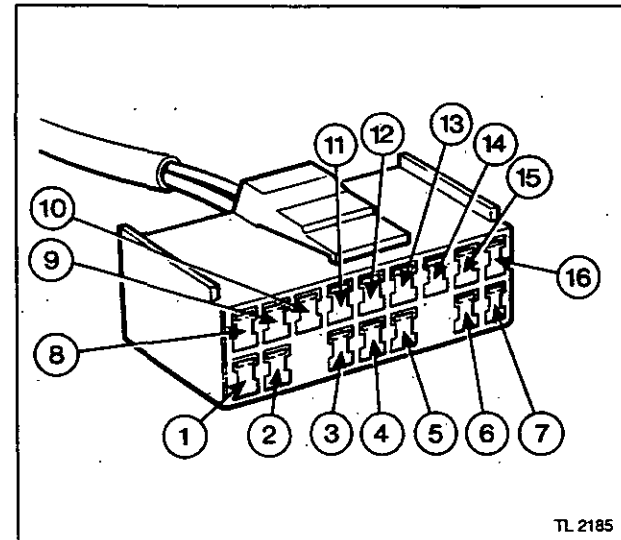


Fig.13

Instrument Panel

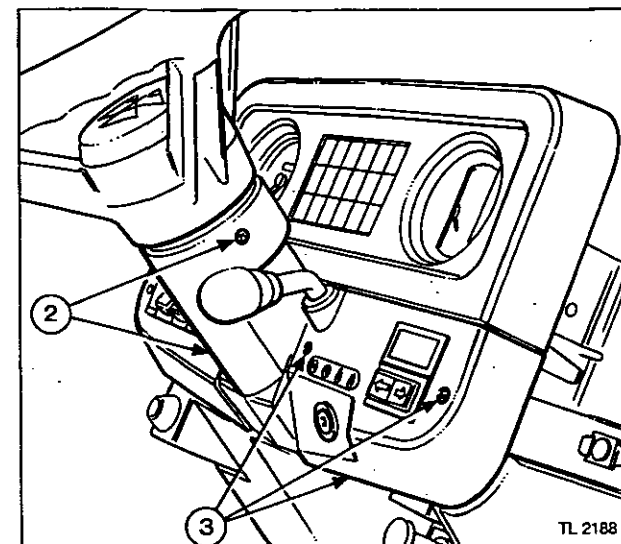
Removal and Refitment

14A-15

Removal

Footstep tractors

1. Remove the left- and right-hand instrument panel side covers.
2. Remove the cross head screw and steering column guard (2).
3. Remove the cross head screws and the two lower switch panels (3). The switch panels do not require disconnecting, only moving clear of the instrument panel.

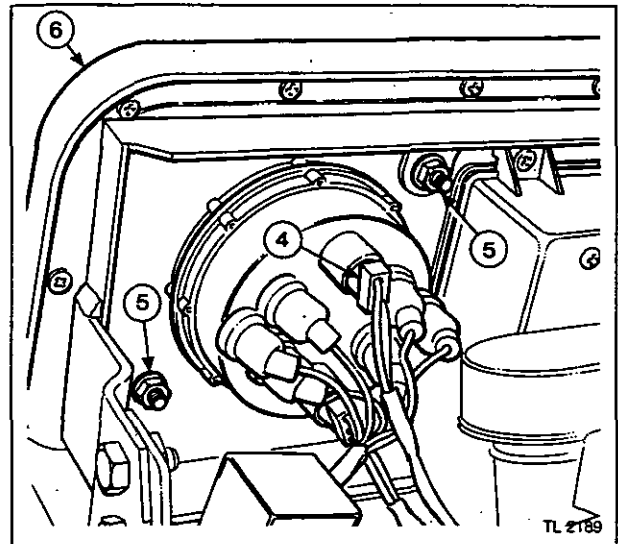


Footstep tractors

4. Remove the tachometer and fuel/water temperature gauge lights (4).
5. Remove the four nuts and washers (5) securing the panel to the frame.
6. Carefully move the panel (6) to the rear to disengage the studs from the frame and then lift it up and away from the steering column. Disconnect the instrument wiring at the plugs.
7. Remove the panel from the tractor.

Refitment

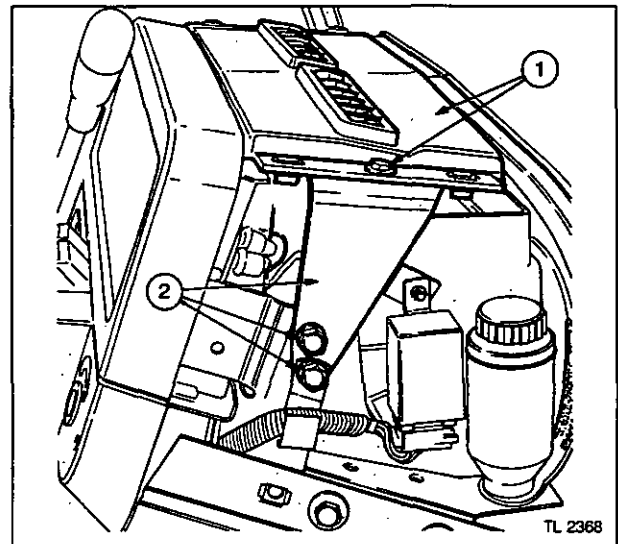
8. Reverse removal procedures.



Footstep tractors

Cab tractors

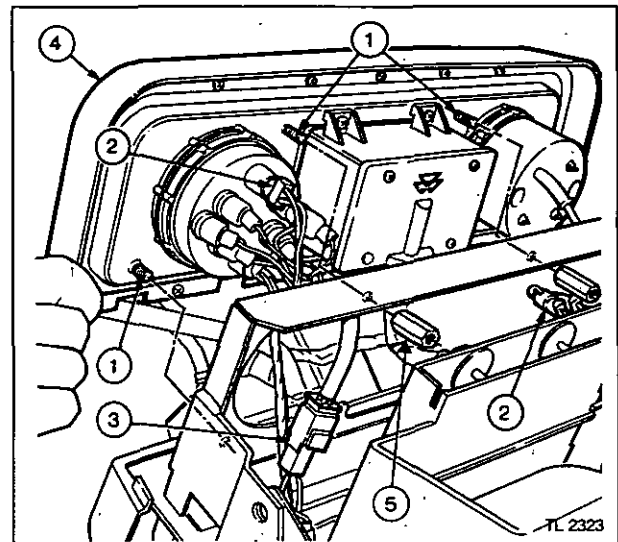
1. Remove the left- and right-hand instrument panel side covers.
2. Remove the central heater duct panel (1).
3. Remove the two support brackets (2).
4. The instrument panel is retained by four long series nuts attached to four studs (1).
5. To aid removal, a small 10 mm across flats socket and ratchet handle will be required.
6. Remove the four nuts (5).
7. Carefully remove the instrument panel from the support frame, tilting it as necessary to clear the lower switch panel and steering column. If you require more clearance, the switch panels and steering column guard can be moved as described for the footstep tractor.
8. Remove the instrument panel lights (2) from the tachometer and fuel/temperature gauge.
9. Disconnect the wiring loom at the plugs (3).
10. Remove the panel (4) from the tractor. DO NOT damage any of the wiring or plugs.



Cab Tractors

Refitment

11. Reverse removal procedures.



Cab Tractors

14A-44

ELECTRICAL SYSTEM

Warning Light Bulbs

Removal and Refitment

14A-16

Removal



CAUTION: It is very important to ensure that the instrument panel is correctly sealed at all times to prevent the ingress of dust.

1. Remove the instrument panel, see operation 14A-15.
2. Remove the four screws and lift off the cover.
3. Extract the faulty capless bulb and replace with new.

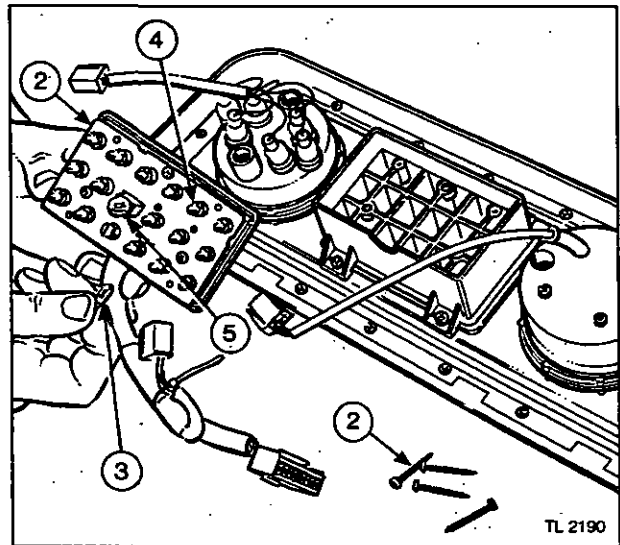
Bulb identification:-

L1=Left turn	L7=Engine oil	L13=Hydraulic filter
L2=Trailer 1	L8=Transmission	L14=Air cleaner
L3=Trailer2	L9=Alternator	L15=Low fuel
L4=Four wheel drive	L10=Parking brake	L16=Differential lock
L5=Right turn	L11=Creeper	L17=Dipped lights
L6=High range	L12=Medium range	L18=Low range

4. The warning light bulbs are 12 volt 1.2 watt capless.
5. The alternator warning bulb is 12 volt 2 watt capless.

Refitment

6. Reverse procedures 1 to 5 and ensure that the sealing rubber around the cover is correctly installed.



14A-45 ELECTRICAL SYSTEM

Instruments

Removal and Refitment

14A-17

Removal



CAUTION: It is very important to ensure that the instrument panel is correctly sealed at all times to prevent the ingress of dust.

1. Remove the instrument panel, see operation 14A-15.
2. Remove the 16 self-tapping screws securing the front panel.
3. Remove the front panel taking care not to damage the sealing ring between the halves.

Tachometer

4. Unscrew the tachometer retaining ring
5. Lift the tachometer out of the instrument panel.

Fuel/water temperature gauge

6. Unscrew the retaining ring and lift out the instrument.
7. The fuel/water temperature gauge is a sealed unit and the individual gauges cannot be replaced.

Refitment

8. Reverse procedures 1 to 7 except:
 - a. Ensure that the sealing rings around the instruments are in good condition and correctly located.
 - b. DO NOT over-tighten the instrument retaining ring. Hand tight only.
 - c. Ensure that the main sealing ring around the front panel is in satisfactory condition and that it is correctly located.
 - d. Test the instrument panel before refitting to the tractor, see operation 14A-14.

Fuses and Fuse Box

Check

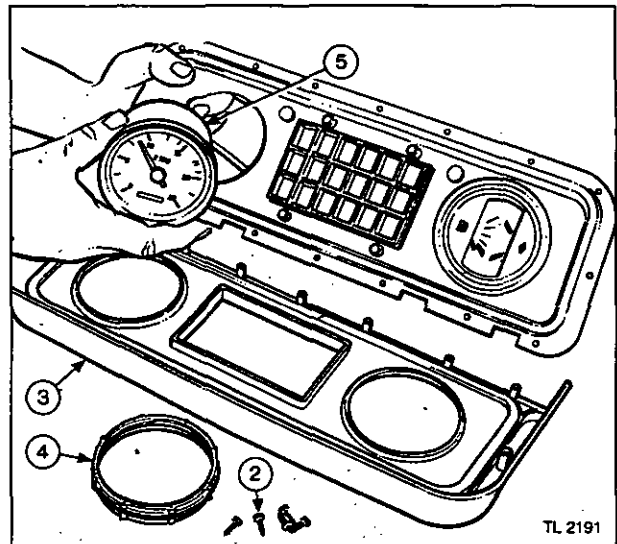
14A-18

Procedure

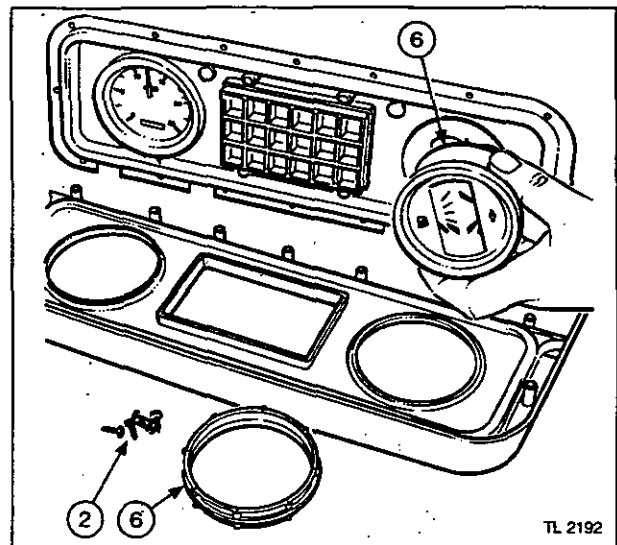
The fuse box is part of the console wiring harness and if replacement is required it will be necessary to change the combined harness and fuse box.

The fuse box is located under the left-hand cover in front of the instrument panel on footstep tractors. Below the instrument panel on cab tractors. There are two applications for each type of fuse box, one for Worldwide use and the other for North America.

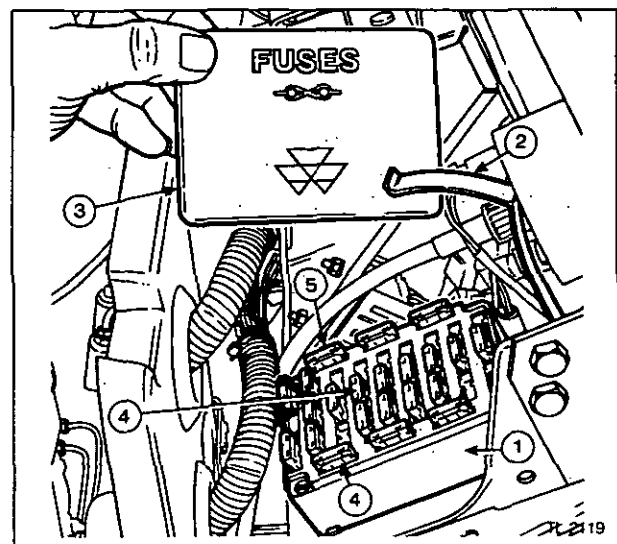
The fuses are numbered and reference to the following charts and figures will permit rapid identification of the circuits they protect. DO NOT replace the blown fuse with another of a different rating.



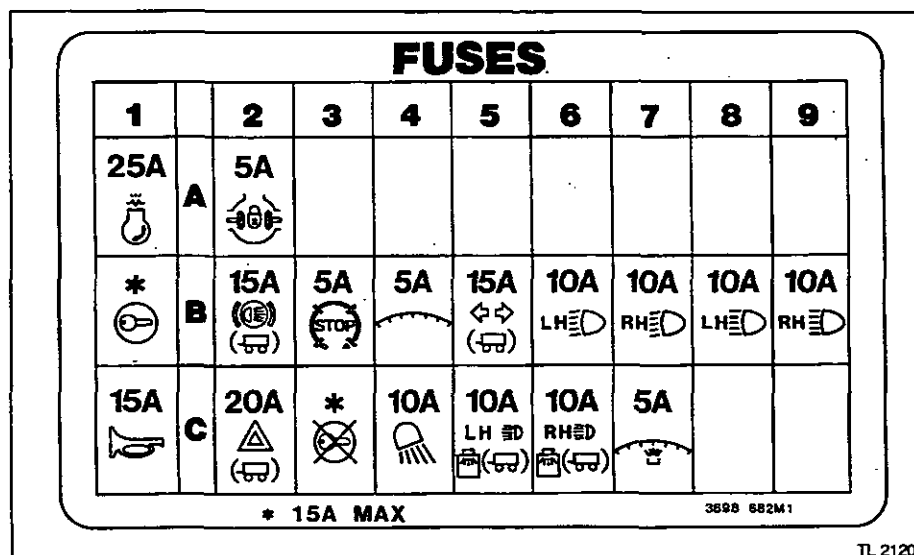
TL 2191



TL 2192



Footstep tractors



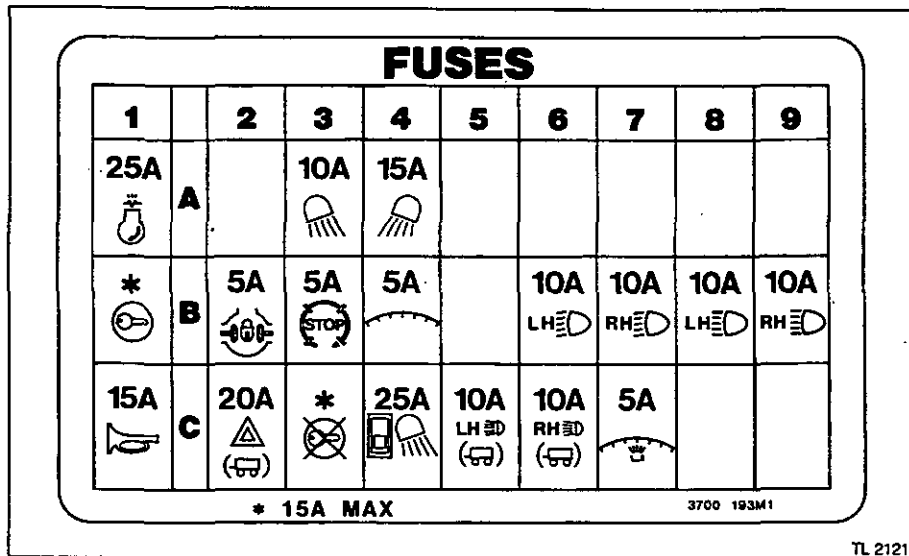
Footstep Tractors - Worldwide

Fuse	Service	Size Amp	Fuse colour
A1	Thermostart	20A	Yellow
A2	Differential lock solenoid	5A	Tan
B1	Starter switch to auxiliary power	15A	Blue
B2	Brake stop light, trailer stop light	15A	Blue
B3	Fuel cut-off switch (399)	5A	Tan
B4	Instrument console lighting and warning lights	5A	Tan
B5	Direction indicators and trailer indicators	15A	Blue
B6	Dipped headlights - left	10A	Red
B7	Dipped headlights - right	10A	Red
B8	Main headlight - left	10A	Red
B9	Main headlight - right	10A	Red
C1	Horn	15A	Blue
C2	Hazard warning and trailer warning	20A	Yellow
C3	Non-starter switch auxiliary power	15A	Blue
C4	Rear work light	10A	Red
C5	Side lights, number plate light & trailer lights - left	10A	Red
C6	Side lights, number plate light & trailer lights - right	10A	Red
C7	Instrument panel gauges and lighting	5A	Tan

Fuses – footstep tractors

1. Locate the fuse box (1) behind the left-hand cover or below the instrument panel.
2. Release the spring clip (2).
3. Remove the lid (3).
4. Remove the faulty fuse (4), refer to the relevant chart below.
5. Spare fuses (5) are provided in two racks. DO NOT replace the blown fuse with another of a different rating.

14A-47 ELECTRICAL SYSTEM



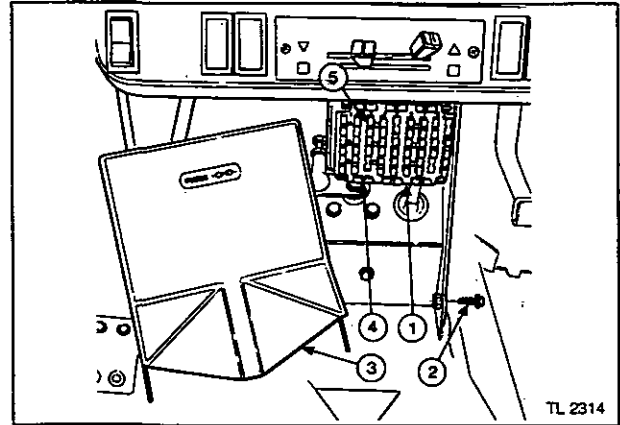
Footstep Tractors - North America

Fuse	Service	Size Amp	Fuse colour
A1	Thermostart	20A	Yellow
A3	Rear work light	10A	Red
A4	Front work light	15A	Blue
B1	Starter switch to auxiliary power	5A	Tan
B2	Differential lock solenoid	15A	Blue
B3	Fuel cut-off switch (396, 399)	5A	Tan
B4	Instrument console lighting and warning lights	5A	Tan
B6	Dipped headlights - left	10A	Red
B7	Dipped headlights - right	10A	Red
B8	Main headlight - left	10A	Red
B9	Main headlight - right	10A	Red
C1	Horn	15A	Blue
C2	Hazard warning and trailer warning	20A	Yellow
C3	Non-starter switch auxiliary power	15A	Blue - max
C4	Rear work light switch	25A	Natural (white)
C5	Side lights, number plate light & trailer lights - left	10A	Red
C6	Side lights, number plate light & trailer lights - right	10A	Red
C7	Instrument panel gauges and lighting	5A	Tan

ELECTRICAL SYSTEM

Fuses – cab tractors

1. Locate the fuse box (1) behind the left-hand cover or below the instrument panel.
2. Remove the two bolts (2).
3. Remove the cover (3).
4. Remove the faulty fuse (4), refer to the relevant chart below.
5. Spare fuses (5) are provided in two racks. DO NOT replace the blown fuse with another of a different rating.



Cab tractors

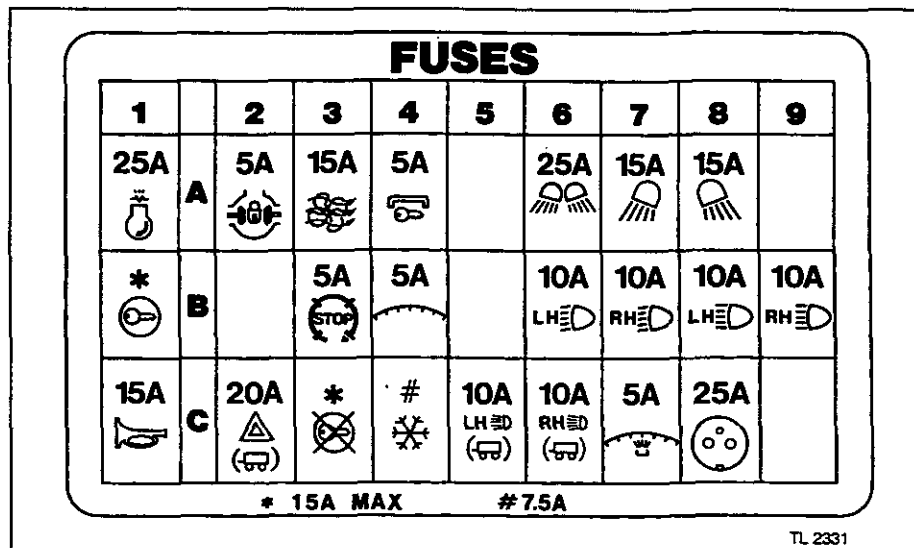
FUSES									
1	2	3	4	5	6	7	8	9	
25A ⚡	A 5A ⚡	15A ⚡	5A ⚡		25A ⚡	15A ⚡	15A ⚡		
* ⚡	B 15A ⚡	5A STOP ⚡	5A ⚡	15A ⚡	10A LH ⚡	10A RH ⚡	10A LH ⚡	10A RH ⚡	
15A ⚡	C 20A ⚡	* ⚡	# ⚡	10A LH ⚡	10A RH ⚡	5A ⚡	25A ⚡		
* 15A MAX				# 7.5A		3701 903M1			

TL 2315

Cab Tractors - Worldwide

Fuse	Service	Size Amp	Fuse colour
A1	Thermostart	20A	Yellow
A2	Differential lock solenoid	5A	Tan
A3	Heater blower motor	15A	Blue
A4	Switched supply to roof relay	5A	Tan
A6	Supply to work light relay	25A	Natural (white)
A7	Front work light	15A	Blue
A8	Rear work light	15A	Blue
B1	Starter switch to auxiliary power	15A	Blue max.
B2	Brake stop light, trailer stop light	15A	Blue
B3	Fuel cut-off switch (399)	5A	Tan
B4	Instrument console lighting and warning lights	5A	Tan
B5	Direction indicators and trailer indicators	15A	Blue
B6	Dipped headlights - left	10A	Red
B7	Dipped headlights - right	10A	Red
B8	Main headlight - left	10A	Red
B9	Main headlight - right	10A	Red
C1	Horn	15A	Blue
C2	Hazard warning and trailer warning	20A	Yellow
C3	Non-starter switch auxiliary power	15A	Blue max.
C4	Air conditioning compressor	7.5A	Brown
C5	Side lights, number plate light & trailer lights - left	10A	Red
C6	Side lights, number plate light & trailer lights - right	10A	Red
C7	Instrument panel gauges and lighting	5A	Tan
C8	Auxiliary power socket	25A	Natural (white)

ELECTRICAL SYSTEM



Cab Tractors - North America

Fuse	Service	Size Amp	Fuse colour
A1	Thermostart	20A	Yellow
A2	Differential lock solenoid	5A	Tan
A3	Heater blower motor	15A	Blue
A4	Switched supply to roof relay	5A	Tan
A6	Supply to work light relay	25A	Natural (white)
A7	Front work light	15A	Blue
A8	Rear work light	15A	Blue
B1	Starter switch to auxiliary power	15A	Blue - max.
B3	Fuel cut-off switch (399)	5A	Tan
B4	Instrument console lighting and warning lights	5A	Tan
B6	Dipped headlights - left	10A	Red
B7	Dipped headlights - right	10A	Red
B8	Main headlight - left	10A	Red
B9	Main headlight - right	10A	Red
C1	Horn	15A	Blue
C2	Hazard warning and trailer warning	20A	Yellow
C3	Non-starter switch auxiliary power	15A	Blue - max.
C4	Air conditioning compressor	7.5A	Brown
C5	Side lights, number plate light & trailer lights - left	10A	Red
C6	Side lights, number plate light & trailer lights - right	10A	Red
C7	Instrument panel gauges and lighting	5A	Tan
C8	Auxiliary power socket	25A	Natural (white)

14A-50

ELECTRICAL SYSTEM

Cab Fuse Box

Check

14A-19

Procedure

The cab fuse box is part of the cab wiring loom and cannot be replaced separately. The fuse box is located on the left-hand side of the cab roof lining in two boxes as follows:-

Fuse Box 'A'			
Position	Description	Fuse rating	Colour
1	Front wash/wipe	10A	Red
2	Rear wash/wipe	10A	Red
3	Air conditioning	5A	Tan
4	Speedometer	2A	Clear

Fuse Box 'B'			
Position	Description	Fuse rating	Colour
1	Fresh air fan	25A	White
2	Interior light	5A	Tan
3	Beacon	7.5A	Brown
4	Radio	5A	Tan

To gain access to the fuses pull off the plastic cover and replace the failed fuse. DO NOT replace a blown fuse with another of a different rating. Spare fuses will be found in the main tractor fuse box.

Direction Indicator Flasher Unit

Removal and Refitment

14A-20

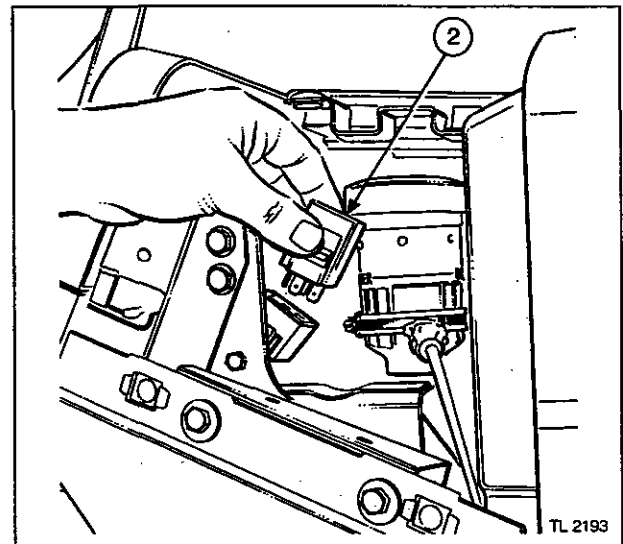
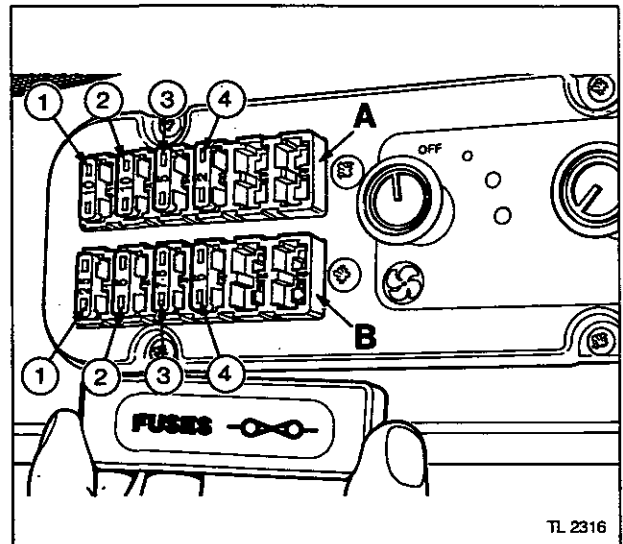
Procedure

Footstep Tractors

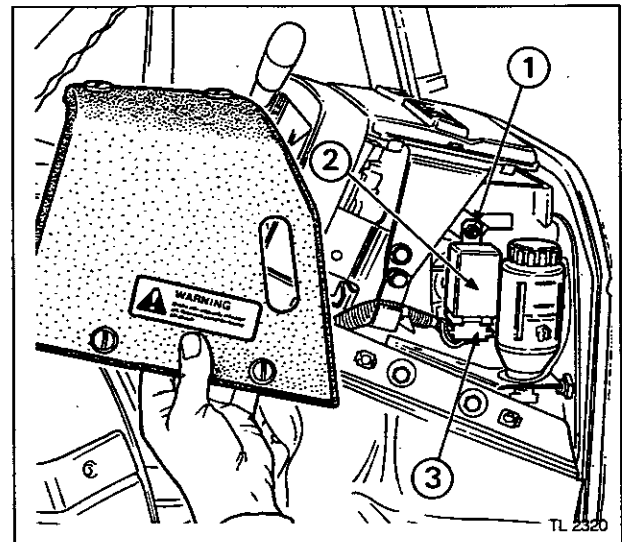
1. Remove the right-hand instrument panel side cover.
2. To replace the flasher unit relay (2), pull it from the base and replace it with a new unit.

Cab Tractors

1. Remove the right-hand instrument panel side cover.
2. Remove the small screw, nut and washer (1).
3. Remove the flasher unit (2) from the base (3).
4. Fit a new flasher and replace the fixing screw.



Footstep tractor



Cab tractor

Electrical Relays

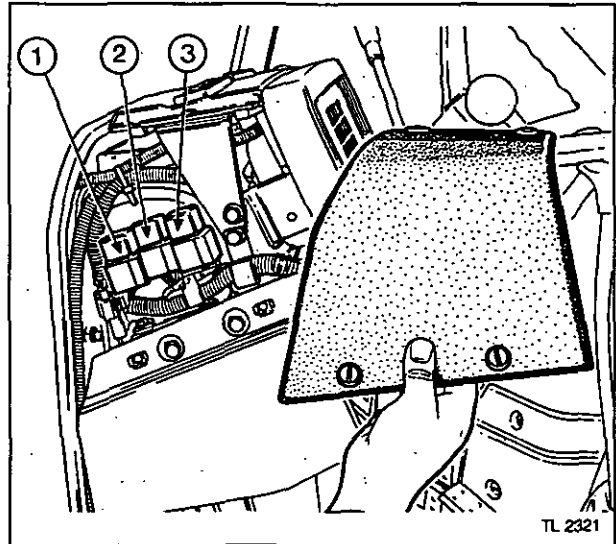
Removal and Refitment

14A-21

Procedure

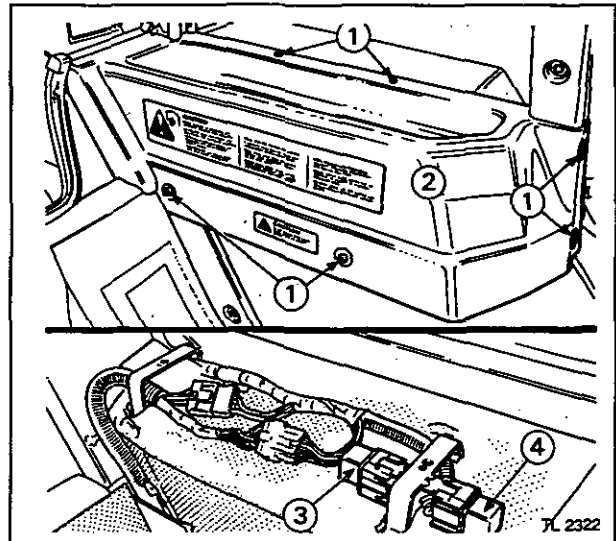
Cab tractors are fitted with a number of electrical relays to control the electrical circuits. They are multi-pin type fitting into simple sockets, and are identified as follows:-

- Air conditioning relay (1 blue)
- Work light relay (2 red)
- Headlight flash relay (3 yellow)



The relays controlling the cab electrics are located under the left-hand parcel shelf (see Fig.31). To gain access to the relays remove the cross head screws (1) and parcel shelf (2). The two relays are identified as follows:

- All circuits controlled by the starter switch (3 Red).
 - Air conditioning (4 blue)
1. Remove the instrument panel side cover or parcel shelf.
 2. Select the failed relay.
 3. Pull the relay from its socket and fit a new unit.



Work Light Relay

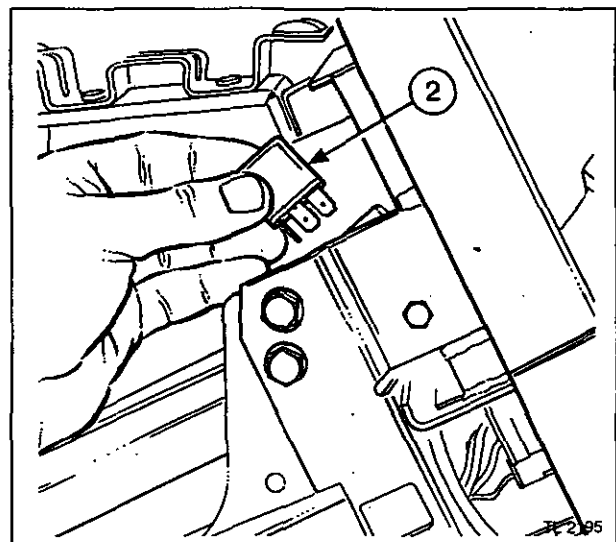
Removal and Refitment

14A-22

(North America only)

Procedure

1. Remove the left-hand instrument panel side cover.
2. To replace the work light relay, pull it from the base and replace it with a new unit.



14A-52

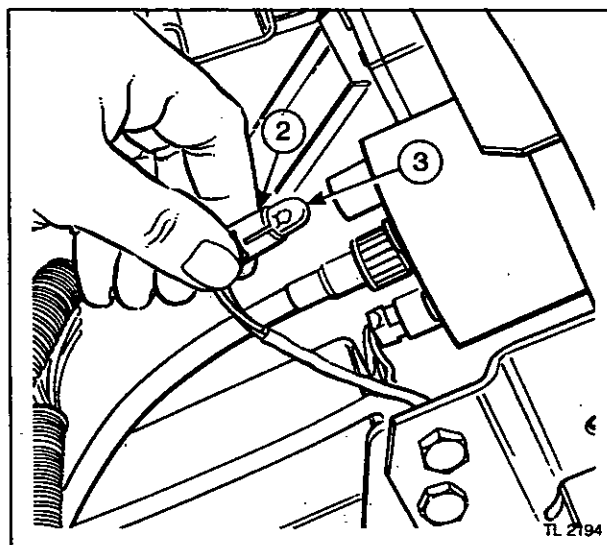
ELECTRICAL SYSTEM

Instrument Lights

Removal and Refitment 14A-23

Procedure

1. Remove the appropriate instrument panel side cover.
2. Pull the holder of the failed bulb from its housing in the instrument.
3. Pull the capless bulb from its holder.
4. Replace the bulb with a 12 volt 2 watt capless bulb.



Tachometer Sensor

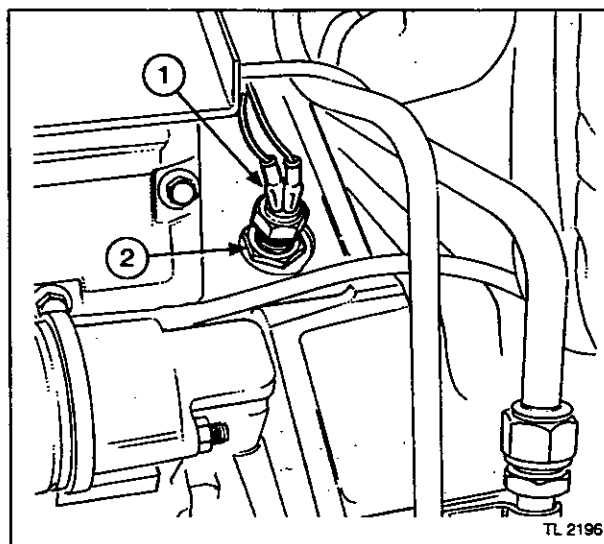
Removal and Refitment 14A-24

(Six cylinder engine only)

Special tools:
MF.3005 Digital Multimeter

Removal

1. Disconnect the wire from the sensor.
2. Slacken the lock-nut and unscrew the sensor.

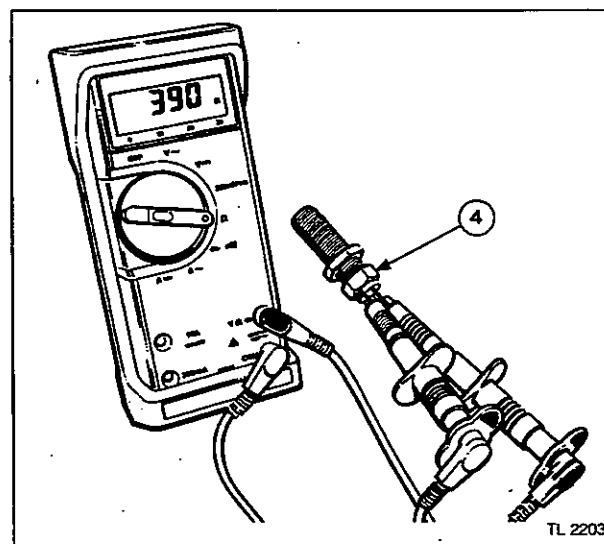


Diagnosis

3. Check the sensor for open circuit with a MF3005 digital multimeter. The reading should be 350 ohm plus/minus 50 ohms.

Refitment

4. The correct clearance between the sensor and the flywheel ring gear is 0,6 mm (0.025 in). This is set by turning the engine until a tooth is in line with the centre of the hole.
5. Screw in the sensor until it bottoms on the tooth then back off by 1/2 turn. Tighten the lock-nut. If the sensor is screwed in too far it will be damaged.
6. Reconnect the wiring.



Tachometer Drive Cable

Removal and Refitment 14A-25

(Four cylinder engine footstep tractors only)

Removal

1. Remove the left-hand instrument panel side cover.
2. Disconnect the tachometer cable from the tachometer.
3. Remove the right-hand lower hood panel.
4. Disconnect the tachometer cable from the drive gearbox.
5. Disconnect the two clips retaining the cable to the rear hood support.
6. Remove the cable.

Refitment



CAUTION: DO NOT kink or bend the tachometer drive cable. When working on the tachometer or engine, slide the cable back out of the way in a straight line.

7. Reverse procedures 1 to 5, ensure that the cable is installed without any sharp bends.

Tachometer Drive Gearbox

Removal and Refitment 14A-26

(Four cylinder engine footstep tractors only)

Removal

1. Remove the right-hand lower hood panel.
2. Disconnect the drive cable from the gearbox. DO NOT bend the drive cable.
3. Remove the two bolts and washers.
4. Lift out the tachometer drive gearbox from its mounted position. Inspect for damage, replace if necessary.

Refitment

5. Reverse procedures 1 to 4, ensure that the drive blade engages correctly with the timing gear.

Brake Switch

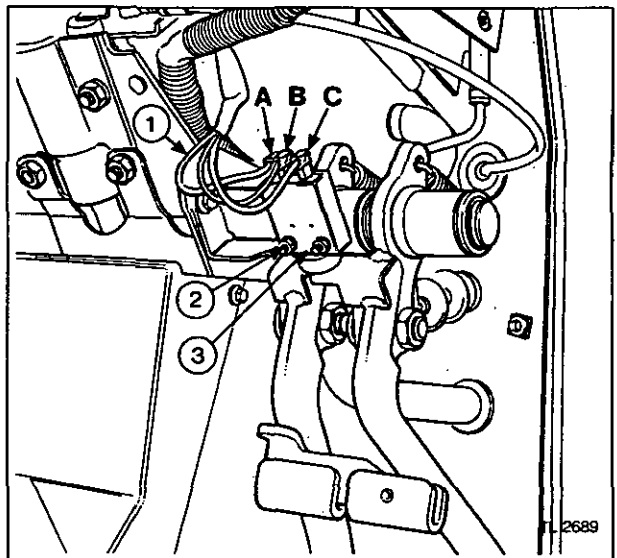
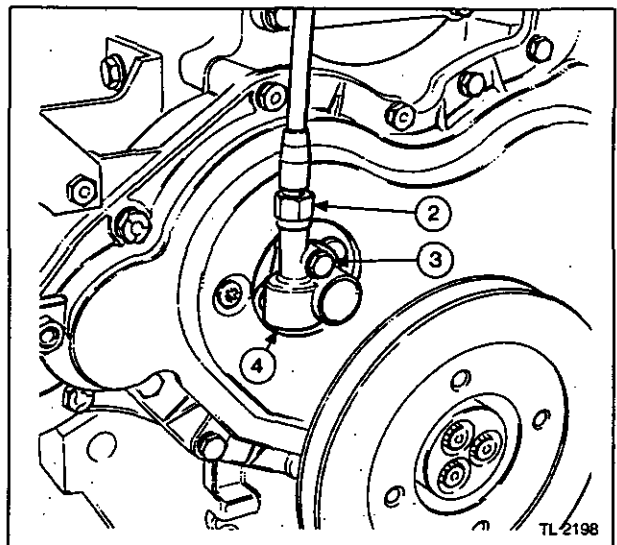
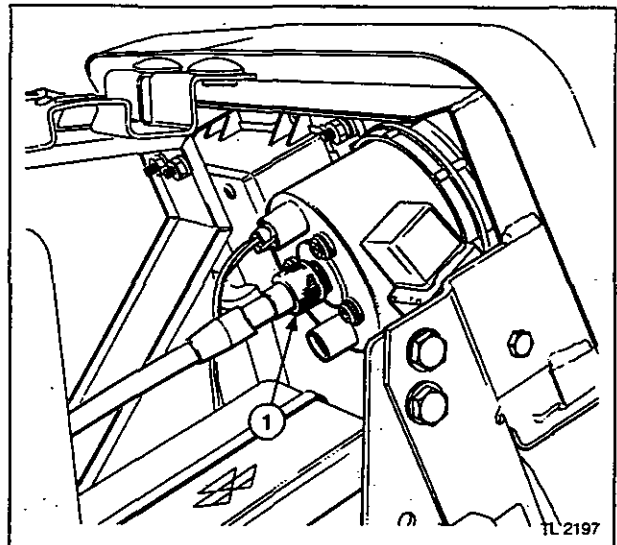
Removal and Refitment 14A-27

Removal

1. Disconnect and move to one side the lower instrument panel.
2. Disconnect the wires from the switch.
3. Remove the two nuts and washers.
4. Remove the switch.

Refitment

5. Reverse procedures 1 to 4.
6. Reconnect the wires in the following order:-
 - A. Green/purple.
 - B. Black/light green.
 - C. Green.



14A-54

ELECTRICAL SYSTEM

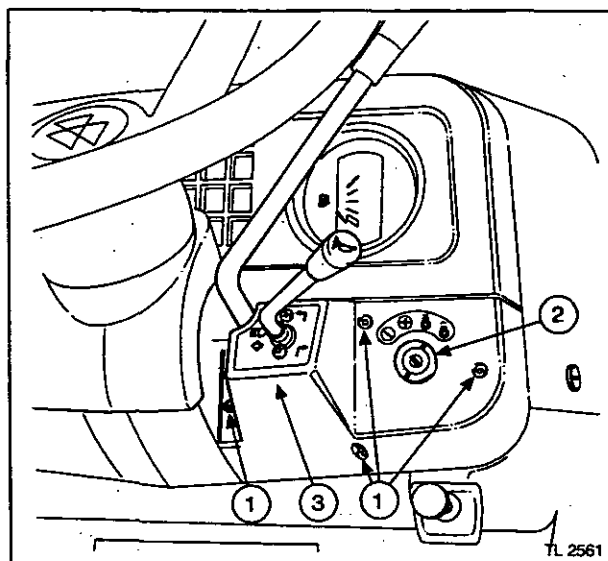
Direction Indicator & Starter Switch

Removal and Refitment

14A-28

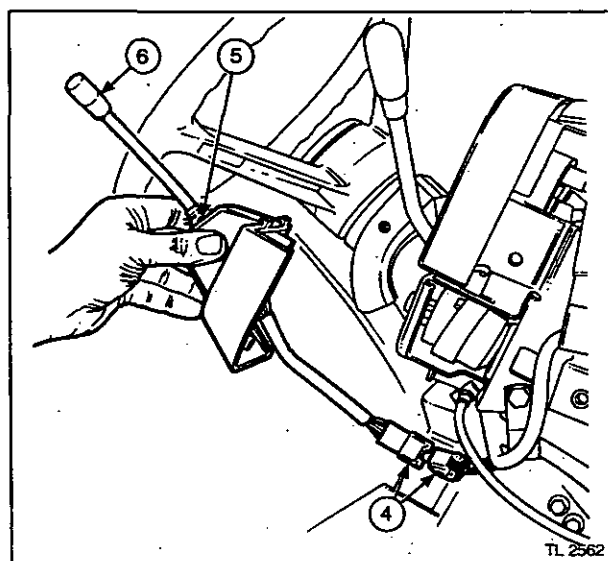
Removal

1. Remove the four screws.
2. Remove the screwed ring securing the starter switch.
3. Remove the switch panel carefully by pulling it away from the bottom, unclip it from the instrument panel and slide it out from the throttle lever.



Direction Indicator Switch

4. Disconnect the wiring loom.
5. Remove the two screws.
6. Remove the switch by passing the lever through the hole in the panel.

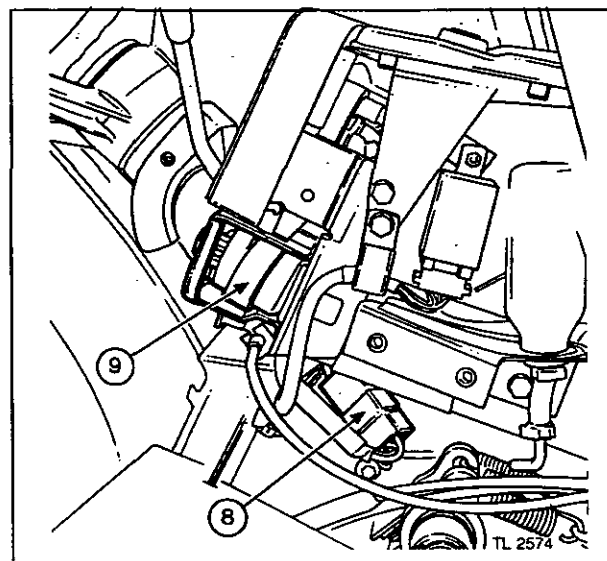


Starter Switch

7. Remove the cable clip.
8. Disconnect the switch at the loom.
9. Remove the switch from the instrument panel support by pushing the switch forward, then sliding it out sideways.

Refitment

10. Reverse procedures 1 to 9 except:
 - a. Reassemble the switches carefully. Ensure that the cable connectors are fully locked together.
 - b. Stow the cables so that they do not chafe on any moving parts i.e. brake pedals.
 - c. Replace all cable clips in their original positions.



Fusible Links

Check 14A-29

The tractor electrical system is fitted with a final protection device, a set of fusible links. These fusible links are situated in the cables adjacent to the starter motor, see illustration. They are designed to protect the wiring loom in the event of a major circuit failure.

The following circuits are protected:-

Footstep Tractors

Footstep tractors have four fusible links.

Engine harness:-

1. Alternator (B+)

Main bulkhead/instrument panel harness:-

2. Non-ignition switched items (not lights) but including hazard flasher, horn, non-ignition switched auxiliary supply under instrument panel.
3. All lights including work lights.
4. Ignition switched items including starter solenoid, thermostart, Ignition switched auxiliary supply under instrument panel, instrument panel.

Cab Tractors

Cab tractors have five fusible links.

Engine harness:-

1. Alternator (B+)

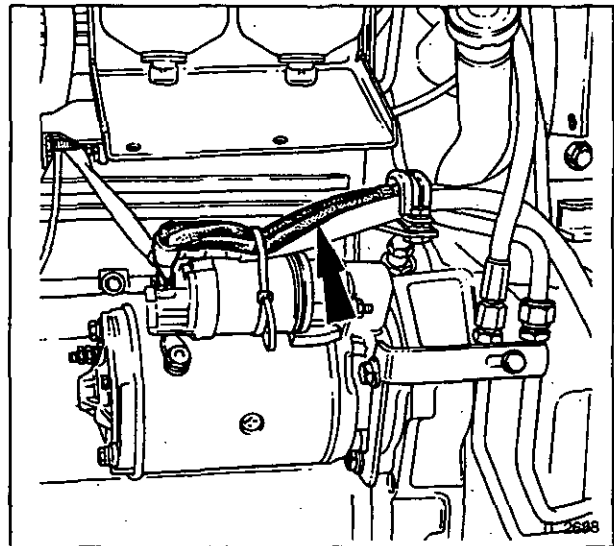
Main bulkhead/instrument panel harness:-

2. Non-ignition switched items including the 25A power socket (not lights) but including hazard flasher, horn, air conditioner compressor supply via relay, non-ignition switched auxiliary supply under instrument panel.
3. Cab roof fuse box 'A'.
4. All lights including work lights.
5. Ignition switched items including starter solenoid, thermostart, Ignition switched auxiliary supply under instrument panel, cab ignition switched relay supply to cab roof fuse box 'B', instrument panel.
6. Ignition switched items including starter solenoid, thermostart, Ignition switched auxiliary supply, cab ignition switched relay supply to cab roof fuse box No.2, instrument panel.

Check

In the unlikely event of a failure of one of the links, it can normally be recognised by a discolouration of the protective sleeve over the fusible link. If this is not visible, it will be necessary to remove the plastic tie and feel along the length of each wire to determine if one of them has parted.

It is important not to connect the battery the wrong way round. This will result in a failure of the front engine harness fusible link feeding the alternator.



Action



CAUTION: DO NOT under any circumstance bridge the failed fusible link with another cable. It will result in a more serious failure, possibly setting fire to the tractor.

The fusible links should not be replaced, it will be necessary to replace the failed wiring harness complete.

Solenoid Valves

Check

14A-30

When performing fault finding work on the hydraulic solenoids associated with the differential lock, 18 Speedshift and lift system hydraulic lock circuits (Japanese tractors only), great care must be exercised when connecting an alternative electrical supply, e.g. testing the valve.

These solenoids incorporate an integral suppressor diode and correct polarity MUST be observed. The diode is fitted to preserve the associated switch components.

Failure to do this will result in failure of the coil assembly.

NOTE: The four wheel drive solenoid does NOT have an integral suppressor diode – The diode is fitted in the connector plug.

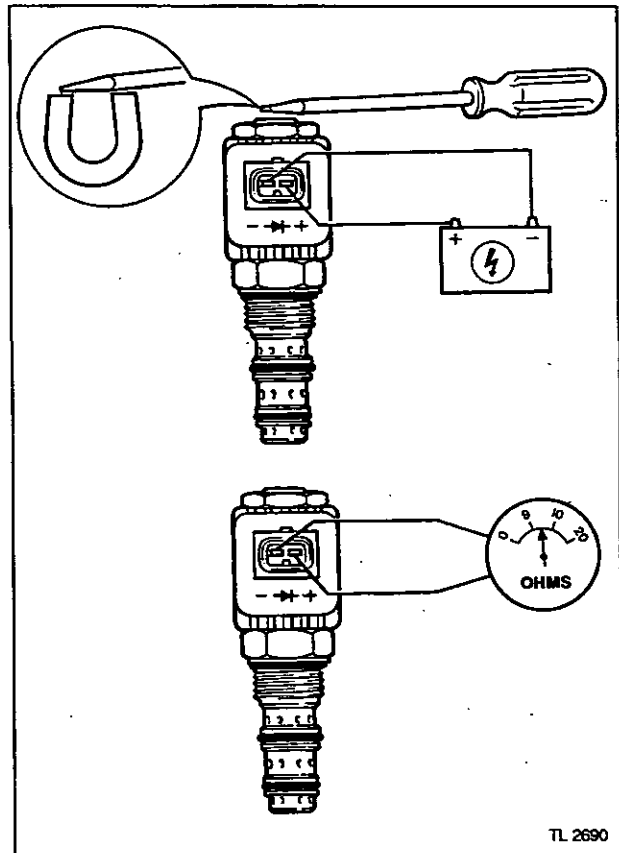
Testing



CAUTION: Solenoid valves fitted with 2 pin polarised plugs. Always observe polarity.

There are three methods of testing the solenoids:-

1. With the coil connected to the tractor electrical system, switch on service. With the aid of a ferrous spanner or screwdriver test the top of the coil core for magnetism.
2. Test the coil with an outside source of power (12 volt battery). Connect the battery across the two terminal, observe the polarity of the coil, see above. Test for magnetism or you will feel the coil being pulled in.
3. Test the coil winding for continuity with a multi-meter, you should obtain a reading of approximately 9-10 ohms.



Speedometer Calibration

Adjust

14A-31

Programming Procedure

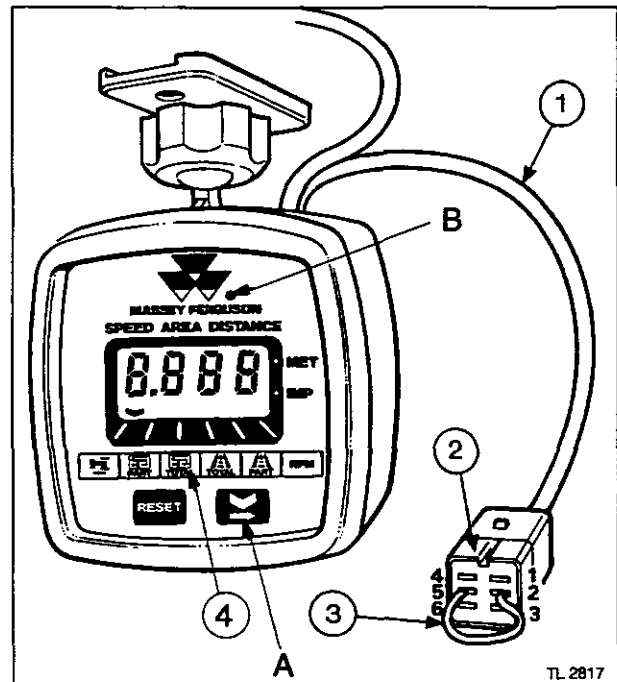
If there has been a change in tyre size, or you are installing a new speedometer, it must be programmed for the size of tyre fitted to ensure accuracy. The instructions given are for metric units, if imperial units are to be used select the 'IMP' setting in procedure 2.

1. Turn the ignition switch to the auxiliary position.
2. Check that Metric operation is selected. By pressing button 'B', four horizontal bars will briefly appear across the screen in line with the words MET at the right-hand side of the display. The figure display after the four-bar to indicate MET/IMP is the value of the rolling circumference held in the memory. If it is necessary to change to metric, proceed as follows:-
 - a. Advance the chevron to the third position from the left (4). On early speedometers this will be 'Part Area', on later instruments, with 'RPM', this will be 'Total Area'
 - b. Press and hold button 'B'.
 - c. While holding 'B', press and hold button 'A'. The position of the bars will alternate between the two. Release button 'A' when the bars appear in the MET position.
 - d. Release button 'B' and the instrument will return to 'operating' mode.
3. Move the chevron on the LCD display to the forward speed position on the left, see illustration, by pressing and holding down button 'A'.
4. You must now input the rolling circumference of the rear wheel in metres. The attached chart gives the more popular sizes, if the tyre size you require is not listed, it can be obtained from your local tyre supplier.

Tyre size	Tyre type	Rolling circumference
14.9R28	Super Traction Radial R1	4.033 m
14.9-28	Dyna Torque II R1	4.115 m
14.9-28	Traction Sure Grip R1	4.172 m
16.9R30	Super Traction Radial R1	4.404 m
16.9-30	Dyna Torque II R1	4.408 m
16.9-30	Traction Sure Grip R1	4.371 m
18.4-30	Dyna Torque II R1	4.584 m
18.4-30	Traction Sure Grip R1	4.617 m
12.4R32	Super Traction Radial R1	4.045 m
16.9R34	Super Traction Radial R1	4.717 m
18.4-34	Dyna Torque II R1	4.876 m
18.4-34	Traction Sure Grip R1	4.899 m
13.6R36	Super Traction Radial R1	4.493 m
13.6R38	Super Traction Radial R1	4.658 m
16.9R38	Super Traction Radial R1	5.001 m
16.9-38	Dyna Torque II R1	5.044 m
18.4R38	Super Traction Radial R1	5.212 m

All figures taken from the Goodyear Agricultural Tyre Handbook.

NOTE: 342 tractors only – divide rolling circumference by 4 and use this figure.



If for any reason you are unable to obtain the rolling circumference of your tyre the following procedure may be adopted on a level and straight road:

- a. With a piece of chalk mark the bottom of the rear tyre, adjacent to this mark, mark the road.
- b. Drive the tractor forward so that the rear wheel rotates exactly ten times.
- c. Re-mark the road adjacent to the mark on the tyre.
- d. Measure the distance between the marks on the road and divide the result by ten. This figure is the rolling circumference.
5. Gain access to the speedometer cables (1) behind the head lining.
6. Taking the blue plug (2), place a loop wire (3) between terminals 2 and 5, see illustration.
7. Press and hold button 'B', the decimal point will now flash.
8. Press and hold button 'A' (you are now pressing two buttons) until the decimal point has cycled to the position shown in the illustration.
9. Release button 'A' only, the first digit from the left will now flash.
10. Now input the first figure of the rolling circumference of the rear wheel in metres.
11. By pressing and holding button 'A' the digit will cycle, release button 'A' when the correct figure appears.
12. When button 'A' is released the next digit will flash, press button 'A' again to cycle the next digit, and so on until all the digits have been completed.
13. Releasing button 'B' will return the instrument to its 'operating' mode.
14. If a mistake is made with the input, release button 'B' and re-press, the instrument will go back to the start of the program with the decimal point flashing.

WIRING DIAGRAMS

Section 14 - Part B

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Serial number details:

- ★ Serial No. V52268 to R15000 tractors with 3 cylinder engines
V52268 to R14072 tractors with 4 cylinder engines
V52268 to R14231 tractors with 6 cylinder engines
- # Serial No. P22200 to R15195 tractors with 3 cylinder engines
P22200 to R15143 tractors with 4 cylinder engines
P22200 to R15158 tractors with 6 cylinder engines
- = Serial No. R15001 to S00000 tractors with 3 cylinder engines
R14073 to S00000 tractors with 4 cylinder engines
R14232 to S00000 tractors with 6 cylinder engines
- @ Serial No. R15196 to S00000 tractors with 3 cylinder engines
R15144 to S00000 tractors with 4 cylinder engines
R15159 to S00000 tractors with 6 cylinder engines

WIRING DIAGRAMS

Key to wiring diagram figure 1.

1. Horn
2. Headlights
3. Fuel sender and low fuel indicator
4. Differential lock solenoid – 4WD (when fitted)
5. Engine oil pressure switch
6. Water temperature sender
7. Air filter switch
8. Temperature switch – Hydraulic filter
9. Pressure switch – Hydraulic filter
10. Alternator
11. Starter motor
12. Battery
13. Thermostat unit
14. Cigar lighter (when fitted)
15. Stop light switch
16. Trailer indicator warning light
17. Direction indicator warning light
18. Direction indicator switch
19. Direction indicator flasher unit
20. Start switch
21. Main fuse box
22. 13 pin plug – warning lights (instrument panel)
23. 12 pin plug – instruments (instrument panel)
24. Main/dip beam switch
25. Off/side/head light switch
26. Rear work light switch
27. Hazard warning light switch
28. Warning light dimmer switch
29. Neutral start safety switch (transmission)
30. Horn push switch
31. Idle speed indicator light
32. Single fuse – main start circuit
33. Speedometer kit (when fitted)
- 33a. Speedometer interface (black box)
- 33b. Speedometer Transducer.
34. PTO safety start switch
35. Differential lock engaged switch
36. Front fender lights – right hand
37. Rear fender lights – right hand
38. Rear work light – right hand
39. Trailer socket
40. Number plate light
41. Parking brake switch
42. 4WD switch (when fitted)
43. Front fender lights – left hand.
44. Rear fender lights – left hand.
45. Earth (–) junction
46. Feed (+) junction
47. IPTO switch (when fitted)
48. Plug and socket – Red – behind engine
49. Plug and socket – Blue – behind engine
50. Plug and socket – Black – behind engine
51. Plug and socket – right hand clutch housing
52. Plug and socket – right hand side cover
53. Plug and socket – right hand clutch housing
54. Plug and socket – right hand side cover
55. Plug and socket – left hand seat deck
56. Plug and socket – right hand seat deck
57. Plug and socket – Speedometer
58. Plug and socket – Speedometer
59. Rear work light left-hand
60. Front work light right-hand (when fitted)
61. Front work light left-hand (when fitted)
62. Beacon (when fitted)
63. Interior light (cab models)
64. Front wiper motor (cab models)

65. Rear wiper motor (when fitted)
66. Radio (when fitted)
67. Road Hi-Lo switch (North America only)
68. Rear wiper switch (when fitted)
69. Front wiper switch (cab models)
70. Cab heater blower motor switch
71. Beacon switch (when fitted)
72. Cab heater blower motor
73. Multi-Power switch (when fitted)
74. Left hand flasher (North America only)
75. Plug and socket
76. Plug and socket
77. Right hand flasher (North America only)
78. Front work light switch (when fitted)
79. Screen washer pump (cab models)
80. Cab fuse box
81. Multi-Power Solenoid (when fitted)
82. Reverse horn switch (when fitted)
83. Reverse horn (when fitted)
84. Starter motor solenoid relay

Wiring colour codes

- | | |
|-----|---------------------|
| B | – Black |
| G | – Green |
| GN | – Green/brown |
| GP | – Green/purple |
| GR | – Green/red |
| GU | – Green/blue |
| GW | – Green/white |
| K | – Pink |
| LG | – Light green |
| LU | – Light blue |
| N | – Brown |
| NB | – Brown/black |
| NG | – Brown/green |
| NK | – Brown/pink |
| NR | – Brown/red |
| NU | – Brown/blue |
| O | – Orange |
| P | – Purple |
| PN | – Purple/brown |
| R | – Red |
| RB | – Red/black |
| RG | – Red/green |
| RLG | – Red/light green |
| RY | – Red/yellow |
| S | – Grey |
| U | – Blue |
| UK | – Blue/pink |
| UR | – Blue/red |
| UW | – Blue/white |
| W | – White |
| WG | – White/green |
| WK | – White/pink |
| WLG | – White/light green |
| WS | – White/grey |
| Y | – Yellow |

Trailer socket wiring

- | | |
|-----|---|
| L | – left hand rear direction indicator |
| R | – Right hand rear direction indicator |
| 31 | – Earth (–) |
| 54 | – Right hand and left hand brake stop lights |
| 54G | – Not used spare |
| 58L | – Left hand rear light and number plate light |
| 58R | – Right hand rear light |

WIRING DIAGRAMS – CAB TRACTORS**Section 14 – Part C**Table of Contents

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Electrical wiring diagrams

These electrical wiring diagrams are for footstep tractors manufactured from July 1992, serial number A29151 onwards.

The electrical wiring diagrams have been laid out in accordance with each harness fitted to the tractor, starting at the front and working through to the rear of the tractor. All the electrical components are numbered, and where possible a small emblem is used to illustrate the component for easy reference. The component list on the opposite page describes the part and shows the emblem. The wiring colour code is also given.

Due to the complexity of the diagrams and to help with diagnosis, details are given in the first part of this section on the layout of all connectors, pin numbers and the destination of every wire and its colour code. The various connectors are numbered as follows:-

C = Connector

HJ = Header joint

R = Relay or flasher unit

S = Switch

Each connector, header joint, relay and switch is numbered, e.g. C5 = connector number five. In the listing under connector C5 an illustration shows the plug or socket and all the terminal or pin numbers, the destination of each wire is described and the terminal number of the connector to which the wire destined, e.g. Terminal 2 goes to Connector C1/3 Alternator. This means the wire from terminal 2 goes to connector C1 terminal 3. This method is used for all connectors, joints, relays and switches.

WIRING DIAGRAM FIGURE 1

All models, footstep or cab, World wide
For tractors up to Serial No. V52267

Key to wiring diagram figure 2.

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Horn 2. Headlights 3. Fuel sender and low fuel indicator 4. Differential lock solenoid – 4WD (when fitted) 5. Engine oil pressure switch 6. Water temperature sender 7. Air filter switch 8. Temperature switch – Hydraulic filter 9. Pressure switch – Hydraulic filter 10. Alternator 11. Starter motor 12. Battery 13. Thermostart unit 14. Cigar lighter (when fitted) 15. Stop light switch 16. Trailer indicator warning light 17. Direction indicator warning light 18. Direction indicator switch 19. Direction indicator flasher unit 20. Start switch 21. Main fuse box 22. 13 pin plug – warning lights (instrument panel) 23. 12 pin plug – instruments (instrument panel) 24. Main/dip beam switch 25. Off/side/head light switch 26. Rear work light switch 27. Hazard warning light switch 28. Warning light dimmer switch 29. Neutral start safety switch (transmission) 30. Horn push switch 31. Idle speed indicator light 32. Single fuse – main start circuit 33. Speedometer kit (when fitted) 33a. Speedometer interface (black box) 33b. Speedometer Transducer 34. PTO safety start switch 35. Differential lock engaged switch 36. Front fender lights – right hand 37. Rear fender lights – right hand 38. Rear work light – right hand 39. Trailer socket 40. Number plate light 41. Parking brake switch 42. 4WD switch (when fitted) 43. Front fender lights – left hand. 44. Rear fender lights – left hand. 45. Earth (–) junction 46. Feed (+) junction 47. IPTO switch (when fitted) 48. Plug and socket – Red – behind engine 49. Plug and socket – Blue – behind engine 50. Plug and socket – Black – behind engine 51. Plug and socket – right hand clutch housing 52. Plug and socket – right hand side cover 53. Plug and socket – right hand clutch housing 54. Plug and socket – right hand side cover 55. Plug and socket – left hand seat deck 56. Plug and socket – right hand seat deck 57. Plug and socket – Speedometer 58. Plug and socket – Speedometer 59. Rear work light left-hand 60. Front work light right-hand (when fitted) 61. Front work light left-hand (when fitted) 62. Beacon (when fitted) 63. Interior light (cab models) 64. Front wiper motor (cab models) | <ol style="list-style-type: none"> 65. Rear wiper motor (when fitted) 66. Radio (when fitted) 67. Road Hi-Lo switch (North America only) 68. Rear wiper switch (when fitted) 69. Front wiper switch (cab models) 70. Cab heater blower motor switch 71. Beacon switch (when fitted) 72. Cab heater blower motor 73. Multi-Power switch (when fitted) 74. Left hand flasher (North America only) 75. Plug and socket 76. Plug and socket 77. Right hand flasher (North America only) 78. Front work light switch (when fitted) 79. Screen washer pump (cab models) 80. Cab fuse box 81. Multi-Power Solenoid (when fitted) 82. Reverse horn switch (when fitted) 83. Reverse horn (when fitted) 84. Starter motor solenoid relay |
|--|---|

Wiring colour codes

- | | |
|-----|---------------------|
| B | – Black |
| G | – Green |
| GN | – Green/brown |
| GP | – Green/purple |
| GR | – Green/red |
| GU | – Green/blue |
| GW | – Green/white |
| K | – Pink |
| LG | – Light green |
| LU | – Light blue |
| N | – Brown |
| NB | – Brown/black |
| NG | – Brown/green |
| NK | – Brown/pink |
| NR | – Brown/red |
| NU | – Brown/blue |
| O | – Orange |
| P | – Purple |
| PN | – Purple/brown |
| R | – Red |
| RB | – Red/black |
| RG | – Red/green |
| RLG | – Red/light green |
| RY | – Red/yellow |
| S | – Grey |
| U | – Blue |
| UK | – Blue/pink |
| UR | – Blue/red |
| UW | – Blue/white |
| W | – White |
| WG | – White/green |
| WK | – White/pink |
| WLG | – White/light green |
| WS | – White/grey |
| Y | – Yellow |

Trailer socket wiring

- | | |
|-----|---|
| L | – left hand rear direction indicator |
| R | – Right hand rear direction indicator |
| 31 | – Earth (–) |
| 54 | – Right hand and left hand brake stop lights |
| 54G | – Not used spare |
| 58L | – Left hand rear light and number plate light |
| 58R | – Right hand rear light |

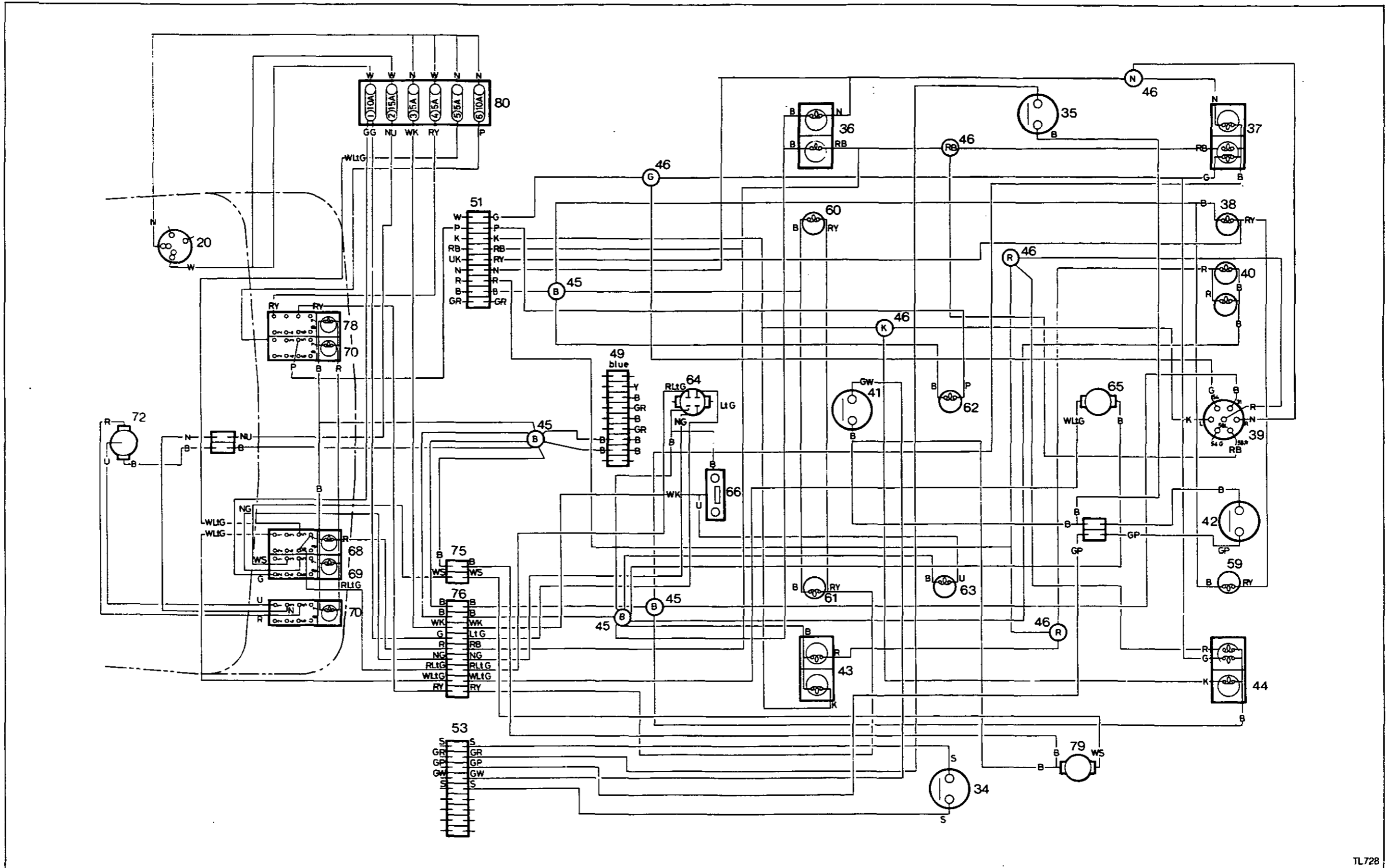


Figure 2. Wiring diagram, all models, additional for cabs World wide.
For tractors up to Serial No. V52267

Key to wiring diagram figure 3.

1. Horn
2. Headlights
3. Fuel sender and low fuel indicator
4. Differential lock solenoid – 4WD (when fitted)
5. Engine oil pressure switch
6. Water temperature sender
7. Air filter switch
8. Temperature switch – Hydraulic filter
9. Pressure switch – Hydraulic filter
10. Alternator
11. Starter motor
12. Battery
13. Thermostart unit
14. Cigar lighter (when fitted)
15. Stop light switch
16. Trailer indicator warning light
17. Direction indicator warning light
18. Direction indicator switch
19. Direction indicator flasher unit
20. Start switch
21. Main fuse box
22. 13 pin plug – warning lights (instrument panel)
23. 12 pin plug – instruments (instrument panel)
24. Main/dip beam switch
25. Off/side/head light switch
26. Rear work light switch
27. Hazard warning light switch
28. Warning light dimmer switch
29. Neutral start safety switch (transmission)
30. Horn push switch
31. Idle speed indicator light
32. Single fuse – main start circuit
33. Speedometer kit (when fitted)
- 33a. Speedometer interface (black box)
- 33b. Speedometer Transducer
34. PTO safety start switch
35. Differential lock engaged switch
36. Front fender lights – right hand
37. Rear fender lights – right hand
38. Rear work light – right hand
39. Trailer socket
40. Number plate light
41. Parking brake switch
42. 4WD switch (when fitted)
43. Front fender lights – left hand.
44. Rear fender lights – left hand.
45. Earth (–) junction
46. Feed (+) junction
47. IPTO switch (when fitted)
48. Plug and socket – Red – behind engine
49. Plug and socket – Blue – behind engine
50. Plug and socket – Black – behind engine
51. Plug and socket – right hand clutch housing
52. Plug and socket – right hand side cover
53. Plug and socket – right hand clutch housing
54. Plug and socket – right hand side cover
55. Plug and socket – left hand seat deck
56. Plug and socket – right hand seat deck
57. Plug and socket – Speedometer
58. Plug and socket – Speedometer
59. Rear work light left-hand
60. Front work light right-hand (when fitted)
61. Front work light left-hand (when fitted)
62. Beacon (when fitted)
63. Interior light (cab models)
64. Front wiper motor (cab models)

65. Rear wiper motor (when fitted)
66. Radio (when fitted)
67. Road Hi-Lo switch (North America only)
68. Rear wiper switch (when fitted)
69. Front wiper switch (cab models)
70. Cab heater blower motor switch
71. Beacon switch (when fitted)
72. Cab heater blower motor
73. Multi-Power switch (when fitted)
74. Left hand flasher (North America only)
75. Plug and socket
76. Plug and socket
77. Right hand flasher (North America only)
78. Front work light switch (when fitted)
79. Screen washer pump (cab models)
80. Cab fuse box
81. Multi-Power Solenoid (when fitted)
82. Reverse horn switch (when fitted)
83. Reverse horn (when fitted)
84. Starter motor solenoid relay

Wiring colour codes

- | | |
|-----|---------------------|
| B | – Black |
| G | – Green |
| GN | – Green/brown |
| GP | – Green/purple |
| GR | – Green/red |
| GU | – Green/blue |
| GW | – Green/white |
| K | – Pink |
| LG | – Light green |
| LU | – Light blue |
| N | – Brown |
| NB | – Brown/black |
| NG | – Brown/green |
| NK | – Brown/pink |
| NR | – Brown/red |
| NU | – Brown/blue |
| O | – Orange |
| P | – Purple |
| PN | – Purple/brown |
| R | – Red |
| RB | – Red/black |
| RG | – Red/green |
| RLG | – Red/light green |
| RY | – Red/yellow |
| S | – Grey |
| U | – Blue |
| UK | – Blue/pink |
| UR | – Blue/red |
| UW | – Blue/white |
| W | – White |
| WG | – White/green |
| WK | – White/pink |
| WLG | – White/light green |
| WS | – White/grey |
| Y | – Yellow |

Trailer socket wiring

- | | |
|-----|---|
| L | – left hand rear direction indicator |
| R | – Right hand rear direction indicator |
| 31 | – Earth (–) |
| 54 | – Right hand and left hand brake stop lights |
| 54G | – Not used spare |
| 58L | – Left hand rear light and number plate light |
| 58R | – Right hand rear light |

WIRING DIAGRAM FIGURE 2

All models, additional for Cabs World wide
For tractors up to Serial No. V52267

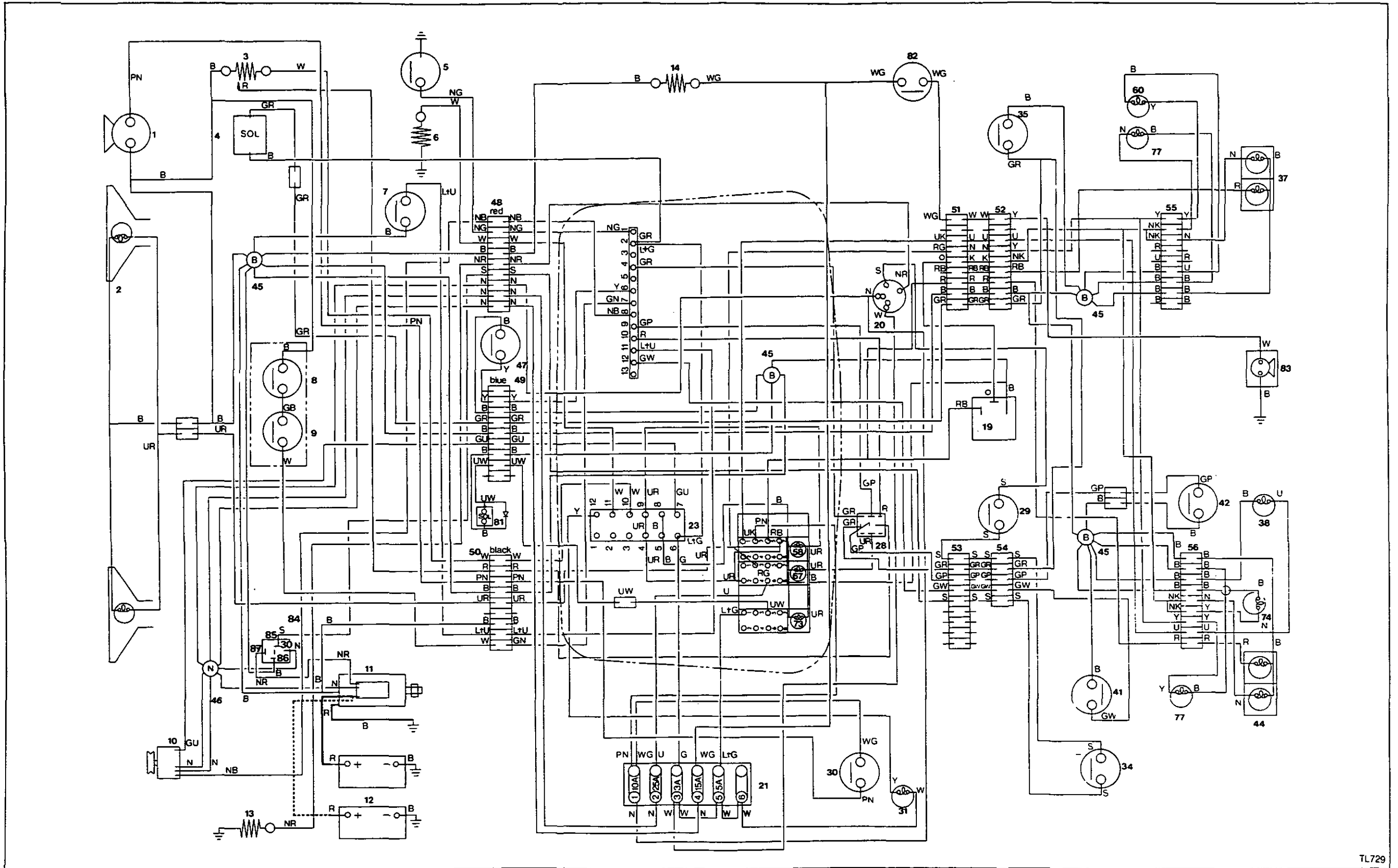


Figure 3. Wiring diagram, all models, North America only.
For tractors up to Serial No. V52267

WIRING DIAGRAM FIGURE 3
All models, North America only.
For tractors up to Serial No. V52267

Key to wiring diagram figure 4.

1. Horn
2. Headlights
3. Fuel sender and low fuel indicator
4. Differential lock solenoid—4WD (when fitted)
5. Engine oil pressure switch
6. Water temperature sender
7. Air filter switch
8. Temperature switch—Hydraulic filter
9. Pressure switch—Hydraulic filter
10. Alternator
11. Starter motor
12. Battery
13. Thermostat unit
14. Cigar lighter (when fitted)
15. Stop light switch
16. Trailer indicator warning light
17. Direction indicator warning light
18. Direction indicator switch
19. Direction indicator flasher unit
20. Start switch
21. Main fuse box
22. 13 pin plug—warning lights (instrument panel)
23. 12 pin plug—instruments (instrument panel)
24. Main/dip beam switch
25. Off/side/head switch
26. Rear work light switch
27. Hazard warning light switch
28. Warning light dimmer switch
29. Neutral start safety switch (transmission)
30. Horn push switch
31. Idle speed indicator light
32. Single fuse—main start circuit
33. Speedometer kit (when fitted)
- 33a. Speedometer interface (black box)
- 33b. Speedometer Transducer
34. PTO safety start switch
35. Differential lock engaged switch
36. Front fender lights—right hand
37. Rear fender lights—right hand
38. Rear work light—right hand
39. Trailer socket
40. Number plate light
41. Parking brake switch
42. 4WD switch (when fitted)
43. Front fender lights—left hand
44. Rear fender lights—left hand
45. Earth (—) junction
46. Feed (+) junction
47. IPTO switch (when fitted)
48. Plug and socket—Red—behind engine
49. Plug and socket—Black—R. H. side clutch housing
50. Plug and socket—Blue—behind engine
51. Plug and socket—Black—right hand clutch housing
52. Plug and socket—behind engine
53. Plug and socket—Red—right hand clutch housing
54. Lighting internal splice
55. Plug and socket—right hand seat deck
56. Plug and socket—left hand seat deck
57. Plug and socket—Speedometer
58. Plug and socket—Speedometer
59. Rear work light left-hand
60. Front work light right-hand (when fitted)
61. Front work light left-hand (when fitted)
62. Beacon (when fitted)
63. Interior light (cab models)
64. Front wiper motor (cab models)
65. Rear wiper motor (when fitted)
66. Radio (when fitted)
67. Road warning light switch (North America only)
68. Rear wiper switch (when fitted)
69. Front wiper switch (cab models)
70. Cab heater blower motor switch
71. Front work light switch (when fitted)
72. Cab heater blower motor
73. Multi-Power switch (when fitted)
74. Left hand flasher (North America only)
75. Lighting internal splice
76. Feed—internal splice

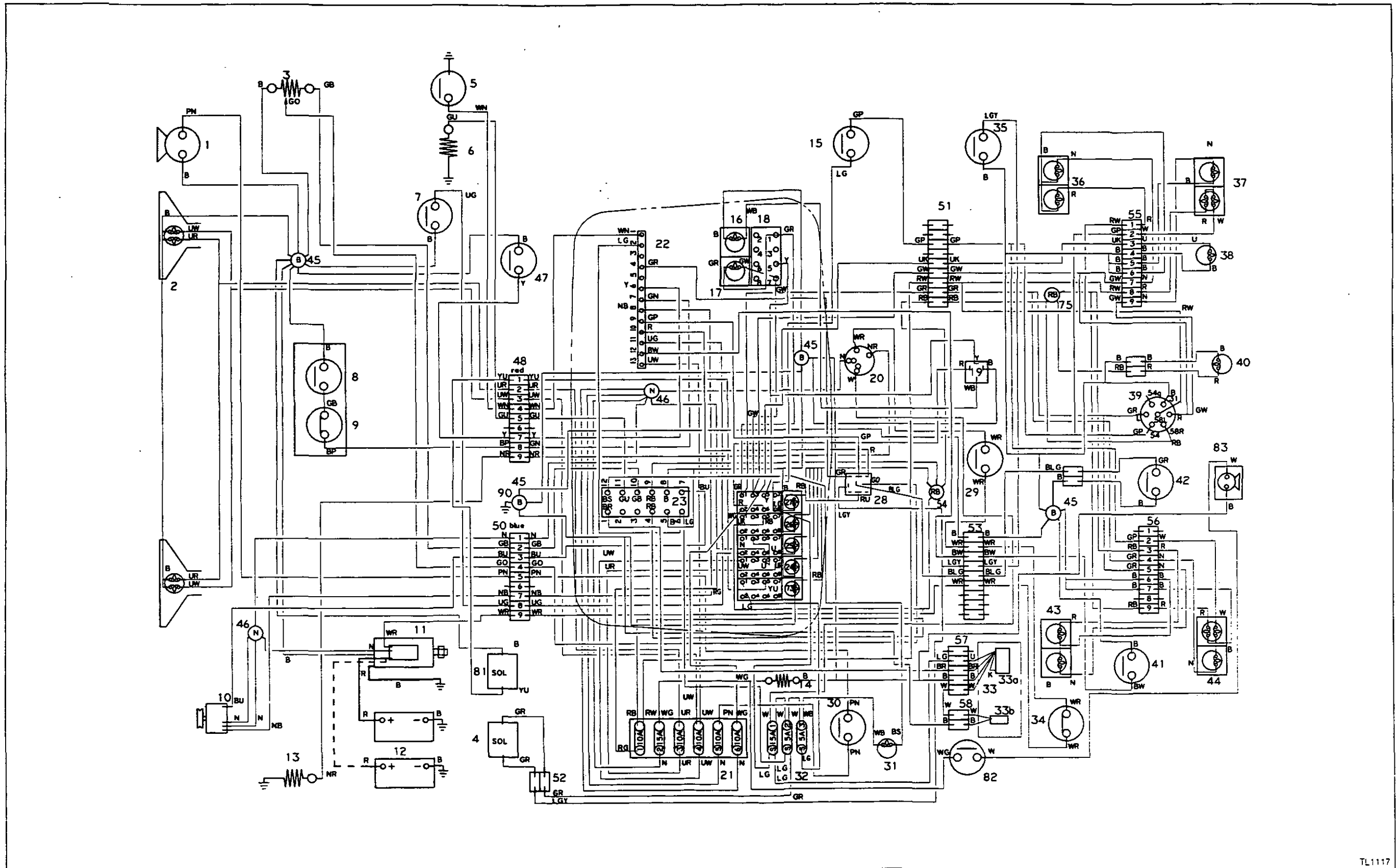
77. Right hand flasher (North America only)
78. Beacon switch
79. Screen washer pump (cab models)
80. Cab fuse box
81. Multi-Power Solenoid (when fitted)
82. Reverse horn switch (when fitted)
83. Reverse horn (when fitted)
- 84.
85. Road warning lights—North America
86. Road warning light switch—North America
87. Road warning light flasher unit—North America
88. Radio speaker—Cab only
89. Radio aerial—Cab only
90. Engine earth

Wiring colour codes

- | | |
|-----|---------------------|
| B | —Black |
| BU | —Black/blue |
| BP | —Black/purple |
| BR | —Black/red |
| BS | —Black/slate |
| BLG | —Black/light green |
| BW | —Black/white |
| G | —Green |
| GB | —Green/black |
| GN | —Green/brown |
| GO | —Green/orange |
| GP | —Green/purple |
| GR | —Green/red |
| GU | —Green/Blue |
| GW | —Green/white |
| K | —Pink |
| LG | —Light Green |
| LGY | —Light green/yellow |
| LU | —Light blue |
| N | —Brown |
| NB | —Brown/black |
| NG | —Brown/green |
| NK | —Brown/pink |
| NR | —Brown/red |
| NU | —Brown/blue |
| O | —Orange |
| P | —Purple |
| PB | —Purple/black |
| PN | —Purple/brown |
| R | —Red |
| RB | —Red/black |
| RU | —Red/blue |
| RG | —Red/green |
| RLG | —Red/light green |
| RW | —Red/white |
| RY | —Red/yellow |
| S | —Grey |
| U | —Blue |
| UK | —Blue/pink |
| UR | —Blue/pink |
| UW | —Blue/white |
| UG | —Blue/green |
| W | —White |
| WN | —White/brown |
| WR | —White/red |
| WB | —White/black |
| WG | —White/green |
| WK | —White/pink |
| WLG | —White/light green |
| WS | —White/grey |
| Y | —Yellow |
| YU | —Yellow/blue |

Trailer socket wiring

- | | |
|-----|--|
| L | —left hand rear direction indicator |
| R | —Right hand rear direction indicator |
| 31 | —Earth (—) |
| 54 | —Right hand and left hand brake stop lights |
| 54G | —Not used spare |
| 58L | —Left hand rear light and number plate light |
| 58R | —Right hand rear light |



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Figure 4. Wiring diagram, all models, footstep World wide.
For tractors Serial No. V52268 to R15000 (3 cyl. engines),
R14072 (4 cyl. engines), R14231 (6 cyl engines)

Key to wiring diagram figure 5.

1. Horn
2. Headlights
3. Fuel sender and low fuel indicator
4. Differential lock solenoid—4WD (when fitted)
5. Engine oil pressure switch
6. Water temperature sender
7. Air filter switch
8. Temperature switch—Hydraulic filter
9. Pressure switch—Hydraulic filter
10. Alternator
11. Starter motor
12. Battery
13. Thermostat unit
14. Cigar lighter (when fitted)
15. Stop light switch
16. Trailer indicator warning light
17. Direction indicator warning light
18. Direction indicator switch
19. Direction indicator flasher unit
20. Start switch
21. Main fuse box
22. 13 pin plug—warning lights (instrument panel)
23. 12 pin plug—instruments (instrument panel)
24. Main/dip beam switch
25. Off/side/head switch
26. Rear work light switch
27. Hazard warning light switch
28. Warning light dimmer
29. Neutral start safety switch (transmission)
30. Horn push switch
31. Idle speed indicator light
32. Single fuse—main start circuit
33. Speedometer kit (when fitted)
- 33a. Speedometer interface (black box)
- 33b. Speedometer Transducer
34. PTO safety start switch
35. Differential lock engaged switch
36. Front fender lights—right hand
37. Rear fender lights—right hand
38. Rear work light—right hand
39. Trailer socket
40. Number plate light
41. Parking brake switch
42. 4WD switch (when fitted)
43. Front fender lights—left hand
44. Rear fender lights—left hand
45. Earth (–) junction
46. Feed (+) junction
47. IPTO switch (when fitted)
48. Plug and socket—Red—behind engine
49. Plug and socket—Black—R. H. side clutch housing
50. Plug and socket—Blue—behind engine
51. Plug and socket—Black—right hand clutch housing
52. Plug and socket—behind engine
53. Plug and socket—Red—right hand clutch housing
54. Lighting internal splice
55. Plug and socket—right hand seat deck
56. Plug and socket—left hand seat deck
57. Plug and socket—Speedometer
58. Plug and socket—Speedometer
59. Rear work light left-hand
60. Front work light right-hand (when fitted)
61. Front work light left-hand (when fitted)
62. Beacon (when fitted)
63. Interior light (cab models)
64. Front wiper motor (cab models)
65. Rear wiper motor (when fitted)
66. Radio (when fitted)
67. Road warning light switch (North America only)
68. Rear wiper switch (when fitted)
69. Front wiper switch (cab models)
70. Cab heater blower motor switch
71. Front work light switch (when fitted)
72. Cab heater blower motor
73. Multi-Power switch (when fitted)
74. Left hand flasher (North America only)
75. Lighting internal splice
76. Feed—internal splice

77. Right hand flasher (North America only)
78. Beacon switch
79. Screen washer pump (cab models)
80. Cab fuse box
81. Multi-Power Solenoid (when fitted)
82. Reverse horn switch (when fitted)
83. Reverse horn (when fitted)
- 84.
85. Road warning lights—North America
86. Road warning light switch—North America
87. Road warning light flasher unit—North America
88. Radio speaker—Cab only
89. Radio aerial—Cab only
90. Engine earth

Wiring colour codes

- | | |
|-----|---------------------|
| B | —Black |
| BU | —Black/blue |
| BP | —Black/purple |
| BR | —Black/red |
| BS | —Black/slate |
| BLG | —Black/light green |
| BW | —Black/white |
| G | —Green |
| GB | —Green/black |
| GN | —Green/brown |
| GO | —Green/orange |
| GP | —Green/purple |
| GR | —Green/red |
| GU | —Green/Blue |
| GW | —Green/white |
| K | —Pink |
| LG | —Light Green |
| LGY | —Light green/yellow |
| LU | —Light blue |
| N | —Brown |
| NB | —Brown/black |
| NG | —Brown/green |
| NK | —Brown/pink |
| NR | —Brown/red |
| NU | —Brown/blue |
| O | —Orange |
| P | —Purple |
| PB | —Purple/black |
| PN | —Purple/brown |
| R | —Red |
| RB | —Red/black |
| RU | —Red/blue |
| RG | —Red/green |
| RLG | —Red/light green |
| RW | —Red/white |
| RY | —Red/yellow |
| S | —Grey |
| U | —Blue |
| UK | —Blue/pink |
| UR | —Blue/pink |
| UW | —Blue/white |
| UG | —Blue/green |
| W | —White |
| WN | —White/brown |
| WR | —White/red |
| WB | —White/black |
| WG | —White/green |
| WK | —White/pink |
| WLG | —White/light green |
| WS | —White/grey |
| Y | —Yellow |
| YU | —Yellow/blue |

Trailer socket wiring

- | | |
|-----|--|
| L | —left hand rear direction indicator |
| R | —Right hand rear direction indicator |
| 31 | —Earth (–) |
| 54 | —Right hand and left hand brake stop lights |
| 54G | —Not used spare |
| 58L | —Left hand rear light and number plate light |
| 58R | —Right hand rear light |

WIRING DIAGRAM FIGURE 4

All models, footstep World wide

For tractors Serial No. V52268 to R15000 (3 cyl. engines),
R14072 (4 cyl. engines), R14231 (6 cyl engines)

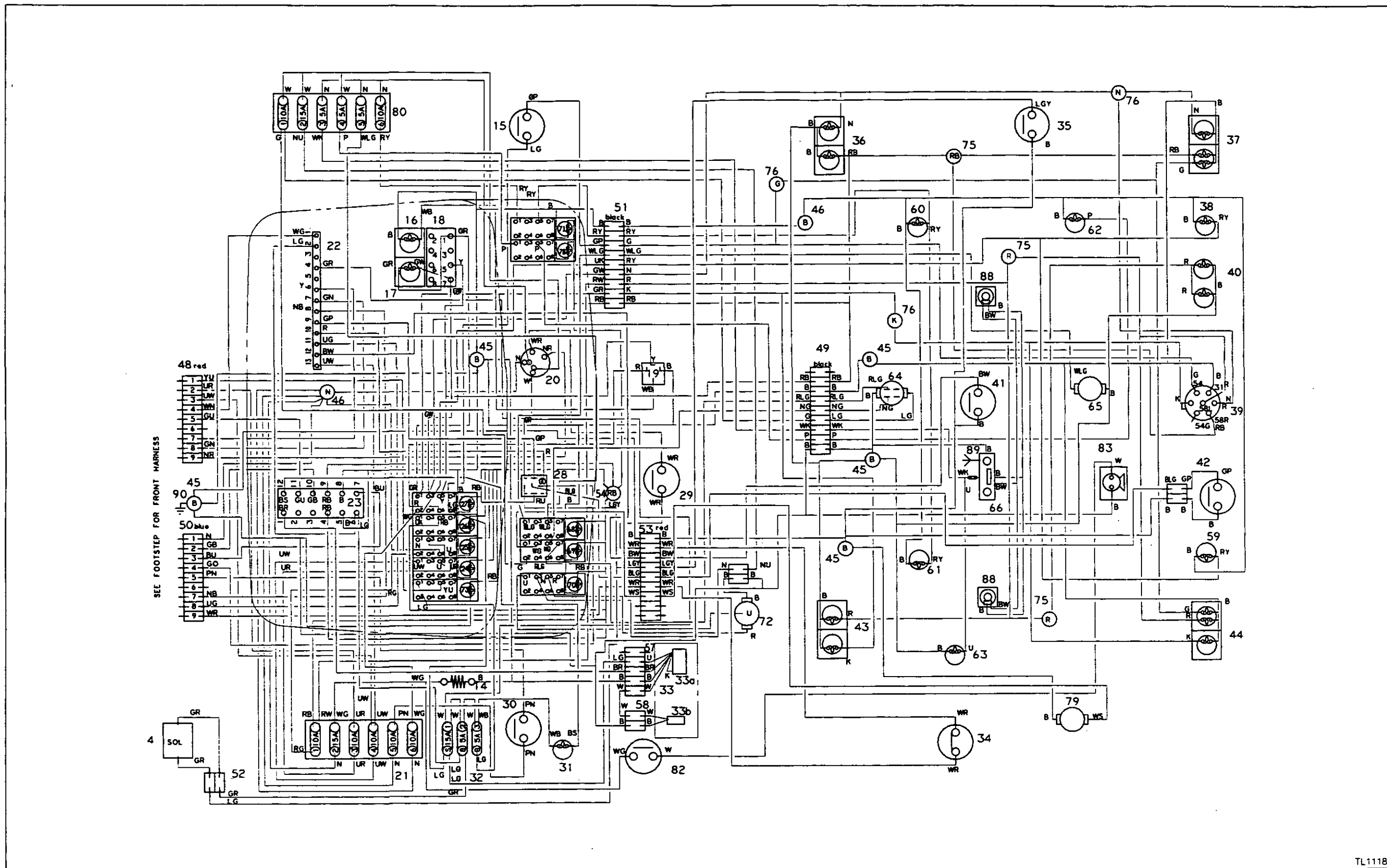


Figure 5. Wiring diagram, all models, Cab, World wide.
For tractors Serial No. V52268 to P22199

WIRING DIAGRAM FIGURE 5
All models, Cabs, World wide
For tractors Serial No. V52268 to P22199

Key to wiring diagram figure 6.

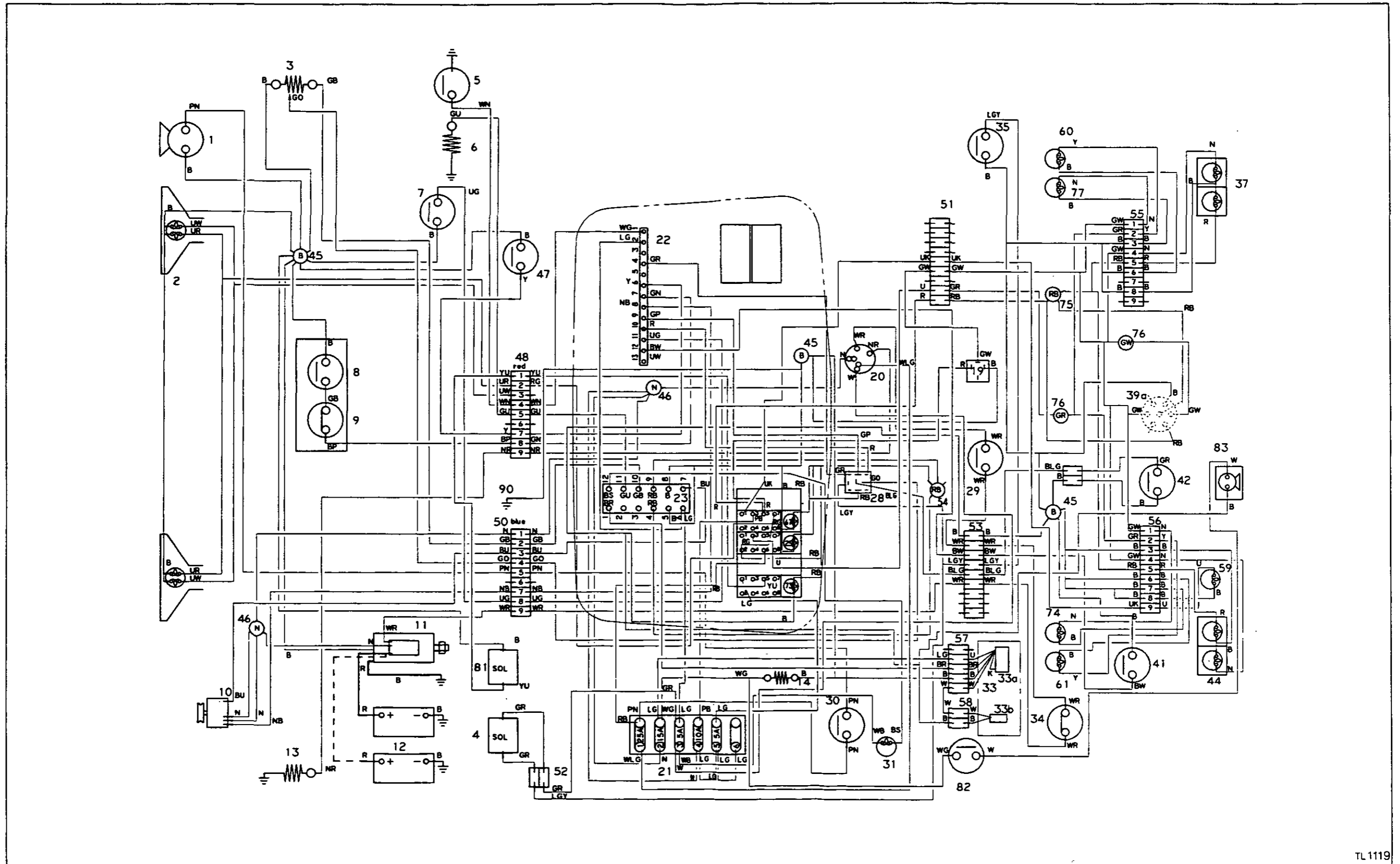
- | | |
|------|---|
| 1. | Horn |
| 2. | Headlights |
| 3. | Fuel sender and low fuel indicator |
| 4. | Differential lock solenoid - 4WD (when fitted) |
| 5. | Engine oil pressure switch |
| 6. | Water temperature sender |
| 7. | Air filter switch |
| 8. | Temperature switch - Hydraulic filter |
| 9. | Pressure switch - Hydraulic filter |
| 10. | Alternator |
| 11. | Starter motor |
| 12. | Battery |
| 13. | Thermostart unit |
| 14. | Cigar lighter (when fitted) |
| 15. | Stop light switch |
| 16. | Trailer indicator warning light |
| 17. | Direction indicator warning light |
| 18. | Direction indicator switch |
| 19. | Direction indicator flasher unit |
| 20. | Start switch |
| 21. | Main fuse box |
| 22. | 13 pin plug - warning lights (instrument panel) |
| 23. | 12 pin plug - instruments (instrument panel) |
| 24. | Main/dip beam switch |
| 25. | Off/side/head switch |
| 26. | Rear work light switch |
| 27. | Hazard warning light switch |
| 28. | Warning light dimmer switch |
| 29. | Neutral start safety switch (transmission) |
| 30. | Horn push switch |
| 31. | Idle speed indicator light |
| 32. | Single fuse - main start circuit |
| 33. | Speedometer kit (when fitted) |
| 33a. | Speedometer interface (black box) |
| 33b. | Speedometer Transducer |
| 34. | PTO safety start switch |
| 35. | Differential lock engaged switch |
| 36. | Front fender lights - right hand |
| 37. | Rear fender lights - right hand |
| 38. | Rear work light - right hand |
| 39. | Trailer socket |
| 40. | Number plate light |
| 41. | Parking brake switch |
| 42. | 4WD switch (when fitted) |
| 43. | Front fender lights - left hand |
| 44. | Rear fender lights - left hand |
| 45. | Earth (-) junction |
| 46. | Feed (+) junction |
| 47. | IPTO switch (when fitted) |
| 48. | Plug and socket - Red - behind engine |
| 49. | Plug and socket - Black - R. H. side clutch housing |
| 50. | Plug and socket - Blue - behind engine |
| 51. | Plug and socket - Black - right hand clutch housing |
| 52. | Plug and socket - behind engine |
| 53. | Plug and socket - Red - right hand clutch housing |
| 54. | Lighting internal splice |
| 55. | Plug and socket - right hand seat deck |
| 56. | Plug and socket - left hand seat deck |
| 57. | Plug and socket - Speedometer |
| 58. | Plug and socket - Speedometer |
| 59. | Rear work light left-hand |
| 60. | Front work light right-hand (when fitted) |
| 61. | Front work light left-hand (when fitted) |
| 62. | Beacon (when fitted) |
| 63. | Interior light (cab models) |
| 64. | Front wiper motor (cab models) |
| 65. | Rear wiper motor (when fitted) |
| 66. | Radio (when fitted) |
| 67. | Road warning light switch (North America only) |
| 68. | Rear wiper switch (when fitted) |
| 69. | Front wiper switch (cab models) |
| 70. | Cab heater blower motor switch |
| 71. | Front work light switch (when fitted) |
| 72. | Cab heater blower motor |
| 73. | Multi-Power switch (when fitted) |
| 74. | Left hand flasher (North America only) |
| 75. | Lighting internal splice |
| 76. | Feed - internal splice |
| 77. | Right hand flasher (North America only) |
| 78. | Beacon switch |
| 79. | Screen washer pump (cab models) |
| 80. | Cab fuse box |
| 81. | Multi-Power Solenoid (when fitted) |
| 82. | Reverse horn switch (when fitted) |
| 83. | Reverse horn (when fitted) |
| 84. | |
| 85. | Road warning lights - North America |
| 86. | Road warning light switch - North America |
| 87. | Road warning light flasher unit - North America |
| 88. | Radio speaker - Cab only |
| 89. | Radio aerial - Cab only |
| 90. | Engine earth |

Wiring colour codes

- | | |
|-----|---------------------|
| B | -Black |
| BU | -Black/blue |
| BP | -Black/purple |
| BR | -Black/red |
| BS | -Black/slate |
| BLG | -Black/light green |
| BW | -Black/white |
| G | -Green |
| GB | -Green/black |
| GN | -Green/brown |
| GO | -Green/orange |
| GP | -Green/purple |
| GR | -Green/red |
| GU | -Green/Blue |
| GW | -Green/white |
| K | -Pink |
| LG | -Light Green |
| LGY | -Light green/yellow |
| LU | -Light blue |
| N | -Brown |
| NB | -Brown/black |
| NG | -Brown/green |
| NK | -Brown/pink |
| NR | -Brown/red |
| NU | -Brown/blue |
| O | -Orange |
| P | -Purple |
| PB | -Purple/black |
| PN | -Purple/brown |
| R | -Red |
| RB | -Red/black |
| RU | -Red/blue |
| RG | -Red/green |
| RLG | -Red/light green |
| RW | -Red/white |
| RY | -Red/yellow |
| S | -Grey |
| U | -Blue |
| UK | -Blue/pink |
| UR | -Blue/purple |
| UW | -Blue/white |
| UG | -Blue/green |
| W | -White |
| WN | -White/brown |
| WR | -White/red |
| WB | -White/black |
| WG | -White/green |
| WK | -White/pink |
| WLG | -White/light green |
| WS | -White/grey |
| Y | -Yellow |
| YU | -Yellow/blue |

Trailer socket wiring

- | | |
|-----|--|
| L | -left hand rear direction indicator |
| R | -Right hand rear direction indicator |
| 31 | -Earth (-) |
| 54 | -Right hand and left hand brake stop lights |
| 54G | -Not used spare |
| 58L | -Left hand rear light and number plate light |
| 58R | -Right hand rear light |



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Figure 6. Wiring diagram, all models, footstep, North America.
For tractors Serial No. V52268 to R15000 (3 cyl. engines),
R14072 (4 cyl. engines), R14231 (6 cyl engines)

Key to wiring diagram figure 7.

- | | |
|---|---|
| 1. Horn | 77. Right hand flasher (North America only) |
| 2. Headlights | 78. Beacon switch |
| 3. Fuel sender and low fuel indicator | 79. Screen washer pump (cab models) |
| 4. Differential lock solenoid - 4WD (when fitted) | 80. Cab fuse box |
| 5. Engine oil pressure switch | 81. Multi-Power Solenoid (when fitted) |
| 6. Water temperature sender | 82. Reverse horn switch (when fitted) |
| 7. Air filter switch | 83. Reverse horn (when fitted) |
| 8. Temperature switch - Hydraulic filter | 84. |
| 9. Pressure switch - Hydraulic filter | 85. Road warning lights - North America |
| 10. Alternator | 86. Road warning light switch - North America |
| 11. Starter motor | 87. Road warning light flasher unit - North America |
| 12. Battery | 88. Radio speaker - Cab only |
| 13. Thermostat unit | 89. Radio aerial - Cab only |
| 14. Cigar lighter (when fitted) | 90. Engine earth |
| 15. Stop light switch | |
| 16. Trailer indicator warning light | |
| 17. Direction indicator warning light | |
| 18. Direction indicator switch | |
| 19. Direction indicator flasher unit | |
| 20. Start switch | |
| 21. Main fuse box | |
| 22. 13 pin plug - warning lights (instrument panel) | |
| 23. 12 pin plug - instruments (instrument panel) | |
| 24. Main/dip beam switch | |
| 25. Off/side/head switch | |
| 26. Rear work light switch | |
| 27. Hazard warning light switch | |
| 28. Warning light dimmer switch | |
| 29. Neutral start safety switch (transmission) | |
| 30. Horn push switch | |
| 31. Idle speed indicator light | |
| 32. Single fuse - main start circuit | |
| 33. Speedometer kit (when fitted) | |
| 33a. Speedometer interface (black box) | |
| 33b. Speedometer Transducer | |
| 34. PTO safety start switch | |
| 35. Differential lock engaged switch | |
| 36. Front fender lights - right hand | |
| 37. Rear fender lights - right hand | |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - Red - behind engine | |
| 49. Plug and socket - Black - R. H. side clutch housing | |
| 50. Plug and socket - Blue - behind engine | |
| 51. Plug and socket - Black - right hand clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - Red - right hand clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - Speedometer | |
| 58. Plug and socket - Speedometer | |
| 59. Rear work light left-hand | |
| 60. Front work light right-hand (when fitted) | |
| 61. Front work light left-hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |

Wiring colour codes

- | | |
|-----|---------------------|
| B | -Black |
| BU | -Black/blue |
| BP | -Black/purple |
| BR | -Black/red |
| BS | -Black/slate |
| BLG | -Black/light green |
| BW | -Black/white |
| G | -Green |
| GB | -Green/black |
| GN | -Green/brown |
| GO | -Green/orange |
| GP | -Green/purple |
| GR | -Green/red |
| GU | -Green/Blue |
| GW | -Green/white |
| K | -Pink |
| LG | -Light Green |
| LGY | -Light green/yellow |
| LU | -Light blue |
| N | -Brown |
| NB | -Brown/black |
| NG | -Brown/green |
| NK | -Brown/pink |
| NR | -Brown/red |
| NU | -Brown/blue |
| O | -Orange |
| P | -Purple |
| PB | -Purple/black |
| PN | -Purple/brown |
| R | -Red |
| RB | -Red/black |
| RU | -Red/blue |
| RG | -Red/green |
| RLG | -Red/light green |
| RW | -Red/white |
| RY | -Red/yellow |
| S | -Grey |
| U | -Blue |
| UK | -Blue/pink |
| UR | -Blue/pink |
| UW | -Blue/white |
| UG | -Blue/green |
| W | -White |
| WN | -White/brown |
| WR | -White/red |
| WB | -White/black |
| WG | -White/green |
| WK | -White/pink |
| WLG | -White/light green |
| WS | -White/grey |
| Y | -Yellow |
| YU | -Yellow/blue |

Trailer socket wiring

- | | |
|-----|--|
| L | -left hand rear direction indicator |
| R | -Right hand rear direction indicator |
| 31 | -Earth (-) |
| 54 | -Right hand and left hand brake stop lights |
| 54G | -Not used spare |
| 58L | -Left hand rear light and number plate light |
| 58R | -Right hand rear light |

WIRING DIAGRAM FIGURE 6

All models, footstep, North America

For tractors Serial No. V52268 to R15000 (3 cyl. engines),
R14072 (4 cyl. engines), R14231 (6 cyl engines)

Key to wiring diagram figure 8.

- | | |
|---|---|
| 1. Horn | 77. Right-hand flasher (North America only) |
| 2. Headlights | 78. Beacon switch |
| 3. Fuel sender and low fuel indicator | 79. Screen washer pump (cab models) |
| 4. Differential lock solenoid-4WD (when fitted) | 80. Cab fuse box |
| 5. Engine oil pressure switch | 81. Multi-Power Solenoid (when fitted) |
| 6. Water temperature sender | 82. Reverse horn switch (when fitted) |
| 7. Air filter switch | 83. Reverse horn (when fitted) |
| 8. Temperature switch-Hydraulic filter | 84. Front differential lock switch 4WD |
| 9. Pressure switch-Hydraulic filter | 85. Road warning lights-North America |
| 10. Alternator | 86. Road warning light switch-North America |
| 11. Starter motor | 87. Road warning light flasher unit-North America |
| 12. Battery | 88. Radio speaker-Cab only |
| 13. Thermostart unit | 89. Radio aerial-Cab only |
| 14. Cigar lighter (when fitted) | 90. Engine earth |
| 15. Stop light switch | 91. Air conditioner relay |
| 16. Trailer indicator warning light | 92. Air conditioner thermostat |
| 17. Direction indicator warning light | 93. Air conditioner compressor |
| 18. Direction indicator switch | 94. Air conditioner cut-out switches |
| 19. Direction indicator flasher unit | 95. Plug and socket (Air conditioner) |
| 20. Start switch | 96. Rear screen washer pump |
| 21. Main fuse box | 97. Fresh air blower motor |
| 22. 13 pin plug-warning lights (instrument panel) | 98. Fresh air blower motor resistor |
| 23. 12 pin plug-instruments (instrument panel) | 99. Fresh air blower motor switch |
| 24. Main/dip switch | 100. Air conditioner line fuse |
| 25. Off/side/head switch | 101. Fresh air blower motor relay |
| 26. Rear work light switch | 102. Plug and socket (R.H. lamp unit) |
| 27. Hazard warning light switch | 103. Plug and socket (L.H. lamp unit) |
| 28. Warning light dimmer | 104. Plug and socket (Direction indicators) |
| 29. Neutral start safety switch (transmission) | |
| 30. Horn push switch | |
| 31. Idle speed indicator light | |
| 32. Single fuse-main start circuit | |
| 33. Speedometer kit (when fitted) | |
| 33a. Speedometer interface (black box) | |
| 33b. Speedometer transducer | |
| 34. PTO safety switch | |
| 35. Differential lock engaged switch | |
| 36. Front fender lights-right-hand | |
| 37. Rear fender lights-right-hand | |
| 38. Rear work light-right-hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights-left-hand | |
| 44. Rear fender lights-left-hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket-Red-behind engine | |
| 49. Plug and socket-Black-R.H. side clutch housing | |
| 50. Plug and socket-Blue-behind engine | |
| 51. Plug and socket-Black-right-hand clutch housing | |
| 52. Plug and socket-behind engine | |
| 53. Plug and socket-Red-right-hand clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket-right-hand seat deck | |
| 56. Plug and socket-left-hand seat deck | |
| 57. Plug and socket-Speedometer | |
| 58. Plug and socket-Speedometer | |
| 59. Rear work light left-hand | |
| 60. Front work light right-hand (when fitted) | |
| 61. Front work light left-hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left-hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed-internal splice | |

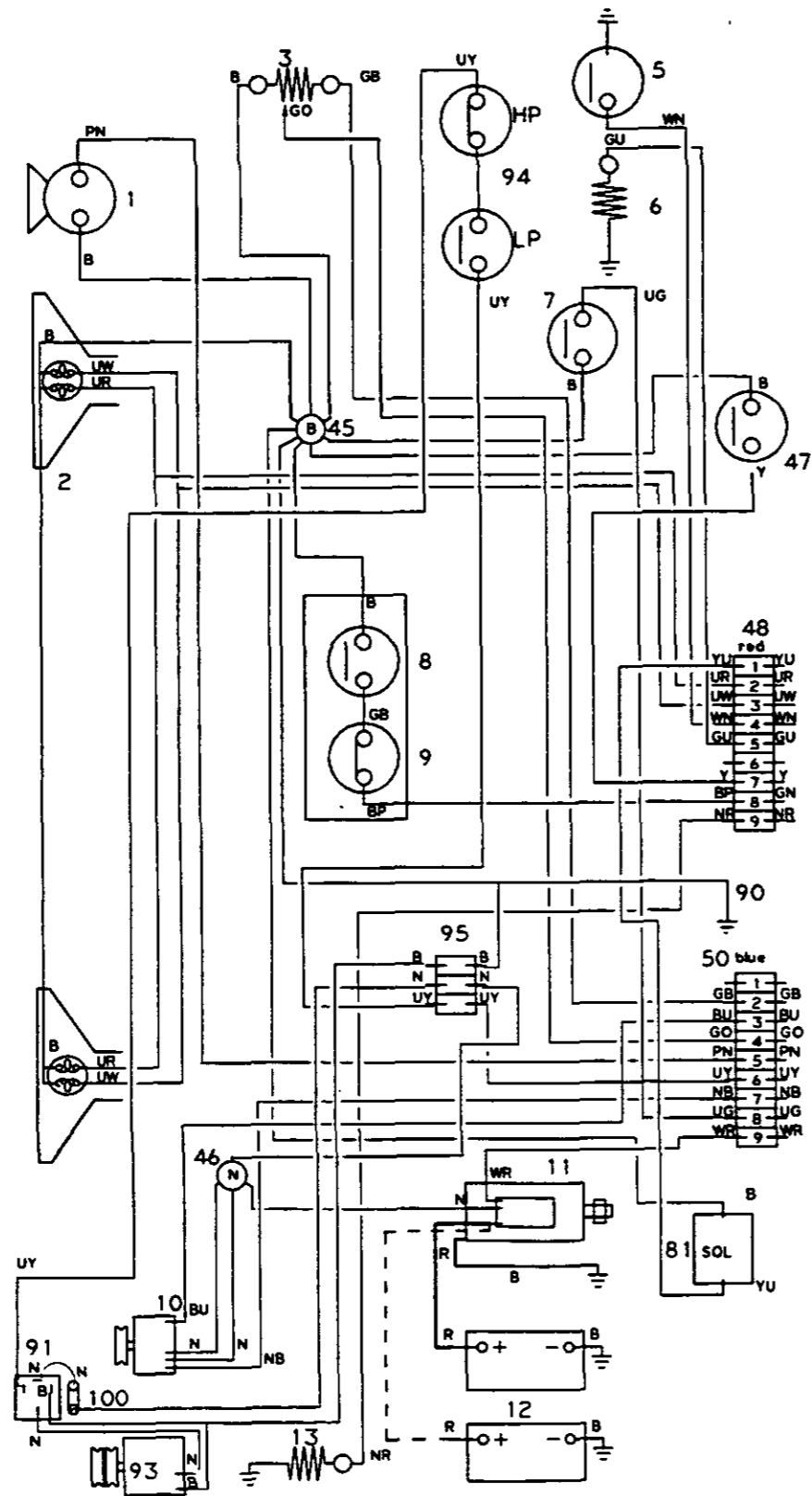
WIRING DIAGRAM FIGURE 7
All models, Cab, North America
For tractors Serial No. V52268 to P22199

Wiring colour codes

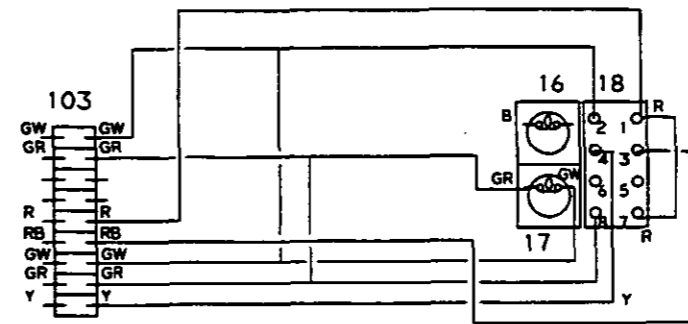
B	—Black	P	—Purple
BU	—Black/blue	PB	—Purple/black
BP	—Black/purple	PN	—Purple/brown
BR	—Black/red	R	—Red
BS	—Black/slate	RB	—Red/black
BLG	—Black/light green	RU	—Red/blue
BW	—Black/white	RG	—Red/green
G	—Green	RLG	—Red/light green
GB	—Green/black	RW	—Red/white
GN	—Green/brown	RY	—Red/yellow
GO	—Green/orange	S	—Grey
GP	—Green/purple	U	—Blue
GR	—Green/red	UK	—Blue/pink
GU	—Green/blue	UR	—Blue/pink
GW	—Green/white	UW	—Blue/white
K	—Pink	UG	—Blue/green
LG	—Light green	W	—White
LGY	—Light green/yellow	WN	—White/brown
LU	—Light blue	WR	—White/red
N	—Brown	WB	—White/black
NB	—Brown/black	WG	—White/green
NG	—Brown/green	WK	—White/pink
NK	—Brown/pink	WLG	—White/light green
NR	—Brown/red	WS	—White/grey
NU	—Brown/blue	Y	—Yellow
O	—Orange	YU	—Yellow/blue

Trailer socket wiring

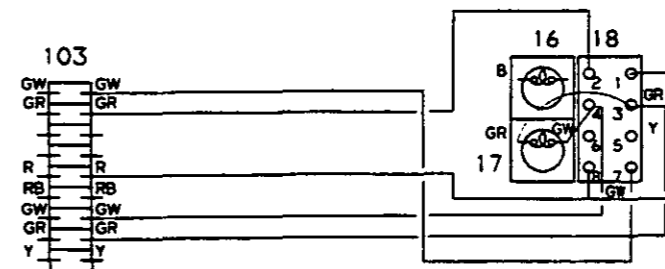
- | | |
|-----|--|
| L | —Left-hand rear direction indicator |
| R | —Right-hand rear direction indicator |
| 31 | —Earth (-) |
| 54 | —Right-hand and left-hand brake stop lights |
| 54G | —Not used spare |
| 58L | —Left-hand rear light and number plate light |
| 58R | —Right-hand rear light |



See figure 2 for rear harness



Direction indicator harness circuit - Worldwide



Direction indicator harness circuit - North America

Key to wiring diagram figure 9.

1. Horn
2. Headlights
3. Fuel sender and low fuel indicator
4. Differential lock solenoid-4WD (when fitted)
5. Engine oil pressure switch
6. Water temperature sender
7. Air filter switch
8. Temperature switch-Hydraulic filter
9. Pressure switch-Hydraulic filter
10. Alternator
11. Starter motor
12. Battery
13. Thermostart unit
14. Cigar lighter (when fitted)
15. Stop light switch
16. Trailer indicator warning light
17. Direction indicator warning light
18. Direction indicator switch
19. Direction indicator flasher unit
20. Start switch
21. Main fuse box
22. 13 pin plug-warming lights (instrument panel)
23. 12 pin plug-instruments (instrument panel)
24. Main/dip switch
25. Off/side/head switch
26. Rear work light switch
27. Hazard warning light switch
28. Warning light dimmer
29. Neutral start safety switch (transmission)
30. Horn push switch
31. Idle speed indicator light
32. Single fuse-main start circuit
33. Speedometer kit (when fitted)
- 33a. Speedometer interface (black box)
- 33b. Speedometer transducer
34. PTO safety switch
35. Differential lock engaged switch
36. Front fender lights-right-hand
37. Rear fender lights-right-hand
38. Rear work light-right-hand
39. Trailer socket
40. Number plate light
41. Parking brake switch
42. 4WD switch (when fitted)
43. Front fender lights-left-hand
44. Rear fender lights-left-hand
45. Earth (-) junction
46. Feed (+) junction
47. IPTO switch (when fitted)
48. Plug and socket-Red-behind engine
49. Plug and socket-Black-R.H. side clutch housing
50. Plug and socket-Blue-behind engine
51. Plug and socket-Black-right-hand clutch housing
52. Plug and socket-behind engine
53. Plug and socket-Red-right-hand clutch housing
54. Lighting internal splice
55. Plug and socket-right-hand seat deck
56. Plug and socket-left-hand seat deck
57. Plug and socket-Speedometer
58. Plug and socket-Speedometer
59. Rear work light left-hand
60. Front work light right-hand (when fitted)
61. Front work light left-hand (when fitted)
62. Beacon (when fitted)
63. Interior light (cab models)
64. Front wiper motor (cab models)
65. Rear wiper motor (when fitted)
66. Radio (when fitted)
67. Road warning light (North America only)
68. Rear wiper switch (when fitted)
69. Front wiper switch (cab models)
70. Cab heater blower motor switch
71. Front work light switch (when fitted)
72. Cab heater blower motor
73. Multi-Power switch (when fitted)
74. Left-hand flasher (North America only)
75. Lighting internal splice
76. Feed-internal splice

77. Right-hand flasher (North America only)
78. Beacon switch
79. Screen washer pump (cab models)
80. Cab fuse box
81. Multi-Power Solenoid (when fitted)
82. Reverse horn switch (when fitted)
83. Reverse horn (when fitted)
84. Front differential lock switch 4WD
85. Road warning lights-North America
86. Road warning light switch-North America
87. Road warning light flasher unit-North America
88. Radio speaker-Cab only
89. Radio aerial-Cab only
90. Engine earth
91. Air conditioner relay
92. Air conditioner thermostat
93. Air conditioner compressor
94. Air conditioner cut-out switches
95. Plug and socket (Air conditioner)
96. Rear screen washer pump
97. Fresh air blower motor
98. Fresh air blower motor resistor
99. Fresh air blower motor switch
100. Air conditioner line fuse
101. Fresh air blower motor relay
102. Plug and socket (R.H. lamp unit)
103. Plug and socket (L.H. lamp unit)
104. Plug and socket (Direction indicators)

Cab models only

WIRING DIAGRAM FIGURE 8

Cab Models only, All markets.

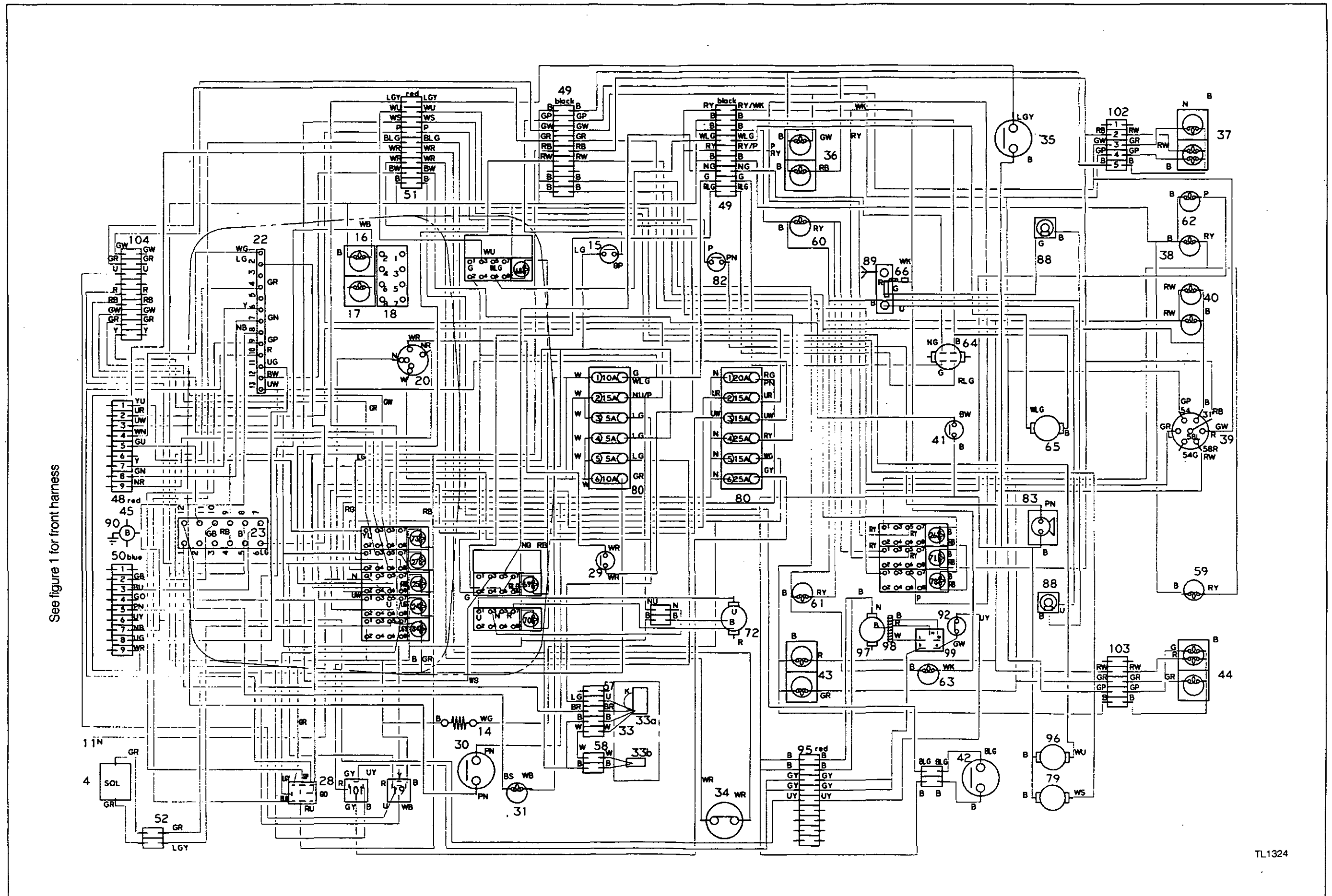
For tractors Serial No. P22200 to R15195 (3 cyl. engines),
R15143 (4 cyl. engines), R15158 (6 cyl. engines)

Wiring colour codes

B	—Black	P	—Purple
BU	—Black/blue	PB	—Purple/black
BP	—Black/purple	PN	—Purple/brown
BR	—Black/red	R	—Red
BS	—Black/slate	RB	—Red/black
BLG	—Black/light green	RU	—Red/blue
BW	—Black/white	RG	—Red/green
G	—Green	RLG	—Red/light green
GB	—Green/black	RW	—Red/white
GN	—Green/brown	RY	—Red/yellow
GO	—Green/orange	S	—Grey
GP	—Green/purple	U	—Blue
GR	—Green/red	UK	—Blue/pink
GU	—Green/blue	UR	—Blue/pink
GW	—Green/white	UW	—Blue/white
K	—Pink	UG	—Blue/green
LG	—Light green	W	—White
LGY	—Light green/yellow	WN	—White/brown
LU	—Light blue	WR	—White/red
N	—Brown	WB	—White/black
NB	—Brown/black	WG	—White/green
NG	—Brown/green	WK	—White/pink
NK	—Brown/pink	WLG	—White/light green
NR	—Brown/red	WS	—White/grey
NU	—Brown/blue	Y	—Yellow
O	—Orange	YU	—Yellow/blue

Trailer socket wiring

- L —Left-hand rear direction indicator
- R —Right-hand rear direction indicator
- 31 —Earth (-)
- 54 —Right-hand and left-hand brake stop lights
- 54G —Not used spare
- 58L —Left-hand rear light and number plate light
- 58R —Right-hand rear light



See figure 1 for front harness

Figure 9. Wiring diagram, Cab models only, All markets.
 For tractors Serial No. P22200 to R15195 (3 cyl. engines),
 R15143 (4 cyl. engines), R15158 (6 cyl. engines)

Key to wiring diagram figure 10.

1. Horn
2. Headlights
3. Fuel sender and low fuel indicator
4. Differential lock solenoid - 4WD (when fitted)
5. Engine oil pressure switch
6. Water temperature sender
7. Air filter switch
8. Temperature switch - hydraulic filter
9. Pressure switch - hydraulic filter
10. Alternator
11. Starter motor
12. Battery
13. Thermostat unit
14. Cigar lighter (when fitted)
15. Stop light switch
16. Trailer indicator warning light
17. Direction indicator warning light
18. Direction indicator switch
19. Direction indicator flasher unit
20. Start switch
21. Main fuse box
22. 13 pin plug - warning lights (instrument panel)
23. 12 pin plug - instruments (instrument panel)
24. Main/dip beam switch
25. Off/side/head switch
26. Rear work light switch
27. Hazard warning light switch
28. Warning light dimmer
29. Neutral start safety switch (transmission)
30. Horn push
31. Idle speed indicator light
32. Single fuse - main start circuit
33. Speedometer kit (when fitted)
- 33a. Speedometer interface (black box)
- 33b. Speedometer transducer
34. PTO safety start switch
35. Differential lock engaged switch
36. Front fender lights - right hand
37. Rear fender lights - right hand
38. Rear work light - right hand
39. Trailer socket
40. Number plate light
41. Parking brake switch
42. 4WD switch (when fitted)
43. Front fender lights - left hand
44. Rear fender lights - left hand
45. Earth (-) junction
46. Feed (+) junction
47. IPTO switch (when fitted)
48. Plug and socket - red - behind engine
49. Plug and socket - black - R.H. side clutch housing
50. Plug and socket - blue - behind engine
51. Plug and socket - black - R.H. clutch housing
52. Plug and socket - behind engine
53. Plug and socket - red - R.H. clutch housing
54. Lighting internal splice
55. Plug and socket - right hand seat deck
56. Plug and socket - left hand seat deck
57. Plug and socket - speedometer
58. Plug and socket - speedometer
59. Rear work light - left hand
60. Front work light - right hand (when fitted)
61. Front work light - left hand (when fitted)
62. Beacon (when fitted)
63. Interior light (cab models)
64. Front wiper motor (cab models)
65. Rear wiper motor (when fitted)
66. Radio (when fitted)
67. Road warning light switch (North America only)
68. Rear wiper switch (when fitted)
69. Front wiper switch (cab models)
70. Cab heater blower motor switch
71. Front work light switch (when fitted)
72. Cab heater blower motor
73. Multi-Power switch (when fitted)
74. Left hand flasher (North America only)
75. Lighting internal splice
76. Feed - internal splice
77. Right hand flasher (North America only)
78. Beacon switch
79. Screen washer pump (cab models)

80. Cab fuse box
81. Multi-Power solenoid (when fitted)
82. Reverse horn switch (when fitted)
83. Reverse horn (when fitted)
84. Front differential lock switch - 4WD
85. Road warning lights - North America } Cab
86. Road warning light switch - North America } models only
87. Road warning light flasher unit - North America
88. Radio speaker - (cab models)
89. Radio aerial - (cab models)
90. Engine earth
91. Air conditioner relay
92. Air conditioner thermostat
93. Air conditioner compressor
94. Air conditioner cut-out switches
95. Plug and socket (air conditioner)
96. Rear screen washer pump
97. Fresh air blower motor
98. Fresh air blower motor resistor
99. Fresh air blower motor switch
100. Air conditioner line fuse
101. Fresh air blower motor relay
102. Plug and socket (R.H. lamp unit)
103. Plug and socket (L.H. lamp unit)
104. Plug and socket (direction indicators)
105. 4WD switch (when fitted)
106. Range indicator light junction
107. Range indicator light
108. Range indicator light switch junction
109. Range indicator light switch
110. Plug and socket reverse horn junction L.H. side
111. Plug and socket reverse horn switch L.H. side
112. Plug and socket differential lock switch junction (right hand side rear axle)
113. Engine speed sensor (when fitted)
114. Fuel valve (when fitted)
115. Plug and socket 4WD switch junction L.H. side spacer
116. Battery isolator switch (when fitted)
117. Tachometer interface unit (when fitted)
118. 4WD solenoid valve (when fitted)

WIRING DIAGRAM FIGURE 9

Cab models only, All markets.

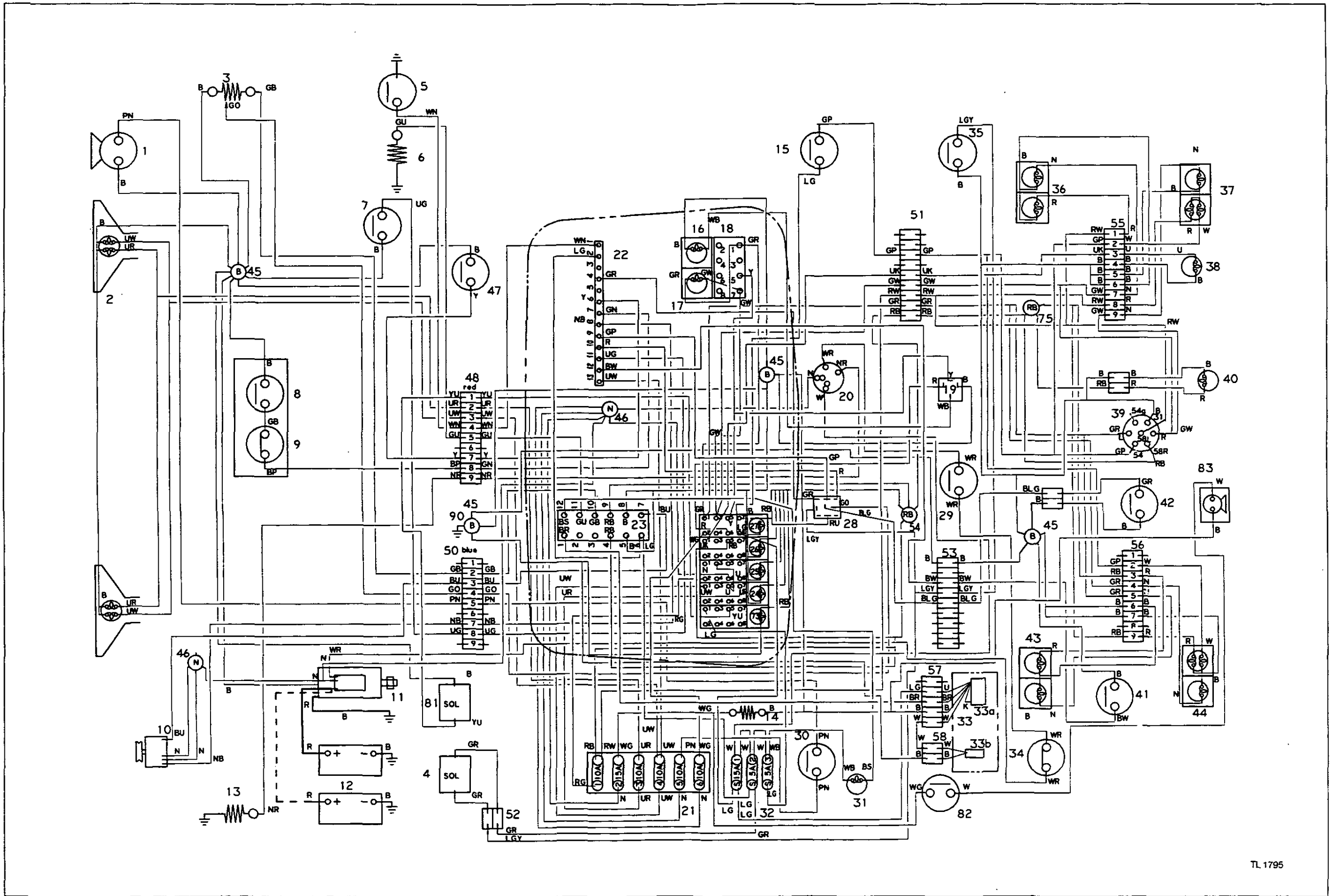
For tractors Serial No. P22200 to R15195 (3 cyl. engines),
R15143 (4 cyl. engines), R15158 (6 cyl. engines)

Wiring colour codes

B - Black	P - Purple
BU - Black/blue	PB - Purple/black
BP - Black/purple	PN - Purple/brown
BR - Black/red	R - Red
BS - Black/slate	RB - Red/black
BLG - Black/light green	RU - Red/blue
BW - Black/white	RG - Red/green
G - Green	RLG - Red/light green
GB - Green/black	RW - Red/white
GN - Green/brown	RY - Red/yellow
GO - Green/orange	S - Grey
GP - Green/purple	U - Blue
GR - Green/red	UK - Blue/pink
GU - Green/blue	UR - Blue/red
GW - Green/white	UW - Blue/white
K - Pink	UG - Blue/green
LG - Light green	W - White
LGY - Light green/yellow	WN - White/brown
LU - Light blue	WR - White/red
N - Brown	WB - White/black
NB - Brown/black	WG - White/green
NG - Brown/green	WK - White/pink
NK - Brown/pink	WLG - White/light green
NR - Brown/red	WS - White/grey
NU - Brown/blue	Y - Yellow
O - Orange	YU - Yellow/blue

Trailer socket wiring

- L - Left-hand rear direction indicator
- R - Right-hand rear direction indicator
- 31 - Earth
- 54 - Right-hand and left-hand brake stop lights
- 54G - Not used - spare
- 58L - Left-hand rear light and number plate light
- 58R - Right hand rear light



TL 1795

Figure 10. Wiring diagram, All models only, Footstep, World wide.
For tractors Serial No. R15001 (3 cyl. engines), R14073 (4 cyl. engines),
R14232 (6 cyl. engines), to S00000 (all engines)

Key to wiring diagram figure 11.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America |
| 7. Air filter switch | 86. Road warning light switch - North America |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side spacer |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

WIRING DIAGRAM FIGURE 10

All models, Footstep, World wide.

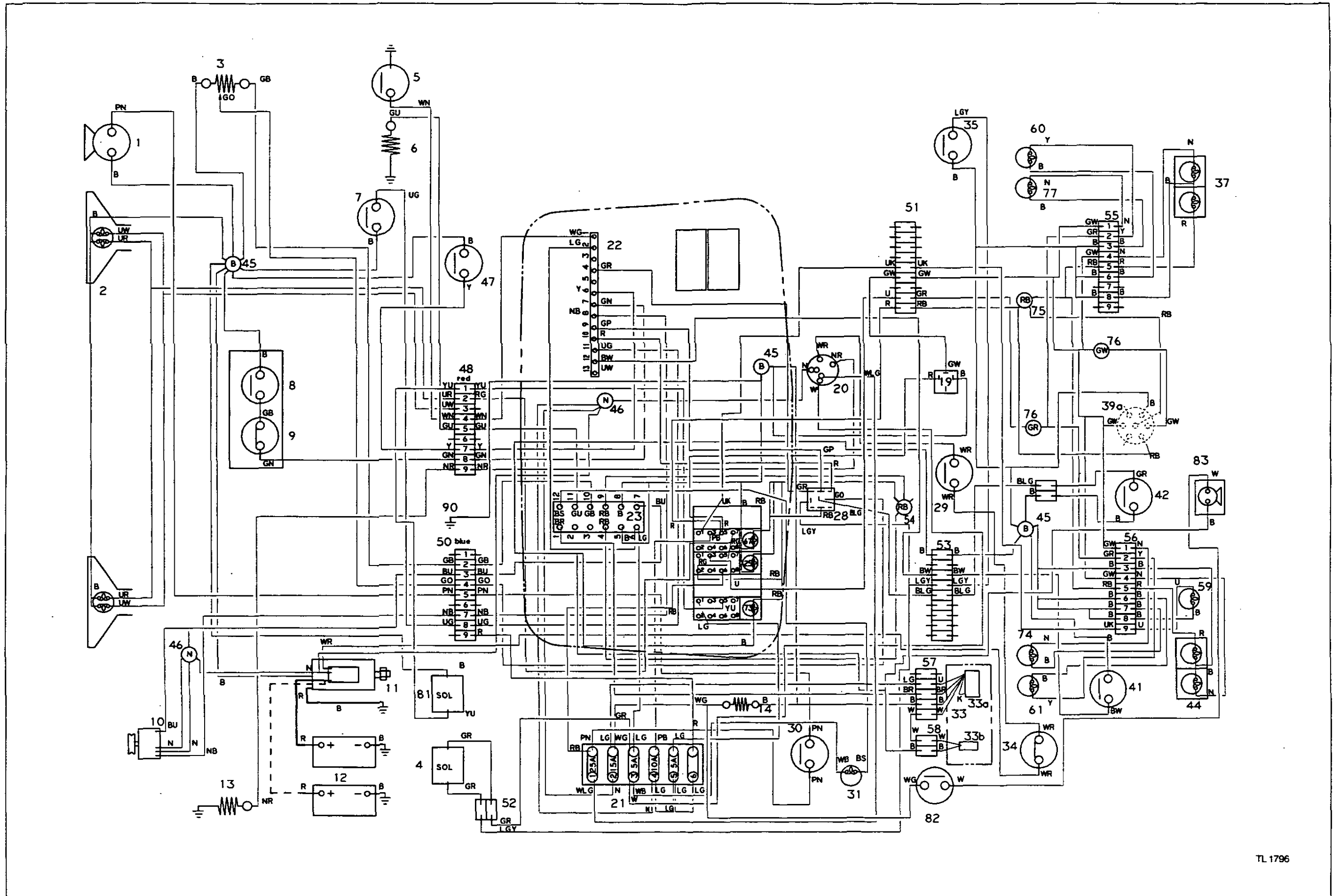
For tractors Serial No. R15001 (3 cyl. engines), R14073 (4 cyl. engines), R14232 (6 cyl. engines) to S00000 (all engines)

Wiring colour codes

- | | |
|--------------------------|-------------------------|
| B - Black | P - Purple |
| BU - Black/blue | PB - Purple/black |
| BP - Black/purple | PN - Purple/brown |
| BR - Black/red | R - Red |
| BS - Black/slate | RB - Red/black |
| BLG - Black/light green | RU - Red/blue |
| BW - Black/white | RG - Red/green |
| G - Green | RLG - Red/light green |
| GB - Green/black | RW - Red/white |
| GN - Green/brown | RY - Red/yellow |
| GO - Green/orange | S - Grey |
| GP - Green/purple | U - Blue |
| GR - Green/red | UK - Blue/pink |
| GU - Green/blue | UR - Blue/red |
| GW - Green/white | UW - Blue/white |
| K - Pink | UG - Blue/green |
| LG - Light green | W - White |
| LGY - Light green/yellow | WN - White/brown |
| LU - Light blue | WR - White/red |
| N - Brown | WB - White/black |
| NB - Brown/black | WG - White/green |
| NG - Brown/green | WK - White/pink |
| NK - Brown/pink | WLG - White/light green |
| NR - Brown/red | WS - White/grey |
| NU - Brown/blue | Y - Yellow |
| O - Orange | YU - Yellow/blue |

Trailer socket wiring

- | |
|---|
| L - Left-hand rear direction indicator |
| R - Right-hand rear direction indicator |
| 31 - Earth |
| 54 - Right-hand and left-hand brake stop lights |
| 54G - Not used - spare |
| 58L - Left-hand rear light and number plate light |
| 58R - Right hand rear light |



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Figure 11. Wiring diagram, All models, Footstep, North America.
For tractors Serial No. R15001 (3 cyl. engines), R14073 (4 cyl. engines),
R14232 (6 cyl. engines) to S00000 (all engines)

Key to wiring diagram figure 12.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America] Cab |
| 7. Air filter switch | 86. Road warning light switch - North America] models only |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side spacer |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

WIRING DIAGRAM FIGURE 11

All models, Footstep, North America.

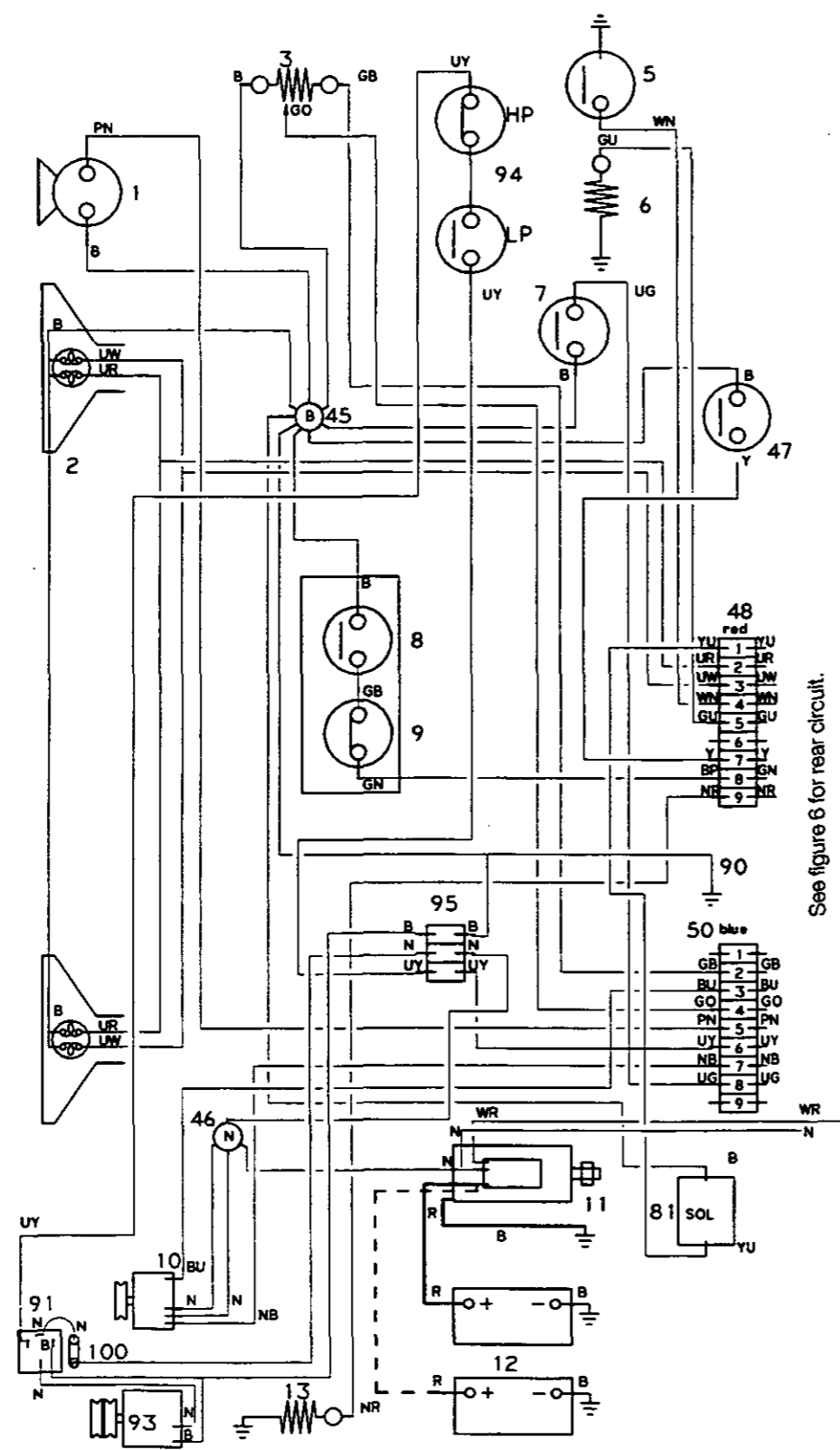
For tractors Serial No. R15001 (3 cyl. engines),
R14073 (4 cyl. engines), R14232 (6 cyl. engines)
to S00000 (all engines)

Wiring colour codes

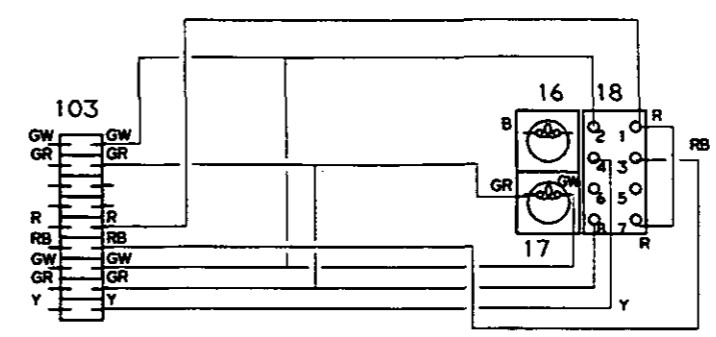
B - Black	P - Purple
BU - Black/blue	PB - Purple/black
BP - Black/purple	PN - Purple/brown
BR - Black/red	R - Red
BS - Black/slate	RB - Red/black
BLG - Black/light green	RU - Red/blue
BW - Black/white	RG - Red/green
G - Green	RLG - Red/light green
GB - Green/black	RW - Red/white
GN - Green/brown	RY - Red/yellow
GO - Green/orange	S - Grey
GP - Green/purple	U - Blue
GR - Green/red	UK - Blue/pink
GU - Green/blue	UR - Blue/red
GW - Green/white	UW - Blue/white
K - Pink	UG - Blue/green
LG - Light green	W - White
LGY - Light green/yellow	WN - White/brown
LU - Light blue	WR - White/red
N - Brown	WB - White/black
NB - Brown/black	WG - White/green
NG - Brown/green	WK - White/pink
NK - Brown/pink	WLG - White/light green
NR - Brown/red	WS - White/grey
NU - Brown/blue	Y - Yellow
O - Orange	YU - Yellow/blue

Trailer socket wiring

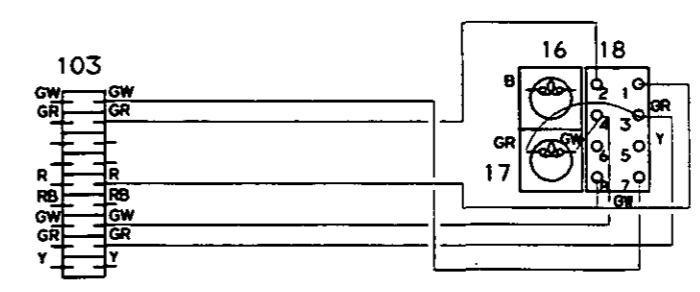
L - Left-hand rear direction indicator
R - Right-hand rear direction indicator
31 - Earth
54 - Right-hand and left-hand brake stop lights
54G - Not used - spare
58L - Left-hand rear light and number plate light
58R - Right hand rear light



See figure 6 for rear circuit.



Direction indicator circuit - Worldwide.



Direction indicator circuit - North America.

Key to wiring diagram figure 13.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America } Cab |
| 7. Air filter switch | 86. Road warning light switch - North America } models c |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side space |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

FRONT WIRING DIAGRAM FIGURE 12

Cab models only, All markets.

For tractors Serial No. R15196 (3 cyl. engines), R15144 (4 cyl. engines), R15159 (6 cyl. engines) to S00000 (all engines)

Wiring colour codes

B - Black	P - Purple
BU - Black/blue	PB - Purple/black
BP - Black/purple	PN - Purple/brown
BR - Black/red	R - Red
BS - Black/slate	RB - Red/black
BLG - Black/light green	RU - Red/blue
BW - Black/white	RG - Red/green
G - Green	RLG - Red/light green
GB - Green/black	RW - Red/white
GN - Green/brown	RY - Red/yellow
GO - Green/orange	S - Grey
GP - Green/purple	U - Blue
GR - Green/red	UK - Blue/pink
GU - Green/blue	UR - Blue/red
GW - Green/white	UW - Blue/white
K - Pink	UG - Blue/green
LG - Light green	W - White
LGY - Light green/yellow	WN - White/brown
LU - Light blue	WR - White/red
N - Brown	WB - White/black
NB - Brown/black	WG - White/green
NG - Brown/green	WK - White/pink
NK - Brown/pink	WLG - White/light green
NR - Brown/red	WS - White/grey
NU - Brown/blue	Y - Yellow
O - Orange	YU - Yellow/blue

Trailer socket wiring

- | |
|---|
| L - Left-hand rear direction indicator |
| R - Right-hand rear direction indicator |
| 31 - Earth |
| 54 - Right-hand and left-hand brake stop lights |
| 54G - Not used - spare |
| 58L - Left-hand rear light and number plate light |
| 58R - Right hand rear light |

14B-28

WIRING DIAGRAMS

Key to wiring diagram figure 14.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America } Cab |
| 7. Air filter switch | 86. Road warning light switch - North America } models only |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side spacer |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

REAR WIRING DIAGRAM FIGURE 13

Cab models only, All markets.

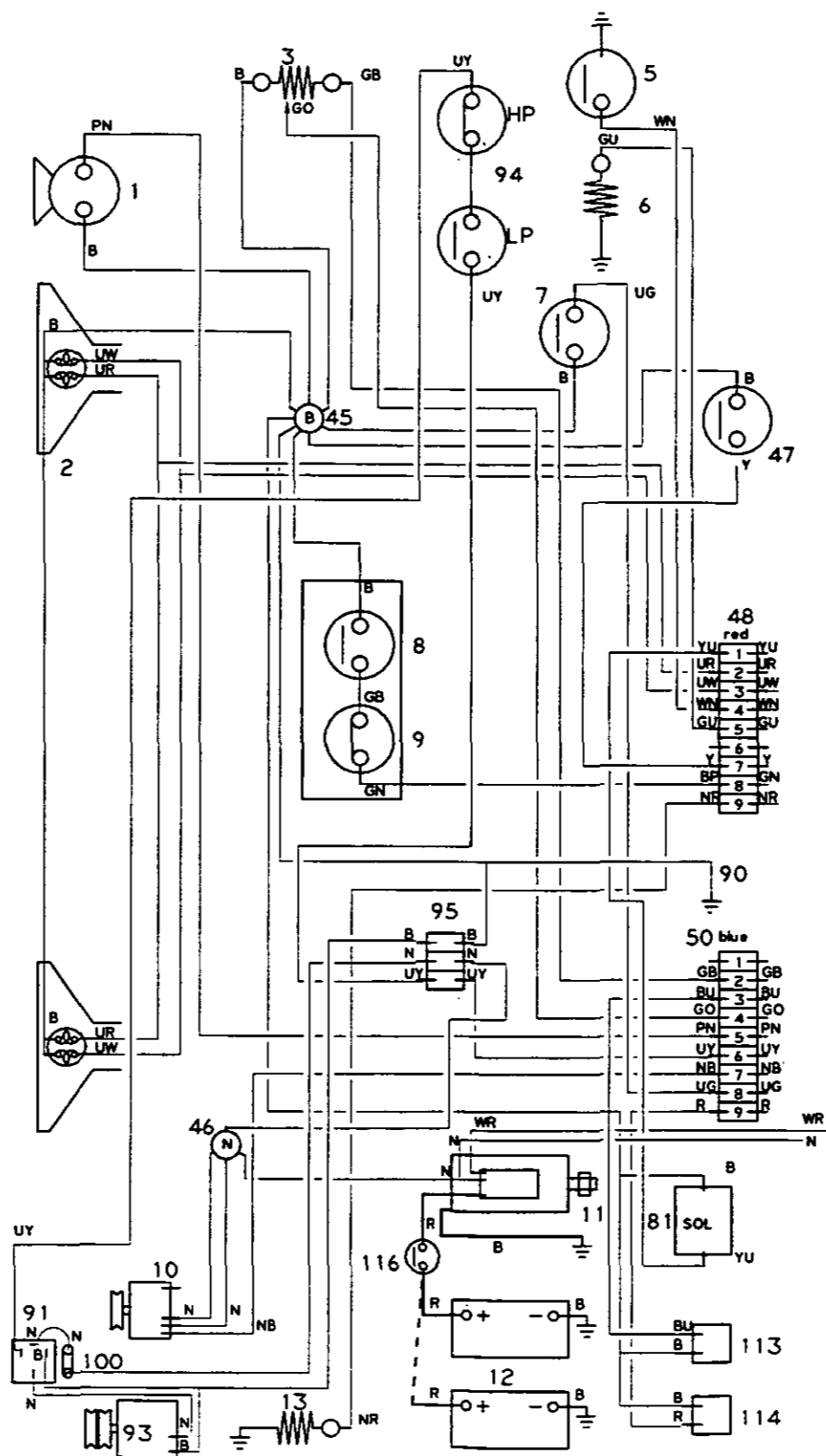
For tractors Serial No. R15196 (3 cyl. engines),
R15144 (4 cyl. engines), R15159 (6 cyl. engines)
to S00000 (all engines)

Wiring colour codes

B - Black	P - Purple
BU - Black/blue	PB - Purple/black
BP - Black/purple	PN - Purple/brown
BR - Black/red	R - Red
BS - Black/slate	RB - Red/black
BLG - Black/light green	RU - Red/blue
BW - Black/white	RG - Red/green
G - Green	RLG - Red/light green
GB - Green/black	RW - Red/white
GN - Green/brown	RY - Red/yellow
GO - Green/orange	S - Grey
GP - Green/purple	U - Blue
GR - Green/red	UK - Blue/pink
GU - Green/blue	UR - Blue/red
GW - Green/white	UW - Blue/white
K - Pink	UG - Blue/green
LG - Light green	W - White
LGY - Light green/yellow	WN - White/brown
LU - Light blue	WR - White/red
N - Brown	WB - White/black
NB - Brown/black	WG - White/green
NG - Brown/green	WK - White/pink
NK - Brown/pink	WLG - White/light green
NR - Brown/red	WS - White/grey
NU - Brown/blue	Y - Yellow
O - Orange	YU - Yellow/blue

Trailer socket wiring

- L - Left-hand rear direction indicator
- R - Right-hand rear direction indicator
- 31 - Earth
- 54 - Right-hand and left-hand brake stop lights
- 54G - Not used - spare
- 58L - Left-hand rear light and number plate light
- 58R - Right hand rear light



See figure 9, 10 or 11 for rear circuit.

Figure 14. Front wiring diagram, Footstep and Cab tractors, M-F 399 tractor only.
For tractors Serial No. S01001 onwards.

Key to wiring diagram figure 15.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America } Cab |
| 7. Air filter switch | 86. Road warning light switch - North America } models only |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side spacer |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

FRONT WIRING DIAGRAM FIGURE 14

Footstep and Cab tractors. M-F 399 tractor only.

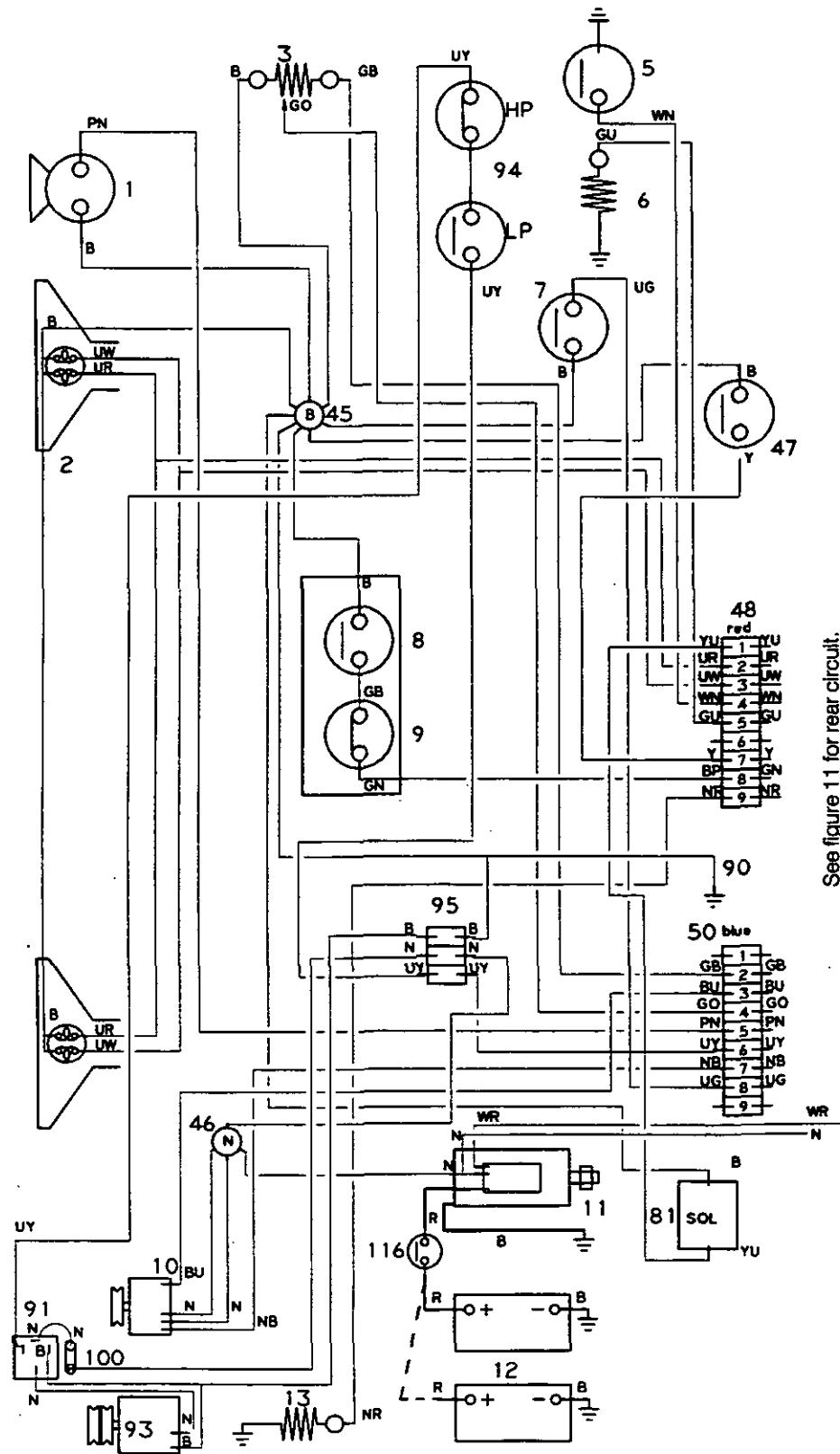
For tractors Serial No. S01001 onwards

Wiring colour codes

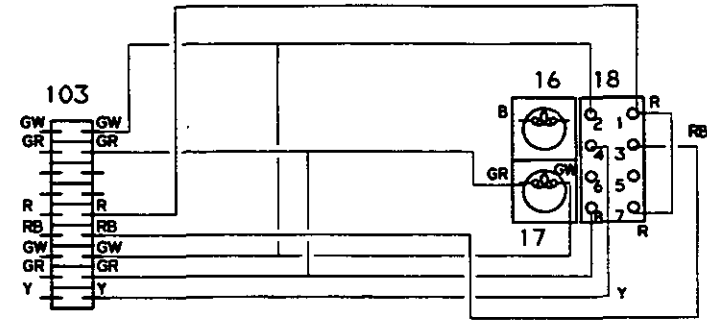
B - Black	P - Purple
BU - Black/blue	PB - Purple/black
BP - Black/purple	PN - Purple/brown
BR - Black/red	R - Red
BS - Black/slate	RB - Red/black
BLG - Black/light green	RU - Red/blue
BW - Black/white	RG - Red/green
G - Green	RLG - Red/light green
GB - Green/black	RW - Red/white
GN - Green/brown	RY - Red/yellow
GO - Green/orange	S - Grey
GP - Green/purple	U - Blue
GR - Green/red	UK - Blue/pink
GU - Green/blue	UR - Blue/red
GW - Green/white	UW - Blue/white
K - Pink	UG - Blue/green
LG - Light green	W - White
LGY - Light green/yellow	WN - White/brown
LU - Light blue	WR - White/red
N - Brown	WB - White/black
NB - Brown/black	WG - White/green
NG - Brown/green	WK - White/pink
NK - Brown/pink	WLG - White/light green
NR - Brown/red	WS - White/grey
NU - Brown/blue	Y - Yellow
O - Orange	YU - Yellow/blue

Trailer socket wiring

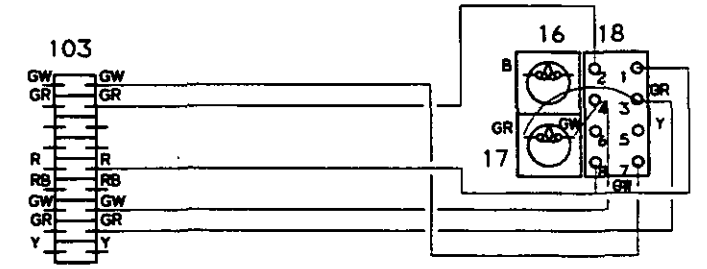
- L - Left-hand rear direction indicator
- R - Right-hand rear direction indicator
- 31 - Earth
- 54 - Right-hand and left-hand brake stop lights
- 54G - Not used - spare
- 58L - Left-hand rear light and number plate light
- 58R - Right hand rear light



See figure 11 for rear circuit.



Direction circuit circuit - Worldwide.



Direction circuit circuit - North America.

Key to wiring diagram figure 16.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America |
| 7. Air filter switch | 86. Road warning light switch - North America |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side spacer |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

FRONT WIRING DIAGRAM FIGURE 15

Cab tractors only. All models, excluding M-F 399 tractor.

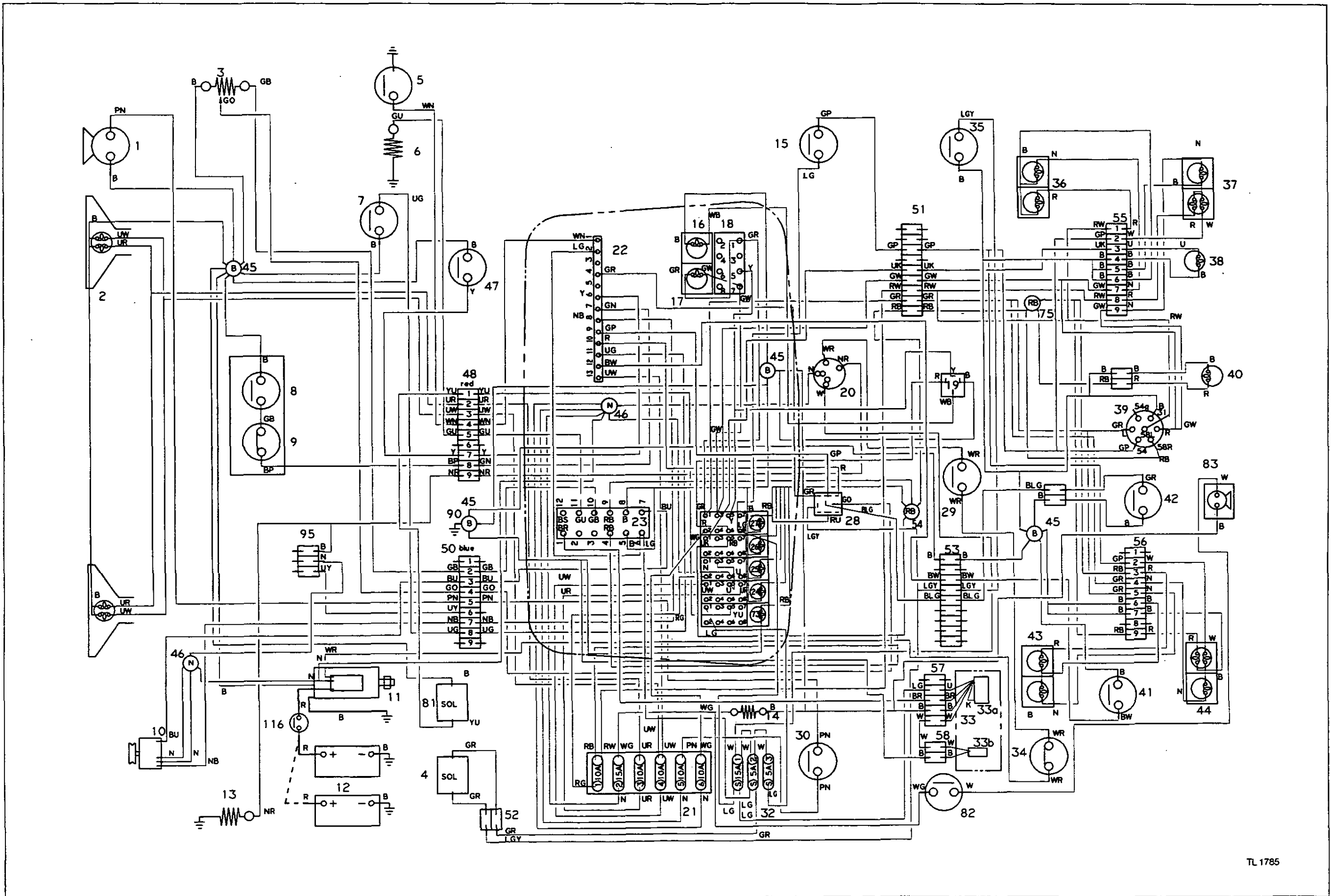
For tractors Serial No. S01001 onwards

Wiring colour codes

B - Black	P - Purple
BU - Black/blue	PB - Purple/black
BP - Black/purple	PN - Purple/brown
BR - Black/red	R - Red
BS - Black/slate	RB - Red/black
BLG - Black/light green	RU - Red/blue
BW - Black/white	RG - Red/green
G - Green	RLG - Red/light green
GB - Green/black	RW - Red/white
GN - Green/brown	RY - Red/yellow
GO - Green/orange	S - Grey
GP - Green/purple	U - Blue
GR - Green/red	UK - Blue/pink
GU - Green/blue	UR - Blue/red
GW - Green/white	UW - Blue/white
K - Pink	UG - Blue/green
LG - Light green	W - White
LGY - Light green/yellow	WN - White/brown
LU - Light blue	WR - White/red
N - Brown	WB - White/black
NB - Brown/black	WG - White/green
NG - Brown/green	WK - White/pink
NK - Brown/pink	WLG - White/light green
NR - Brown/red	WS - White/grey
NU - Brown/blue	Y - Yellow
O - Orange	YU - Yellow/blue

Trailer socket wiring

- L - Left-hand rear direction indicator
- R - Right-hand rear direction indicator
- 31 - Earth
- 54 - Right-hand and left-hand brake stop lights
- 54G - Not used - spare
- 58L - Left-hand rear light and number plate light
- 58R - Right hand rear light



TL 1785

Figure 16. Wiring diagram, Footstep tractor, All models - for M-F 399 tractor front harness see fig. 7
For tractors Serial No. S01001 onwards

Key to wiring diagram figure 17.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America } Cab |
| 7. Air filter switch | 86. Road warning light switch - North America } models only |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side spacer |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

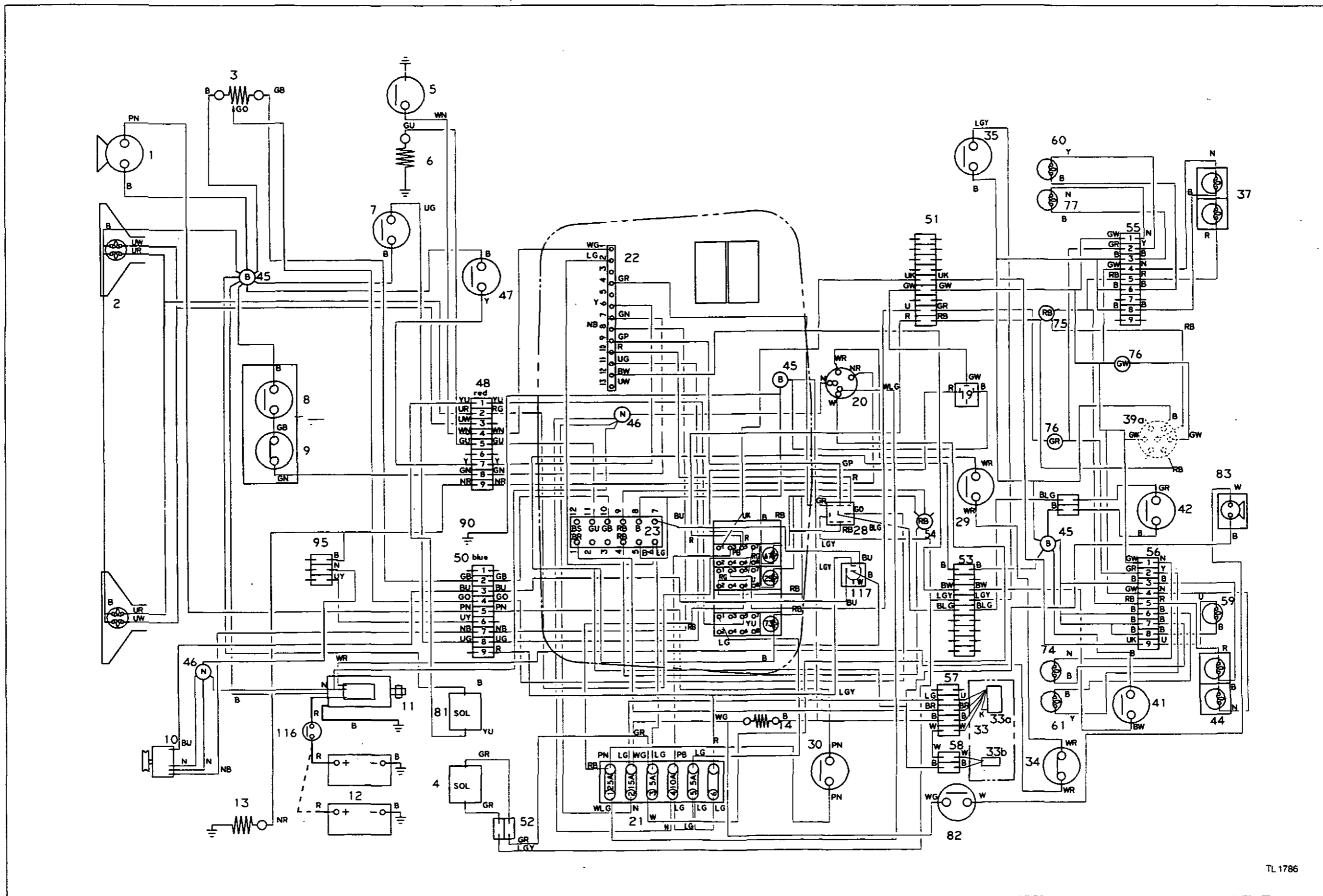
WIRING DIAGRAM FIGURE 16
Footstep tractor, All models.
For tractors Serial No. S01001 onwards

Wiring colour codes

B - Black	P - Purple
BU - Black/blue	PB - Purple/black
BP - Black/purple	PN - Purple/brown
BR - Black/red	R - Red
BS - Black/slate	RB - Red/black
BLG - Black/light green	RU - Red/blue
BW - Black/white	RG - Red/green
G - Green	RLG - Red/light green
GB - Green/black	RW - Red/white
GN - Green/brown	RY - Red/yellow
GO - Green/orange	S - Grey
GP - Green/purple	U - Blue
GR - Green/red	UK - Blue/pink
GU - Green/blue	UR - Blue/red
GW - Green/white	UW - Blue/white
K - Pink	UG - Blue/green
LG - Light green	W - White
LGY - Light green/yellow	WN - White/brown
LU - Light blue	WR - White/red
N - Brown	WB - White/black
NB - Brown/black	WG - White/green
NG - Brown/green	WK - White/pink
NK - Brown/pink	WLG - White/light green
NR - Brown/red	WS - White/grey
NU - Brown/blue	Y - Yellow
O - Orange	YU - Yellow/blue

Trailer socket wiring

- | |
|---|
| L - Left-hand rear direction indicator |
| R - Right-hand rear direction indicator |
| 31 - Earth |
| 54 - Right-hand and left-hand brake stop lights |
| 54G - Not used - spare |
| 58L - Left-hand rear light and number plate light |
| 58R - Right hand rear light |



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Figure 17. Wiring diagram, Footstep tractors, North America only. All models for M-F 399 tractor front Harness see fig. 7.

For tractors Serial No. S01001 onwards

Key to wiring diagram figure 18.

- | | |
|--|--|
| 1. Horn | 80. Cab fuse box |
| 2. Headlights | 81. Multi-Power solenoid (when fitted) |
| 3. Fuel sender and low fuel indicator | 82. Reverse horn switch (when fitted) |
| 4. Differential lock solenoid - 4WD (when fitted) | 83. Reverse horn (when fitted) |
| 5. Engine oil pressure switch | 84. Front differential lock switch - 4WD |
| 6. Water temperature sender | 85. Road warning lights - North America } Cab |
| 7. Air filter switch | 86. Road warning light switch - North America } models only |
| 8. Temperature switch - hydraulic filter | 87. Road warning light flasher unit - North America |
| 9. Pressure switch - hydraulic filter | 88. Radio speaker - (cab models) |
| 10. Alternator | 89. Radio aerial - (cab models) |
| 11. Starter motor | 90. Engine earth |
| 12. Battery | 91. Air conditioner relay |
| 13. Thermostat unit | 92. Air conditioner thermostat |
| 14. Cigar lighter (when fitted) | 93. Air conditioner compressor |
| 15. Stop light switch | 94. Air conditioner cut-out switches |
| 16. Trailer indicator warning light | 95. Plug and socket (air conditioner) |
| 17. Direction indicator warning light | 96. Rear screen washer pump |
| 18. Direction indicator switch | 97. Fresh air blower motor |
| 19. Direction indicator flasher unit | 98. Fresh air blower motor resistor |
| 20. Start switch | 99. Fresh air blower motor switch |
| 21. Main fuse box | 100. Air conditioner line fuse |
| 22. 13 pin plug - warning lights (instrument panel) | 101. Fresh air blower motor relay |
| 23. 12 pin plug - instruments (instrument panel) | 102. Plug and socket (R.H. lamp unit) |
| 24. Main/dip beam switch | 103. Plug and socket (L.H. lamp unit) |
| 25. Off/side/head switch | 104. Plug and socket (direction indicators) |
| 26. Rear work light switch | 105. 4WD switch (when fitted) |
| 27. Hazard warning light switch | 106. Range indicator light junction |
| 28. Warning light dimmer | 107. Range indicator light |
| 29. Neutral start safety switch (transmission) | 108. Range indicator light switch junction |
| 30. Horn push | 109. Range indicator light switch |
| 31. Idle speed indicator light | 110. Plug and socket reverse horn junction L.H. side |
| 32. Single fuse - main start circuit | 111. Plug and socket reverse horn switch L.H. side |
| 33. Speedometer kit (when fitted) | 112. Plug and socket differential lock switch junction (right hand side rear axle) |
| 33a. Speedometer interface (black box) | 113. Engine speed sensor (when fitted) |
| 33b. Speedometer transducer | 114. Fuel valve (when fitted) |
| 34. PTO safety start switch | 115. Plug and socket 4WD switch junction L.H. side spacer |
| 35. Differential lock engaged switch | 116. Battery isolator switch (when fitted) |
| 36. Front fender lights - right hand | 117. Tachometer interface unit (when fitted) |
| 37. Rear fender lights - right hand | 118. 4WD solenoid valve (when fitted) |
| 38. Rear work light - right hand | |
| 39. Trailer socket | |
| 40. Number plate light | |
| 41. Parking brake switch | |
| 42. 4WD switch (when fitted) | |
| 43. Front fender lights - left hand | |
| 44. Rear fender lights - left hand | |
| 45. Earth (-) junction | |
| 46. Feed (+) junction | |
| 47. IPTO switch (when fitted) | |
| 48. Plug and socket - red - behind engine | |
| 49. Plug and socket - black - R.H. side clutch housing | |
| 50. Plug and socket - blue - behind engine | |
| 51. Plug and socket - black - R.H. clutch housing | |
| 52. Plug and socket - behind engine | |
| 53. Plug and socket - red - R.H. clutch housing | |
| 54. Lighting internal splice | |
| 55. Plug and socket - right hand seat deck | |
| 56. Plug and socket - left hand seat deck | |
| 57. Plug and socket - speedometer | |
| 58. Plug and socket - speedometer | |
| 59. Rear work light - left hand | |
| 60. Front work light - right hand (when fitted) | |
| 61. Front work light - left hand (when fitted) | |
| 62. Beacon (when fitted) | |
| 63. Interior light (cab models) | |
| 64. Front wiper motor (cab models) | |
| 65. Rear wiper motor (when fitted) | |
| 66. Radio (when fitted) | |
| 67. Road warning light switch (North America only) | |
| 68. Rear wiper switch (when fitted) | |
| 69. Front wiper switch (cab models) | |
| 70. Cab heater blower motor switch | |
| 71. Front work light switch (when fitted) | |
| 72. Cab heater blower motor | |
| 73. Multi-Power switch (when fitted) | |
| 74. Left hand flasher (North America only) | |
| 75. Lighting internal splice | |
| 76. Feed - internal splice | |
| 77. Right hand flasher (North America only) | |
| 78. Beacon switch | |
| 79. Screen washer pump (cab models) | |

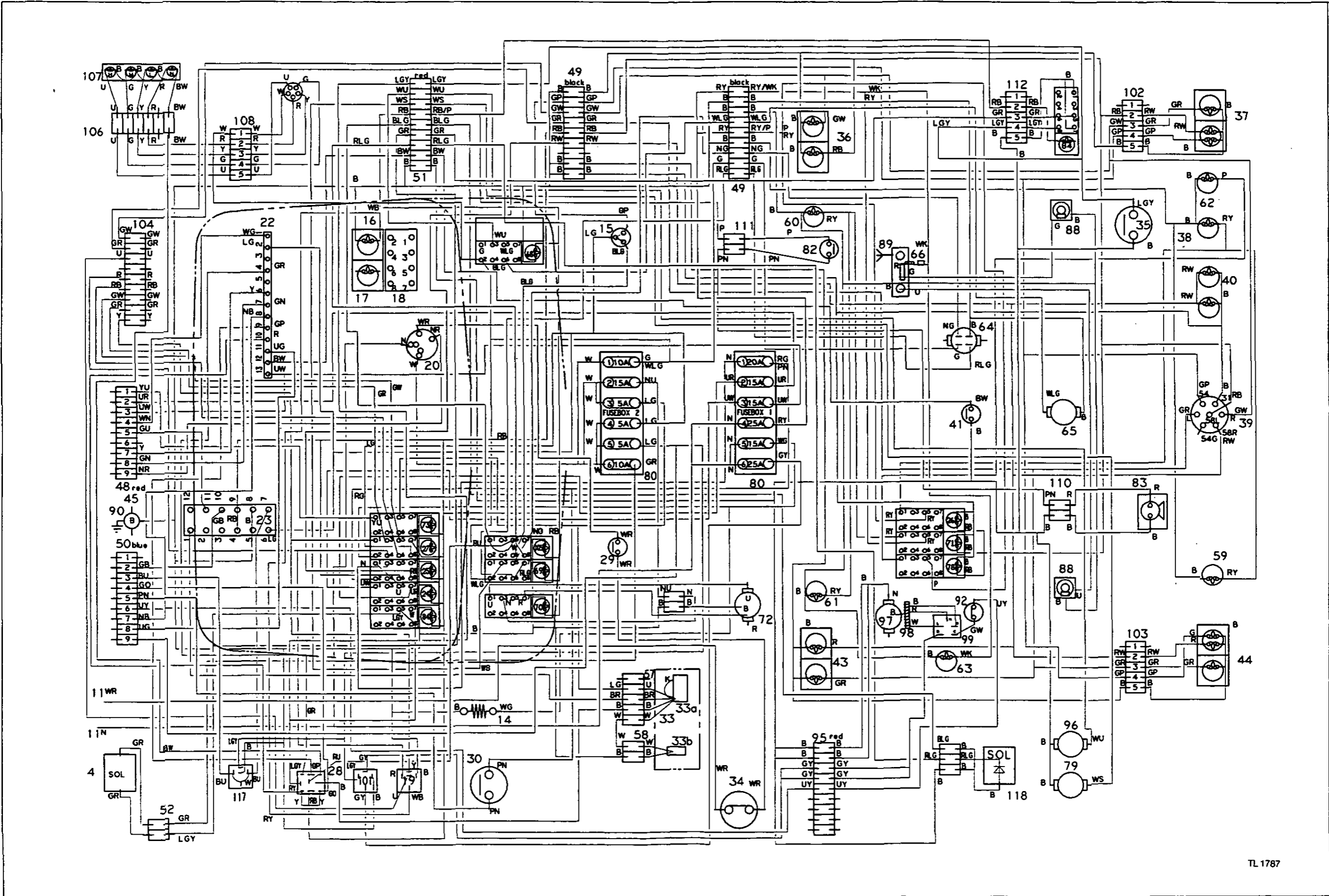
WIRING DIAGRAM FIGURE 17
Footstep tractors, North America only.
For tractors Serial No. S01001 onwards

Wiring colour codes

- | | |
|--------------------------|-------------------------|
| B - Black | P - Purple |
| BU - Black/blue | PB - Purple/black |
| BP - Black/purple | PN - Purple/brown |
| BR - Black/red | R - Red |
| BS - Black/slate | RB - Red/black |
| BLG - Black/light green | RU - Red/blue |
| BW - Black/white | RG - Red/green |
| G - Green | RLG - Red/light green |
| GB - Green/black | RW - Red/white |
| GN - Green/brown | RY - Red/yellow |
| GO - Green/orange | S - Grey |
| GP - Green/purple | U - Blue |
| GR - Green/red | UK - Blue/pink |
| GU - Green/blue | UR - Blue/red |
| GW - Green/white | UW - Blue/white |
| K - Pink | UG - Blue/green |
| LG - Light green | W - White |
| LGY - Light green/yellow | WN - White/brown |
| LU - Light blue | WR - White/red |
| N - Brown | WB - White/black |
| NB - Brown/black | WG - White/green |
| NG - Brown/green | WK - White/pink |
| NK - Brown/pink | WLG - White/light green |
| NR - Brown/red | WS - White/grey |
| NU - Brown/blue | Y - Yellow |
| O - Orange | YU - Yellow/blue |

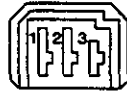
Trailer socket wiring

- | |
|---|
| L - Left-hand rear direction indicator |
| R - Right-hand rear direction indicator |
| 31 - Earth |
| 54 - Right-hand and left-hand brake stop lights |
| 54G - Not used - spare |
| 58L - Left-hand rear light and number plate light |
| 58R - Right hand rear light |



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Figure 18. Rear Wiring diagram, Cab tractors, All markets, All models.
For tractors Serial No. S01001 onwards

FOOTSTEP TRACTOR WIRING DIAGRAMS**ENGINE HARNESS
WORLDWIDE AND NORTH AMERICA****Front engine harness four cylinder engines (Fig. 1)****C1 Alternator connector**

Terminal No.	Destination	Colour Code
1	Starter motor and battery - Positive (+)	Brown
2	Starter motor and battery - Positive (+)	Brown
3	Connector C5/2 - Alternator warning light	Brown /yellow

C2 Earth to engine cylinder block**C3 Earth to alternator body****C4 Hydraulic oil filter temperature and pressure switches**

Terminal No.	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block	Black
2	Connector C5/7 - Warning light hydraulic filter blocked	Black/purple

C5 Front harness connector - Red

Connects to connector C11



Terminal No.	Destination	Colour Code
1	Connector C7/2 - Left-hand head light - Dip beam (2)	Blue/pink
2	Connector C1/3 - Alternator (10)	Brown/yellow
3	Connector C9/1 - Right-hand headlight - Main beam (17)	Blue/black
4	Connector C7/1 - Left-hand headlight - Main beam (2)	Blue/grey
5	Not used	
6	Low hydraulic oil pressure switch (15)	Yellow
7	Connector C4/2 - Hydraulic oil filter warning switches (11 & 12)	Black/purple
8	Connector C8/2 - Fuel tank sender unit - Fuel level (3)	Green/black
9	Horn (1)	Purple/yellow
10	Connector C6/2 - Tachometer (47) - Six cylinder engines only	Green/yellow
11	Fuel cut-off valve (6) - Six cylinder engines only	Orange
12	Water temperature transmitter (5)	Green/blue
13	Air cleaner switch (4)	Blue/green
14	Connector C6/3 - Tachometer - Negative (-) (47) - Six cylinder engines only	Black
15	Engine oil pressure switch (7)	White/brown
16	Not used	
17	Connector C8/1 - Low fuel warning (3)	Green/orange
18	Not used	
19	Connector C9/2 - Right-hand head light - Dip beam (17)	Blue/orange
20	Thermostart (13)	Orange/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

C6 Tachometer connector



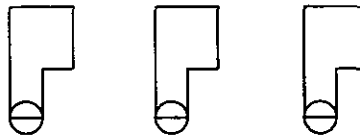
Terminal No.	Destination	Colour Code
1	Engine speed sensor (14)	White/grey
2	Connector C5/10 - Tachometer	Green/yellow
3	Connector C5/14 - Negative (-)	Black
4	Not used	

C7 Left-hand head light connector



Terminal No.	Destination	Colour Code
1	Connector C5/4 - Head light - Main beam	Blue/grey
2	Connector C5/1 - Head light - Dip beam	Blue/pink
3	Connector C2 - Engine cylinder block negative (-)	Black

C8 Fuel tank sender unit



Terminal No.	Destination	Colour Code
1	Connector C5/17 - Low fuel warning - Red terminal	Green/orange
2	Connector C5/8 - Fuel tank contents - White terminal	Green/black
3	Connector C2 - Engine cylinder block negative (-)	Black

C9 Right-hand head light connector



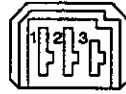
Terminal No.	Destination	Colour Code
1	Connector C5/3 - Head light - Main beam	Blue/black
2	Connector C5/19 - Head light - Dip beam	Blue/orange
3	Connector C2 Engine cylinder block negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

ENGINE HARNESS WORLD WIDE AND NORTH AMERICA

Front engine harness six cylinder engines (Fig. 2)

C1 Alternator connector



Terminal No.	Destination	Colour Code
1	Starter motor and battery - Positive (+)	Brown
2	Starter motor and battery - Positive (+)	Brown
3	Connector C5/2 - Alternator warning light	Brown /yellow

C2 Earth to engine cylinder block



C3 Earth to alternator body



C4 Hydraulic oil filter temperature and pressure switches



Terminal No.	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block	Black
2	Connector C5/7 - Warning light hydraulic filter blocked	Black/purple

C5 Front harness connector – Red

Connects to connector C11



Terminal No.	Destination	Colour Code
1	Connector C7/2 - Left-hand head light - Dip beam (2)	Blue/pink
2	Connector C1/3 - Alternator (10)	Brown/yellow
3	Connector C9/1 - Right-hand headlight - Main beam (17)	Blue/black
4	Connector C7/1 - Left-hand headlight - Main beam (2)	Blue/grey
5	Not used	
6	Low hydraulic oil pressure switch (15)	Yellow
7	Connector C4/2 - Hydraulic oil filter warning switches (11 & 12)	Black/purple
8	Connector C8/2 - Fuel tank sender unit - Fuel level (3)	Green/black
9	Horn (1)	Purple/yellow
10	Connector C6/2 - Tachometer (47) - Six cylinder engines only	Green/yellow
11	Fuel cut-off valve (6) - Six cylinder engines only	Orange
12	Water temperature transducer (5)	Green/blue
13	Air cleaner switch (4)	Blue/green
14	Connector C6/3 - Tachometer- Negative (-) (47) - Six cylinder engines only	Black
15	Engine oil pressure switch (7)	White/brown
16	Not used	
17	Connector C8/1 - Low fuel warning (3)	Green/orange
18	Not used	
19	Connector C9/2 - Right-hand head light - Dip beam (17)	Blue/orange
20	Thermostart (13)	Orange/red

C6 Tachometer connector



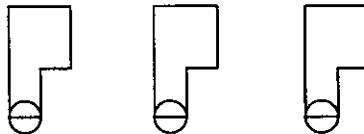
Terminal No.	Destination	Colour Code
1	Engine speed sensor (14)	White/grey
2	Connector C5/10 - Tachometer	Green/yellow
3	Connector C5/14 - Negative (-)	Black
4	Not used	

C7 Left-hand head light connector



Terminal No.	Destination	Colour Code
1	Connector C5/4 - Head light - Main beam	Blue/grey
2	Connector C5/1 - Head light - Dip beam	Blue/pink
3	Connector C2 - Engine cylinder block negative (-)	Black

C8 Fuel tank sender unit



Terminal No.	Destination	Colour Code
1	Connector C5/17 - Low fuel warning - Red terminal	Green/orange
2	Connector C5/8 - Fuel tank contents - White terminal	Green/black
3	Connector C2 - Engine cylinder block negative (-)	Black

C9 Right-hand head light connector



Terminal No.	Destination	Colour Code
1	Connector C5/3 - Head light - Main beam	Blue/black
2	Connector C5/19 - Head light - Dip beam	Blue/orange
3	Connector C2 - Engine cylinder block negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

CONSOLE HARNESS NORTH AMERICA ONLY

Console harness (Fig. 3)

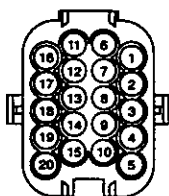
C10 Four wheel drive differential lock solenoid



Terminal	Destination	Colour Code
1	Fuse B2 - Differential lock	Green/red
2	Connector C12/15 - Differential lock switch	Yellow

C11 Front harness connector – Red

Connects to connector C5

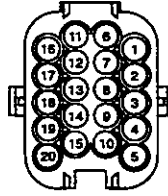


Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light - Dip beam	Blue/pink
2	Charge circuit diode (23) - Header joint H2/11	Brown/yellow
3	Fuse B9 - Right-hand head light - Main beam	Blue/black
4	Fuse B8 - Left-hand head light - Main beam	Blue/grey
5	Not used	
6	Connector C13/4 - Hydraulic pressure warning light	Yellow
7	Connector C13/2 - Hydraulic oil filter warning light	White/brown
8	Connector C14/4 - Fuel tank gauge	Green/black
9	Horn push (32)	Purple/yellow
10	Header joint HJ3/19- Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C14/1 - Water temperature gauge	Green/blue
13	Connector C13/9 - Air cleaner warning light	Blue/green
14	Header Joint HJ2/2 - Tachometer negative (-)	Black
15	Connector C13/3 - Engine oil pressure warning light	White/brown
16	Not used	
17	Connector C13/10 - Low fuel warning light	Green/orange
18	Not used	
19	Fuse B7 - Right-hand head light - Dip beam	Blue/orange
20	Fuse A1 - Hydraulic oil filter	Orange/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

C12 Rear harness connector – Black

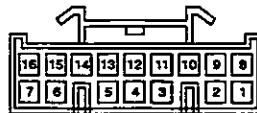
Connects to connector C18



Terminal	Destination	Colour Code
1	Switch S2/6 - Work light switch (27)	Blue/green
2	Connector C13/6 - Parking brake warning light	Black/white
3	Header joint HJ1/4 - Front flashing indicator light	Green/red
4	Header joint HJ1/3 - Rear flashing indicator light	Green/red
5	Header joint HJ1/1 - 7 pin trailer socket (L)	Green/red
6	Header joint HJ1/16 - 7 pin trailer socket (58R)	Red/black
7	Header joint HJ1/14 - Rear red light	Red/black
8	Not used	
9	Not used	
10	Not used	
11	Header joint HJ1/11 - 7 pin trailer socket (58L)	Red/white
12	Not used	
13	Switch S2/8 - Work light switch (27)	Blue/green
14	Header joint HJ1/9 - Rear red light	Red/white
15	Connector C10/2 - Four wheel drive differential lock solenoid	Yellow
	Connector C13/11 - Differential lock warning light	Yellow
16	Switch S2/3 - Work light switch (27)	Blue/pink
17	Connector C13/15 - Four wheel drive warning light	Light green
18	Header joint HJ1/5 - Rear flashing light	Green/white
19	Header joint HJ1/8 - Front flashing light	Green/white
20	Header joint HJ1/7 - 7 pin trailer socket	Green/white

C13 Instrument panel warning lights connector

See also page 14A-42



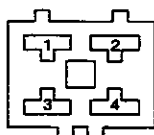
Terminal	Destination	Colour Code
1	Not used	
2	Connector C11/7 - Hydraulic oil filter switch	Black/purple
3	Connector C11/15 - Engine oil pressure switch	White/brown
4	Connector C11/6 - Low hydraulic oil pressure switch	Yellow
5	Header joint HJ2/9 - Alternator charge	Brown/yellow
6	Connector C12/2 - Parking brake switch	Black/white
7	Fuse B9 - Right-hand head light - Main beam	Blue/black
8	Header joint HJ3/16 - Positive (+)	Green/yellow
9	Connector C11/13 - Air cleaner switch	Blue/green
10	Connector C11/17 - Low fuel - tank sender unit	Green/orange
11	Connector C12/15 - Differential lock switch	Yellow
12	Header joint HJ2/6 - Negative (-)	Black
13	Switch S4/3 - Direction indicator switch (29)	Green/white
14	Relay R2/2 - Direction indicator flasher unit (54)	Light purple/green
15	Connector C12/17 - Four wheel drive switch	Light green
16	Switch S4/6 - Direction indicator switch (29)	Green/red

FOOTSTEP TRACTOR WIRING DIAGRAMS**C14 Fuel level and water temperature gauge connector**

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C11/12 - Water temperature	Green/blue
2	Header joint HJ2/18 - Negative (-)	Black
3	Header joint HJ3/20 - Positive (+)	Green/yellow
4	Not used	

C15 Ignition switch connector (Fig. 13)

Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse B1, 2, 3, 4 - Power supply positive (+)	White
3	Fuse B1, 2, 3, 4 - Power supply positive (+)	White
4	Safety start switches (18 & 44)	White/red

C16 Non-ignition switched auxiliary supply - Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/1 - Positive (+) - switch light	Red/yellow
3	Fuse C3 - Positive (+)	Purple

C17 Ignition switched auxiliary supply - Black

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/7 - Positive (+)	Red/yellow
2	Fuse C7 - Positive (+) - switch light	Red/yellow
3	Fuse B1 - Positive (+)	White/green

HJ1 Header joint 1 – Yellow



Terminal	Destination	Colour Code
1	Connector C12/5 - 7 pin trailer socket (L - Left-hand direction indicator)	Green/red
2	Switch S4/6 - Direction indicator switch (29)	Green/red
3	Connector C12/4 - Rear flashing indicator light - left-hand	Green/red
4	Connector C12/3 - Front flashing indicator light - left-hand	Green/red
5	Connector C12/18 - Rear flashing light - right-hand	Green/red
6	Switch S4/3 - Direction indicator switch (29)	Green/white
7	Connector C12/20 - 7 pin trailer socket (R - Right-hand direction indicator)	Green/white
8	Connector C12/19 - Front flashing light - right-hand	Green/white
9	Connector C12/14 - Rear red light	Red/white
10	Fuse C6 - Right-hand side lights including trailer	Red/white
11	Connector C12/11 - 7 pin trailer socket (58L - Left-hand rear light)	Red/white
12	Not used	
13	Not used	
14	Connector C12/7 - Rear red light	Red/black
15	Fuse C5 - Left-hand side lights including trailer socket	Red/black
16	Connector C12/6 - 7 pin trailer socket (58R - Right-hand rear light)	Red/black
17	Not used	
18	Not used	
19	Not used	
20	Not used	

HJ2 Header joint 2 – Grey



Terminal	Destination	Colour Code
1	Switch S3/B - Hazard warning switch (28)	Black
2	Connector C11/14 - Tachometer	Black
3	Tachometer illumination light (22)	Black
4	Tachometer illumination light (22)	Black
5	Connection C2 - Earth to engine cylinder block	Black
6	Connector C13/12 - Negative (-) - Warning lights	Black
7	Water temperature gauge illumination light (21)	Black
8	Fuel gauge illumination light (20)	Black
9	Connector C13/5 - Four wheel drive light	Brown/yellow
10	Work light resistor (24)	Brown/yellow
11	Charge circuit diode (23)	Brown/yellow
12	Not used	
13	Switch S2/B - Work light switch (27) - Negative (-) switch light	Black
14	Switch S1/B - Light switch (26) - Negative (-) switch light	Black
15	Relay R1/6 - Work light relay (57) - Negative (-)	Black
16	Connector C2 - Earth to engine cylinder block	Black
17	Not used	
18	Connector C14/2 - Water temperature and fuel gauge	Black
19	Relay R2/4 Direction indicator flasher unit (54)	Black
20	Not used	

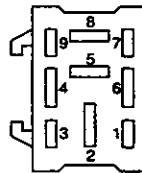
FOOTSTEP TRACTOR WIRING DIAGRAMS

HJ3 Header joint 3 – Grey



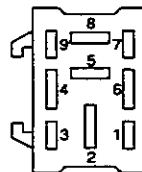
Terminal	Destination	Colour Code
1	Connector C16/2 - Auxiliary non-switched - switch light	Red/yellow
2	Tachometer illumination light (22)	Red/yellow
3	Switch S3/8 - Hazard warning switch (28)	Red/yellow
4	Switch S1/A - Lighting switch (26) - switch light	Red/yellow
5	Switch S3/7 - Hazard warning light switch (28) - switch light	Red/yellow
6	Switch S2/A - Work light switch (27) - switch light	Red/yellow
7	Connector C17/2 - switch light	Red/yellow
8	HJ3/9 - Interconnecting wire	Red/yellow
9	HJ3/8 - Interconnecting wire	Red/yellow
10	Water temperature gauge illumination light (21)	Red/yellow
11	Fuel level gauge illumination light (20)	Red/yellow
12	Tachometer illumination light (22)	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Connector C13/8 - Positive (+) - Warning lights	Green/yellow
17	Fuse B4 - Warning and instrument lights	Green/yellow
18	Work light resistor (24)	Green/yellow
19	Connector C11/10 - Tachometer	Green/yellow
20	Connector C14/3 - Fuel level and water temperature gauge	Green/yellow

R1 Work light relay



Terminal	Destination	Colour Code
1	Not used	
2	Fuse C4 - Rear work light	Purple/red
4	Switch S3/6 - Hazard warning switch (28)	Red/orange
5	Fuse A4 - Front work light	Blue/purple
6	Header joint HJ2/15 - Negative (-)	Black
7	Not used	
8	Fuse A3 - Rear work light	Blue/purple
9	Not used	

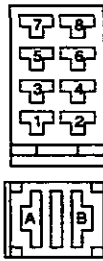
R2 Direction indicator flasher unit – Blue



Terminal	Destination	Colour Code
1	Not used	
2	Connector C13/14 - Direction indicator light	Light green/purple
3	Not used	
4	Header joint HJ2/19 - Negative (-)	Black
5	Not used	
6	Switch S4/1 - Direction indicator switch (29)	Light green/pink
6	Switch S3/2 - Hazard warning switch (28)	Light green/pink
7	Not used	
8	Switch S4/2 - Direction indicator switch (29)	Light green/brown
8	Switch S3/2 - Hazard warning switch (28)	Light green/brown

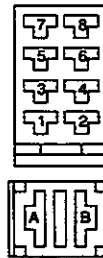
FOOTSTEP TRACTOR WIRING DIAGRAMS

S1 Lighting switch



Terminal	Destination	Colour Code
1	Fuse B8/B9 - Head lights main beam	Blue/white
2	Fusible link (16)	Brown
3	Loop to terminal 6	Red
4	Not used	
5	Not used	
6	Fuse C5 - Side lights	Red
6	Loop to terminal 3	Red
7	Fuse B6 /B7 - Head lights dipped beam	Blue/red
8	Not used	
Switch lights		
A	Header junction HJ3/4 - Light positive (+)	Red/yellow
B	Header junction HJ2/14 - Negative	Black

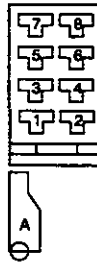
S2 Work light switch



Terminal	Destination	Colour Code
1	Fuse A3 - Rear work light	Red/pink
2	Fuse A4 - Front work light	Blue/yellow
3	Connector C12/16 - Work light	Blue/pink
4	Not used	
5	Not used	
6	Connector C12/1 - Work light	Blue/green
7	Not used	
8	Connector C12/13 - Work light	Blue green
Switch lights		
A	Header junction HJ3/6 - Light positive (+)	Red/yellow
B	Header junction HJ2/13 - Negative	Black

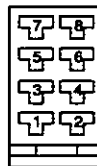
FOOTSTEP TRACTOR WIRING DIAGRAMS

19S3 Hazard warning switch



Terminal	Destination	Colour Code
1	Not used	
2	Relay R2/6 - Direction indicator flasher unit (54)	Light green/pink
3	Not used	
4	Fuse C2 - Hazard warning	Pink/green
5	Relay R2/8 - Direction indicator flasher unit (54)	Light green/brown
6	Relay R1/4 - Work light relay (57)	Red/orange
7	Header junction HJ3/5	Red/yellow
8	Header junction HJ3/3	Red/yellow
Switch lights		
A	Header junction HJ2/1 - Light negative (-)	Black

S4 Direction indicator switch



Terminal	Destination	Colour Code
1	Relay R2/6 - Direction indicator flasher unit (54)	Light green/pink
1	Loop to terminal 8	Light green/pink
2	Loop to terminal 7	Light green/brown
2	Relay R2/8 - Direction indicator flasher unit (54)	Light green/brown
3	Header joint HJ1/6	Green/white
3	Connector C13/13	Green/white
4	Not used	
5	Not used	
6	Connector C13/16	Green/red
6	Header joint HJ1/2	Green/red
7	Loop to terminal 2	Light green/brown
8	Loop to terminal 1	Light green/pink

**CONSOLE HARNESS
WORLD WIDE**

Console harness (Fig. 4)

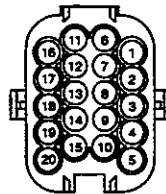
C10 Four wheel drive differential lock solenoid



Terminal	Destination	Colour Code
1	Fuse A2 - Differential lock	Green/red
2	Connector C12/15 - Differential lock switch	Yellow

C11 Front harness connector – Red

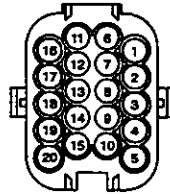
Connects to connector C5



Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light - Dip beam	Blue/pink
2	Charge circuit diode (23) - Header joint H2/11	Brown/yellow
3	Fuse B9 - Right-hand head light - Main beam	Blue/black
4	Fuse B8 - Left-hand head light - Main beam	Blue/grey
5	Not used	
6	Connector C13/4 - Hydraulic pressure warning light	Yellow
7	Connector C13/2 - Hydraulic oil filter warning light	White/brown
8	Connector C14/4 - Fuel tank gauge	Green/black
9	Horn push (32)	Purple/yellow
10	Header joint HJ3/19- Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C14/1 - Water temperature gauge	Green/blue
13	Connector C13/9 - Air cleaner warning light	Blue/green
14	Header joint HJ2/2 - Tachometer negative (-)	Black
15	Connector C13/3 - Engine oil pressure warning light	White/brown
16	Not used	
17	Connector C13/10 - Low fuel warning light	Green/orange
18	Not used	
19	Fuse B7 - Right-hand head light - Dip beam	Blue/orange
20	Fuse A1 - Hydraulic oil filter	Orange/red

FOOTSTEP TRACTOR WIRING DIAGRAMS**C12 Rear harness connector – Black**

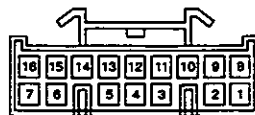
Connects to connector C18



Terminal	Destination	Colour Code
1	Header joint HJ1/20 - 7 pin trailer socket	Green/purple
2	Connector C13/6 - Parking brake warning light	Black/white
3	Header joint HJ1/4 - Left-hand front direction indicator light	Green/red
4	Header joint HJ1/3 - Left-hand rear direction indicator light	Green/red
5	Header joint HJ1/1 - 7 pin trailer socket	Green/red
6	Header joint HJ1/16 - 7 pin trailer socket	Red/black
7	Header joint HJ1/14 - Left-hand rear light	Red/black
8	Not used	
9	Header joint HJ1/13 - Left-hand side light	Red/black
10	Header joint HJ1/17 - Right-hand stop light	Green/purple
11	Header joint HJ1/11 - 7 pin trailer socket	Red/white
12	Header joint HJ1/12 - Right-hand side light	Red/white
13	Header joint HJ1/18 - Left-hand stop light	Green/purple
14	Header joint HJ1/9 - Right-hand rear light	Red/white
15	Connector C10/2 - Four wheel drive differential lock solenoid	Yellow
15	Connector C13/11 - Differential lock warning light	Yellow
16	Switch S7/1 - Work light switch (27)	Blue/pink
17	Connector C13/15 - Four wheel drive warning light	Light green
18	Header joint HJ1/5 - Right-hand rear direction indicator light	Green/white
19	Header joint HJ1/8 - Right-hand front direction indicator light	Green/white
20	Header joint HJ1/7 - 7 pin trailer socket	Green/white

C13 Instrument panel warning lights connector

See also page 14A-42



Terminal	Destination	Colour Code
1	Not used	
2	Connector C11/7 - Hydraulic oil filter switch	Black/purple
3	Connector C11/15 - Engine oil pressure switch	White/brown
4	Connector C11/6 - Low hydraulic oil pressure switch	Yellow
5	Header joint HJ2/9 - Alternator charge	Brown/yellow
6	Connector C12/2 - Parking brake switch	Black/white
7	Fuse B9 - Right-hand head light - Main beam	Blue/black
8	Header joint HJ3/16 - Positive (+)	Green/yellow
9	Connector C11/13 - Air cleaner switch	Blue/green
10	Connector C11/17 - Low fuel - tank sender unit	Green/orange
11	Connector C11/15 - Differential lock switch	Yellow
12	Header joint HJ2/6 - Negative (-)	Black
13	Switch S4/7 - Direction indicator switch (29)	Green/white
14	Relay R2/2 - Direction indicator flasher unit (54)	Light purple/green
15	Connector C12/17 - Four wheel drive switch	Light green
16	Relay R2/1 - Direction indicator flasher unit (54)	Green/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

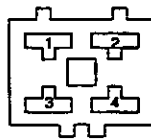
C14 Fuel level and water temperature gauge connector

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C11/12 - Water temperature	Green/blue
2	Header joint HJ2/18 - Negative (-)	Black
3	Header joint HJ3/20 - Positive (+)	Green/yellow
4	Not used	

C15 Ignition switch connector



Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse A2 - Auxiliary power supply	White
3	Fuse B1 - Auxiliary power supply	White
4	Safety start switches (18 & 44)	White/red

C16 Non-ignition switched auxiliary supply – Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/1 - Positive (+) - switch light	Red/yellow
3	Fuse C3 - Positive (+)	Purple

C17 Ignition switched auxiliary supply – Black

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/7 - Positive (+)	Red/yellow
	Fuse C7 - Positive (+) - switch light	Red/yellow
3	Fuse B1 - Positive (+)	White/green

FOOTSTEP TRACTOR WIRING DIAGRAMS

HJ1 Header joint 1 – Yellow



Terminal	Destination	Colour Code
1	Connector C12/5 - 7 pin trailer socket (L - Left-hand direction indicator)	Green/red
2	Switch S3/3 - Hazard warning switch (28)	Green/red
3	Connector C12/4 - Left-hand rear direction indicator light	Green/red
4	Connector C12/3 - Left-hand front direction indicator light	Green/red
5	Connector C12/18 - Right-hand rear direction indicator	Green/red
6	Switch S3/1 - Hazard warning switch (28)	Green/white
7	Connector C12/20 - 7 pin trailer socket (R - Right-hand direction indicator)	Green/white
8	Connector C12/19 - Right-hand front direction indicator	Green/white
9	Connector C12/14 - Right-hand rear light	Red/white
10	Fuse C6 - Right-hand side lights including trailer	Red/white
11	Connector C12/11 - 7 pin trailer socket (58L - Left-hand rear light)	Red/white
12	Connector C12/12 - Right-hand side light	Red/white
13	Connector C12/9 - Left-hand side light	Red/black
14	Connector C12/7 - Left-hand rear light	Red/black
15	Fuse C5 - Left-hand side lights including trailer socket	Red/yellow
16	Connector C12/6 - 7 pin trailer socket (58R - Right-hand rear light)	Red/black
17	Connector C12/10 - Right-hand stop light	Green/purple
18	Connector C12/13 - Left-hand stop light	Green/purple
19	Stop light switch (31)	Green/purple
20	Connector C12/1 - 7 pin trailer socket (L - Left-hand direction indicator)	Green/purple

HJ2 Header joint 2 – Grey



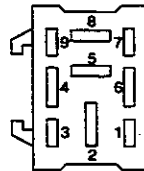
Terminal	Destination	Colour Code
1	Switch S3/8 - Hazard warning switch (28)	Black
2	Connector C11/14 - Tachometer	Black
3	Tachometer illumination light (22)	Black
4	Tachometer illumination light (22)	Black
5	Connection C2 - Earth to engine cylinder block	Black
6	Connector C13/12 - Negative (-) - Warning lights	Black
7	Water temperature gauge illumination light (21)	Black
8	Fuel gauge illumination light (20)	Black
9	Connector C13/5 - Four wheel drive light	Brown/yellow
10	Work light resistor (24)	Brown/yellow
11	Charge circuit diode (23)	Brown/yellow
12	Not used	
13	Switch S7/B - Work light switch (27) - Negative (-) switch light	Black
14	Switch S6/B - Side and head light switch (26) - Negative (-) switch light	Black
15	Switch S5/B - Head light dip switch (30) - Negative (-) switch light	Black
16	Connector C2 - Earth to engine cylinder block	Black
17	Not used	
18	Connector C14/2 - Water temperature and fuel gauge	Black
19	Relay R2/4 - Direction indicator flasher unit (54)	Black
20	Not used	

HJ3 Header joint 3 – Grey



Terminal	Destination	Colour Code
1	Connector C16/2 - Auxiliary non-switched - switch light	Red/yellow
2	Tachometer illumination light	Red/yellow
3	Switch S5/A - Head light dip switch (30) - switch light	Red/yellow
4	Switch S6/A - Side and head lighting switch (26) - switch light	Red/yellow
5	Switch S3/7 - Hazard warning light switch (28) - switch light	Red/yellow
6	Switch S7/A - Work light switch (27) - switch light	Red/yellow
7	Connector C17/2 - switch light	Red/yellow
8	HJ3/9 - Interconnecting wire	Red/yellow
9	HJ3/8 - Interconnecting wire	Red/yellow
10	Water temperature gauge illumination light	Red/yellow
11	Fuel level gauge illumination light	Red/yellow
12	Tachometer illumination light	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Connector C13/8 - Positive (+) - Warning lights	Green/yellow
17	Fuse B4 - Warning and instrument lights	Green/yellow
18	Work light resistor (24)	Green/yellow
19	Connector C11/10 - Tachometer	Green/yellow
20	Connector C14/3 - Fuel level and water temperature gauge	Green/yellow

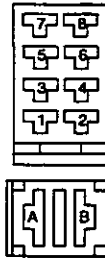
R1 Direction indicator flasher unit – Blue



Terminal	Destination	Colour Code
1	Not used	
2	Connector C13/14 - Direction indicator light	Light green/purple
3	Not used	
4	Header joint HJ2/19 - Negative (-)	Black
5	Not used	
6	Switch S3/6 - Hazard warning switch (28)	Light green/pink
7	Not used	
8	Switch S3/5 - Hazard warning switch (28)	Light green/brown

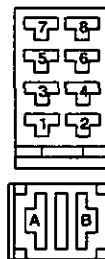
FOOTSTEP TRACTOR WIRING DIAGRAMS

S5 Head light dip switch



Terminal	Destination	Colour Code
1	Fuse B8/B9 - Headlights main beam	Blue/white
2	Not used	
3	Not used	
4	Not used	
5	Switch S6/3 - Side/head light switch (26)	Blue
6	Not used	
7	Fuse B6/B7 - Head lights dipped beam	Blue/red
8	Not used	
Switch light		
A	Header joint HJ3/3 - Switched positive (+)	Red/yellow
B	Header joint HJ2/15 - Negative (-)	Black

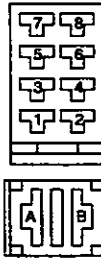
S6 Side/head light switch



Terminal	Destination	Colour Code
1	Not used	
2	Fuse C3 - Auxiliary power	Red
3	Switch S5/5 - Headlight dip switch (30)	Blue
4	Not used	
5	Not used	
6	Fusible link (16)	Brown
7	Not used	
8	Not used	
Switch light		
A	Header joint HJ3/4 - Switched positive (+)	Red/yellow
B	Header joint HJ2/14 - Negative (-)	Black

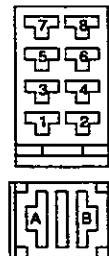
FOOTSTEP TRACTOR WIRING DIAGRAMS

S7 Work light switch



Terminal	Destination	Colour Code
1	Connector C12/16 - Rear work light	Blue/pink
2	Not used	
3	Not used	
4	Not used	
5	Fuse C4 -Rear work light	Red/pink
6	Not used	
7	Not used	
8	Not used	
Switch light		
A	Header joint HJ3/6 - Switched positive (+)	Red/yellow
B	Header joint HJ2/13 - Negative (-)	Black

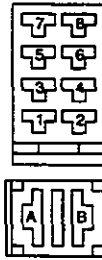
S8 Hazard warning switch



Terminal	Destination	Colour Code
1	Switch S4/7 - Direction indicator switch (29)	Green/white
1	Header joint HJ1/6	Green/white
2	Fuse C2 - Hazard warning and trailer warning	Purple/green
3	Header joint HJ1/2	Green/red
3	Switch S4/1 - Direction indicator switch (29)	Green/red
4	Not used	
5	Relay R2/8 - Flashing indicator unit (54)	Light green/brown
5	Switch S4/5 - Flashing indicator switch (29)	Light green/brown
6	Relay R2/6 - Flashing indicator unit (54)	Light green/pink
7	Header joint HJ3/5	Red/yellow
8	Fuse B5 - Direction indicators and trailer indicators	Green/pink
Switch light		
A	Header joint HJ2/1 - Light negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

S9 Direction indicator switch



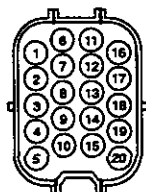
Terminal	Destination	Colour Code
1	Switch S8/3 - Hazard warning switch (28)	Green/red
1	Connector C13/16 - Panel indicator light	Green/red
2	Not used	
3	Not used	
4	Not used	
5	Switch S8/5 - Hazard warning switch (28)	Light green/brown
6	Not used	
7	Connector C13/13 - Panel indicator light	Green/white
7	Switch S8/1 - Hazard warning switch (28)	Green/white
8	Not used	

**REAR HARNESS
WORLD WIDE**

Rear harness (Fig. 5)

C18 Rear harness connector – Black

Connects to connector C12



Terminal	Destination	Colour Code
1	7 Pin trailer socket '54' (39) - Stop lights	Green/purple
2	Parking brake switch (34)	Black/white
3	Connector C24/3 - Left-hand front direction indicator light	Green/red
4	Connector C23/2 - Left-hand rear direction indicator light	Green/red
5	7 pin trailer socket 'L' (39) - Left-hand direction indicator	Green/red
6	7 pin trailer socket '58R' (39) - Right-hand rear light	Red/black
7	Connector C23/3 - Left-hand rear light	Red/black
8	Not used	
9	Connector C24/2 - Left-hand side light	Red/black
10	Connector C20/1 - Right-hand stop light	Green/purple
11	7 pin trailer socket '58L' (39) - Left-hand rear light	Red/white
12	Connector C19/2 - Right-hand side light	Red/white
13	Connector C23/1 - Left-hand stop light	Green/purple
14	Connector C20/3 - Right-hand rear light	Red/white
15	Differential lock switch (35)	Yellow
16	Connector C25/2 - Rear work light (40)	Blue/pink
17	Four wheel drive switch (33)	Light green
18	Connector C20/2 - Right-hand rear direction indicator light	Green/white
19	Connector C19/3 - Right-hand front direction indicator light	Green/white
20	7 pin trailer socket 'R' (39) - Right-hand rear direction indicator	Green/white

C19 Right-hand front light connector



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/12 - Side light	Red/white
3	Connector C18/19 - Direction indicator light	Green/white

C20 Right-hand rear light connector



Terminal	Destination	Colour Code
1	Connector C18/10 - Stop light	Green/purple
2	Connector C18/18 - Direction indicator	Green/white
3	Connector C18/14 - Rear light	Red/white
4	Connector C21 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS**C21 Earth – Chassis connections****C22 Number plate connector**

Terminal	Destination	Colour Code
1	Connector C21 - Negative	Black
2	Trailer socket 58R (39)	Red/black

C23 Left-hand rear light connector

Terminal	Destination	Colour Code
1	Connector C18/13 - Stop light	Green/purple
2	Connector C18/4 - Direction indicator	Green/red
3	Connector C18/7 - Rear light	Red/black
4	Connector C21 - Negative (-)	Black

C24 Left-hand front light connector

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/9 - Side light	Red/black
3	Connector C18/3 - Direction indicator light	Green/red

C25 Rear work light connector

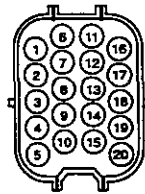
Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/16 - Rear work light	Blue/pink

**REAR HARNESS
NORTH AMERICA ONLY**

Flat top fenders (Fig. 6)

C18 Rear harness connector – Black

Connects to connector C12



Terminal	Destination	Colour Code
1	Connector C26/2 - Front work light (43) - Right-hand	Blue/green
2	Parking brake switch (34)	Black/white
3	Connector C31/3 - Front flashing indicator (42) - Left-hand	Green/red
4	Connector C30/2 - Rear flashing indicator (41) - Left-hand	Green/red
5	7 pin trailer socket 'L' (39) - Left-hand direction indicator	Green/red
6	7 pin trailer socket '58R' (39) - Right-hand rear light	Red/black
7	Connector C30/3 - Rear red light (41) - Left-hand	Red/black
8	Not used	
9	Not used	
10	Not used	
11	7 pin trailer socket '58L' (39) - Left-hand rear light	Red/white
12	Not used	
13	Connector C32/2 - Front work light (43) - Left-hand	Blue/green
14	Connector C28/3 - Rear red light (38) - Right-hand	Red/white
15	Differential lock switch (35)	Yellow
16	Connector C29/2 - Rear work light (40)	Blue/pink
17	Four wheel drive switch (33)	Light green
18	Connector C28/2 - Rear flashing indicator (38) - Right-hand	Green/white
19	Connector C27/3 - Front flashing indicator (37) - Right-hand	Green/white
20	7 pin trailer socket 'R' (39) - Right-hand rear direction indicator	Green/white

C19 Earth – Chassis connections



C26 Front right-hand work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/1 - Front work light	Blue/green

C27 Front right-hand indicator light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Not used	
3	Connector C18/19 - Front indicator light	Green/white

FOOTSTEP TRACTOR WIRING DIAGRAMS

C28 Rear right-hand indicator light



Terminal	Destination	Colour Code
1	Not used	
2	Connector C18/18 - Rear flashing indicator light	Green/white
3	Connector C18/14 - Rear red light	Red/white

C29 Rear work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/16 - Rear work light	Blue/pink

C30 Rear left-hand indicator light



Terminal	Destination	Colour Code
1	Not used	
2	Connector C18/4 - Rear flashing indicator light	Green/red
3	Connector C18/7 - Rear red light	Red/black
4	Connector C21 - Negative (-)	Black

C31 Front left-hand work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Not used	
3	Connector C18/3 - Front work light	Green/red

C32 Front left-hand work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/13 - Front work light	Blue/green

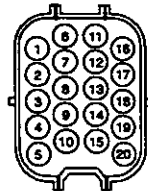
FOOTSTEP TRACTOR WIRING DIAGRAMS

**REAR HARNESS
NORTH AMERICA**

Shell type fenders (Fig. 7)

C18 Rear harness connector – Black

Connects to connector C12



Terminal	Destination	Colour Code
1	Not used	
2	Parking brake switch (34)	Black/white
3	Connector C36/3 - Front flashing indicator (42) - Left-hand	Green/red
4	Not used	
5	7 pin trailer socket 'L' (39) - Left-hand direction indicator	Green/red
6	7 pin trailer socket '58R' (39) - Right-hand rear light	Red/black
7	Connector C35/2 - Rear red light (41) - Left-hand	Red/black
8	Not used	
9	Not used	
10	Not used	
11	7 pin trailer socket '58L' (39) - Left-hand rear light	Red/white
12	Not used	
13	Not used	
14	Not used	
15	Differential lock switch (35)	Yellow
16	Connector C34/2 - Rear work light (40)	Blue/pink
17	Four wheel drive switch (33)	Light green
18	Not used	
19	Front flashing indicator (37) - Right-hand	Green/white
20	7 pin trailer socket 'R' (39) - Right-hand rear direction indicator	Green/white

C21 Earth – Chassis connections



C33 Right-hand rear flashing indicator light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Not used	
3	Connector C18/19 - Rear flashing indicator	Green/white

C34 Rear work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/16 - Rear work light	Blue/pink

C35 Red rear light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/7 - Rear light	Red/black

FOOTSTEP TRACTOR WIRING DIAGRAMS

C33 Left-hand rear flashing indicator light















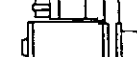












































Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Not used	
3	Connector C18/3 - Rear flashing indicator	Green/red

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FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

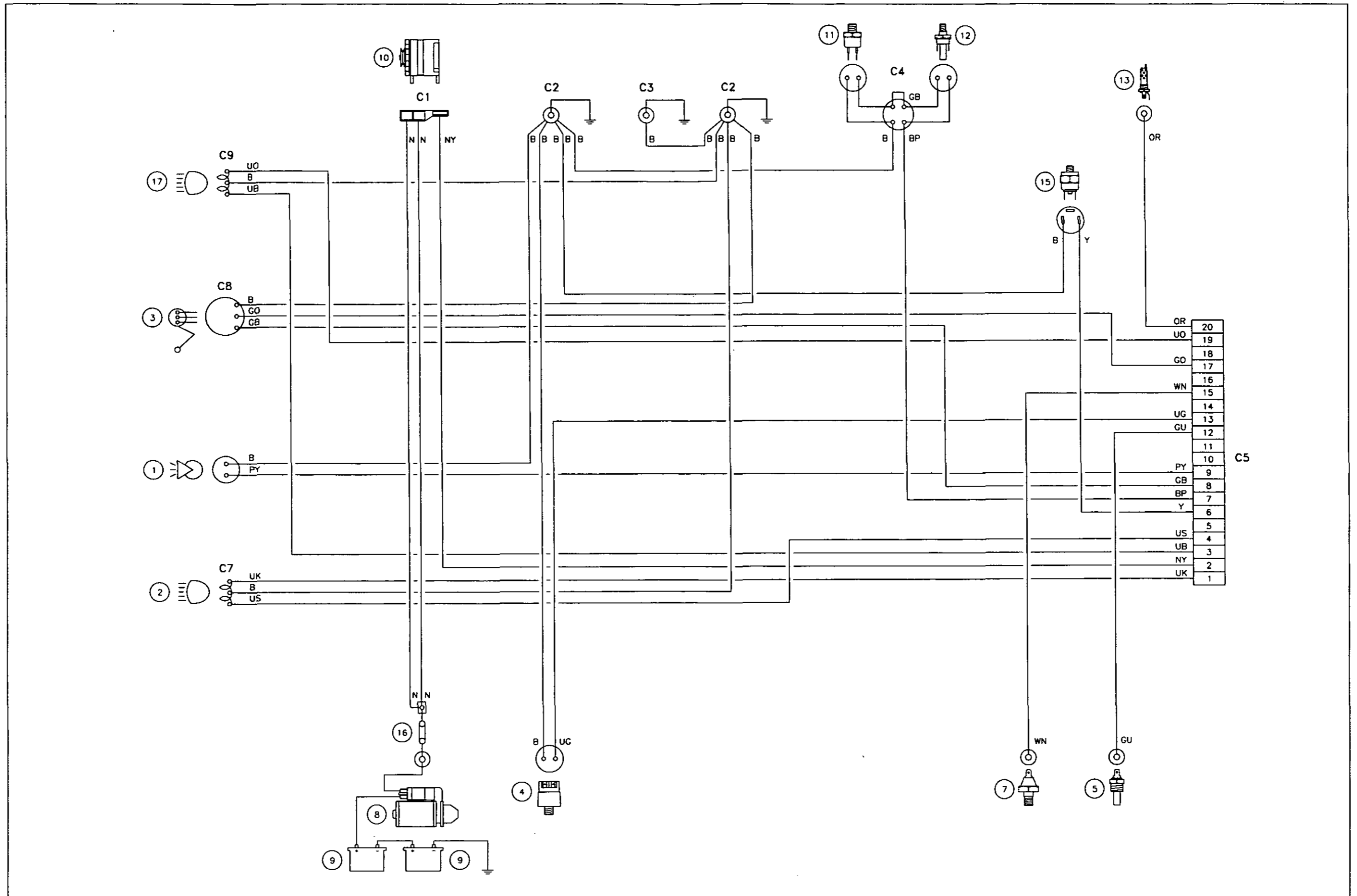














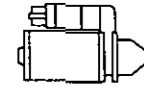



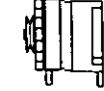














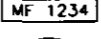


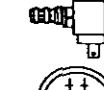










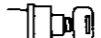
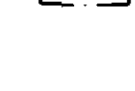











Figure 1. Engine harness - Four cylinder engines
World wide and North America

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT			
18		GEARBOX SAFETY START SWITCH	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	48		FUEL AND WATER TEMPERATURE GAUGE
20		FUEL GAUGE ILLUMINATION	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
24		WORK LIGHT RESISTOR (PART OF HARNESS)	53		STARTER SWITCH
25		FUSE BOX	54		FLASHING INDICATOR UNIT
26		LIGHTING SWITCH	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
27		WORK LIGHT SWITCH	56		AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
28		HAZARD WARNING SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

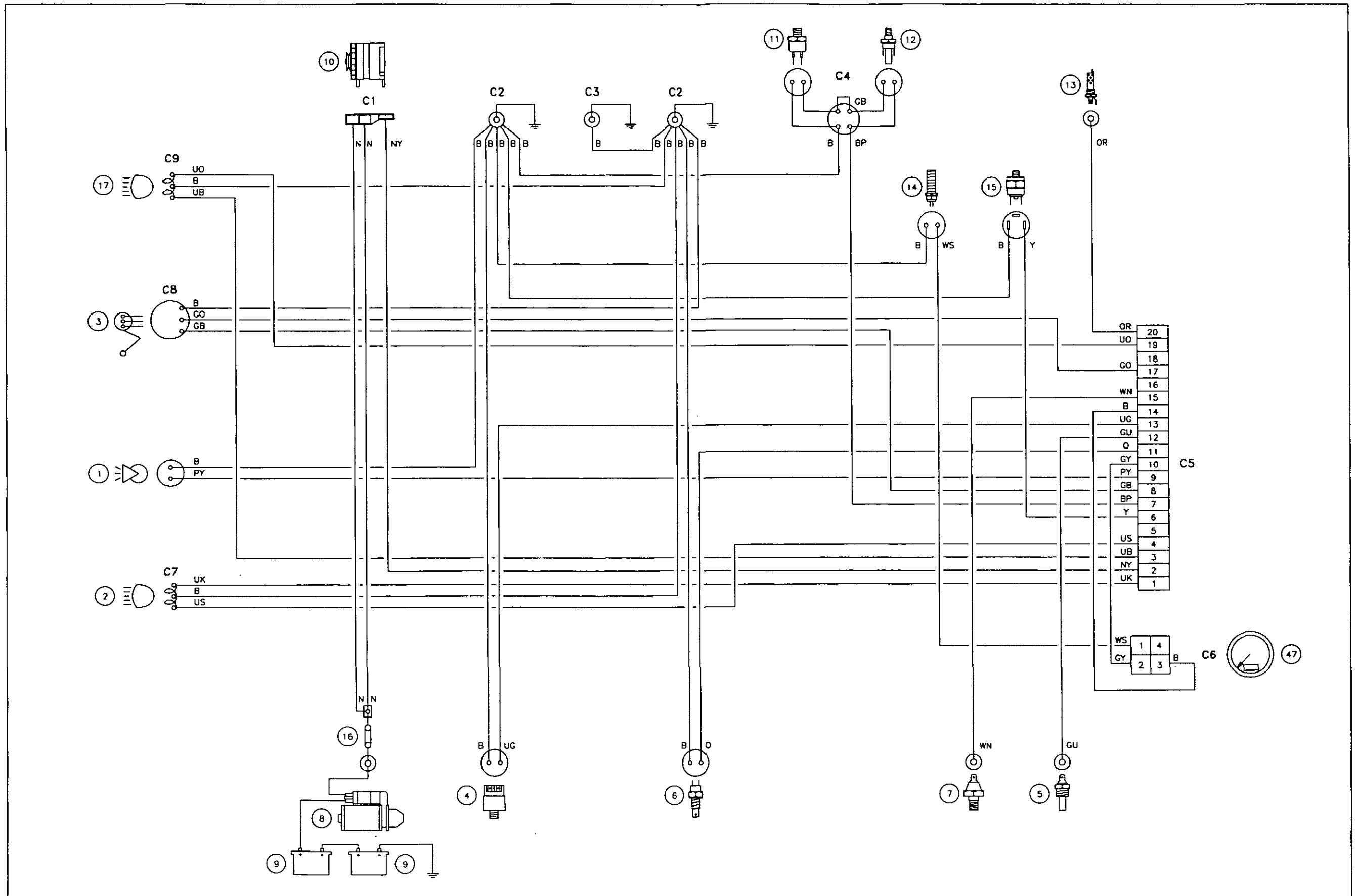














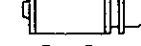













































Figure 2. Engine harness - Six cylinder engines
World wide and North America

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT			
18		GEARBOX SAFETY START SWITCH	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	48		FUEL AND WATER TEMPERATURE GAUGE
20		FUEL GAUGE ILLUMINATION	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
24		WORK LIGHT RESISTOR (PART OF HARNESS)	53		STARTER SWITCH
25		FUSE BOX	54		FLASHING INDICATOR UNIT
26		LIGHTING SWITCH	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
27		WORK LIGHT SWITCH	56		AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
28		HAZARD WARNING SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

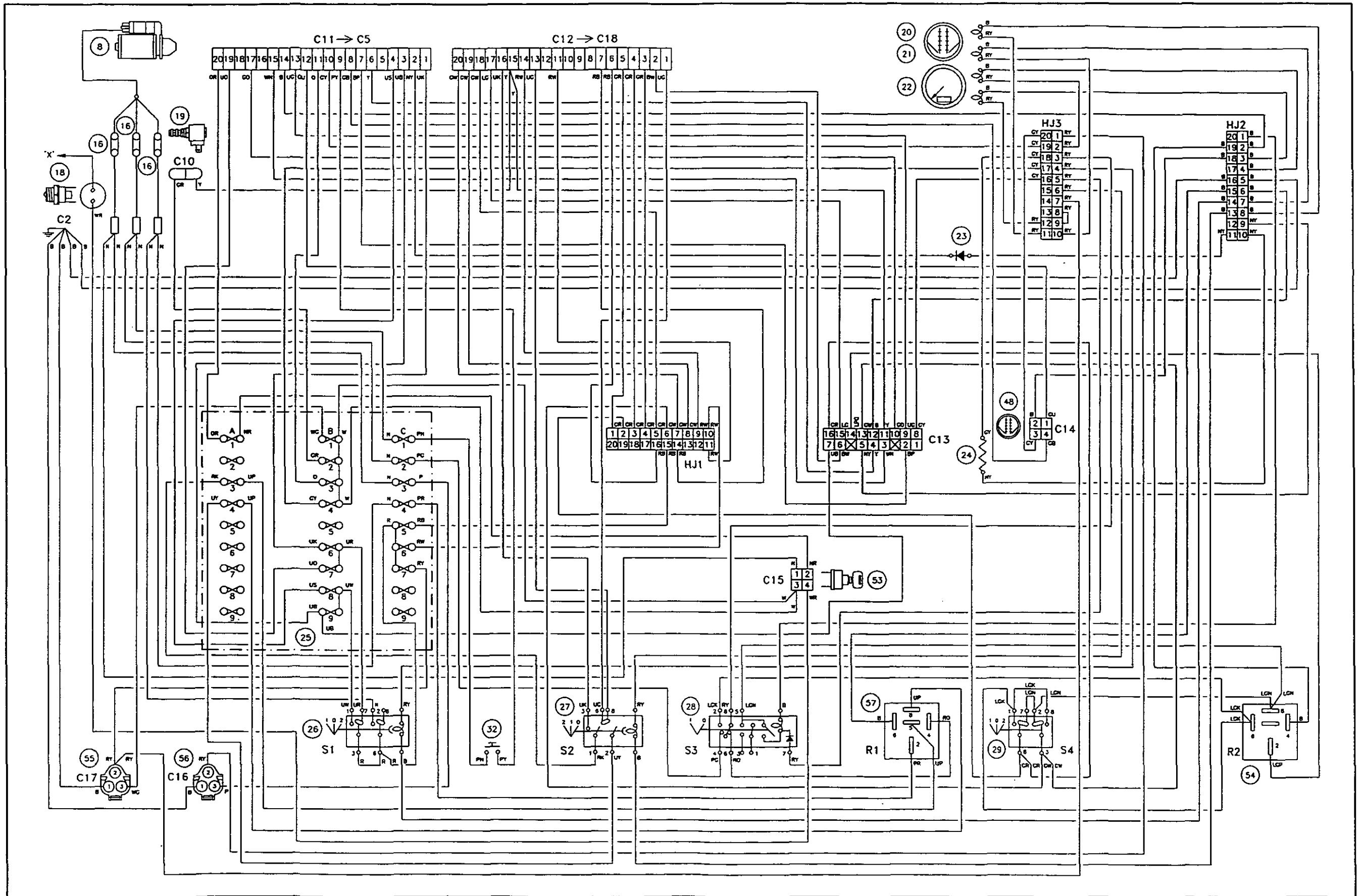














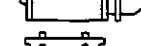





































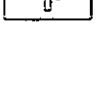


Figure 3. Console harness
North America

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- | | | | | | |
|----|---|--|----|---|--|
| 1 |  | HORN | 31 |  | STOP LIGHT SWITCH |
| 2 |  | LEFT-HAND HEAD LIGHTS | 32 |  | HORN PUSH |
| 3 |  | FUEL TANK SENDER UNIT | 33 |  | FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH |
| 4 |  | AIR FILTER SWITCH | 34 |  | PARKING BRAKE SWITCH |
| 5 |  | WATER TEMPERATURE TRANSMITTER | 35 |  | DIFFERENTIAL LOCK INDICATOR SWITCH |
| 6 |  | FUEL CUT-OFF VALVE | 36 |  | FRONT RIGHT-HAND WORK LIGHT |
| 7 |  | ENGINE OIL PRESSURE SWITCH | 37 |  | RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY) |
| 8 |  | STARTER MOTOR AND SOLENOID | 38 |  | REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY) |
| 9 |  | BATTERY(IES) | 39 |  | 7 PIN TRAILER SOCKET |
| 10 |  | ALTERNATOR | 40 |  | REAR WORK LIGHT |
| 11 |  | HYDRAULIC OIL FILTER TEMPERATURE SWITCH | 41 |  | REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY) |
| 12 |  | HYDRAULIC OIL FILTER PRESSURE SWITCH | 42 |  | LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY) |
| 13 |  | THERMOSTAT | 43 |  | FRONT LEFT-HAND WORK LIGHT |
| 14 |  | ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY) | 44 |  | PTO SAFETY START SWITCH |
| 15 |  | LOW HYDRAULIC OIL PRESSURE SWITCH | 45 |  | RED REAR LIGHT (NORTH AMERICA ONLY) |
| 16 |  | FUSIBLE LINKS | 46 |  | NUMBER PLATE LIGHT |
| 17 |  | RIGHT-HAND HEAD LIGHT | |  | |
| 18 |  | GEARBOX SAFETY START SWITCH | 47 |  | TACHOMETER (SIX CYLINDER ENGINES ONLY) |
| 19 |  | FRONT AXLE DIFFERENTIAL LOCK SOLENOID | 48 |  | FUEL AND WATER TEMPERATURE GAUGE |
| 20 |  | FUEL GAUGE ILLUMINATION | 49 |  | RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT |
| 21 |  | WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION | 50 |  | RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT |
| 22 |  | TACHOMETER ILLUMINATION | 51 |  | LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT |
| 23 |  | CHARGE CIRCUIT DIODE (PART OF HARNESS) | 52 |  | LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT |
| 24 |  | WORK LIGHT RESISTOR (PART OF HARNESS) | 53 |  | STARTER SWITCH |
| 25 |  | FUSE BOX | 54 |  | FLASHING INDICATOR UNIT |
| 26 | | LIGHTING SWITCH | 55 |  | AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK |
| 27 | | WORK LIGHT SWITCH | 56 |  | AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED |
| 28 | | HAZARD WARNING SWITCH | 57 |  | WORK LIGHT RELAY (NORTH AMERICA ONLY) |
| 29 | | DIRECTION INDICATOR SWITCH | | | |
| 30 | | HEAD LIGHT DIP SWITCH | | | |

Wiring colour code

- | | |
|----|-------------|
| B | Black |
| G | Green |
| K | Pink |
| LG | Light green |
| LU | Light blue |
| N | Brown |
| O | Orange |
| P | Purple |
| R | Red |
| S | Grey |
| U | Blue |
| W | White |
| Y | Yellow |

Trailer socket wiring

- | | |
|-----|---|
| L | Left hand rear direction indicator |
| R | Right hand rear direction indicator |
| 31 | Earth (-) |
| 54 | Right hand and left hand brake stop lights |
| 54G | Not used spare |
| 58L | Left hand rear light and number plate light |
| 58R | Right hand rear light |

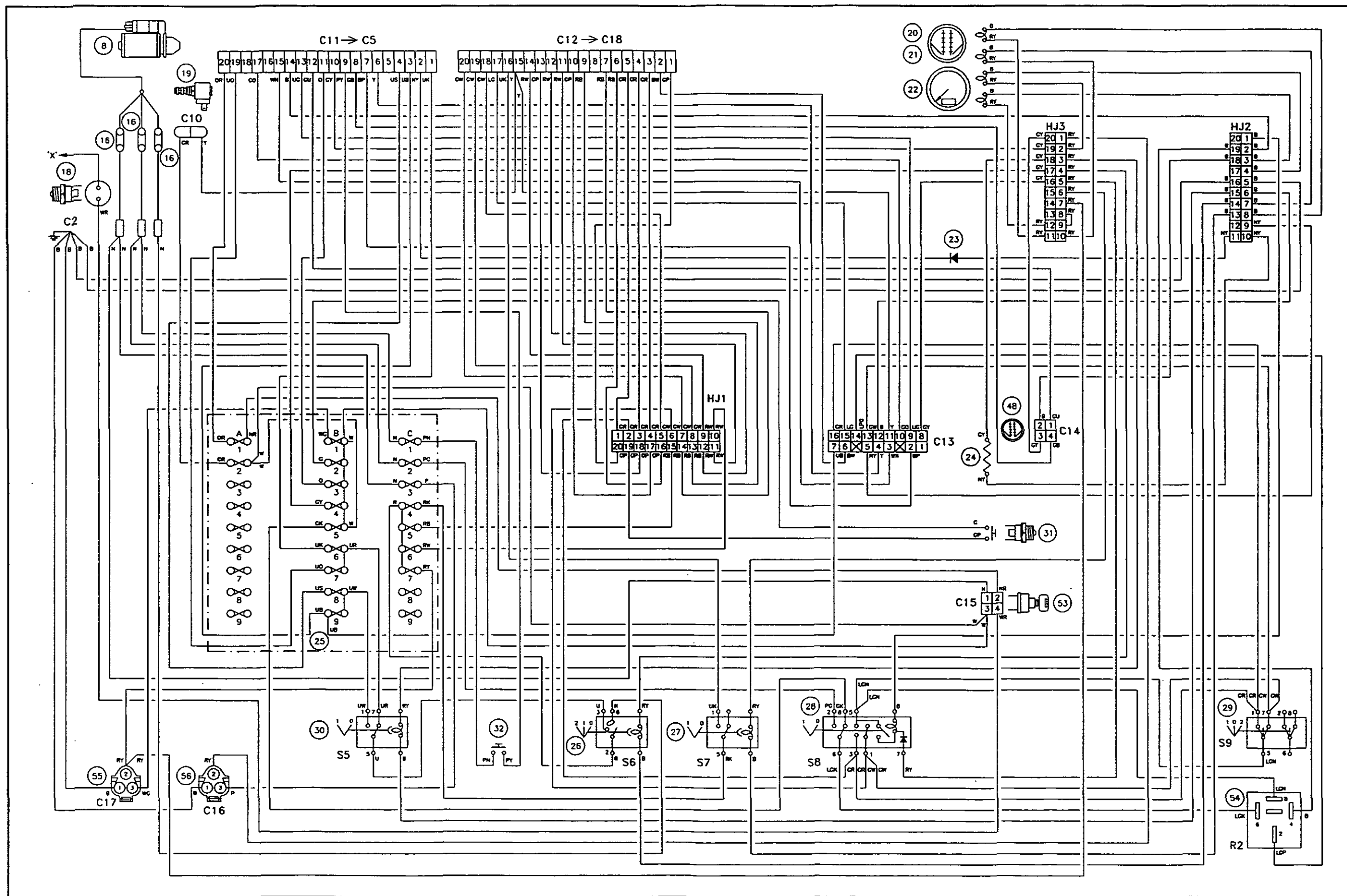















































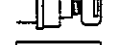

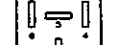









Figure 4. Console harness
World wide

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

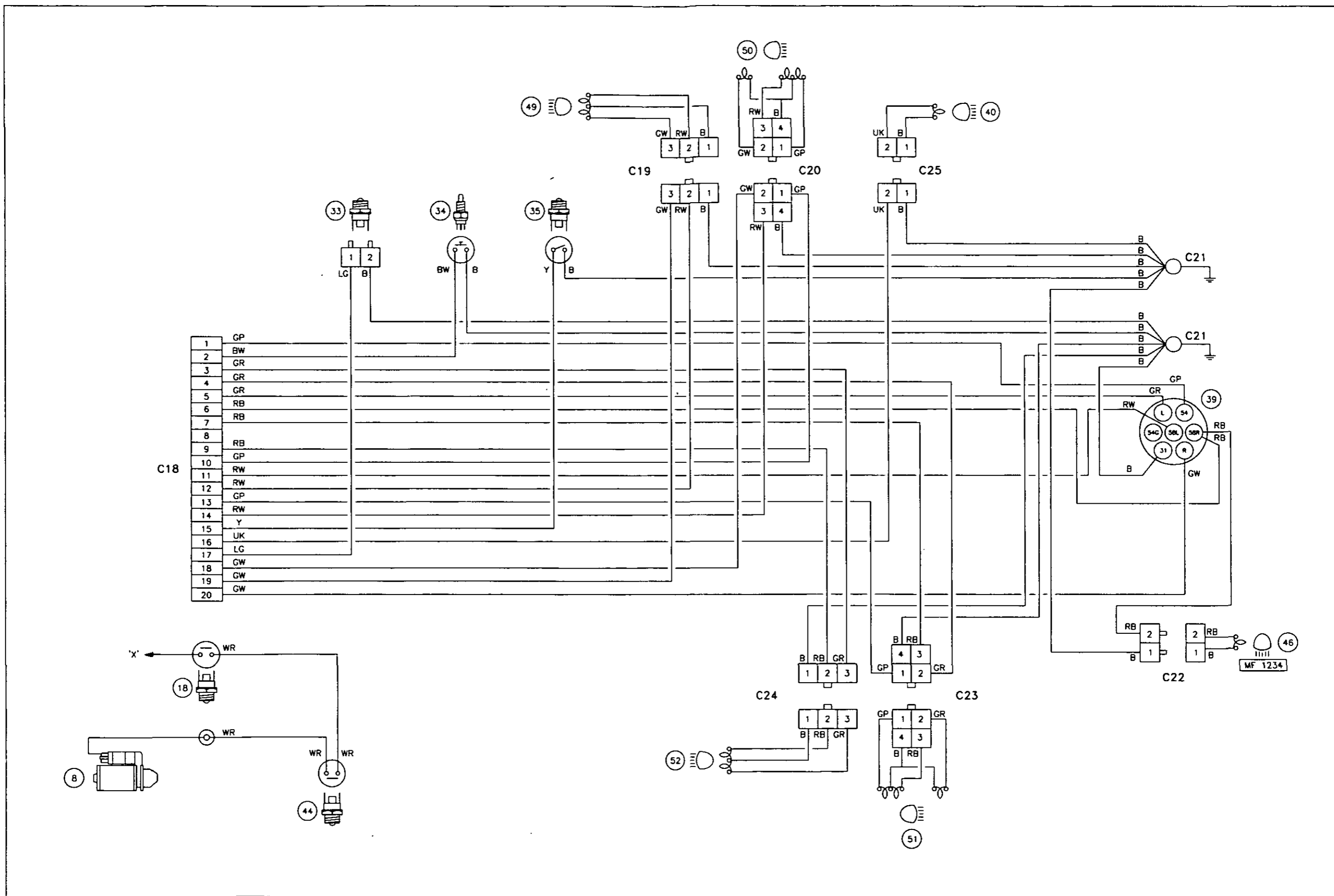




























































Figure 5. Rear harness - Flat top fenders

World wide

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT			
18		GEARBOX SAFETY START SWITCH	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	48		FUEL AND WATER TEMPERATURE GAUGE
20		FUEL GAUGE ILLUMINATION	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIDDE (PART OF HARNESS)	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
24		WORK LIGHT RESISTOR (PART OF HARNESS)	53		STARTER SWITCH
25		FUSE BOX	54		FLASHING INDICATOR UNIT
26		LIGHTING SWITCH	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
27		WORK LIGHT SWITCH	56		AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
28		HAZARD WARNING SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

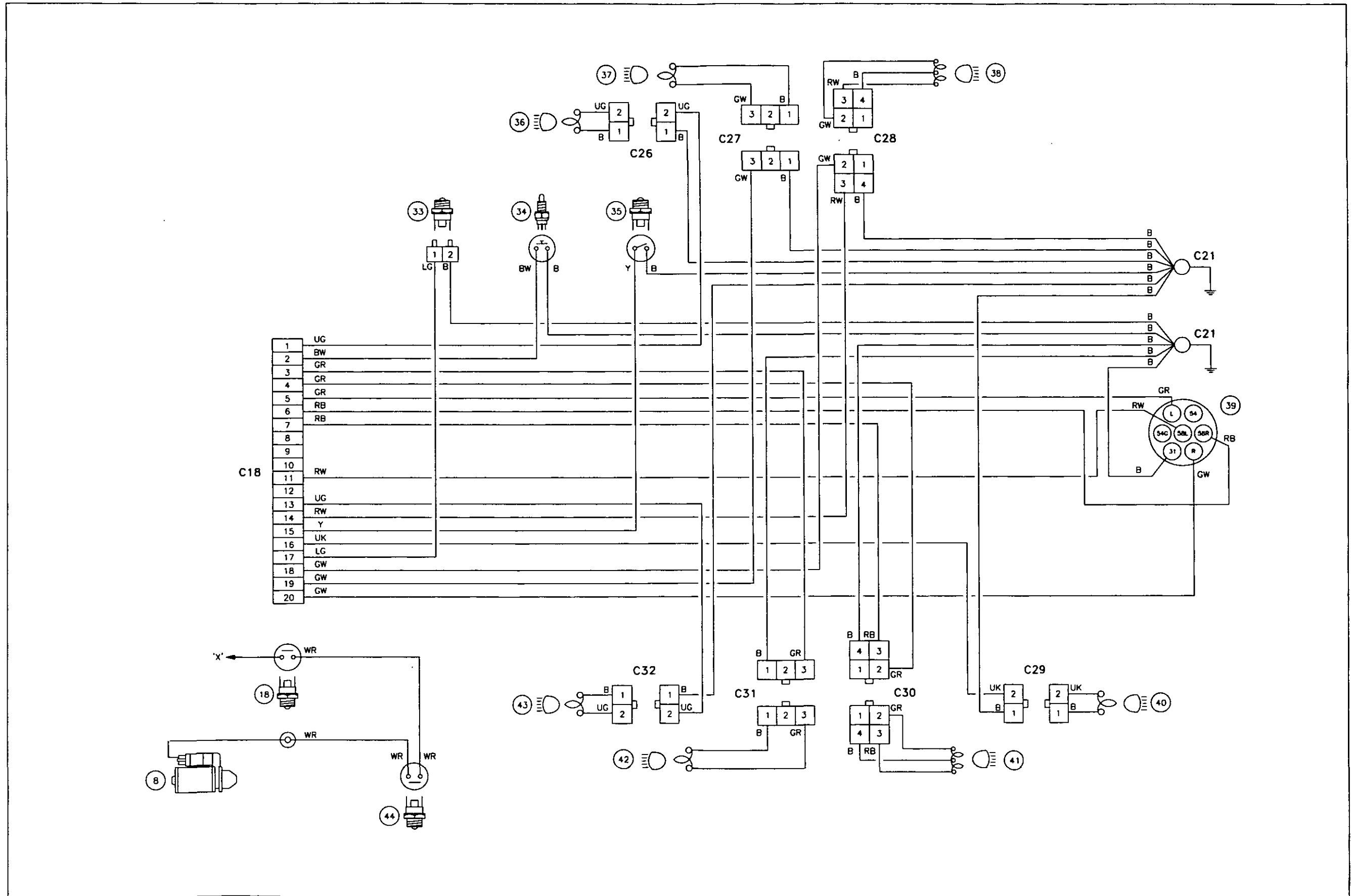














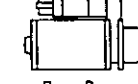



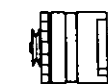








































Figure 6. Rear harness - Flat top fenders
North America

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTART	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

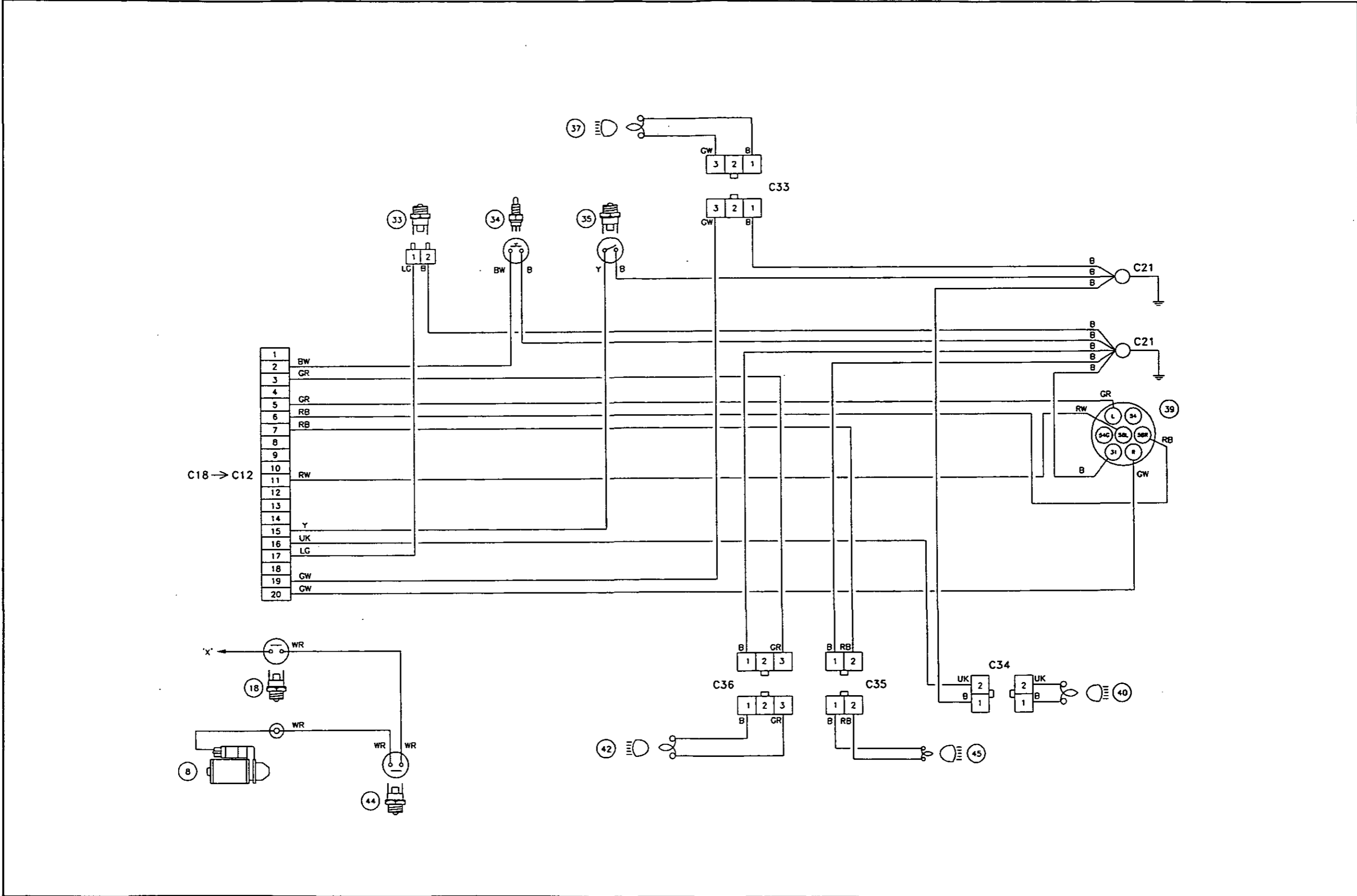


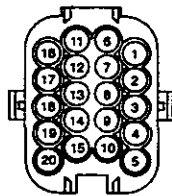
Figure 7. Rear harness-Shell type fenders
North America

FOOTSTEP TRACTOR WIRING DIAGRAMS**CONSOLE HARNESS – 12 x 12 GEARBOX
NORTH AMERICA ONLY****Console harness (Fig. 3)****C2 Earth to engine block cylinder block****C10 Four-wheel drive differential lock solenoid**

Terminal	Destination	Colour Code
1	Fuse B2 - Differential lock	Green/red
2	Connector C12/15 - Differential lock switch	Yellow

C11 Front harness connector – Red

Connects to engine harness connector C5

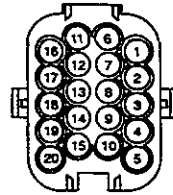


Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light - Dip beam	Blue/pink
2	Charge circuit diode (23) - Header joint H2/11	Brown/yellow
3	Fuse B9 - Right-hand head light - Main beam	Blue/black
4	Fuse B8 - Left-hand head light - Main beam	Blue/grey
5	Not used	
6	Connector C13/4 - Hydraulic pressure warning light	Yellow
7	Connector C13/2 - Hydraulic oil filter warning light	White/brown
8	Connector C14/4 - Fuel tank gauge (48)	Green/black
9	Horn push (32)	Purple/yellow
10	Header joint HJ3/19 - Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C14/1 - Water temperature gauge (48)	Green/blue
13	Connector C13/9 - Air cleaner warning light	Blue/green
14	Header joint HJ2/2 - Tachometer negative (-)	Black
15	Connector C13/3 - Engine oil pressure warning light	White/brown
16	Not used	
17	Connector C13/10 - Low fuel warning light	Green/orange
18	Not used	
19	Fuse B7 - Right-hand head light - Dip beam	Blue/orange
20	Fuse A1 - Hydraulic oil filter	Orange/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

C12 Console harness rear connector – Black

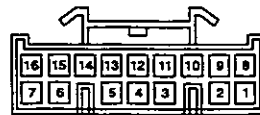
Connects to rear harness connector C18



Terminal	Destination	Colour Code
1	Switch S2/6 - Work light switch (27)	Blue/green
2	Connector C13/6 - Parking brake warning light	Black/white
3	Header joint HJ1/4 - Front flashing indicator light	Green/red
4	Header joint HJ1/3 - Rear flashing indicator light	Green/red
5	Connector C23/2 - Foot brake switch (58)	Black/light green
6	Header joint HJ1/16 - 7 pin trailer socket (58R)	Red/black
7	Header joint HJ1/14 - Rear red light	Red/black
8	Connector C10/2 - Differential lock solenoid (19)	Yellow
9	Not used	
10	Not used	
11	Header joint HJ1/11 - 7 pin trailer socket (58L)	Red/white
12	Not used	
13	Switch S2/8 - Work light switch (27)	Blue/green
14	Header joint HJ1/9 - Rear red light	Red/white
15	Connector C13/11 - Differential lock warning light	Yellow
16	Switch S2/3 - Work light switch (27)	Blue/pink
17	Connector C13/15 - Four-wheel drive warning light	Light green
18	Header joint HJ1/5 - Rear flashing light	Green/white
19	Header joint HJ1/8 - Front flashing light	Green/white
20	Not used	

C13 Instrument panel warning lights connector

See also page 14A-42



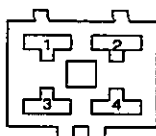
Terminal	Destination	Colour Code
1	Not used	
2	Connector C11/7 - Hydraulic oil filter switch	Black/purple
3	Connector C11/15 - Engine oil pressure switch	White/brown
4	Connector C11/6 - Low hydraulic oil pressure switch	Yellow
5	Header joint HJ2/9 - Alternator charge	Brown/yellow
6	Connector C12/2 - Parking brake switch	Black/white
7	Fuse B9 - Right-hand head light - Main beam	Blue/black
8	Header joint HJ3/16 - Positive (+)	Green/yellow
9	Connector C11/13 - Air cleaner switch	Blue/green
10	Connector C11/17 - Low fuel - tank sender unit	Green/orange
11	Connector C12/15 - Differential lock switch	Yellow
12	Header joint HJ2/6 - Negative (-)	Black
13	Switch S4/3 - Direction indicator switch (29)	Green/white
14	Relay R2/2 - Direction indicator flasher unit (54)	Light purple/green
15	Connector C12/17 - Four-wheel drive switch	Light green
16	Switch S4/6 - Direction indicator switch (29)	Green/red

FOOTSTEP TRACTOR WIRING DIAGRAMS**C14 Fuel level and water temperature gauge connector**

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C11/12 - Water temperature	Green/blue
2	Header joint HJ2/18 - Negative (-)	Black
3	Header joint HJ3/20 - Positive (+)	Green/yellow
4	Connector C11/8 - Fuel tank sender unit	Green/black

C15 Ignition switch connector (Fig. 13)

Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse B1, 2, 3, 4, 5 - Power supply positive (+)	White
3	Fuse B1 - Power supply positive (+)	White
4	Safety start switches (18 & 44)	White/red

C16 Non-ignition switched auxiliary supply – Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/1 - Positive (+) - switch light	Red/yellow
3	Fuse C3 - Positive (+)	Purple

C17 Ignition switched auxiliary supply – Black

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/7 - Positive (+)	Red/yellow
2	Fuse C7 - Positive (+) - switch light	Red/yellow
3	Fuse B1 - Positive (+)	White/green

C23 Stop light switch connector

Terminal	Destination	Colour Code
1	Fuse B5	Green
2	Connector C12/5 - Four-wheel drive switch (67)	Black/light green
3	Not used	
4	Not used	

FOOTSTEP TRACTOR WIRING DIAGRAMS

C25 Range change indicator lights and creeper connector



Terminal	Destination	Colour Code
1	Not used	
2	Range speed indicator switch (64) - 'Low' range	Yellow
3	Range speed indicator switch (64) - 'Medium' range	Green
4	Range speed indicator switch (64) - 'High' range	Blue
5	Creeper indicator switch (65)	Red
6	Range speed indicator switch (64) and creeper switch (65) - Supply (+)	White

HJ1 Header joint 1 – Yellow



Terminal	Destination	Colour Code
1	Not used	
2	Switch S4/6 - Direction indicator switch (29)	Green/red
3	Connector C12/4 - Rear flashing indicator light - left-hand	Green/red
4	Connector C12/3 - Front flashing indicator light - left-hand	Green/red
5	Connector C12/18 - Rear flashing light - right-hand	Green/red
6	Switch S4/3 - Direction indicator switch (29)	Green/white
7	Not used	
8	Connector C12/19 - Front flashing light - right-hand	Green/white
9	Connector C12/14 - Rear red light	Red/white
10	Fuse C6 - Right-hand side lights including trailer	Red/white
11	Connector C12/11 - 7 pin trailer socket (58L - Left-hand rear light)	Red/white
12	Not used	
13	Not used	
14	Connector C12/7 - Rear red light	Red/black
15	Fuse C5 - Left-hand side lights including trailer socket	Red/black
16	Connector C12/6 - 7 pin trailer socket (58R - Right-hand rear light)	Red/black
17	Not used	
18	Not used	
19	Not used	
20	Not used	

HJ2 Header joint 2 – Grey



Terminal	Destination	Colour Code
1	Switch S3/B - Hazard warning switch (28)	Black
2	Connector C11/14 - Tachometer	Black
3	Tachometer illumination light (22)	Black
4	Tachometer illumination light (22)	Black
5	Connection C2 - Earth to engine cylinder block	Black
6	Connector C13/12 - Negative (-) - Warning lights	Black
7	Water temperature gauge illumination light (21)	Black
8	Fuel gauge illumination light (20)	Black
9	Connector C13/5 - Four-wheel drive light	Brown/yellow
10	Work light resistor (24)	Brown/yellow
11	Charge circuit diode (23)	Brown/yellow
12	Not used	
13	Switch S2/B - Work light switch (27) - Negative (-) switch light	Black
14	Switch S1/B - Light switch (26) - Negative (-) switch light	Black
15	Relay R1/6 - Work light relay (57) - Negative (-)	Black
16	Connector C2 - Earth to engine cylinder block	Black
17	Not used	
18	Connector C14/2 - Water temperature (48) and fuel gauge (48)	Black
19	Relay R2/4 Direction indicator flasher unit (54)	Black
20	Not used	

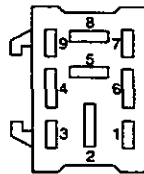
FOOTSTEP TRACTOR WIRING DIAGRAMS

HJ3 Header joint 3 – Grey



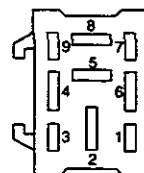
Terminal	Destination	Colour Code
1	Connector C16/2 - Auxiliary non-switched - switch light (56)	Red/yellow
2	Tachometer illumination light (22)	Red/yellow
3	Switch S3/8 - Hazard warning switch (28)	Red/yellow
4	Switch S1/A - Lighting switch (26) - switch light	Red/yellow
5	Switch S3/7 - Hazard warning light switch (28) - switch light	Red/yellow
6	Switch S2/A - Work light switch (27) - switch light	Red/yellow
7	Connector C17/2 - switch light (55)	Red/yellow
8	HJ3/9 - Interconnecting wire	Red/yellow
9	HJ3/8 - Interconnecting wire	Red/yellow
10	Water temperature gauge illumination light (21)	Red/yellow
11	Fuel level gauge illumination light (20)	Red/yellow
12	Tachometer illumination light (22)	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Connector C13/8 - Positive (+) - Warning lights	Green/yellow
17	Fuse B4 - Warning and instrument lights	Green/yellow
18	Work light resistor (24)	Green/yellow
19	Connector C11/10 - Tachometer	Green/yellow
20	Connector C14/3 - Fuel level and water temperature gauge (48)	Green/yellow

R1 Work light relay



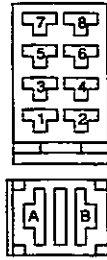
Terminal	Destination	Colour Code
1	Not used	
2	Fuse C4 - Rear work light	Purple/red
3	Not used	
4	Switch S3/6 - Hazard warning switch (28)	Red/orange
5	Fuse A3 - Rear work light	Blue/purple
6	Header joint HJ2/15 - Negative (-)	Black
7	Not used	
8	Fuse A4 - Front work light	Blue/purple
9	Not used	

R2 Direction indicator flasher unit – Blue



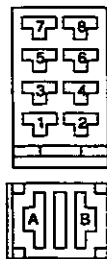
Terminal	Destination	Colour Code
1	Not used	
2	Connector C13/14 - Direction indicator light	Light green/purple
3	Not used	
4	Header joint HJ2/19 - Negative (-)	Black
5	Not used	
6	Switch S4/1 - Direction indicator switch (29)	Light green/pink
6	Switch S3/2 - Hazard warning switch (28)	Light green/pink
7	Not used	
8	Switch S4/2 - Direction indicator switch (29)	Light green/brown
8	Switch S3/5 - Hazard warning switch (28)	Light green/brown

S1 Lighting switch



Terminal	Destination	Colour Code
1	Fuse B8/B9 - Head lights main beam	Blue/white
2	Fusible link (16)	Brown
3	Loop to terminal 6	Red
4	Not used	
5	Not used	
6	Fuse C5 - Side lights	Red
6	Loop to terminal 3	Red
7	Fuse B6/B7 - Head lights dipped beam	Blue/red
8	Not used	
Switch lights		
A	Header junction HJ3/4 - Light positive (+)	Red/yellow
B	Header junction HJ2/14 - Negative (-)	Black

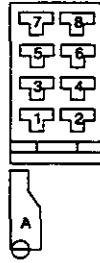
S2 Work light switch



Terminal	Destination	Colour Code
1	Fuse A3 - Rear work light	Red/pink
2	Fuse A4 - Front work light	Blue/yellow
3	Connector C12/16 - Work light	Blue/pink
4	Not used	
5	Not used	
6	Connector C12/1 - Work light	Blue/green
7	Not used	
8	Connector C12/13 - Work light	Blue/green
Switch lights		
A	Header junction HJ3/6 - Light positive (+)	Red/yellow
B	Header junction HJ2/13 - Negative (-)	Black

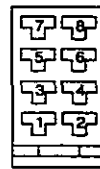
FOOTSTEP TRACTOR WIRING DIAGRAMS

S3 Hazard warning switch



Terminal	Destination	Colour Code
1	Not used	
2	Relay R2/6 - Direction indicator flasher unit (54)	Light green/pink
3	Not used	
4	Fuse C2 - Hazard warning	Pink/green
5	Relay R2/8 - Direction indicator flasher unit (54)	Light green/brown
6	Relay R1/4 - Work light relay (57)	Red/orange
7	Header junction HJ3/5	Red/yellow
8	Header junction HJ3/3	Red/yellow
Switch lights		
B	Header junction HJ2/1 - Light negative (-)	Black

S4 Direction indicator switch



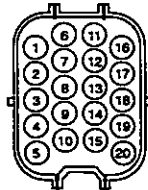
Terminal	Destination	Colour Code
1	Relay R2/6 - Direction indicator flasher unit (54)	Light green/pink
1	Loop to terminal 8	Light green/pink
2	Loop to terminal 7	Light green/brown
2	Relay R2/8 - Direction indicator flasher unit (54)	Light green/brown
3	Header joint HJ1/6	Green/white
3	Connector C13/13	Green/white
4	Not used	
5	Not used	
6	Connector C13/16	Green/red
6	Header joint HJ1/2	Green/red
7	Loop to terminal 2	Light green/brown
8	Loop to terminal 1	Light green/pink

**REAR HARNESS – 12 X 12 GEARBOX
NORTH AMERICA ONLY**

Flat top fenders (Fig. 9)

C18 Rear harness connector – Black

Connects to console harness rear connector C12



Terminal	Destination	Colour Code
1	Connector C26/2 - Front work light (43) - Right-hand	Blue/green
2	Connector C36/4 - Parking brake switch (62)	Black/white
3	Connector C31/3 - Front flashing indicator (42) - Left-hand	Green/red
4	Connector C30/2 - Rear flashing indicator (41) - Left-hand	Green/red
4	7 pin trailer socket 'L' (39) - Left-hand direction indicator	Green/red
5	Connector 67A/4 - Four-wheel drive switch (67)	Black/light green
6	7 pin trailer socket '58R' (39) - Right-hand rear light	Red/black
7	Connector C30/3 - Rear red light (41) - Left-hand	Red/black
7	Connector C67A/1 - Differential lock (66) and Four-wheel drive switch lights (67)	Red/black
8	Connector C67A/3 - Differential lock (66)	Red/black
9	Not used	
10	Not used	
11	7 pin trailer socket '58L' (39) - Left-hand rear light	Red/white
12	Not used	
13	Connector C32/2 - Front work light (43) - Left-hand	Blue/green
14	Connector C28/3 - Rear red light (38) - Right-hand	Red/white
15	Differential lock switch (35)	Yellow
16	Connector C29/2 - Rear work light (40)	Blue/pink
17	Connector C33/2 - Four-wheel drive solenoid (63)	Light green
17	Connector C67A/6 - Four-wheel drive switch (67)	Light green
18	Connector C28/2 - Rear flashing indicator (38) - Right-hand	Green/white
18	7 pin trailer socket 'R' (39) - Right-hand rear direction indicator	Green/white
19	Connector C27/3 - Front flashing indicator (37) - Right-hand	Green/white
20	Not used	

C21 Earth – Chassis connections



C26 Front right-hand work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/1 - Front work light	Blue/green

C27 Front right-hand indicator light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Not used	
3	Connector C18/19 - Front indicator light	Green/white

FOOTSTEP TRACTOR WIRING DIAGRAMS

C28 Rear right-hand indicator light



Terminal	Destination	Colour Code
1	Not used	
2	Connector C18/18 - Rear flashing indicator light	Green/white
3	Connector C18/14 - Rear red light	Red/white
3	Connector C21 - Negative (-)	Black

C29 Rear work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/16 - Rear work light	Blue/pink

C30 Rear left-hand indicator light



Terminal	Destination	Colour Code
1	Not used	
2	Connector C18/4 - Rear flashing indicator light	Green/red
3	Connector C18/7 - Rear red light	Red/black
4	Connector C21 - Negative (-)	Black

C31 Front left-hand work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Not used	
3	Connector C18/3 - Front work light	Green/red

C32 Front left-hand work light



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/13 - Front work light	Blue/green

C33 Four-wheel drive solenoid connector



Terminal	Destination	Colour Code
1	Connector C36/1 - Parking brake switch (62)	Red/light green
2	Connector 18/17 - Four-wheel drive indicator light	Light green
3	Connector C21 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

C36 Parking brake switch connector



Terminal	Destination	Colour Code
1	Connector C33/1 - Four-wheel drive solenoid (63)	Red/light green
2	Connector C67A/5 - Four-wheel drive switch (67)	Red/light green
3	Connector C21 - Negative (-)	Black
4	Connector C18/2 - Parking brake indicator light	Black/white

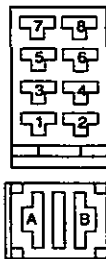
C67A Differential lock and four-wheel drive switches

Terminal	Destination	Colour Code
1	Connector C18/7 - Switch light supply (+)	Red/black
2	Connector C21 - Negative (-)	Black
3	Connector C18/8 - Differential lock solenoid (19)	Yellow
4	Connector C18/5 - Foot brake switch (33)	Black/light green
5	Connector C36/2 - Parking brake switch (62)	Red/light green
6	Connector C18/17 - Four-wheel drive indicator light	Light green

C67B Differential lock and four-wheel drive switches

Terminal	Destination	Colour Code
1	Switch S7/1 - Four-wheel drive switch (67)	Red/yellow
2	Switch S7/5 - Four-wheel drive switch (67)	Black
3	Switch S6/1 - Differential lock switch (66)	Yellow
4	Switch S7/6 - Four-wheel drive switch (67)	Black/light green
5	Switch S7/8 - Four-wheel drive switch (67)	Red/light green
6	Switch S7/1 - Four-wheel drive switch (67)	Light green

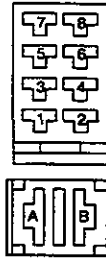
S6 Differential lock switch



Terminal	Destination	Colour Code
1	Connector C67B/3 - Differential lock solenoid (19)	Yellow
2	Not used	
3	Not used	
4	Not used	
5	Switch S7/5 - Four-wheel drive switch (67)	Black
5	Switches S6 and S7/B - Switch light negative (-)	Black
6	Not used	
7	Not used	
8	Not used	
Switch lights		
A	Connector C67B/1 - Power supply switch light	Red/yellow
A	Switch S7/A - Four-wheel drive switch light	Red/yellow
B	Connector C67B/2 - Negative (-) switch light	Black
B	Switch S7B/6 - Four-wheel drive switch light	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

S7 Four-wheel drive switch



Terminal	Destination	Colour Code
1	Connector C67B/6 - Four-wheel drive indicator light	Light green
2	Not used	
3	Not used	
4	Not used	
5	Connector C67B/2 - Negative (-)	Black
5	Switches S6/5 - Differential lock switch (54)	Black
6	Connector C67B/4 - Foot brake switch (33)	Black/light green
7	Not used	
8	Connector C67B/5 - Parking brake switch (58)	Red/light green
Switch lights		
A	Switch S6/A - Differential lock switch (54)	Red/yellow
B	Switch S6/B - Differential lock switch (54)	Black

**CONSOLE HARNESS 12 x 12 GEARBOX
WORLD WIDE**

Console harness (Fig. 10)

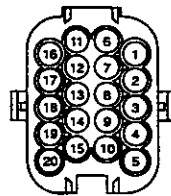
C10 Four-wheel drive differential lock solenoid



Terminal	Destination	Colour Code
1	Fuse A2 - Differential lock	Green/red
2	Connector C12/8 - Differential lock switch	Yellow

C11 Front harness connector – Red

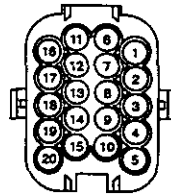
Connects to engine harness connector C5



Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light - Dip beam	Blue/pink
2	Charge circuit diode (23) - Header joint H2/11	Brown/yellow
3	Fuse B9 - Right-hand head light - Main beam	Blue/black
4	Fuse B8 - Left-hand head light - Main beam	Blue/grey
5	Not used	
6	Connector C13/4 - Hydraulic pressure warning light	Yellow
7	Connector C13/2 - Hydraulic oil filter warning light	White/brown
8	Connector C14/4 - Fuel tank gauge (48)	Green/black
9	Horn push (32)	Purple/yellow
10	Header joint HJ3/19 - Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C14/1 - Water temperature gauge (48)	Green/blue
13	Connector C13/9 - Air cleaner warning light	Blue/green
14	Header joint HJ2/2 - Tachometer negative (-)	Black
15	Connector C13/3 - Engine oil pressure warning light	White/brown
16	Not used	
17	Connector C13/10 - Low fuel warning light	Green/orange
18	Not used	
19	Fuse B7 - Right-hand head light - Dip beam	Blue/orange
20	Fuse A1 - Hydraulic oil filter	Orange/red

FOOTSTEP TRACTOR WIRING DIAGRAMS**C12 Console harness rear connector – Black**

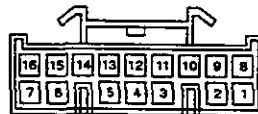
Connects to rear harness connector C18



Terminal	Destination	Colour Code
1	Header joint HJ1/20 - 7 pin trailer socket	Green/purple
2	Connector C13/6 - Parking brake warning light	Black/white
3	Header joint HJ1/4 - Left-hand front direction indicator light	Green/red
4	Header joint HJ1/3 - Left-hand rear direction indicator light	Green/red
5	Connector C23/1 - Stop light switch (58)	Black/light green
6	Header joint HJ1/16 - 7 pin trailer socket	Red/black
7	Header joint HJ1/14 - Left-hand rear light	Red/black
8	Connector C10/2 - Differential lock solenoid (19)	Yellow
9	Header joint HJ1/13 - Left-hand side light	Red/black
10	Header joint HJ1/17 - Right-hand stop light	Green/purple
11	Header joint HJ1/11 - 7 pin trailer socket	Red/white
12	Header joint HJ1/12 - Right-hand side light	Red/white
13	Header joint HJ1/18 - Left-hand stop light	Green/purple
14	Header joint HJ1/9 - Right-hand rear light	Red/white
15	Connector C13/11 - Differential lock warning light	Yellow/black
16	Switch S7/1 - Work light switch (27)	Blue/pink
17	Connector C13/15 - Four-wheel drive warning light	Light green
18	Header joint HJ1/5 - Right-hand rear direction indicator light	Green/white
19	Header joint HJ1/8 - Right-hand front direction indicator light	Green/white
20	Not used	

C13 Instrument panel warning lights connector

See also page 14A-42



Terminal	Destination	Colour Code
1	Not used	
2	Connector C11/7 - Hydraulic oil filter switch	Black/purple
3	Connector C11/15 - Engine oil pressure switch	White/brown
4	Connector C11/6 - Low hydraulic oil pressure switch	Yellow
5	Header joint HJ2/9 - Alternator charge	Brown/yellow
6	Connector C12/2 - Parking brake switch	Black/white
7	Fuse B9 - Right-hand head light - Main beam	Blue/black
8	Header joint HJ3/16 - Positive (+)	Green/yellow
9	Connector C11/13 - Air cleaner switch	Blue/green
10	Connector C11/17 - Low fuel - tank sender unit	Green/orange
11	Connector C12/15 - Differential lock switch	Yellow
12	Header joint HJ2/6 - Negative (-)	Black
13	Switch S9/7 - Direction indicator switch (29)	Green/white
14	Relay R2/2 - Direction indicator flasher unit (54)	Light purple/green
15	Connector C12/17 - Four-wheel drive switch	Light green
16	Switch S9/7 - Direction indicator switch (29)	Green/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

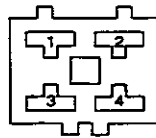
C14 Fuel level and water temperature gauge connector

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C11/12 - Water temperature	Green/blue
2	Header joint HJ2/18 - Negative (-)	Black
3	Header joint HJ3/20 - Positive (+)	Green/yellow
4	Connector C11/8 - Fuel tank gauge	Green/black

C15 Ignition switch connector



Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse A2 - Auxiliary power supply	White
3	Fuse B1 - Auxiliary power supply	White
4	Safety start switches (18 & 44)	White/red

C16 Non-ignition switched auxiliary supply – Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/1 - Positive (+) - switch light	Red/yellow
3	Fuse C3 - Positive (+)	Purple

C17 Ignition switched auxiliary supply – Black

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/7 - Positive (+)	Red/yellow
2	Fuse C7 - Positive (+) - switch light	Red/yellow
3	Fuse B1 - Positive (+)	White/green

C23 Stop light switch connector



Terminal	Destination	Colour Code
1	Connector C12/5 - Four-wheel drive switch (67)	Green
2	Connected to terminal 4	Green
3	Header joint HJ1/19	Green/purple
4	Fuse B2 - supply (+)	Green
4	Connected to terminal 2	Green

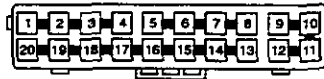
FOOTSTEP TRACTOR WIRING DIAGRAMS

C25 Range change indicator lights and creeper connector



Terminal	Destination	Colour Code
1	Not used	
2	Range speed indicator switch (64) - 'Low' range	Yellow
3	Range speed indicator switch (64) - 'Medium' range	Green
4	Range speed indicator switch (64) - 'High' range	Blue
5	Creeper indicator switch (65)	Red
6	Range speed indicator switch (64) and creeper switch (65) - Supply (+)	White

HJ1 Header joint 1 – Yellow



Terminal	Destination	Colour Code
1	Not used	
2	Switch S8/3 - Hazard warning switch (28)	Green/red
3	Connector C12/4 - Left-hand rear direction indicator light	Green/red
4	Connector C12/3 - Left-hand front direction indicator light	Green/red
5	Connector C12/18 - Right-hand rear direction indicator	Green/red
6	Switch S8/1 - Hazard warning switch (28)	Green/white
7	Not used	
8	Connector C12/19 - Right-hand front direction indicator	Green/white
9	Connector C12/14 - Right-hand rear light	Red/white
10	Fuse C6 - Right-hand side lights including trailer	Red/white
11	Connector C12/11 - 7 pin trailer socket (58L - Left-hand rear light)	Red/white
12	Connector C12/12 - Right-hand side light	Red/white
13	Connector C12/9 - Left-hand side light	Red/black
14	Connector C12/7 - Left-hand rear light	Red/black
15	Fuse C5 - Left-hand side lights including trailer socket	Red/yellow
16	Connector C12/6 - 7 pin trailer socket (58R - Right-hand rear light)	Red/black
17	Connector C12/10 - Right-hand stop light	Green/purple
18	Connector C12/13 - Left-hand stop light	Green/purple
19	Connector C23/3 - Stop light switch (58)	Green/purple
20	Connector C12/1 - 7 pin trailer socket (L - Left-hand direction indicator)	Green/purple

HJ2 Header joint 2 – Grey



Terminal	Destination	Colour Code
1	Switch S8/8 - Hazard warning switch (28)	Black
2	Connector C11/14 - Tachometer	Black
3	Tachometer illumination light (22)	Black
4	Tachometer illumination light (22)	Black
5	Connection C2 - Earth to engine cylinder block	Black
6	Connector C13/12 - Negative (-) - Warning lights	Black
7	Water temperature gauge illumination light (21)	Black
8	Fuel gauge illumination light (20)	Black
9	Connector C13/5 - Four-wheel drive light	Brown/yellow
10	Work light resistor (24)	Brown/yellow
11	Charge circuit diode (23)	Brown/yellow
12	Not used	
13	Switch S7/B - Work light switch (27) - Negative (-) switch light	Black
14	Switch S6/B - Side and head light switch (26) - Negative (-) switch light	Black
15	Switch S5/B - Head light dip switch (30) - Negative (-) switch light	Black
16	Connector C2 - Earth to engine cylinder block	Black
17	Not used	
18	Connector C14/2 - Water temperature and fuel gauge (48)	Black
19	Relay R2/4 - Direction indicator flasher unit (54)	Black
20	Not used	

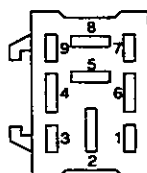
FOOTSTEP TRACTOR WIRING DIAGRAMS

HJ3 Header joint 3 – Grey



Terminal	Destination	Colour Code
1	Connector C16/2 - Auxiliary non-switched - switch light (56)	Red/yellow
2	Tachometer illumination light	Red/yellow
3	Switch S5/A - Head light dip switch (30) - switch light	Red/yellow
4	Switch S6/A - Side and head lighting switch (26) - switch light	Red/yellow
5	Switch S8/7 - Hazard warning light switch (28) - switch light	Red/yellow
6	Switch S7/A - Work light switch (27) - switch light	Red/yellow
7	Connector C17/2 - switch light (55)	Red/yellow
8	HJ3/9 - Interconnecting wire	Red/yellow
9	HJ3/8 - Interconnecting wire	Red/yellow
10	Water temperature gauge illumination light	Red/yellow
11	Fuel level gauge illumination light	Red/yellow
12	Tachometer illumination light	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Connector C13/8 - Positive (+) - Warning lights	Green/yellow
17	Fuse B4 - Warning and instrument lights	Green/yellow
18	Work light resistor (24)	Green/yellow
19	Connector C11/10 - Tachometer	Green/yellow
20	Connector C14/3 - Fuel level and water temperature gauge (48)	Green/yellow

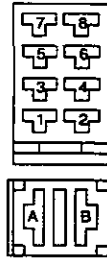
R2 Direction indicator flasher unit – Blue



Terminal	Destination	Colour Code
1	Not used	
2	Connector C13/14 - Direction indicator light	Light green/purple
3	Not used	
4	Header joint HJ2/19 - Negative (-)	Black
5	Not used	
6	Switch S8/6 - Hazard warning switch (28)	Light green/pink
7	Not used	
8	Switch S8/5 - Hazard warning switch (28)	Light green/brown

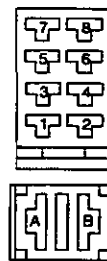
FOOTSTEP TRACTOR WIRING DIAGRAMS

S5 Head light dip switch



Terminal	Destination	Colour Code
1	Fuse B8/B9 - Headlights main beam	Blue/white
2	Not used	
3	Not used	
4	Not used	
5	Switch S6/3 - Side/head light switch (26)	Blue
6	Not used	
7	Fuse B6/B7 - Head lights dipped beam	Blue/red
8	Not used	
Switch light		
A	Header joint HJ3/3 - Switched positive (+)	Red/yellow
B	Header joint HJ2/15 - Negative (-)	Black

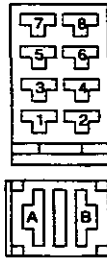
S6 Side/head light switch



Terminal	Destination	Colour Code
1	Not used	
2	Fuse C4 - Auxiliary power	Red
3	Switch S5/5 - Headlight dip switch (30)	Blue
4	Not used	
5	Not used	
6	Fusible link (16)	Brown
7	Not used	
8	Not used	
Switch light		
A	Header joint HJ3/4 - Switched positive (+)	Red/yellow
B	Header joint HJ2/14 - Negative (-)	Black

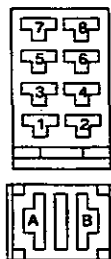
FOOTSTEP TRACTOR WIRING DIAGRAMS

S7 Work light switch



Terminal	Destination	Colour Code
1	Connector C12/16 - Rear work light	Blue/pink
2	Not used	
3	Not used	
4	Not used	
5	Fuse C4 - Rear work light	Red/pink
6	Not used	
7	Not used	
8	Not used	
Switch light		
A	Header joint HJ3/6 - Switched positive (+)	Red/yellow
B	Header joint HJ2/13 - Negative (-)	Black

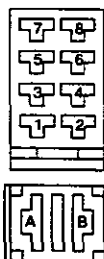
S8 Hazard warning switch



Terminal	Destination	Colour Code
1	Switch S9/7 - Direction indicator switch (29)	Green/white
1	Header joint HJ1/6	Green/white
2	Fuse C2 - Hazard warning and trailer warning	Purple/green
3	Header joint HJ1/2	Green/red
3	Switch S9/1 - Direction indicator switch (29)	Green/red
4	Not used	
5	Relay R2/8 - Flashing indicator unit (54)	Light green/brown
5	Switch S9/5 - Flashing indicator switch (29)	Light green/brown
6	Relay R2/6 - Flashing indicator unit (54)	Light green/pink
7	Header joint HJ3/5	Red/yellow
8	Fuse B5 - Direction indicators and trailer indicators	Green/pink
Switch light		
B	Header joint HJ2/1 - Light negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

S9 Direction indicator switch



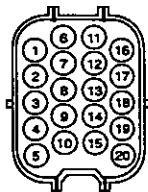
Terminal	Destination	Colour Code
1	Switch S8/3 - Hazard warning switch (28)	Green/red
1	Connector C13/16 - Panel indicator light	Green/red
2	Not used	
3	Not used	
4	Not used	
5	Switch S8/5 - Hazard warning switch (28)	Light green/brown
6	Not used	
7	Connector C13/13 - Panel indicator light	Green/white
7	Switch S8/1 - Hazard warning switch (28)	Green/white
8	Not used	

**REAR HARNESS – 12 X 12 GEARBOX
WORLD WIDE**

Rear harness (Fig. 11)

C18 Rear harness connector – Black

Connects to console harness rear connector C12



Terminal	Destination	Colour Code
1	7 Pin trailer socket '54' (39) - Stop lights	Green/purple
2	Connector C36/4 - Parking brake switch (62)	Black/white
3	Connector C24/3 - Left-hand front direction indicator light	Green/red
4	Connector C23/2 - Left-hand rear direction indicator light	Green/red
4	7 pin trailer socket 'L' (39) - Left-hand direction indicator	Green/red
6	7 pin trailer socket '58R' (39) - Right-hand rear light	Red/black
7	Connector C23/3 - Left-hand rear light	Red/black
7	Connector C67A/1 - Differential lock (66) and four-wheel drive switch lights (67)	Red/black
8	Connector C67A/3 - Differential lock switch (66)	Yellow
9	Connector C24/2 - Left-hand side light	Red/black
10	Connector C20/1 - Right-hand stop light	Green/purple
11	7 pin trailer socket '58L' (39) - Left-hand rear light	Red/white
12	Connector C19/2 - Right-hand side light	Red/white
13	Connector C23/1 - Left-hand stop light	Green/purple
14	Connector C20/3 - Right-hand rear light	Red/white
15	Differential lock switch (35)	Yellow
16	Connector C25/2 - Rear work light (40)	Blue/pink
17	Connector C33/2 - Four-wheel drive solenoid (63)	Light green
17	Connector C67A/6 - Four-wheel drive switch (67)	Light green
18	Connector C20/2 - Right-hand rear direction indicator light	Green/white
19	Connector C19/3 - Right-hand front direction indicator light	Green/white
19	7 pin trailer socket 'R' (39) - Right-hand rear direction indicator	Green/white
20	Not used	

C19 Right-hand front light connector



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/12 - Side light	Red/white
3	Connector C18/19 - Direction indicator light	Green/white

C20 Right-hand rear light connector



Terminal	Destination	Colour Code
1	Connector C18/10 - Stop light	Green/purple
2	Connector C18/18 - Direction indicator	Green/white
3	Connector C18/14 - Rear light	Red/white
4	Connector C21 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS**C21 Earth – Chassis connections****C22 Number plate connector**

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Trailer socket 58R (39)	Red/black

C23 Left-hand rear light connector

Terminal	Destination	Colour Code
1	Connector C18/13 - Stop light	Green/purple
2	Connector C18/4 - Direction indicator	Green/red
3	Connector C18/7 - Rear light	Red/black
4	Connector C21 - Negative (-)	Black

C24 Left-hand front light connector

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/9 - Side light	Red/black
3	Connector C18/3 - Direction indicator light	Green/red

C25 Rear work light connector

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/16 - Rear work light	Blue/pink

C33 Four-wheel drive solenoid

Terminal	Destination	Colour Code
1	Connector C36/1 - Parking brake switch (62)	Red/light green
2	Connector 18/17 - Four-wheel drive indicator light	Light green
3	Connector C21 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

C36 Parking brake switch



Terminal	Destination	Colour Code
1	Connector C33/1 - Four-wheel drive solenoid (63)	Red/light green
2	Connector C67/5 - Four-wheel drive switch (67)	Red/light green
3	Connector C21 - Negative (-)	Black
4	Connector C18/2 - Parking brake indicator light	Black/white

C67A Differential lock and four-wheel drive switches

Connects to connector 67B

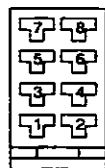
Terminal	Destination	Colour Code
1	Connector C18/7 - Switch light supply (+)	Red/black
2	Connector C21 - Negative (-)	Black
3	Connector C18/8 - Differential lock solenoid (19)	Yellow
4	Connector C18/5 - Foot brake switch (33)	Black/light green
5	Connector C36/2 - Parking brake switch (62)	Red/light green
6	Connector C18/17 - Four-wheel drive indicator light	Light green

C67B Differential lock and four-wheel drive switches

Connects to connector 67A

Terminal	Destination	Colour Code
1	Switch S11/1 - Four-wheel drive switch (67)	Red/yellow
2	Switch S11/5 - Four-wheel drive switch (67)	Black
3	Switch S10/1 - Differential lock switch (66)	Yellow
4	Switch S11/6 - Four-wheel drive switch (67)	Black/light green
5	Switch S11/8 - Four-wheel drive switch (67)	Red/light green
6	Switch S11/1 - Four-wheel drive switch (67)	Light green

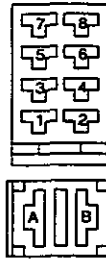
S10 Differential lock switch



Terminal	Destination	Colour Code
1	Connector C67B/3 - Differential lock solenoid (19)	Yellow
2	Not used	
3	Not used	
4	Not used	
5	Switch S11/5 - Four-wheel drive switch (67)	Black
5	Switches S10/B and S11/B - Switch light negative (-)	Black
6	Not used	
7	Not used	
8	Not used	
Switch lights		
A	Switch S10/A - Differential lock switch light	Red/yellow
B	Switch S10/6 - Differential lock switch light	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

S11 Four-wheel drive switch



Terminal	Destination	Colour Code
1	Connector C67B/6 - Four-wheel drive indicator light	Light green
2	Not used	
3	Not used	
4	Not used	
5	Connector C67B/2 - Negative (-)	Black
5	Switches S10/5 - Differential lock switch (54)	Black
6	Connector C67B/4 - Foot brake switch (33)	Black/light green
7	Not used	
8	Connector C67B/5 - Parking brake switch (58)	Red/light green
Switch lights		
A	Switch S10/A - Differential lock switch light	Red/yellow
A	Connector C67/B1 - Power supply switch lights	Red/yellow
B	Switch S10/B - Differential lock switch light	Black
B	Connector C67B/2 - Negative (-) switch lights	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

**CONSOLE HARNESS – 18 SPEEDSHIFT GEARBOX
NORTH AMERICA ONLY**

Console harness (Fig. 12)

C2 Earth to engine block cylinder block



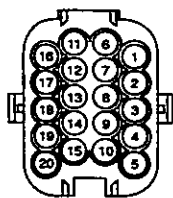
C10 Four-wheel drive differential lock solenoid



Terminal	Destination	Colour Code
1	Fuse B2 - Differential lock	Green/red
2	Connector C12/8 - Differential lock switch (66)	Yellow

C11 Front harness connector – Red

Connects to engine harness connector C5

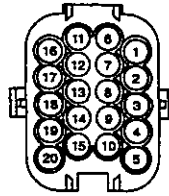


Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light - Dip beam	Blue/pink
2	Charge circuit diode (23) - Header joint H2/11	Brown/yellow
3	Fuse B9 - Right-hand head light - Main beam	Blue/black
4	Fuse B8 - Left-hand head light - Main beam	Blue/grey
5	Not used	
6	Connector C13/4 - Hydraulic pressure warning light	Yellow
6	Connector C22/3 - Speedshift solenoid (59)	Yellow
7	Connector C13/2 - Hydraulic oil filter warning light	White/brown
8	Connector C14/4 - Fuel tank gauge (48)	Green/black
9	Horn push (32)	Purple/yellow
10	Header joint HJ3/19 - Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C14/1 - Water temperature gauge (48)	Green/blue
13	Connector C13/9 - Air cleaner warning light	Blue/green
14	Header joint HJ2/2 - Tachometer negative (-)	Black
15	Connector C13/3 - Engine oil pressure warning light	White/brown
16	Not used	
17	Connector C13/10 - Low fuel warning light	Green/orange
18	Not used	
19	Fuse B7 - Right-hand head light - Dip beam	Blue/orange
20	Fuse A1 - Hydraulic oil filter	Orange/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

C12 Console harness rear connector – Black

Connects to rear harness connector C18



Terminal	Destination	Colour Code
1	Switch S2/6 - Work light switch (27)	Blue/green
2	Connector C13/6 - Parking brake warning light	Black/white
3	Header joint HJ1/4 - Front flashing indicator light	Green/red
4	Header joint HJ1/3 - Rear flashing indicator light	Green/red
5	Connector C23/2 - Foot brake switch (58)	Black/light green
6	Header joint HJ1/16 - 7 pin trailer socket (58R)	Red/black
7	Header joint HJ1/14 - Rear red light	Red/black
8	Connector C10/2 - Differential lock solenoid (19)	Yellow
9	Not used	
10	Not used	
11	Header joint HJ1/11 - 7 pin trailer socket (58L)	Red/white
12	Not used	
13	Switch S2/8 - Work light switch (27)	Blue/green
14	Header joint HJ1/9 - Rear red light	Red/white
15	Connector C13/11 - Differential lock warning light	Yellow
16	Switch S2/3 - Work light switch (27)	Blue/pink
17	Connector C13/15 - Four-wheel drive warning light	Light green
18	Header joint HJ1/5 - Rear flashing light	Green/white
19	Header joint HJ1/8 - Front flashing light	Green/white
20	Connector C22/2 - Speedshift solenoid (59)	Orange/brown
20	Speedshift 'Slow' indicator light (60)	Orange/yellow

C13 Instrument panel warning lights connector

See also page 14A-42



Terminal	Destination	Colour Code
1	Not used	
2	Connector C11/7 - Hydraulic oil filter switch	Black/purple
3	Connector C11/15 - Engine oil pressure switch	White/brown
4	Connector C11/6 - Low hydraulic oil pressure switch	Yellow
5	Header joint HJ2/9 - Alternator charge	Brown/yellow
6	Connector C12/2 - Parking brake switch	Black/white
7	Fuse B9 - Right-hand head light - Main beam	Blue/black
8	Header joint HJ3/16 - Positive (+)	Green/yellow
9	Connector C11/13 - Air cleaner switch	Blue/green
10	Connector C11/17 - Low fuel - tank sender unit	Green/orange
11	Connector C12/15 - Differential lock switch	Yellow
12	Header joint HJ2/6 - Negative (-)	Black
13	Switch S4/3 - Direction indicator switch (29)	Green/white
14	Relay R2/2 - Direction indicator flasher unit (54)	Light purple/green
15	Connector C12/17 - Four-wheel drive switch	Light green
16	Switch S4/6 - Direction indicator switch (29)	Green/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

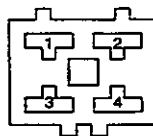
C14 Fuel level and water temperature gauge connector

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C11/12 - Water temperature	Green/blue
2	Header joint HJ2/18 - Negative (-)	Black
3	Header joint HJ3/20 - Positive (+)	Green/yellow
4	Connector C11/8 - Fuel tank sender unit	Green/black

C15 Ignition switch connector (Fig. 13)



Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse B1, 2, 3, 4, 5 - Power supply positive (+)	White
3	Fuse B1 - Power supply positive (+)	White
4	Safety start switches (18 & 44)	White/red

C16 Non-ignition switched auxiliary supply – Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/1 - Positive (+) - switch light	Red/yellow
3	Fuse C3 - Positive (+)	Purple

C17 Ignition switched auxiliary supply – Black

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/7 - Positive (+)	Red/yellow
2	Fuse C7 - Positive (+) - switch light	Red/yellow
3	Fuse B1 - Positive (+)	White/green

C22 Speedshift solenoid



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C12/20 - Speedshift selector switch (68)	Orange/brown
3	Connector C11/6 - Low hydraulic oil pressure switch (15)	Yellow

FOOTSTEP TRACTOR WIRING DIAGRAMS**C23 Stop light switch connector**

Terminal	Destination	Colour Code
1	Fuse B5	Green
2	Connector C12/5 - Four-wheel drive switch (67)	Black/light green
3	Not used	
4	Not used	

C25 Range change indicator lights and creeper connector

Terminal	Destination	Colour Code
1	Not used	
2	Range speed indicator switch (64) - 'Low' range	Yellow
3	Range speed indicator switch (64) - 'Medium' range	Green
4	Range speed indicator switch (64) - 'High' range	Blue
5	Creeper indicator switch (65)	Red
6	Range speed indicator switch (64) and creeper switch (65)	Green/red

HJ1 Header joint 1 – Yellow

Terminal	Destination	Colour Code
1	Not used	
2	Switch S4/6 - Direction indicator switch (29)	Green/red
3	Connector C12/4 - Rear flashing indicator light - left-hand	Green/red
4	Connector C12/3 - Front flashing indicator light - left-hand	Green/red
5	Connector C12/18 - Rear flashing light - right-hand	Green/red
6	Switch S4/3 - Direction indicator switch (29)	Green/white
7	Not used	
8	Connector C12/19 - Front flashing light - right-hand	Green/white
9	Connector C12/14 - Rear red light	Red/white
10	Fuse C6 - Right-hand side lights including trailer	Red/white
11	Connector C12/11 - 7 pin trailer socket (58L - Left-hand rear light)	Red/white
12	Not used	
13	Not used	
14	Connector C12/7 - Rear red light	Red/black
15	Fuse C5 - Left-hand side lights including trailer socket	Red/black
16	Connector C12/6 - 7 pin trailer socket (58R - Right-hand rear light)	Red/black
17	Not used	
18	Not used	
19	Not used	
20	Not used	

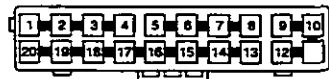
FOOTSTEP TRACTOR WIRING DIAGRAMS

HJ2 Header joint 2 – Grey



Terminal	Destination	Colour Code
1	Switch S3/B - Hazard warning switch (28)	Black
2	Connector C11/14 - Tachometer	Black
3	Tachometer illumination light (22)	Black
4	Tachometer illumination light (22)	Black
5	Connection C2 - Earth to engine cylinder block	Black
6	Connector C13/12 - Negative (-) - Warning lights	Black
7	Water temperature gauge illumination light (21)	Black
8	Fuel gauge illumination light (20)	Black
9	Connector C13/5 - Four-wheel drive light	Brown/yellow
10	Work light resistor (24)	Brown/yellow
11	Charge circuit diode (23)	Brown/yellow
12	Not used	
13	Switch S2/B - Work light switch (27) - Negative (-) switch light	Black
14	Switch S1/B - Light switch (26) - Negative (-) switch light	Black
15	Relay R1/6 - Work light relay (57) - Negative (-)	Black
16	Connector C2 - Earth to engine cylinder block	Black
17	Speedshift 'Fast' and 'Slow' indicator lights (60 and 61)	Black
18	Connector C14/2 - Water temperature and fuel gauge (48)	Black
19	Relay R2/4 Direction indicator flasher unit (54)	Black
20	Not used	

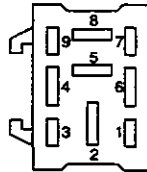
HJ3 Header joint 3 – Grey



Terminal	Destination	Colour Code
1	Connector C16/2 - Auxiliary non-switched - switch light (56)	Red/yellow
2	Tachometer illumination light (22)	Red/yellow
3	Switch S3/8 - Hazard warning switch (28)	Red/yellow
4	Switch S1/A - Lighting switch (26) - switch light	Red/yellow
5	Switch S3/7 - Hazard warning light switch (28) - switch light	Red/yellow
6	Switch S2/A - Work light switch (27) - switch light	Red/yellow
7	Connector C17/2 - switch light (55)	Red/yellow
8	HJ3/9 - Interconnecting wire	Red/yellow
9	HJ3/8 - Interconnecting wire	Red/yellow
10	Water temperature gauge illumination light (21)	Red/yellow
11	Fuel level gauge illumination light (20)	Red/yellow
12	Tachometer illumination light (22)	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Connector C13/8 - Positive (+) - Warning lights	Green/yellow
17	Fuse B4 - Warning and instrument lights	Green/yellow
18	Work light resistor (24)	Green/yellow
19	Connector C11/10 - Tachometer	Green/yellow
20	Connector C14/3 - Fuel level and water temperature gauge (48)	Green/yellow

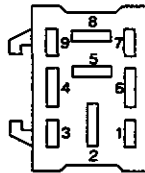
FOOTSTEP TRACTOR WIRING DIAGRAMS

R1 Work light relay



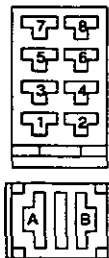
Terminal	Destination	Colour Code
1	Not used	
2	Fuse C4 - Rear work light	Purple/red
3	Not used	
4	Switch S3/6 - Hazard warning switch (28)	Red/orange
5	Fuse A3 - Rear work light	Blue/purple
6	Header joint HJ2/15 - Negative (-)	Black
7	Not used	
8	Fuse A4 - Front work light	Blue/purple
9	Not used	

R2 Direction indicator flasher unit – Blue



Terminal	Destination	Colour Code
1	Not used	
2	Connector C13/14 - Direction indicator light	Light green/purple
3	Not used	
4	Header joint HJ2/19 - Negative (-)	Black
5	Not used	
6	Switch S4/1 - Direction indicator switch (29)	Light green/pink
6	Switch S3/2 - Hazard warning switch (28)	Light green/pink
7	Not used	
8	Switch S4/2 - Direction indicator switch (29)	Light green/brown
8	Switch S3/2 - Hazard warning switch (28)	Light green/brown

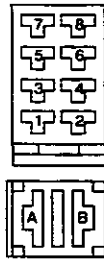
S1 Lighting switch



Terminal	Destination	Colour Code
1	Fuse B8/B9 - Head lights main beam	Blue/white
2	Fusible link (16)	Brown
3	Loop to terminal 6	Red
4	Not used	
5	Not used	
6	Fuse C5 - Side lights	Red
6	Loop to terminal 3	Red
7	Fuse B6/B7 - Head lights dipped beam	Blue/red
8	Not used	
Switch lights		
A	Header junction HJ3/4 - Light positive (+)	Red/yellow
B	Header junction HJ2/14 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

S2 Work light switch



Terminal	Destination	Colour Code
1	Fuse A3 - Rear work light	Red/pink
2	Fuse A4 - Front work light	Blue/yellow
3	Connector C12/16 - Work light	Blue/pink
4	Not used	
5	Not used	
6	Connector C12/1 - Work light	Blue/green
7	Not used	
8	Connector C12/13 - Work light	Blue/green
Switch lights		
A	Header junction HJ3/6 - Light positive (+)	Red/yellow
B	Header junction HJ2/13 - Negative (-)	Black

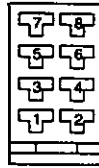
S3 Hazard warning switch



Terminal	Destination	Colour Code
1	Not used	
2	Relay R2/6 - Direction indicator flasher unit (54)	Light green/pink
3	Not used	
4	Fuse C2 - Hazard warning	Pink/green
5	Relay R2/8 - Direction indicator flasher unit (54)	Light green/brown
6	Relay R1/4 - Work light relay (57)	Red/orange
7	Header junction HJ3/5	Red/yellow
8	Header junction HJ3/3	Red/yellow
Switch lights		
B	Header junction HJ2/1 - Light negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

S4 Direction indicator switch



Terminal	Destination	Colour Code
1	Relay R2/6 - Direction indicator flasher unit (54)	Light green/pink
1	Loop to terminal 8	Light green/pink
2	Loop to terminal 7	Light green/brown
2	Relay R2/8 - Direction indicator flasher unit (54)	Light green/brown
3	Header joint HJ1/6	Green/white
3	Connector C13/13	Green/white
4	Not used	
5	Not used	
6	Connector C13/16	Green/red
6	Header joint HJ1/2	Green/red
7	Loop to terminal 2	Light green/brown
8	Loop to terminal 1	Light green/pink

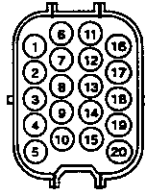
FOOTSTEP TRACTOR WIRING DIAGRAMS

**REAR HARNESS – 18 SPEEDSHIFT GEARBOX
NORTH AMERICA ONLY**

Flat top fenders (Fig. 13)

C18 Rear harness connector – Black

Connects to console harness rear connector C12



Terminal	Destination	Colour Code
1	Connector C26/2 – Front work light (43) – Right-hand	Blue/green
2	Connector C36/4 – Parking brake switch (62)	Black/white
3	Connector C31/3 – Front flashing indicator (42) – Left-hand	Green/red
4	Connector C30/2 – Rear flashing indicator (41) – Left-hand	Green/red
4	7 pin trailer socket 'L' (39) – Left-hand direction indicator	Green/red
5	Connector 67A/4 – Four-wheel drive switch (67)	Black/light green
6	7 pin trailer socket '58R' (39) – Right-hand rear light	Red/black
7	Connector C30/3 – Rear red light (41) – Left-hand	Red/black
7	Connector C67A/1 – Differential lock (66) and Four-wheel drive switch lights (67)	Red/black
8	Connector C67A/3 – Differential lock (66)	Red/black
9	Not used	
10	Not used	
11	7 pin trailer socket '58L' (39) – Left-hand rear light	Red/white
12	Not used	
13	Connector C32/2 – Front work light (43) – Left-hand	Blue/green
14	Connector C28/3 – Rear red light (38) – Right-hand	Red/white
15	Differential lock switch (35)	Yellow
16	Connector C29/2 – Rear work light (40)	Blue/pink
17	Connector C33/2 – Four-wheel drive solenoid (63)	Light green
17	Connector C67/6 – Four-wheel drive switch (67)	Light green
18	Connector C28/2 – Rear flashing indicator (38) – Right-hand	Green/white
18	7 pin trailer socket 'R' (39) – Right-hand rear direction indicator	Green/white
19	Connector C27/3 – Front flashing indicator (37) – Right-hand	Green/white
20	Connector C70/1 – Speedshift selector switch (68)	Orange/brown

C21 Earth – Chassis connections



C26 Front right-hand work light



Terminal	Destination	Colour Code
1	Connector C21 – Negative (-)	Black
2	Connector C18/1 – Front work light	Blue/green

C27 Front right-hand indicator light



Terminal	Destination	Colour Code
1	Connector C21 – Negative (-)	Black
2	Not used	
3	Connector C18/19 – Front indicator light	Green/white

FOOTSTEP TRACTOR WIRING DIAGRAMS**C28 Rear right-hand indicator light**

Terminal	Destination	Colour Code
1	Not used	
2	Connector C18/18 - Rear flashing indicator light	Green/white
3	Connector C18/14 - Rear red light	Red/white
3	Connector C21 - Negative (-)	Black

C29 Rear work light

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/16 - Rear work light	Blue/pink

C30 Rear left-hand indicator light

Terminal	Destination	Colour Code
1	Not used	
2	Connector C18/4 - Rear flashing indicator light	Green/red
3	Connector C18/7 - Rear red light	Red/black
4	Connector C21 - Negative (-)	Black

C31 Front left-hand work light

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Not used	
3	Connector C18/3 - Front work light	Green/red

C32 Front left-hand work light

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/13 - Front work light	Blue/green

C33 Four-wheel drive solenoid connector

Terminal	Destination	Colour Code
1	Connector C36/1 - Parking brake switch (62)	Red/light green
2	Connector C18/17 - Four-wheel drive indicator light	Light green
3	Connector C21 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

C36 Parking brake switch connector



Terminal	Destination	Colour Code
1	Connector C33/1 - Four-wheel drive solenoid (63)	Red/light green
2	Connector C67A/5 - Four-wheel drive switch (67)	Red/light green
3	Connector C21 - Negative (-)	Black
4	Connector C18/2 - Parking brake indicator light	Black/white

C67A Differential lock and four-wheel drive switches

Terminal	Destination	Colour Code
1	Connector C18/7 - Switch light supply (+)	Red/black
2	Connector C21 - Negative (-)	Black
3	Connector C18/8 - Differential lock solenoid (19)	Yellow
4	Connector C18/5 - Foot brake switch (58)	Black/light green
5	Connector C36/2 - Parking brake switch (62)	Red/light green
6	Connector C18/17 - Four-wheel drive indicator light	Light green

C67B Differential lock and four-wheel drive switches

Terminal	Destination	Colour Code
1	Switch S7/1 - Four-wheel drive switch (67)	Red/yellow
2	Switch S7/5 - Four-wheel drive switch (67)	Black
3	Switch S6/1 - Differential lock switch (66)	Yellow
4	Switch S7/6 - Four-wheel drive switch (67)	Black/light green
5	Switch S7/8 - Four-wheel drive switch (67)	Red/light green
6	Switch S7/1 - Four-wheel drive switch (67)	Light green

C69 Speedshift connector



Terminal	Destination	Colour Code
1	Connector C70/2 - Speedshift selector switch (68)	Green
2	Connector C70/3 - Speedshift selector switch (68)	Blue/pink

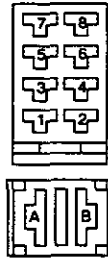
C70 Speedshift switch connector



Terminal	Destination	Colour Code
1	Connector C18/20 - Speedshift solenoid (59)	Orange/brown
2	Connector C69/1 - Fuse A2 power supply (+)	Green
3	Connector C69/2 - Speedshift indicator light 'Fast'	Green/red

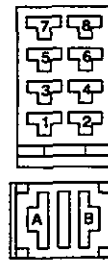
FOOTSTEP TRACTOR WIRING DIAGRAMS

S6 Differential lock switch



Terminal	Destination	Colour Code
1	Connector C67B/3 - Differential lock solenoid (19)	Yellow
2	Not used	
3	Not used	
4	Not used	
5	Switch S7/5 - Four-wheel drive switch (66)	Black
5	Switches S6 and S7/B - Switch light negative (-)	Black
6	Not used	
7	Not used	
8	Not used	
Switch lights		
A	Connector C67B/1 - Power supply switch lights	Red/yellow
A	Switch S7/A - Power supply switch lights	Red/yellow
B	Connector C67B/21 - Negative (-) switch lights	Black
B	Switch S7/B - Negative (-) switch lights	Black

S7 Four-wheel drive switch



Terminal	Destination	Colour Code
1	Connector C67B/6 - Four-wheel drive indicator light	Light green
2	Not used	
3	Not used	
4	Not used	
5	Connector C67B/2 - Negative (-)	Black
5	Switches S6/5 - Differential lock switch (66)	Black
6	Connector C67B/4 - Foot brake switch (58)	Black/light green
7	Not used	
8	Connector C67B/5 - Parking brake switch (62)	Red/light green
Switch lights		
A	Switch S6/A - Power supply switch lights	Red/yellow
B	Switch S6/B - Negative (-) switch lights	Black

**CONSOLE HARNESS – 18 SPEEDSHIFT GEARBOX
WORLD WIDE**

Console harness (Fig. 14)

C2 Earth to engine block cylinder block



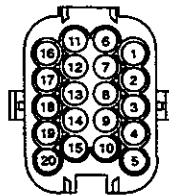
C10 Four-wheel drive differential lock solenoid



Terminal	Destination	Colour Code
1	Fuse A2 - Differential lock	Green/red
2	Connector C12/8 - Differential lock switch (66)	Yellow

C11 Front harness connector – Red

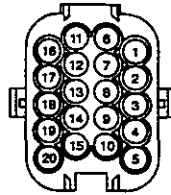
Connects to engine harness connector C5



Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light - Dip beam	Blue/pink
2	Charge circuit diode (23) - Header joint H2/11	Brown/yellow
3	Fuse B9 - Right-hand head light - Main beam	Blue/black
4	Fuse B8 - Left-hand head light - Main beam	Blue/grey
5	Not used	
6	Connector C13/4 - Hydraulic pressure warning light	Yellow
6	Connector C22/3 - Speedshift solenoid (59)	Yellow
7	Connector C13/2 - Hydraulic oil filter warning light	White/brown
8	Connector C14/4 - Fuel tank gauge (48)	Green/black
9	Horn push (32)	Purple/yellow
10	Header joint HJ3/19 - Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C14/1 - Water temperature gauge (48)	Green/blue
13	Connector C13/9 - Air cleaner warning light	Blue/green
14	Header joint HJ2/2 - Tachometer negative (-)	Black
15	Connector C13/3 - Engine oil pressure warning light	White/brown
16	Not used	
17	Connector C13/10 - Low fuel warning light	Green/orange
18	Not used	
19	Fuse B7 - Right-hand head light - Dip beam	Blue/orange
20	Fuse A1 - Hydraulic oil filter	Orange/red

FOOTSTEP TRACTOR WIRING DIAGRAMS**C12 Console harness rear connector – Black**

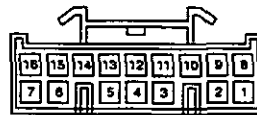
Connects to rear harness connector C18



Terminal	Destination	Colour Code
1	Header joint HJ1/20 - 7 pin trailer socket	Green/purple
2	Connector C13/6 - Parking brake warning light	Black/white
3	Header joint HJ1/4 - Left-hand front direction indicator light	Green/red
4	Header joint HJ1/3 - Left-hand rear direction indicator light	Green/red
5	Connector C23/1 - Stop brake switch (58)	Black/light green
6	Header joint HJ1/16 - 7 pin trailer socket	Red/black
7	Header joint HJ1/14 - Left-hand rear light	Red/black
8	Connector C10/2 - Differential lock solenoid (19)	Yellow
9	Header joint HJ1/13 - Left-hand side light	Red/black
10	Header joint HJ1/17 - Right-hand stop light	Green/purple
11	Header joint HJ1/11 - 7 pin trailer socket	Red/white
12	Header joint HJ1/12 - Right-hand side light	Red/white
13	Header joint HJ1/18 - Left-hand stop light	Green/purple
14	Header joint HJ1/9 - Right-hand rear light	Red/white
15	Connector C13/11 - Differential lock warning light	Yellow/black
16	Switch S7/1 - Work light switch (27)	Blue/pink
17	Connector C13/15 - Four-wheel drive warning light	Light green
18	Header joint HJ1/5 - Right-hand rear direction indicator light	Green/white
19	Header joint HJ1/8 - Right-hand front direction indicator light	Green/white
20	Connector C22/2 - Speedshift solenoid (59)	Orange/brown
20	Speedshift 'Slow' indicator light (66)	Orange/yellow

C13 Instrument panel warning lights connector

See also page 14A-42



Terminal	Destination	Colour Code
1	Not used	
2	Connector C11/7 - Hydraulic oil filter switch	Black/purple
3	Connector C11/15 - Engine oil pressure switch	White/brown
4	Connector C11/6 - Low hydraulic oil pressure switch	Yellow
5	Header joint HJ2/9 - Alternator charge	Brown/yellow
6	Connector C12/2 - Parking brake switch	Black/white
7	Fuse B9 - Right-hand head light - Main beam	Blue/black
8	Header joint HJ3/16 - Positive (+)	Green/yellow
9	Connector C11/13 - Air cleaner switch	Blue/green
10	Connector C11/17 - Low fuel - tank sender unit	Green/orange
11	Connector C12/15 - Differential lock switch	Yellow
12	Header joint HJ2/6 - Negative (-)	Black
13	Switch S9/7 - Direction indicator switch (29)	Green/white
14	Relay R2/2 - Direction indicator flasher unit (54)	Light purple/green
15	Connector C12/17 - Four-wheel drive solenoid (63)	Light green
16	Switch S9/7 - Direction indicator switch (29)	Green/red

FOOTSTEP TRACTOR WIRING DIAGRAMS

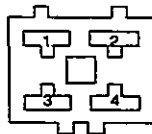
C14 Fuel level and water temperature gauge connector

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C11/12 - Water temperature	Green/blue
2	Header joint HJ2/18 - Negative (-)	Black
3	Header joint HJ3/20 - Positive (+)	Green/yellow
4	C11/8 Fuel tank gauge	Green/black

C15 Ignition switch connector



Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse A2 - Auxiliary power supply	White
3	Fuse B1 - Auxiliary power supply	White
4	Safety start switches (18 & 44)	White/red

C16 Non-ignition switched auxiliary supply – Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/1 - Positive (+) - switch light	Red/yellow
3	Fuse C3 - Positive (+)	Purple

C17 Ignition switched auxiliary supply – Black

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/7 - Positive (+)	Red/yellow
2	Fuse C7 - Positive (+) - switch light	Red/yellow
3	Fuse B1 - Positive (+)	White/green

C22 Speedshift solenoid



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C12/20 - Speedshift selector switch (68)	Orange/brown
3	Connector C11/5 - Low hydraulic oil pressure switch (15)	Yellow

FOOTSTEP TRACTOR WIRING DIAGRAMS

C23 Stop light switch connector



Terminal	Destination	Colour Code
1	Connector C12/5 - Four-wheel drive switch (67)	Green
2	Connected to terminal 4	Green
3	Header joint HJ1/19	Green/purple
4	Fuse B2 - supply (+)	Green
4	Connected to terminal 2	Green

C25 Range change indicator lights and creeper connector



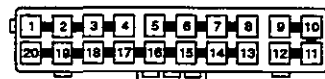
Terminal	Destination	Colour Code
1	Not used	
2	Range speed indicator switch (64) - 'Low' range	Yellow
3	Range speed indicator switch (64) - 'Medium' range	Green
4	Range speed indicator switch (64) - 'High' range	Blue
5	Creeper indicator switch (65)	Red
6	Range speed indicator switch (64) and creeper switch (65) - supply (+)	White

C68 Speedshift connector



Terminal	Destination	Colour Code
1	Fuse A3 - Power supply (+)	Green
2	Speedshift indicator light 'Fast' (61)	Green/red

HJ1 Header joint 1 – Yellow



Terminal	Destination	Colour Code
1	Not used	
2	Switch S8/3 - Hazard warning switch (28)	Green/red
3	Connector C12/4 - Rear flashing indicator light - left-hand	Green/red
4	Connector C12/3 - Front flashing indicator light - left-hand	Green/red
5	Connector C12/18 - Rear flashing indicator light - right-hand	Green/red
6	Switch S8/3 - Hazard warning switch (28)	Green/white
7	Not used	
8	Connector C12/19 - Front flashing light - right-hand	Green/white
9	Connector C12/14 - Rear red light - right-hand	Red/white
10	Fuse C6 - Right-hand side lights including trailer	Red/white
11	Connector C12/11 - 7 pin trailer socket (58L - Left-hand rear light)	Red/white
12	Connector C12/12 - Right hand side light	Red/white
13	Connector C12/9 - Left-hand side light	Red/black
14	Connector C12/7 - Rear red light - left-hand	Red/black
15	Fuse C5 - Left-hand side lights including trailer socket red/yellow	Red/black
16	Connector C12/6 - 7 pin trailer socket (58R - Right-hand rear light)	Red/black
17	Connector C12/10 - Stop light - right-hand	Green/purple
18	Connector C12/13 - Stop light - left-hand	Green/purple
19	Connector C23/3 - Stop light switch (58)	Green/purple
20	Connector C12/1 - 7 pin trailer socket (L - Left-hand direction indicator)	Green/purple

FOOTSTEP TRACTOR WIRING DIAGRAMS

HJ2 Header joint 2 – Grey



Terminal	Destination	Colour Code
1	Switch S8/B - Hazard warning switch (28)	Black
2	Connector C11/14 - Tachometer	Black
3	Tachometer illumination light (22)	Black
4	Tachometer illumination light (22)	Black
5	Connection C2 - Earth to engine cylinder block	Black
6	Connector C13/12 - Negative (-) - Warning lights	Black
7	Water temperature gauge illumination light (21)	Black
8	Fuel gauge illumination light (20)	Black
9	Connector C13/5 - Four-wheel drive light	Brown/yellow
10	Work light resistor (24)	Brown/yellow
11	Charge circuit diode (23)	Brown/yellow
12	Not used	
13	Switch S7/B - Work light switch (27) - Negative (-) switch light	Black
14	Switch S6/B - Side and head light switch (26) - Negative (-) switch light	Black
15	Switch S5/B - Head light dip switch (30) - Negative (-) switch light	Black
16	Connector C2 - Earth to engine cylinder block	Black
17	Speedshift 'Fast' and 'Slow' indicator lights (60 and 61)	Black
18	Connector C14/2 - Water temperature and fuel gauge (48)	Black
19	Relay R2/4 Direction indicator flasher unit (54)	Black
20	Not used	

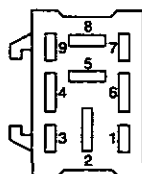
HJ3 Header joint 3 – Grey



Terminal	Destination	Colour Code
1	Connector C16/2 - Auxiliary non-switched - switch light (56)	Red/yellow
2	Tachometer illumination light	Red/yellow
3	Switch S5/A - Head light dip switch (30) - switch light	Red/yellow
4	Switch S6/A - Side and head lighting switch (26) - switch light	Red/yellow
5	Switch S8/7 - Hazard warning light switch (28) - switch light	Red/yellow
6	Switch S7/A - Work light switch (27) - switch light	Red/yellow
7	Connector C17/2 - switch light (55)	Red/yellow
8	HJ3/9 - Interconnecting wire	Red/yellow
9	HJ3/8 - Interconnecting wire	Red/yellow
10	Water temperature gauge illumination light	Red/yellow
11	Fuel level gauge illumination light	Red/yellow
12	Tachometer illumination light	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Connector C13/8 - Positive (+) - Warning lights	Green/yellow
17	Fuse B4 - Warning and instrument lights	Green/yellow
18	Work light resistor (24)	Green/yellow
19	Connector C11/10 - Tachometer	Green/yellow
20	Connector C14/3 - Fuel level and water temperature gauge (48)	Green/yellow

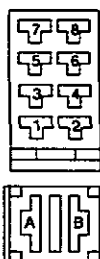
FOOTSTEP TRACTOR WIRING DIAGRAMS

R2 Direction indicator flasher unit – Blue



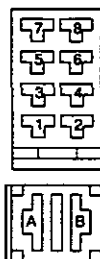
Terminal	Destination	Colour Code
1	Not used	
2	Connector C13/14 - Direction indicator light	Light green/purple
3	Not used	
4	Header joint HJ2/19 - negative (-)	Black
5	Not used	
6	Switch S8/6 - Hazard warning switch (28)	Light green/pink
7	Not used	
8	Switch S8/5 - Hazard warning switch (28)	Light green/brown
9	Not used	

S5 Head light dip switch



Terminal	Destination	Colour Code
1	Fuse B8/B9 - Headlights main beam	Blue/white
2	Not used	
3	Not used	
4	Not used	
5	Switch S6/3 - Side/head light switch (26)	Blue
6	Not used	
7	Fuse B6/B7 - Head lights dipped beam	Blue/red
8	Not used	
Switch light		
A	Header joint HJ3/3 - Switched positive (+)	Red/yellow
B	Header joint HJ2/15 - Negative (-)	Black

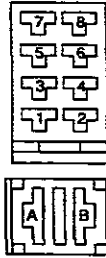
S6 Side/head light switch



Terminal	Destination	Colour Code
1	Not used	
2	Fuse C4 - Auxiliary power	Red
3	Switch S5/5 - Headlight dip switch (30)	Blue
4	Not used	
5	Not used	
6	Fusible link (16)	Brown
7	Not used	
8	Not used	
Switch light		
A	Header joint HJ3/4 - Switched positive (+)	Red/yellow
B	Header joint HJ2/14 - Negative (-)	Black

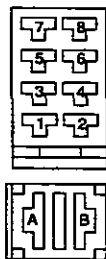
FOOTSTEP TRACTOR WIRING DIAGRAMS

S7 Work light switch



Terminal	Destination	Colour Code
1	Connector C12/16 - Rear work light	Blue/pink
2	Not used	
3	Not used	
4	Not used	
5	Fuse C4 - Rear work light	Red/pink
6	Not used	
7	Not used	
8	Connector C12/13 - Work light	Blue/green
Switch lights		
A	Header junction HJ3/6 - Switched positive (+)	Red/yellow
B	Header junction HJ2/13 - Negative (-)	Black

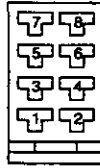
S8 Hazard warning switch



Terminal	Destination	Colour Code
1	Switch S9/7 - Direction indicator switch (29)	Green/white
1	Header joint HJ1/6	Green/white
2	Fuse C2 - Hazard warning and trailer warning	Purple/green
3	Header joint HJ1/2	Green/red
3	Switch S9/1 - Direction indicator switch (29)	Green/red
4	Not used	
5	Relay R2/8 - Flasher indicator unit (54)	Light green/brown
5	Switch S9/5 - Direction indicator switch (29)	Light green/brown
6	Relay R2/6 - Flasher indicator unit (54)	Light green/pink
7	Header joint HJ3/5	Red/yellow
8	Fuse B5 - Direction indicators and trailer indicators	Green/pink
Switch lights		
A	Header joint HJ2/1 - Light negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

S9 Direction indicator switch



Terminal	Destination	Colour Code
1	Switch S8/3 - Hazard warning switch (28)	Green/red
1	Connector C13/16 - Panel indicator light	Green/red
2	Not used	
3	Not used	
4	Not used	
5	Switch S8/5 - Hazard warning switch (28)	Light green/brown
6	Not used	
7	Connector C13/13 - Panel indicator light	Green/white
7	Switch S8/1 - Hazard warning switch (28)	Green/white
8	Not used	

FOOTSTEP TRACTOR WIRING DIAGRAMS

**REAR HARNESS – 18 SPEEDSHIFT GEARBOX
WORLD WIDE**

Rear harness (Fig. 15)

C18 Rear harness connector – Black

Connects to console harness rear connector C12



Terminal	Destination	Colour Code
1	7 Pin trailer socket '54' (39) - Stop lights	Green/purple
2	Connector C36/4 - Parking brake switch (62)	Black/white
3	Connector C24/3 - Left-hand front direction indicator light	Green/red
4	Connector C23/2 - Left-hand rear direction indicator light	Green/red
4	7 pin trailer socket 'L' (39) - Left-hand direction indicator	Green/red
6	7 pin trailer socket '58R' (39) - Right-hand rear light	Red/black
7	Connector C23/3 - Left-hand rear light	Red/black
7	Connector C67A/1 - Differential lock (66) and four-wheel drive switch lights (67)	Red/black
8	Connector C67A/3 - Differential lock switch (66)	Yellow
9	Connector C24/2 - Left-hand side light	Red/black
10	Connector C20/1 - Right-hand stop light	Green/purple
11	7 pin trailer socket '58L' (39) - Left-hand rear light	Red/white
12	Connector C19/2 - Right-hand side light	Red/white
13	Connector C23/1 - Left-hand stop light	Green/purple
14	Connector C20/3 - Right-hand rear light	Red/white
15	Differential lock switch (35)	Yellow
16	Connector C25/2 - Rear work light (40)	Blue/pink
17	Connector C33/2 - Four-wheel drive solenoid (63)	Light green
17	Connector C67A/6 - Four-wheel drive switch (67)	Light green
18	Connector C20/2 - Right-hand rear direction indicator light	Green/white
19	Connector C19/3 - Right-hand front direction indicator light	Green/white
19	7 pin trailer socket 'R' (39) - Right-hand rear direction indicator	Green/white
20	Connector C70/1 - Speedshift selector switch (68)	Orange/brown

C19 Right-hand front light connector



Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/12 - Side light	Red/white
3	Connector C18/19 - Direction indicator light	Green/white

C20 Right-hand rear light connector



Terminal	Destination	Colour Code
1	Connector C18/10 - Stop light	Green/purple
2	Connector C18/18 - Direction indicator	Green/white
3	Connector C18/14 - Rear light	Red/white
4	Connector C21 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS**C21 Earth – Chassis connections****C22 Number plate connector**

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Trailer socket 58R (39)	Red/black

C23 Left-hand rear light connector

Terminal	Destination	Colour Code
1	Connector C18/13 - Stop light	Green/purple
2	Connector C18/4 - Direction indicator	Green/red
3	Connector C18/7 - Rear light	Red/black
4	Connector C21 - Negative (-)	Black

C24 Left-hand front light connector

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/9 - Side light	Red/black
3	Connector C18/3 - Direction indicator light	Green/red

C25 Rear work light connector

Terminal	Destination	Colour Code
1	Connector C21 - Negative (-)	Black
2	Connector C18/16 - Rear work light	Blue/pink

C33 Four-wheel drive solenoid

Terminal	Destination	Colour Code
1	Connector C36/1 - Parking brake switch (62)	Red/light green
2	Connector 18/17 - Four-wheel drive indicator light	Light green
3	Connector C21 - Negative (-)	Black

FOOTSTEP TRACTOR WIRING DIAGRAMS

C36 Parking brake switch



Terminal	Destination	Colour Code
1	Connector C33/1 - Four-wheel drive solenoid (63)	Red/light green
2	Connector C67A/5 - Four-wheel drive switch (67)	Red/light green
3	Connector C21 - Negative (-)	Black
4	Connector C18/2 - Parking brake indicator light	Black/white

C67A Differential lock and four-wheel drive switches

Connects to connector 67B

Terminal	Destination	Colour Code
1	Connector C18/7 - Switch light supply (+)	Red/black
2	Connector C21 - Negative (-)	Black
3	Connector C18/8 - Differential lock solenoid (19)	Yellow
4	Connector C18/5 - Foot brake switch (33)	Black/light green
5	Connector C36/2 - Parking brake switch (62)	Red/light green
6	Connector C18/17 - Four-wheel drive indicator light	Light green

C67B Differential lock and four-wheel drive switches

Connects to connector 67A

Terminal	Destination	Colour Code
1	Switch S11/1 - Four-wheel drive switch (67)	Red/yellow
2	Switch S11/5 - Four-wheel drive switch (67)	Black
3	Switch S10/1 - Differential lock switch (66)	Yellow
4	Switch S11/6 - Four-wheel drive switch (67)	Black/light green
5	Switch S11/8 - Four-wheel drive switch (67)	Red/light green
6	Switch S11/1 - Four-wheel drive switch (67)	Light green

C69 Speedshift connector

Connects to connector 68



Terminal	Destination	Colour Code
1	Connector C70/2 - Speedshift selector switch (68)	Green
2	Connector C70/3 - Speedshift selector switch (68)	Blue/pink

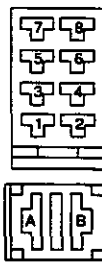
FOOTSTEP TRACTOR WIRING DIAGRAMS

C70 Speedshift switch connector



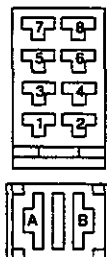
Terminal	Destination	Colour Code
1	Connector C18/20 - Speedshift solenoid (59)	Orange/brown
2	Connector C69/1 - Fuse A2 power supply (+)	Green
3	Connector C69/2 - Speedshift indicator light 'Fast'	Green/red

S10 Differential lock switch



Terminal	Destination	Colour Code
1	Connector C67B/3 - Differential lock solenoid (19)	Yellow
2	Not used	
3	Not used	
4	Not used	
5	Switch S11/5 - Four-wheel drive switch (67)	Black
5	Switches S10/B and S11/B - Switch light negative (-)	Black
6	Not used	
7	Not used	
8	Not used	
Switch lights		
A	Switch S10/5 - Differential lock switch (66)	Red/yellow
A	Switch S11/5 - Four-wheel drive switch light (67)	Red/yellow
B	Switch S10/6 - Differential lock switch (66)	Black
B	Switch S11/6 - Four-wheel drive switch light (67)	Black

S11 Four-wheel drive switch







































































Terminal	Destination	Colour Code
1	Connector C67B/6 - Four-wheel drive indicator light	Light green
2	Not used	
3	Not used	
4	Not used	
5	Switches S11/B - Differential lock switch light (66)	Black
6	Connector C67B/4 - Foot brake switch (58)	Black/light green
7	Not used	
8	Connector C67B/5 - Parking brake switch (62)	Red/light green
Switch lights		
A	Switch S10/A - Differential lock switch (66)	Red/yellow
A	Connector C67B - Power supply (+)	Red/yellow
B	Switch S10/B - Differential lock switch (66)	Black
B	Switch - Negative (-)	Black

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FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
60		SPEEDSHIFT "SLOW" INDICATOR LIGHT
61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

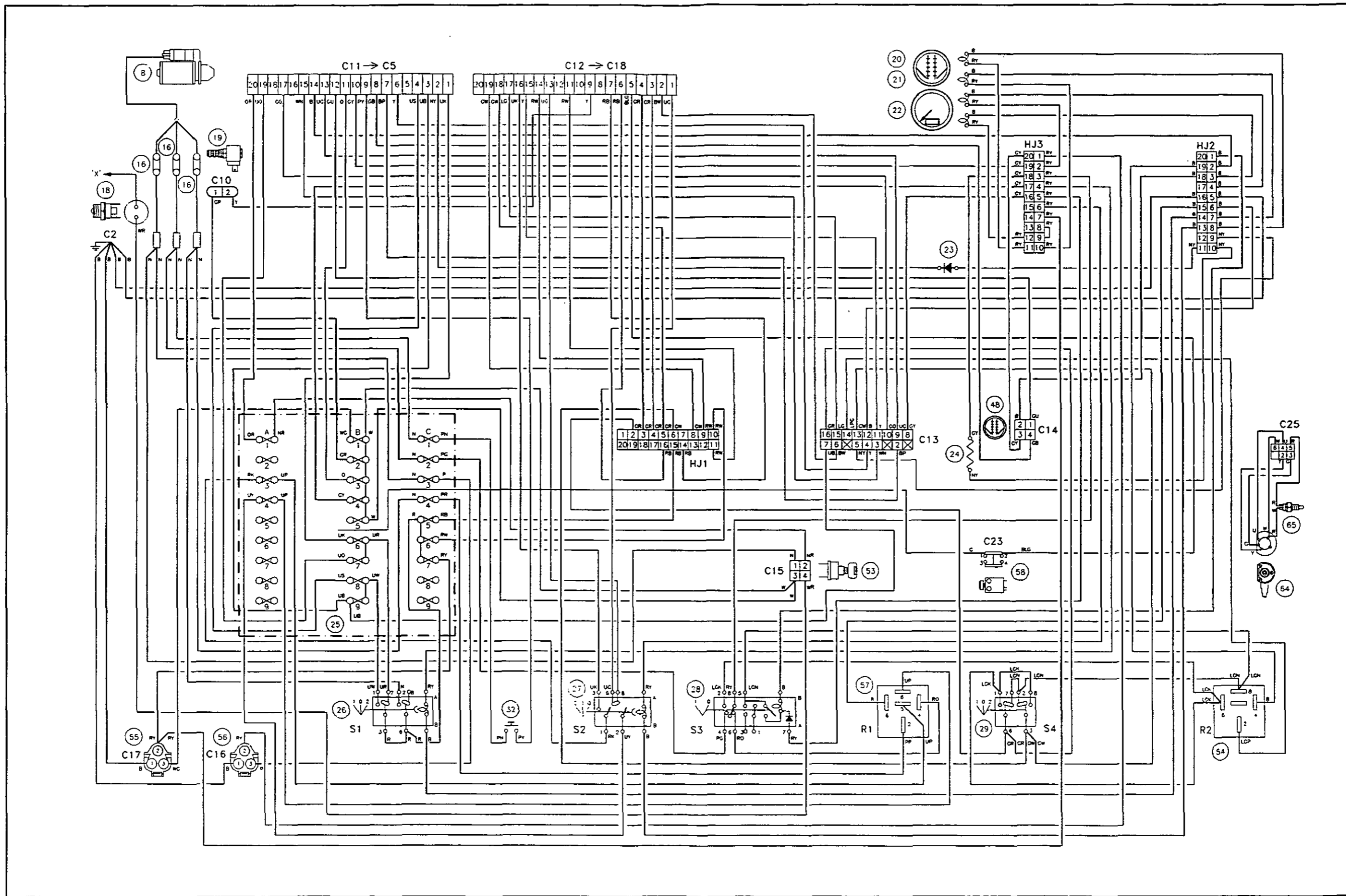


















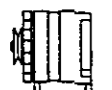


































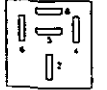





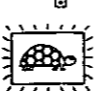
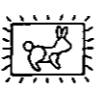


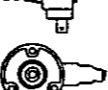






Figure 8. Console Harness - 12 x 12 Gearbox
North America Only

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
60		SPEEDSHIFT "SLOW" INDICATOR LIGHT
61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

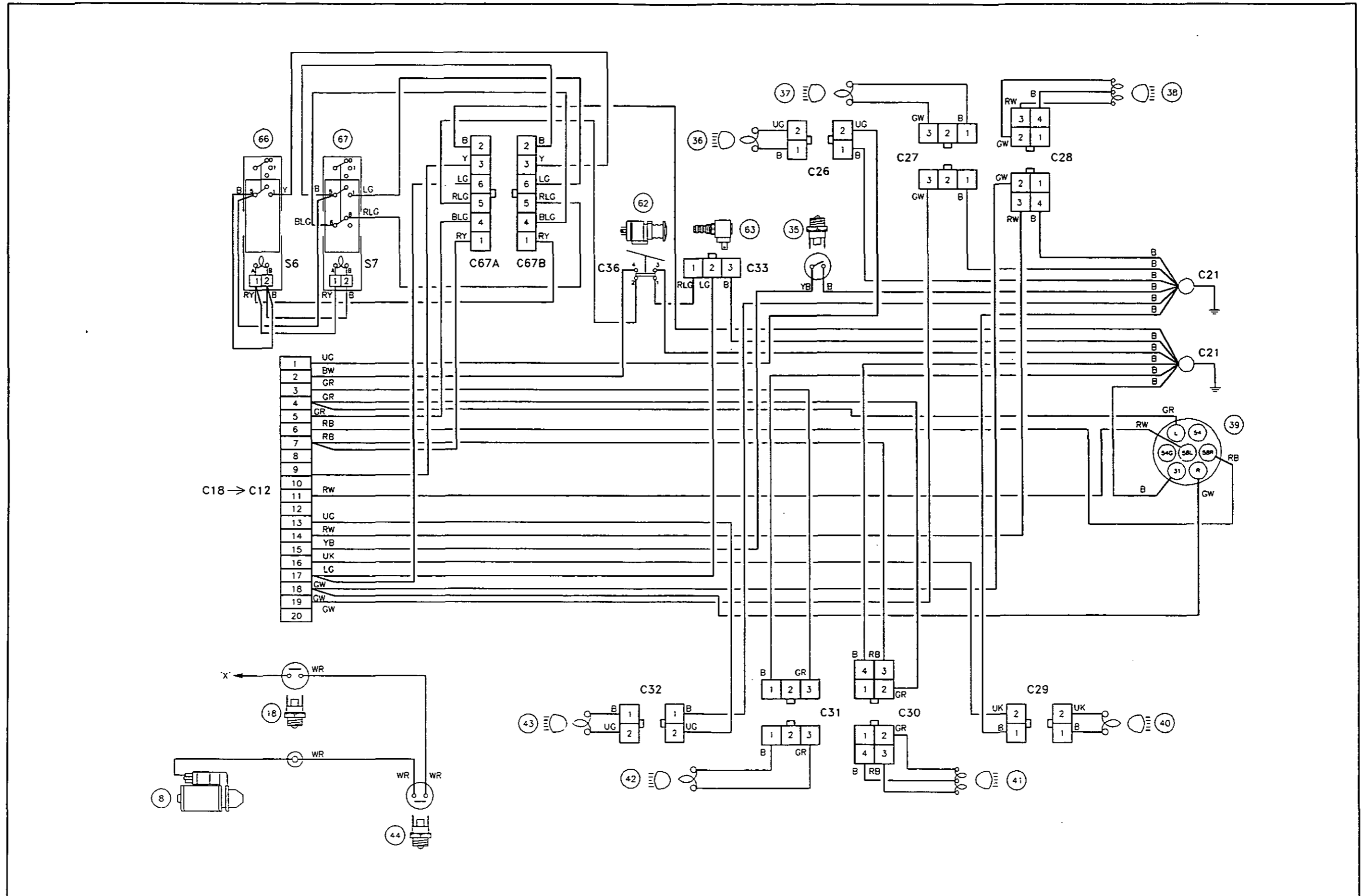














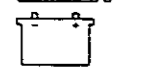


















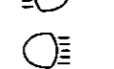

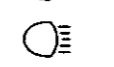











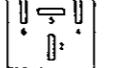



















Figure 9. Rear Harness - 12 x 12 Gearbox
North America Only

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
60		SPEEDSHIFT "SLOW" INDICATOR LIGHT
61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

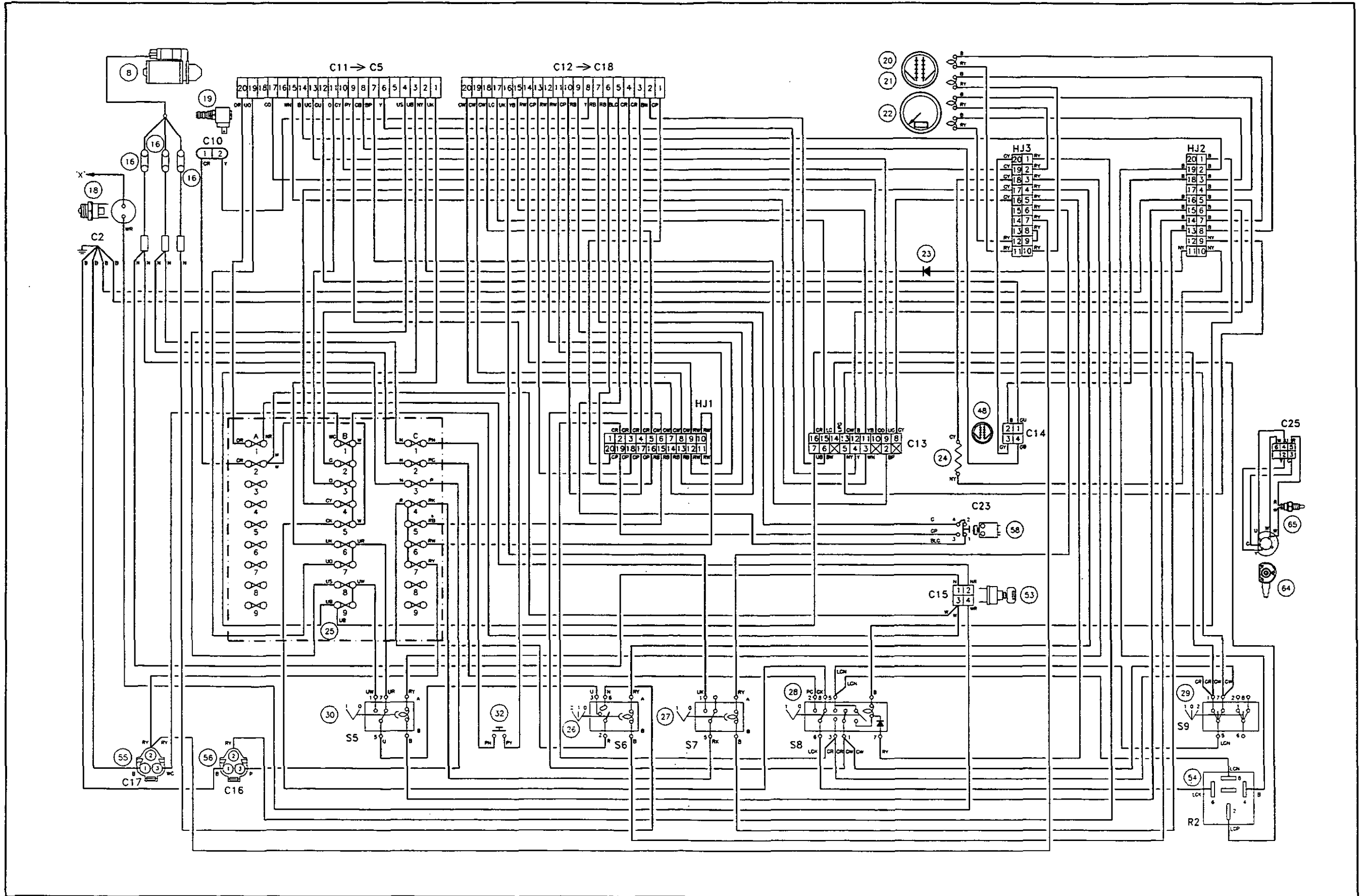






































































Figure 10. Console Harness - 12 x 12 Gearbox
World wide

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
60		SPEEDSHIFT "SLOW" INDICATOR LIGHT
61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

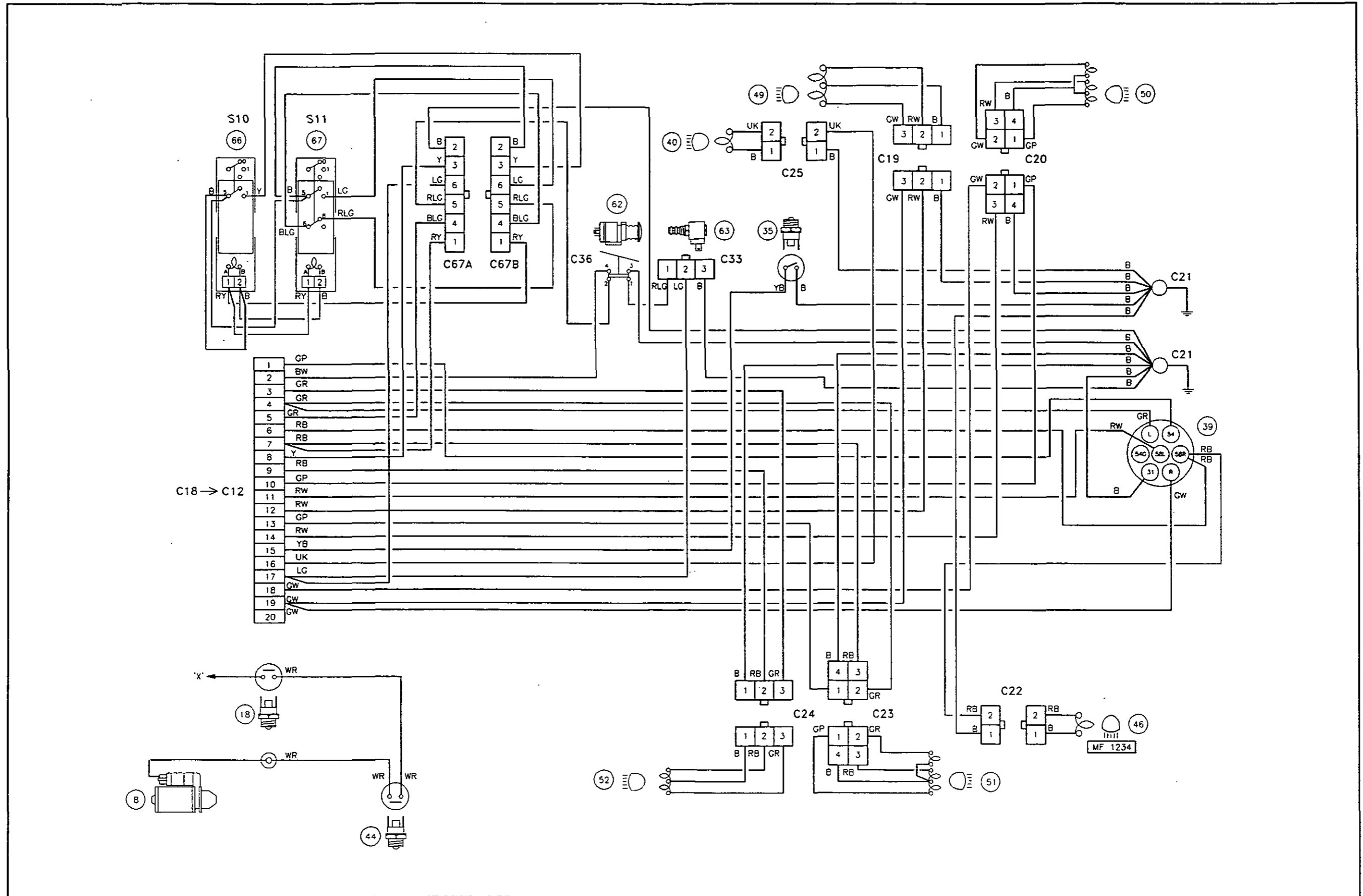



































































Figure 11. Rear Harness - 12 x 12 Gearbox
World wide

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTART	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
60		SPEEDSHIFT "SLOW" INDICATOR LIGHT
61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

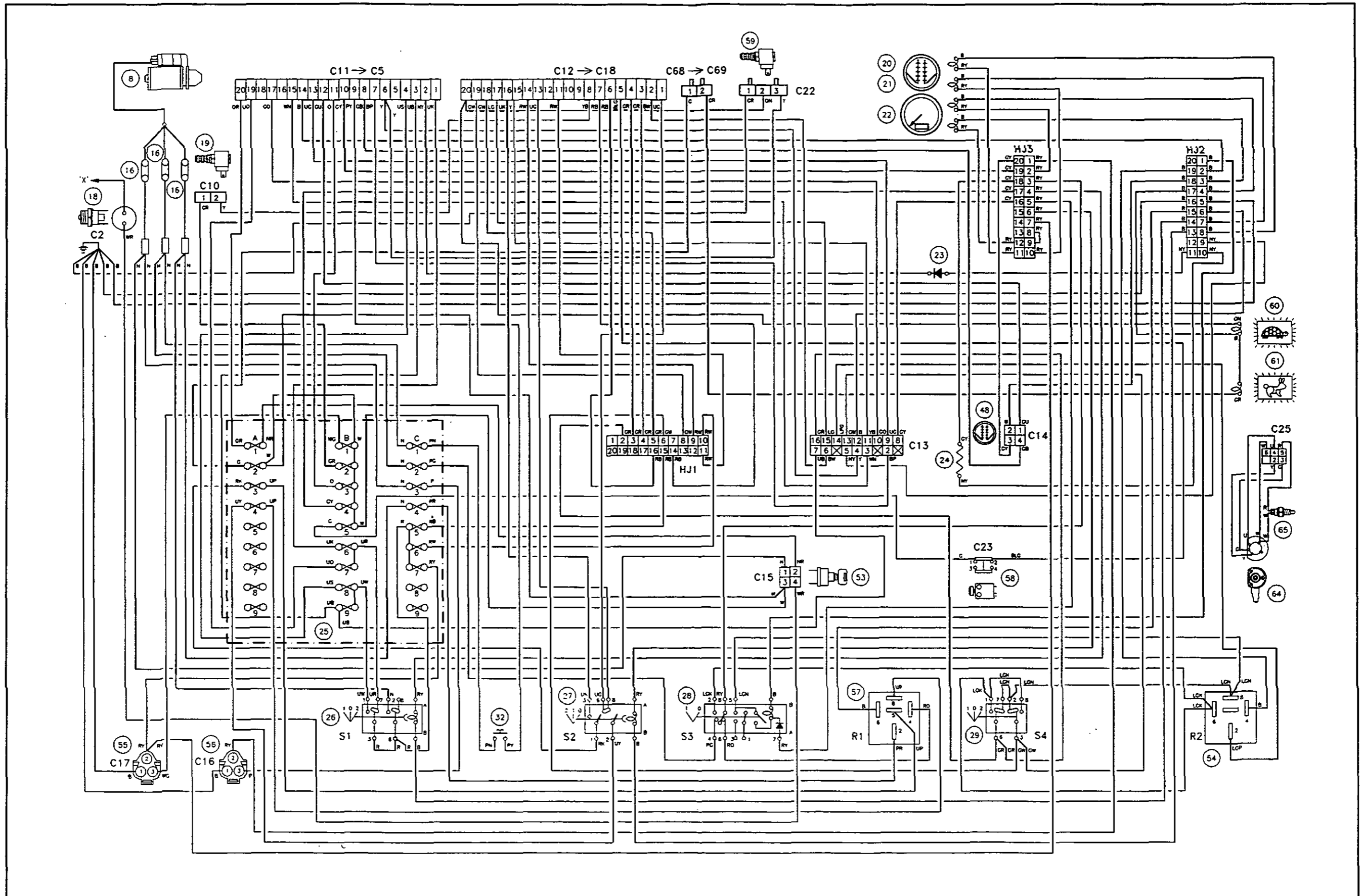














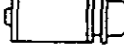


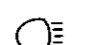





























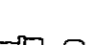

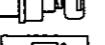

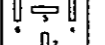

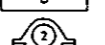





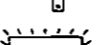
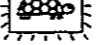


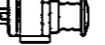






Figure 12. Console Harness - 18 Speedshift Gearbox
North America Only

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
60		SPEEDSHIFT "SLOW" INDICATOR LIGHT
61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

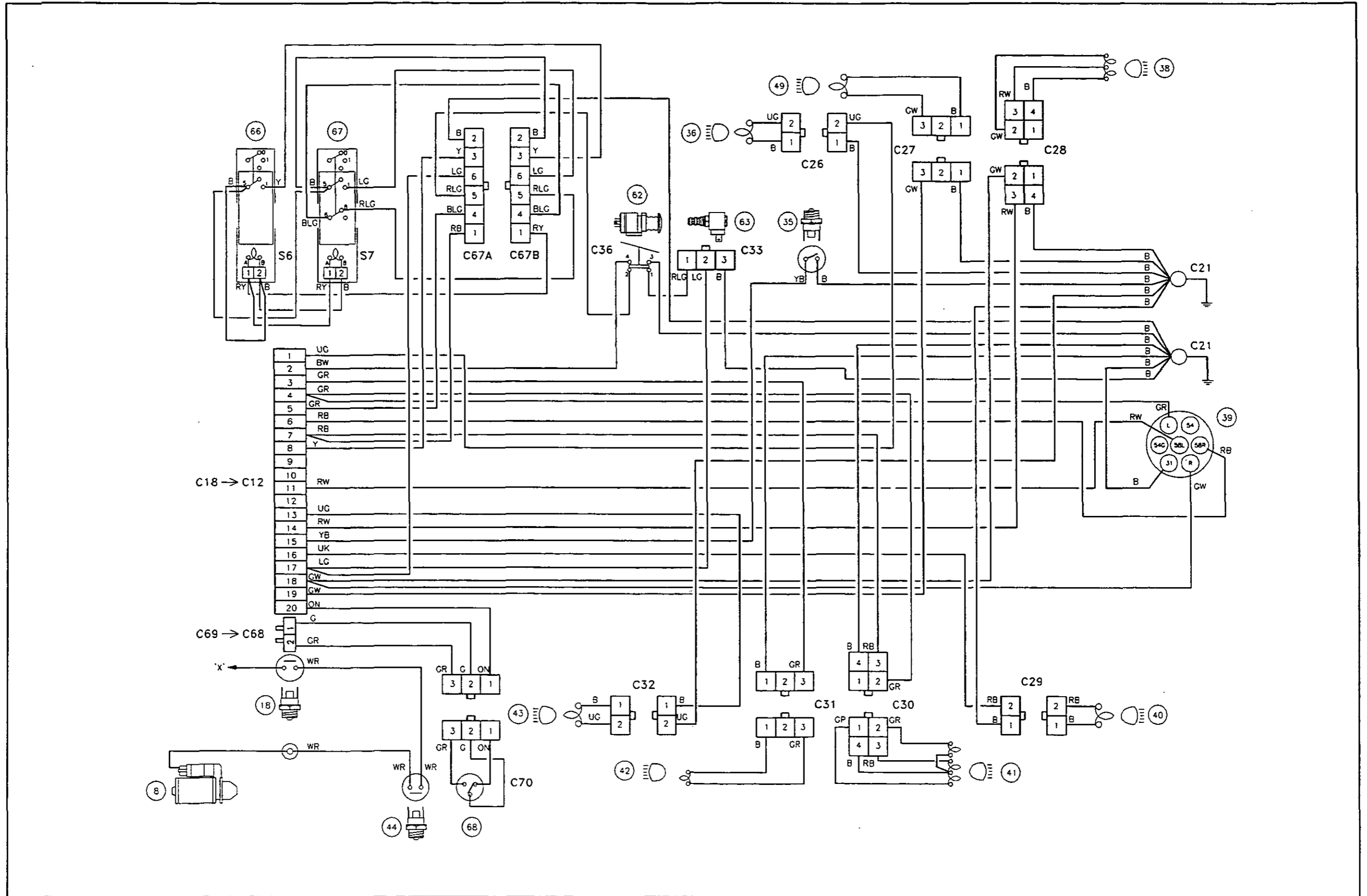




































































Figure 13. Rear Harness - 18 Speedshift Gearbox
North America Only

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY (IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTART	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT			
18		GEARBOX SAFETY START SWITCH	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	48		FUEL AND WATER TEMPERATURE GAUGE
20		FUEL GAUGE ILLUMINATION	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
24		WORK LIGHT RESISTOR (PART OF HARNESS)	53		STARTER SWITCH
25		FUSE BOX	54		FLASHING INDICATOR UNIT
26		LIGHTING SWITCH	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
27		WORK LIGHT SWITCH	56		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
28		HAZARD WARNING SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
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61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

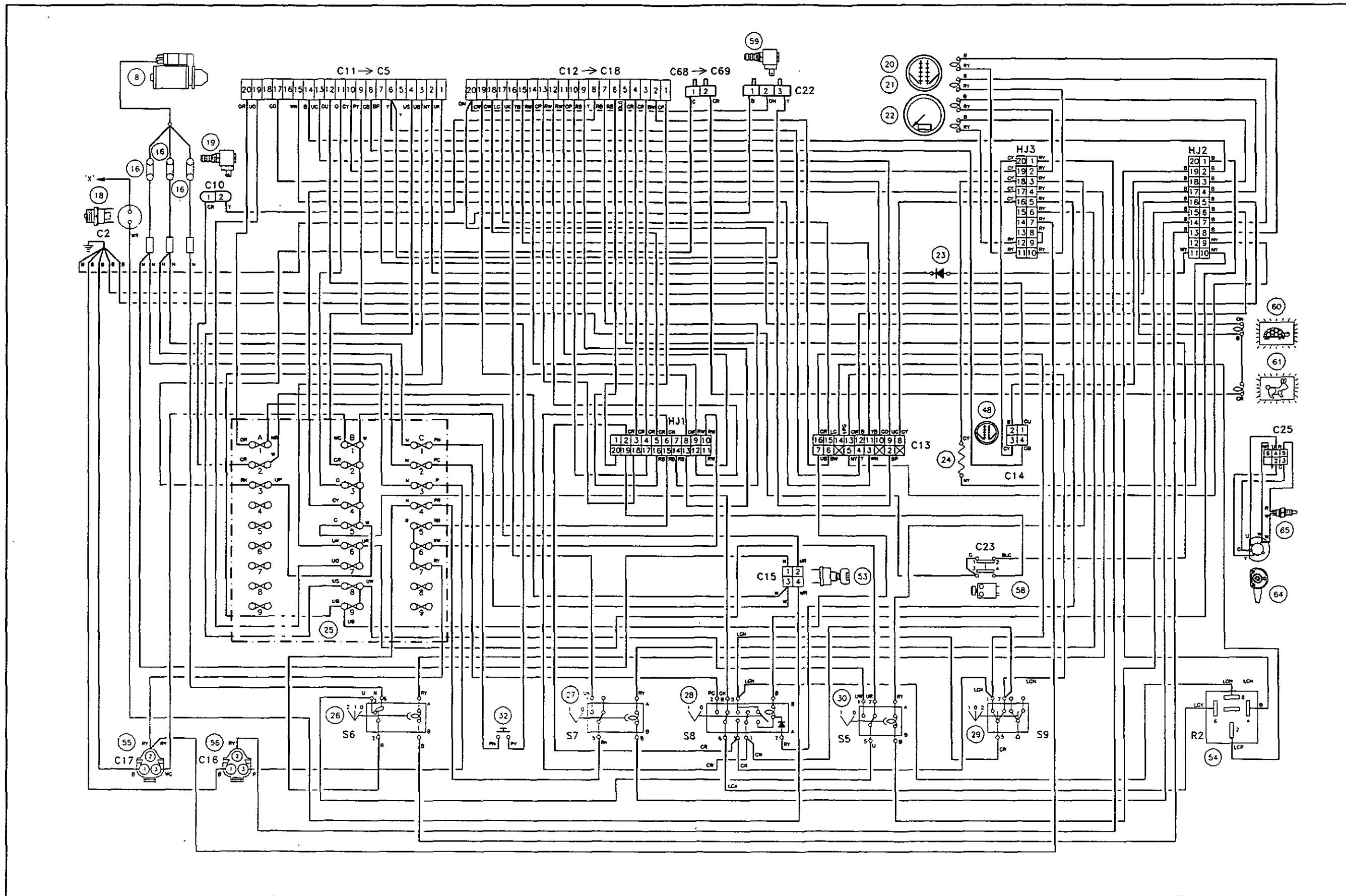














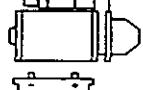


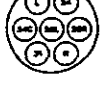





























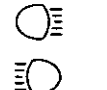

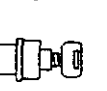

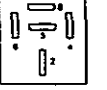















Figure 14. Console Harness - 18 Speedshift Gearbox
World wide

FOOTSTEP TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

1		HORN	31		STOP LIGHT SWITCH
2		LEFT-HAND HEAD LIGHTS	32		HORN PUSH
3		FUEL TANK SENDER UNIT	33		FOUR WHEEL DRIVE INDICATOR LIGHT SWITCH
4		AIR FILTER SWITCH	34		PARKING BRAKE SWITCH
5		WATER TEMPERATURE TRANSMITTER	35		DIFFERENTIAL LOCK INDICATOR SWITCH
6		FUEL CUT-OFF VALVE	36		FRONT RIGHT-HAND WORK LIGHT
7		ENGINE OIL PRESSURE SWITCH	37		RIGHT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
8		STARTER MOTOR AND SOLENOID	38		REAR RIGHT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
9		BATTERY(IES)	39		7 PIN TRAILER SOCKET
10		ALTERNATOR	40		REAR WORK LIGHT
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	41		REAR LEFT-HAND FLASHING AND REAR LIGHT (NORTH AMERICA ONLY)
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	42		LEFT-HAND FLASHING INDICATOR LIGHT (NORTH AMERICA ONLY)
13		THERMOSTAT	43		FRONT LEFT-HAND WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	44		PTO SAFETY START SWITCH
15		LOW HYDRAULIC OIL PRESSURE SWITCH	45		RED REAR LIGHT (NORTH AMERICA ONLY)
16		FUSIBLE LINKS	46		NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	47		TACHOMETER (SIX CYLINDER ENGINES ONLY)
18		GEARBOX SAFETY START SWITCH	48		FUEL AND WATER TEMPERATURE GAUGE
19		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	49		RIGHT-HAND SIDE AND DIRECTION INDICATOR LIGHT
20		FUEL GAUGE ILLUMINATION	50		RIGHT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
21		WATER TEMPERATURE AND FUEL GAUGE ILLUMINATION	51		LEFT-HAND REAR, STOP AND DIRECTION INDICATOR LIGHT
22		TACHOMETER ILLUMINATION	52		LEFT-HAND SIDE AND DIRECTION INDICATOR LIGHT
23		CHARGE CIRCUIT DIODE (PART OF HARNESS)	53		STARTER SWITCH
24		WORK LIGHT RESISTOR (PART OF HARNESS)	54		FLASHING INDICATOR UNIT
25		FUSE BOX	55		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
26		LIGHTING SWITCH	56		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
27		WORK LIGHT SWITCH	57		WORK LIGHT RELAY (NORTH AMERICA ONLY)
28		HAZARD WARNING SWITCH			
29		DIRECTION INDICATOR SWITCH			
30		HEAD LIGHT DIP SWITCH			

58		STOP LIGHT SWITCH-FOOT BRAKES
59		SPEEDSHIFT SOLENOID
60		SPEEDSHIFT "SLOW" INDICATOR LIGHT
61		SPEEDSHIFT "FAST" INDICATOR LIGHT
62		PARKING BRAKE SWITCH
63		FOUR WHEEL DRIVE SOLENOID
64		RANGE SPEED INDICATOR SWITCH
65		CREEPER INDICATOR SWITCH
66		DIFFERENTIAL LOCK SWITCH
67		FOUR WHEEL DRIVE SWITCH
68		SPEEDSHIFT SELECTOR SWITCH

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

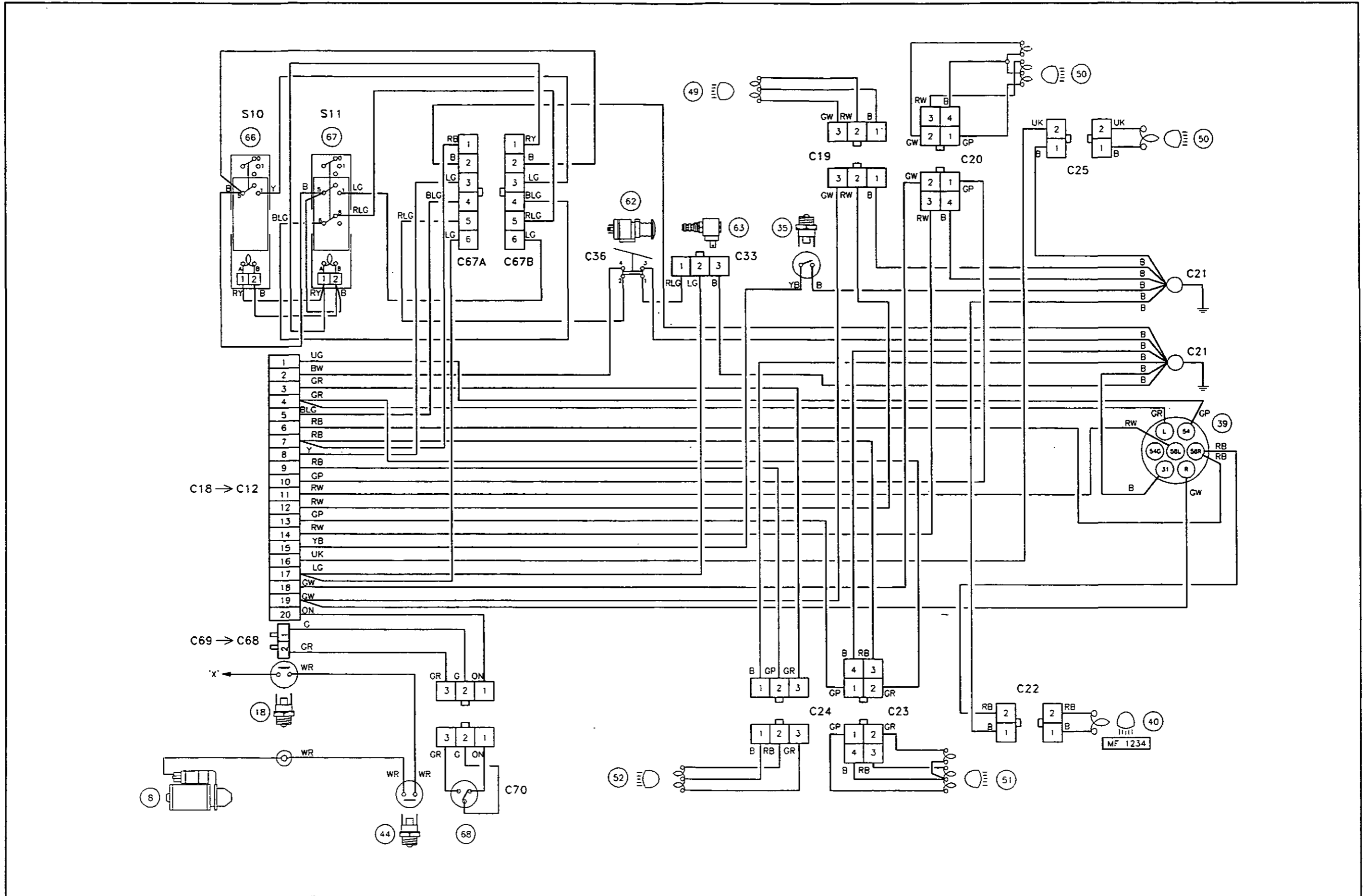


Figure 15. Rear Harness - 18 Speedshift Gearbox
World wide

WIRING DIAGRAMS – CAB TRACTORS**Section 14 – Part D**Table of Contents

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Electrical wiring diagrams

These electrical wiring diagrams are for cab tractors manufactured from May 1993, serial number B18009 onwards. The electrical wiring diagrams have been laid out in accordance with each harness fitted to the tractor, starting at the front and working through to the rear of the tractor. All the electrical components are numbered, and where possible a small emblem is used to illustrate the component for easy reference. The component list on the opposite page describes the part and shows the emblem. The wiring colour code is also given.

Due to the complexity of the diagrams and to help with diagnosis, details are given in the first part of this section on the layout of all connectors, pin numbers and the destination of every wire and its colour code. The various connectors are numbered as follows:-

C = Connector

HJ = Header joint

R = Relay or flasher unit

S = Switch

Each connector, header joint, relay and switch is numbered, e.g. C5 = connector number five. In the listing under connector C5 an illustration shows the plug or socket and all the terminal or pin numbers, the destination of each wire is described and the terminal number of the connector to which the wire destined, e.g. Terminal 2 goes to Connector C1/3 Alternator, This means the the wire from terminal 2 goes to connector C1 terminal 3. This method is used for all connectors, joints, relays and switches.

CAB TRACTOR WIRING DIAGRAMS

ENGINE HARNESS

Front engine harness three cylinder engines (Fig. 1)

Front engine harness four cylinder engines (Fig. 2)

Front engine harness six cylinder engines (Fig. 3)

C1 Alternator connector



Terminal No.	Destination	Colour Code
1	Starter motor and battery - Positive (+)	Brown
2	Starter motor and battery - Positive (+)	Brown
3	Connector C5/2 - Alternator warning light	Brown /yellow
Eyelet connector		
4	Connector C6/1 - Tachometer (18)	White/grey

C2 Earth to engine cylinder block



C3 Earth to alternator body



C4 Hydraulic oil filter temperature and pressure switch connector

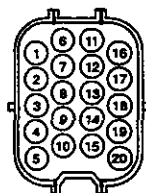


Terminal No.	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C5/7 - Warning light hydraulic filter blocked	Black/purple
3	Not used	

CAB TRACTOR WIRING DIAGRAMS

C5 Front harness connector – Red

Connects to connector C12



Terminal No.	Destination	Colour Code
1	Connector C7/2 - Left-hand head light dip beam (2)	Blue/pink
2	Connector C1/3 - Alternator (10)	Brown/yellow
3	Connector C9/1 - Right-hand headlight main beam (17)	Blue/black
4	Connector C7/1 - Left-hand headlight main beam (2)	Blue/grey
5	Connector C10/1 - Air conditioning low pressure switch	Yellow
6	Low hydraulic oil pressure switch (15)	Yellow
7	Connector C4/2 - Hydraulic oil filter warning switches (11 & 12)	Black/purple
8	Connector C8/2 - Fuel tank sender unit - Fuel level (3)	Green/black
9	Horn (1)	Purple/yellow
10	Connector C6/2 - Tachometer (18)	Green/yellow
11	Fuel cut-off valve (6) - Six cylinder engines only	Orange
12	Water temperature transmitter (5)	Green/blue
13	Air cleaner switch (4)	Blue/green
14	Not used (Three cylinder engines)	
14	Connector C2 - Earth to engine cylinder block (-)	Black
14	Connector C6/3 - Tachometer (47) (Six cylinder engines)	Black
14	Engine speed sensor (14) (Six cylinder engines)	Black
15	Engine oil pressure switch (7)	White/brown
16	Connector C10/3 - Air conditioning compressor (19)	Purple/black
17	Connector C8/3 - Low fuel warning (3)	Green/orange
18	Connector C10/4 - Air conditioning low pressure switch (20)	Black/yellow
19	Connector C9/2 - Right-hand head light dip beam (17)	Blue/orange
20	Thermostart (13)	Orange/red

C6 Tachometer connector



Terminal No.	Destination	Colour Code
1	Alternator speed sensor terminal (Three and four cylinder engines)	White/grey
1	Engine speed sensor (14) (Six cylinder engines)	White/grey
2	Connector C5/10 - Tachometer	Green/yellow
3	Connector C2 - Earth to engine cylinder block (-) (Three and four cylinder engines)	Black
3	Connector C5/14 - Negative (-) (Six cylinder engines)	Black
4	Not used	

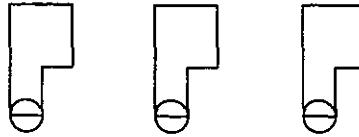
C7 Left-hand head light connector



Terminal No.	Destination	Colour Code
1	Connector C5/4 - Left-hand head light main beam	Blue/grey
2	Connector C5/1 - Left-hand head light dip beam	Blue/pink
3	Connector C2 - Earth to engine cylinder block (-)	Black

CAB TRACTOR WIRING DIAGRAMS

C8 Fuel tank sender unit connector



Terminal No.	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-) Plain terminal	Black
2	Connector C5/8 - Fuel tank contents - White terminal	Green/black
3	Connector C5/17 - Low fuel warning - Red terminal	Green/orange

C9 Right-hand head light connector



Terminal No.	Destination	Colour Code
1	Connector C5/3 - Right-hand head light main beam	Blue/black
2	Connector C5/19 - Right-hand head light dip beam	Blue/orange
3	Connector C2 - Earth to engine cylinder block (-)	Black

C10 Air conditioning compressor and low pressure switch connector



1	Connector C5/5 - Low pressure switch	Blue/yellow
2	Connector C2 - Earth to engine cylinder block (-)	Black
3	Connector C5/16 - Compressor	Purple/black
4	Connector C5/18 - Low pressure switch	Black/yellow

**CONSOLE HARNESS
WORLD WIDE**

Console harness (Fig. 4)

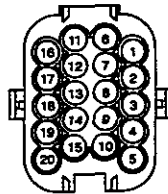
C11 Differential lock solenoid connector



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C13/19 - Differential lock warning light	Yellow/black

C12 Front harness connector – Red

Connects to connector C5

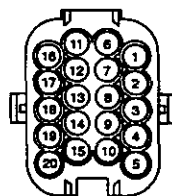


Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light dip beam	Blue/pink
2	Charge circuit diode (26)	Brown/yellow
3	Fuse B9 - Right-hand head light main beam	Blue/black
4	Fuse B8 - Left-hand head light main beam	Blue/grey
5	Connector C13/8 - Air conditioning low pressure switch	Blue/yellow
6	Connector C14/4 - Hydraulic pressure warning light	Yellow
7	Connector C14/2 - Hydraulic oil filter warning light	Black/purple
8	Connector C15/4 - Fuel gauge (39)	Green/black
9	Connector C19/8 - Column switch (31) - Horn	Purple/yellow
10	Header joint HJ3/18- Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C15/1 - Water temperature gauge (39)	Green/blue
13	Connector C14/9 - Air filter warning light	Blue/green
14	Header Joint HJ2/20 - Negative (-)	Black
15	Connector C14/3 - Engine oil pressure warning light	White/brown
16	Relay R3/8 - Air conditioning (38)	Purple/black
17	Connector C14/10 - Low fuel warning light	Green/orange
18	Relay R3/4 - Air conditioning (38)	Black/yellow
19	Fuse B7 - Right-hand head light dip beam	Blue/orange
20	Fuse A1 - Thermostart	Orange/red

CAB TRACTOR WIRING DIAGRAMS

C13 Rear harness connector – Black

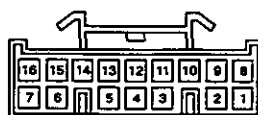
Connects to connector C30



Terminal	Destination	Colour Code
1	Header joint HJ1/20 - Trailer stop light	Green/purple
2	Connector C14/6 - Parking brake warning light	Black/white
3	Connector C14/11 - Differential lock indicator light	Yellow/black
4	Header joint HJ1/5 - Left-hand rear direction indicator light	Green/red
5	Fuse A7 - Front work lights	Blue/yellow
6	Fuse C5 - Trailer left-hand side/rear light	Red/black
7	Fuse C5 -Left-hand side/ rear light	Red/black
8	Connector C12/5 - Air conditioning low pressure switch	Blue/yellow
9	Connector C14/15 - Four wheel drive indicator light	Light green
10	Header joint HJ1/17 - Right-hand stop light	Green/purple
11	Fuse C6 - Trailer right-hand side/rear light	Red/white
12	Fuse C6 - Right-hand side/rear light	Red/white
13	Header joint HJ1/18 - Stop light	Green/purple
14	Connector C17/2 - Auxiliary supply red (34) - switch illumination	Red/yellow
15	Fuse A2 - Differential lock	Yellow
16	Fuse A4 - Fused cab supply (+)	Green
17	Connector C23/1 - Stop light switch (33) - Foot brake	Black/Light green
18	Header joint HJ1/1 - Right-hand rear direction indicator light	Green/white
19	Connector C11/2 - Differential lock solenoid (22)	Yellow/black
20	Fuse A8 - Rear work light	Red/pink

C14 Instrument panel warning lights connector

See also page 14A-42



Terminal	Destination	Colour Code
1	Relay R4/3 - Direction indicator flasher unit (48)	Light green/red
2	Connector C12/7 - Hydraulic oil filter	Black/purple
3	Connector C12/15 - Engine oil pressure	White/brown
4	Connector C12/6 - Low hydraulic oil pressure	Yellow
5	Header joint HJ2/11 - Alternator charge	Brown/yellow
6	Connector C13/2 - Parking brake	Black/white
7	Fuse B9 - Head light main beam	Blue/black
8	Header joint HJ3/17 - Positive (+)	Green/yellow
9	Connector C12/13 - Air filter	Blue/green
10	Connector C12/17 - Low fuel	Green/orange
11	Connector C13/3 - Differential lock	Yellow/black
12	Header joint HJ2/8 - Negative (-)	Black
13	Switch S1/1 - Direction indicator switch (29) - Right-hand indicator	Green/white
14	Relay R4/2 - Direction indicator flasher unit (R2)	Light green/purple
15	Connector C13/9 - Four wheel drive	Light green
16	Switch S1/3 - Direction indicator switch (29) - Left-hand indicator	Green/red

CAB TRACTOR WIRING DIAGRAMS

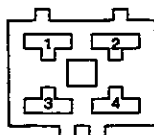
C15 Fuel level and water temperature gauge connector

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C12/12 - Water temperature	Green/blue
2	Header joint HJ2/17 - Negative (-)	Black
3	Header joint HJ3/19 - Positive (+)	Green/yellow
4	Connector C12/8 - Fuel tank sender	Green/black

C16 Ignition switch connector



Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse B1 - Auxiliary power supply	White
	Fuse A4 - Fused cab supply	White
4	Gearbox safety start switch (21)	White/red

C17 Non-ignition switched auxiliary supply connector- Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/12 - Positive (+)	Red/yellow
	Connector C13/14 - Switch light	Red/yellow
3	Fuse C3 - Auxiliary positive (+)	Purple

C18 Ignition switched auxiliary supply connector - Black

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/5 - Positive (+)	Red/yellow
	Fuse C7 - Switch light	Red/yellow
3	Fuse B1 - Auxiliary positive (+)	White/green

C19 Steering column switch connector

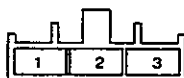


Terminal	Destination	Colour Code
1	Terminal 4 on connector	Purple/brown
2	Not used	
3	Relay R1/4 - Head light flash relay (36)	Black/blue
4	Terminal 1 on connector	Purple/brown
	Fuse C1 - Horn	Purple/brown
5	Header joint HJ1/2	Green/white
6	Switch S1/5 - Hazard warning switch (30)	Light green/brown
7	Header joint HJ1/6	Green/red
8	Connector C12/9 - Horn	Purple/yellow

CAB TRACTOR WIRING DIAGRAMS

C20 Cab main supply connector

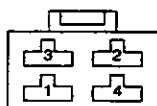
Connects to connector C31



Terminal	Destination	Colour Code
1.	Fusible link - Power supply to cab roof	Brown
2.	Fusible link - Power supply to cab roof	Brown
3.	Fusible link - Power supply to cab roof	Brown

C21 Speedshift connector

Connects to connector C32



Terminal	Destination	Colour Code
1	Fuse C8 - Rear power supply	Purple
2	Connector C22/2 - Speedshift solenoid (43)	Orange/brown
	Speedshift indicator light - 'Slow' (46)	Orange/brown
3	Speedshift indicator light - 'Fast' (47)	Green/red

C22 Speedshift solenoid connector



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C21/2 - Speedshift	Orange/brown
3	Not used	

C23 Stop light switch connector



Terminal	Destination	Colour Code
1	Connector C13/17 - Four-wheel drive switch	Black/light green
2	Fuse B2 - Stop light	Green
3	Fuse B2 - Stop light - Connected to terminal 2	Green
4	Header joint HJ1/19	Green/purple

C24 Heater fan motor connector



Terminal	Destination	Colour Code
1	Fuse A3 - Heater fan motor	Brown/blue
2	Connector C2 - Earth to engine cylinder block (-)	Black

CAB TRACTOR WIRING DIAGRAMS

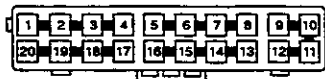
C25 Range change indicator lights and creeper connector

See also page 14A-42



Terminal	Destination	Colour Code
1	Not used	
2	Range speed indicator switch (49) - 'Low' range	Yellow
3	Range speed indicator switch (49) - 'Medium' range	Green
4	Range speed indicator switch (49) - 'High' range	Blue
5	Creeper indicator switch (50)	Red
6	Range speed indicator switch (49) and creeper switch (50) - Supply (+)	White

HJ1 Header joint 1 – Yellow



Terminal	Destination	Colour Code
Terminals 4, 8, 9, 10, 11, 12, 13, 14, 15 and 16 - Not used		
1	Connector C13/18 - Right-hand rear direction indicator	Green/white
2	Connector C19/5 - Steering column switch (31) - Direction indicator	Green/white
3	Switch S1/1 - Hazard warning switch (30)	Green/white
5	Connector C13/4 - Left-hand direction indicator	Green/red
6	Connector C19/7 - Steering column switch (30) - Direction indicator	Green/red
7	Switch S1/3 - Hazard warning switch (30)	Green/red
17	Connector C13/10 - Right-hand stop light	Green/purple
18	Connector C13/13 - Stop light	Green/purple
19	Connector C23/4 - Stop light switch (33)	Green/purple
20	Connector C13/1 - Trailer stop light	Green/purple

HJ2 Header joint 2 – Grey



Terminal	Destination	Colour Code
1	Relay R3/6 - Air conditioning relay (38)	Black
2	Switch S1/A - Hazard warning switch (30) - Indicator light	Black
3	Relay R2/6 - Work light relay (37)	Black
4	Switch S2/B - Side and head light switch (29) - Switch light	Black
5	Connection C2 - Earth to engine cylinder block (-)	Black
6	Switch S3/B - Head light dip switch (32) - Switch light	Black
7	Relay R4/1 - Direction indicator flasher unit (48)	Black
8	Connector C14/12 - Negative (-)	Black
9	Work light resistor (27)	Brown/yellow
10	Charge circuit diode (26)	Brown/yellow
11	Connector C14/5 - Alternator charge warning	Brown/yellow
12	Not used	
13	Switch S4/B - Heater motor switch (42) - Switch light	Black
14	Tachometer illumination (25)	Black
15	Tachometer illumination (25)	Black
16	Connector C2 - Earth to engine cylinder block (-)	Black
17	Connector C15/2 - Fuel and temperature gauge (39)	Black
18	Fuel and temperature gauge illumination (23)	Black
19	Fuel and temperature gauge illumination (24)	Black
20	Connector C12/14 - Negative (-)	Black

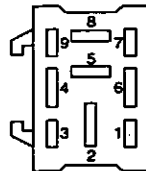
CAB TRACTOR WIRING DIAGRAMS

HJ3 Header joint 3 – Grey



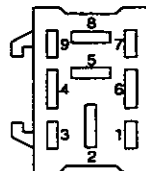
Terminal	Destination	Colour Code
1	Switch S4/A - Heater fan motor switch (42) - Switch light	Red/yellow
2	Fuel and water gauge illumination (23 & 24)	Red/yellow
3	Switch S1/7 - Hazard warning switch (30) - Switch light	Red/yellow
4	Tachometer illumination (25)	Red/yellow
5	Connector C18/2 - Auxiliary supply black (35) - Switch light	Red/yellow
6	Tachometer illumination (25)	Red/yellow
7	Not used	
8	Connected to terminal 9	Red/yellow
9	Connected to terminal 8	Red/yellow
10	Switch S2/A - Side and head light switch (32) - Switch light	Red/yellow
11	Switch S3/A - Head light dip switch (32) - Switch light	Red/yellow
12	Connector C17/2 - Auxiliary power socket red (34) - Switch light	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Fuse B4 - Instrument panel	Green/yellow
17	Connector C14/8 - Instrument light panel supply (+)	Green/yellow
18	Connector C12/10 - Tachometer	Green/yellow
19	Connector C15/3 - Fuel and temperature gauge (39)	Green/yellow
20	Work light resistor (27)	Green/yellow

R1 Head lamp flash relay – Yellow



Terminal	Destination	Colour Code
Terminals 1, 3, 5, 7 and 9	Not used	
2	Fusible link (16)	Brown
4	Connector C19/3 - Steering column switch (31) - Head light flash	Black/blue
6	Connector C2 - Earth to engine cylinder block (-)	Black
8	Fuse B8 and B9 - Left and right-hand head lights main beam	Blue/white

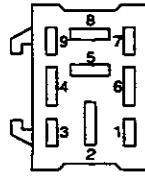
R2 Work light relay – Red



Terminal	Destination	Colour Code
Terminals 1, 3, 5, 7, and 9	Not used	
2	Fuse A6 - Work lights	Purple/red
4	Fuse C7 - Instrument panel illumination	Red/yellow
6	Connector C2 - Earth to engine cylinder block (-)	Black
8	Fuse A7 - Front work lights	Blue/purple
	Fuse A8 - Rear work lights	Blue/purple

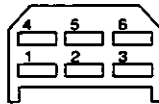
CAB TRACTOR WIRING DIAGRAMS

R3 Air conditioning relay – Blue



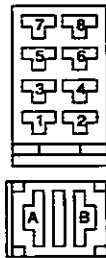
Terminal	Destination	Colour Code
Terminals 1, 3, 5, 7, and 9 - Not used		
2	Fuse C4 - Air conditioning	Purple/blue
4	Connector C12/18 - Air conditioning low pressure switch	Black/yellow
6	Header junction HJ2/1 - Negative supply (-)	Black
8	Connector C12/16 - Air conditioning compressor	Purple/black

R4 Direction indicator flasher unit – Blue



Terminal	Destination	Colour Code
1	Header junction HJ2/7 - Negative (-)	Black
2	Connector C14/14 - Direction indicator light	Light green/purple
3	Connector C14/1 - Trailer 2 indicator light	Light green/red
4	Switch S1/5 - Hazard warning switch (30)	Light green/brown
5	Not used	
6	Switch S1/6 - Hazard warning switch (30)	Light green/pink

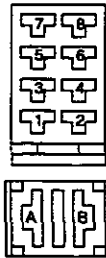
S1 Hazard warning switch



Terminal	Destination	Colour Code
1	Connector C14/13 - Right-hand indicator	Green/white
	Header joint HJ1/3	Green/white
2	Fuse C2 - Hazard warning	Purple/green
3	Header joint HJ1/7	Green/red
	Connector C14/16 - Left-hand indicator	Green/red
4	Not used	
5	Relay R4/4 - Flashing indicator unit (48)	Light green/brown
	Connector C19/6 - Steering column switch (31)	Light green/brown
6	Relay R4/6 - Flashing indicator unit (48)	Light green/pink
7	Header joint HJ3/3 - Switch light	Red/yellow
8	Fuse B5 - Direction indicators	Green/pink
Switch light		
A	Not used	
B	Header joint HJ2/2 - Switch light negative (-)	Black

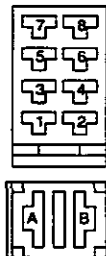
CAB TRACTOR WIRING DIAGRAMS

S2 Side/head light switch



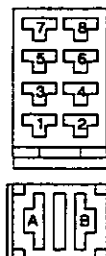
Terminal	Destination	Colour Code
Terminals 1, 4, 5, 7, 8 and 9 - Not used		
2	Fuse C5 and C6 - Left and right-hand side lights	Red
3	Switch S2/5 - Headlight dip switch (32)	Blue
6	Fusible link (16)	Brown
Switch light		
A	Header joint HJ3/10 - Switched positive (+)	Red/yellow
B	Header joint HJ2/4 - Negative (-)	Black

S3 Head light dip switch



Terminal	Destination	Colour Code
Terminals 2, 3, 4, 6, 8 and 9 - Not used		
1	Fuse B8 and B9 - Left and right-hand headlight main beam	Blue/white
5	Switch S2/3 - Side and head light switch (29)	Blue
7	Fuse B6 and B7 - Left and right-hand head light dip beam	Blue/red
Switch light		
A	Header joint HJ3/11 - Switched positive (+)	Red/yellow
B	Header joint HJ2/6 - Negative (-)	Black

S4 Heater fan motor switch



Terminal	Destination	Colour Code
Terminals 2, 4, 6, 7, 8 and 9 - Not used		
1	Motor - 'Fast' speed	Black
3	Connector C24/1 - Supply (+)	Black
5	Motor resistor - 'Slow' speed	White
Switch light		
A	Header joint HJ3/1 - Switched positive (+)	Red/yellow
B	Header joint HJ2/13 - Negative (-)	Black

**CONSOLE HARNESS
NORTH AMERICA**

Console harness (Fig. 5)

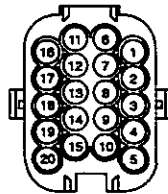
C11 Differential lock solenoid connector



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C13/19 - Differential lock warning light	Yellow/black

C12 Front harness connector – Red

Connects to connector C5

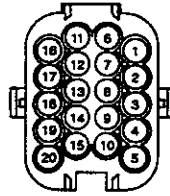


Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light dip beam	Blue/pink
2	Charge circuit diode (26)	Brown/yellow
3	Fuse B9 - Right-hand head light main beam	Blue/black
4	Fuse B8 - Left-hand head light main beam	Blue/grey
5	Connector C13/8 - Air conditioning low pressure switch	Blue/yellow
6	Connector C14/4 - Hydraulic pressure warning light	Yellow
7	Connector C14/2 - Hydraulic oil filter warning light	Black/purple
8	Connector C15/4 - Fuel gauge (39)	Green/black
9	Connector C24/1 - Horn push (51)	Purple/yellow
10	Header joint HJ3/18- Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C15/1 - Water temperature gauge (39)	Green/blue
13	Connector C14/9 - Air filter warning light	Blue/green
14	Header Joint HJ2/20 - Negative (-)	Black
15	Connector C14/3 - Engine oil pressure warning light	White/brown
16	Relay R3/8 - Air conditioning (38)	Purple/black
17	Connector C14/10 - Low fuel warning light	Green/orange
18	Relay R3/4 - Air conditioning (38)	Black/yellow
19	Fuse B7 - Right-hand head light dip beam	Blue/orange
20	Fuse A1 - Thermostat	Orange/red

CAB TRACTOR WIRING DIAGRAMS

C13 Rear harness connector – Black

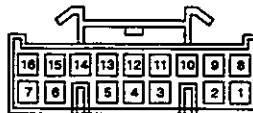
Connects to connector C30



Terminal	Destination	Colour Code
1	Not used	
2	Connector C14/6 - Parking brake warning light	Black/white
3	Connector C14/11 - Differential lock indicator light	Yellow/black
4	Switch S5/3 - Direction indicator switch (54) - Left-hand rear	Green/red
5	Fuse A7 - Front work lights	Blue/yellow
6	Fuse C5 - Trailer left-hand side/rear light	Red/black
7	Fuse C5 -Left-hand side/rear light	Red/black
8	Connector C12/5 - Air conditioning low pressure switch	Blue/yellow
9	Connector C14/15 - Four wheel drive indicator light	Light green
10	Not used	
11	Fuse C6 - Trailer right-hand side/rear light	Red/white
12	Fuse C6 - Right-hand side/rear light	Red/white
13	Not used	
14	Auxiliary supply red - switch illumination	Red/yellow
15	Fuse A2 - Differential lock	Yellow
16	Fuse A4 - Fused cab supply (+)	Green
17	Connector C23/1 - Foot brake switch (52)	Black/Light green
18	Switch S5/6 - Direction indicator switch (54)	Green/white
19	connector C11/12 - Differential lock solenoid (22)	Yellow/black
20	Fuse A8 - Rear work light	Red/pink

C14 Instrument panel warning lights connector

See also page 14A-42



Terminal	Destination	Colour Code
1	Not used	
2	Connector C12/7 - Hydraulic oil filter	Black/purple
3	Connector C12/15 - Engine oil pressure	White/brown
4	Connector C12/6 - Low hydraulic oil pressure	Yellow
5	Header joint HJ2/11 - Alternator charge	Brown/yellow
6	Connector C13/2 - Parking brake	Black/white
7	Fuse B9 - Head light main beam	Blue/black
8	Header joint HJ3/17 - Positive (+)	Green/yellow
9	Connector C12/13 - Air filter	Blue/green
10	Connector C12/17 - Low fuel	Green/orange
11	Connector C13/3 - Differential lock	Yellow/black
12	Header joint HJ2/8 - Negative (-)	Black
13	Switch S5/6 - Direction indicator switch (54) - Right-hand indicator	Green/white
14	Relay R4/2 - Direction indicator flasher unit (48)	Light green/purple
15	Connector C13/9 - Four wheel drive	Light green
16	Switch S5/3 - Direction indicator switch (54) - Left-hand indicator	Green/red

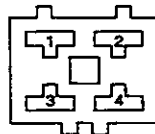
C15 Fuel level and water temperature gauge connector

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C12/12 - Water temperature	Green/blue
2	Header joint HJ2/17 - Negative (-)	Black
3	Header joint HJ3/19 - Positive (+)	Green/yellow
4	Connector C12/8 - Fuel tank sender	Green/black

C16 Ignition switch connector



Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse B1 - Auxiliary power supply	White
	Fuse A4 - Fused cab supply	White
4	Gearbox safety start switch (21)	White/red

C17 Non-ignition switched auxiliary supply connector- Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/12 - Positive (+)	Red/yellow
	Connector C13/14 - Switch light	Red/yellow
3	Fuse C3 - Auxiliary positive (+)	Purple

C18 Ignition switched auxiliary supply connector - Black

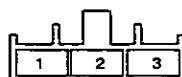
See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/5 - Positive (+)	Red/yellow
	Fuse C7 - Switch light	Red/yellow
3	Fuse B1 - Auxiliary positive (+)	White/green

C20 Cab main supply - Bulkhead connector 2

Connects to connector C31



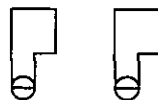
Terminal	Destination	Colour Code
1.	Fusible link - Power supply to cab roof	Brown
2.	Fusible link - Power supply to cab roof	Brown
3.	Fusible link - Power supply to cab roof	Brown

CAB TRACTOR WIRING DIAGRAMS**C21 Multi-Power connector**

Terminal	Destination	Colour Code
1	Fuse C8 - Rear power supply	purple
2	Connector C22/2 - Multi-Power solenoid (22)	Orange/brown

C22 Multi-Power solenoid connector

Terminal	Destination	Colour Code
1	Connector C2 - Engine block earth	Black
2	C21/2 - Multi-Power connector	Orange/brown
3	Not used	

C23 Stop light switch connector

Terminal	Destination	Colour Code
1	Connector C13/17 - Four wheel drive switch	Black/light green
2	Fuse B2 - Four wheel drive	Green

C24 Heater fan motor connector

Terminal	Destination	Colour Code
1	Fuse A3 - Heater fan motor	Brown/blue
2	Connector C2 - Earth to engine cylinder block (-)	Black

C25 Horn connector

Terminal	Destination	Colour Code
1	Connector C12/9 - Horn	Purple/yellow
2	Fuse C1 - Horn	Purple/brown

HJ2 Header joint 2 – Grey

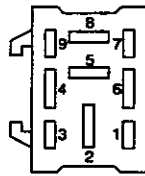


Terminal	Destination	Colour Code
1	Relay R3/6 - Air conditioning relay (38)	Black
2	Switch S1/A - Hazard warning switch (30) - Indicator light	Black
3	Relay R2/6 - Work light relay (37)	Black
4	Not used	
5	Connection C2 - Earth to engine cylinder block (-)	Black
6	Switch S2/B - Side/head light switch (29) - switch light	Black
7	Relay R4/4 - Direction indicator flasher unit (48)	Black
8	Connector C14/12 - Negative (-)	Black
9	Work light resistor (27)	Brown/yellow
10	Charge circuit diode (26)	Brown/yellow
11	Connector C14/5 - Alternator charge warning	Brown/yellow
12	Not used	
13	Switch S4/B - Heater motor switch (42) - switch light	Black
14	Tachometer illumination (25)	Black
15	Tachometer illumination (25)	Black
16	Connector C2 - Earth to engine cylinder block (-)	Black
17	Connector C15/2 - Fuel and temperature gauge (39)	
18	Fuel and temperature gauge illumination (23)	Black
19	Fuel and temperature gauge illumination (24)	Black
20	Connector C12/14 - Negative (-)	Black

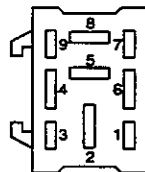
HJ3 Header joint 3 – Grey



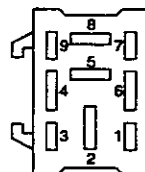
Terminal	Destination	Colour Code
1	Switch S4/A - Heater fan motor switch (42) - switch light	Red/yellow
2	Fuel and water gauge illumination (23 & 24)	Red/yellow
3	Fuse B8 - Left-hand head light main beam	Red/yellow
4	Tachometer illumination (25)	Red/yellow
5	Connector C18/2 - Auxiliary supply black (35) - switch light	Red/yellow
6	Tachometer illumination (25)	Red/yellow
7	Switch S1/8 - Hazard warning switch (30)	Red/yellow
8	Connected to terminal 9	Red/yellow
9	Connected to terminal 8	Red/yellow
10	Not used	
11	Switch S2/A - Side/head light switch (29) - switch light	Red/yellow
12	Connector C17/2 - Auxiliary power socket red (34) - switch light	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Fuse B4 - Instrument panel	Green/yellow
17	Connector C14/8 - Instrument light panel supply (+)	Green/yellow
18	Connector C12/10 - Tachometer	Green/yellow
19	Connector C15/3 - Fuel and temperature gauge (39)	Green/yellow
20	Work light resistor (27)	Green/yellow

CAB TRACTOR WIRING DIAGRAMS**R2 Work light relay – Red**

Terminal	Destination	Colour Code
Terminals 1, 3, 5 and 7 - Not used		
2	Fuse A6 - Work lights	Purple/red
4	Switch S1/6 - Hazard warning switch (30)	Red/orange
6	Header joint HJ2/3 - Negative (-)	Black
8	Fuse A8 - Work lights	Blue/purple

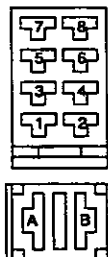
R3 Air conditioning relay – Blue

Terminal	Destination	Colour Code
Terminals 1, 3, 5, and 8 - Not used		
2	Fuse C4 - Air conditioning	Purple/blue
4	Connector C12/18 - Air conditioning low pressure switch	Black/yellow
6	Header junction HJ2/1 - Negative supply (-)	Black
8	Connector C12/16 - Air conditioning compressor	Purple/black

R4 Direction indicator flasher unit – Blue

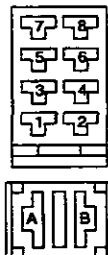
Terminal	Destination	Colour Code
Terminals 1, 3, 5 and 7 - Not used		
2	Connector C14/14 - Direction indicator light	Light green/purple
4	Header joint HJ2/7 - Negative (-)	Black
6	Switch S5/1 - Direction indicator switch (54)	Light green/pink
6	Switch S1/2 - Hazard warning switch (30)	Light green/pink
6	Switch S1/5 - Hazard warning switch (30)	Light green/brown

S1 Hazard warning switch



Terminal	Destination	Colour Code
1	Not used	
2	Relay R4/6 - Flasher unit (48)	Light green/pink
3	Not used	
4	Fuse C2 - Hazard warning	Purple/green
5	Relay R4/8 - Flashing indicator unit (48)	Light green/brown
	Switch S5/2 - Direction indicator switch (54)	Light green/brown
6	Relay R2/4 - Work light relay (37)	Red/orange
7	Header joint HJ3/3 - switch light	Red/yellow
8	Header joint HJ3/7	Red/yellow
	Switch light	
A	Not used	
B	Header joint HJ2/2 - Switch light negative (-)	Black

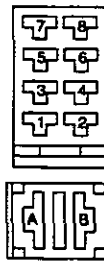
S2 Side/head light switch



Terminal	Destination	Colour Code
1	Fuse B8 & B9 - Left and right-hand main beam	Blue/white
2	Fusible link (16) - Supply (+)	Brown
3	Terminal 6 on plug	Red
4	Not used	
5	Not used	
6	Fuse C5, C6 & C7 - Left and right-hand side light, instrument panel lights	Red
7	Fuse B6 - Left and right-hand head light dip beam	Blue/red
8	Not used	
	Switch light	
A	Header joint HJ3/10 - Switched positive (+)	Red/yellow
B	Header joint HJ2/4 - Negative (-)	Black

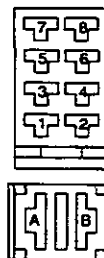
CAB TRACTOR WIRING DIAGRAMS

S4 Heater fan motor switch



Terminal	Destination	Colour Code
Terminals 2, 4, 6, 7, 8 and 9 - Not used		
1	Motor resistor- 'Fast' speed	Black
3	Connector C24 - Supply (+)	Black
5	Motor resistor - 'Slow' speed	White
Switch light		
A	Header joint HJ3/1 - Switched positive (+)	Red/yellow
B	Header joint HJ2/13 - Negative (-)	Black

S5 Direction indicator switch

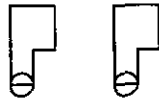


Terminal	Destination	Colour Code
1	Relay R4/6 - Flasher unit (48)	Light green/pink
	Terminal 8	Light green/pink
2	Hazard switch (30)	Light green/brown
	Terminal 7	Light green/brown
3	Connector C13/4 - Left-hand direction indicator	Green/white
	Connector C14/16 - Left-hand indicator	Green/white
4	Not used	
5	Not used	
6	Connector C13/18 - Right-hand direction indicator	Green/white
	Connector C14/13 - Right-hand indicator	Green/white
7	Terminal 2	Light green/brown
8	Terminal 1	Light green/pink

**REAR HARNESS
WORLD WIDE and NORTH AMERICA**

Rear harness (Fig. 6)

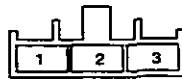
C26 Differential lock switch



Terminal	Destination	Colour Code
1	Connector C30/3 - Differential lock warning	yellow/black
2	Connector C29 - Tractor chassis earth (-)	Black

C27 Cab connector 1

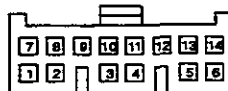
Connects to connector C56



Terminal	Destination	Colour Code
1	Connector C31 - Power supply to cab	Brown
2	Connector C31 - Power supply to cab	Brown
3	Connector C31 - Power supply to cab	Brown

C28 Cab connector 2

Connects to connector C57



Terminal	Destination	Colour Code
1	Connector C30/8 - Air conditioning low pressure switch	Blue/yellow
2	Connector C34/1 - Rear window washer pump (56)	White/blue
3	Connector C35/2 - Front windscreen washer pump (57)	White/grey
4	Connector C30/14 - Switch illumination	Red/yellow
	Switch S6/A - Differential lock switch (64) - Switch light	Red/yellow
	Switch S7/A - Four wheel drive switch (65) - Switch light	Red/yellow
5	Connector C30/20 - Rear work light	Red/pink
6	Connector C30/5 - Front work lights	Blue/yellow
7	Connector C30/12 - Right-hand side and rear lights	Red/white
8	Connector C30/7 - Left-hand side and rear lights	Red/black
9	Connector C30/16 - Fused supply (+)	Green
	Connector C39/2 - Speedshift switch (61)	Green
10	Connector C30/10 - Right-hand stop light	Green/purple
11	Connector C30/18 - Right-hand rear direction indicator	Green/white
12	Connector C30/4 - Rear left-hand direction indicator	Green/red
13	Connector C30/13 - Left-hand stop light	Green/purple
14	Not used	

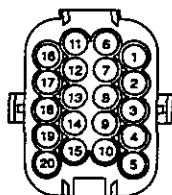
C29 Tractor chassis earth (-)



CAB TRACTOR WIRING DIAGRAMS

C30 Bulkhead connector 1

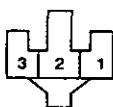
Connects to connector C13



Terminal	Destination	Colour Code
1	Connector C42/1 - Trailer stop light	Green/purple
2	Connector C36/4 - Parking brake	Black/white
3	Connector C26/1 - Differential lock switch warning	Yellow black
4	Connector C28/12 - Rear left-hand direction indicator	Green/red
	Connector C42/2 - Trailer left-hand direction indicator	Green/red
5	Connector C28/6 - Front work light	Blue/yellow
6	Connector C42/5 - Trailer left-hand side and rear lights	Red/black
7	Connector C28/8 - Left-hand side and rear lights	Red/black
8	Connector C28/1 - Air conditioning low pressure switch	Blue/yellow
9	Switch S7/1 - Four-wheel drive switch (65)	Light green
10	Connector C28/10 - Right-hand stop light	Green/purple
11	Connector C42/4 - Trailer right-hand side and rear light	Red/white
12	Connector C28/7 - Right-hand side and rear lights	Red/white
13	Connector C28/13 - Left-hand stop light	Green/purple
14	Connector C28/4 - Switch illumination	Red/yellow
15	Switch S6/1 - Differential lock switch (64)	Yellow
16	Connector C28/9 - Fused ignition	Green
17	Switch S7/6 - Four-wheel drive switch (65)	Blue/light green
18	Connector C28/11 - Rear right-hand direction indicator	Green/white
	Connector C42/3 - Trailer right-hand direction indicator	Green/white
19	Switch S6/5 - Differential lock switch (64)	Yellow/black
20	Connector C28/5 - Rear work light	Red/pink

C31 Bulkhead connector 2

Connects to connector C20



Terminal	Destination	Colour Code
1	Connector C31 - Power supply to cab	Brown
2	Connector C31 - Power supply to cab	Brown
3	Connector C31 - Power supply to cab	Brown

C32 Bulkhead connector 3

Connects to connector C21



Terminal	Destination	Colour Code
1	Connector C37/1 - 25 amp power socket (59)	Purple
2	Connector C38/1 - Speedshift switch (60)	Orange/brown
3	Connector C38/2 - Speedshift switch (60)	Green/red

C33 Four-wheel drive solenoid connector



Terminal	Destination	Colour Code
1	Connector C36/2 - Parking brake switch (58)	ed/light green
2	Switch S7/1 - Four-wheel drive switch (65)	Light green
3	Connector C29 - Earth to tractor chassis (-)	Black

CAB TRACTOR WIRING DIAGRAMS

C34 Rear window washer pump connector



Terminal	Destination	Colour Code
1	Connector C28/2 - Rear window washer	White/blue
2	Connector C29 - Earth to tractor chassis (-)	Black
3	Not used	

C35 Front windscreen washer pump connector



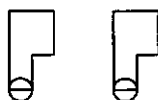
Terminal	Destination	Colour Code
1	Connector C29 - Earth to tractor chassis (-)	Black
1	Connector C28/3 - Front windscreen washer	White/grey

C36 Parking brake switch connector



Terminal	Destination	Colour Code
1	Switch S7/8 - Four-wheel drive switch (65)	Red/light green
2	Connector C33/1 - Four-wheel drive solenoid (55)	Red/light green
3	Connector C29 - Earth to tractor chassis (-)	Black
4	Connector C30/2 - Parking brake light	Black/white

C37 25 Amp power socket connector



Terminal	Destination	Colour Code
1	Connector C32/1 - Power supply (+)	Purple
2	Connector C29 - Earth to tractor chassis (-)	Black

C38 Speedshift switch connector



Terminal	Destination	Colour Code
1	Connector C32/2 - Bulkhead connector 3	Orange/brown
	Connector C41/2 - Speedshift indicator light 'Slow' (63)	Orange/brown
2	Connector C40/2 - Speedshift indicator light - 'Fast' (62)	Green/red
	Connector C32/3 - Bulkhead connector 3	Green/red
3	Connector C39/1 - Speedshift gear lever switch (61)	Yellow
4	Connector C39/3 - Speedshift gear lever switch (61)	Yellow/green

C39 Speedshift gear lever connector



Terminal	Destination	Colour Code
1	Connector C38/3 - Speedshift switch (60)	Yellow
2	Connector C28/9 - Power supply (+)	Green
3	Connector C38/4 - Speedshift switch (60)	Yellow/green

CAB TRACTOR WIRING DIAGRAMS

C40 Speedshift 'Fast' light connector



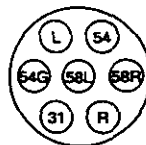
Terminal	Destination	Colour Code
1	Connector C41/1 - Slow speed light (62)	Black
2	Connector C38/2 - Speedshift switch (60)	Green/red

C41 Speedshift 'Slow' light connector



Terminal	Destination	Colour Code
1	Connector C40/1 - Negative (-) Switch S7/B - Four wheel drive switch (65) - switch light	Black
2	Connector C38/1 - Speedshift switch (60)	Orange/brown

C42 Trailer socket connector



Terminal	Destination	Colour Code
1	Connector C30/1 - '54G' Trailer stop light	Green/purple
2	Connector C30/4 - 'L' Left-hand direction indicator	Green/red
3	Connector C30/18 - 'R' Right-hand direction indicator	Green/white
4	Connector C30/11 - '58L' Right-hand side and rear lights	Red/white
5	Connector C30/6 - '58R' Left-hand side and rear lights	Red/black
6	Connector C29 - '31' Tractor chassis earth (-)	Black

S6 Differential lock switch

1	Connector C30/15 - Differential lock	Yellow
2	Not used	
3	Not used	
4	Not used	
5	Connector C30/19 - Differential lock solenoid	Yellow/black
6	Not used	
7	Not used	
8	Not used	
Switch light		
A	Connector C28/4 - Switch light	Red/yellow
B	Connector C29 - Earth to tractor chassis (-)	Black

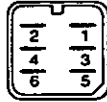
S7 Four wheel drive switch

1	Connector C30/9 - Four wheel drive switch	Light green
1	Connector C33/2 - Four wheel drive solenoid	Light green
2	Not used	
3	Not used	
4	Not used	
5	Connector C29 - Earth to tractor chassis (-)	Black
6	Connector C30/17 - Four wheel drive switch	Black/light green
7	Not used	
8	Connector C36/1 - Parking brake switch	Red/light green
Switch light		
A	Switch S6/A - Switch light	Red/yellow
B	Connector C29 - Earth to tractor chassis (-)	Black
	Connector C41/1 - Speedshift light (-)	Black

**CAB HARNESS
WORLD WIDE and NORTH AMERICA**

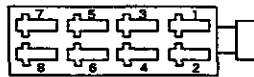
Cab harness (Fig. 7)

C43 Speedometer connector



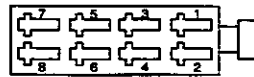
Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Fuse box 2/4 - Supply (+)	Black/yellow
3	Sensor - speed signal (-)	Blue/brown
4	Sensor - speed signal (+)	Blue/brown
5	Not used	
6	Not used	

C44 Radio connector 2 - Grey



Terminal	Destination	Colour Code
Terminals 1, 2, 3, 5 and 6 - Not used		
4	Fuse box 1/4 - Supply (+)	Purple/white
	To terminal 7 on connector	Purple/white
7	To terminal 4 on connector	Purple/white
8	Connector C46 - Earth to cab chassis (-)	Black

C45 Radio connector 1 - Brown

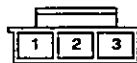


Terminal	Destination	Colour Code
Terminals 1, 2, 7 and 8 - Not used		
3	Right-hand speaker (76)	Grey/white
4	Right-hand speaker (76)	Grey/black
5	Left-hand speaker (75)	Grey/white
4	Left-hand speaker (75)	Grey/black

C46 Earth to cab chassis (-)

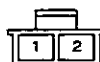


C47 Left-hand front side/indicator light connector

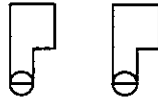


Terminal	Destination	Colour Code
1	Header joint HJ4/9 - Left-hand indicator supply (+)	Green/white
2	Connector C60/2 - Right-hand number plate light (93)	Red/black
3	Connector C46 - Earth to cab chassis (-)	black

C48 Left-hand front work light connector



Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Switch S6/1 - Front work light switch (68)	Red/yellow

CAB TRACTOR WIRING DIAGRAMS**C49 Interior light connector**

Terminal	Destination	Colour Code
1	Fuse box 1/2 - Interior light	Purple/white
2	Header joint HJ4/4 - Negative (-)	Black

C50 Front windscreen wiper motor connector

Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Switch S8/5 - Front windscreen wash/wipe switch (70)	Brown/green
3	Not used	
4	Switch S8/6 - Front windscreen wash/wipe switch (70)	Red/light green
5	Switch S8/2 - Front windscreen wash/wipe switch (70)	Green
6	Connector C46 - Earth to cab chassis (-)	Black

C51 Right-hand front side/indicator light connector

Terminal	Destination	Colour Code
1	Header joint HJ4/5 - Right-hand indicator supply (+)	Green/white
2	Connector C57/7 - Right-hand side and rear lights	Red/white
3	Connector C46 - Earth to cab chassis (-)	Black

C52 Right-hand front work light connector

Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Switch S6/1 - Right-hand front work light (68)	Red/yellow

C53 Air conditioner temperature control connector

Terminal	Destination	Colour Code
1	Terminal 4 - Temperature control switch (84)	Brown
2	Terminal 3 - Temperature control switch (84)	Yellow
3	Terminal 2 - Temperature control switch (84)	Blue
4	Terminal 1 - Temperature control switch (84)	Black

C54 Air conditioner connector 1

Terminal	Destination	Colour Code
1	Terminal L - Blower motor switch 'Low' speed (86)	White
2	Terminal M - Blower motor switch 'Medium' speed (86)	Red
3	Connector C46 - Earth to cab chassis (-)	Black
4	Terminal H - Blower motor switch 'High' speed (86)	Black/white
5	Not used	
6	Connector C46 - Earth to cab chassis (-)	Black

CAB TRACTOR WIRING DIAGRAMS

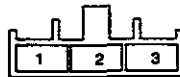
C55 Air conditioner connector 2



Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Connector C57/1 - Air conditioning compressor	Blue/yellow
3	Connector C46 - Earth to cab chassis (-)	Black
4	Terminal C - Blower motor switch (86)	Green/white
	Air conditioner connection 1	Green/white

C56 Cab main supply connector

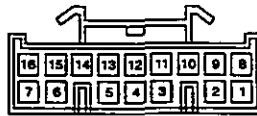
Connects to connector C31



Terminal	Destination	Colour Code
1	Fuse box 1 - Supply (+)	Brown
2	Fuse box 1 - Supply (+)	Brown
3	Relay R6/2 - Cab ignition switched supply (+)	Brown

C57 Cab connector connector

Connects to connector C30



Terminal	Destination	Colour Code
1	Connector C55/2 - Air conditioner connector 2	Blue/yellow
2	Switch S9/3 - Rear window wash/wipe switch (71)	White/blue
3	Switch S8/3 - Front windscreen wash/wipe switch (70)	White/grey
4	Header joint HJ5/16 - Switch light illumination	Red/yellow
5	Switch S7/5 - Rear work light switch (69)	Red/pink
6	Switch S6/5 - Front work light switch (68)	Blue/pink
7	Connector C58/3 - Right-hand rear light (91)	Red/black
	Connector C51/2 - Front right-hand side light (81)	Red/black
8	Connector C60/2 - Left-hand number plate light (93)	Red/black
	Connector C64/3 - Left-hand rear light (97)	Red/black
9	Relay R6/4 - Cab relay (88)	Green
10	Connector C58/1 - Rear right-hand stop light (91)	Green/purple
11	Header joint HJ4/6 - Right-hand indicator supply (+)	Green/white
12	Header joint HJ4/10 - Left-hand indicator supply (+)	Green/red
13	Connector C64/1 - Rear left-hand stop light (97)	Green/purple
14	Not used	

C58 Right-hand rear light assembly connector



Terminal	Destination	Colour Code
1	Connector C57/10 - Right-hand stop light	Green/purple
2	Header joint HJ4/7 - Right-hand indicator	Green/white
3	Connector C57/7 - Right-hand rear light	Red/white
4	Connector C65 - Earth to cab chassis (-)	Black

C59 Right-hand rear work light connector



Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Switch S7/1 - Rear work light (69)	Blue/pink

CAB TRACTOR WIRING DIAGRAMS

C60 Right-hand number plate connector



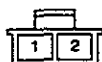
Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Connector C47/2 - Front left-hand side light (77) Connector C57/8 - Left-hand side/rear light	Red/black Red/black

C61 Rear wiper motor connector



Terminal	Destination	Colour Code
1	Switch S9/6 - Rear wiper motor switch (71)	White/light green
2	Connector C65 - Earth to cab chassis (-)	Black

C62 Left-hand number plate light connector



Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Connector C64/3 - Rear left-hand light (97)	Red/black

C63 Left-hand rear work light connector



Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Switch S7/1 - Rear work light switch (69)	Blue/pink

C64 Left-hand rear light connector



Terminal	Destination	Colour Code
1	Connector C57/13 - Left-hand stop light	Green/purple
2	Header joint HJ4/11 - Left-hand indicator	Green/red
3	Connector C57/8 - Rear left-hand light Connector C62/2 - Left-hand number plate	Red/black Red/black
4	Connector C65 - Earth to cab chassis (-)	Black

C65 Earth to cab chassis connector



C66 Beacon light and beacon plug connector



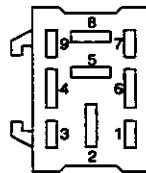
Terminal	Destination	Colour Code
1	Header joint HJ4/3 - Negative (-) Beacon light socket (73C)	Black Black
2	Switch S10/1 - Beacon switch (72) Beacon light socket (73C)	Purple/white Purple/white

HJ4 Header joint – Green



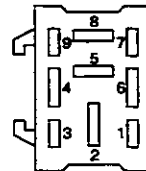
Terminal	Destination	Colour Code
1	Relay R5/6 - Negative (-)	Black
2	C65 - Earth to cab chassis (-)	Black
3	Connector C66/1 - Beacon light (73)	Black
4	Connector C49/2 - Interior light (79)	Black
5	Connector C51/1 - Front right-hand indicator light (81)	Green/white
6	Connector C57/11 - Right-hand indicator supply (+)	Green/white
7	Connector C58/2 -Rear right-hand indicator, rear and stop light (91)	Green/white
8	Not used	
9	Connector C47/1 - Front left-hand indicator and side light (77)	Green/red
10	Connector C57/12 - Left-hand indicator supply (+)	Green/red
11	Connector C64/2 - Rear left-hand indicator light (97)	Green/red
12	Not used	
13	Not used	
14	Switch S6/A - Front work light (68) switch light	Red/yellow
15	Switch S7/A - Rear work light (69) switch light	Red/yellow
16	Connector C57/4 - Switch supply (+)	Red/yellow
17	Switch S8/A - Front wash/wipe switch (70) switch light	Red/yellow
18	Switch S9/A - Rear wash/wipe switch (71) switch light	Red/yellow
19	Switch S10/A - Beacon switch (72) switch light	Red/yellow
20	Not used	

R5 Air conditioner relay – Blue

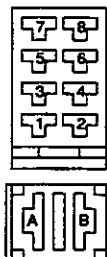


Terminal	Destination	Colour Code
Terminals 1, 3, 5, 7, and 8 - Not used		
2	Fuse box 1/1 - Air conditioner blower motor	Green/yellow
4	Fuse box 2/3 - Air conditioner relay	Light green
6	Header joint HJ4/1 - Negative (-)	Black
8	Terminal B - Air conditioner switch (86)	Green/yellow

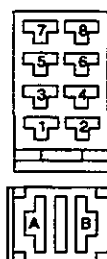
R6 Cab relay – Red



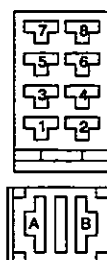
Terminal	Destination	Colour Code
Terminals 1, 3, 7 and 9 - Not used		
2	Connector C56/3 - Cab roof supply (+)	Brown
4	Connector C57/9 - Ignition supply to relay (+)	Green
5	Fuse box 2/4 - Supply to fuse box (+)	White
6	Connector C65 - Earth to cab chassis (-)	Black
8	Fuse box 2/1 - Supply to fuse box (+)	White

CAB TRACTOR WIRING DIAGRAMS**S6 Front work light switch**

Terminal	Destination	Colour Code
Terminals 2, 3, 4, 6, 7 and 8 - Not used		
1	Connector C48/2 - Front left-hand work light (78)	Red/yellow
	Connector C52/2 - Front right-hand work light (82)	Red/yellow
5	Connector C57/6 - Front work light supply (+)	Blue/yellow
Switch light		
A	Header joint HJ4/14 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

S7 Rear work light switch

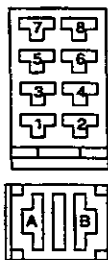
Terminal	Destination	Colour Code
Terminals 2, 3, 4, 6, 7 and 8 - Not used		
1	Connector C59/2 - Rear left-hand work light (92)	Blue/pink
	Connector C63/2 - Rear right-hand work light (96)	Blue/pink
5	Connector C57/5 - Rear work light supply (+)	Red/pink
Switch light		
A	Header joint HJ4/15 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

S8 Front wash/wipe switch

Terminal	Destination	Colour Code
1	Not used	
2	Fuse box 2/1 - Front wash/wipe switch	Green
	Connector C50/5 - Front wash/wipe pump (80)	Green
3	Connector C57/3 - Front wash/wipe	White/grey
4	Not used	
5	Connector C50/2 - Front wash/wipe pump (80)	Brown/green
6	Connector C50/4 - Front wash/wipe pump (80)	Red/light green
	Connected to terminal 7	Red/light green
7	Connected to terminal 6	Red/light green
8	Not used	
Switch light		
A	Header joint HJ4/17 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

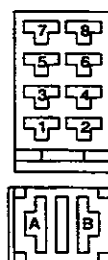
CAB TRACTOR WIRING DIAGRAMS

S9 Rear wash/wipe switch



Terminal	Destination	Colour Code
Terminals 1, 4, 5, 7 and 8 - Not used		
2	Fuse box 2/2 - Rear wash/wipe	White/light green
3	Connector C57/2 - Rear wash/wipe	White/blue
6	Connector C61/1 - Rear wash/wipe pump (94)	White/light green
Switch light		
A	Header joint HJ4/18 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

S10 Beacon switch



Terminal	Destination	Colour Code
Terminals 2, 3, 4, 6, 7 & 8 - Not used		
1	Connector C66/2 - Right-hand beacon light (73A)	Purple/yellow
	Connector C66/2 - Left-hand beacon light (73B)	Purple/yellow
	Beacon light socket (73C)	Purple/yellow
5	Fuse box 1/3 - Beacon light	Purple
Switch light		
A	Header joint HJ4/19 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

CAB TRACTOR WIRING DIAGRAMS

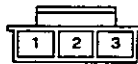
FLAT ROOF CAB HARNESS WORLD WIDE

Cab harness (Fig. 8)

C46 Earth to cab chassis

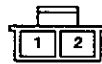


C47 Left-hand front side/indicator light connector



Terminal	Destination	Colour Code
1	Header joint HJ4/9 - Left-hand indicator light	Green/white
2	Header joint HJ4/3 - Left-hand side light	Red/black
3	Connector C46 - Earth to cab chassis (-)	Black

C48 Left-hand front work light connector



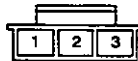
Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Switch S6/1 - Front work light switch (68)	Red/yellow

C50 Front windscreen wiper motor connector



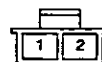
Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Switch S8/5 - Front windscreen wash/wipe switch (70)	Brown/green
3	Not used	
4	Switch S8/6 - Front windscreen wash/wipe switch (70)	Red/light green
5	Switch S8/2 - Front windscreen wash/wipe switch (70)	Green
6	Connector C46 - Earth to cab chassis (-)	Black

C51 Right-hand front side/indicator light connector



Terminal	Destination	Colour Code
1	Header joint HJ4/5 - Right-hand indicator	Green/white
2	Connector C57/7 - Right-hand side lights	Red/white
3	Connector C46 - Earth to cab chassis (-)	Black

C52 Right-hand front work light connector

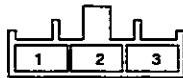


Terminal	Destination	Colour Code
1	Connector C46 - Earth to cab chassis (-)	Black
2	Switch S6/1 - Front right-hand work light (68)	Red/yellow

CAB TRACTOR WIRING DIAGRAMS

C56 Cab main supply connector

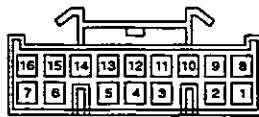
Connects to connector C27



Terminal	Destination	Colour Code
1	Fuse box 1 - Supply (+)	Brown
2	Fuse box 1 - Supply (+)	Brown
3	Relay R6/2 - Cab ignition switched supply (+)	Brown

C57 Cab connector

Connects to connector C28



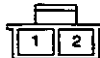
Terminal	Destination	Colour Code
1	Not used	
2	Switch S9/3 - Rear window wash/wipe switch (71)	White/blue
3	Switch S8/3 - Front windscreen wash/wipe switch (70)	White/grey
4	Header joint HJ5/16 - Switch light illumination	Red/yellow
5	Switch S7/5 - Rear work light switch (69)	Red/pink
6	Switch S6/5 - Front work light switch (68)	Blue/yellow
7	Connector C58/3 - Right-hand rear light (93)	Red/white
	Connector C51/3 - Front right-hand side light (81)	Red/white
8	Header joint HJ4/1 - Right-hand side and number plate lights (93)	Red/black
	Connector C64/3 - Left-hand rear light (97)	Red/black
9	Relay R6/4 - Cab relay (88)	Green
10	Connector C58/1 - Rear right-hand stop light (91)	Green/purple
11	Header joint HJ4/6 - Right-hand indicator supply (+)	Green/white
12	Header joint HJ4/10 - Left-hand indicator supply (+)	Green/red
13	Connector C64/2 - Rear left-hand indicator light (97)	Green/purple
14	Not used	

C58 Right-hand rear light connector



Terminal	Destination	Colour Code
1	Connector C57/10 - Right-hand stop light	Green/purple
2	Header joint HJ4/7 - Right-hand indicator light	Green/white
3	Connector C57/7 - Right-hand rear light	Red/white
4	Connector C65 - Earth to cab chassis (-)	Black

C59 Right-hand rear work light connector



Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Switch S7/1 - Rear work light (69)	Blue/pink

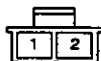
C60 Right-hand number plate connector



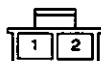
Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Connector C67/2 - Left-hand number plate light (98)	Red/black

CAB TRACTOR WIRING DIAGRAMS**C61 Rear wiper motor connector**

Terminal	Destination	Colour Code
1	Switch S9/6 - Rear wiper motor switch (71)	White/light green
2	Connector C65 - Earth to cab chassis (-)	Black

C62 Left-hand number plate light connector

Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Header joint HJ4/2 - Left-hand number plate light	Red/black

C63 Left-hand rear work light connector

Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Switch S7/1 - Rear work light switch (69)	Blue/pink

C64 Left-hand rear light connector

Terminal	Destination	Colour Code
1	Header joint HJ4/11 - Left-hand stop light	Green/red
2	Connector C57/13 - Left-hand indicator	Green/purple
3	Connector C57/8 - Left-hand rear light	Red/black
4	Connector C65 - Earth to cab chassis (-)	Black

C65 Earth to cab chassis**C66 Beacon light and beacon plug connector**

Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
	Beacon light socket (73C)	Black
2	Switch S10/1 - Beacon switch (72)	Purple/white
	Beacon light socket (73C)	Purple/white

C67 Left-hand number plate light connector

Terminal	Destination	Colour Code
1	Connector C65 - Earth to cab chassis (-)	Black
2	Connector C60/2 - Right-hand number plate light (93)	Red/black
	Header joint HJ4/4 - Switched supply	Red/black

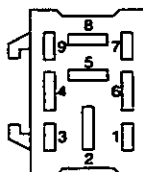
CAB TRACTOR WIRING DIAGRAMS

HJ4 Header joint – Green



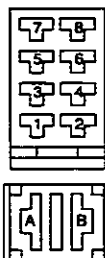
Terminal	Destination	Colour Code
1	Connector C57/8 - Left-hand side/rear light	Red/black
2	Connector C62/2 - Left-hand number plate light (95)	Red/black
3	Connector C47/2 - Front left-hand side light (77)	Red/black
4	Connector C67/2 - Rear left-hand number plate light (98)	Red/black
5	Connector C51/1 - Front right-hand indicator light (81)	Green/white
6	Connector C57/11 - Right-hand indicator supply (+)	Green/white
7	Connector C58/2 -Rear right-hand indicator light (91)	Green/white
8	Not used	
9	Connector C47/1 - Front left-hand indicator light (77)	Green/red
10	Connector C57/12 - Left-hand indicator supply (+)	Green/red
11	Connector C64/1 - Rear left-hand stop light (97)	Green/white
12	Not used	
13	Not used	
14	Switch S6A - Front work light (68) switch light	Red/yellow
15	Switch S7A - Rear work light (69) switch light	Red/yellow
16	connector C57/4 - Switch light supply (+)	Red/yellow
17	Switch S8A - Front wash/wipe switch (70) switch light	Red/yellow
18	Switch S9A - Rear wash/wipe switch (71) switch light	Red/yellow
19	Switch S10A - Beacon switch (72) switch light	Red/yellow
20	Not used	

R6 Cab relay – Red



Terminal	Destination	Colour Code
1	Not used	
2	Connector C56/3 - Cab roof supply (+)	Brown
3	Not used	
4	Connector C57/9 - Ignition supply to relay (+)	Green
5	Fuse box 1/2 - Supply to fuse box (+)	White
6	Connector C65 - Earth to cab chassis (-)	Black
7	Not used	
8	Fuse box 1/1 - Supply to fuse box (+)	White
9	Not used	

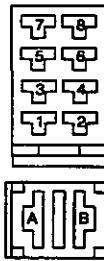
S6 Front work light switch



Terminal	Destination	Colour Code
Terminals 2, 3, 4, 6, 7 & 8 - Not used		
1	Connector C48/2 - Front left-hand work light (78)	Red/yellow
	Connector C52/2 - Front right-hand work light (82)	Red/yellow
5	Connector C57/6 - Front work light supply (+)	Blue/yellow
Switch light		
A	Header joint HJ4/14 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

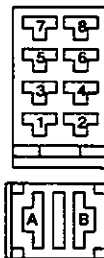
CAB TRACTOR WIRING DIAGRAMS

S7 Rear work light switch



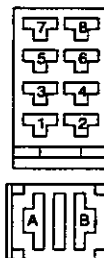
Terminal	Destination	Colour Code
Terminals 2, 3, 4, 6, 7 & 8 - Not used		
1	Connector C59/2 - Rear left-hand work light (92)	Blue/pink
	Connector C63/2 - Rear right-hand work light (96)	Blue/pink
5	Connector C57/5 - Rear work light supply (+)	Red/pink
Switch light		
A	Header joint HJ4/15 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

S8 Front wash/wipe switch



Terminal	Destination	Colour Code
1	Not used	
2	Fuse box 1/1 - Front wash/wipe switch	Green
	Connector C50/2 - Front wash/wipe pump (80)	Brown/green
3	Connector C57/3 - Front wash/wipe	White/grey
4	Not used	
5	Connector C50/5 - Front wash/wipe pump (80)	Green
6	Connector C50/4 - Front wash/wipe pump (80)	Red/light green
	Connected to terminal 7	Red/light green
7	Connected to terminal 6	Red/light green
8	Not used	
Switch light		
A	Header joint HJ4/17 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

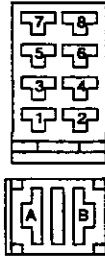
S9 Rear wash/wipe switch



Terminal	Destination	Colour Code
Terminals 1, 4, 5, 7 & 8 - Not used		
2	Fuse box 1/2 - Rear wash/wipe	White/light green
3	Connector C57/2 - Rear wash/wipe supply (+)	White/blue
6	Connector C61/1 - Rear wash/wipe pump (94)	White/light green
Switch light		
A	Header joint HJ4/18 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black

CAB TRACTOR WIRING DIAGRAMS

S10 Beacon switch








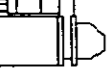























































Terminal	Destination	Colour Code
Terminals 2, 3, 4, 6, 7 & 8 - Not used		
1	Connector C66/2 - Right-hand beacon light (73A)	Purple/yellow
	Connector C66/2 - Left-hand beacon light (73B)	Purple/yellow
	Beacon light socket (73C)	Purple/yellow
5	Fuse box 1/3 - Beacon light	Purple
Switch light		
A	Header joint HJ4/19 - Switch supply (+)	Red/yellow
B	Connector C46 - Earth to cab chassis (-)	Black




















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


















CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- 1  HORN
- 2  LEFT-HAND HEAD LIGHTS
- 3  FUEL TANK SENDER UNIT
- 4  AIR FILTER SWITCH
- 5  WATER TEMPERATURE TRANSMITTER
- 6  FUEL CUT-OFF VALVE
- 7  ENGINE OIL PRESSURE SWITCH
- 8  STARTER MOTOR AND SOLENOID
- 9  BATTERY(IES)
- 10  ALTERNATOR
- 11  HYDRAULIC OIL FILTER TEMPERATURE SWITCH
- 12  HYDRAULIC OIL FILTER PRESSURE SWITCH
- 13  THERMOSTAT
- 14  ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)
- 15  LOW HYDRAULIC OIL PRESSURE SWITCH
- 16  FUSIBLE LINKS
- 17  RIGHT-HAND HEAD LIGHT
- 18  TACHOMETER
- 19  AIR CONDITIONING COMPRESSOR
- 20  LOW PRESSURE SWITCH-AIR CONDITIONING
- 21  GEARBOX SAFETY START SWITCH
- 22  FRONT AXLE DIFFERENTIAL LOCK SOLENOID
- 23  FUEL GAUGE ILLUMINATION
- 24  WATER TEMPERATURE GAUGE ILLUMINATION
- 25  TACHOMETER ILLUMINATION
- 26  CHARGE CIRCUIT DIODE (PART OF HARNESS)
- 27  WORK LIGHT RESISTOR (PART OF HARNESS)
- 28  FUSE BOX
- 29  LIGHTING SWITCH
- 30  HAZARD WARNING SWITCH
- 31  COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH

- 32  HEAD LIGHT DIP SWITCH
- 33  STOP LIGHT SWITCH-FOOT BRAKES
- 34  AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
- 35  AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
- 36  HEAD LIGHT FLASH RELAY-YELLOW
- 37  ROOF WORK LIGHT RELAY -RED
- 38  AIR CONDITIONING RELAY BLUE
- 39  FUEL AND WATER TEMPERATURE GAUGE
- 40  HEATER FAN MOTOR
- 41  SLOW SPEED RESISTOR
- 42  HEATER FAN MOTOR SWITCH
- 43  SPEEDSHIFT SOLENOID
- 44  PTO SAFETY START SWITCH
- 45  STARTER SWITCH
- 46  SPEEDSHIFT 'SLOW' INDICATOR LIGHT
- 47  SPEEDSHIFT 'FAST' INDICATOR LIGHT
- 48  FLASHING INDICATOR UNIT
- 49  RANGE SPEED INDICATOR SWITCH
- 50  CREEPER INDICATOR SWITCH
- 51  HORN PUSH
- 52  FOOT BRAKE SWITCH (NORTH AMERICA ONLY)
- 53  MULTI-POWER SOLENOID
- 54  DIFFERENTIAL LOCK SWITCH
- 55  FOUR WHEEL DRIVE SOLENOID
- 56  REAR WINDOW WASHER PUMP
- 57  FRONT WINDSCREEN WASHER PUMP
- 58  PARKING BRAKE SWITCH
- 59  25 AMP POWER SOCKET
- 60  SPEEDSHIFT SWITCH-PANEL
- 61  SPEEDSHIFT SWITCH-GEAR LEVER
- 62 SPEEDSHIFT INDICATOR LIGHT-FAST SPEED

- 63  SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED
- 64  DIFFERENTIAL LOCK SWITCH
- 65  FOUR WHEEL DRIVE SWITCH
- 66  TRAILER SOCKET
- 67  SPEEDOMETER
- 68  FRONT WORK LIGHT SWITCH
- 69  REAR WORK LIGHT SWITCH
- 70  FRONT WINDSCREEN WASH/WIPE SWITCH
- 71  REAR WINDOW WASH/WIPE SWITCH
- 72  BEACON SWITCH
- 73A  BEACON-RIGHT-HAND
- 73B  BEACON-LEFT-HAND
- 73C  BEACON SOCKET
- 74  RADIO
- 75  LEFT-HAND SPEAKER
- 76  RIGHT-HAND SPEAKER
- 77  LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 78  LEFT-HAND FRONT WORK LIGHT
- 79  INTERIOR LIGHT

- 80  FRONT WINDSCREEN WIPER MOTOR
- 81  RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 82  RIGHT-HAND FRONT WORK LIGHT
- 83  AIR CONDITIONER UNIT
- 84  AIR CONDITIONER TEMPERATURE CONTROL
- 85  AIR CONDITIONER THERMISTER
- 86  AIR CONDITIONER BLOWER MOTOR SWITCH
- 87  AIR CONDITIONER RELAY (BLUE)
- 88  CAB IGNITION SWITCHED SUPPLY RELAY (RED)
- 89  FUSE BOX NO.1
- 90  FUSE BOX NO.2
- 91  RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 92  RIGHT-HAND REAR WORK LIGHT
- 93  RIGHT-HAND NUMBER PLATE LIGHT
- 94  REAR WINDOW WIPER MOTOR
- 95  LEFT-HAND NUMBER PLATE LIGHT
- 96  LEFT-HAND REAR WORK LIGHT
- 97  LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 98  LEFT-HAND REAR NUMBER PLATE LIGHT
- 99  SPEEDOMETER SPEED SENSOR

Wiring colour code

- B Black
- G Green
- K Pink
- LG Light green
- LU Light blue
- N Brown
- O Orange
- P Purple
- R Red
- S Grey
- U Blue
- W White
- Y Yellow

Trailer socket wiring

- L Left hand rear direction indicator
- R Right hand rear direction indicator
- ⊕ Earth (-)
- 54 Right hand and left hand brake stop lights
- 54G Not used spare
- 58L Left hand rear light and number plate light
- 58R Right hand rear light

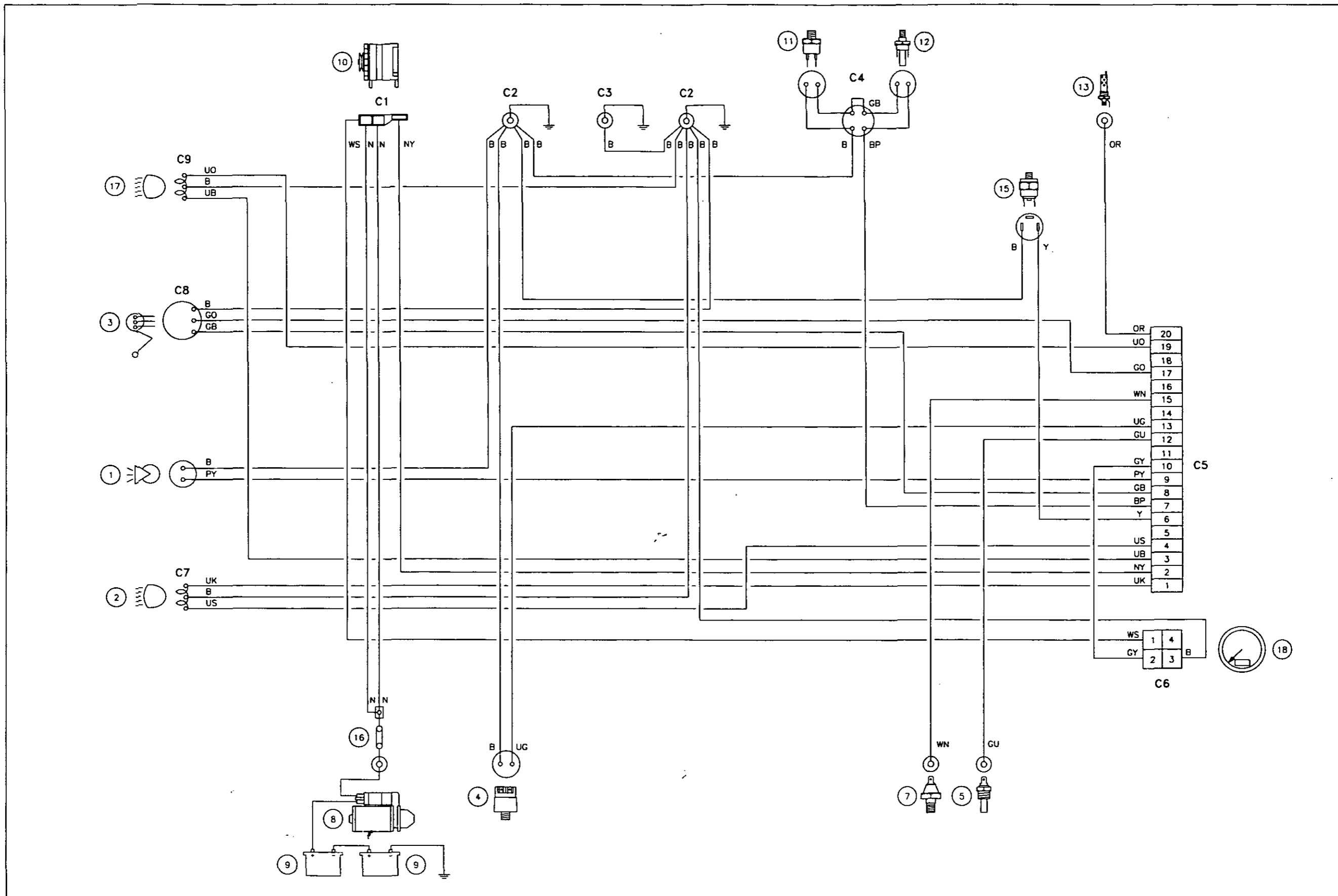


Figure 1. Engine harness - Three cylinder engines
World wide 342 and 352 tractors

CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- | | | | | | |
|----|--|--|----|--|--|
| 1 | | HORN | 32 | | HEAD LIGHT DIP SWITCH |
| 2 | | LEFT-HAND HEAD LIGHTS | 33 | | STOP LIGHT SWITCH-FOOT BRAKES |
| 3 | | FUEL TANK SENDER UNIT | 34 | | AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK |
| 4 | | AIR FILTER SWITCH | 35 | | AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED |
| 5 | | WATER TEMPERATURE TRANSMITTER | 36 | | HEAD LIGHT FLASH RELAY-YELLOW |
| 6 | | FUEL CUT-OFF VALVE | 37 | | ROOF WORK LIGHT RELAY -RED |
| 7 | | ENGINE OIL PRESSURE SWITCH. | 38 | | AIR CONDITIONING RELAY BLUE |
| 8 | | STARTER MOTOR AND SOLENOID | 39 | | FUEL AND WATER TEMPERATURE GAUGE |
| 9 | | BATTERY(IES) | 40 | | HEATER FAN MOTOR |
| 10 | | ALTERNATOR | 41 | | SLOW SPEED RESISTOR |
| 11 | | HYDRAULIC OIL FILTER TEMPERATURE SWITCH | 42 | | HEATER FAN MOTOR SWITCH |
| 12 | | HYDRAULIC OIL FILTER PRESSURE SWITCH | 43 | | SPEEDSHIFT SOLENOID |
| 13 | | THERMOSTART | 44 | | PTO SAFETY START SWITCH |
| 14 | | ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY) | 45 | | STARTER SWITCH |
| 15 | | LOW HYDRAULIC OIL PRESSURE SWITCH | 46 | | SPEEDSHIFT 'SLOW' INDICATOR LIGHT |
| 16 | | FUSIBLE LINKS | 47 | | SPEEDSHIFT 'FAST' INDICATOR LIGHT |
| 17 | | RIGHT-HAND HEAD LIGHT | 48 | | FLASHING INDICATOR UNIT |
| 18 | | TACHOMETER | 49 | | RANGE SPEED INDICATOR SWITCH |
| 19 | | AIR CONDITIONING COMPRESSOR | 50 | | CREEPER INDICATOR SWITCH |
| 20 | | LOW PRESSURE SWITCH-AIR CONDITIONING | 51 | | HORN PUSH |
| 21 | | GEARBOX SAFETY START SWITCH | 52 | | FOOT BRAKE SWITCH (NORTH AMERICA ONLY) |
| 22 | | FRONT AXLE DIFFERENTIAL LOCK SOLENOID | 53 | | MULTI-POWER SOLENOID |
| 23 | | FUEL GAUGE ILLUMINATION | 54 | | DIFFERENTIAL LOCK SWITCH |
| 24 | | WATER TEMPERATURE GAUGE ILLUMINATION | 55 | | FOUR WHEEL DRIVE SOLENOID |
| 25 | | TACHOMETER ILLUMINATION | 56 | | REAR WINDOW WASHER PUMP |
| 26 | | CHARGE CIRCUIT DIODE (PART OF HARNESS) | 57 | | FRONT WINDSCREEN WASHER PUMP |
| 27 | | WORK LIGHT RESISTOR (PART OF HARNESS) | 58 | | PARKING BRAKE SWITCH |
| 28 | | FUSE BOX | 59 | | 25 AMP POWER SOCKET |
| 29 | | LIGHTING SWITCH | 60 | | SPEEDSHIFT SWITCH-PANEL |
| 30 | | HAZARD WARNING SWITCH | 61 | | SPEEDSHIFT SWITCH-GEAR LEVER |
| 31 | | COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH | 62 | | SPEEDSHIFT INDICATOR LIGHT-FAST SPEED |

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|-----|--|--|----|--|---|
| 63 | | SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED | 80 | | FRONT WINDSCREEN WIPER MOTOR |
| 64 | | DIFFERENTIAL LOCK SWITCH | 81 | | RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT |
| 65 | | FOUR WHEEL DRIVE SWITCH | 82 | | RIGHT-HAND FRONT WORK LIGHT |
| 66 | | TRAILER SOCKET | 83 | | AIR CONDITIONER UNIT |
| 67 | | SPEEDOMETER | 84 | | AIR CONDITIONER TEMPERATURE CONTROL |
| 68 | | FRONT WORK LIGHT SWITCH | 85 | | AIR CONDITIONER THERMISTER |
| 69 | | REAR WORK LIGHT SWITCH | 86 | | AIR CONDITIONER BLOWER MOTOR SWITCH |
| 70 | | FRONT WINDSCREEN WASH/WIPE SWITCH | 87 | | AIR CONDITIONER RELAY (BLUE) |
| 71 | | REAR WINDOW WASH/WIPE SWITCH | 88 | | CAB IGNITION SWITCHED SUPPLY RELAY (RED) |
| 72 | | BEACON SWITCH | 89 | | FUSE BOX NO.1 |
| 73A | | BEACON-RIGHT-HAND | 90 | | FUSE BOX NO.2 |
| 73B | | BEACON-LEFT-HAND | 91 | | RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR |
| 73C | | BEACON SOCKET | 92 | | RIGHT-HAND REAR WORK LIGHT |
| 74 | | RADIO | 93 | | RIGHT-HAND NUMBER PLATE LIGHT |
| 75 | | LEFT-HAND SPEAKER | 94 | | REAR WINDOW WIPER MOTOR |
| 76 | | RIGHT-HAND SPEAKER | 95 | | LEFT-HAND NUMBER PLATE LIGHT |
| 77 | | LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT | 96 | | LEFT-HAND REAR WORK LIGHT |
| 78 | | LEFT-HAND FRONT WORK LIGHT | 97 | | LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR |
| 79 | | INTERIOR LIGHT | 98 | | LEFT-HAND REAR NUMBER PLATE LIGHT |
| | | | 99 | | SPEEDOMETER SPEED SENSOR |

Wiring colour code

- | | |
|----|-------------|
| B | Black |
| G | Green |
| K | Pink |
| LG | Light green |
| LU | Light blue |
| N | Brown |
| O | Orange |
| P | Purple |
| R | Red |
| S | Grey |
| U | Blue |
| W | White |
| Y | Yellow |

Trailer socket wiring

- | | |
|-----|---|
| L | Left hand rear direction indicator |
| R | Right hand rear direction indicator |
| 31 | Earth (-) |
| 54 | Right hand and left hand brake stop lights |
| 54G | Not used spare |
| 58L | Left hand rear light and number plate light |
| 58R | Right hand rear light |

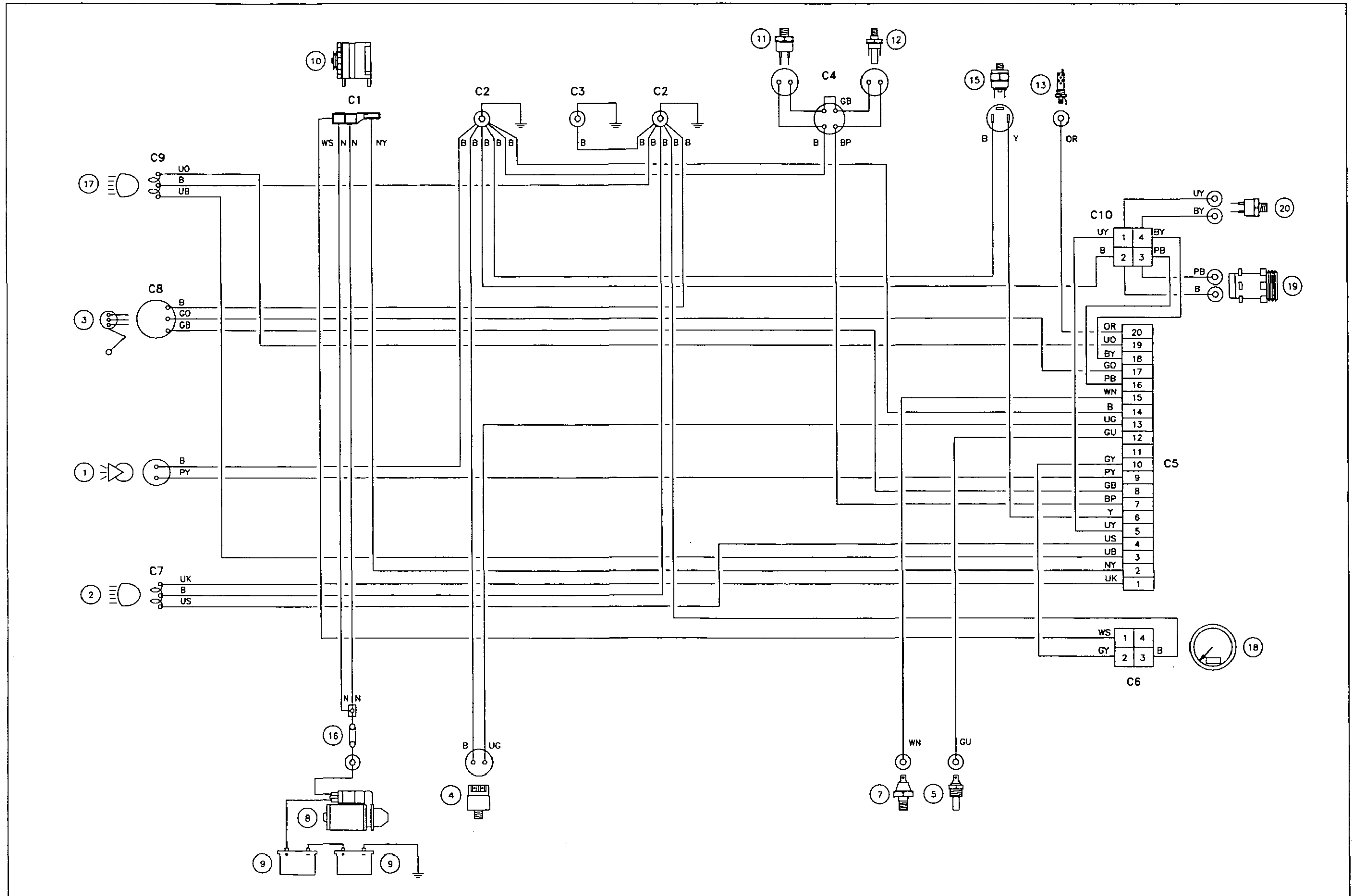


Figure 2. Engine harness - Four cylinder engines
World wide and North America

CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- | | | | | | |
|----|--|--|----|--|--|
| 1 | | HORN | 32 | | HEAD LIGHT DIP SWITCH |
| 2 | | LEFT-HAND HEAD LIGHTS | 33 | | STOP LIGHT SWITCH-FOOT BRAKES |
| 3 | | FUEL TANK SENDER UNIT | 34 | | AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK |
| 4 | | AIR FILTER SWITCH | 35 | | AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED |
| 5 | | WATER TEMPERATURE TRANSMITTER | 36 | | HEAD LIGHT FLASH RELAY-YELLOW |
| 6 | | FUEL CUT-OFF VALVE | 37 | | ROOF WORK LIGHT RELAY -RED |
| 7 | | ENGINE OIL PRESSURE SWITCH | 38 | | AIR CONDITIONING RELAY BLUE |
| 8 | | STARTER MOTOR AND SOLENOID | 39 | | FUEL AND WATER TEMPERATURE GAUGE |
| 9 | | BATTERY(IES) | 40 | | HEATER FAN MOTOR |
| 10 | | ALTERNATOR | 41 | | SLOW SPEED RESISTOR |
| 11 | | HYDRAULIC OIL FILTER TEMPERATURE SWITCH | 42 | | HEATER FAN MOTOR SWITCH |
| 12 | | HYDRAULIC OIL FILTER PRESSURE SWITCH | 43 | | SPEEDSHIFT SOLENOID |
| 13 | | THERMOSTAT | 44 | | PTO SAFETY START SWITCH |
| 14 | | ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY) | 45 | | STARTER SWITCH |
| 15 | | LOW HYDRAULIC OIL PRESSURE SWITCH | 46 | | SPEEDSHIFT 'SLOW' INDICATOR LIGHT |
| 16 | | FUSIBLE LINKS | 47 | | SPEEDSHIFT 'FAST' INDICATOR LIGHT |
| 17 | | RIGHT-HAND HEAD LIGHT | 48 | | FLASHING INDICATOR UNIT |
| 18 | | TACHOMETER | 49 | | RANGE SPEED INDICATOR SWITCH |
| 19 | | AIR CONDITIONING COMPRESSOR | 50 | | CREEPER INDICATOR SWITCH |
| 20 | | LOW PRESSURE SWITCH-AIR CONDITIONING | 51 | | HORN PUSH |
| 21 | | GEARBOX SAFETY START SWITCH | 52 | | FOOT BRAKE SWITCH (NORTH AMERICA ONLY) |
| 22 | | FRONT AXLE DIFFERENTIAL LOCK SOLENOID | 53 | | MULTI-POWER SOLENOID |
| 23 | | FUEL GAUGE ILLUMINATION | 54 | | DIFFERENTIAL LOCK SWITCH |
| 24 | | WATER TEMPERATURE GAUGE ILLUMINATION | 55 | | FOUR WHEEL DRIVE SOLENOID |
| 25 | | TACHOMETER ILLUMINATION | 56 | | REAR WINDOW WASHER PUMP |
| 26 | | CHARGE CIRCUIT DIODE (PART OF HARNESS) | 57 | | FRONT WINDSCREEN WASHER PUMP |
| 27 | | WORK LIGHT RESISTOR (PART OF HARNESS) | 58 | | PARKING BRAKE SWITCH |
| 28 | | FUSE BOX | 59 | | 25 AMP POWER SOCKET |
| 29 | | LIGHTING SWITCH | 60 | | SPEEDSHIFT SWITCH-PANEL |
| 30 | | HAZARD WARNING SWITCH | 61 | | SPEEDSHIFT SWITCH-GEAR LEVER |
| 31 | | COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH | 62 | | SPEEDSHIFT INDICATOR LIGHT-FAST SPEED |

- | | | |
|-----|--|--|
| 63 | | SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED |
| 64 | | DIFFERENTIAL LOCK SWITCH |
| 65 | | FOUR WHEEL DRIVE SWITCH |
| 66 | | TRAILER SOCKET |
| 67 | | SPEEDOMETER |
| 68 | | FRONT WORK LIGHT SWITCH |
| 69 | | REAR WORK LIGHT SWITCH |
| 70 | | FRONT WINDSCREEN WASH/WIPE SWITCH |
| 71 | | REAR WINDOW WASH/WIPE SWITCH |
| 72 | | BEACON SWITCH |
| 73A | | BEACON-RIGHT-HAND |
| 73B | | BEACON-LEFT-HAND |
| 73C | | BEACON SOCKET |
| 74 | | RADIO |
| 75 | | LEFT-HAND SPEAKER |
| 76 | | RIGHT-HAND SPEAKER |
| 77 | | LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT |
| 78 | | LEFT-HAND FRONT WORK LIGHT |
| 79 | | INTERIOR LIGHT |

- | | | |
|----|--|---|
| 80 | | FRONT WINDSCREEN WIPER MOTOR |
| 81 | | RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT |
| 82 | | RIGHT-HAND FRONT WORK LIGHT |
| 83 | | AIR CONDITIONER UNIT |
| 84 | | AIR CONDITIONER TEMPERATURE CONTROL |
| 85 | | AIR CONDITIONER THERMISTER |
| 86 | | AIR CONDITIONER BLOWER MOTOR SWITCH |
| 87 | | AIR CONDITIONER RELAY (BLUE) |
| 88 | | CAB IGNITION SWITCHED SUPPLY RELAY (RED) |
| 89 | | FUSE BOX NO.1 |
| 90 | | FUSE BOX NO.2 |
| 91 | | RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR |
| 92 | | RIGHT-HAND REAR WORK LIGHT |
| 93 | | RIGHT-HAND NUMBER PLATE LIGHT |
| 94 | | REAR WINDOW WIPER MOTOR |
| 95 | | LEFT-HAND NUMBER PLATE LIGHT |
| 96 | | LEFT-HAND REAR WORK LIGHT |
| 97 | | LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR |
| 98 | | LEFT-HAND REAR NUMBER PLATE LIGHT |
| 99 | | SPEEDOMETER SPEED SENSOR |

Wiring colour code

- | | |
|----|-------------|
| B | Black |
| G | Green |
| K | Pink |
| LG | Light green |
| LU | Light blue |
| N | Brown |
| O | Orange |
| P | Purple |
| R | Red |
| S | Grey |
| U | Blue |
| W | White |
| Y | Yellow |

Trailer socket wiring

- | | |
|-----|---|
| L | Left hand rear direction indicator |
| R | Right hand rear direction indicator |
| 31 | Earth (-) |
| 54 | Right hand and left hand brake stop lights |
| 54G | Not used spare |
| 58L | Left hand rear light and number plate light |
| 58R | Right hand rear light |

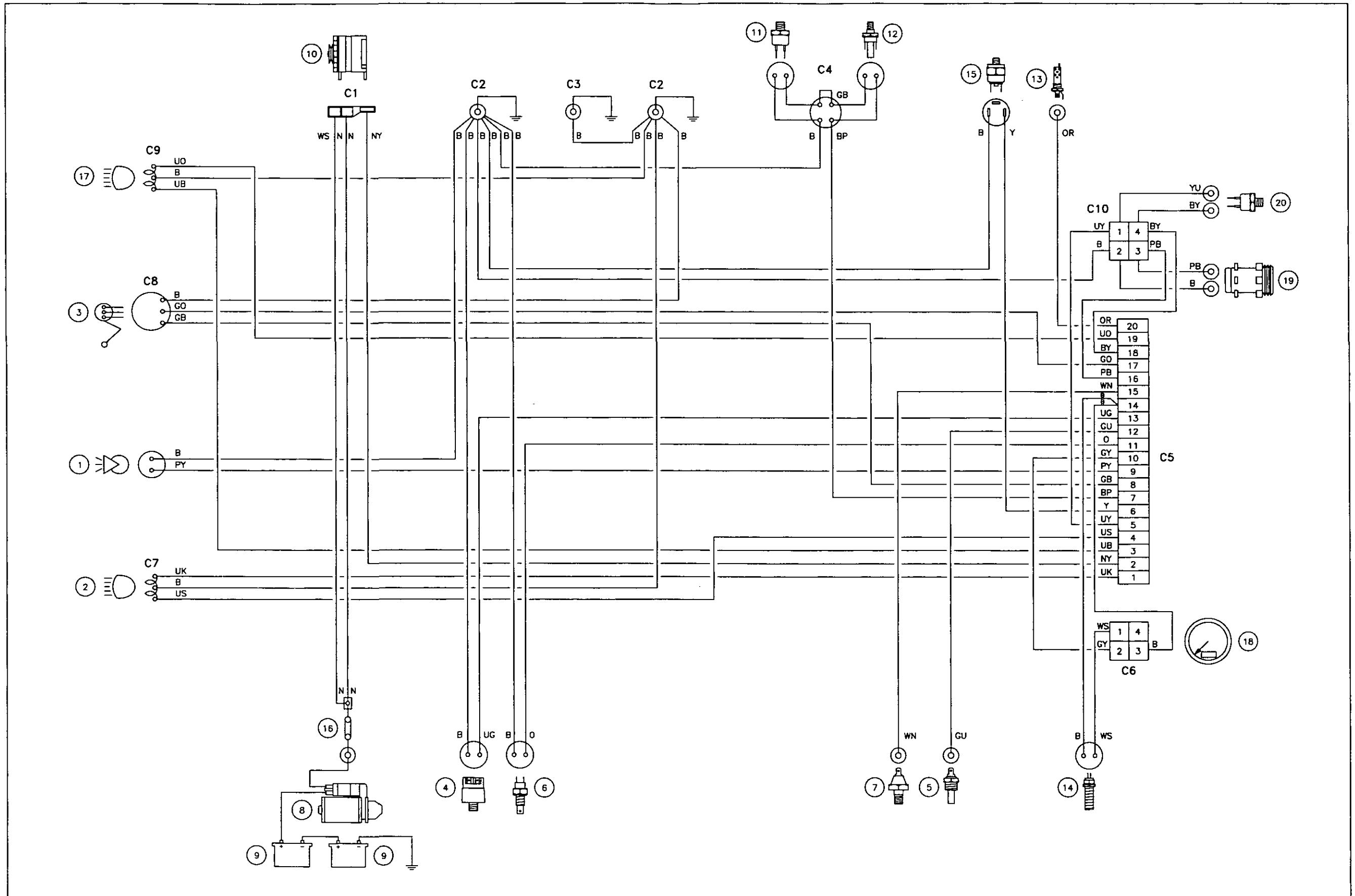



















































































Figure 3. Engine harness - Six cylinder engines
World wide and North America





















CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- 1  HORN
- 2  LEFT-HAND HEAD LIGHTS
- 3  FUEL TANK SENDER UNIT
- 4  AIR FILTER SWITCH
- 5  WATER TEMPERATURE TRANSMITTER
- 6  FUEL CUT-OFF VALVE
- 7  ENGINE OIL PRESSURE SWITCH
- 8  STARTER MOTOR AND SOLENOID
- 9  BATTERY(IES)
- 10  ALTERNATOR
- 11  HYDRAULIC OIL FILTER TEMPERATURE SWITCH
- 12  HYDRAULIC OIL FILTER PRESSURE SWITCH
- 13  THERMOSTAT
- 14  ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)
- 15  LOW HYDRAULIC OIL PRESSURE SWITCH
- 16  FUSIBLE LINKS
- 17  RIGHT-HAND HEAD LIGHT
- 18  TACHOMETER
- 19  AIR CONDITIONING COMPRESSOR
- 20  LOW PRESSURE SWITCH-AIR CONDITIONING
- 21  GEARBOX SAFETY START SWITCH
- 22  FRONT AXLE DIFFERENTIAL LOCK SOLENOID
- 23  FUEL GAUGE ILLUMINATION
- 24  WATER TEMPERATURE GAUGE ILLUMINATION
- 25  TACHOMETER ILLUMINATION
- 26  CHARGE CIRCUIT DIODE (PART OF HARNESS)
- 27  WORK LIGHT RESISTOR (PART OF HARNESS)
- 28  FUSE BOX
- 29  LIGHTING SWITCH
- 30  HAZARD WARNING SWITCH
- 31  COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH

- 32  HEAD LIGHT DIP SWITCH
- 33  STOP LIGHT SWITCH-FOOT BRAKES
- 34  AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
- 35  AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
- 36  HEAD LIGHT FLASH RELAY-YELLOW
- 37  ROOF WORK LIGHT RELAY -RED
- 38  AIR CONDITIONING RELAY BLUE
- 39  FUEL AND WATER TEMPERATURE GAUGE
- 40  HEATER FAN MOTOR
- 41  SLOW SPEED RESISTOR
- 42  HEATER FAN MOTOR SWITCH
- 43  SPEEDSHIFT SOLENOID
- 44  PTO SAFETY START SWITCH
- 45  STARTER SWITCH
- 46  SPEEDSHIFT 'SLOW' INDICATOR LIGHT
- 47  SPEEDSHIFT 'FAST' INDICATOR LIGHT
- 48  FLASHING INDICATOR UNIT
- 49  RANGE SPEED INDICATOR SWITCH
- 50  CREEPER INDICATOR SWITCH
- 51  HORN PUSH
- 52  FOOT BRAKE SWITCH (NORTH AMERICA ONLY)
- 53  MULTI-POWER SOLENOID
- 54  DIFFERENTIAL LOCK SWITCH
- 55  FOUR WHEEL DRIVE SOLENOID
- 56  REAR WINDOW WASHER PUMP
- 57  FRONT WINDSCREEN WASHER PUMP
- 58  PARKING BRAKE SWITCH
- 59  25 AMP POWER SOCKET
- 60  SPEEDSHIFT SWITCH-PANEL
- 61  SPEEDSHIFT SWITCH-GEAR LEVER
- 62  SPEEDSHIFT INDICATOR LIGHT-FAST SPEED

- 63  SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED
- 64  DIFFERENTIAL LOCK SWITCH
- 65  FOUR WHEEL DRIVE SWITCH
- 66  TRAILER SOCKET
- 67  SPEEDOMETER
- 68  FRONT WORK LIGHT SWITCH
- 69  REAR WORK LIGHT SWITCH
- 70  FRONT WINDSCREEN WASH/WIPE SWITCH
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- 78  LEFT-HAND FRONT WORK LIGHT
- 79  INTERIOR LIGHT

- 80  FRONT WINDSCREEN WIPER MOTOR
- 81  RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 82  RIGHT-HAND FRONT WORK LIGHT
- 83  AIR CONDITIONER UNIT
- 84  AIR CONDITIONER TEMPERATURE CONTROL
- 85  AIR CONDITIONER THERMISTER
- 86  AIR CONDITIONER BLOWER MOTOR SWITCH
- 87  AIR CONDITIONER RELAY (BLUE)
- 88  CAB IGNITION SWITCHED SUPPLY RELAY (RED)
- 89  FUSE BOX NO.1
- 90  FUSE BOX NO.2
- 91  RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 92  RIGHT-HAND REAR WORK LIGHT
- 93  RIGHT-HAND NUMBER PLATE LIGHT
- 94  REAR WINDOW WIPER MOTOR
- 95  LEFT-HAND NUMBER PLATE LIGHT
- 96  LEFT-HAND REAR WORK LIGHT
- 97  LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 98  LEFT-HAND REAR NUMBER PLATE LIGHT
- 99  SPEEDOMETER SPEED SENSOR

Wiring colour code
































- B Black
- G Green
- K Pink
- LG Light green
- LU Light blue
- N Brown
- O Orange
- P Purple
- R Red
- S Grey
- U Blue
- W White
- Y Yellow
































Trailer socket wiring




















- L Left hand rear direction indicator
- R Right hand rear direction indicator
- 31 Earth (-)
- 54 Right hand and left hand brake stop lights
- 54G Not used spare
- 58L Left hand rear light and number plate light
- 58R Right hand rear light





















CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- 1  HORN
- 2  LEFT-HAND HEAD LIGHTS
- 3  FUEL TANK SENDER UNIT
- 4  AIR FILTER SWITCH
- 5  WATER TEMPERATURE TRANSMITTER
- 6  FUEL CUT-OFF VALVE
- 7  ENGINE OIL PRESSURE SWITCH
- 8  STARTER MOTOR AND SOLENOID
- 9  BATTERY(IES)
- 10  ALTERNATOR
- 11  HYDRAULIC OIL FILTER TEMPERATURE SWITCH
- 12  HYDRAULIC OIL FILTER PRESSURE SWITCH
- 13  THERMOSTAT
- 14  ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)
- 15  LOW HYDRAULIC OIL PRESSURE SWITCH
- 16  FUSIBLE LINKS
- 17  RIGHT-HAND HEAD LIGHT
- 18  TACHOMETER
- 19  AIR CONDITIONING COMPRESSOR
- 20  LOW PRESSURE SWITCH-AIR CONDITIONING
- 21  GEARBOX SAFETY START SWITCH
- 22  FRONT AXLE DIFFERENTIAL LOCK SOLENOID
- 23  FUEL GAUGE ILLUMINATION
- 24  WATER TEMPERATURE GAUGE ILLUMINATION
- 25  TACHOMETER ILLUMINATION
- 26  CHARGE CIRCUIT DIODE (PART OF HARNESS)
- 27  WORK LIGHT RESISTOR (PART OF HARNESS)
- 28  FUSE BOX
- 29  LIGHTING SWITCH
- 30  HAZARD WARNING SWITCH
- 31  COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH

- 32  HEAD LIGHT DIP SWITCH
- 33  STOP LIGHT SWITCH-FOOT BRAKES
- 34  AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
- 35  AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
- 36  HEAD LIGHT FLASH RELAY-YELLOW
- 37  ROOF WORK LIGHT RELAY -RED
- 38  AIR CONDITIONING RELAY BLUE
- 39  FUEL AND WATER TEMPERATURE GAUGE
- 40  HEATER FAN MOTOR
- 41  SLOW SPEED RESISTOR
- 42  HEATER FAN MOTOR SWITCH
- 43  SPEEDSHIFT SOLENOID
- 44  PTO SAFETY START SWITCH
- 45  STARTER SWITCH
- 46  SPEEDSHIFT 'SLOW' INDICATOR LIGHT
- 47  SPEEDSHIFT 'FAST' INDICATOR LIGHT
- 48  FLASHING INDICATOR UNIT
- 49  RANGE SPEED INDICATOR SWITCH
- 50  CREEPER INDICATOR SWITCH
- 51  HORN PUSH
- 52  FOOT BRAKE SWITCH (NORTH AMERICA ONLY)
- 53  MULTI-POWER SOLENOID
- 54  DIFFERENTIAL LOCK SWITCH
- 55  FOUR WHEEL DRIVE SOLENOID
- 56  REAR WINDOW WASHER PUMP
- 57  FRONT WINDSCREEN WASHER PUMP
- 58  PARKING BRAKE SWITCH
- 59  25 AMP POWER SOCKET
- 60  SPEEDSHIFT SWITCH-PANEL
- 61  SPEEDSHIFT SWITCH-GEAR LEVER
- 62  SPEEDSHIFT INDICATOR LIGHT-FAST SPEED

- 63  SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED
- 64  DIFFERENTIAL LOCK SWITCH
- 65  FOUR WHEEL DRIVE SWITCH
- 66  TRAILER SOCKET
- 67  SPEEDOMETER
- 68  FRONT WORK LIGHT SWITCH
- 69  REAR WORK LIGHT SWITCH
- 70  FRONT WINDSCREEN WASH/WIPE SWITCH
- 71  REAR WINDOW WASH/WIPE SWITCH
- 72  BEACON SWITCH
- 73A  BEACON-RIGHT-HAND
- 73B  BEACON-LEFT-HAND
- 73C  BEACON SOCKET
- 74  RADIO
- 75  LEFT-HAND SPEAKER
- 76  RIGHT-HAND SPEAKER
- 77  LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 78  LEFT-HAND FRONT WORK LIGHT
- 79  INTERIOR LIGHT

- 80  FRONT WINDSCREEN WIPER MOTOR
- 81  RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 82  RIGHT-HAND FRONT WORK LIGHT
- 83  AIR CONDITIONER UNIT
- 84  AIR CONDITIONER TEMPERATURE CONTROL
- 85  AIR CONDITIONER THERMISTER
- 86  AIR CONDITIONER BLOWER MOTOR SWITCH
- 87  AIR CONDITIONER RELAY (BLUE)
- 88  CAB IGNITION SWITCHED SUPPLY RELAY (RED)
- 89  FUSE BOX NO.1
- 90  FUSE BOX NO.2
- 91  RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 92  RIGHT-HAND REAR WORK LIGHT
- 93  RIGHT-HAND NUMBER PLATE LIGHT
- 94  REAR WINDOW WIPER MOTOR
- 95  LEFT-HAND NUMBER PLATE LIGHT
- 96  LEFT-HAND REAR WORK LIGHT
- 97  LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 98  LEFT-HAND REAR NUMBER PLATE LIGHT
- 99  SPEEDOMETER SPEED SENSOR

Wiring colour code

- B Black
- G Green
- K Pink
- LG Light green
- LU Light blue
- N Brown
- O Orange
- P Purple
- R Red
- S Grey
- U Blue
- W White
- Y Yellow

Trailer socket wiring

- L Left hand rear direction indicator
- R Right hand rear direction indicator
- 31 Earth (-)
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- 54G Not used spare
- 58L Left hand rear light and number plate light
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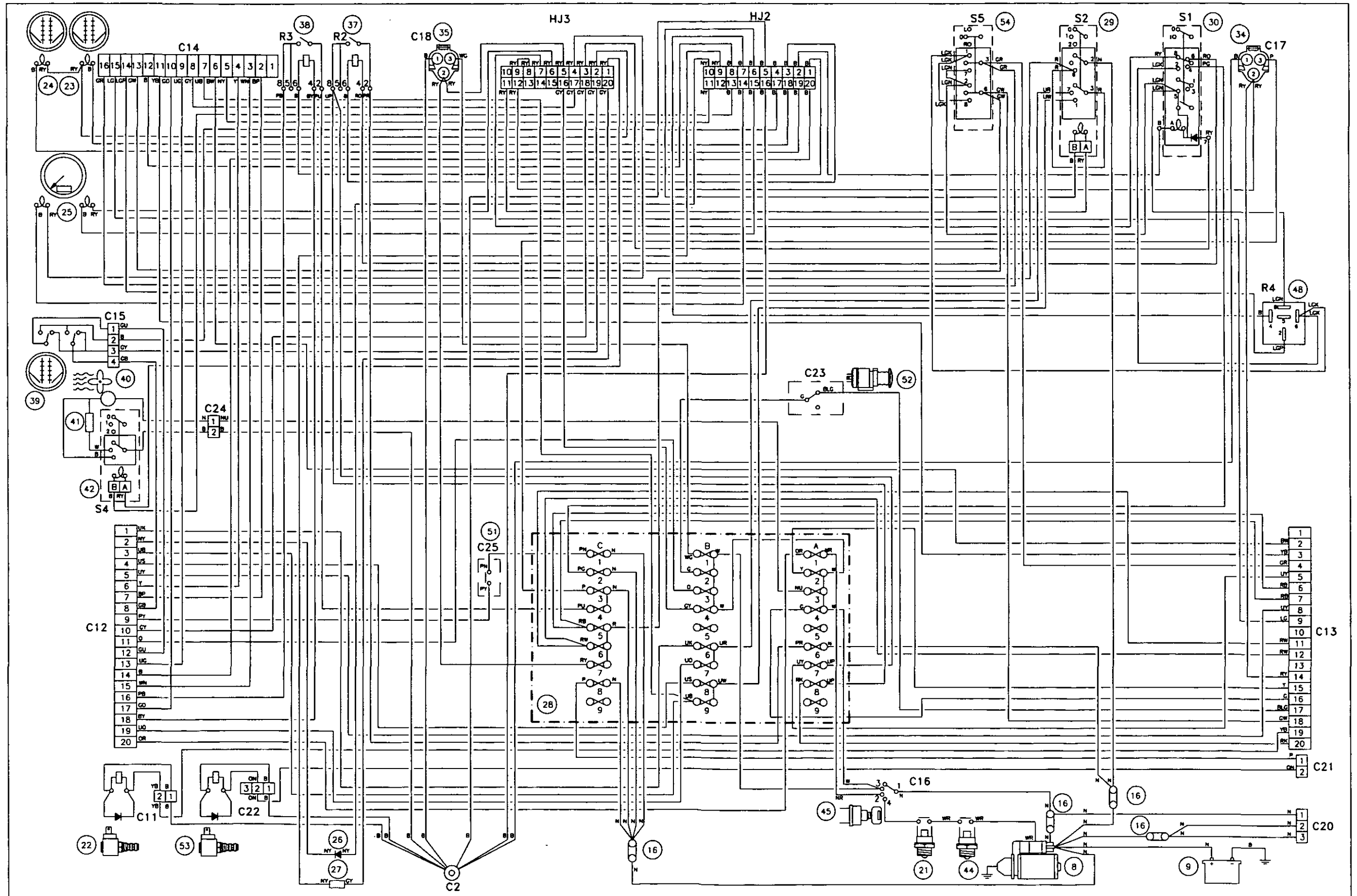


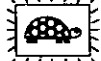



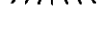








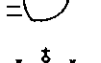







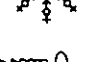



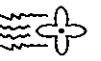



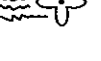















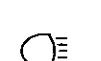



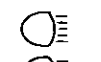



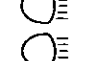



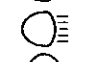







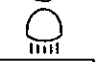



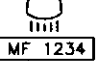



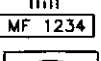


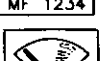
























Figure 5. Console harness
North America

Key to wiring diagrams

1		HORN	32		HEAD LIGHT DIP SWITCH	63		SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED	80		FRONT WINDSCREEN WIPER MOTOR
2		LEFT-HAND HEAD LIGHTS	33		STOP LIGHT SWITCH-FOOT BRAKES	64		DIFFERENTIAL LOCK SWITCH	81		RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
3		FUEL TANK SENDER UNIT	34		AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK	65		FOUR WHEEL DRIVE SWITCH	82		RIGHT-HAND FRONT WORK LIGHT
4		AIR FILTER SWITCH	35		AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED	66		TRAILER SOCKET	83		AIR CONDITIONER UNIT
5		WATER TEMPERATURE TRANSMITTER	36		HEAD LIGHT FLASH RELAY-YELLOW	67		SPEEDOMETER	84		AIR CONDITIONER TEMPERATURE CONTROL
6		FUEL CUT-OFF VALVE	37		ROOF WORK LIGHT RELAY -RED	68		FRONT WORK LIGHT SWITCH	85		AIR CONDITIONER THERMISTER
7		ENGINE OIL PRESSURE SWITCH	38		AIR CONDITIONING RELAY BLUE	69		REAR WORK LIGHT SWITCH	86		AIR CONDITIONER BLOWER MOTOR SWITCH
8		STARTER MOTOR AND SOLENOID	39		FUEL AND WATER TEMPERATURE GAUGE	70		FRONT WINDSCREEN WASH/WIPE SWITCH	87		AIR CONDITIONER RELAY (BLUE)
9		BATTERY(IES)	40		HEATER FAN MOTOR	71		REAR WINDOW WASH/WIPE SWITCH	88		CAB IGNITION SWITCHED SUPPLY RELAY (RED)
10		ALTERNATOR	41		SLOW SPEED RESISTOR	72		BEACON SWITCH	89		FUSE BOX NO.1
11		HYDRAULIC OIL FILTER TEMPERATURE SWITCH	42		HEATER FAN MOTOR SWITCH	73A		BEACON-RIGHT-HAND	90		FUSE BOX NO.2
12		HYDRAULIC OIL FILTER PRESSURE SWITCH	43		SPEEDSHIFT SOLENOID	73B		BEACON-LEFT-HAND	91		RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
13		THERMOSTAT	44		PTO SAFETY START SWITCH	73C		BEACON SOCKET	92		RIGHT-HAND REAR WORK LIGHT
14		ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)	45		STARTER SWITCH	74		RADIO	93		RIGHT-HAND NUMBER PLATE LIGHT
15		LOW HYDRAULIC OIL PRESSURE SWITCH	46		SPEEDSHIFT 'SLOW' INDICATOR LIGHT	75		LEFT-HAND SPEAKER	94		REAR WINDOW WIPER MOTOR
16		FUSIBLE LINKS	47		SPEEDSHIFT 'FAST' INDICATOR LIGHT	76		RIGHT-HAND SPEAKER	95		LEFT-HAND NUMBER PLATE LIGHT
17		RIGHT-HAND HEAD LIGHT	48		FLASHING INDICATOR UNIT	77		LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT	96		LEFT-HAND REAR WORK LIGHT
18		TACHOMETER	49		RANGE SPEED INDICATOR SWITCH	78		LEFT-HAND FRONT WORK LIGHT	97		LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
19		AIR CONDITIONING COMPRESSOR	50		CREEPER INDICATOR SWITCH	79		INTERIOR LIGHT	98		LEFT-HAND REAR NUMBER PLATE LIGHT
20		LOW PRESSURE SWITCH-AIR CONDITIONING	51		HORN PUSH				99		SPEEDOMETER SPEED SENSOR
21		GEARBOX SAFETY START SWITCH	52		FOOT BRAKE SWITCH (NORTH AMERICA ONLY)						
22		FRONT AXLE DIFFERENTIAL LOCK SOLENOID	53		MULTI-POWER SOLENOID						
23		FUEL GAUGE ILLUMINATION	54		DIFFERENTIAL LOCK SWITCH						
24		WATER TEMPERATURE GAUGE ILLUMINATION	55		FOUR WHEEL DRIVE SOLENOID						
25		TACHOMETER ILLUMINATION	56		REAR WINDOW WASHER PUMP						
26		CHARGE CIRCUIT DIODE (PART OF HARNESS)	57		FRONT WINDSCREEN WASHER PUMP						
27		WORK LIGHT RESISTOR (PART OF HARNESS)	58		PARKING BRAKE SWITCH						
28		FUSE BOX	59		25 AMP POWER SOCKET						
29		LIGHTING SWITCH	60		SPEEDSHIFT SWITCH-PANEL						
30		HAZARD WARNING SWITCH	61		SPEEDSHIFT SWITCH-GEAR LEVER						
31		COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH	62		SPEEDSHIFT INDICATOR LIGHT-FAST SPEED						

Wiring colour code

B	Black
G	Green
K	Pink
LG	Light green
LU	Light blue
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Trailer socket wiring

L	Left hand rear direction indicator
R	Right hand rear direction indicator
31	Earth (-)
54	Right hand and left hand brake stop lights
54G	Not used spare
58L	Left hand rear light and number plate light
58R	Right hand rear light

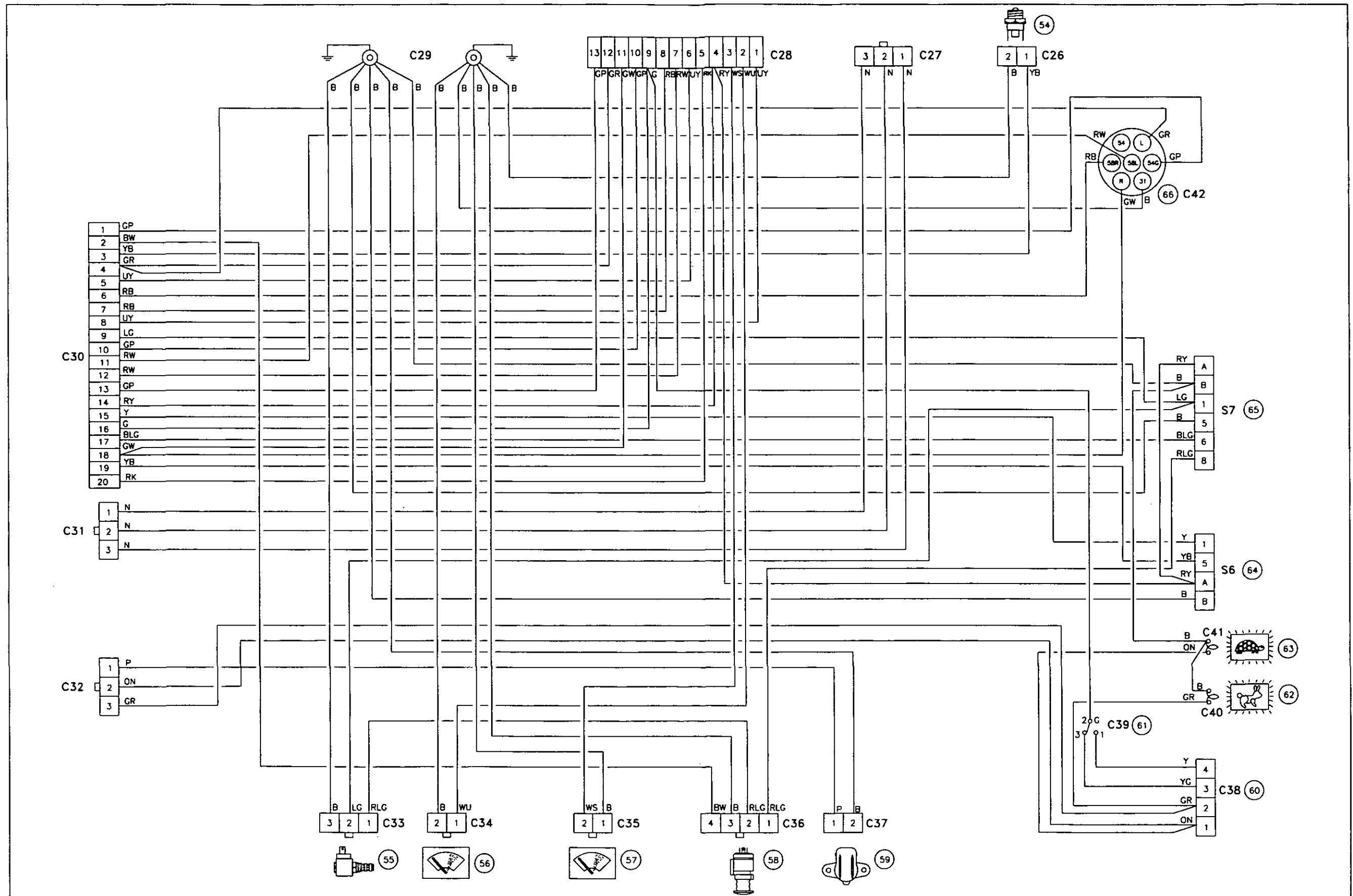


Figure 6. Rear harness
World wide and North America

CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- | | | | | | |
|----|--|--|----|--|--|
| 1 | | HORN | 32 | | HEAD LIGHT DIP SWITCH |
| 2 | | LEFT-HAND HEAD LIGHTS | 33 | | STOP LIGHT SWITCH-FOOT BRAKES |
| 3 | | FUEL TANK SENDER UNIT | 34 | | AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK |
| 4 | | AIR FILTER SWITCH | 35 | | AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED |
| 5 | | WATER TEMPERATURE TRANSMITTER | 36 | | HEAD LIGHT FLASH RELAY-YELLOW |
| 6 | | FUEL CUT-OFF VALVE | 37 | | ROOF WORK LIGHT RELAY -RED |
| 7 | | ENGINE OIL PRESSURE SWITCH | 38 | | AIR CONDITIONING RELAY BLUE |
| 8 | | STARTER MOTOR AND SOLENOID | 39 | | FUEL AND WATER TEMPERATURE GAUGE |
| 9 | | BATTERY(IES) | 40 | | HEATER FAN MOTOR |
| 10 | | ALTERNATOR | 41 | | SLOW SPEED RESISTOR |
| 11 | | HYDRAULIC OIL FILTER TEMPERATURE SWITCH | 42 | | HEATER FAN MOTOR SWITCH |
| 12 | | HYDRAULIC OIL FILTER PRESSURE SWITCH | 43 | | SPEEDSHIFT SOLENOID |
| 13 | | THERMOSTAT | 44 | | PTO SAFETY START SWITCH |
| 14 | | ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY) | 45 | | STARTER SWITCH |
| 15 | | LOW HYDRAULIC OIL PRESSURE SWITCH | 46 | | SPEEDSHIFT 'SLOW' INDICATOR LIGHT |
| 16 | | FUSIBLE LINKS | 47 | | SPEEDSHIFT 'FAST' INDICATOR LIGHT |
| 17 | | RIGHT-HAND HEAD LIGHT | 48 | | FLASHING INDICATOR UNIT |
| 18 | | TACHOMETER | 49 | | RANGE SPEED INDICATOR SWITCH |
| 19 | | AIR CONDITIONING COMPRESSOR | 50 | | CREEPER INDICATOR SWITCH |
| 20 | | LOW PRESSURE SWITCH-AIR CONDITIONING | 51 | | HORN PUSH |
| 21 | | GEARBOX SAFETY START SWITCH | 52 | | FOOT BRAKE SWITCH (NORTH AMERICA ONLY) |
| 22 | | FRONT AXLE DIFFERENTIAL LOCK SOLENOID | 53 | | MULTI-POWER SOLENOID |
| 23 | | FUEL GAUGE ILLUMINATION | 54 | | DIFFERENTIAL LOCK SWITCH |
| 24 | | WATER TEMPERATURE GAUGE ILLUMINATION | 55 | | FOUR WHEEL DRIVE SOLENOID |
| 25 | | TACHOMETER ILLUMINATION | 56 | | REAR WINDOW WASHER PUMP |
| 26 | | CHARGE CIRCUIT DIODE (PART OF HARNESS) | 57 | | FRONT WINDSCREEN WASHER PUMP |
| 27 | | WORK LIGHT RESISTOR (PART OF HARNESS) | 58 | | PARKING BRAKE SWITCH |
| 28 | | FUSE BOX | 59 | | 25 AMP POWER SOCKET |
| 29 | | LIGHTING SWITCH | 60 | | SPEEDSHIFT SWITCH-PANEL |
| 30 | | HAZARD WARNING SWITCH | 61 | | SPEEDSHIFT SWITCH-GEAR LEVER |
| 31 | | COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH | 62 | | SPEEDSHIFT INDICATOR LIGHT-FAST SPEED |

- | | | | | | |
|-----|--|--|----|--|---|
| 63 | | SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED | 80 | | FRONT WINDSCREEN WIPER MOTOR |
| 64 | | DIFFERENTIAL LOCK SWITCH | 81 | | RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT |
| 65 | | FOUR WHEEL DRIVE SWITCH | 82 | | RIGHT-HAND FRONT WORK LIGHT |
| 66 | | TRAILER SOCKET | 83 | | AIR CONDITIONER UNIT |
| 67 | | SPEEDOMETER | 84 | | AIR CONDITIONER TEMPERATURE CONTROL |
| 68 | | FRONT WORK LIGHT SWITCH | 85 | | AIR CONDITIONER THERMISTER |
| 69 | | REAR WORK LIGHT SWITCH | 86 | | AIR CONDITIONER BLOWER MOTOR SWITCH |
| 70 | | FRONT WINDSCREEN WASH/WIPE SWITCH | 87 | | AIR CONDITIONER RELAY (BLUE) |
| 71 | | REAR WINDOW WASH/WIPE SWITCH | 88 | | CAB IGNITION SWITCHED SUPPLY RELAY (RED) |
| 72 | | BEACON SWITCH | 89 | | FUSE BOX NO.1 |
| 73A | | BEACON-RIGHT-HAND | 90 | | FUSE BOX NO.2 |
| 73B | | BEACON-LEFT-HAND | 91 | | RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR |
| 73C | | BEACON SOCKET | 92 | | RIGHT-HAND REAR WORK LIGHT |
| 74 | | RADIO | 93 | | RIGHT-HAND NUMBER PLATE LIGHT |
| 75 | | LEFT-HAND SPEAKER | 94 | | REAR WINDOW WIPER MOTOR |
| 76 | | RIGHT-HAND SPEAKER | 95 | | LEFT-HAND NUMBER PLATE LIGHT |
| 77 | | LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT | 96 | | LEFT-HAND REAR WORK LIGHT |
| 78 | | LEFT-HAND FRONT WORK LIGHT | 97 | | LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR |
| 79 | | INTERIOR LIGHT | 98 | | LEFT-HAND REAR NUMBER PLATE LIGHT |
| | | | 99 | | SPEEDOMETER SPEED SENSOR |

Wiring colour code

- | | |
|----|-------------|
| B | Black |
| G | Green |
| K | Pink |
| LG | Light green |
| LU | Light blue |
| N | Brown |
| O | Orange |
| P | Purple |
| R | Red |
| S | Grey |
| U | Blue |
| W | White |
| Y | Yellow |

Trailer socket wiring

- | | |
|-----|---|
| L | Left hand rear direction indicator |
| R | Right hand rear direction indicator |
| 31 | Earth (-) |
| 54 | Right hand and left hand brake stop lights |
| 54G | Not used spare |
| 58L | Left hand rear light and number plate light |
| 58R | Right hand rear light |

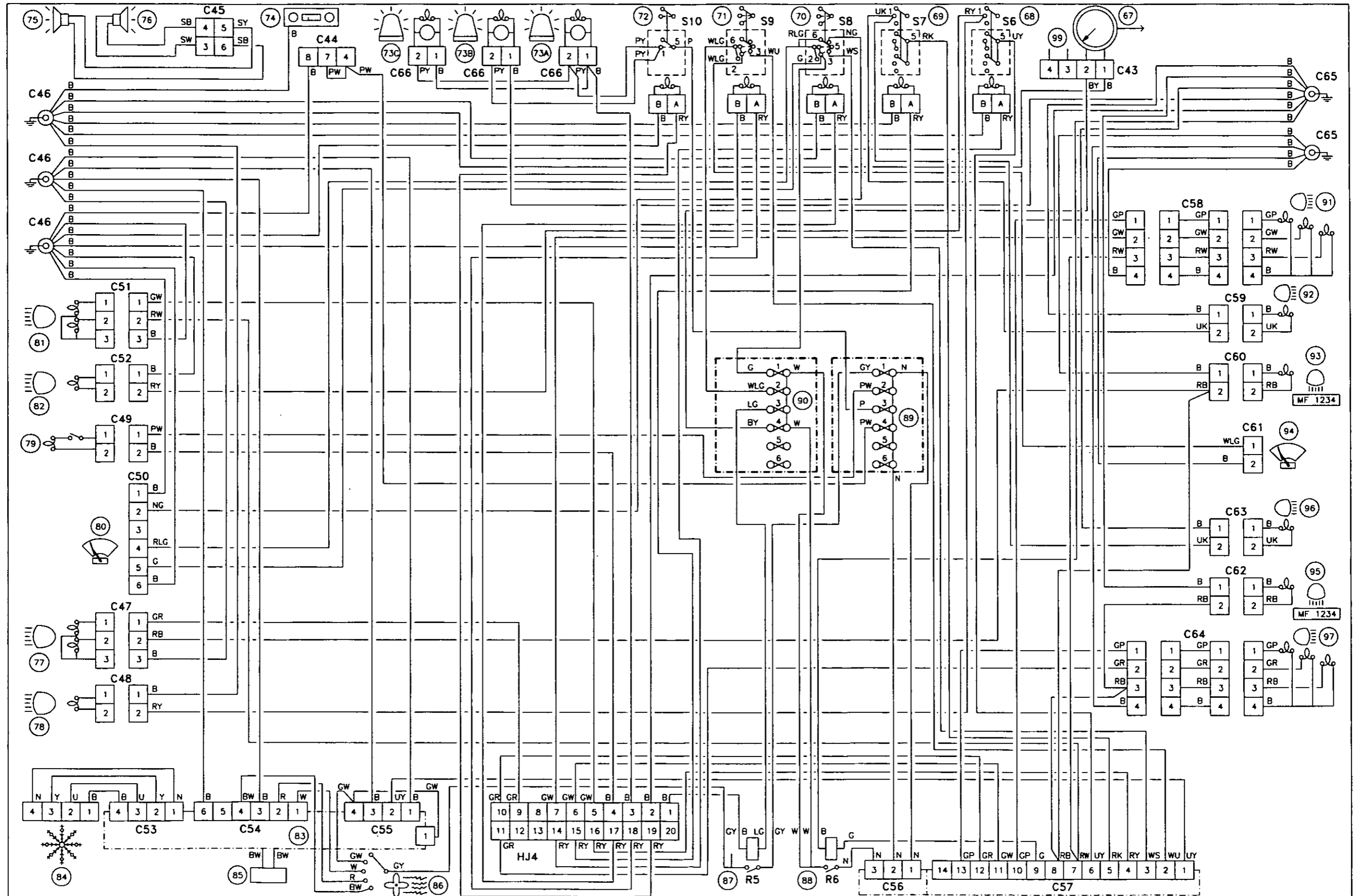



















































































Figure 7. Cab harness





















CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- 1  HORN
- 2  LEFT-HAND HEAD LIGHTS
- 3  FUEL TANK SENDER UNIT
- 4  AIR FILTER SWITCH
- 5  WATER TEMPERATURE TRANSMITTER
- 6  FUEL CUT-OFF VALVE
- 7  ENGINE OIL PRESSURE SWITCH
- 8  STARTER MOTOR AND SOLENOID
- 9  BATTERY(IES)
- 10  ALTERNATOR
- 11  HYDRAULIC OIL FILTER TEMPERATURE SWITCH
- 12  HYDRAULIC OIL FILTER PRESSURE SWITCH
- 13  THERMOSTAT
- 14  ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)
- 15  LOW HYDRAULIC OIL PRESSURE SWITCH
- 16  FUSIBLE LINKS
- 17  RIGHT-HAND HEAD LIGHT
- 18  TACHOMETER
- 19  AIR CONDITIONING COMPRESSOR
- 20  LOW PRESSURE SWITCH-AIR CONDITIONING
- 21  GEARBOX SAFETY START SWITCH
- 22  FRONT AXLE DIFFERENTIAL LOCK SOLENOID
- 23  FUEL GAUGE ILLUMINATION
- 24  WATER TEMPERATURE GAUGE ILLUMINATION
- 25  TACHOMETER ILLUMINATION
- 26  CHARGE CIRCUIT DIODE (PART OF HARNESS)
- 27  WORK LIGHT RESISTOR (PART OF HARNESS)
- 28  FUSE BOX
- 29  LIGHTING SWITCH
- 30  HAZARD WARNING SWITCH
- 31  COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH

- 32  HEAD LIGHT DIP SWITCH
- 33  STOP LIGHT SWITCH-FOOT BRAKES
- 34  AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
- 35  AUXILLARY SUPPLY-NON SWITCH CONTROLLED-RED
- 36  HEAD LIGHT FLASH RELAY-YELLOW
- 37  ROOF WORK LIGHT RELAY -RED
- 38  AIR CONDITIONING RELAY BLUE
- 39  FUEL AND WATER TEMPERATURE GAUGE
- 40  HEATER FAN MOTOR
- 41  SLOW SPEED RESISTOR
- 42  HEATER FAN MOTOR SWITCH
- 43  SPEEDSHIFT SOLENOID
- 44  PTO SAFETY START SWITCH
- 45  STARTER SWITCH
- 46  SPEEDSHIFT 'SLOW' INDICATOR LIGHT
- 47  SPEEDSHIFT 'FAST' INDICATOR LIGHT
- 48  FLASHING INDICATOR UNIT
- 49  RANGE SPEED INDICATOR SWITCH
- 50  CREEPER INDICATOR SWITCH
- 51  HORN PUSH
- 52  FOOT BRAKE SWITCH (NORTH AMERICA ONLY)
- 53  MULTI-POWER SOLENOID
- 54  DIFFERENTIAL LOCK SWITCH
- 55  FOUR WHEEL DRIVE SOLENOID
- 56  REAR WINDOW WASHER PUMP
- 57  FRONT WINDSCREEN WASHER PUMP
- 58  PARKING BRAKE SWITCH
- 59  25 AMP POWER SOCKET
- 60  SPEEDSHIFT SWITCH-PANEL
- 61  SPEEDSHIFT SWITCH-GEAR LEVER
- 62  SPEEDSHIFT INDICATOR LIGHT-FAST SPEED

- 63  SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED
- 64  DIFFERENTIAL LOCK SWITCH
- 65  FOUR WHEEL DRIVE SWITCH
- 66  TRAILER SOCKET
- 67  SPEEDOMETER
- 68  FRONT WORK LIGHT SWITCH
- 69  REAR WORK LIGHT SWITCH
- 70  FRONT WINDSCREEN WASH/WIPE SWITCH
- 71  REAR WINDOW WASH/WIPE SWITCH
- 72  BEACON SWITCH
- 73A  BEACON-RIGHT-HAND
- 73B  BEACON-LEFT-HAND
- 73C  BEACON SOCKET
- 74  RADIO
- 75  LEFT-HAND SPEAKER
- 76  RIGHT-HAND SPEAKER
- 77  LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 78  LEFT-HAND FRONT WORK LIGHT
- 79  INTERIOR LIGHT

- 80  FRONT WINDSCREEN WIPER MOTOR
- 81  RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 82  RIGHT-HAND FRONT WORK LIGHT
- 83  AIR CONDITIONER UNIT
- 84  AIR CONDITIONER TEMPERATURE CONTROL
- 85  AIR CONDITIONER THERMISTER
- 86  AIR CONDITIONER BLOWER MOTOR SWITCH
- 87  AIR CONDITIONER RELAY (BLUE)
- 88  CAB IGNITION SWITCHED SUPPLY RELAY (RED)
- 89  FUSE BOX NO.1
- 90  FUSE BOX NO.2
- 91  RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 92  RIGHT-HAND REAR WORK LIGHT
- 93  RIGHT-HAND NUMBER PLATE LIGHT
- 94  REAR WINDOW WIPER MOTOR
- 95  LEFT-HAND NUMBER PLATE LIGHT
- 96  LEFT-HAND REAR WORK LIGHT
- 97  LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 98  LEFT-HAND REAR NUMBER PLATE LIGHT
- 99  SPEEDOMETER SPEED SENSOR

Wiring colour code

- B Black
- G Green
- K Pink
- LG Light green
- LU Light blue
- N Brown
- O Orange
- P Purple
- R Red
- S Grey
- U Blue
- W White
- Y Yellow

Trailer socket wiring

- L Left hand rear direction indicator
- R Right hand rear direction indicator
- 31 Earth (-)
- 54 Right hand and left hand brake stop lights
- 54G Not used spare
- 58L Left hand rear light and number plate light
- 58R Right hand rear light

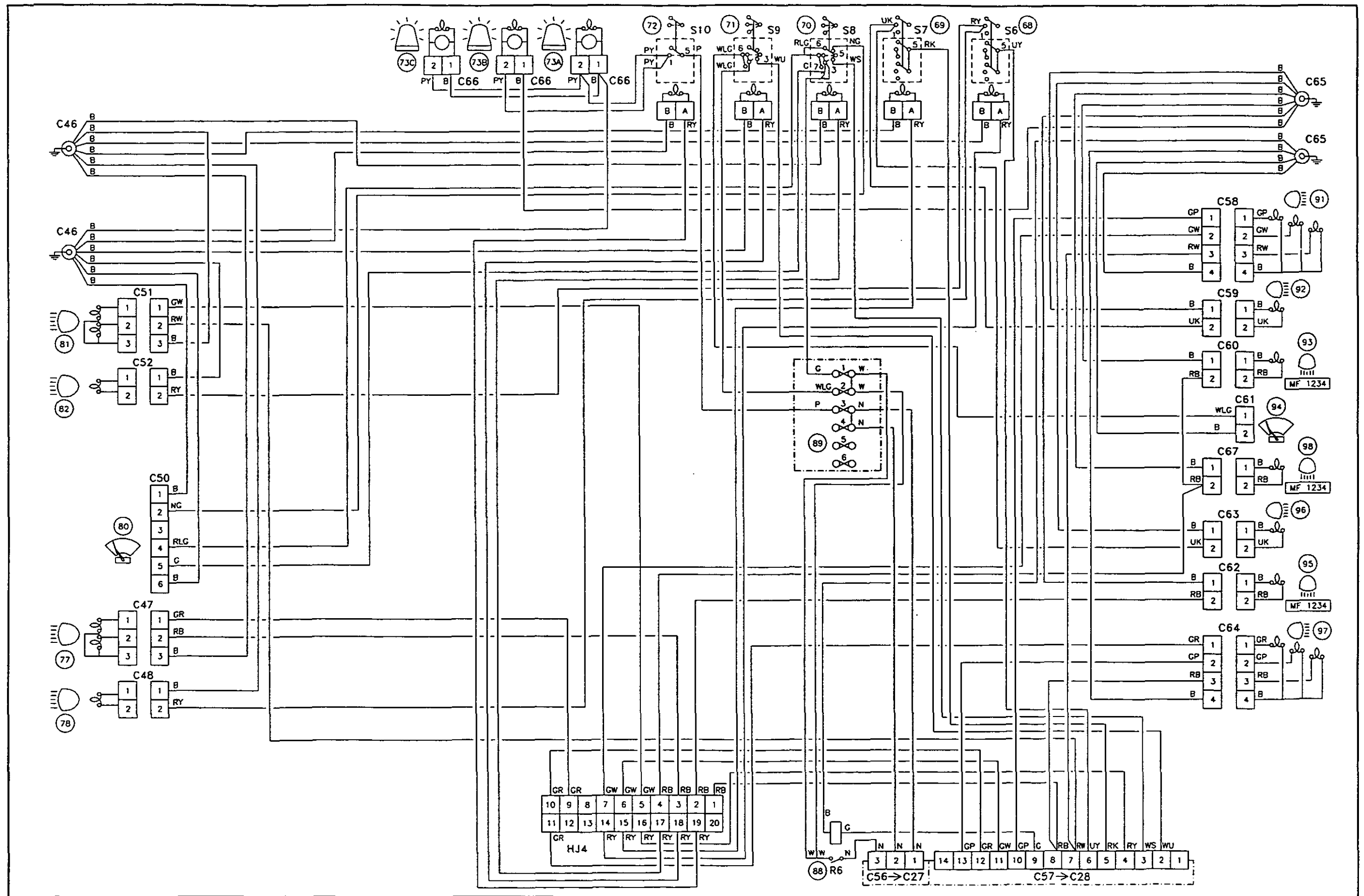


Figure 8. Cab harness-Flat top roof cab

CAB TRACTOR WIRING DIAGRAMS

**CONSOLE HARNESS – 12 x 12 and 18 SPEEDSHIFT GEARBOXES
NORTH AMERICA ONLY**

Console harness (Fig. 9)

C2 Earth to engine cylinder block

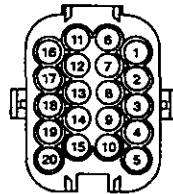


C11 Differential lock solenoid connector



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C13/19 - Differential lock warning light	Yellow/black

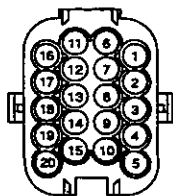
C12 Front harness connector – Red
Connects to connector C5



Terminal	Destination	Colour Code
1	Fuse B6 - Left-hand head light dip beam	Blue/pink
2	Charge circuit diode (26)	Brown/yellow
3	Fuse B9 - Right-hand head light main beam	Blue/black
4	Fuse B8 - Left-hand head light main beam	Blue/grey
5	Connector C13/8 - Air conditioning low pressure switch	Blue/yellow
6	Connector C14/4 - Hydraulic pressure warning light	Yellow
7	Connector C14/2 - Hydraulic oil filter warning light	Black/purple
8	Connector C15/4 - Fuel gauge (39)	Green/black
9	Connector C24/1 - Horn push (51)	Purple/yellow
10	Header joint HJ3/18- Tachometer	Green/yellow
11	Fuse B3 - Fuel cut-off	Orange
12	Connector C15/1 - Water temperature gauge (39)	Green/blue
13	Connector C14/9 - Air filter warning light	Blue/green
14	Header Joint HJ2/20 - Negative (-)	Black
15	Connector C14/3 - Engine oil pressure warning light	White/brown
16	Relay R3/8 - Air conditioning (38)	Purple/black
17	Connector C14/10 - Low fuel warning light	Green/orange
18	Relay R3/4 - Air conditioning (38)	Black/yellow
19	Fuse B7 - Right-hand head light dip beam	Blue/orange
20	Fuse A1 - Thermostart	Orange/red

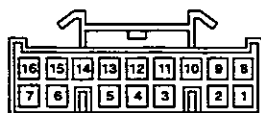
CAB TRACTOR WIRING DIAGRAMS

C13 Rear harness connector – Black
Connects to connector C30



Terminal	Destination	Colour Code
1	Not used	
2	Connector C14/6 - Parking brake warning light	Black/white
3	Connector C14/11 - Differential lock indicator light	Yellow/black
4	Switch S5/3 - Direction indicator switch (54) - Left-hand rear	Green/red
5	Fuse A7 - Front work lights	Blue/yellow
6	Fuse C5 - Trailer left-hand side/rear light	Red/black
7	Fuse C5 - Left-hand side/rear light	Red/black
8	Connector C12/5 - Air conditioning low pressure switch	Blue/yellow
9	Connector C14/15 - Four-wheel drive indicator light	Light green
10	Not used	
11	Fuse C6 - Trailer right-hand side/rear light	Red/white
12	Fuse C6 - Right-hand side/rear light	Red/white
13	Not used	
14	Auxiliary supply red - switch illumination	Red/yellow
15	Fuse A2 - Differential lock	Yellow
16	Fuse A4 - Fused cab supply (+)	Green
17	Connector C23/1 - Foot brake switch (52)	Black/Light green
18	Switch S5/6 - Direction indicator switch (54)	Green/white
19	connector C11/12 - Differential lock solenoid (22)	Yellow/black
20	Fuse A8 - Rear work light	Red/pink

C14 Instrument panel warning lights connector
See also page 14A-42



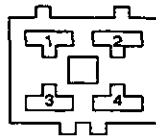
Terminal	Destination	Colour Code
1	Not used	
2	Connector C12/7 - Hydraulic oil filter	Black/purple
3	Connector C12/15 - Engine oil pressure	White/brown
4	Connector C12/6 - Low hydraulic oil pressure	Yellow
5	Header joint HJ2/11 - Alternator charge	Brown/yellow
6	Connector C13/2 - Parking brake	Black/white
7	Fuse B9 - Head light main beam	Blue/black
8	Header joint HJ3/17 - Positive (+)	Green/yellow
9	Connector C12/13 - Air filter	Blue/green
10	Connector C12/17 - Low fuel	Green/orange
11	Connector C13/3 - Differential lock	Yellow/black
12	Header joint HJ2/8 - Negative (-)	Black
13	Switch S5/6 - Direction indicator switch (54) - Right-hand indicator	Green/white
14	Relay R4/2 - Direction indicator flasher unit (48)	Light green/purple
15	Connector C13/9 - Four-wheel drive	Light green
16	Switch S5/3 - Direction indicator switch (54) - Left-hand indicator	Green/red

CAB TRACTOR WIRING DIAGRAMS**C15 Fuel level and water temperature gauge connector**

See also page 14A-41



Terminal	Destination	Colour Code
1	Connector C12/12 - Water temperature	Green/blue
2	Header joint HJ2/17 - Negative (-)	Black
3	Header joint HJ3/19 - Positive (+)	Green/yellow
4	Connector C12/8 - Fuel tank sender	Green/black

C16 Ignition switch connector

Terminal	Destination	Colour Code
1	Fusible link to starter motor (16)	Brown
2	Fuse A1 - Thermostart	Brown/red
3	Fuse B1 - Auxiliary power supply	White
	Fuse A4 - Fused cab supply	White
4	Gearbox safety start switch (21)	White/red

C17 Non-ignition switched auxiliary supply connector- Red

See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/12 - Positive (+)	Red/yellow
	Connector C13/14 - Switch light	Red/yellow
3	Fuse C3 - Auxiliary positive (+)	Purple

C18 Ignition switched auxiliary supply connector - Black

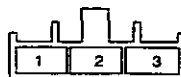
See also page 14A-37



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Header joint HJ3/5 - Positive (+)	Red/yellow
	Fuse C7 - Switch light	Red/yellow
3	Fuse B1 - Auxiliary positive (+)	White/green

C20 Cab main supply - Bulkhead connector 2

Connects to connector C31

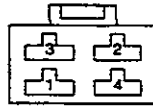


Terminal	Destination	Colour Code
1.	Fusible link - Power supply to cab roof	Brown
2.	Fusible link - Power supply to cab roof	Brown
3.	Fusible link - Power supply to cab roof	Brown

CAB TRACTOR WIRING DIAGRAMS

C21 Speedshift connector

Connects to connector C32



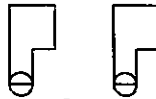
Terminal	Destination	Colour Code
1	Fuse C8 - Rear power supply	Purple
2	Connector C22/2 - Speedshift solenoid (43)	Orange/brown
	Speedshift indicator light - 'Slow' (46)	Orange/brown
3	Speedshift indicator light - 'Fast' (47)	Green/red
4	Not used	

C22 Speedshift solenoid connector



Terminal	Destination	Colour Code
1	Connector C2 - Earth to engine cylinder block (-)	Black
2	Connector C21/2 - Speedshift	Orange/brown
3	Not used	

C23 Stop light switch connector



Terminal	Destination	Colour Code
1	Connector C13/17 - Four-wheel drive switch	Black/light green
2	Fuse B2 - Four-wheel drive	Green

C24 Heater fan motor connector



Terminal	Destination	Colour Code
1	Fuse A3 - Heater fan motor	Brown/blue
2	Connector C2 - Earth to engine cylinder block (-)	Black

C25 Horn connector



Terminal	Destination	Colour Code
1	Connector C12/9 - Horn	Purple/yellow
2	Fuse C1 - Horn	Purple/brown

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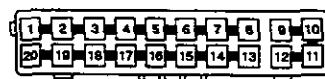
CAB TRACTOR WIRING DIAGRAMS

HJ2 Header joint 2 – Grey



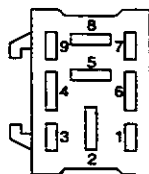
Terminal	Destination	Colour Code
1	Relay R3/6 - Air conditioning relay (38)	Black
2	Switch S1/A - Hazard warning switch (30) - Indicator light	Black
3	Relay R2/6 - Work light relay (37)	Black
4	Not used	
5	Connection C2 - Earth to engine cylinder block (-)	Black
6	Switch S2/B - Side/head light switch (29) - switch light	Black
7	Relay R4/4 - Direction indicator flasher unit (48)	Black
8	Connector C14/12 - Negative (-)	Black
9	Work light resistor (27)	Brown/yellow
10	Charge circuit diode (26)	Brown/yellow
11	Connector C14/5 - Alternator charge warning	Brown/yellow
12	Not used	
13	Switch S4/B - Heater motor switch (42) - switch light	Black
14	Tachometer illumination (25)	Black
15	Tachometer illumination (25)	Black
16	Connector C2 - Earth to engine cylinder block (-)	Black
17	Connector C15/2 - Fuel and temperature gauge (39)	
18	Fuel and temperature gauge illumination (23)	Black
19	Fuel and temperature gauge illumination (24)	Black
20	Connector C12/14 - Negative (-)	Black

HJ3 Header joint 3 – Grey



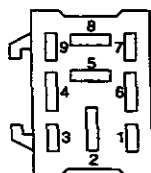
Terminal	Destination	Colour Code
1	Switch S4/A - Heater fan motor switch (42) - switch light	Red/yellow
2	Fuel and water gauge illumination (23 & 24)	Red/yellow
3	Fuse B8 - Left-hand head light main beam	Red/yellow
4	Tachometer illumination (25)	Red/yellow
5	Connector C18/2 - Auxiliary supply black (35) - switch light	Red/yellow
6	Tachometer illumination (25)	Red/yellow
7	Switch S1/8 - Hazard warning switch (30)	Red/yellow
8	Connected to terminal 9	Red/yellow
9	Connected to terminal 8	Red/yellow
10	Not used	
11	Switch S2/A - Side/head light switch (29) - switch light	Red/yellow
12	Connector C17/2 - Auxiliary power socket red (34) - switch light	Red/yellow
13	Not used	
14	Not used	
15	Not used	
16	Fuse B4 - Instrument panel	Green/yellow
17	Connector C14/8 - Instrument light panel supply (+)	Green/yellow
18	Connector C12/10 - Tachometer	Green/yellow
19	Connector C15/3 - Fuel and temperature gauge (39)	Green/yellow
20	Work light resistor (27)	Green/yellow

R2 Work light relay – Red



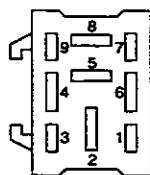
Terminal	Destination	Colour Code
1	Not used	
2	Fuse A6 - Work lights	Purple/red
3	Not used	
4	Switch S1/6 - Hazard warning switch (30)	Red/orange
5	Not used	
6	Header joint HJ2/3 - Negative (-)	Black
7	Not used	
8	Fuse A8 - Work lights	Blue/purple

R3 Air conditioning relay – Blue



Terminal	Destination	Colour Code
1	Not used	
2	Fuse C4 - Air conditioning	Purple/blue
3	Not used	
4	Connector C12/18 - Air conditioning low pressure switch	Black/yellow
5	Not used	
6	Header junction HJ2/1 - Negative supply (-)	Black
7	Not used	
8	Connector C12/16 - Air conditioning compressor	Purple/black

R4 Direction indicator flasher unit – Blue

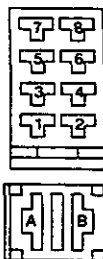


Terminal	Destination	Colour Code
1	Not used	
2	Connector C14/14 - Direction indicator light	Light green/purple
3	Not used	
4	Header joint HJ2/7 -Negative (-)	Black
5	Not used	
6	Switch S5/1 - Direction indicator switch (54)	Light green/pink
6	Switch S1/2 - Hazard warning switch (30)	Light green/pink
6	Switch S1/5 - Hazard warning switch (30)	Light green/brown
7	Not used	
8	Not used	

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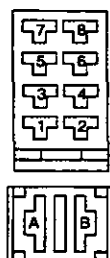
CAB TRACTOR WIRING DIAGRAMS

S1 Hazard warning switch



Terminal	Destination	Colour Code
1	Not used	
2	Relay R4/6 - Flasher unit (48)	Light green/pink
3	Not used	
4	Fuse C2 - Hazard warning	Purple/green
5	Relay R4/8 - Flashing indicator unit (48)	Light green/brown
	Switch S5/2 - Direction indicator switch (54)	Light green/brown
6	Relay R2/4 - Work light relay (37)	Red/orange
7	Header joint HJ3/3 - switch light	Red/yellow
8	Header joint HJ3/7	Red/yellow
Switch light		
A	Not used	
B	Header joint HJ2/2 - Switch light negative (-)	Black

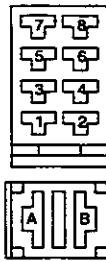
S2 Side/head light switch



Terminal	Destination	Colour Code
1	Fuse B8 & B9 - Left and right-hand main beam	Blue/white
2	Fusible link (16) - Supply (+)	Brown
3	Terminal 6 on plug	Red
4	Not used	
5	Not used	
6	Fuse C5, C6 & C7 - Left and right-hand side light, instrument panel lights	Red
7	Fuse B6 - Left and right-hand head light dip beam	Blue/red
8	Not used	
Switch light		
A	Header joint HJ3/10 - Switched positive (+)	Red/yellow
B	Header joint HJ2/4 - Negative (-)	Black

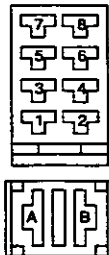
CAB TRACTOR WIRING DIAGRAMS

S4 Heater fan motor switch



Terminal	Destination	Colour Code
1	Motor resistor- 'Fast' speed	Black
2	Not used	
3	Connector C24 - Supply (+)	Black
4	Not used	
5	Motor resistor - 'Slow' speed	White
6	Not used	
7	Not used	
8	Not used	
9	Not used	
Switch light		
A	Header joint HJ3/1 - Switched positive (+)	Red/yellow
B	Header joint HJ2/13 - Negative (-)	Black

S5 Direction indicator switch

































































Terminal	Destination	Colour Code
1	Relay R4/6 - Flasher unit (48)	Light green/pink
	Terminal 8	Light green/pink
2	Hazard switch (30)	Light green/brown
	Terminal 7	Light green/brown
3	Connector C13/4 - Left-hand direction indicator	Green/white
	Connector C14/16 - Left-hand indicator	Green/white
4	Not used	
5	Not used	
6	Connector C13/18 - Right-hand direction indicator	Green/white
	Connector C14/13 - Right-hand indicator	Green/white
7	Terminal 2	Light green/brown
8	Terminal 1	Light green/pink





















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



















CAB TRACTOR WIRING DIAGRAMS

Key to wiring diagrams

- 1  HORN
- 2  LEFT-HAND HEAD LIGHTS
- 3  FUEL TANK SENDER UNIT
- 4  AIR FILTER SWITCH
- 5  WATER TEMPERATURE TRANSMITTER
- 6  FUEL CUT-OFF VALVE
- 7  ENGINE OIL PRESSURE SWITCH
- 8  STARTER MOTOR AND SOLENOID
- 9  BATTERY(IES)
- 10  ALTERNATOR
- 11  HYDRAULIC OIL FILTER TEMPERATURE SWITCH
- 12  HYDRAULIC OIL FILTER PRESSURE SWITCH
- 13  THERMOSTAT
- 14  ENGINE SPEED SENSOR-TACHOMETER (SIX CYLINDER ENGINES ONLY)
- 15  LOW HYDRAULIC OIL PRESSURE SWITCH
- 16  FUSIBLE LINKS
- 17  RIGHT-HAND HEAD LIGHT
- 18  TACHOMETER
- 19  AIR CONDITIONING COMPRESSOR
- 20  LOW PRESSURE SWITCH-AIR CONDITIONING
- 21  GEARBOX SAFETY START SWITCH
- 22  FRONT AXLE DIFFERENTIAL LOCK SOLENOID
- 23  FUEL GAUGE ILLUMINATION
- 24  WATER TEMPERATURE GAUGE ILLUMINATION
- 25  TACHOMETER ILLUMINATION
- 26  CHARGE CIRCUIT DIODE (PART OF HARNESS)
- 27  WORK LIGHT RESISTOR (PART OF HARNESS)
- 28  FUSE BOX
- 29  LIGHTING SWITCH
- 30  HAZARD WARNING SWITCH
- 31  COLUMN SWITCH-HORN, DIRECTION INDICATOR AND HEAD LIGHT FLASH

- 32  HEAD LIGHT DIP SWITCH
- 33  STOP LIGHT SWITCH-FOOT BRAKES
- 34  AUXILIARY SUPPLY-STARTER SWITCH CONTROLLED-BLACK
- 35  AUXILIARY SUPPLY-NON SWITCH CONTROLLED-RED
- 36  HEAD LIGHT FLASH RELAY-YELLOW
- 37  ROOF WORK LIGHT RELAY -RED
- 38  AIR CONDITIONING RELAY BLUE
- 39  FUEL AND WATER TEMPERATURE GAUGE
- 40  HEATER FAN MOTOR
- 41  SLOW SPEED RESISTOR
- 42  HEATER FAN MOTOR SWITCH
- 43  SPEEDSHIFT SOLENOID
- 44  PTO SAFETY START SWITCH
- 45  STARTER SWITCH
- 46  SPEEDSHIFT 'SLOW' INDICATOR LIGHT
- 47  SPEEDSHIFT 'FAST' INDICATOR LIGHT
- 48  FLASHING INDICATOR UNIT
- 49  RANGE SPEED INDICATOR SWITCH
- 50  CREEPER INDICATOR SWITCH
- 51  HORN PUSH
- 52  FOOT BRAKE SWITCH (NORTH AMERICA ONLY)
- 53  MULTI-POWER SOLENOID
- 54  DIFFERENTIAL LOCK SWITCH
- 55  FOUR WHEEL DRIVE SOLENOID
- 56  REAR WINDOW WASHER PUMP
- 57  FRONT WINDSCREEN WASHER PUMP
- 58  PARKING BRAKE SWITCH
- 59  25 AMP POWER SOCKET
- 60  SPEEDSHIFT SWITCH-PANEL
- 61  SPEEDSHIFT SWITCH-GEAR LEVER
- 62  SPEEDSHIFT INDICATOR LIGHT-FAST SPEED

- 63  SPEEDSHIFT INDICATOR LIGHT-SLOW SPEED
- 64  DIFFERENTIAL LOCK SWITCH
- 65  FOUR WHEEL DRIVE SWITCH
- 66  TRAILER SOCKET
- 67  SPEEDOMETER
- 68  FRONT WORK LIGHT SWITCH
- 69  REAR WORK LIGHT SWITCH
- 70  FRONT WINDSCREEN WASH/WIPE SWITCH
- 71  REAR WINDOW WASH/WIPE SWITCH
- 72  BEACON SWITCH
- 73A  BEACON-RIGHT-HAND
- 73B  BEACON-LEFT-HAND
- 73C  BEACON SOCKET
- 74  RADIO
- 75  LEFT-HAND SPEAKER
- 76  RIGHT-HAND SPEAKER
- 77  LEFT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 78  LEFT-HAND FRONT WORK LIGHT
- 79  INTERIOR LIGHT
- 80  FRONT WINDSCREEN WIPER MOTOR

- 81  RIGHT-HAND FRONT SIDE AND DIRECTION INDICATOR LIGHT
- 82  RIGHT-HAND FRONT WORK LIGHT
- 83  AIR CONDITIONER UNIT
- 84  AIR CONDITIONER TEMPERATURE CONTROL
- 85  AIR CONDITIONER THERMISTER
- 86  AIR CONDITIONER BLOWER MOTOR SWITCH
- 87  AIR CONDITIONER RELAY (BLUE)
- 88  CAB IGNITION SWITCHED SUPPLY RELAY (RED)
- 89  FUSE BOX NO.1
- 90  FUSE BOX NO.2
- 91  RIGHT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 92  RIGHT-HAND REAR WORK LIGHT
- 93  RIGHT-HAND NUMBER PLATE LIGHT
- 94  REAR WINDOW WIPER MOTOR
- 95  LEFT-HAND NUMBER PLATE LIGHT
- 96  LEFT-HAND REAR WORK LIGHT
- 97  LEFT-HAND REAR LIGHT ASSEMBLY-REAR, STOP AND DIRECTION INDICATOR
- 98  LEFT-HAND REAR NUMBER PLATE LIGHT
- 99  SPEEDOMETER SPEED SENSOR
- 100  SPEEDSHIFT SOLENOID

Wiring colour code

- B Black
- G Green
- K Pink
- LG Light green
- LU Light blue
- N Brown
- O Orange
- P Purple
- R Red
- S Grey
- U Blue
- W White
- Y Yellow

Trailer socket wiring

- L Left hand rear direction indicator
- R Right hand rear direction indicator
- 31 Earth (-)
- 54 Right hand and left hand brake stop lights
- 54G Not used spare
- 58L Left hand rear light and number plate light
- 58R Right hand rear light

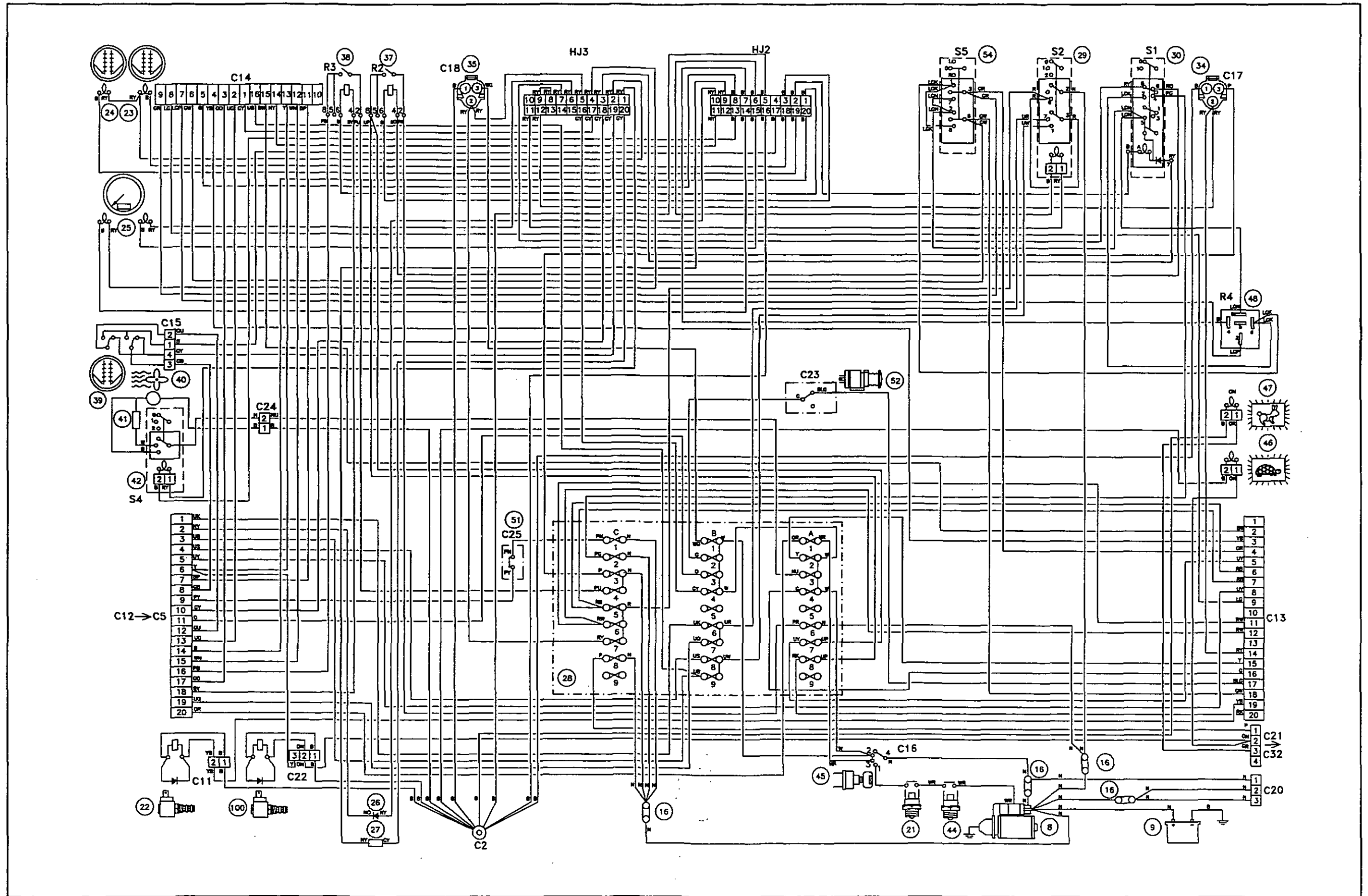


Figure 9. Console Harness - 12 x 12
North America



