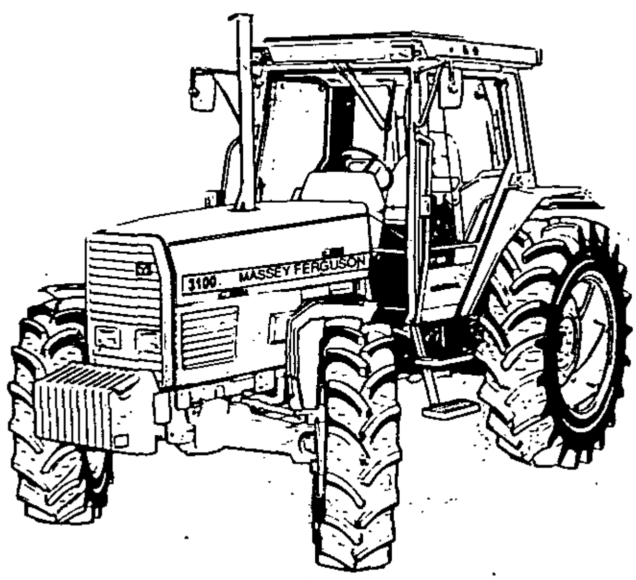
WORKSHOP SERVICE MANUAL Part 2

CONTENTS



Massey Ferguson Manufacturing
Beauvais France

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7

7 . FRONT AXLE 2 WD AND 4 WD

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7 A01 4 WD Clutch Assembly

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7 A01.2

Front axle - 4 WD clutch assembly

General

The clutch assembly for the drive to the front axle is mounted in the lower part of the rear axle housing. An *inspection cover placed under the housing provides* access to the unit which comprises :

- A shaft **(25)** turning on two taper roller bearings mounted in the bore of the centre housing.
- A hydraulic clutch assembly mounted on the shaft.
- A transfer gear **(15)** centred on the shaft by a bush **(43)**, driving the clutch plates **(36)**.

The transfer gear **(15)** has helical teeth and engages constantly with the gear **(7)** fitted on the bevel drive pinion.

The shaft is fitted with shims **[20]** placed between the cap **(22)** and the cup **(18)** so as to obtain play of 0 to +0.10 mm.

Operation

Disengaging

The 4WD solenoid valve sends oil at a pressure of 17 bar via a gallery in the centre housing, through bush **(11)** into the drilling in shaft **(25)**.
The piston **(30)** is forced by oil pressure along hub **(40)** *and pulls drum* **(42)** *which compresses the Belleville* washers **/34** and **/35** releasing plates **(36)**. The transfer gear **(15)** then runs freely on bush **(43)**.

Engaging

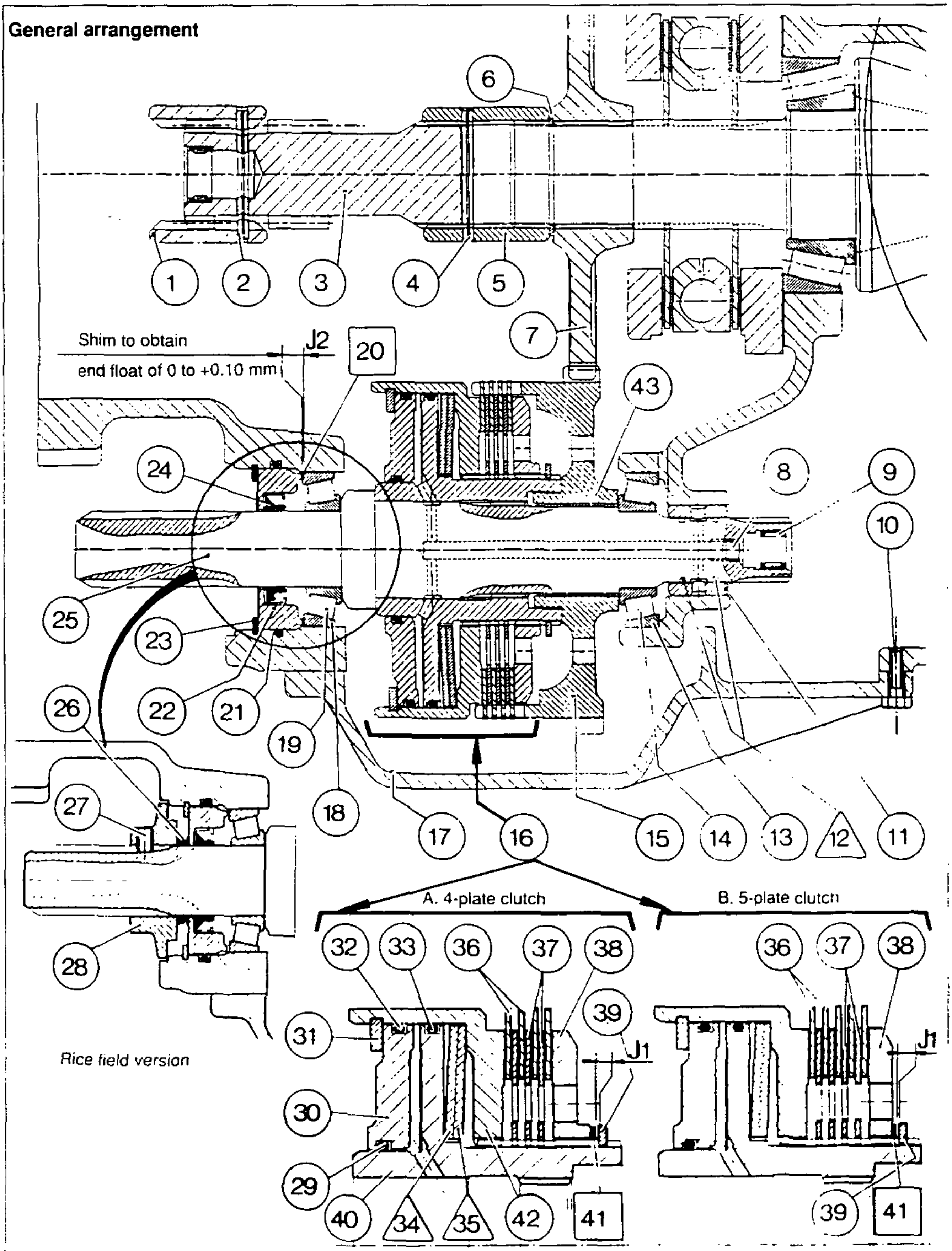
With the solenoid valve releasing the oil pressure, the Belleville washers push back the drum **(42)** which through the plates locks up with transfer gear **(15)** and *drives shaft* **(25)**. *The returning oil is dumped back into* the centre housing.

Parts list

(1) Sleeve
(2) Double pin
(3) Shaft
(4) Double pin
(5) Sleeve
(6) Circlip
(7) Gear
(8) Plug
(9) Needle roller bearing
(10) Bolt
(11) Bush
/12 Seal rings
(13) Bearing cup
(14) Bearing cone
(15) Transfer gear
(16) Clutch assembly
(17) Cover
(18) Bearing cup
(19) Bearing cone
[20] Shim(s)
(21) O-ring
(22) Cap
(23) Circlip
(24) Seal
(25) 4WD drive shaft
(26) Seal
(27) Locking screw
(28) Flange
(29) O-ring
(30) Piston
(31) Circlip
(32) O-ring
(33) O-ring
/34 Belleville washer
/35 Belleville washer
(36) Outer plate
A : 4-plate clutch
B : 5-plate clutch
(37) Inner plate
A : 4-plate clutch
B : 5-plate clutch
(38) Cover
(39) Circlip
(40) Hub
[41] Shim(s)
(42) Drum
(43) Bush

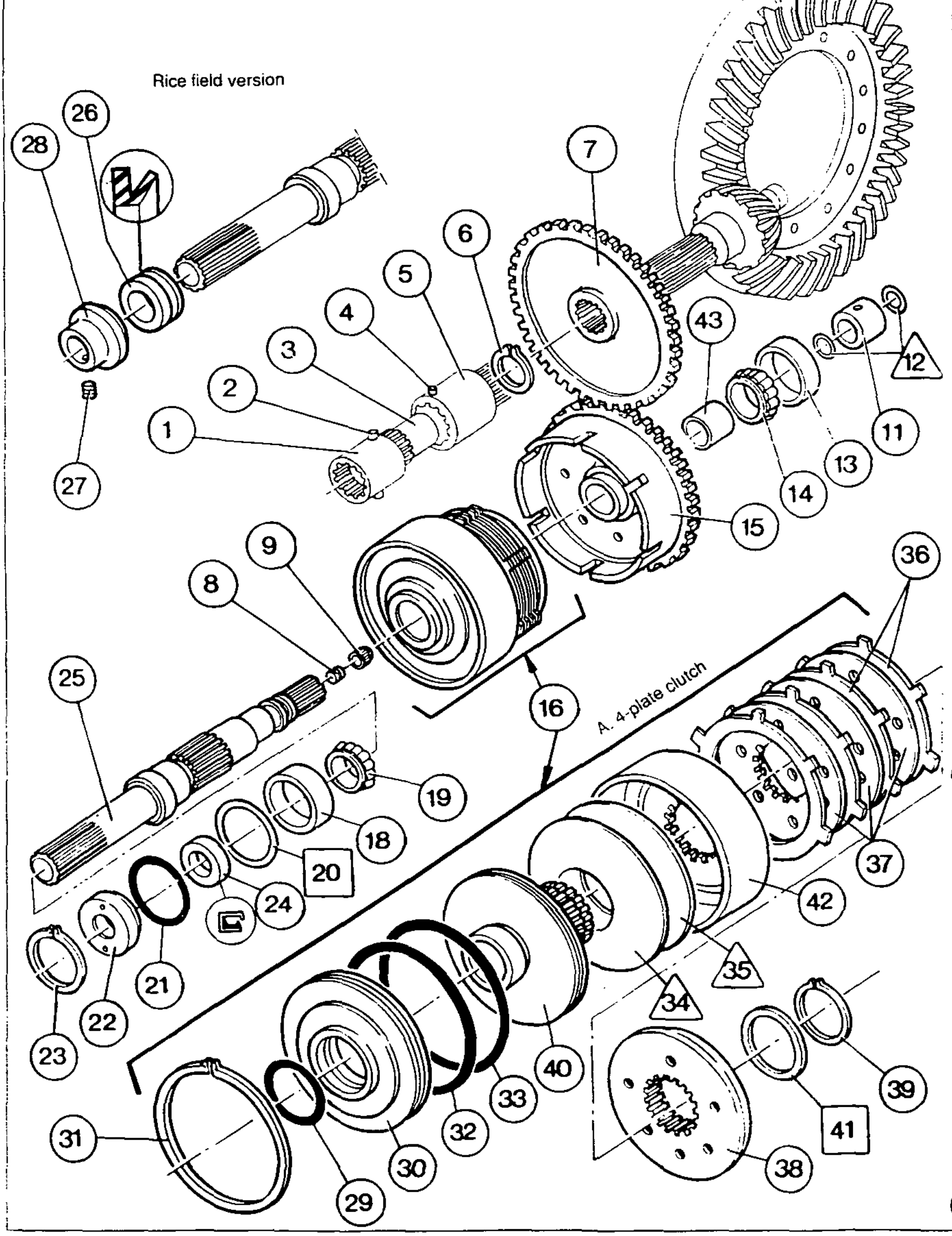
Front axle - 4 WD clutch assembly

General arrangement



Front axle - 4 WD clutch assembly

Exploded view



Front axle - 4 WD clutch assembly

A. Removal of clutch assembly

1. Immobilise the tractor. Drain the rear axle housing.
2. Disconnect the hoses for the front differential lock (plug the fittings). Remove the guard and the drive shaft.
3. Remove the bolts **(10)** and the cover **(17)**.
   Note: On tractors with a ground speed PTO (G.S. PTO), recover the spring (3), the plunger (2) and the retaining tube (1) (Fig. 1).
   On tractors equipped with a protector flange and rice field seal, remove the screw (27), the flange (28) and the seal (26).
4. Remove the circlip **(23)**.
5. Protect the splined section of the shaft **(25)**. Extract the cap **(22)** with its seal **(24)** using the locally made tool (see section E). Remove the seal **(24)** (Fig. 2).
6. Remove the O-ring **(21)**.
7. Remove the shims **[20]** and the cup **(18)**.
   Note: On tractors equipped with a G.S. PTO, set the control to the disengaged position.
8. Remove the shaft assembly **(25)** and bearing cone **(19)**, whilst keeping the clutch assembly **(16)** and transfer gear **(15)** together.
9. Remove the clutch assembly **(16)** with the transfer gear **(15)** and bearing cone **(14)**.
10. Using the locally made tool (see section E), remove the bush **(11)** (Fig. 3). This tool is essential for tractors with G.S. PTO. If necessary, also remove the cup **(13)** with a suitable extractor.

If removing the gear (7), it is necessary to remove the right-hand hydraulic cover.

11. Raise the relevant side of the tractor with a jack.
12. Place a stand in position and remove the wheel.
13. Remove the right-hand hydraulic cover.
    Carry out operations 2 to 14, chapter 8 I01.

Tractors without creeper gears

14. Drive out the double pins **(2)** and **(4)** of the coupling sleeves **(1)** and **(5)**.
15. Slide the sleeves towards each other on the shaft **(3)** and remove the shaft - sleeve assembly.
16. Remove the circlip **(6)** and the gear **(7)**.

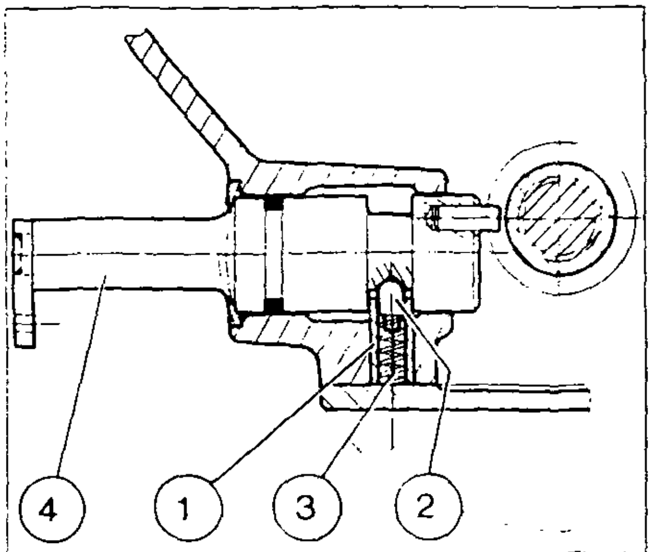


Fig. 1

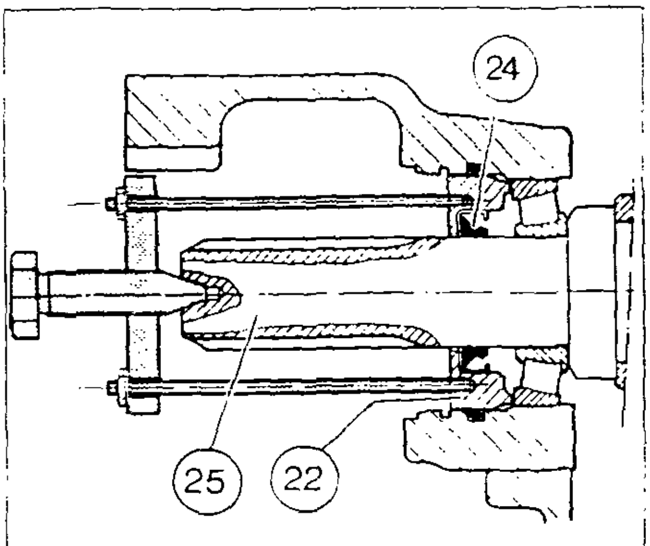


Fig. 2

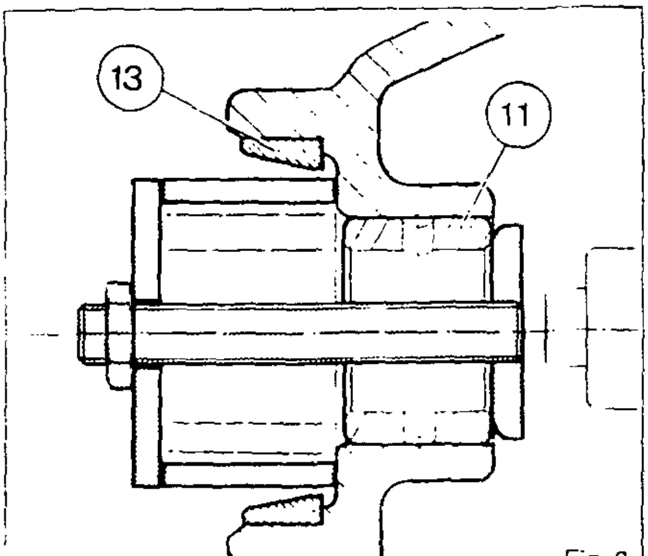


Fig. 3

Front axle - 4 WD clutch assembly

Tractors with creeper gears

17. Carry out operations 3 to 8 and 13 to 16. chapter 5 D01.A.
18. Remove the circlip **(6)** and take off the pinion **(7)**.

B. Disassembly of clutch

19. Separate the transfer gear **(15)** from the clutch assembly **(16)**.
20. Remove the circlip **(31)**.
21. Remove the cover **(30)**.
22. Remove the O-rings **(29)** and **(32)**.
23. Compress the Belleville washers **/34** and **/35** with a press and a suitable device (Fig. 4).
24. Remove the circlip **(39)** and the shim(s) **[41]** (Fig. 4).
25. Remove the device.
26. Remove the cover **(38)**, the outer plates **(36)** and the inner plates **(37)**.
Note: The number of outer plates and inner plates varies according to the type of tractor.
Assembly A : 4 outer plates and 3 inner plates:
• 3050 to 3095 tractors without G.S. PTO.
Assembly B : 5 outer plates and 4 inner plates:
• 3050 and 3095 tractors with G.S. PTO from serial no. N309034 onwards.
• 3115 - 3125 tractors with or without G.S. PTO.
27. Separate the hub **(40)** from the drum **(42)**.
28. Remove the O-ring **(33)**.
29. Remove the Belleville washers **/34** and **/35**.

Disassembly of shaft

30. Remove the two seal rings **/12**.
31. Extract the bearing cone **(19)** with a press and a suitable device.
32. Extract the needle roller bearing **(9)**. Remove the plug.

Reassembly of shaft

Make sure that the oil drilling of the shaft is not blocked.

33. Tighten the plug **(8)** smeared with Loctite 542.
34. Fit the needle roller bearing **(9)** 2.5 mm back from the face F (Fig. 5).
35. Fit the bearing cone **(19)** against the shoulder of the shaft **(25)**.

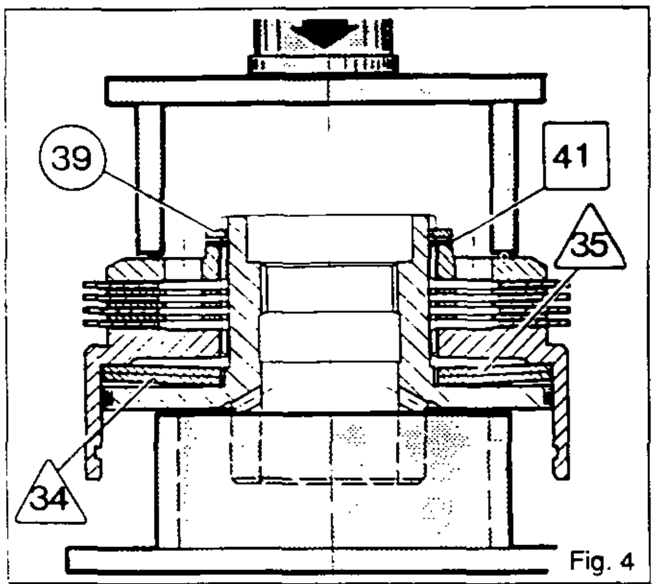


Fig. 4

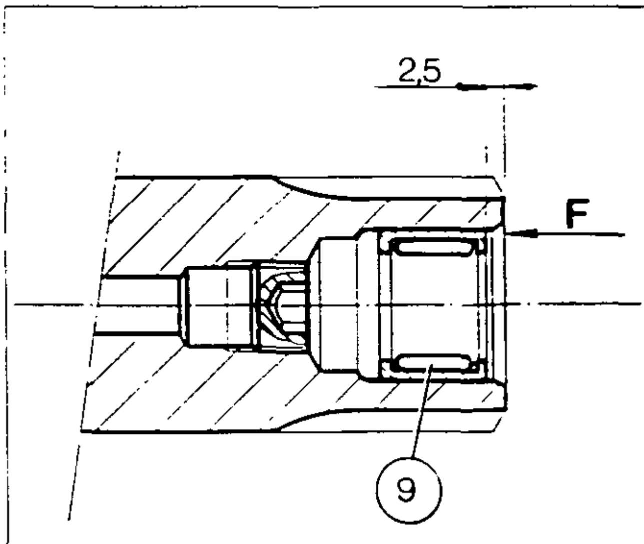


Fig. 5

C. Reassembly of clutch

36. Clean and check the parts. Replace those which are defective.
Check that the oil drilling in hub **(40)** is not blocked.
37. Position the Belleville washers **/35** and **/34** in the drum **(42)** (Fig. 6).
38. Lubricate and fit the O-ring **(33)** on the hub **(40)**.
39. Position the hub **(40)** in the drum **(42)** up against the Belleville washers.
40. Fit the outer plates **(36)** and inner plates **(37)** alternatively, aligning the lugs and fit the cover **(38)**.

Front axle - 4 WD clutch assembly

41. **Shimming J1** (Fig. 7)
    Using a press and a suitable device (Fig. 4) exert a force of approx 2000 daN, to compress the Belleville washers /**35**\ and /**34**\.
    Fit the circlip **(39)**. Using a feeler gauge, determine the space X between the cover **(38)** and the circlip **(39)**. Select the shim(s) to obtain a play of :
    J1 = 1.5 to 1.7 mm (Fig. 7).
42. Remove the circlip **(39)**.
43. Position the shim(s) selected in operation 41 between the cover and the circlip (the thickest shim on the circlip side).
44. Refit the circlip.
45. Lubricate and fit the O-rings **(32)** and **(29)** on the cover **(30)** and refit them.
46. Fit the circlip **(31)**.
47. Fit the clutch assembly **(16)** to the transfer gear **(15)**.
    Note: The bush (43) is press-fitted into the transfer gear (15) and then rebored.

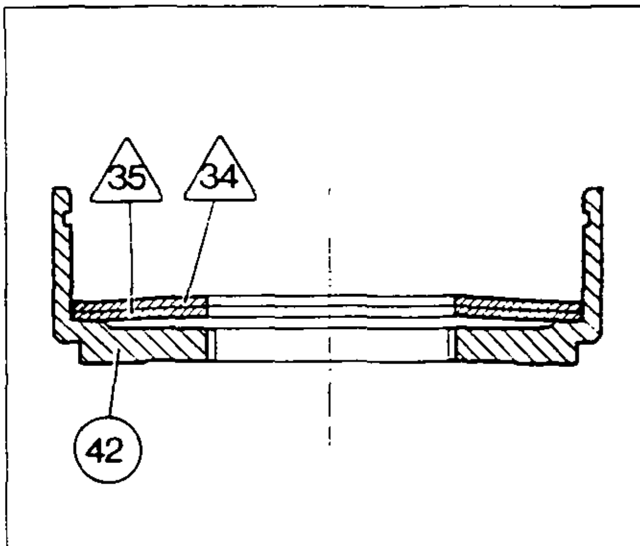


Fig. 6

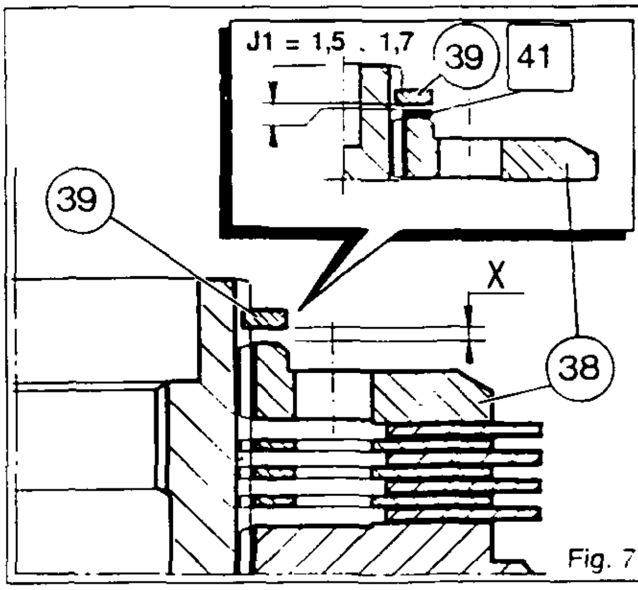


Fig. 7

D. Refitting of clutch assembly

If the gear (7) has been removed
Tractors without creeper gears

48. Refit the gear **(7)**.
49. Position the circlip **(6)**.
50. Carry out operations 103 and 104, chapter 6 F01.

Tractors with creeper gears

51. Refit the gear **(7)**.
52. Position the circlip **(6)**.
53. Carry out operations 22 to 31, chapter 5 D01 A.
54. Refit the right hydraulic cover.
    Carry out operations 15 to 29, chapter 8 I01.
55. Fit the cup **(13)** (if removed).
56. Fit the bush **(11)** with a locally made tool (see section E) so that the bush is positioned 4 to 5 mm back from the rear face of the cup **(13)** (Fig. 8). Ensure that a hole in the bush aligns with the feed channel in the centre housing.
57. Fit the seal **(24)** in the cap **(22)**.

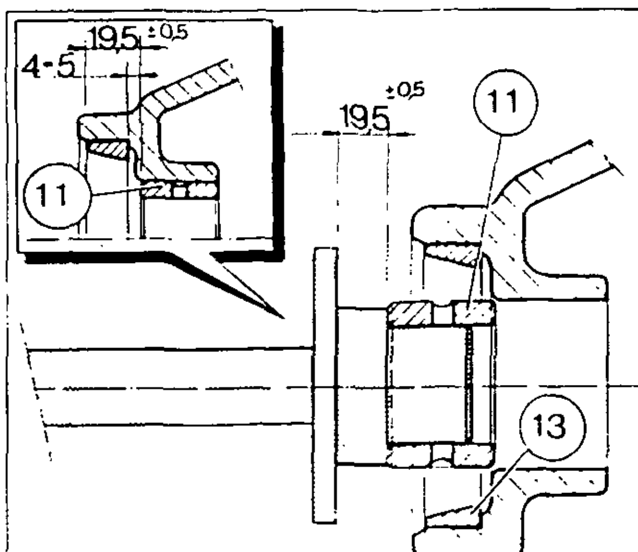


Fig. 8

Front axle - 4 WD clutch assembly

58. In order to position the bearing cones correctly in the cups, shim as follows:
J2 ≈ 0 to 0.10 mm. fit the bearing cone **(14)**, the shaft **(25)**, the cup **(18)**.
59. Protect the shaft splines.
60. Mount the cup **(22)** and the circlip **(23)**.
61. Place the tip of the dial gauge against the end of the shaft **(25)** (Fig. 9).
62. Pull on the shaft, turning it back and forth, in order to seat the bearing cones in the cups.
63. Set the dial gauge to zero.
64. Repeat operation 62 while pushing.
65. Select the thickness of the shims **[20]** required to obtain J2.
66. Remove the circlip **(23)**, the cap **(22)**, the cup **(18)** and the shaft **(25)**.
67. Place the seal rings **/12** in the grooves of the shaft **(25)**. Join up the ends. Ensure that they turn freely.
68. Place the bearing cone **(14)** in the cup **(13)**. Fit the shaft **(25)** after having positioned the clutch assembly **(16)** and the transfer gear **(15)** in the housing.
69. Fit the cup **(18)** and the shim(s) **[20]** (smeared with grease) selected in operation 65.
70. Fit the O-ring **(21)** in the groove of the housing.
71. Mount the cap **(22)** and the circlip **(23)**, remove the protection of the shaft splines.
72. On tractors with rice field sealing, grease and fit the seal **(26)** with the lip facing towards the cap **(22)**. Remove the protection.
73. Mount the flange **(28)**, ensuring that there is suitable play between the flange and the housing.
74. Tighten the screw **(27)** smeared with Loctite 241.
75. Clean and degrease the joint face of the cover **(17)** and of the housing.
76. Smear the joint face of the cover with a sealing compound (Master Joint 510 or equivalent).

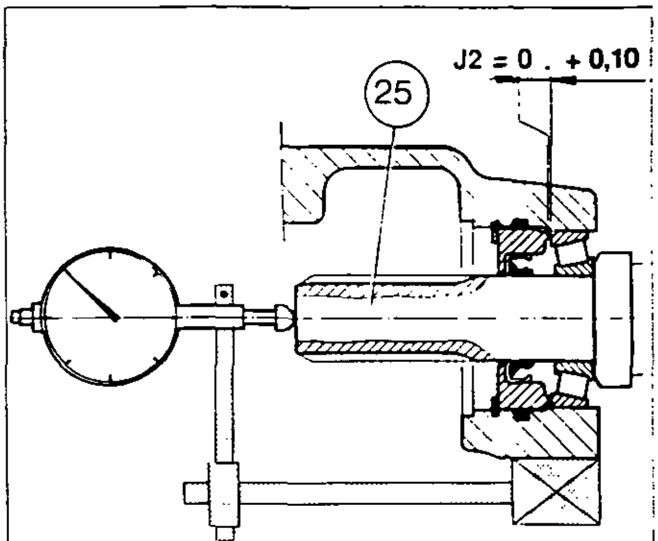
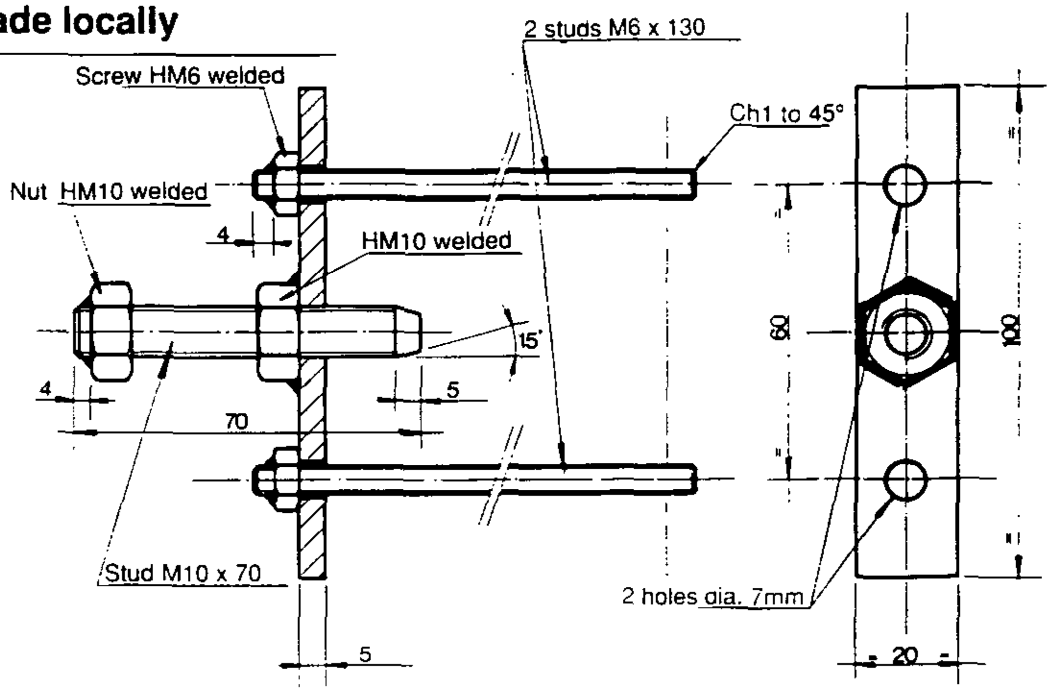


Fig. 9

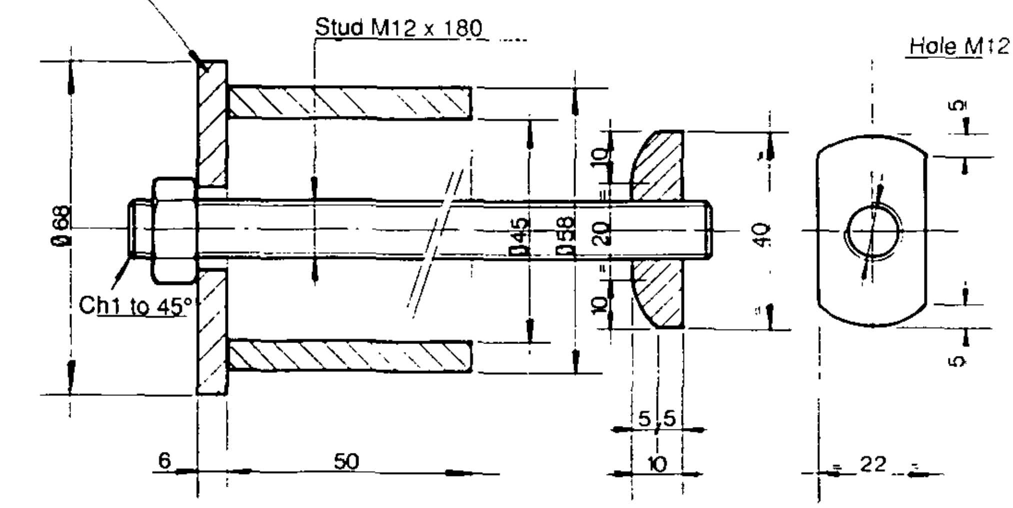
77. Screw in two guide studs in opposite positions on the housing.
78. On tractors equipped with a G.S. PTO, check the position of the lever **(4)**. Mount the retaining tube **(1)**, the plunger **(2)** and the spring **(3)** (Fig. 1).
79. Refit the cover **(17)**.
80. Remove the guide studs, fit and tighten the bolts **(10)** to a torque of 130 - 170 Nm.
81. Coat the two drive shaft couplings with "Anti-seize" grease or equivalent. Refit the drive shaft and reconnect the two hoses for the front differential lock.
82. Refill transmission with oil.
83. Check the operation of the clutch and of the G.S. PTO control (if fitted).
84. Check for leaks:
    - at the joint faces of the cover under the rear axle housing
    - at the right hydraulic cover (if removed)
    - at the hydraulic connectors.

E. Tools to be made locally

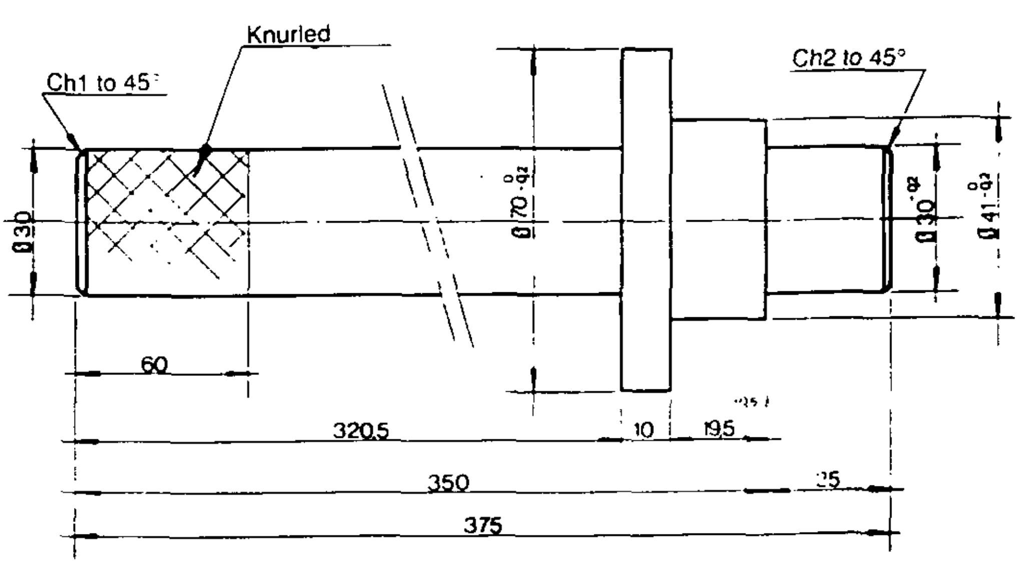
1. Cap extractor



2. Bush extractor



3. Bush fitting tool



7 B01 Final drive units

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Front axle - *Final drive units*

General

The final drive unit comprises a housing **(47)** articulated on the front axle case through two swivels **(7)** and **(11)**. The wheel hub **(22)** turns on two taper roller bearings whose cups **(23)** and **(19)** are press fitted inside the hub. The bearing cone **(18)** is fitted on the housing and the opposing bearing cone **(25)** is fitted freely so that the assembly can be adjusted by means of shims **[26]**.
The drive from the front differential is transmitted to the wheel hub through the universal drive shaft assembly **(10)**, the sun gear **(28)**, the planetary pinion **(38)** and the ring gear **(44)**. The ring gear is held by the circlip **(24)** on the ring gear carrier **(42)** which is fastened by a bolt on to the housing **(47)**.
Oil is contained by seal **(45)** between swivel housing **(47)** and hub **(22)** and seal **(16)** between swivel housing and outer drive shaft. There is another seal **(8)** between axle housing **(52)** and inner drive shaft.
"O"rings **(6)** and **(12)** are fitted to seal the swivel bearings.

Special cases

Improved sealing is provided in cases where prolonged use in wet conditions is likely, such as in rice fields. Special seals are fitted on the 4WD clutch output, on the rear axle case, in the differential input and on the final drive units.

Different categories of front axle :

Cat. 1 . MF 3050

Cat. 2 : MF 3060
MF 3065

Cat. 2.5: MF 3070
MF 3080
MF 3095
MF 3115

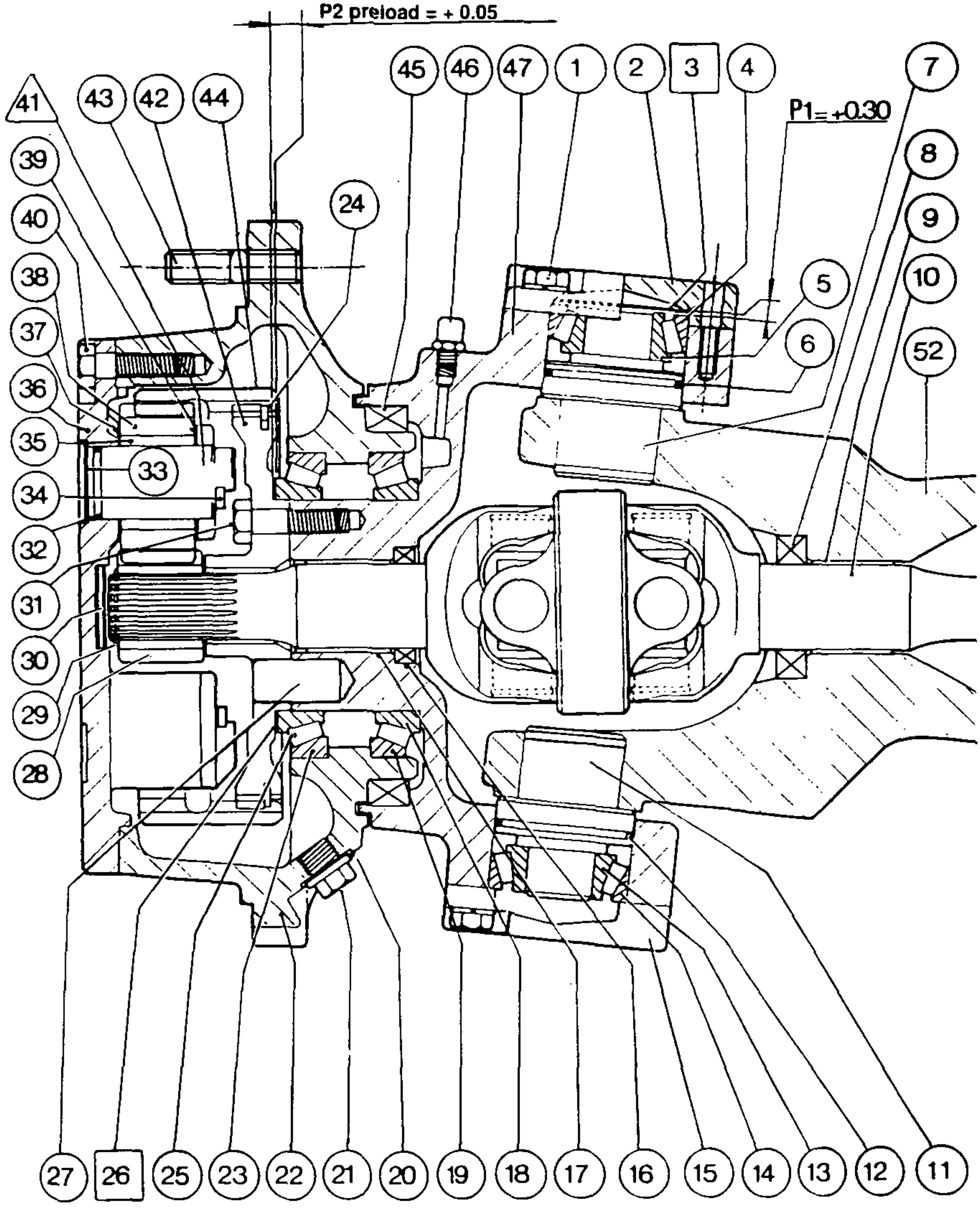
Cat. 3 : MF 3125

Parts list

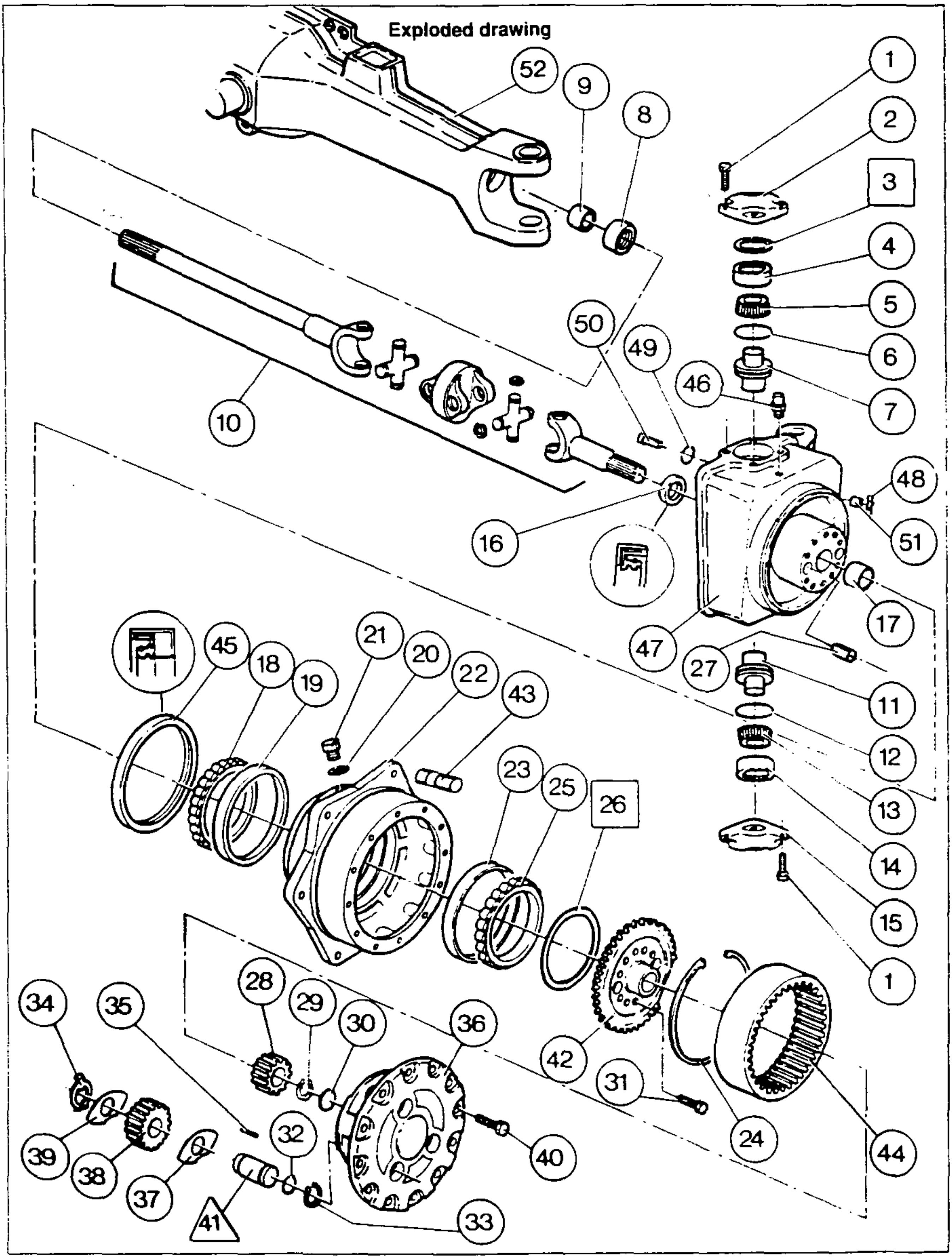
(1) Bolt
(2) Cover
[3] Shims
(4) Bearing cup
(5) Bearing cone
(6) O-ring
(7) Swivel pin
(8) Oil seal
(9) Bush
(10) Universal drive shaft
(11) Swivel pin
(12) O-ring
(13) Bearing cone
(14) Bearing cup
(15) Cover
(16) Oil seal
(17) Bush
(18) Bearing cone
(19) Bearing cup
(20) Seal
(21) Plug
(22) Wheel hub
(23) Bearing cup
(24) Circlip
(25) Bearing cone
[26] Shims
(27) Dowel pin
(28) Sun gear
(29) Circlip
(30) Thrust washer
(31) Screw
(32) O-ring
(33) Retaining ring
(34) Circlip
(35) Needle roller bearing
(36) Planetary carrier
(37) Plate
(38) Planetary pinion
(39) Plate
(40) Bolt
/41 Planetary pinion pin
(42) Ring gear carrier
(43) Wheel stud
(44) Ring gear
(45) Oil seal
(46) Breather or plug
(47) Swivel housing
(48) Pin
(49) Washer
(50) Stop
(51) Spacer
(52) Axle housing

Front axle - Final drive units

General arrangement



Front axle - *Final drive units*



A. Removal of planetary carrier, sun gear, ring gear

1. Chock the rear wheels. Apply the handbrake.
2. On 3000/3100 tractors, with the 4WD clutch engaged, lift the two wheels so that the wheel hub **(22)** turns freely. Place stands in position.
3. Remove the wheel on the relevant side.
4. Drain the final drive unit.
5. Remove screws **(40)**.
6. Remove the planetary carrier with the thrust washer **(30)**.
7. Remove the circlip **(29)** and the sun gear **(28)**.
8. Close the circlip **(24)** and remove the ring gear **(44)**.

Disassembly of planetary carrier

9. Place the planetary carrier in a vice with soft jaws.
10. Remove the circlips **(34)**.
11. Gradually drive out the planetary pinion pin /**41**\ (Fig. 1). Recover the needles. Remove the O-ring **(32)** and if necessary the retaining ring **(33)**.
12. Repeat operation 11 for the other two planetary pinions.

Reassembly of planetary carrier

13. Clean and check the parts. Replace those which are defective.
14. In one planetary pinion **(38)**, place the needles **(35)** smeared with bearing grease.
15. Replace the O-ring **(32)** on the planetary pinion pin /**41**\. Refit the retaining ring **(33)** (if removed on disassembly).
16. Lightly engage the planetary pinion pin /**41**\ in the planetary carrier cover, ensuring that the notch of the pin is aligned with that of the cover, in order to fit the circlip **(34)**.Fit the plate **(37)**. Center the planetary pinion **(38)** with the needles. Engage the pin in the planetary pinion. Fit the plate **(39)**. Insert the pin as far as it will go and fit the circlip **(34)**.
17. Manually check the axial play and rotation of the planetary pinion.
18. Repeat operations 14 to 17 for the other two planetary pinions.

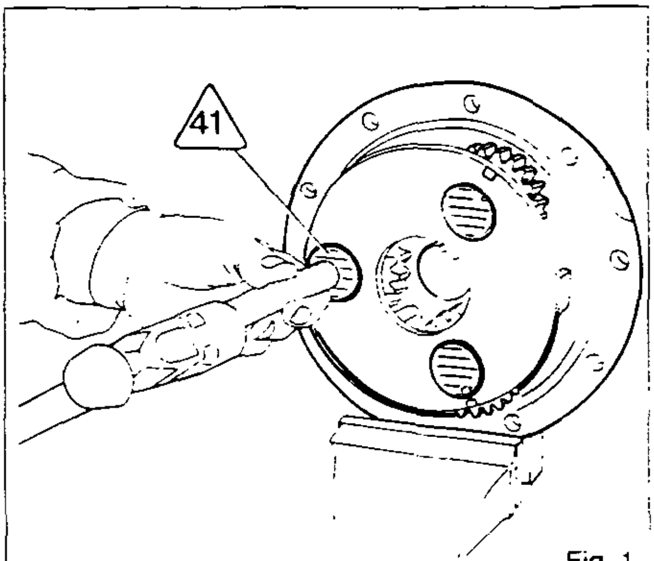


Fig. 1

B. Refitting of ring gear, sun gear, planetary carrier

19. Assemble the ring gear **(44)** on the ring gear carrier **(42)** with the circlip **(24)**, ensuring that it is properly positioned in the groove. Mount the sun gear **(28)** and fit the circlip **(29)**.
20. Screw two guide pins diametrically opposed on the wheel hub **(22)**.
21. Smear the joint face of the planetary carrier with a sealing compound (Loctite 520 or equivalent).
22. Check that the thrust washer **(30)** is present
23. Refit the planetary carrier.
24. Fit the screws **(40)**. Remove the guide pins. Tighten the screws to a torque of 91 - 112 Nm.
25. Turn the wheel hub so that the filler plug is in a horizontal position. Top up the oil level of the final drive unit. Refit the plug **(21)** with its seal **(20)**.
26. Refit the wheel. Remove the stands and the trolley jack. Tighten the nuts to a torque of 250 - 300 Nm
27. Remove the chocks and release the handbrake.
28. Carry out road test of front axle. Check for leaks on the joint face of the planetary carrier and of the filler-plug.

C. Disassembly of wheel hub

29. Remove the planetary carrier. Carry out operations 1 to 6.
30. Remove the circlip **(29)** and the sun gear **(28)**. In view of the weight of the hub, place in a sling before removing.
31. Remove the screws **(31)**.
32. Use a locally made puller (see section I) to extract the wheel hub **(22)** (Fig. 2).
33. Remove the ring gear **(44)** assembled on the ring gear carrier **(42)** with the circlip **(24)**, the shims **[26]** and the bearing cone **(25)**. The shrink-fitted dowel pins **(27)** should remain in the swivel housing **(47)**.
34. If it proves necessary to replace the oil seal **(45)** and the bearing cones **(18)** and **(25)**, remove the oil seal **(45)**, extract the bearing cone **(18)** with a suitable extractor and disassemble the bearing cups **(19)** and **(23)**.

D. Reassembly of wheel hub

35. Clean and check the parts. Replace those which are defective.
36. If the bearing cone **(18)** and the bearing cups **(19)** and **(23)** are to be replaced, push the bearing cone in the swivel housing and the bearing cups in the wheel hub until they meet the shoulder.
Smear the outer periphery of the oil seal **(45)** with Loctite 542. Push against the shoulder without deforming it.
37. Fit the wheel hub **(22)** on the swivel housing **(47)**. Fit the bearing cone **(25)** supported by the bearing cup **(23)** to determine shims required to obtain :
P2 = + 0.05 mm.
38. Using a depth gauge, check the height "A" of the ring gear carrier **(42)** (Fig. 3) and the protrusion "B" of the bearing cone **(25)** out from the housing **(47)** (Fig. 4).
39. Determine the thickness "SP" of the shims **[26]** (Fig. 5) to obtain the preload P2 using the formula :
SP = (A-B) + 0.05 mm
Note : Shims come in various thicknesses as per the parts book.
40. Fit the shims **[26]** (Fig. 6) chosen in operation 39 on the ring gear carrier **(42)** with bearing grease. Fit the assembled ring gear carrier **(42)**, ring gear **(44)** and shims **[26]**, with the two ends of the circlip **(24)** towards the bottom (Fig. 7).

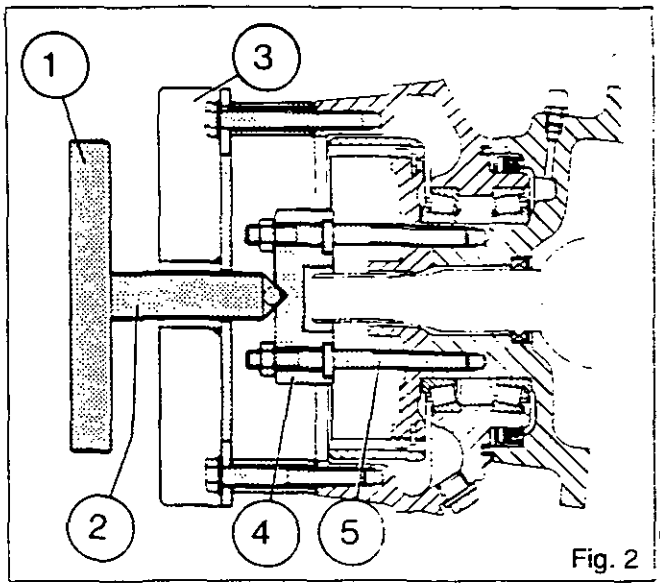


Fig. 2

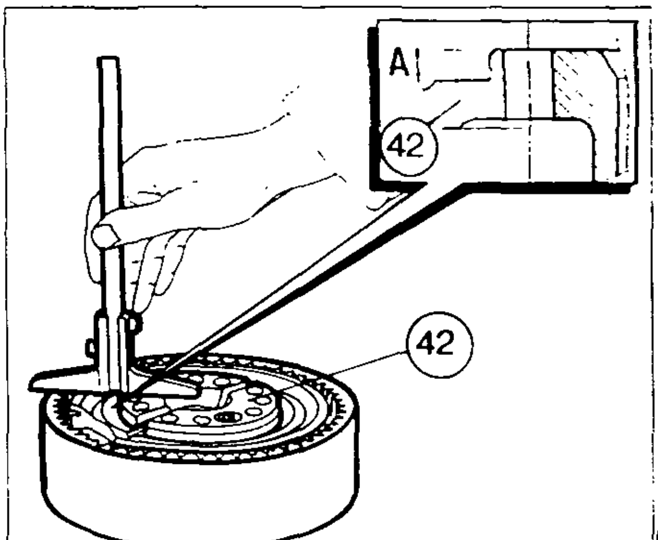


Fig. 3

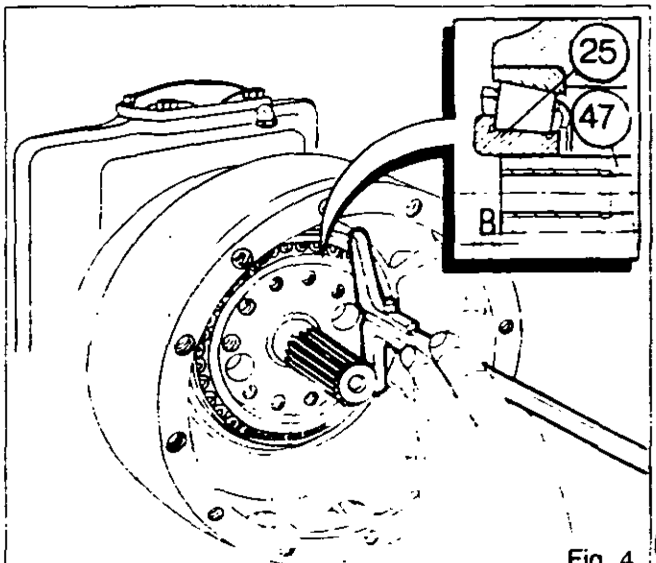


Fig. 4

41. *Smear the screws* **(31)** *with Loctite 270 and tighten* them gradually and alternately to a torque of 113 - 125 Nm.
    Note : Later axles fitted with 12.9 grade screws can be torqued to 125 - 155 Nm.
42. Refit the sun gear **(28)** and the circlip **(29)**.
43. Refit the planetary carrier. Carry out operations 20 to 28.

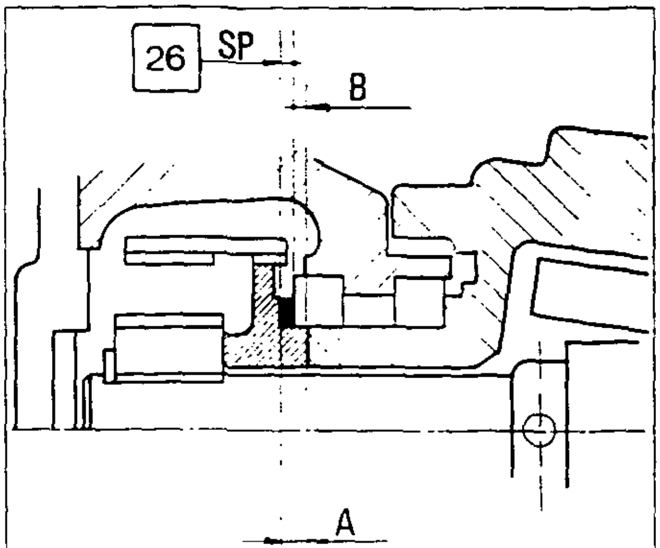


Fig. 5

E. Replacement of a wheel stud

44. Chock the rear wheels. Apply the handbrake.
45. Lift the relevant side with a trolley jack. Position a stand and remove the front wheel.
46. *Unscrew the faulty stud using a nut and a lock-nut.*
47. Lightly smear the new stud with Loctite 270 and fit it.
48. Lubricate the studs **(43)**. Refit the wheel. Remove *the stand and the jack. Tighten the nuts to a torque* of 250 - 300 Nm.

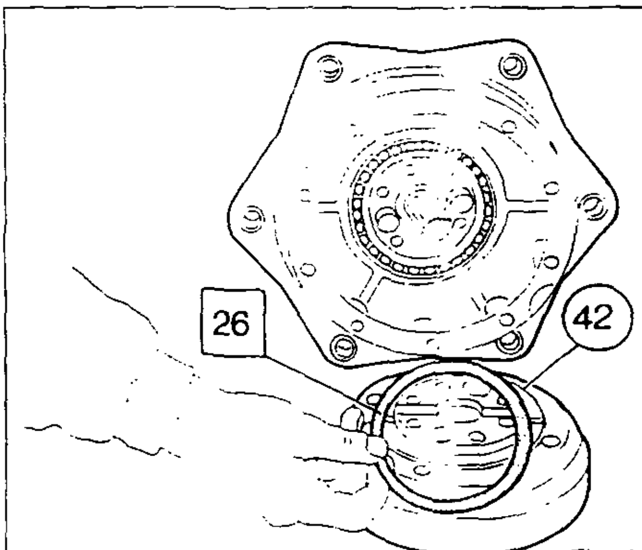


Fig. 6

F. Disassembly of swivel housing

49. Remove the planetary carriers. Carry out operations 1 to 6.
50. Remove the wheel hub. Carry out operations 30 to 34.
51. Remove the split pin and the nut from the steering ball joint. Remove the ball joint.
52. Support the swivel housing **(47)** in a sling.

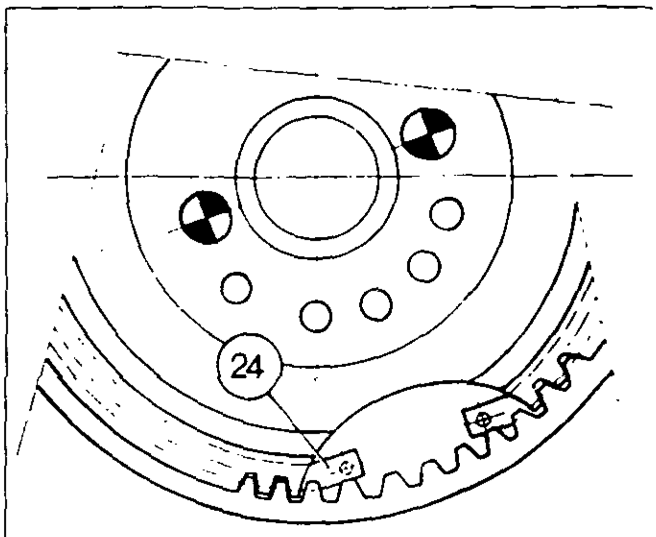


Fig. 7

Front axle - Final drive units

53. Remove the screws **(1)**, cover **(2)**, shims **[3]** and the bearing cup **(4)**. Extract the swivel pin **(17)** with tools MF 195C and MF451 (Fig. 8).
54. Remove the screws **(1)**, cover **(15)** and the bearing cup **(14)**. Extract the swivel pin **(11)** as described above for the upper swivel pin (Fig. 8).
    If necessary, remove the bearing cones **(5)** and **(13)** from the swivel pins
55. Protect the splines of the universal drive shaft so as not to damage the seal **(16)**.
56. Remove the swivel housing **(47)**.
57. Remove the seal **(16)**. If necessary, remove the breather **(46)** (if fitted) and drive out the bush **(17)**.
    Note: To avoid risk of leakage, the breather in the swivel housing was eliminated and replaced with a plug. Refer to service bulletin issued in 1990 for cut-in.
58. Remove the universal drive shaft assembly.
59. Remove the seal **(8)**. If necessary, extract the bush (9).

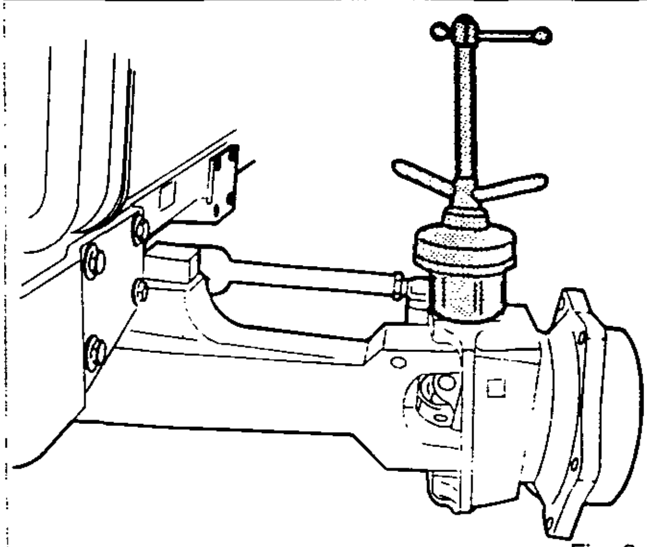


Fig. 8

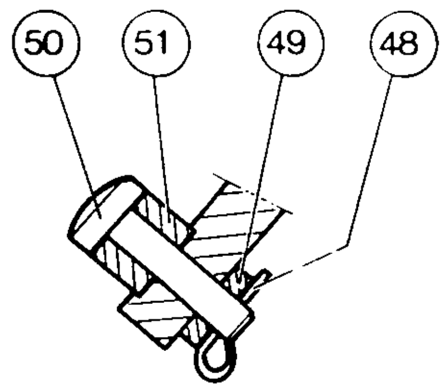


Fig. 9

G. Reassembly of swivel housing

60. Clean and check the parts. Replace those which are defective.
61. Fit the bush **(9)** (if removed). Smear the outer periphery of the new seal **(8)** with Loctite 542 and fit it against the shoulder of the axle housing **(52)**.
62. Lubricate the seal **(8)**. Refit the universal drive shaft **(10)**. Insert a guide through the oil filling hole to align the left drive shaft with the differential.
63. Fit the bush **(17)** (if removed). Smear the outer periphery of the new seal **(16)** with Loctite 542 and fit it against the shoulder of the swivel housing **(47)**.
64. If the steering lock stops have been removed, refit them as shown in Fig. 9 depending on angle required..
    Push the bearing cones **(5)** and **(13)** (if removed) on to the swivel pins **(7)** and **(11)**. Replace the O-rings **(6)** and **(12)**.
65. Refit the swivel housing **(47)**. Position the swivel pin **(7)** in such a way that the swivel housing assembly is aligned with the axle case **(52)**.
66. Fit the swivel pin **(11)**, the bearing cup **(14)** and the cover **(15)**. Tighten the screws **(1)** evenly and alternately so as to push the swivel pin **(11)** into the axle case. Tighten the screws to a torque of 91 - 112 Nm.
67. Fit the bearing cup **(4)**, the shims **[3]** and the cover **(2)**. Fit and tighten the screws **(1)** in the manner described in operation 66.
    Check that the swivel pins (7) and (11) are properly in contact with the axle case.
68. Remove the cover **(2)**. Remove the shims **[3]**. Refit the cover and tighten the screws to a torque 11Nm.

Shimming P1

69. With a dial gauge, measure the axial play **"J"** using a lever between the axle case and the swivel housing (Fig. 10).
70. Depending on the play **"J"** that is measured, determine the thickness of shims **[3]** needed to obtain (Fig. 11) :
    P1 = "J" +0.30
    (0.30 being the preload value).
71. Remove the screws **(1)**, the cover **(2)** and the bearing cup **(4)**. Pack the bearing cone **(5)** with bearing grease. Refit the bearing cup and the shims **[3]** selected in operation 70. Refit the cover. Smear the screws **(1)** with Loctite 241 and tighten them to a torque of 91 - 112 Nm.
72. Remove the cover **(15)** and bearing cup **(14)**. Pack the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Smear the screws **(1)** with Loctite 241 and tighten them to a torque of 91 - 112 Nm.
73. Refit the steering ball joint. Tighten the nut to a torque of 105 - 115 Nm. Lock the nut with a new split pin.
74. Refit the wheel hub. Carry out operations 36 to 41.
75. Remove the protection from the splines of the universal drive shaft. Fit the sun gear **(28)** and the circlip **(29)**.
76. Refit the planetary carrier. Carry out operations 20 to 28.

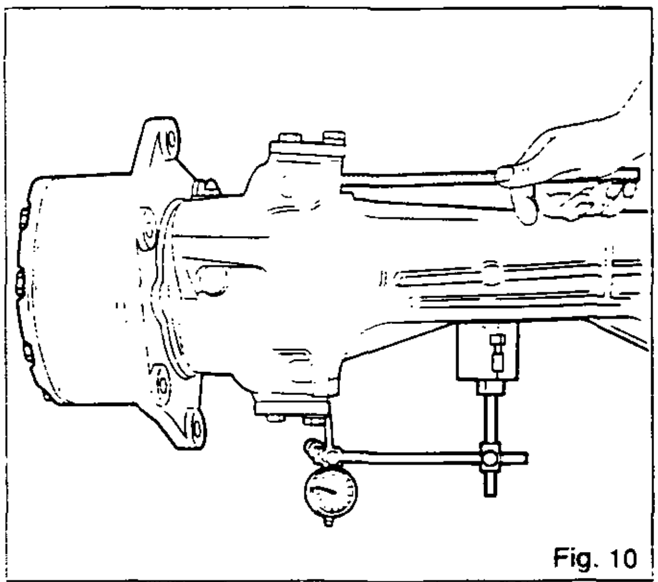


Fig. 10

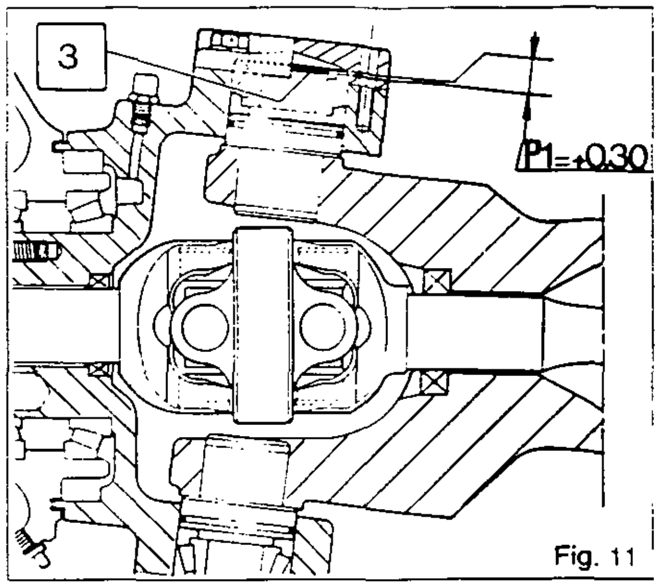


Fig. 11

H. Removal and refitting of universal drive shaft

Removal

77. Remove the planetary carrier. Carry out operations 1 to 6.
78. Remove the circlip **(29)**, sun gear **(28)** and the steering ball joint.
79. Remove the assembled swivel housing **(47)** and wheel hub **(22)**. Carry out operations 52 to 56.
80. Remove the universal drive shaft **(10)**.

Front axle - Final drive units

Disassembly of universal joint (Fig. 12)

81. Place the drive shaft in a vice with soft jaws.
82. Remove the four circlips **(3)** of each extremity of the joint.
83. Use a plastic mallet to drive the central yoke **(2)** downwards until the bearing sleeve emerges.
84. Place the bearing sleeve in a vice and strike the yoke to drive it out.
85. Remove the opposite bearing sleeve in the same way and remove the section of the shaft.
86. Turn the whole shaft through 90. then repeat operations 83 to 85 to remove the universal joint from the shaft.
87. Place the outer section of the shaft assembly in the vice and repeat operations 82 to 86.

Reassembly of universal joint

88. Clean and check the parts. Replace the universal joint assembly comprising the cross-pins. the seals. the bearings, the sleeves and the circlips.
89. Smear the needles with bearing grease and ensure that they are all in the sleeves.
90. Position the universal joint **(1)** in the yoke and push it as far as possible to the side (Fig. 13). so that the extremity of the cross-pin serves as a guide for fitting the sleeve with the needles.
91. Drive the sleeve **(1)** sufficiently into the yoke, holding the cross-pin (Fig. 14) in order to fit the circlip.
92. Fit the other sleeves and cross-pin in the same way.

Refitting

93. Refit the drive shaft assembly. Insert a guide through the oil filling hole to align the left drive shaft with the differential.
94. Replace the seals **(6)** and **(12)**. Refit the assembled swivel housing and wheel hub.
95. Position the swivel pin **(7)** in such a way that the swivel housing assembly **(47)** is aligned with the axle case **(52)**.
96. Fit the swivel pin, **(11)** the bearing cup **(14)** and the cover **(15)**. Tighten the screws **(1)** evenly and alternately so as to push the swivel pin **(11)** into the axle case.

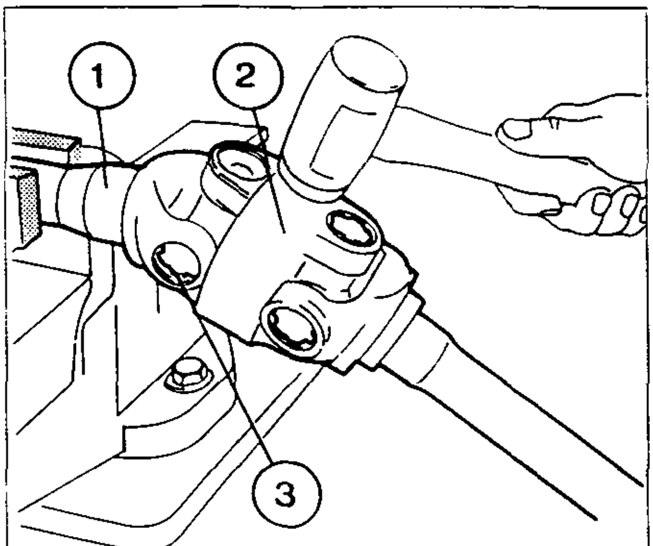


Fig. 12

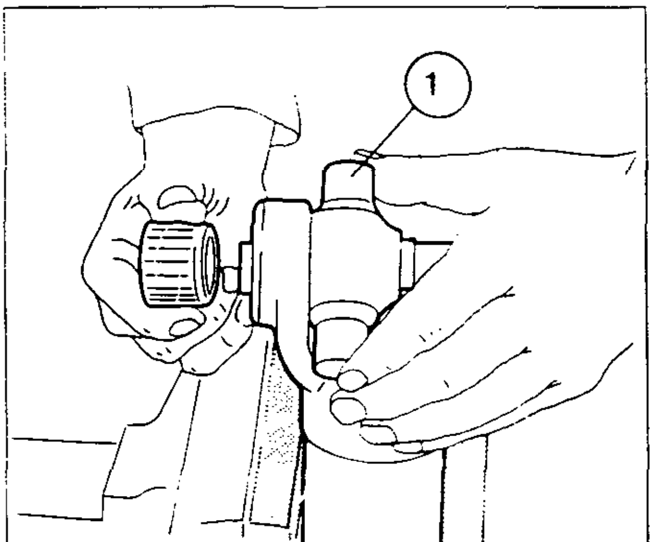


Fig. 13

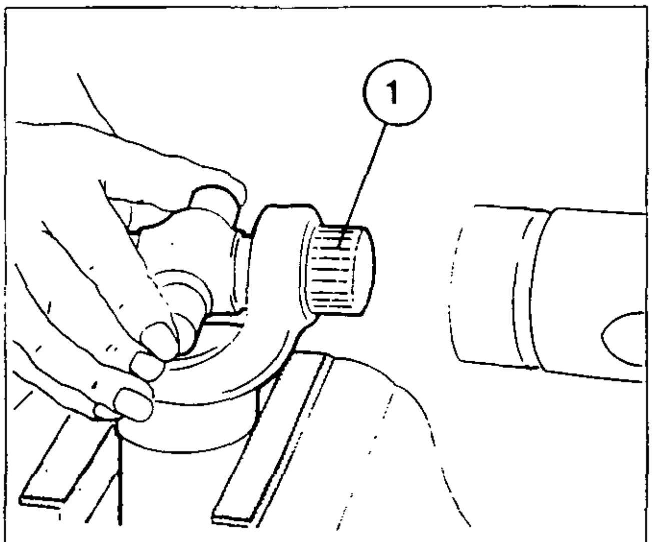


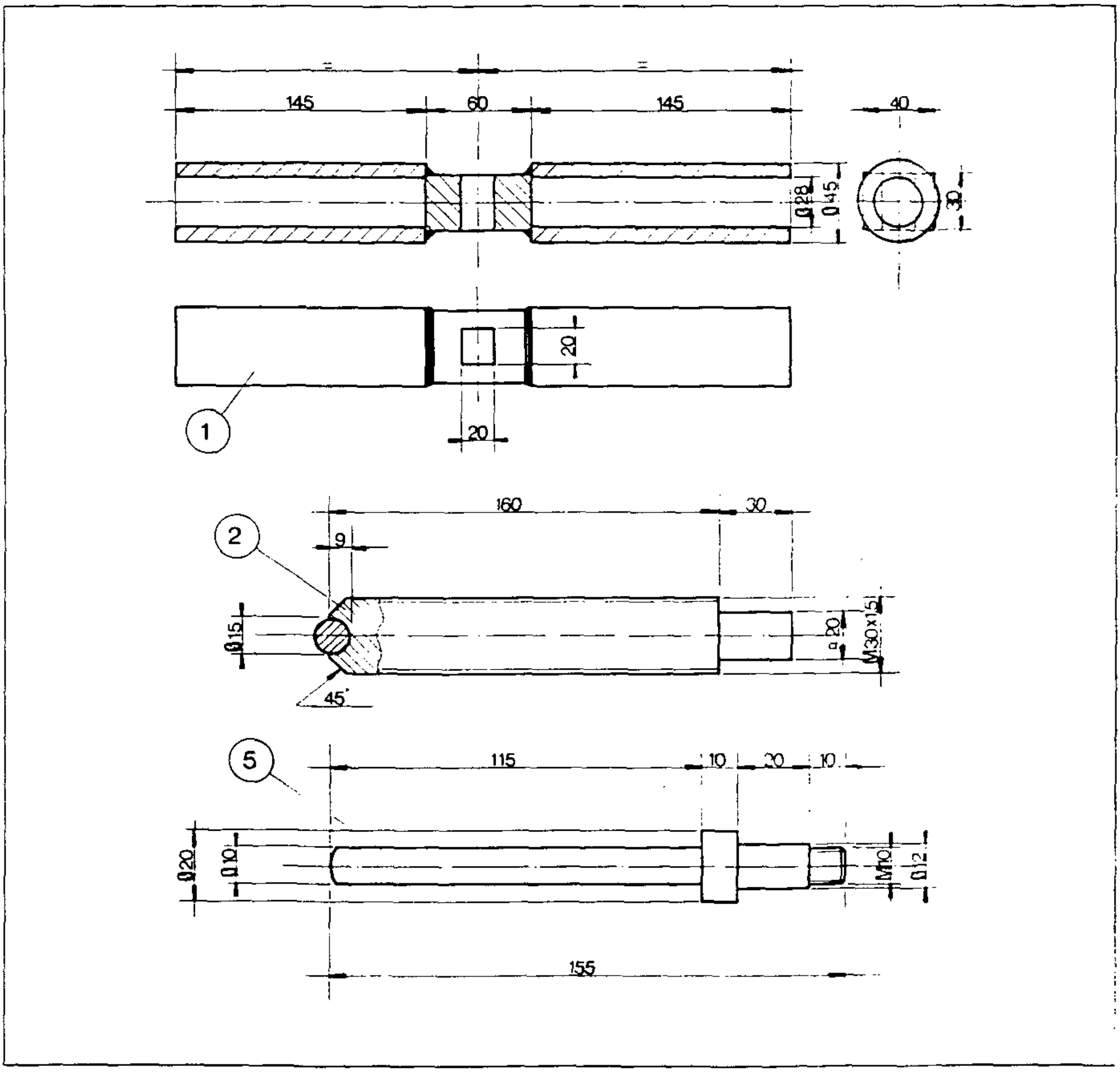
Fig. 14

97. Remove the cover **(15)** and the bearing cup **(14)**. Pack the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Tighten the bolts **(1)** smeared with Loctite 241 to a torque of 91 - 112 Nm.
98. Fit the bearing cup **(4)**, the shims **[3]** and the cover **(2)**. Tighten the bolts as in operation 96.
Check that the swivel pins (7) and (11) are properly in contact with the axle case (52).
99. *Remove the cover* **(2)**. *Remove the shims* **[3]** *and* the bearing cup **(4)**. Pack the bearing cone **(5)** with bearing grease. Refit the bearing cup, the shims and the cover. Tighten the bolts **(1)** smeared with Loctite 241 to a torque of 91 - 112 Nm.
100. Refit the steering ball joint. Tighten the nut to a torque of 103 - 115 Nm. Lock the nut with a new pin.
101. Remove the protection of the shaft. Refit the sun *gear* **(28)** *and the circlip* **(29)**.
102. Refit the planetary carrier. Carry out operations 20 to 28.

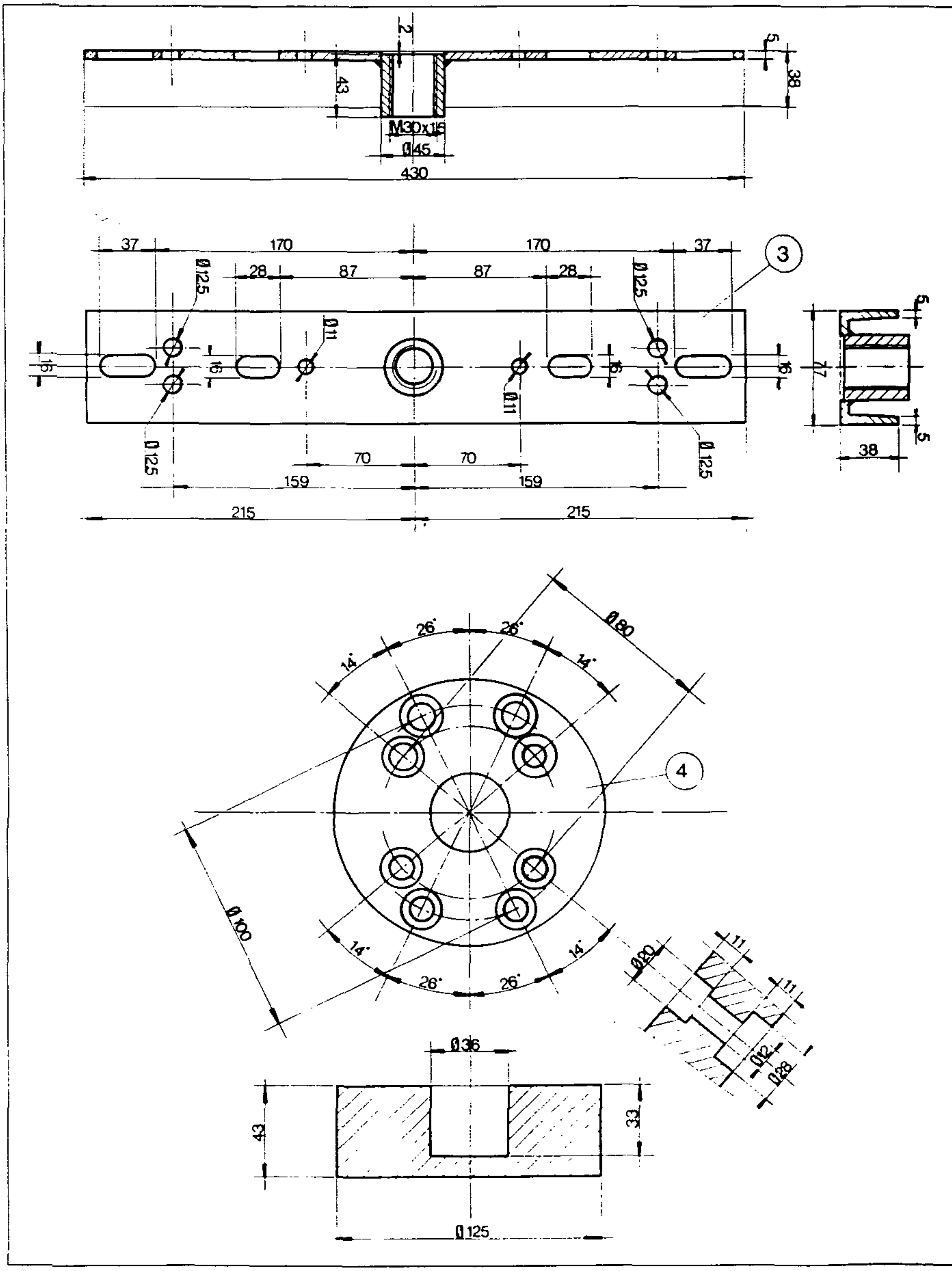
I. Service tool

Tool to be made locally.

Wheel hub puller (see Fig. 2).



Front axle - Final drive units



7 B02 Final drive units

CONTENTS

Improved front axle - Final drive units

General

Note : This procedure applies to tractors equipped with improved front axles cat. 1 to 3.5 fitted from serial numbers :
- axles cat. 1 and 2
3050 : A209023
3060/3065 : standard seal : A163015
reinforced seal : A161005
- axle cat. 2.5
3070/80/85/95/3115/20 : A209011
- axle cat. 3.5
3125 : A007039

The final drive unit has a swivel housing **(47)** which articulates on the front axle round the two swivels **(7)** and **(11)**. The wheel hub **(22)** turns on two taper roller bearings whose cups **(23)** and **(19)** are force fitted in the housing. The bearing cone **(18)** is free on the swivel housing and the opposite bearing cone **(25)** is force fitted on the ring gear carrier **(42)**.
Unlike the non improved axle, the taper roller bearings are not adjustable. The components are produced with machining tolerances which do not require adjustment or shimming.
The drive from the front differential is transmitted to the wheel through the universal drive shaft assembly **(10)**, the sun gear **(28)**, and the wheel hub which is fastened to the planetary pinions **(38)** which react off the static ring gear **(44)**.
This ring gear is held by two rings **(24)** and **(26)** onto its carrier **(42)** which is splined onto the swivel housing **(47)** and locked in position by the central nut **(27)**.
The hub/housing is sealed by a double lip seal **(45)** working against the seal cage **(46)** and it also has a seal against water ingress **(50)**. The swivel housing is sealed on its input shaft by seal **(16)**.
The front axle housing is sealed on its drive shaft by seal **(8)**.
The two pivots are sealed by O'rings **(6)** and **(12)**.

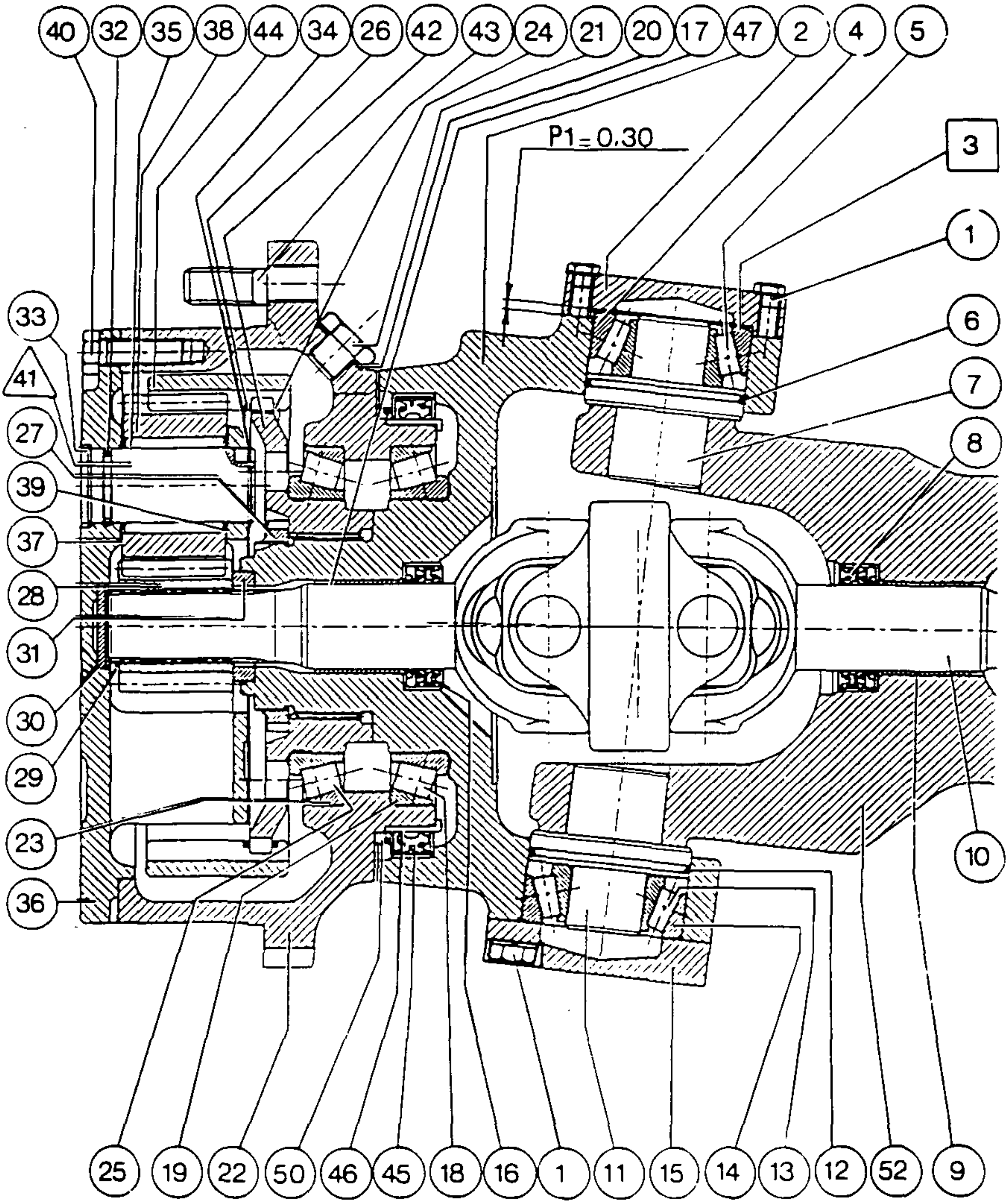
Service tools (see section I p. 10)

MF 451B Wheel hub puller
MF451B3 Extractor for puller Ø M18
3376880 M1 Socket for ring gear carrier nut (axle cat. 2.5 and 3.5)
3376926 M1 Socket for ring gear carrier nut (axle cat. 1 and 2)

Parts list

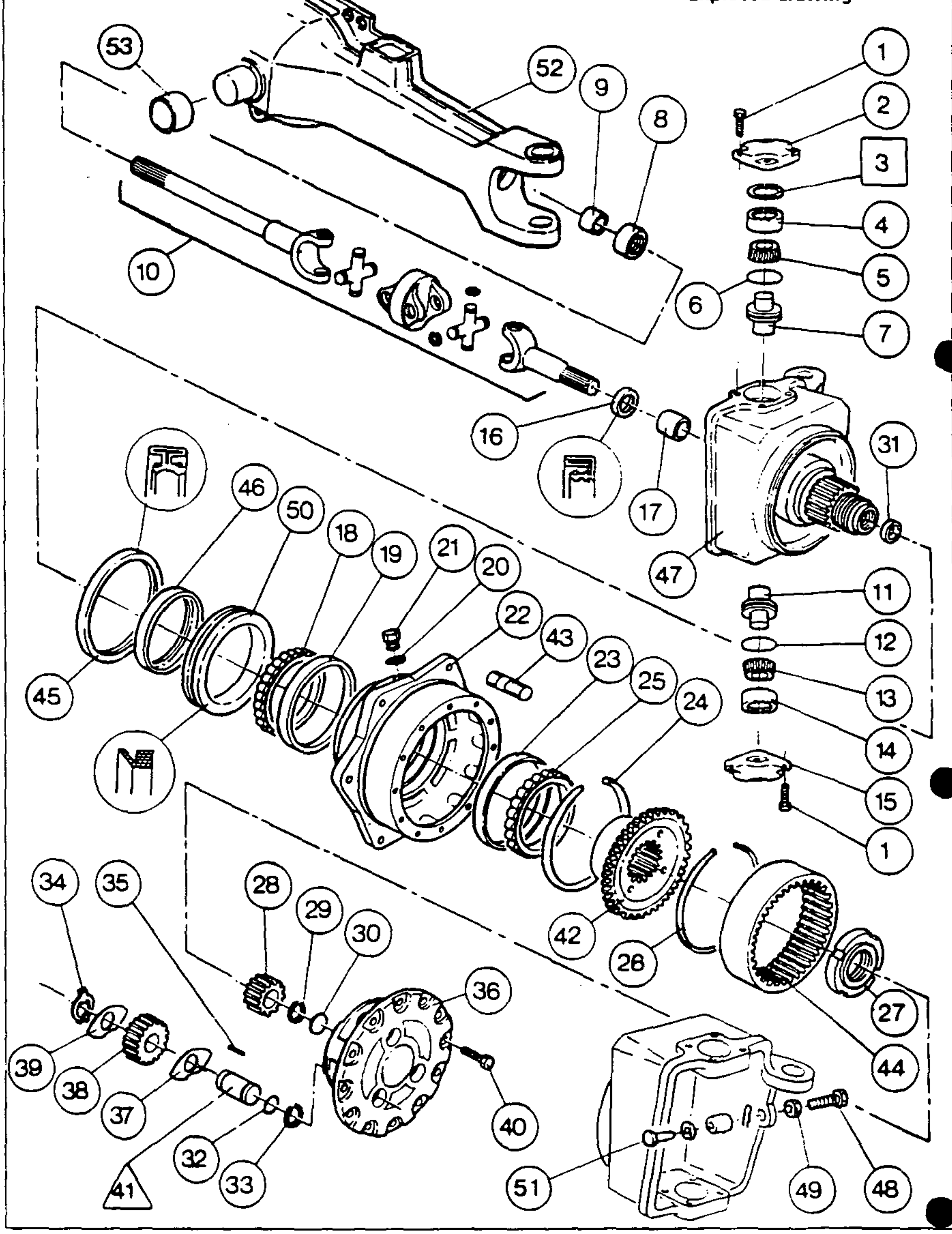
(1)	Bolt
(2)	Cover
(3)	Shim(s)
(4)	Bearing cup
(5)	Bearing cone
(6)	O-ring
(7)	Swivel pin
(8)	Oil seal
(9)	Bush
(10)	Universal drive shaft
(11)	Swivel pin
(12)	O-ring
(13)	Bearing cone
(14)	Bearing cup
(15)	Cover
(16)	Oil seal
(17)	Bush
(18)	Bearing cone
(19)	Bearing cup
(20)	Seal
(21)	Plug
(22)	Wheel hub
(23)	Bearing cup
(24)	Retaining ring
(25)	Bearing cone
(26)	Retaining ring
(27)	Nut
(28)	Sun gear
(29)	Circlip
(30)	Thrust washer
(31)	Bush
(32)	O-ring
(33)	Retaining ring
(34)	Circlip
(35)	Needles
(36)	Planetary carrier
(37)	Plate
(38)	Planetary pinion
(39)	Plate
(40)	Screw
(41)	Planetary pinion pin
(42)	Ring gear carrier
(43)	Wheel stud
(44)	Ring gear
(45)	Oil seal
(46)	Seal cage
(47)	Swivel housing
(48)	Stop screw
(49)	Nut
(50)	Oil seal
(51)	Spacer (cat. 1 to 2.5)
(52)	Axle housing
(53)	Sintered bushing

General arrangment



Improved front axle - *Final drive units*

Explosed drawing



A . Removal of planetary carrier, sun gear, ring gear

1. Block the rear wheels. Apply the handbrake.
2. The 4WD clutch being engaged, lift the two wheels to allow to the wheel hub **(22)** to turn freely. Position props.
3. *Remove the wheel on the relevant side.*
4. Drain the final drive unit.
5. Remove bolts **(40)**.
6. Remove the planetary carrier with the thrust washer **(30)**.
7. Remove the circlip **(29)** and the sun gear **(28)**.
8. *Unstake the nut* **(27)** *and unscrew it using socket* 3376880 M1 (axle cat. 2.5 and 3.5) or 3376926 M1 (axle cat. 1 and 2) (Fig. 2). Extract the ring gear carrier **(42)** assembly. Remove the retaining rings **(24) (26)**. Separate the ring gear **(44)** from the ring gear carrier.

Disassembly of planetary carrier

9. Place the planetary carrier in a vice with soft jaws.
10. Remove the circlip **(34)**.
11. Gradually remove the planetary pinion pin **/41** (Fig. 1), recover the needles. Remove the O'ring **(32)** and if necessary the retaining ring **(33)**.
12. Repeat operation 11 for both planetary pinions.

Reassembly of planetary carrier

13. *Clean and check the parts, replace those which are* defective.
14. In one planetary pinion **(38)**, place the needles **(35)** coated with bearing grease.
15. Replace the O'ring **(32)** on the planetary pinion pin **/41**, refit the retaining ring **(33)** (if removed).
16. Lightly engage the planetary pinion pin **/41** in the planetary carrier cover, insuring that the notch of the shaft is aligned with that of the cover to fit the circlip **(34)**. Fit the plate **(37)**. Center the planetary *pinion* **(38)** *with its needles*. Engage the pin in the planetary pinion. Fit the plate **(39)**. Insert entirely the pin and fit the circlip **(34)**.
17. Manually check the axial play and rotation of the planetary pinion.
18. Repeat operations 14 to 17 for the other two planetary pinions.

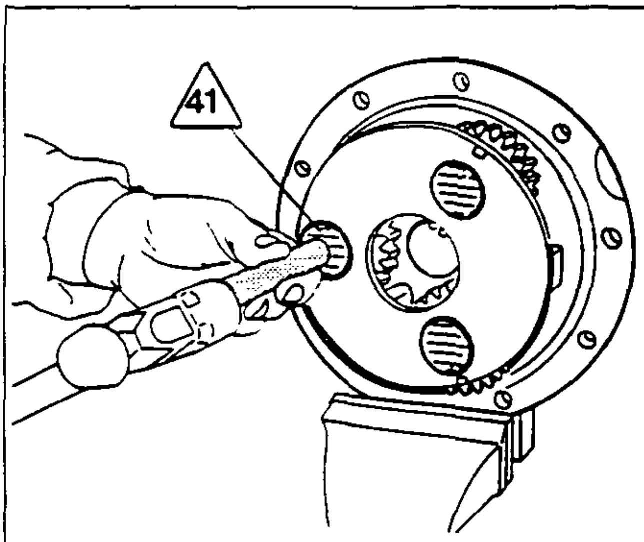


Fig. 1

B . Refitting of ring gear, sun gear, planetary carrier

19. Assemble the ring gear **(44)** on the ring gear carrier **(42)** with retaining rings **(24) (26)** ensuring that they are properly engaged in their grooves.
20. *Fit the ring gear carrier* **(42)** *assembly on the splines* of the swivel housings **(47)**.
21. Clean the threads of the nut **(27)**, lightly coat them with Loctite 270. Tighten to o torque of 400 - 450 Nm.
22. Lock the nut by bending its lock tab into the slot.
23. Manually check rotation of the wheel hub **(22)**.
24. Fit sun gear **(28)** and circlip **(29)**.
25. Screw two guide studs diametraly opposed on the wheel hub **(22)**.
26. Coat the joint of the planetary carrier with a sealing product (Loctite 510 or equivalent).
27. Check that the thrust washer **(30)** is present.
28. Refit the planetary carrier
29. Fit the bolts **(40)**. Remove the guide studs. Tighten the bolts to a torque of 91 - 112 Nm.
30. Turn the wheel hub to place the filler plug in a horizontal position. Top up the oil level of the final drive unit. Refit the plug **(21)** with its seal **(20)**.

31. Refit the wheel. Remove the props and the trolley jack. *Tighten the nuts to a torque of 250 - 300 Nm.*
32. Remove the shims and release the handbrake.
33. Carry out road test of front axle. Check the sealing of the joint face of the planetary carrier and of the filler plug.

C. Disassembly of wheel hub

34. Remove the planetary carrier. Carry out operations 1 to 6.
35. Remove the circlip **(29)** and the sun gear **(28)**.
36. In view of the weight of the hub, place in a sling before removing. Unstake and unscrew the nut **(27)** with socket (Fig. 2) :
    - 3376926 M1 : axle cat. 1 and 2
    - 3376880 M1 : axle cat. 2.5 and 3.5
37. Remove the wheel hub **(22)**.
38. Remove the bearing cone **(18)** and if necessary extract the bearing cone **(25)** by the ring gear carrier **(42)** holes with a suitable extractor. Disassemble the bearing cups **(19)** **(23)**.
39. Remove the seal **(50)**. Extract the seal cage **(46)** (if necessary).

D. Reassembly of wheel hub

40. Clean and check the parts, replace those which are defective.
41. If the bearing cones **(18)** **(25)** and the bearing cups **(19)** **(23)** have to be replaced, push the bearing cone **(18)** on the swivel housing, the bearing cone **(25)** on the ring gear carrier **(42)** and the bearing cups on the wheel hub until they meet the shoulder.
    Note : The bearing cones (18) (25) and the bearing cups (19) (23) must imperatively be from the serie N (width tolerance = 0,1 instead of 0,2mm). The shimming of these bearings is determined by the machining tolerances of the swivel housing (47), the wheel hub (22) and the ring gear carrier (42). Each part could be replaced separately. If the rotation of the wheel hub (22) is incorrect after fitting, research the defective part.

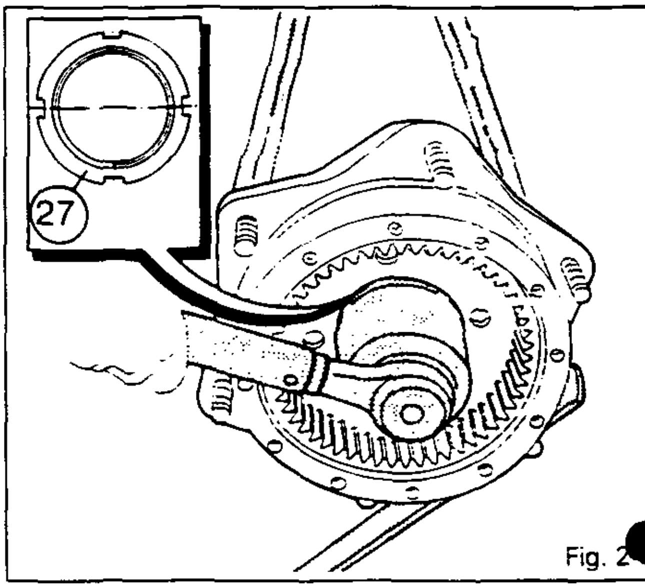


Fig. 2

42. With a locally made drift, push the seal cage **(46)** (if removed) until it meets the shoulder. Place the oil seal **(50)** the lip facing the oil seal **(45)**.
    Note : The tool is centered on the inner diameter of the wheel hub (22). To push the cage, it is necessary to remove the bearing cups (19) (23).
43. Fit the wheel hub **(22)** on the swivel housing **(47)**.
44. Engage the ring gear carrier assembled with the ring gear **(44)** on the splines of swivel housing.
45. Clean the threads of the nut **(27)**. Apply Loctite 270 and tighten to a torque of 400 - 450 Nm with special socket 3376880 M1.
46. Lock the nut by bending its lock tab into the slot.
47. Manually check the rotation of wheel hub **(22)**.
48. Refit the sun gear **(28)** and the circlip **(29)**.
49. Refit the planetary carrier. Carry out operations 2[illegible] to 33.

E . Replacement of a wheel stud

50. Block the rear wheels. Apply the handbrake.
51. *Lift the relevant side with a trokey jack. Position a* prop and remove the front wheel.
52. Unscrew the faulty stud using a nut and a lock-nut.
53. Lightly coat the new stud with Loctite 270 and fit it.
54. Lubricate the studs. Refit the wheel. Remove the prop and the jack. Tighten the nuts to a torque of 250 - 300 Nm.

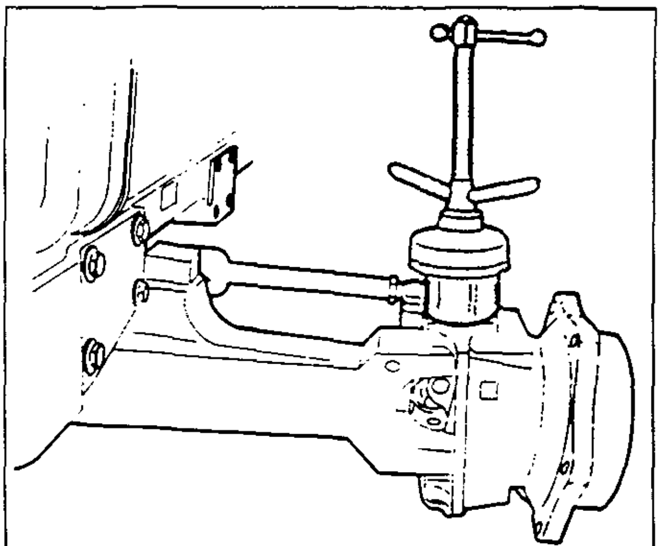


Fig. 3

F . Disassembly of swivel housing

55. Remove the planetary carrier. Carry out operations 1 to 6.
56. Remove the wheel hub. Carry out operations 35 to 38.
57. Remove seal **(45)** if necessary. Remove the pin and the nut of the steering ball joint. Extract the ball joint.
58. Place the swivel housing **(47)** in a sling.
59. Remove the bolts **(1)**, the cover **(2)**. Take off the shims **[3]** and the bearing cup **(4)**, extract the swivel pin **(7)** with remover MF451B and adaptor MF451B3 (Fig. 3).
60. *Remove the bolts* **(1)**. *Remove the cover* **(15)** *and* the bearing cup **(14)**. Extract the swivel pin **(11)** as described above for the upper swivel pin (Fig. 3). **If necessary**, extract the bearing cones **(5) (13)** of the swivel pins.
61. Protect the splines of the universal drive shaft as not to damage the seal **(16)**.
62. Remove the swivel housing **(47)**.
63. Remove the seal **(16)** and drive out the bush **(17)**. ***Note : The bush (31) is fitted with Loctite 270. To avoid risk of leakage, the breather of the swivel housing has been suppressed.***
64. *If necessary, remove the universal drive shaft.* Remove the seal **(8)** and extract the bush **(9)**.

G . Reassembly of swivel housing

65. Clean and check the parts, replace those which are defective.
66. If removed, fit the bush **(9)** and the new seal **(8)** against the shoulder of the axle housing **(52)**, oil the seal **(8)**. Refit the universal drive shaft. Introduce a *guide through the filling hole to align the* left drive shaft with the differential.
67. If removed, fit the bush **(17)** and the new seal **(16)** against the shoulder of the axle housing **(47)**.

68. The steering lock adjustment of axles cat.1 to 2.5 is made by spacers **(51)** of different lenghts fitted on swivel housing **(47)**. For axles cat. 3.5 adjust the screw **(48)** (Fig. 4). According to the turning circle required, report to the table here below. After adjustment, lock the nut **(49)** :

Dimension **X**	Turning circle
77 mm	35°
63 mm	40°
34 mm	50°

69. Refit the swivel housing **(47)**. Position the swivel pin **(7)** provided with O'ring **(6)** so that the swivel housing assembly is aligned with the axle case **(52)**.
70. *Fit the swivel pin* **(11)** *provided with O'ring* **(12)**, the bearing cup **(14)**, the cover **(15)**. Tighten the bolts **(1)** evenly and alternately to push the swivel pin **(11)** into the axle housing. Tighten the bolts to a torque of 91 - 112 Nm.
71. Fit the bearing cup **(4)**, the shims **[3]**, the cover **(2)**. Fit and tighten the bolts **(1)** in the same way that in operation 70. **Check that the swivel pins (7) (11) are properly in contact with the axle housing.**
72. Remove the cover **(2)**, remove the shims **[3]**. Refit the cover and tighten the bolts to a torque of 91 - 112 Nm.

Shimming P1.

73. With a dial gauge, measure the axial play using a lever between the axle housing and the swivel housing (Fig. 5).
74. According to the play **J**, determine the thickness of shims **[3]** to obtain (Fig. 6) :
P1 = J + 0,30 (0,30 being the preload value)
75. Remove the bolts **(1)**, the cover **(2)**, the bearing cup **(4)**, coat the bearing cone **(5)** with bearing grease. Refit the bearing cup, the shims **[3]** selected in *operation 74. Refit the cover.* Apply Loctite 241 on bolts **(1)** and tighten to a torque of 91 - 112 Nm.
76. Remove the cover **(15)** and the bearing cup **(14)**. Coat the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Apply Loctite 241 on bolts **(1)** and tighten to a torque of 91 - 112 Nm.
77. Using a locally made drift push seal **(45)** (if removed) against the shoulder. Refit the steering ball joint. Tighten the nut to a torque of 103 - 115 Nm. Lock the nut with a new pin.
78. Refit the wheel hub. Carry out operations 41 to 47.
79. Remove the protection on the splines of the universal drive shaft. Fit the sun gear **(28)** and the circlip **(29)**.
80. Remove the planetary carrier. Carry out operations 25 to 33.

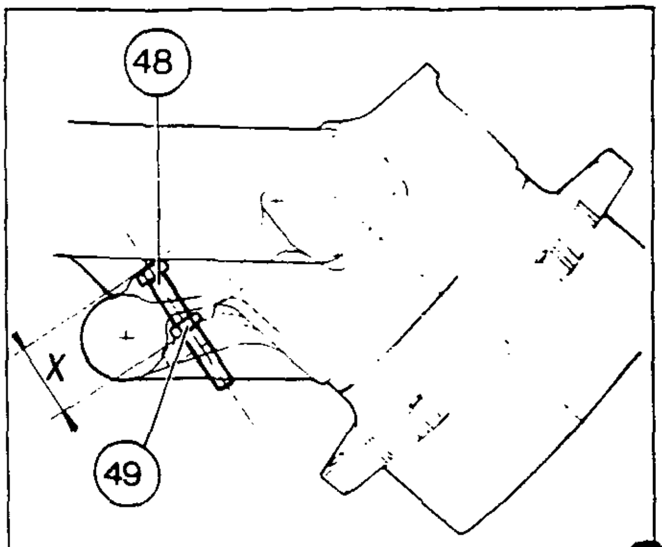


Fig. 4

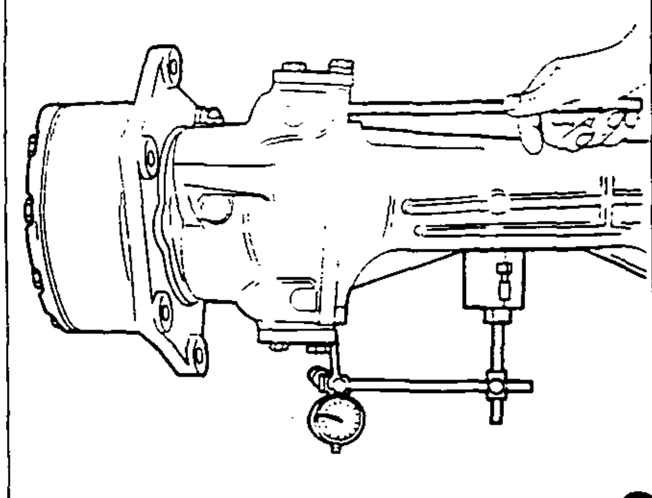


Fig.

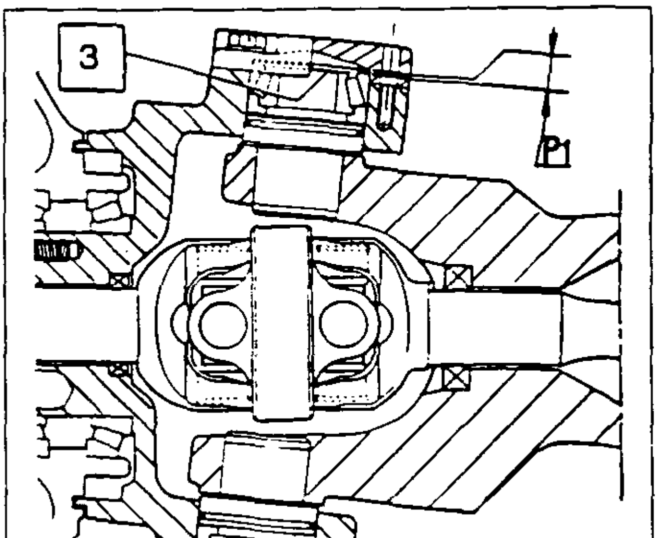


Fig.

H. Removal and refitting of universal drive shaft

Removal

81. Remove the planetary carrier. Carry out operations 1 to 6.
82. Remove the circlip **(29)**, the sun gear **(28)** and extract the steering ball joint.
83. Remove the swivel housing **(47)** assembly and the wheel hub **(22)**. Carry out operations 58 to 62.
84. Remove the universal drive shaft **(10)**.

Disassembly of universal joint (Fig. 7)

85. Maintain the external section **(1)** of the universal drive shaft in a vice with soft jaws.
86. Remove the four circlips **(3)** from each end of the universal joint.
87. Use a plastic mallet to drive the central yoke **(2)** downwards until the bearing sleeve protrudes.
88. Place the bearing sleeve in a vice and tap the central yoke from the bearing.
89. Remove the opposing bearing sleeve in the same way and remove the external section of the shaft.
90. Turn the shaft assembly through 90°, then repeat operations 87 to 89 to disengage the universal joint from the shaft.
91. Place the interior section of the drive shaft in the vice and repeat operations 86 to 90.

Reassembly of universal joint

92. Clean and check the parts. Replace the universal joint assembly comprising the yokes, the seals, the bearings, the sleeves and the circlips.
93. Coat the needles with bearing grease and ensure that they are all in the sleeves.
94. Position the universal joint **(1)** in the yoke and move it sideways as far as possible to provide a guide for the needle rollers of the bearing sleeve being installed (Fig. 8).
95. Drive the sleeve **(1)** into the yoke deep enough to permit insertion of the circlip (Fig. 9).
96. Fit the other sleeves and universal joints in the same way.

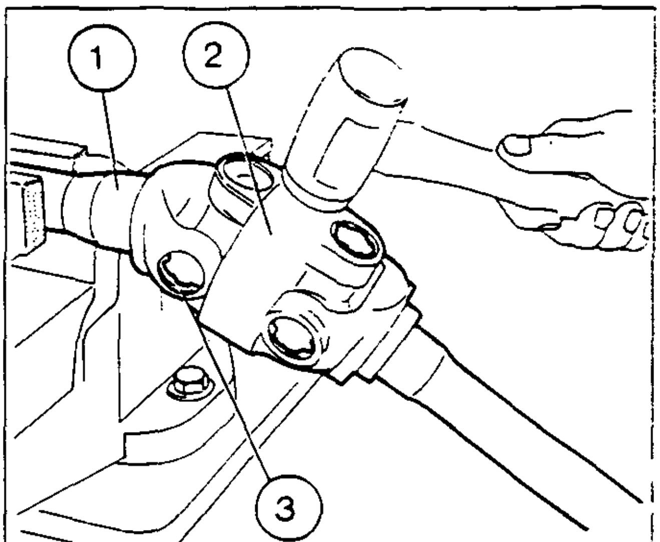


Fig. 7

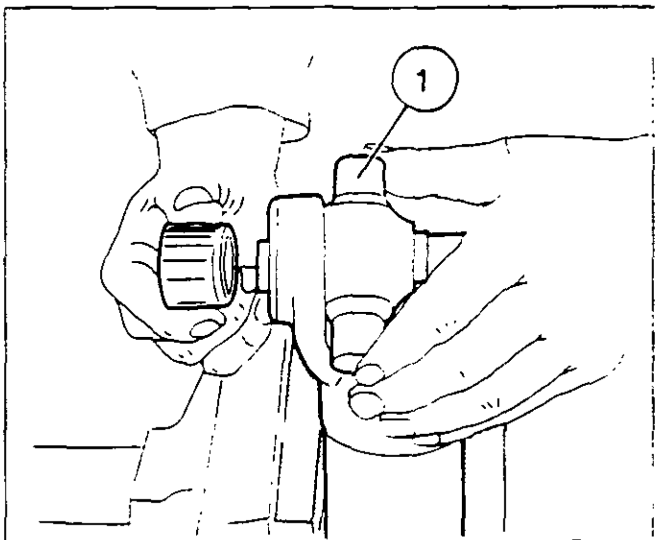


Fig. 8

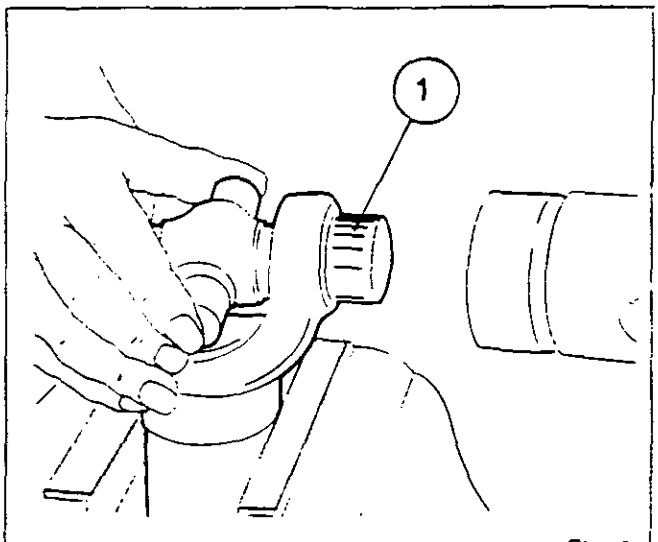


Fig. 9

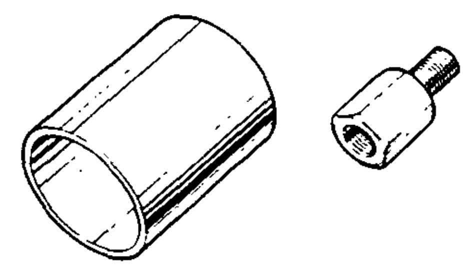
Refitting

97. Refit the universal drive shaft. Introduce a guide through the filling hole to align the left drive shaft with the differential.
98. Replace the seals **(6)** and **(12)**. Remove the swivel housing assembly and wheel hub.
99. Position the swivel pin **(7)** in such a way that the swivel housing **(47)** assembly is aligned with the axle case **(52)**.
100. Fit the swivel pin **(11)**, the bearing cup **(14)**, the cover **(15)**. Tighten the screws **(1)** evenly and alternately to push the swivel pin **(11)** into the axle case.
101. Remove the cover **(15)** and the bearing cup **(14)**. Coat the bearing cone **(13)** with bearing grease. Refit the bearing cup and the cover. Apply Loctite 241 on bolts **(1)** and tighten to a a torque of 91 - 112 Nm.
102. Fit the bearing cup **(4)**, the shims **(3)**, the cover **(2)**. Tighten the bolts as in operation 100. **Check that the swivel pin (7) and (11) are properly in contact with the axle case (52).**
103. Remove the cover **(2)**. Remove the shims **(3)** and the bearing cup **(4)**. Coat the bearing **(5)** with bearing grease. Refit the bearing cup, the shims and the cover. Apply Loctite 241 on bolts **(1)** and tighten to a a torque of 91 - 112 Nm.
104. Refit the steering ball joint. Tighten the nut to a torque of 103 - 115 Nm. Stake the nut with a new pin.
105. Remove the protection of the shaft. Refit the sun gear **(28)** and the circlip **(29)**.
106. Refit the planetary carrier. Carry our operations 25 to 33.

I . Service tools

A . Tools available on the MF network

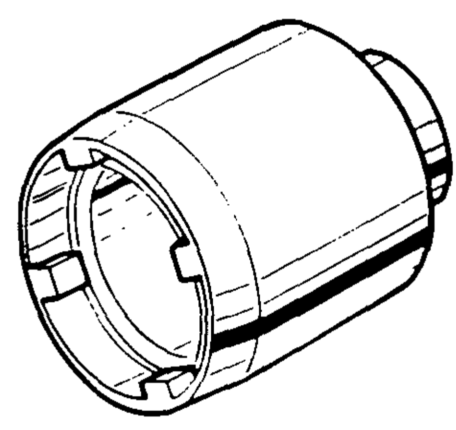
MF451B Wheel hub puller
MF451B3 Adaptor for puller Ø M18.



Used with MF195C

3376880 M1 Socket for ring gear carrier nut (cat. 2.5 and 3.5)

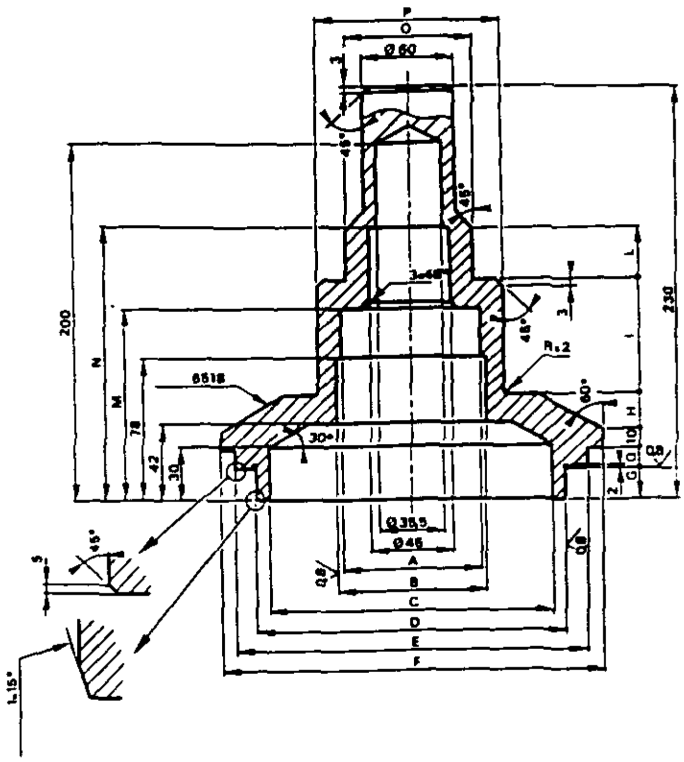
3376926 M1 Socket for ring gear carrier nut (cat. 1 and 2)



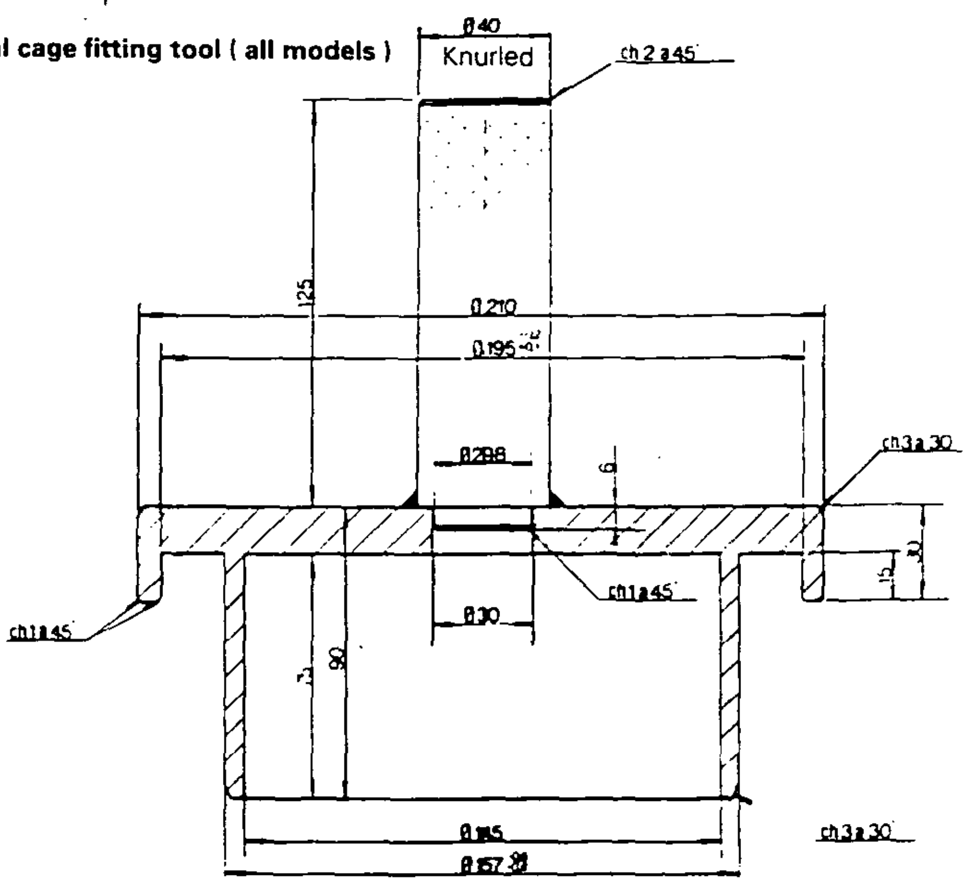
B . Tools to be made up locally

Swivel housing oil seal fitting tool

	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q
Cal. 1 - 2	Ø 76	Ø 81,3+0,3+0,2	Ø 156	Ø 168,8 +0,1/0	Ø 194,2	Ø 210	18,5	19	64	28	106	151	Ø 70	Ø 102	10,1 0/-0,1
Cal. 2,5 - 3,5	Ø 86	Ø 87,3 +0,3+0,2	Ø 180	Ø 193,8 +0,1/0	Ø 219.2	Ø 240	20,5	17	67	42	118	173	Ø 76	Ø 108	9.50/-0.1



Seal cage fitting tool (all models)



7 C01 Differential

CONTENTS

Front axle - *Differential*

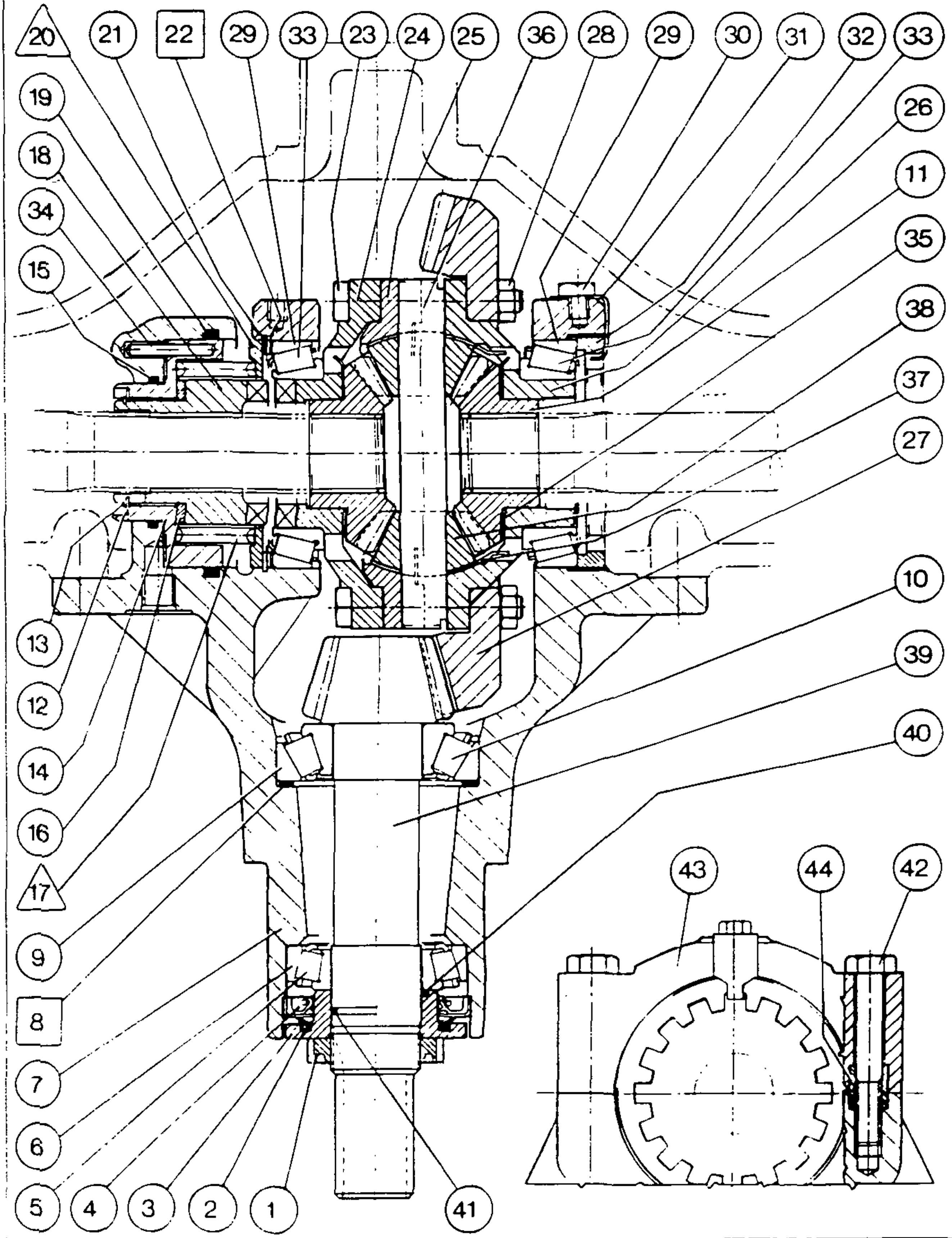
General

The bevel crownwheel and pinion assembly containing the differential lock device (hydralock) is mounted in a casing **(7)** comprising two bearing halves **(43)** fastened by bolts **(42)**.
The bevel drive pinion is mounted at the rear of the casing on two opposed taper roller bearings. Its position can be adjusted by means of shims **[8]** situated behind the head roller bearing. The preload of the roller bearings is adjusted by controlled tightening of the nut **(1)**.
The assembly is sealed by two seals **(4)** and **(2)**. Axles of categories 2.5 and 3 have an O-ring **(41)** mounted on the bevel drive pinion and axles of categories 1 and 2 have an O-ring **(40)** fitted in the spacer **(3)**.
Axles of categories 1 to 2.5 have two planetary pinions **(38)** and one pin **(36)** and axles of category 3 have four planetary pinions and two pins.
The clearance between the crownwheel and bevel drive pinion is adjusted by shims **[22]** placed behind the cup **(29)**.
Preload of the case and crownwheel assembly is done with the splined nut **(32)**.

Parts list

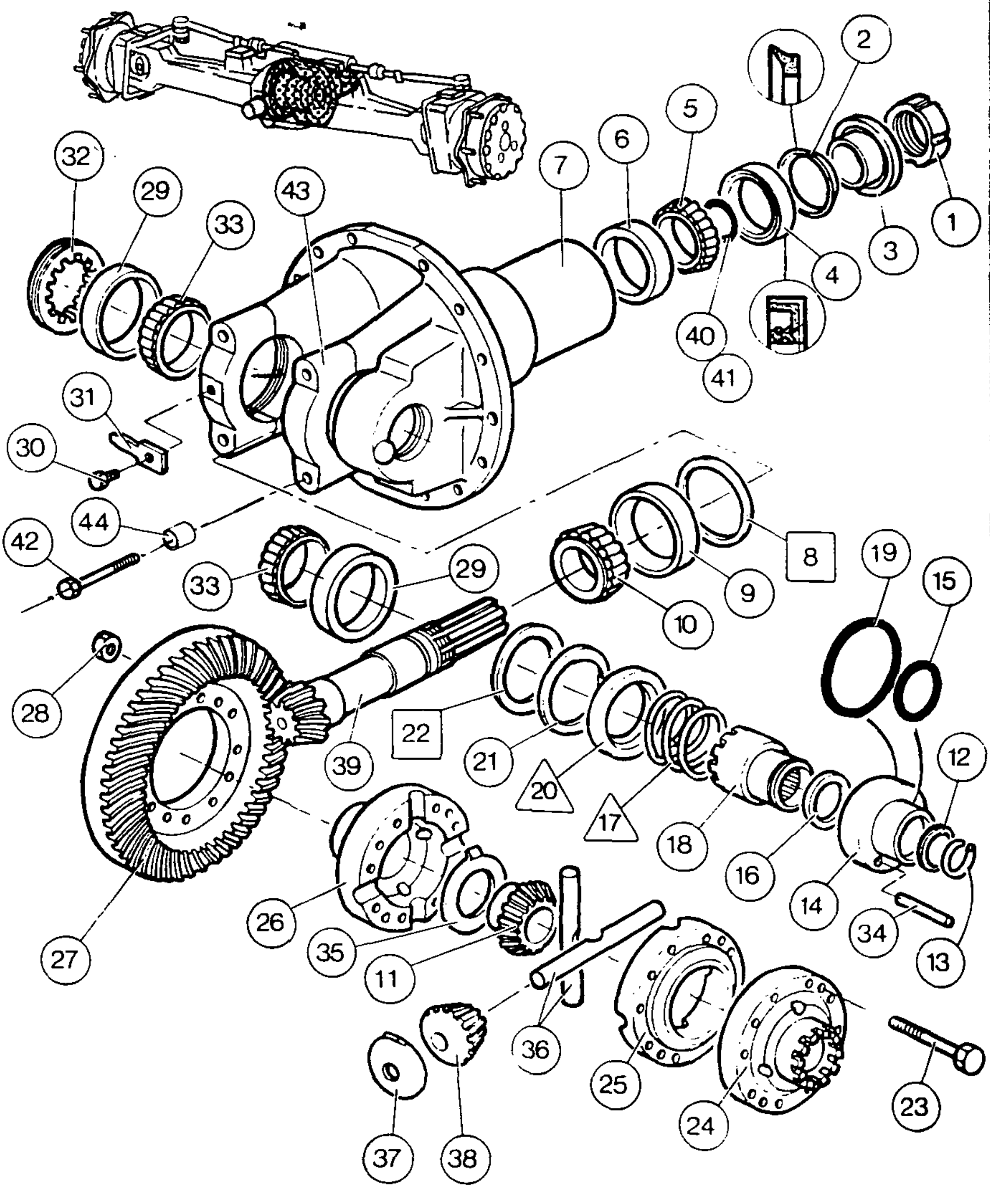
- **(1)** Slotted nut
- **(2)** Lip seal
- **(3)** Spacer
- **(4)** Sealing ring
- **(5)** Bearing cone
- **(6)** Bearing cup
- **(7)** Casing
- **[8]** Shim(s)
- **(9)** Bearing cup
- **(10)** Bearing cone
- **(11)** Diff. gear
- **(12)** Lug washer
- **(13)** Retaining ring
- **(14)** Piston
- **(15)** O-ring
- **(16)** Thrust washer
- **(17)** Spring
- **(18)** Dog tooth coupler
- **(19)** O-ring
- **(20)** Guide washer
- **(21)** Washer
- **[22]** Shim(s)
- **(23)** Bolt
- **(24)** Cover
- **(25)** Housing half
- **(26)** Housing half
- **(27)** Crownwheel
- **(28)** Nut
- **(29)** Cup
- **(30)** Bolt
- **(31)** Locking plate
- **(32)** Splined nut
- **(33)** Bearing cone
- **(34)** Dowel
- **(35)** Washer
- **(36)** Planetary pinion pin
- **(37)** Spherical washer
- **(38)** Planetary pinion
- **(39)** Bevel drive pinion
- **(40)** O-ring (cat. 1 - 2)
- **(41)** O-ring (cat. 2.5 - 3)
- **(42)** Bolt
- **(43)** Bearing half
- **(44)** Centring bush

General arrangement



Front axle - Differential

Exploded view



A. Splitting front axle / frame

1. Chock the rear wheels and apply the handbrake.
2. Disconnect the two hoses of the front differential lock (plug the channels). Remove the shield and the drive shaft.
3. Drain the axle.
4. Raise the tractor with a jack positioned under the axis of the axle housing. Place a stand (Fig. 3) under the lower engine housing. Remove the wheels.
5. Disconnect the pipes of the steering cylinder, marking their position (plug the channels).
6. Place the front axle in slings (Fig. 3).
7. Remove the bolts **(1)** and the grease nipple **(3)**. Remove bearing **(2)** and washer **(4)** (Fig. 1).
8. Remove the front axle, disengaging it from its rear bearing, and place it on a support. Remove the chamfered washer **(7)** (Fig. 1).

Note: On tractors equipped with a belly weight, it is necessary to remove this in order to remove the front axle.

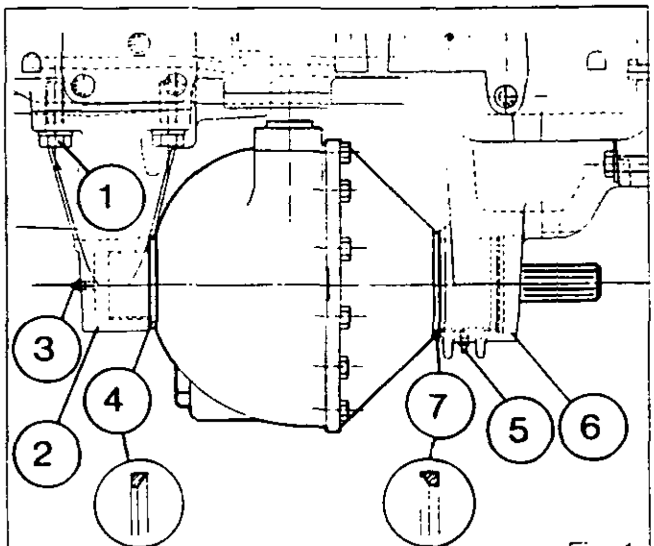


Fig. 1

B. Removal of swivel housings, wheel hubs and universal drive shafts

Note: Exercise care when carrying out this operation

9. Remove the steering ball joints.
10. Place the swivel housing assembly in a sling.
11. Remove the swivel housings. Carry out operations 53 and 54, chapter 7B01.
12. With the help of another person, remove the assemblies.
13. If necessary, remove the seals **(8)** (Fig. 2)

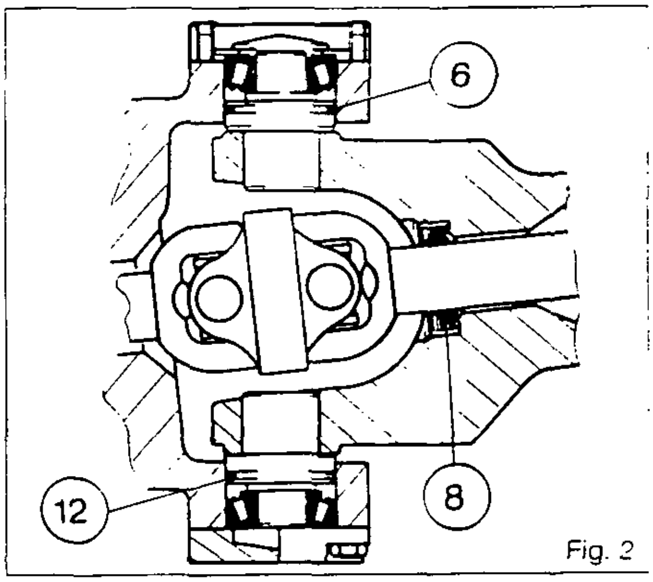


Fig. 2

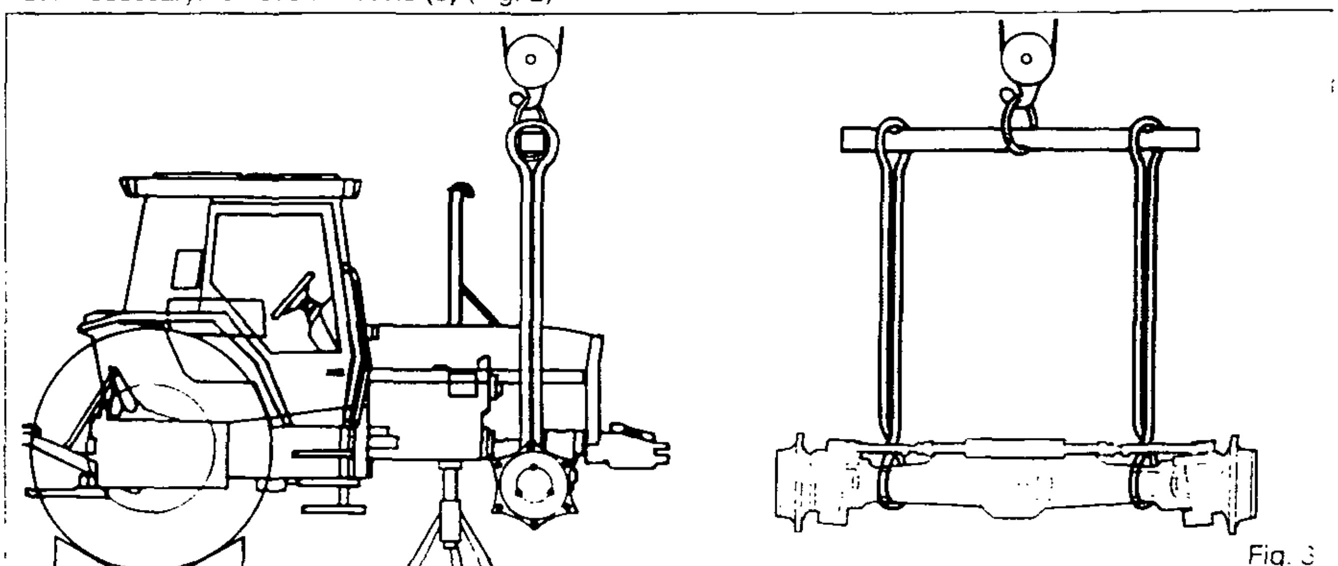


Fig. 3

C. Removal of differential case assembly

14. Remove the bolts **(1)** and detach the steering cylinder **(2)**, taking care not to lose the centring bushes or the rings **(3)** (depending on the category) (Fig. 4).
15. Remove the bolts **(1)**. Detach and remove the differential case assembly **(8)** (Fig. 5).
On tractors equipped with front axles of categories 1 - 2 - 2.5, the differential case is centred by means of dowels force-fitted in the axle casing **(52)**, and on category 3 axles by means of rings, likewise force-fitted.

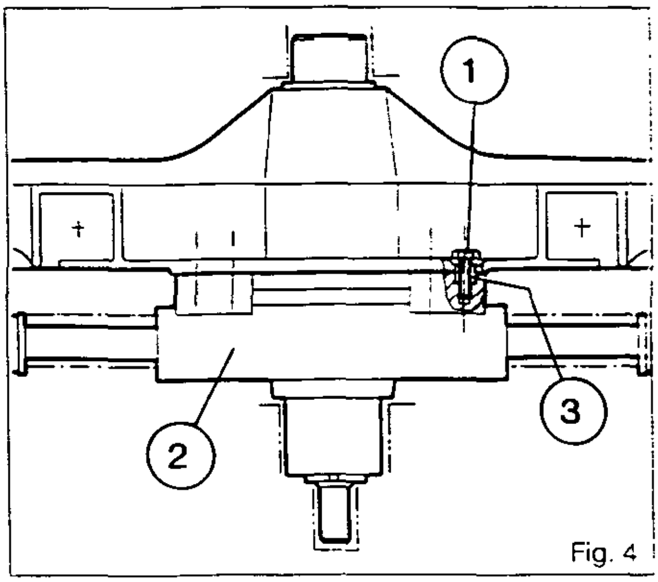


Fig. 4

D. Disassembly of differential

16. Place the casing **(7)** in a soft-jawed vice (Fig. 6).
17. Remove the bolt **(30)** and its retainer **(31)** (Fig. 6).
18. Remove the splined nut **(32)** using the special, locally made spanner (see section M).
19. Remove the four bolts **(42)**, detach the bearing halves **(43)** (Fig. 6).
Note: Carefully remove the bearing half on the lock control side; with the spring /17\ compressed, the washer (21) should remain in the casing (7).
20. Remove the complete differential assembly with the bearing cones **(33)** and the cups **(29)** (Fig. 7). Separate the cups from the taper roller bearings. Remove the shim(s) **[22]**.
Note: Keep the bearing cones and cups paired if they are to be reused .

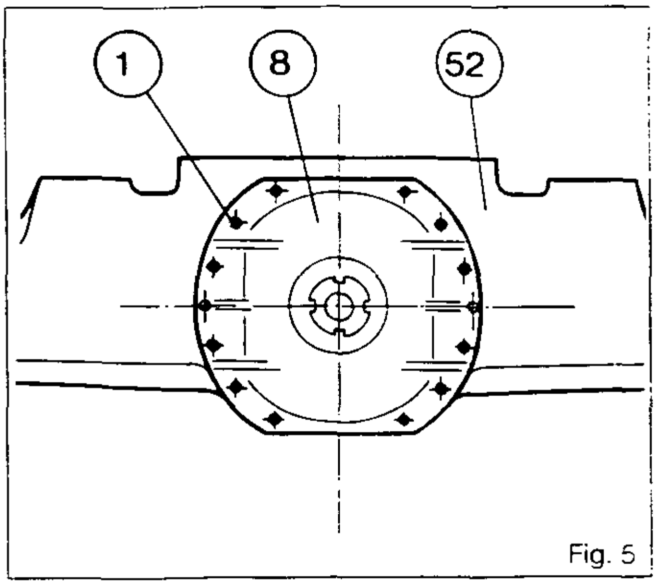


Fig. 5

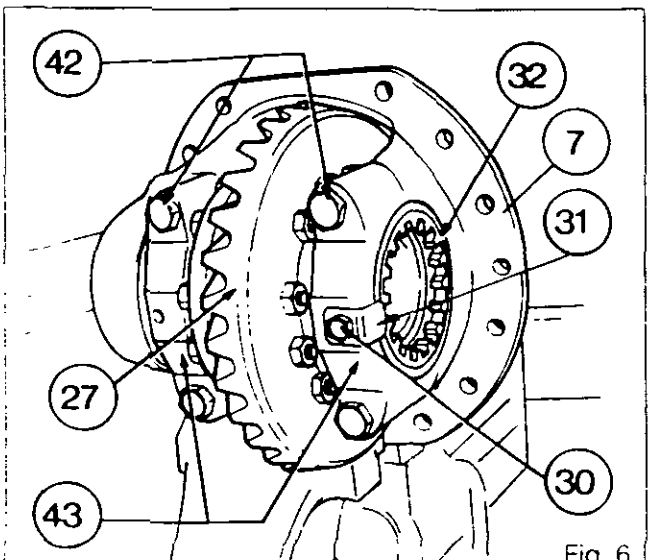


Fig. 6

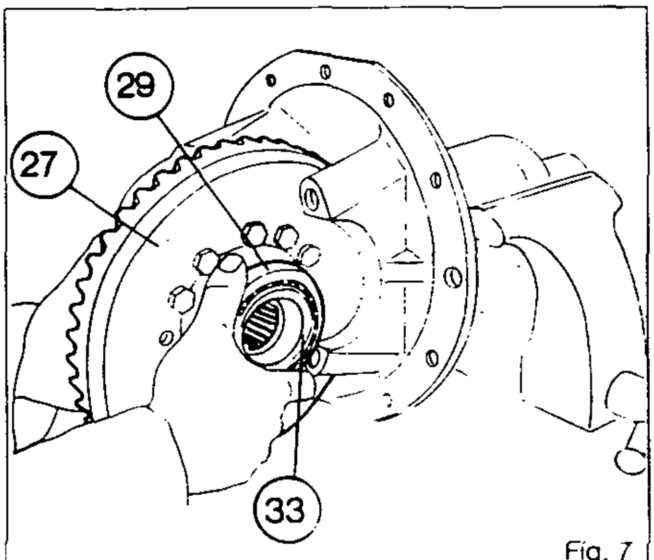


Fig. 7

21. If necessary, extract the two bearing cones **(33)**.
22. Place the differential assembly in a soft-jawed vice. Remove the nuts **(28)**. Take out the bolts **(23)**. ***Note: Prior to disassembly, mark the position of the bearing halves (25) and (26) and of the cover (24) so that they can be paired when refitting.***
23. Separate the bearing halves **(25)**, **(26)** and the cover **(24)**.
24. Remove the gear **(11)** and washer **(35)**.

Front axle, category 1 - 2 - 2.5 (Fig. 8)

25. Separate the pin **(36)**, the planetary pinions **(38)** and the spherical washers **(37)**.

Front axle, category 3 (Fig. 9)

26. Separate the two pins **(36)**, the planetary pinions **(38)** and the spherical washers **(37)**.

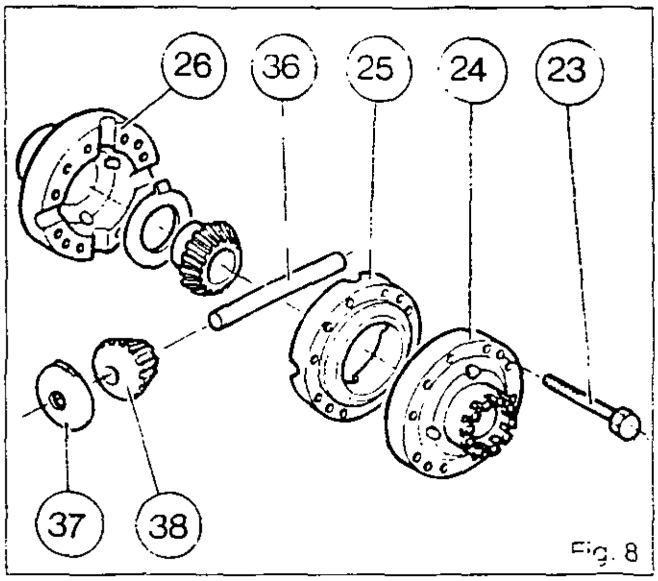


Fig. 8

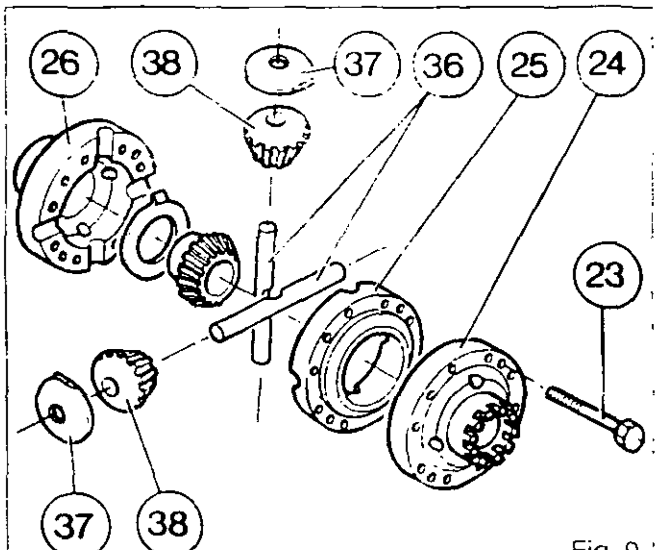


Fig. 9

E. Removal of differential lock (Fig. 10)

27. Using tool MF 471, correctly centred, compress the spring **/17** until the supporting washer **(21)** is free.
28. Remove the washer **(21)**.
29. Gradually relax the spring **/17**.
30. Remove the service tool MF 471.
31. Remove the guide washer **/20** of the spring.
32. Remove the spring **/17**.
33. Remove the retaining ring **(13)** of the dog tooth coupler **(18)**.
34. *Dismantle the coupler* **(18)**, *the thrust washer* **(16)** and the lug washer **(12)**.
35. Remove the piston **(14)**.
36. Take out the O-rings **(15)** and **(19)**.

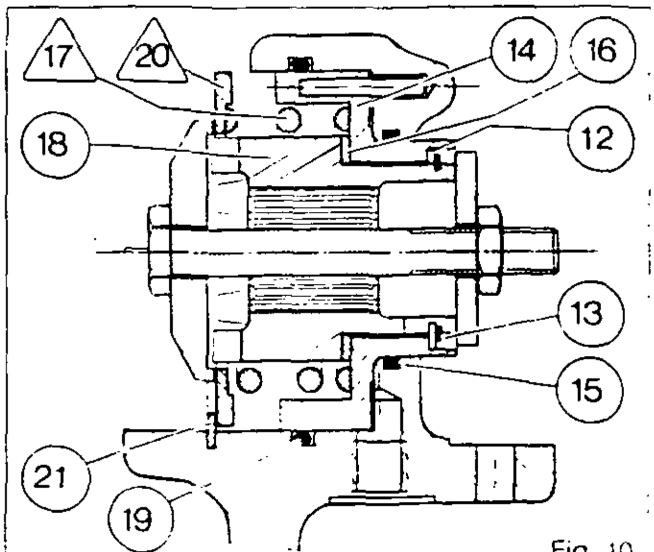


Fig. 10

F. Removal of bevel drive pinion

37. Unlock the nut **(1)** and untighten it with Facom spanner n° 125-80 or equivalent (Fig. 11).
38. Remove the bevel gear pinion **(39)** together with the bearing cone **(10)**.
39. **Front axles category 2.5 and 3:** Remove the O-ring **(41)**.
40. Remove the bearing cone **(10)** of the bevel drive pinion.
41. Remove the cup **(9)** and the shims **[8]**.
    Remove the spacer **(3)**. Take out the seal **(2)**.
    Front axles category 1 and 2: Remove the O-ring **(40)**.
42. Remove the sealing ring **(4)**, the cone **(5)** and the cup **(6)**.

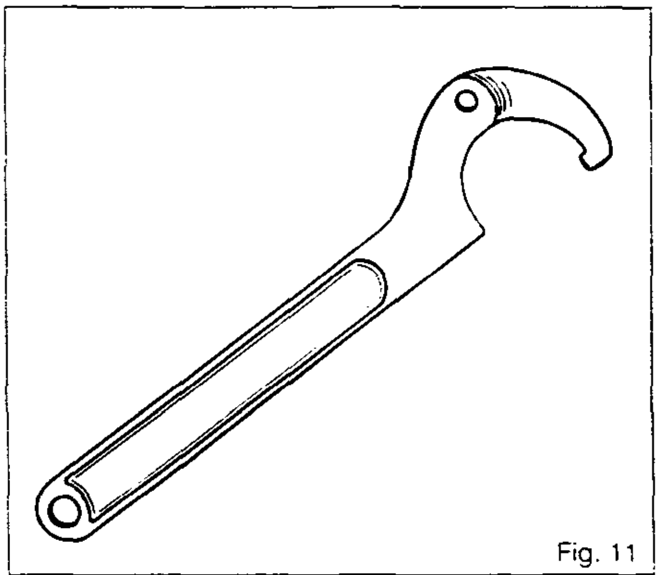


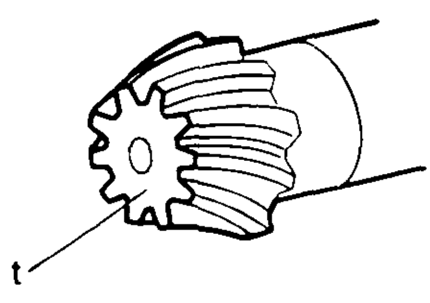
Fig. 11

G. Reassembly of bevel drive pinion

43. Before reassembly, clean the parts and replace those which are defective. Check that the channels of the differential lock are not obstructed.
    Note: If it should prove necessary to replace the crownwheel (27) or the bevel drive pinion (39), the two parts should be replaced together.
44. Adjust the position of the bevel drive pinion (Fig. 12). The thickness of the shims needed to position the bevel drive pinion correctly is calculated according to the following formula:
    SP = A - (d+t)
    where:
    SP: required thickness of shims **[8]**
    A: distance measured between the bearing cone **(10)** placed in the cup **(9)** and the machined face F of the casing **(7)**.
    d: nominal dimension varying according to the type of axle.

category 1 (3050)	=	118
category 2 (3060-3065)	=	118
category 2.5 (3070 up to 3115-3120)	=	118
category 3 (3125 -3140)	=	135

t: actual dimension marked on the head of the bevel drive pinion. This value may be positive or negative (to be added or subtracted from nominal dimension **d**).



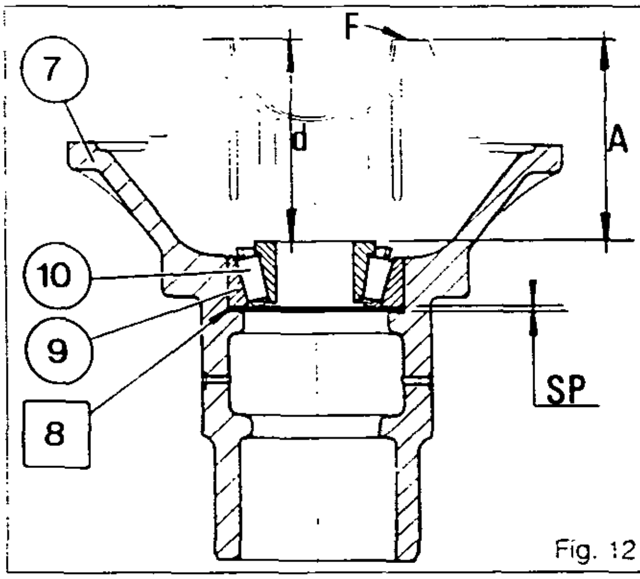


Fig. 12

Method of operation (Fig. 12)

45. Position the cup **(9)** and the bearing cone **(10)** in the casing **(7)** without the shims **[8]**.
    Using a depth gauge, measure dimension A.
    Take care to seat the bearing cone correctly in the cup. Having taken the measurement, apply the formula to determine the thickness of the shims needed.

46. Remove the bearing cone **(10)** and cup **(9)** again.
47. Push the bearing cone **(10)** against the shoulder of the bevel drive pinion using a press and a suitable tool (Fig. 13).
48. Place the shim **[8]** of the previously calculated thickness in the casing.
49. Fit the cup **(9)**.
50. Place the cup **(6)** in the casing as far as it will go.
51. Position the bevel drive pinion **(39)** prepared with the cone **(10)**.
52. Smear the bearing surface of the bearing cone **(5)** with Loctite 601 and position it on the bevel drive pinion.
53. Fit the O-ring **(41) (axles category 2.5 and 3)**, the O-ring **(40) (axles category 1 - 2)**.
54. Smear the periphery of the sealing ring **(4)** with Loctite 542 and push it into the casing **(7)** as far as it will go, with the metal part turned towards the exterior of the casing.
55. Fit the seal **(2)** in the spacer **(3)** with the lip facing towards the interior of the housing.
56. Smear the interior of the spacer **(3)** with Loctite 601, then position it temporarily at the end of the bevel drive pinion. Grease the exterior of the spacer and the lip joint **(2)**. Place the spacer finally in contact with the bearing cone **(5)**.
57. Replace the nut **(1)**, smear it with Loctite 270 and then tighten it lightly on the bevel drive pinion.
    Note: Check that there is clearance between the spacer (3) and housing.
58. Rotate the bevel drive pinion through a few turns. Using a torque wrench and an adapted grooved sleeve, check that the rotational torque is between 2.5 and 3.5 Nm (Fig. 14). Tighten or untighten the *nut* **(1)** *with Facom spanner n° 125-80 or equivalent* until the desired rotational torque is obtained.
59. Lock the nut **(1)** by bending its collar in 3 equidistant grooves.

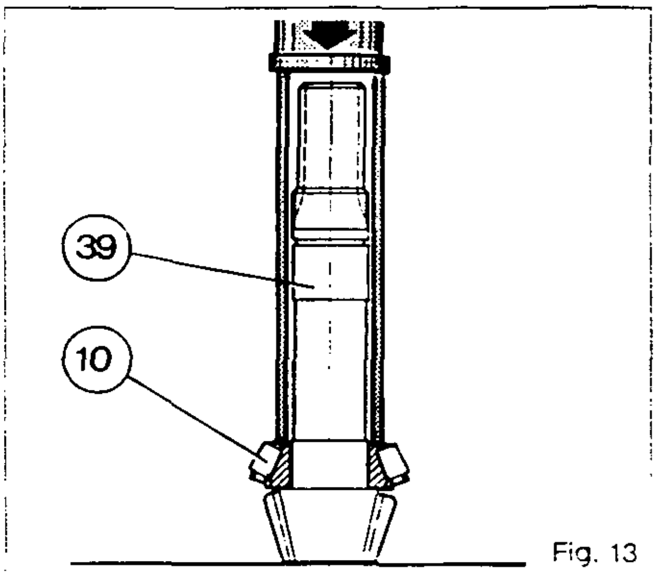


Fig. 13

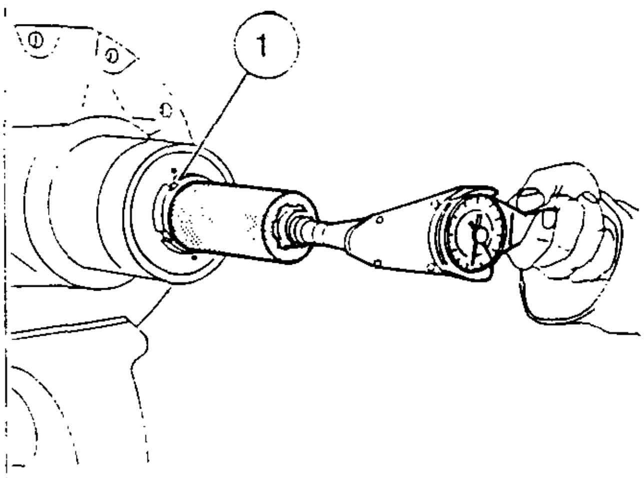


Fig. 14

H. Reassembly of differential lock

60. Mount the thrust washer **(16)** on the coupler **(18)**. Fit the assembly in the piston **(14)**. Fit the lug washer **(12)** and position the retaining ring **(13)** in the groove of the coupler.
Note: The toothing of the coupler has been strengthened (see service bulletin Tract.89/ 005).
61. Mount the piston **(14)** together with the coupler **(18)** in the packingless casing.
Note: The dowel (34) is force-fitted in the piston. Check that the piston and the dowel slide freely in the housing.
Having carried out the check, remove the piston together with the coupler.
62. Fit new O-rings **(15)** and **(19)**. Position the piston with the coupler, then insert it with the aid of a plastic mallet, striking it on the periphery.
63. Position the spring **(17)** and the washer **(20)**, with the shoulder of the washer facing the spring. Tension the assembly with service tool MF 471 until the washer **(21)** slides freely in the groove of the casing.
64. Loosen the service tool MF 471, taking care to ensure that the spring cannot escape.
65. Fit the bearing cone **(33)**, if it has been removed, on the housing half **(26)** using a press or a suitable tool (Fig. 15).
66. Fit the other bearing cone **(33)**, if it has been removed, on the cover **(24)**.
67. Assemble the housing half **(25)** in the cover **(24)** (with claw teeth), observing the marking made at the time of dismantling.
68. Position the washer **(35)** on the axle gear **(11)**. Place the assembly in the housing half **(25)**, putting the tab of the washer in one of the holes of the housing half.

Front axles, category 1 - 2 - 2.5 (Fig. 8)

69. Place the two planetary pinions **(38)** and the two spherical washers **(37)** on the planetary pinion pin **(36)**, then place the assembly in the housing half **(25)**, putting the tabs of the spherical washers **(37)** in the holes of the housing half **(25)**.

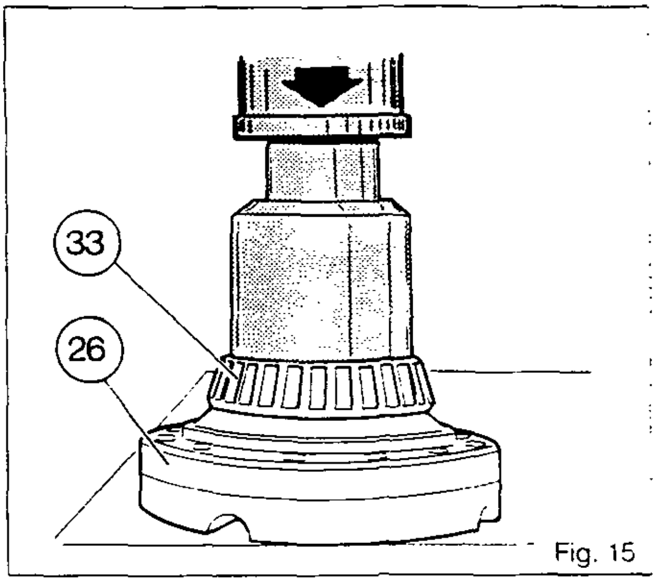


Fig. 15

Front axles, category 3 (Fig. 9)

70. Place the four planetary pinions **(38)** and the four spherical washers **(37)** on the two pins **(36)**, then place the assemblies in the housing half **(25)**, putting the tabs of the spherical washers **(37)** in the holes of the housing half **(25)**.

Front axles, categories 1 to 3

71. Place the other washer **(35)** on the other gear **(11)**. Place the assembly in the housing half **(26)**, taking care to ensure that the position of the tab of the washer **(35)** is correct.
72. Position the housing half **(26)** assembly on the housing half **(25)**, maintaining the assembly position marked at the time of dismantling.
73. Position the crownwheel **(27)** on the housing half **(26)**. Fasten together the housing halves **(25)** and **(26)**, the cover **(24)** and the crownwheel.
Fit the bolts **(23)** and smear them with Loctite 270.
Tighten the nuts **(28)** to a torque of 66 - 73 Nm.
74. Position the cups **(29)** on their cones **(33)**.
75. Place the crownwheel assembly in the casing **(7)** (Fig. 7).
76. Check that the centring bushes **(44)** are present. Fit the shims **[22]**. Position the bearing halves **(43)**. Moderately tighten the bolts **(42)** so that the cups **(29)** move freely.

77. Put the housing in a horizontal position in a soft-jawed vice, the crown uppermost (Fig. 16).
78. Put a dial gauge in place. Tighten the nut **(32)** (Fig. 16) and turn the crownwheel a few times to seat the bearing cones properly in the cups. Tighten the nut again to eliminate the axial play.
79. Tighten the nut **(32)** a further 3 notches to obtain the correct preload.
80. Check the backlash between the teeth of the crownwheel and of the pinion with a dial gauge (Fig. 17). Take three readings at three equidistant points. Determine the average of the three readings. This should be within the following values :
    Category 1 and 2 = 0.17 mm - 0.22 mm
    Category 2.5 = 0.15 mm - 0.20 mm
    Category 3 = 0.10 mm - 0.20 mm
    If the reading is too high, reduce the thickness of the shims **[22]**. If it is too low, increase the thickness until a correct backlash is obtained.
81. Remove the bearing bolts **(42)** one by one. Smear them with Loctite 270 and tighten them to a torque of 136 - 150 Nm.
82. Refit the locking plate **(31)** with the bolt **(30)** smeared with Loctite 270 and tighten to a torque of 16-26 Nm. Lock the nut **(32)**, bending the tab of the locking plate in the appropriate groove.

I. Piston leak test

83. Connect a pressure gauge equipped with a valve to the supply connector of the differential lock.
84. Supply the circuit with compressed air at a pressure of approx. 5 bar and check the movement of the piston **(14)**.
    Reduce the pressure to 0.3 bar and close the valve.
    The pressure gauge should not show any drop in pressure for 1 minute.
85. Remove the pressure gauge and valve assembly.

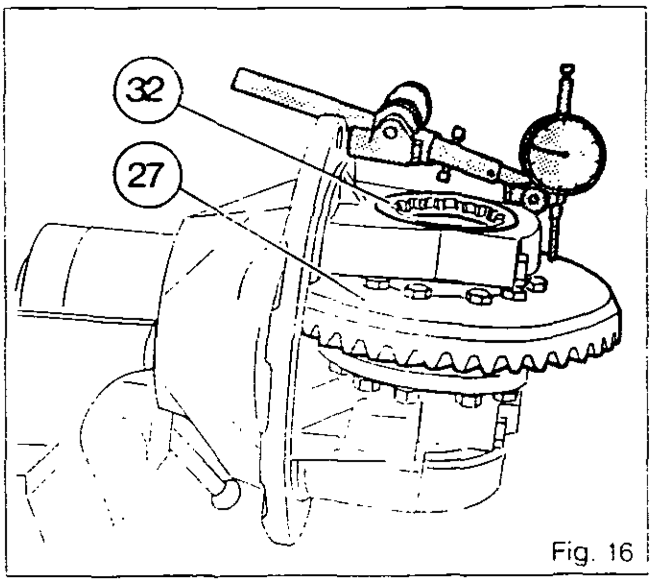


Fig. 16

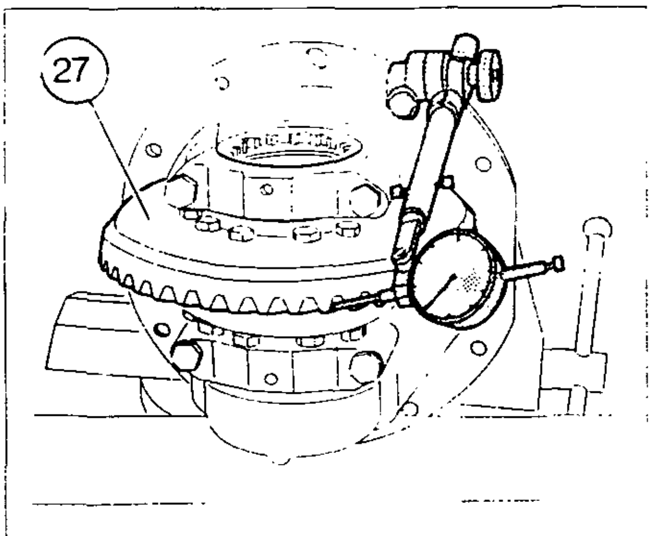


Fig. 17

J. Refitting of differential case assembly

86. Clean and check the parts. Replace those which are defective.
Note: To avoid risk of leakage, the breather in the swivel housing was eliminated and replaced with a plug. Refer to service bulletin Front Axle 011 issue 1.
87. Check that the centring pins (category 1 - 2 - 2.5) and bushes (category 3) are present on the axle casing **(52)**.
88. Smear the joint face of the differential case on the axle case with sealing compound Loctite 510 or equivalent and screw in two diametrically opposed guide studs.
89. Refit the differential case assembly **(8)**.
Remove the guide studs. Fit and tighten the bolts **(1)** (Fig. 5) to a torque of 91 - 112 Nm.
90. Check that the centring bushes **(3)** are present and refit the steering cylinder **(2)**. Apply Loctite 270 on bolts **(1)** and tighten to a torque of 102 - 112 Nm (Fig. 4).

K. Refitting of swivel housings, wheel hubs and universal drive shafts

91. If the seals **(8)** (Fig. 2) have been removed, smear the new seals with Loctite 542 on the periphery and fit them against the shoulder. Replace the seals **(6)** and **(12)** (Fig. 2).
92. With the help of another person, fit the assemblies. Slide the universal drive shafts in the axle case without damaging the seals **(8)**. Insert a guide through the oil filling hole to align the left drive shaft with the differential.
93. Turn the wheel hubs to engage the drive shafts.
94. Refit the swivel housings. Carry out operations 95 to 100, chapter 7B01.

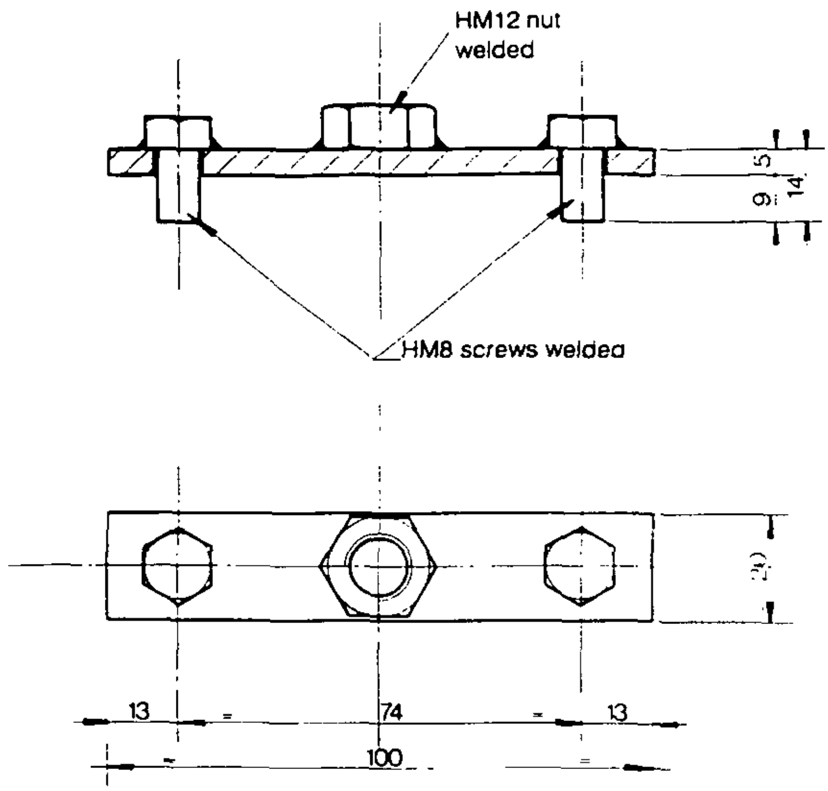
L. Reassembly of front axle / frame

95. Put the washer **(7)** in place, lightly smeared with grease (the chamfer facing towards the axle (Fig. 1)). Place the front axle in slings (Fig. 3) and position it so that it is in contact with its support **(6)** (Fig. 1).
Note: The rear support of the axle is fixed to the frame on tractors 3050 to 3070 and detachable on types 3080 to 3125.
96. Fit the washer **(4)** (the chamfer facing towards the axle (Fig. 1)) with the bearing **(2)** against the washer **(4)** in such a way as to eliminate play. Fit and tighten the bolts **(1)** (Fig. 1) smeared with Loctite 270 to a torque of 520 - 640 Nm.
97. Fit the grease nipple **(3)**. Grease the bearings **(2)** and **(6)** (Fig. 1) with a grease gun.
98. Reconnect the pipes of the steering cylinder (marked at the time of dismantling).
99. Raise the tractor with a jack. Refit the wheels. Remove the stand. Tighten the nuts to a torque of 250 - 300 Nm.
100. Top up the axle oil and check the oil level of the final drives.
101. Coat the two drive shaft couplings with "Anti-seize" grease or equivalent. Refit the drive shaft. Reconnect the two hoses of the front differential lock.
102. Remove the blocks and release the handbrake.
103. Carry out a road test on the front axle and differential lock control.
104. **Check for leaks:**
    - of the seals and of the joint face of the differential case
    - of the hydraulic connectors.

M . Service tools

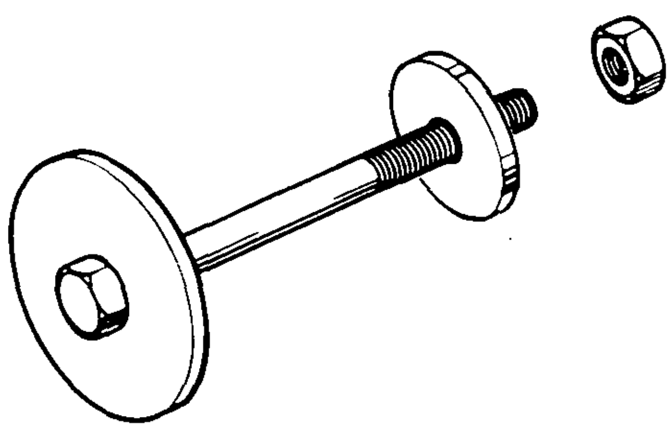
1 . Tool to be made locally

Special spanner for splined nut



2 . Tool available from the MF network

Spring compression tool MF471



7 C02 Differential

CONTENTS

Improved front axle - *Differential*

General

Note : This procedure applies to tractors equipped with improved front axles cat. 1 to 3.5 fitted from serial numbers :
- axles cat. 1 and 2
3050 : A209023
3060/3065 : standard seal : A163015
reinforced seal : A161005
- axle cat. 2.5
3070/80/85/95/3115/20 : A209011
- axle cat. 3.5
3125 : A007039

The bevel crownwheel and pinion assembly containing the differential lock device (hydralock) is mounted in a casing **(7)** comprising two bearing halves **(43)** fastened by screws **(42)**.
The bevel drive pinion is mounted at the rear of the casing on two opposed taper roller bearings. Its position can be adjusted by means of shims **[8]** situated behind the head roller bearing. The preload of the roller bearings is adjusted by means of shims **[2]** located between the spacer **/45** and the bearing cone **(5)**.

The assembly is sealed by two seals **(4)** and **(40)** fitted on the bevel drive pinion. Axles of categories 1 - 2 and 2.5 have two planetary pinions **(38)** and a pin **(36)**, those of category 3.5 are fitted with four planetary pinions and two pins.
Backlash between the crownwheel and bevel drive pinion is set by means of shims **[22]** placed behind the cup **(29)**.
Preload of the case and crownwheel assembly is done with the splined nut **(32)**.
A riveted plate on the RH side of the front axle housing shows the category and the serial number.

Service tools (see section M)

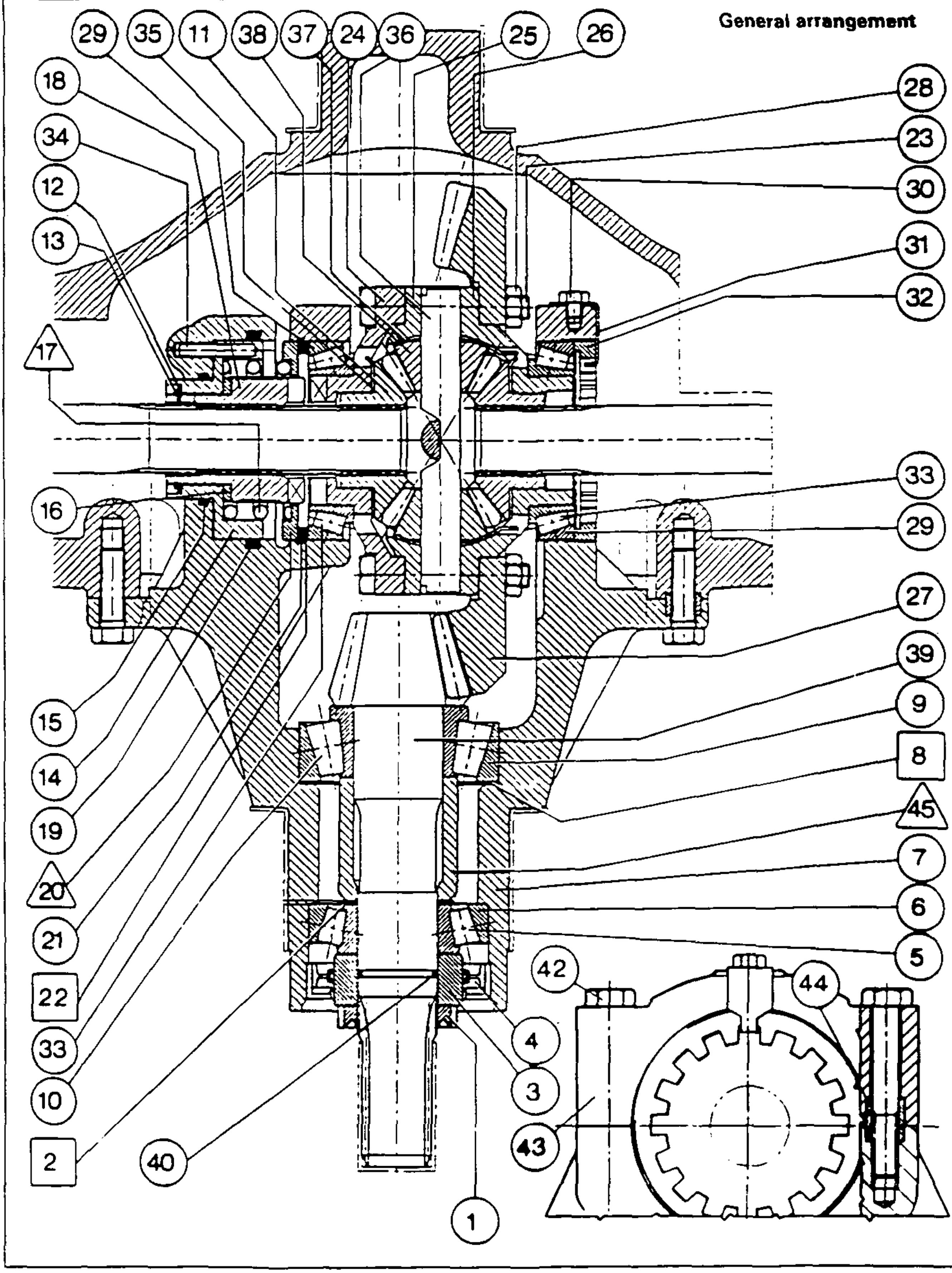
MF451B Swivel pin bearing remover
MF451B.3 Adaptor for remover diam M18
MF471 Spring compression tool
3376881 M1 Special spanner for slotted nut of bevel drive pinion (axles cat. 2.5 and 3.5)
3376927 M1Special spanner for slotted nut of bevel drive pinion (axles cat. 1 and 2).

Parts list

(1) Slotted nut
[2] Shim(s)
(3) Spacer
(4) Seal
(5) Bearing cone
(6) Bearing cup
(7) Casing
[8] Shim(s)
(9) Bearing cup
(10) Bearing cone
(11) Diff. gear
(12) Lug washer
(13) Retaining ring
(14) Piston
(15) O'ring
(16) Thrust washer
/17 Spring
(18) Dog tooth coupler
(19) O'ring
/20 Guide washer
(21) Washer
[22] Shim(s)
(23) Bolt
(24) Cover
(25) Housing half
(26) Housing half
(27) Crownwheel
(28) Nut
(29) Cup
(30) Bolt
(31) Locking plate
(32) Splined nut
(33) Bearing cone
(34) Dowel
(35) Washer
(36) Planetary pinion pin
(37) Spherical washer
(38) Planetary pinion
(39) Bevel drive pinion
(40) O'ring
(42) Bolt
(43) Bearing half
(44) Centring bush
/45 Spacer

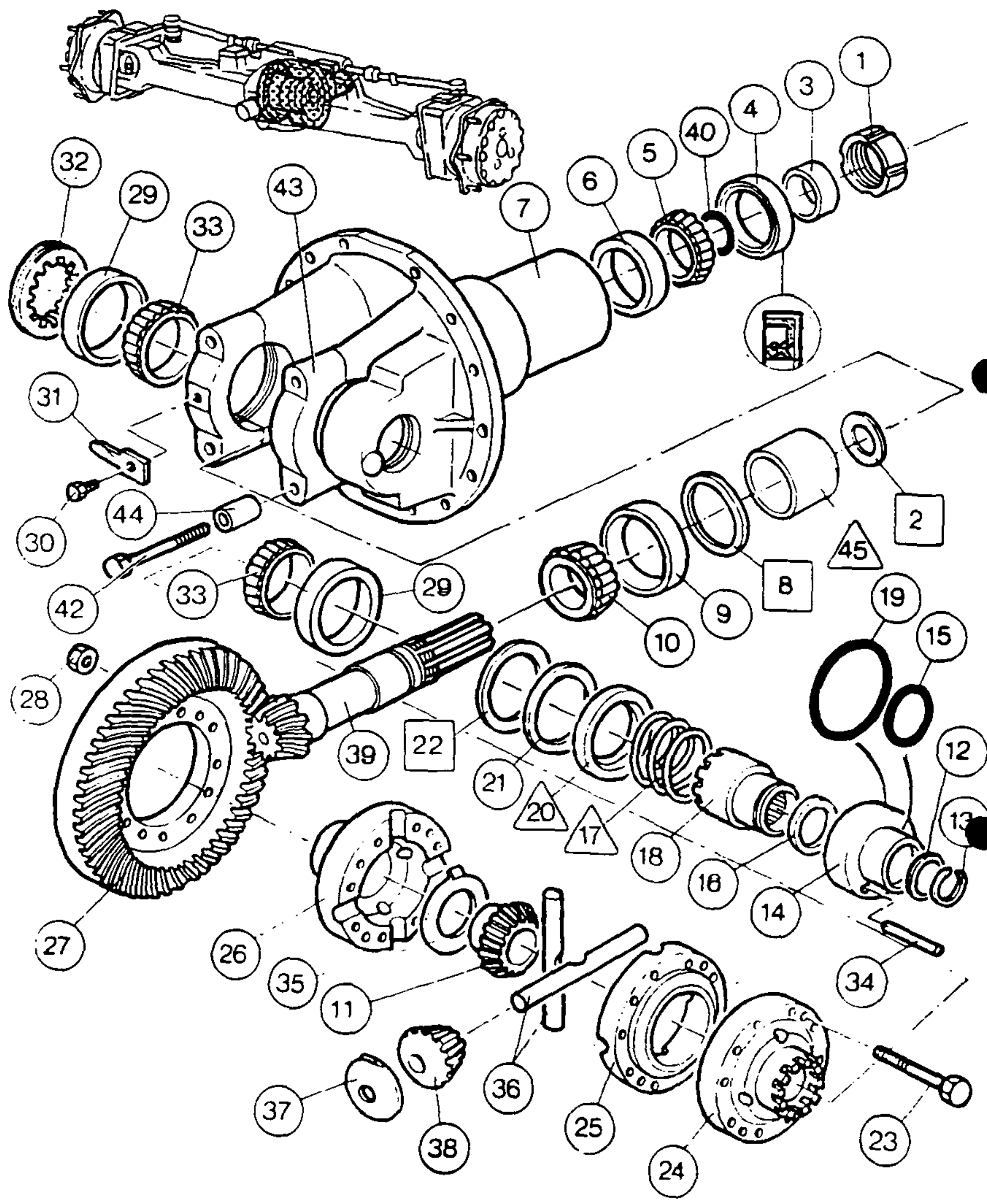
Improved front axle - Differential

General arrangement



Improved front axle - *Differential*

Exploded view



A . Splitting front axle / frame

1. Block the rear wheels and apply the handbrake.
2. Disconnect the two hoses of the front differential lock (plug the channels). Remove the shield and the transmission shaft.
3. Drain the axle.
4. Raise the tractor with a jack positioned under the axis of the axle housing. Place a prop (Fig. 2) under the lower engine housing. Remove the wheels.
5. Disconnect the pipes of the steering cylinder, marking their position (plug the channels).
6. Place the front axle in slings (Fig. 2).
7. Remove the bolts **(1)** and the grease nipple **(3)**. Remove bearing **(2)** and washer **(4)** (Fig. 1).
8. Remove the front axle, disengaging it from its rear bearing, and place it on a support. Remove the chamfered washer **(7)** (Fig. 1).
   Note : On tractors equipped with a belly weight, it is necessary to remove this in order to remove the front axle.

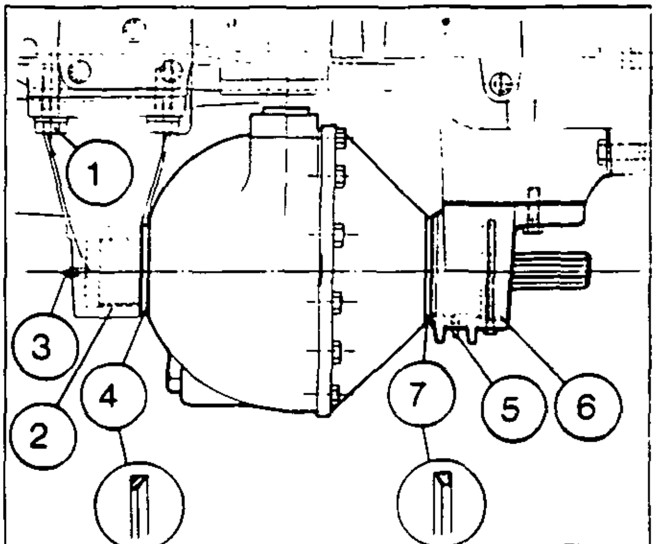


Fig. 1

B . Removal of swivel housings, wheel hubs and universal drive shafts

Note : Exercise care when carrying out this operation.

9. Remove the steering ball joints.
10. Place the swivel housing assembly in a sling.

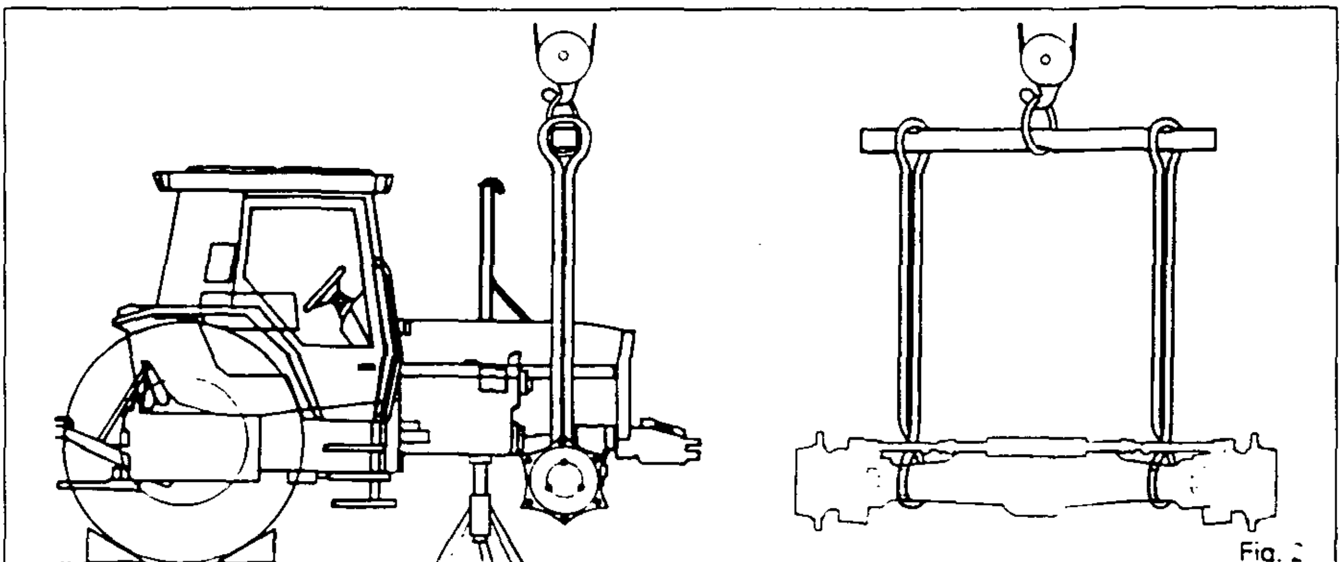


Fig. 2

Improved front axle - *Differential*

Removal of swivel housings (Fig. 3 - 4)

11. Remove bolts **(1)** and cover **(2)**. Remove shims **(3)**. Extract swivel pin **(7)** with tool MF451B and adaptor MF451B3.
12. Remove the lower swivel pin as explained previously.
13. With the help of another person, remove the assemblies.
14. If necessary, remove oil seals **(8)** (Fig. 3).

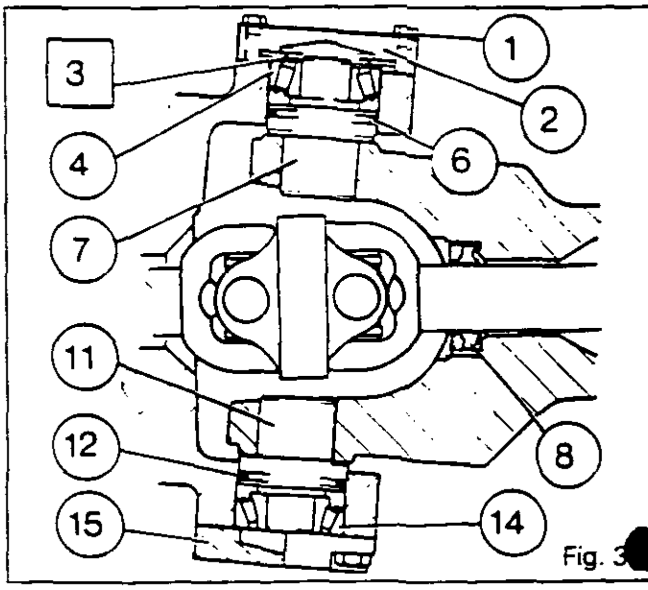


Fig. 3

C . Removal of differential case assembly

15. Remove the bolts **(1)** and detach the steering cylinder **(2)**, taking care not to lose the centring bushes or the rings **(3)** (Fig. 5).
16. Remove the bolts **(1)**. Detach and remove the differential case assembly **(8)** (Fig. 6).
    On improved axles, the differential case is centred by means of bushes force-fitted in the axle casing **(52)**.

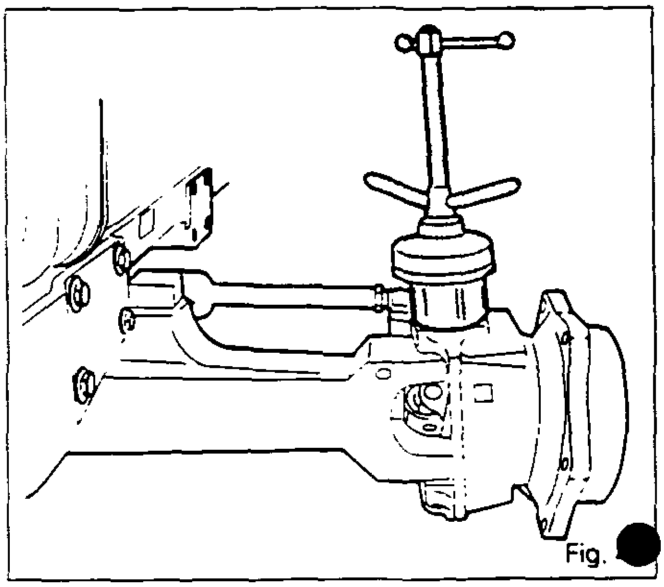


Fig. 4

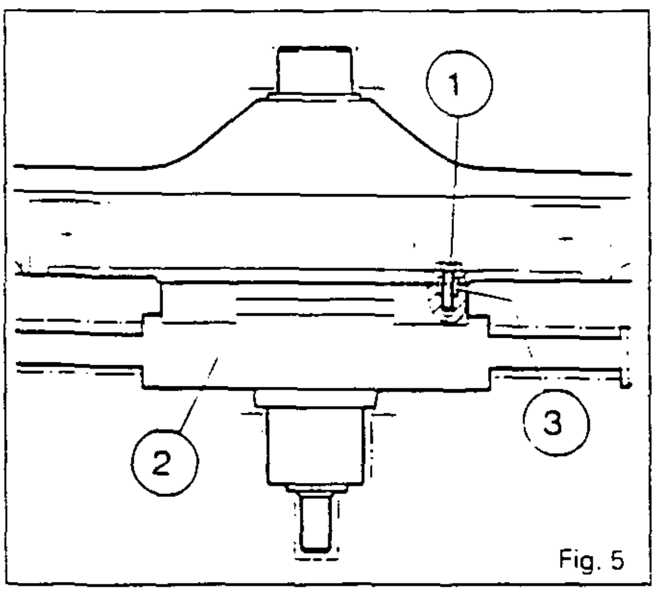


Fig. 5

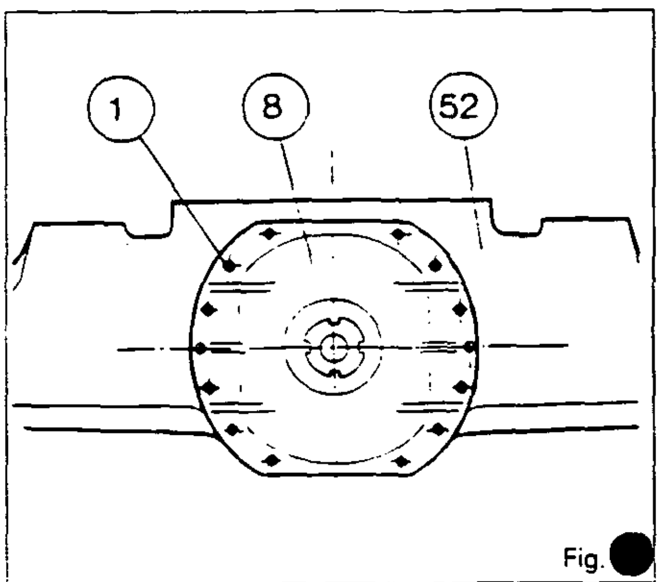


Fig. 6

D . Disassembly of differential

17. Place the casing **(7)** in a soft-jawed vice (Fig. 7).
18. Remove the bolt **(30)** and its retainer **(31)** (Fig. 7).
19. Remove the splined nut **(32)** using the special, locally made spanner (see section M).
20. Remove the four screws **(42)**, detach the bearing halves **(43)** (Fig. 7).
 Note : Carefully remove the bearing half on the lock control side ; with the spring /17\ compressed, the washer (21) should remain in the casing (7).
21. Remove the complete differential assembly with the bearing cones **(33)** and the cups **(29)** (Fig. 8). Separate the cups from the taper roller bearings. Remove the shim(s) **[22]**.
 Note : Keep the bearing cones and cups paired if they are to be reused.
22. If necessary, extract the two bearing cones **(33)**.
23. Place the differential assembly in a soft-jawed vice. Remove the nuts **(28)**. Take out the bolts **(23)**.
 Note : Prior to disassembly, mark the position of the bearing halves (25) and (26) and of the cover (24) so that they can be paired when refitting.
24. Separate the bearing halves **(25)**, **(26)** and the cover **(24)**.
25. Remove the gear **(11)** and washers **(35)**.
26. According to category, separate one or two pins **(36)**, the planetary pinions **(38)** and the spherical washers **(37)** (Fig. 9).

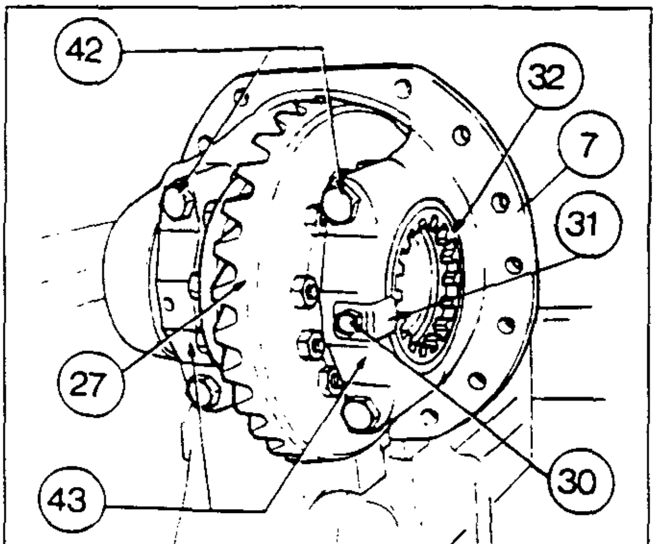


Fig. 7

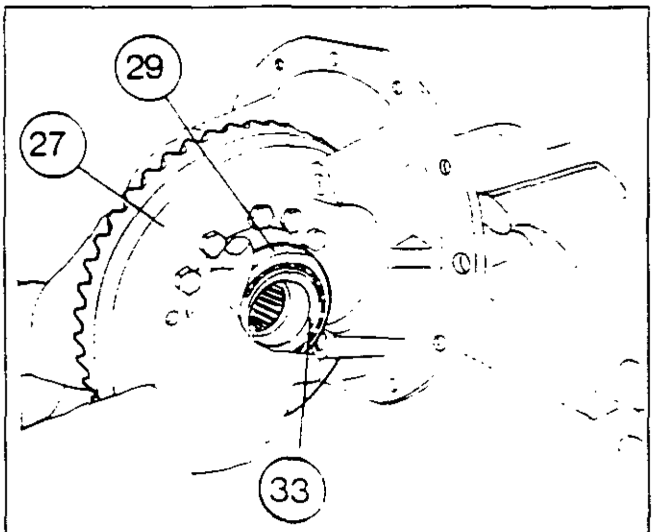


Fig. 8

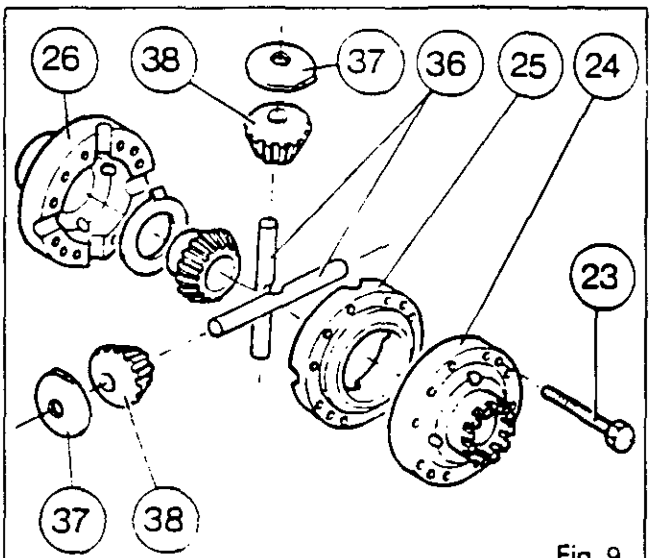


Fig. 9

E . Removal of differential lock (Fig. 10).

27. Using tool MF471, correctly centred, compress the spring /17\ until the supporting washer (21) is free.
28. Remove the washer (21).
29. Gradually relax the spring /17\.
30. Remove the service tool MF471.
31. Remove the guide washer /20\ of the spring.
32. *Remove the spring /17\.*
33. Remove the retaining ring (13) of the dog tooth coupler (18).
34. Dismantle the coupler (18), the thrust washer (16) and the lug washer (12).
35. Remove the piston (14).
36. Take out the O'rings (15) and (16).

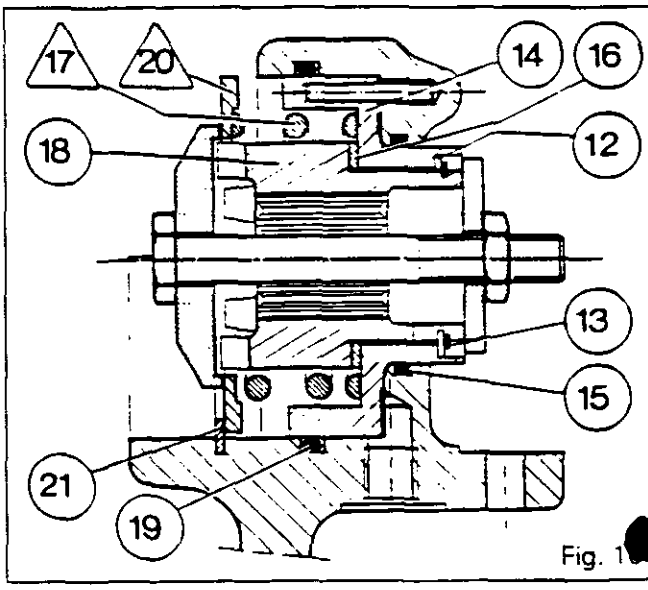


Fig. 1

F . Removal of bevel drive pinion

37. Unstake the nut (1) and maintain it using the special spanner (Fig. 11 - 12) :
    - 3376927 M1 : Cat. 1 and 2
    - 3376881 M1 : Cat. 2.5 and 3.5

    Untighten the bevel drive pinion clockwise using the special sleeve "C" (Fig. 11) locally manufactured (see section M).
38. Remove the bevel drive pinion together with cone (10), spacer /45\, shims [2] and O'ring (40).
39. From the bevel drive pinion, remove O'ring (40), shims [2], spacer /45\.
40. Extract cone (10) from bevel drive pinion.
41. *Remove cup (9) and shims [8].*
42. Remove spacer (3), drive out cup (6) with its cone (5) in order to extract the seal ring (4).

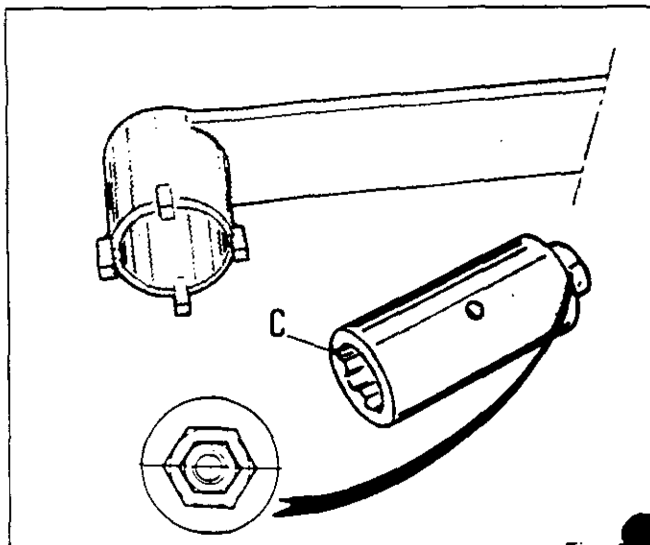


Fig.

G . Reassembly of bevel drive pinion

43. Before reassembly, clean the parts and replace those which are defective. Check that the channels of the differential lock are not obstructed.
    Note : If it should prove necessary to replace the crownwheel (27) or the bevel drive pinion (39), the two parts should be replaced together.

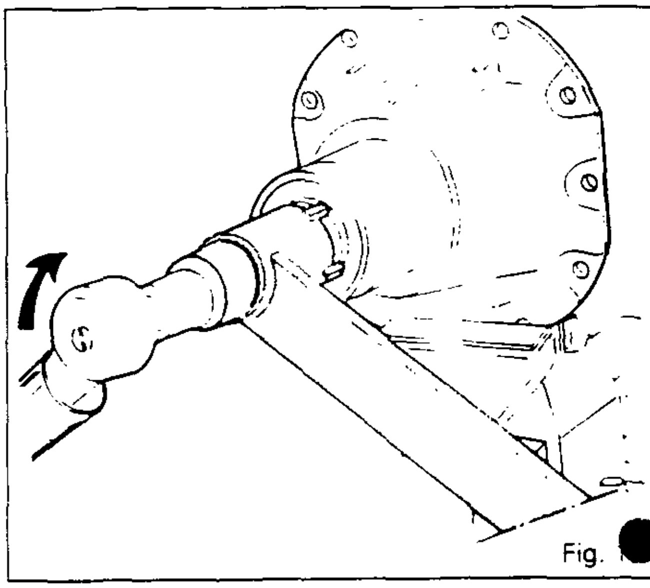


Fig.

44. Adjust the position of the bevel drive pinion (Fig. 13). The thickness of the shims needed to position the bevel drive pinion correctly is calculated according to the formula : **SP = A - (d±t)**
SP : required thickness of shims **[8]**
A : distance measured between the bearing cone **(10)** placed in the cup **(9)** and the machined face F of the casing **(7)**.
d : nominal dimension = 118± 0.1 (cat. 1-2-2.5)
133.5 ± 0.1(cat. 3.5)
t : actual dimension marked on the head of the bevel drive pinion (Fig. 14). This value may be positive or negative (to be added or subtracted from nominal dimension **d**).

Method of operation (Fig. 13)

45. Position the cup **(9)** and the bearing cone **(10)** in the casing **(7)** without the shims **[8]**. Using a depth gauge, measure dimension A. Take care to seat the bearing cone correctly in the cup. Having taken the measurement, apply the formula to determine the thickness of the shims needed.
46. Remove the bearing cone **(10)** and cup **(9)** again.
47. *Push the bearing cone* **(10)** *against the shoulder of* the bevel drive pinion using a press and a suitable tool (Fig. 15).
48. Place the shim **[8]** of the previously calculated thickness in the casing.
49. Fit the cup **(9)**.
50. Place the cup **(6)** in the casing as far as it will go.
51. On the bevel drive pinion prepared with cone **(10)**, engage the spacer **/45** with its chamfer facing the bevel drive pinion splines.
52. Place the bevel drive pinion assembly into the casing and fit the shims **[2]**, then fit cone **(5)** and spacer **(3)** (Fig. 16).

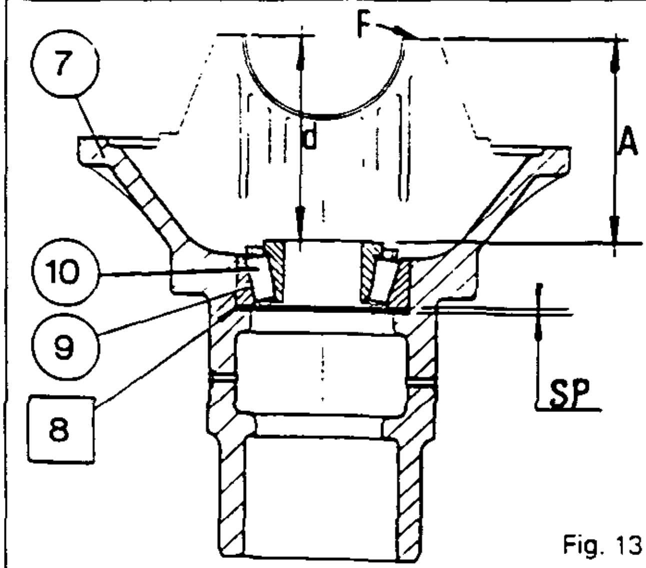


Fig. 13

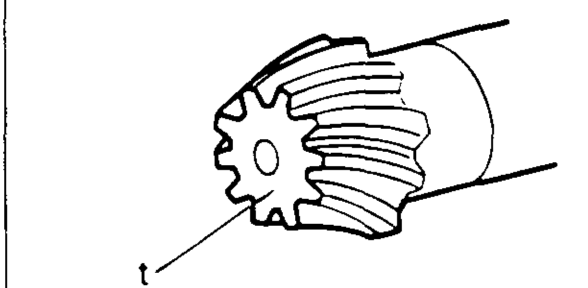


Fig. 14

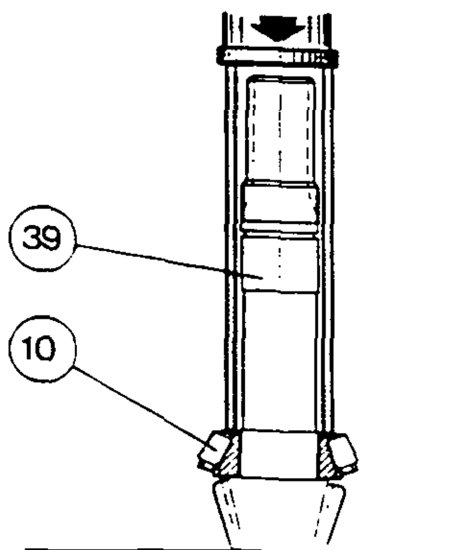


Fig. 15

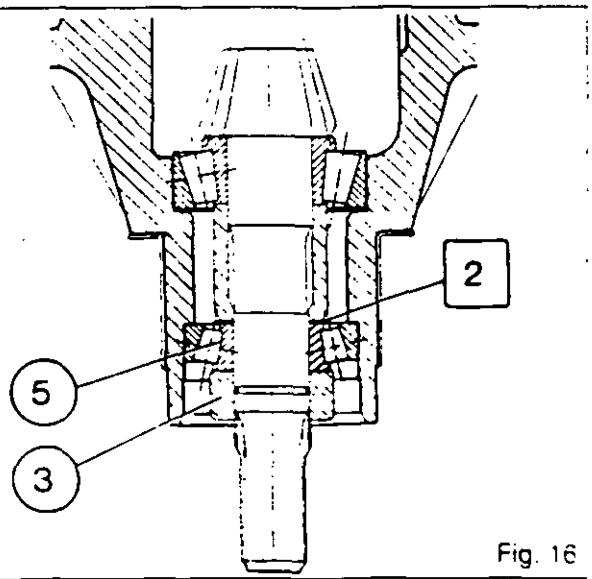


Fig. 16

Improved front axle - *Differential*

53. Maintain nut **(1)** with the special spanner 3376927 M1 or 3376881 M1. Using the special sleeve and a torque wrench, turn the bevel drive pinion, to obtain a torque of 250 - 295 Nm (Fig. 17).
54. Preload the bevel drive pinion.
Method : The principle consists of removing or adding shims **[2]** to obtain a rotational torque of 1 to 3 Nm.
55. Rotate the bevel drive pinion through a few turns using a torque wrench and the special sleeve (Fig. 18). Check that the above torque is correct.
Note : The torque of 250 - 295 Nm should be applied to every refitting of nut (1).
56. After setting, maintain nut **(1)** and untighten the bevel drive pinion.
57. Fit O'ring **(40)**. Apply Loctite 270 on nut **(1)**. Rotate the bevel drive pinion until torque of 250 - 295 Nm is obtained, lock the nut by bending its tab in two opposite slots. Check nut **(1)** is free of burrs. Oil the seal ring **(4)** and fit it into the casing using a locally made drift (see section M).

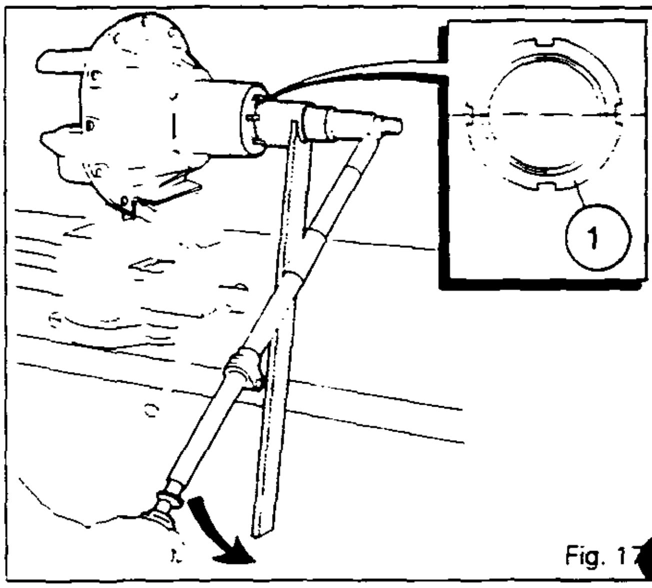


Fig. 1

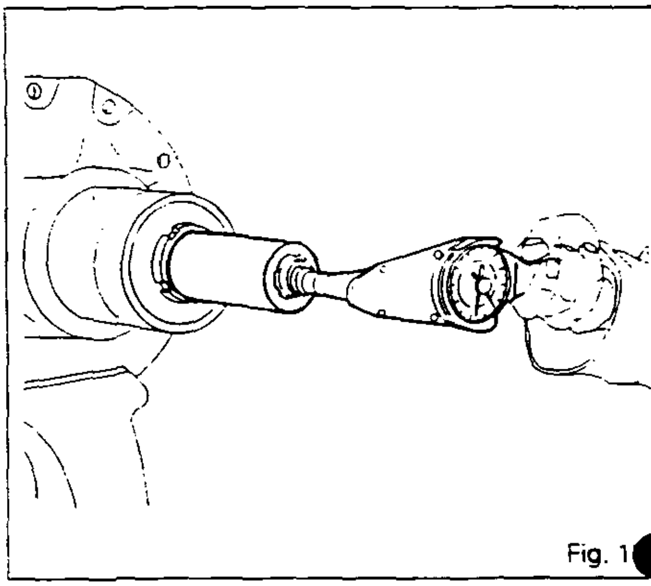


Fig. 1

H . Reassembly of differential lock

58. Mount the thrust washer **(16)** on the coupler **(18)**. Fit the assembly in the piston **(14)**. Fit the lug washer **(12)** and position the retaining ring **(13)** in the groove of the coupler.
59. Fit the piston **(14)** together with the coupler **(18)** in the packingless casing.
Note : The dowel (34) is force-fitted in the piston. Check that the piston and the dowel slide freely in the housing. Having carried out the check, remove the piston together with the coupler.
60. Fit new O'rings **(15)** and **(19)**. Position the piston with the coupler, then insert it with a plastic mallet, striking it on the periphery.
61. Position the spring **/17** and the washer **/20**, with the shoulder of the washer facing the spring. Tension the assembly with service tool MF471 until the washer **(21)** slides freely in the groove of the casing.
62. Loosen the service tool MF471, taking care to ensure that the spring cannot escape.
63. Fit the bearing cone **(33)** (if removed) on the housing half **(26)** using a press or a suitable tool (Fig. 19).

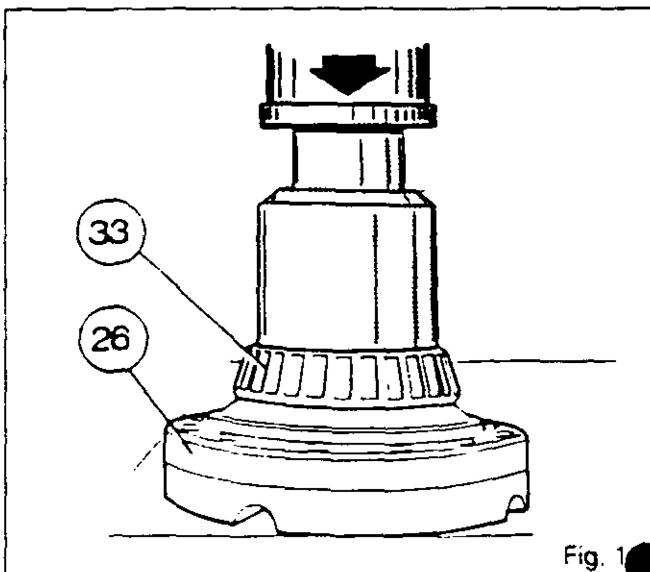


Fig. 1

64. Fit the other bearing cone **(33)** (if removed) on the cover **(24)**.
65. Assemble the housing half **(25)** in the cover **(24)** (with claw teeth) observing the marking made at the time of dismantling.
66. Position the washer **(35)** on the axle gear **(11)**. Place the assembly in the housing half **(25)**, putting the tab of the washer in one of the holes of the housing half.
67. According to category, place the corresponding number of planetary pinions **(38)** and washers **(37)** on two or one pin **(36)**. Then place the assemblies in the housing half **(25)**, putting the tabs of the spherical washers **(37)** in the holes of the housing half **(25)** (Fig. 9).
68. Place the other washer **(35)** on the other gear **(11)**. Place the assembly in the housing half **(26)**, taking care to ensure that the position of the tab of the washer **(35)** is correct.
69. Position the housing half **(26)** assembly on the housing half **(25)** maintaining the assembly position marked at the time of dismantling.
70. Position the crownwheel **(27)** on the housing half **(26)**. Fasten together the housing halves **(25)** and **(26)**, the cover **(24)** and the crownwheel.
    Fit the bolts **(23)** and smear them with Loctite 270.
    Tighten the nuts **(28)** to a torque of 79 - 87 Nm.
71. Position the cups **(29)** on their cones **(33)**.
72. Place the crownwheel assembly in the casing **(7)** (Fig. 8).
73. Check that the centring bushes **(44)** are present. Fit the shims **(22)**. Position the bearing halves **(43)**. Moderately tighten the bolts **(42)** so that the cups **(29)** move freely.
74. Put the housing in a horizontal position in a soft-jawed vice, the crown uppermost (Fig. 20).
75. Put a dial gauge in place. Tighten the nut **(32)** (Fig. 20) and turn the crownwheel a few times to seat the bearing cones properly in the cups. Tighten the nut again to eliminate the axial play.
76. Tighten the nut **(32)** a further 3 notches to obtain the correct preload.
77. Check the backlash between the crownwheel and the pinion with a dial gauge (Fig. 21). Take three readings at three equidistant points. Determine the average of the three readings to obtain backlash of 0.13 to 0.28 mm.
    If the reading is too high, reduce the thickness of the shims **(22)**. If it is too low, increase the thickness until a correct backlash is obtained.

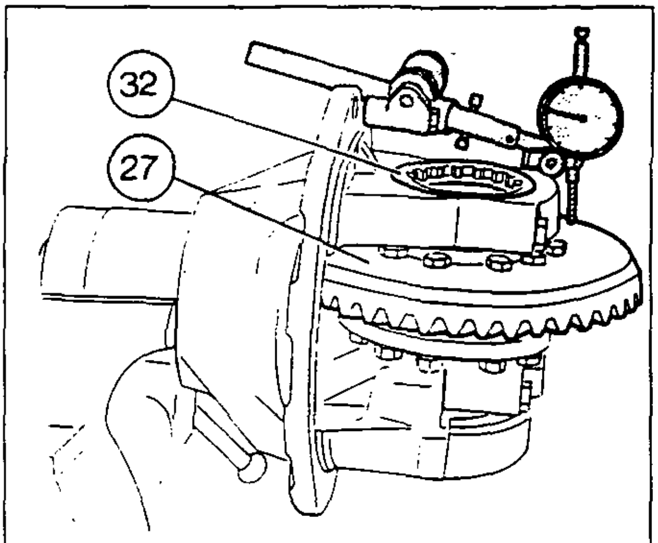


Fig. 20

78. Remove the bearing bolts **(42)** one by one. Smear them with Loctite 270 and tighten them to a torque of 136 - 150 Nm.
79. Refit the locking plate **(31)** with the bolt **(30)** smeared with Loctite 270 and tighten to a torque of 16 - 26 Nm. Lock the nut **(32)**, bending the tab of the locking plate in the appropriate groove.

I . Piston leak test

80. Connect a pressure gauge equipped with a valve to the supply connector of the differential lock.
81. Supply the circuit with compressed air at a pressure of approx. 5 bar and check the movement of the piston **(14)**.
    Reduce the pressure to 0.3 bar and close the valve. The pressure gauge should not show any drop in pressure for 1 minute.
82. Remove the pressure gauge and valve assembly.

J . Refitting of differential case assembly

83. Clean and check the parts. Replace those which are defective.
Note : To avoid risk of leakage, the breather valve on the axle housing has been eliminated and replaced with a plug.
84. Check that the centring bushes are present on the axle housing.
85. Coat the joint face of the differential case on the axle housing with sealing compound, Loctite 510 or equivalent, and screw in two diametrically opposed guide studs.
86. Refit the differential case assembly **(8)**.
Remove the guide studs. Fit and tighten the bolts **(1)** (Fig. 6) to a torque of 91 - 112 Nm.
87. Check that the centring bushes **(3)** are present and refit the steering cylinder **(2)**. Apply Loctite 270 on bolts **(1)** and tighten them to a torque of 102 - 112 Nm (Fig. 5).

K . Refitting of swivel housings, wheel hubs and universal drive shafts (Fig. 22).

88. If the oil seals **(8)** have been removed fit them against the shoulder. Replace the seals **(6)** and **(12)**.
89. Oil the seals **(8)** and with the help of another person, fit the assemblies. Slide the universal drive shafts in the axle housing without damaging the seals. Introduce a guide through the filling hole to align the left drive shaft with the differential.
90. Turn the wheel hubs to engage the drive shafts.
91. Position the pin **(7)** aligning the swivel housing **(47)** with the axle housing **(52)**.
92. Fit the pin **(11)**, the cup **(14)**, the cover **(15)**. Tighten the bolts **(1)** evenly and alternately to press the pin **(11)** into the axle housing.
93. Remove the cover **(15)** and the cup **(14)**. Apply bearing grease on the cone **(13)**. Refit the cup and the cover. Apply Loctite 241 on bolts **(1)** and tighten to a torque of 91 - 112 Nm.
94. Fit the cup **(4)**, the shims **[3]**, the cover **(2)**. Tighten the bolts as in operation 92.
Note : Check that pins (7) and (11) are in contact with the axle housing (52).

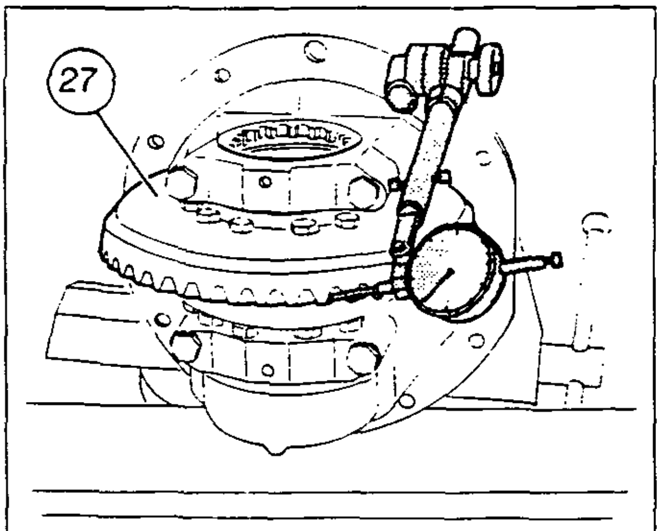


Fig. 2

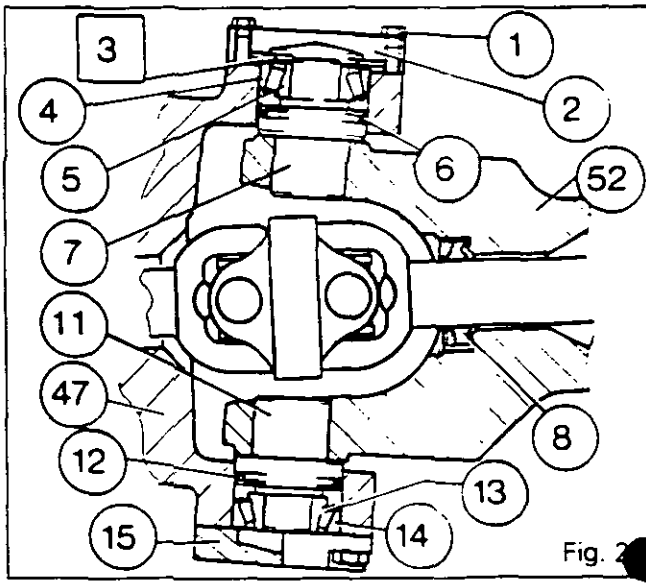


Fig. 2

95. Remove the cover **(2)**. Take off the shims **[3]** and the cup **(4)**. Coat the cone **(5)** with bearing grease. Refit the cup, the shims and the cover. Tighten the bolts **(1)** coated with Loctite 241 to the torque of 91 - 112 Nm.
96. Refit the ball joints. Tighten the nuts to the torque of 103 - 115 Nm. Lock the nuts with new pins.

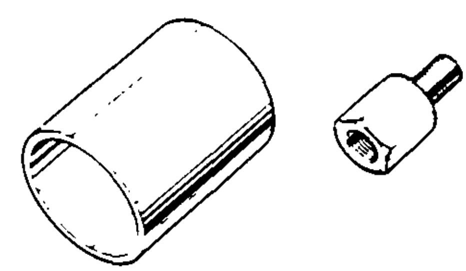
L . Reassembly of front axle / frame

97. Lightly coat the washer **(7)** with grease and put it in place, the chamfer facing the axle (Fig. 1). Place the front axle in slings (Fig. 2) and position it so that it is in contact with its support **(6)** (Fig. 1)
Nota : The rear support of axle is removable on 6 cylinder engines.
98. Fit the washer **(4)** (the chamfer facing towards the axle (Fig. 1)) with the bearing **(2)** against the washer **(4)** in such a way as to eliminate play. Fit and tighten the bolts **(1)** (Fig. 1) coated with Loctite 270 to a torque of 520 - 640 Nm.
99. Fit the grease nipple **(3)**. Grease the bearings **(2)** and **(6)** (Fig. 1) with a grease gun.
100. Reconnect the pipes of the steering cylinder (marked at the time of dismantling).
101. Raise the tractor with a jack. Refit the wheels. Remove the prop. Tighten the nuts to a torque of 250 - 300 Nm.
102. Top up the axle oil and check the oil level of the final drives.
103. Coat the two sleeves with 'Anti-seize' grease or equivalent. Refit the drive shaft and the shield. Reconnect the two hoses of the front differential lock.
104. Remove the blocks and release the handbrake.
105. Carry out a road test on the front axle and differential lock control.
106. **Check for leaks** :
. at the seals and the joint face of the differential case.
. at the hydraulic connectors.

M . Service tools

1. Tools available from the MF network

MF451B Swivel pin bearing remover (Fig. 23)
MF451B3 Adaptor for remover diam M18 (Fig. 23)
MF471 Spring compression tool (Fig. 24)
3376881 M1 Special spanner for slotted nut of bevel drive pinion, cat. 2.5 and 3.5 axles (Fig. 25)
3376927 M1 Special spanner for slotted nut of bevel drive pinion, cat. 1 and 2 axles (Fig. 25)



used with MF195C

Fig. 23

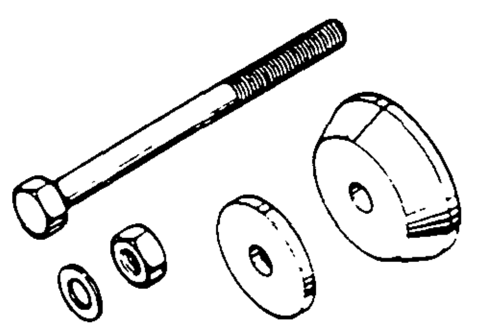


Fig. 24

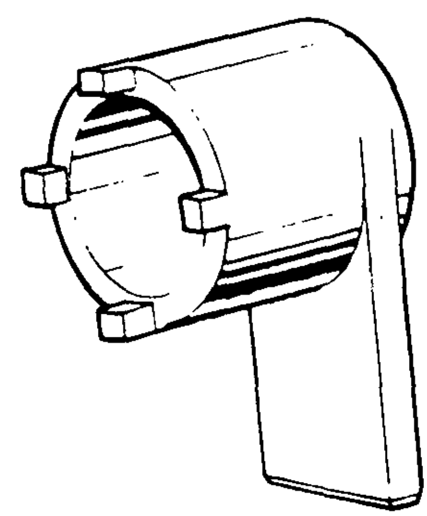
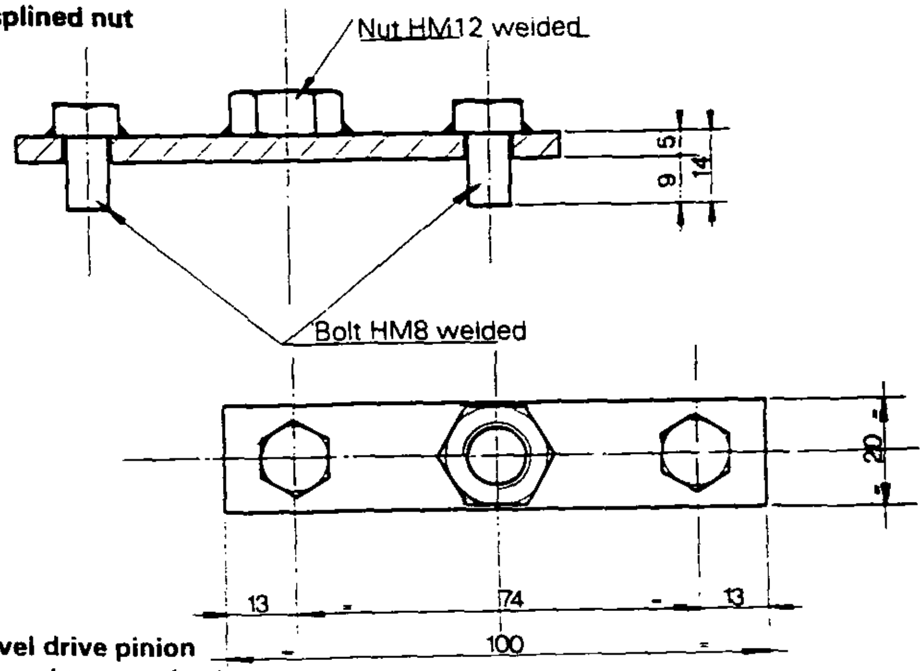


Fig. 25

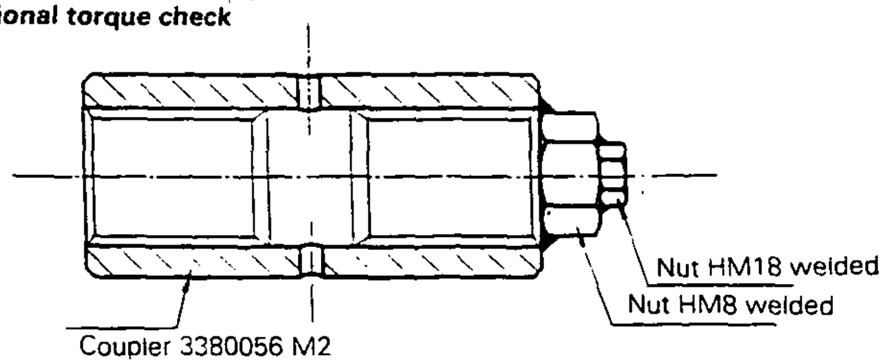
Improved front axle - *Differential*

2. Tools to be made locally

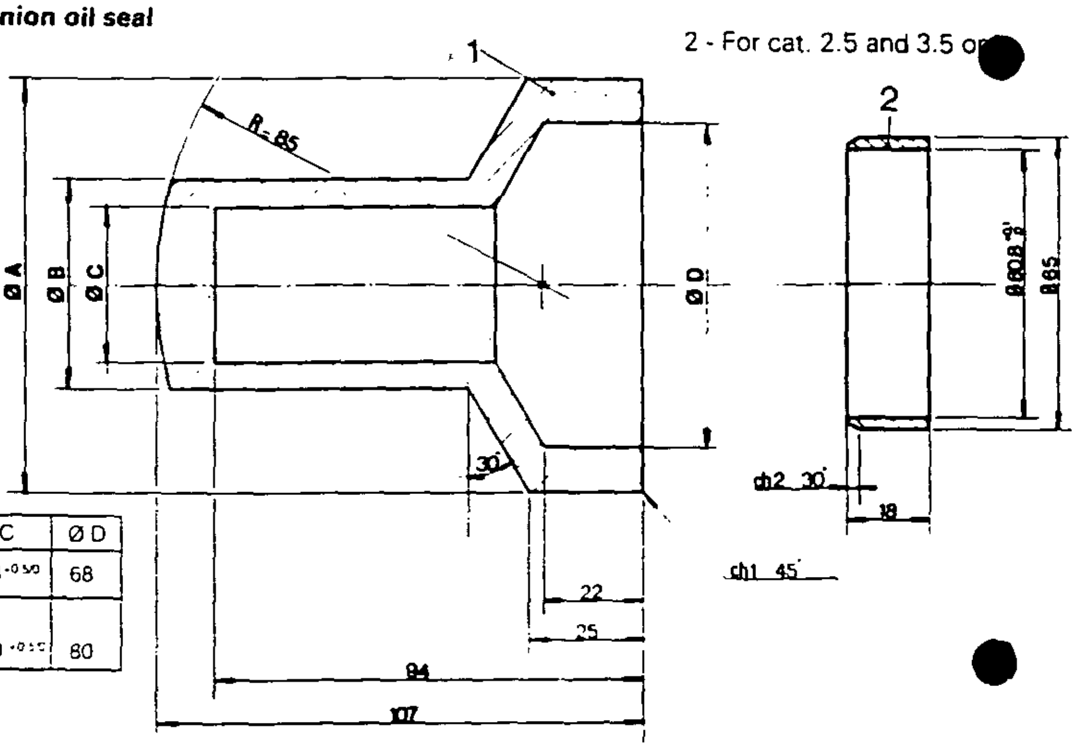
Special spanner for splined nut



Special sleeve for bevel drive pinion tightening and rotational torque check



Drift for bevel drive pinion oil seal



	Ø A	Ø B	Ø C	Ø D
Cat 1 - 2	81.80	40	$25.54^{+0.50}$	68
Cat 2.5 3.5	91.80	47	34.90 [illegible]	80

7 D01 2WD front axle

CONTENTS

Front axle - 2 WD Front axle

General

The front axle comprises the following parts:

- A cast support identical to that of the 4-wheel-drive version, whose lower rear part comprises a bearing supporting the 2nd steering swivel pin (4-cylinder engine) or a removable swivel pin (6-cylinder engine).
- A front bearing fixed on the cast support holding the 1st steering swivel pin.
- An axle beam articulated on two swivels.
- Two spindle arms.
- Two spindles mounted in the bores of the spindle arms.
- A double acting ram linked to the spindles by two steering arms.

There are three axle versions depending on the type of tractor:

MF 3050-3060-3065
Standard axle with 6-hole hub.

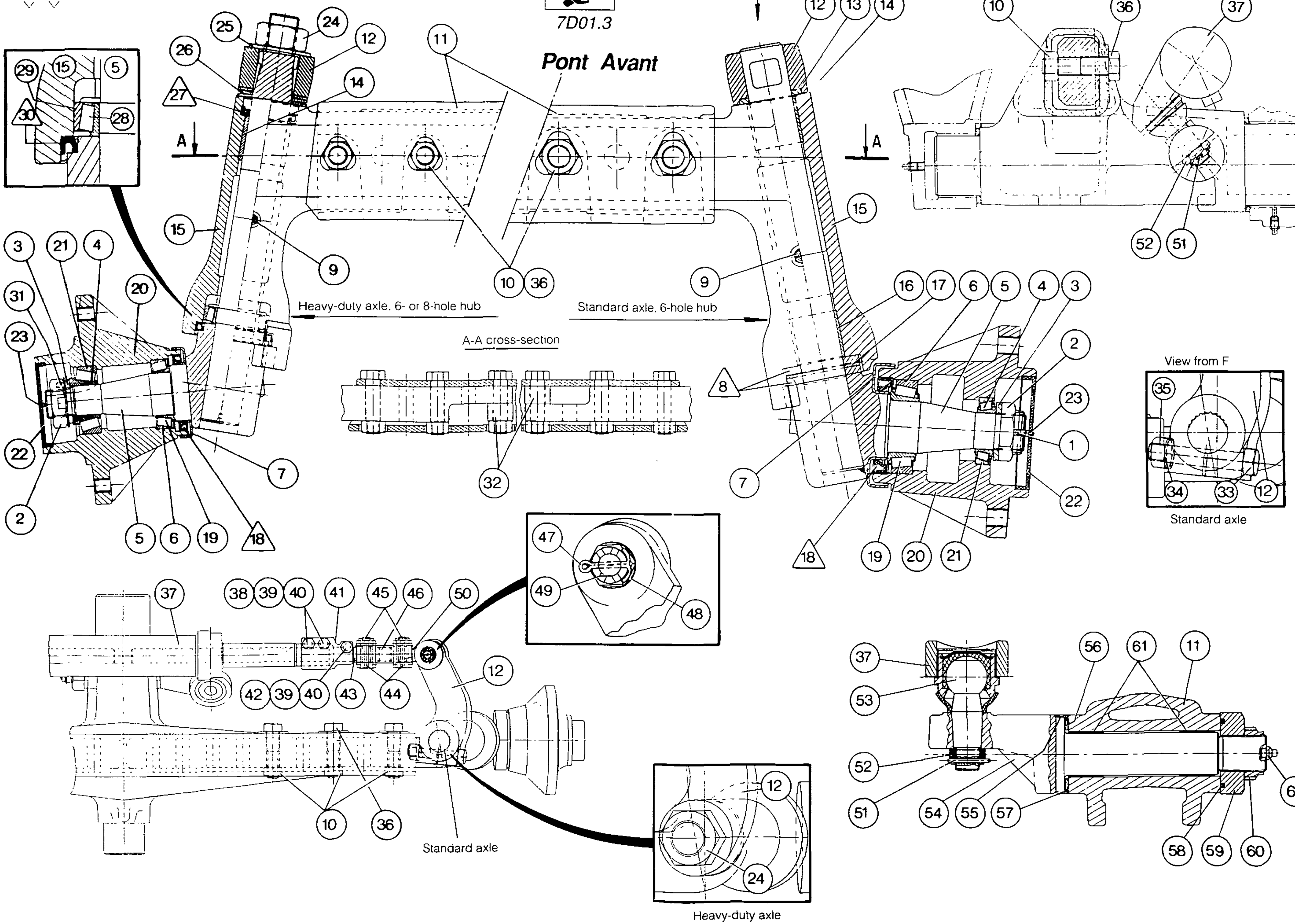
MF 3070
Standard axle with 6-hole hub or heavy-duty axle with 6- or 8-hole hub.

MF 3080-3095-3115-3125
Heavy-duty axle with 6- or 8-hole hub.

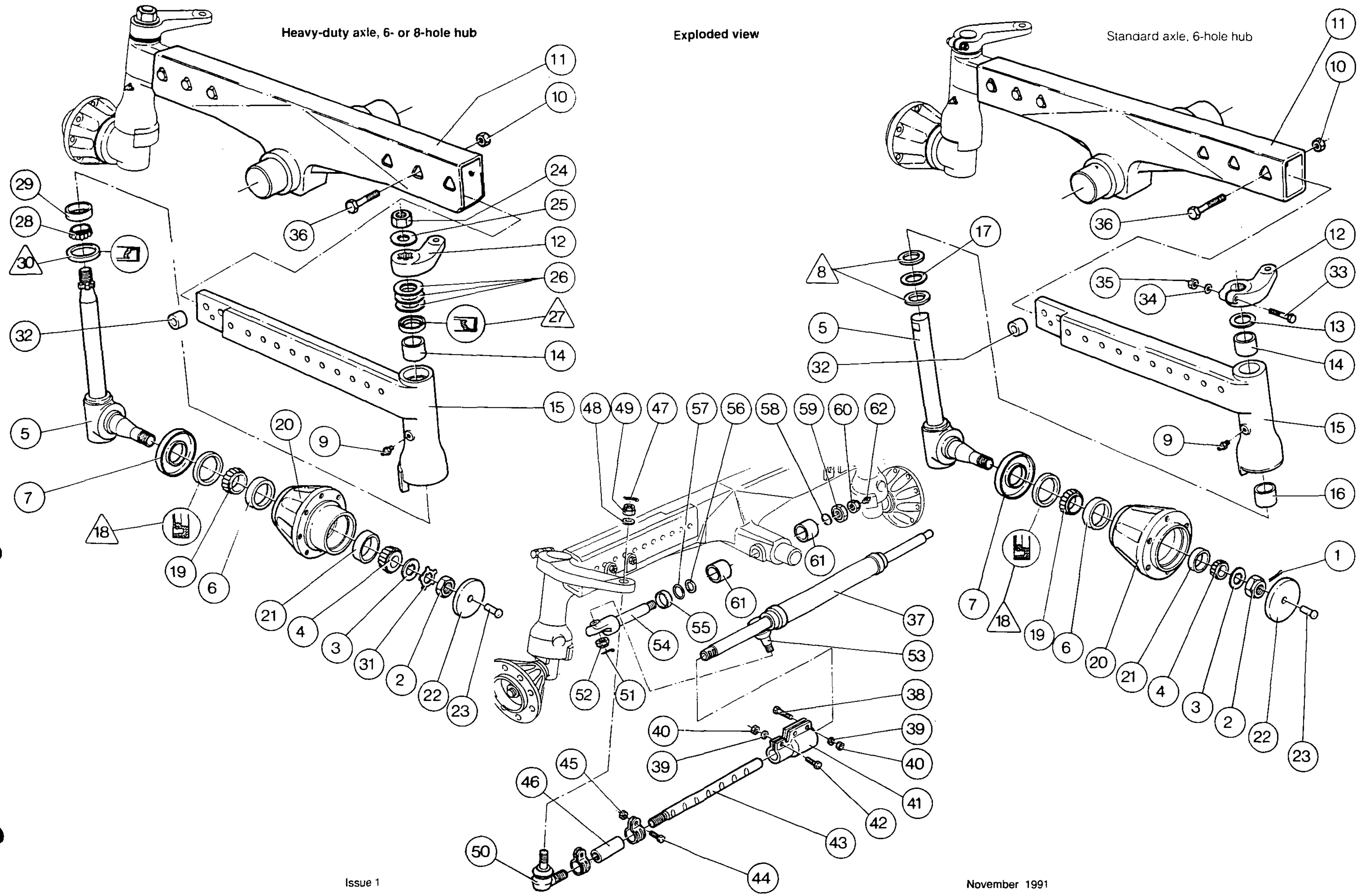
Key

		Version: standard 6-hole hub	Version: heavy-duty 6- or 8-hole hub
(1)	Pin	•	
(2)	Nut	•	•
(3)	Washer	•	•
(4)	Bearing cone	•	•
(5)	Spindle	•	•
(6)	Bearing cup	•	•
(7)	Dust cap	•	•
(8)	Thrust washers	•	
(9)	Grease nipple	•	•
(10)	Nut	•	•
(11)	Axle Beam	•	•
(12)	Steering arm	•	•
(13)	Seal	•	
(14)	Bush	•	•
(15)	Spindle arm	•	•
(16)	Bush	•	
(17)	Washer	•	
(18)	Sealing ring	•	•
(19)	Bearing cone	•	•
(20)	Hub	•	•
(21)	Bearing cup	•	•
(22)	Cover	•	•
(23)	Rivet	•	•
(24)	Nut		•
(25)	Washer		•
(26)	Belleville washers		•
(27)	Sealing ring		•
(28)	Bearing cone		•
(29)	Bearing cup		•
(30)	Sealing ring		•
(31)	Lock washer		•
(32)	Spacers	•	•
(33)	Screw	•	
(34)	Washer	•	
(35)	Nut	•	
(36)	Bolt	•	•
(37)	Steering ram	•	•
(38)	Screw	•	•
(39)	Washers	•	•
(40)	Nuts	•	•
(41)	Sleeve	•	•
(42)	Screw	•	•
(43)	Steering rod	•	•
(44)	Screw	•	•
(45)	Nuts	•	•
(46)	Sleeve	•	•
(47)	Pin	•	•
(48)	Washer	•	•
(49)	Nut	•	•
(50)	Ball joint	•	•
(51)	Pin	•	•
(52)	Nut	•	•
(53)	Ball joint	•	•
(54)	Support	•	•
(55)	Bush	•	•
(56)	Thrust washer	•	•
(57)	O-ring	•	•
(58)	O-ring	•	•
(59)	Nut	•	•
(60)	Lock nut	•	•
(61)	Bushes	•	•
(62)	Grease nipple	•	•

Pont Avant


Heavy-duty axle. 6- or 8-hole hub
Standard axle, 6-hole hub
A-A cross-section
View from F
Standard axle
Standard axle
Heavy-duty axle

Front axle - 2 WD Front axle



A. Removal and refitting of steering arm ball joint

Removal

1. Chock the rear wheels and apply the handbrake.
2. Lift the relevant wheel with a jack. Remove the pin **(47)**, the nut **(49)** and the washer **(48)**.
3. Extract the ball joint **(50)** from the steering arm **(12)**.
4. Loosen the nuts **(45)**, turn the sleeve **(46)** in order to separate the ball joint **(50)** from the rod **(43)**.

Refitting

5. Clean and check the parts. Replace any which are defective.
6. Mount the ball joint **(50)** in the steering arm **(12)**.
7. Couple the sleeve **(46)** to the rod **(43)** and the ball joint **(50)**.
8. Fit the washer **(48)**, tighten the nut **(49)** to a torque of 108 - 122 Nm and lock it with the pin **(47)**.
9. Remove the jack.
10. Remove the chocks and release the handbrake.
11. Adjust the toe-in (see section E).

B. Removal and refitting of hub, spindle and spindle arm

Removal

12. Chock the rear wheels and apply the handbrake.
13. Lift the front of the tractor with a jack positioned in the axis of the axle and insert props.
14. Remove the relevant wheel.
15. Extract the cover **(22)**.
16. Remove the pin **(1)**, loosen the nut **(2)**, remove the washer **(3)** (standard axle).
    Release and loosen the nut **(2)**, remove the lock washer **(31)**, remove the washer **(3)** (heavy-duty axle).
17. Remove the bearing cone **(4)**.
18. Remove the wheel hub **(20)** from the spindle **(5)**.
19. Extract the sealing ring /**18**\ and remove the bearing cone **(19)**.
20. Extract the cups **(6)** and **(21)** from the hub **(20)**.
21. Remove the dust cap **(7)**.

There are 3 axle versions:

MF 3050-3060-3065
Standard axle with 6-hole hub.

MF 3070
Standard axle with 6-hole hub or heavy-duty axle with 6- or 8-hole hub.

MF 3080-3095-3115-3125
Heavy-duty axle with 6- or 8-hole hub.

Standard axle with 6-hole hub

22. Remove the nut **(35)**, the washer **(34)** and the screw **(33)**.
23. Withdraw the steering arm **(12)** from the spindle **(5)**.
24. Withdraw the spindle **(5)** from the spindle arm **(15)**.
25. Remove the washers /**8**\ and **(17)**.
26. Extract the rings **(14)** and **(16)** from the arm **(15)**.

Heavy-Duty axle with 6- or 8-hole hub

27. Remove the nut **(24)** and the washer **(25)**.
28. Withdraw the steering arm **(12)** from the spindle **(5)**. Remove the Belleville washers **(26)**.
29. Withdraw the spindle **(5)** from the spindle arm **(15)**.
30. Separate the bearing cone **(28)** from the spindle **(5)**.
31. Extract the sealing rings /**30**\ and /**27**\ from the spindle arm **(15)**.
32. Extract the bush **(14)** and the cup **(29)** from the arm **(15)**.

Standard or heavy-duty axle

33. Remove the screw **(36)** and the nuts **(10)**.
34. Withdraw the spindle arm **(15)** from the axle beam **(11)**, remove the grease nipple **(9)**.

Front axle - 2 WD Front axle

Refitting

Standard or heavy-duty axle

35. Clean and check the parts. Replace any which are defective.
36. Mount the spindle arm **(15)** in the axle beam **(11)**, fasten it with screws **(36)** and nuts **(10)** placed in the seats of the axle.
    Tightening torque of screws **(36)**:
    - Standard axle : 350 - 430 Nm
    - Reinforced axle : 400 - 600 Nm

Standard axle with 6-hole hub

37. With a punch, push in the bushes **(14)** and **(16)** against the shoulder in the spindle arm **(15)**.
38. Fit the dust cap **(7)** on the spindle **(5)**.
39. Place washers **/8** and **(17)** on the spindle , orientate the grooves of washers **/8** towards washer **(17)**.
40. Introduce the spindle **(5)** into the arm **(15)**.
41. Place the seal **(13)** in the seat of the steering arm **(12)**.
42. Fit the steering arm **(12)** on the spindle **(5)**.
43. Position the screw **(33)** in the recess in the spindle **(5)**, fit the washer **(34)**. Tighten the nut **(35)** to a torque of 250 - 300 Nm.
    Note: Ensure that the spindle (5) is fitted without any play.

Heavy-duty axle with 6- or 8-hole hub

44. With a punch, push in the bush **(14)** against the shoulder in the spindle arm **(15)**.
45. Push in the sealing ring **/27** against the shoulder in the spindle arm with the lip facing outwards.
46. Push the dust cap **(7)** on the spindle **(5)**.
47. Position the bearing cup **(29)** in the spindle arm.
48. Push the sealing ring **/30** in the spindle arm with the lip facing outwards.
49. Push the bearing cone **(28)** on the spindle, then introduce the spindle into the spindle arm.
50. Position the Belleville washers **(26)**, the steering arm **(12)** and the washer **(25)**. Smear the nut **(24)** with Loctite 241, tighten to a torque of 550-580 Nm.

Standard or heavy - duty axle

51. Using a press or an appropriate device push the cups **(6)** and **(21)** against the shoulder in the hub **(20)**.
52. Grease the bearing cone **(19)** (MF1105 grease or equivalent) and place it in the cup **(6)**.
53. Push the sealing ring **/18** into its seat against the shoulder, the lip turned outwards (Fig. 1).

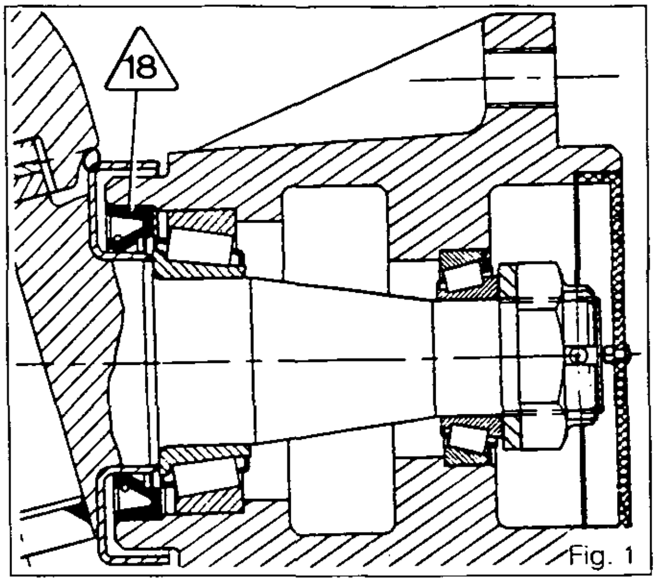


Fig. 1

54. Fill the cavity of the hub **(20)** with MF1105 grease or equivalent.
55. Mount the wheel hub **(20)** on the spindle **(5)**.
56. Grease the bearing cone **(4)** (MF1105 grease or equivalent) and place it on the spindle in contact with the bearing cup **(21)**.
57. Position the washer **(3)**, the nut **(2)** (standard axle), the lock washer **(31)**, the nut **(2)** (heavy-duty axle). After tightening the nut to a torque of 81 Nm, slacken it by 1/12 to 1/16 of a turn to obtain play of between 0 and 0.13.
58. Lock the nut **(2)** on the spindle with the pin **(1)** (standard axle). Bend back the tab of the lock washer **(31)** on the nut **(2)** (heavy-duty axle).
59. Check that the hub turns smoothly.
60. Fill the cavity of the hub **(20)** (nut side) with MF1105 grease or equivalent.
61. Close the hub with the cover **(22)**.
62. Clinch a rivet **(23)** in the hole of the cover. Fit the grease nipple **(9)**.
63. Refit the wheel, remove the props and tighten the bolts to a torque of 140 - 200 Nm. Grease the spindle arm **(15)**.
64. Remove the chocks and release the handbrake.
65. Adjust the toe-in (see section E).

C. Removal and refitting of steering ram

Removal

66. Chock the rear wheels and apply the handbrake. Lift the front of the tractor with a jack positioned in the axis of the axle.
67. Disconnect and block the ram supply hoses.
Note: Mark the position of the hoses before removal.
68. Loosen the nuts **(45)**, turn the sleeves **(46)** to separate the ball joints **(50)** from the steering rods **(43)**.
69. Remove the pin **(51)** and the nut **(52)**. Withdraw the ball joint **(53)** from the support **(54)**.
70. Remove the steering ram assembly.
71. Unscrew the ball joint **(53)** (if necessary).
72. Dismantle the nuts **(40)**, the washers **(39)** and the screws **(38)**. Separate the sleeves **(41)** equipped with rods **(43)**.

Refitting

73. Clean and check the parts. Replace any which are defective.
74. Assemble the sleeves **(41)** equipped with rods **(43)** on the ram. Fit the screws **(38)** and washers **(39)** and tighten the nuts **(40)**.
75. Screw the ball joint **(53)** (if fitted) on the steering ram.
76. Refit the ram assembly on the support **(54)**.
77. Tighten the nut **(52)** of the ball joint to a torque of 100-120 Nm and fit the pin **(51)**.
78. Couple the sleeves **(46)** to the rods **(43)** and to the ball joints **(50)**.
79. Connect the ram supply hoses.
80. Withdraw the jack. Remove the chocks and release the handbrake.
81. Adjust the toe-in (see section E).
82. Check for leaks of the ram connectors.

D. Removal and refitting of front axle

Removal

83. Chock the rear wheels and apply the handbrake.
84. Lift the front of the tractor with a jack positioned in the axis of the axle.
85. Position a stand under the crankcase.
86. Remove the front wheels.
87. Remove the screws **(36)** and the nuts **(10)**.
88. Remove the nuts **(40)**, the washers **(39)** and the screws **(38)**.
89. Remove the assemblies **(1)** (Fig. 2).
90. Remove the pin **(51)** and the nut **(52)**, withdraw the ball joint **(53)** from the support **(54)**, detach the ram from the axle **(11)**.

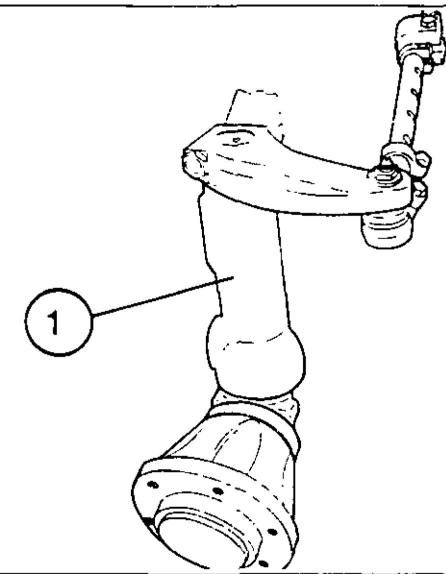


Fig. 2

Front axle - 2 WD Front axle

91. Hoist the axle (Fig. 3).
92. Remove the screws **(1)** and the grease nipple **(3)**. Remove the front bearing **(2)** and the washer /**4**\ (Fig. 4).
93. Remove the front axle, disengaging it from its rear bearing **(5)** with the washer /**6**\ (Fig. 4).
94. Remove the lock nut **(60)** and the nut **(59)** with its seal **(58)**, remove the support **(54)**. The bush **(55)**, the thrust washer **(56)** and the o-ring **(57)** remain on the support **(54)**.
95. If necessary, withdraw the bushes **(61)** from the axle.

Refitting

96. Clean and check the parts. Replace any which are defective.
97. If necessary, fit the bushes **(61)** with a locally made tool (see section G).
98. Position the bush **(55)**, the thrust washer **(56)** and the seal **(57)** and refit the support **(54)**.
99. Tighten the nut **(59)** with O-ring **(58)** on the support **(54)**, then slacken it so as to obtain axial play of 0.05 to 0.25.
100. Using a spanner wrench, tighten the lock nut **(60)** to 120-150 Nm. Check that the support swivels freely.
101. Hoist the axle. Position the washer /**6**\ (the chamfer facing the axle side, Fig. 4). Fit the axle in the support **(5)**.
102. Position the washer /**4**\ (the chamfer facing the axle side, Fig. 4). Mount the front bearing **(2)** so as to eliminate play between the washers and the axle as far as possible.
103. Smear the screws **(1)** with Loctite 270. Tighten to a torque of 540-620 Nm. Detach the hoist.
104. Fit the grease nipple **(3)** (Fig. 4).
105. Refit the ram assembly **(37)** on the support **(54)**. Tighten the nut **(52)** to a torque of 100-120 Nm and fit the pin **(51)**.
106. Grease the bearings **(2)** and **(5)** (Fig. 4) and the ram support **(54)**.
107. Grease the rods **(43)** with molybdenum disulphide. Refit the assemblies **(1)** (Fig. 2). Fit the nuts **(10)** and the screws **(36)**. Tighten to a torque of :
    - Standard axle : 350-430 Nm
    - Heavy-duty axle : 400-600 Nm
108. Fit the screws **(38)**, the washers **(39)** and the nuts **(40)**. Tighten to a torque of 75-81 Nm.
109. Refit the front wheels. Remove the stand under the crankcase. Tighten the bolts to a torque of 140-200 Nm.
110. Remove the chocks and release the handbrake.
111. Adjust the toe-in (see section E).

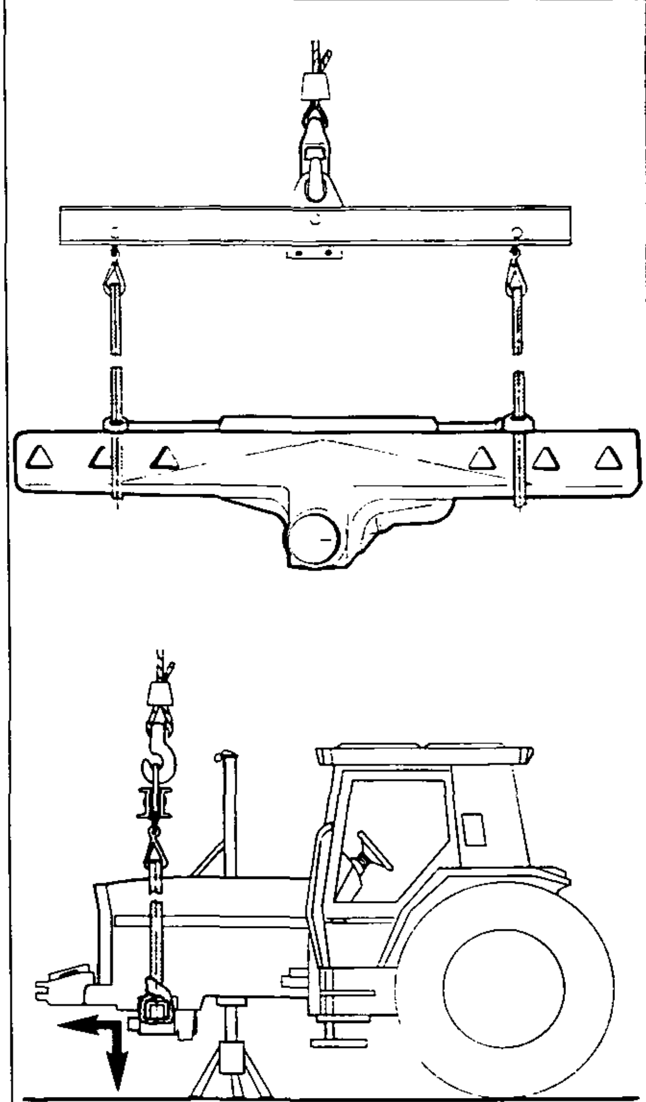


Fig. 3

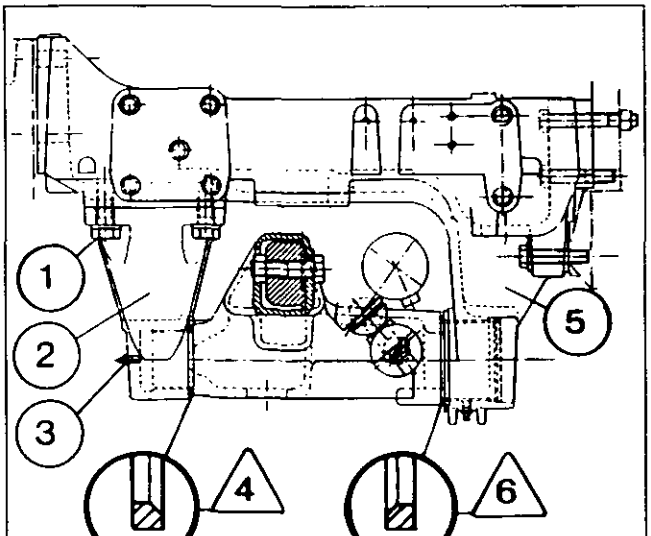
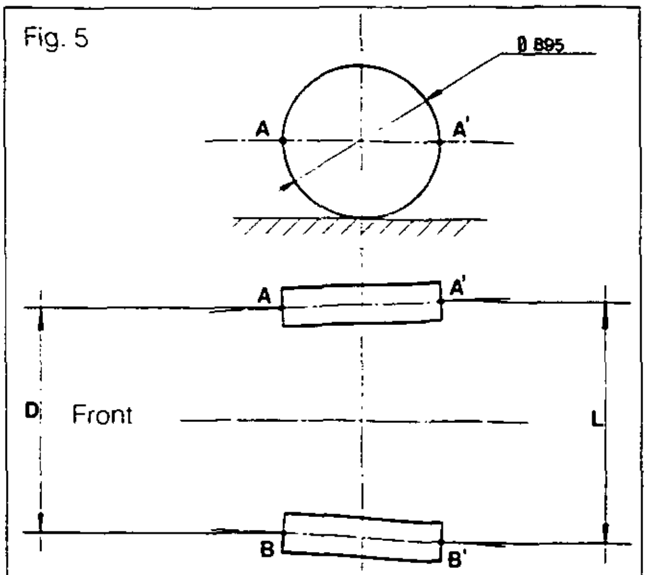


Fig. 4

E. Adjustment of toe-in

112. Set the steering to the central position. It is necessary to adjust the sleeves **(46)** so as to obtain a toe-in of 0 to 14 mm. The toe-in is measured at points A,A' and B,B', determined by a diameter of 895 mm traced on the flanks of the tyres (Fig. 5). It is obtained from the difference of the two values L and D.
Note: If the toe-in is measured on a diameter other than 895 mm, correct the value accordingly. Once adjustment has been carried out, tighten the nuts (45) to a torque of 45-55 Nm.

Fig. 5



F. Track adjustment

113. Lift the front of the tractor in the axis of the axle.
114. Remove the screws **(36)** and **(42)** and the nuts **(10)** and **(40)** (Fig. 6).
115. Place the spindle arms in the desired position.
116. Fit the bolts **(36)**. Tighten to a torque of :
    - Standard axle : 350-430 Nm
    - Heavy-duty axle : 400-600 Nm
117. Fit the rods **(43)** according to the position of the arms.
Fit the screws **(42)**, the washers **(39)** and the nuts **(40)**. Tighten to a torque of 75-81 Nm.
Note: When the tractor is used with the widest track, the spacer (32) must be used when fitting the 3rd screw (36) (Fig. 7).

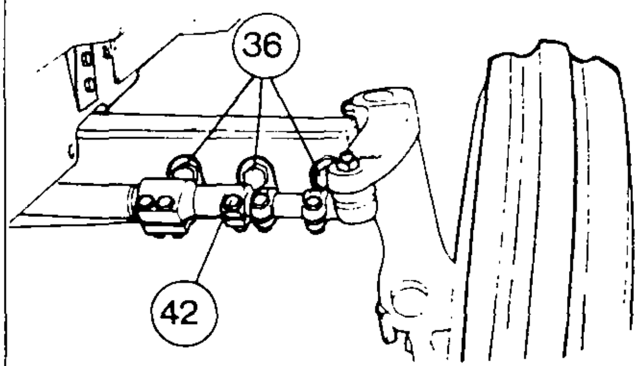


Fig. 6

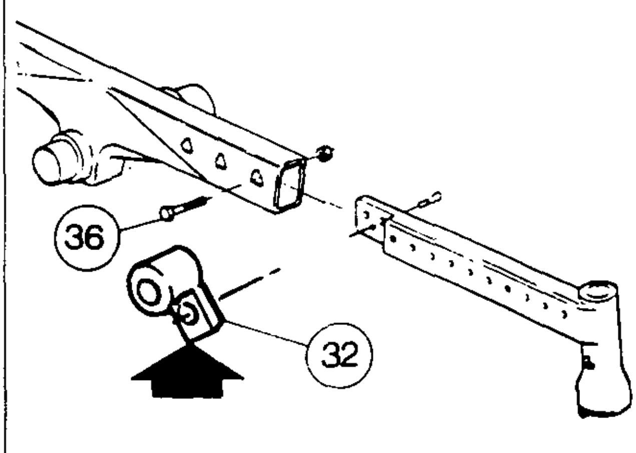
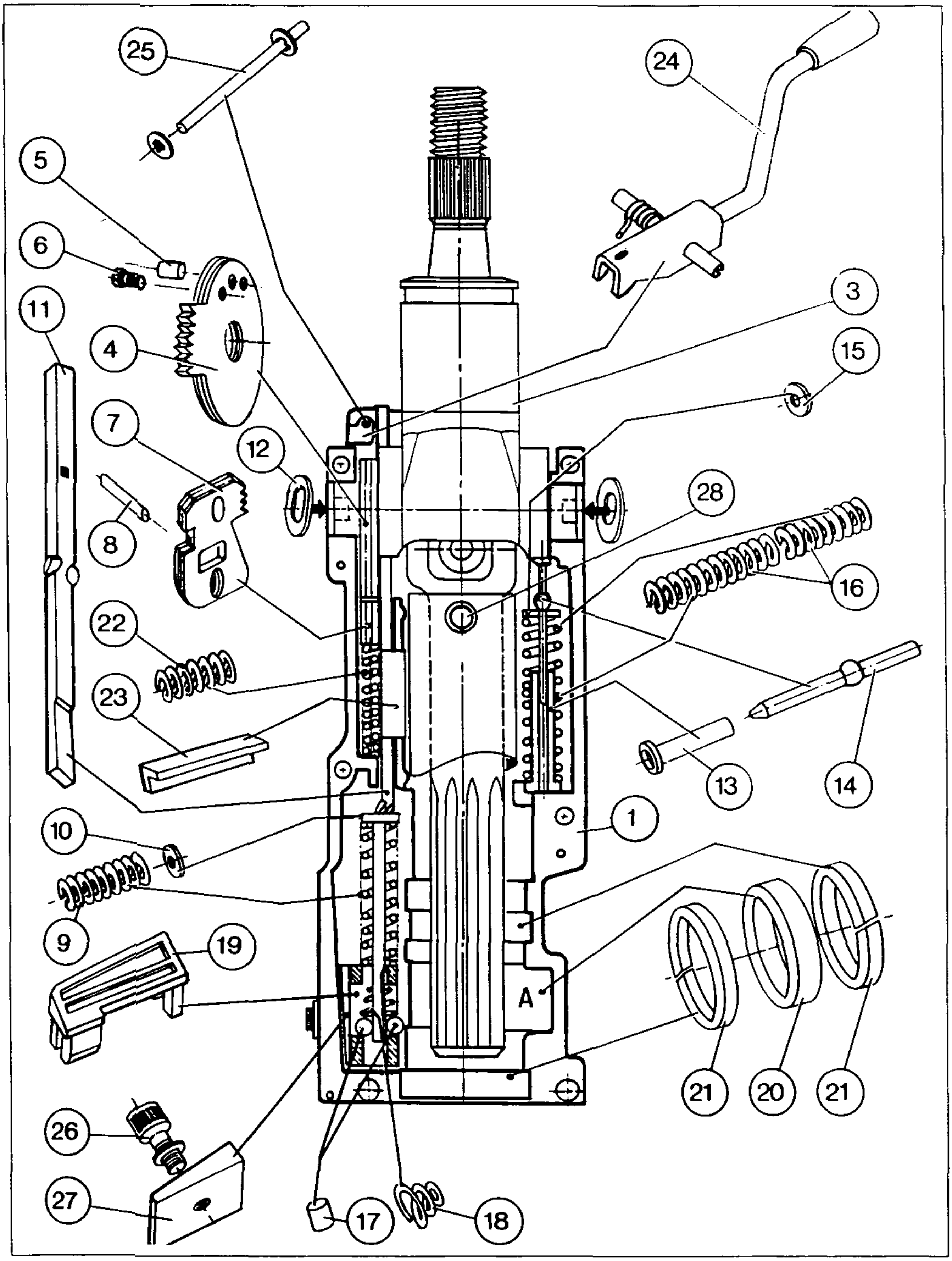


Fig. 7

7 E01 Steering column

CONTENTS

Front axle - Steering column



A . Removal

1. Remove :
   - the instrument panel cover,
   - the steering wheel and the boot.
2. Withdraw the steering column from the instrument panel after having removed the 4 bolts at the base of the column.
3. Place the column assembly on a bench and remove the 2 screws from the plastic half housings.
4. Remove lever **(24)** and pin **(25)**.

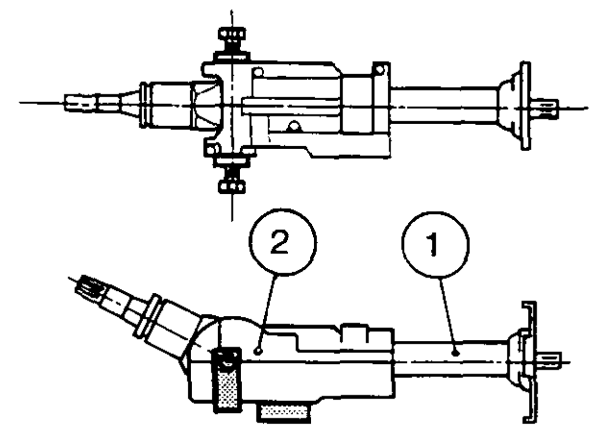


Fig. 1

B . Disassembly of tilt mechanism

5. Fit the yoke of special tool 3582244M1 on housing **(1)**, lining up the 2 screws with the holes in the swivel joints **(3)**. Tighten the 2 screws (Fig. 1).
6. Place a shim about 20 mm thick under housing **(1)** in order to line the assembly up correctly.
7. Remove the 6 screws with a 5 mm Allen key.
8. Remove top housing **(2)**.
9. Remove : guide **(19)**, rollers **(17)**, spring **(18)**, guide **(23)** and spring **(22)** (use a screwdriver).
10. Tilt joint **(3)** to reduce the pressure of springs **(16)**. Remove guide **(13)**, rod **(14)**, springs **(16)** and washer **(15)** (with a screwdriver).
11. Remove the yoke and withdraw the column assembly from housing **(1)**, complete with corrugated washers **(12)**.
12. Drive out pin **(8)** and remove rod **(11)** complete with rack **(7)**, spring **(9)** and washer **(10)**.
13. Remove the 2 screws **(6)** with a 3 mm Allen key. These screws are difficult to extract because they are fitted with Loctite.
14. Remove rack **(4)**.

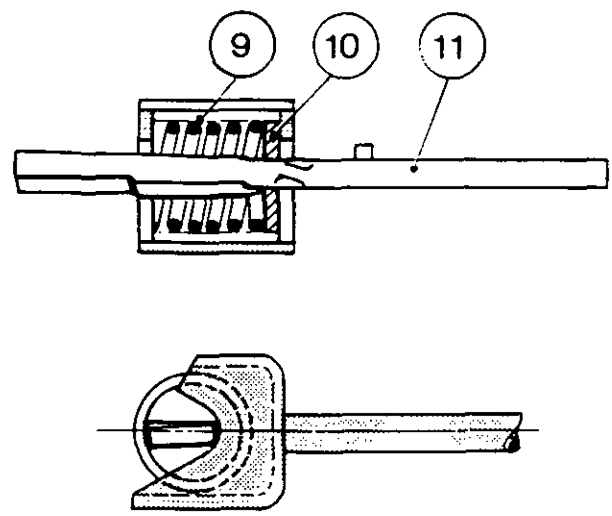


Fig. 2

Reassembly

15. Insert pin **(5)** in rack **(4)**, with the domed end outwards.
16. Fit rack **(4)** onto body **(3)** with the 2 screws **(6)**, having coated them with Loctite 270.
17. Prepare rod **(11)** with washer **(10)** and spring **(9)**.
18. Place the rod in a vice and, using compression tool 3582244M1, Item 2, compress the spring as shown in figure 2.

Front axle - Steering column

19. Fit the rod/tool assembly in position in housing **(1)**.
20. Fit rack **(7)** and insert pin **(8)** coated with Loctite 648.
21. Position spring **(18)** and rollers **(17)** on each side of rod **(11)**, with the chamfers facing downwards. Fit guide **(19)** (note the position of rollers **(17)** and spring **(18)**).
22. Fit 2 corrugated washers **(12)** on the swivel joints of body **(3)** and place the assembly in housing **(1)**. Take care with the two washers **(12)**. Position bush **(20)** in recess A in housing **(1)**. Dowel **(28)** must be facing upwards.
23. Fit the clamping yoke as for disassembly. Also place the shim under housing **(1)**.
24. Fit spring **(22)** using a screwdriver to compress it. Fit guide **(23)**, with the thickest part against the spring.
25. Tilt body **(3)** and fit **(13)** **(14)** **(15)** and **(16)**. Use a screwdriver to compress **(16)**.
26. Hold guide **(19)** with the thumb and remove the compression tool.
27. Fit rings **(21)**, positioning the gaps at 180° to each other.
28. Fit the top half housing **(2)**. Note that rings **(21)** and corrugated washers **(12)** have to be adjusted by hand.
29. Reverse operation 1 to 4.

7 E02 Steering column - 2nd generation

CONTENTS

7E02.2 **Front axle** - *Steering column 2nd gen.*

General

The steering column assembly consists of the following two sections:

- the fixed lower section comprising a tube and an attaching base plate,
- the moving upper section comprising a tube and a welded yoke as well as a housing including the steering wheel height and tilt adjusting mechanisms.

Operation

Height adjustment

When the control rod **(4)** is moved to the high position, rod **T** causes the elbow lever **(8)** to swivel and lower arm **(15)** which is hinged on pin **(14)**.

Adjusting screw **[5]** attached to the arm bears on the lock plate **(16)** which is released, allowing the upper section of the steering column to move.

The spring **(3)** returns the control lever **(4)** to its initial position.

The stop **(25)** limits the movement of both sections.

Tilt adjustment

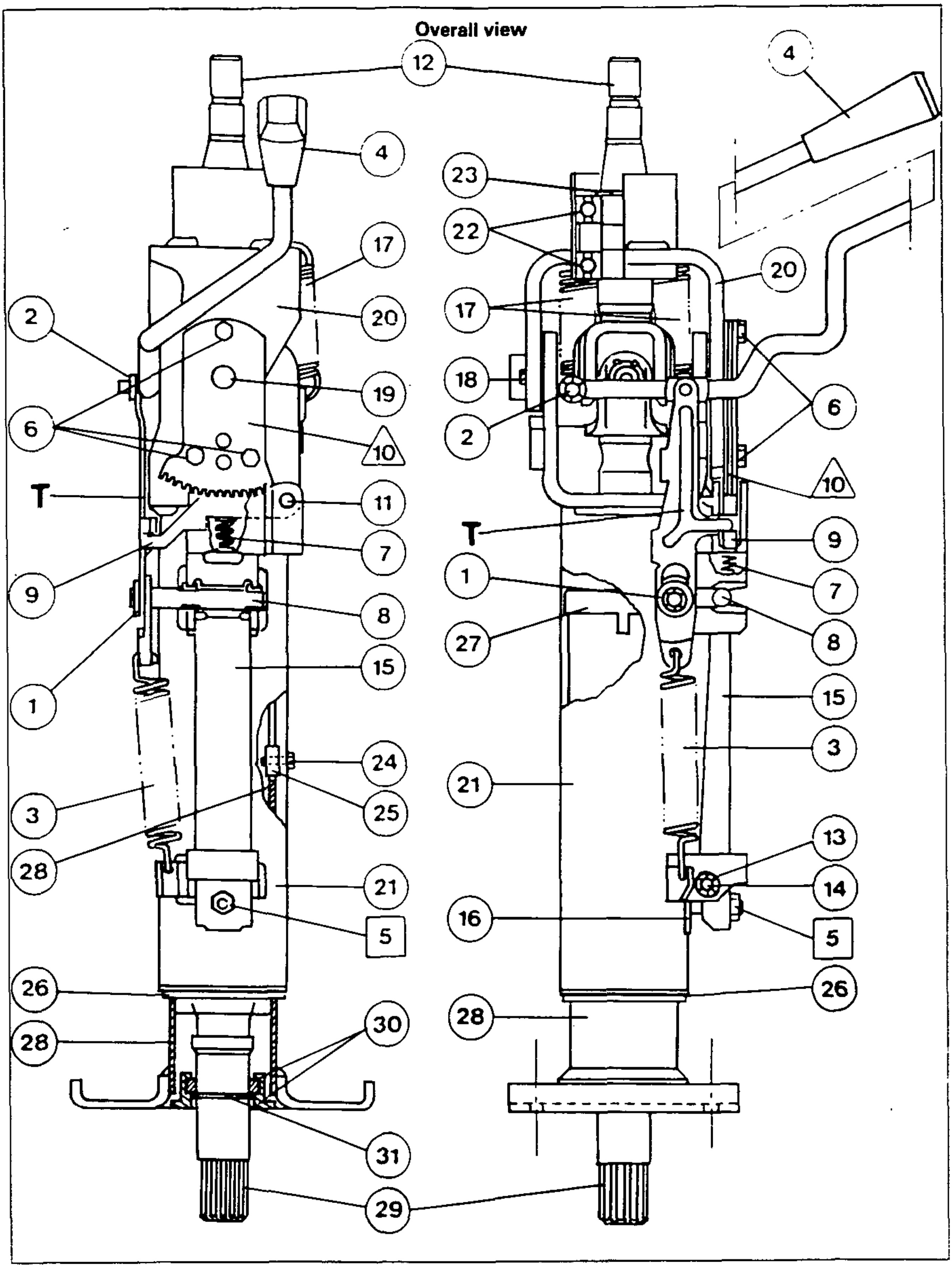
When the control lever **(4)** is moved to the low position, it presses on rod **T** which pushes on the end of the notched lever **(9)** and frees it from the rack **/10** allowing it to tilt the housing **(20)**. The two return springs **(17)** allow the positioning of the steering wheel.

Adjusting screw **[5]** allows the meshing of the teeth on the rack **/10** and notched lever **(9)** to be adjusted.

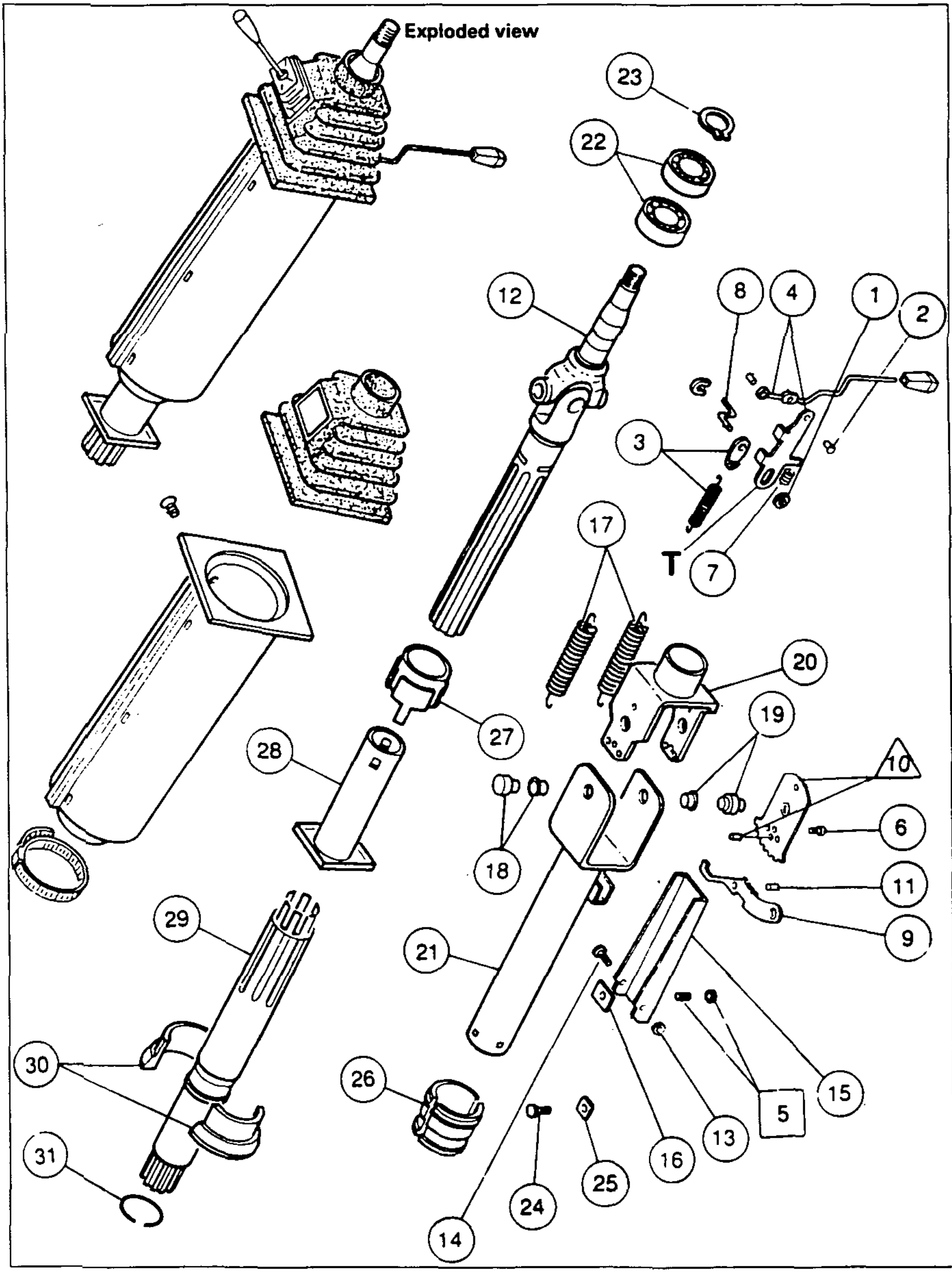
List of parts

(1) Retaining washer
(2) Retaining washer
(3) Spring
(4) Control lever assembly
[5] Adjusting screw
(6) Bolt
(7) Spring
(8) Elbow lever
(9) Notched lever
/10 Rack
(11) Pin
(12) Upper shaft
(13) Retaining washer
(14) Pin
(15) Arm
(16) Lock plate
(17) Springs
(18) Pin
(19) Pin
(20) Housing
(21) Moving column
(22) Bearings
(23) Circlip
(24) Bolt
(25) Stop
(26) Bush
(27) Bush
(28) Fixed column
(29) Lower shaft
(30) Bushes
(31) Circlip

Front axle - *Steering column 2nd gen.* 7E02.3



7E02.4 **Front axle** - Steering column 2nd gen.



A. Removing and refitting the steering column

Removal

1. Using the lever on the right-hand side under the steering wheel, pull the steering column as far towards the driver as possible.
2. Remove the steering wheel and the dashboard covering.
3. On tractors equipped with a Dynashift gearbox, disconnect the control switch **(1)** located under the dashboard (Fig. 1).
4. Take out the bolts **(2)** attaching the base of the column onto the cab support (Fig. 1).
5. Remove the assembly by tilting it so that the base is withdrawn via the dashboard support.

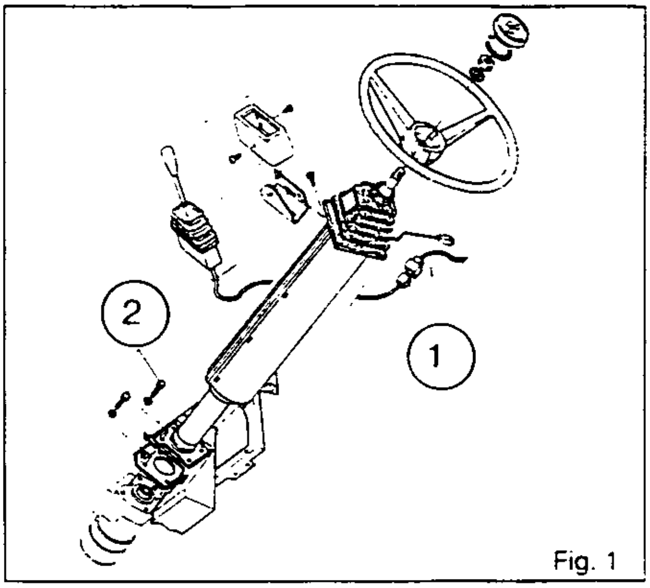


Fig. 1

Refitting

6. Check the operation of all the positions of the steering column.
7. Lightly coat the splines in shaft **(29)** with Loctite «Anti-Seize» grease or equivalent.
8. Carry out procedures 2 to 5 in reverse order.
   Note: Tighten the steering wheel nut to a torque of 57 - 78 Nm.
9. Check the operation of the electrical equipment and the A, B, C, D speeds (for Dynashift type tractors).

B . Disassembling and reassembling the control lever assembly

Disassembly

10. Remove the steering column. Carry out procedures 1 to 5.
11. Remove the housing in two halves around the steering column. Remove the Dynashift control (if fitted).
12. Remove and discard the retaining washers **(1)** and **(2)**. Remove the spring **(3)**, lever **(4)** with the dust cover and lever **(8)**.

Reassembly

13. Refit the levers **(4)** and **(8)** and the spring **(3)**. Replace the retaining washers **(1)** and **(2)**.
14. Adjust the lever **(4)**, rod **T** in contact with the notched lever **(9)** using the adjusting screw **[5]** (3 mm Allen wrench).
15. Carry out procedure 11 in reverse and carry out procedures 6 to 9.

C . Removing and refitting the notched lever and rack

Removal

16. Remove the steering column. Carry out procedures 1 to 5.
17. Remove the housing in two halves around the steering column. Remove the Dynashift control (if fitted).
18. Remove and discard the retaining washers **(1)** and **(2)**. Remove the spring **(3)**, lever **(4)** with the dust cover.
19. Compress spring **(7)** by pressing on the notched lever **(9)**. Take out the bolts **(6)**. Remove the rack **(10)**.
20. Drive out pin **(11)**. Remove the notched lever **(9)** and spring **(7)**.

Refitting

21. Carry out procedure 20 in reverse.
22. Compress spring **(7)**. Position the rack **/10** as per Fig. 2 to avoid any interference with lever **(4)**. Fit and tighten bolts **(6)** after coating them with Loctite 241.
23. Refit the lever **(4)**, rod **T** and spring **(3)**. Replace the retaining washers **(1)** and **(2)**.
24. Adjust the lever **(4)**, with rod **T** in contact with the notched lever **(9)**, using the adjusting screw **[5]** (3 mm Allen wrench).
25. Carry out procedure 17 in reverse and carry out procedures 6 to 9.

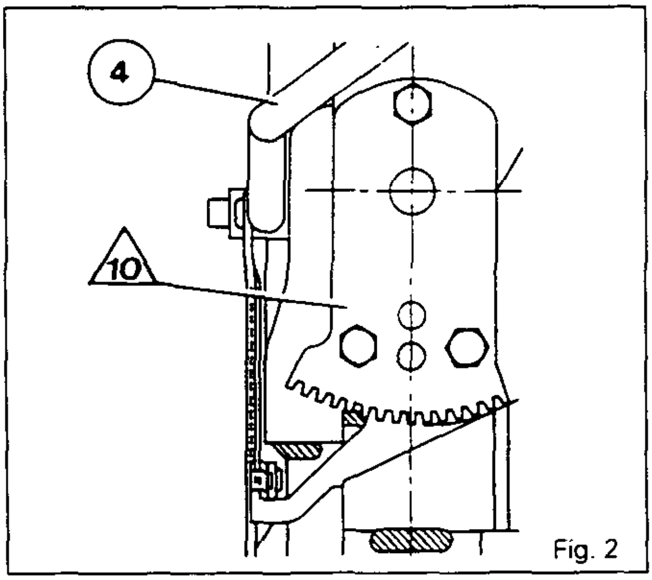


Fig. 2

D. Disassembling and reassembling the locking assembly

Disassembly

26. Remove the steering column. Carry out procedures 1 to 5.
27. Remove the housing in two halves around the steering column.
28. Remove the adjusting screw **[5]** (3 mm Allen wrench). Remove and discard the retaining washer **(13)**. Drive out the pin **(14)**.
29. Remove the arm **(15)** and lock plate **(16)**.

Reassembly

30. Carry out procedure 29 in reverse.
31. Fit the pin **(14)**. Replace the retaining washer **(13)**.
32. Fit and set the adjusting screw **[5]** and lever **(4)** with rod **T** in contact with the notched lever **(9)**.
33. Carry out procedure 27 in reverse and carry out procedures 6 to 9.

E. Replacing the shafts and bearings

Disassembly

34. Remove the steering column. Carry out procedures 1 to 5.
35. Remove the housing in two halves around the steering column. Remove the Dynashift control (if fitted).
36. Slide the dust cover over the control lever **(4)**.
37. Compress spring **(7)** by pressing on the notched lever **(9)**. Remove the bolts **(6)**. Remove the rack **/10**.
38. Remove the springs **(17)**.
39. Uncrimp pin **(18)**. Drive out pins **(18)** and **(19)**.
40. Separate the housing **(20)** from the moving column **(21)**.
41. Remove the circlip **(23)**. Separate the upper shaft **(12)** from the housing **(20)**.
42. Drive out the lower shaft **(29)** from the moving column **(21)**.
43. Extract the bearings **(22)** from the housing **(20)**.

Reassembly

44. Fit the bearings **(22)** in the housing **(20)** using a suitable fixture.
45. Assemble the upper shaft **(12)** on the bearings **(22)**. Fit the circlip **(23)**.
46. Assemble the lower shaft **(29)** equipped with bushes **(30)** and circlip **(31)** on the fixed column **(28)**.
Note: Deform the column tube by striking it with a punch so as to lock the bushes (30) in position.
47. Reassemble the housing **(20)** and mobile column **(21)** assemblies. Fit pins **(18)** and **(19)**. Crimp pin **(18)**.
48. Refit the springs **(17)**.
49. Compress spring **(7)**. Position the rack **/10** as per Fig. 2 to avoid any interference with lever **(4)**. Fit and tighten the bolts **(6)** after coating them with Loctite 241.
50. Adjust the lever **(4)**, rod **T** in contact with the notched lever **(9)** using the adjusting screw **[5]** (3 mm Allen wrench).
51. Carry out procedure 35 in reverse and carry out procedures 6 to 9.

F. Replacing the guide bushes (26) (27) (30)

Disassembly

52. Remove the steering column. Carry out procedures 1 to 5.
53. Remove the housing in two halves around the steering column.
54. Loosen the adjusting screw **[5]** (3 mm Allen wrench). Remove the lock plate **(16)**.
55. Remove the bolt **(24)** from the stop **(25)**.
56. Extract the bush **(26)**.
57. Separate the moving column **(21)** from the fixed column **(28)**.
58. Extract the bush **(27)**.

Reassembly

59. Position bush **(27)**.
60. Place the stop **(25)** in the groove on the fixed column **(28)**.
61. Assemble the mobile column **(21)** with the fixed column **(28)**.
62. Fit the bolt **(24)** without tightening it so that bush **(26)** can be installed. After installing the bush, *tighten the bolt moderately. Check that the moving* column **(21)** slides freely.
63. Refit the lock plate **(16)**. Adjust the lever **(4)**, rod **T** in contact with the notched lever **(9)** using the adjusting screw **[5]**.
64. Carry out procedure 53 in reverse and carry out procedures 6 to 9.

8

8 . HYDRAULICS

Contents

8 A01 Description of circuit

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Hydraulics - Description of circuit

A. General circuit

The hydraulic system of the 3000-3100 tractors is of the open centre type. It is divided into two separate circuits fed by a two-stage gear pump, fitted on the internal face of the right cover. Via a 150 micron strainer also fitted on the right cover, the pump uses the transmission oil contained in the common reservoir formed by the centre housing and the gearbox. A 15 micron pressure filter is fitted on the low flow circuit before the Orbitrol steering unit. The hydraulic pump is driven by the teeth of the PTO clutch housing.

B. Low-pressure circuit, low flow

This circuit gives priority to supplying the hydrostatic steering system where the pressure can reach 170 bar. After satisfying the needs of the steering valve (Orbitrol), the oil is sent to a distribution valve fixed under the hood. This valve has a number of functions:

- Pressure maintaining valve
  Downstream of the Orbitrol, the distribution valve maintains the operating pressure of the various transmission elements at 17 bar.
- Cooling, lubrication and clutch and brake master cylinder supply circuit
  After supplying the various transmission elements, the distribution valve sends the oil to the oil cooler if it is hot, or directly to the gearbox and PTO lubrication system if it is cold. The lubrication pressure is maintained by a valve set at 1.5 bar, fitted on the front left of the gearbox. The residual flow from the distribution valve also supplies the clutch and brake master cylinders.

Functions supplied by the low flow circuit

The 17 bar circuit supplies the various transmission functions in parallel, via solenoid valves screwed into the main gallery of the right cover.
None of these are priority functions and they can be actuated simultaneously.
Certain of the solenoid valves (4WD, PTO etc.) are connected to the Autotronic device.
The functions supplied by the low-pressure circuit are as follows:

. The hydrostatic steering
. The hi/lo (Hare/Tortoise) range
. The differential lock (front and rear)
. The 4WD clutch
. The speedshift
. The A/B range
. The PTO circuits:
 - clutch
 - PTO brake
 - Front PTO (option)

C. High-pressure circuit, high flow

The second stage of the pump supplies, in this sequence:

- The trailer brake valve, which has priority
- The auxiliary spool valves
- The lift control valve (rear linkage)

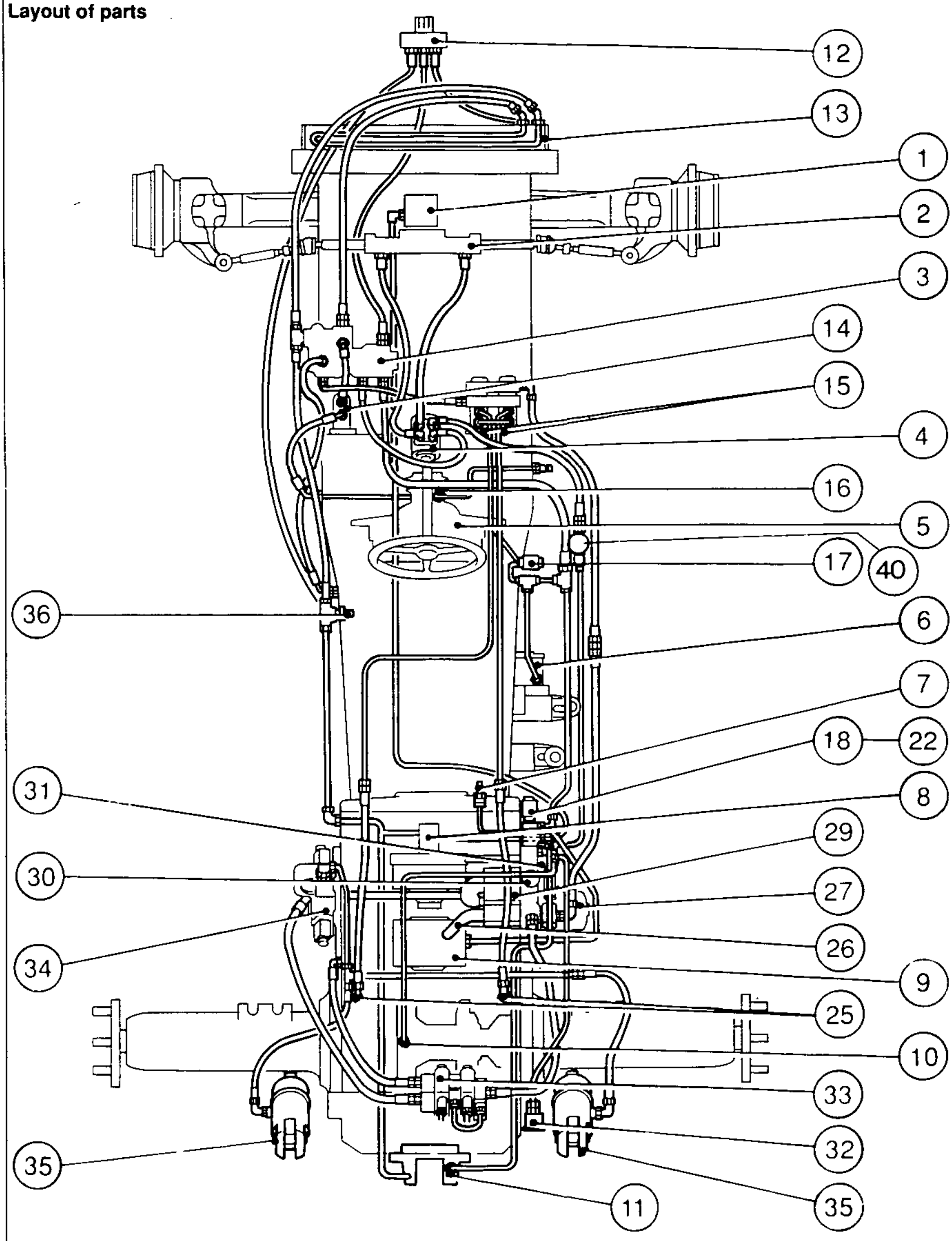
The oil not used by the trailer brake valve supplies the auxiliary spool valves fitted on the rear of the lift cover.
Exiting from the auxiliary spool valves, a hose supplies the lift valve situated on the left side cover.
The excess flow from these three spool valves returns to the pump intake manifold without passing through the strainer. A safety valve fitted in the delivery pipe of the right hand cover protects the high-pressure circuit.

D. Description, layout of parts

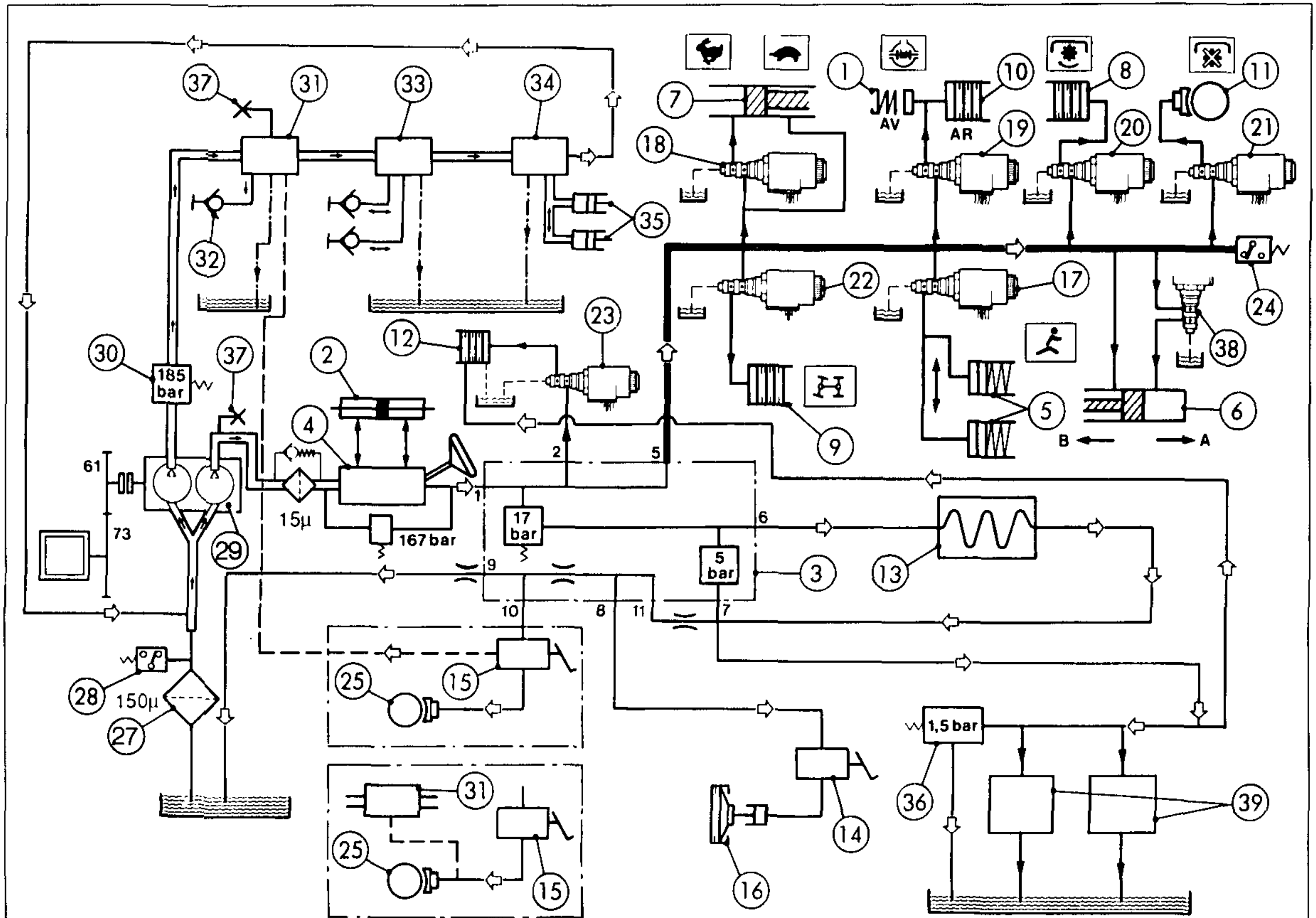
Parts list

(1) Front differential lock
(2) Steering ram
(3) 17 bar distribution valve
(4) Hydrostatic steering unit (Orbitrol)
(5) Speedshift
(6) A/B range
(7) Hare/Tortoise range
(8) PTO clutch
(9) 4WD clutch
(10) Rear differential lock
(11) PTO brake
(12) Front PTO (if fitted)
(13) Oil cooler
(14) Clutch master cylinder
(15) Brake master cylinders
(16) Clutch hydraulic receptor
(17) Speedshift solenoid valve
(18) Hare/Tortoise solenoid valve
(19) Differential lock solenoid valve
(20) PTO solenoid valve
(21) PTO brake solenoid valve
(22) 4WD solenoid valve
(23) Front PTO solenoid valve (option)
(24) Low-pressure switch
(25) RH and LH brake
(26) Pump inlet pipe
(27) 150 micron suction strainer
(28) Filter vacuum switch
(29) Hydraulic pump
(30) Safety valve
(31) Trailer brake valve
(32) Trailer brake connector
(33) Auxiliary spool valve
(34) Lift valve
(35) Lift rams
(36) 1.5 bar valve
(37) Diagnostic connector
(38) A/B spool
(39) Lubrication : Speedshift - reverse shuttle - gearbox, PTO
(40) 15 micron pressure filter

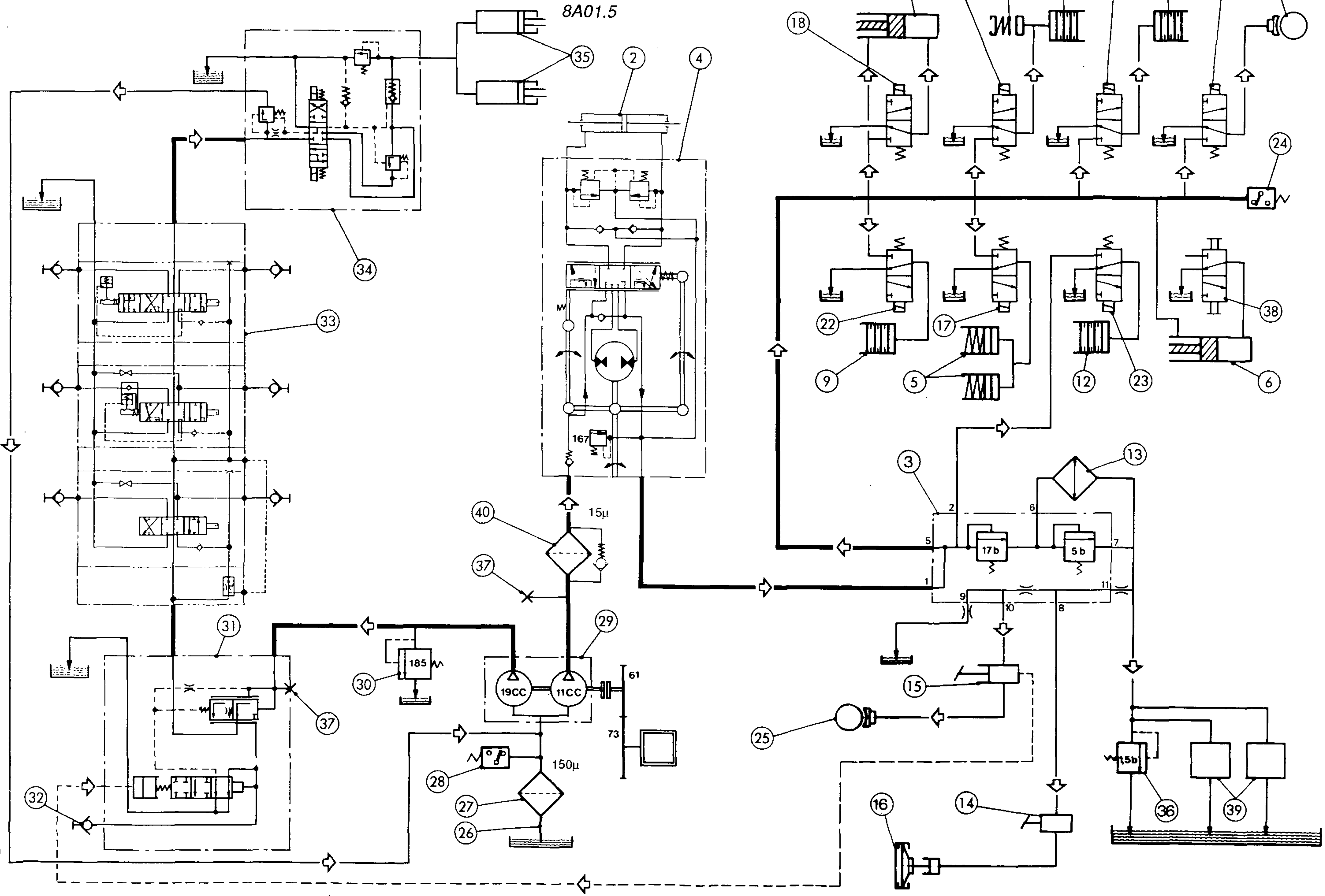
Layout of parts



Hydraulics - Description of circuit



Simplified diagram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39
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167
185
19CC
11CC
61
73
17b
5b
15b
15μ
150μ

8 B01 Trailer braking

CONTENTS

Hydraulics - Trailer braking

General

3000/3100 tractors can be equipped with a trailer braking system consisting of:

- A valve assembly (spool valve) fitted on the right-hand hydraulic cover.
- A pipe linking the trailer braking valve to a connector situated at the rear of the tractor.
- A pipe connected to the master cylinders or to a supply hose of the main right-hand brake (depending on version) linked to the pilot head of the valve.

The valve is supplied as a matter of priority by the high-pressure circuit. The oil not used for the braking of the *trailer is sent to the auxiliary spool valves.*

The valve controls the flow and pressure towards the trailer brakes. It is controlled by the pressure of the tractor braking circuit so as to obtain tractor/trailer braking that is progressive and proportional to the effort applied to the pedal. The trailer brake only works if the two pedals are coupled.

Description of the trailer braking valve (Fig. 1)

Flow control valve (1)
Provides control of the flow Qx and regulation of the hydraulic flow, transmitting the pressure to the trailer-brakes (see pages 4 and 6).

Control spool assembly(2)
Changes the position of the flow control valve and regulates the trailer braking pressure.

Check valve(3)
Prevents oil flowing back from brake line B to port N (see pages 4 and 6).

Pressure relief valve (4)
with loaded springs **(8)**
Limits the maximum brake pressure.

Pilot flow housing (5)
with piston **(6)** *and bleed screw* **(7)**
Operates the trailer brake valve via a sensing line from the tractor brakes.

Designation of ports
(see pages 4 and 6)

B Supply to the trailer brake connection (junction)
N Continuation to the auxiliary spool valve
P Pressure
R Return to sump
Y Supply coming from the tractor braking system

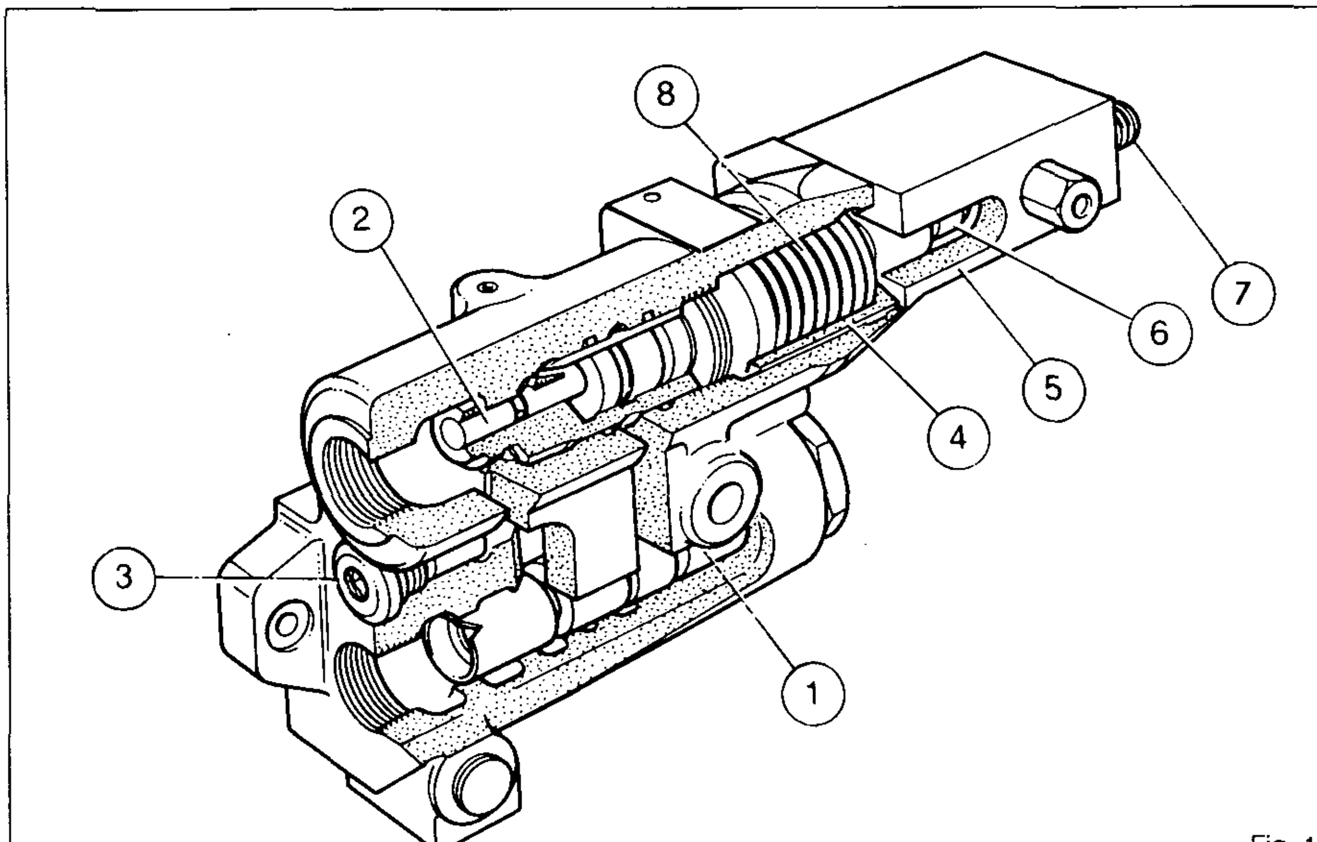


Fig. 1

A. Removal and refitting of trailer brake valve

Removal (Fig. 2)

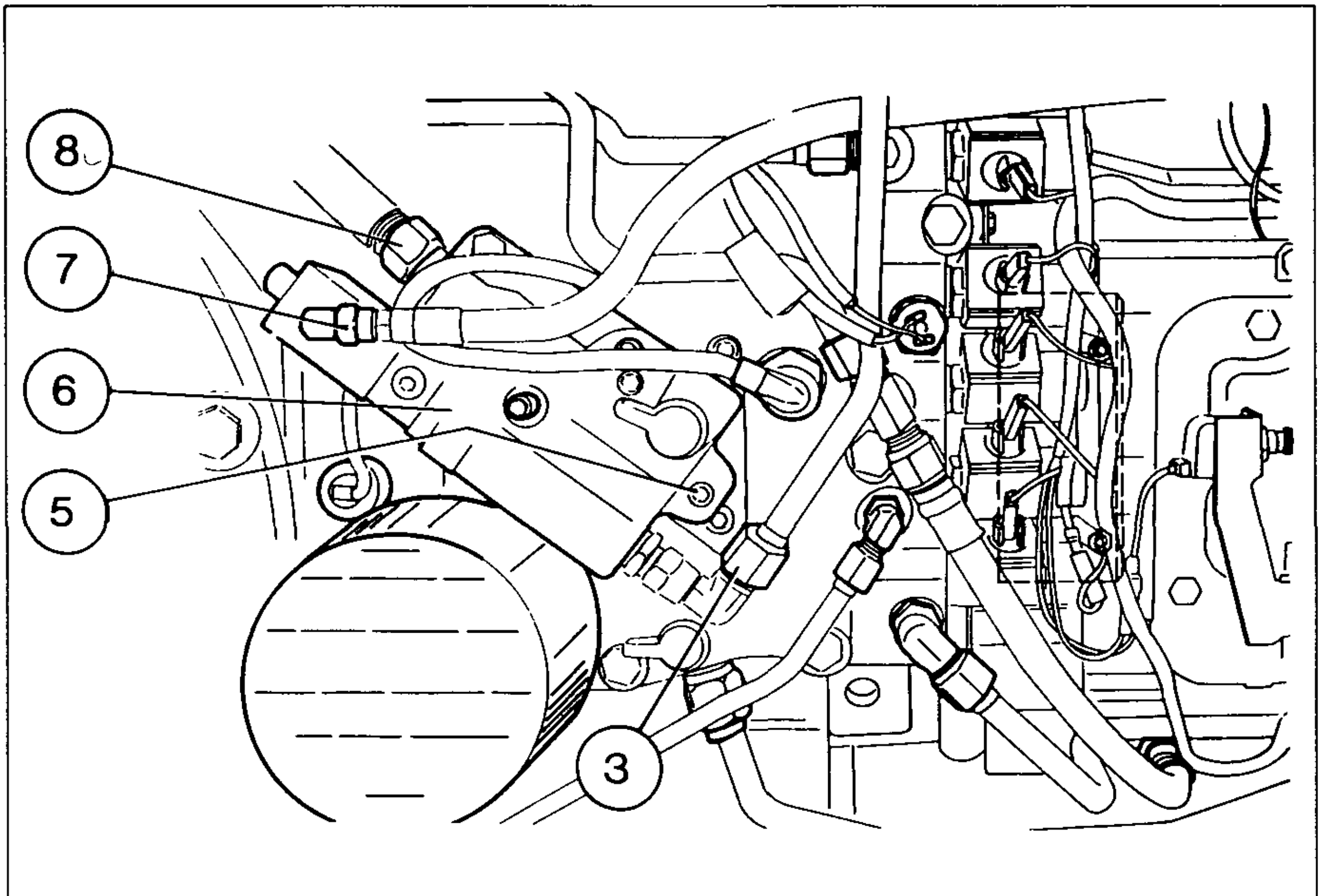


Fig. 2

1. **Disconnect and block:**
   - the hose **(7)** of the pilot housing,
   - the supply hose **(8)** of the auxiliary spool valve and the tube **(3)** of the trailer brake connector.
2. Remove the screws **(5)** and the valve **(6)**.

Refitting

3. Clean the joint faces of the hydraulic cover and of the valve.
4. Replace the O-rings **(1)** and **(2)** (Fig. 3).
5. Refit the valve, fit and tighten the screws **(5)** to a torque of 21 - 24 Nm.
6. **Reconnect** : The tube **(3)** of the trailer brake connector, the supply hose **(8)** of the spool valve and the hose **(7)** of the pilot housing.
7. Bleed the main brake and the trailer brake and check the pressure. Carry out sections C and D, chapter 6K01.

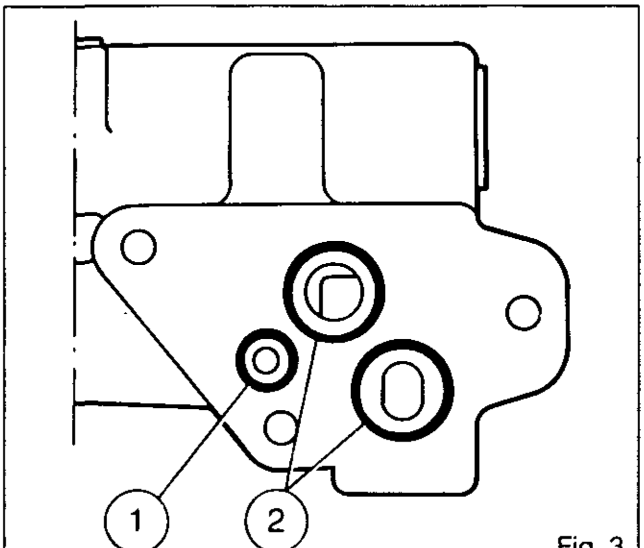


Fig. 3

Hydraulics - Trailer braking

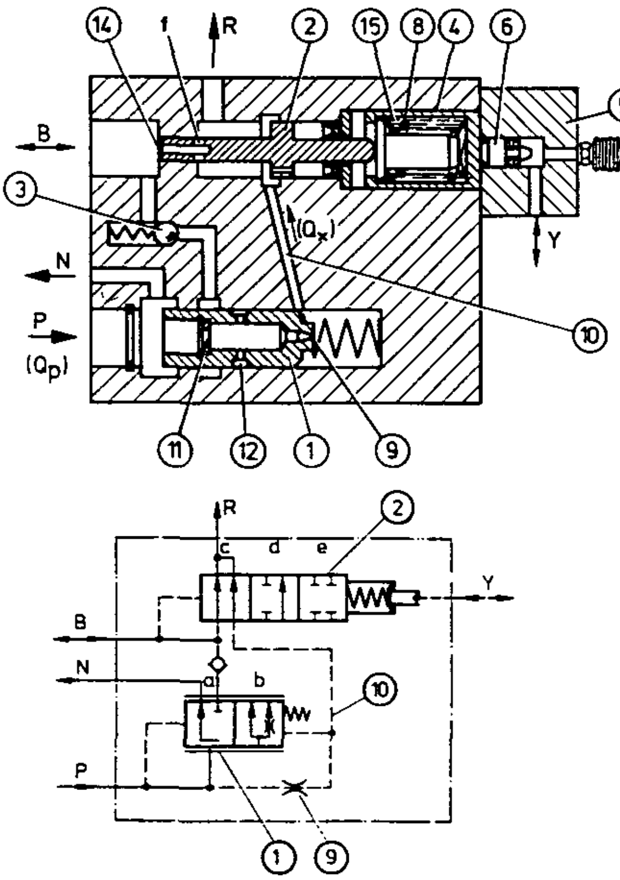


Fig. 4 - Trailer brakes released

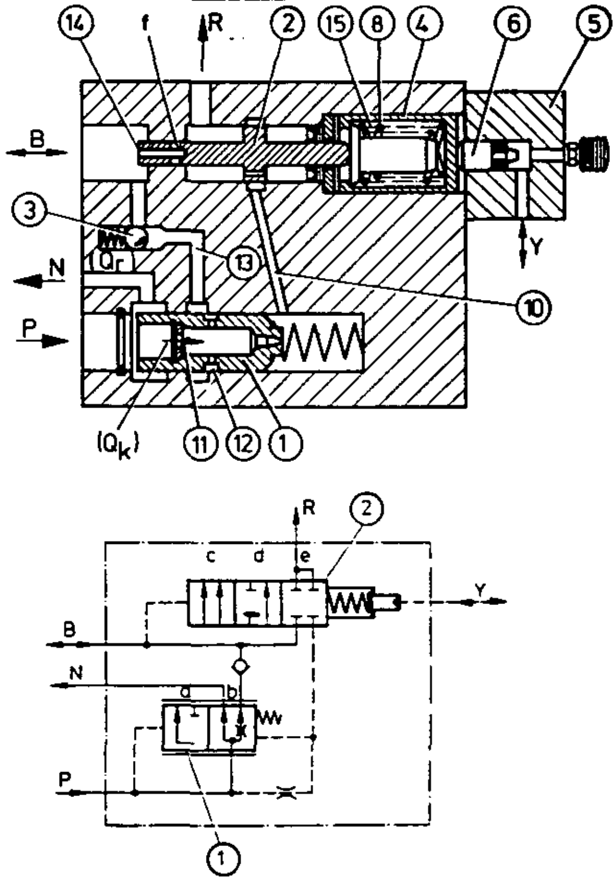
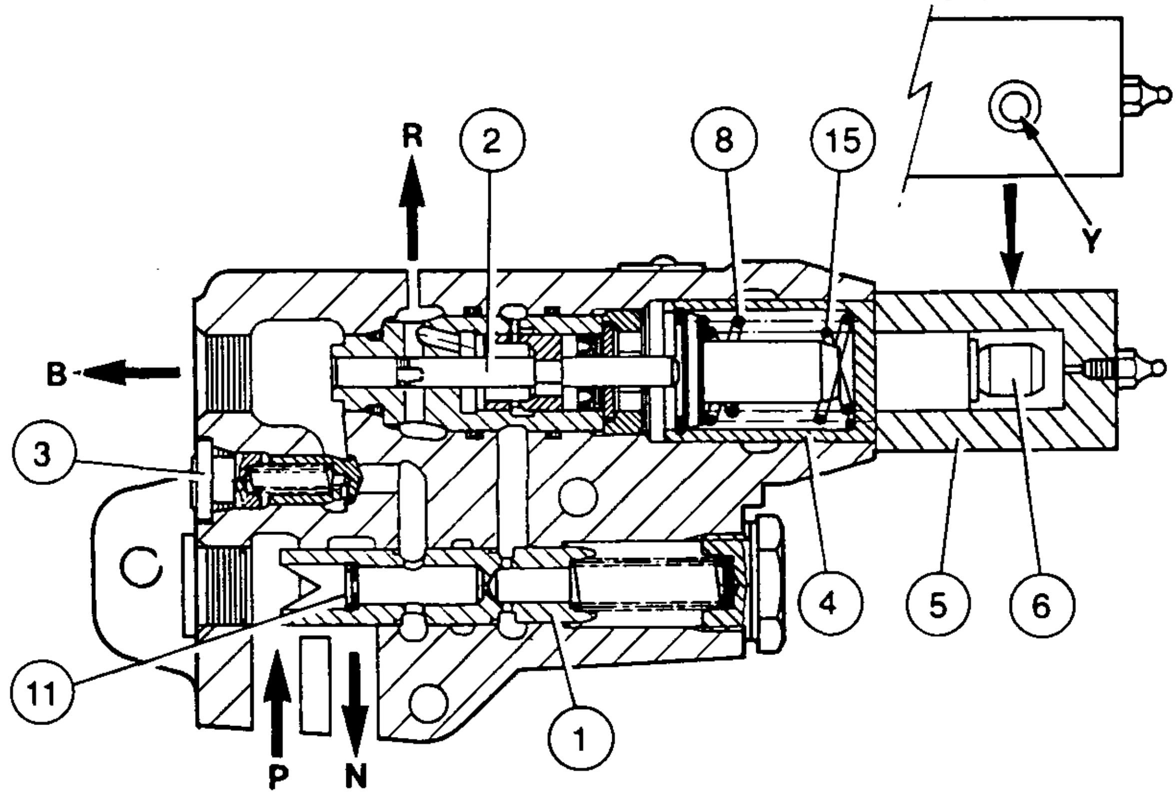


Fig. 5 - Partial trailer braking, initial braking operation.



B. Operation, trailer brakes released and partial trailer braking

Trailer brakes released (Fig. 4)

There is no pressure in sensing line Y (no effort applied to the pedals).

Port B (supply to the trailer brake junction) is open to return line R via channel f of the control spool **(2)**.

Flow QP coming from the pump passes through port P in flow control valve **(1)**.

A flow QP - QX is sent towards the port N (continuation to the auxiliary spool valve and the lift valve). A partial flow QX (approx. 0.6 l/min) coming from port P and going towards the diaphragm **(11)**, the restrictor **(9)**, the gallery **(10)** and the control spool **(2)** comes back to line R.

Consequently the pressure drop produced by restrictor **(9)** holds flow control valve **(1)** in the fully open position a, where it has no regulating function.

Partial braking of the trailer

Initial braking operation (Fig. 5)

The piston **(6)** of the pilot flow housing **(5)** is supplied under pressure by the tractor braking system (effort applied to the brake pedals).

Note: To improve braking efficiency, the diameter of the pilot piston valve has been increased from 16 to 20 mm.
This modification has been introduced on 3000 tractors from serial number R 030013 onwards.

The pressure arrives via port Y. The control spool **(2)** is then pushed to the left, obstructing channel f and interrupting the communication between port B (towards the trailer brake junction) with the return line R, and thus the connection with the gallery **(10)**.

Control spool **(2)** moves from position c to position e.

Control flow QX is cut off and the flow control valve **(1)** moves to position b (regulating position).

A constant flow QK flows from port P to port B (towards the trailer brake junction) via the diaphragm **(11)**, the channel **(12)**, the line **(13)** and the check valve **(3)**. The surface of the diaphragm **(11)** is calculated in accordance with the constant flow QK.

The residual flow QR passes through the control valve **(1)** then to port N (continuity to the auxiliary spool valve and the lift valve).

The line from port B (towards the trailer brake junction is placed under pressure and acts on the surface **(14)** of the control spool **(2)** against the pressure exerted on the piston **(6)** by the tractor braking system.

Hydraulics - Trailer braking

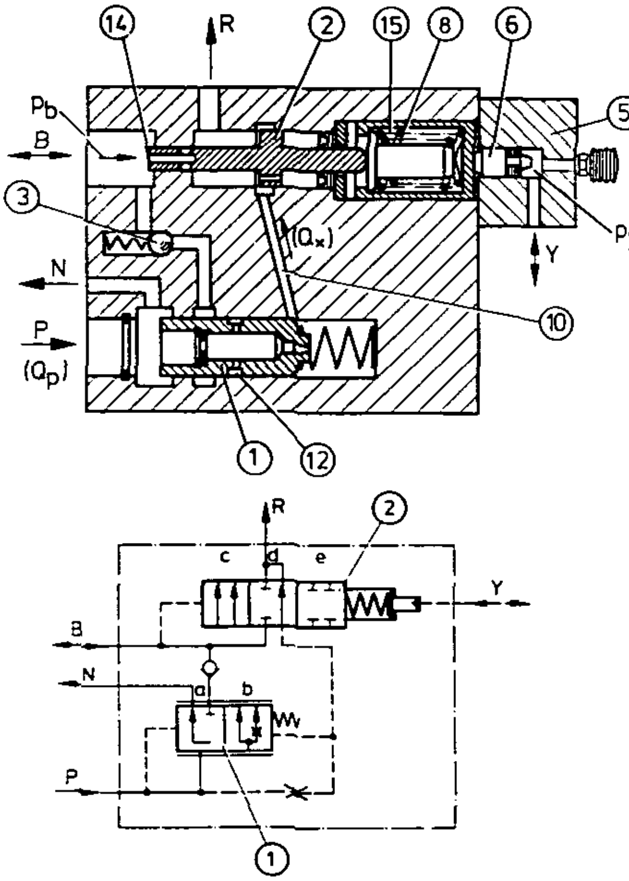


Fig.6 - Partial braking of trailer

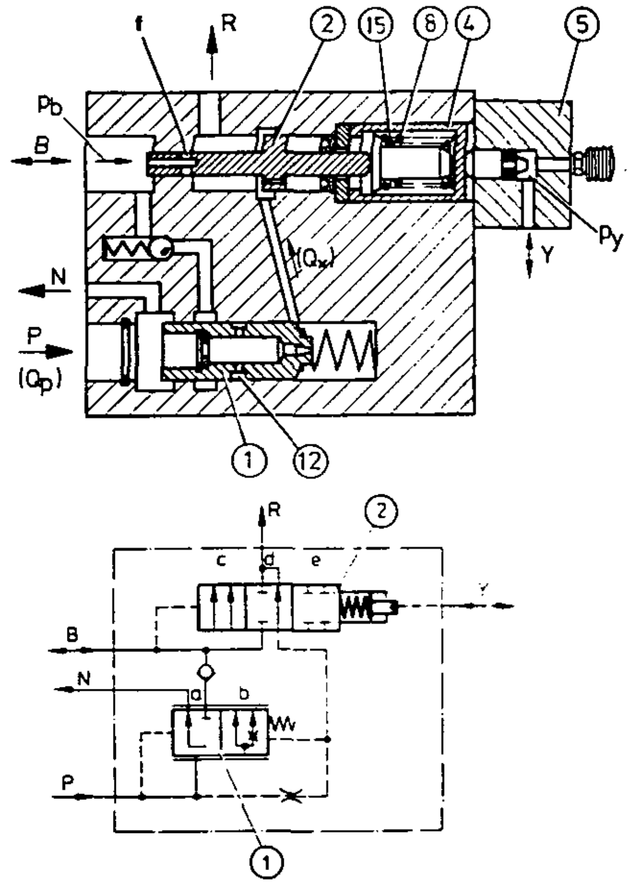
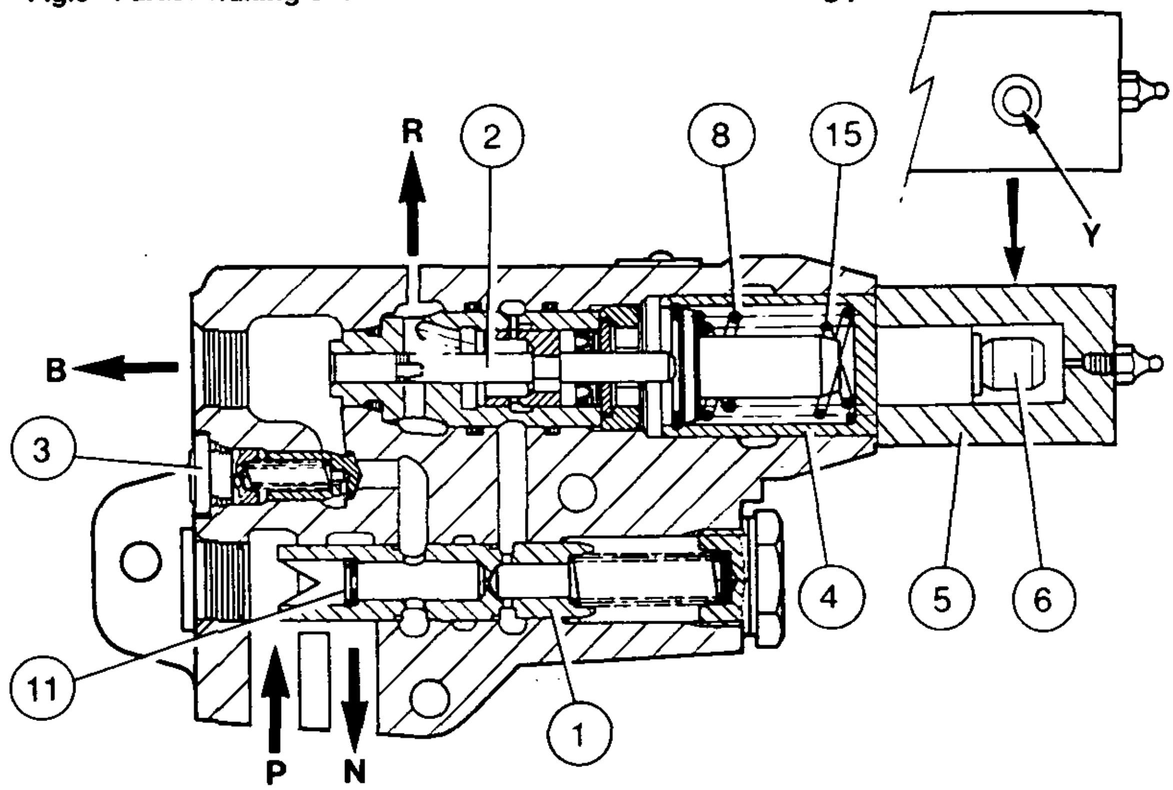


Fig 7 - Maximum braking of trailer; limited braking pressure



C. Partial braking and maximum braking of trailer

Partial braking of trailer (Fig. 6)

Pressure Pb existing in the trailer brake line (pressure acting on the active surface **(14)** of the control spool **(2)**) equalises with the pressure Py (coming from the tractor braking system) acting on the piston **(6)** of the pilot flow housing **(5)**.

The line from port B (towards the trailer brake junction) is cut off from the return port R. Therefore the oil is trapped within the trailer braking system. When the pressures have equalised the control spool **(2)** is in position d.

The flow control valve **(1)** then moves to position a, where it has no regulating function.

As when the trailer brakes are released, flow Qp - Qx is directed to port N (continuity to the auxiliary spool valve and the lift valve) and control flow Qx is sent towards the return line R via the control spool **(2)**.

Maximum braking of trailer (Fig. 7)

Limited braking pressure

Flow control valve **(1)** and control spool **(2)** occupy the same positions (a and d) as for partial braking.

Flows Qp and Qx are the same as for partial braking. The maximum admissible braking pressure for the trailer is attained (Pb = 150 bar). There can be no increase in trailer braking pressure, even if the braking pressure of the tractor continues to increase.

The pressure relief valve **(4)** is then pushed to the left.

The springs **(8)** and **(15)** preloaded to the maximum admissible braking pressure for the trailer (Pb = 150 bar) are compressed.

If the trailer braking pressure Pb should increase due to external influences, the control spool **(2)** momentarily opens channel f between orifice B (supply towards the trailer brake junction) and the return line R.

In all operating positions of the trailer brake valve, the auxiliary spool valve and the lift valve are usable via orifice N (Fig. 8) without having any major effect on the trailer braking system. This has priority over the high-pressure hydraulic circuit.

Note: To prevent possible vibrations in the brake pedals, the following modifications have been introduced on tractors equipped with trailer braking.

1) **Temporary solution** :
   A damper valve and a new pilot hose have been introduced on 3000 tractors between serial numbers N 103023 and N 159018.

2) **Final solution :**
   A new trailer brake valve incorporating a damper valve has been introduced from serial number N159019 onwards.

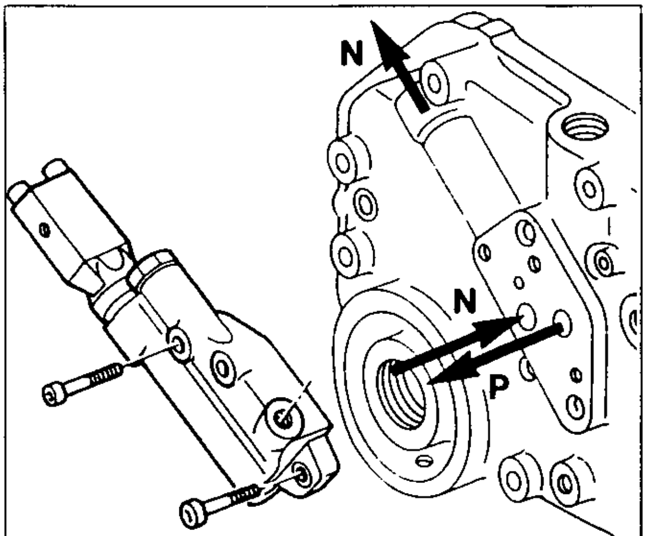


Fig. 8

8 C01 "Rexroth" auxiliary spool valves

CONTENTS

Hydraulics - "Rexroth" auxiliary spool valves

General

The auxiliary spool valves are fitted on the high-pressure circuit. They are fed by the oil coming from the trailer brake valve or from the cover plate (depending on the option).

In the neutral position, the oil not used by the spool valves is available for the lift valve fitted downstream.

The auxiliary spool valves are fixed on a support which in turn is mounted on the rear of the lift cover. The quick couplings are mounted directly on the body of the spool. To obtain an adequate distance between the couplings, the spool valves contain blocks which serve as distance pieces. These blocks also permit the oil to continue to the next spool.

Rexroth and Bosch spool valves have the same characteristics and contain essentially the same features but are not interchangeable in part.

Characteristics

Each spool valve is activated by a lever in the cab, and has three phases:
- 35% slow flow
- 45% progressive increase in flow and pressure
- 20% full flow

The progressive increase in flow and pressure enables uniform control of implements.
This characteristic also enables two spool valves to be activated simultaneously, the overall flow being shared. The flow to each quick coupler is proportional to the position of the control lever.

Different types of spool valves

- 3 positions, convertible to single or double acting.
- 3 positions, convertible to single or double acting with kickout return to neutral.
- 3 positions, convertible to single or double acting *with nonreturn valve and kickout return to neutral.*
- 4 positions, double acting with kickout return and floating position.
- *3 positions with shock valves.*

Assembly procedure (Fig. 1 and 2)

1. For correct assembly of the plates **(2)** and seals each spool valve must be disassembled and reassembled vertically with the end plate **(11)** at the bottom.
2. Screw on the nuts **(12)** until they touch the intake *block* **(1)**.
3. Place the spool valve assembly with the fastening surfaces "F" supported on a flat surface, ensuring *that it is lying perfectly flat.*
4. Tighten the nuts **(12)** to a torque of 17 - 20 Nm.
5. Fit the connectors **(13)** and the pipe **(3)**, then tighten them to a torque of 50 Nm.
   To improve the reliability of the spool valve assemblies, internal leakage has been reduced from 50 cm³/min to 25 cm³/min. See Service Bulletin n° *88/02, issue 1.*

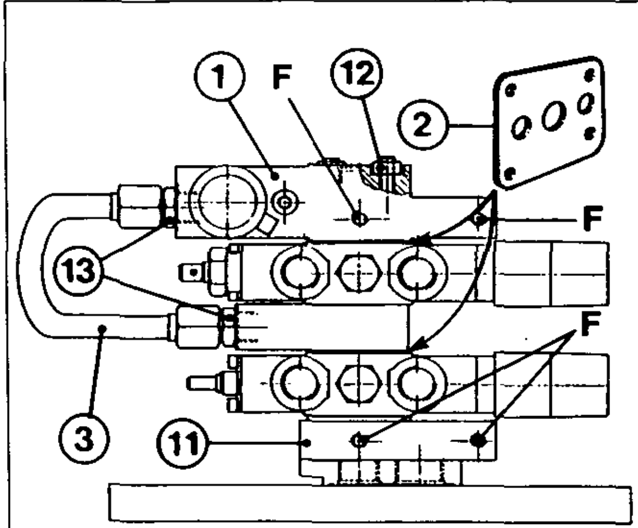


Fig. 1

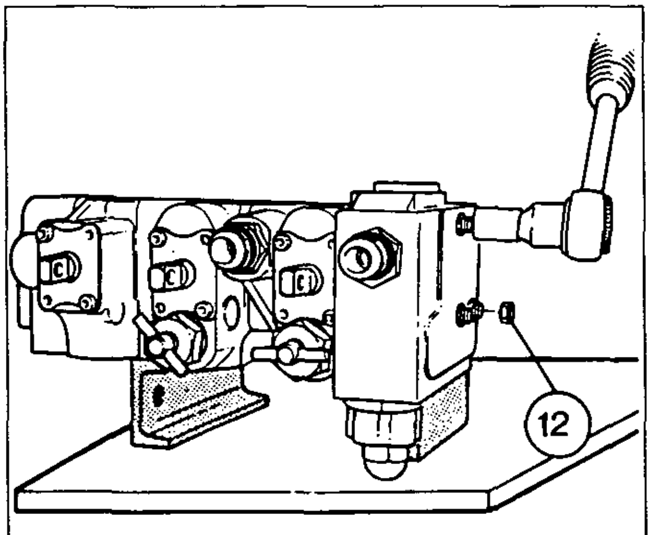
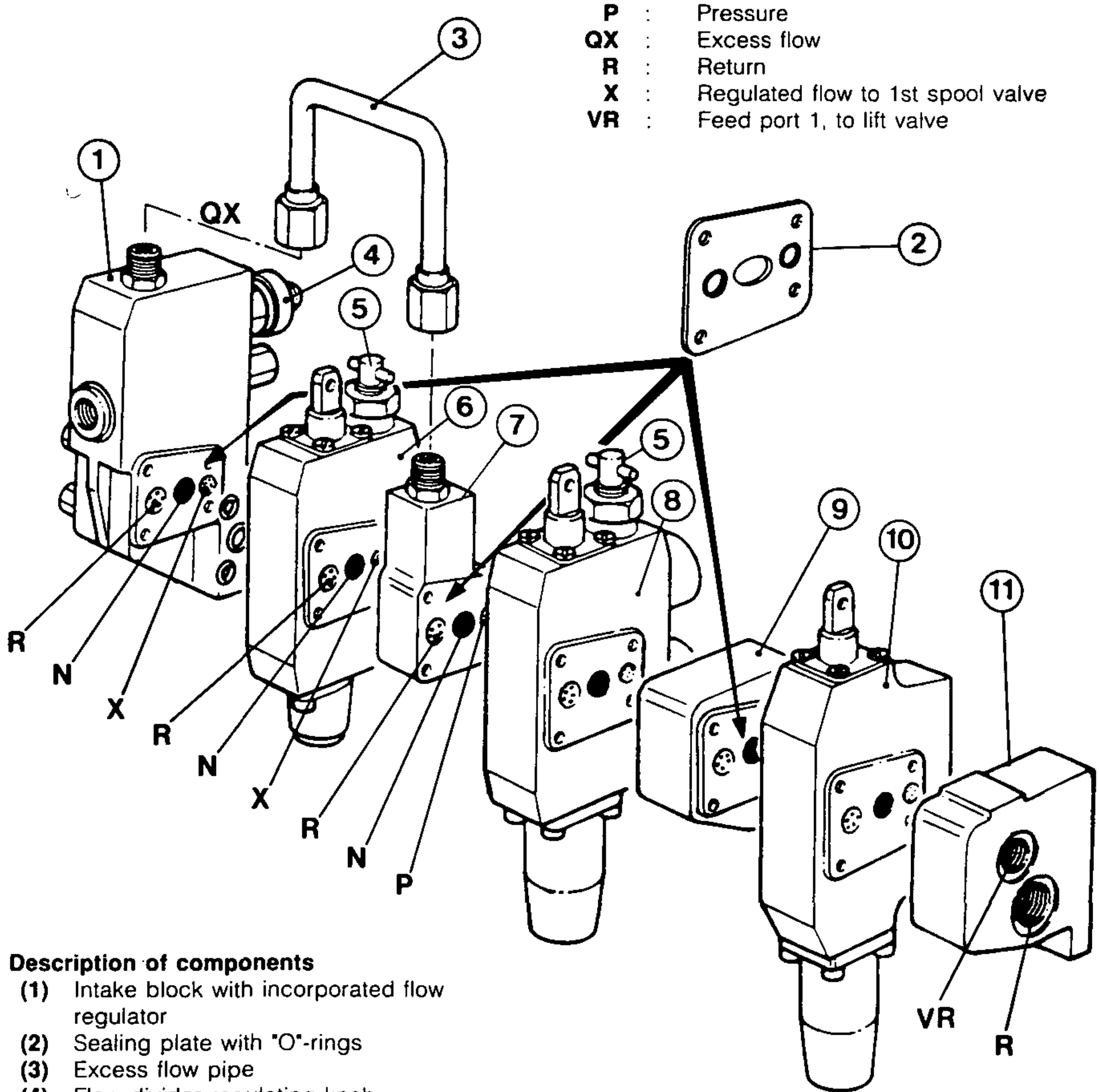


Fig. 2

Hydraulics - "Rexroth" auxiliary spool valves

Designation of ports

N	:	Continuity (to lift valve)
P	:	Pressure
QX	:	Excess flow
R	:	Return
X	:	Regulated flow to 1st spool valve
VR	:	Feed port 1, to lift valve



Description of components

- **(1)** Intake block with incorporated flow regulator
- **(2)** Sealing plate with "O"-rings
- **(3)** Excess flow pipe
- **(4)** Flow divider regulating knob
- **(5)** Single/double change-over screw
- **(6)** 3-position spool valve, convertible single/ double acting, return to neutral by spring
- **(7)** Intermediate block receiving excess flow
- **(8)** 3-position spool valve, convertible single/ double acting with kickout return to neutral
- **(9)** Intermediate block
- **(10)** 4-position spool valve with kickout return to neutral
- **(11)** End-plate enabling continuity to lift and return to sump

Fig. 3

Hydraulics - "Rexroth" auxiliary spool valves

A. Flow divider

For work requiring a regulated flow, the divider enables a variable flow to be obtained, by adjusting the knob **(4)** between the minimum and maximum positions (Fig. 4).

The divider is situated at the intake of the auxiliary spool valve assembly. It is fed by the oil from the high-pressure circuit passing through the brake valve or the cover plate (depending on the option).

Operation (Fig. 5)

The oil coming from port **N** is sent to port **X** and feeds the first spool valve. The flow is regulated according to the position of the knob **(4)**.
At the same time, the pressure existing in channel **N** enables the oil to pass through hole "**a**" and restrictor "**b**".
The piston **(7)** is then moved upwards, sending the oil through the port **QX** and the intermediate block, *which receives the excess flow through the pipe* **(3)**.

Adjustment (Fig. 6)

1. Remove the stop screw **(6)**, the lock nut **(1)** and the washer **(2)**.
2. Unscrew and remove the knob **(4)**.
3. Without forcing it, tighten the screw **(3)** so that the valve **(8)** is in contact with its seat.
4. Screw in the knob so that it is in contact with the cap **(5)**.
5. Unscrew the knob by two turns.
6. Screw in and tighten the stop screw **(6)** to a torque of 20 Nm.
7. Place the knob in the closed position (Fig. 4).
8. Fit the washer **(2)** and tighten the locknut **(1)** to a torque of 30-40 Nm.

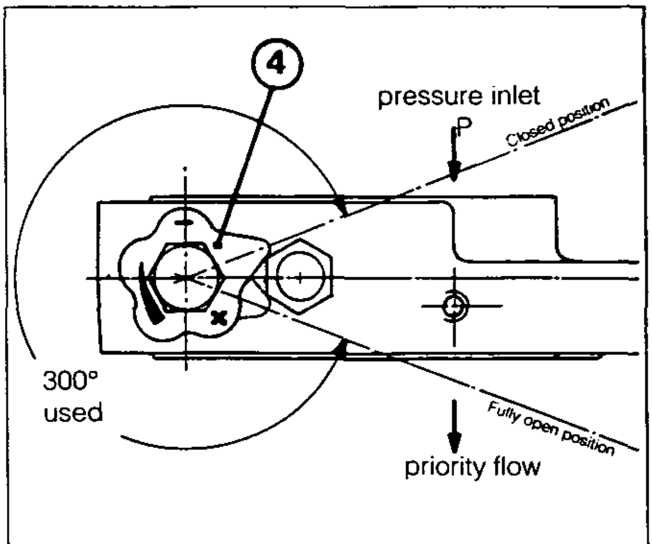


Fig. 4

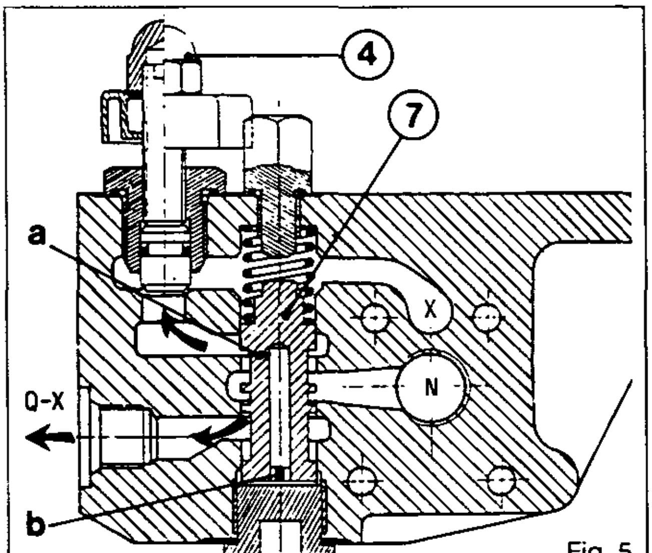


Fig. 5

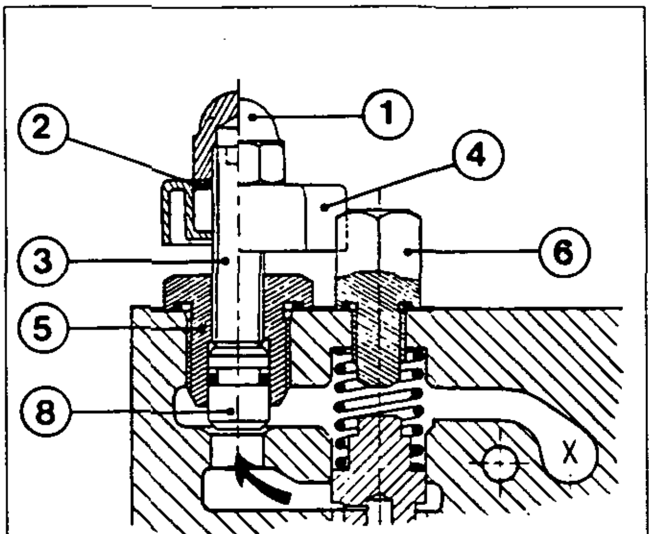


Fig. 6

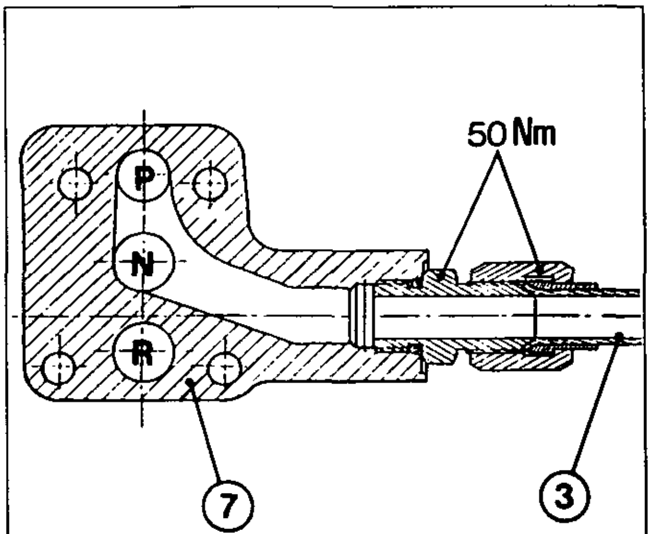


Fig. 7

B. 3-position spool valve, single/ double acting

Operation (Fig. 8)

The oil from the high-pressure circuit passes through the brake valve (if fitted) or the cover plate fixed on the right hydraulic cover and feeds the various spool valves via the continuity channel **N**.

Neutral position

The oil is not available at outputs **S1** or **S2**. It is sent via the continuity line towards the lift valve and passes directly to the intake manifold of the pump when the lift is in the neutral position.

Channels **N** and **P** are connected in the intermediate block **7** (Fig. 7) to feed the following spool valves.

Intake - Discharge phase

When the spool **(2)** is moved to right or left, the pressure increases and lifts the valve **(1)**. The oil is sent to channel D or G, depending on the direction of movement of the spool, to feed the outputs **S1** or **S2** via grooves **g1** or **g2**. At the same time, the returning oil is sent from the ram to output S1 or S2, depending on the position of the spool, and comes back to the return channel **R**.

Note: To prevent oil flowing on to the rear of the tractor, oil catchers (1) with pipes have been fitted on to the quick couplers (Fig. 9). Introduced from serial number R178047.

Change-over single/double acting

For the single acting position, unscrew the valve **(4)**. Output **S1** is now connected to channel **R**. Output **S2** feeds the ram.
For the double acting position, screw in the valve **(4)**.

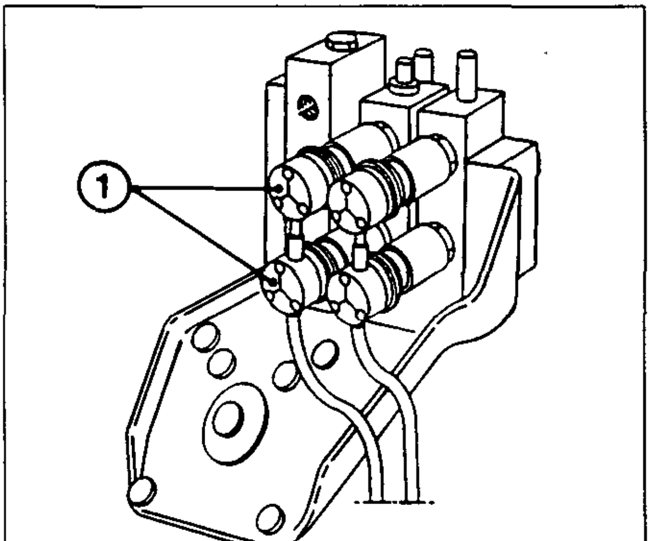


Fig. 9

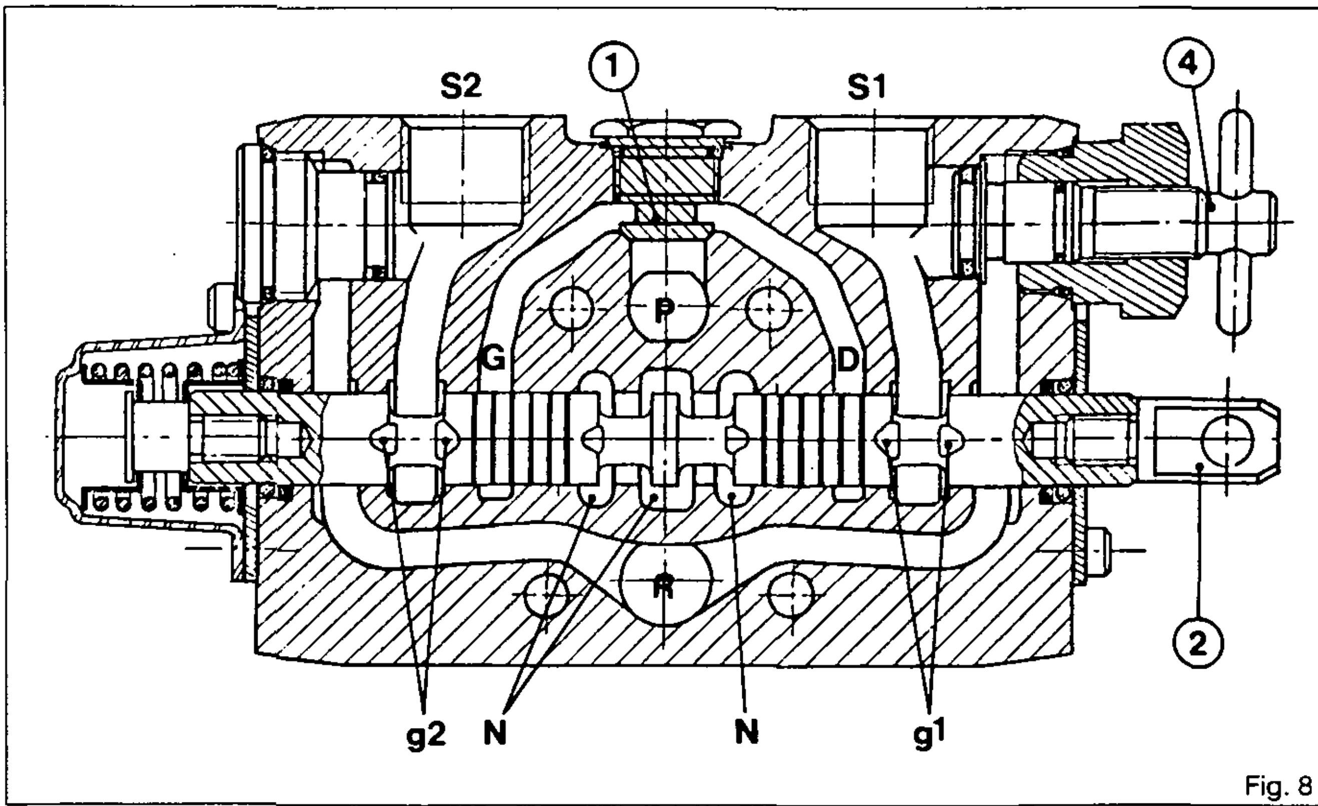


Fig. 8

C. 3-position spool valve, single/ double acting with kickout return to neutral

Operation

Neutral position

The operating principle of the 3-position spool valve, single and double acting with kickout return to neutral, is the same as that of the previous spool valve.

Intake - discharge phase (Fig. 10)

Operation identical to the previous 3-position spool valve, plus the special characteristic that it automatically returns to the neutral point.

The system in the housing **(3)** locks when the spool **(2)** is actuated.

The spool automatically returns at a pressure of 140-160 bar.

The pressure passes through the holes **a** and **b**, releases the system, and enables automatic return of the spool to the neutral position.

The housing **(3)** is in communication with channel **R**.

Residual pressure in the housing (above 2 bar) may cause the spool to return to neutral.

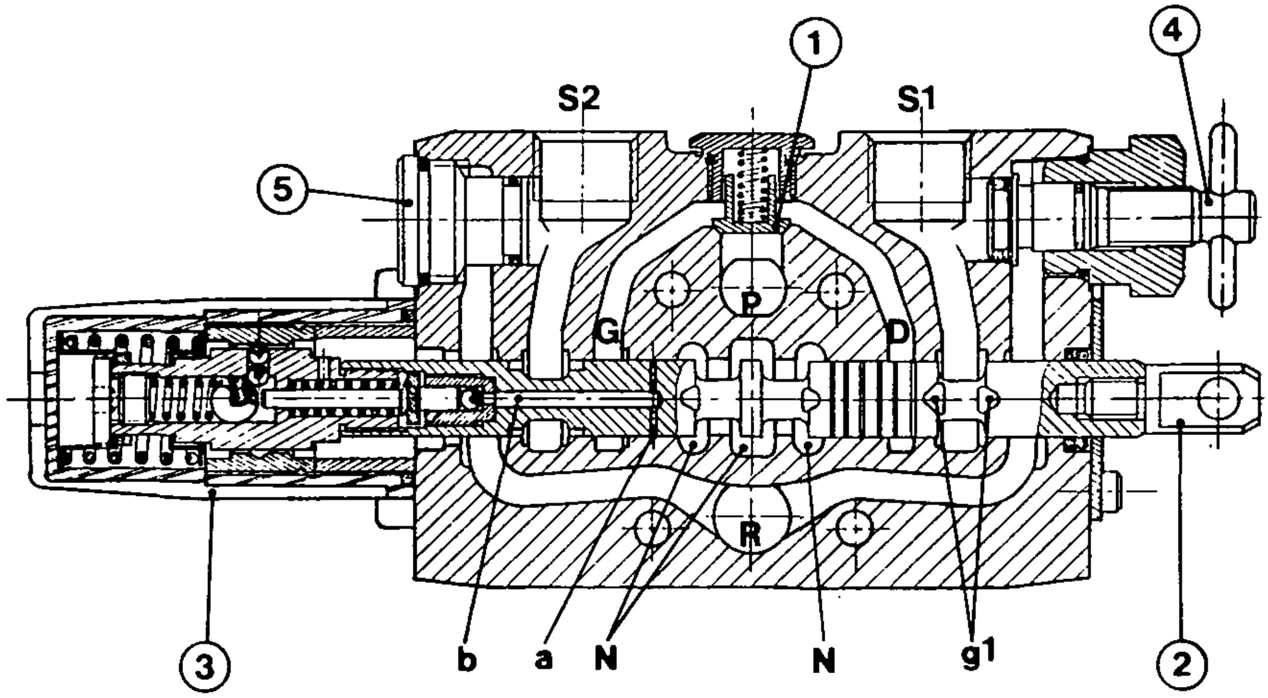


Fig. 10

D. 3-position spool valve, single/ double acting, with nonreturn valve and kickout return

This spool valve operates in the same way as the previous ones.

Operation of check valve (Fig. 11)

When the spool **(2)** is moved to the right, the oil coming from channel **N** is sent to the output **S2**, lifting the check valve **(6)** to feed the service side.

In the neutral position, the check valve seals the circuit.

When the spool **(2)** is moved to the left, the oil coming from channels **N** and **P** lifts the valve **(1)** and is sent to channel **D** to feed the service side via grooves **g1** and output **S1**.

In its movement, the spool moves the needle **(5)** which lifts the ball and causes the pressure to drop on the service side, enabling the valve **(6)** to lift from its seat and oil to flow towards channel **R**.

Note: When dismantling the spool, it is essential to dismantle the checkvalve (6) and the needle (5) first.
The spool valve body is available as spare part paired with the spool (2), the needle (5) and the valve (6).

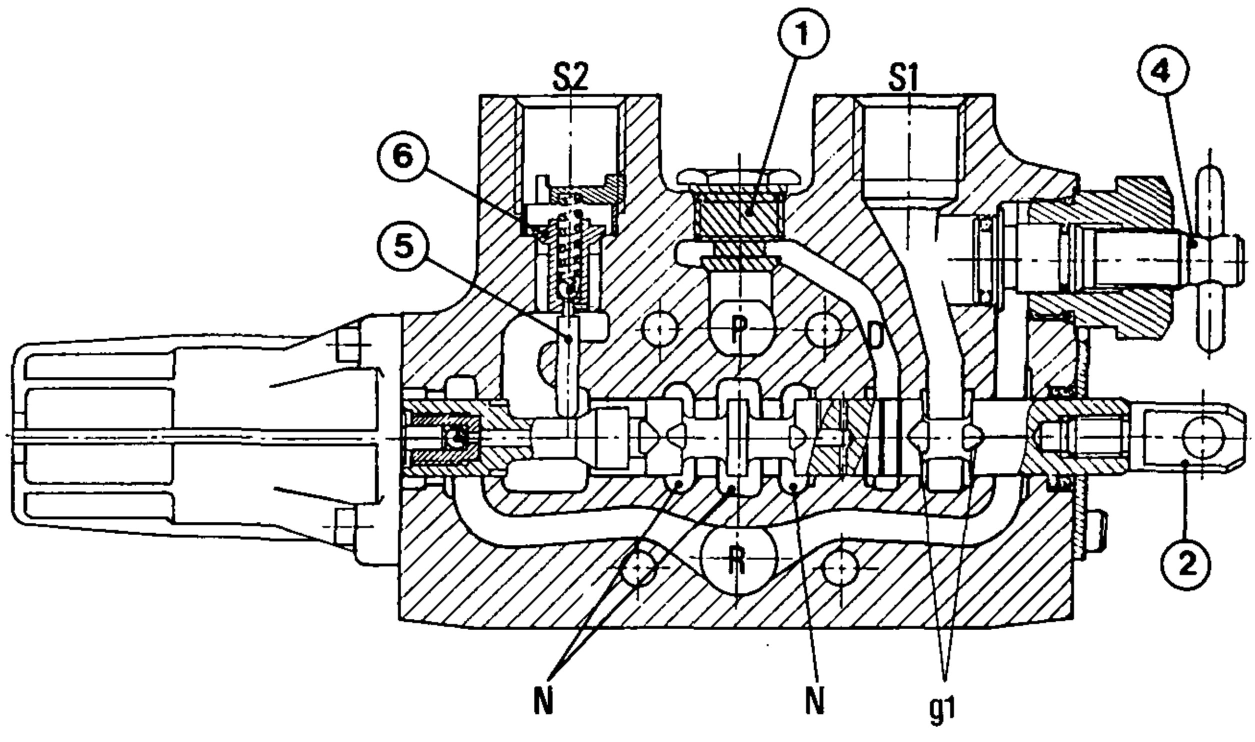


Fig. 11

E. 4-position spool valve, double acting with kickout return to neutral and floating position

Operation (Fig. 12)

When the spool **(2)** is moved to right or left, the same positions are obtained as with the previous spool valves.

The special characteristic of this spool valve is that it has a floating position **F**, when the spool is withdrawn as far as possible, beyond the kickout return to neutral position.

In this **F** position, the channels of outputs **S1** and **S2** are connected with the return channel **R**. Therefore the oil can circulate freely.

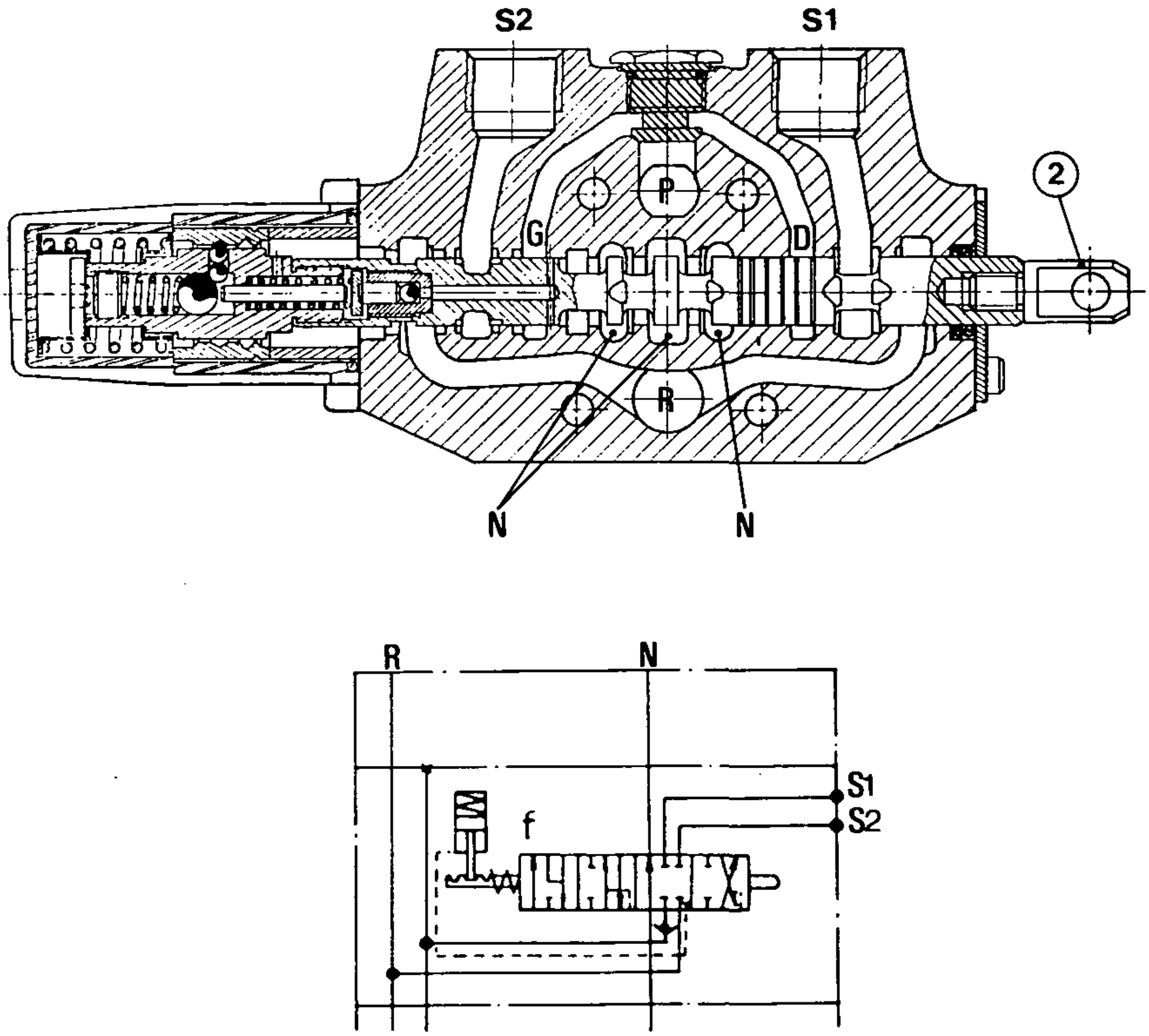


Fig. 12

F. Diagrams

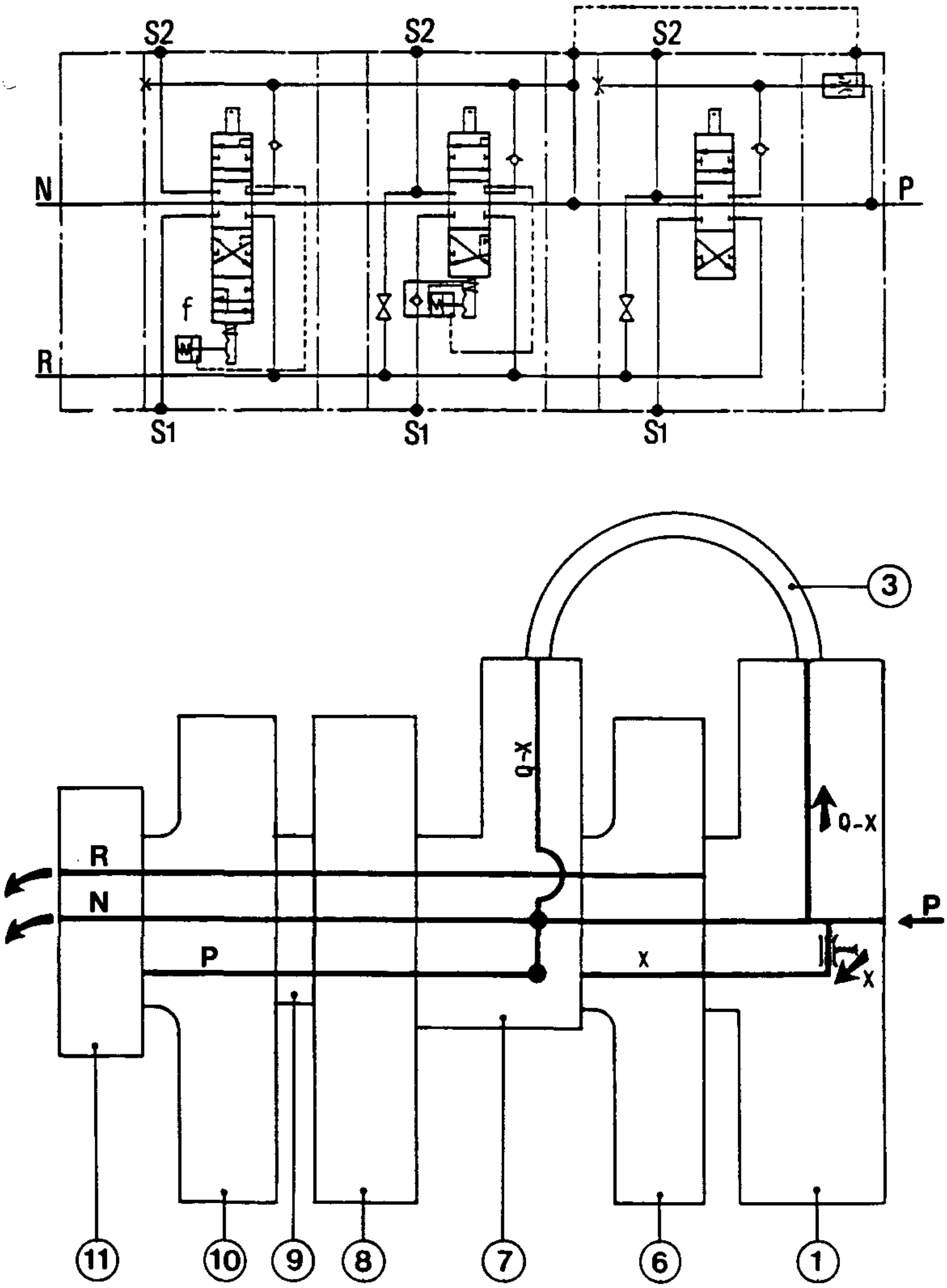


Fig. 13

G. Assembly and adjustment of control cables

Note: Depending on the version of the support, operations 1 to 6 have to be carried out when replacing the cables.

On levers with old support (Fig. 14)

1. Pass the cable through the grommet **(10)** at the rear of the cab and through the fastening **(6)** on the support **(9)**.
2. Fit the pin **(5)**.
3. Screw the clevis **(1)** on to the threaded part of the cable **(2)** and fit it on the lever **L** with the clip **(7)**. Tighten the nut **(3)**.
   Note: Check that the cable is not constrained.

On levers with new support (Fig. 15)

4. Pass the cable through the grommet **(10)** at the rear of the cab.
5. Fit and tighten the fastening **(6)** on the support **(9)**.
6. Screw the clevis **(1)** on to the threaded part of the cable **(2)** and fit it on the lever **L** with the clip **(7)**. Tighten the nut **(3)**.
   Note: Check that the cable is not constrained.

On the spool valves (Fig. 16)

7. Check that the spools are in the neutral position.
8. Screw the clevis **(1)** on to the threaded part of the cables **(2)**.
   Tighten the nuts **(3)** and fit the pins **(4)**.
9. Partially screw on the sleeves **(5)** and fit the screws **(6)** without tightening them.
10. Adjust the sleeves so that the control levers are correctly positioned in relation to the "symbol" plates, according to the dimensions shown in Figs. 14 and 15.
11. Fix the screws **(6)** and tighten the nut **(7)** to a torque of 20 Nm.
12. Check the operation of the controls and the spool valves in the three or four positions, depending on the option.

Fig. 14

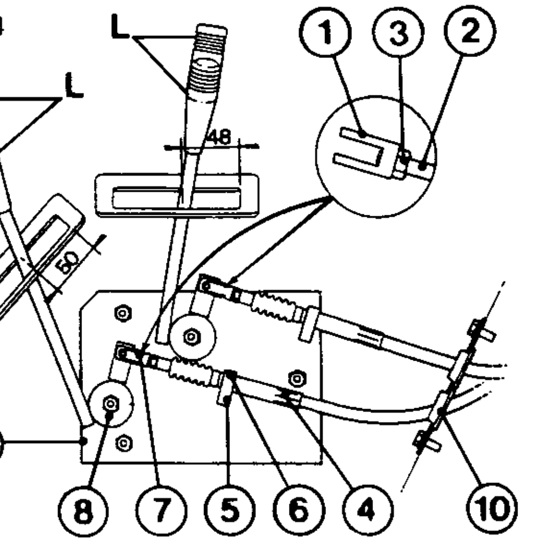
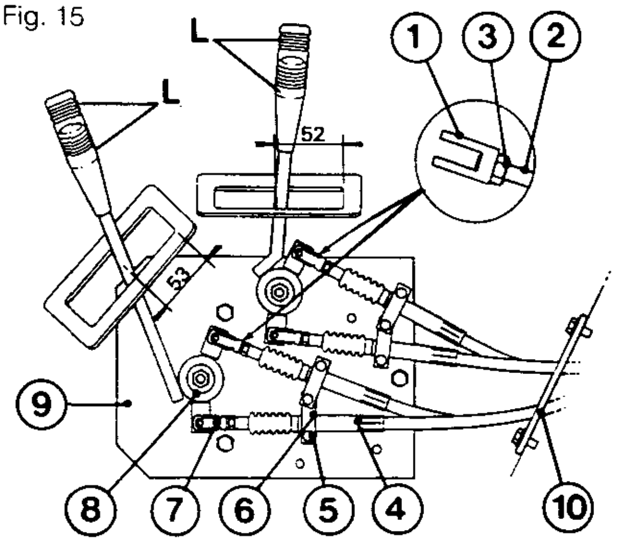


Fig. 15



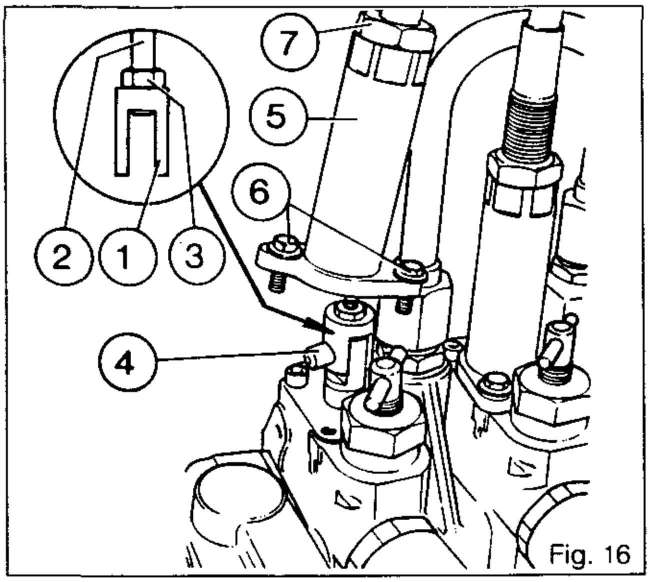


Fig. 16

8 C02 "Bosch" auxiliary spool valves

CONTENTS

Hydraulics - "Bosch" auxiliary spool valves

General

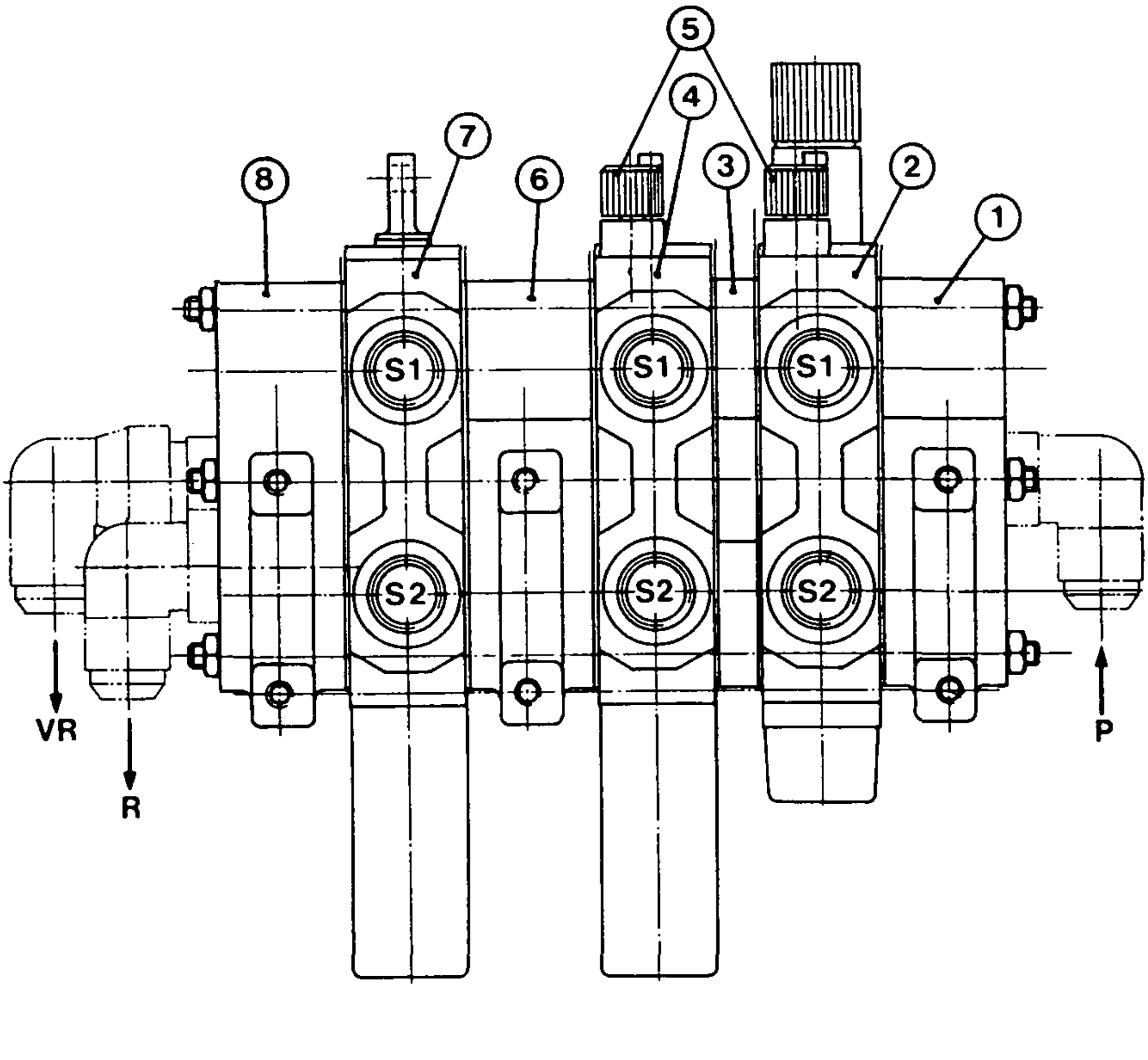
"Bosch" spool valve can be fitted instead of and in place of "Rexroth" spool valves. Their operation is identical and the different options are also the same.
For assembly and adjustment of control cables, refer to chapter 8C01, section G.

Parts list

(1) Intake block
(2) 3-position spool valve, single/double acting with flow divider, return to neutral by spring
(3) Spacer
(4) 3-position spool valve, single/double acting with kickout return to neutral
(5) Single/double acting change-over knobs
(6) Intermediate block
(7) 4-position spool valve, double acting, kickout return to neutral and floating position
(8) End plate enabling continuation to lift and return to casing

Designation of ports

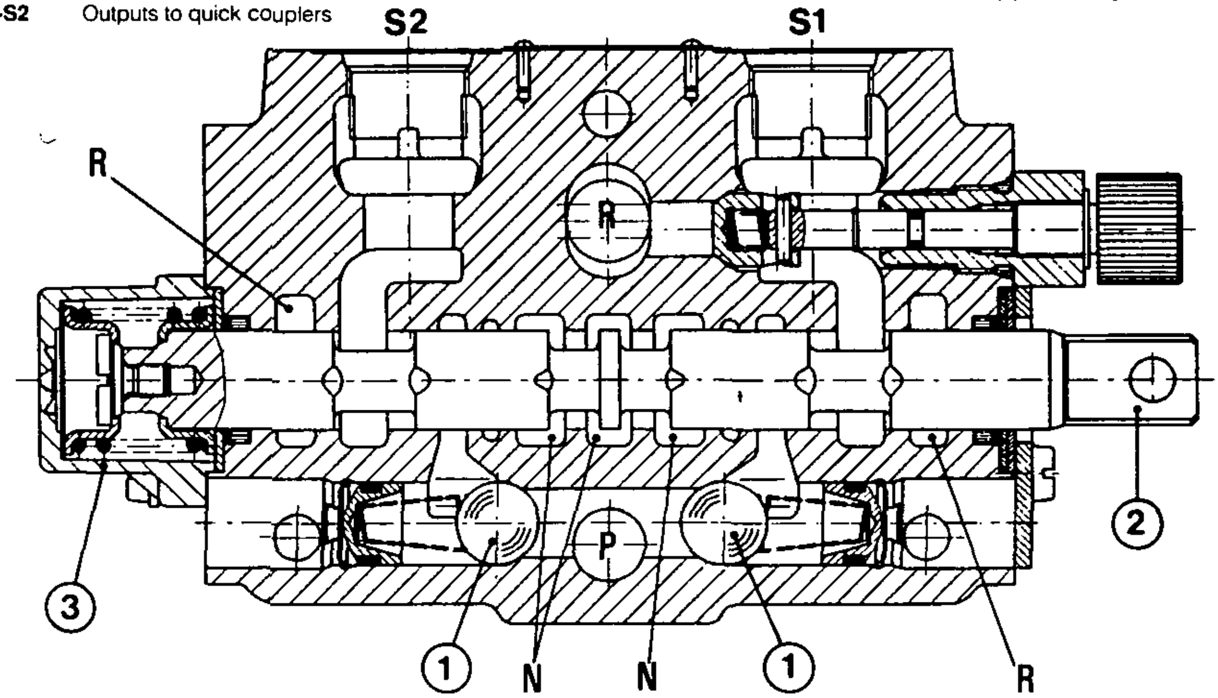
VR Feed port, towards the lift valve
P Pressure
R Return
S1-S2 Outputs to quick couplers



A. 3-position spool valve, single/double acting

N	Continuity to lift valve
P	Pressure
R	Return
S1-S2	Outputs to quick couplers

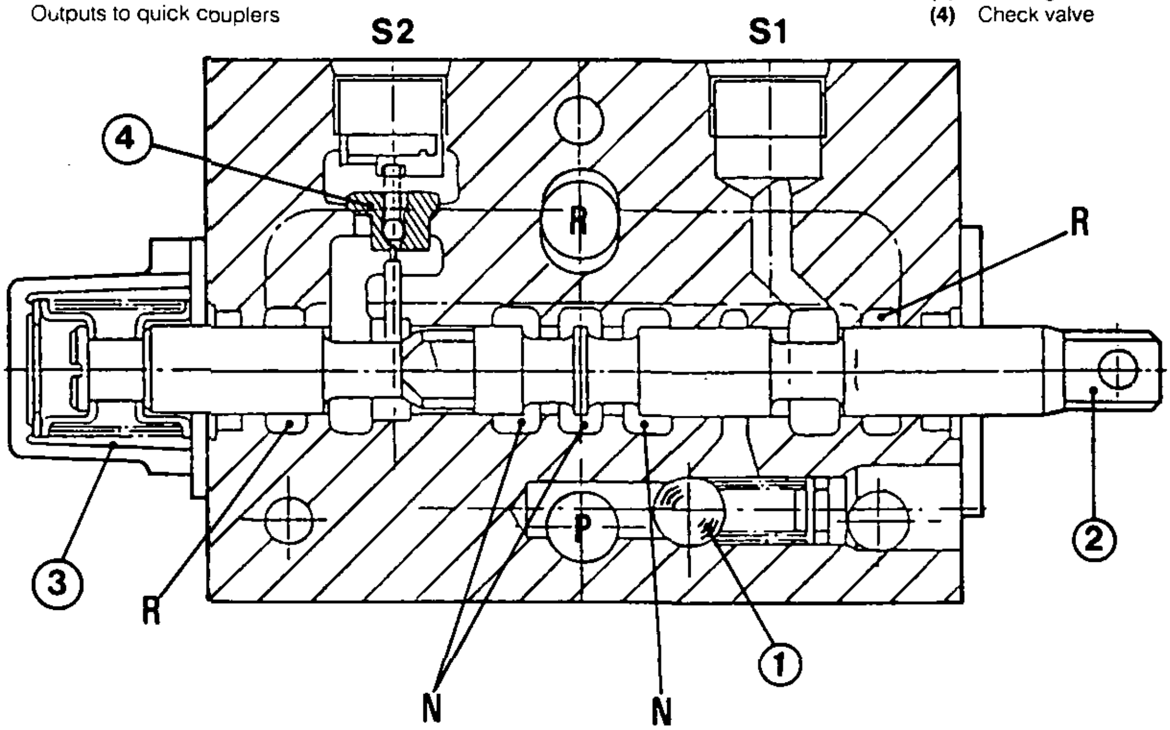
(1)	Valves
(2)	Spool
(3)	Housing



B. 3-position spool valve, double acting with check valve

N	Continuity to lift valve
P	Pressure
R	Return
S1-S2	Outputs to quick couplers

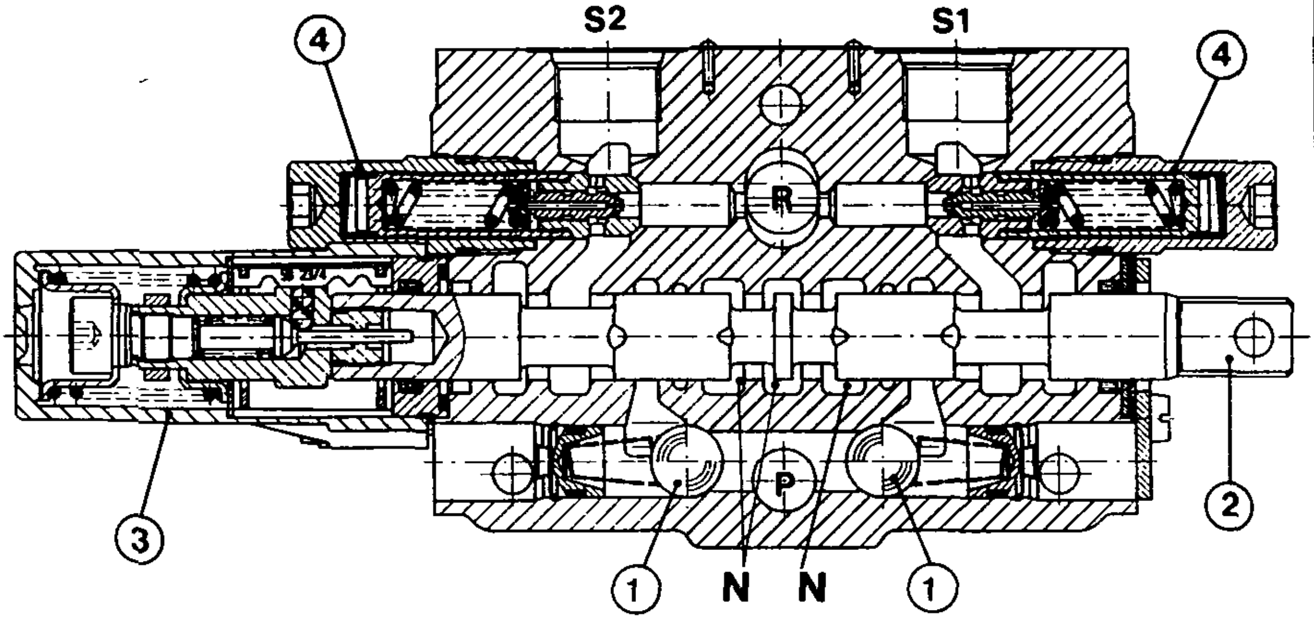
(1)	Valve
(2)	Spool
(3)	Housing
(4)	Check valve



C. 3-position spool valve, double acting with shock valves

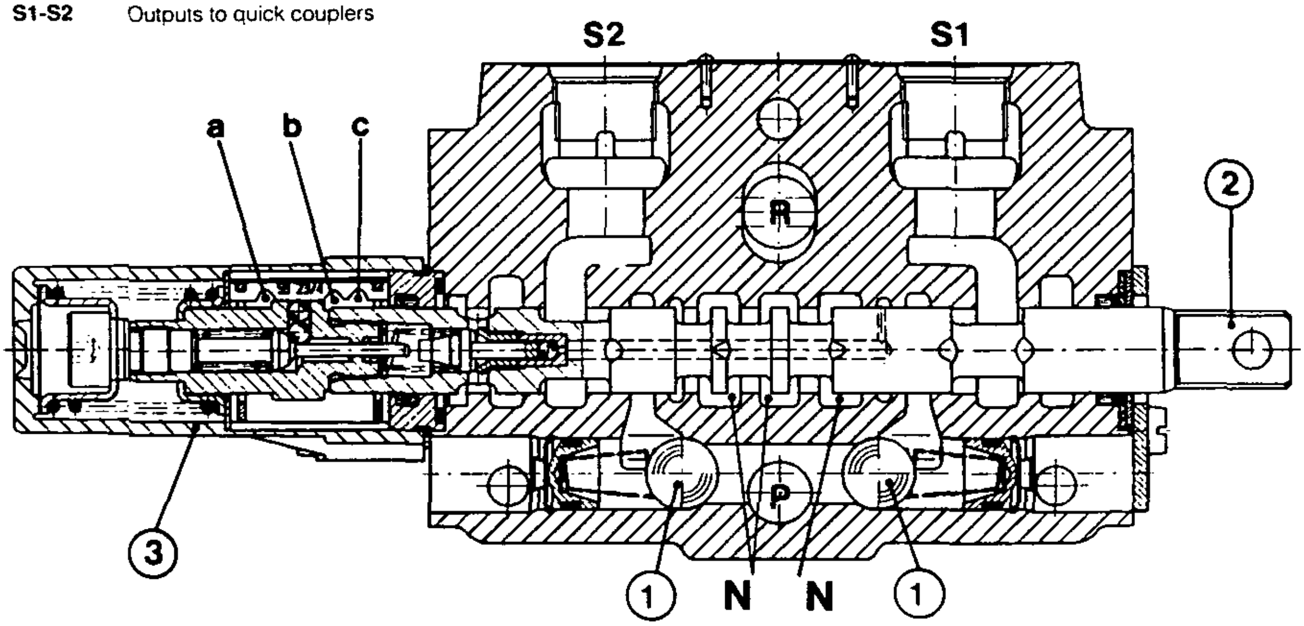
This type of spool valve is used with high-inertia hydraulic motors.

N	Continuity to lift valve	**(1)**	Valves	**(3)**	Housing
R	Return	**(2)**	Spool	**(4)**	Shock valves
S1-S2	Outputs to quick coupling				



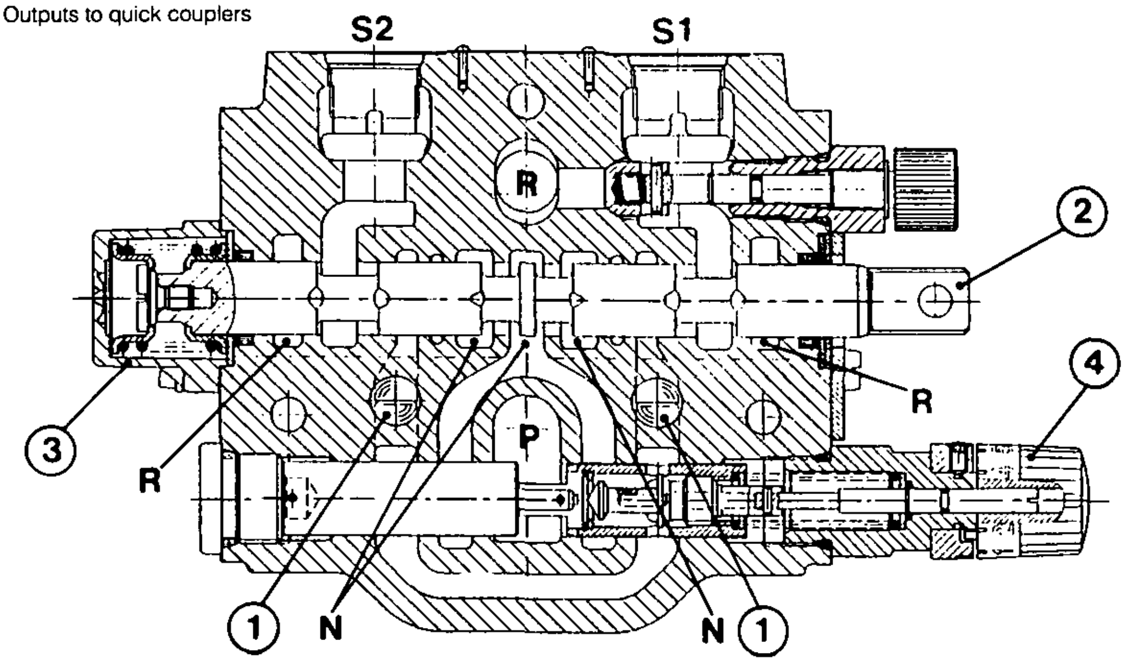
D. 4-position spool valve, double acting, kickout return to neutral and floating position

(1)	Valves	**a-b**	Locking of kickout return to neutral position, depending on position of spool
(2)	Spool	**c**	Locking of floating position
(3)	Lock housing		
N	Continuity to lift valve		
R	Return		
S1-S2	Outputs to quick couplers		

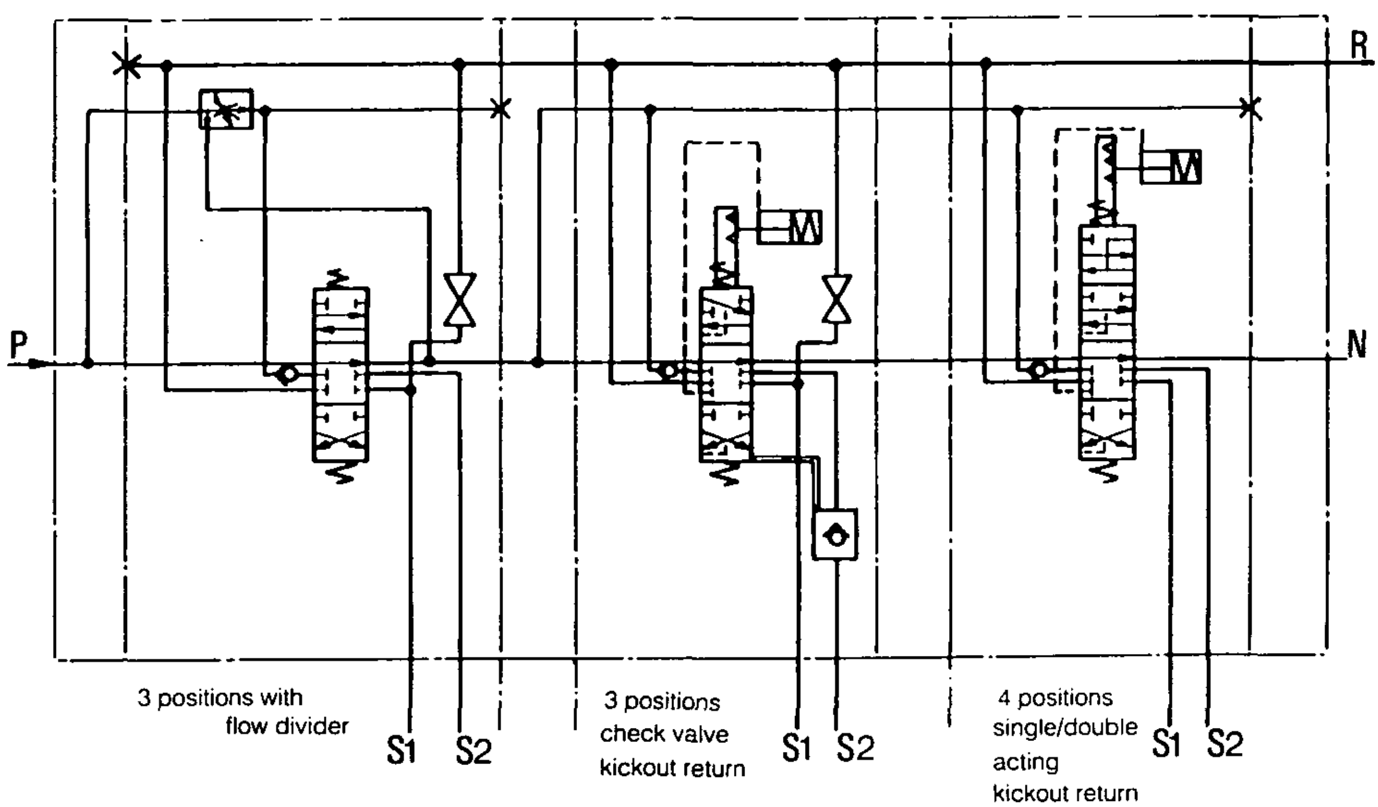


E. 3-position spool valve, single/double acting with flow divider

N	Continuity to lift valve	(1)	Valves	(3)	Housing
P	Pressure	(2)	Spool	(4)	Flow divider
R	Return				
S1-S2	Outputs to quick couplers				



F. Diagram



8 D01 Lift Control Valve

CONTENTS

General

The lift valve is fixed on the left cover mounted on the centre housing. Its function is to regulate the flow of oil to and from the lift cylinders according to the signals transmitted to it by the computer of the electronic control system. This valve is composed of a series of spools and valves, most of which are not reparable as separate parts.

A. Removal and refitting of lift control valve (Fig. 1)

Removal

1. Mark and disconnect the harnesses of the lift **(1)** and lower **(2)** solenoid valves.
2. Disconnect and plug the supply hose **(3)** of the valve and the supply tube **(4)** to the lift cylinders.
3. Remove the screws **(7)**.

Refitting

4. Clean the joint faces of the cover and of the valve.
5. Change the seals **(1)**, refit the valve (Fig. 2).
6. Fit and tighten the screws **(7)** to a torque of 25-35 Nm.
7. Reconnect the hose **(3)** and the tube **(4)**.
8. Reconnect the lift **(1)** and lower **(2)** solenoid valves (yellow connector).
9. With a clip, fasten the cable on the valve supply hose.
10. Start the engine.
11. *Check the operation of the lift system and check* the seals and hydraulic connectors for leaks.

Description

The BOSCH hydraulic valve controls the supply to the lift cylinders and is composed of two sections:

Hydraulic section comprising the following parts:

(1) Nonreturn valve, maintaining oil in the cylinders.
(2) Servo piston used in the lower phase.
(3) Nonreturn valve used in the lower phase.
(4) Control spool valve.
(5) Flow regulator spool valve.
(6) Shock valve set at 200 bar.
(9) Spool valve spring, flow regulation.
(10) Control spool valve spring.
(11) Control spool valve spring.
(12) Nonreturn valve ball.
(13) Restrictor.

Electrical section comprising two electromagnetic coils:

(7) Lower solenoid.
(8) Lift solenoid.

Designation of ports:

N : Continuity port towards transfer tube and pump intake.
P : Pressure.
R : Return to housing.
V : Cylinders supply and return.

Note: To distinguish between a hydraulic fault and an electrical fault, simply operate the push-buttons at the ends of the solenoid valves, thereby eliminating the effect of the electronic lift system.

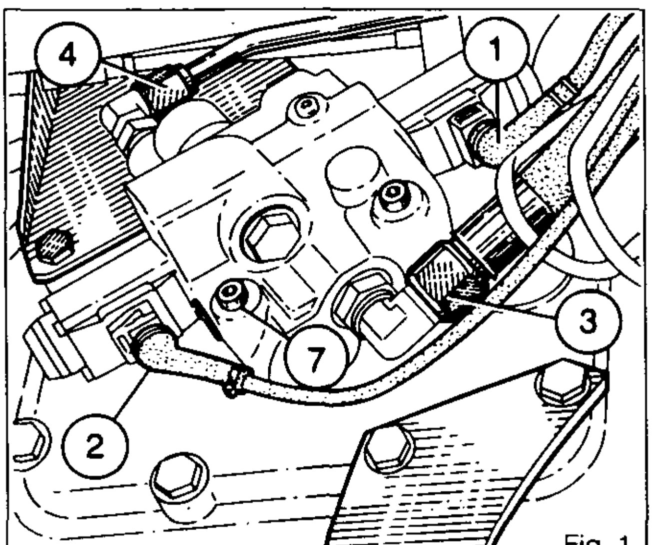


Fig. 1

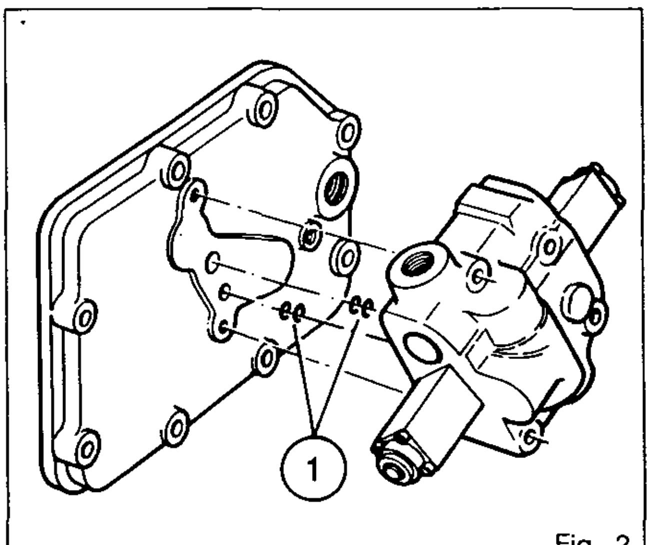
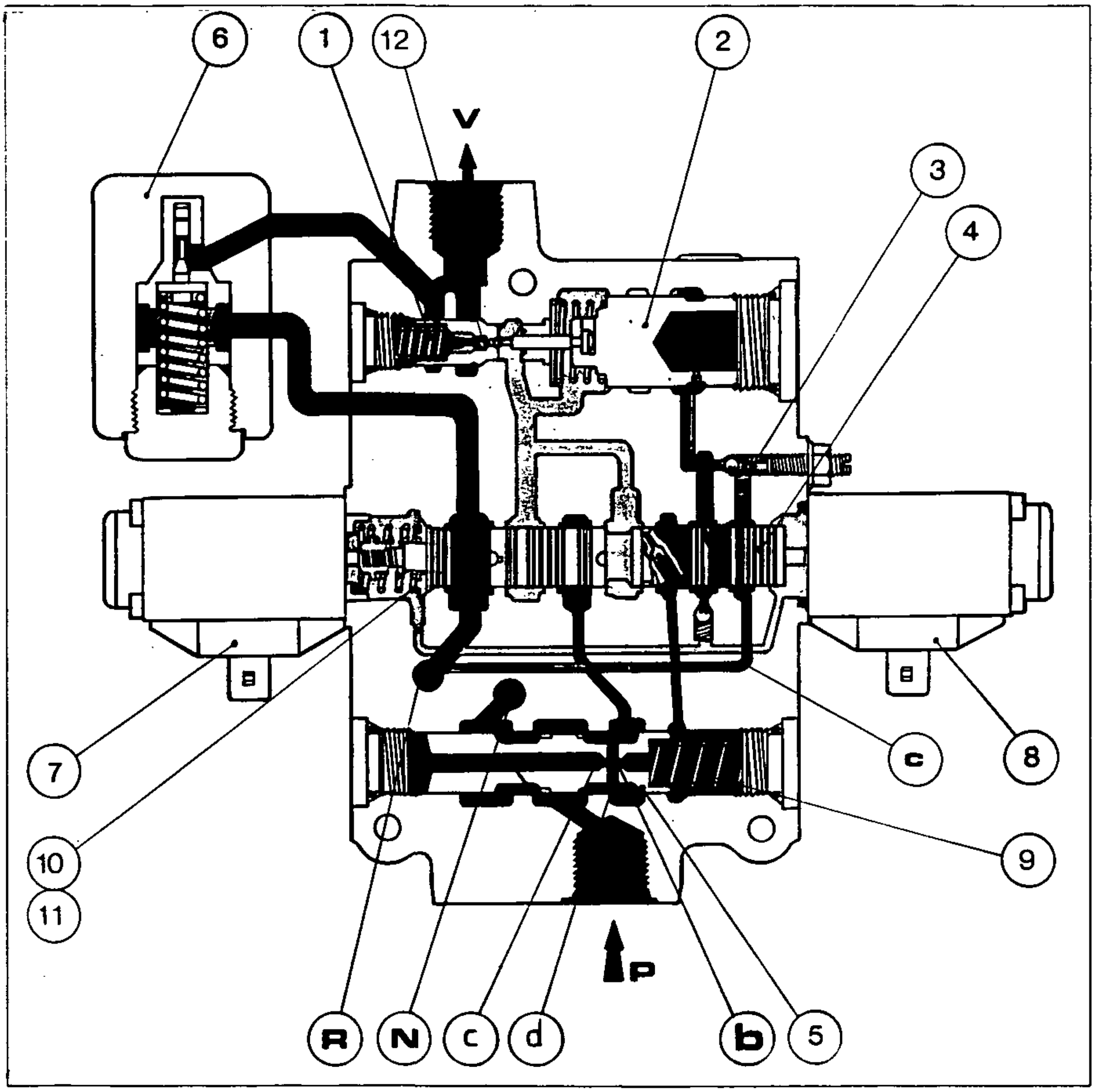


Fig. 2

B. Neutral position

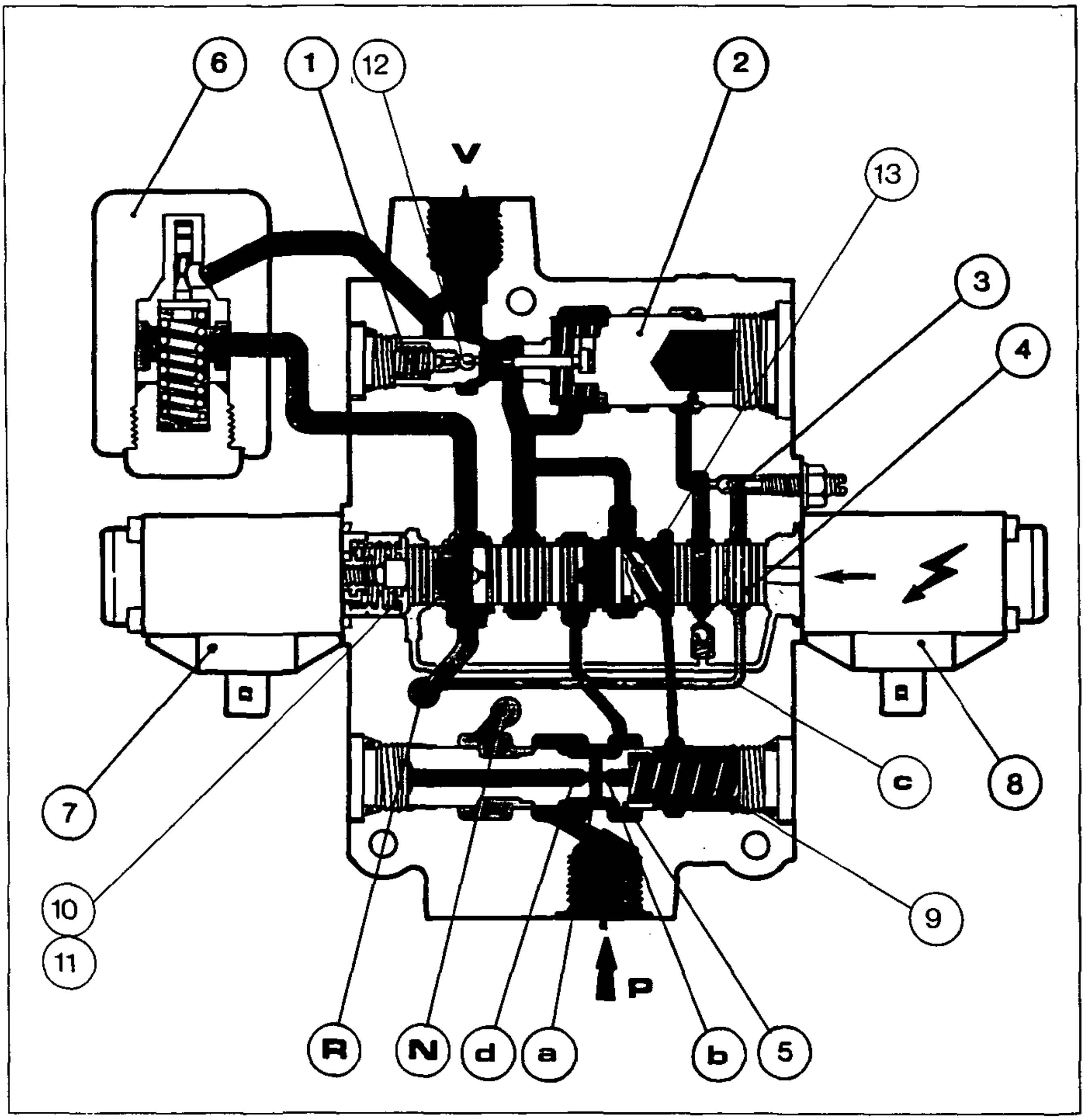
When the engine is stopped, the control valve is in the neutral position. The spool valve **(4)** is held in position by the springs **(10)** and **(11)**.
The flow regulator spool valve **(5)** is pushed towards the left by the spring **(9)**.
When the engine is running, the hydraulic pump supplies the spool valve via the braking valve (if fitted) and the auxiliary spool valves. Pressure is delivered via orifice P. The oil flows initially through hole «a» and orifice «b». Because orifice «b» is smaller than hole «a», there is a pressure drop on the spring **(9)** side.
This action causes a control flow to be established which passes to the spool valve **(4)** and then to the return orifice R on the casing.
Once the control flow is established, the spool valve **(5)** moves to the right to a position which maintains the control flow and thus enables the oil to be directed towards the intake of the pump via the continuity orifice N and the transfer tube.
When the spool valve is brought back to the neutral position from the lower position, a channel from behind the piston to the return port C is still open.



C. Lift phase

The lift solenoid **(8)** is actuated to raise the tractor linkage.
The control spool valve **(4)** moves to the left and stops the control flow, placing the chamber of the spring **(9)** under pressure and pushing the spool valve **(5)** to the left.
The movement is dampened by the volume of oil flowing through orifice d.

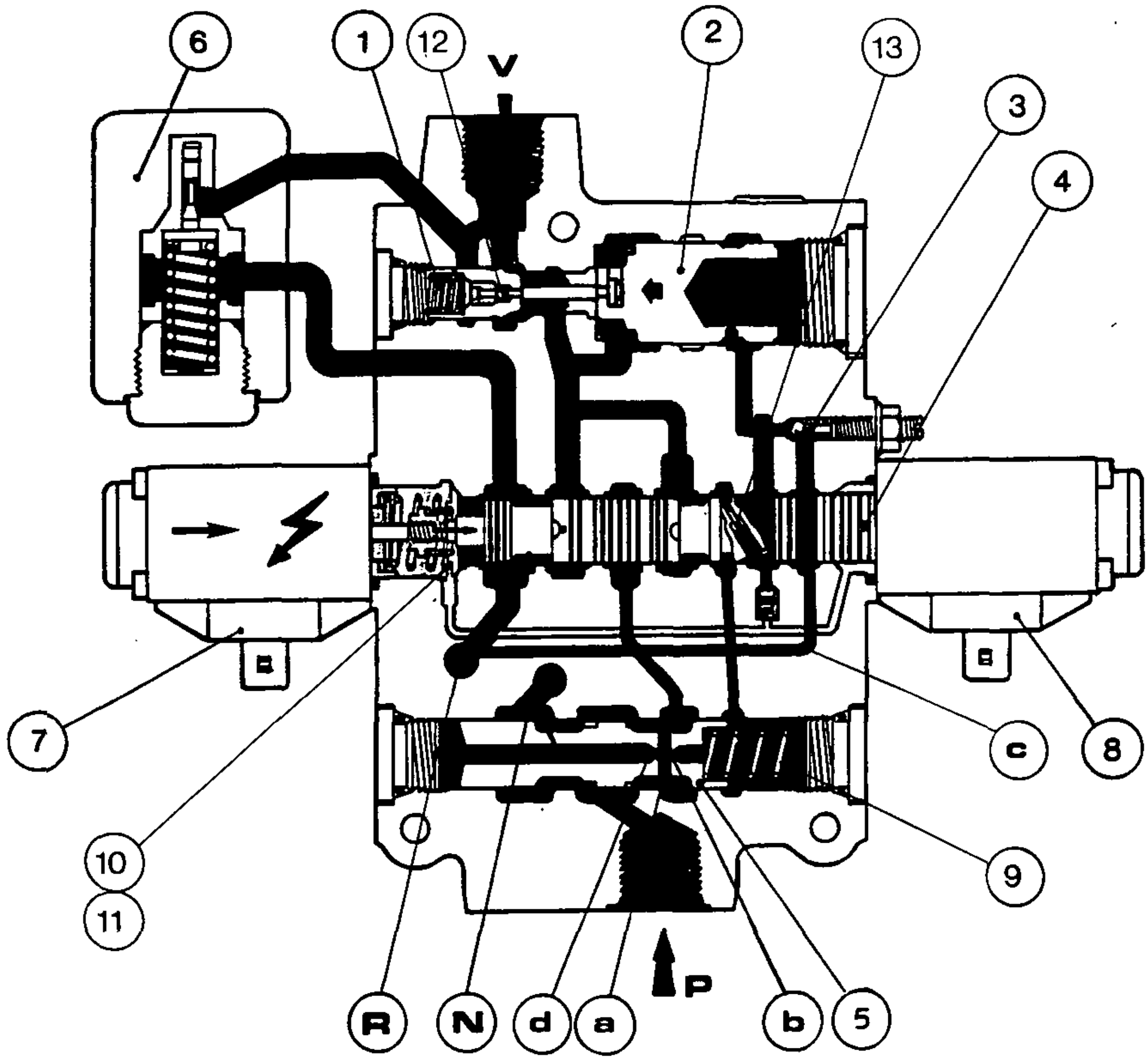
The spool valve **(5)**, having moved to the left, enables the main flow to be directed to the spool valve **(4)** and to the nonreturn valve **(1)**.
As soon as the pressure on the nonreturn valve is greater than the pressure in the channels of the cylinders, the valve opens and linkage rises.



D. Lower phase

The lower solenoid **(7)** is actuated to lower the tractor linkage. The control spool valve **(4)** moves to the right. The control flow stops and the return channel from the piston **(2)** is closed. Oil is directed under pressure via the hole a, the orifice b and the restrictor **(13)** towards the piston **(2)** which is moved to the left.

The rod at the end of the piston **(2)** lifts the ball **(12)** of the nonreturn valve **(1)** from its seat, firstly causing a pressure drop in the lift cylinders circuit. Secondly, the piston **(2)** opens the valve **(1)**, enabling the oil returning from the cylinders to be directed towards the return port R to the housing. As the movement of the piston **(2)** is limited, the control flow is reestablished, and is directed towards the nonreturn valve **(3)**, the return port C and the return port R to the housing. The lower phase has no effect on the spool valve **(5)** which is in a floating position. *It enables the minimal flow required for control* purposes and ensures that the main flow is able to pass to the pump intake via the continuity port N and the transfer tube.



8 E01 Hydrostatic steering

CONTENTS

Hydraulics - Hydrostatic steering

General

The steering system used on 3000/3100 series tractors is a hydrostatic system with no mechanical linkage between the steering wheel and the steering cylinder. The main components of the system are as follows :
- A pressurised oil feed supplied by the low-flow stage of the hydraulic pump.
- A hydrostatic steering unit (Orbitrol).
- A double acting steering cylinder fitted on the 4WD front axle or the 2WD axle.

The Orbitrol is supplied by the low-flow system as a matter of priority. When the steering wheel is turned, the required flow of oil is sent to the relevant side of the steering cylinder. The excess flow not required for steering, combined with the oil returning from the cylinder is then directed on to the distribution valve situated under the hood, which then goes on to satisfy the needs of the transmission, brakes and clutch..

If the engine breaks down or the hydraulic pump fails, the Orbitrol acts as a manual pump, so that steering control is maintained at all times.

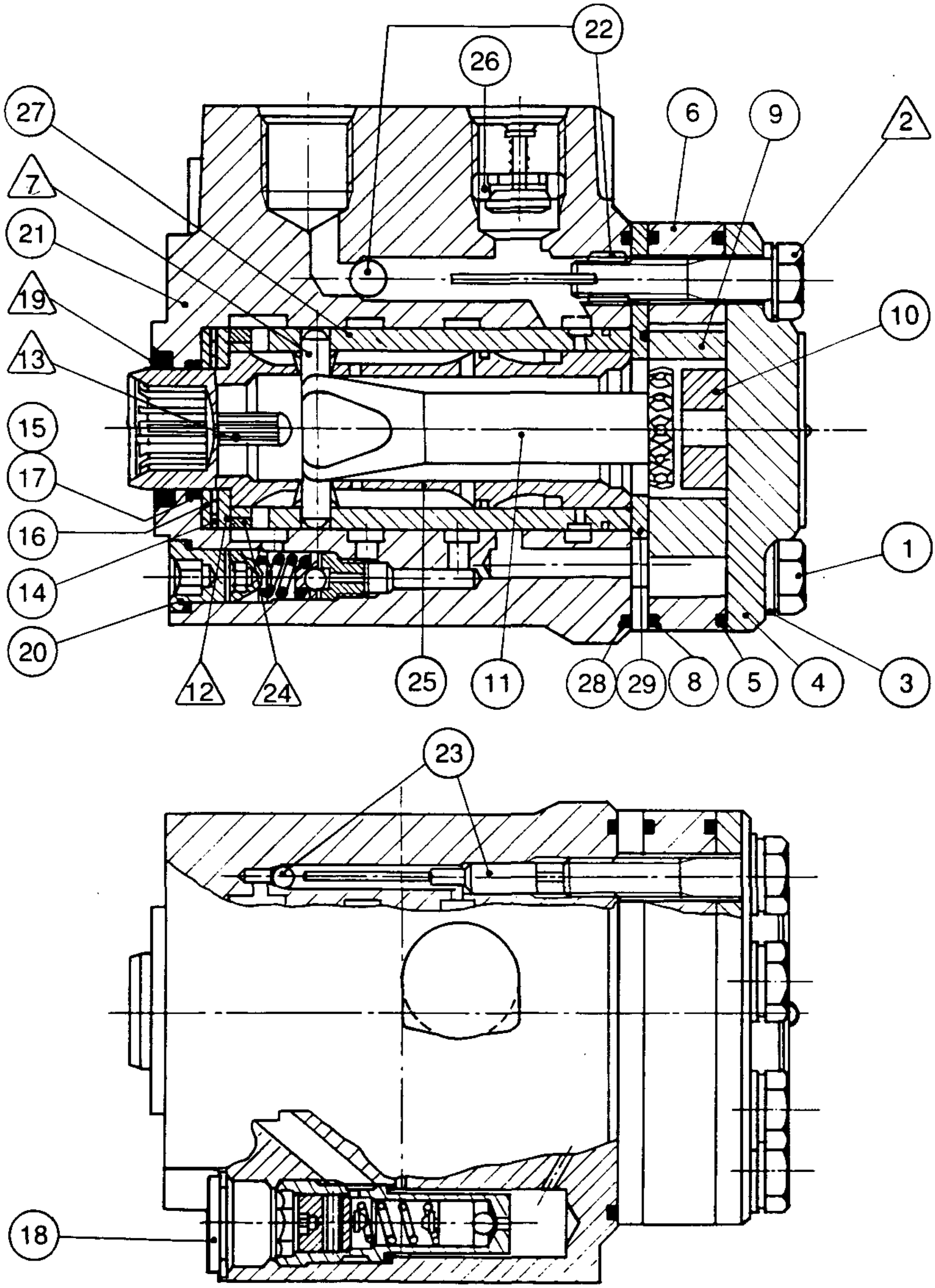
Operation

The Orbitrol unit consists of spool and sleeve with neutralising springs and a drive pin which connects to the cardan shaft. The cardan shaft is in turn connected to the metering unit. The Orbitrol unit has 4 hydraulic connections, pressure,returns (to distribution valve) and 2 service ports for the steering ram. The steering system is protected by a relief valve and 2 shock valves with suction valves.
The spool and sleeve act as a valve which has a neutral and 2 operating positions, the latter relate to left and right hand turns. When no movement of the steering ram is required the sleeve and spool are maintained in a neutral position by a set of leaf type neutralising springs. There is also a pin which passes through holes in the sleeve and spool.
The pin has 2 functions :
-1 to limit the maximum travel between the sleeve and spool to fully select the left or right turn mode
- 2 drive the metering unit via the cardan shaft

Parts list

(1) Screw
(2) Screw
(3) Seal
(4) Cover plate
(5) O-ring
(6) Stator
(7) Pin
(8) O-ring
(9) Rotor (metering valve)
(10) Spacer
(11) Cardan shaft
(12) Washer
(13) Centring springs
(14) Needle roller bearing
(15) Kin-ring
(16) Washer
(17) O-ring
(18) Relief valve
(19) Seal
(20) Shock valves
(21) Orbitrol
(22) Non return valve
(23) Suction valves
(24) Ring
(25) Spool valve
(26) Check valve
(27) Sleeve
(28) O-ring
(29) Distributor plate

General arrangement

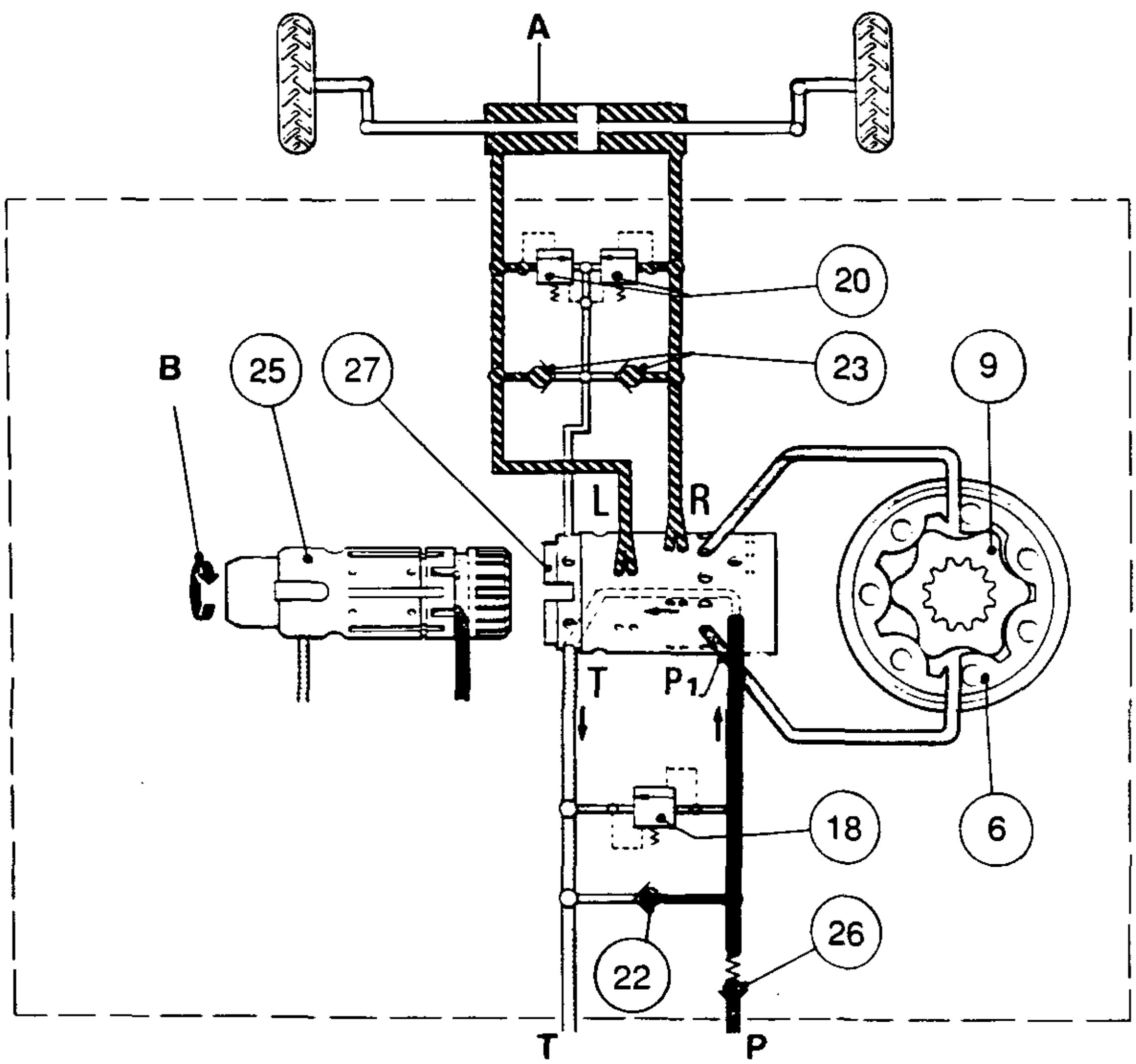


A. Neutral position (engine running)

In the neutral position, holes in the spool **(25)** line up with holes in the sleeve **(27)**. Oil from the low flow pump is directed through the open centre of the valve to the returns port and to the distribution valve. There is no oil supply to ports P1 - L and R.

The hydraulic lines to the ram cylinder are isolated. Two shock valves **(20)** and two suction valves **(23)** are fitted internally to the left and right outlet ports. The shock valves protect the system between the steering ram and the orbitrol unit from excessive pressure, such as when the wheels hit an obstruction when the steering is in neutral. The suction valves allow the other side of the system to compensate for any oil that is released by the shock valves.

A check valves **(26)** is fitted in the oil feed port of the orbitrol unit. This is a one-way valve to prevent peak induced pressures that can be generated by the road wheels bearing passed to pump when steering.

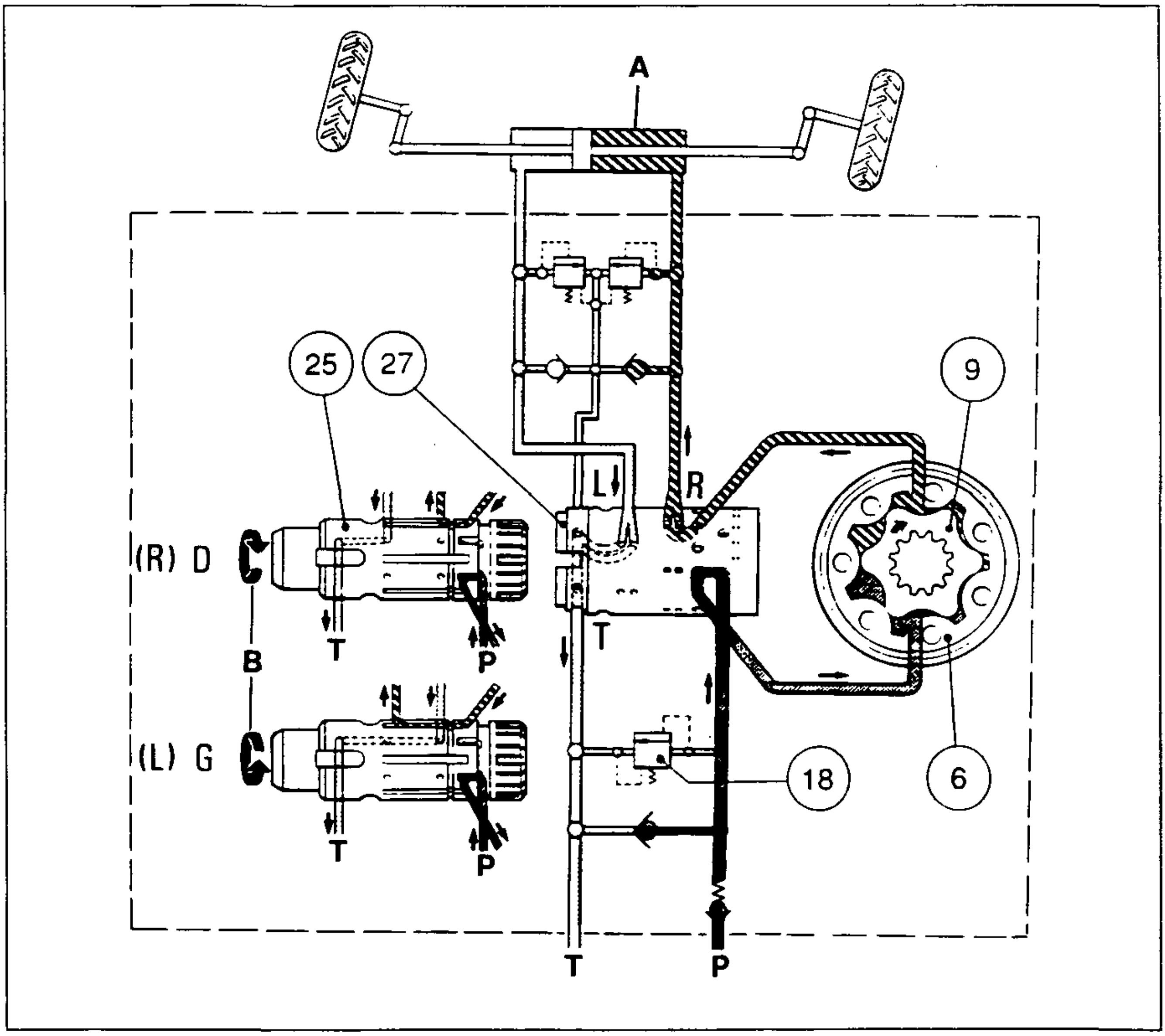


A Steering cylinder
B Position of steering wheel, left or right
L Supply to the left hand side of the steering cylinder
P Low-flow supply coming from the hydraulic pump
P1 Supply to the metering valve (stator **(6)** and rotor **(9)**)
R Supply to the right hand side of the steering cylinder
T Supply to the distribution valve

B. Wheel turning (engine running)

The first movement of the steering wheel moves the spool **(25)** against the leaf springs **(13)**. This closes the neutral ports and aligns slots in the spool with holes in the sleeve allowing oil to pass to the metering unit (stator **(6)** and rotor **(9)**). Further movement of the steering wheel continues to turn spool, sleeve and metering unit. Simultaneously the metering unit controls 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 holes in the sleeve to direct the oil to the left or right side of the «balanced action» steering ram. The oil returning from the steering ram is directed, by the slots in the spool valve which align with the holes in the sleeve, to the returns port which leads to the distribution valve.

Should the pressure within the steering system exceed 160 bar (2322 lbf/in²), the relief valve **(18)** situated in the Orbitrol unit will relieve the excess pressure. When the relief valve is actuated for example when the steering wheels are at full lock or against an obstruction, the oil which is released goes out to the returns port.

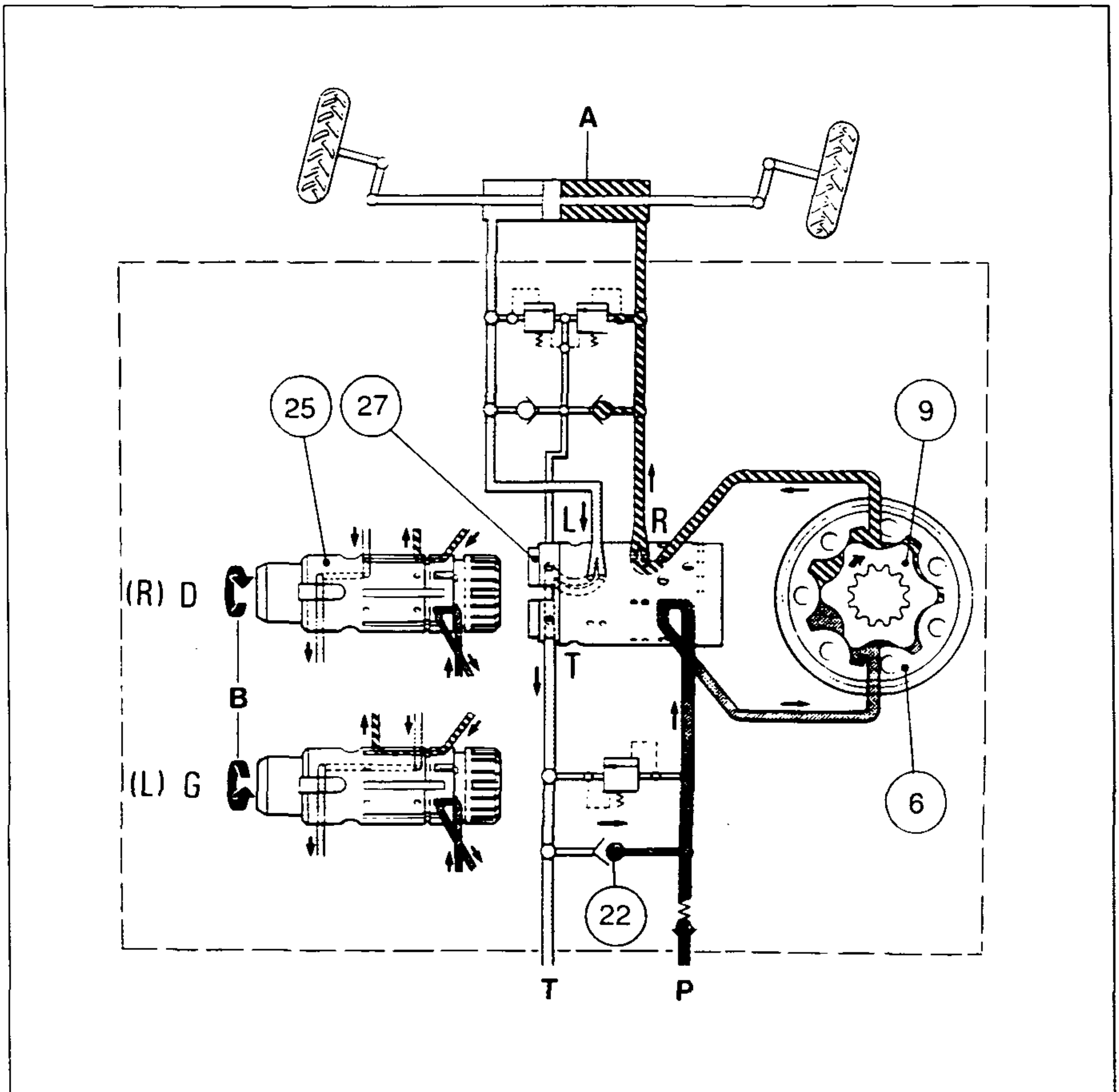


C. Manual steering (engine stopped)

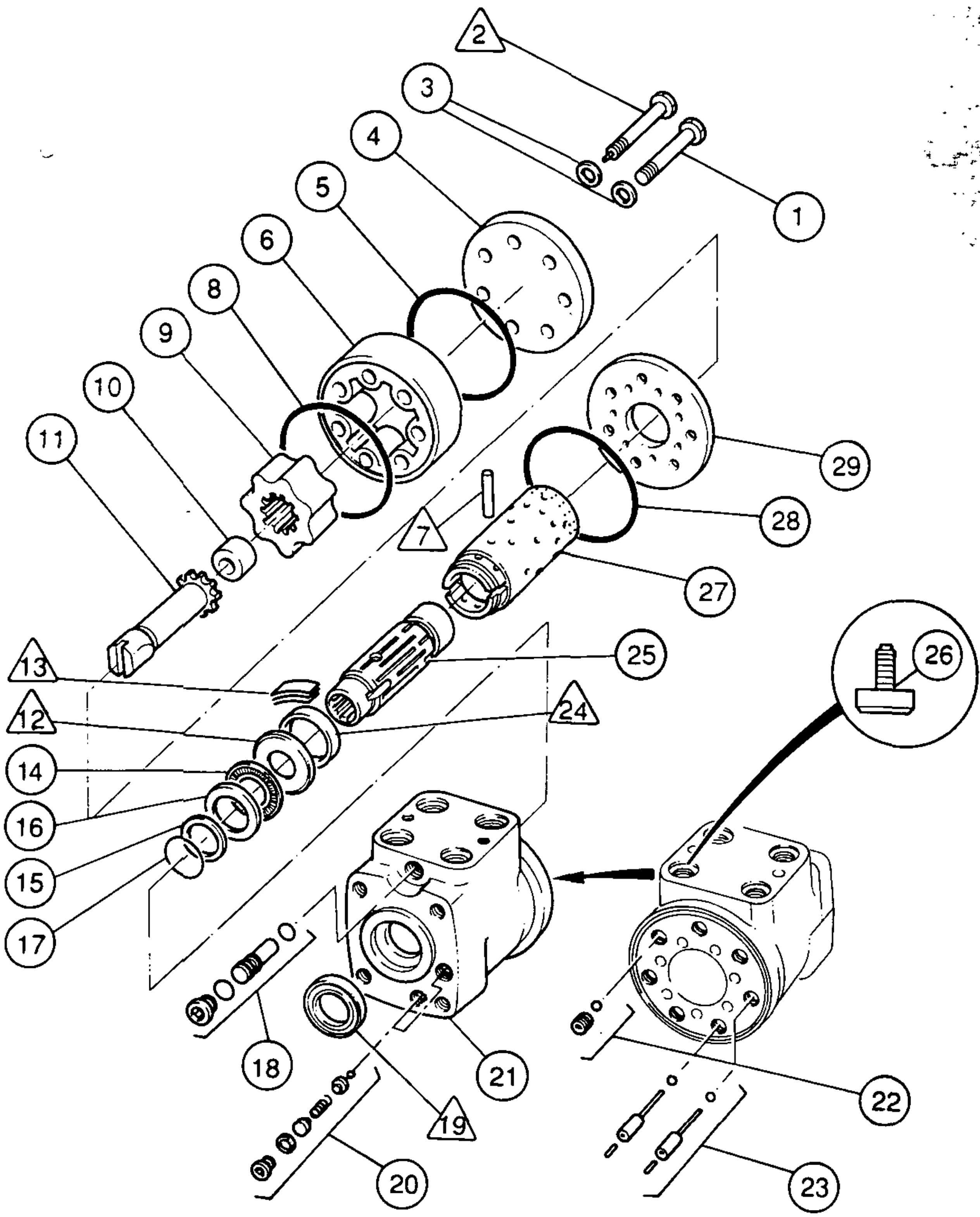
Should the pressure from the hydraulic pump cease, it is important that steering should still be maintained. For this reason, a non-return valve **(22)** is situated between the inlet and return galleries inside the orbitrol assembly.

When the hydraulic pump is functioning normally, the non-return valve is held on its seat by the oil pressure, allowing the oil to pass into the spool and sleeve valves.

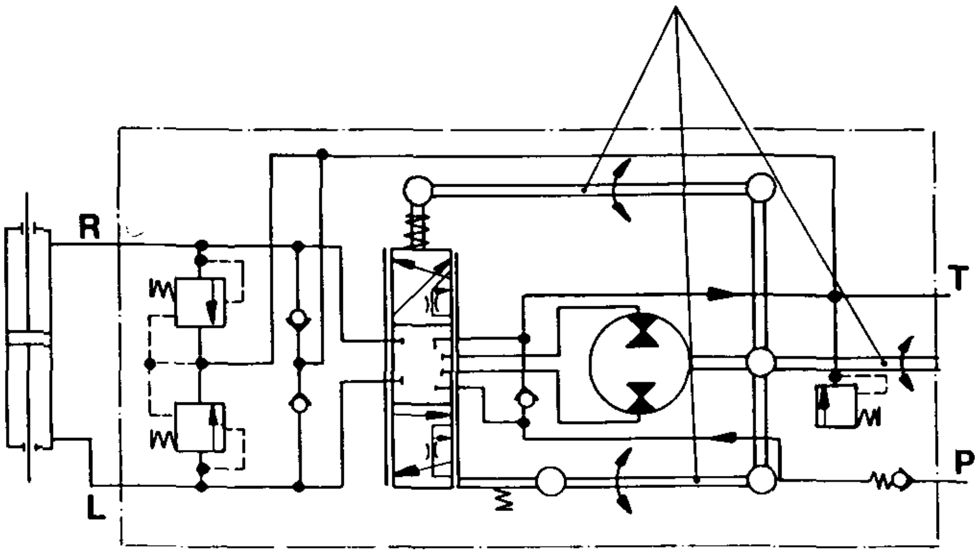
When the pressure from the hydraulic pump drops, the oil returning from the steering cylinder «A» is allowed to pass through the non-return valve to the inlet side of the spool valve, enabling oil to be passed from one side of the steering cylinder to the other. In this way steering control is maintained at all times. The pressure generated is proportional to the torque exerted on the steering wheel.

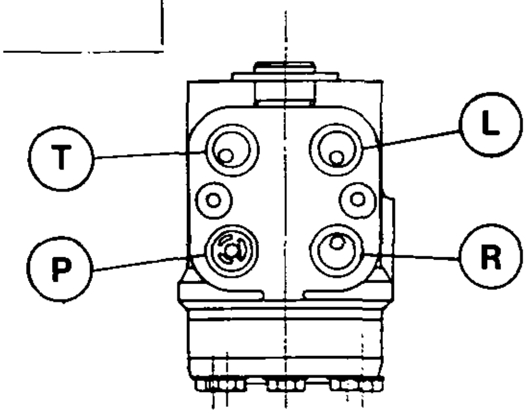


Exploded diagram



MECHANICAL LINKAGES





L : Left hand supply to steering cylinder
P : Supply from low-flow circuit
R : Right hand supply to steering cylinder
T : Supply towards distribution valve

D. Disassembly and reassembly of the steering unit (Orbitrol)

Disassembly

1. Remove the unit from the tractor.
2. Place the unit in a vice with plastic grips.
3. Remove the screws **(1)**. Mark the position of screw **(2)** and remove it.
4. Remove the cover plate **(4)**, the O-ring **(5)**, the stator **(6)** and the O- ring **(8)**.
5. Remove the spacer **(10)**, the rotor **(9)**, the distributor plate **(29)** and the O-ring **(28)**.
6. Withdraw the connecting shaft **(11)**.
7. Unscrew the threaded bush and recover the ball of the nonreturn valve **(22)**.
8. Withdraw the two pins and the two balls of the suction valves **(23)**.
9. Extract the sleeve **(27)** and spool valve **(25)** assembly by pushing it, making sure that the pin **(7)** *is horizontal.*
10. Remove the washers **(12)** and **(16)**, the needle roller bearing **(14)** and the ring **(24)** of the sleeve/spool valve assembly.
    Remove the pin **(7)** and the centring springs **(13)** by pressing on one of their ends. Separate the sleeve **(27)** from the spool valve **(25)**.
11. Unscrew the cap of the relief valve **(18)**. Using an 8mm Allen key, remove the threaded ring and take out the seal, the spring and the valve (the crimped *seat is not removable*).
12. Unscrew the two caps of the shock valves **(20)**. Remove the seals. Using a 6mm Allen key, remove the threaded rings and take out the springs, the balls and their seats (the crimped seats are not removable).
13. Take out the seal **(19)**, the kin-ring **(15)** and the O-ring **(17)**.
14. Remove the check valve **(26)**.

Reassembly

15. Check and clean the parts, replacing any which are defective. Lubricate with suitable transmission oil before reassembling.
16. Refit the check valve **(26)**.
17. Using special tool MS62A, fit the seal **/19**, the O-ring **(17)** and the kin-ring **(15)**.
18. In the holes for the shock valves **(20)** place the balls and the springs. Screw in the threaded rings. Fit the seals and tighten the caps.
19. In the hole for the relief valve **(18)** place the valve and the spring. Screw in the threaded ring. Fit the seal and tighten the cap to a torque of 40-60 Nm.
20. Fit the spool valve **(25)** into the sleeve **(27)**. Position the centring springs **/13** as shown in Fig. 1 and fit *the pin /7\ using special tool* MS63..
21. Position the ring **/24** on the sleeve and spool valve assembly so that the chamfer facilitates assembly in the unit.
22. Fit the washers **/12** and **(16)** with the chamfer of the washer **/12** facing towards the centring springs **/13**, and with the needle roller bearing **(14)** between them.
23. Fit the sleeve and spool valve assembly in the unit, applying a slight oscillating movement. Ensure that the pin **/7** is held horizontally.
24. In the receptacles of the suction valves **(23)** place the two balls and the two pins.
25. In the receptacle of the non-return valve **(22)** place the ball and screw on the threaded ring.
26. Position the connecting shaft **(11)**.
27. Fit the O-ring **(28)** and the distributor plate **(29)**.
28. Fit the rotor **(9)** in such a way that two of the «C» shaped hollows are in the axis of the aperture of the shaft **(11)** (Fig. 2). Refit the spacer **(10)**.
29. Place the O-rings **(5)** and **(8)** on the stator **(6)**.
30. Whilst taking care not to move the rotor **(9)**, fit the stator **(6)**. Then move the stator so that its fastening holes coincide with those of the distributor.
Note: The rotor (9) and the pin /7\ must be in the position shown in Fig. 3.
31. Refit the cover plate **(4)**.
32. Refit the screw **/2** (in the position marked upon disassembly) and the screws **(1)** with their seals **(3)**. Tighten alternately to a torque of 30– 35 Nm.
33. Using a test bench or an appropriate equipment, check the adjustment and operation of the Orbitrol.
34. Refit the unit on the tractor.

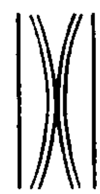


Fig. 1

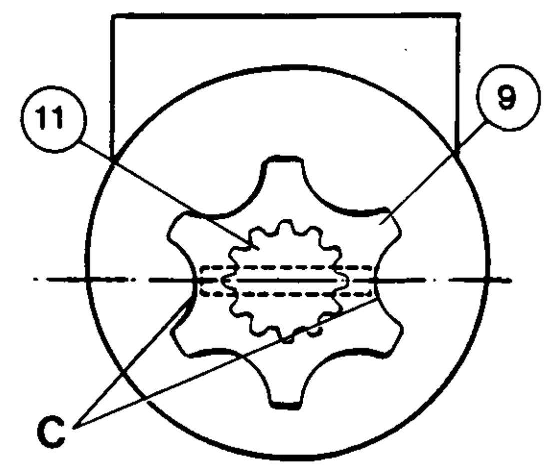


Fig. 2

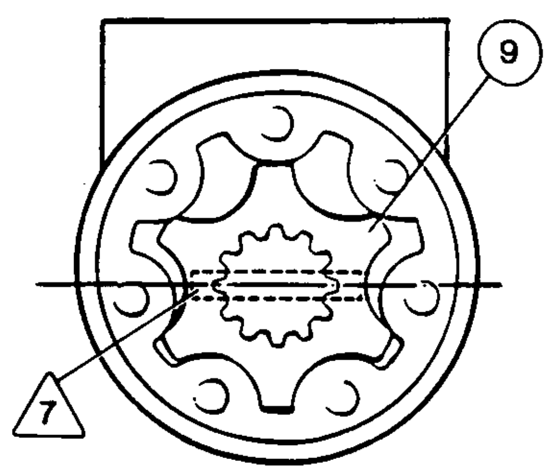


Fig. 3

8 F01 Low-pressure components

CONTENTS

General

Functions or mechanisms supplied by the low-pressure system	**For operation refer to section**
. The hydrostatic steering unit (Orbitrol)	8E01
. The Speedshift situated in front of the gearbox	5E02
. The A/B range device situated in the gearbox selection cover	5K01
. The Hi/Lo (Hare/Tortoise) device fitted at the rear of the gearbox	5K01
. The front axle clutch (4WD) fitted, in the lower part of the rear axle	7A01
. The front and rear differential lock	7C01 - 6J01
. The p.t.o. clutch located at the front of the centre housing	6G01
. The p.t.o. brake fitted at the rear of the centre housing	6D01
. *The lubrication and cooling system*	5A01 (p.3)

A. Lubrication and cooling system

When the main functions of the low-pressure system have been satisfied, the oil flows through the 17 bar distribution valve **(3)** and travels towards the oil cooler **(13)**. It enters the oil cooler and passes into the lubrication line **L**, connected by a T-fitting to the 17 bar distribution valve (Fig. 2).
When the oil is cold, the 5 bar valve opens in the 17 bar distribution valve and enables a quantity of oil to pass directly into the lubrication line **L** (Fig. 3).

B. 1.5 bar valve

The lubrication line has a valve situated at the front left of the gearbox which maintains a pressure of 1.5 bar in the circuit.

Operation

The flow of oil coming from the 17 bar distribution valve lubricates the front cover and the gearbox as well as the PTO shaft which traverses it.
An external pipe also brings the oil to the PTO clutch. A small-bore pipe directs the oil towards the driving pinion of the PTO upper shaft and the coupler as well as the compound pinion of the 4-speed PTO (if fitted).
If the pressure is greater than 1.5 bar, the spring **(2)** is compressed, the valve **(1)** lifts up and the oil flows into the gearbox housing (Fig. 1).

Legend (Fig. 2/3)
(3) 17 bar distribution valve
(13) Oil cooler
(36) 1.5 bar valve
A Front PTO lubrication (if fitted)
B Lubrication hose coming from the 17 bar distribution valve
C Lubrication of front cover PTO shaft and gearbox
D Lubrication of PTO clutch
E *Lubrication of driving pinion of PTO and coupler as well as compound pinion (4-speed version)*
L Lubrication line

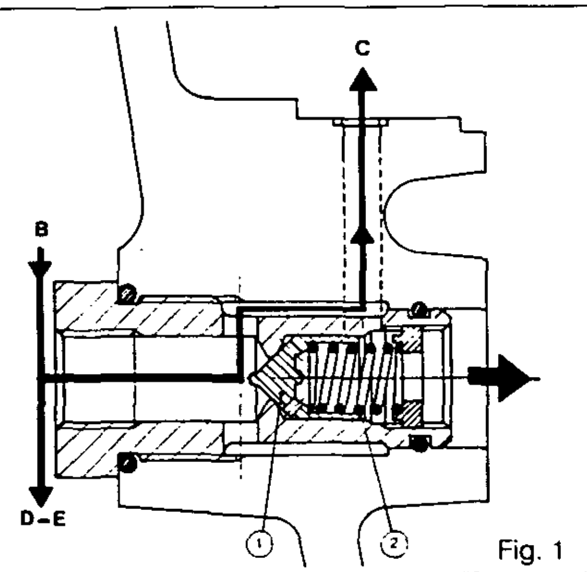


Fig. 1

Lubrication and cooling system, 5 bar valve closed (oil hot)

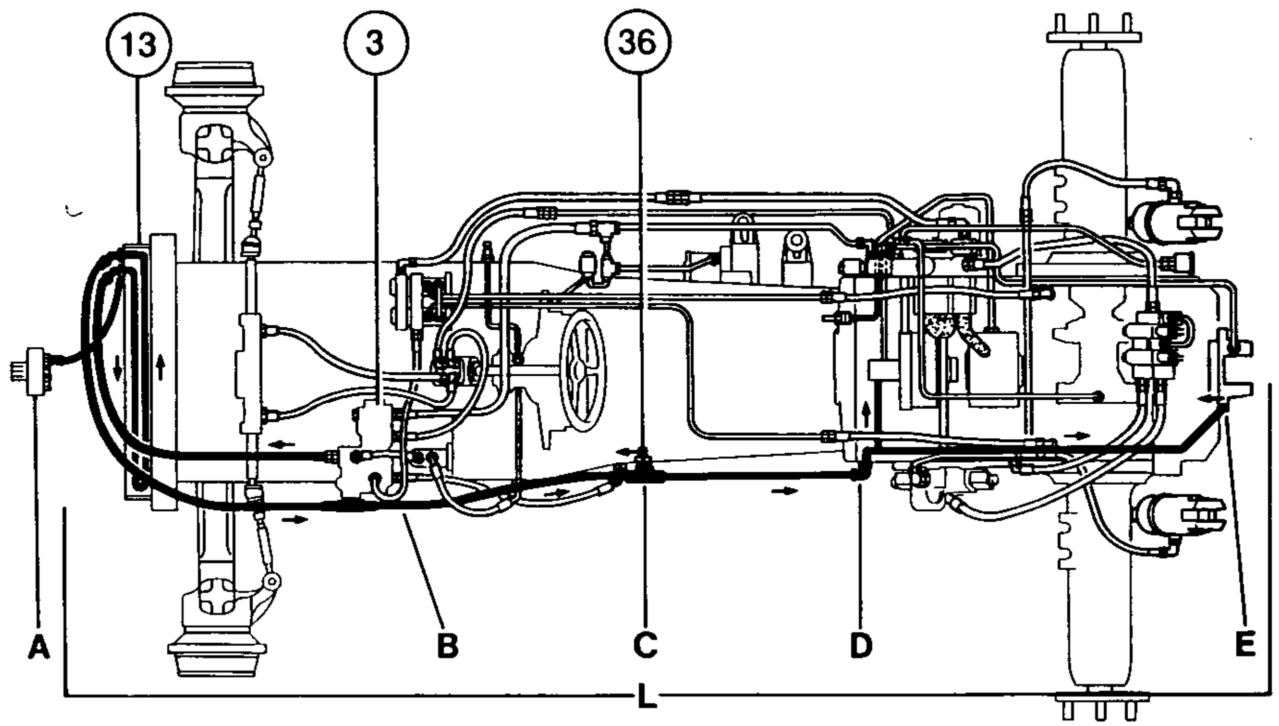


Fig. 2

Lubrication system, 5 bar valve opened (oil cold)

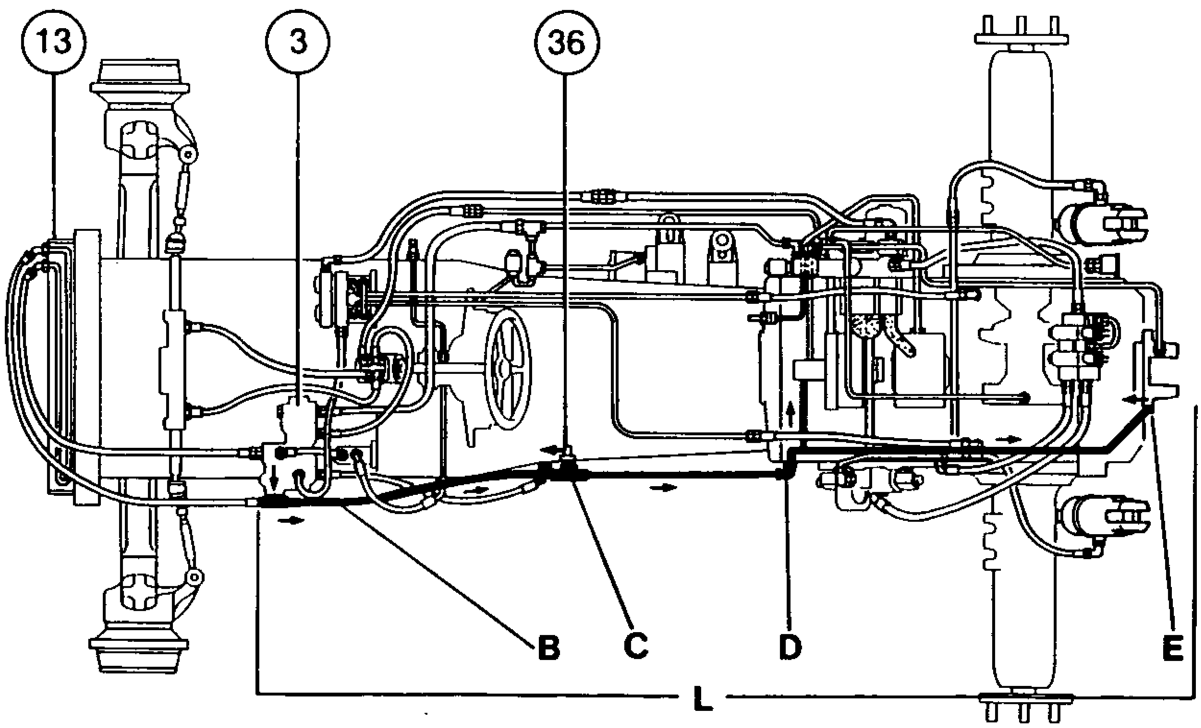


Fig. 3

8 G01 Brake and clutch master cylinder circuit

CONTENTS

Hydraulics - Master cylinders

A. Working on the brake and clutch master cylinders

If it should prove necessary to dismantle the master cylinders, clean all parts carefully. Replace those which are scratched or deformed.
Brake and clutch master cylinder repair kits can be found in the spare parts catalogue.
After disassembly or replacement of the brake master cylinders, bleed the main brake circuit and the trailer brake circuit (if fitted). Refer to chapter 6K01 (sections C and D). Check pedal adjustment (section D).
After disassembly or replacement of the clutch master cylinder, bleed the circuit, refer to chapter 5C01.G. Check pedal adjustment (section F).

B. Master cylinders with trailer brake (dual circuit) (Fig. 2)

Pedals unlatched (Fig. 1):

The effort applied to a pedal, transmitted by the rod **(5)**, moves the piston **(4)** in the bore of the active master cylinder. The valve **(1)** closes the feed port, the balancing valve **(3)** is opened by the piston **(4)** and the ball **(2)** and oil is fed under pressure to the ports of the main brake C and of the pressure balancing junction D.
Through the junction, the pressure closes the valve **(3)** *of the passive master cylinder.*
The action on the piston **(4)** likewise causes the movement of the piston **(6)** and the closure of the valve F. The oil contained in the chamber E is channelled via the connecting bar to the chamber E' and to the orifice B' through the open valve F' of the passive master cylinder.
The assembly comprising the valve F and the piston **(6)** rapidly meets the end of the active master cylinder.
In this position, only the tractor brake is activated.
The trailer is not braked.

Pedals latched

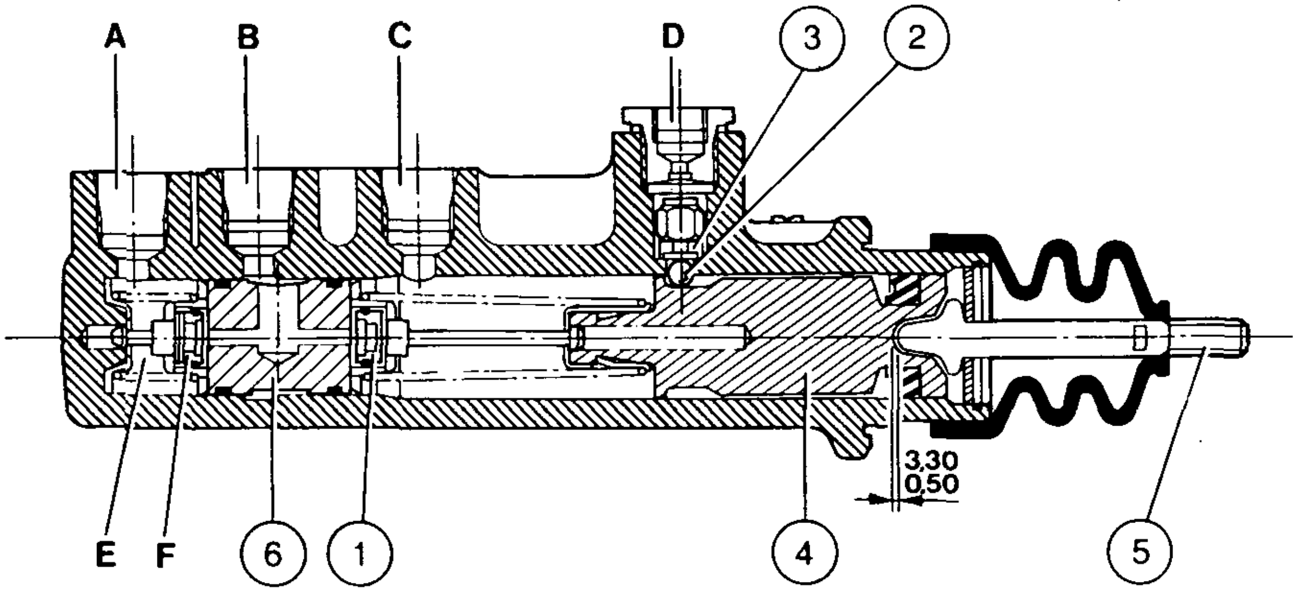
Braking and balancing of pressure

The effort applied to both pedals, transmitted by the push rods **(5)**, moves the pistons **(4)** in the bores of the two master cylinders. The two valves **(1)** close the feed ports, the two balancing valves **(3)** are opened by the pistons **(4)** and the balls **(2)**. The pressure equalizes in the two master cylinders by the balancing junction D. The oil is likewise fed under pressure to the ports C and C' of the main brake circuit.

Trailer braking

The continuous action of the pistons **(4)** and **(6)** closes the valves F and F'. The chambers E and E' which are pressured feed the control valve of the trailer brake via the ports A and A'.

Fig. 1



A Control of trailer brake valve (dual circuit).
B Supply of master cylinders via the distribution valve.
C Supply to main brake
D Pressure balancing junction
E Trailer brake pressure chamber (dual circuit)
F Valve (dual circuit)

Hydraulics - Master cylinders

Brake master cylinders with trailer braking (dual circuit)

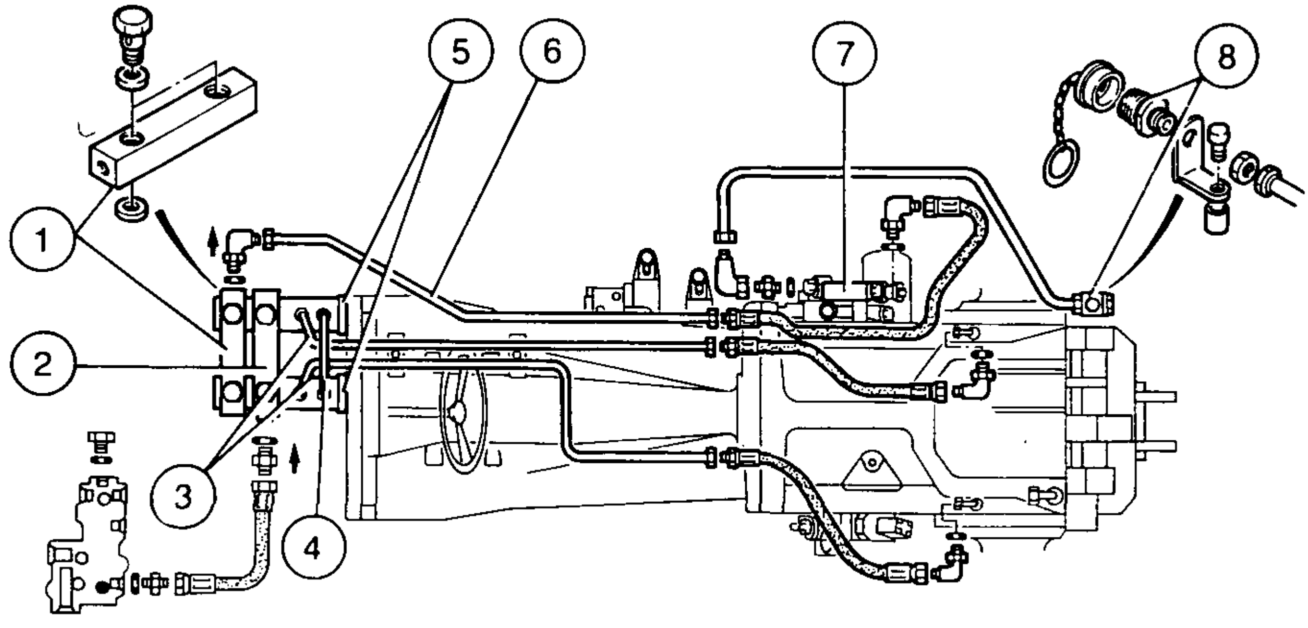
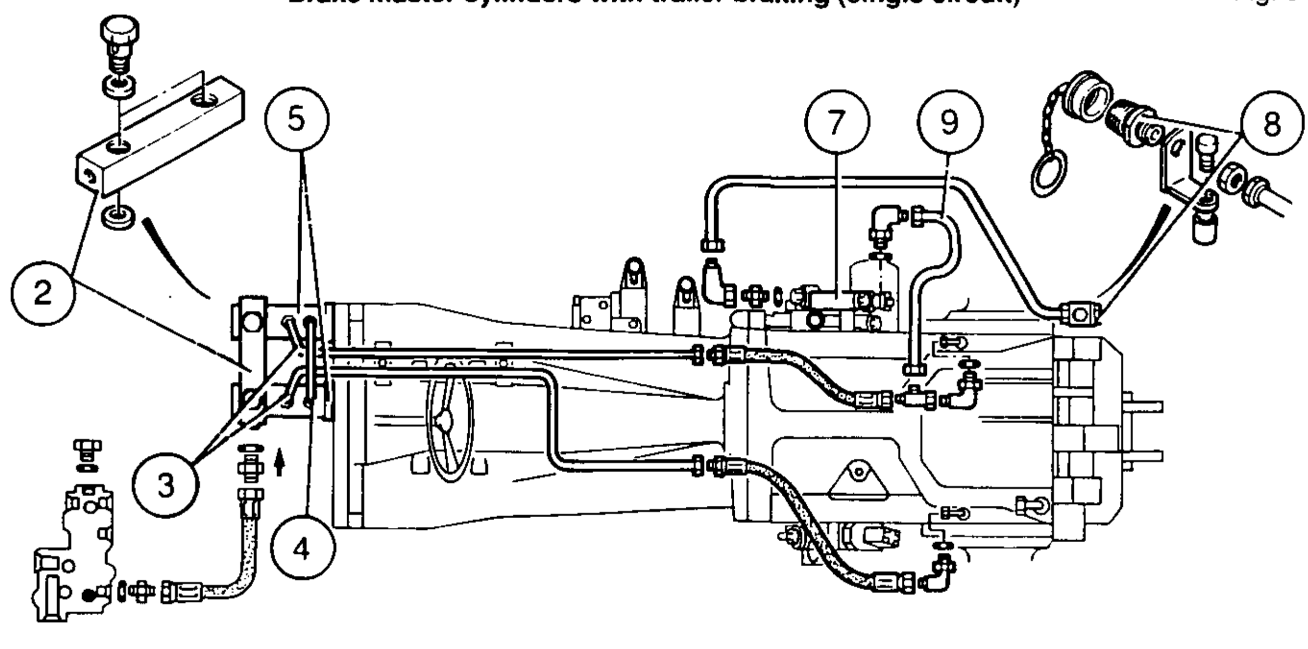


Fig. 2

Brake master cylinders with trailer braking (single circuit)

Fig. 3



(1) Bar (control of trailer brake valve)
(2) Bar (supply of master cylinders, coming from the distribution valve)
(3) Main brake supply
(4) Pressure balancing junction pipe
(5) Brake master cylinders
(6) Trailer brake sensing pipe
(7) Trailer brake valve
(8) Trailer brake junction
(9) Sensing pipe (single-circuit version with trailer brake)

Hydraulics - Master cylinders

C . Master cylinders without trailer brake (single circuit) (Fig. 6)

Pedals unlatched (Fig. 4):

The effort applied to a pedal, transmitted by the rod **(5)**, moves the piston **(4)** in the bore of the active master cylinder. The valve **(1)** closes the feed port, the balancing valve **(3)** is opened by the piston **(4)** and the ball **(2)** and the oil is fed under pressure to the ports of the main brake C and of the pressure balancing junction D. Through the balancing junction, the pressure closes the valve **(3)** of the passive master cylinder.

Pedals latched

Braking and balancing of pressure

The effort applied to the two pedals, transmitted by the rods **(5)**, moves the pistons **(4)** in the bores of the two master cylinders. The two valves **(1)** close the feed ports, the two balancing valves **(3)** are opened by the pistons **(4)** and the balls **(2)**.

The pressures equalize in the two master cylinders by the balancing junction D. The oil is likewise fed under pressure to the ports C and C' of the main brake circuit.

Note: There is a version with trailer brake (Fig. 3) for tractors equipped with a single-circuit assembly. The trailer brake valve (7) is controlled by a pipe (9) connected to the feed hose (3) of the right hand-brake, on the upper part of the rear axle housing (Fig. 5).

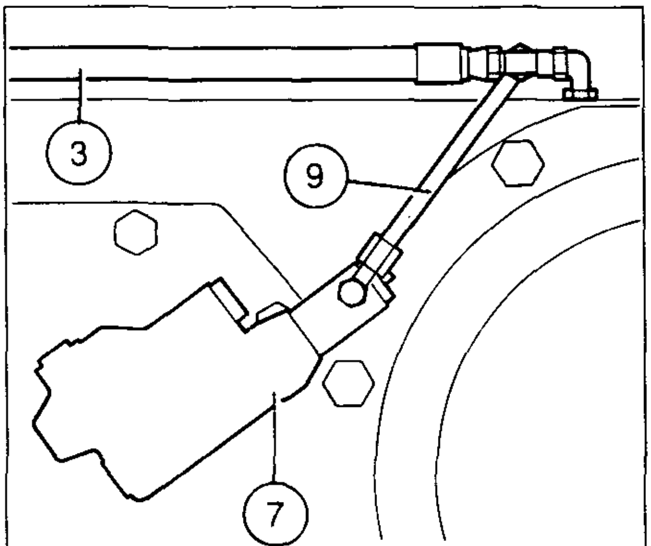


Fig. 5

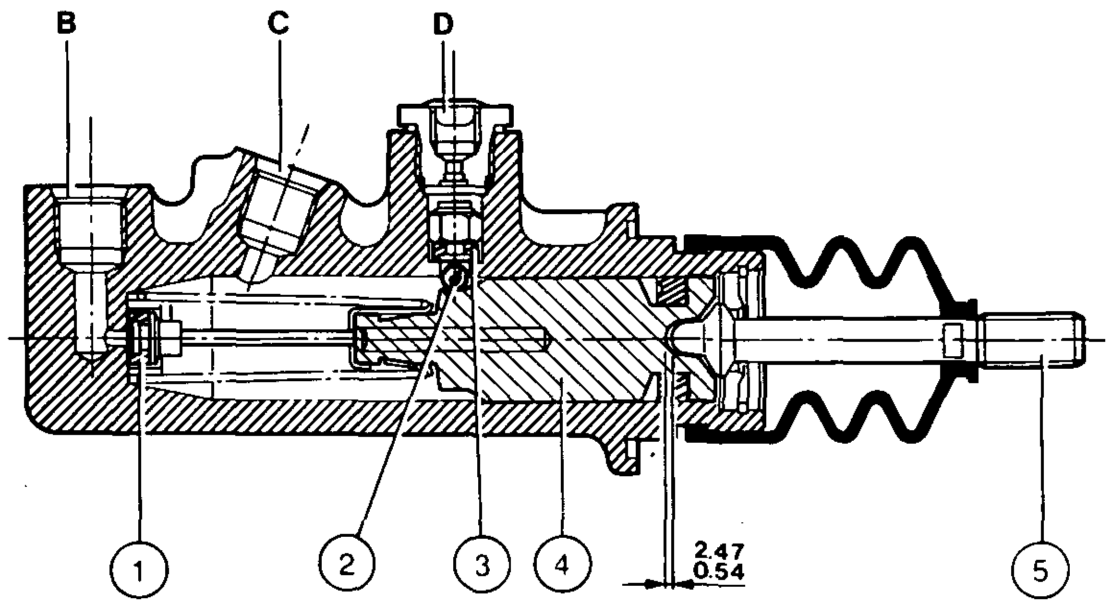
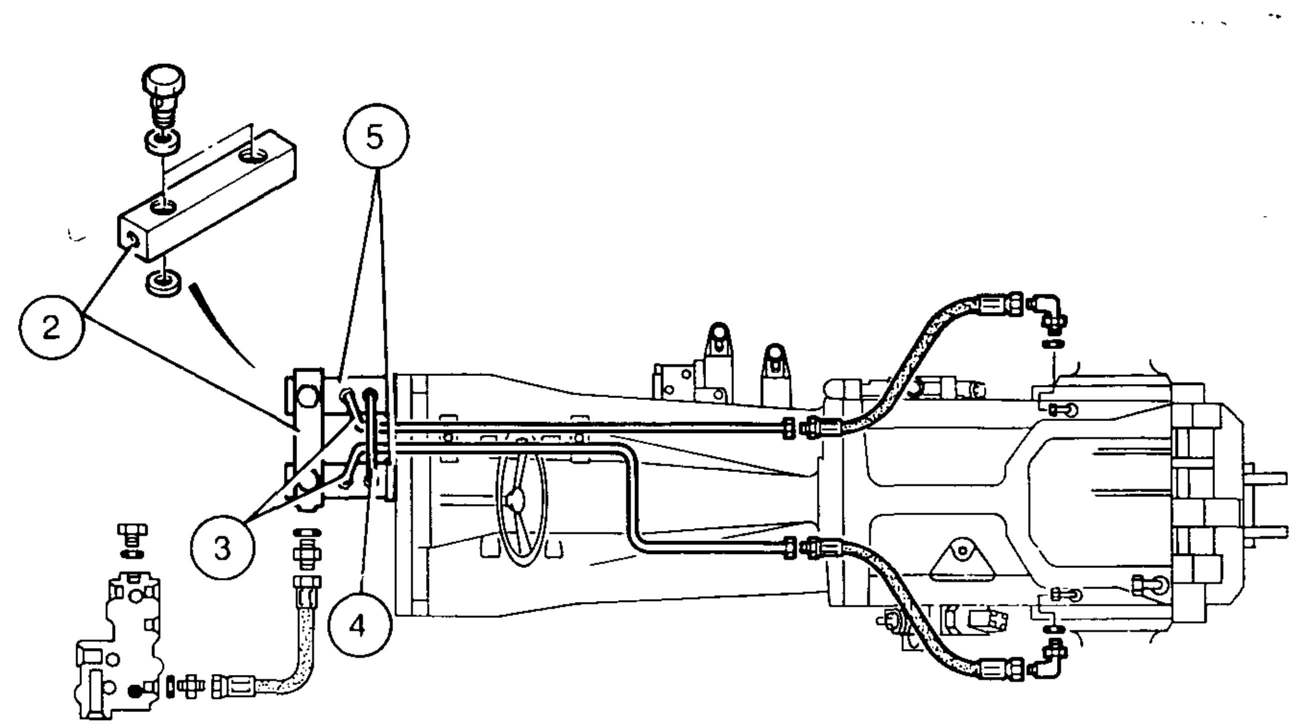


Fig. 4

B Supply of the master cylinders via the distribution valve
C Supply to the main brake
D Pressure balancing junction

Brake master cylinders without trailer braking (single circuit) Fig. 6



(2) Bar (supply of master cylinders, coming from the distribution valve)
(3) Main brake supply
(4) Pressure balancing junction pipe
(5) Brake master cylinders

D. Brake pedal adjustment

1. Smear the pins **(5)** and **(6)** with molybdenum disulphide (Fig. 7).
2. Smear the clevis **(1)** with Loctite 542 and screw it on to the rod **(2)**.
3. Fit the return spring **(3)**.
4. Adjust the clevis so as to obtain a distance X of 115 mm ± 0.5 between the support **(4)** and the clevis fastening pin.
5. Do the same for the second clevis and check that the twinning mechanism operates smoothly.
6. Manually check the operation of each pedal to ensure that they operate freely.

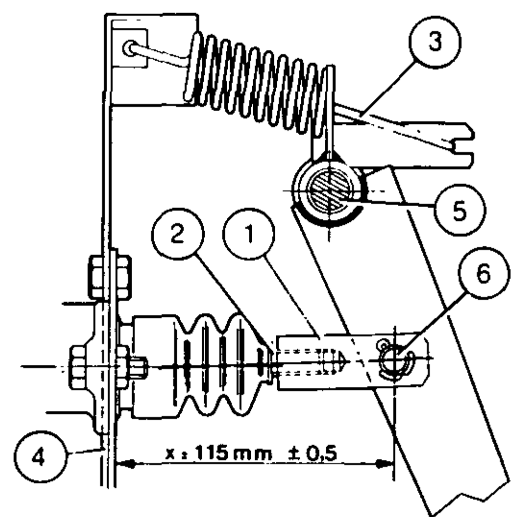


Fig. 7

Hydraulics - Master cylinders

E. Clutch master cylinder

Operation (Fig. 10)

The effort applied to the pedal, transmitted by the rod **(1)**, moves the piston **(2)** in the bore of the master cylinder. The valve **(3)** closes the feed port **A** and the oil is fed under pressure to the port **B** and the supply channel of the clutch slave cylinder.

Note : For sealing improvement two guide rings have been added to the piston from serial n°R334024.

Only complete master cylinder are interchangeable, not the repair kits.

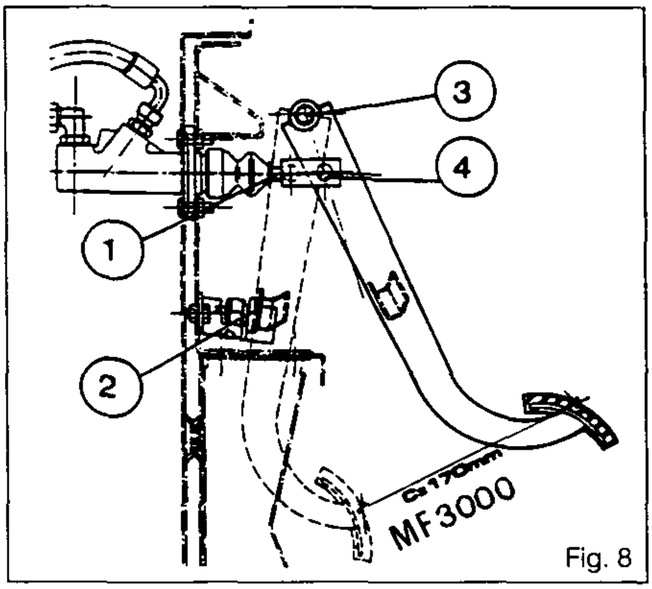


Fig. 8

F. Clutch pedal adjustment

1. Coat the pins **(3)** and **(4)** with molybdenum disulphide.
2. Apply Loctite 542 on thread of the rod **(1)**.
3. Adjust the rod so as to obtain travel of:
   - 170 mm (3000 tractors) (Fig. 8)
   - 200 mm (3100 tractors) (Fig. 9)

   between the declutched position (pedal in contact with the stop **(2)**) and the engaged position.
4. Manually check the operation of the pedal to ensure that it operates freely.

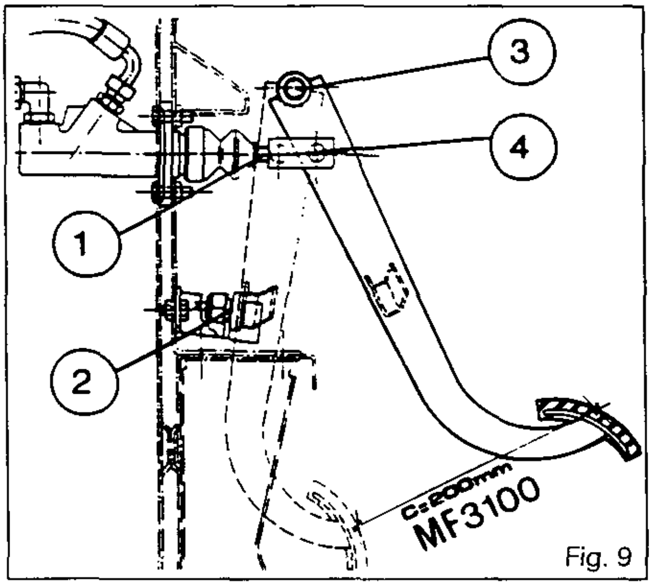
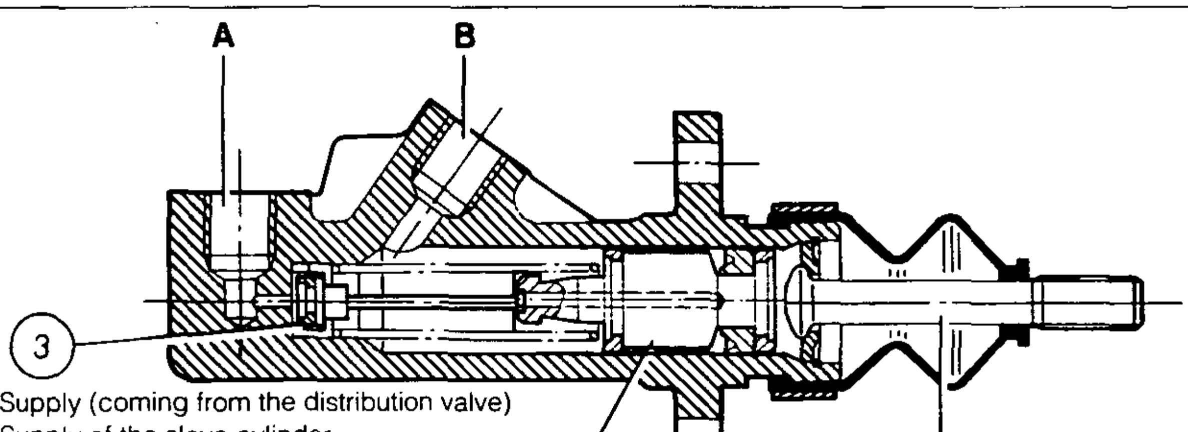


Fig. 9



A Supply (coming from the distribution valve)
B Supply of the slave cylinder
(1) Rod
(2) Piston
(3) Valve

Fig. 10

8 H01 Distribution valve

CONTENTS

Hydraulics - Distribution valve

General

The distribution valve is fitted on the rear bonnet support. Its function is:
- To supply oil and keep the low pressure circuit to 17 bar.
- To supply the lubrication and cooling system.
- To ensure a constant level in the brake and clutch master cylinders.

A. Operation (Fig. 2)

When the engine is started, the oil coming from the steering control valve (Orbitrol) enters through port 1 and flows out through port 5 towards the low pressure circuit of the right hand hydraulic cover to feed:
- the speedshift
- the A/B range
- the Hare/Tortoise range
- the 4WD clutch
- the differential lock
- the p.t.o. clutch
- the p.t.o. brake
- the front p.t.o. (if fitted)

A back pressure is then created in the circuit, forcing the ball **(20)** to lift from its seat, compressing the spring **(21)**. The oil passes to the back of the spool **(19)**, creating a pressure which gradually moves it, compressing the spring **(17)**, resting against the shims **[18]**.

The spool **(19)** enables the oil to pass towards the port 6 and towards the oil cooler. It emerges cooled and travels towards the channels **(14)** and **(13)** of the lubrication system. When the oil is cool, the 5 bar valve **(15)** opens and allows a quantity of oil to pass directly to the channel **(13)** of the lubrication system without passing through the cooler.

When one of the low-pressure functions is required, the momentary pressure drop causes the ball **(20)** to return to its seat due to the action of the spring **(21)**, and the spool **(19)** attempts to move, being pushed back by its own spring **(17)**. The oil in the end chamber escapes through the drain hole V, enabling the spool to move back slowly.

When the needs of the low-pressure circuit are satisfied, the oil finally passes through the feed ports **8** and **10** (Fig. 1). Flow and residual pressure are regulated by a pipe **11** and a restrictor **A**, thereby maintaining a constant level in the brake and clutch master cylinders.

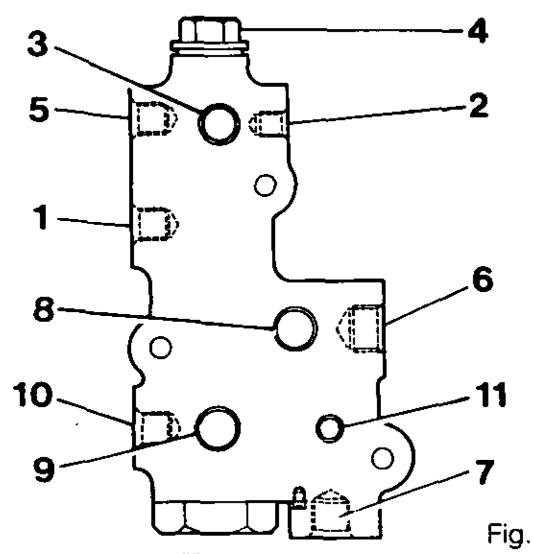


Fig. 1

Leakages return to the gearbox via port 9.

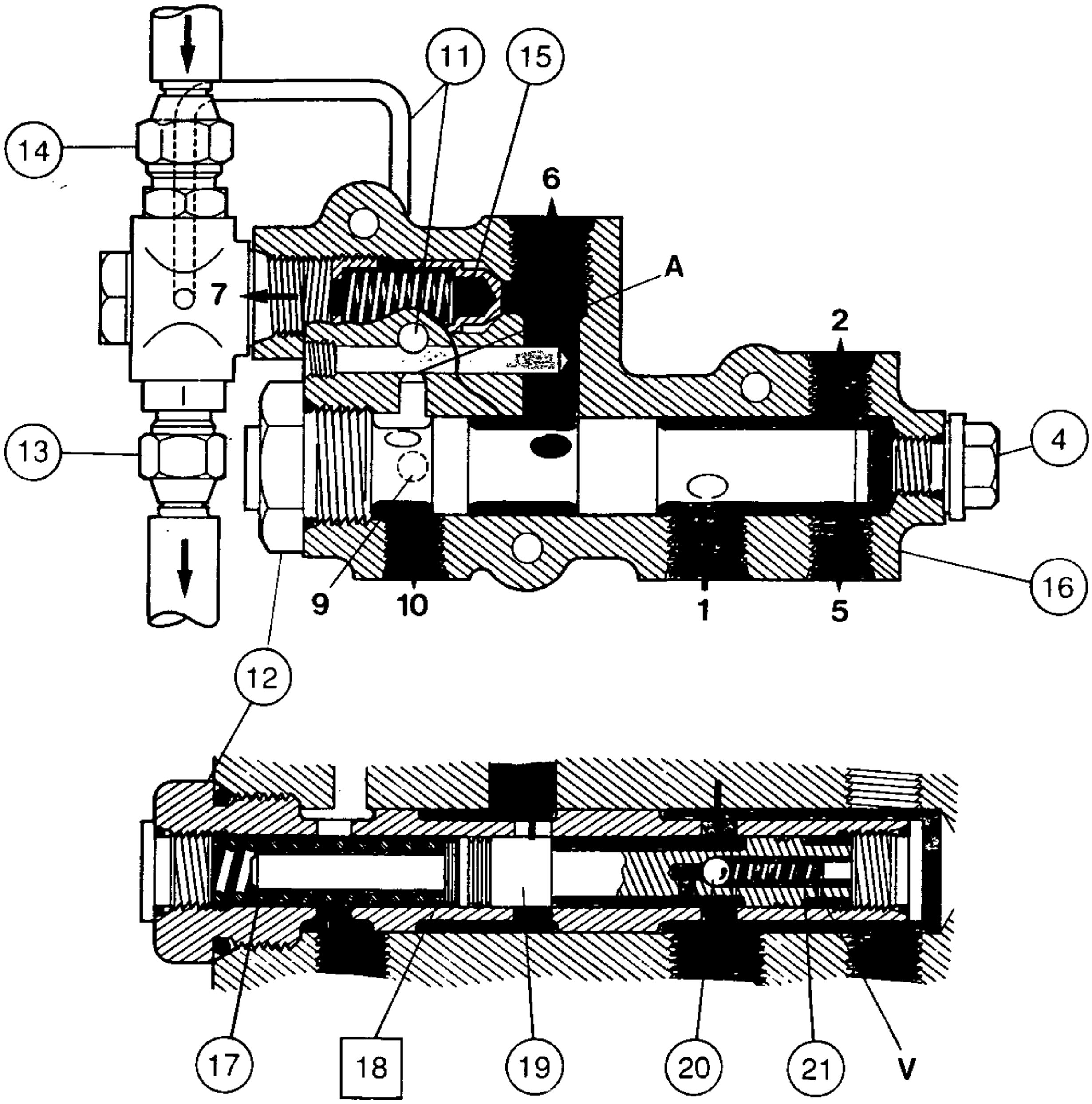
Note: After dismantling or replacement of the valve, tighten it to a torque of 40 to 55 Nm.

Designation of ports (Fig. 1).

Each port is numbered on the valve body.

- **1** Supply coming from the Orbitrol unit.
- **2** Outlet to the front p.t.o. (if fitted).
- **3** Not used (plug)
- **4** Not used (plug)
- **5** Outlet (17 bar) to the Speedshift, the A/B range (if fitted) and the solenoids fastened on the right hand cover.
- **6** Outlet to the oil cooler (5 bar valve closed).
- **7** Outlet to the lubrication line (5 bar valve open).
- **8** Clutch master cylinder supply (residual flow).
- **9** Return to front left hand of gearbox.
- **10** Brake master cylinder supply (residual flow).
- **11** Outlet with external pipe connecting the supply channels of the brake and clutch master cylinders and the T-piece mounted on the outlet of the lubrication line.

Fig. 2



(12)	Distribution valve	**(16)**	Valve body
(13)	Lubrication towards the front cover, the p.t.o. shaft, the p.t.o clutch and the driving gear 2 or 4-speed p.t.o.	**(17)**	Spring
		[18]	Shims
		(19)	Spool
(14)	Lubrication coming from the oil cooler (5 bar valve closed)	**(20)**	Ball
		(21)	Spring
(15)	5 bar valve	**A**	Restrictor
		V	Drain hole

8I01 Right-hand hydraulic cover

CONTENTS

Hydraulics - RH hydraulic cover

General

The right-hand cover fitted on the rear axle housing has two main functions:
- It serves as a support for numerous components of the hydraulic system.
- It comprises various intake and delivery channels of the high- and low-flow (high- and low-pressure) circuits.

The internal face of the cover accommodates:
- The dual element hydraulic pump and its driving gear.
- The suction pipe.
- The intake manifold.
- The transfer pipe from the left cover.

Its external faces accommodate:
- The five solenoids controlling the low-pressure functions (depending on option).
- The safety valve of the high-pressure circuit.
- The trailer brake valve (if fitted) or a cover plate.
- The pressure test coupler.
- The oil filter.
- The low oil pressure switch.
- The filter vacuum switch.
- The engine speed sensor.

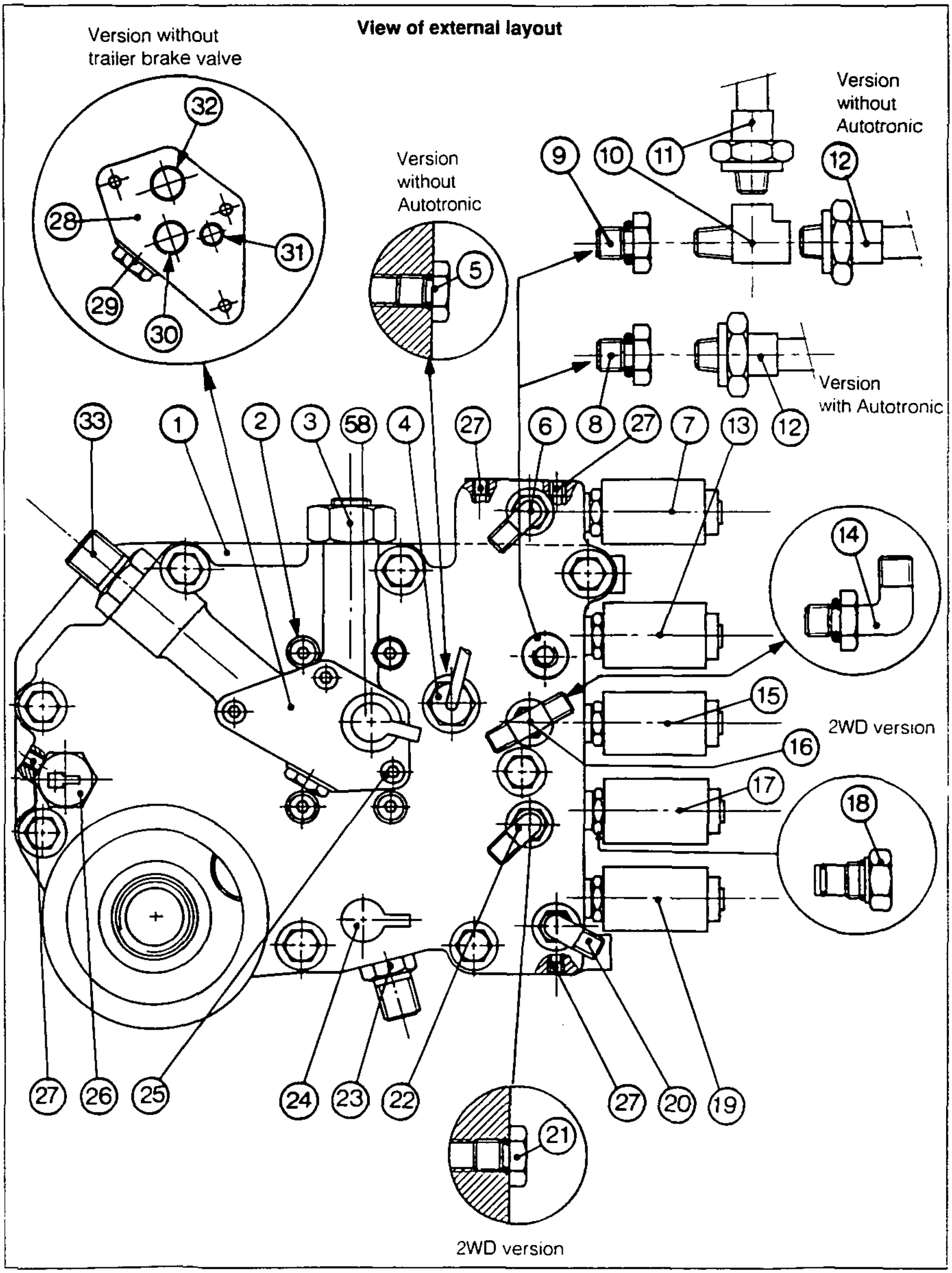
Parts list

(1) Cover
(2) Screw
(3) High-pressure (high-flow) valve
(4) Engine speed sensor
(5) Plug (version without Autotronic)
(6) P.T.O. brake supply connector
(7) P.T.O brake solenoid
(8) Reducer (version with Autotronic)
(9) Reducer (version without Autotronic)
(10) Fitting (version without Autotronic)
(11) Low-pressure switch (see table)
(12) Low-pressure switch (see table)
(13) Solenoid valve (p.t.o. clutch)
(14) Fitting (2WD version)
(15) Differential lock solenoid
(16) Differential lock supply connector
(17) 4WD solenoid
(18) Plug (2WD version)
(19) Hare/tortoise solenoid
(20) 17 bar supply connector
(21) Plug (2WD version)
(22) 4WD clutch supply connector
(23) Low-pressure output connector (to Orbitrol steering valve)
(24) Low pressure test coupler
(25) Screw
(26) Filter vacuum switch
(27) Plugs
(28) Cover plate (version without trailer brake)
(29) Plug
(30) O-ring
(31) O-ring
(32) O-ring
(33) High-pressure output connector (to auxiliary spool valves)
(34) Seal
(35) O-ring
(36) O-ring
(37) Dowels
(38) O-rings
(39) Transfer pipe
(40) Pin
(41) Collar
(42) Screw
(43) Screw
(44) Deflector
(45) Suction pipe
(46) Seal
(47) Intake manifold
(48) Pipe
(49) O-rings
(50) Oil filter
(51) Nut
(52) Washer
(53) Pump gear
(54) Key
(55) Screw
(56) Pump
(57) Trailer brake valve
(58) High pressure test coupler

Different fittings for low-pressure switch		
Version	Switch **(12)** Red mark	Switch **(11)** Green mark
With Autotronic	1	
Without Autotronic	1	1
With Autotronic With super-creeper	2	

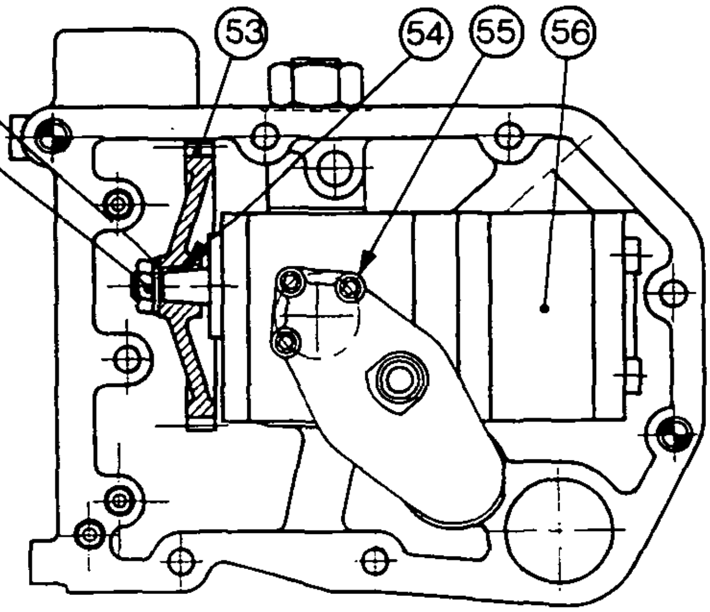
Hydraulics - RH hydraulic cover

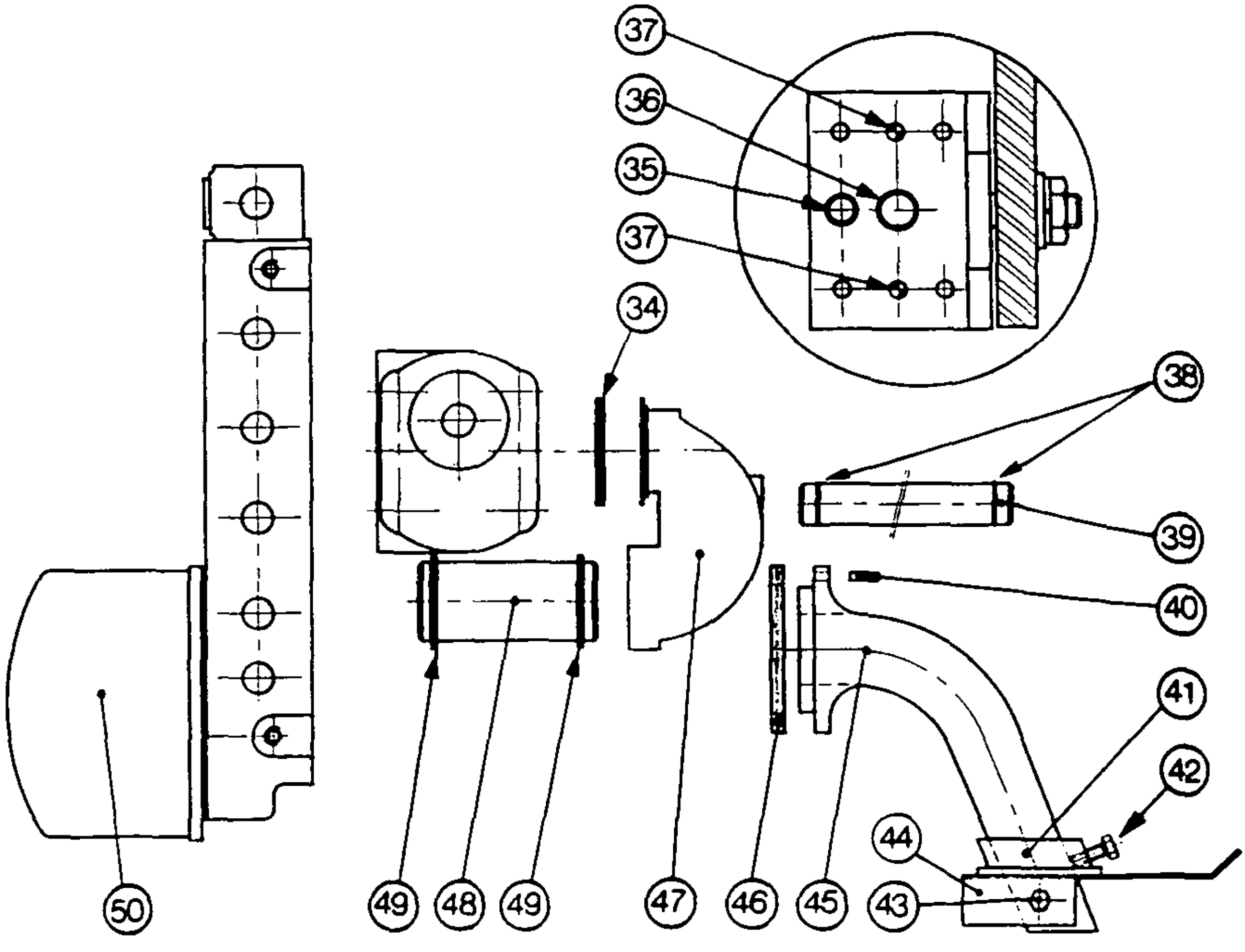
View of external layout



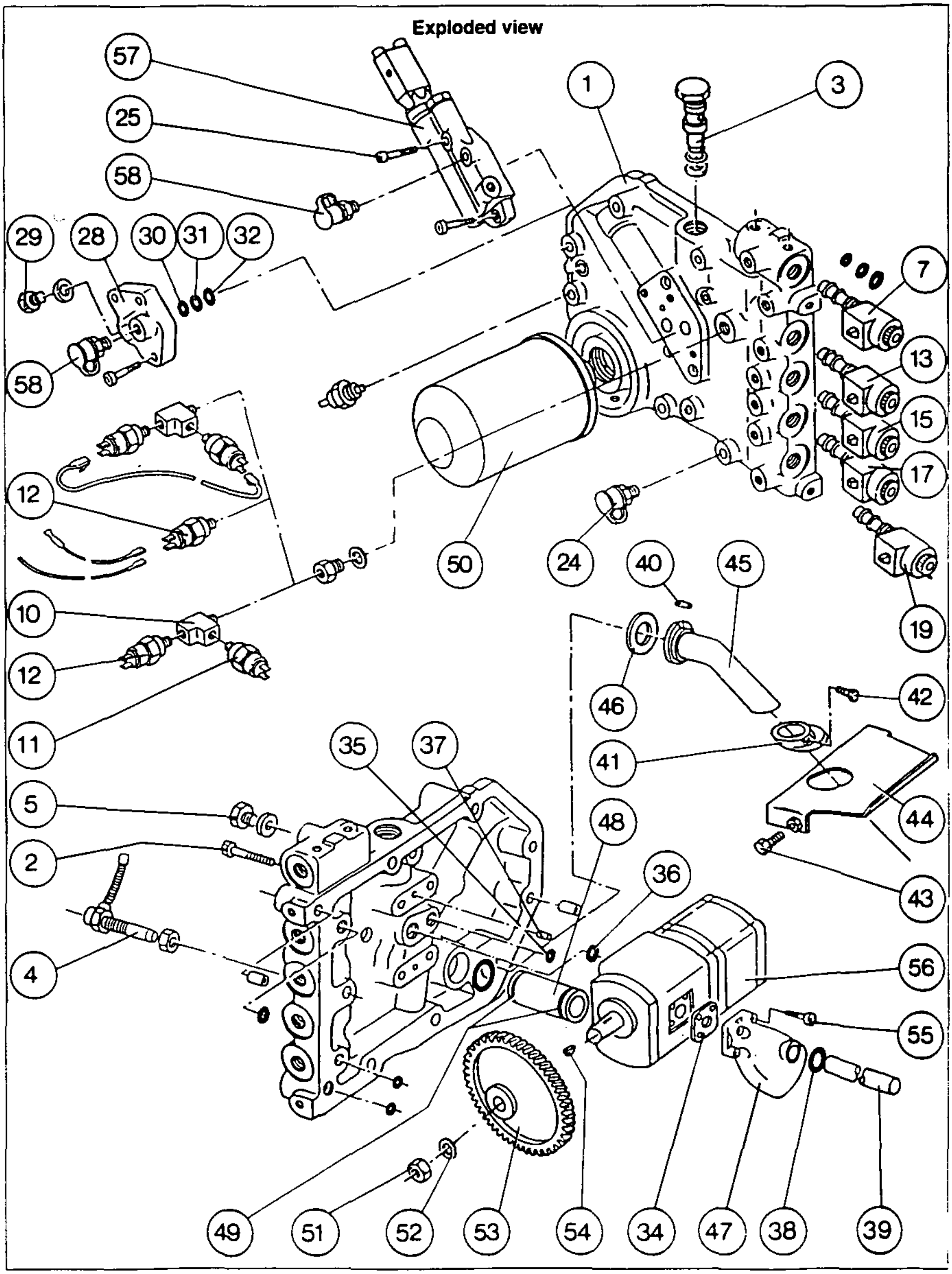
Hydraulics - *RH hydraulic cover*

View of internal layout



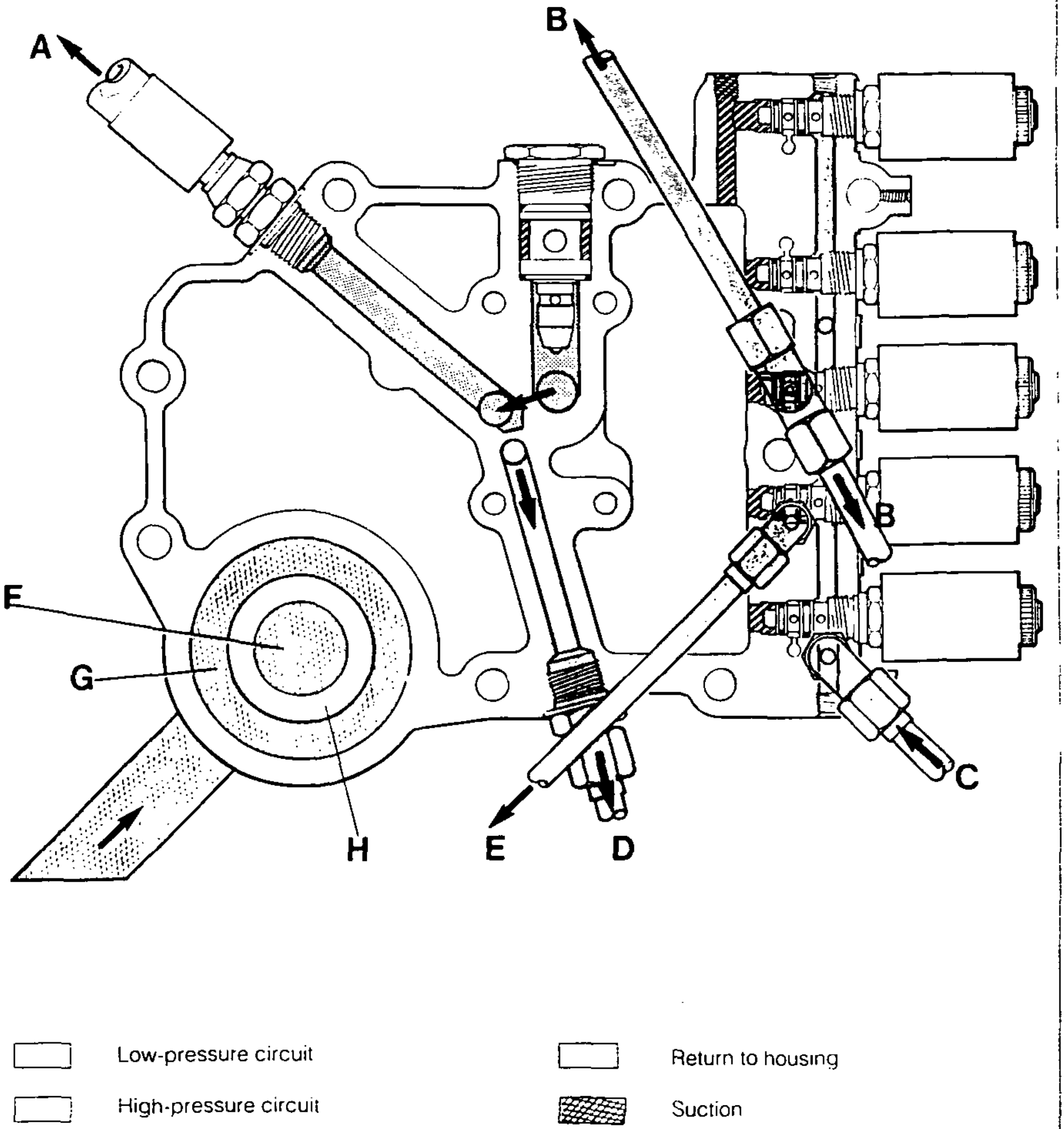


Hydraulics - RH hydraulic cover



Hydraulics - RH hydraulic cover

Identification of ports and lines



Low-pressure circuit

High-pressure circuit

Return to housing

Suction

A : Line to auxiliary spool valves
B : Front and rear differential lock (4WD)
C : 17 bar line coming from distribution valve
D : Low-pressure line to Orbitrol distributor
E : Line to 4WD clutch (if fitted)
F : Suction
G : Suction (Output from filter to two-stage pump)
H : Filter

Hydraulics *- RH hydraulic cover*

A. Removal of cover

1. Carry out operations 1 to 7 (Chapter 5K01).
   For operations 2 to 12 refer to Fig. 1.
2. *Remove the oil filter* ***(1)*** *to gain access to screw* ***(2)***.
3. Remove the trailer brake socket feed pipe **(3)** (if fitted).
4. Remove the screws **(5)**.
5. Remove the valve **(6)**.
   Note: Do not disconnect the hose (7) on the pilot head, to avoid having to bleed the trailer brake circuit.
6. Disconnect and block:
   - the hose **(8)** towards the auxiliary circuit
   - the pipe **(10)** and hose **(12)** of the differential lock control (4WD)

   Note: Hose (12) must be disconnected from the connector at the protector end.
   On 2WD tractors, disconnect hose (10) only.
   - the supply pipe **(16)** of the 4WD clutch **at both ends**
   - the supply pipe **(11)** of the p.t.o. brake **at both ends**
   - the supply pipe **(17)** of the Orbitrol steering valve
   - the pipe **(15)** coming from the distribution valve.
7. Disconnect the harness **(9)** of the engine speed sensor.
8. Disconnect the harness **(13)** of the low-pressure switch and the wire **(4)** of the filter vacuum switch.
9. Remove the cover plate **(14)**.
10. Disconnect the solenoids (mark the connections).
11. Remove the p.t.o. brake solenoid in order to avoid interference with the cab (low cab).
    Note: The p.t.o. solenoid is equipped with a diode. It is marked with the symbol
12. Remove the screws **(2)**.
13. Remove the cover.
14. Remove the transfer pipe **(1)** (Fig. 2)

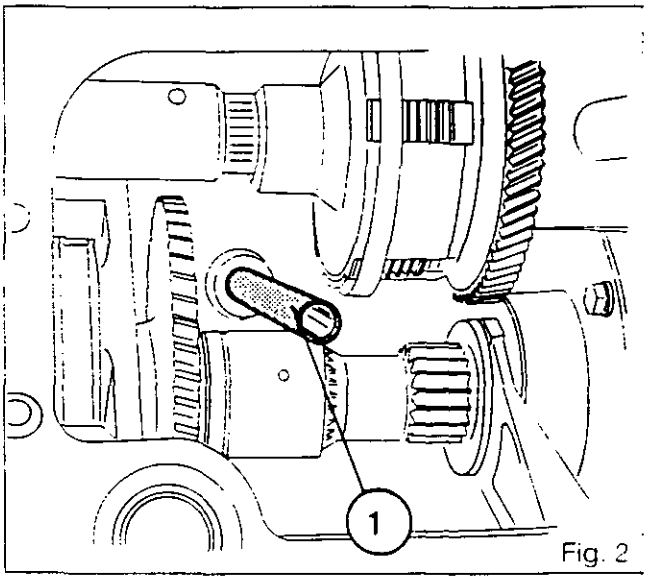


Fig. 2

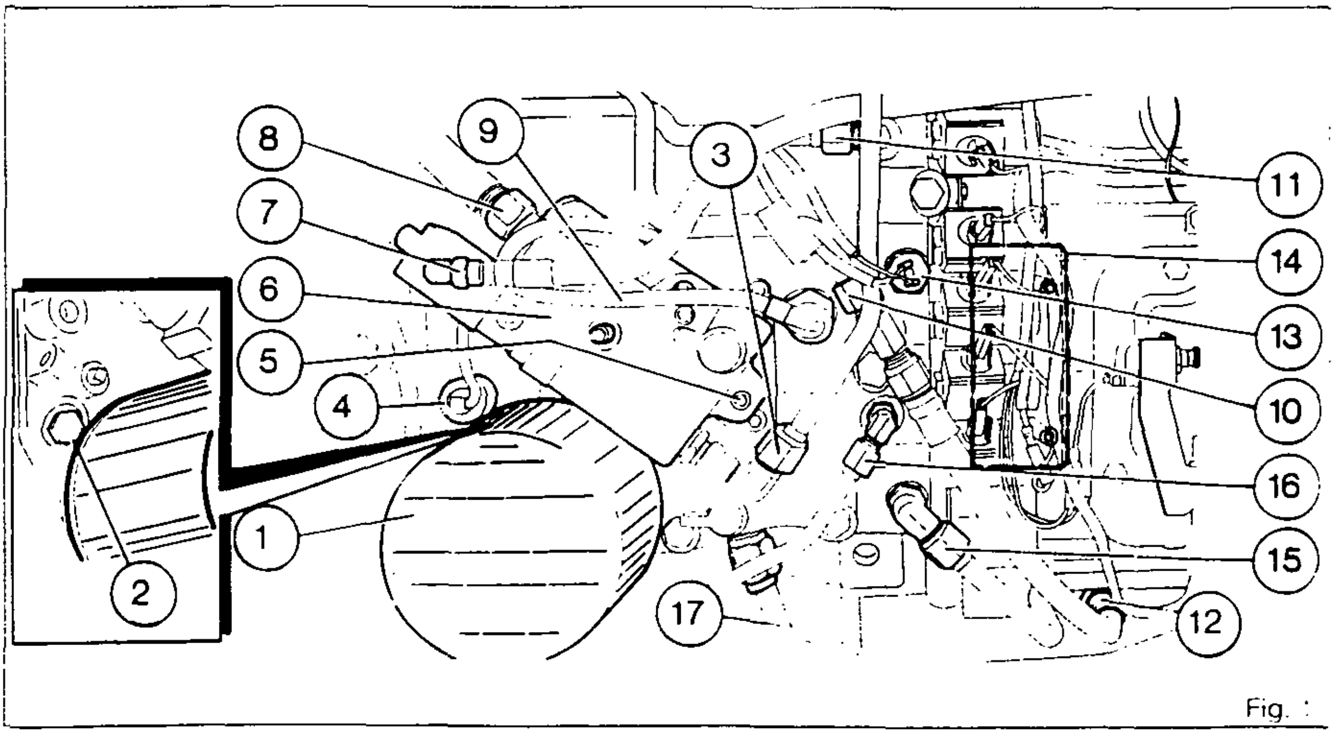


Fig. 1

B. Refitting of cover

15. Clean the housing and cover joint faces .
16. Check the presence of the two dowels **(1)** on the cover (Fig. 3).
17. **Fit new seals on the cover:**
    - for the Hare/Tortoise lines **(2)** (Fig. 3)
    - for the p.t.o. clutch line **(3)** (Fig. 3)
    - for the suction pipe **(4)** (Fig. 4) (ensure the pipe is the right way round: the pin on the housing must be in the notch (Fig. 4)).
18. *Screw two guide studs, manufactured locally, in* diametrically opposite positions on the housing.
19. Refit the transfer pipe.
20. Smear the cover joint face, with a sealing compound (Loctite 510 or equivalent).
    Note: Take care not to obstruct the Hare/Tortoise lines.
21. Refit the cover and screws **(2)** (Fig. 1).
    Note: Remove the two guide studs. Tighten to a torque of 72-96 Nm.
22. Refit the PTO brake solenoid and tighten to a torque of 18-20 Nm. Reverse operations 7 to 10.
23. Fix the harnesses with a clip.
24. Reverse operation 6.
25. Refit valve **(6)** (if fitted) (Fig. 1).
    Note: Replace the O-rings.
26. Refit the screws **(5)** (Fig. 1) and tighten them to a torque of 25-35 Nm.
27. Reverse operations 2 and 3.
28. Jack up the tractor. Refit the wheel.
29. Remove the jack and tighten the wheel nuts to a torque of 400-450 Nm.
30. Take away the chocks.
31. Top up the oil. Start the engine.
32. Check the operation of the electrical circuits, low-pressure switch, solenoids and filter vacuum switch.
33. *If the pump has had to be removed or replaced* (see sections E and F) repeat hydraulic tests. Check the cover joint face and hydraulic connectors for leaks.

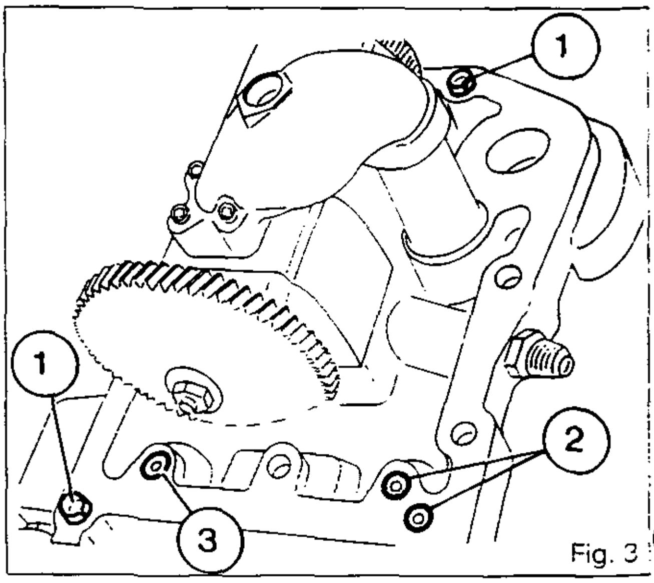


Fig. 3

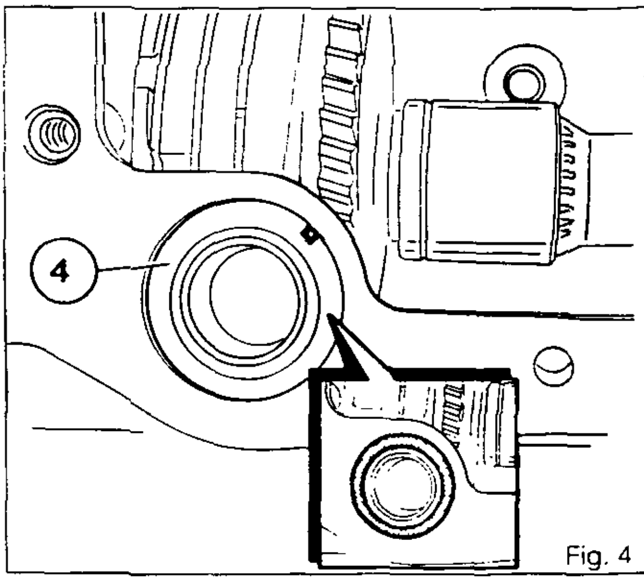


Fig. 4

C. Disassembly and reassembly of high-pressure valve

Operation (Fig. 5)

If the pressure **P** exceeds 188 bar, spring **(4)** is compressed and valve **(7)** moves allowing oil to pass to the housing via port **C**.

Disassembly

34. Unscrew the plug **(1)**. Retrieve the shims **[2]**, withdraw the spring **(4)**.
35. Remove the O-ring **(5)**, withdraw the body **(6)** complete with valve **(7)** and washer **(8)** from the RH cover.
    Note: Ball (9) is fitted in the valve body.

Reassembly

36. Check that the valve **(7)** slides freely in the valve body **(6)**.
37. Fit washer **(8)**, mount the body **(6)** complete with valve **(7)** in the cover. Position the O-ring **(5)**.
38. Fit the spring **(4)** and shims **[2]** and tighten the plug **(1)** to a torque of 50 - 60 Nm.

D. Disassembly of cover

39. Remove the cover. Carry out operations 1 to 14.
40. Place the cover **(1)** in a vice with soft plastic jaws.
41. Remove the solenoids and plug **(18)** (2WD version).
42. Remove the low-pressure switch **(12)** (see table, page 2) and the reducer **(8)**.
43. Remove the switches **(11)** and **(12)** (see table, page 2), the fitting **(10)** and the reducer **(9)**.
44. Remove connector **(16)**, then fitting **(22)**,(or fitting **(14)** and a plug **(21)** on 2WD version).

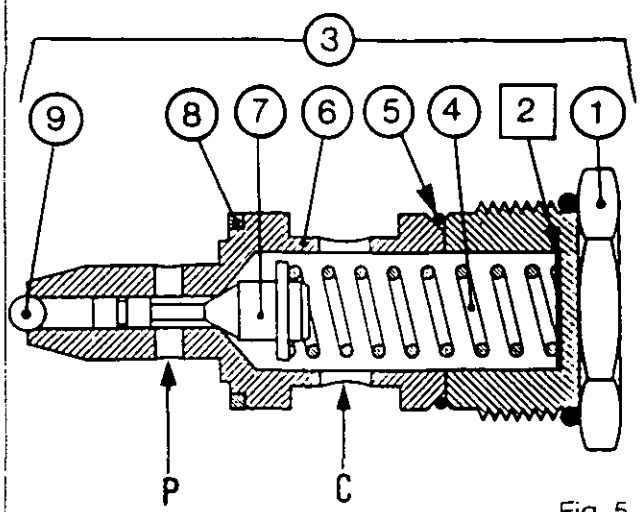


Fig. 5

45. Remove connectors **(6)**, **(20)**, **(23)**, **(33)**.
46. Remove the screws **(25)** and the cover plate **(28)** (version without trailer brake). Remove the O-rings **(30)**, **(31)** and **(32)**.
47. Unscrew the engine speed sensor **(4)** or the plug **(5)** (version without Autotronic).
48. Remove the filter vacuum switch **(26)** and the test coupler **(24)**.
49. Remove the screws **(55)**, the intake manifold **(47)**, the seal **(34)** and the pipe **(48)**. Remove the seals **(49)**.
50. If necessary, unscrew the plugs **(27)**.

Removal of driving gear

51. Unscrew the nut **(51)**. Remove the washer **(52)**, the gear **(53)** and the key **(54)**.

Hydraulics - RH hydraulic cover

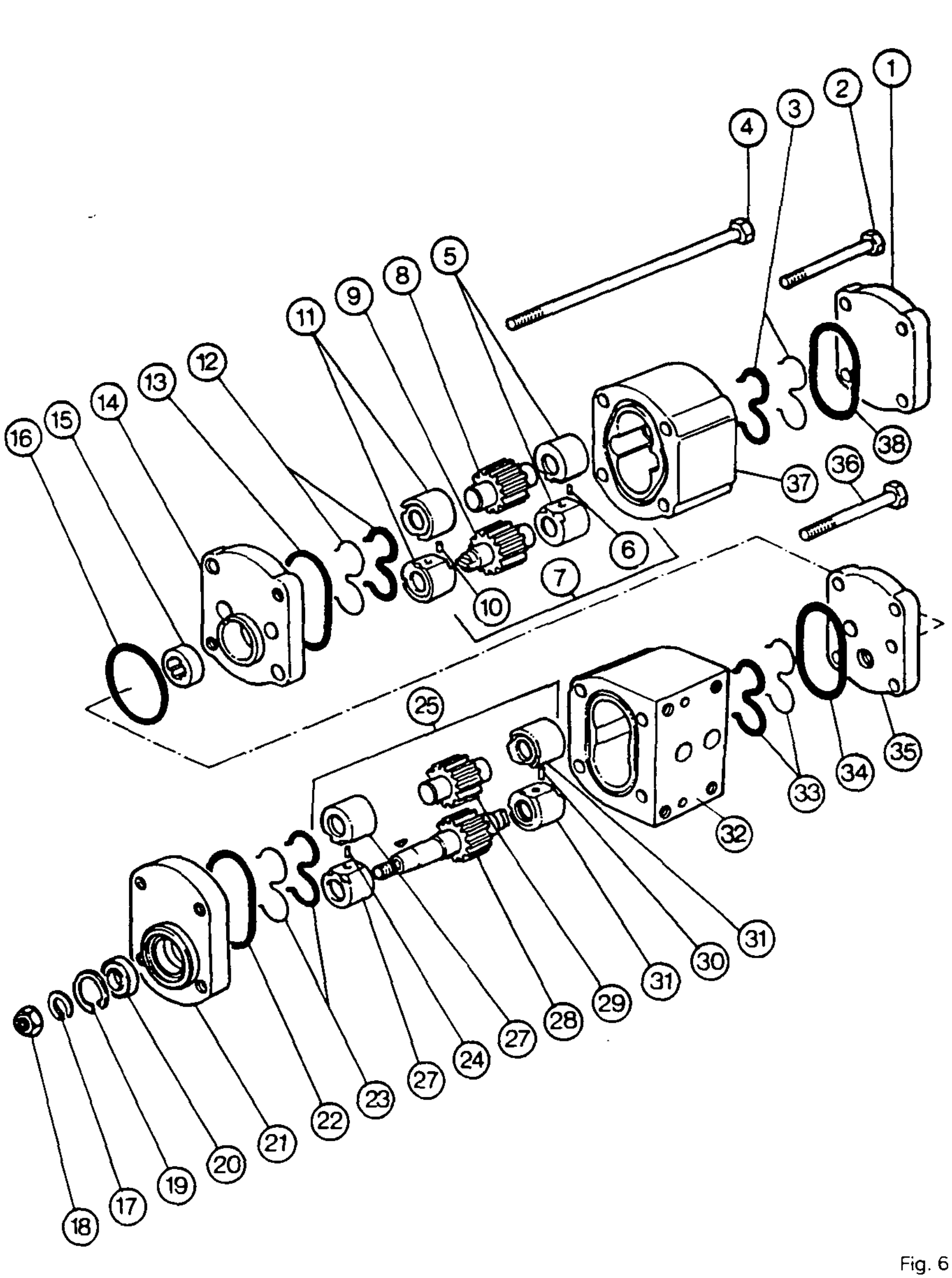


Fig. 6

E. Removal and disassembly of Bosch pump

Removal (Fig. 7)

52. Remove the screws **(2)**, and pump **(56)**. Remove the O-rings **(35)** and **(36)**.
__Note: The dowels (37) are force-fitted in the cover.__

Disassembly (Fig. 6)

53. Place the pump in a vice (Fig. 8).
54. Mark the position of: the stages, the intermediate plate and the plates.
55. Remove the screws **(2)** and **(4)**.
56. Remove the cover plate **(1)**.
57. Remove the composite seal **(3)** and seal **(38)**. Separate the low-pressure stage **(37)** from the intermediate plate **(14)**.
58. Remove the stage and the bearing/pinions assembly **(7)**.
59. Remove the pinions **(8)** and **(9)** from the bearing assemblies **(5)** and **(11)**.
__Note: Keep the bearing assemblies paired. Each bearing is linked by a dowel «P» (Fig. 9).__
60. Remove the composite seal **(12)** and seal **(13)**.
61. Remove the intermediate plate **(14)**, the driver **(15)** and the seal **(16)**.
62. Untighten and remove the screws **(36)**.
63. Remove the intermediate plate **(35)**.
64. Remove the composite seal **(33)** and seal **(34)**.
65. Separate the high-pressure stage **(32)** from the flange **(21)**.
66. Remove the bearing/pinions assembly **(25)**.
67. Remove the pinions **(28)** and **(29)** from the bearing assemblies **(27)** and **(31)**.
__Note: Keep the bearing assemblies paired.__
68. Remove the composite seal **(23)**.
69. Remove the seal **(22)**.
70. Remove the circlip **(19)** and drive out the bush **(20)**.

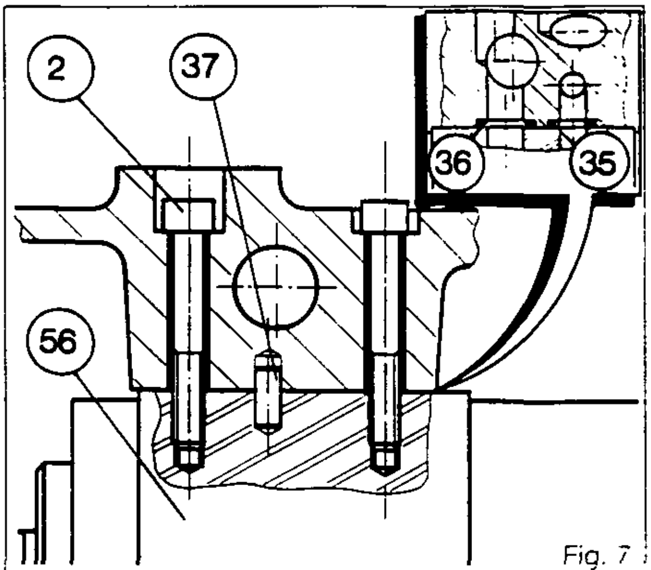


Fig. 7

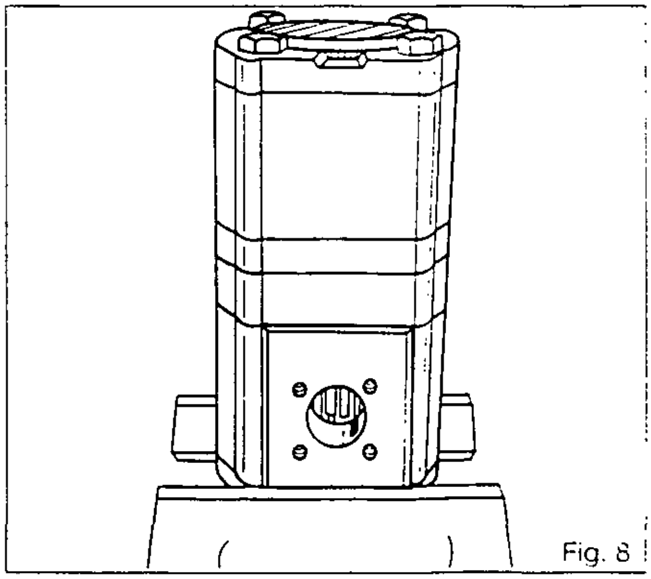


Fig. 8

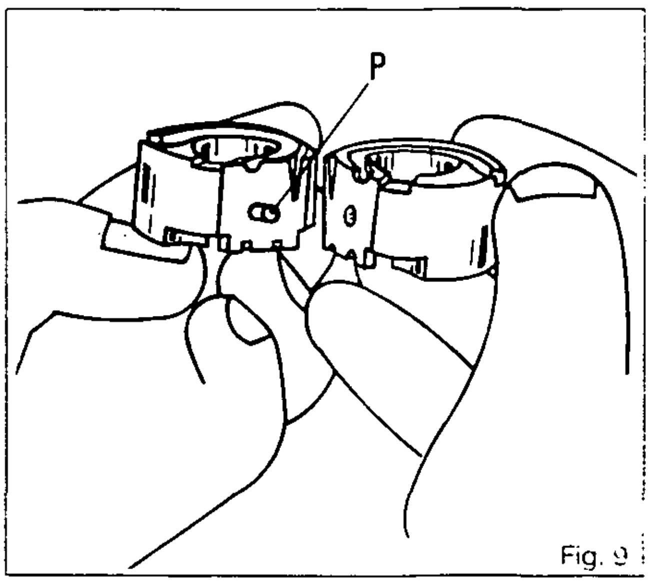


Fig. 9

F. Reassembly and refitting of Bosch pump

Reassembly (Fig. 6)

71. Clean and check the parts. Replace any which are defective.
    Note: The seals and the bush must always be replaced and fitted in the lubricated state.
72. Push the seal ring **(20)** in the plate **(21)** and fit the circlip **(19)**.
    Note: The bearing assemblies have different forms. The intermediate bearing assemblies (11) and (31) have a recess «E» (Fig. 10) for oil to pass to the low-pressure stage (37).
73. Fit the bearing assembly **(27)** (without recess), located by the pin **(24)**, in the high-pressure stage **(32)**. Position the lubrication channels «G» towards the intake orifice «O», and the groove «R» of the composite seal **(23)** towards the plate **(21)** (*Fig. 11*).
74. Place the pinions **(28)** and **(29)** of the high-pressure stage in the bearing assembly **(27)**.
    Note: The pinions of the high-pressure stage are wider.
75. Position the composite seal **(23)** and seal **(22)** (Fig. 12).
76. Assemble the high-pressure stage **(32)** on the flange **(21)** according to the marks made at the time of disassembly.
77. Fit the bearing assembly **(31)** (with recess), located by the pin **(30)**, in the high-pressure stage **(32)**. Position the lubrication channels «G» and the recess «E» towards the intake orifice «O», and the groove «R» of the composite seal **(33)** towards the top (Fig. 13).

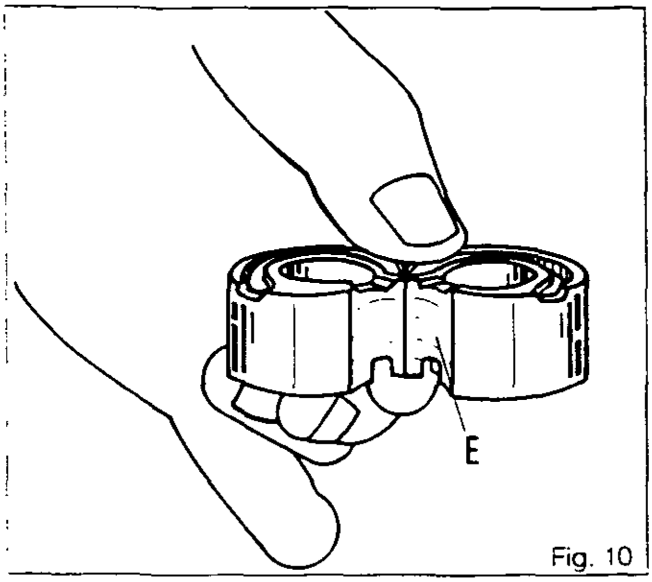


Fig. 10

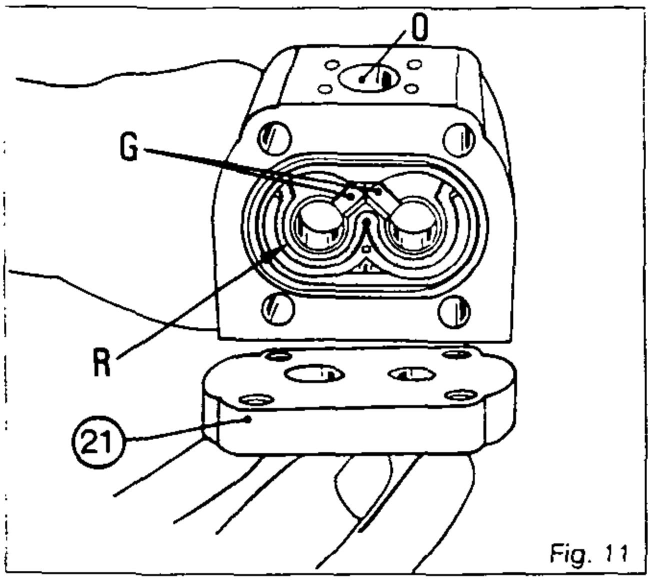


Fig. 11

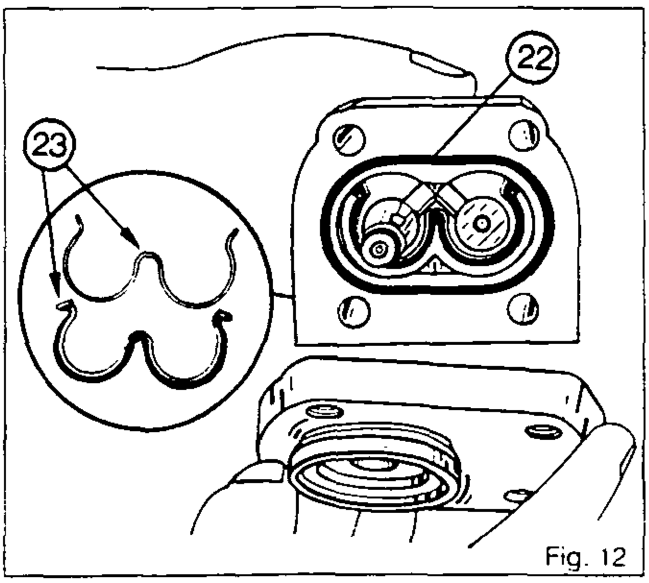


Fig. 12

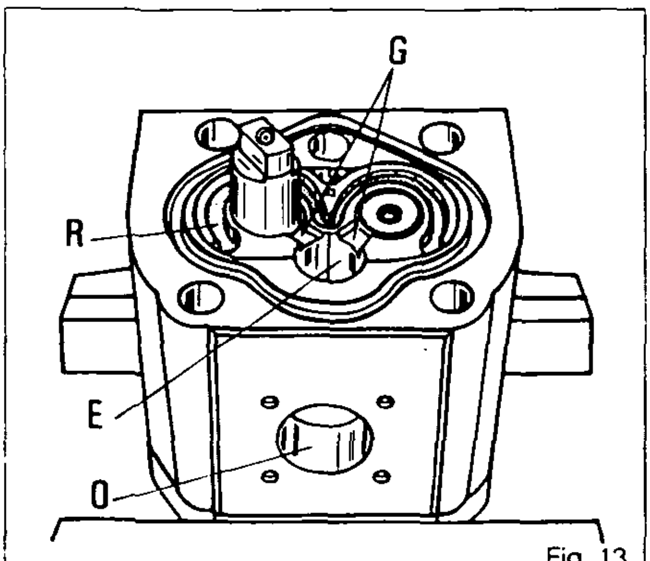


Fig. 13

78. Position the composite seal **(33)** and seal **(34)**. Assemble the flange **(35)** on the high-pressure stage **(32)** (Fig. 14) according to the marks made at the time of disassembly.
79. Centre the flange **(35)**. Fit and tighten the screws **(36)** to a torque of 40-47 Nm.
80. Refit the driver **(15)** against the flat surface of the driving pinion **(28)**. Position the seal **(16)**.
81. Fit the intermediate plate **(14)** according to the marks made at the time of disassembly.
82. Fit the bearing assembly **(11)** (with recess), located by the pin **(10)**, in the low-pressure stage **(37)**. Position the lubrication channels «G» and the recess «E» towards the intake orifice «O», and the groove «R» of the composite seal **(12)** towards the intermediate plate **(14)** (Fig. 15).
83. Position the composite seal **(12)** and seal **(13)** (Fig. 15).
84. Assemble the low-pressure stage **(37)** on the intermediate plate **(14)** according to the marks made at the time of disassembly.
85. Place the pinions **(8)** and **(9)** in the low-pressure stage, ensuring that the flat surface of the driving pinion **(9)** enters the driver **(15)**.
86. Fit the bearing assembly **(5)** (without recess), located by the pin **(6)**, in the low-pressure stage **(37)**. Position the lubrication channels «G» towards the intake orifice «O», and the groove «R» of the composite seal **(3)** towards the cover plate **(1)** (Fig. 16).
87. Position the composite seal **(3)** and seal **(38)** (Fig. 17).

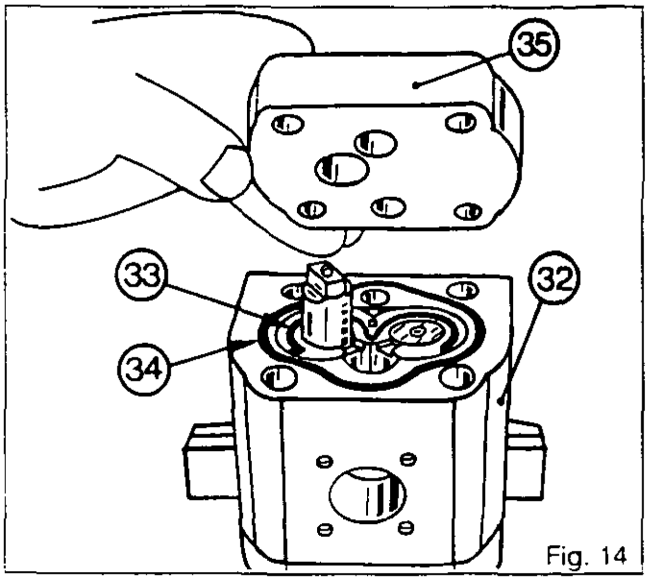


Fig. 14

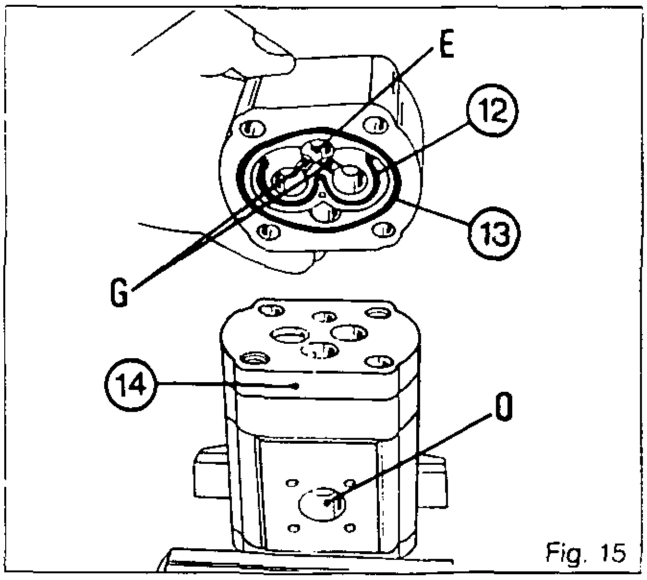


Fig. 15

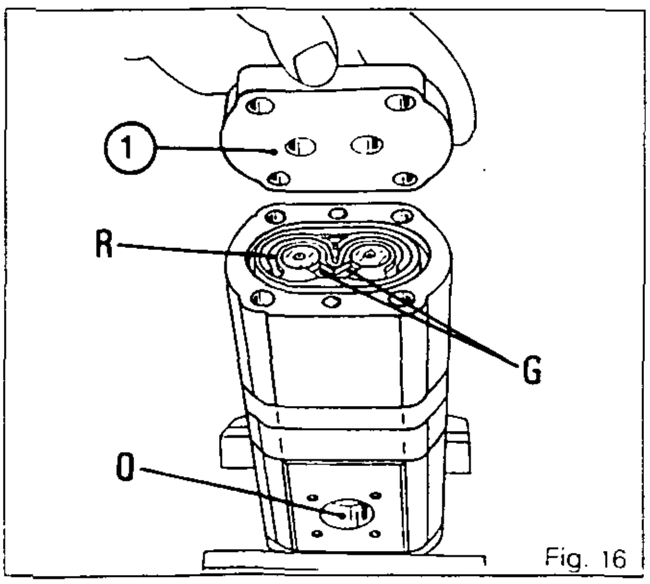


Fig. 16

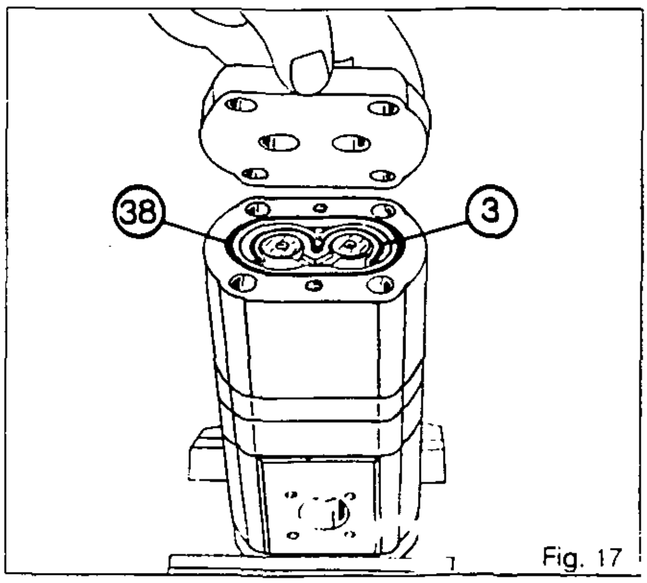


Fig. 17

88. Centre the low-pressure stage **(37)** and assemble the cover plate **(1)** according to the marks made at the time of disassembly.
89. Fit and tighten the screws **(2)** and **(4)** to a torque of 40-47 Nm.
90. Manually check the rotation of the pump.

Refitting

91. Clean and check the parts. Replace any which are defective. Check that none of the channels of the cover are blocked.
92. Push the dowels **(37)** (if removed) into the cover (Fig. 18).
93. On the cover, fit new O-rings **(35)** and **(36)** in the counterbores of the high- and low-pressure channels (Fig. 18).
94. Inside the cover, apply a bead C of Loctite 575 around the four screw holes (Fig. 18).
95. Refit the pump on the dowels **(37)** (Fig. 7).
96. Smear the screws **(2)** with Loctite 221 and tighten them to a torque of 10 - 12 Nm (Fig. 7).

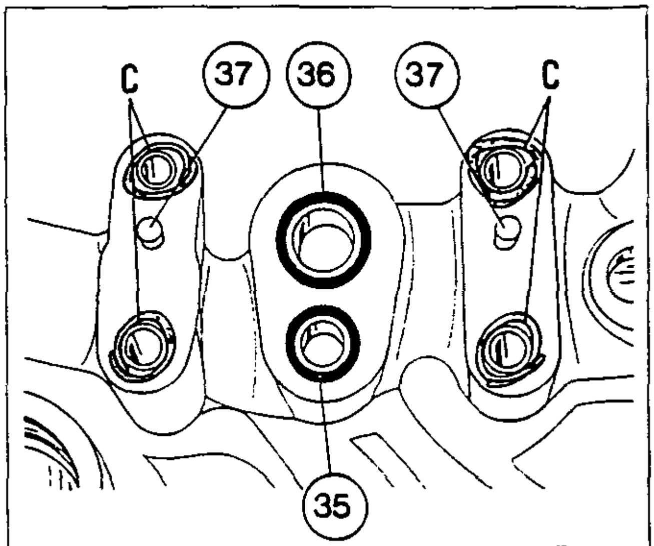


Fig. 18

G. Reassembly of cover

Refitting of driving gear

97. Position the key **(54)**. Fit the driving gear **(53)**, ensuring that it is correctly engaged on the key. Fit the washer **(52)**.
98. Smear the nut **(51)** with Loctite 241 and tighten to a torque of 50 - 60 Nm.
99. Refit the plugs **(27)** smeared with Loctite 542 (if removed).
100. Replace the O-rings **(49)** on the pipe **(48)**.
101. Replace the seal **(34)**, refit the pipe and intake manifold **(47)**. Refit the screws **(55)**.
102. Fit the filter vacuum switch **(26)**.
103. Fit and tighten the test coupler **(24)** with its O-ring.
104. Fit the sensor **(4)** (Autotronic, Datatronic) with "Loctite 577 Sensor Sealing" or equivalent.
105. Screw in the sensor, without forcing it, until it is in contact with the pump gear.
106. Unscrew the sensor 3/4 of a turn to provide clearance of approx. 1 mm between the sensor **(4)** and the gear **(53)**. Tighten the nut **(1)** to a torque of 10-12 Nm (Fig. 19).
107. Fit the O-rings **(30)** **(31)** **(32)** in their respective locations on the cover plate **(28)** (version without trailer brake).

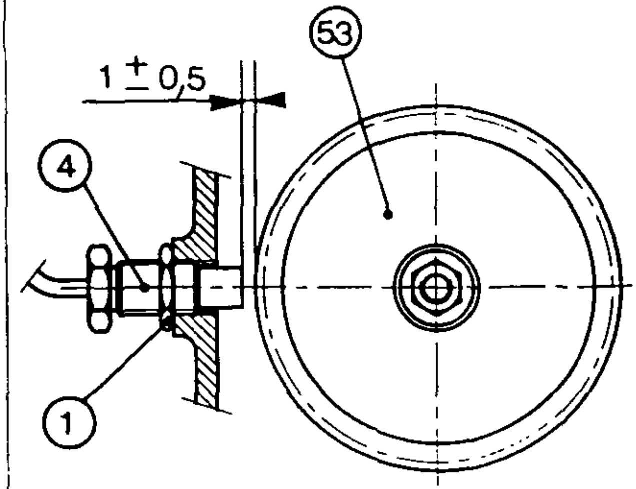


Fig. 19

108. Refit the plate, fit the screws **(25)** and tighten them to a torque of 25 - 35 Nm.
109. Refit the connectors **(6)**, **(20)**, **(23)** and **(33)**.
110. Fit the plug **(21)** and connector **(14)** (2WD version), connectors **(16)** and **(22)** (4WD version).
111. Refit the reducer **(8)** with its O-ring and low-pressure switch **(12)**, lightly smeared with Loctite 221 (version with Autotronic, see table on page 2).
112. Refit the reducer **(9)** with its O-ring, the connector **(10)** and the two low-pressure switches smeared with Loctite 221.

    Note: The low-pressure switches are marked with a spot of paint between the two terminals. It is important to fit them according to the table on page 2.

    For tractors without Autotronic or with Autotronic and super-creeper, fit the switches as shown in Fig. 20.
113. Refit the solenoid and plug **(18)** (2WD version).

    Note: To avoid interference with the cab, do not refit the p.t.o. brake solenoid on tractors with a low cab. The p.t.o. brake solenoid is equipped with a diode. It is marked with the symbol ⟶

    Tighten the solenoid to a torque of 18-20 Nm.
114. Refit the high-pressure valve. Carry out operations 36 to 38.
115. Refit the cover. Carry out operations 15 to 33.

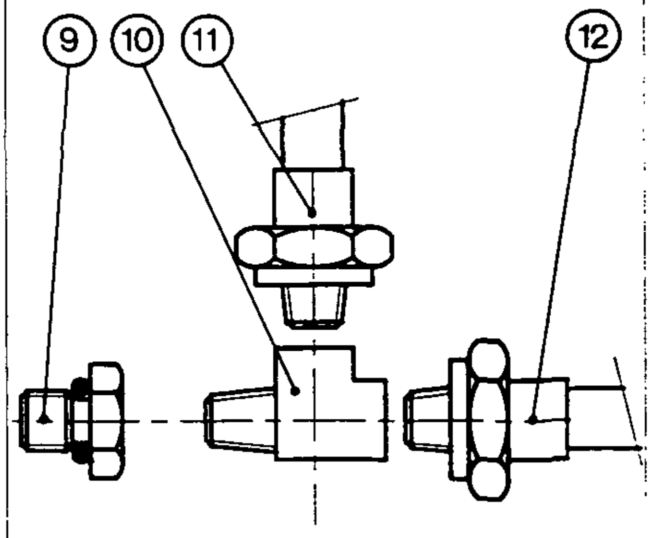


Fig. 20

8 102 Left-hand hydraulic cover

CONTENTS

Hydraulics - LH cover

A. Removal

1. Immobilise the tractor and lift the rear with a trolley jack. Slacken the left rear wheel and put a stand in place. Remove the wheel.
2. Drain the gearbox (only).
3. Mark and disconnect the cables of the lift **(1)** and lowering **(2)** solenoid (Fig. 1).
4. Disconnect and block the lift valve supply hose **(3)** and the ram supply tube **(4)** (Fig. 1).
   Note: On tractors with a low cab, remove the bolts (7) and take away the valve to facilitate access to the upper bolts (5) of the cover.
5. Remove the bolts **(5)** and take away the support **(6)** of the of the hand brake control.
   Note: On tractors equipped with GSPTO, disconnect the control (8) and remove the support (9) (Fig. 1).
6. Remove the cover and the transfer tube.

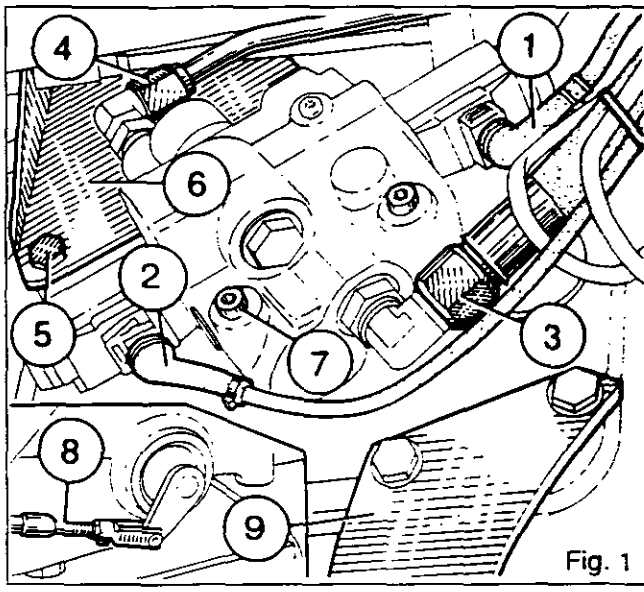


Fig. 1

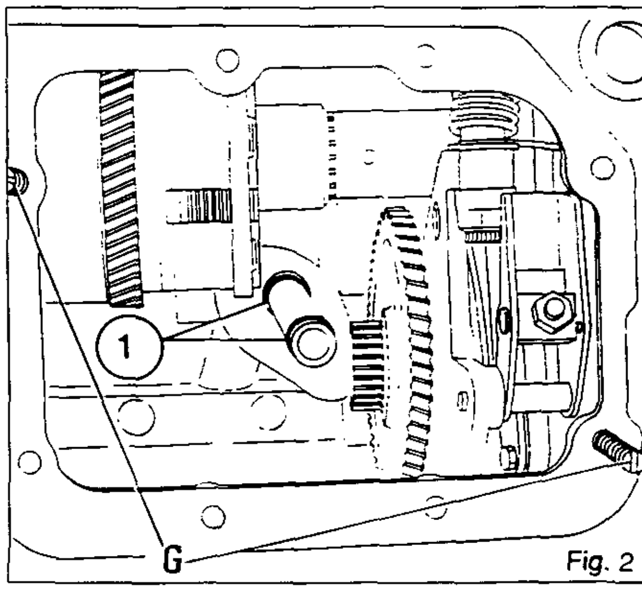


Fig. 2

B. Refitting

7. Clean the cover and housing joint surfaces .
8. Check that the O-rings **(1)** of the transfer tube are not damaged and refit the tube (Fig. 2).
9. Coat the housing joint surface with a sealant (Master Joint or equivalent).
10. Screw in two opposing guide studs **G** (Fig. 2).
11. Refit the cover.
12. Mount the handbrake control support **(6)**, the GSPTO support **(9)** (if fitted) (Fig. 1). Remove the guide studs. Fit and tighten the bolts to a torque of 72 - 96 Nm. Connect the controls.
    Note: On tractors with a low cab, check that the O-rings of the lift control valve are not damaged and refit the valve.
    Fit and tighten the bolts (7) to a torque of 25 - 35 Nm (Fig. 1).
13. Check the adjustment of the control:
    - of the handbrake; carry out operations 71 to 75, chapter 6 I01.
    - of the GSPTO (if fitted) : carry out operations 99 to 105, chapter 6 F01.
14. Reconnect the supply hose **(3)** of the lift valve and the feed tube **(4)** of the lift rams (Fig. 1).
15. Reconnect the lift **(1)** and lowering **(2)** solenoid (yellow connector) (Fig. 1).
16. Fasten the cable to the valve supply hose with a clip.
17. Refit the wheel. Take away the stand and the trolley jack. Tighten the nuts to a torque of 400 - 450 Nm.
18. Top up the housing oil level.
19. Start the engine.
20. Check the operation of the lift system and check for leaks at the joint faces of the cover and the hydraulic connectors.

Version without lift
The cover (valve support) is replaced by a plate with a hydraulic sleeve.

8 J01 Hydraulic tests

CONTENTS

Hydraulics - *Hydraulic tests*

Preparation

Before beginning the tests, the engine should be run to bring the oil temperature up to minimum 60°C (140°F). The following equipment is recommended for the tests shown in this section. It is available through the MF dealer network.

- MF3001 : Pressure gauge kit
- MF3002 : Hoses and unions kit
- MF3003 : Flowmeter assembly
- 3582045 M1 : *Hydraulic coupler*

Otherwise, use suitable equivalent equipment.

In all cases, make sure of the direction of flow of the oil to avoid damaging the flowmeter. Also choose pressure gauges, hoses and unions of sufficient capacity and strength.

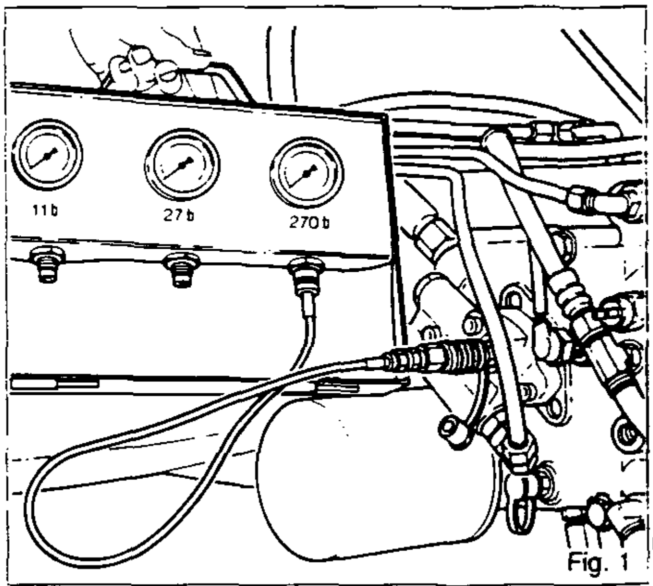
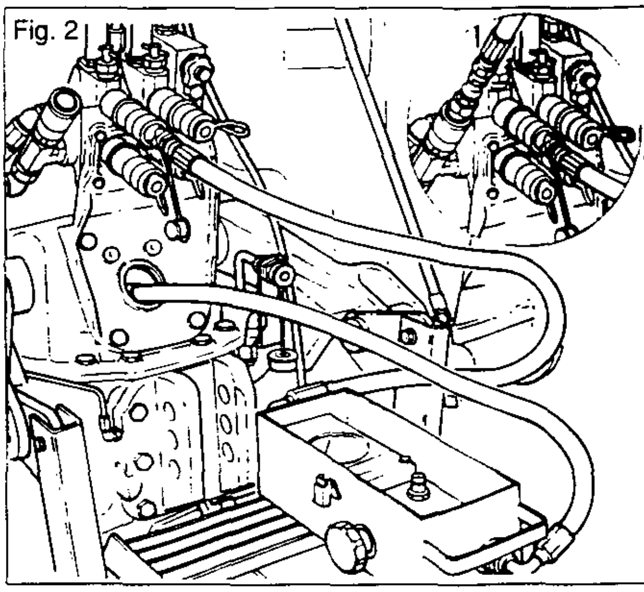


Fig. 1

Fig. 2


A. High flow circuit

1. HP safety valve

Fit a pressure gauge with coupler 3582045 M1 (Fig. 1) on the diagnostic point located on the trailer brake valve (if fitted), or on the cover plate fitted on the right-hand cover. Run the engine at 2000 rpm. Operate an auxiliary spool valve so as to open the valve. Read :

P1 = 185 bar (+15 bar - 5 bar)

At 1000 rpm, the pressure should not fall.

If necessary, adjust the valve by the use of shims (See Section C 8I01).

2. Pump flow

Connect the inlet pressure port of the flowmeter to a spool valve quick coupler other than the one fed by the flow divider.

Connect the return directly to the centre housing via the transmission filler orifice. The return can also be connected to Accessory No. 3467953M91, giving a direct *connection with the centre housing (Fig. 2).*

Operate the spool valve concerned and check that the following minimum readings are obtained :

Engine speed rpm	Q1 : l/min	P2 : bar
2000	40	0
2000	38.5	100

3. Trailer brake valve (if fitted)

Connect a pressure gauge to the trailer brake socket. Run the engine at 2000 rpm.

Apply a progressive force to the brake pedals, which should be locked together. The pressure reading should gradually increase and reach :

P3 = 130 - 150 bar max.

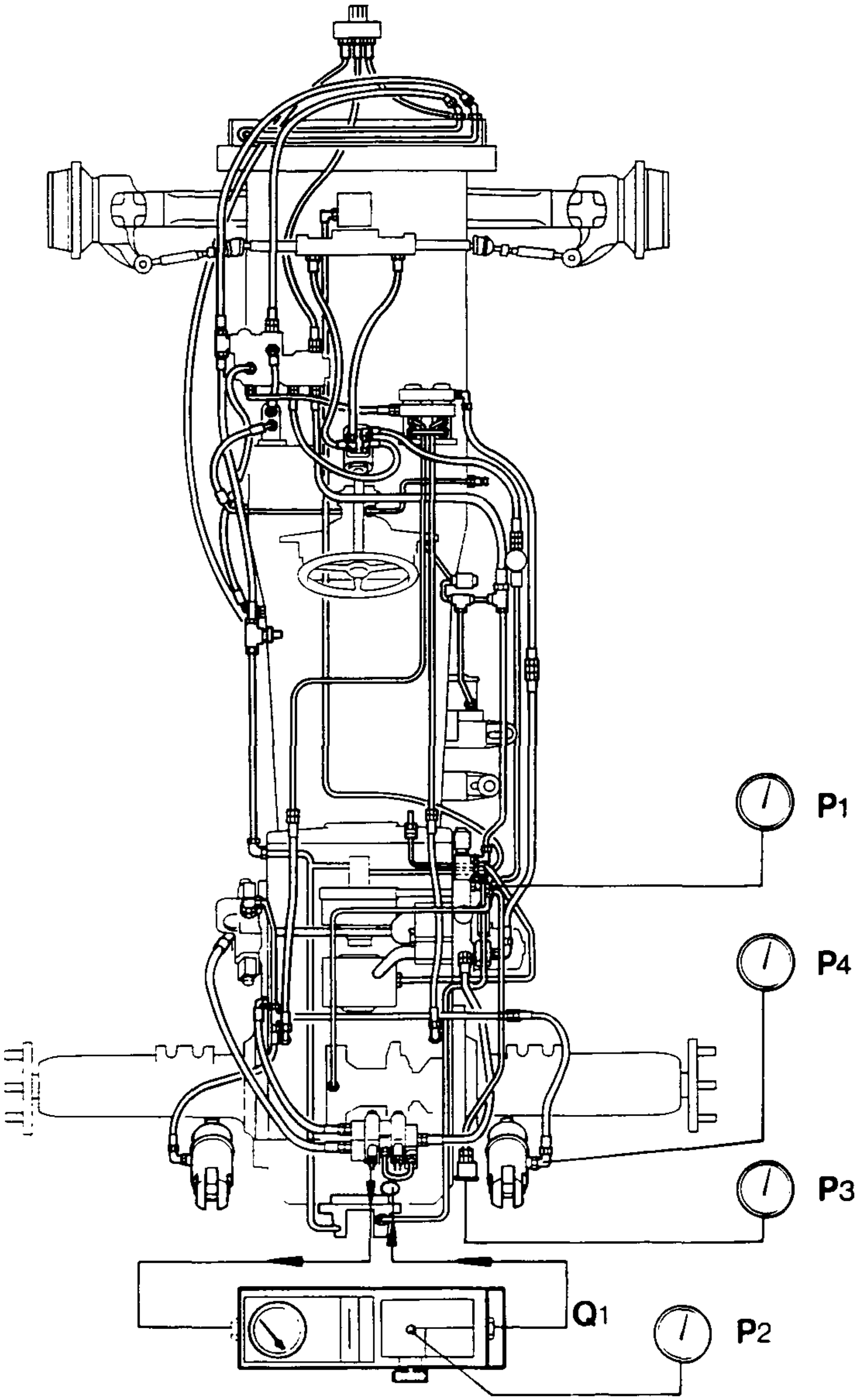
4. Anti-shock lift valve

Disconnect the cylinder inlet hoses and connect them to a manual adjustment pump.

With the engine shut down and the lift valve in neutral position, apply pressure to the system. Note the opening pressure :

P4 = 200 - 210 bar.

High flow



B. Low flow circuit

1. Pump flow

As shown in Fig. 3, connect the flowmeter between the distribution valve and the 1.5 bar valve hose.

Caution : Check that the flowmeter valve is completely open.

Also connect a pressure gauge to the distribution valve (Port 4 with plug).

The following minimum readings should be found :

Engine speed rpm	Q2 : l/mn	P5 : bar	Rem.
2000	23	17	Steering at rest
1000	11.5	17	Steering at rest

During these tests, the rear axle must not be put on blocks with the front axle (4 WD) engaged.

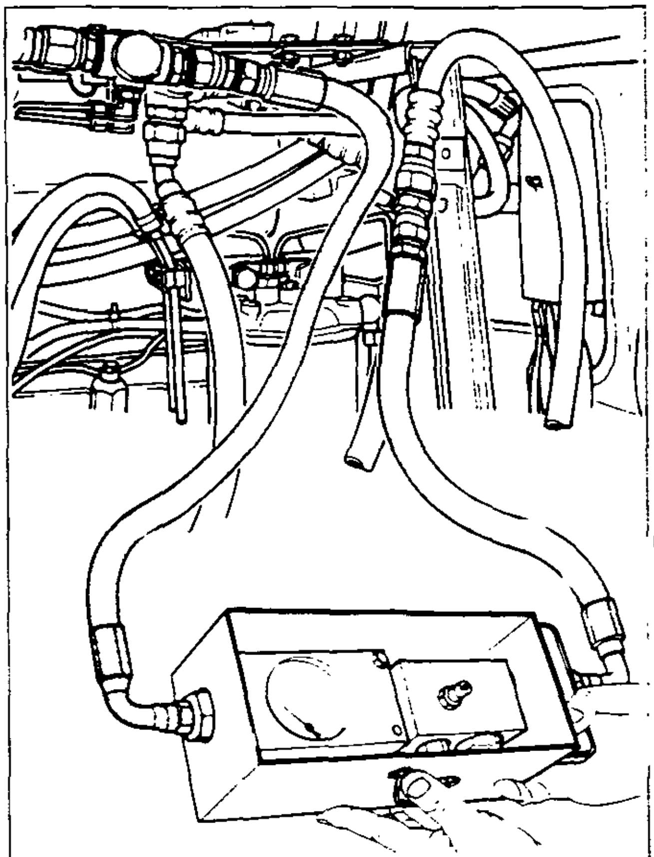


Fig. 3

2. Checking leaks at clutches and receiving components

To check the reference point flow at Q2, the front axle should be **engaged** (no flow to clutch, warning light «on»), the range lever in Tortoise position, the A/B control lever at position B.

Remain connected as at B1. Note the reference point Flow Q2 at 1000 rpm.

Operate each function separately and note flow Q3. The difference Q2 - Q3 represents the leak, which must not exceed the values shown in the guide table :

Example : PTO Clutch

Q2 = 13 l/min. Q3 = 11.5 l/min. Leak = 1.5 l/min. OK

Q2 = 13 l/min. Q3 = 10.8 l/min. Leak = 2.2 l/min. higher than acceptable leak.

Note: Before checking the following function and so that flow Q3 is not falsified, move the lever of the function under test to the neutral position or to the range position shown below.

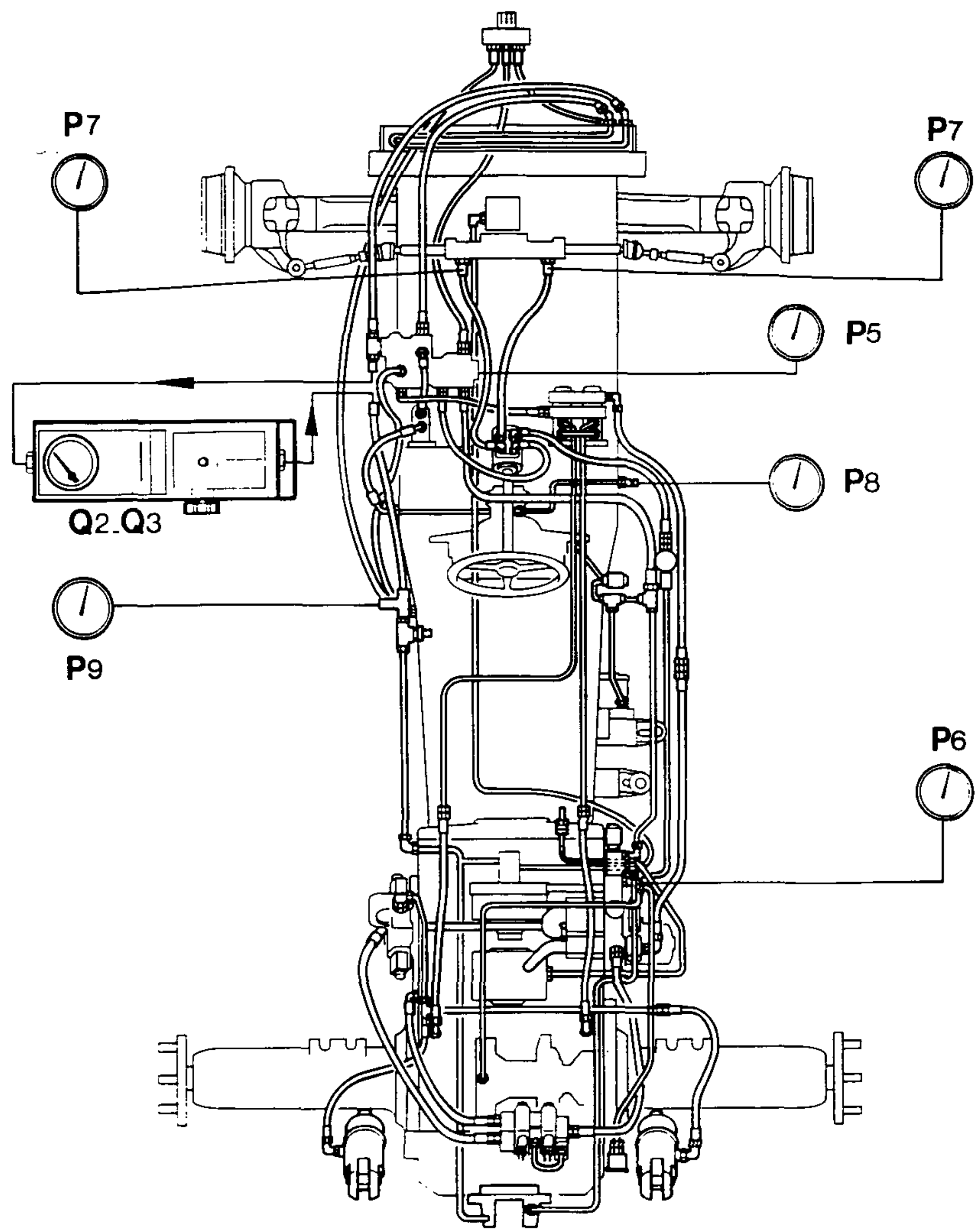
When all clutches and other components are fed, pressure P5 should stay at 17 bar.

	PTO Clutch	PTO Brake	Diff. Lock	Front PTO	Speed-shift	A Range	Hare Range	Front Axle	
Reference point flow Q2									*
Flow read at Q3									*
Leak registered Q2 - Q3 l/mn									
Acceptable leak l/mn	2	2	2	3	3	1.5	2	2	
Pressure at P5	17 bar								

* Q2 = With front axle engaged (no flow to clutch)
* Q3 = With front axle disengaged (flow to clutch)

As from tractor No. N047049, to disengage the front axle when the tractor is stopped the solenoid has to be connected directly from the positive terminal of the battery.

Low flow



Hydraulics - *Hydraulic tests*

3. Supply to steering valve (Orbitrol)

Connect a pressure gauge to the diagnostic point on the right-hand hydraulic cover, as shown in Fig. 4.
Turn the steering to full lock and read :
P6 = 170 bar at 1000 rpm and at 2000 rpm

4. Supply to steering cylinder

Connect a pressure gauge to a bypass on each steering cylinder hose.
With the steering at rest, read :
P7 = 17 bar
Turn the steering wheel. The pressure should reach between 17 and 170 bar on the inlet end of the cylinder. The pressure on the return line should be 17 bar.

5. Clutch release bearing

Connect a pressure gauge with a 3582045 M1 coupler to the bleed point located on the right-hand side of the gearbox (Fig. 5).
Caution: Since the pressure can reach 30 bar when the pedal is depressed, it is essential to connect the pressure gauge after starting the engine.
Note pressure **P8 = 1.5 bar max.**

6. Lubricating pressure

Connect a pressure gauge to the tee-union on the valve on the left of the gearbox. Note **P9 = 1.5 bar max.**

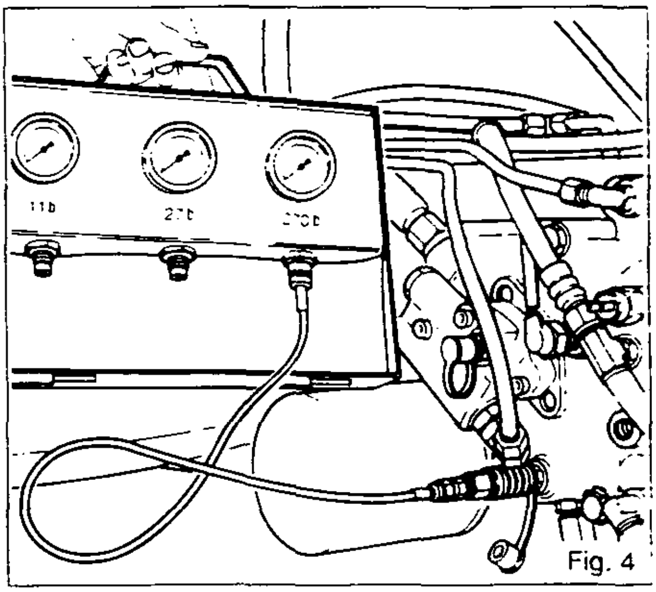


Fig. 4

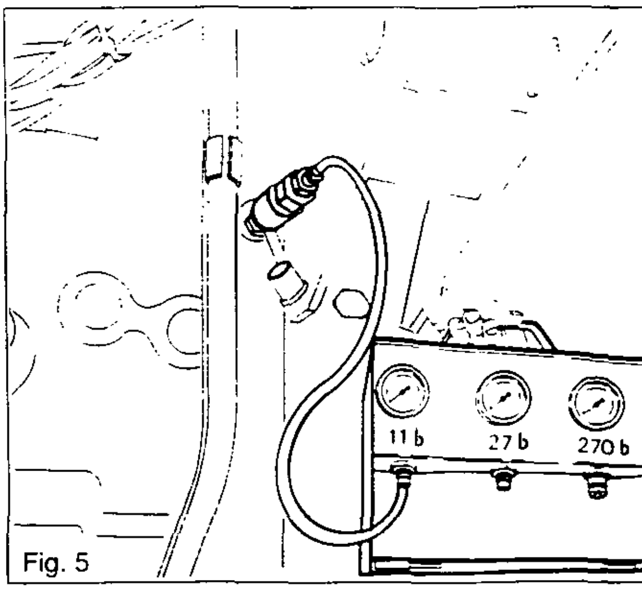


Fig. 5

8 K01 Dynashift control

CONTENTS

General

The system control assembly comprises of the three main parts (Fig. 1) :

- **The distribution unit (1)** mounted on the right side of the gearbox, it has two internal oilways A and B (Fig. 2) allowing the oil to circulate from one solenoid valve to the other.

- **The solenoid valves (2)** are screwed into the distribution unit, they include:
  . the lower solenoid valve EV1 with four ports and two positions.
  . the upper solenoid valve EV2 with three ports and two positions.

- **The accumulator (3)** mounted on the distribution unit, on the inlet line, enhances the oil flow to fill the Dynashift unit piston chambers when necessary. Thus piston reaction is maintained.

Make	:	Olaer
Type	:	1/20
Capacity	:	1 litre
Gas	:	Nitrogen
Pressure	:	9 ± 1 bar (must be checked every 6 month, with engine stopped)

Note: When the engine is stopped, the accumulator maintains a pressure of 17 bars for a short period. If immediate maintenance action is necessary on the system, proceed with caution.

Two test couplers may be fitted to check the pressure in the piston chambers (Fig. 7).
The distribution unit oil is supplied by pipe. The return oil, from the piston chambers goes to the gearbox housing selector cover via the pipe **(4)** (Fig. 7).

Lubrication

The oil flow coming from the cooler lubricates the mechanical elements of the Dynashift, reverse shuttle unit, gearbox and P.T.O. shaft which pass through the transmission (see chapter 5 N01).

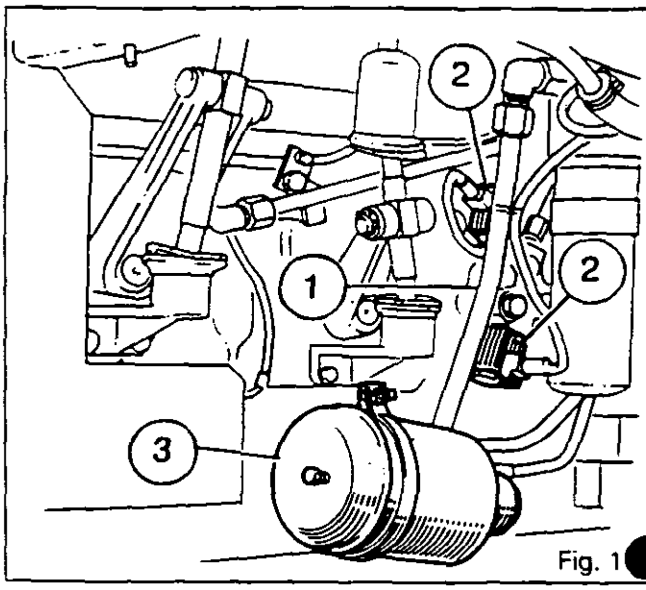
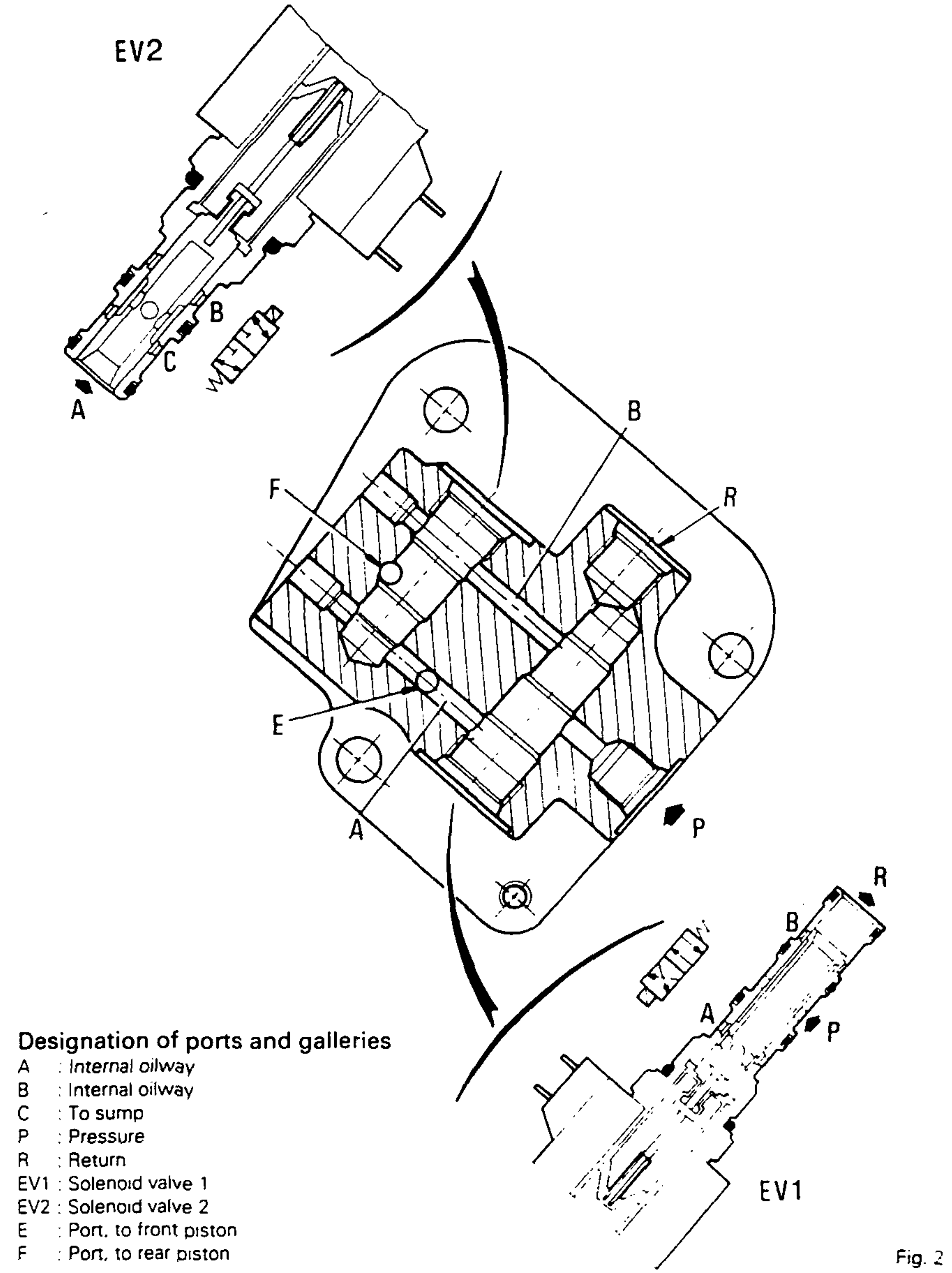


Fig. 1



Designation of ports and galleries

A : Internal oilway
B : Internal oilway
C : To sump
P : Pressure
R : Return
EV1 : Solenoid valve 1
EV2 : Solenoid valve 2
E : Port, to front piston
F : Port, to rear piston

Fig. 2

A . Ratios explanation

Refer to chapter 5 R02 for the theoretical operation and the mechanical explanation of the ratios (refer also to page 8K01-3 - Fig. 2).

Ratio A (Fig. 3)

Solenoid valve EV1 is supplied, thus allowing oil under pressure to reach gallery A. This gallery directs the oil to the front piston via orifice E, and also, to solenoid valve EV2. Since EV2 is in neutral position, the oil can circulate through the spool valve and orifice F to the rear piston chamber. Both pistons are thus under pressure.

Ratio B (Fig. 4)

A gear change from A to B is obtained when both solenoid valves are supplied. The oil flow to the rear piston is thus interrupted. The rear piston is pushed back by springs which send oil back into gallery B. This gallery communicates with the sump via solenoid valve EV1.

Ratio C (Fig. 5)

A gear change from B to C is obtained by interrupting the electrical supply to solenoid valve EV1, solenoid valve EV2 remains energized. Gallery A is no longer under pressure but is connected to the sump. Consequently, the front piston can return to neutral position.
Gallery B is under pressure. The oil circulates to the rear piston through solenoid valve EV2.

Ratio D (Fig. 6)

Ratio D is obtained by cutting the electrical supply to EV2. The two pistons are connected to the sump by gallery A.

Ratio A

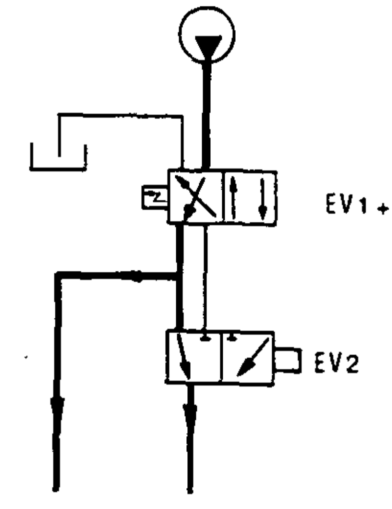


Fig. 3

Ratio B

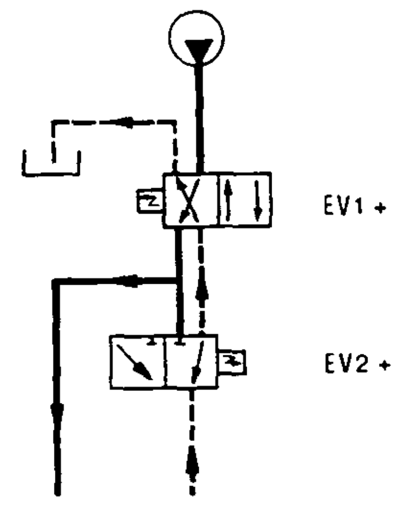


Fig. 4

Ratio C

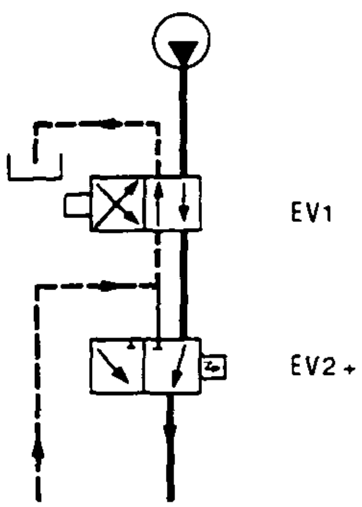


Fig. 5

Ratio D

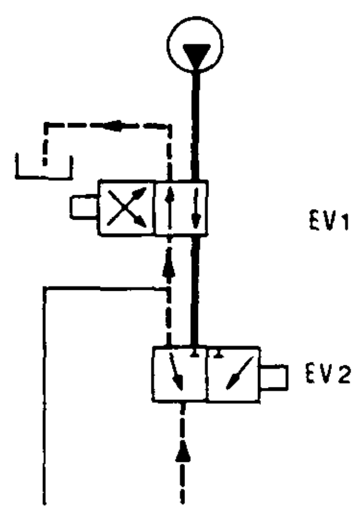


Fig. 6

B . Dynashift piston pressure check (Fig. 7)

1. Remove plugs **(1)** from the distribution unit.
2. Screw on two male couplers **(2)** and **(3)**, ref. 3384387 M1, and connect them to couplers ref. 3582045 M1, connected to pressure gauges with a capacity of 27 bar approx.
3. Start the engine.
4. Operate the lever under the steering wheel to select each ratio (A, B, C, D).
5. Check that the pressures are correct in accordance with the following table.

Ratio	Front piston coupler (2)	Rear piston coupler (3)
A	17 bar	17 bar
B	17 bar	0
C	0	17 bar
D	0	0

6. If the pressures are not correct, check the displacement of the solenoid spool valve or refer to the electrical tests (chapter 10 C01 p. 4).

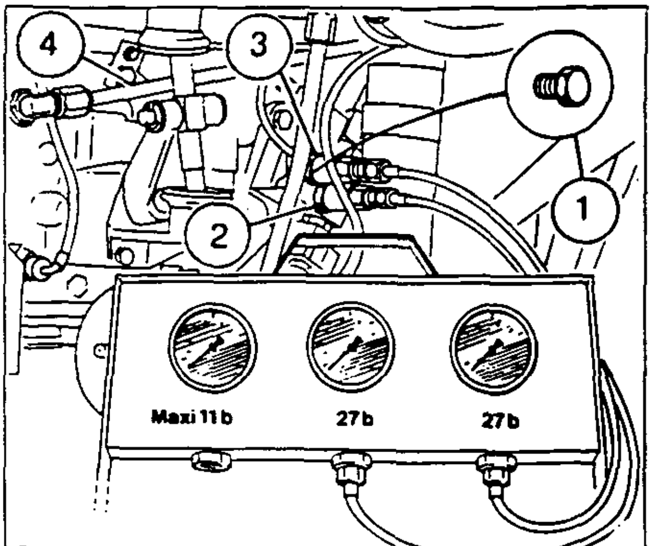


Fig. 7

6

9A01 Electrical system

CONTENTS

Electrical equipment

A . General

The electrical arrangements in MF 3000/3100 Series tractors comprise a 12 volt negative system, charged by a 70 ampere alternator. The alternator has an integral rectifier and regulator and the charging control is machine sensed. An additional terminal is provided to power the electronic engine tachometer . The alternator is fitted on the right hand side of the engine and is driven by a V-belt from the crankshaft pulley.
The starter motor is of the pre-engaged type mounted on the right hand side of the 1000 series engine and on the left hand side of other engines.
A safety start switch is fitted below the clutch pedal. This renders the starter motor inoperative until the clutch pedal is pressed.

Specifications

Battery

MF 3050-3060-3065

Number	1
Make	CEAC
Type	Maintenance free
Model	FCM 125388
Cold start performance	505 A (-18°C)
Reserve capacity at 25 A	120 min
Voltage	12 V
Acid capacity	8,2 l

MF 3050-3060-3065 (cold climates)
MF 3080-3095-3115-3125

Number	2
Make	CEAC
Type	Maintenance free
Model	FCM 066431
Cold start performance	420 A (-18°C)
Reserve capacity at 25 A	120 min
Voltage	12 V
Acid capacity	4,3 l

Alternator

Make	Valeo
Type	NG
Max. output	70 A
Regulator	Machine sensed
Regulator voltage 1	4,2 V

Starter motor

Make	Magnetti-Marelli
Model	M127 (2,8 Kw)
Voltage	12 V
Type	Pre-engaged

Connector identification

	Colour	Way	Location
C1	Black (circular)	9	Beneath hood
C2	Black (circular) red band	9	Beneath hood
C3	Black	6	Instrument panel
C4	White	5	Instrument panel
C5	Black	7	Instrument panel
C6	White	6	Instrument panel
C7	White	4	Instrument panel
C8	Black	2	Beneath hood
C9	Black (circular)	3	Beneath hood
C10	Black	1	Beneath cab - Front RH
C11	Black	1	Engine - RH side
C12	White	3	Beneath lift console
C13	Black	3	RH cab pillar
C14	White	5	Beneath lift console
C15	Black	1	Beneath cab - Front RH
C16	Black	6	Roof - Front RH
C17	Black	3	Roof - Front RH
C18	Black	6	Roof - Front RH
C19	Black	2	Roof - Front RH
C21	Black	2	Instrument panel
C22	Black	2	Beneath lift console
C23	Black	1	Roof - Front RH
C24	Black	4	Roof - Front RH
C25	Black	1	Instrument panel
C26	Black	1	Beneath hood
C27	Black	1	Instrument panel
C30	Black	2	Instrument panel
C31	White	7	Instrument panel
C33	Black	2	Autotronic box
C34	Black	2	Autotronic box
C45	Black	1	Instrument panel
C60	Black	6	Instrument panel

Identification of harnesses

(a) Instrument panel main harness
(b) Engine harness
(c) Engine harness extension
(d) Control panel harness
(e) Thermostart wire (or harness)
(f) Instrument panel / roof harness
(g) Roof harness
(i) Rear wiper / washer harness
(j) Washer pump harness
(l) Harness - Door switch for interior light
(m) Instrument panel electronic harness
(o) Battery harness
(v) Instrument panel lighting harness
(w) Front and rear lighting harness
(y) Main switch harness
(z) Wire for radio, digital clock, interior light (for main switch)

B . Instrument panel and engine area wiring (with thermostart)

Key to diagram

1 . Starter switch
2 . Safety switch
3 . Alternator warning light
4 . Rev. counter
5 . Engine oil pressure warning light
6 . Water temperature gauge
7 . Air filter vacuum warning light
8 . Brake oil pressure warning light
9 . *Parking brake warning light*
10 . *Oil filter vacuum warning light*
11 . Fuel gauge indicator
12 . Hare warning light (instrument panel)
13 . Hare warning light (console)
14 . Switch illumination
15 . Cigar lighter
16 . Fuel gauge
17 . Oil filter vacuum switch
18 . Parking brake switch
19 . Air filter vacuum switch
20 . Temperature sender unit
21 . Engine oil pressure sensor
23 . Alternator
24 . Starter motor
25 . Battery
26 . Main switch (if fitted)
27 . Fuse 5 A (if fitted)
28 . Thermostart
30 . Pressure switch
31 . Air conditioning compressor
32 . Injection pump solenoid *
33 . Front windscreen washer pump
34 . Rear windscreen washer pump (if fitted)
35 . Switch (if fitted)
36 . Water circulating pump (if fitted)
37 . Front windscreen washer switch
38 . Air conditioning thermostat
39 . Console illumination
40 . Blower switch
41 . Blower motor
42 . Front windscreen wiper switch
43 . Windscreen wiper motor
44 . Interior light
45 . Door switch
46 . Digital clock
47 . Radio (except NA)
48 . Radio (NA only)
49 . Relay

Colour code

A = Silver
B = White
BL = Blue
G = Grey
I = Ivory
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark
C = Light

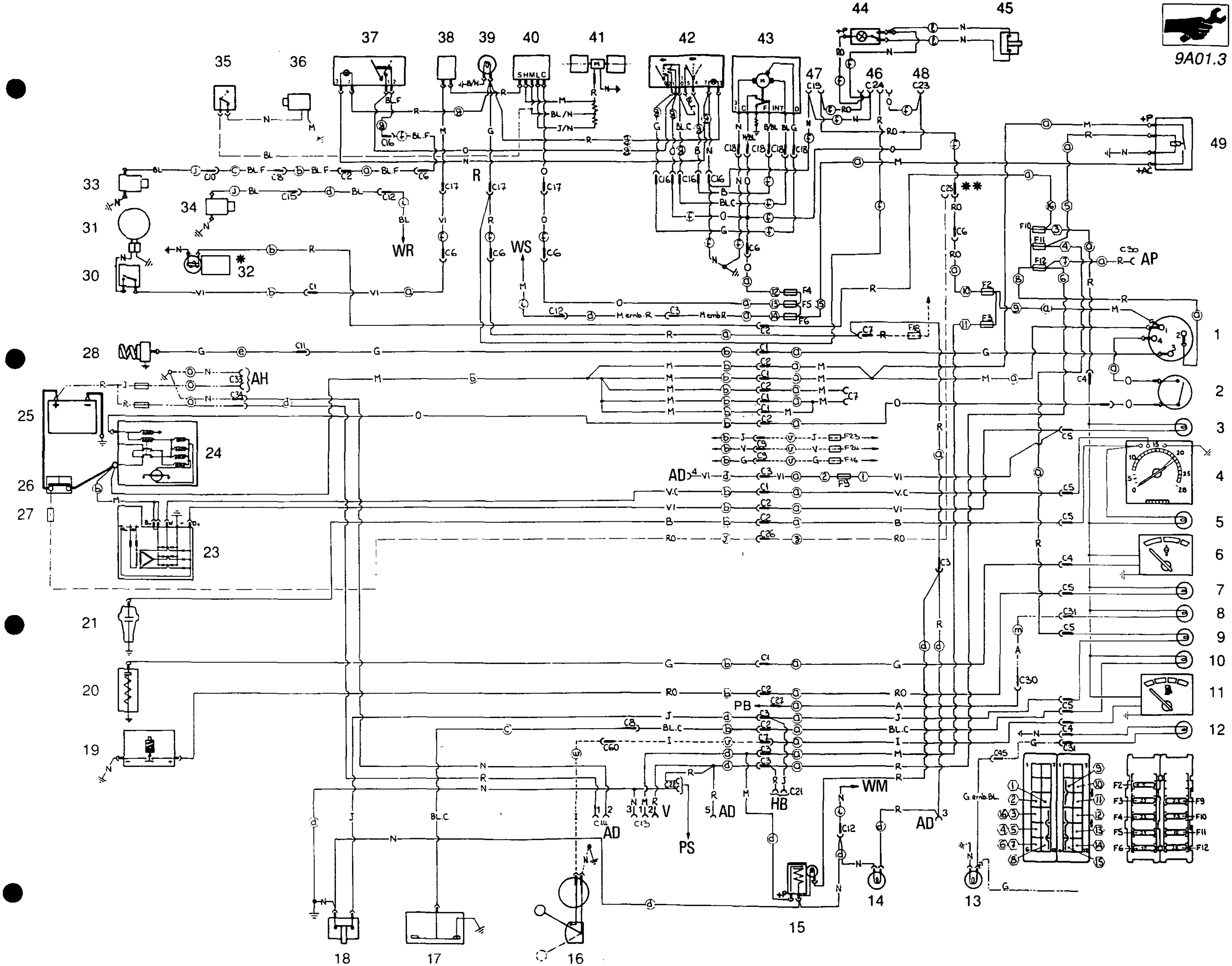
Abbreviations, symbols

AD : Connector AD (= C14) connected to AC (section 13 B01.C) or N
V : connected to connector V, section 13B01.C
AH : Connector AH, section 12B01.E
AP : Connector Ap, section 12B01.E
HB : Hand brake buzzer (if fitted)
PB : Pneumatic brake (if fitted)
PS : Pneumatic seat (if fitted)
WM : Rear windscreen wiper motor
WR : Rear washer switch
WS : Rear windscreen wiper / washer switch

— — — = Wiring forming part of lighting harnesses
— - - — = Wiring forming part of electronic harnesses

+P = + Permanently live
+AC = + *live when ignition is on*
* Tractors equipped with series 1000 engines
** On tractors fitted with main switch disconnect connector C25 of harness (f) and connect its terminal to the female terminal of wire (Z). The unused female connector should be insulated carefully and attached to the harness using adhesive tape

Note : If the alternator warning light (3) does not illuminate at position 2 of the starter switch check that bulb is not burnt out. If the bulb is burnt out the excitation will not occur and the alternator will not charge rendering the electronic lift control inoperative.


WR
WS
AH
AP
AD
PB
HB
PS
WM
V

C. Instrument panel and engine area wiring (with etherstart)

Key to diagram

1. Starter switch
2. Safety switch
3. Alternator warning light
4. Rev. counter
5. Engine oil pressure warning light
6. Water temperature gauge
7. Air filter vacuum warning light
8. Brake oil pressure warning light
9. Parking brake warning light
10. Oil filter vacuum warning light
11. Fuel gauge indicator
12. Hare warning light (instrument panel)
13. Hare warning light (console)
14. Switch illumination
15. Cigar lighter
16. Fuel gauge
17. Oil filter vacuum switch
18. Parking brake switch
19. Air filter vacuum switch
20. Temperature sender unit
22. Engine oil pressure sensor
23. Alternator
24. Starter motor
25. Battery
26. Main switch (if fitted)
27. Fuse 5 A (if fitted)
29. Ether solenoid
30. Pressure switch
31. Air conditioning compressor
32. Injection pump solenoid *
33. Front windscreen washer pump
34. Rear windscreen washer pump (if fitted)
35. Switch (if fitted)
36. Water circulating pump (if fitted)
37. Front windscreen washer switch
38. Air conditioning thermostat
39. Console illumination
40. Blower switch
41. Blower motor
42. Front windscreen wiper switch
43. Windscreen wiper motor
44. Interior light
45. Door switch
46. Digital clock
47. Radio (except NA)
48. Radio (NA only)
49. Relay
50. Ether switch
51. Relay

Colour code

A = Silver
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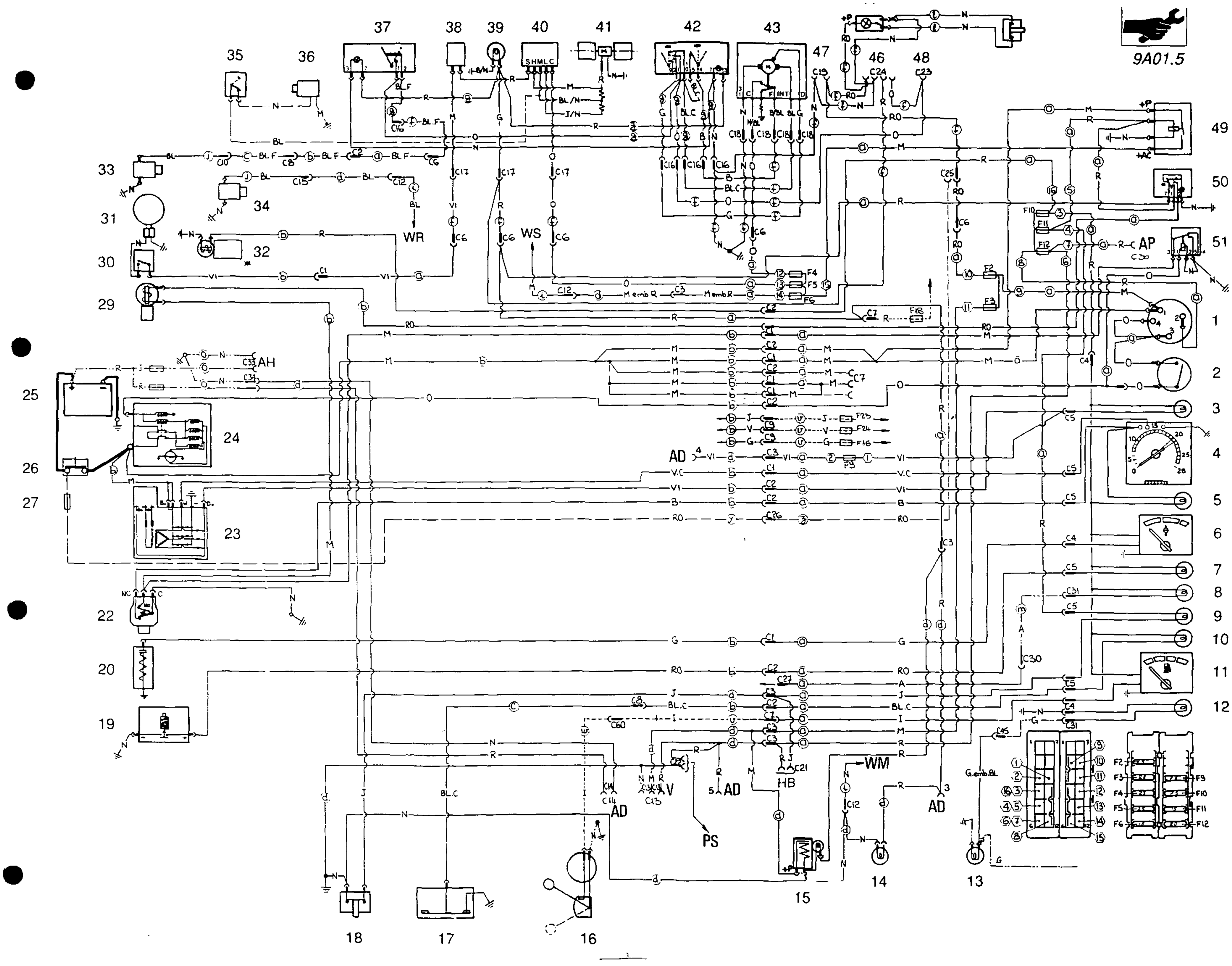
PB : Pneumatic brake (if fitted)
PS : Pneumatic seat (if fitted)
WM : Rear windscreen wiper motor
WR : Rear washer switch
WS : Rear windscreen wiper / washer switch

— — — = Wiring forming part of lighting harnesses
— - - — = Wiring forming part of electronic harnesses

+P = + Permanently live
+AC = + live when ignition is on
* Tractors equipped with series 1000 engines
** On tractors fitted with main switch disconnect connector C25 of harness (f) and connect its terminal to the female terminal of wire (Z). The unused female connector should be insulated carefully and attached to the harness using adhesive tape

Note : If the alternator warning light (3) does not illuminate at position 2 of the starter switch check that bulb is not burnt out. If the bulb is burnt out the excitation will not occur and the alternator will not charge rendering the electronic lift control inoperative.

9A01.5



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D . Lighting system - Europe type

Key to diagram

1 . Starter switch
2 . Stop switches
3 . Rear RH direction indicator
4 . Rear RH brake light
5 . Rear RH work lamp
6 . Number plate lights
7 . Power socket
8 . Rear LH work lamp
9 . Rear LH brake light
10 . Rear LH direction indicator
11 . Front LH direction indicator
12 . Front LH side light
13 . Front LH work lamp
14 . LH headlight
15 . Horn
16 . RH headlight
17 . Front RH work lamp
18 . Front RH side light
19 . Front RH direction indicator
20 . Flashing beacon
23 . Flasher unit
24 . Lighting switch
25 . Hazard warning light switch
26 . Flashing beacon switch
27 . Control cluster illumination
28 . LH direction indicator warning light
29 . RH direction indicator warning light
30 . Main beam warning light
31 . 1st trailer warning light
32 . 2nd trailer warning light
33 . Front work lamp switch
34 . Rear work lamp switch
35 . Fuel gauge

Colour code

A = Silver
B = White
BL = Blue
G = Grey
I = Ivory
J = Yellow
M = Brown
N = Black
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark

Abbreviations, symbols

Emb = Sleeve (band)
+P = +Permanently live
+AC = + Live when ignition is on

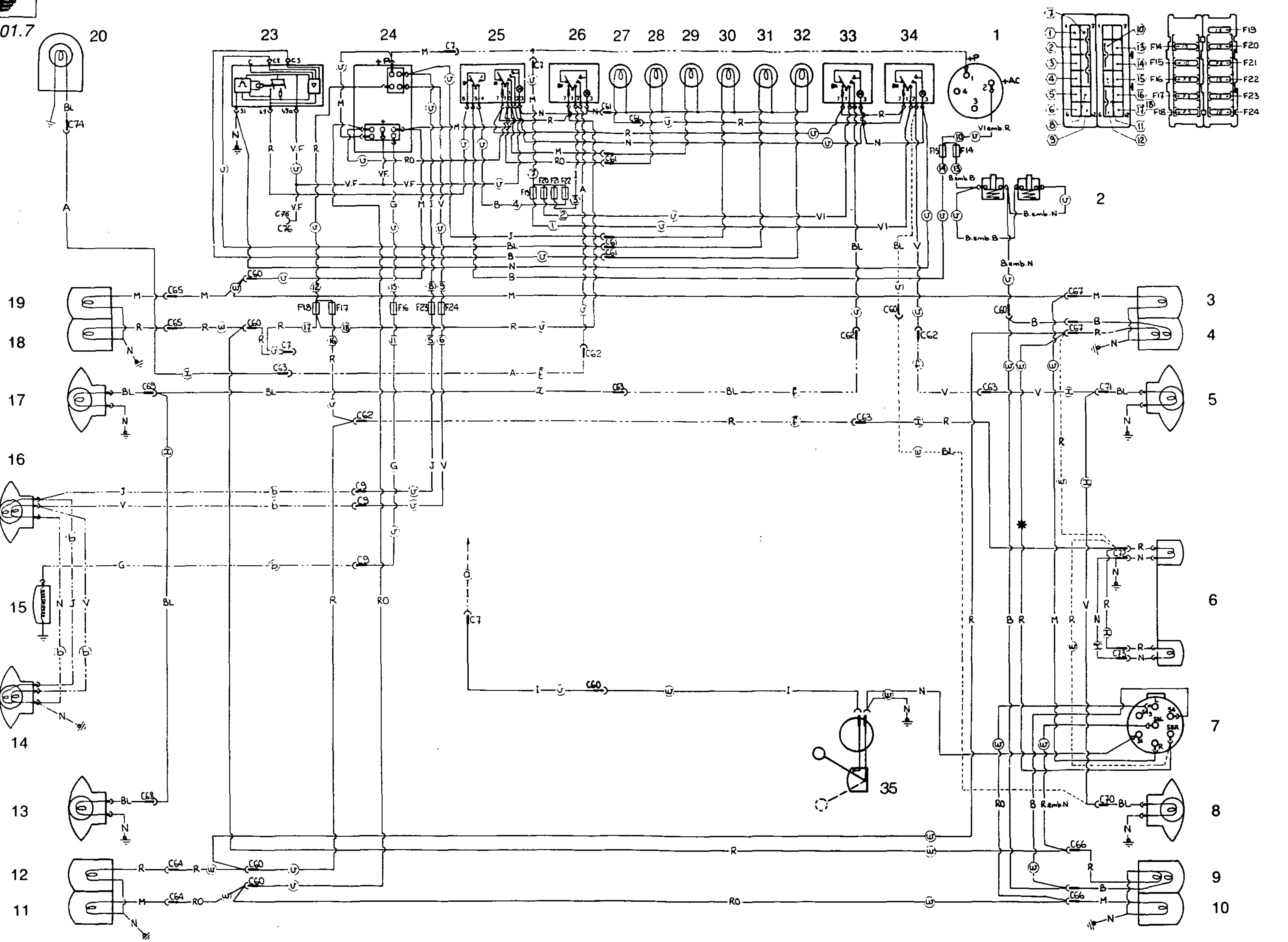
— — — = wiring forming part of engine harnesses
— - - — = wiring for platform tractors without pillar only
* wire non present on platform tractors without pillar

Connector identification

C7 = White, 4 way connector
C9 = Black, 3 way connector
C60 = Black, 6 way connector (8 way on plateform tractors without pillar)
C61 = Green, 7 way connector (instrument panel)
C62 = Black, 4 way connector
C63 = Black, 4 way connector
C64 = Black, 2 way connector
C65 = Black, 2 way connector
C66 = Black, 3 way connector
C67 = Black, 3 way connector
C68 = Black, 1 way connector
C69 = Black, 1 way connector
C70 = Black, 1 way connector
C71 = Black, 1 way connector
C72 = Black, 2 way connector
C73 = Black, 2 way connector
C74 = Circular, 1 way connector
C76 = Black, 1 way connector

Harness identification

(a) Instrument panel main harness
(b) Engine harness
(f) Instrument panel / roof harness
(v) Instrument panel lighting harness
(w) Front and rear lighting harness
(x) Roof lighting harness



E . Lighting system - Germany type

Key to diagram

1 . Starter switch
2 . Stop switches
3 . Rear RH direction indicator
4 . Rear RH brake light
5 . Rear RH work lamp
6 . Number plate lights
7 . Power socket
8 . Rear LH work lamp
9 . Rear LH brake light
10 . Rear LH direction indicator
11 . Front LH direction indicator
12 . Front LH side light
13 . Front LH work lamp
14 . LH headlight
15 . Horn
16 . RH headlight
17 . Front RH work lamp
18 . Front RH side light
19 . Front RH direction indicator
20 . Flashing beacon
22 . Work lamp relay
23 . Flasher unit
24 . Lighting switch
25 . Hazard warning light switch
26 . Flashing beacon switch
27 . Control cluster illumination
28 . LH direction indicator warning light
29 . RH direction indicator warning light
30 . Main beam warning light
31 . 1st trailer warning light
32 . 2nd trailer warning light
33 . Front work lamp switch
34 . Rear work lamp switch
35 . Fuel gauge

Colour code

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F = Dark

Abbreviations, symbols

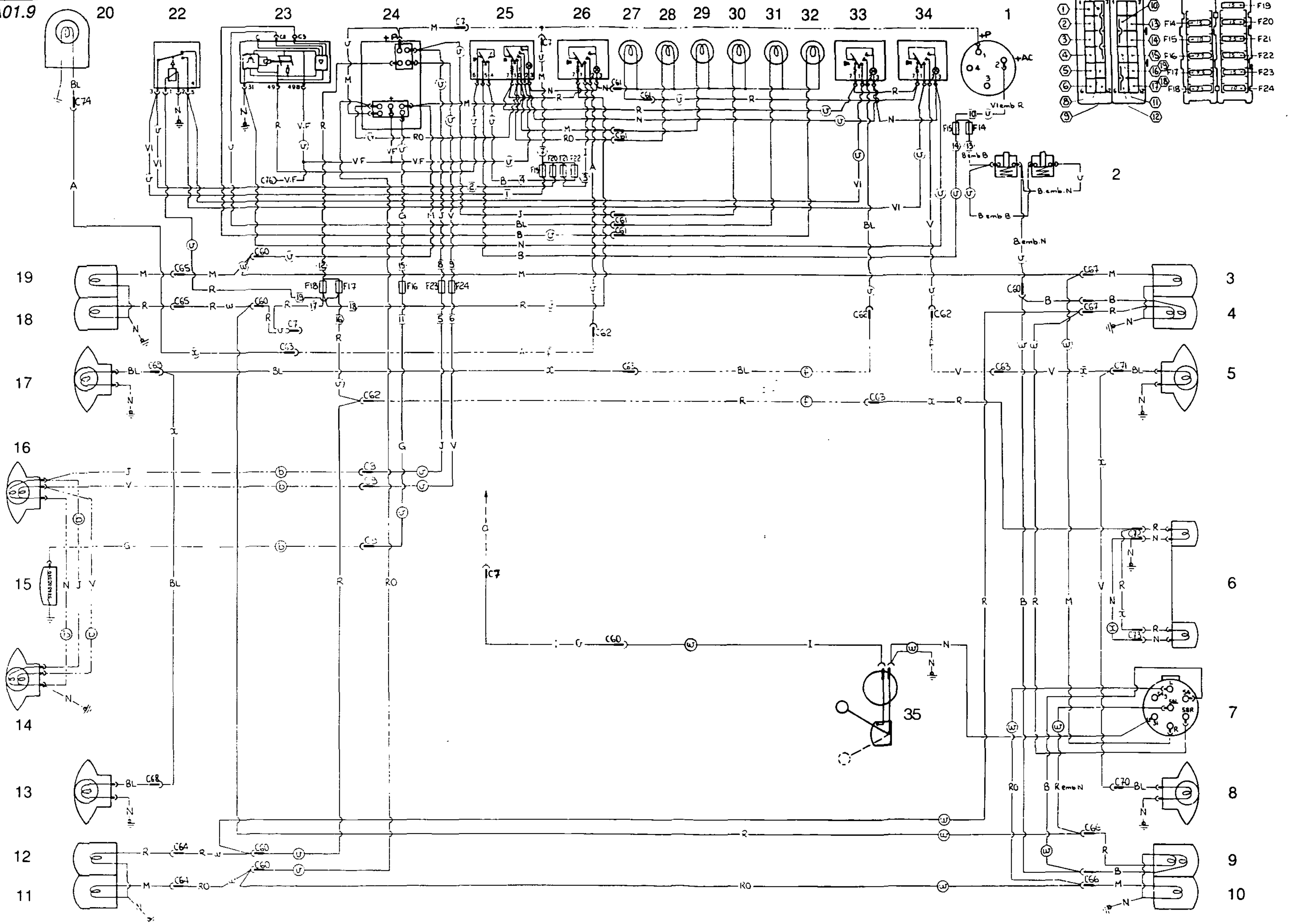
Emb = Sleeve (band)
+P = +Permanently live
+AC = + Live when ignition is on
— — — = wiring forming part of engine harnesses

Connector identification

C7 = White, 4 way connector
C9 = Black, 3 way connector
C60 = Black, 6 way connector
C61 = Green, 7 way connector (instrument panel)
C62 = Black, 4 way connector
C63 = Black, 4 way connector
C64 = Black, 2 way connector
C65 = Black, 2 way connector
C66 = Black, 3 way connector
C67 = Black, 3 way connector
C68 = Black, 1 way connector
C69 = Black, 1 way connector
C70 = Black, 1 way connector
C71 = Black, 1 way connector
C72 = Black, 2 way connector
C73 = Black, 2 way connector
C74 = Circular, 1 way connector
C76 = Black, 1 way connector, junction with creeper gear harness

Harness identification

(a) Instrument panel main harness
(b) Engine harness
(f) *Instrument panel / roof harness*
(v) Instrument panel lighting harness
(w) Front and rear lighting harness
(x) Roof lighting harness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F . Lighting system - USA type

Key to diagram

1 . Starter switch
2 . Stop switches
3 . Rear RH direction indicator
4 . Rear RH brake light
5 . Rear RH work lamp
6 . Number plate lights
8 . Rear LH work lamp
9 . Rear LH brake light
10 . Rear LH direction indicator
11 . Front LH direction indicator
13 . Front LH work lamp
14 . LH headlight
15 . Horn
16 . RH headlight
17 . Front RH work lamp
19 . Front RH direction indicator
21 . Relay
22 . Relay
23 . Flasher unit
24 . Lighting switch
25 . Hazard warning light switch
27 . Control cluster illumination
28 . LH direction indicator warning light
29 . RH direction indicator warning light
30 . Main beam warning light
31 . 1st trailer warning light
32 . 2nd trailer warning light
33 . Front work lamp switch
34 . Rear work lamp switch
35 . Fuel gauge

Colour code

A = Silver
B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark

Abbreviations, symbols

Emb= Sleeve (band)
+P = +Permanently live
+AC= + Live when ignition is on
— — — = wiring forming part of engine harnesses
* = not used

Connector identification

C7 = White, 4-way connector
C9 = Black, 3-way connector
C60 = Black, 6-way connector
C61 = Green, 7-way connector (instrument panel)
C62 = Black, 4-way connector
C63 = Black, 4-way connector
C64 = Black, 2-way connector
C65 = Black, 2-way connector
C66 = Black, 2-way connector
C67 = Black, 2-way connector
C68 = Black, 1-way connector
C69 = Black, 1-way connector
C70 = Black, 1-way connector
C71 = Black, 1-way connector
C72 = Black, 2-way connector
C73 = Black, 2-way connector
C76 = Black, 1-way connector, junction with MF 3000 creeper gear harness

Harness identification

(a) Instrument panel main harness
(b) Engine harness
(f) Instrument panel / roof harness
(v) Instrument panel lighting harness
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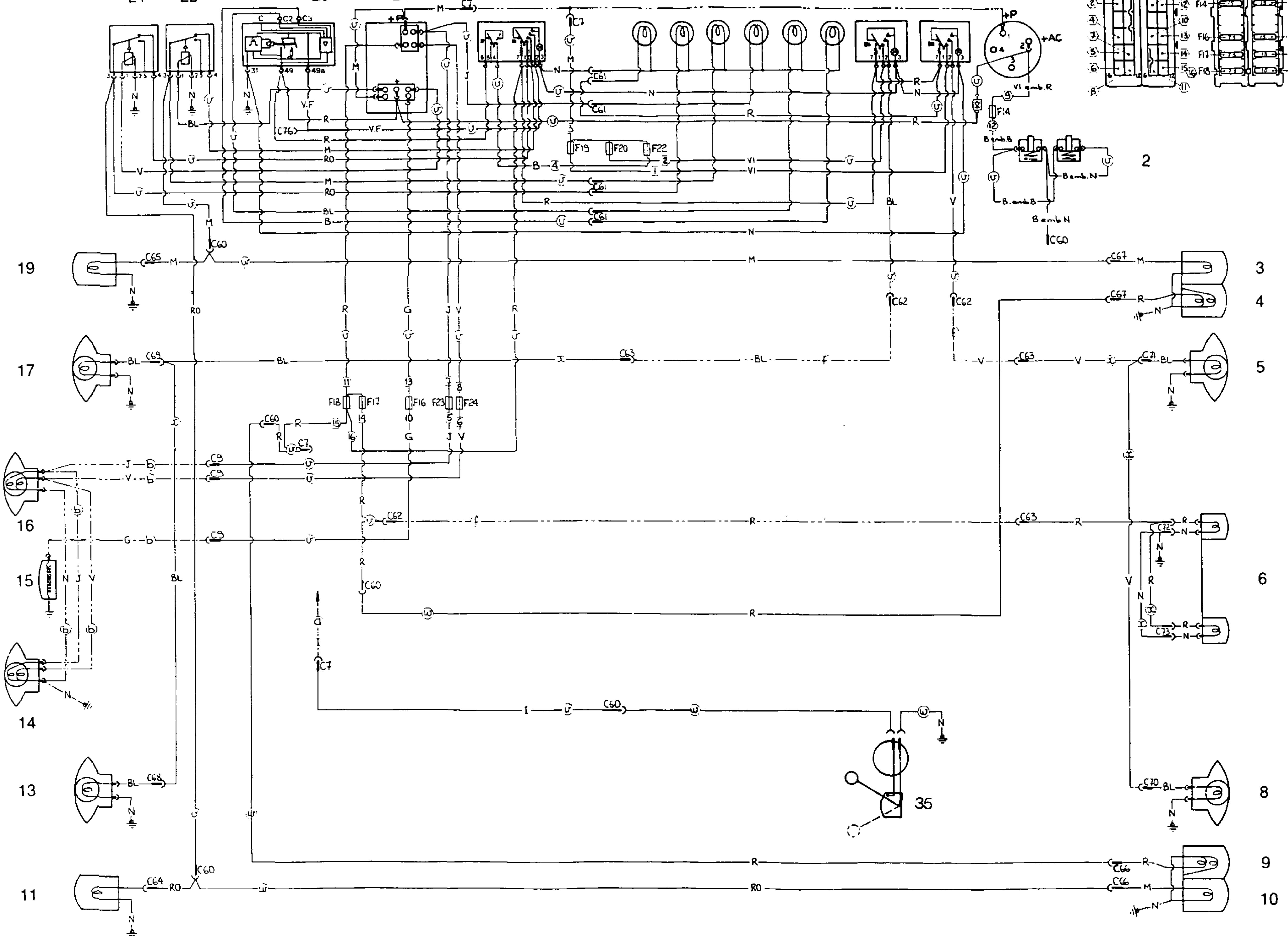
(x) Roof lighting harness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C63
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C70
C71
C72
C73
C76
B.emb.B
B.emb.N
Vi emb.R

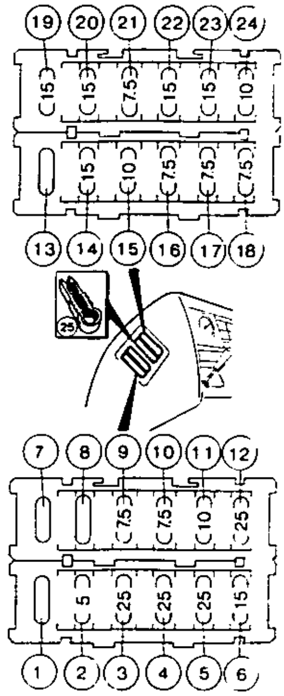
G . Fuses

Fuses are fitted in a box located on the left hand side of the instrument panel.

The box is divided into two parts. The upper part contains the fuses for the lighting system and the lower part the fuses which protect the engine and electronic functions.

A special tool (25) located in the box enables fuses to be replaced easily.

Note : Fuse box should always be kept very clean. Fuses must not be replaced with ones of higher rating, since this may cause damage to the electrical equipment. If any of the fuses blow, the fault must be traced and remedied.



In addition to those fitted in the fuse box, there are also three fuses situated at the front RH side, beneath the hood.

- a 7,5 amp (brown) protects the electronic lift.
- a 10 amp (red) protects the Autotronic transmission control unit.
- a 5 amp (yellow) protects the front PTO (if fitted).

A 3 amp in Datatronic tractor performance monitor wiring harness in console (if fitted).

Fuse n°	Rating (Amp)	Colour	Applications
1 - 7 - 8	Spares		
2	5	Yellow	(+P) Interior light - Radio
3	25	White	(+P) Cigar lighter and internal power socket
4	25	White	(+AC) Front windscreen wiper and washer
5	25	White	(+AC) Air conditioning blower and compressor
6	15	Blue	(+AC) Rear screen wiper and washer
9	7,5	Brown	(+ ER) Electronic lift
10	7,5	Brown	(+AC) Instrument panel unit and injection pump solenoid
11	10	Red	(+AC) Cab relay solenoid and parking brake warning light
12	25	White	(+AC) Hare/Tortoise range control
			4 WD control
			Differential lock control
			PTO and PTO brake control
			4 speed PTO control (economy PTO)
			Creeper gear control
			Low pressure warning light (tractors without Autotronic)
			Linkage raised position switch (tractors with Autotronic)
			Speedshift control
			Internal power socket
			Tractor performance monitor
			Pneumatic suspension seat (if fitted)
13	Spare		
14	15	Blue	Brake lights (within rear lights)
15	10	Red	Direction indicators
16	7,5	Brown	Horn
17	7,5	Brown	Front left, rear RH side lights and number plate lights
18	7,5	Brown	Front RH and rear LH side lights
			Instrument panel lighting
			Illumination of instrument panel
			Switches roof panel and front windscreen wiper / washer switches
			Cigar lighter and electronic console switches
			Electronic linkage console
19	15	Blue	Rear work lamps
20	15	Blue	Front work lamps
21	7,5	Brown	Rotating light (if fitted)
22	15	Blue	Hazard warning lights
23	15	Blue	Headlights (main beam)
24	10	Red	Headlights (dipped beam)

10

10 . ACCESSORIES

Contents

10 A01 Auxiliary spool valve kit

CONTENTS

Accessories - Auxiliary spool valve kit

A. Removing the factory- fitted 2-spool valve assembly

Note: To make a correct installation, remove the «two-spool valves» as an assembly.

1. Remove the oil collectors (if fitted).
2. Disconnect hoses **(1)**, **(2)** and **(3)**(Fig.1).
   Unscrew nuts **(7)**, screws **(6)** and couplers **(5)**. On each spool valve, take out pin **(4)** linking the clevis to the spool (Fig.2).
3. Remove unions **(4)**, **(6)** and **(7)**, quick fit couplings **(5)** and screws **(8)**(Fig.1). Remove the spool valve assembly and place upright on a bench.
4. Remove hose **(3)**. Unscrew nuts **(12)**(Fig.3).
   Remove the flow divider, the spool valves and the intermediate blocks separately.

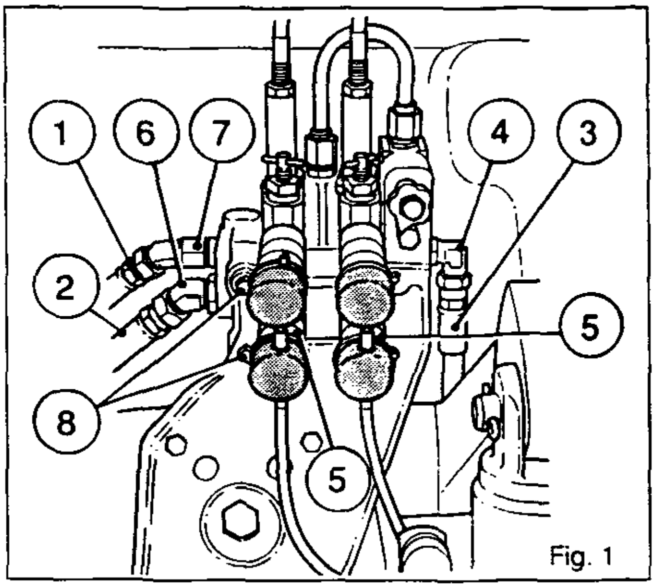


Fig. 1

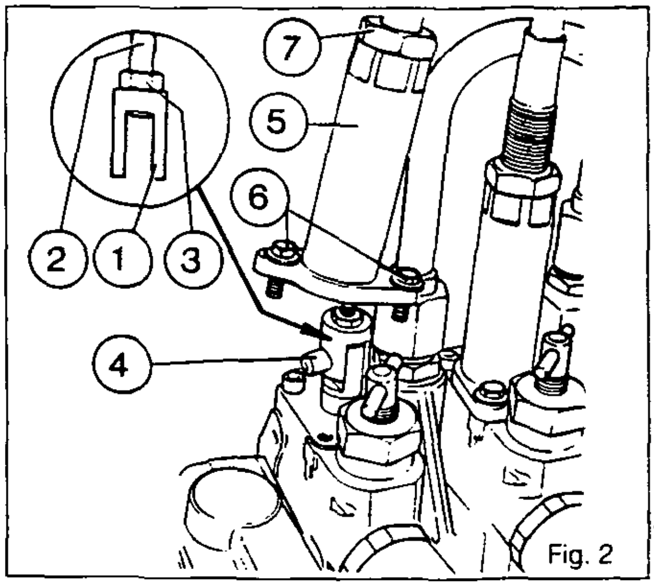


Fig. 2

B. Fitting the three-spool valve assembly

5. Clean the seal surfaces on each spool valve, replace the plates and seals.
6. Replace threaded rods **(1)**(Fig.4).
   Note: The length of the threaded rods differs according to the number of spool valves.
7. Put the end plate with its threaded rods on a bench.

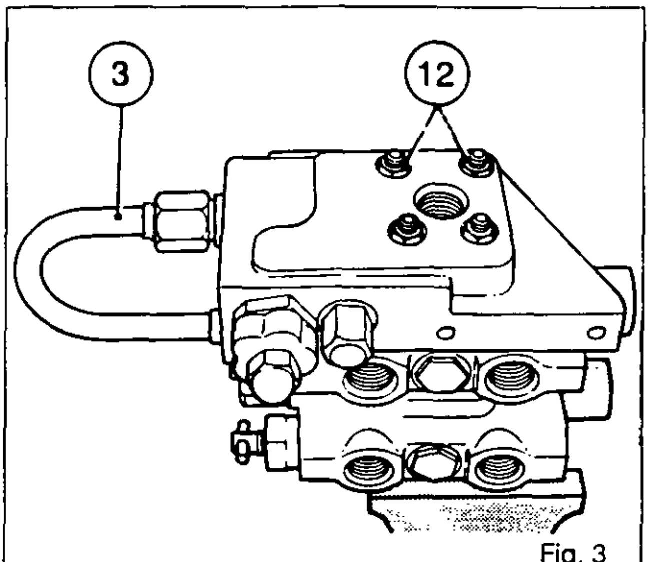


Fig. 3

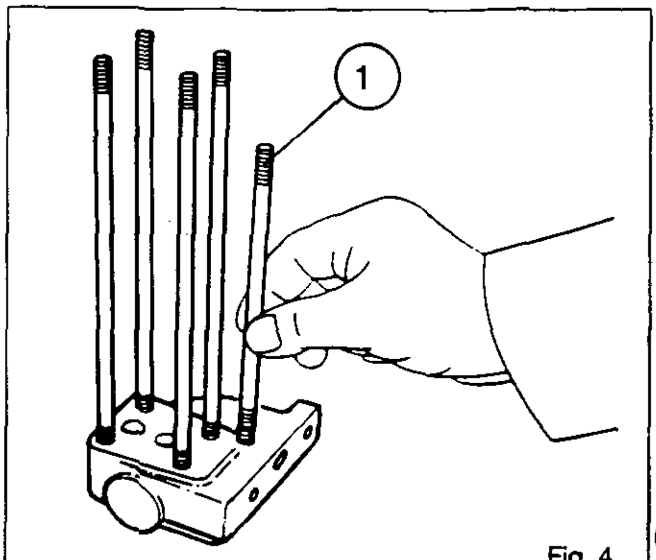


Fig. 4

Accessories - Auxiliary spool valve kit

8. In order, assemble the sealing plates with their seals, the intermediate blocks, the spool valves and the flow divider (Fig.5).
9. Position the spool valve unit, with fixing faces **F** (Fig.5) resting on a flat surface (Fig.6) to ensure that the spool valves are properly fitted onto their bracket.
   Tighten nuts **(12)** to torque 17 - 20 Nm.
10. Fit and tighten unions **(13)**(Fig.6) and hose **(3)**(Fig.3) to torque 50 Nm.
11. Refit the spool valve assembly (Fig.7). Tighten screws **(8)**. Refit quick couplers **(5)** and connectors **(4)**, **(6)** and **(7)**.
    Note : Replace the 45° union on the lift control valve inlet with a 90° union.
12. Position unions **(4)**, **(6)** and **(7)**. Reconnect and tighten hoses **(1)**, **(2)** and **(3)**(Fig.7).
13. Slide pin **(4)** into each clevis **(1)**(Fig.2).
    Note: Check that the valve spools are in neutral position. Partially screw couplers (5) on the first and second spool valves and fit screws (6) without tightening.

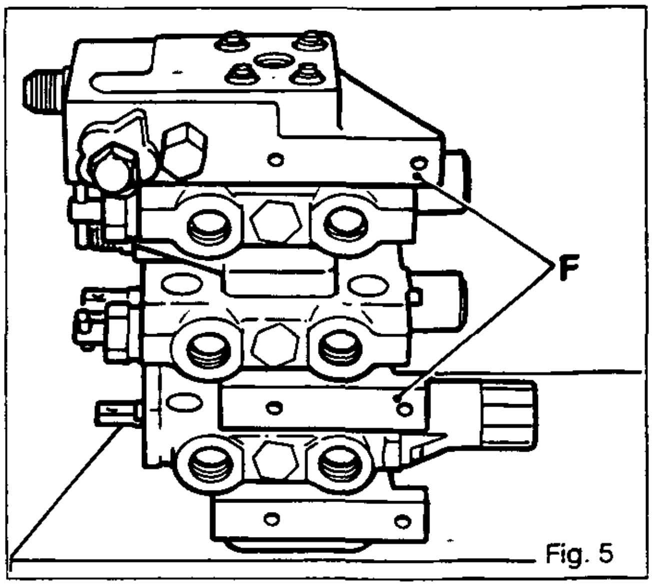


Fig. 5

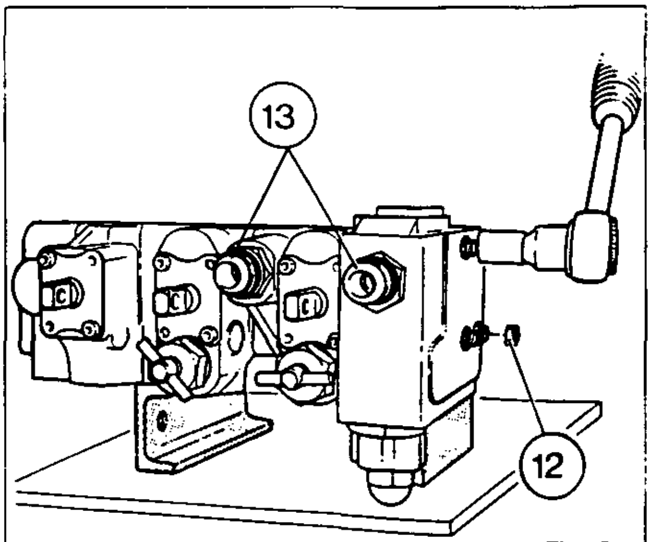


Fig. 6

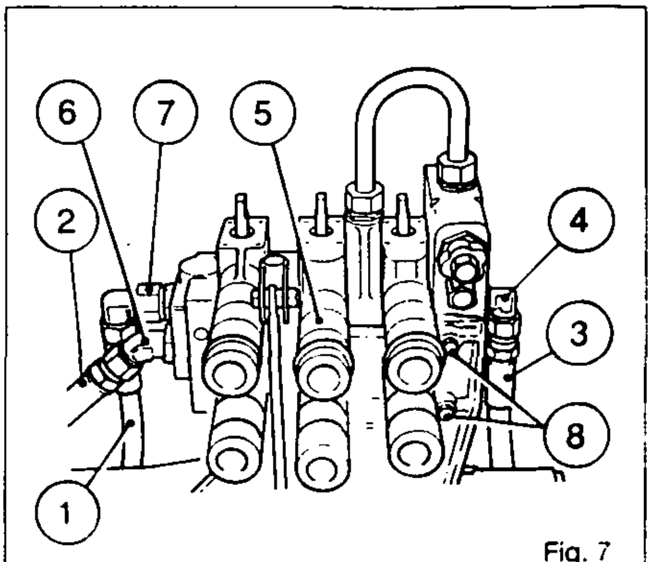


Fig. 7

C. Removing the consoles in the cab

14. Disconnect the batteries (only the earth cable).
15. Disconnect one end of the right-hand door gas strut and open it to its maximum extent (Protect the fender from any contact with the door).
16. Remove the retaining screws on the lift console and disconnect the connector.
17. Remove the indicator plate retainers from the PTO and auxiliary spool valve controls. If necessary, remove the rubber knobs from the control levers. Remove the hand throttle control adjustment stop (if fitted).
18. Remove the mouldings around the trim.
19. Remove the screws, lift up and push the two consoles forward (Fig. 8), taking care not to disconnect the harnesses.

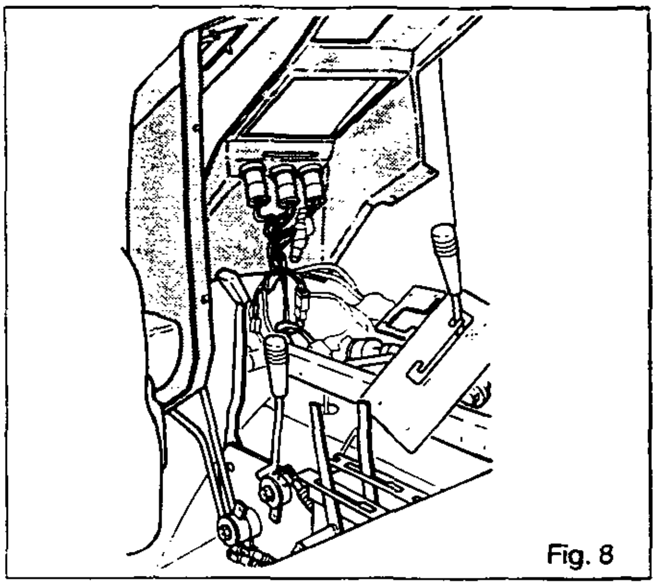


Fig. 8

Fitting the auxiliary spool valve control lever

Early-type bracket without automatic hook control (Fig. 9)

Note: To facilitate installation on tractors fitted with creeper gears, remove only the bracket for the control, inside the cab.

20. Fit the lever **(1)** with bearing **(2)** and friction washer, coated with molybdenum bisulphide grease.
21. Fit spacer **(5)**, washer **(7)** and tighten nut **(4)** so that the lever moves freely, without any axial play.
22. Fit and adjust the control cable. Carry out operations 44 and 45

    Note: Tractors with creeper gears: Refit the control lever bracket.

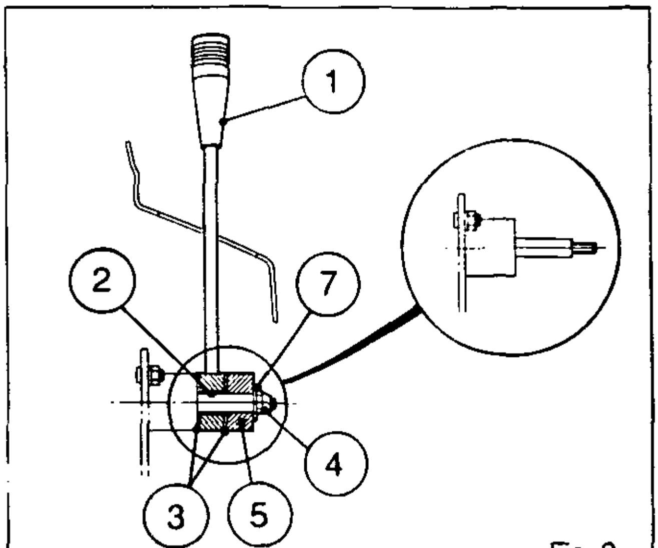


Fig. 9

Early-type bracket with automatic hook control (Fig. 10)

Note: To facilitate installation on tractors with creeper gears, remove only the bracket for the control, inside the cab.

23. Remove the clip attaching the clevis to the lever **(6)**.
24. Unscrew the nut **(4)**. Remove washers **(7)** and **(8)**. Remove control lever **(6)** with bearing **(2)**, friction washers **(3)** and spacer **(5)**.
25. Fit auxiliary spool valve control lever **(1)** and automatic hook lever **(6)** with bearings **(2)** and friction washers **(3)** coated with molybdenum bisulphide grease.
26. Refit washers **(8)** and **(7)**. Tighten nut **(4)** so that the levers move freely with no axial play.

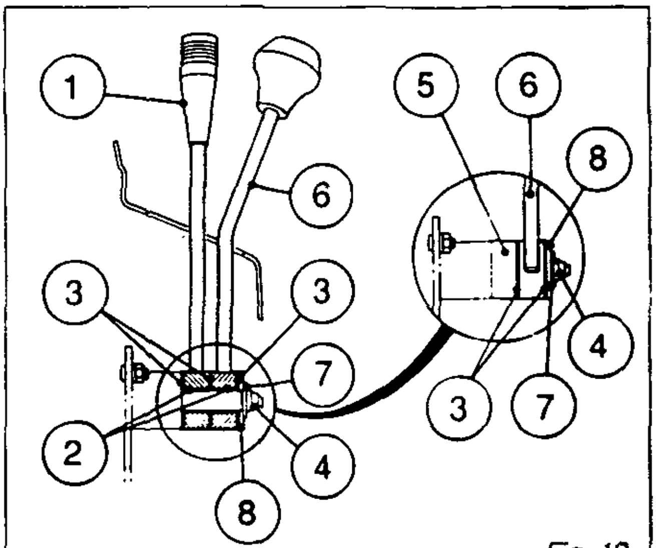


Fig. 10

Accessories - Auxiliary spool valve kit

27. Fit and adjust the control. Carry out operations 44 and 45.

Note: Tractors with creeper gears, refit the control bracket.

New bracket (Fig.11)

28. Coat the thread of pin **(9)** with Loctite 241 and screw into bracket **(11)**. Tighten nut **(10)**.
29. Fit lever **(1)** with pad **(2)** and friction washers **(3)** coated with molybdenum bisulphide grease.
30. Place washers **(8)** and **(7)**. Tighten nut **(4)** so that the lever operates with no axial play.
31. Fit and adjust the control, carry out operations 50 to 52.

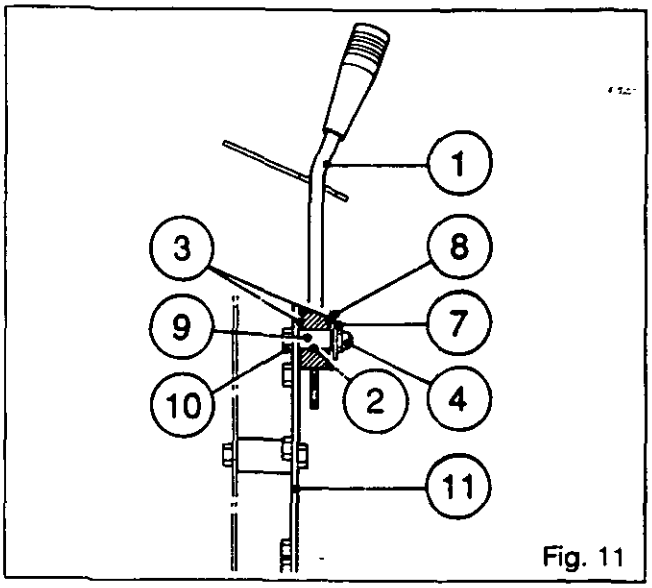


Fig. 11

D. Refitting the consoles in the cab

32. Refit the two consoles. Check that the wiring harnesses are connected. Tighten the screws.
33. Refit the indicator plates, rubber knobs (if removed) and hand throttle control adjustment stop (if fitted).
34. Connect the lifting console connector and refit the console.
35. Connect the battery earth cables.
36. Reconnect the door gas strut.
37. Check that the lifting console and electronic and electric controls work.
38. Apply a bead of silicomet in the angle between the fender and the moulding.
39. Using housing **(5)**(Fig.12), adjust the control cables for the first and second spool valves, making sure that levers C are positioned within tolerances. According to the type of fitting, refer to figures 13 and 14 (early and later type bracket). Tighten screws **(6)** and lock nut **(7)** to torque 20 Nm.
40. Fit and adjust the auxiliary spool valve cable. Early bracket : perform operations 46 to 48. Later bracket : perform operations 53 to 55.
41. Connect a pressure gauge to the quick couplers and check that the three or four positions (depending on option) on each spool valve work.
42. Using several clips, refix the oil collectors (if fitted).
43. Check that the controls work, and check for leaks at the sealing faces of each spool valve, at the quick couplers and at the hydraulic unions.

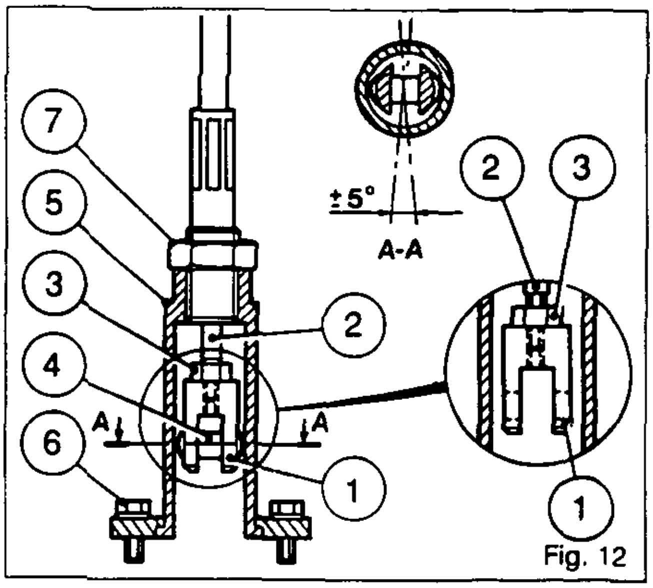


Fig. 12

Accessories - Auxiliary spool valve kit

E. Fitting and adjusting the auxiliary spool valve cable - Old bracket

On lever (Fig. 13)

44. Put the control cable in the grommet-plate **(10)** at the rear of the cab. Slide cable housing stop **(4)** in slotted bracket **(6)** and fix pin **(5)**.
45. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)** and fit on lever **L** with clip **(7)**. Tighten nut **(3)**.
    Note: Check that the cable is not restricted.

On spool valves (Fig. 12)

46. Check that the valve spools are in neutral position. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)**. Tighten nut **(3)**. Fit pin **(4)** in clevis **(1)**.
47. Partially screw housing **(5)** and fit screws **(6)** but do not tighten.
48. Screw housing **(5)** fully home so as to position lever L as shown in Fig. 13. Lock screws **(6)** and tighten nut **(7)** to torque 20 Nm.
49. Make sure the control works in all three or four positions (depending on option).

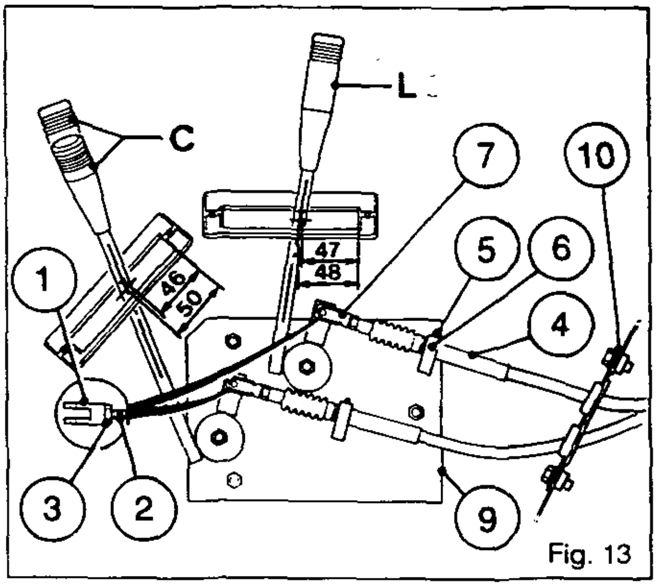


Fig. 13

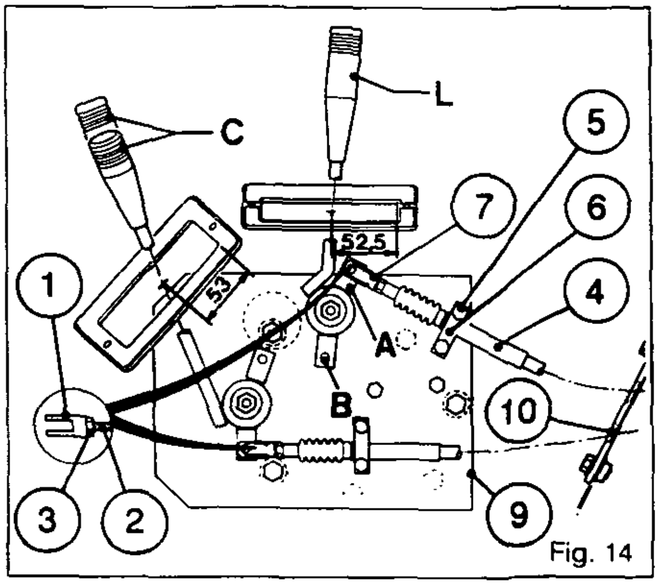


Fig. 14

F. Fitting and adjusting the auxiliary spool valve cable - New bracket

On lever (Fig. 14)

50. Put the control cable through the grommet-plate **(10)** at the rear of the cab.
51. Fit and tighten cable clamp **(6)** on bracket **(9)** on the console.
    Note: The attachment of clevis (1) to lever L differs, depending on the type of spool valve.
    Attachment A : Four position spool valve, one floating.
    Attachment B : Three position spool valve.
    Depending on the attachment required on lever L, fix clamp (6) for cable housing end (4) in the correct position.
52. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)** and fit it to lever **L** with clip **(7)**. Tighten nut **(3)**.
    Note: Check that the cable is not restricted.

On spool valves (Fig. 12)

53. Check that the spool valve spool is in neutral position. Screw clevis **(1)** level with the edge of the threaded part of cable **(2)**. Tighten nut **(3)**. Fit pin **(4)** in clevis **(1)**.
54. Partially screw clevis housing **(5)** and fit screws **(6)** but do not tighten.
55. Screw clevis housing **(5)** down so as to position lever **L** as shown in figure 14. Lock screws **(6)** and tighten nut **(7)** to torque 20 Nm.
56. Check that the control works in all three or four positions (depending on option).

41. Fit the shaft assembly **(8)** (Fig.10) and circlip **(4)** in the housing.
42. Place gear **(3)** and fit circlip **(2)**(Fig.11).
43. Check the movement of coupler **(10)** through the access panel in the cover **(12)**.
44. Replace and clean plug **(1)** (Fig.2), apply Loctite 542, and then fix it slightly behind the face of the housing.
45. Fit link **(7)** (fitted with a new O-ring **(5)**) with the dog **(1)** in the groove of coupler **(10)**(Fig.12).
46. Clean and degrease the seal surfaces on the cover and housing.
47. Apply sealing compound (Master joint 510 or equivalent) to the surface of the cover seal.
48. Screw two studs into the housing in opposing positions.
49. Fit the control link retainer tube **(4)**, locking plunger **(2)** and spring **(3)** (Fig.12).
50. Refit cover **(12)**. Remove the guide studs. Fit and tighten the bolts to torque 130 - 170 Nm. Check operation of link **(7)** (Fig.12).
51. On the left-hand cover, fit bracket **(1)** for cable (Fig.13).
52. Jack up the tractor.
53. Refit the wheel. Remove the axle stand and the jack.
54. Tighten the wheel nuts to torque 400 - 450 Nm.
55. Fill oil to level in the rear axle.
56. Refit the tow hook.

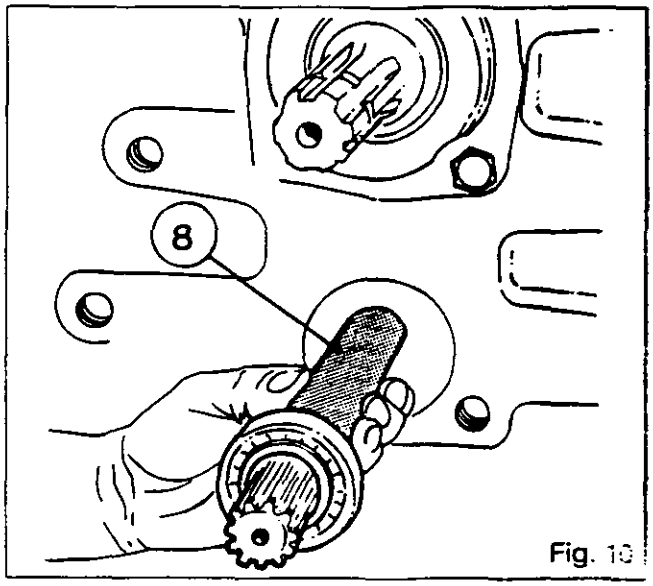


Fig. 10

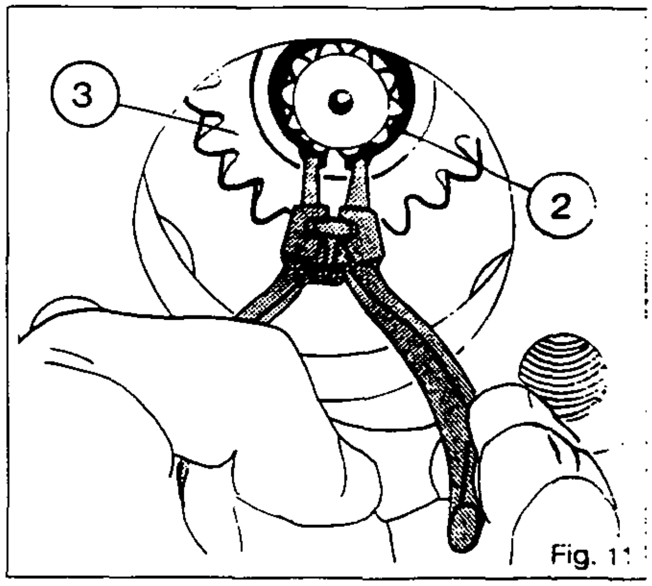
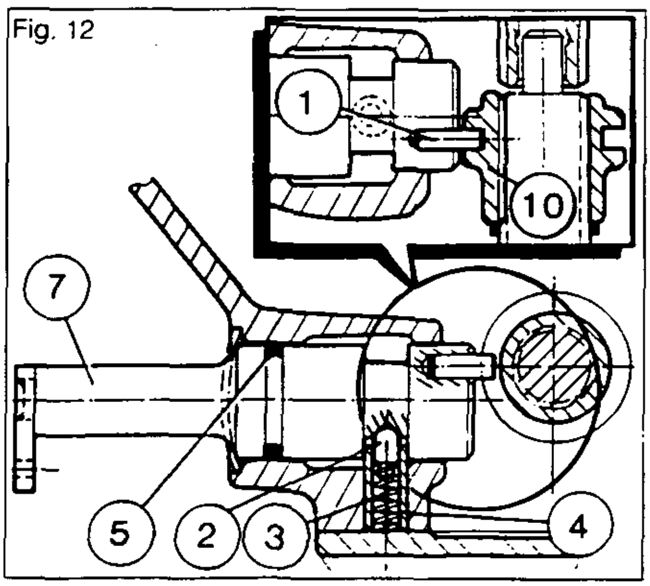


Fig. 11

Fig. 12


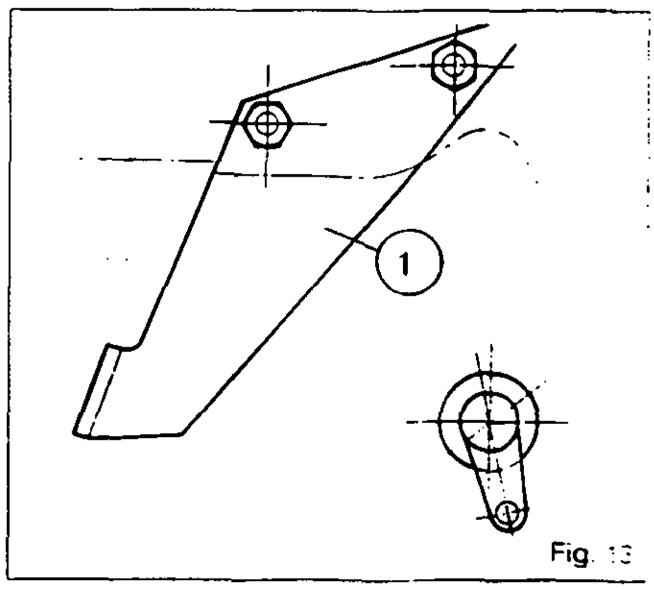


Fig. 13

Accessories - GSPTO

C. Removing the lift console

57. Disconnect the batteries (earth cable only).
58. Disconnect one end of the right-hand door gas strut and open fully (protect the fender from any contact with the door).
59. Remove the retaining screws on the lift console and disconnect the connector.
60. Remove the upper mouldings around the fender trim.
61. *Remove the screws, lift and push the console* forward, making sure not to disconnect the wiring harness.

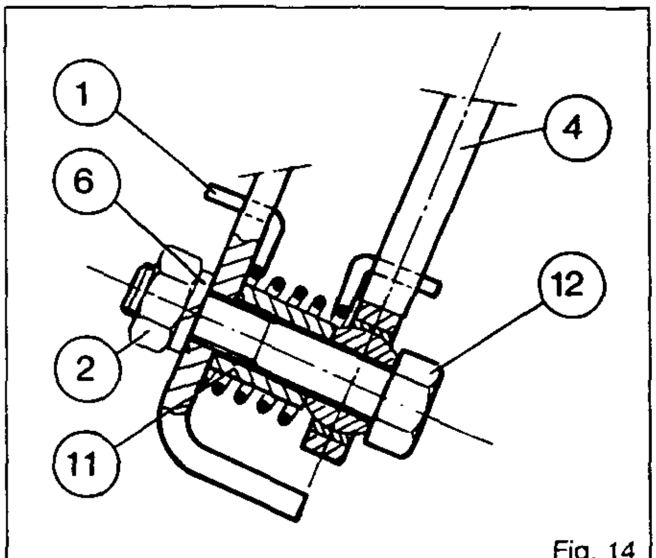


Fig. 14

D. Fitting the control lever (Figs. 14 and 15)

62. Remove nut **(2)** and washer (6). Separate screw **(12)** from lever **(4)** spacer **(11)** and spring **(1)**.
63. Fit pin **(5)** and washer **(6)** on the console and tighten nut **(2)**.
64. Position spring **(1)**, lever **(4)** and link **(7)** with bearings **(3)** and spring **(8)**.
65. Put on washer **(9)** and fit retaining ring **(10)**.
66. Fit and adjust the control. Carry out operations 76 to 80.

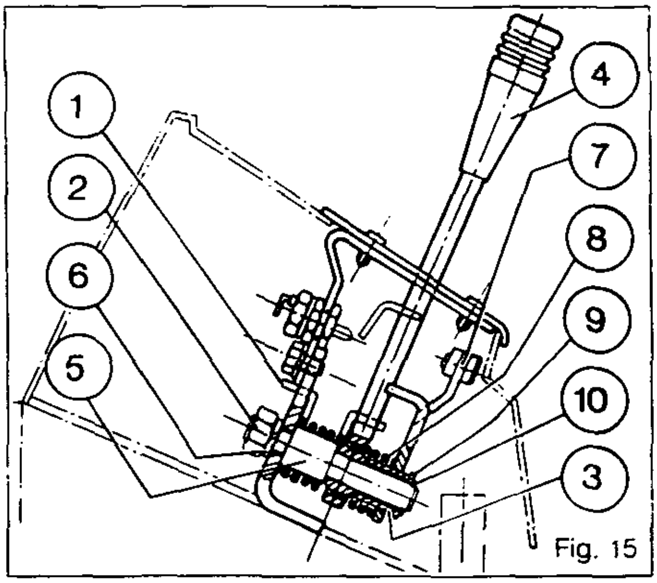


Fig. 15

E. Refitting the lift console

67. Refit the console. Check that the wiring harnesses are connected. Tighten the screws.
68. Refit the "symbol" plate, the rubber knob (if removed), and the adjustable stop on the hand throttle (if fitted).
69. Connect the lift console connector and refit.
70. Connect the battery earth cables.
71. Reconnect the door gas strut.
72. Apply a bead of silicomet in the angle between the fender and the moulding.
73. Fit and adjust the cable on the link located to the left of the rear axle housing. Carry out operations 81 to 87.
74. Check the working of :
    - the lift console and the electronic and electric controls.
    - the ground speed PTO.
    - the automatic hook (if fitted). If it needs adjusting, carry out operations 1 and 6 to 9, chapter 6M01.
75. Check sealing of the seal surfaces :
    - on the cover under the rear axle housing.
    - on the right-hand hydraulic cover and fittings.

B. Fitting

16. Clean and check the parts and replace any faulty parts. Remove all traces of Loctite from the angles of the plug housing recesses **(1)** and **(24)**(Figs. 3 and 4).
17. Fit gear **(31)** and circlip **(30)**.

Tractors without creeper gears

18. Refit the coupling shaft and sleeve unit and position coupling sleeves **(27)** and **(28)** on shaft **(29)**.
19. Fit double pins **(25)** and **(26)** on the coupling sleeves.
Note: Direct the groove end of sleeve (28) towards the rear of the tractor (Fig.5). Replace the pins (the long pin is fitted on sleeve (27)).

Tractors with creeper gears

20. Refit the shifter fork, coupling shaft and coupler. Carry out operations 22 to 31, chapter 5D01.A.

Tractors with or without creeper gears

21. Replace the right-hand hydraulic cover. Carry out operations 15 to 27, chapter 8101.
22. If needle bearing **(13)** is not fitted in shaft **(18)**, position it 2.5mm back from face "F" (Fig.6).
23. *Fix bearing cup* **(14)** *right up against the shoulder* of the housing.
24. Fix bearing cone **(19)** right up against the shoulder of shaft **(18)**, using a suitable press and driver, and then position circlip **(17)**.
25. In order to be able to turn the shaft for J1 shimming, do not fit gear **(16)**. Position bearing cone **(15)**, fit shaft **(18)** assembled with bearing cone **(19)** and circlip **(17)**.
26. Refit bearing cup **(20)**, spacer **(22)** and circlip **(23)**.
Note : For correct shimming, make sure the spacer moves freely in the housing bore.
27. Shim shaft **(18)** to : **J1 = 0 to +0.10**

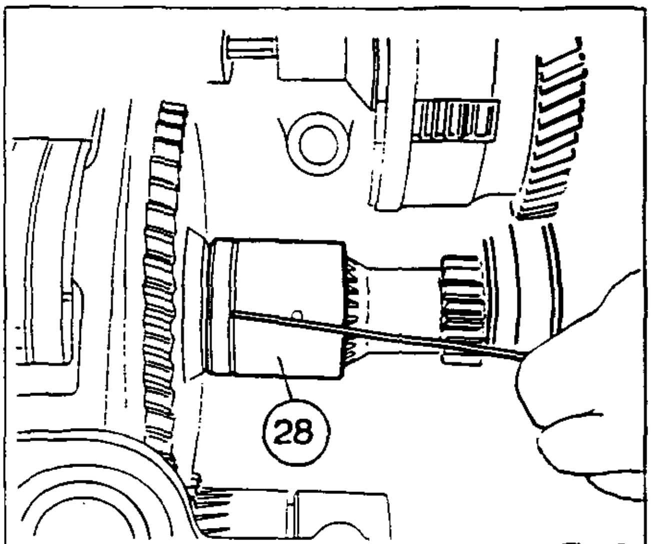


Fig. 5

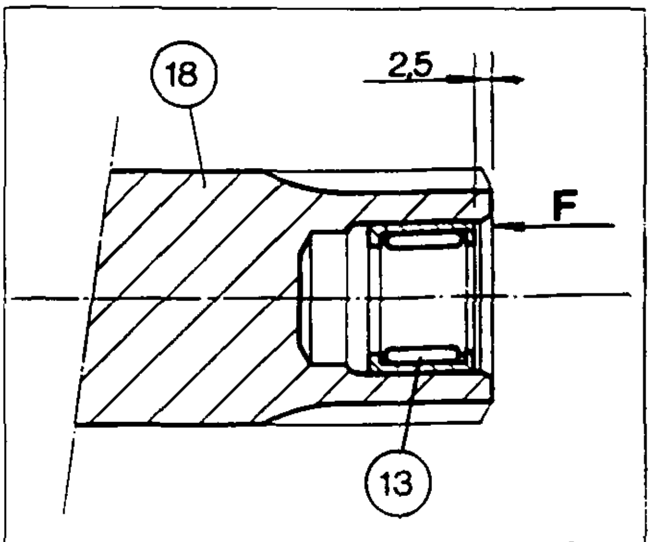


Fig. 6

Accessories - GSPTO

28. Place a dial indicator on the end of spacer **(22)**(Fig.7).
29. Through the panel in cover **(12)** pull on the shaft, spring **(3)**(Fig.12).
30. Reset the dial indicator to zero.
31. Repeat the operation, this time pushing.
32. Select shims of the right thickness, depending on the amount of play shown on the dial indicator.
33. Remove circlip **(23)** and spacer **(22)**, take out shaft **(18)** assembled with bearing cone **(19)** and circlip **(17)**, keeping circlip **(15)** in place. Refit gear **(16)**, shaft **(18)** and bearing cup **(20)**.
34. Apply two spots of grease on adjusting shims **[21]** selected at step 32, and place them against bearing cup **(20)**.
35. Fit spacer **(22)** and circlip **(23)**.
36. Replace and clean plug **(24)**, apply Loctite 542 to the rim of its housing and fix in place.
37. Place coupler **(10)** on shaft **(18)**.
    Note : Put short shoulder "E" facing towards shaft (8)(Fig.8).
38. Fit circlips **(6)** and **(9)** on shaft **(8)**.
39. Using a suitable driver, press bearing **(5)** onto the shaft in contact with circlip (6).
40. Fit circlip **(7)** using long-nose pliers (Fig.9).

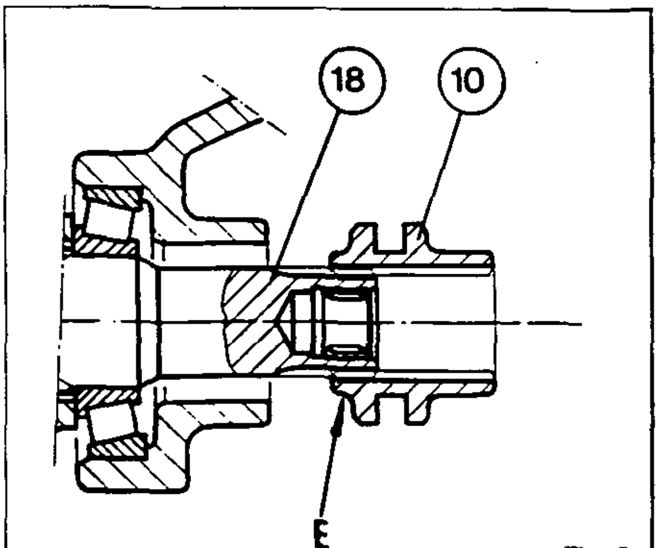


Fig. 8

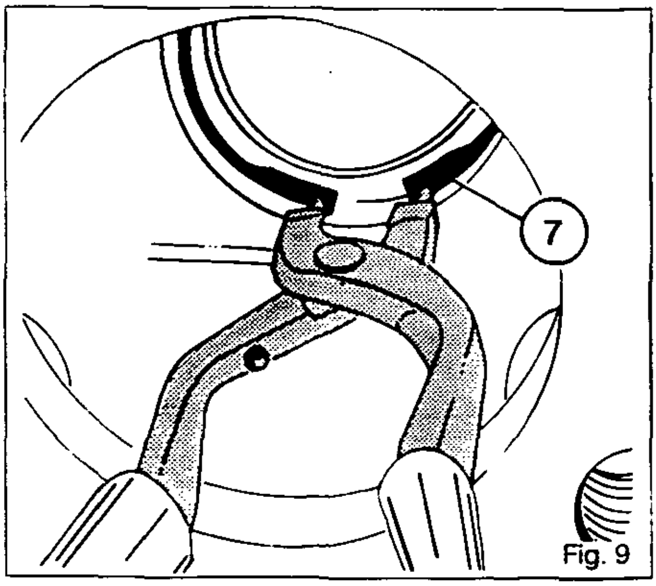


Fig. 9

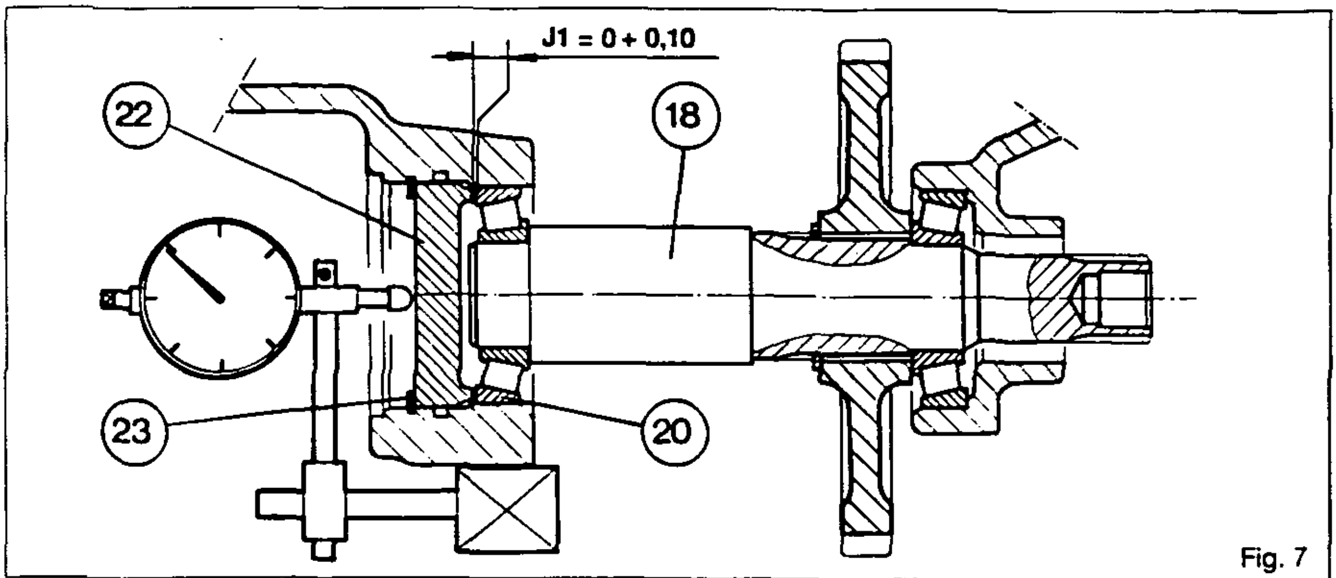
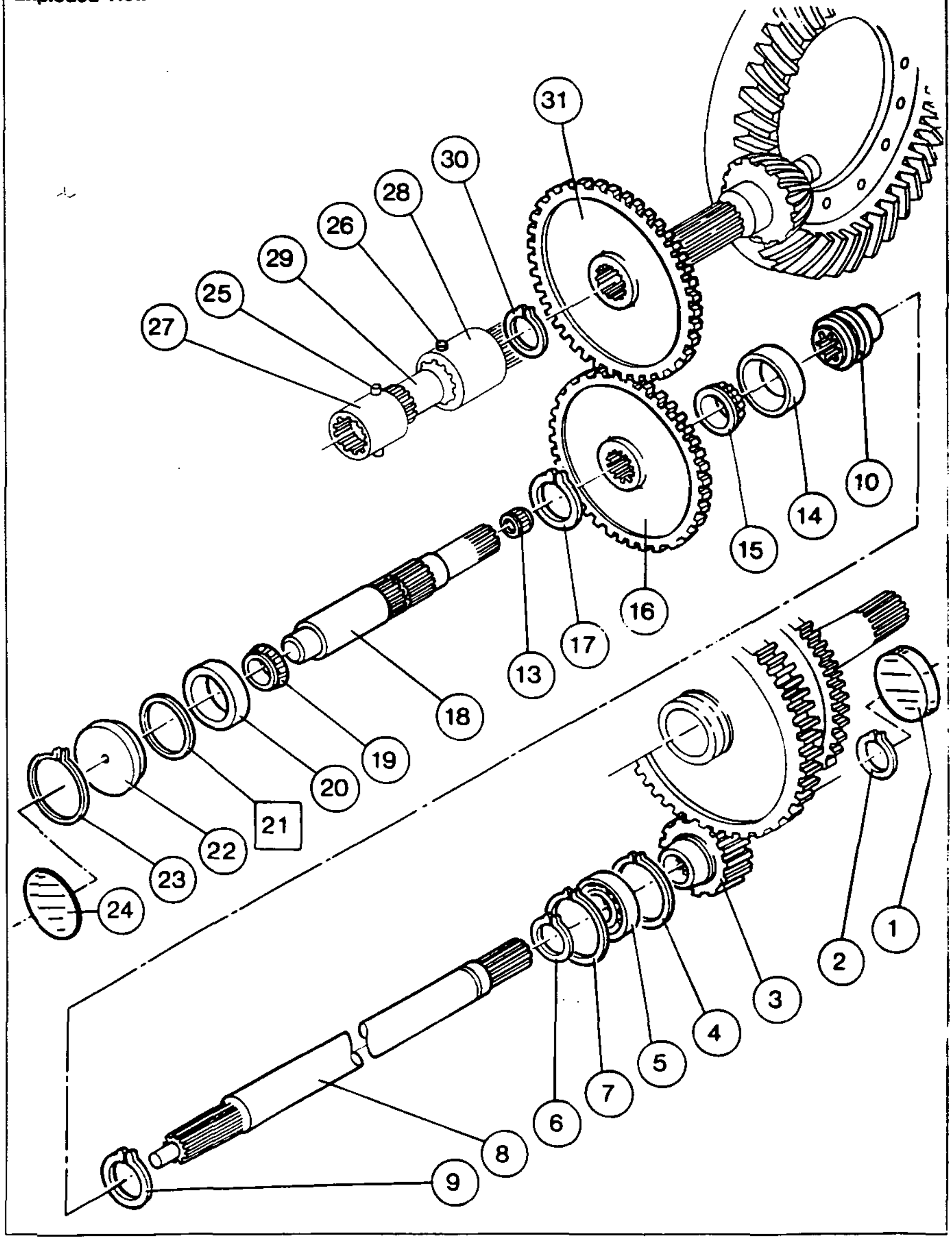


Fig. 7

Accessories - GSPTO

Exploded View



A. Preliminary operations

1. Immobilise the tractor and block the left-hand rear wheel.
2. Place a wedge between the frame and the front axle (Fig.1).
3. Drain the rear axle housing.
4. Remove the tow hook.
5. Extract the rear plug **(1)**(Fig.2).
6. Jack up the right-hand rear side of the tractor.
7. Install an axle stand and remove the wheel.
8. Remove bolts **(11)** and cover **(12)**.
9. Remove the right-hand hydraulic cover. Carry out operations 2 to 14, chapter 81.01.

Tractors without creeper gears

10. Take out double pins **(25)** and **(26)** from coupling sleeves **(27)** and **(28)**.
11. *Slide the sleeves towards each other along shaft* **(29)**.
12. Remove the shaft and sleeve assembly.

Tractors with creeper gears

13. Remove the shifter fork, the sleeve unit, the coupling shaft and the coupler. Carry out operations 3 to 8 and 13 to 16, chapter 5D.01A.

Tractors with or without creeper gears

14. Remove circlip **(30)**.
15. Remove plugs **(1)** and **(24)**(Figs.3 and 4).

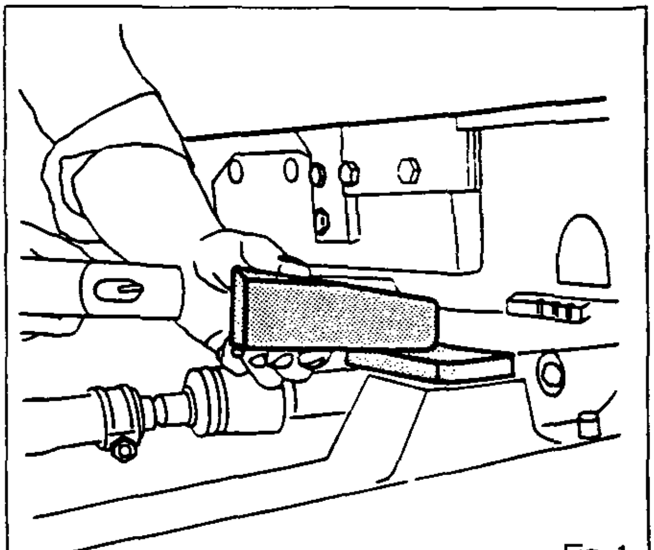


Fig. 1

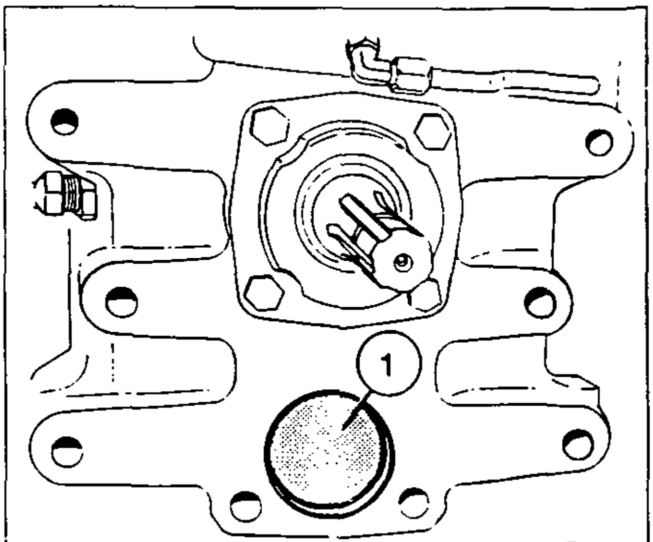


Fig. 2

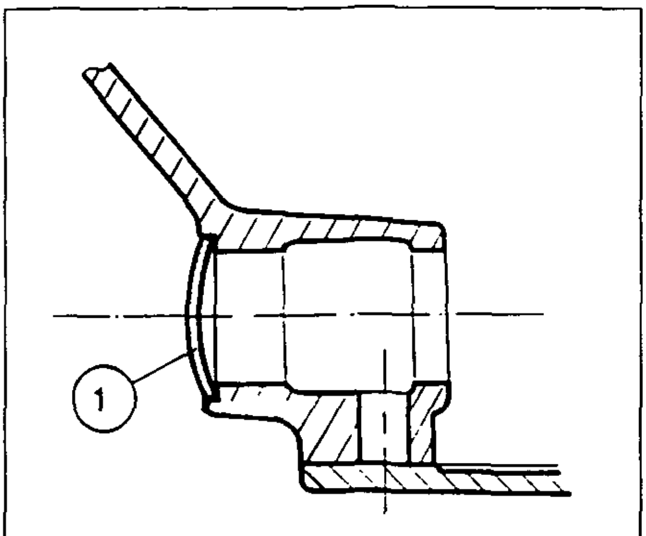


Fig. 3

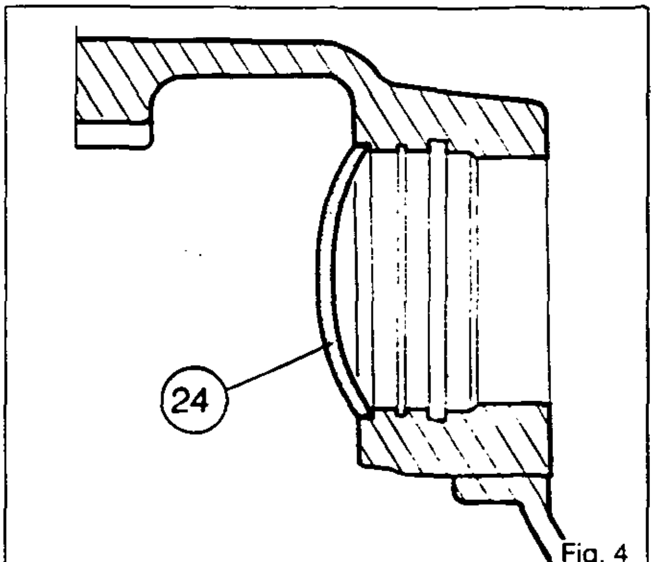
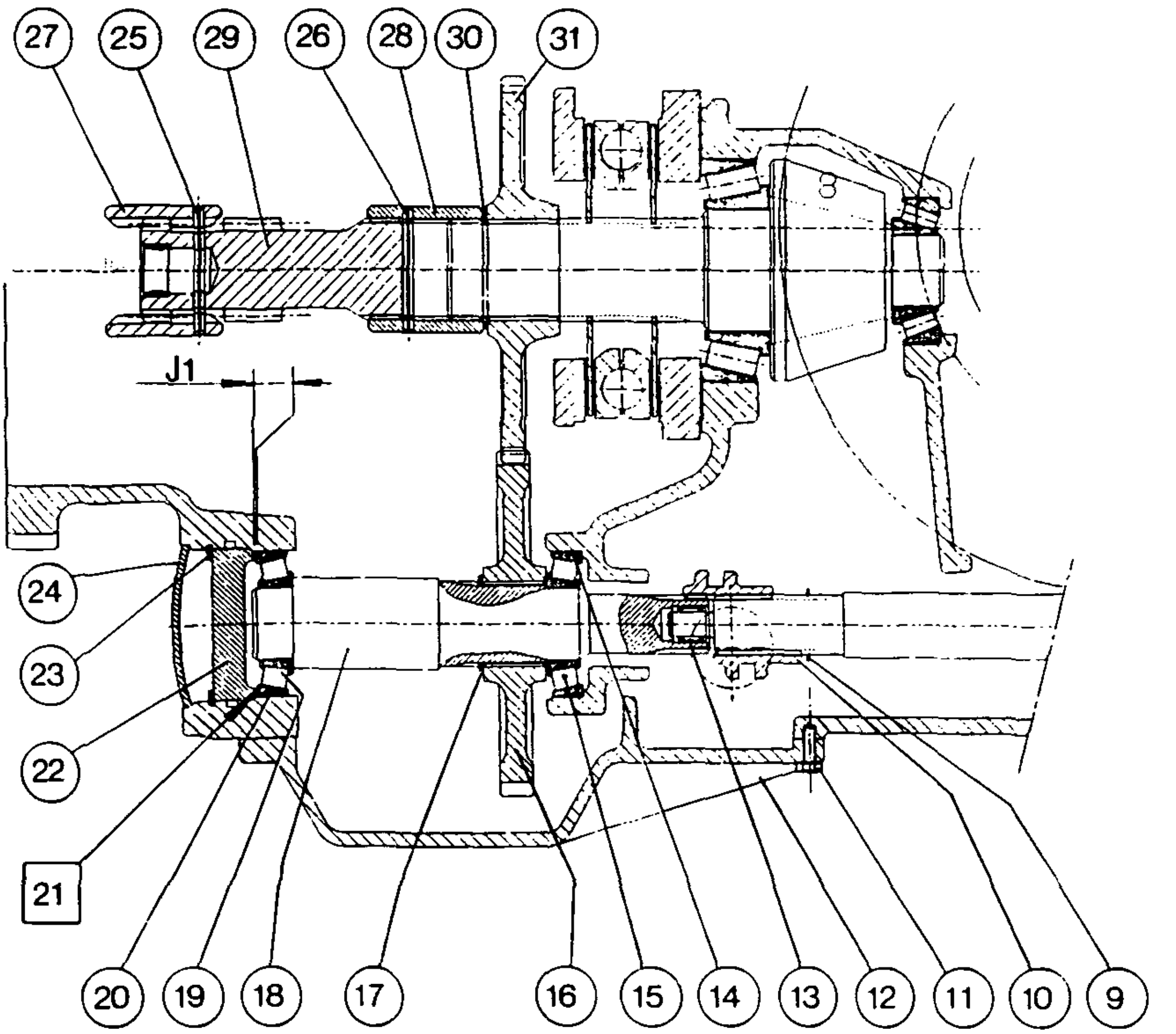


Fig. 4

10 B01 Fitting a ground speed PTO on 2 WD tractors

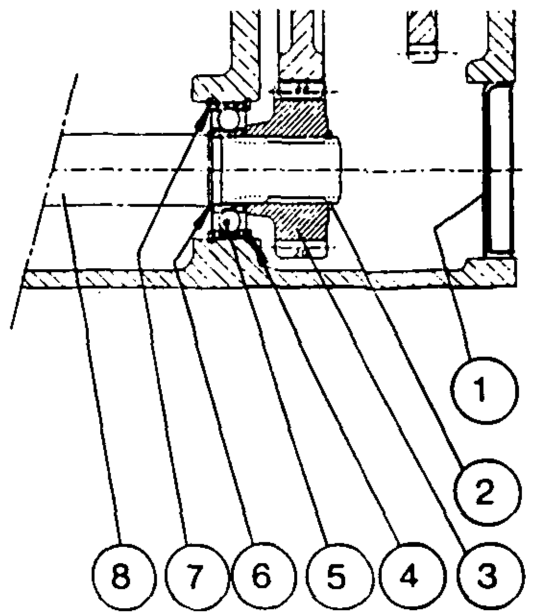
CONTENTS

Accessories - GSPTO



Key to illustration

- **(1)** Cap
- **(2)** Circlip
- **(3)** Pinion
- **(4)** Circlip
- **(5)** Bearing
- **(6)** Circlip
- **(7)** Circlip
- **(8)** Shaft
- **(9)** Circlip
- **(10)** Coupler
- **(11)** Bolt
- **(12)** Cover
- **(13)** Needle bearing
- **(14)** Bearing cup
- **(15)** Bearing cone
- **(16)** Transfer gear
- **(17)** Circlip
- **(18)** 2WD shaft
- **(19)** Bearing cone
- **(20)** Bearing cup
- **[21]** Shim(s)
- **(22)** Spacer
- **(23)** Circlip
- **(24)** Plug
- **(25)** Double pin
- **(26)** Double pin
- **(27)** Sleeve
- **(28)** Sleeve
- **(29)** Shaft
- **(30)** Circlip
- **(31)** Gear



F. Fitting and adjusting the control cable

76. Put the cable into the grommet at the rear of the cab.
77. Slide cable housing end stop **(5)** into bracket **(6)** (Fig.16).
78. Screw the clevis to the edge of the threaded part of cable **(7)** (Fig.16).
79. Fit clevis **(1)** to link **U** with clip **(8)** and tighten nut **(2)** (Fig.16).
80. Adjust cable end stop **(5)** to obtain a measurement of 105mm between bracket **(6)** and the clevis pin **(1)** (Fig.16).
    Note: Make sure the cable can move freely.
81. Put link **U** in "engaged" position (Fig.17).
82. Put rod **V** in "clutch engaged" position (Fig.18).
    Note: Make sure that link V is properly locked in place.
83. Screw clevis **(6)** to the edge of the threaded part of cable **(4)**(Fig.18).
84. Fit clevis **(6)** on link **V** with clip **(5)** and tighten nut **(7)**.
85. Adjust cable end stop **(1)** using nut **(3)**, making sure that link **V** is still in "clutch engaged" position.
86. Tighten nut **(2)**.
    Note: After tightening, check that there is no drag on the cable in "clutch disengaged" and "clutch engaged" positions (Fig.18).
87. Check that the control works properly in "clutch disengaged" position.

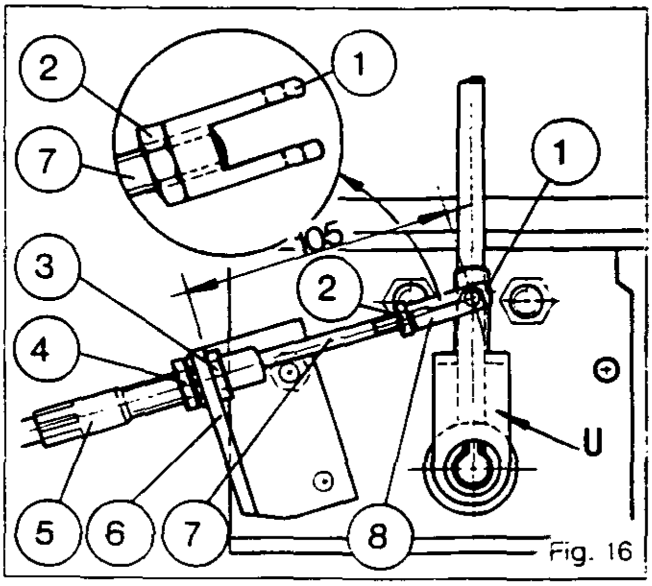


Fig. 16

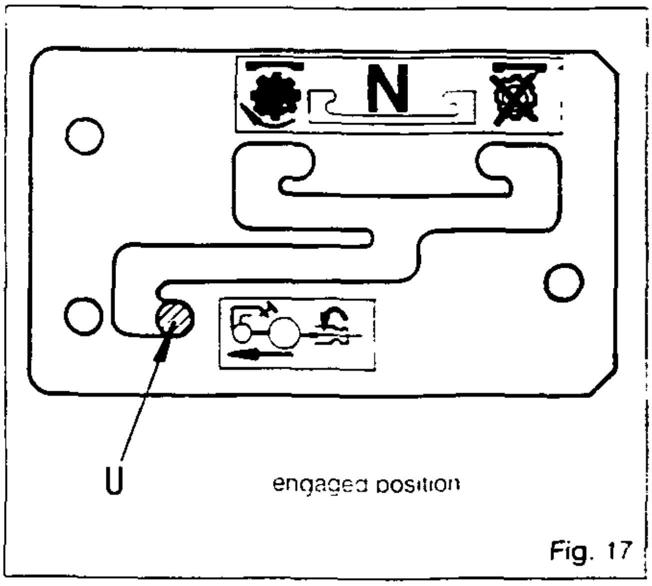
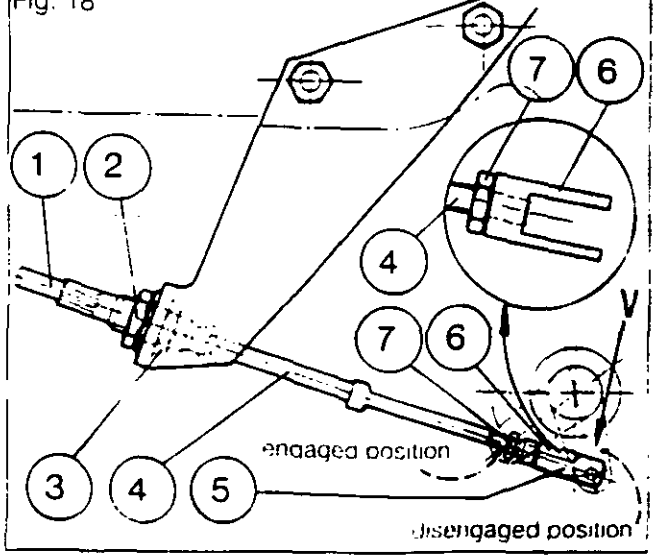


Fig. 17

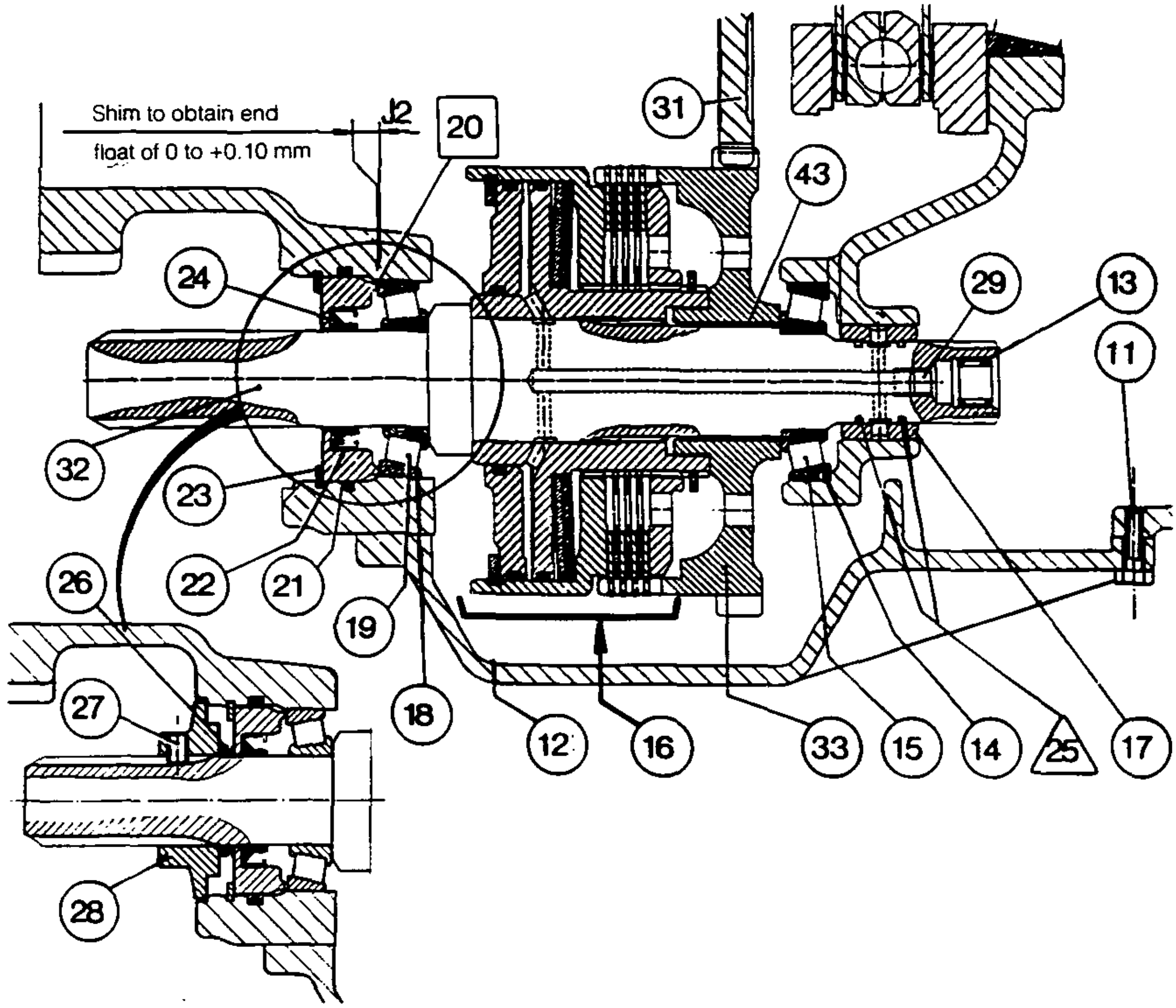
Fig. 18


10 B02 Fitting a ground speed PTO on 4 WD tractors

CONTENTS

Accessories - GSPTO

Fig. 1



Rice field version

Key to illustration

(11) Bolt
(12) Cover
(13) Needle bearing
(14) Bearing cup
(15) Bearing cone
(16) Clutch unit
(17) Bush
(18) Bearing cup
(19) Bearing cone
(20) Shim(s)
(21) O-ring
(22) Retainer - bearing
(23) Circlip
(24) Seal
/25 Sealing rings
(26) Seal
(27) Setscrew
(28) Flange
(29) Cap
(31) Transfer gear
(32) 4 WD shaft
(33) Drum
(43) Bush

A. Preliminary operations

1. Immobilise the tractor and block the rear wheels.
2. Drain the axle housing
3. Remove the tow hook.
4. Extract rear plug **(1)**(Fig.2).
5. Remove bolts **(11)** and cover **(12)**.
6. Extract plug **(1)** (Fig.3).

   Note : To stop the 4 WD clutch from slipping in certain working conditions, where the front axle and the ground speed PTO are used simultaneously, a five-disc clutch has been fitted on the 3000 tractor range as from serial number N309034 (see service bulletin 88/027, issue 2, December 1988). All 3100 tractors are fitted with a 4WD five-disc clutch.

For 3000 tractors prior to this number

- Remove and refit the clutch unit (see Fig.1) and carry out operations 7 to 23.
- Remove and refit the clutch (see chapter 7A01, sections B and C.
- Continue assembling the ground speed PTO. Carry out operations 24 to 33.

For 3000 tractors after this number and for 3100 tractors

- If the bearing is fitted, continue assembling the GS PTO. Carry out operations 24 to 33.
- Check that needle bearing **(13)** is in place. If the needle bearing is not fitted, refer to Figure 1 and carry out operations 7 to 33.

7. Disconnect the two front differential locking control hoses (plug the pipes). Remove the shield and transmission shaft.
8. On tractors fitted with a reinforced seal protector, remove screw **(27)**, flange **(28)** and seal **(26)**.
9. Remove circlip **(23)**.
10. Protect the splined part of shaft **(32)**. Pull out bearing retainer **(22)** with seal **(24)** using the locally manufactured tool (see section E, chapter 7A01).
11. Remove O-ring **(21)**, adjusting shim(s) **[20]** and bearing cup **(18)**.
12. Take out shaft **(32)** and bearing cone **(19)** but retain clutch **(16)** and drum **(33)** assembly.
13. Remove clutch **(16)** with drum **(33)** and bearing cone **(15)**.

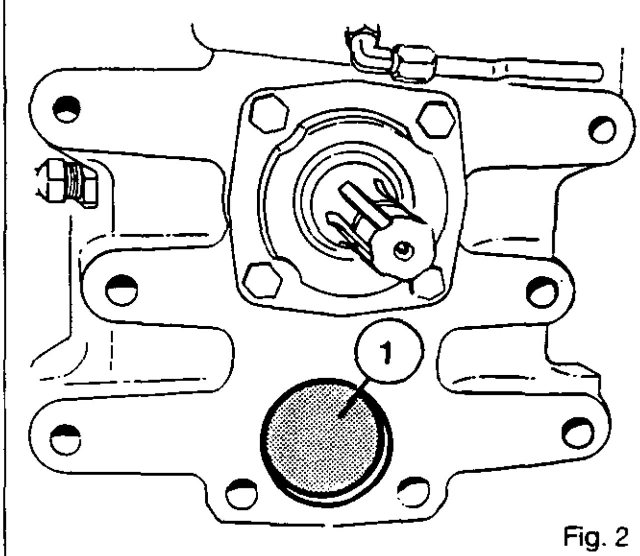


Fig. 2

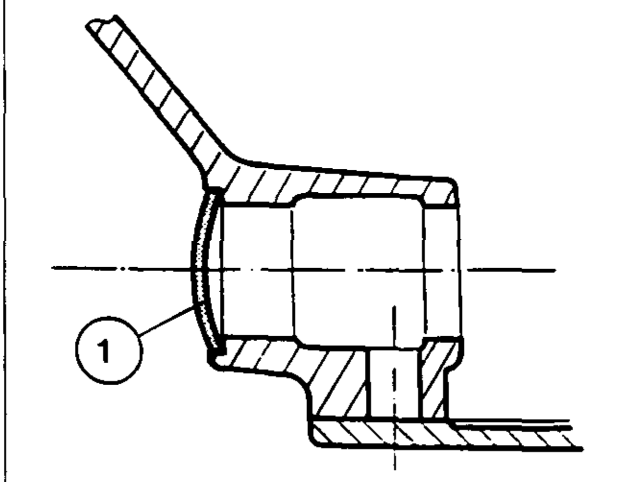


Fig. 3

B. Fitting

14. If needle bearing **(13)** is not fitted on shaft **(32)**, fit it 2.5mm back from side "F" (Fig.4).
15. Check that sealing rings **(25)** are not damaged and that they turn freely.
16. Place bearing cone **(15)** in bearing cup **(14)**, push in shaft **(32)** after positioning clutch **(16)** and drum **(33)** assembly in the housing.
17. Put bearing cup **(18)** and adjusting shim(s) **[20]** coated with grease, in place.
18. Fit O-ring **(21)** in the housing groove.
19. Fit bearing retainer **(22)** with seal **(24)** and circlip **(23)**. Remove the shaft splines protector.
20. *On tractors with rice field version, grease and place* seal **(26)**, with the lip facing bearing retainer **(22)**. Remove the protector.
21. Fit flange **(28)** leaving some play relative to the housing.
22. Tighten screw **(27)** coated with Loctite 241.
23. Refit the drive shaft and shield. Reconnect the two front differential locking control hoses.
24. Put coupler **(10)** on shaft **(32)**.
    Note: Put short shoulder "E" facing towards shaft (32)(Fig.5).
25. Fit the ground speed PTO shaft and carry out operations 38 to 51, chapter 10B01.
26. Refill the rear axle with oil to level.
27. Refit the tow hook.
28. Remove the lift console. Carry out operations 57 to 61, chapter 10B01.
29. Fit and adjust the control lever and cable and carry out operations 62 to 65 and 76 to 80, chapter 10B01.
30. Refit the lift console and carry out operations 67 to 72, chapter 10B01.
31. Fit and adjust the cable on the link located on the left of the rear axle housing. Carry out operations 81 to 87, chapter 10B01.
32. Check that the following function correctly :
    - the lift console, and electronic and electric controls
    - the ground speed PTO
    - the automatic hook (if fitted). If adjustment is required, carry out operations 1 and 6 to 9, *chapter 6M01.*
33. Check the sealing of the cover seal surface under the rear axle housing and of the front differential locking control hose connectors.

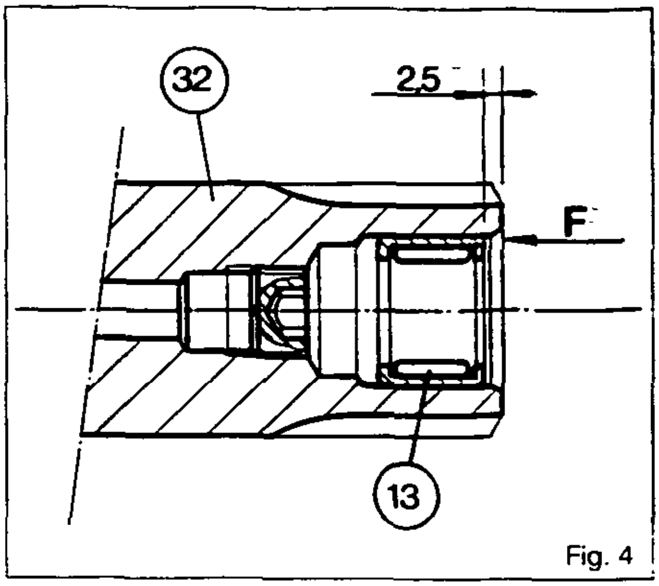


Fig. 4

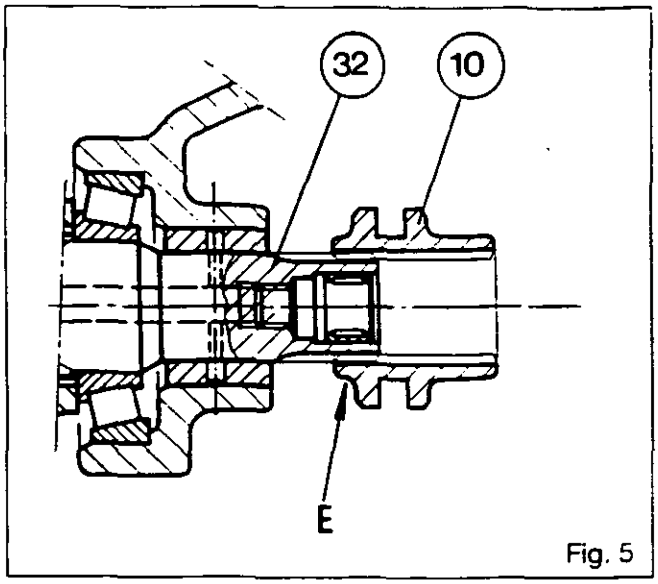


Fig. 5

10 C01 Fitting the front PTO

CONTENTS

10C01.2 **Accessories** - *Fitting the front PTO*

General (Fig. 1)

The whole power take-off unit, installed on the front axle bearing, is driven via a coupling sleeve connected to the engine pulley.

The power take-off is started by operating a knob (contactor) **(2)** in the cab.
For details on its operation, see section 10 C02, page 2.

(1) PTO unit assembly
(2) Contactor
(3) Contactor harness
(4) Power supply harness
(5) Solenoid valve and electromagnetic brake harness

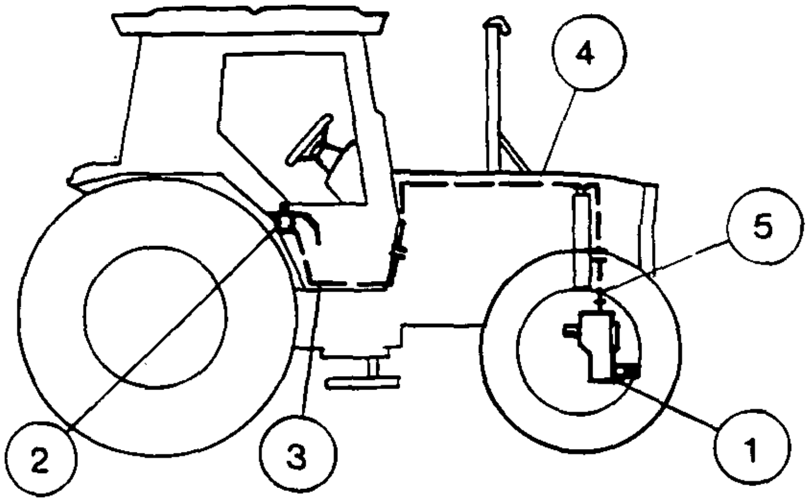


Fig. 1

A. Preliminary operations (Fig. 2)

Note: Before disassembly, apply the handbrake and immobilise the front wheels with blocks.

1. Remove the front weights.
2. Remove the sheet metal panels.
3. Disconnect the vacuum switch, the horn, the headlights, the battery cables and the fuse.
4. Remove the batteries.
5. Unscrew the air-conditioning condenser and take it out of the grille.
6. Remove the grille.
7. Remove the weight supporting frame.
8. Remove the air-conditioning drier support.
9. Position an adjustable stand under the engine to allow the removal of the front axle bearing. Free the front axle.

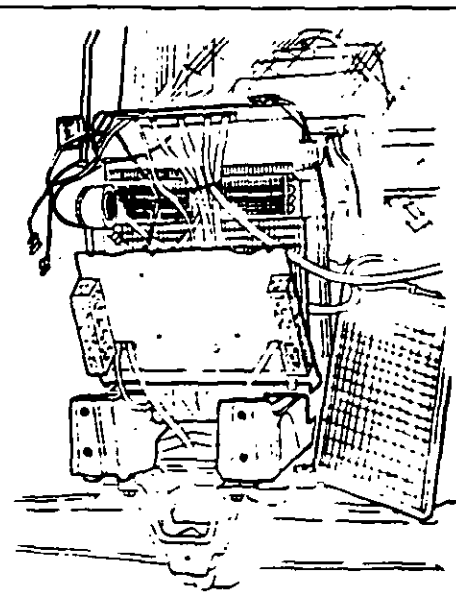


Fig.

B. Fitting the hydraulic installation

Left-hand side of gearbox

10. Remove hose **A** (Fig. 3) which comes from the 17 bar valve.
11. *Remove the union* **(1)** *and install a union tee* **(2)** *in* its place. Reinstall the elbow union **(1)**.
12. Reinstall hose **A** on the union tee **(2)**.
13. Fit the power take-off return hose **(3)** (Fig. 3 and 4).

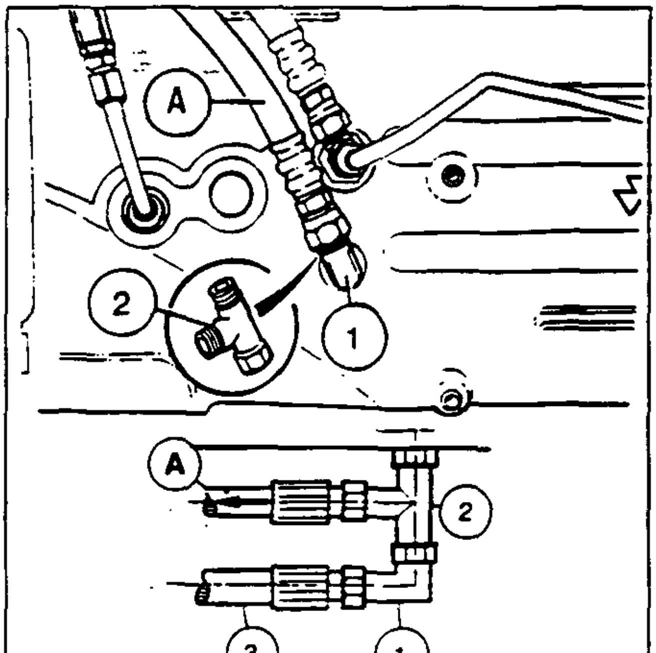


Fig. 3

Different types of installation
A - B - C : Clockwise PTO version
D : High-visibility version

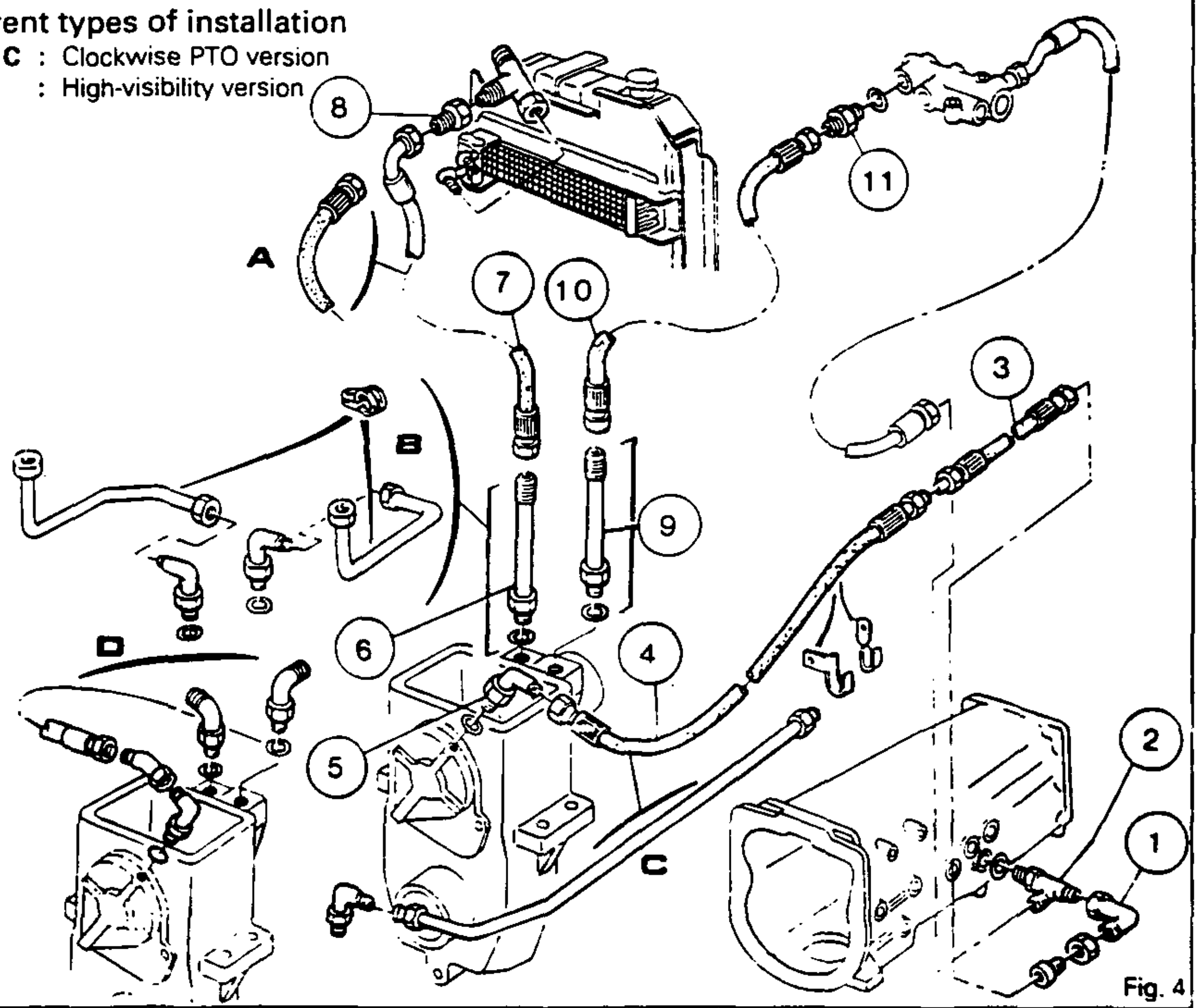


Fig. 4

C. Fitting the PTO unit assembly

Coupling sleeve (Fig. 5)

1st section : Engine side

14. Unscrew the engine pulley, fit the hub **(1)** with the new bolts supplied with the kit. Tighten the bolts to a torque of:
    - 4 cyl. engine: 51 - 69 Nm,
    - 6 cyl. engine: 52 - 75 Nm.
15. Install the bush **(2)**, coupling **(3)** (tighten to a torque of 36 - 46 Nm), vibration damper **(4)** and coupling **(5)**.

2nd section : PTO side

16. Assemble the hub **(8)**, bush **(9)** and shaft **(7)** (tighten the hub to a torque of 36 - 46 Nm.)
17. Position the vibration damper **(10)** and coupling **(11)**.
18. Fit the coupling sleeve **(6)**, positioning it away from the end of the shaft **(7)**.
19. Fit the elbow unions on the PTO unit (Fig. 4).
20. Engage the PTO unit assembly in the pivot on the front axle. Fit the attaching bolts coated with Loctite 270 and tighten to a torque of 520 - 640 Nm.
21. Connect up and position the coupling sleeve **(6)**, complying with the dimension of 15 mm as per Fig. 6. Tighten the sleeve to 36 - 46 Nm.
22. Fit the connecting pipes and hoses onto the gearbox cover and secure them with attaching lugs **B** (Fig. 7) on the engine side.
23. Connect up the hose to the oil cooler on the lower outlet. Fit the jet **(8)** (Fig. 4).
24. Connect the hose to the 17 bar valve on the free outlet.

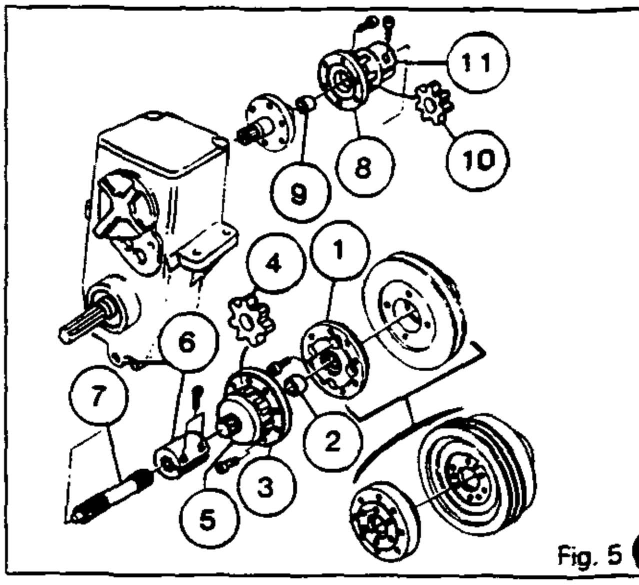


Fig. 5

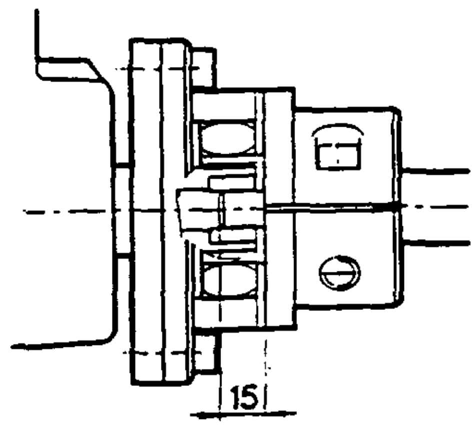


Fig. 6

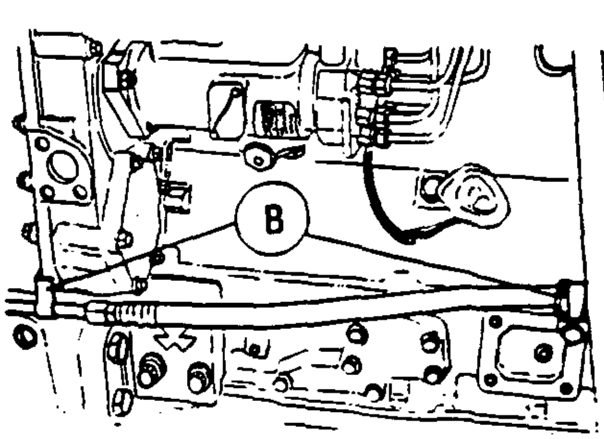


Fig. 7

D . Fitting the electrical installation (Fig. 8 - 9)

Preparing the contactor assembly

25. Fit the plate **(11)** onto the console in the cab and secure it with four rivets after removing the blanking part.
26. Assemble the relay **(6)** on the mounting plate **(13)**.
27. Place the prepared assembly on the contactor **(2)** after unscrewing parts **(14)** and **(15)**.
28. Connect the harness **(3)** to the relay **(6)** and the knob (contactor) **(2)**.
29. Free the bellow from the gear levers. Install the contactor assembly in position through the opening. Do not forget to fit the Grower washer **(12)**. Screw the bushes **(14)** and **(15)**.
30. Connect the solenoid valve **(10)** onto the power take-off. Feed the wire through the battery support.
31. Connect up the PTO brake wires by means of the connecting strip.

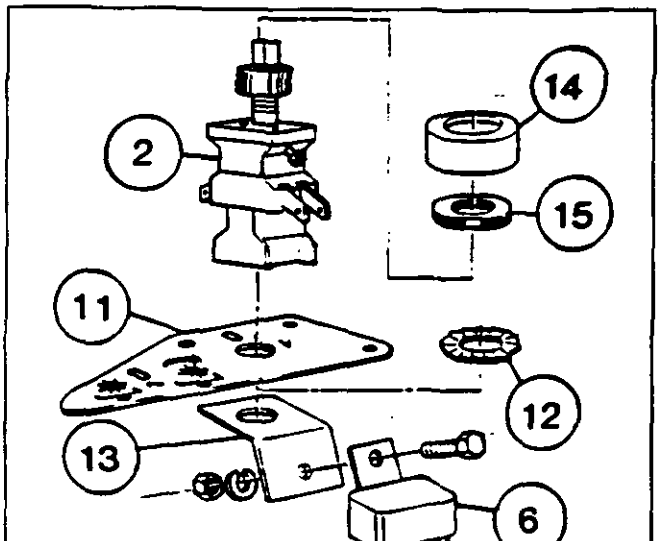


Fig. 8

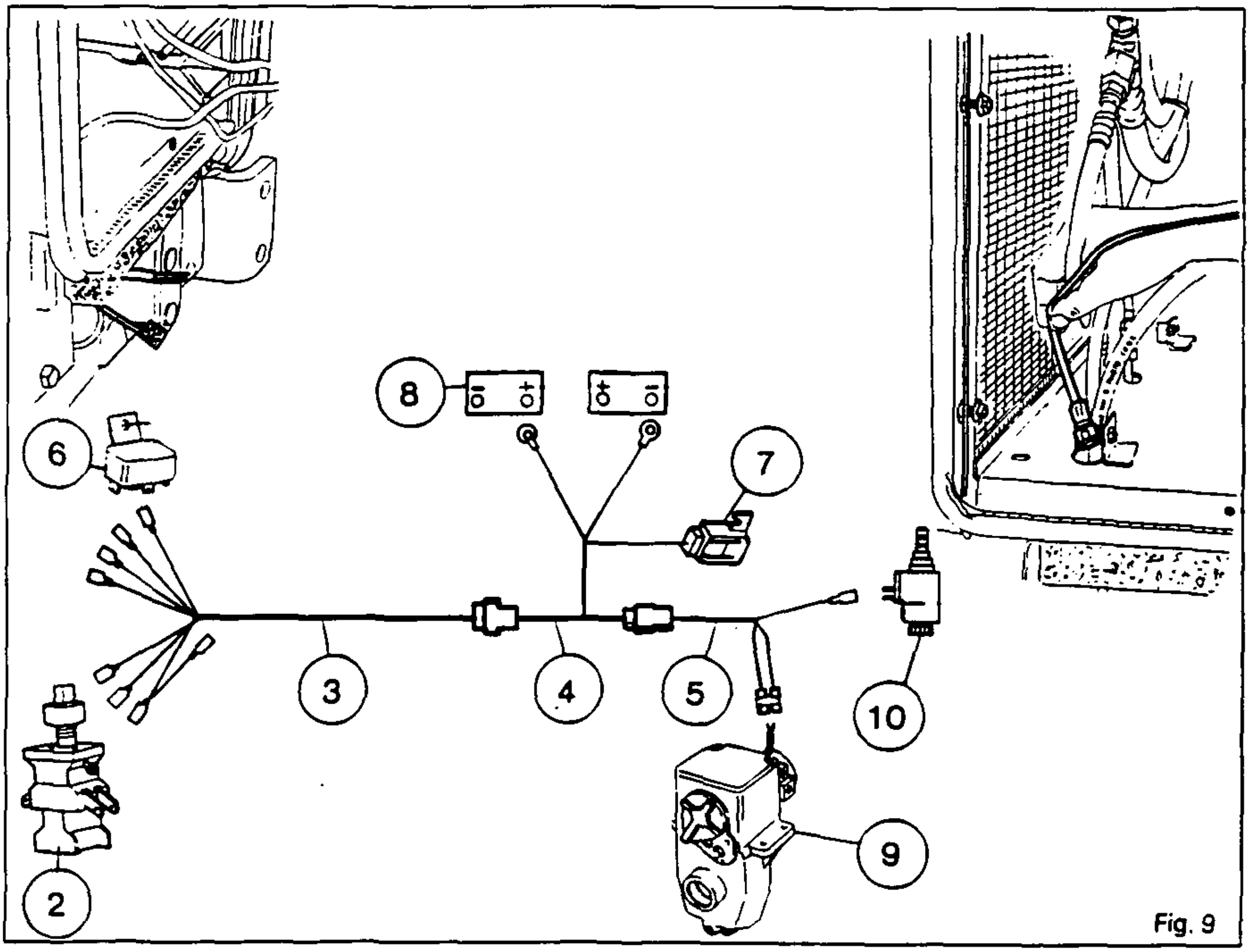
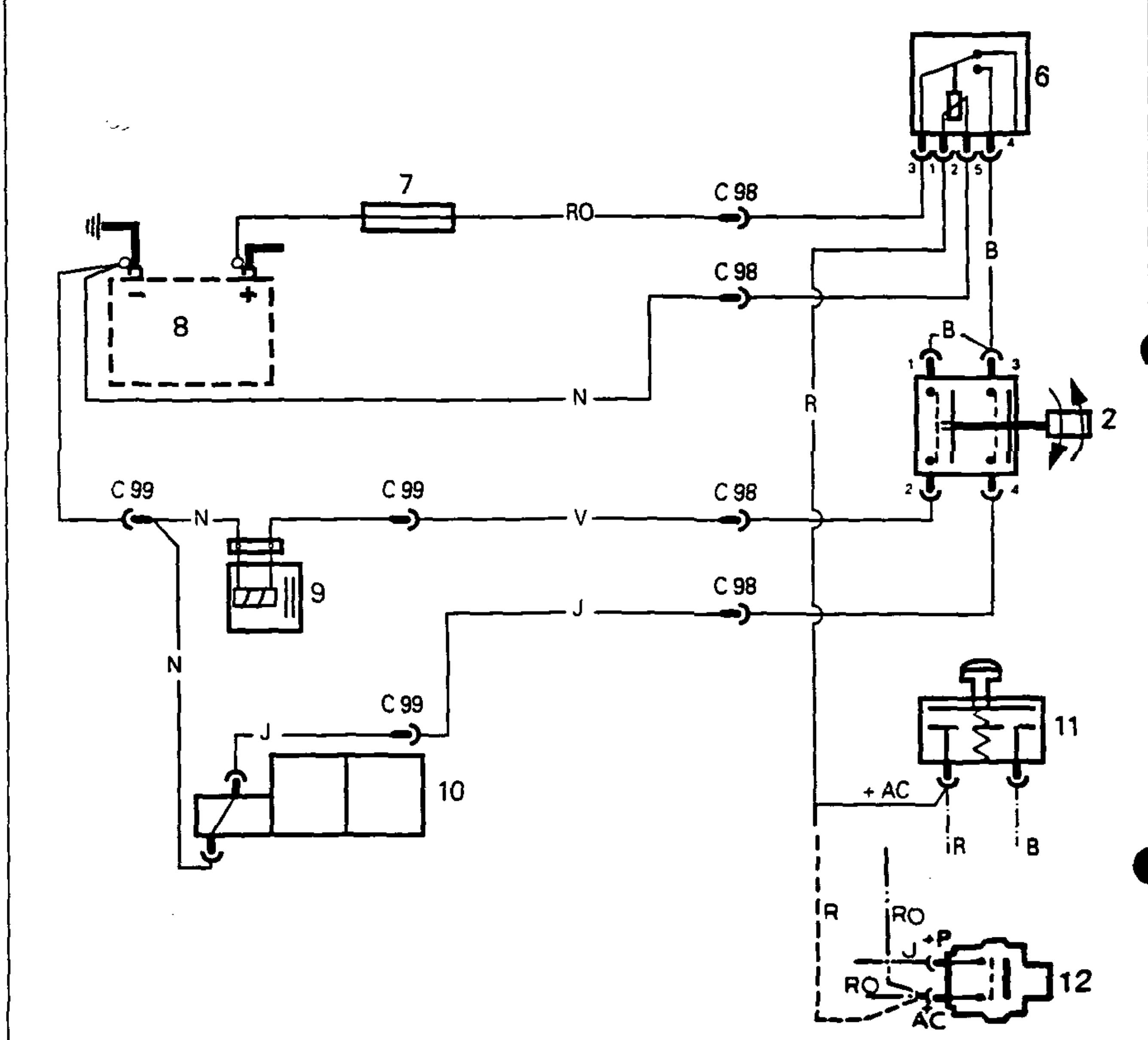


Fig. 9

E. Wiring diagram



List of parts

2 Front PTO contactor
6 Relay
7 Fuse 5 A
8 Battery
9 Front PTO brake
10 PTO solenoid valve
11 Hare/Tortoise (Hi-Lo) range contactor (tractors with Autotronic system)
12 Low-pressure contactor (tractors without Autotronic system)

Colour

B	White
J	Yellow
N	Black
R	Red
RO	Pink
V	Green

Connectors

C98	4-way
C99	3-way

Fig. 1

F. Final reassembly

Note: Before proceeding with final reassembly, it is advisable to check that the system operates correctly and that there are no leaks.

Important: Before starting up the engine, check the oil level in the power take-off. When switching on, allow the engine to idle for a few minutes, check for leaks, stop the engine and retighten components, if necessary.

Carry out procedures 1 to 9 in reverse order.
Precautions: Install and secure the battery attaching clamps before closing the supporting sheet metal.

Operation

Engine speed of 1,000 to 2,040 rpm.
To engage the power take-off, press and turn the knob (Fig. 11).
Important: The tractor must be stopped with the ignition switched off before engaging the front power take-off.

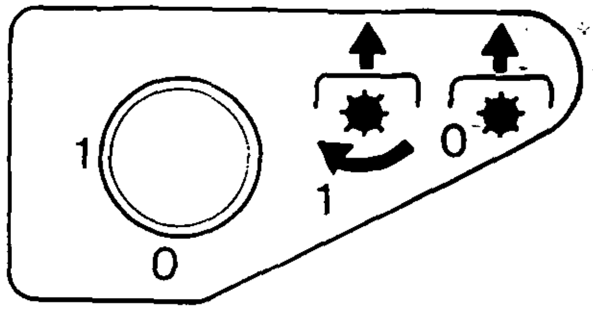


Fig.11

10 C02 Repairing the front PTO

CONTENTS

10C02.2 **Accessories** - Repairing the front PTO

General

The front power take-off unit is mounted under the front frame. It can be installed on two or four-wheel drive tractors. The PTO shaft rotates at single speed of 1,000 rpm and can be installed in 6 or 21 spline versions.
The maximum torque transmitted by the PTO shaft is 50 m/kg.

Operation

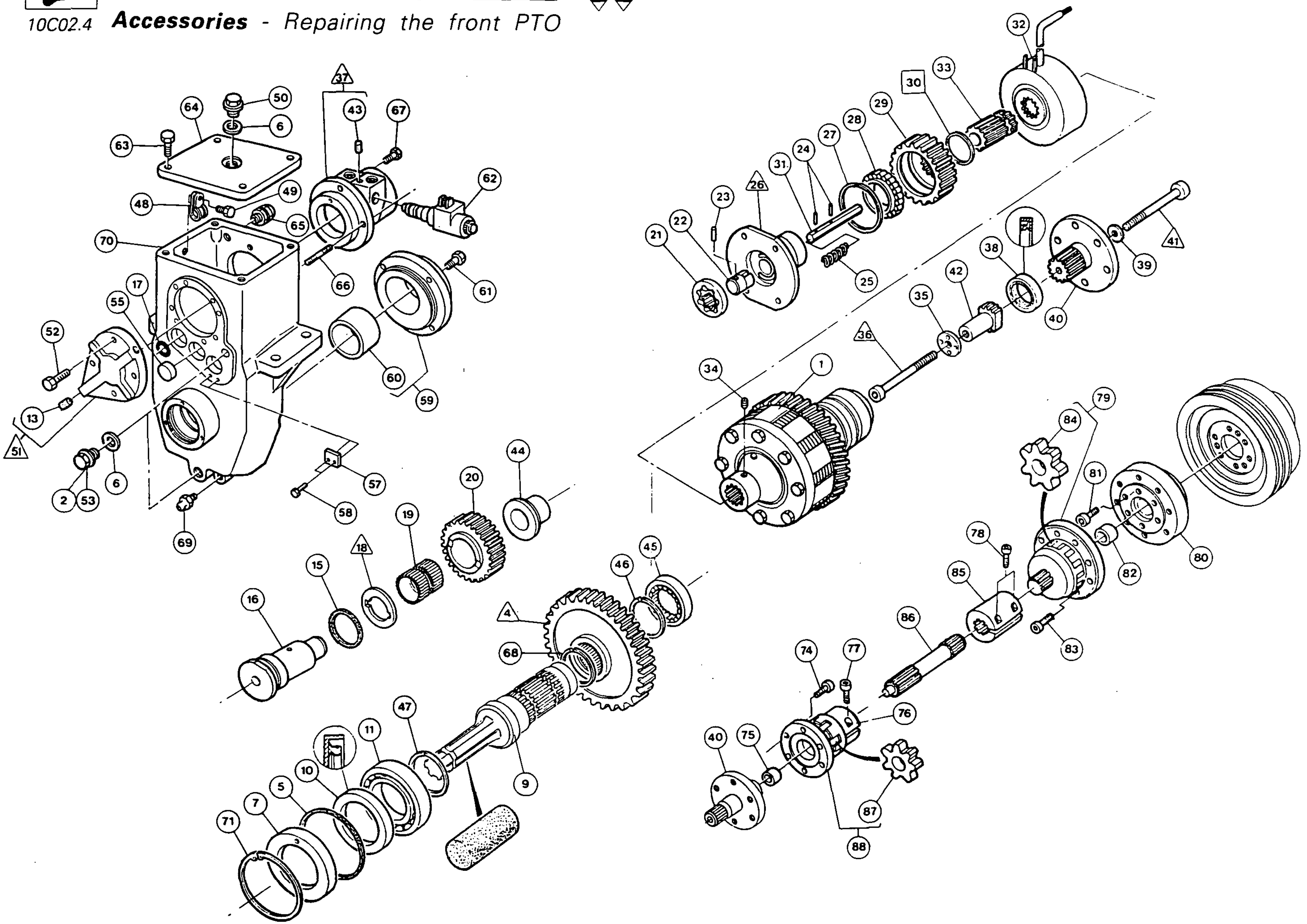
The power take-off is provided from the input shaft **(40)** which is connected to the engine pulley by means of shaft **(86)** which is splined at both ends. The link is provided by the splined sleeve **(85)** and the flexible couplings **(76)** and **(79)**.
The solenoid valve **(62)** sends the oil from the 17-bar low-pressure system via the union **(73)** to act on the piston **(a)** of the clutch **(1)**, thus linking the hub **(b)** and the unit **(c)** via the clutch friction discs. The shaft **(33)** and driving pinion **(29)** transmit the output drive to the PTO shaft **(9)** via gears **(20)** and **/4**. As soon as the control knob is turned to the "0" position, the solenoid valve **(62)** shuts off the oil supply and the electromagnetic brake **(32)** immobilises shaft **(33)** and, consequently, stops the PTO shaft **(9)** rotating.
The unit is lubricated by means of the oil flow outlet from the cooler at a pressure of 1.5 bar (orifice **L**).
An eccentric type pump **(21) (22) (23)** ensures that a constant oil level is maintained in the unit. Capacity of housing: approximately 4.75 litres.

Reverse direction version

An additional pin **(16)** and a gear **(20)** which is meshed with gear **/4** allows the direction of rotation of the output shaft **(9)** to be reversed.

List of parts

(1) Clutch assembly
(2) Plug
(3) O-ring
/4 Driven gear
(5) O-ring
(6) O-ring
(7) Seal holder
(8) Guard
(9) PTO shaft
(10) Sealing bush
(11) Bearing
(12) Bolt
(13) Rivet
(14) Guard
(15) O-ring
(16) Pin
(17) O-ring
/18 Washer
(19) Double needle-roller bearing
(20) Intermediate gear
(21) Pump assembly
(22) Pump hub
(23) Pump pin
(24) Dowels
(25) Spring
/26 Support
(27) Stop ring
(28) Bearing
(29) Driving gear
(30) Adjusting shims
(31) Pin
(32) Electromagnetic brake
(33) Shaft
(34) Bolt
(35) Washer
/36 Bolt
/37 Cover
(38) Sealing bush
(39) Seal
(40) Shaft
/41 Bolt
(42) Special nut
(43) Rivet
(44) Shouldered bushes
(45) Bearing
(46) Retaining ring
(47) Stop ring
(48) Clamp
(49) Bolt
(50) Filler plug
/51 Cover
(52) Bolt
(53) Plug
(54) Plugs
(55) Cup plug(s)
(56) Rivet
(57) Lock plate
(58) Bolt
(59) Rear bearing
(60) Bush
(61) Bolt
(62) Solenoid valve
(63) Bolt
(64) Cover
(65) Grommet
(66) Studs
(67) Bolt
(68) Retaining ring
(69) Grease nipple
(70) Housing
(71) Circlip
(72) Union
(73) Union
(74) Bolt
(75) Bush
(76) Coupling
(77) Bolt
(78) Bolt
(79) Coupling
(80) Hub
(81) Bolt
(82) Bush
(83) Bolt
(84) Bush
(85) Sleeve
(86) Shaft
(87) Bush
(88) Coupling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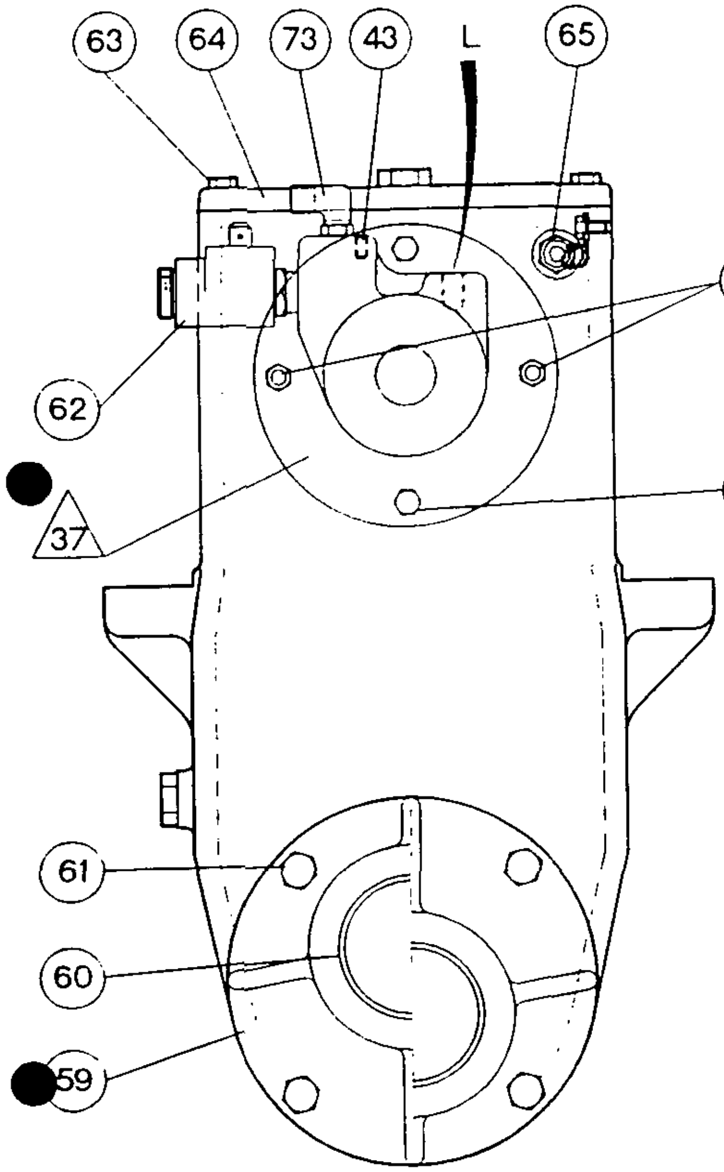
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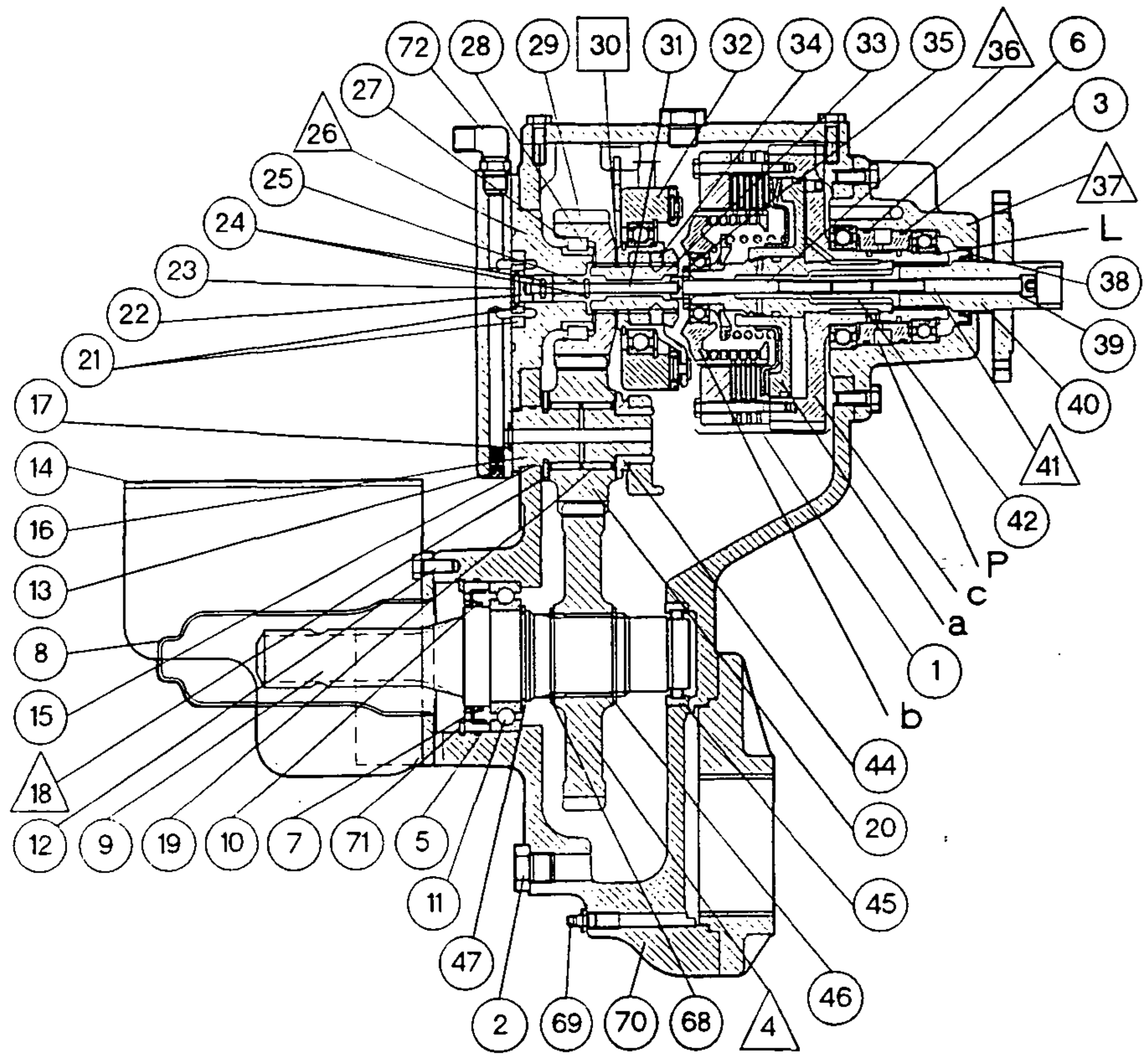
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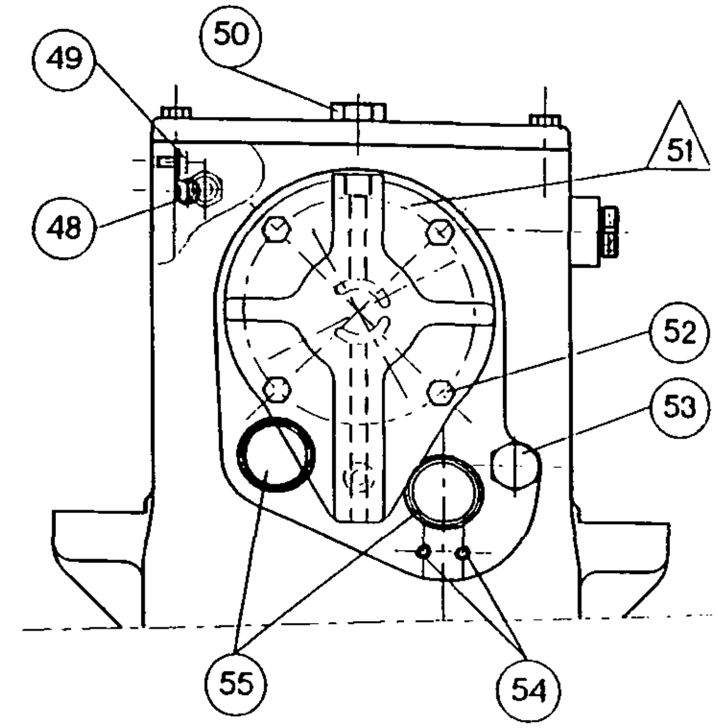
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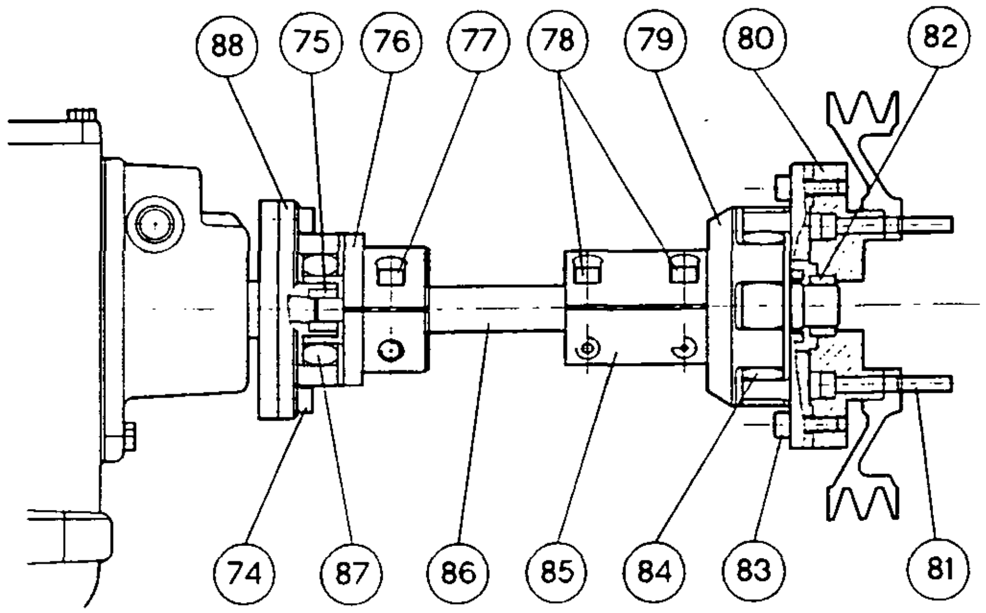
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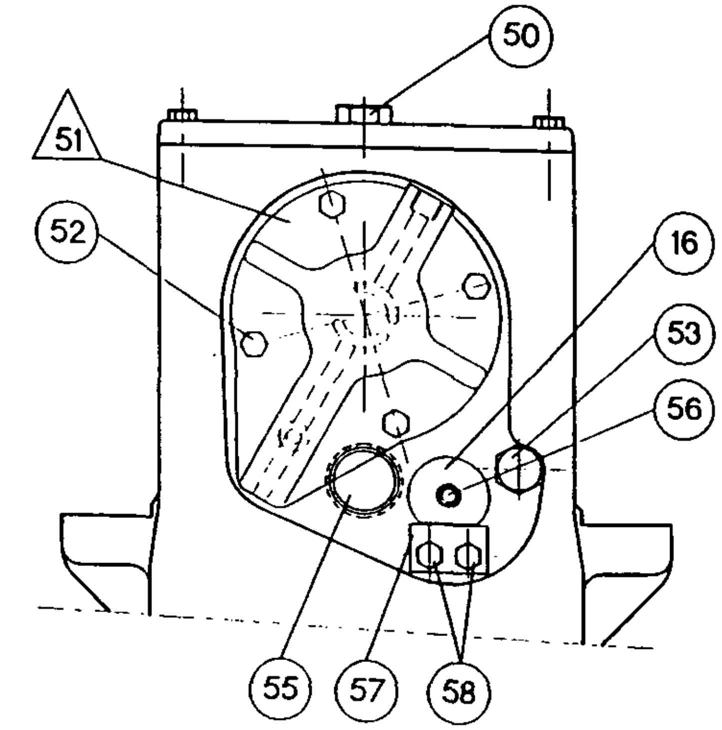
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10C02.5 **Accessories** - Repairing the front PTO

A. Removing the PTO unit

1. Immobilise the rear wheels with blocks. Apply the handbrake fully. Remove the sheet metal.
2. Remove the front weights (if installed), their support and the spacer (depending on type).
3. Disconnect and remove the batteries (depending on type). Remove the grille.
4. Remove the battery bracket. Disconnect the wiring harness from the solenoid valve. Remove the supply (17 bar), return and lubricating pipes.
5. Drain the PTO unit.
6. On 4WD tractors, disconnect the front differential locking hoses (and plug the openings). Remove the guard and the drive shaft.
7. Lift the tractor with a jack positioned in line with the axle housing. Install a stand (see Fig. 2) under the engine's lower casing.
8. Install a sling and hold the front axle with straps (see Fig. 2).
9. Remove the bolts **(1)** and the grease nipple **(69)** (see Fig. 1).
10. Screw a locally manufactured hook in place of the filler plug **(50)**. Using a travelling hoist, remove the PTO unit as shown in Fig. 2, disengaging the bush **(87)** from the coupling **(76)**. Recover the chamfered washer /7\ (see Fig. 1).

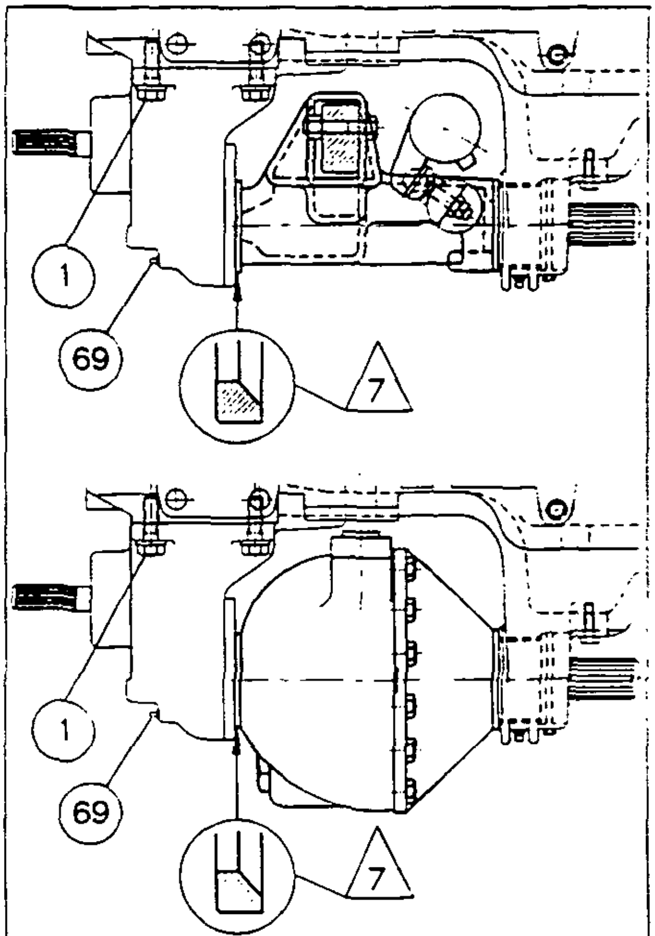


Fig. 1

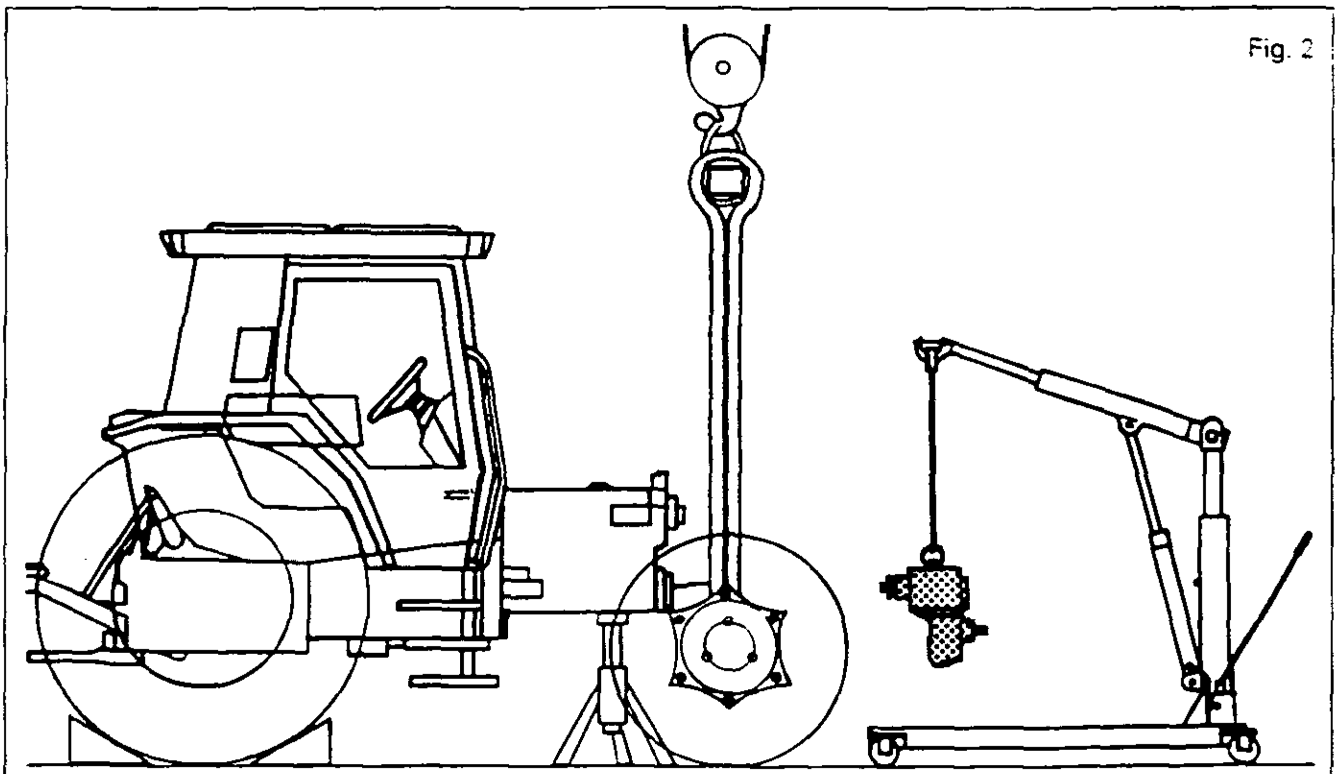


Fig. 2

10C02.6 **Accessories** - *Repairing the front PTO*

B. Disassembly

Clockwise and reverse PTO versions

11. Position the assembly on a suitable support.
12. Remove the bolts **(63)** and **(52)**. Detach and remove the covers **(64)** and **(51)**. Recover the O-ring **(17)**.
13. Remove the pump assembly **(21)**, the hub **(22)**, the pin **(31)** installed with the spring **(25)** and dowels **(24)**.
14. If necessary, extract dowels **(23)** and **(24)**. Remove the spring **(25)**.
15. Detach and remove the support **(26)** installed with gear **(29)**, bearing **(28)** and stop ring **(27)**.
    If necessary, separate the gear **(29)** and the bearing **(28)** from the support **(26)**. Take off the stop ring. Remove the bearing.
    Note : The bearing (28) has no external cage. Recover the rollers.
16. Remove the shims **(30)**.
17. Remove the bolt **(41)** (left-hand thread) and the seal **(39)**. Remove the shaft **(40)**.
18. Remove the bolts **(67)** and the nuts from studs **(66)**. Detach and remove the cover **(37)** with the solenoid valve **(62)**.
    If necessary, drive out the seal **(38)**. Remove the solenoid valve **(62)**.
19. Remove the bolt **(49)** and the clamp **(48)**. Unscrew the grommet **(65)**. Free the supply wire. Remove the clutch assembly **(1)** along with the electromagnetic brake **(32)** and the shaft **(33)**.
20. If necessary, separate the brake from the clutch. Take out the bolt **(34)** and remove the shaft **(33)**.
    Note: The front PTO clutch is fitted with three discs, three backing plates and two spacers. If it is necessary to dimantle it, see Section 6 G01, part D.

Clockwise PTO version (Fig. 3)

21. Take out pin **(16)**. Remove the gear **(20)**, the bearing **(19)** and washer **(18)**.
22. Discard the O-ring **(15)**.
23. If necessary, extract the shouldered bush **(44)**. Drive out the cup plugs **(55)**.

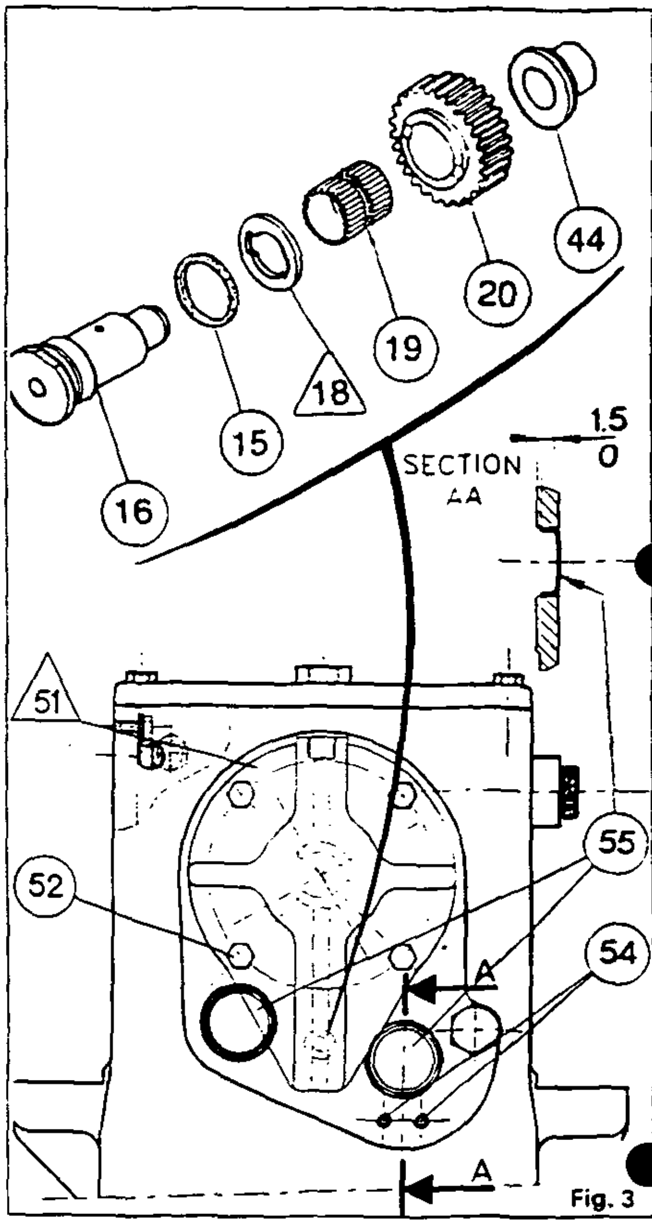


Fig. 3

10C02.7 **Accessories** - *Repairing the front PTO*

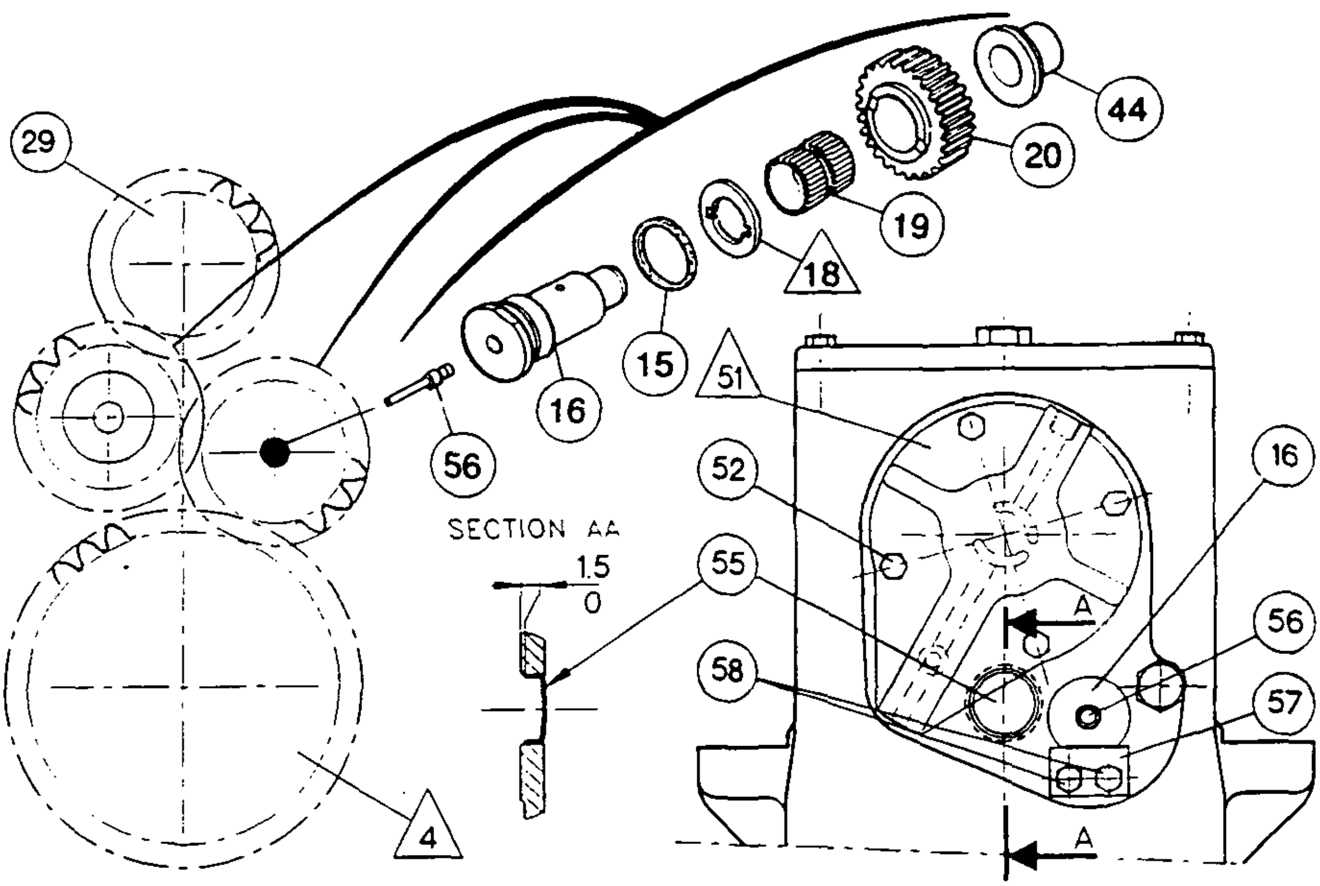


Fig. 4

Reverse PTO version (Fig. 4)

24. Remove the bolts **(58)** and the lock plate **(57)**. Take out pins **(16)**.
    Remove the gears **(20)**, the bearings **(19)** and the washers **(18)**.
    Discard the O-ring **(15)**.
    If necessary, extract the shouldered bushes **(44)**.
    Drive out the cup plug **(55)**.
    Note: On the outer face of pin (16) held by plate (57), the end of the hole is blanked by a rivet (56).

Clockwise and reverse PTO versions

25. Remove the guards **(8)** and **(14)** (depending on type).
26. using tool MF 460 (section F) fitted with a sleeve of suitable length, remove the retainer ring **(46)**.
27. Remove the circlip **(71)**.
28. Extract the seal holder **(7)** with the sealing bush **(10)** using the locally manufactured tool (section F) (see Fig. 5).
    If necessary, drive out the seal holder of the sealing bush.
29. Discard the O-ring **(5)**.
30. Secure gear **/4**, take out the shaft assembly **(9)**, the bearing **(11)**, the stop ring **(47)** and the retaining ring **(68)**. Remove the gear.
    If necessary, extract the bearing **(45)**. Remove the plugs **(2)** and **(53)** with their seals. Remove the rear bearing **(59)** and extract the bush **(60)**. Remove the studs **(66)** and the grommet **(65)** equipped with its seal.

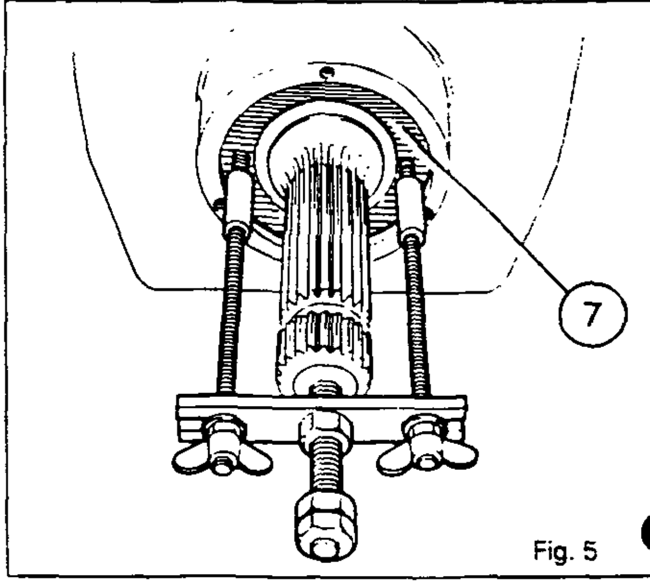


Fig. 5

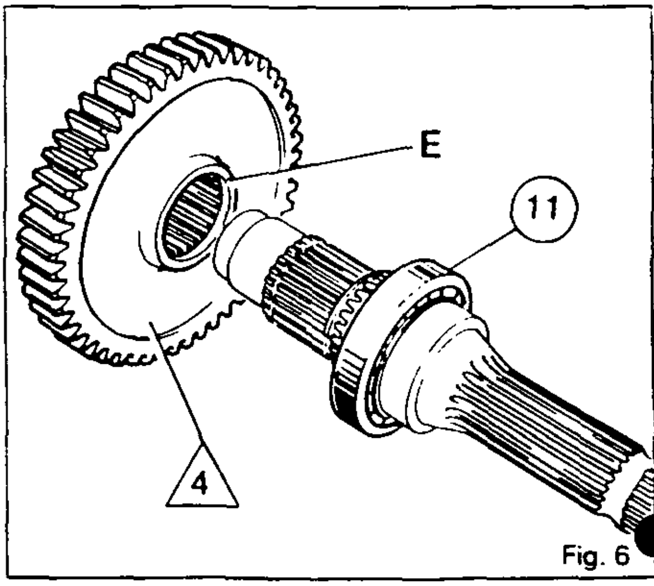


Fig. 6

C. Reassembly

31. Clean and check the parts and replace any that are faulty.
32. If necessary, fit the bush **(60)** in the rear bearing **(59)** and reinstall it.
    Tighten the bolts **(61)** to a torque of 90 - 120 Nm, after coating them with Loctite 241. Screw in the plugs **(2)** and **(53)** with their seals.
    Lightly smear the outside diameter of the bearing **(45)** with loctite 638 and fit it into the housing.
    Fit the bearing **(11)** onto the shaft **(9)**.
    Position the stop ring **(47)** and the retaining ring **(68)**.
    Using a press and a suitable fixture, install the sealing bush **(10)** in the seal holder **(7)**.
33. Hold the gear **/4** in the housing, orienting the gear tooth chamfer **E** towards the bearing **(11)**.(see Fig. 6). Engage the shaft in the gear and in the bearing **(45)**.
34. Using tool MF 459 (section F) fitted with a sleeve of suitable length, install the retaining ring **(46)** in its correct position. Position the lubricated O-ring **(5)** in the recess in the housing.
35. Lubricate the sealing bush **(10)**. Install the seal holder **(7)** and the circlip **(71)**.

Clockwise PTO version (Fig. 3)

36. Slightly smear the shouldered bush **(44)** with Loctite 638 and fit it into the housing.
37. Fit the cup plugs **(55)**, coated with Loctite 542 and positioned back from the face of the housing.
38. Slide the gear **(20)** with the bearing **(19)** into the housing.
39. Position the washer **/18** with its lubricating grooves oriented towards the gear **(20)**.
40. Check that the channels in pin **(16)** are not blocked.
41. Fit the pin with the O-ring **(15)**, line up the flats with those on the washer **/18**.
42. Fit the plugs **(54)** after coating them with Loctite 510. Check the normal backlash and the end play on the gear **(20)** by hand.

10C02.9 **Accessories** - Repairing the front PTO

Reverse PTO version (Fig. 4)

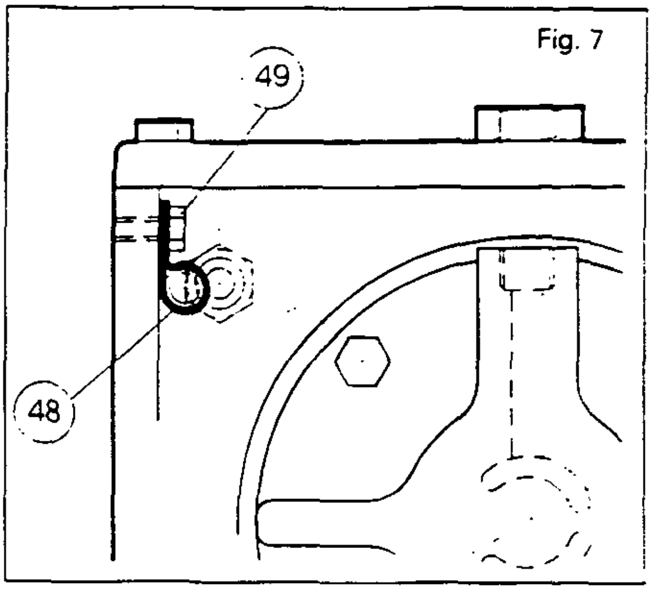
43. Slightly smear the shouldered bush **(44)** with Loctite 638 and fit it into the housing.
44. Fit the cup plugs **(55)**, coated with Loctite 542 and positioned back from the face of the housing.
45. Slide the gears **(20)** with the bearings **(19)** into the housing.
46. Position the washers **/18** with its lubricating grooves oriented towards the gears **(20)**.
47. Check that the channels in pins **(16)** are not blocked.
    Note: Pin (16) secured by plate (57) is riveted at its end.
48. Fit the pins with the O-rings **(15)**, line up the flats with those on the washers **/18**.
49. Immobilise the riveted pin **(16)** with the lock plate **(57)**. Coat the bolts **(58)** with Loctite 510 and tighten them to a torque of 25 - 35 Nm.
    Check the normal backlash and the end play on the gears **(20)** by hand.

Clockwise and reverse PTO versions

Note: If it was necessary to dismantle the clutch, see Section 6 G01, part D. Coat the bolt /36\ with Loctite 270 and tighten it (left-hand thread) to a torque of 25 - 35 Nm.

50. If it was disassembled, position the shaft **(33)** in the clutch **(1)**.Install and tighten the bolt **(34)**, coated with Loctite 221.
    Slide the electromagnetic brake **(32)** onto the shaft **(33)**.
51. Reinstall the clutch and brake assembly via the opening in the cover **(64)**.
52. Using a press and a suitable fixture, fit the bush **(38)** in the cover **(37)** if necessary.
    Check for the presence of the rivet **(43)**.
    Tighten and lock the studs **(66)** to a torque of 25 - 35 Nm, after coating them with Loctite 510.
    Check the cleanliness of the channels in the cover **/37**.
53. Coat the cover **/37** with a sealing compound (Master Joint 510 Loctite or equivalent).
54. Check that the O-rings **(3)** and **(6)** are not damaged.
    If they are to be replaced, see Section 6 G01, procedure 79.
    Fit the cover **/37**. Tighten the bolts **(67)** and the nuts on the studs **(66)** to a torque of 25 - 35 Nm, after coating them with Loctite 510.
55. Lubricate the bush **(38)**. Fit the shaft **(40)** in the clutch. Position the seal **(39)**. Fit and tighten the bolt **/41** (with left-hand thread) to a torque of 25 - 35 Nm.

Fig. 7



56. Fit and tighten the solenoid valve **(62)**.
    Tightening torques:
    - body : 18 - 20 Nm
    - knurled nut : 5 Nm
57. Position the electromagnetic brake wiring harness in the clamp **(48)**. Check that the harness is not in contact with the clutch.
    Install and tighten the bolt **(49)**, coated with Loctite 510 (see Fig. 7).
58. Install and tighten the grommet **(65)** equipped with its seal.
59. Assemble the bearing **(28)** in the gear **(29)**. Fit the stop ring **(27)**.
60. Fit the gear **(29)** and bearing **(28)** assembly on the support **/26**.
61. Position the assembly without the shims **(30)**. Install and tighten the bolts **(52)**.

62. Carry out shimming in order to obtain a play of (see Fig. 8):
    J1 = 0.20 to 0.50
    Check that the clutch **(1)** and the gear **(29)** are correctly positioned.
    Using a set of shims, measure the space between the electromagnetic brake **(32)** and the gear **(29)**. According to the measured value, determine the thickness of shims required to obtain a play of 0.20 to 0.50.
63. Remove the bolts **(52)**. Remove the support **/26** and gear **(29)** assembly.
64. Slide the previously selected shims onto the shaft **(33)**.
65. Smear the housing **(70)** with a sealing compound (Master Joint 510 Loctite or equivalent).
    Screw in two diametrically opposite locating studs.
66. Install the support assembly **/26** (with the holes **L** oriented in accordance with Fig. 10), the bearing **(28)** and the gear **(29)**.
67. If they were dismantled, assemble the spring **(25)**, the dowels **(24)** and **(23)**, and the pin **(31)** as per Fig. 10.
68. Check that the parts, **(21)**, **(22)** and **(31)** slide freely in their respective positions.
69. Fit the pin **(31)** assembly correctly positioned in the head of bolt **/36**. Position the hub **(22)** with the groove engaged on the dowel **(23)**. Install the pump assembly **(21)**.
70. Smear the support **/26** with a sealing compound (Master Joint 510 Loctite or equivalent) as shown in Fig. 11.
    Note: No trace of Loctite should be visible around the pump assembly (21).

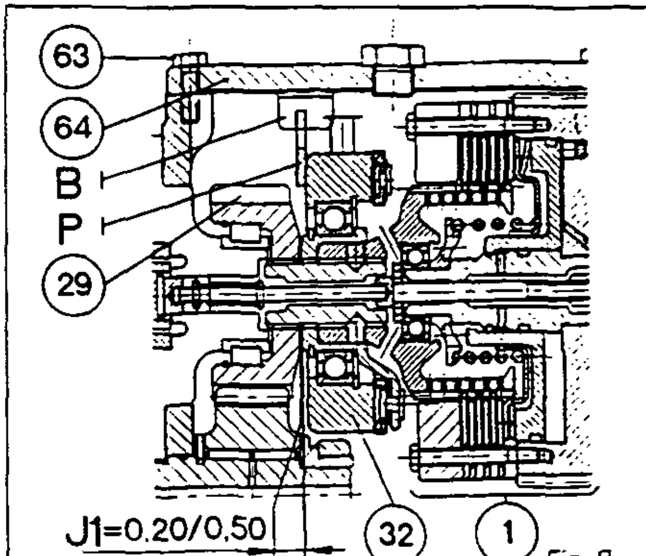


Fig. 8

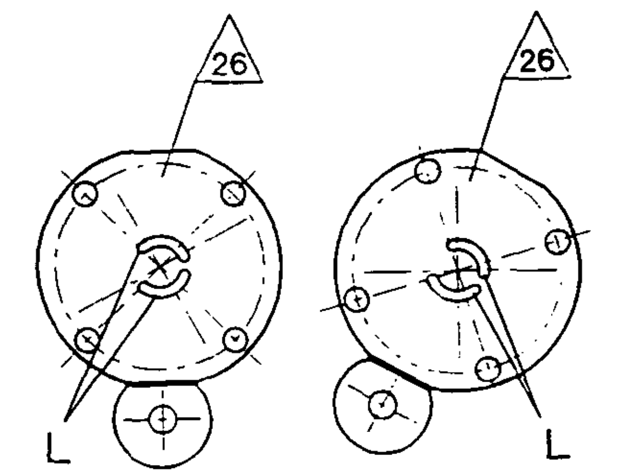


Fig. 9

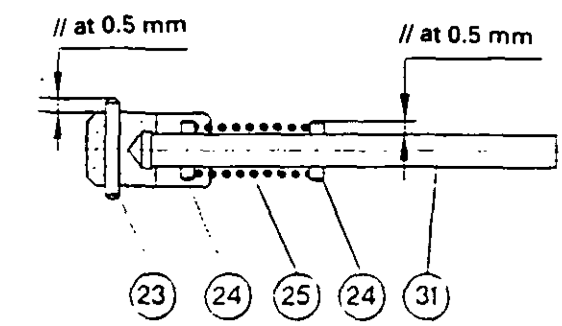


Fig. 10

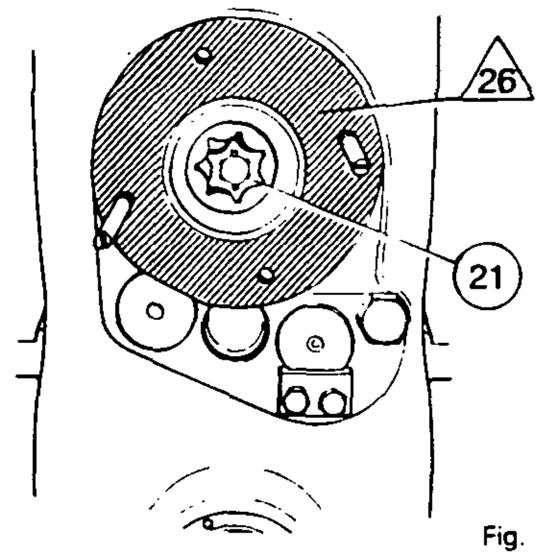


Fig. 11

10C02.11 **Accessories** - Repairing the front PTO

71. Install and position the union **(72)** on the cover **(51)**. Fit a new O-ring **(17)**.
72. Install and orient the cover **(51)** as shown in Fig. 3 (for the clockwise PTO version) or in Fig. 4 (for the reverse PTO version).
Remove the locating studs. Tighten the bolts **(52)** to a torque of 25 - 35 Nm, after coating them with Loctite 510.
73. Check the normal backlash and the rotation of the gears by hand.
74. Using a battery, check that the electromagnetic brake operates correctly.
75. Smear the cover **(64)** with a sealing compound (Master Joint 510 Loctite or equivalent).
76. Install the cover **(64)** with the stop **B** positioned in the lock plate **P** (see Fig. 8).
Fit the bolts **(63)** and tighten them to a torque of 25 - 35 Nm, after coating them with Loctite 510.
77. Pour 4.75 litres of transmission oil through the plug orifice **(50)**.
Install and tighten the plug with its O-ring.
78. Visually check the operation of the pump by turning the shaft **(40)** by hand in the direction of rotation of the engine until oil runs from the union **(72)**.
79. Remove the PTO unit from the support.

D. Refitting the PTO unit

80. Position the washer **(7)**, lightly coated with grease (and with the chamfer oriented towards the axle or the front axle assembly) (see Fig. 1).
81. Using a travelling hoist, reinstall the PTO unit as shown in Fig. 2, engaging the bush **(87)** in the coupling **(76)**.
82. With the unit correctly supported on the washer **(7)**, fit the bolts **(1)** (see Fig. 1) and tighten them to a torque of 520 - 640 Nm, after coating them with Loctite 270.
83. Fit the grease nipple **(69)** and grease the bearing surface.
84. Remove the straps securing the axle or the front axle assembly (depending on the type). Lift the tractor. Remove the stand.
85. Carry out procedures 6 and 1 to 4 in reverse.
86. Check the operation of the PTO and its brake.
87. Check the mating faces and the hydraulic unions for leaks.

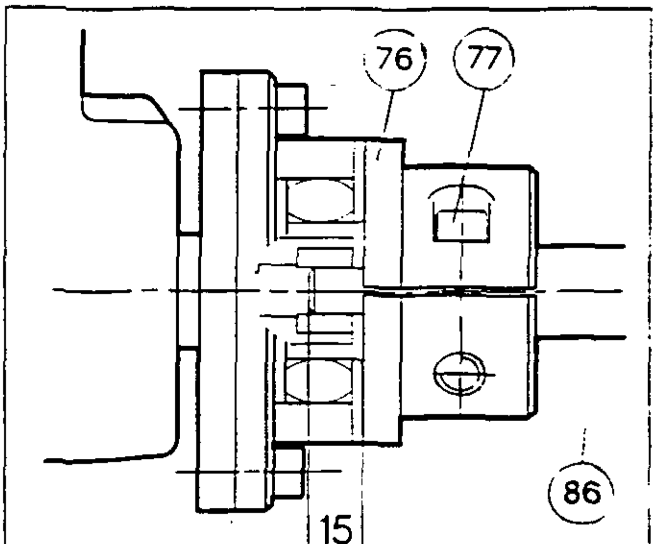


Fig. 12

E. Removing and refitting the connecting shaft

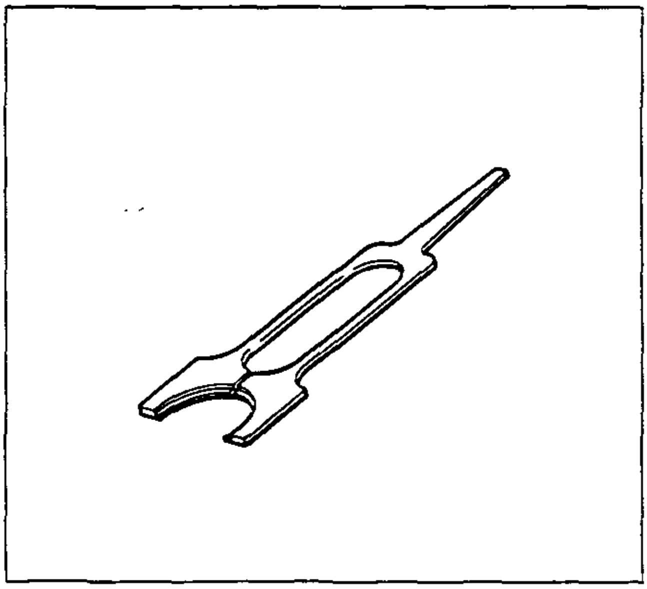
Removal

88. Remove the bolts **(78)**. Slide the sleeve **(85)** forwards.
89. Free the coupling assembly **(76)**, the shaft **(86)** and the bushes **(87)** and **(75)**.
90. If necessary, separate the shaft **(86)** from the coupling **(76)**. Remove the couplers **(79)** and **(88)**. Dismantle the hub **(80)** with the bush **(82)**.

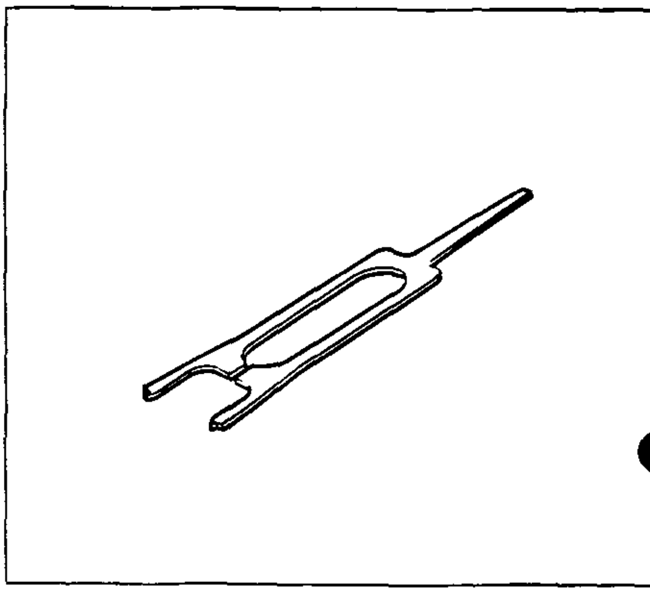
Refitting

91. If they were dismantled, assemble the shaft **(86)** with the coupling **(76)**, complying with the dimension of 15 mm (see Fig. 12).
Tighten the bolt **(77)** to a torque of 36 - 46 Nm.
Reassemble the hub **(80)** with the bush **(82)**.
Tighten the bolts **(81)** to the torque of :
4 cyl. engine : 51 - 69 Nm.
6 cyl. engine : 52 - 75 Nm.
Refit the couplings **(79)** and **(88)** with their respective bushes **(84)** and **(87)**. Tighten the bolts **(74)** and **(83)** to a torque of 36 - 46 Nm.
92. Correctly position the shaft **(86)**. Slide the sleeve **(85)** in contact with the coupling **(79)**. Tighten the bolts **(78)** to a torque of 36 - 46 Nm.

F. Service tools

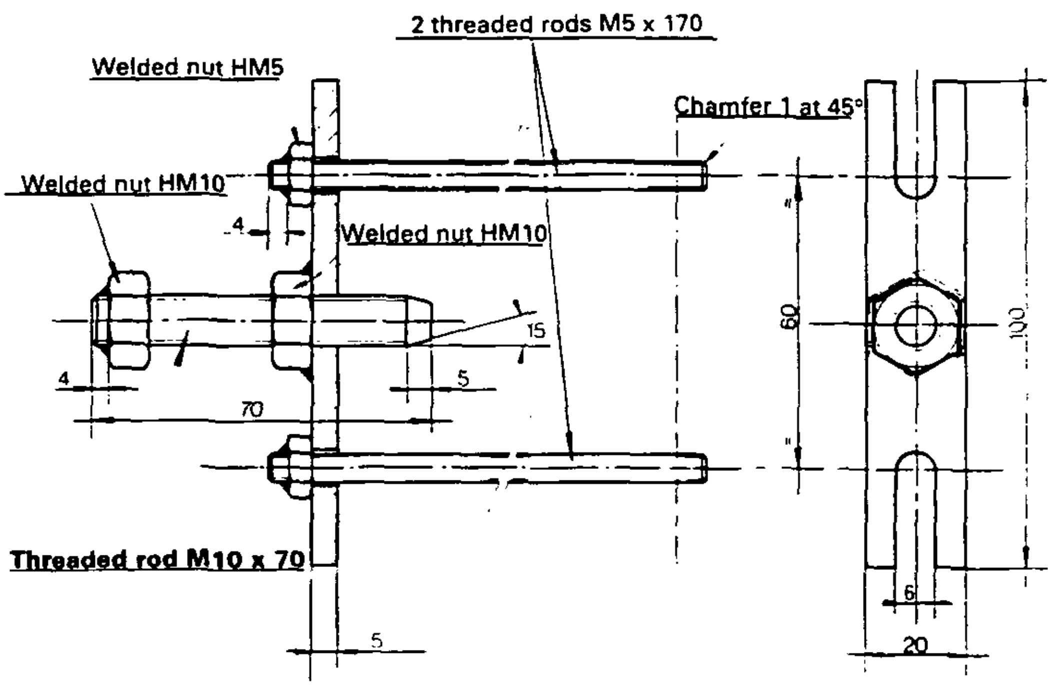


MF 459 Retaining ring refitting tool



MF 460 Retaining ring removing tool

Tool to be manufactured locally



10 D01 Front lift position indicator

CONTENTS

10D01.2 **Accessories** - *Front lift position indicator*

Operation (Fig. 1 and 4)

The position indicator **(3)** is supplied with 12 V + power after starting up and is protected by a 5 A fuse located on the black power supply wire.

The position sensor **(4)** installed in the position of the right-hand lifting arm pin consists of a potentiometer. The sensor pin A is immobilised by a locating pin fitted in the cover **(6)** which is held to the front support by means of bolts **(5)**.

The sensor body is actuated by the lifting arms. It is connected to the position indicator by three wires (blue for earth, white for signal, red for power supply). The indicator's diodes light up according to the signals emitted by the position sensor **(4)** and the potentiometer **(1)** of the position indicator **(3)**.

Utilisation for work (Fig. 2 and 3)

1. Determine the required height of the lifting arms at which the tool operates correctly.
2. Set the switch **(2)** to the "on" position.
3. Turn the potentiometer knob **(1)** until the green diodes **E** located in the middle of the screen light up.
4. Each time the hitch linkage is raised or lowered, the movement of the arms is shown by the lighting up of the red diodes **D**. When the green diodes come back on, the lifting arms have returned to the initial position.

Colour code
B White
BL Blue
J Yellow
M Brown
N Black
R Red
V Green

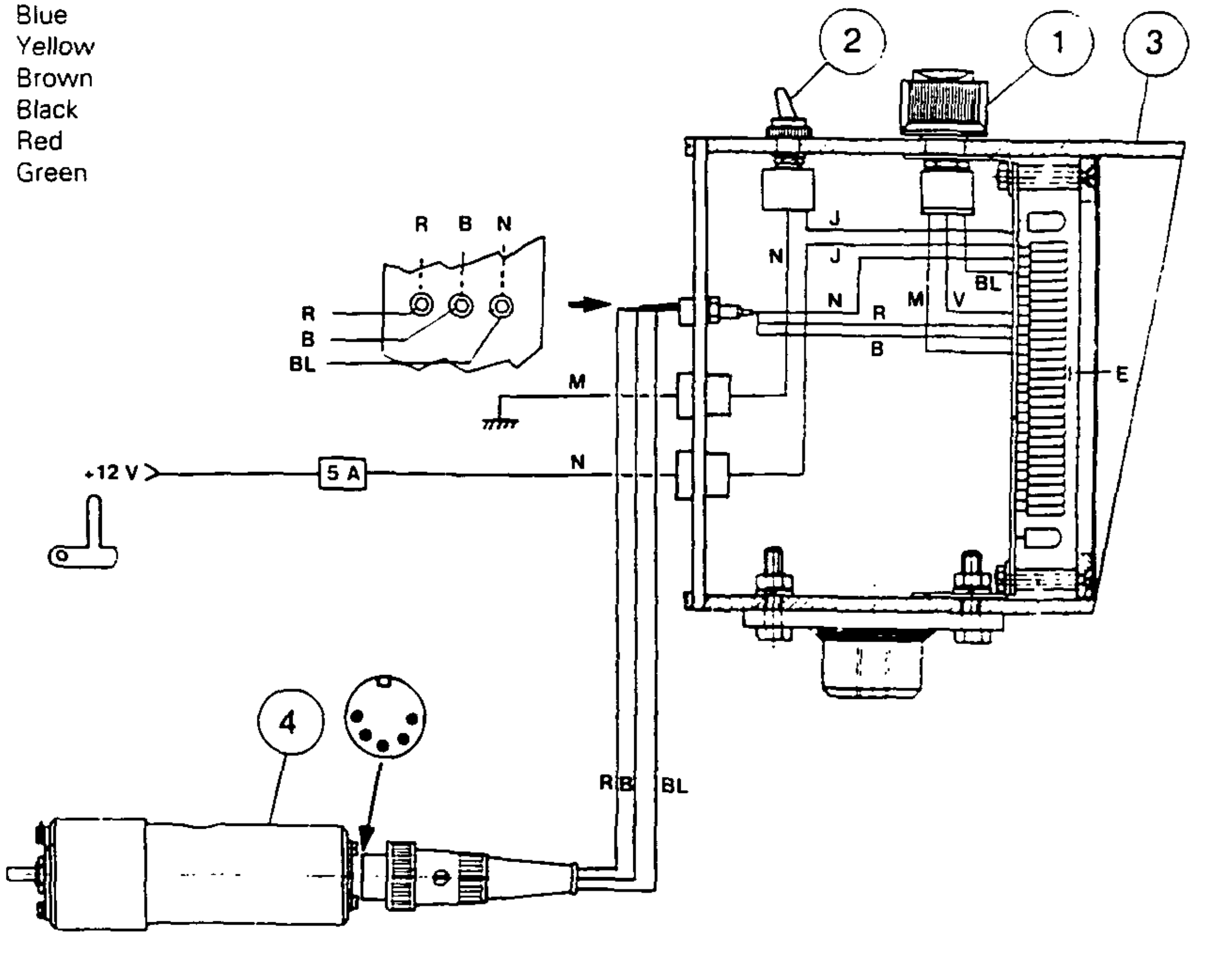


Fig.

A. Checking the power supply to the position indicator (3)

1. On the position indicator **(3)**, disconnect the wires (blue, white, red) for the position sensor **(4)**.
2. Start up. Set the switch **(2)** to the working position.
3. On the position indicator, check that the lower round diode comes on.
   If does not, check: the brown earth wire, the black power supply wire and the 5 A fuse between the starting switch and the position indicator, the switch **(2)**, etc..

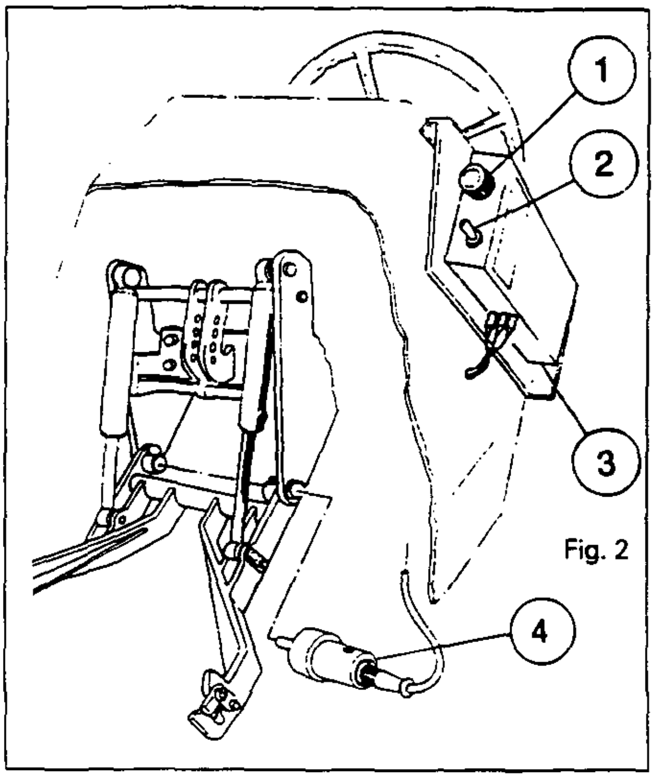


Fig. 2

B. Checking the potentiometer (1) and position sensor (4)

1. On the position indicator, reconnect the wires (blue, white, red) for the position sensor **(4)** and set the lifting function to the mid position.

2. Turn the potentiometer **(1)**. Check that all the diodes come on one after the other.If they do not:
   a) Check the wires between the potentiometer and the position indicator PCB. If they are satisfactory:
   b) On the position indicator **(3)**, disconnect the wires (blue, white, red) for the sensor **(4)**. Check the resistance between the red **(+)** and blue (earth) terminals of the harness.
   If it is approximately 10 kohms: it is correct (see step c).
   If R = 0 ohms: there is a short circuit between the two wires.
   Disconnect the harness from the position sensor **(4)**. Trace the short circuit (sensor or harness).
   If R is infinite: check the connection of the sensor, the continuity of the lines and the resistance of the sensor.
   c) Carry out the same test between the blue (earth) and white (signal) terminals. The correct value must be between 100 ohms and 11,000 ohms approximately (depending on the sensor adjustment and the position of the lifting arms).
   If R = 0 ohms: there is short circuit between the two wires.
   Disconnect the harness from the position sensor **(4)**. Trace the short circuit (sensor or harness).
   If R is infinite: check the connection of the sensor, the continuity of the lines and the resistance of the sensor.
   d) If it is correct, reconnect the position sensor and check the potentiometer or the diodes.

3. Raise and lower the lifting mechanism. Check that the diodes light up to indicate lifting or lowering.
   If they do not:
   a) Disconnect the sensor on the position indicator and check that the resistance between the blue and white terminals of the sensor harness increases when the hitch linkage is lifted and decreases when it is lowered.
   b) Remove the cover **(6)** and check the attachment of the trunnion **(8)**. Readjust the sensor setting (see part C).

4. Check that all the diodes light up when the potentiometer **(1)** is turned, regardless of the position of the lifting system (minimum or maximum position).
   If they do not: readjust the sensor setting (see part C).

10D01.4 **Accessories** - *Front lift position indicator*

C. Setting the position sensor (4) (Fig. 3 and 4)

1. Place the arms in the maximum high position.
2. Remove the cover **(6)** from the position sensor **(4)**.
3. Unscrew the grooved trunnion **(8)** fitted on the sensor pin.
4. Turn the sensor pin **A** as far as it will go in the clockwise direction.
5. Turn the pin **A** in the anticlockwise direction until the lower round diode lights up. With the diode lit up, turn through 10 more degrees.
6. Check the position of locating pin **P** on the outer face of the cover **(6)** and position it with bolts **(5)**.
   On the front support, draw a marking in line with that on the cover. Remove the cover.
7. Without turning the sensor pin, fit the trunnion **(8)**, lining up the groove **R** with the marking drawn on the support. Refit the cover **(6)** with seal **(7)**, ensuring that the markings are aligned. Tighten the bolts **(5)** lightly.
8. Start up the tractor. Check that the lifting function and the position indicator **(3)** operate correctly.

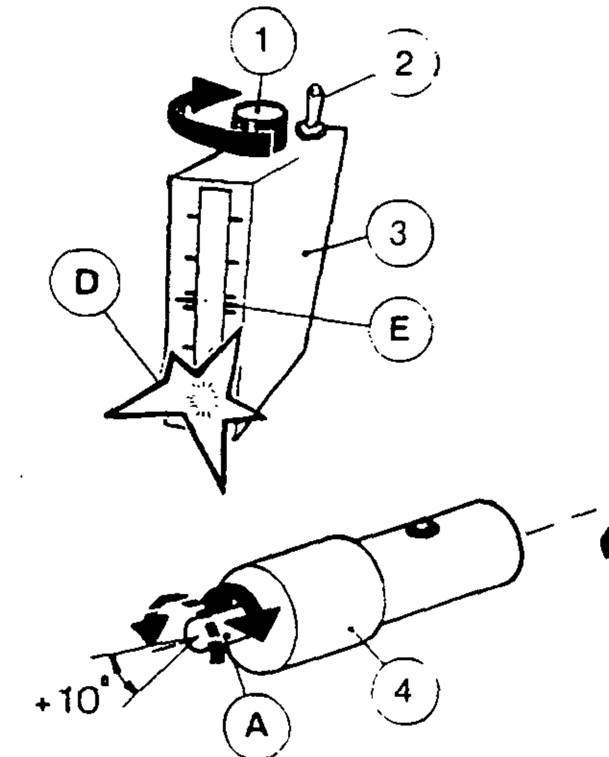


Fig. 3

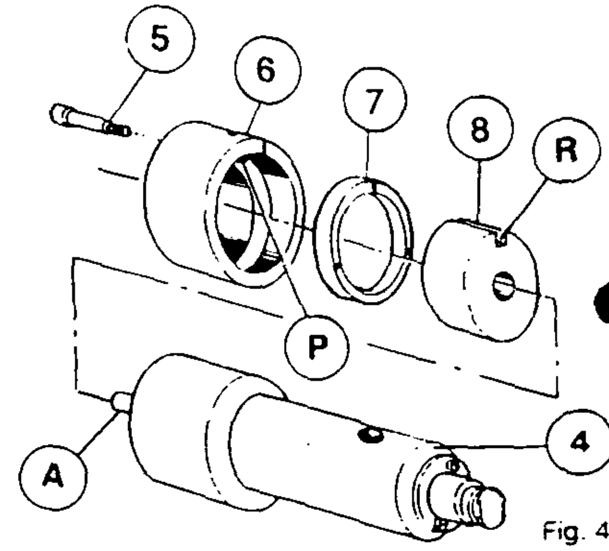


Fig. 4

List of parts

(1) Potentiometer
(2) Switch
(3) Position indicator
(4) Position sensor
(5) Bolt
(6) Cover
(7) Seal
(8) Trunnion

A Sensor pin
R Trunnion groove
P Locating pin
D Diodes (red)
E Diodes (green)

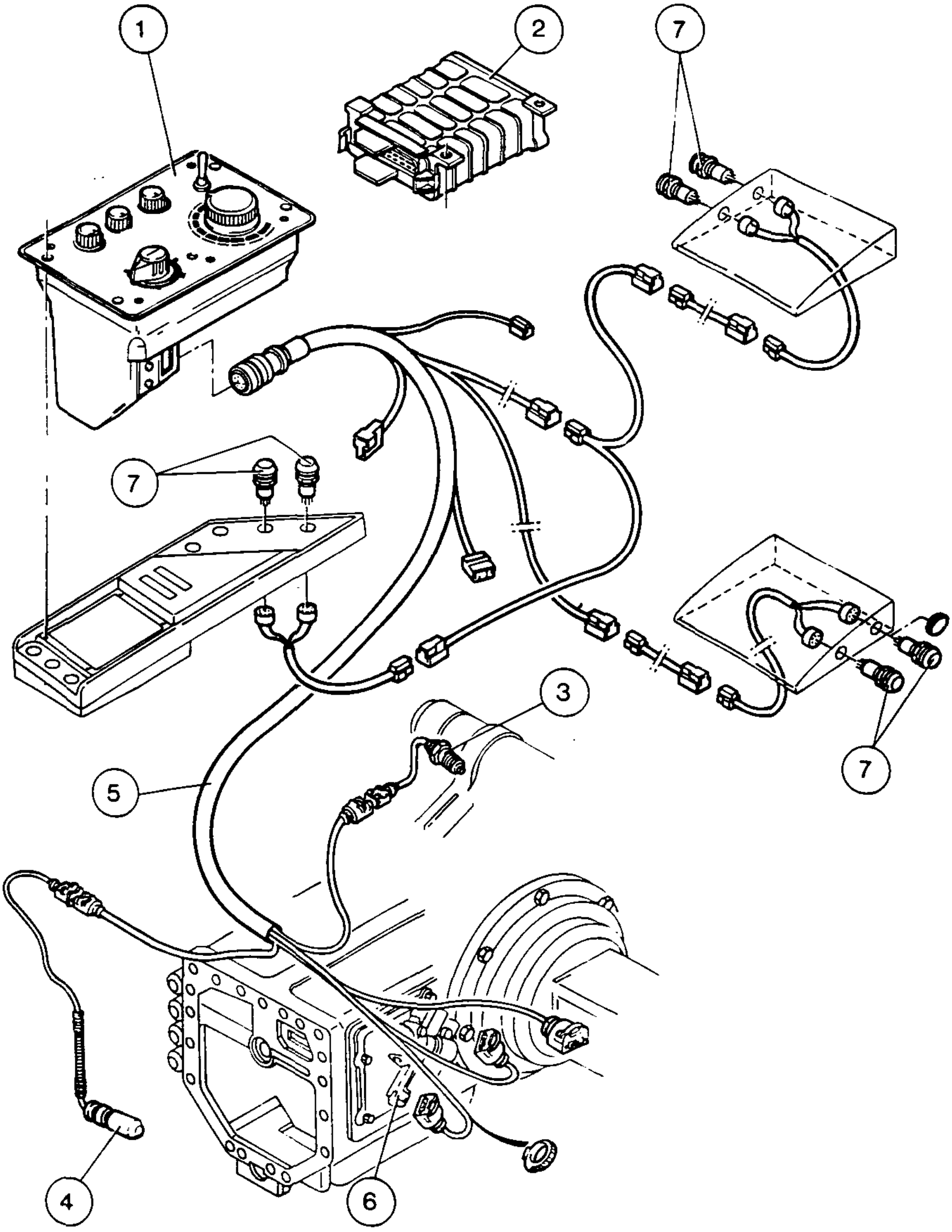
11

11 A01 General description

CONTENTS

Electronic lift control - General description

General description



Electronic lift control - General description

A . Description of components

The electronic linkage control system consists of 7 basic components :

(1) Control panel
Situated inside the cab on the right hand side, it comprises the various potentiometers and diodes for the 8 main functions.

(2) Electronic calculator
Situated directly underneath the control panel and connected to it.
The electronic calculator is the «brain» of the system. The purpose of the electronic calculator is to compare the signals relayed from the sensors **(4)** and **(3)** with the settings of the various controls on the control panel **(1)**.
When the value of the control panel settings differs from those sent from the sensors, the electronic calculator sends a signal to the control valve solenoids **(6)**. This raises or lowers the 3 point hitch until the values set on the controls equal those received from the sensors.

(3) Position sensor
Located on the right hand side of the lift cover.
The position sensor registers the angular position of the cross shaft (rock shaft) by means of a linear sensor, located against a cam connected to the cross shaft (see 6 B01, p.3). The electrical signal from the sensor is relayed back to the electronic calculator by means of a well-protected cable.

(4) Draft sensors (sensing pins)
Situated at the pivot point where the lower links meet the axle housings.
The draft sensors register the draft force on the lower links. The sensors are built into the lower link pivot pins. They measure draft forces extremely accurately by measuring changes in internal forces caused by the changing loads on the pins. The electrical signals from the sensor are then relayed back to the electronic calculator by means of well-protected cables.

(5) Electrical harness linking the various components

(6) Hydraulic/Electrical control valve
Located on the left hand side cover on the rear axle housing.
The valve is of the open centre type and forms one section of the high flow (high pressure) hydraulic circuit. The circuit components are connected in series, the circuit also contains the trailer brake valve (if fitted) and the auxiliairy spool valves.
The valve is basically hydraulic in design with 2 pilot valves controlled electrically by solenoids. One solenoid is lift and the other lower. The solenoids receive electrical signals from the electronic calculator **(2)**.
Note : Never connect an electrical supply directly to the solenoids as serious damage to the solenoids may occur.

(7) External controls
Situated on the fenders or inside the cab according to the specifications.
Designed to simplify the coupling of implements, the system allows the operator to control the height of the lower links by means of two push button switches conveniently mounted on the outer edge of rear fenders.

B . Working principles

The principles by which these components work together to achieve an effective linkage control system is as follows :
The system operates around the central component which is the electronic calculator **(2)** «the brain».
The electronic calculator receives 2 types of electrical signal, the operator's signal, through the dials on the control panel, and the tractor/working signal, from the draft and position sensors.
The calculator takes the signal, sent from the various controls on the control panel and compares that signal with the signal relayed from the sensors. If the 2 signals are of different values the electronic calculator will then send its own signal to the control valve solenoids. This raises or lowers the 3 point hitch until the values set on the controls are equal to those received from the sensors.

When the tractor is working these corrections are constantly being made ensuring that the quality of the work is maintained and optimum performance is achieved.

11A01.4 **Electronic lift control** - General description

C . Using the control panel

(A) Maximum height control

This potentiometer is used to set the maximum lift/ height.
It is normally used with PTO driven linkage mounted implements where excessive lift height can cause rapid wear on the PTO shaft universal joints.
It can also be used to save time at the headland by avoiding lifting the implement to transport height.

(B) Sensitivity control

The sensitivity control establishes the size of the systems «dead band».
An electronic system is always capable of being more sensitive than a hydraulic one. To accomodate this the calculator has a «dead band « incorporated into it. This «dead band» is a means of reducing the sensitivity of the system. Under the majority of applications this built in «buffer» will prevent the «shuddering» experienced when the calculator is reacting to too many draft signal variations.
However, should the application mean that large rapid variations in draft force are ocurring (subsoiler in stoney subsoil) then it is possible to increase the «dead band» by movement of the sensitivity dial.
The sensitivity control operates on draft and intermix but not on position control.

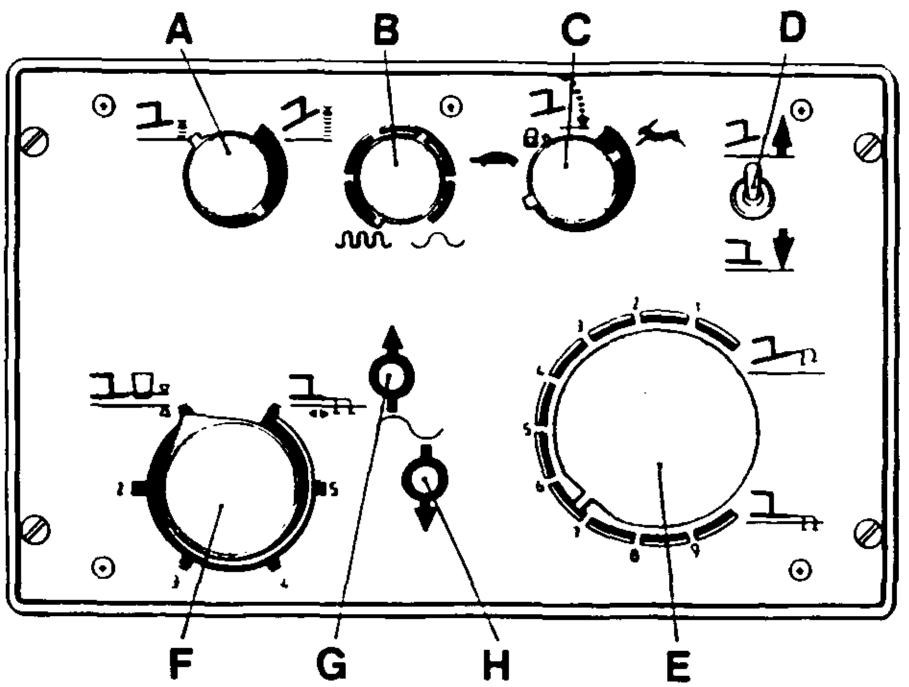
(C) Rate of drop control and transport lock

This potentiometer provides an adjustable rate of implement drop.
The system allows optimum implement lowering rate consistent with fast entry into work, whilst still protecting the implement from damage. The implement drop speed is independent of the implement weight.
Also when turned fully clockwise past the slow position, it locks the hydraulic lift in the transport position.

(D) Lift/Lower switch

This toggle switch controls the lift and lowering of the 3 point hitch.
A safety device is built into the system which automatically locks the hydraulic lift when the engine is switched off.
This places the whole hydraulic system into «hold» making it impossible to operate any of the hydraulic functions. When the engine is started up again movement on the lift/lower switch to the lift position will re-actuate the system and all functions will become "live".

Fig. 1 - Early control panel



Electronic lift control - *General description*

(E) Depth/Height control

This dial is used with one of the three controls, position, draft or intermix, as determined by the position of the function selector control.

When the dial is used with the function selector in position control (fully clockwise), it will act as an implement height control (used with non-soil engaging implements).

When the dial is used with the function selector in draft control (fully anti-clockwise), it will act as an implement depth control (used with soil engaging implements). The system senses draft forces on the lower links to attain the depth set on the dial.

When the dial is used with the function selector in any other position (2, 3, 4 or 5) it will act as an implement depth control (soil-engaging implements). The system will attain the depth set on the dial by sensing draft forces on the lower links as well as the height of the implement by sensing the angular position of the cross shaft (rock shaft). This is known as Intermix. The position of the function selector will determine the percentage mixture of draft/position signals.

The purpose of intermix is best explained as follows. With the increasing size of tractors and implements a system of linkage control that relies solely on changes in draft force for its reactions can have its limitations. 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 in soils with bands of different consistency. Using intermix which reacts to position sensor signals, as well, will result in less linkage movement for the same change in draft force allowing a closer control of the depth to be attained.

(F) Function, Selector Control

The purpose of this dial is to select position control, draft control or various degrees of intermix

Mark 1	:	position control only
Marks 2 to 5	:	draft control progressivity
Mark 6	:	draft control only

(G) (H) Indicator lights (diodes)

The two indicator lights show the operator when and in which direction the hydraulic linkage is moving. They are a visual check that the Electronic Lift Control is operating as the lights will continually go on and off when working in draft control or intermix.

(G) : Lift warning light

(H) : Lower warning light

(J) Quick soil engagment button

This button was introduced on the new control panel from June 1991.

You can obtain working depth quicker by pressing button J. When you release the button, working depth returns to that set on button E.

Fig. 3 :

1 : normal engagement

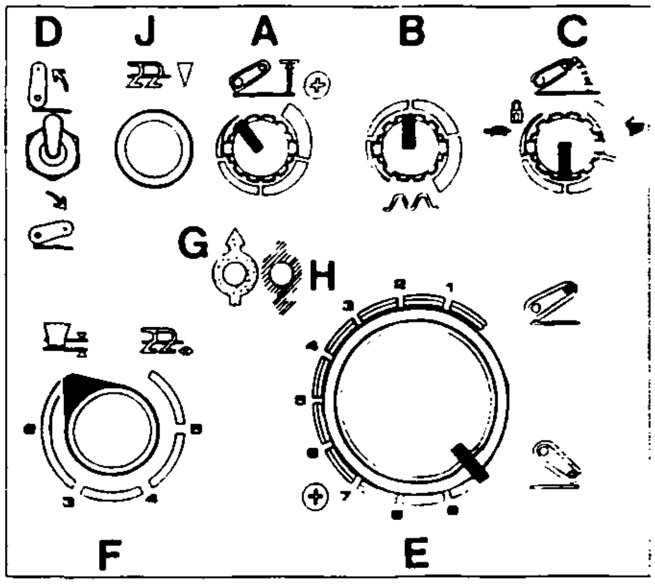
2 : quick soil engagement

Advantages : faster, more precise entry of soil.

Note : When you press the quick soil engagement button, active slip control is deactivated until the button is released.

During rapid soil engagement, keep slip control below 80 % to prevent the implement from lifting when releasing the button.

Fig. 2 - New control panel



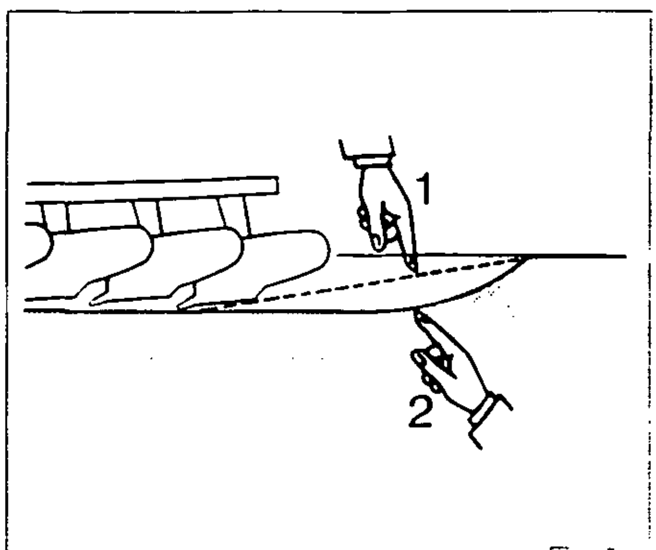


Fig. 3

11A01.6 **Electronic lift control** - General description

D . Attaching an implement (Fig. 4-5)

1. **With the internal controls**
   After starting the engine, move the switch **(D)** to lift, then lower, in order to bring the console into service, then adjust the position of the arms with the depth control knob **(E)**.
   Note : The other controls must be placed as follows :
   (A) At the maximum position
   (B) In intermediate position
   (C) In intermediate position
   (F) On position control

2. **With the external controls**
   Use of the external control can only be made if the switch **(D)** is in the lower position or neutral. In this position, a simple movement of the external control allows the lift arms to move. For safety, when the external buttons are operated, the control panel is automatically switched off.
   Note : The movement of the linkage stops as soon as the button is released. When the external control is used, the lowering speed is 70% of the maximum speed.

3. **Reactivate the control panel**
   After attaching an implement as described previously, or also after stopping the engine, move the switch **(D)** into the lift, then the lowering position.
   Note : Locking of the arms is carried out with the potentiometer (C) controlling the lowering speed : if this is set at lock, with control (A) set at maximum position and (E) at any position.

4. **Headland turn manœuvres**
   Switch **(D)** at lift ; depending upon the position of **(A)** the arms will rise.
   At the end of manœuvring, set **(D)** at lower and the former position will be resumed.
   Note : The floating position is obtained with button (E) set between 8 and 10.

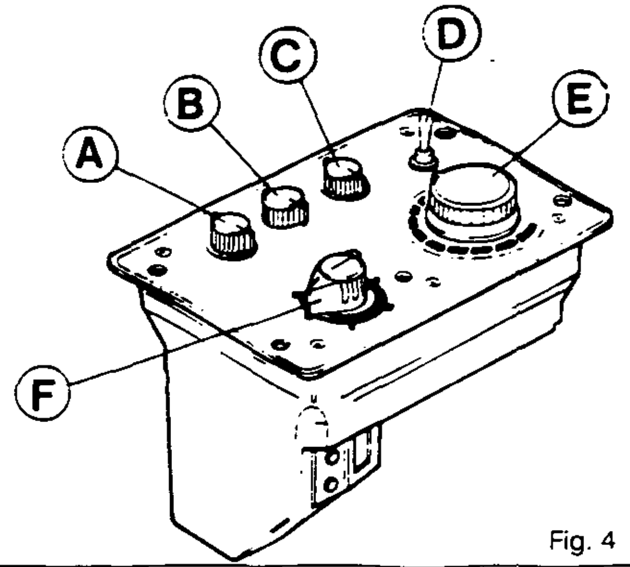


Fig. 4

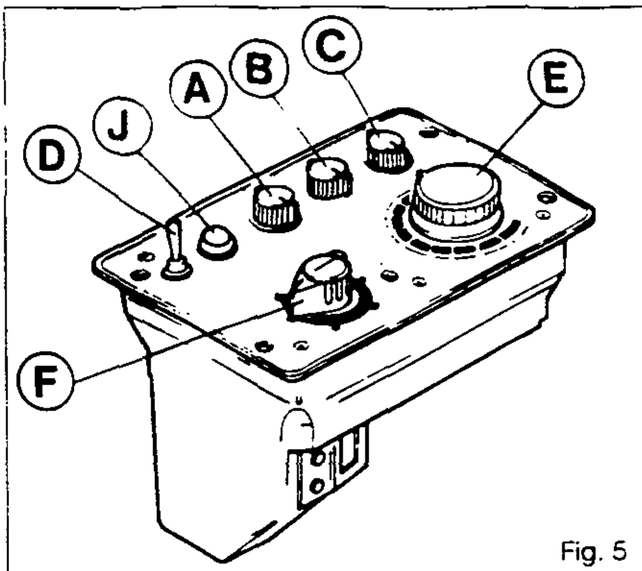


Fig. 5

11B01 Fast checking of lift

CONTENTS

Electronic lift control - *Fast checking*

For these checks, the oil must be at 60° C and the engine running at approx. 1200 rev/min ; a load of 300 to 400 Kg is required on the lower links in order to overcome the friction resistances.

A . Lift/lower switch in neutral

Check that there is no reaction on the arms.
Make sure that the lift functions correctly when operating the external controls.

B . Lift/lower switch in lift

Set controls as shown in Fig. 1 : lower links at lowest position.
Switch **D** set to lift allow lift arms to raise and stop, check that the ram rods have moved out 50 ± 5 mm.
The warning light **G** remains lit as long as the arms are rising. Rotate **A** and check that :
- The lift is proportional
- There are no oscillations when the arms have reached their position. (**G** light goes off).
- Knob **A** at maxi height setting, relief valve does not blow off whatever other knob settings ; light **H** never comes on.
- Check also that operating the external controls do not bring about any variations.

Fault identification
Push on electrovalve spools manually. If linkage lifts and lowers the hydraulic circuit is not faulty. The following electrical test procedure should be carried out.

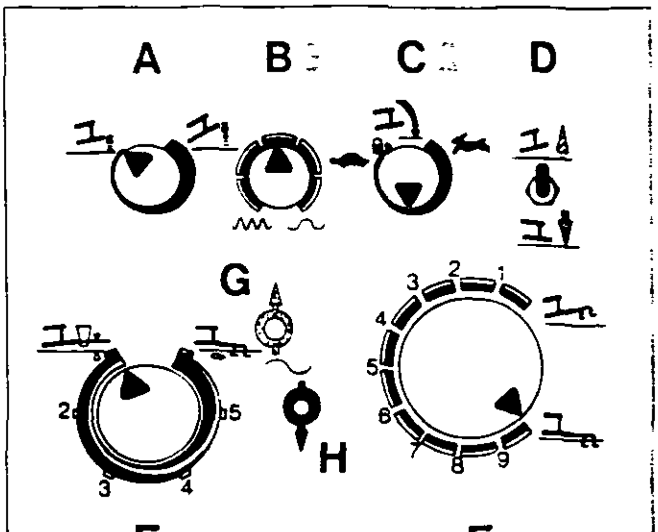


Fig. 1

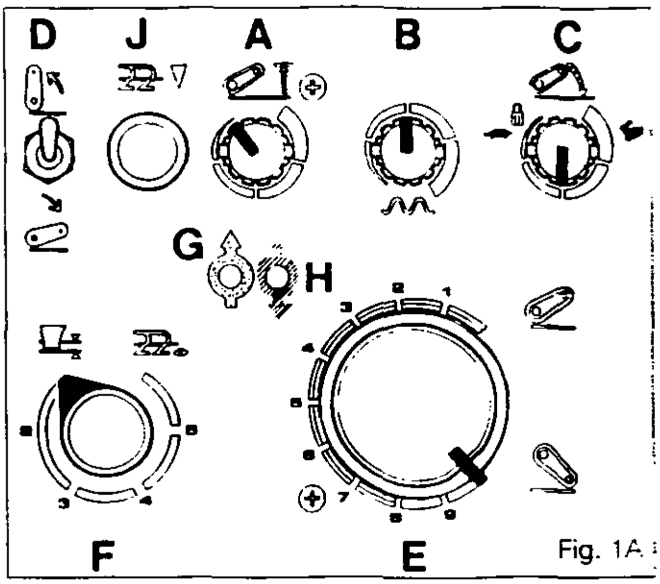


Fig. 1A

Fig. 1 : Old control panel
Fig. 1A: New control panel from serial N° S191036

C . Lift/lower switch in "Lower"

Timing active (Datatronic only)

Datatronic «Timing active» light comes on a few seconds after switch **D** is placed on «lower» position (whatever above settings are).

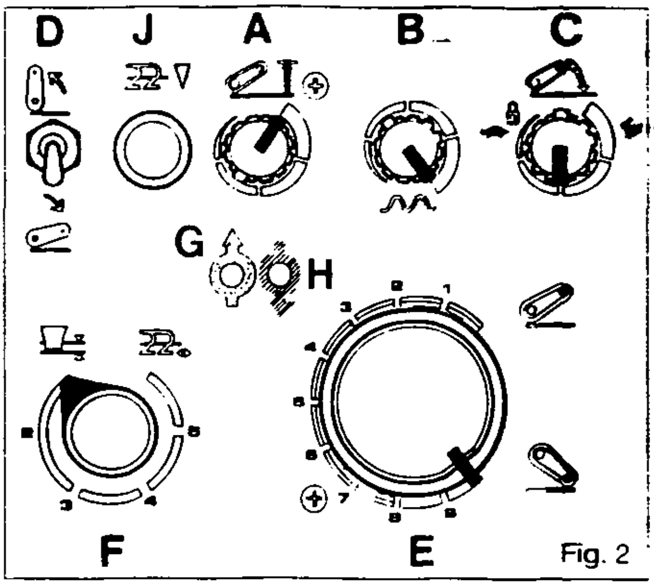


Fig. 2

Depth control

a) Lift

Set controls as shown Fig. 2, lower links at lowest position, light **H** on.

When the depth control knob is turned towards O: check that the lifting warning light **G** comes on when the setting 7.5 to 8.5 is reached.

The lifting of the arms must then be proportional to the settings of knob **E**, without oscillations.

The lift arms reach the maximum high position when the depth control knob **E** is at 0: the warning light goes out: make sure that the relief valve does not blow.

Set sensitivity to maxi, repeat above operations. Reactions should be identical.

Sensitivity is inactive for 100 % position setting.

b) Lower

Set controls as shown Fig. 3, lower links at highest position.

Turn depth control **E** to lower, light **H** should come on from 0.

Lower links should be at lowest position from 7.5-8.5.

From 8.5 light **H** should stay on.

Set sensitivity to maxi, repeat above operations. Reactions should be identical.

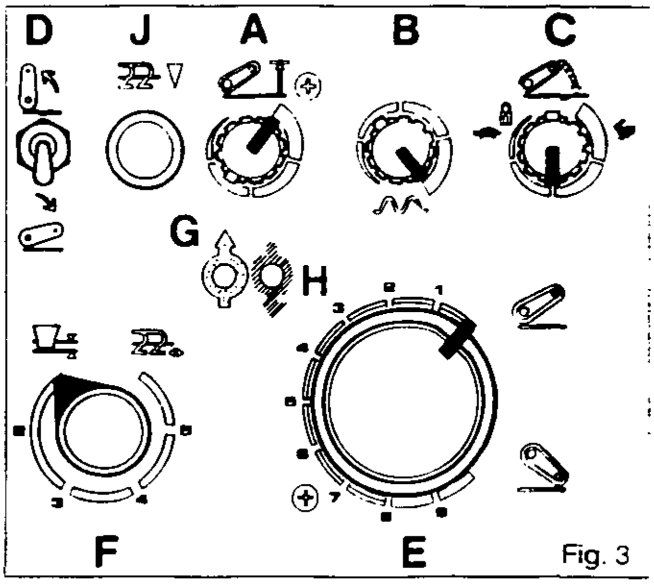


Fig. 3

Maxi height

Lower links at lowest position, set controls as shown Fig. 4.

Raise lower links using knob **E** : ckeck that from 6, **G** light goes out, lift not possible, lift rams have moved out 50 ± 5 mm.

c) Quick soil engagement

Set controls as shown fig. 3.

Push on button J and check that lift arms lower. Release the button and check that they raise to their initial position.

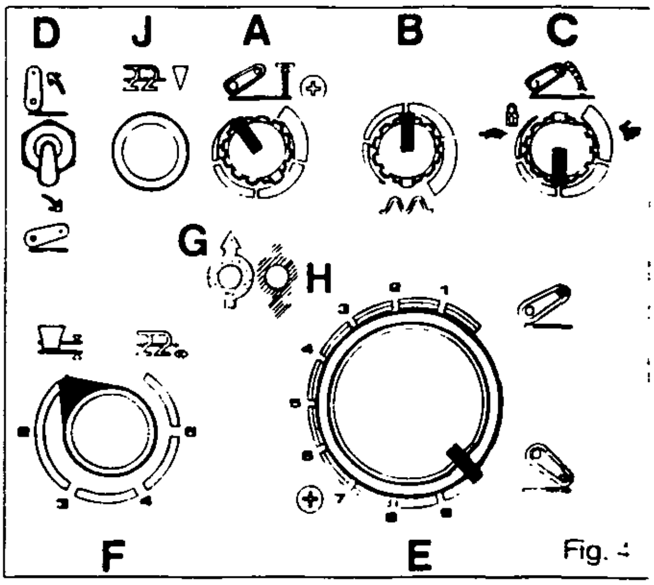
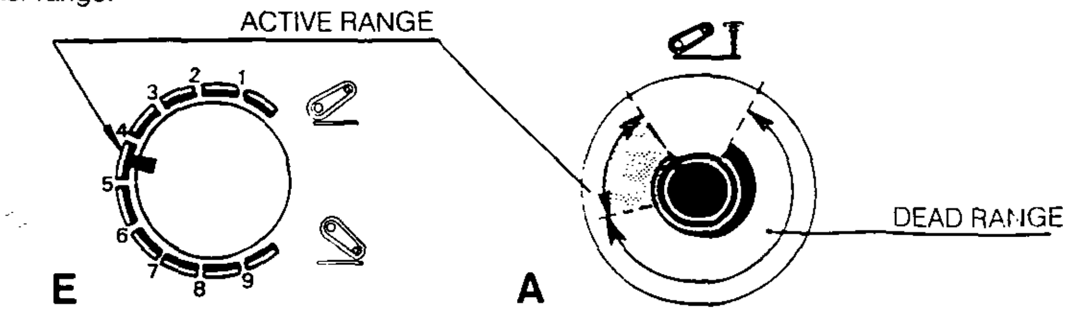


Fig. 4

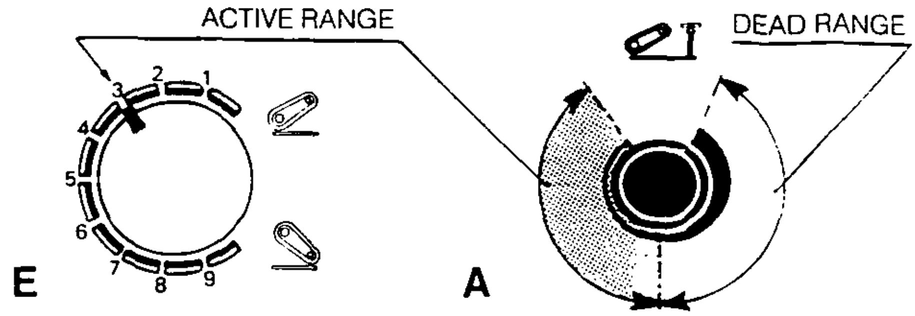
11B01.4

Electronic lift control - *Fast checking*

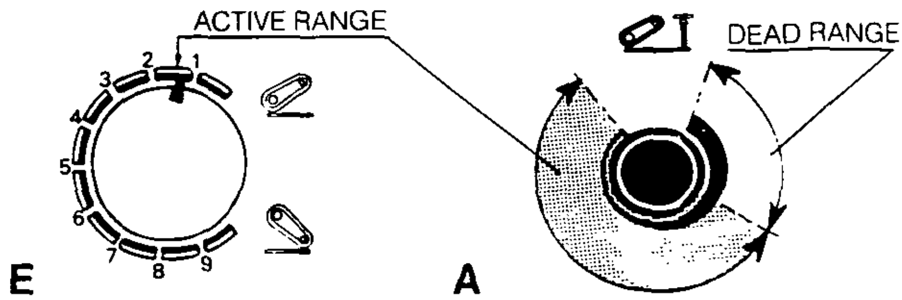
Continue the test procedure as follows :
Set knob **E** at 4.5. Operate knob **A** and check that the lifting or lowering operates only for the first quarter of the potentiometer range.



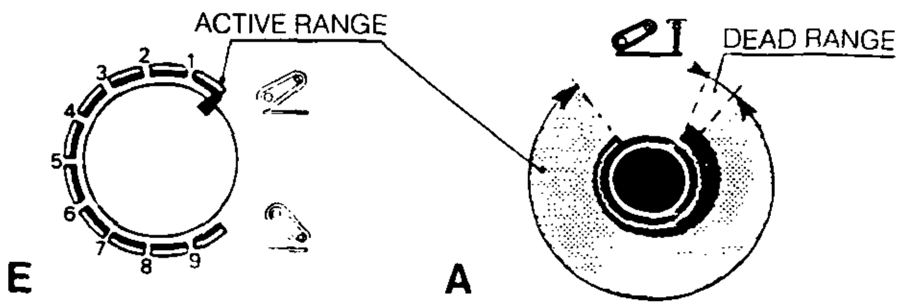
Depth control knob **E** at mark 3 ; the arms raise through half the adjustment range, when **A** is operated.



Knob **E** at mark 1.5. When knob **A** is turned, the arms raise over 3/4 of the range.



Knob **E** at 0 ; knob **A** at top position ; the arms raise over 7/8 of the adjustment range of the potentiometer



When switch **D** is at "lower", lift stroke is limited from mark 6 by knob **A**. Max height range setting is influenced by knob **E** setting.

Electronic lift control - Fast checking

Draft control

Draft control at minimum sensitivity

Position the various potentiometers as shown Fig. 5.
Lower links at lowest position, **H** light on.

Lift control

Then turn knob **E**. In order to raise the lift, the warning light **G** must come on at the setting 3-3.5.
The lift reaches the transport position at setting 2.5.
Note : Lift stroke is no longer proportional to knob E setting.

Lowering control

Turn knob **E** to low, check that :
- lift lowers from 3-3.5
- lift is at lowest position at 4.5
- stroke not proportional to knob **E** setting.

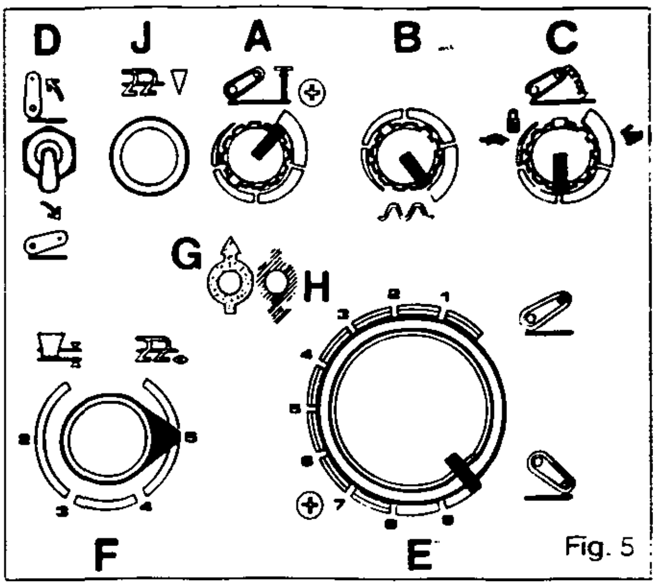


Fig. 5

Draft control at maximum sensitivity

Position the various potentiometers as shown Fig. 6.
The lower links at lowest position, the lowering warning light is lit.

Lift

Raise the arms by operating knob **E** ; the warning light must come on from 4-4.5. They reach the transport position at 3.

Lower

Turn knob **E** to low, check that :
- light comes on at 3-3.5
- lift is at lowest position from 4.5.
- stroke not proportional to knob **E** setting.

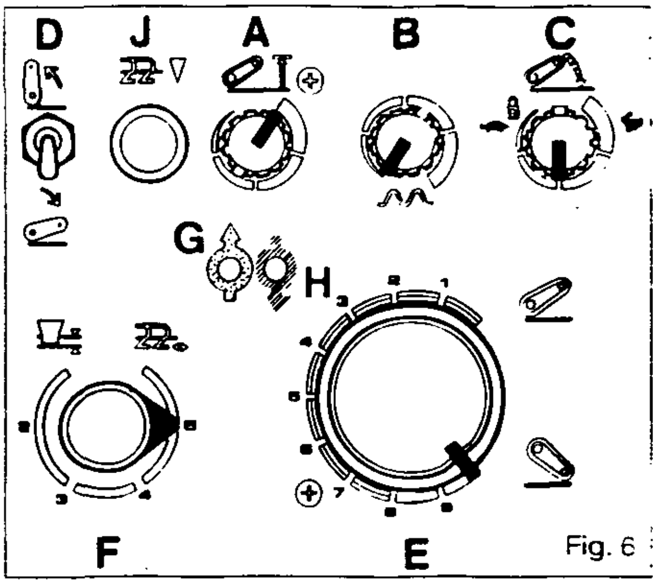


Fig. 6

Electronic lift control - Fast checking

Draft / position intermix minimum sensitivity

Position the potentiometer as shown Fig. 7.

By operating knob **E**, raise and lower the arms making sure that the depth control range is limited (4 to 3 marks).

Set knob **F** to marks 4, 3, 2 check that depth control range increases as shown Fig. 8.

Note : On the earlier control panel the minimum sensitivity position on knob B is situated at the right.

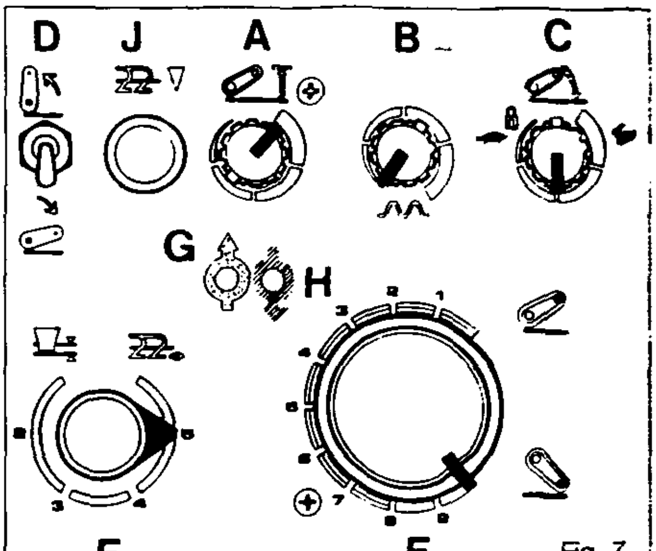


Fig. 7

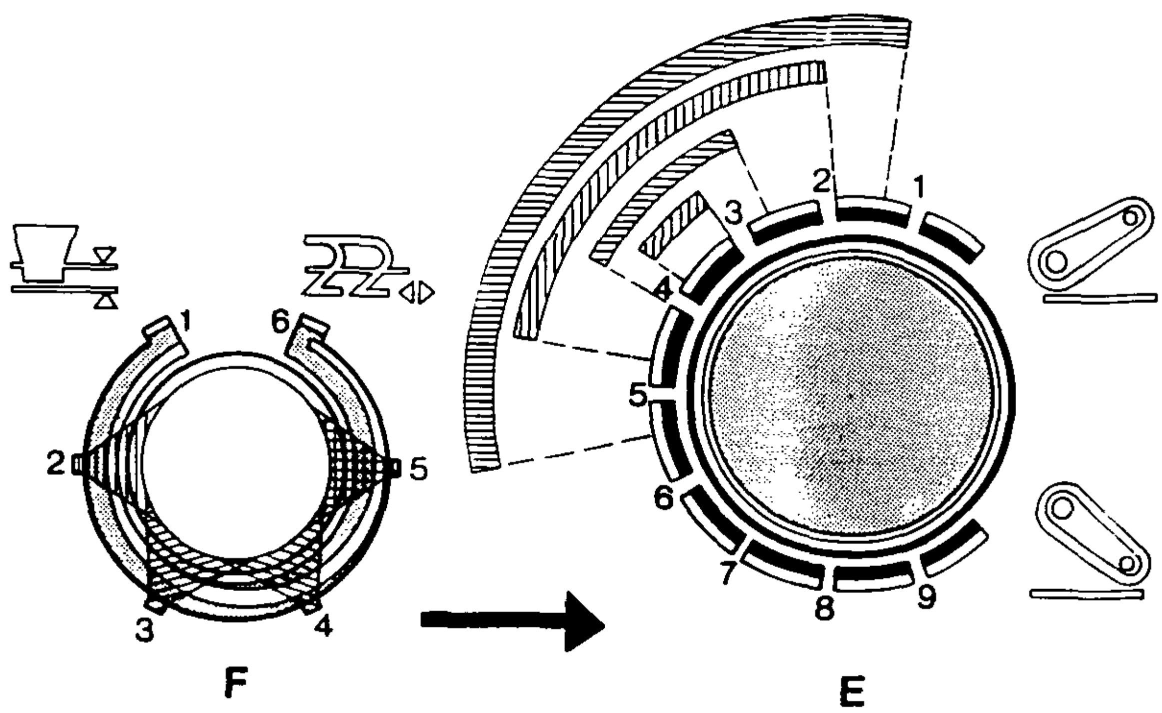


Fig. 8

Electronic lift control *- Fast checking*

Draft/position mixing, maximum sensitivity
Adjust the potentiometers as shown Fig. 9.
Carry out same operations as previously, but checking as shown Fig. 10.
The sensitivity adjustment acting on the draft control has a lesser effect if the draft/position selector is nearer to the pure position control, because sensitivity only acts on draft.
Note : the indications are given for a load of approx. 400 Kg on the ball ends and may vary if the load is different.

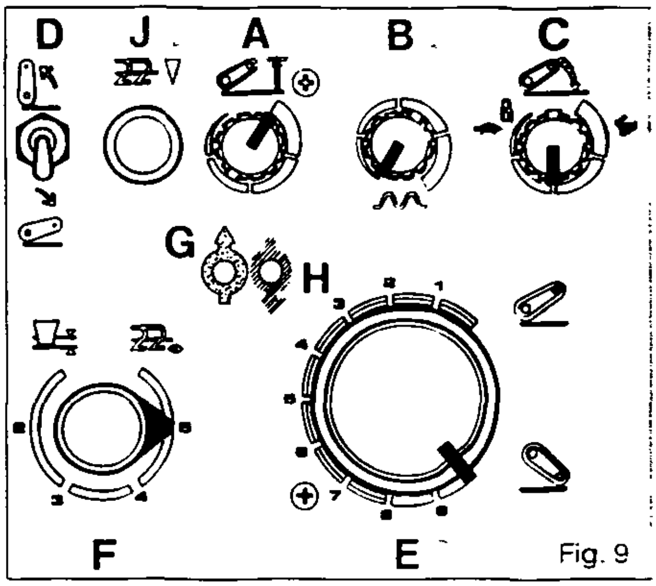


Fig. 9

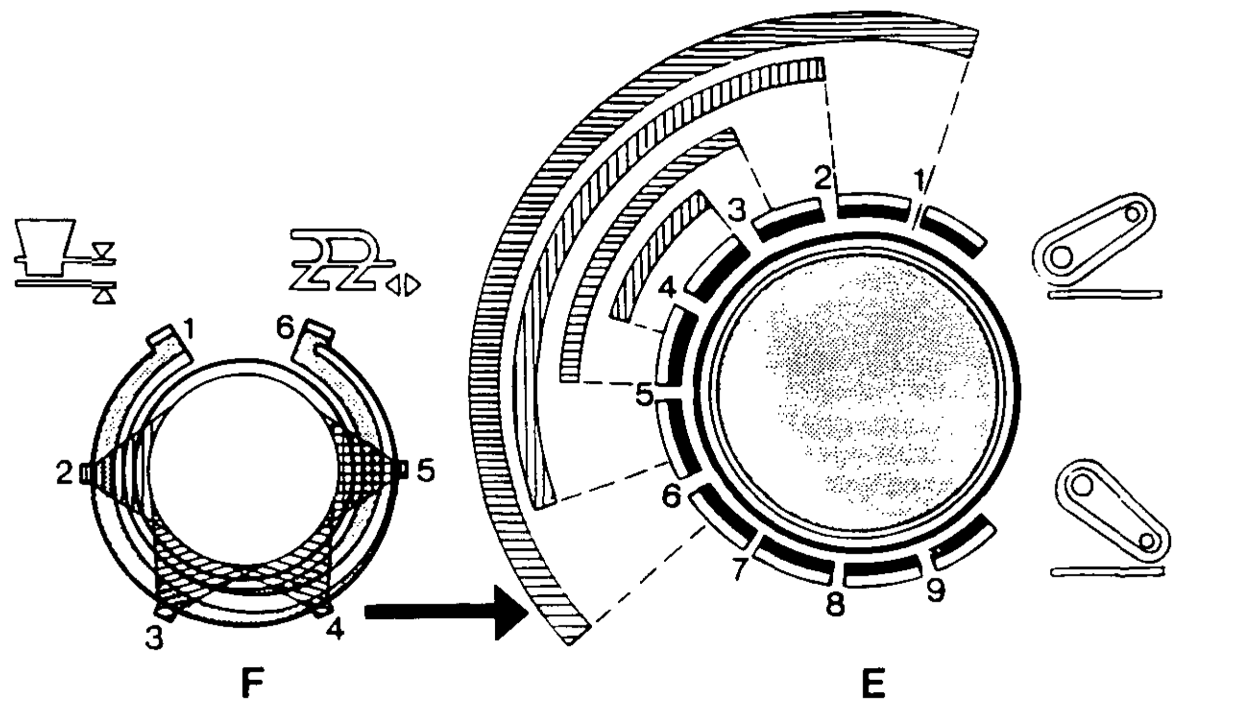


Fig. 10

Electronic lift control - Fast checking

Lowering lock

Make sure that the lift arms are in the lowest position, then set controls as shown Fig. 11.
Light **H** goes out.

1) **Calculator 3383891 M3 (Bosch 053 82 001 008)**
Check that it is impossible to raise the lift arms with switch **D** on lift, or with knobs **A** or **B**.
Check it is possible to raise the lift arms with depth control knob **E** (switch **D** set to lower), but that it is impossible to lower the arms.
Lower the lift arms to lowest position, set the controls as follows :
- knob **A** to minimum
- Knob **E** to 1
- Knob **C** on lock

Make sure that it is impossible to raise the lift arms with switch **D**.
Make sure that it is possible to raise the arms when turning knob **A**, but that it is impossible to lower them.

2) **Calculator 3383891 M2 (Bosch 053 82 01 006)**
Set controls as shown fig. 11.
Make sure that it is possible to raise the lift arms by turning the knob **E** but not possible to lower them.
Check that it is possible to raise the lift arm with switch **D** on lift but that it is not possible to lower them.
Lower the arms to lowest position. Set the controls as follows :
- Knob **A** to minimum
- Knob **E** to 1
- Knob **C** on lock

Check that it is possible to raise then to lower the lift arms when turning knob **A**.

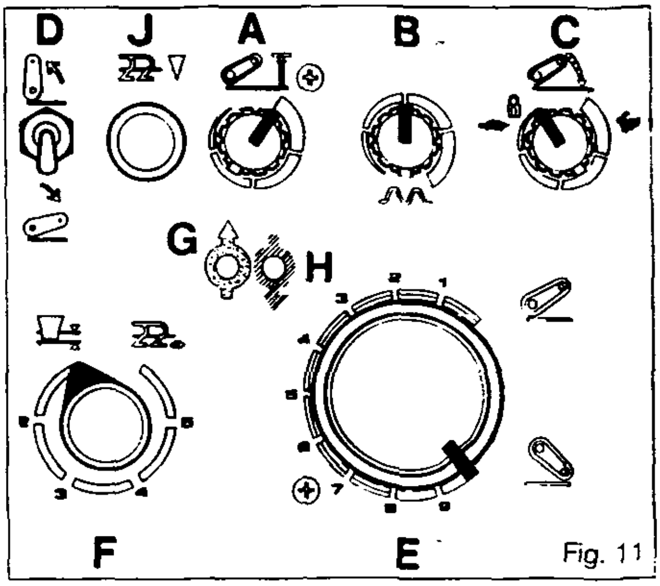


Fig. 11

External controls (if fitted)

Make sure that operation of the external controls takes priority over adjustment carried out at the console.
If this operation ceases, the lift must stop. (Warning light goes out).
In order to control the lift again from the console, set the lift/lower selector **D** at least once at the position Lift.

11 C01 Checking the harnesses and components

CONTENTS

A . General

The various checks to be carried out on tractors equipped with electronic lift, when there is a functional anomaly, are carried out using a tester 3389502 M1 and multimeter MF 3005.
The tester **(B)** is connected to the round 24 pin connector **(C2)** or the harness **(FR)**, or both (Fig. 1).
The aim of the tester is to prevent damage to the plugs on the connector and it is provided with female plugs which are able to fit the ohmmeter test leads.

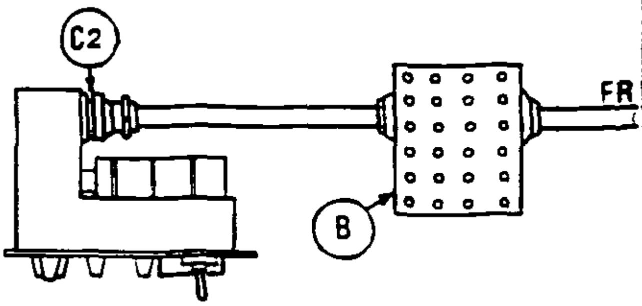


Fig. 1

Use of the ohmmeter / voltmeter (multimeter) (Fig. 2)
Before carrying out any measurements read carefully the multimeter use instructions. Select ohmmeter (Ω) - voltmeter direct current (VDC) or voltmeter alternating current (VAC).
For the ohmmeter function, measuring resistance, it is useful to make readings according to the scale of resistances.

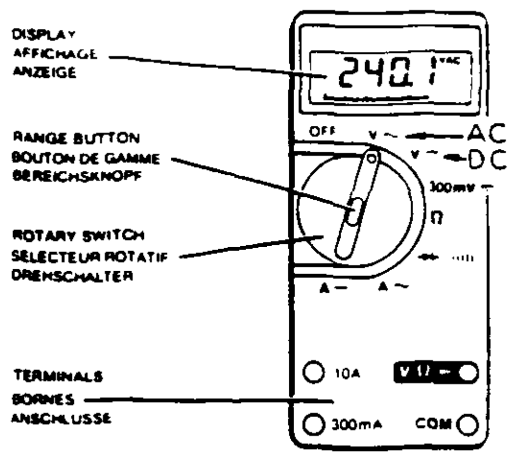


Fig. 2

Interpretation of readings with ohmmeter :
When the display is about 0 Ω, this means that there is no break in the harness or in the part forming the line where the measurement is being carried out.
When the display is 0.L M Ω (infinity), this means that there is a break on the line, hence there is more chance of current and voltage transfer, which may be the cause of the breakdown.
Note : Never connect two test box jacks when calculator is functioning.

Trouble - Shooting on Datatronic tractors
To find the cause of faults in case of incorrect functioning of the Electronic Lift Control, disconnect connector L and check to see if the problem still exists. If it does not, check the Datatronic wiring harness (see 13B01-4) and not the lift control.

B . Voltage checks

Tester **(B)** connected between control console and tractor harness **(FR)** as shown Fig. 1.

Engine stopped, ignition off

Voltage between terminal + -	Normal values	Others values see fault nbr in 11 D-01
16 - 14	Battery voltage 10.4 - 15.3 VDC	1
17 - 14	Alternator voltage 0 VDC	2

Engine running, ignition on

The console must be brought into use by operating the switch **D** (see chapter 11 A. pages 4-5) to transport position.
Battery charging warning light off.

Voltage between Terminals + -	Instructions	Normal Values	Other values See Faults in 11D-01
16 - 14		Battery voltage 10.4 -15.3 VDC	1
17 - 14		Alternator Voltage 13.5 - 14.5 VDC	3
2 - 14		Battery voltage to solenoids 10.4 - 15.3 VDC	4
8 - 10		Voltage provided by calculator to draft sensors 9.5 - 10.5 VDC	5
9 - 10 12 - 10	Lower links unloaded	RHS draft sensor signal Maxi 5.7VDC Mini 4.3 VDC LHS draft sensor signal	20 20
5 - 7	Select multimeter MF 3005 "Range hold" for these measures. Press white button once and place selector on V~(VAC)	Position sensor power supply 6.7 - 7.2 VAC	6
6 - 7	Set switch D to neutral. Press (lift) external control button until links stop raising	Position sensor signal 4.5 - 4.9 VAC	21
6 - 7	Set switch D to lift then to lower Lower links in minimum position	Position sensor signal 2.0 - 2.6 VAC	21

Connector identification

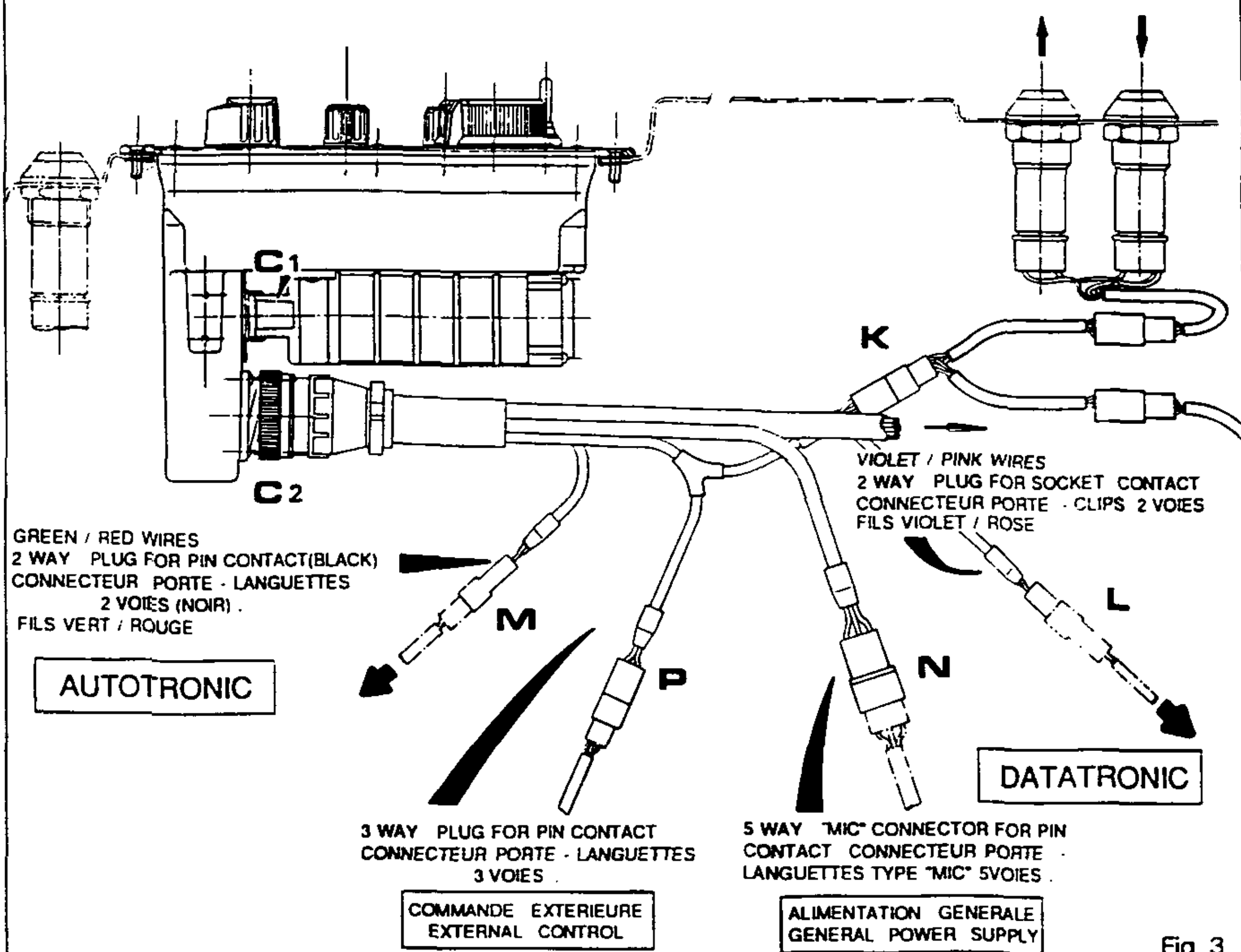


Fig. 3

C . Checking resistances

- harness
- sensors
- solenoids
- external controls

Engine stopped - Ignition off

Disconnect the control console (Fig. 4)
Disconnect Autotronic and Datatronic connectors **M** and **L** (Fig. 3).
Measure resistance between tester **(B)** terminals.
Replace the multimeter in "automatic range selection" mode.

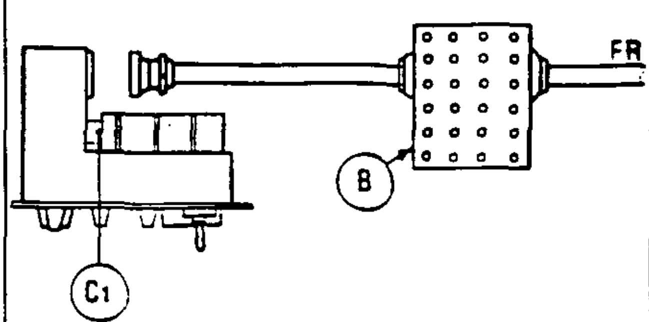


Fig. 4

Resistance between terminals B	Instructions	Normal values	Other values see faults in 11D.01
5 - 7 5 - 6 7 - 6		Position sensor R=48 ± 3 Ω Position sensor R=24 ± 1 Ω Position sensor R=24 ± 1 Ω	7 8 9
10 - 8 9 - 8 9 - 10	Disconnect left hand draft sensor *before measurement on RH side* : white connector + white band (Fig. 5)	Right hand draft sensor R = 30 K Ω *min* - 40 K Ω *max* * R = 35 K Ω min - 45 K Ω max * R = 6.5K Ω min - 7 K Ω max *	 10 11 12
	Reconnect LH sensor		
10 - 8 12 - 8 12 - 10	Disconnect right hand draft sensor before measurement : RH side of *tractor.*	*Left hand draft sensor* R = 30 K Ω min - 40 K Ω max * R = 35 K Ωmin - 45 K Ω max * *R = 6.5 K Ω min - 7 K Ω max* *	 13 14 15
	Reconnect RH sensor		
2 - 1		Lifting electrovalve R = 1.7 Ω + 0.5 **	16
2 - 3		Lowering electrovalve R = 1.7 Ω + 0.5 **	17
23 - 1	External controls for lifting (Fig. 6) Release lift button *Press lift button*	 R = 0 L - M Ω R = 0 Ω	18
23 - 3	External controls for lowering (Fig. 6) Release lower button Press lower button	 R = 0 L - M Ω R = 0 Ω	19

* Values correct for multimeter giving voltage drop < 0.2 V. (All digital display multimeters) - other multimeter will induce different measurements

** When measuring electrovalves, very low resistance can be influenced by harness and test leads resistance

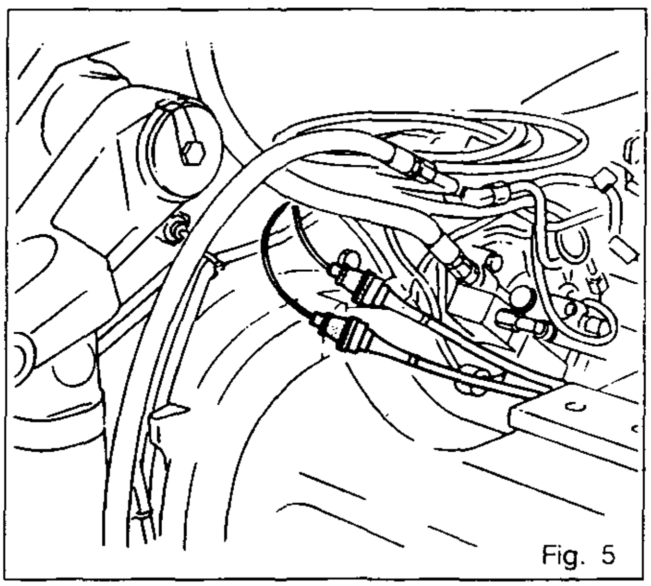


Fig. 5

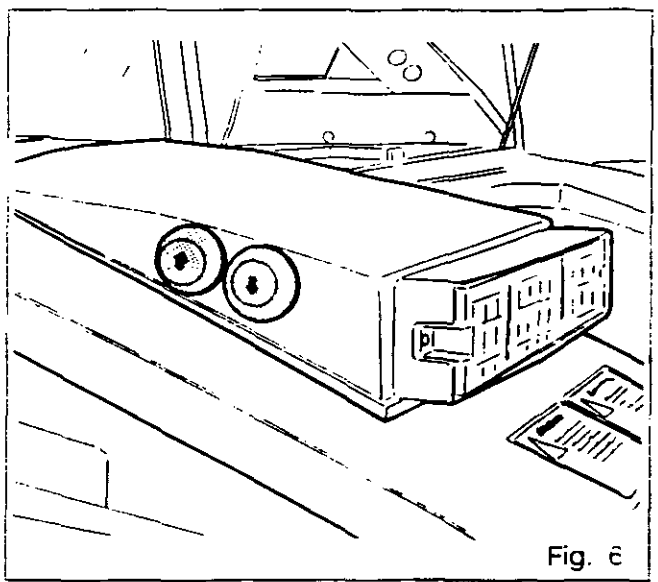


Fig. 6

D . Checking connectors C1 - C2 continuity (harness - calculator)

Disconnect calculator and tractor harness **(FR)**.
Connect tester **(B)** to connector **(C2)** (see Fig. 7)

Measure resistance between tester **(B)** and calculator connector **(C1)** (see Fig. 8).

*All values must be between O and 1.5 Ω except *.*

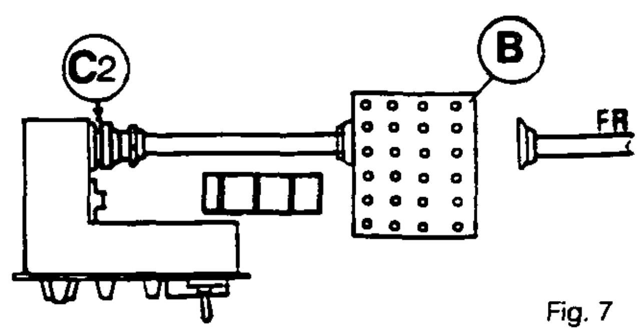


Fig. 7

Resistance between terminals		Instructions	Functions
B	C1		
7	10		Position Sensor (ground)
6	9		Position Sensor (signal)
5	19		Position Sensor (power)
12	12		LH draft sensor signal
9	11		RH draft sensor signal
23	5		External controls ground
2	4		Electrovalves power
16	1		Calculator power supply (+ battery)
* 13	8	100 Ω with quick soil engagement	Depth signal from datatronic
8	18		Draft sensors power
10	17		Draft sensors ground
3	2		Lower E.V. ground
1	3		Lift E.V. ground
24	7		Lower switch signal to datatronic
14	16		General ground (battery)
17	15		Calculator power supply (alternator voltage)
8	7	Switch D on "lower" position	
8	21	Switch D on "lift" position	

N.B : If no continuity (R = Infinity) check the internal wiring of the control console and the lift/lower switch if required.

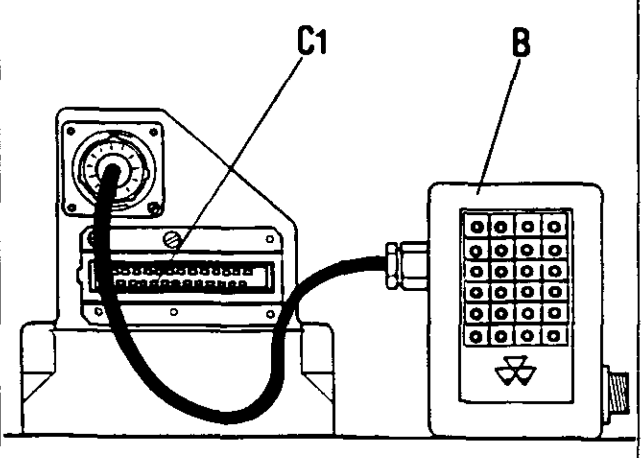


Fig. 8

Terminal identification on connector C1

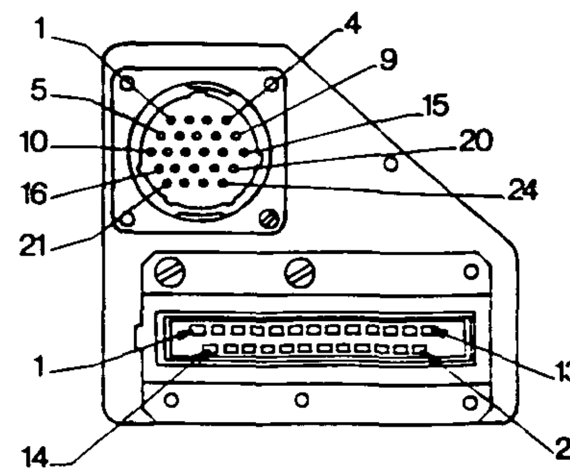


Fig. 9

E . Checking control console

Disconnect tractor harness **(FR)** and calculator. Connect tester **(B)** to connector **(C2)** (Fig. 7). Follow instructions and measure resistances between **(B)** terminals.

TERMINAL NBR	INSTRUCTIONS	RESISTANCE	FUNCTION	IF FAULT,CHECK
15 - 14		18 ± 2 Ω	Internal lighting	Printed circuit (bulbs) Internal wiring
21 - 20	Selector "D" at lift pos.	0 Ω	Transport position information to Autotronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
21 - 20	Selector "D" at lower pos.	0.L M Ω (infinity)	Transport position information to Autotronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
24 - 8	Selector "D" at lower pos.	0 Ω	Timing active signal to Datatronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
24 - 8	Selector "D" at lift pos.	0.L M Ω (infinity)	Timing active signal to Datatronic	Switch "D" Printed circuit Switch "D" harness Internal wiring
13 - 8	Depth control knob "E" at "low"	1650 ± 200 Ω	Depth control (signal from Datatronic)	Printed circuit (Depth potentiometer) Internal wiring
13 - 8	Depth control knob "E" at "high"	560 mini ± 56 Ω (1)	Depth control (signal from Datatronic)	Printed circuit (Depth potentiometer) Internal wiring
10 - 8		960 ± 96 Ω	Draft sensors power supply	Printed circuit Internal wiring

(1) See adjustment procedure page 9 if different value

F . Checking potentiometers

Disconnect the calculator.
All the following measurements of resistance are carried out at the terminals of the 25 pin connector **C1** (Fig. 9). The two resistance values are given for a minimum and maximum adjustment. However it is necessary to measure the resistance whilst varying the adjustment of the potentiometer, in order to detect any fault within the potentiometer which would only be apparent for a certain setting of the knob. Any sudden variation denotes a fault.

WHEN TESTING TAKE PRECAUTIONS TO AVOID DAMAGING THE CONNECTION TERMINALS.
Note : It is normal to observe that the value of the resistance is greater than 960 ± 96 Ω before the potentiometer reaches its stop. However, this value must not exceed 2100 Ω (2200 Ω with quick soil engagement)for depth control potentiometer and 1600 Ω for the others.

See location of internal wiring page 11.

TERMINAL NBR (C1)	FUNCTION	NORMAL RESISTANCE VALUE	IF FAULT, CHECK :
8 - 17 Control console without quick soil engagement	Depth Control	High : 1650 ± 200 Ω Low : 560 ± 56 Ω (see adjustment p. 9)	-R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
8- 17 Control console with quick soil engagement	Depth Control	High : 1750 ± 200 Ω Low : 660 ± 56 Ω (see adjustment p. 9)	-R = 0.LM Ω, console printed circuit (soldering) internal wiring - other values, potentiometer
8- 17 Control console with quick soil engagement	Quick soil engagement (button pressed)	R = 63 Ω ± 7	Button J Printed circuit
6 - 17	Maxi height	Mini : 864 - 1056 Ω Maxi : 0 Ω	-R = 0.LM Ω, console printed circuit (soldering) or internal wiring -other values, potentiometer
24 - 17	Sensitivity	Mini : 0 Ω Maxi : 960 ± 96 Ω	-R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
14 - 17	Drop speed	Mini : 0 Ω Maxi : 960 ± 96 Ω	- R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
20 - 17	Intermix	Draft : 0 Ω Position : 960 ± 96 Ω	- R = 0.LM Ω, console printed circuit (soldering) or internal wiring - other values, potentiometer
18 - 17	Potentiometers power supply	960 ± 96 Ω	- R > 1.1 k Ω = one or more potentiometers not powered. Check console printed circuit or internal wiring

G . Adjusting position sensor and potentiometer

Adjusting position sensor

If work is carried out on the lift requiring it to be assembled and adjusted, the following method should be applied :

1. Position sensor removed.
2. Run engine and raise the arms using the external control or solenoid manual actuation, until the relief valve blows.
3. Stop engine, then make a mark between the lift cover and a lift arm hub.
4. Screw down the sensor fully by hand, without forcing it, then turn back one turn and a half.
5. Start engine, then lower and raise the arms with position control potentiometer.
   The difference between marks on the lift cover hub and the lift arm must be about 3 mm, which corresponds to the transport position.
   N.B. : If the difference is less than 3 mm : screw in sensor.
   If the difference is greater than 3 mm : screw out sensor.
6. Tighten nut to 20 Nm.

Adjusting depth control knob

If resistance at terminals 8 - 7 of connector C1 is higher than 560 ± 56 Ω (660 ± 66 Ω with quick soil engagement) when knob is at index 10 ("low"), turned up to it's stop, then check installation on potentiometer shaft as follows :

1. Unscrew screws and remove knob preventing loss of springs and pads by placing fingers on mark 5 and opposite.
2. Turn potentiometer shaft anti-clockwise up to it's stop.
3. Replace springs and friction pads.
4. Replace knob on potentiometer shaft, indexed to 8 or 7.
5. Turn knob anti-clockwise up to it's stop, then tighten the 2 screws (preventing knob from turning clockwise before tightening screws).

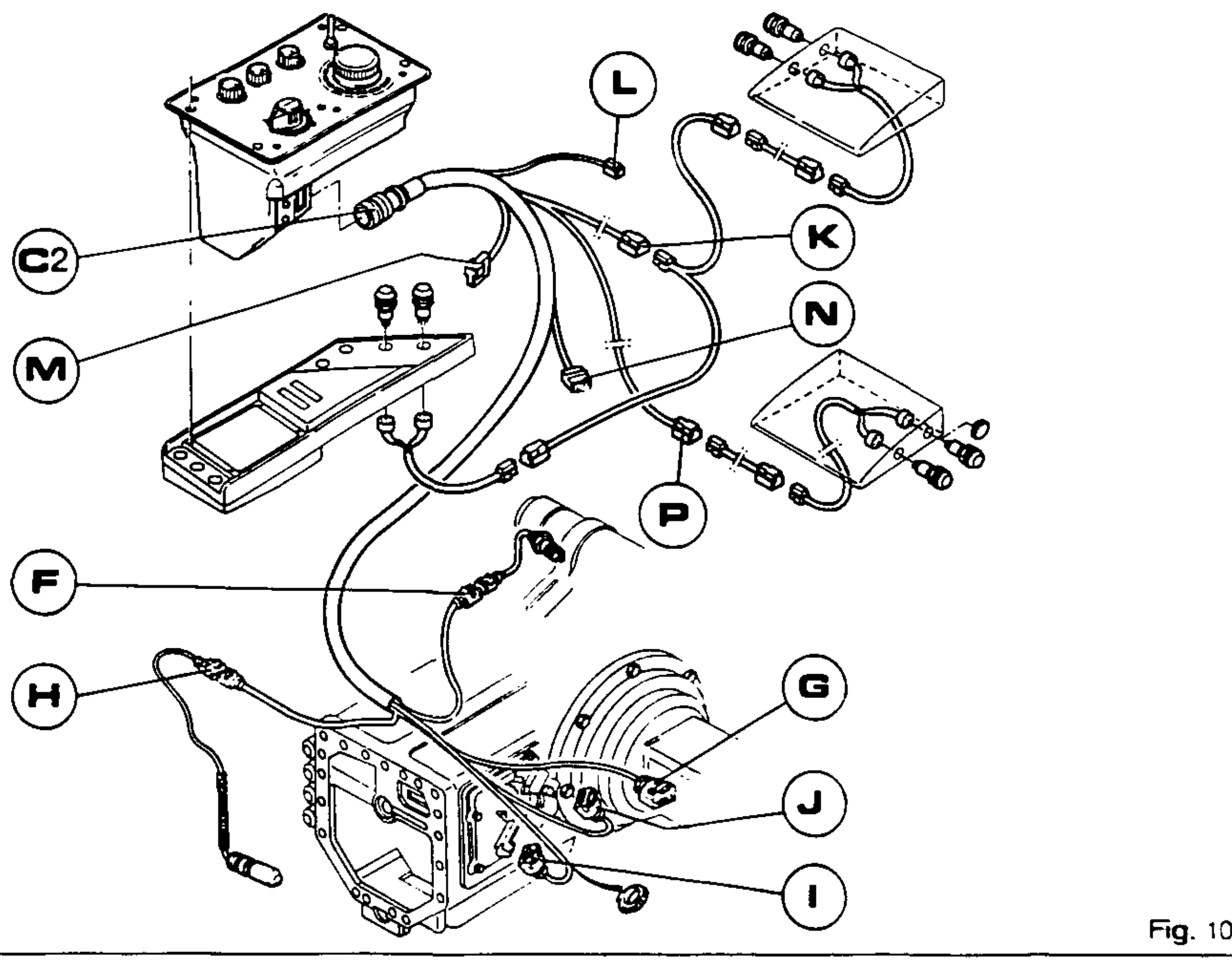


Fig. 10

H . Wiring diagram (with quick soil engagement)

Key

42 . Position sensor
43 . LH draft sensor
44 . RH draft sensor
45 . Lift control valve
46 . External lift control buttons
47 . ELC calculator
F . ELC harness junction with position sensor
G . ELC harness junction with LH draft sensor
H . ELC harness junction with RH draft sensor
I . ELC harness junction with lift valve (lowering)
J . ELC harness junction with lift valve (raising)
K . ELC harness junction with external control buttons
L . ELC harness junction with Datatronic (connector Z)
M . ELC harness junction with Autotronic (connector Q)
N . ELC junction with Datatronic (connector AB) or console harness (connector AD)
P . ELC harness junction with external control buttons.
C1 . 25-way connector on ELC calculator
C2 . 24-way ELC harness connector
C3. 20-way connector on printed circuit

Wire colour code

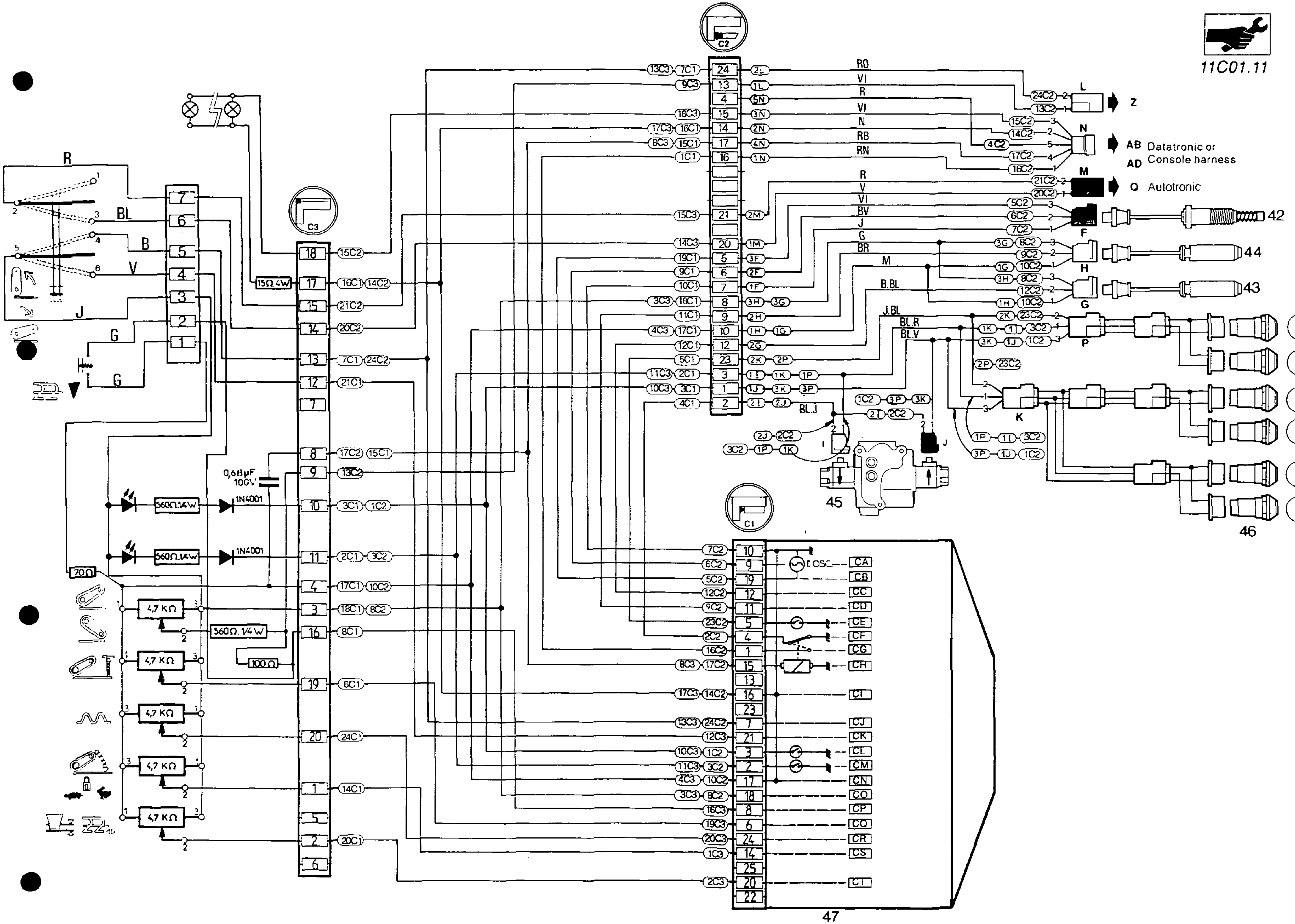
B : White
B.BL : White, blue mark
B.R. : White, red mark
B.V. : White, green mark
BL : Blue
BL.J. : Blue, yellow mark
BL.R. : Blue, red mark
BL.V. : Blue, green mark
G : Grey
J : Yellow
J.BL. : Yellow, blue mark
M : Brown
N : Black
R : Red
R.B. : Red, white mark
R.N. : Red, black mark
RO : Pink
V : Green
VI : Violet

Description of calculator functions

CA : Position sensor signal
CB : Position sensor power supply
CC : LH draft sensor signal
CD : RH draft sensor signal
CE : External controls ground
CF : ELC solenoids power supply
CG : Power supply from battery
CH : Safety relay power supply (+ engine running)
CI : General ground (from chassis)
CJ : Working mode
CK : Transport mode
CL : Lift solenoid
CM : Lower solenoid
CN : Ground
CO : 10 volt - Draft sensors power supply
CP : Info. depth setting
CQ : Info. high position setting
CR : Info. sensitivity
CS : Info. lowering speed setting
CT : Info. intermix setting

Identification of connector terminals

Connector	Terminal	Identification
N	1 2 3 4 5	+Battery Ground + Lighting + Engine running Dual Control provision
L	1 2	Slip control Working position (for Datatronic)
P.K	1 2 3	Lower (external control) Ground Lift (external control)


C2
C3
C1
R
BL
B
V
J
G
15Ω 4W
0,68µF 100V
1N4001
560Ω.1/4W
70Ω
4,7 KΩ
100Ω
RO
VI
N
RB
RN
BV
BR
M
B.BL
J.BL
BL.R
BL.V
BL.J
L
Z
N
AB Datatronic or
AD Console harness
M
Q Autotronic
F
H
G
P
K
I
J
42
43
44
45
46
47
f. OSC.
CA
CB
CC
CD
CE
CF
CG
CH
CI
CJ
CK
CL
CM
CN
CO
CP
CQ
CR
CS
CT

I. Wiring diagram (without quick soil engagement)

Key

42 . Position sensor
43 . LH draft sensor
44 . RH draft sensor
45 . Lift control valve
46 . External lift control buttons
47 . ELC calculator
F . ELC harness junction with position sensor
G . ELC harness junction with LH draft sensor
H . ELC harness junction with RH draft sensor
I . ELC harness junction with lift valve (lowering)
J . ELC harness junction with lift valve (raising)
K . ELC harness junction with external control buttons
L . ELC harness junction with Datatronic (connector Z)
M . ELC harness junction with Autotronic (connector Q)
N . ELC junction with Datatronic (connector AB) or console harness (connector AD)
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C1 . 25-way connector on ELC calculator
C2 . 24-way ELC harness connector
C3. 20-way connector on printed circuit

Wire colour code

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CG : Power supply from battery
CH : Safety relay power supply (+ engine running)
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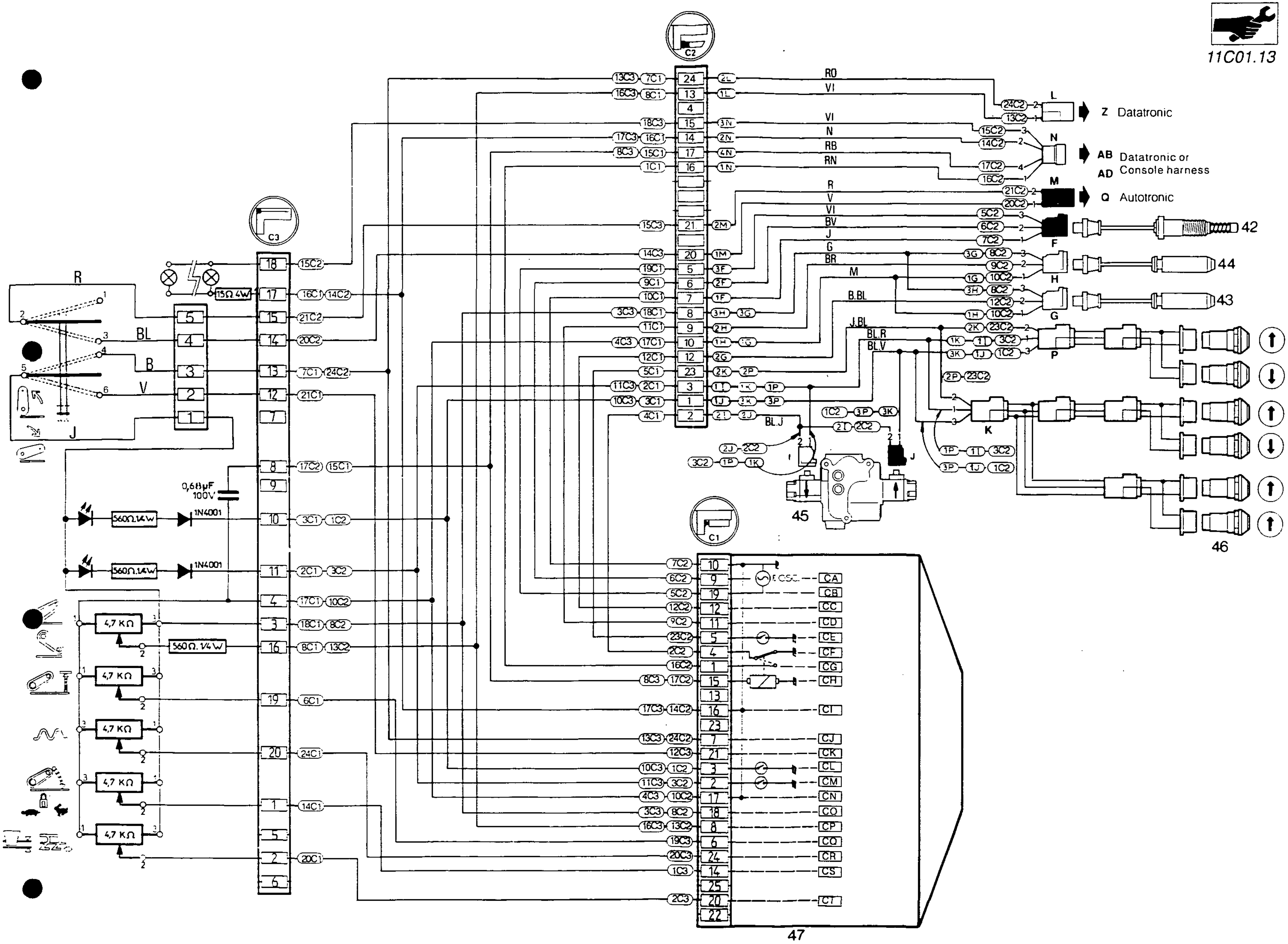
CM : Lower solenoid
CN : Ground
CO : 10 volt - Draft sensors power supply
CP : Info. depth setting
CQ : Info. high position setting
CR : Info. sensitivity
CS : Info. lowering speed setting
CT : Info. intermix setting

Identification of connector terminals

Connector	Terminal	Identification
N	1	+Battery
	2	Ground
	3	+ Lighting
	4	+ Engine running
L	1	Slip control
	2	Working position (for Datatronic)
P.K	1	Lower (external control)
	2	Ground
	3	Lift (external control)


C2
C3
C1
Z Datatronic
AB Datatronic or
AD Console harness
Q Autotronic
L
N
M
F
H
G
P
K
J
42
44
43
45
46
47
R
BL
B
V
RO
VI
RN
RB
BV
BR
B.BL
J.BL
BL.R
BL.V
BL.J
15Ω 4W
0,68µF
100V
560Ω.1/4W
1N4001
4,7 KΩ
560Ω. 1/4 W
CA
CB
CC
CD
CE
CF
CG
CH
CI
CJ
CK
CL
CM
CN
CO
CP
CQ
CR
CS
CT

11 D01 Analysis of possible faults

Electronic lift control

FAULT 1

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(16)** = Terminal 16 on tester

If 0 < voltage < 10.4 V : The battery is insufficiently charged to achieve correct operation of the electronic lift.

If voltage > 15.3 V : Risk of damage to calculator.

If voltage = 0 V :

1. Check battery compartment connections :
   - If OK : see 2
2. Check 7.5 A fuse in battery compartment :
   - If OK : see 3
   - If faulty : see 5
3. Check voltage between **(16)** and tractor chassis :
   - If 12 V : see 4
   - If 0 V : supply line from battery broken
4. Check resistance between **(14)** and tractor chassis :
   - If R approx. 0 Ω : OK
   - If other value : ground line broken or bad ground connexion (see gearbox cover or battery)
5. Disconnect console and positive terminal of the battery.
   Check resistance between **(16)** and **(14)** :
   - If R = O Ω : short circuit between + battery line and ground.
   - If R = infinity : see 6 (harness correct)
6. *Connect the console to the tester. Disconnect computer and harness.*
   Check resistance between **(16)** and **(14)** :
   - If R approx. infinity : OK and computer faulty if all other harness checks are correct
   - If R approx. O Ω : console faulty (see internal wiring)

FAULT 2

If voltage = 12 V approx. Check that the + line after the starter switch is not directly *connected to a permanent + 12 V line.*
(Check starter switch or look for short circuit)

Electronic lift control

FAULT 3

Tractors with serial number after U262030

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(16)** = Terminal 16 on tester
- C1 - 15 = TERMINAL 15 ON CONNECTOR C1

If 0 < voltage < 13.5 V : The alternator warning light remains lightly illuminated (engine running or stopped, ignition on).
Disconnect alternator connector (engine stopped - ignition on).
Connect earth to connector contact of the alternator (linked by a violet wire) :

If the alternator warning light comes on normally :
- alternator regulator faulty.

If the alternator warning light comes on slightly :
- engine harness faulty (break).

If voltage > 14.5 V : Voltage too high. Check alternator regulator and battery.

If voltage ≃ 0 V :

1. Check the 7,5A fuse in the fuse box (F9)
2. Engine stopped. Ignition on.
   Check the alternator warning light :
   If on , check : - lift harness
   - console harness / fuel gauge.

   If off , check : - dashboard fuse F10
   - alternator warning light
   - engine harness
   - main harness (on panel)
   } Break between alternator and Dashboard

FAULT 3

Only for tractor with serial number up to U262030

If voltage < 10.3 V : The battery is insufficiently charged to achieve correct operation of the electronic lift.

If voltage > 15.3 V : Voltage too high. Risk of damage to computer.

Electronic lift control

FAULT 3 (cont'd)

Only for tractor with serial number up to U262030

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(16)** = Terminal 16 on tester
- C1 - 15 = TERMINAL 15 ON CONNECTOR C1

If voltage = 0 V :

1. Check 7,5 A fuse
   - If OK : see 2.
   - If faulty : short circuit between + after starter contact.

   Disconnect the 9 way red connector (under hood on left hand side of cab).
   Measure resistance between terminal 8 (red wire) of the 9 way red connector located in engine harness and earth.
   - If R = 0 Ω : short circuit (engine harness faulty or panel main harness faulty).
   - If R = infinity : disconnect the 2nd 5 way white connector located under the lift console.

   Measure resistance between terminals 5 and 2 of this connector (on plug side)
   - If R ≃ 0 Ω : short circuit in harness or relay faulty (located behind the right pillar trimming of cab).
   - If R ≃ 650 Ω : short circuit in coupled harness.

2. Check 7,5 A fuse in battery compartment.
   - If OK : see 3.
   - If it is faulty : check whole of the circuit between + battery and C1 - 15

Checking instructions :

a) Disconnect connectors one by one, as far as you're carrying out checking from + battery to harness.
   For each disconnected connector, look for its corresponding terminal. connected to + battery.
   (Measure resistance between terminal linked to + battery and each connector contact).
   - If R = 0 Ω : the contact is good.

b) Measure resistance between this contact and earth.
   - If R = infinity : reconnect connector and carry out the same operations for the next one.
   - If R = 0 Ω : harness is faulty.

   If harnesses and console are correct : computer unit is faulty

3. If the first checked resistance (between terminals **(16)** and **(14)** is OK:
   - Check circuit between terminal 5 of relay (located down the right pillar of cab, behind trimming) and C1 - 15, then check the relay.

   If voltage is 0 V :
   - Check whole of the circuit between + battery and terminal 3 of relay (located down the right pillar of cab, behind trimming).

   Follow checking instructions given in paragraph 2 here above but on section a :
   If R = infinity at all terminals, harness is faulty.

FAULT 4

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(16)** = Terminal 16 on tester
- C1 - 15 = TERMINAL 15 ON CONNECTOR C1

If voltage < 10,3 V : The battery is insufficiently charged to achieve correct operation of the lift.

If voltage > 15,3 V : The voltage is too high (risk of damage to calculator).

If voltage ~ 0 V : Engine stopped, ignition off

1. Disconnect calculator. Measure the resistance between terminals **(17)** and C1 - 15
   - If R = infinity : console faulty (internal wiring)
   - If R approx. 0 Ω : see 2
2. Measure the resistance between terminals **(16)** and C1 - 1
   - If R approx. 0 Ω : see 3
   - If R approx. infinity: console faulty (internal wiring)
3. Measure the resistance between terminals **(2)** and C1 - 4
   - If R = infinity : console faulty (internal wiring)
   - If R approx. 0 Ω: see 4
4. Check position sensor as indicated page 11C01-04 and 05
   - If OK : see 5
5. Check the selector "D" as indicated page 11C01-6 (terminals 8/7 and 8/21)

Electronic lift control

FAULT 5

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(10)** = Terminal 10 on tester
- C1 - 17 = TERMINAL 17 ON CONNECTOR C1

If voltage ≤ 9,5 V or if voltage > 10,5 : Calculator faulty if all other checks of voltage and resistance are correct. Carry on test procedure.

If voltage ≃ 0 V :

1. Disconnect the harness and the calculator.
   Measure the resistance between terminals **(10)** and C1 - 17
   - If R approx. 0 Ω OK : see 2
   - If R approx. infinity : console faulty (internal wiring)
2. Measure the resistance between terminals **(8)** and C1 - 18
   - If R approx. 0 Ω OK : see 3
   - If R approx. infinity console faulty (internal wiring)
3. Measure the resistance between terminals **(8)** and **(10)**
   - If R = 960 ± 96 Ω : calculator faulty if the checks of resistance of the harness are OK. Carry on procedure 11C01-4.
   - If R approx. 0 Ω or infinity : console faulty (potentiometers or internal wiring).

FAULT 6

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER . Example **(5)** = Terminal 5 on tester
- C1 - 19 = TERMINAL 19 ON CONNECTOR C1

If voltage ≃ 0 V :

1. Disconnect the harness and calculator.
   Measure resistance between terminals **(5)** and **(7)**.
   - If R approx. 0 Ω : console faulty
   - If R approx. infinity see 2
2. Measure the resistance between terminals **(5)** and C1 - 19
   - If R approx. 0 Ω see 3
   - If R approx. infinity console faulty
3. Measure the resistance between terminals **(7)** and C1 - 10
   - If R = infinity : console faulty
   - If R approx. 0 Ω . OK - calculator faulty if all the checks of resistance of harness are correct. Carry on test procedure 11 C01-4.

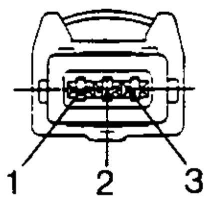
FAULT 7

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(7)** = Terminal 7 on tester

If R > 49 Ω or infinity :

1. Disconnect the position sensor black connectors
   Measure the resistance between terminal **(5)** and terminal 3 of the position sensor female connector
   If R approx. 0 Ω : see 2
   If R = infinity : harness faulty (break)

2. Measure the resistance between terminal **(7)** and terminal 1 of the position sensor female connector
   If R = 0 Ω : harness OK - sensor faulty
   If R = infinity : harness faulty (break)



If R < 47 Ω :

1. Disconnect the position sensor
   Measure resistance between terminals **(5)** and **(7)**
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity : harness OK (sensor faulty)

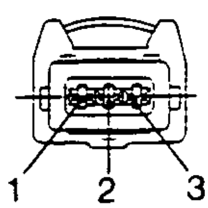
FAULT 8

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER Example **(6)** = Terminal 6 on tester

If R > 25 Ω or infinity :

1. Disconnect the position sensor
   Measure the resistance between terminal **(5)** and terminal 3 of the position sensor female connector (black connectors)
   If R approx. 0 Ω : see 2
   If R = infinity : harness faulty (break)

2. Measure the resistance between terminals **(6)** and terminal 2 of the position sensor female connector (black connectors)
   If R approx. 0 Ω : harness OK - sensor faulty
   If R approx. infinity : harness faulty (break)



If R < 23 Ω :

1. Disconnect the position sensor
   Measure resistance between terminals **(5)** and **(6)**
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity : harness OK (sensor faulty)

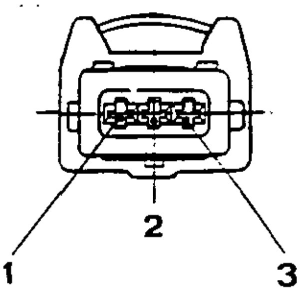
Electronic lift control

FAULT 9

- LABELLED CIRCLES INDICATE TEST JACK ON TESTER : Example **(6)** = Terminal 6 on tester

If R > 25 Ω (or infinity) :

1. Disconnect the position sensor black connectors
   Measure the resistance between terminal **(7)** and terminal 1 of the position sensor female connector
   If R approx. 0 Ω : see 2
   If R = infinity : harness faulty (break)
2. Measure the resistance between terminals **(6)** and terminal 2 of the position sensor female connector (black connectors)
   If R approx. 0 Ω : harness OK - sensor faulty
   If R approx. infinity: harness faulty (break)



If R < 23 Ω :

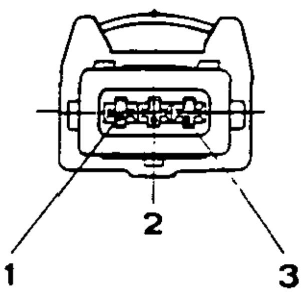
1. Disconnect the position sensor
   Measure resistance between terminals **(6)** and **(7)**
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity: harness OK (sensor faulty)

FAULT 10

LABELED CIRCLES INDICATE TEST JACK ON TESTER : example **(10)** = Terminal 10 on tester

If R > 40 K Ω (or infinity) :

1. Disconnect both draft sensors.
   Measure the resistance between terminal **(10)** and terminal 1 of the right hand side draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2
   If R approx. infinity: harness faulty (break)
2. Measure the resistance between terminal **(8)** and terminal 3 of the right hand side draft sensor female connector (white connector).
   If R approx. 0 Ω : harness OK - sensor faulty
   If R approx. infinity: harness faulty (break)



If R < 30 K Ω :

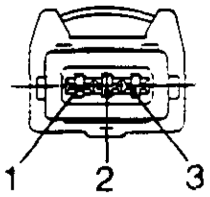
1. Disconnect both draft sensors
   Measure the resistance between terminals **(8)** and **(10)**.
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity: harness OK - sensor faulty

FAULT 11

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(9)** = Terminal 9 on tester

If R > 45 K Ω (or infinity) :

1. Disconnect both draft sensors
   Measure the resistance between terminal **(9)** and terminal 2 of the right hand draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2
   If R approx. infinity: harness faulty (break)



2. Measure the resistance between terminal **(8)** and terminal 3 of the right hand draft sensor female connector (white connector).
   If R approx. 0 Ω : right hand sensor faulty
   If R approx. infinity: harness faulty (break)

If R < 35 K Ω

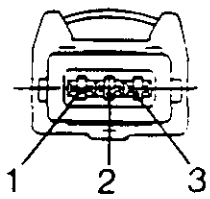
1. Disconnect both draft sensors
   Measure the resistance between terminal **(8)** and **(9)**.
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity: right hand sensor faulty

FAULT 12

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(10)** = Terminal 10 on tester

If R > 7 K Ω (or infinity) :

1. Disconnect both draft sensors.
   Check continuity for the right hand draft sensor.
   Measure the resistance between terminal **(9)** and terminal 2 of the right hand draft sensor female connector in order to ensure that there is no break.
   If R approx. 0 Ω : see 2.
   If R approx. infinity: harness faulty (break).



2. Measure the resistance between terminal **(10)** and terminal 1 of the right hand draft sensor female connector.
   If R approx. 0 Ω : right hand sensor faulty.
   If R approx. infinity: harness faulty (break).

If R < 6.5 K Ω

1. Disconnect both draft sensors
   Measure resistance between terminals **(9)** and **(10)**
   If R approx. 0 Ω : harness faulty (short circuit).
   If R approx. infinity: harness correct, right hand sensor faulty.

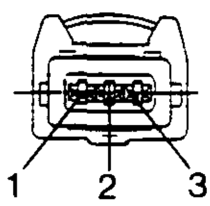
Electronic lift control

FAULT 13

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(10)** = Terminal 10 on tester

If R > 40 K Ω (or infinity) :

1. Disconnect both draft sensors
   Check continuity for the left hand draft sensor.
   Measure the resistance between terminal **(10)** and terminal 1 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2.
   If R approx. infinity : harness faulty (break).



2. Measure the resistance between terminal **(8)** and terminal 3 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : harness correct, left hand sensor faulty
   If R approx. infinity : harness faulty (break)

If R < 30 K Ω :

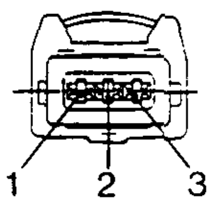
1. Disconnect both draft sensors.
   Measure resistance between terminals **(10)** and **(8).**
   If R approx. 0 Ω : harness faulty (short circuit).
   If R approx. infinity : harness correct, left hand sensor faulty

FAULT 14

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(12)** = Terminal 12 on tester

If R > 45 K Ω (or infinity)

1. Disconnect both draft sensors
   Measure the resistance between terminal **(12)** and terminal 2 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : see 2.
   If R approx. infinity : harness faulty (break).



2. Measure the resistance between terminal **(8)** and terminal 3 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : harness correct, left hand sensor faulty
   If R approx. infinity : harness faulty (break)

If R < 35 K Ω

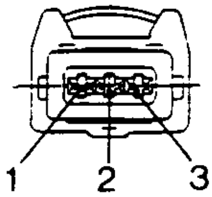
1. Disconnect both draft sensors.
   Measure the resistance between terminals **(12)** and **(8)**.
   If R approx. 0 Ω : harness faulty (short circuit)
   If R approx. infinity : harness correct, left hand sensor faulty

FAULT 15

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(12)** = Terminal 12 on tester

If R > 7 K Ω (or infinity) :

1. Disconnect both draft sensors
   Measure resistance between terminal **(12)** and terminal 2 of the left hand draf sensor female connector (white connector).
   If R approx. 0 Ω : see 2
   If R approx. infinity : harness faulty (break)



2. Measure resistance between terminal **(10)** and terminal 1 of the left hand draft sensor female connector (white connector).
   If R approx. 0 Ω : left hand sensor faulty
   If R approx. infinity : harness faulty (break).

If R < 6.5 K Ω :

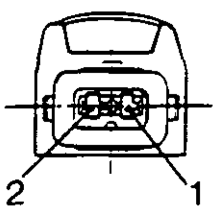
1. Disconnect both draft sensors
   Measure resistance between terminals **(12)** and **(10)**.
   If R approx. 0 Ω : harness faulty
   If R approx. infinity : harness correct. left hand sensor faulty

FAULT 16

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(2)** = Terminal 2 on tester

If R > 2.2 Ω (or infinity) :

1. Disconnect the lift solenoid (black connector).
   Measure the resistance between terminal **(2)** and terminal 1 of the lift solenoid female connector (black connector).
   If R approx.0 Ω : see 2
   If R approx. infinity : harness faulty (break)



2. Measure the resistance between terminal **(1)** and terminal 2 of the lift solenoid female connector (black connector).
   If R approx. 0 Ω : harness correct. lift solenoid faulty
   If R approx. infinity harness faulty (break)

If R < 1.2 Ω :

1. Disconnect the lift solenoid (black connector).
   Measure the resistance between terminals **(1)** and **(2)**.
   If R approx. infinity : harness correct. lift solenoid faulty
   If R approx. 0 Ω : harness faulty (short circuit)

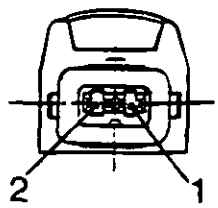
Electronic lift control

FAULT 17

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(3)** = Terminal 3 on tester

If R > 2.2 Ω (or infinity) :

1. Disconnect the lower solenoid (yellow connector).
   Measure the resistance between terminal **(3)** and terminal 2 of the *lower solenoid female connector (yellow connector).*
   If R approx 0 Ω : see 2.
   If R approx. infinity : harness faulty (break).



2. *Measure the resistance between terminal* **(2)** *and terminal* 1 of female lower solenoid (yellow).
   If R approx. 0 Ω : harness correct, lower solenoid faulty
   If R approx. infinity : harness faulty (break).

If R < 1.2 Ω :

1. Disconnect the lower solenoid (yellow connector).
   Measure the resistance between terminals **(2)** and **(3)**
   If R approx. 0 Ω : harness faulty
   If R approx. infinity harness correct, lower solenoid faulty

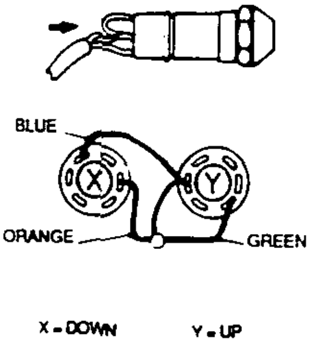
FAULT 18

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(1)** = Terminal 1 on tester

If R approx = infinity position "released" and R = infinity position "activated" :

1. Disconnect all "Y" connectors from external lift push-buttons (raising).
   Measure the resistance between terminals **(1)** and the terminals of the connectors linked by a green wire.
   If R approx. 0 Ω : see 2
   If R approx. infinity : see 3

2. Measure the resistance between terminal **(23)** and the terminals of the connectors linked by a blue wire.
   If R approx. 0 Ω : harness correct, replace push-button
   Before replacing the push-button, check that the lugs are fully engaged onto the connector terminals as indicated.
   If R approx. infinity : see 4



3. Disconnect the external control harnesses at the connectors located beneath the control console (three way white connectors).
   Measure the resistance between terminal **(1)** and the terminal of each three-way connector linked by a green wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω . see 5

FAULT 18 (cont'd)

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(1)** = Terminal 1 on tester

4. Disconnect the external control harness at the connectors located beneath the control console (three way white connectors).
   Measure the resistance between terminal **(23)** and the terminal of each three-way connector linked by a yellow wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω : see 5

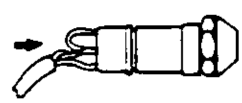
5. Should the tractor be equipped with two external controls, find which is the harness linked to the faulty control : this harness is faulty.
   -If there is only one external control, the harness which links it to the main harness is faulty (break).
   -If the two controls do not function : the two harnesses are faulty.

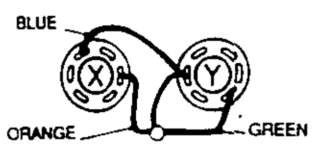
If R approx. 0 Ω "released" and R approx. 0 Ω position "activated" :

1. Disconnect all "Y" connectors from external lift push-buttons (raising).
   Measure the resistance between terminals **(1)** and **(23).**
   If R approx. 0 Ω : see 2
   If R approx. infinity : control knob faulty

2. Disconnect the external control harnesses at the connectors located beneath the control console (three-way white connectors).
   If R approx. 0 Ω : main harness faulty (short circuit)
   If R approx. infinity : see 3

3. Measure the resistance of each three-way white connector between the terminals linked by a green and blue wire.
   If R approx. 0 Ω : the corresponding harness is faulty (short circuit).





X = DOWN Y = UP

If R approx. 0 Ω position "released" and R approx. infinity position "activated" :

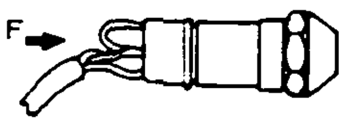
1. Check that the lugs are properly fitted into the connector terminals, as indicated.

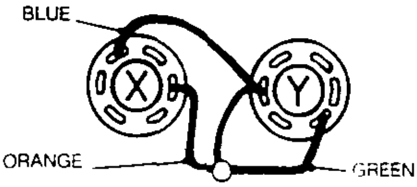
Electronic lift control

FAULT 19

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(3)** = Terminal 3 on tester

If R approx. infinity : position "released" and R approx. infinity position "activated"





X = DOWN   Y = UP

1. Disconnect all "X" connectors from external lift push-button (Lower).
   Measure the resistance between terminal **(3)** and the terminals of the connectors linked by an orange wire.
   If R approx. 0 Ω : see 2
   If R approx. Infinity : see 3

2. Measure the resistance between terminal **(23)** and the terminals of the connectors linked by a blue wire.
   If R approx. infinity : see 4
   If R approx.0 Ω : harness correct, push-button faulty
   Before replacing the push-button, check that the lugs are properly fitted into the connector terminals as indicated.

3. Disconnect the external control harness at the connectors located the control console (three-way white connectors).
   Measure the resistance between terminal **(3)** and the terminal of each three-way connector linked by an orange wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω : see 5

4. Disconnect the external control harness at the connector located beneath the control console (three-way white connector).
   Measure the resistance between terminal **(23)** and the terminal of each three-way connector linked by a yellow wire.
   If R approx. infinity : main harness faulty
   If R approx. 0 Ω : see 5

5. If only one external control is operating the harness which links the control to the main harness is faulty.
   If there are two external controls, the harness which is linked to the control not operating is faulty.
   If the two controls do not operate, both harnesses are faulty.

FAULT 19 (cont'd)

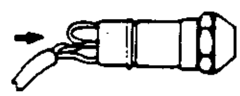
LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(3)** = Terminal 3 on tester

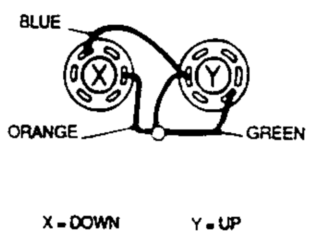
If R. approx. 0 Ω position "released" and R approx. 0 Ω position "activated" :

1. Disconnect the "X" connectors from external lift push-button (Lower).
   Measure the resistance between terminals **(3)** and **(23).**
   If R approx. 0 Ω : see 2
   If R approx. infinity : push-button faulty

2. Disconnect the external control harness at the connectors located beneath the control console (three-way white connectors).
   If R approx. 0 Ω : main harness faulty (short circuit)
   If R approx. infinity : see 3

3. Measure the resistance of each three-way white connector between the terminals linked by an orange and blue wire.
   If R approx. 0 Ω : the corresponding harness is faulty (short circuit).
   Check that the lugs are properly in the connector terminals, as indicated.





If R approx. 0 Ω position "released" and R approx. infinity position "activated" :

1. Check that the lugs are properly fitted into the connector terminals, as indicated.

FAULT 20

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(8)** = Terminal 8 on tester

If voltage < 4,3 VDC or voltage > 5,7 VDC :

1. Carry out voltage checks (in particular between terminals **(8)** and **(10)**)
   If correct : see 2.

2. Carry out resistance checks on lift harness (limited to checks relating to draft sensors)
   If correct : see 3.

3. Carry out all measurements of resistance relating to control console (page 11C01-6).
   If correct : draft sensor faulty

Electronic lift control

FAULT 21

LABELLED CIRCLES INDICATE TEST JACK ON TESTER : example **(5)** = Terminal 5 on tester

Lift in up position :
If voltage < 4.5 VAC
or voltage > 4.9 VAC

1. Check that the lift arms are in highest position by operating the push-button at the end of the lift solenoid.

   Check that the multimeter is not in "automatic range selection" mode.

2. Carry out voltage checks (in particular between terminals **(5)** and **(7)**).
   If correct : see 3.

3. Check adjustment of position sensor.
   If correct : see 4.

4. Carry out resistance checks on lift harness (limited to checks relating to position sensor)(page 11C01- 3-4 and 5).
   If correct : see 5.

5. *Carry out all measurements of resistances relating to control panel* (page 11C01-6).

Lift in down position :
If voltage < 2 VAC
or voltage > 2.6 VAC

1. Check that the lift arms are in the lowest position by operating the push button at the end of the lower solenoid.

   Check that the multimeter is not in "automatic range selection" mode.
   If correct : report to n° 2 of this page.

12 . AUTOTRONIC

Contents

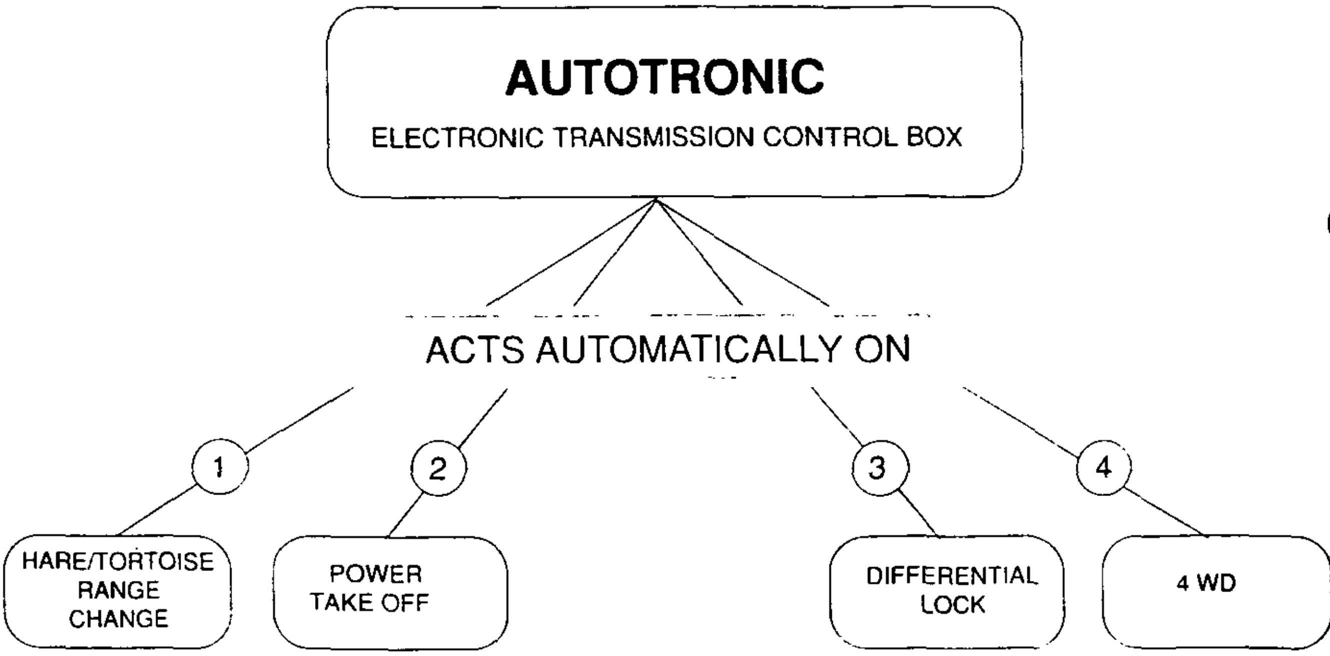
12 A01 Operation and checking without tester

CONTENTS

Autotronic

Description

General : The following information and procedure apply to Autotronic generation 2 equipped with the new ETCU box 3582042 M fitted on 3000/3100 tractors from serial n° N047049.
For previous tractors refer to workshop service manual n° 1646640 M1.



Hydraulic protection of functions 1 - 2 - 3 - 4

Automatic cut-out of both following functions if hydraulic pressure becomes too low (17 bar nominal)

2 - P.T.O.
3 - Diff. lock

1 - Hare/Tortoise range change prevented
4 - Automatic engagement of 4 WD

HARE/TORTOISE RANGE CHANGE

1

Tortoise/Hare or Hare/Tortoise change impossible

- If ground speed higher than 2 Kph
- If hydraulic pressure too low

Change to Hare range prohibited

- If the hare range is selected when the creeper gear is engaged the Hare warning light flashes. In this case move the gear lever to Tortoise position.

POWER TAKE OFF

2

Controlled gradual engagement

- by supplying pulsed current to the solenoid until full engagement is achieved.

Disengaged if PTO clutch slips

- If pressure drops (17 bar nominal), or if clutch slips, oil supply to PTO clutch is cut-off (warning light flashes)

Does not re-engage when engine started

- If engine is stopped with PTO engaged, or if PTO is re-engaged before starting the engine, Autotronic prevents PTO engagement when engine is started (warning light flashes)

Does not engage if implement is blocked

- If implement is blocked engagement is cut-off before stalling (warning light flashes).

Economy PTO desengagement in case of over speed

- If economy PTO (engine 1550 rpm) is selected, Autotronic disengages the PTO when the engine speed exceeds 1900 rpm

DIFFERENTIAL LOCK

3

Disengaged when brakes are applied

- Diff.lock is disengaged when either brake pedal is depressed.
  Re-engages when brake pedals are released

Disengaged when 3 point linkage is raised

- Diff. lock is disengaged when lift/lower switch is moved to lift position.
  Re-engages when switch is returned to lower position (warning light goes out then comes back on).

4 WD engaged when diff.lock switch is operated

- Warning light comes on

Disengaged if ground speed exceeds 14 kph

- Does not re-engage when speed reduced to below 14 Kph (warning light goes out).

Disengaged if hydraulic pressure drops (17 bar nominal)

FOUR WHEEL DRIVE

4

Engaged when starting tractor

- To desengage 4WD after starting the engine, press and release brake pedal then push on 4WD button(warning light goes out)
- 4 WD is still engaged until tractor starts moving (solenoid then energized)

Disengaged if speed exceeds 14 Kph

- If tractor speed is below 14 Kph and the 4 WD button is pressed once :
  4 WD will be disengaged when ground speed exceeds 14 Kph, but will be re-engaged as soon as ground speed drops below 14 Kph.
- If tractor is being driven at more than 14 Kph and 4 WD has been disengaged, it can be re-engaged by pressing the 4 WD control button once.

Engaged whatever tractor speed is

- Button pressed for more than 2 s when ground speed is below 14 Kph.
  When ground speed is over 14 Kph, press the 4 WD button once

Engaged when braking at speeds higher than 5 Kph

- When braking, Autotronic automatically engages 4 WD if ground speed is higher than 5 Kph (warning light does come on in this case).

Engaged when diff. lock is engaged

Engaged if hydraulic pressure drops

General

Note : The following procedure applies from serial n° N047049. For previous tractors refer to service manual n° 1646650 M1.

This procedure is for checking correct operation of the electronic transmission control unit generation two as well as for solving very simple breakdown problems.

The use of the tester becomes necessary in more complex cases.

You will find in this section checks to be made, set out in chronological order ; when you have a problem, refer to the corresponding paragraph in the section with tester.

1. Power supply

Engine stopped, ignition off

The following warning lights should illuminate almost immediately :
- hydraulic pressure
- 4 WD
- Hare/Tortoise

Re-engage : the warning lights should extinguish after four seconds.

This shows that :
- There is power supply to the Autotronic system.
- Processor is operating.
- Hydraulic pressure warning light, 4 WD light, hare/tortoise light are correctly wired.
- Clutch switch is correct.

2 . Hydraulic pressure switch

Engine stopped (disconnect fuel injector pump shut-off valve : series 1000 engines).

Declutch and turn over the starter without starting the engine for no more than ten seconds (only do this if the ambient temperature is greater than 10° C).

The hydraulic pressure warning light should illuminate when you declutch. After a few seconds of turning over the starter, the hydraulic pressure warning light extinguishes. Stop operating the starter. The warning light should re-illuminate.

This shows that :
- The 17 bar circuit operates and is primed.
- No major hydraulic leak on the circuit.
- The 17 bar pressure switch is connected and appears to be operating.

3 . Hydraulic pressure switch

Reconnect fuel injection pump shut-off valve (series 1000 engines) and start the engine at idling .

The hydraulic pressure warning light should extinguish. Wait 4/5 seconds.

Accelerate to more than 1500 rev/min. Wait 4/5 seconds. The warning light should remain extinguished.

This shows that :
- The 17 bar circuit appears to be normal.

4 . Differential lock

Engine idling

4 WD light illuminated.
Press differential lock button.
Differential lock light illuminates.
Press differential lock button again.
Differential lock warning light extinguishes.

This shows that :
- Differential lock button is correct.
- Differential lock warning light is correct.

5 . Brake switch

Engine idling

4 WD light illuminated.
Press differential lock button again.
Differential lock light illuminates.
Unlatch brake pedals. Apply light pressure to each brake pedal in turn. The differential lock warning light should go out as soon as each pedal has left the return stop.

This shows that :
- The two brake switches are correct and well adjusted.

6 . Four wheel drive

Engine idling

4 WD light illuminated.
Press the 4 WD button.
The 4 WD warning light should go out.
Press diff.lock button : 4 WD and diff.lock warning lights come on.
Press both buttons in turn, both lights should extinglish.

This shows that :
- 4 WD button correct.

7 . Lift raising/lowering switch

Engine idling

Lift switch in down position. Press the differential lock button. The differential lock and 4 WD warning lights come on. Then put it to up position : the differential lock warning light should go out. Move the switch to down position, the differential lock warning light should re-illuminate (the 4 WD light stays on).

This shows that :
- The lift raising/lowering switch is working properly.

8 . Hare/tortoise range change

Engine idling. Tractor stationary

Operate the Hare/Tortoise change using the lever. On each movement the Hare/Tortoise warning lights should illuminate alternately.

This shows that :
- The hare/tortoise is correctly wired.
- The range warning lights are correctly wired.

9 . P.T.O.

Engine idling

Engage the P.T.O.
The P.T.O. warning light should come on.
The P.T.O. shaft should start to rotate.

This checks that :
- The P.T.O. switch is correctly wired.
- The P.T.O. warning light is correctly wired.
- The P.T.O. electrovalve is correctly wired.

Disengage the PTO

10. Checking the engine speed sensor

Stop engine

Disconnect 17 bar hydraulic pressure switch.
Start engine on idling.
The hydraulic pressure warning light should illuminate. Wait approx 10 seconds after having released the clutch pedal. If the engine speed sensor is operating, the hydraulic pressure warning light will remain illuminated. If the engine speed sensor is not operating, the hydraulic pressure warning light and the range warning light will extinguish after four seconds.

This shows that :
- The engine speed sensor is operating.

Note : Subsidiary check : in these conditions the 4 WD, differential lock and P.T.O. must not be capable of being engaged. If these functions are operating, this means that there is a problem with the wiring of the hydraulic pressure switch.

Reconnect the hydraulic pressure switch.

11 . Checking the P.TO. speed sensor

Engage the P.T.O. with engine idling.

Disconnect the P.T.O. sensor (near the LH lifting ram). The P.T.O. should stop after 5/6 seconds and the P.T.O. warning light should begin to flash.

Note : Reconnect the sensor. If this is not done the P.T.O. would appear to operate but in reality without progressive engagement and without clutch protection. This is specially designed in such a way that the user can continue to work even if the sensor is faulty. If the P.T.O. does not reengage and the warning light continues to flash, stop the P.T.O., set the engine at 2000 rev/min for thirty seconds minimum then re-engage.

12. Checking the forward speed sensor

Start moving

Check that above 2 Kph the hare/tortoise range change is impossible.

This shows that :
- the forward speed sensor is operating.

Note :
These tests indicate that the sensors are present, electrically connected and operating. These tests do not prove that they have been correctly adjusted. The only way to ensure correct adjustment is by carrying it out again :
- Screw down the sensor fully against the pinion teeth, without forcing it.
- Slacken off the sensor by half to three quarter turn.
- Lock the securing nut moderately - maximum 20 Nm.

13. Hare/tortoise range solenoid wiring

Drive the tractor forward and change the range several times. checking that the forward speed changes. Also check that the range warning light corresponds to the range actually engaged. Above approx 2 Kph , it should be impossible to change the range.

14. Four wheel drive solenoid wiring

Drive the tractor forward at approx 4 Kph. Make as tight a turn as possible. Engage and disengage the 4 WD alternately several times. When 4 WD is engaged you should see the front wheels skid and feel a jerk as you engage and disengage.

This shows that :
- The front axle solenoid is wired and operates.
- The front axle clutch is operating.

15. Differential lock solenoid wiring

Whilst moving along at 4 Kph engage the differential lock.
The 4 WD will engage as well. Make a tight turn, raise and lower the lift. The diff.lock warning light should illuminate and extinguish : you should see the rear tyres skid when the differential lock is engaged, and feel a jerk as you engage and disengage.

This shows that :
- The solenoid is wired and operating.
- The differential lock is operating.

16. Checking the non synchro earth wire

Check presence of a «2 Kph» earth wire on C1(black wire) to ETCU.
If the wire is not present check that C1 terminal of ETCU box is connected to ground. If not add an earth wire.

12 B01 Checking and repair with tester

CONTENTS

A . General

The «Autotronic» is an electronic system including :
- inputs
- Electronic Transmission Control Unit (ETCU)
- outputs

The inputs are created by signal sent from :
- The sensors :
  - . Engine speed
  - . Forward speed
  - . PTO speed

- The switches :
  - . hydraulic pressure
  - . Differential lock
  - . 4 WD
  - . Lift raising/lowering
  - . P.T.O.
  - . Hare/Tortoise
  - . Brake
  - . Clutch

- The earth wire :
  - . non synchro

- Power supply :
  - . + 12 volts
  - . Earth

The outputs activate the following components :
- The warning lights :
  - . Differential lock
  - . 4 WD
  - . P.T.O.
  - . Oil pressure
  - . Hare
  - . Tortoise

- The solenoids :
  - . Differential lock
  - . 4 WD
  - . P.TO. clutch
  - . Hare/Tortoise

According to the state of the inputs (if there is a signal or not), the ETCU controls the corresponding outputs. To check a correct operation of an ETCU system, it is necessary to control simultaneously the inputs and the outputs of the ETCU, i.e. to visualize the state of inputs and outputs. The ETCU tester is the quickest and most efficient equipment to perform this check.

Remarks

- The test procedure must be carried out in the proper order.

- When a ETCU box has been changed, the test procedure should be carried out from start to finish.

Recommended equipment

- 1 ETCU Tester with its harness : 3584002 M92
- 1 Multimeter : MF 3005
- 1 Test screwdriver 12 V.
- 2 Test leads
- 1 Repair kit comprising :
. Repair wires with terminals
. Service tools : 3580817M1, 3580818M1, 3580820M1

B . The ETCU tester

The tester is connected between the tractor harness and the ETCU. The Tester is fitted in parallel with input and output lines.

Description

- On the front face, a decal shows all the inscriptions corresponding to the inputs and outputs. On the left are the inputs, on the right are the outputs such as solenoids. In the middle, are the warning lights which are also on the instrument panel, near the Hare/ Tortoise Range lever.

- On the side of the Tester, are the terminals to allow to make measures without removing the connectors.

Tester installation (see page 5)

- Remove the ETCU box cover and disconnect harnesses at junction A.B.C.
  Caution : To disconnect each connector, press the blade lock as shown by the arrow (Fig. 1).
- Connect the male connectors of the tester harness to the corresponding female connectors of the ETCU.
- Connect the female connectors of the tester harness to the corresponding male connectors of the ETCU harnesses.

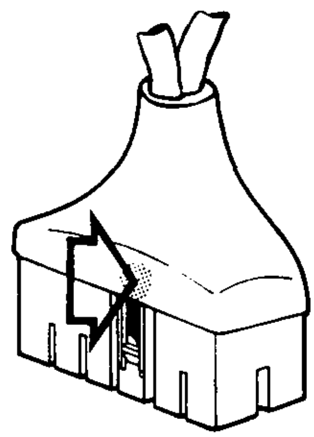


Fig. 1

Note : When a warning light illuminates on the Tester, this does not mean there is a breakdown, but that the control signal comes to or goes out the ETCU.

Example : When the diff.lock button is pressed, the following warning lights should appear on the tester :
- Diff.lock switch
- Diff.lock light
- Diff.lock solenoid

Because the ETCU installation is a system with inputs and outputs, the investigation of a breakdown is based on the following possibilities :

1) The diff.lock button input signal does not come to the ETCU :
   Check the circuit from the input component (example : switch).

2) The input signal comes to the ETCU but no signal comes out of the ETCU to the output (solenoid or warning light) :
   The ETCU is probably faulty.

3) The input signal is present on the ETCU.
   The output signal is correct, but the selected function is not obtained :
   Check the circuit to the controlled component (for example : solenoid, warning light).

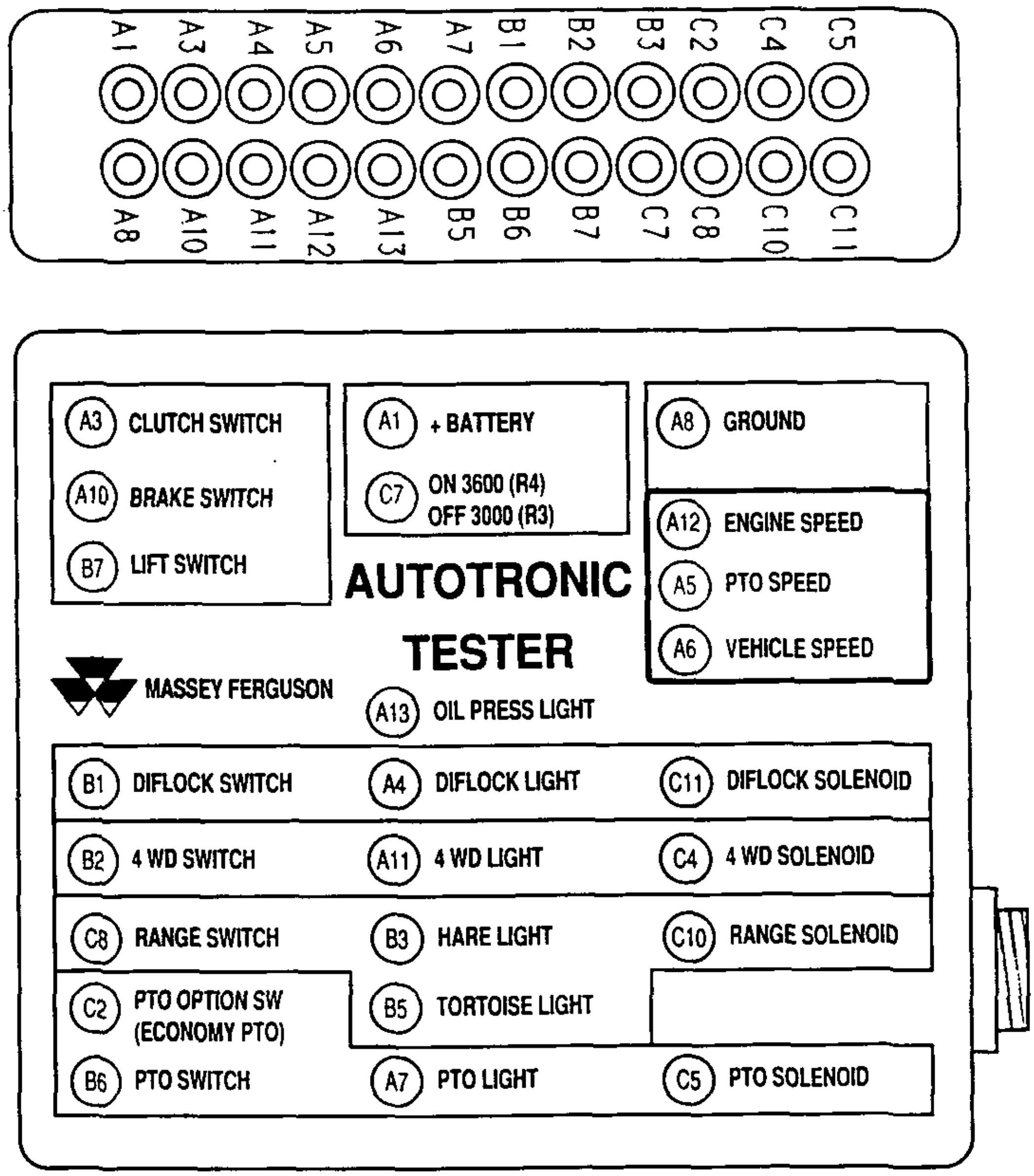
If something appears wrong in the correct operation section, refer to the same section in incorrect operation (12 B01-10 to 17).

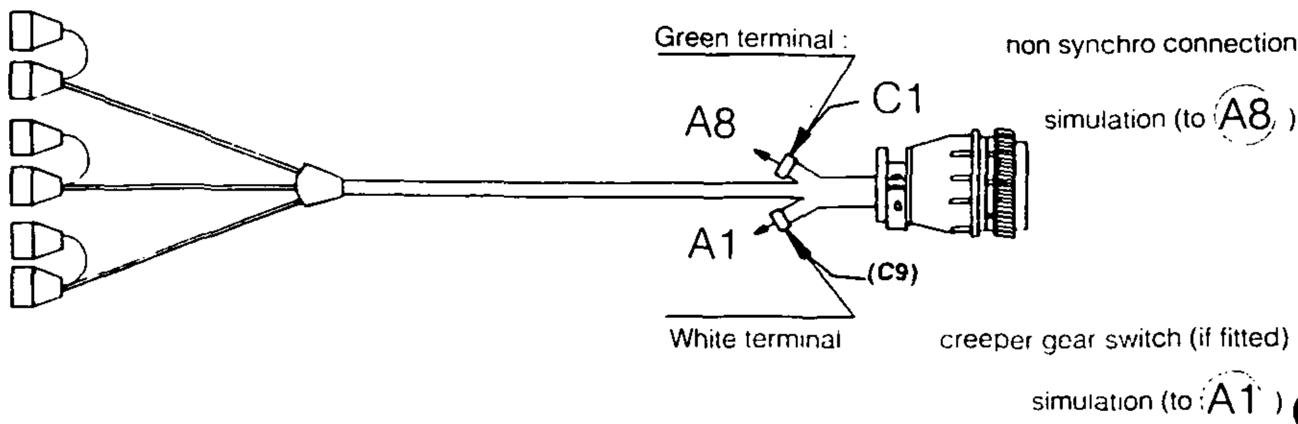
Precaution to be taken

To avoid damaging the tester, only carry out the tests described in this procedure.

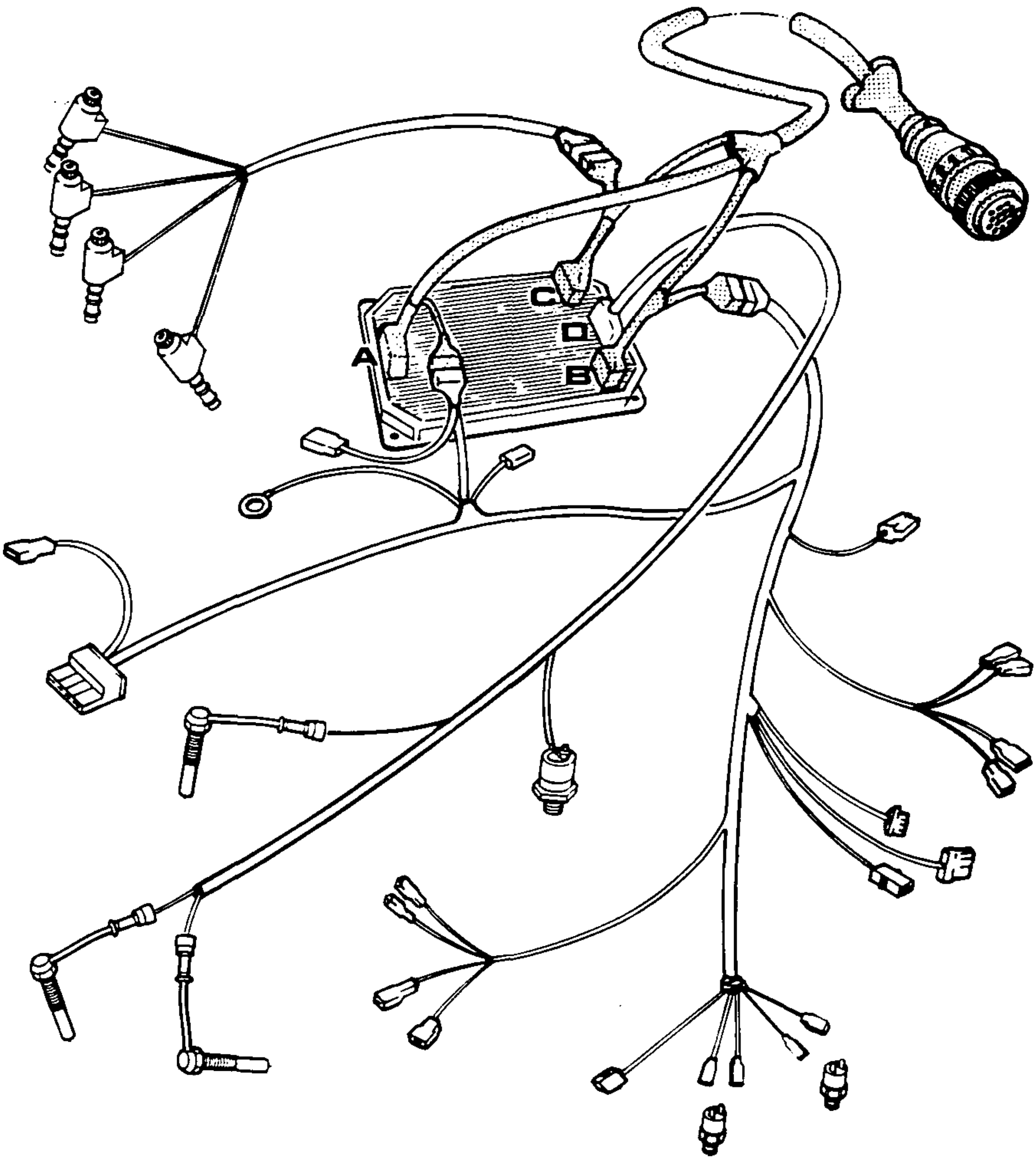
Autotronic

Tester description





Tester harness installation



C . Correct operation

**Note : The following procedure applies from serial n° N047049.
For previous tractors refer to service manual n° 1646650 M1**

PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER
TEST N°1 - Power supply - Engine stopped		
Ignition off Declutch	4 WD light Oil pressure light Hare/Tortoise light } **come on**	Clutch switch Oil pressure light Hare light and range solenoid or Tortoise light 4 WD light } **come on**
Re-engage clutch	After 4 seconds, the lights **go out**	After 4 seconds, the lights **go out**

TEST N°2 - Hydraulic pressure switch - Engine stopped

Declutch	4 WD light Oil pressure light Hare/Tortoise light } **come on**	Clutch switch light Oil pressure light Tortoise light or Hare light and range solenoid 4 WD light } **come on**
Operate the starter without starting engine	Oil pressure light **goes out**	Engine speed light **comes on** Oil pressure light **goes out**

TEST N°3 - Hydraulic pressure switch *- Engine idling*

Start the engine	Hare/Tortoise light 4 WD light } **illuminated**	Tortoise light or Hare light and range solenoid 4 WD light Engine speed light } **illuminated**

PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER

TEST N° 4 - Differential lock - Engine idling

Press the diff. lock button (holding on)	Diff. lock light **comes on** 4 WD light, Range light } **remain illuminated**	Diff. lock switch, Diff. lock light, Diff. lock solenoid } **come on** 4 WD light, *Hare light and Range* solenoid or Tortoise light, Engine speed light } **stay on**
Release diff. lock button	Diff. lock light, 4 WD light, Range light } **remain illuminated**	Diff. lock switch **goes out**
Press diff. lock button once	Diff. lock light **goes out**	Diff. lock light, Diff. lock solenoid } **go out**

TEST N° 5 - Brake switch - Engine idling

Press diff. lock button.	Diff. lock light, 4 WD light } **come on**	Diff. lock switch, Diff. lock light, Diff. lock solenoid, 4 WD light } **come on** Hare light and Range solenoid or Tortoise light, Engine speed light } **stay on**
Apply light pressure to each brake pedal in turn	Diff. lock light **goes out** 4 WD light **stays on**	Brake switch **comes on** Diff. lock solenoid, Diff. lock light } **go out** when pedal is pressed

TEST N° 6 - 4 WD - Engine idling

Press and release brake pedal		Brake switch **comes on** when brake pedal is pressed
Press 4 WD button for less than 2 sec.	4 WD light **goes out**	4 WD switch **comes on** when button pressed 4 WD light **goes out** 4 WD solenoid **comes on** when tractor starts moving

PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER

TEST N°7 - Lift raising/lowering switch - Engine idling

Engage diff.lock , lift/lower switch in neutral or lower Move lift/lowering switch to lift position	Diff. lock light **goes out** 4 WD light **stays on**	Lift switch B7 **comes on** Diff. lock light } **go out** Diff. lock solenoid } 4 WD light **stays on**

TEST N°8 - Hare/Tortoise range change -Engine idling - Creeper gear disengaged - Tractor stationary

Move the range lever	Hare light } **Alternately** Tortoise light } **illuminated**	Hare light and } **Alternately** Range solenoid } **illuminated** orTortoise light } Range switch **comes on** each change

TEST N°9 - P.T.O. - Engine idling

Engage the P.T.O.	P.T.O. light **comes on**	P.T.O. switch } P.T.O. light } **come on** P.T.O. solenoid } P.T.O. speed sensor }
Disengage the P.T.0.		
If economy PTO fitted engage it (shaft not rotating)		P.T.O. option switch light **comes on**

TEST N°10 - Engine speed sensor - Engine stopped. disconnect the hydraulic pressure switch

Start engine on idling Wait for 10 seconds after having released the clutch pedal	Hydraulic pressure light } Range light } **stay on** 4 WD light }	Hydraulic pressure light **stays on** Engine speed sensor } 4 WD light } Hare light and } **come on** Range solenoid or } Tortoise light }
Reconnect the sensor		

PROCEDURE	CAB AND INSTRUMENT PANEL	ON TESTER

TEST N°11 - PTO speed sensor - Engine idling

Engage the P.T.O.	P.T.O. light **comes on**	Engine speed **illuminated** P.T.O. switch **comes on** Hare light and range solenoid or Tortoise light } **illuminated** P.T.O. light and P.T.O. solenoid P.T.O. speed } **come on**
Disconnect the P.T.O. sensor The P.T.O. should stop rotating after 4/5 seconds	P.T.O. light **should begin to flash**	P.T.O. speed light P.T.O. solenoid light } **go out** P.T.O. light **flashes**
Reconnect sensor		

TEST N°12 - Forward speed sensor - Tractor moving

Engage 4 WD Check that above 14 kph, 4 WD disengages automatically	4 WD light should **go out**	Forward speed sensor **on** 4 WD light **goes out** 4 WD solenoid **comes on**
Then decrease speed below 14 kph	4 WD light **comes on**	Forward speed sensor **stays on** 4 WD light **comes on** 4 WD solenoid **goes out**

TESTS N° 13 - 14 - 15 - 16

These tests are covered in the operation and checking (without tester). If you encounter problems refer to n° 13 - 14 - 15 and 16 of incorrect operation, page 12B01-13)

D . Incorrect operation

The numbers in brackets () correspond to the numbers of the tester lights or test jacks on the side.
The numbers not in brackets correspond to the terminal of the tractor harness connector .
For example :
(A1) = Female test jack on tester side
A1 = Terminal 1 on connector **A** of the tractor harness (see 12B01-14).

To prevent a short circuit and therefore damage to the tester ensure that when putting a jump wire from another terminal to (A1), (A1) must be the last to be connected.

In case of only one non-working output, report directly to the correct paragraph a, b, c or d.

GROUND

Bad ground connection of the ETCU may cause an intermittent incorrect working of the electronic system. Always check resistance between terminal A8 of the harness and the negative terminal of the battery.
If R ≃ 0 Ω : correct
If other value : check ground connections on battery or on gearbox cover

TEST N° 1 . Checking power supply

If no light on instrument panel check a, b and c.

a) Power supply engine stopped - ignition off
Check voltage between **A1** and **A8**
If V = 12 V: correct figure. No problem in power supply (see b)
If V = 0 V : incorrect figure. Check voltage between **A1** and chassis
If V = 12 V: break on line **A8**
If V = 0 V : break on line **A1**

b) Clutch switch
Tractor starts when you declutch / Tractor does not start when clutch engaged } Clutch switch correct (see c)

Ignition off, depress the clutch pedal and check *resistance between* **A3** *and* **A8** .
If R = 1- 1.5 ohm correct value
If R = infinity break on line **A3** or clutch switch faulty (see diagram, page 14)

c) Hydraulic pressure switch
1) Check resistance between **D1** and the feed wire (green) connected to the hydraulic pressure switch
If R = 55 to 65 Ω, correct value. See 2.
If R = 0 Ω, short circuit on line **D1**
If R = infinity, break on line **D1**. Check the resistance of the portion of wire including the 60 Ω resistance.

2) Check resistance between **D4** and the black wire connected to the hydraulic pressure switch.
If R = 0 Ω, correct. See 3.
If R = Infinity, break on line **D4**

3) *Disconnect the hydraulic pressure switch.*
Check resistance between **D1** and **D4**.
If R = 0 Ω, short circuit
If R = infinity, correct. See 4.

4) Measure the resistance between the two terminals of the hydraulic pressure switch, correct values :
R = infinity, when engine stopped
R = 0 Ω, when engine running
If not, hydraulic pressure switch faulty

d) Instrument panel hydraulic pressure warning light off
Shunt **(A1)** - **(A13)** with a test lead.
- *If the warning light does not come on* : check line **A13**
- If the warning light comes on refer to the instructions in paragraphs **a**, **b** and **c** above.

e) Instrument panel 4WD light off
See test 6d, page 12B01-11

f) Hare and Tortoise light off
See test 8 b and c, page 12B01-12

TEST N° 2 . Hydraulic pressure switch

a) Hydraulic pressure switch
If the tests performed in paragraph 1C are OK, continue the procedure as follows :
- Check pressure in 17 bar circuit.
- Start engine : check switch closes at 17 bar.
- Stop engine : check switch opens at 9 ± 0.9 bar.
- If opening and closing are correct with tractor running, ETCU is defective.

b) Engine speed sensor
See test 10 page 12B01-12

TEST N° 3 . Hydraulic pressure switch

See test 2 page 12B01-10.

TEST N° 4 . Differential lock

Engine idling, operate the differential lock button.

a) **Diff. lock switch**
Input **(B1)** does not come on, neither do outputs **(A4)** **(C11)**
Now shunt between **(A1)** and **(B1)**
(A4) and **(C11)** come on, then check line **B1**, fuse F12, switch supply or switch
(A4) or **(C11)** remain extinguished, refer to following instructions

b) **Diff. lock warning light**
Output **(A4)** does not come on, shunt between **(A1)** and **(A4)**. If **(A4)** and the diff. lock warning light illuminate, the ETCU is faulty.
If **(A4)** comes on and the diff. lock warning light on instrument panel remains extinguished then check line **A4**

c) **If output (C11) does not comes on :**
Measure voltage between **(C11)** and **(A8)**
If 0 V : ETCU is faulty
If 12 V : check line **C11**

TEST N° 5 . Brake switch

Engine idling, operate the differential lock button to engage the diff. lock.
Press on each brake pedal in turn.
Warning lights **(A4)** and **(C11)** go out.
Warning light **(A10)** illuminates

a) **The input (A10) remains extinguished, therefore (A4) and (C11) stay on.**
Shunt between **(A1)** and **(A10)**
If **(A4)** and **(C11)** come off, check line **A10** (fuse F14, brake switch....).
If **(A4)** and **(C11)** remain extinguished, see instructions b - c.

b) **The input (A10) comes ON and (A4) and (C11) stay on :**
ETCU faulty if test 4 was correct.

TEST N° 6 . 4 WD

Engine idling, 4 WD light ON, operate the 4 WD button after having pressed the brake pedal.

a) **If input (B2) does not come ON, therefore (A11) remains ON**
Shunt between **(A1)** and **(B2)** for less than 2 seconds
If **(A11)** comes OFF, then check line **B2**
If **(A11)** remains ON, refer to next paragraphs.

b) **If (B2) comes ON and (A11) does not come OFF**
the ETCU is faulty

c) **If the output (C4) does not illuminate when moving**
Measure voltage between **(C4)** and **(A8)**
If = 12V : check line **C4** to solenoid.
If = 0 V : the ETCU or the forward speed sensor are defective (see test 12 p. 12B01-13).

d) **If the output (A11) does not come on**
Shunt between **(A1)** and **(A11)**
If **(A11)** and 4 WD warning light come on, the ETCU or its connections are faulty.
If **(A11)** comes on and the 4 WD warning light remains extinguished, check line **A11**

TEST N° 7 . Lift raising/lowering switch

With the electronic lift operating normally, push the differential lock button, so that diff. lock and 4 WD engage. Put the lift/lower toggle switch to the lift position.
Warning light **(A4)** and **(C11)** go out
Warning light **(A11)** remains illuminated.

a) Warning lights (A4) and (C11) remain illuminated.
Shunt between **(A1)** and **(B7)**
If **(A4)** and **(C11)** go out, check line **B7** (connection between ELC and Autotronic)
If **(A4)** and **(C11)** stay on, the ETCU or its connections are faulty

TEST N° 8 - Hare/Tortoise range change

If a creeper gear is fitted, carry out the tests with creeper gear disengaged.
With engine idling, operate the range lever Hare/Tortoise.
(C8) should come on each time a range is selected.
(B5) or **(B3)** will come on alternately
(C10) will illuminate every time **(B3)** is on.

a) Input (C8) stays off.
Shunt between **(C8)** and **(A1)** while maintening the range lever on left position.
If **(B5)** or **(B3)** comes on, check line **C8**
If **(B5)** and **(B3)** remain off, ETCU or its connections are faulty.

b) Output (B3) never illuminates
Shunt between **(A1)** *and* **(B3)**
If **(B3)** and the Hare warning light come on, the ETCU or its connections are faulty.
If **(B3)** is on and the Hare warning light remains off, check line **B3**.

c) Output (B5) never illuminates
Shunt between **(A1)** and **(B5)**
If **(B5)** and the Tortoise warning light illuminate, ETCU or connections are faulty.
If **(B5)** illuminates and the Tortoise light remains off, check line **B5**
If each time you change the range, the opposite warning light for the range selected illuminates, the wires have been crossed at the warning lights.

d) Output (C10) never comes on
Measure voltage between **(C10)** and **(A8)**. Operate the range lever.
If 12 V or 0 V according to the position of lever check line **C10**
If always O V, no matter what the position of the lever, the ETCU or its connections are defective.

TEST N° 9 . PTO

Engine idling - engage PTO
(B6) (A7) (C5) (A5) come on.
a) Input light (B6) stays off, therefore (A7) (C5) (A5) as well
Shunt between **(B6)** and **(A1)**
If **(A7)** *or* **(C5)** *or* **(A5)** *come on, check line* **B6**
If **(A7)**, **(C5)** *and* **(A5)** *remain off, ETCU or its connections are faulty*

b) Output (A7) does not come on
Shunt between **(A7)** and **(A1)**
If **(A7)** and the P.T.O. warning light come on, ETCU or its connections are faulty.
If **(A7)** *comes on and the P.T.O. warning light remains extinguished, check line* **A7**

c) Output (C5) does not come on
Measure voltage between **(C5)** and **(A8)**
If value = 12 V , check line **C5**
If value = 0 V , ETCU or connections are faulty

d) Output light (A5) does not come on and the PTO shaft is not rotating
Check solenoid or line C5.

e) Output light (A5) does not come on and PTO shaft is rotating
Measure resistance between **D6** and **D7**
If R = 450 ohms : check connections **D6** and **D7**
Check the adjustment of the P.T.O. speed sensor.
If R = 0 ohm : short circuit on lines **D6** and **D7**
If R = infinity : break on line **D6** or **D7**

TEST N° 10 .Engine speed sensor

a) Engine stopped, disconnect connector D
Measure resistance between **D2** and **D3**
If R = 450 ohms : check connections **D2** and **D3** to ETCU then see b.
If R = 0 ohm : short circuit between lines **D2** and **D3**
If R = infini : break on line **D2** or **D3**

b) Sensor adjustment
Screw down the sensor until it is in contact with the pump gear.
Slacken off by 1/2 to 3/4 of a turn, lock the securing nut to 20Nm max.

TEST N° 11 .PTO speed sensor

a) Engine stopped, disconnect connector D
Measure resistance between **D6** and **D7**
If R = 450 ohms : check connections **D6** and **D7** on ETCU then see b.
If R = 0 ohm : short circuit between lines **D6** and **D7**
If R = infini : break on line **D6** or **D7**

b) Sensor adjustment
Screw down the sensor until it is in contact with the PTO gear
Slacken off by 1/2 to 3/4 of a turn, lock the securing nut to 20 Nm max.

TEST N° 12 . Forward speed sensor

a) Engine stopped, disconnect connector D

Measure resistance between **D4** and **D5**

- R = 450 ohms : check connections **D4** and **D5** on ETCU then see b.
- R = 0 ohm : short circuit between lines **D4** and **D5**
- R = infini : break on line **D4** or **D5**

b) Sensor adjustment

Screw down the sensor until it is in contact with the differential crownwheel.
Slacken off by 1/2 to 3/4 of a turn, lock the securing nut to 20Nm max.

TEST N° 13 . Hare/Tortoise range solenoid wiring

If test 8 was correct, check the solenoid (line C10, ground,....)

TEST N° 14 . 4 WD solenoid wiring

If test 6 was correct, check the solenoid (line C4, ground,....)

TEST N° 15 .Differential lock solenoid wiring

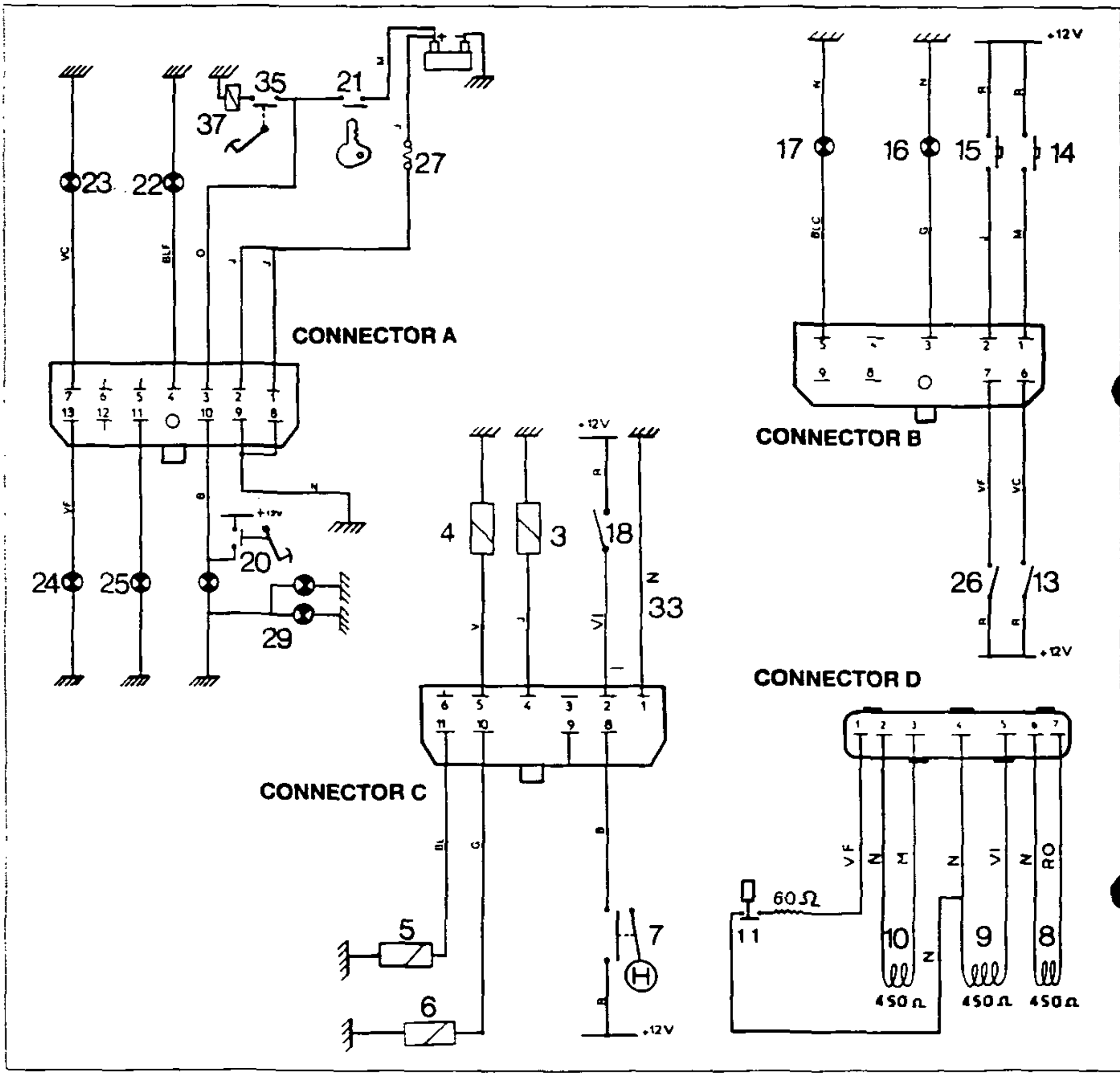
If test 4 was correct, check the solenoid (line C11, ground,....)

TEST N° 16 .Checking the non synchro earth wire

Check that a black wire connected to earth is present on the terminal **C1**. If it is not the case, check that the terminal **C1** of the ETCU is connected to ground. If not, add an earth wire.

Note : (C7) warning light should not be illuminated, otherwise check for a short circuit on line C7.

E. Identification of terminals on tractor harness connectors



Wire colour

B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
C = Light
F = Dark

Component description

3 . 4 WD solenoid
4 . P.T.O. solenoid
5 . Differential lock solenoid
6 . Hare/Tortoise solenoid
7 . Hare/Tortoise switch
8 . P.T.O. speed sensor
9 . Forward speed sensor
10 . Engine speed sensor
11 . Hydraulic pressure switch
13 . P.T.O. switch
14 . Differential lock button
15 . 4 WD button
16 . Hare warning light
17 . Tortoise warning light
18 . Economy PTO switch
20 . Brake switch
21 . Starter switch
22 . Differential lock warning light
23 . P.T.O. warning light
24 . Oil pressure warning light
25 . 4 WD warning light
26 . Lift raising/lowering switch
27 . Fuse 10 A
29 . Stop lights
33 . Non synchro earth wire
35 . Safety switch
37 . Starter motor

F . WIRING DIAGRAM (with ETCU)

Components description

1 . Transmission control unit box (TCU)
2 . PTO brake solenoid *
3 . 4 WD solenoid
4 . P.T.O. solenoid
5 . Differential lock solenoid
6 . Hare/Tortoise solenoid
7 . Hare/Tortoise switch
8 . P.T.O. speed sensor
9 . Forward speed sensor
10 . Engine speed sensor
11 . Hydraulic pressure switch (17 bar)
13 . P.T.O. switch
14 . Differential lock button
15 . 4 WD button
16 . Hare warning light
17 . Tortoise warning light
18 . 4 speed PTO switch *
19 . PTO brake switch *
20. Brake switch
21 . Starter switch
22 . Differential lock warning light
23 . P.T.O. warning light
24 . Oil pressure warning light
25 . 4 WD warning light
27 . Fuse 10 A (to starter + permanent)
28 . Fuse 25 A (to starting contact + after contact)
34 . Fuse 15 A (brake contact)
35 . Safety switch
36 . Alternator
37 . Starter motor
38 . Battery
39 . Fuse 7,5 A (Instrument panel)
41 . Fuse 7,5 A (ELC permanent supply)
67 . Speedshift switch *
68 . Speedshift solenoid *

* Not controlled by the TCU

Harness identification

(a) Main harness, instrument panel
(b) Engine harness
(d) Console harness
(m) Electronic harness, instrument panel
(n) Electronic harness, cab/console
(o) Battery harness
(p) Electronic harness transmission
(q) Sensor harness
(s) Harness, instrument panel and ETCU
(v) Harness, instrument panel lighting

Wires colour

A = Aluminium
B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
C = Light
F = Dark

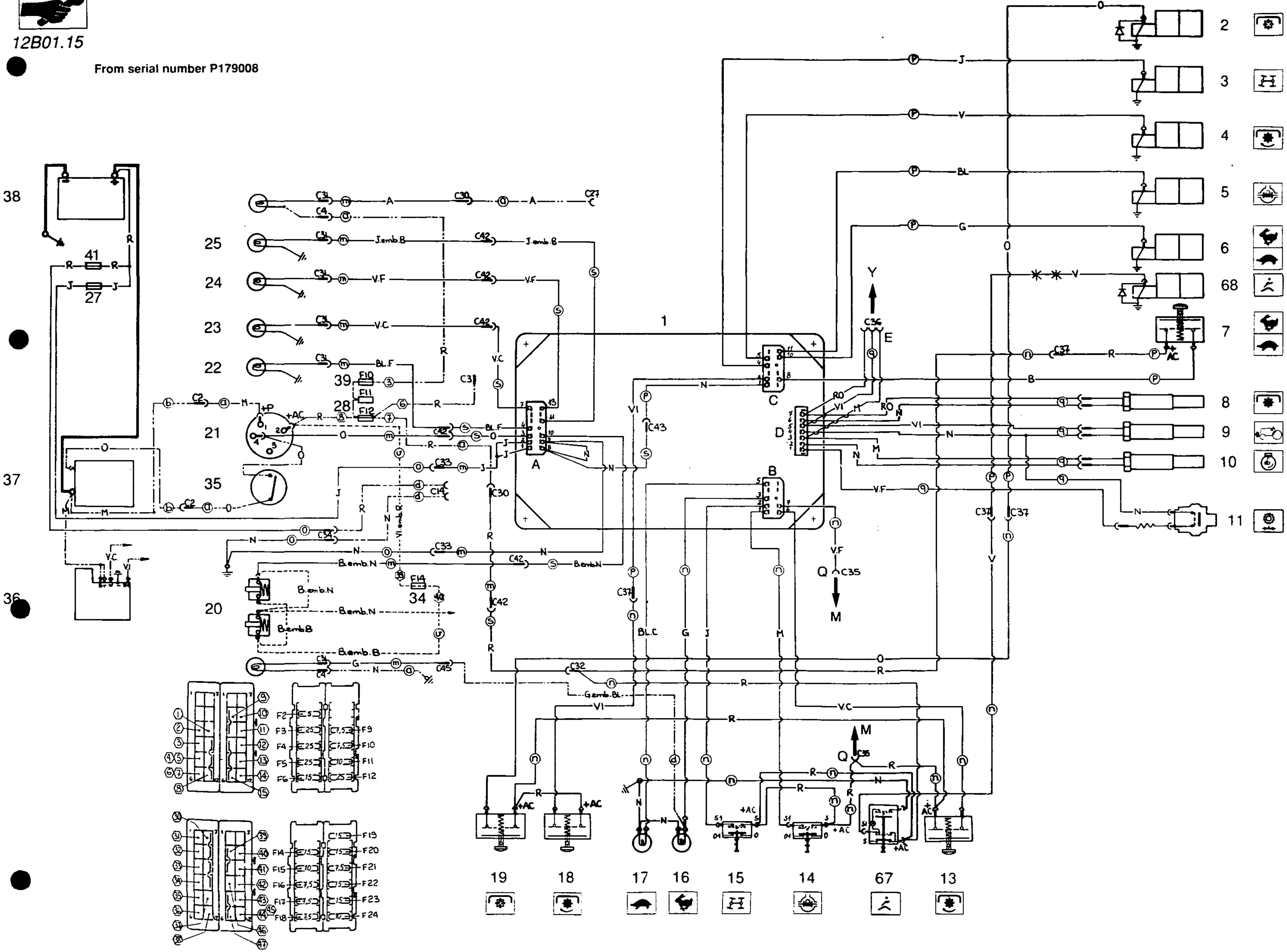
Wiring diagram abbreviations

Emb : End
+ AC : *+ after contact*
+P : Permanent live
— -- — : Engine harness wiring
— — — : Lighting harness wiring
** : not connected on tractors with super creeper gear

Connector identification

A : 13-way connector on TCU
B : 9-way connector on TCU
C : 11-way connector on TCU
D : 7-way connector on TCU
C1 : 9-way black connector, under engine hood
C2 : 9-way black connector, red band, under engine hood
C3 : 6-way black connector
C4 : 5-way white connector (instrument panel)
C14 : 5-way white connector
C27 : not connected
C30 : 2-way black connector
C31 : 7-way white connector (instrument panel)
C32 : 1-way black connector
C33 : 2-way black connector
C34 : 2-way black connector
C35 : 2-way white connector
C36 : 3-way white connector
C37 : 6-way black connector 4 way
C42 : 8-way black connector under instrument panel
C43 : 1-way white connector
C45 : 1-way black connector

From serial number P179008



SIMPLIFIED DIAGRAM

Components description

1 . Transmission control unit box (TCU)
2 . PTO brake solenoid *
3 . 4 WD solenoid
4 . P.T.O. solenoid
5 . Differential lock solenoid
6 . Hare/Tortoise solenoid
7 . Hare/Tortoise switch
8 . P.T.O. speed sensor
9 . Forward speed sensor
10 . Engine speed sensor
11 . Hydraulic pressure switch (17 bar)
13 . P.T.O. switch
14 . Differential lock button
15 . 4 WD button
16 . Hare warning light
17 . Tortoise warning light
18 . 4 speed PTO switch *
19 . PTO brake switch *
20. Brake switch
21 . Starter switch
22 . Differential lock warning light
23 . P.T.O. warning light
24 . Oil pressure warning light
25 . 4 WD warning light
27 . Fuse 10 A (to starter + permanent)
28 . Fuse 25 A (to starting contact + after contact)
34 . Fuse 15 A (brake contact)
35 . Safety switch
36 . Alternator
37 . Starter motor
38 . Battery
39 . Fuse 7.5 A (instrument panel)
40 . Fuse 7.5 A (lift - engine running)
41 . Fuse 7.5 A (lift + direct battery)
53 . Lighting switch
54 . Fuse 7.5 A
55 . Resistor
57 . Alternator warning light
67 . Speedshift switch *
68 . Speedshift solenoid *

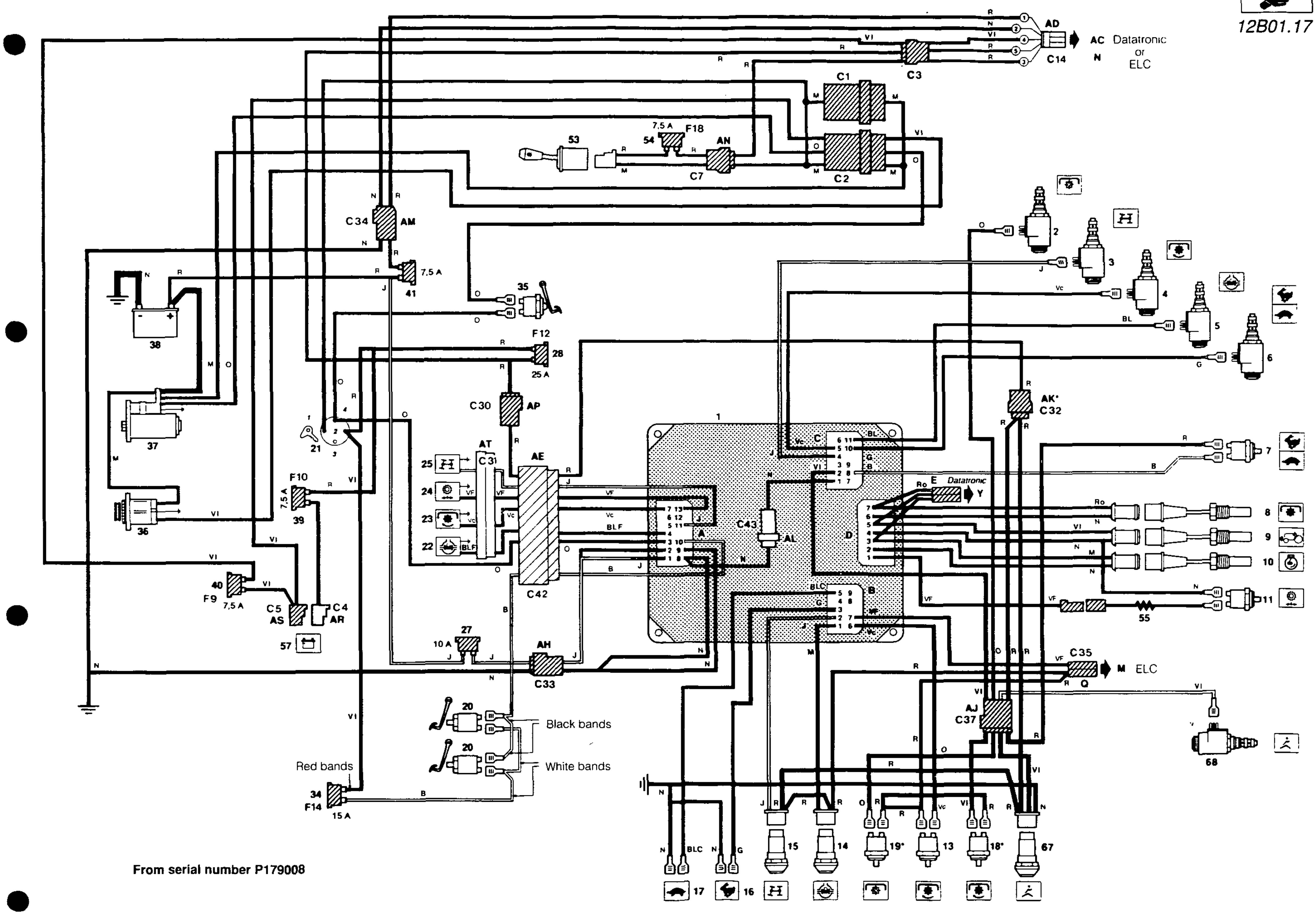
* Not controlled by the TCU

Wires colour

A	=	Aluminium
B	=	White
BL	=	Blue
G	=	Grey
J	=	Yellow
M	=	Brown
N	=	Black
O	=	Orange
R	=	Red
RO	=	Pink
V	=	Green
VI	=	Violet
C	=	Light
F	=	Dark

Connector identification

A	: 13-way connector on TCU
B	: 9-way connector on TCU
C	: 11-way connector on TCU
D	: 7-way connector on TCU
E	: 3-way white connector. Autotronic/Sensors harness(junction with Datatronic. connector Y)
Q	: 2-way white connector. TCU junction with ELC harness (connector M)
AD	: 5-way white connector, console harness junction with Datatronic and/or ELC (connector AC or N)
AE	: 8-way black connector, instrument panel harness junction with Autotronic harness
AH	: 2-way black connector, permanent power supply to "Autotronic"
AJ	: 6-way black connector
AK	: 1-way black connector, switches power supply (ignition on)
AL	: 1-way white connector
AM	: 2-way black connector. ELC power supply and ground
AN	: 4-way white connector. ELC console lighting
AP	: 2-way black connector, switches power supply (ignition on)
AR	: 5-way white connector, junction with instrument panel
AS	: 7-way black connector, junction with instrument panel
AT	: 7-way white connector, junction with instrument panel
C1	: 9-way round black connector located under the engine hood
C2	: 9-way round black connector (red band) located under the engine hood
C3	: 6-way black connector



From serial number P179008

G . WIRING DIAGRAM (without Autotronic)

Components description

2 . PTO brake solenoid
3 . 4 WD solenoid
4 . P.T.O. solenoid
5 . Differential lock solenoid
6 . Hare/Tortoise solenoid
7 . Hare/Tortoise switch
11 . Hydraulic pressure switch (17 bar)
13 . P.T.O. switch
14 . Differential lock button
15 . 4 WD button
16 . Hare warning light
17 . Tortoise warning light
19 . PTO brake switch
21 . Starter switch
22 . Differential lock warning light
23 . P.T.O. warning light
24 . Oil pressure warning light
25 . 4 WD warning light
27 . Fuse 10 A (to starter + permanent)
28 . Fuse 25 A (to starting contact + after contact)
36 . Alternator
37 . Starter motor
38 . Battery
39 . Fuse 7,5 A
41 . Fuse 7,5 A (ELC + direct)
67 . Speedshift switch
68 . Speedshift solenoid
69 . Telebreaker
70 . Oil pressure switch (17 bar)

Harness identification

(a) Main harness, instrument panel
(b) Engine harness
(d) Console harness
(m) Electronic harness, instrument panel
(n) Electronic harness, cab/console
(o) Battery harness
(p) Electronic harness transmission

Wires colour

A = Aluminium
B = White
BL = Blue
G = Grey
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
C = Light
F = Dark

Wiring diagram abbreviations

Emb : End
+ AC : + after contact
+P : Permanent live
—— -- —: Engine harness wiring

Connector identification

C1 : 9-way black, connector, under engine hood
C2 : 9-way black, connector, red band, under engine hood
C3 : 6-way black, connector
C4 : 5-way white, connector (instrument panel)
C14 [illegible]-way white connector
C30 : 2-way black connector
C31 : 7-way white connector (instrument panel)
C32 : 4-way black connector
C33 : 2-way black connector
C34 : 2-way black connector
C37 : 8-way black connector
C41 : 1-way black connector
C45 : 1-way black connector

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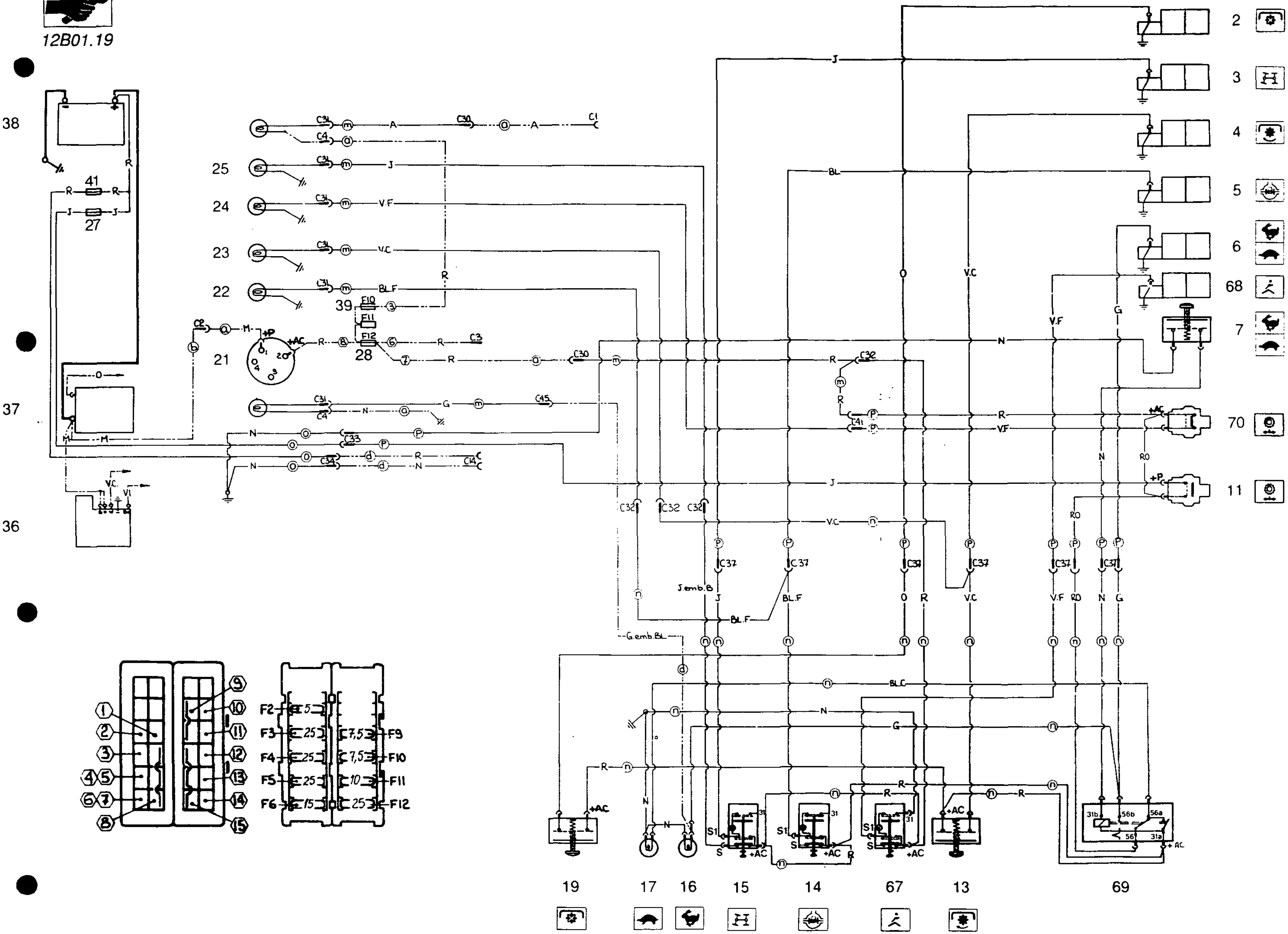

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F10
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F12
C1
C2
C3
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C30
C31
C32
C33
C34
C37
C41
C45
+P
+AC
Gemb.BL
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BL.C
V.C
V.F
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12 C01 Dynashift System

CONTENTS

A . General

The «Dynashift» system controls consist of six main components.

(1) Control lever
Located near the steering wheel, to the left of the steering column, it selects the four ratios A, B, C, D without declutching. It operates a four-position switch whose terminals are linked to the electronic control unit **(2)**.

(2) Elecronic control unit
Fixed above the clutch pedal, it is supplied by the + 12V after ignition line and is connected to earth through the Autotronic harness.
Depending on the data sent by the control lever (switch) **(1)** and the data provided by the Autotronic system, (hydraulic pressure, theoretical tractor speed, engine speed, clutch switch state) it authorizes gear changes by supplying the solenoid valves **(3)** and activating the warning lights **(4)**.
The unit can include an internal system for limiting speed to 30 km/h (for certain markets).

(3) Solenoid valves
Mounted in an external valve block at the front right of the gearbox, they supply the Dynashift unit.
They have two terminals (supply and earth).
The upper solenoid valve is identified by its brown connector.
The lower solenoid valve is identified by its black connector.

(4) Warning lights
Located on the instrument panel, they indicate the Dynashift ratio (A, B, C or D) which is currently engaged.
If they flash, this indicates that this ratio does not correspond to the lever position.

(5) The electrical harness connects the different components.

(6) The temperature sensor fitted on the gearbox selector cover to measure the transmission oil temperature. It is fitted from serial numbers :
- 3600 : A296013
- 3100 : A290012
- 3000 : A295035

In that case, the electronic control unit is fitted with a 17-way connector instead of a 15-way connector.

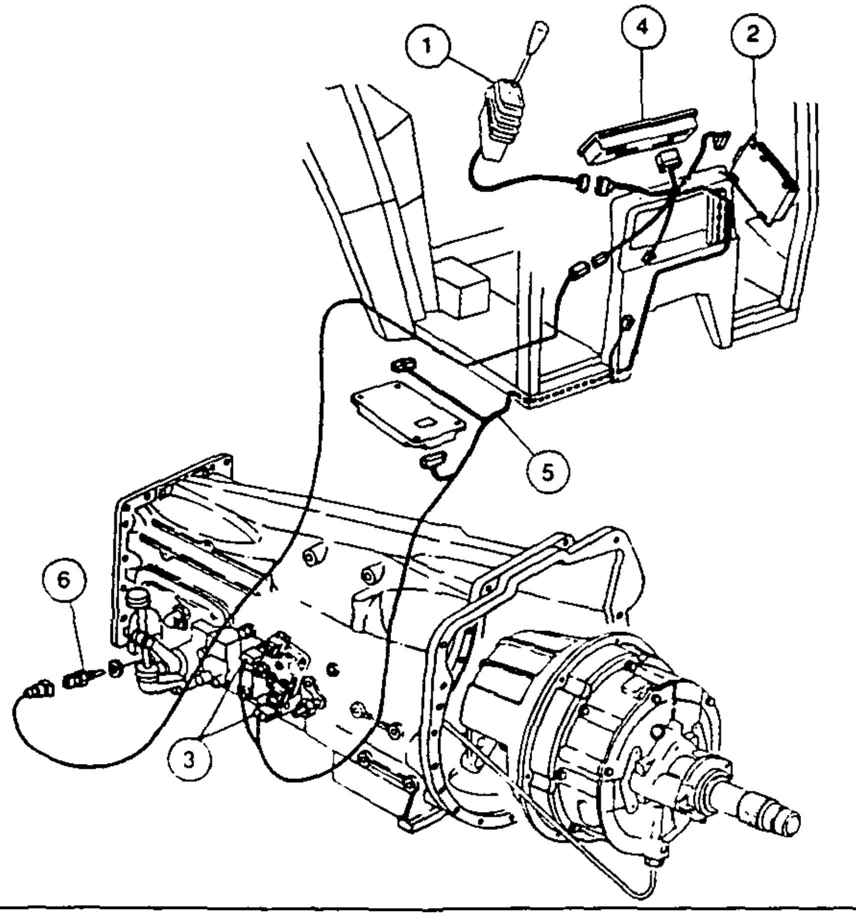


Fig. 1

B . Control unit functions

The control unit carries out of certain number of automatic functions which can easily be checked while driving the tractor.

1. Time delay

By moving the lever directly from position A to positions C or D the Electronic Control unit will shift the intermediate ratios.
Example : If the lever is moved from A to D, gearbox ratios B, C and D are engaged in succession. This is indicated by the warning lights.
This does not apply when the theoretical tractor speed is zero and the clutch is depressed.
The shifting of the intermediate ratios is interrupted when the clutch is depressed while the tractor is moving (simultaneous change of the Dynashift and the synchronised gears).

2. Max. engine speed

All shifting of lower ratios are ignored when the engine speed measured by the Autotronic sensor is greater than 2400 rev/min.

3. Engine speed drop

If, during an automatic ratio change (see paragraph 1), the engine speed falls by more than 12 %, the system locks itself in the gear engaged. The corresponding light flashes.
A change to the next gear will only be authorized if the engine speed rises again.

4. Hydraulic pressure drop

When a hydraulic pressure drop is detected by the Autotronic pressure switch, the Electronic Control unit goes into «Alarm» mode. The four instrument panel warning lights go on. The engaged ratio is locked but the system will automatically change to ratio D as soon as tractor speed is zero.

5. Electrical fault detection on control lever

If the Electronic Control unit detects an electrical fault on the control lever, it goes into «Alarm» mode and will :
- automatically change to D ratio
- light the A, C and D lights

In this case, check the lever lines as indicated in test 3 of the test procedure.

6. Electrical fault detection on solenoids (Electronic Control unit with 17 terminals only)

If the Electronic Control unit detects a break on the solenoid lines, it will shift to alarm mode and :
- change to D ratio
- light A, B and D lights for a fault on solenoid EV1 (brown connector)
- light B and C lights for a fault on solenoid EV2 (black connector)

In that case, check line continuity.

7. Speed limit 30 km/h (for certain markets)

The control unit prevents the maximum legal speed being exceeded by automatically selecting the lower Dynashift ratio (e. g. : 4 D to 4 C or 4 C to 4 B).
Before the change, the light for the engaged ratio flashes, then the 4 lights flash to inform the operator.
To take over control of the system, the lever must then be returned to the position corresponding to the ratio which has just been automatically selected.
Warning: This limit takes account of the theoretical tractor speed measured by the Autotronic sensor and not the real speed measured by the Datatronic radar.

8. Temperature monitoring

If the temperature of the transmission oil is below 0° Celsius when the tractor is started, the Electronic Control Unit will shift to alarm mode and :
- maintain D ratio engaged whatever the lever position is.
- light A and D are on.

With 30 km/h version, if the speed of the tractor exceeds 30 km/h while the temperature is below 0° Celsius, the Dynashift will automatically shift to B ratio.
In all cases, as soon as the temperature reaches the 0° Celsius limit, this will be indicated by :
- A and D lights flashing (40 km/h version)
- D or B light flashing according to engaged ratio (30 km/h version).

It will be possible to change the ratio after having put the control lever on the position corresponding to the engaged ratio (D or eventually B).

C . Test procedure

The system has its own test program.
A test switch **(I)** is installed on the unit electronic circuit (Fig. 2) :
- letter **W** or white dot = "Work" position
- letter **T** or red dot = "Test" position

Before carrying out the test, open the box, remove the printed circuit card and reconnect it to the harness.
Avoid touching the electronic components.
Check that the switch is in "work" position.
In the event of a fault, check the component concerned, the line continuity up to the Autotronic system and the line continuity of the Autotronic-Dynashift unit link.
Note: In all cases, carry out a quick check of the Autotronic system before referring to the Dynashift unit test. If a fault is detected, repair it before testing the Dynashift control unit.

Start the engine.

Test 1: Supply line and warning lights test

- Move the switch to "Test" position
- The four warning lights flash ten times.
- Then light A remains lit (ready to continue).

Fault:
- If the warning lights do not light at all: check the power supply (Dynashift connector terminal 8), the 5A in-line fuse on the unit supply line, the cab relay fuses F6, F11, the earth, etc.
- If one light does not operate: check the bulb and the wiring (terminals 7, 14, 6, 13 of the connector J1).

Test 2: Clutch switch test

- Move the switch to «Work» position. Lights A and B must be lit. They must change from A, B to C, D each time the clutch is pressed.

Fault:
- Check the clutch switch and the corresponding lines (terminal 4 of connector J1).

- Move the switch to the "Test» position.
- Light B lit : ready to continue.

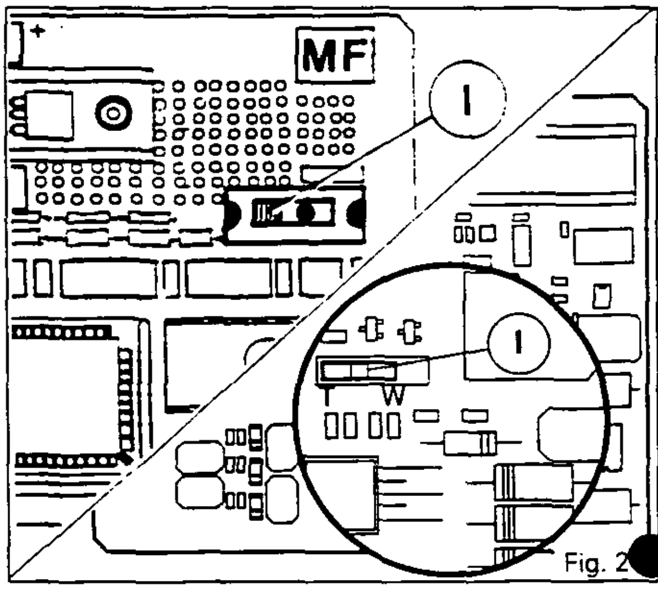


Fig. 2

Test 3: Control lever test

Note: a fault on the lever must have previously been detected during working.
-Move the switch to «Work» position.
-The corresponding light must be lit for each lever position.
The solenoid valves do not react.
Fault: Disconnect the lever
- Check terminal 4 supply
- Check the continuity between terminals 1, 2, 3 and 4 for each lever position (see table).

Connector J3				
Terminal	1	2	3	4
A				+
B	+			+
C	+	+		+
D	+	+	+	+

- Check the continuity of the lines between connectors J3 and J1 :

Lever (J3)	Dynashift (J1)
1	5
2	11
3	3
4	8

- Move the switch to «Test» position.
- *Lights A and B lit : ready to continue.*

Test 4 : Testing solenoid valve supply according to lever position.

- Move the switch to "Work" position.
- Check that the solenoid valves are correctly supplied for each lever position.

	Line	A	B	C	D
Brown connector EV1	Yellow	+12V	+12V	0 V	0 V
Black connector EV2	Dark blue	0 V	+12V	+12V	0 V

CAREFUL : With 17 terminals Electronic Control unit, do not disconnect the solenoids to avoid shifting to alarm mode. The solenoid valve supply can be checked using two lamps of 6 watts approx. (maximum 10 watts).

Fault:

- Check the supply directly at terminals 2 and 10 of the connector J1. If correct, check the lines up to the solenoid valves and to the earth. If correct, change the control unit.

- Move the switch to «Test» position.
- Light C lit : ready to continue.

Test 5: Engine speed sensor test

- Move the switch to «Work» position.
- Lights A and D must be lit when the engine speed is less than 1000 rpm.
- Lights A, B, C and D must be lit when the engine speed is greater than 1000 rpm.

Fault:

- Check the continuity of connector line n°9 J1.
- Check the continuity of the sensor lines (see Autotronic tests, connector D) and of Autotronic output A12.
- Check sensor adjustment.
- Check the Autotronic calculator.
- If it is not possible to reach an engine speed less than 1000 rpm, slightly modify the idle speed adjustment of the injection pump.

- Move the switch to «Test» position.
- Lights A and C lit : ready to continue.

Test 6 : Forward speed sensor test

- Move the switch to «Work» position.
- Drive the tractor forward:
  . lights A and D must be lit for a tractor speed less than 3 km/h
  . the lights A, B, C, D must go on for a tractor speed greater than 3 km/h

Fault:

- First of all, check the continuity of Dynashift connector line n°1
- Check the continuity of the sensor lines (Autotronic test) and of Autotronic output A6.
- Check sensor adjustment.
- Check the Autotronic calculator.

- Move the switch to «Test» position.
- Lights B and C lit : ready to continue.

Test 7 : Hydraulic pressure switch test

- Move the switch to "Working" position.
- Lights A and D must be lit.
  Disconnect the hydraulic pressure switch to simulate a hydraulic pressure drop: the four lights must be lit.
- Reconnect the hydraulic pressure switch.
- Lights B and C go off.

Fault:

- First of all, check the continuity of Dynashift connector line n° 12.
- Check pressure switch opening and closing (see Autotronic test).
- Check the continuity of the pressure switch lines to the Autotronic system.
- Check Autotronic output A13 (12V pressure switch open - 0V pressure switch closed).

- Move the switch to «Test» position.
- Lights A, B and C are lit : ready to continue

15-WAY ELECTRONIC CONTROL UNIT

Test 8 : End of test

- Move the switch to «Work» position.
- The four lights go on one by one continuously, this indicates the end of the test.

- Move the switch to «Test» position.
- Light D is lit: ready to continue.

Return to working conditions

- Move the switch to "Work" position.
- The solenoid valves and the warning lights must switch on in accordance with lever position.

17-WAY ELECTRONIC CONTROL UNIT

Test 8 : Temperature sensor lines test

- Disconnect the temperature sensor fitted on the gearbox selector cover.
- Move the switch to "Work" position.
- Lights A, D must be lit
- Put a short on the sensor connector.
- Lights A, B, C, D must be lit.

Fault :

- Check lines to the Electronic control unit

- Move the switch to "Test" position
- The light D must be lit : ready to continue
- Reconnect the sensor

Test 9 : Temperature sensor test

- Move the switch to "Work" position.
- The lights A, D are lit if the temperature is over 0° Celsius ± 2.
- The lights A, B, C, D are lit if the temperature is below 0° Celsius ± 2.

Fault :

- Check the resistance of the sensor :
  - R = 10,7 K Ω (± 1,3) at 0° Celsius
  - R = approx. 4,0 K Ω at 20° Celsius
  - R = approx. 0,5 K Ω at 50° Celsius
- Check continuity lines
- Check the adjustment of the limit temperature after having finished the test.

- Move the switch to "Test" position.
- The lights A, D must be lit = ready to continue

Test 10 : End of test

- Move the switch to "Work" position.
- The four lights go on one by one continuously, this indicates the end of the test.
- Move the switch to "Test" position.
- The lights B and D are lit.

Return to working mode

- Move the switch to "Work" position.
- The solenoid valves and the warning lights must switch on in accordance with the lever position

If the results of the test procedure are positive and if the system still operates incorrectly (impossible to select one or more ratios):

- *Check the earth very precisely (RH gearbox cover)*
- *Check the resistances of the two solenoid valves.*
- *Check the operation of the spools (see pressure measurement, chapter 8 K01 p. 5).*

Note:

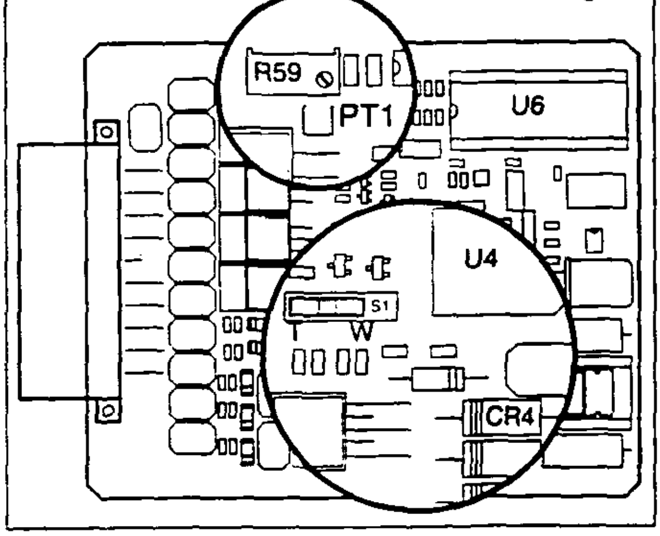
1. ***Before closing the control unit, ensure that the switch is in the "Work" position.***
2. ***If the test is interrupted, disconnect the control unit and repeat the procedure starting from test n° 1. A test may have been disrupted if the switch is not moved fully into position.***

Checking the low temperature monitoring system

- Check voltage between points PT1 and CR4 of the electronic card (see Fig. 3).
- The voltage must be 3,06 VDC (± 0,1)
- If the voltage is not correct, turn the potentiometer screw fitted over PT1 to obtain the correct value.

Note : It is very important to maintain this adjustment to keep the low temperature monitoring operating correctly.

Fig. 3



Test summary : engine running

	WARNING LIGHTS ON	A B C D	
SWITCH POSITION	**IN WORKING POSITION**	**IN TEST POSITION**	**FUNCTION TESTED**
TEST 1	-	A B C D flash then A	Supply and warning lights
TEST 2	A B or C D declutched	B	Clutch switch
TEST 3	A or B or C or D depending on lever position	A B	Lever
TEST 4	Same - Check solenoid valves supply	C	Solenoid valves
TEST 5	A - D when V < 1000 rev/min A B C D when V > 1000 rev/min	AC	Engine speed sensor
TEST 6	A - D when V < 3 km/h A B C D when V > 3 km/h	B C	Forward speed sensor
TEST 7	A D pressure switch connected A B C D pressure switch disconnected	A B C	Hydraulic pressure switch

15-WAY ELECTRONIC CONTROL UNIT (WITHOUT TEMPERATURE SENSOR)

TEST 8	A then B then C then D continuously	D	End of test
WORK	According to lever position	-	Return to working mode Travail

17-WAY ELECTRONIC CONTROL UNIT (WITH TEMPERATURE SENSOR)

TEST 8 (temperature sensor disconnected)	A D open A B C D short	D	Temperature sensor lines
TEST 9	A D over 0° C A B C D below 0° C	A D	Temperature sensor
TEST 10	A then B then C then D	B D	End of test
WORK	According to lever position	-	Return to working mode

Autotronic - *Dynashift*

D . Wiring diagram, without temperature sensor (up to A296013)

Wire colour coding :

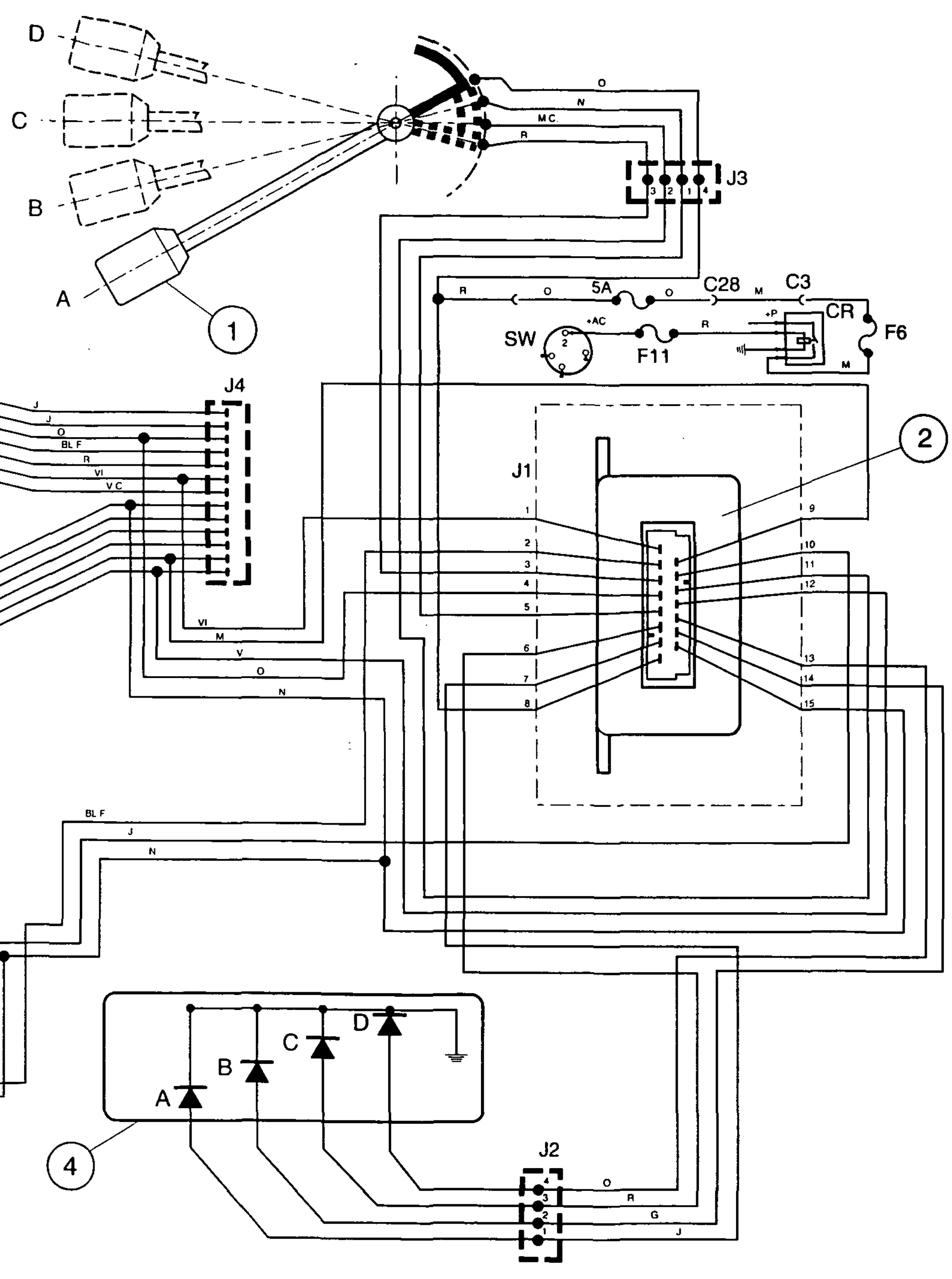
- B : White
- BL : Blue
- G : Grey
- J : Yellow
- M : Brown
- N : Black
- O : Orange
- R : Red
- V : Green
- VI : Violet
- C : Light
- F : Dark

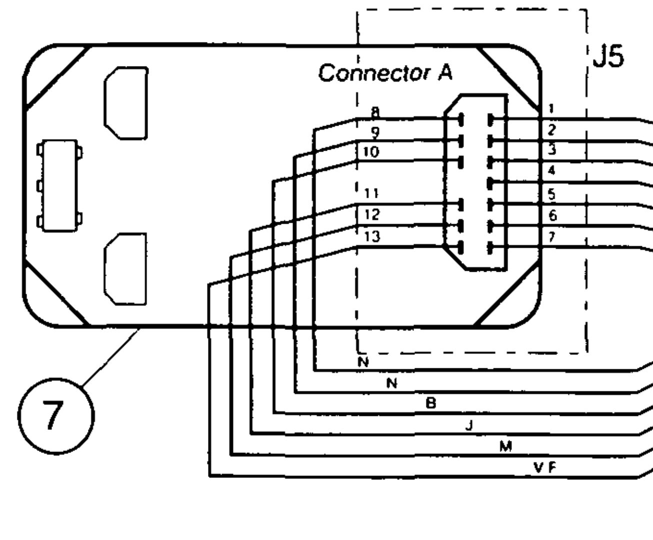
Unit (2) terminal identification

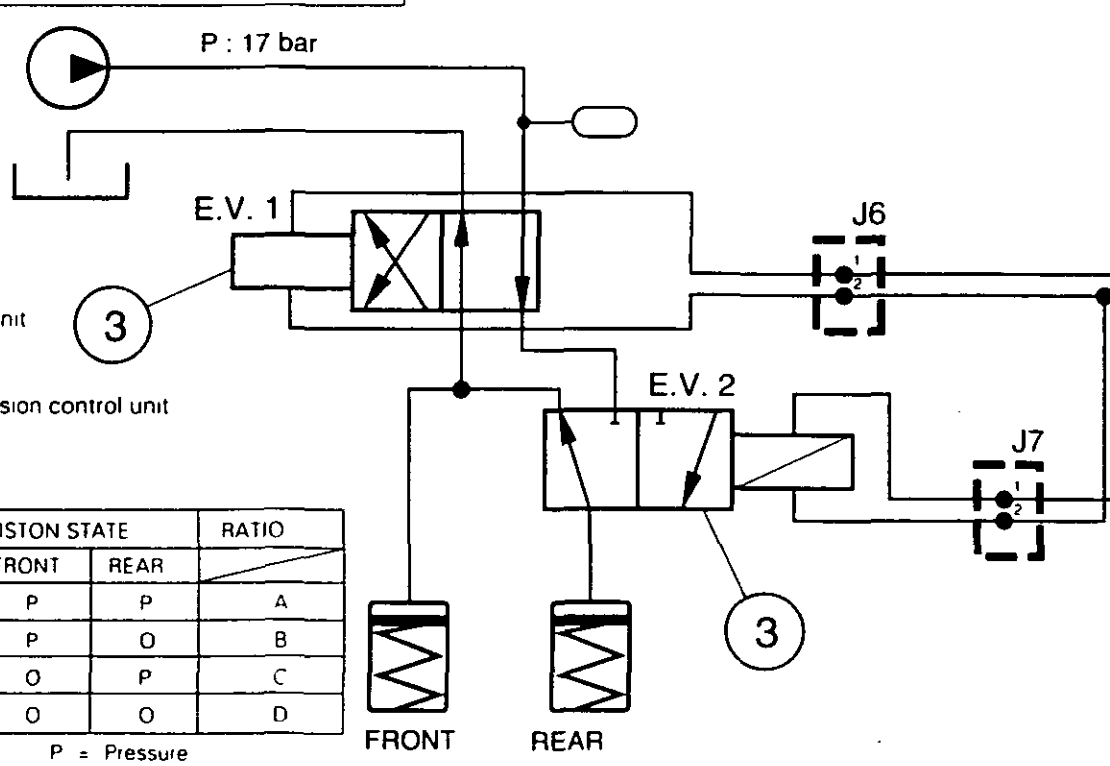
Terminal n°	Function
1	Theoretical tractor speed (ETCU output)
2	Solenoid valve EV2
3	D ratio selection
4	Clutch pedal swith (earth = declutched)
5	B ratio selection
6	C ratio warning light
7	A ratio warning light
8	+ 12 V supply
9	Engine speed (ETCU output)
10	Solenoid valve EV1
11	C ratio selection
12	Low pressure warning light (ETCU output)
13	D ratio warning light
14	B ratio warning light
15	Earth

Key

	Function
SW	Key switch (ignition)
C3	6-way connector (see 9 D01 p.5)
C28	1- way connector (see 9 D01 p.5)
F6	Fuse 15 A
F11	Fuse 10 A or 15 A (see 9 E01 p.5)
CR	Cab relay
J1	15-way connector, electronic unit
J2	4-way connector, dashboard
J3	4-way connector, lever
J4	13-way connector, harness
J5	13-way connector, Autotronic
J6	2-way connector, EV1
J7	2-way connector, EV2







Parts list

- **(1)** Control lever
- **(2)** Electronic control unit
- **(3)** Solenoid valves
- **(4)** Warning lights
- **(7)** Electronic transmission control unit

E.V. STATE		PISTON STATE		RATIO
E.V.1	E.V.2	FRONT	REAR	
1	0	P	P	A
1	1	P	O	B
0	1	O	P	C
0	0	O	O	D

0 = Not energised   P = Pressure
1 = energised   O = No pressure

E . Wiring diagram, with temperature sensor (after A296013)

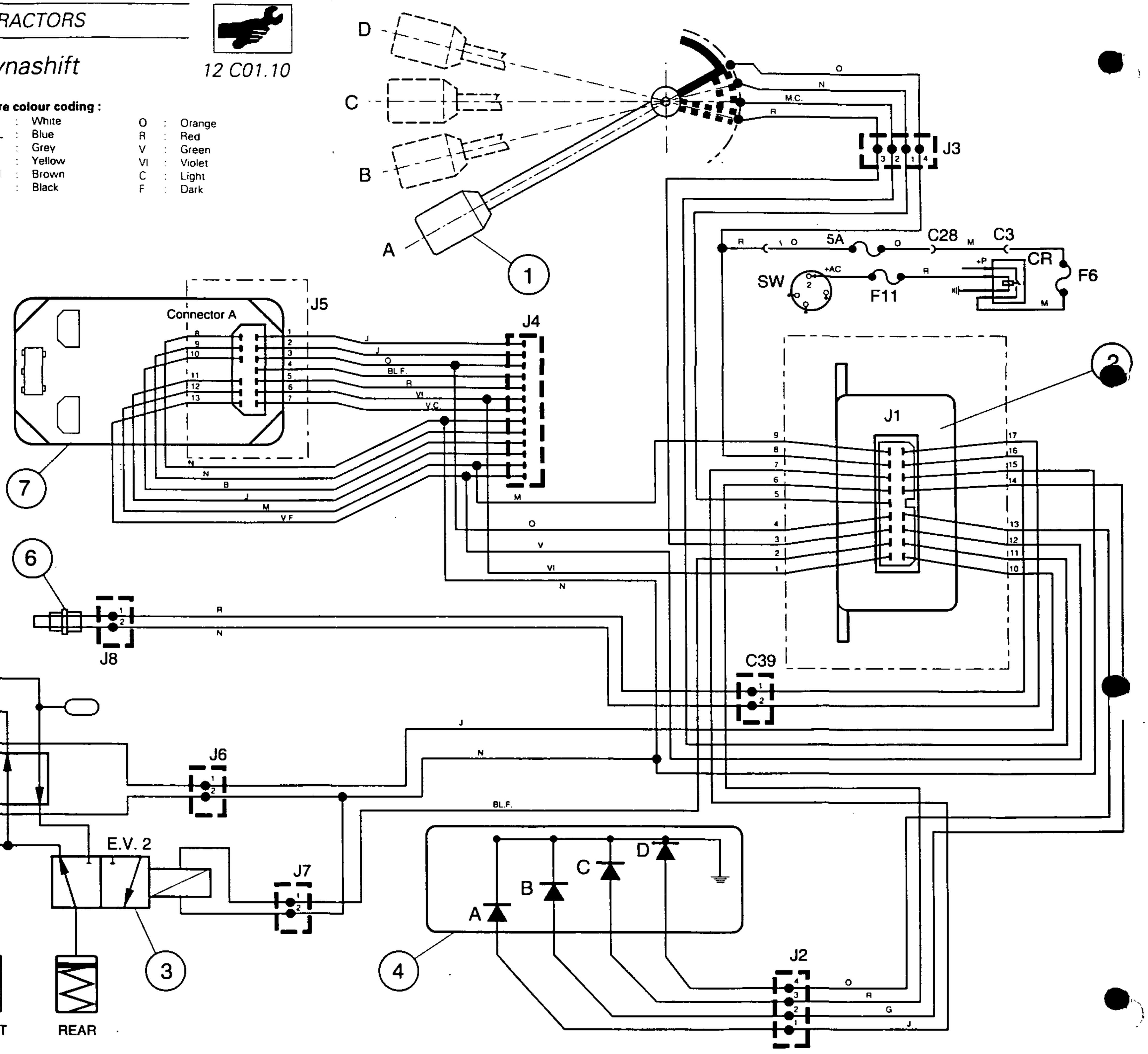
Unit (2) terminal identification	
Terminal n°	**Function**
1	Theoretical tractor speed (ETCU output)
2	Solenoid valve EV2
3	D ratio selection
4	Clutch pedal swith (earth = declutched)
5	B ratio selection
6	C ratio warning light
7	A ratio warning light
8	+ 12 V supply
9	Engine speed (ETCU output)
10	Solenoid valve EV1
11	C ratio selection
12	Low pressure warning light (ETCU output)
13	D ratio warning light
14	B ratio warning light
15	Earth
16	Temperature sensor
17	Temperature sensor (earth)

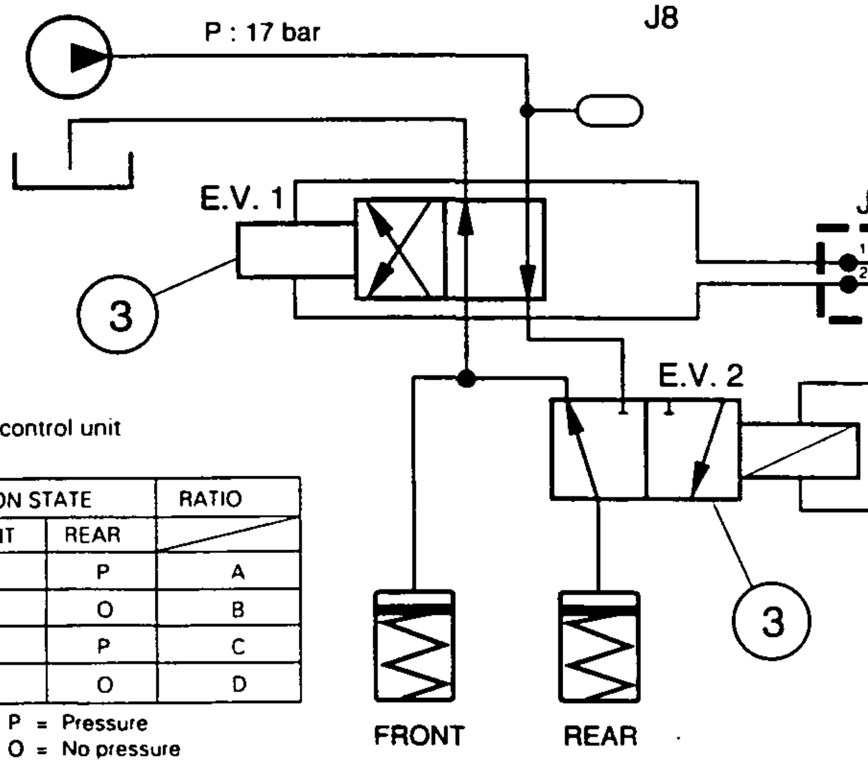
Key

	Function
SW	Key switch (ignition)
C3	6-way connector (see 9 D01 p 5)
C28	1-way connector (see 9 D01 p 5
C39	2 -way connector (if fitted)
F6	Fuse 15 A
F11	Fuse 10 A or 15 A (see 9 E01 p 5)
CR	Cab relay
J1	15-way connector, electronic unit
J2	4-way connector, dashboard
J3	4-way connector, lever
J4	13-way connector, harness
J5	13 -way connector, Autotronic
J6	2-way connector, EV1
J7	2-way connector, EV2
J8	2-way connector temperature sensor

Wire colour coding :

B : White		O : Orange	
BL : Blue		R : Red	
G : Grey		V : Green	
J : Yellow		VI : Violet	
M : Brown		C : Light	
N : Black		F : Dark	





Parts list

(1) Control lever
(2) Electronic control unit
(3) Solenoid valves
(4) Warning lights
(6) Temperature sensor
(7) Electronic transmission control unit

E.V. STATE		PISTON STATE		RATIO
E.V.1	E.V.2	FRONT	REAR	
1	0	P	P	A
1	1	P	O	B
0	1	O	P	C
0	0	O	O	D

0 = Not energised
1 = energised

P = Pressure
O = No pressure

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13A01 Using the Datatronic system

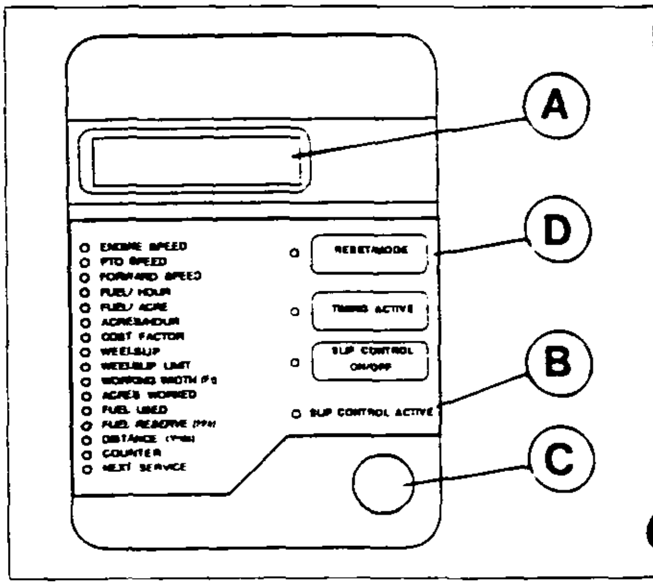
CONTENTS

Datatronic - Use

A . General

This is an electrical measuring system. the information from which helps to make better use of the tractor. It consists of a plastic box, containing the monitoring electronics.
Dialogue between the computer and the operator is carried out by means of :
- the digital display **(A)**
- the decal showing the functions **(B)**
- a rotating knob **(C)**
- touch sensitive keys **(D)**

The computer is placed half way up the internal right hand pillar of the cab. It is connected to the whole of the circuit by an electrical harness which links it in particular to :
- electronic transmission control (Autotronic)
- electronic lift control (ELC)



B. Description of functions

ENGINE SPEED	Instantaneous engine speed in rev/min
PTO SPEED	in rev/min (selection of 540 or 1000 rpm using the sw[illegible] on the panel beside the computer)
FORWARD SPEED	*This is the actual forward speed of the tractor in relation to the ground in km/h*
FUEL/HOUR	Instantaneous consumption in litres per hour.
FUEL/HECTARE	Consumption per hectare worked, in litres per hectare. Updated only when the implement is working.
ACRES/HOUR	Surface worked per hour. Updated only when the implement is working. It does not take into account the time taken up on headland turns.
COST FACTOR	Combines the time used, engine rating, consumption and surface per hour into a single figure which varies IN PROPORTION to the expenditure per hectare
WHEELSLIP	This is the actual degree of wheelslip as % age
WHEELSLIP LIMIT	This is the limit figure for wheel slip you authorize for the wheels. Above this limit, the wheel slip monitor comes into action. Figure shown as %
WORKING WIDTH	This is the width in metres of the implement being used
ACRES WORKED	This is the total surface worked in hectares
FUEL USED	This is the total consumption in litres of fuel since the [illegible] was reset
FUEL RESERVE	This is the time in hours during which you can still work [illegible] regard to the current consumption in litres per hour. Must be reset when filling up the tank.
DISTANCE	This is the total distance in metres covered since the [illegible] occasion on which you initialised the function
COUNTER	*Allows to count and memorise any number desired (for example, bales)*
NEXT SERVICE	Displays the number of hours before the next serv[illegible] *Calculation of the hours is not carried out in real time [illegible] takes into account the engine running.* If this function reaches the figure 0 every time current is applied [illegible] computer [illegible] the function SERVICE whilst causing the display «L000» to flash. *Once the service has taken place, the user resets* [illegible] If he wishes, the operator can change this figure and adjust it to any figure [illegible] but each time that he resets, the figure will be the default figure (250 hours)

C . Use of the tractor performance monitor

1 . Modifying working parameters

In the course of your work you will need to modify the working parameters, such as the working width or the permissible wheel slip.

Example : MODIFICATION OF WORKING WIDTH
- Select the function WORKING WIDTH
- Press once the SELECTION Key.
  You will get a four figure display of the standard figure (in this case 3m).
- Press SELECTION again.
  The display starts to flash.
  For example if you will replace 3 m by 4 m, turn the rotating knob C, figure 4 flashes. Then press SELECTION to memorize the new value.
- In order to adjust the other figures whilst the display is flashing, press twice on SELECTION. The next figure flashes.

Note : You move from one mode to the other (flashing or not flashing display) by pressing the selection key as many times as necessary.

2 . Working position

Meaning : the working position means that the implement is working, i.e., for example, the plough is in the furrow. This means that the headland turns are not counted.

Automatic control by the lift

As soon as you lower the implement, the working position is activated.
- You reach the end of the field : you raise the implement to turn. When the implement is raised, the working position automatically ceases to be active.
  The working position warning light extinguishes.

- When you lower the implement again, THE WORKING POSITION is reactivated.
  The working function warning light comes on after a delay of one second to allow the implement to be lowered. The area covered is again counted.

Manual control

Should you not be using the lift, it is possible to control the operation manually by pressing on the WORKING POSITION key.

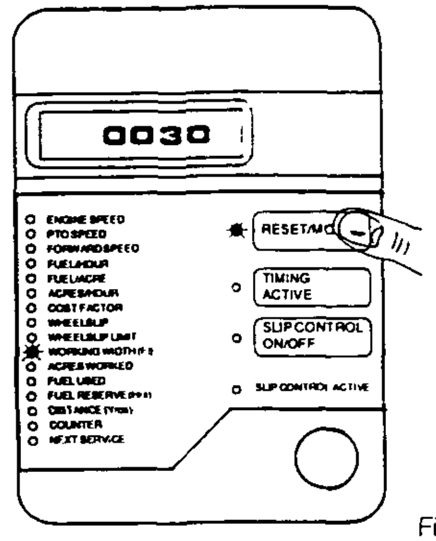


Fig. 1

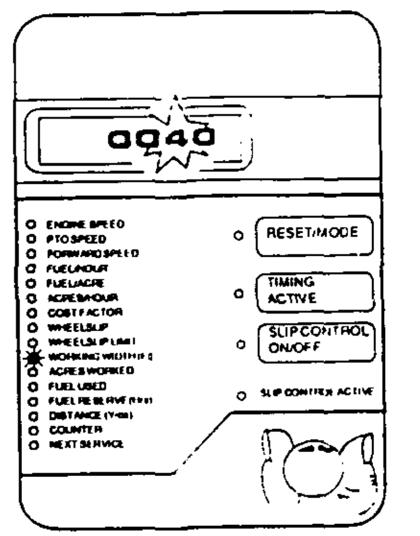


Fig. 2

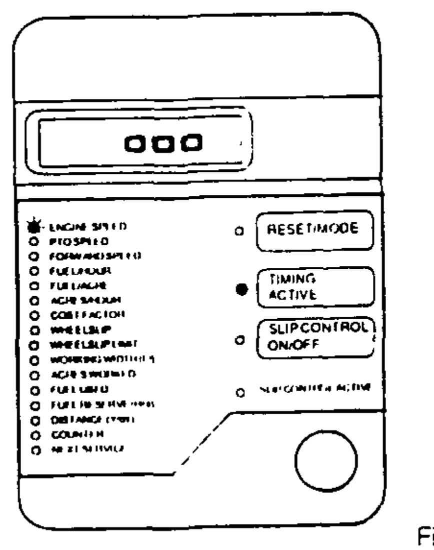


Fig. 3

Datatronic - Use

3 . Wheelslip monitoring

Operation

If the wheelslip monitoring system is running, the system constantly compares the rate of actual wheel slip to the limit fixed by the operator.

If the actual wheelslip is lower than the limit, everything carries on as normal.

If the wheelslip becomes excessive (greater than the limit fixed by the operator), the system raises the *implement as much as necessary for the rate of wheel* slip not to exceed the programmed limits.

The system operates precisely in the *same manner* as if the operator changes the position of the depth knob.

Adjustment and use

a) Reset to zero in order to allow the on board computer to make correct calculation of the rate of wheel slip. Whilst moving with the tractor in conditions where the wheels do not slip (on the road for example), never carry out the operation when working.
- Select the function RATE OF WHEELSLIP
- Press selection
- The screen should then show a sequence of dashes. *Keep pressing* for 4 seconds approx. *until* the display becomes normal.

b) Adjustment of permissible limit
- Select the function PERMISSIBLE WHEELSLIP.
- Press twice on the SELECTION key. The display should flash.
- Adjust the limit with the rotating knob. Adjustment is made from 0 to 99 % in jumps of 3 %. The wheel slip monitoring unit warning light is operating.

c) Using the wheel slip monitor unit
- In order to use the wheel slip monitoring unit, it is sufficient to press the WHEELSLIP MONITOR on/ off key. The warning light illuminates, so the wheel slip monitoring system is operating.
- As soon as wheelslip exceeds the specified slip (18 % for example), the wheel slip monitoring unit becomes active, i.e. the computer control system lifts the implement so as to reduce tractive load and bring wheelslip back to preset limit.

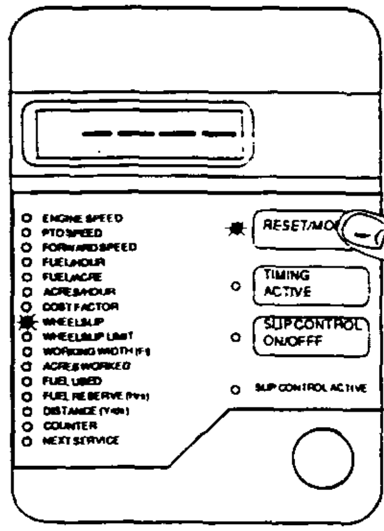


Fig. 4

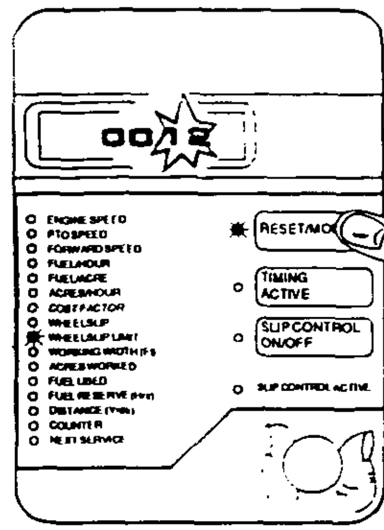


Fig. 5

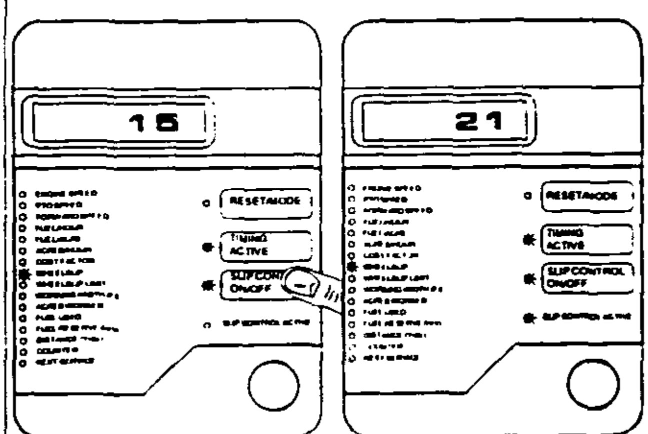


Fig. 6

4 . Initializing the counters

Initial setting

a) Select the function to be initialized, for example TOTAL SURFACE.

b) Press the SELECTION key.
As soon as you press the SELECTION key the parameter is initialized at its factory preset figure in this case 0. To change the figure, press SELECTION again and the display flashes. Set the figure desired by means of the rotating knob.

Functions which can be initialized

Function	Preset figure
Total area	0 ha
Total fuel	0 litre
Total distance	0
Counter	0
Service	250 hours

Note : The display may show the value L000 with L flashing when the service limit (i.e. 250 hours) is reached.

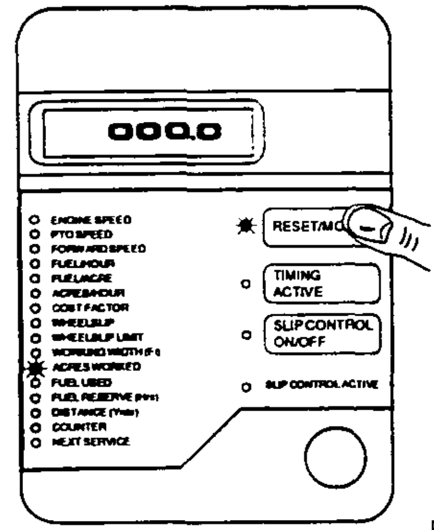


Fig. 7

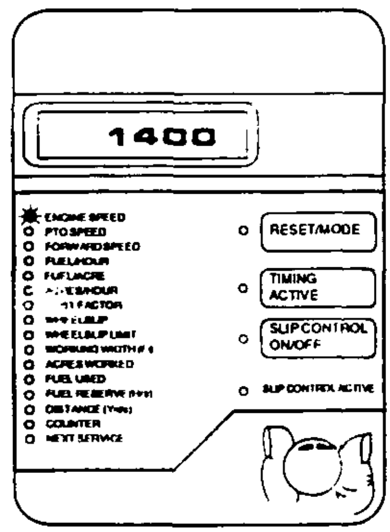


Fig. 8

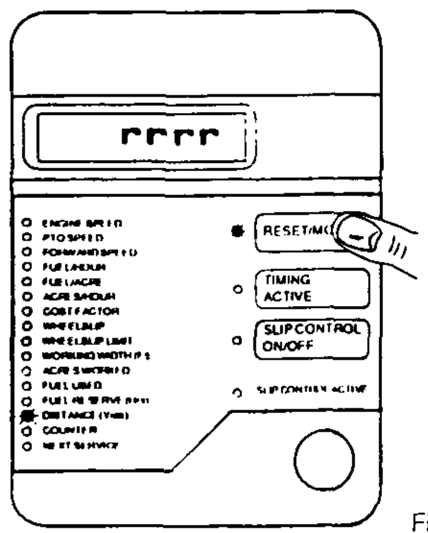


Fig. 9

5 . Using the comparative mode

a) Use of this mode enables the monitoring of the influence of modifying a figure for one function upon the others, notably the cost indicators. In this way you can find the optimum setting for the particular use of the tractor.

b) **Use**
General remarks
This mode can be used for certain functions (engine speed, PTO, forward motion, fuel/hour, fuel/hectare, hectare/hour, cost indicator).
Use
You are moving at more than 2 km/h.
You are about to display one of the functions using the comparative mode.
So you press and hold the selection key.
The display becomes blank(no display) for one second.
Then four r's **«rrrr»**, appear on the display. This means that the computer is about to use as a base, for reference, 100. Only when the 4 r's disappear you can release the selection key.
At this time, all the functions are at reference 100.

Datatronic - Use

The new base is memorized so you can see for example, the influence of the increase of the engine speed, a change of speed, a change of the depth's, ploughing.... on the consumption, working surface or cost. You can also choose a compromise between these possibilities or select one of these functions in particular.

Remark : The increase of the engine speed is shown by indications such as :

- "115" which means increase of 15 % of engine speed.
- "90" which means diminution of 10 % of engine speed.

It is the same for all the functions. It is particularly interesting because you do not have to remember figures. You know which kind of adjustment allows to work on more areas, to consummate less or to make a more economical work (see cost factor).

Example

Choose the function which you wish to change and display the effect of that change (in this case : engine speed).

a) Press SELECTION
   The display moves from the normal mode to the relative mode indicated by the character (r).

b) Keep pressing the selection key
   The display will show **«rrrr»**, it takes an average over 4 to 5 seconds of the figure for the function as reference 100.

c) When the display has returned to normal again, by using the relative mode you can visualize the influence of this parameter on the other functions.

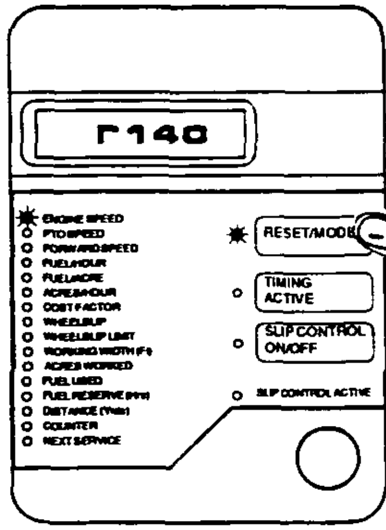


Fig. 10

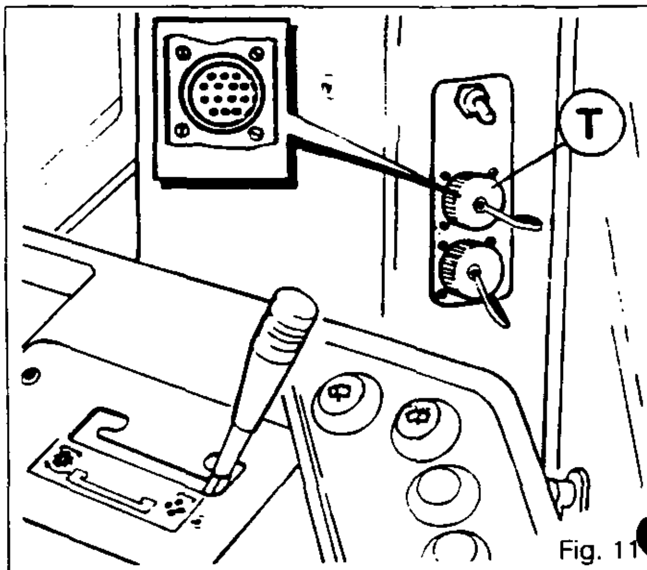


Fig. 11

6 . The counter function

By means of the socket **(T)** located on the right hand pillar of the cab (Fig. 11) and a switch **(1)** located on the implement counter display increases by one until each time this contact is made.

Connection (Fig. 12)

On the 14 pin connector **(B)** there is an input for the counter function.

Connect up as indicated.

An external special socket 3581138 M1 is available as accessory.

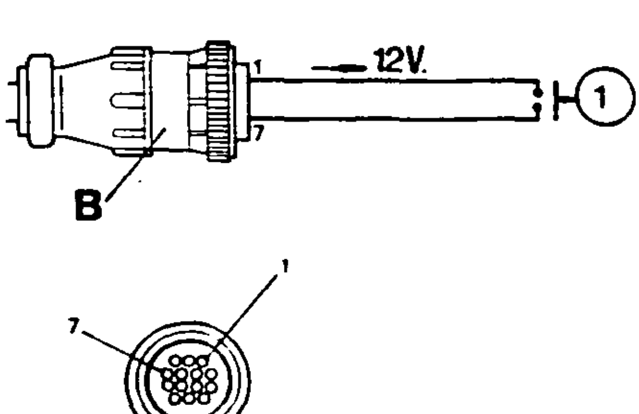


Fig. 12

7. Wiring for a switch for trailed implement

If you are using a trailed implement, you will not use the lift/lower switch on the lift in order to activate or deactivate the working position.
One solution consists of pressing the WORKING POSITION key, each time that you turn or if the surface covered is not to be regarded as surface covered.
This may however become tiresome if you have to operate the switch each time that you make a headland turn.
It is then more useful to connect a switch to the trailed implement which fulfils a similar function to the up-down switch of the lift.

Connection (Fig. 13)
On the 14 pin connector **(B)** there is an input for trailed implement connection.
Connect up as indicated on diagram.
Use the external special socket 3581138 M1 supplied as accessory.

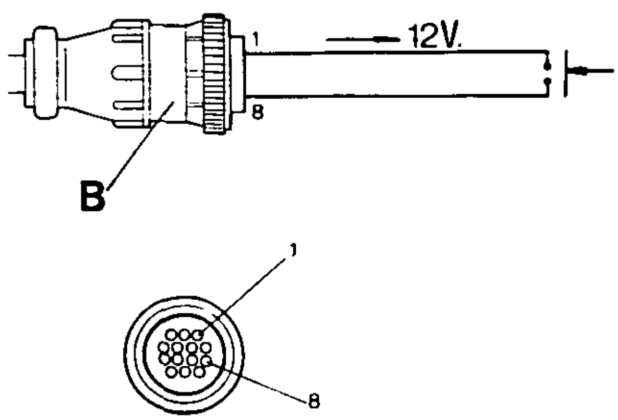


Fig. 13

8. Use of the radar signal on the external connector

You wish to use an implement requiring the use of a radar. This is possible, with the computer system, without having to purchase the same. In fact, the implement is capable of generating radar signals which simulate the majority of radars on the market.

Method (Fig. 14)
The radar simulation signal is available on the 14 pin connector **(B)**.
Connect the radar rev/min signal output to the radar input of the implement.
Connect up as shown.
An external special socket 3581138 M1 is available as accessory.
The output signal must be adjusted as described on page 15 (programming).

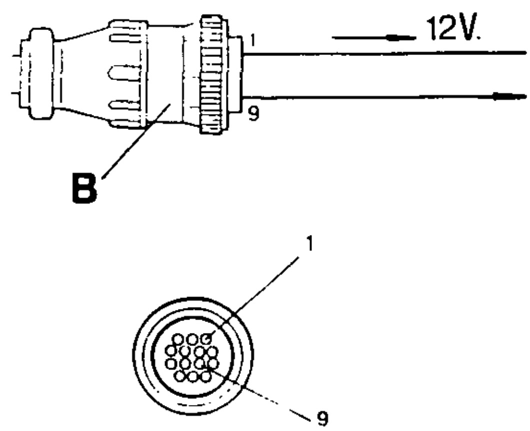


Fig. 14

9. Battery replacement

After several years of use, the Datatronic may malfunction or become be programmed. the batteries should then be replaced. The batteries must be replaced when the voltage is 2,7 V or lower. So that the programming is not lost, replace one battery at a time, use 3 V Lithium batteries type : BR2325 (Panasonic).

Datatronic - Use

MAIN CHARACTERISTICS

FUNCTION	UNIT (see note *)			MEMO RESET FIGURE	RELATIVE MODE	WORKING POSITION NECESSARY	DISPLAY INCREASE	MINI DISPLAY
	METRIC	IMP. (UK)	IMP. (US)					
	1	2	3					
Engine speed	Rev/min	Rev/min	Rev/min	No	Yes	No	10	100
PTO speed	Rev/min	Rev/min	Rev/min	No	Yes	No		
Forward speed	Km/hour	Mile/hour	Mile/hour	No	Yes	No	0.1	1
Fuel/hour *	l/hour	Gal/hour	Gal/hour	No	Yes	No	0.1	
Fuel/acre *		Gal/acre	Gal/acre	No	Yes	No	0.1	
Fuel/hectare *	L/ha			No	Yes	No	0.1	
Acres/hour *		Acre/hour	Acre/hour	No	Yes	No	0.1	
Hectares/hour	Ha/hour			No	Yes	No	0.1	
Cost factor				No	Yes	No	1	
Wheelslip	%	%	%	Yes	No	No	1	
Wheelslip limit	%	%	%	No	No	No	1	3
Working width	Meter	Foot	Yard	Yes	No	No	0.1	
Acres worked *		Acre	Acre	Yes	No	Yes	0.1	
Hectares worked *	Ha			Yes	No	Yes	0.1	
Fuel used	l	Gal	Gal	Yes	No	No	1	
Fuel reserve	Hour	Hour	Hour	Yes	No	No	1	
Distance	Meter	Foot	Yard	Yes	No	No	1	
Counter				Yes	No	No	1	1
Next service	Hour	Hour	Hour	Yes (250)	No	No	1	

Note : * = Display units as programmed (see page 16 stage 5).

D . Fuel flowmeter

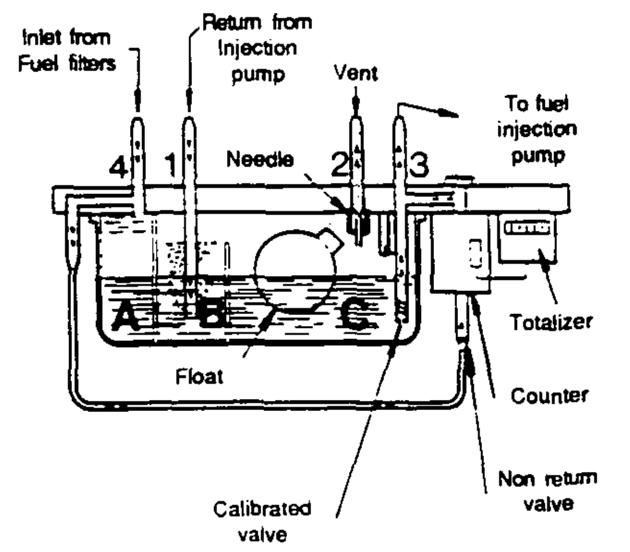
The assembly is made up of two parts : the degassing bowl linked with the volumetric counter located on the engine and the indicator located in the cab.

1 . Principle of operation of the degassing unit (Fig. 15)

It must always be on depression, located between the injection pump and the fuel filter when this one is already on depression, or between the inlet and the injection pump when the filters are under pressure.

The fuel coming from the lifter fills the space **(A)**, coming in via the tube **(4)**, the fuel then passing into the counter to be sucked in by the feed pump (tube **(3)**). The injection pump forces the fuel oil to the atomisers.

The excess fuel from the injection pump comes via tube **(1)** into the well **(B)**, then overflows into the space **(C)** where the gas in removed from the fuel. The gases escape through the needle valve via the vent **(2)**. If the level in **(C)** is adequate, the float closes the needle valve again to prevent fuel escaping via the vent **(2)**. The fuel having had the gas removed is re-cycled in the feed circuit of the injection pump at a point on the line beyond the counter. A calibrated valve located on the tube **(3)** maintains in the degassing unit a pressure which is greater than the pressure in the injection pump circuit in order to prevent air being drawn in.



2 . Principle of operation of the volumetric unit (Fig. 16).

This measurement chamber consists of a mechanical measuring device mounted on the piping and an electromagnetic or electronic indicator located at distance.

The mechanical device consists of an aluminium case in which the measurement chamber is machined and *two oval wheels moulded from a base of carbon and* phenolic resin. It does not contain any packing press or revolving joint. A magnet countersunk in one of the wheels **(3)** *(Fig. 17) opens and closes on each rotation* a magnetic contact **(5)** (Fig. 17) located outside the chamber, thus eliminating any risk of escape or entry of air.

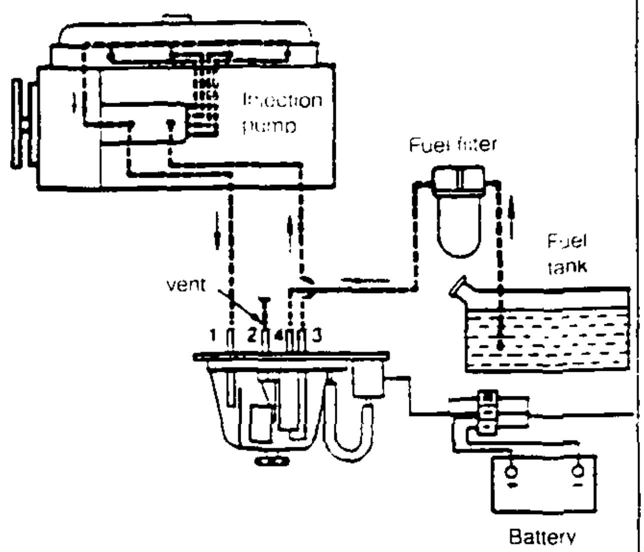


Fig. 16

Datatronic - *Use*

Fuel flowmeter

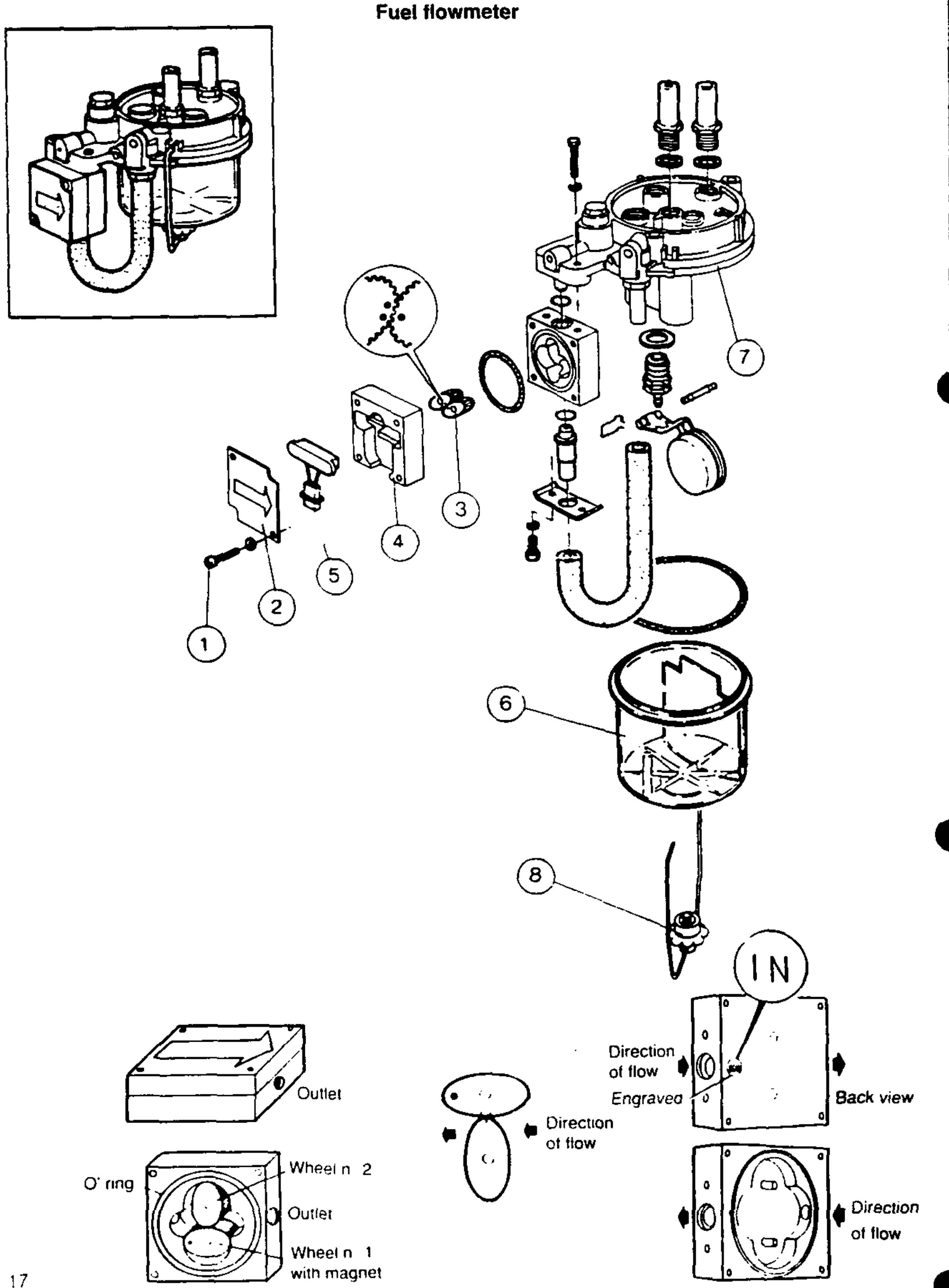


Fig. 17

3 . Service-assembly and disassembly

Never clean with compressed air. In principle, the counter does not require any particular maintenance. However should some impurity block it, it is best to observe the following procedure (see Fig. 17).

- Unscrew the four screws **(1)**
- Separate the lids **(2)**, taking care not to pull out the oval wheels **(3)** with it.
- Remove the oval wheels **(3)** with great care and clean them with petrol using a fine brush.
- Clean the inside of the case **(4)** in the same way.
- Replace the oval wheels **(3)**, taking care to locate the wheel containing the magnet in the correct position, in accordance with the diagram (Fig. 17), since it is essential for the magnet to pass in front of the magnetic contactor **(5)** in order to make it operate.
- Check carefully that the two wheels mesh suitably. If the assembly has been carefully carried out, the two wheels rotate freely under finger pressure. Misalignment of even one tooth is sufficient to cause a blockage. **Never force them**.
- Replace in position the lid **(2)** of the case, checking carefully that the arrow is in direction of flow of the fluid and that the wheel containing the magnet is correctly opposite the magnetic contactor. By way of reference mark, the mark «IN» is engraved on the back of the counter; on the input side (see Fig. 17).

Precautions during assembly

Check carefully that the flow of the liquid takes places in the correct direction (input = «IN»).

The joint should be vertical.

When assembly, take care not to introduce any solid body into the counter or the piping. Such foreign body would risk blocking the counter.

4 . Assembly - disassembly and maintenance of the degassing bowl.

The bowl **(6)** is removed from the degassing unit lid **(7)** by unlocking **(8)**, which allows general cleaning, disassembly of the needle valve and checking of the other valve.

5 . Fitting of fuel flowmeter on 4 cylinder engines

a) Location (see Fig. 18-19)

b) Identify hoses :

(L) for n° 1
(M) for n° 3
(N) for n° 4
(P) for n° 2

c) First position hoses on the flowmeter and tighten them with clamps **(Q)**.

Connection on flowmeter	Connected to
1	Injection pump output
2	Return to atomiser n° 2 (degassing)
3	Injection pump input
4	Filter outlet

d) Then position the flowmeter on its bracket **(R)** (as shown Fig. 18).
After being tightened the flowmeter should move slightly. This is correct, it has been done to prevent it from vibrating.

e) Remove both pipes **(1)** and **(2)** connecting the filter to :
- injection pump input
- injection pump output

Position the plug **(S)** and the seal washer **(T)** on filter input.

f) Fasten the flowmeter and the bracket on the front right-hand side of the tractor on the air filter bracket.

g) Connect hoses as follows :
- hose **G** to fuel filter outlet
- hose **H** to injection pump input
- hose **J** to injection pump output
- tube **K** to atomiser n° 2.

h) Connect the hoses to the tubes.

J) Pass the flowmeter harness above the engine and *connect it to connector X on TPM harness, under* the cab, near the Autotronic box (see coloured sheet).

Note : Do not forget to drain fuel circuit before starting the engine.

Checking operation

- After priming the fuel oil circuit, start up.
- Check seals of fuel circuit at connections (watch for air being sucked in).
- Check correct operation of the unit (counter and indicator).

Datatronic - Use

Fitting on 4 cyl. engines

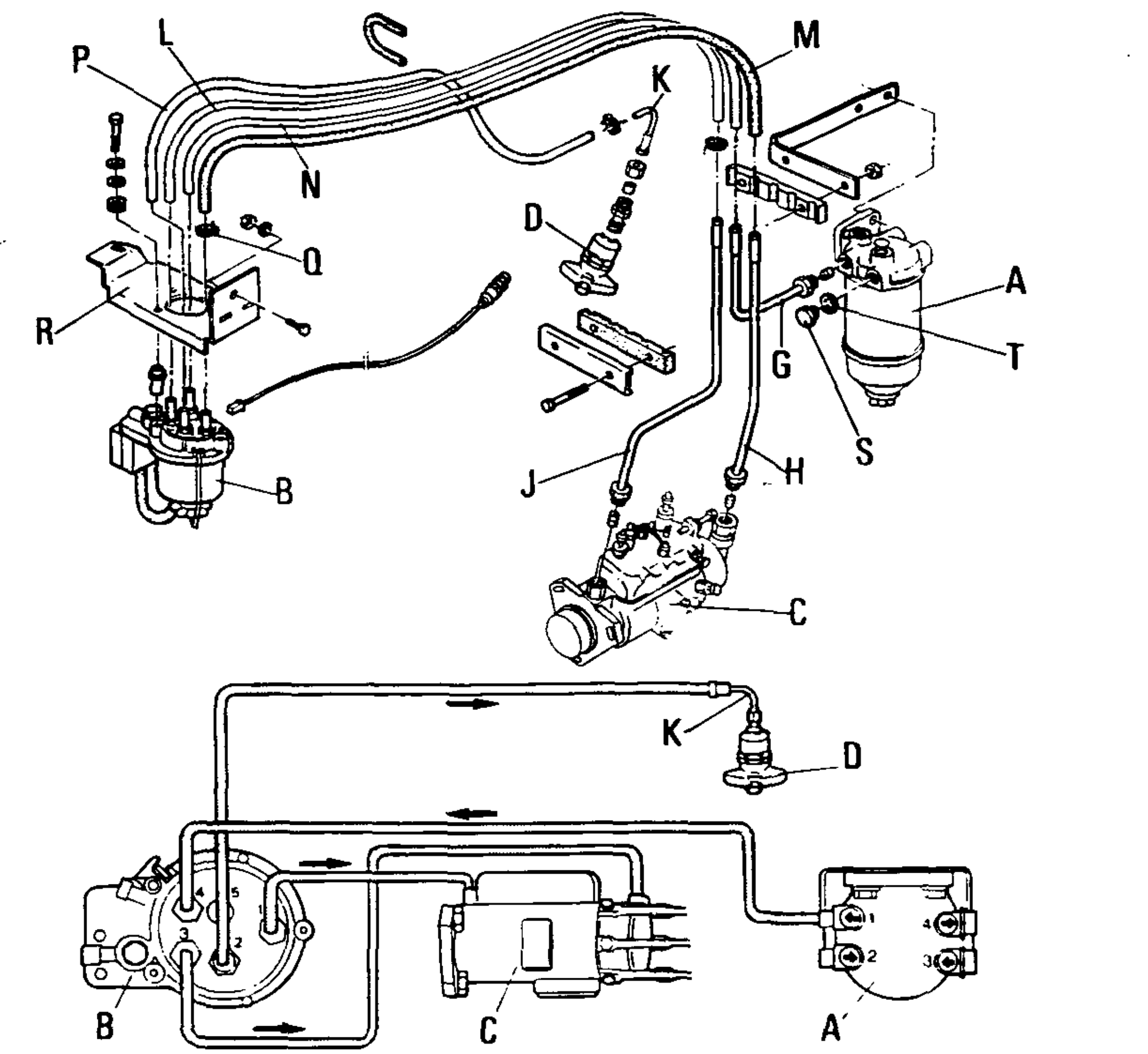


Fig. 18

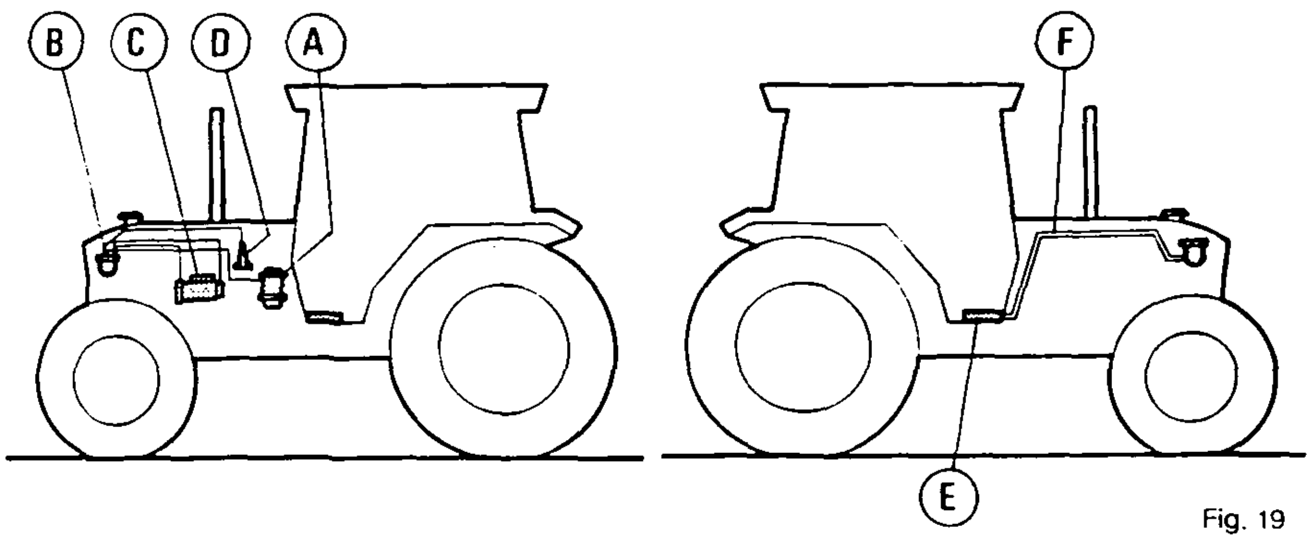


Fig. 19

6 . Fitting of flowmeter on 6 cylinder engines (A6.354)

a) Location (see Fig. 20 - 21)

b) Identify hoses corresponding to flowmeter numbering :

(L) for n° 1
(M) for n° 3
(N) for n° 4
(P) for n° 2

c) First, position hoses on the flowmeter and tighten them with clamps **(Q)**.

d) Then position the flowmeter on its bracket **(R)** (as shown on Fig. 20).
After being tightened the flowmeter should move slightly. This is correct, it has been done to prevent it from vibrating.

e) Remove both pipes **(1)** and **(2)** connecting the filter to :
- injection pump input
- injection pump output

*Position the plug **(S)** and the seal washer **(T)** on filter input.*

f) Fit the three pipes **(U)** on :
- injection pump input
- injection pump output
- filter outlet

g) Fasten the flowmeter and the bracket on the rear left hand side of the engine with 2 screws **(V)** and 2 washers **(W)**.

h) Connect hoses as follows. Check carefully before starting the engine.

Connection on flowmeter	Connected to
1	Injection pump output
2	Atomiser n° 5 or 6 (vent)
3	Injection pump input
4	Fuel filter outlet

i) Connect the flowmeter harness to the connector X on TPM harness, under the cab, near the Autotronic box (see coloured sheet).

Note : Do not forget to drain fuel circuit before starting the engine.

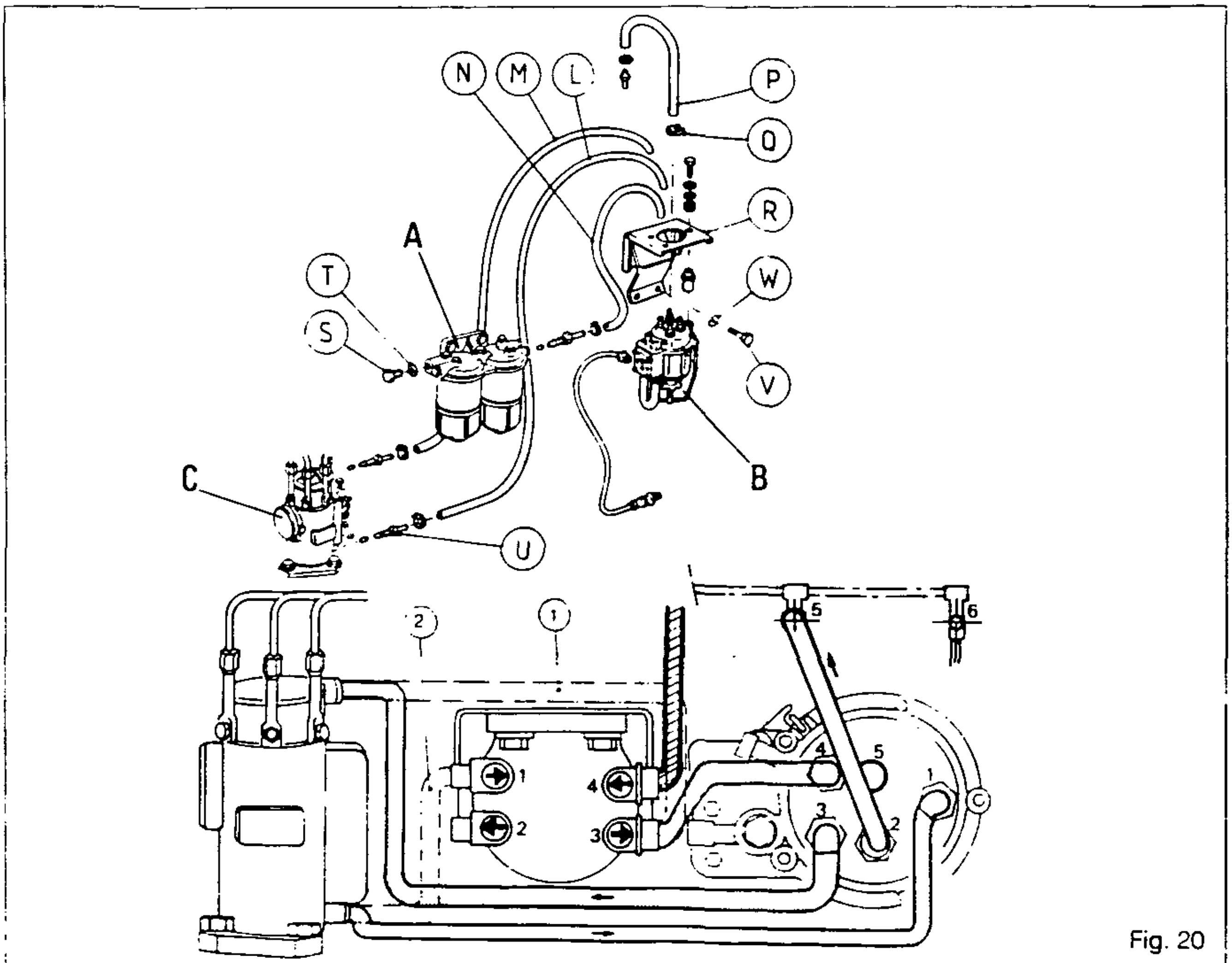


Fig. 20

Datatronic - Use

Fitting on 6 cyl. engines A6.354

(A) Fuel filters
(B) Flowmeter
(C) Injection pump
(E) Autotronic
(F) Harness

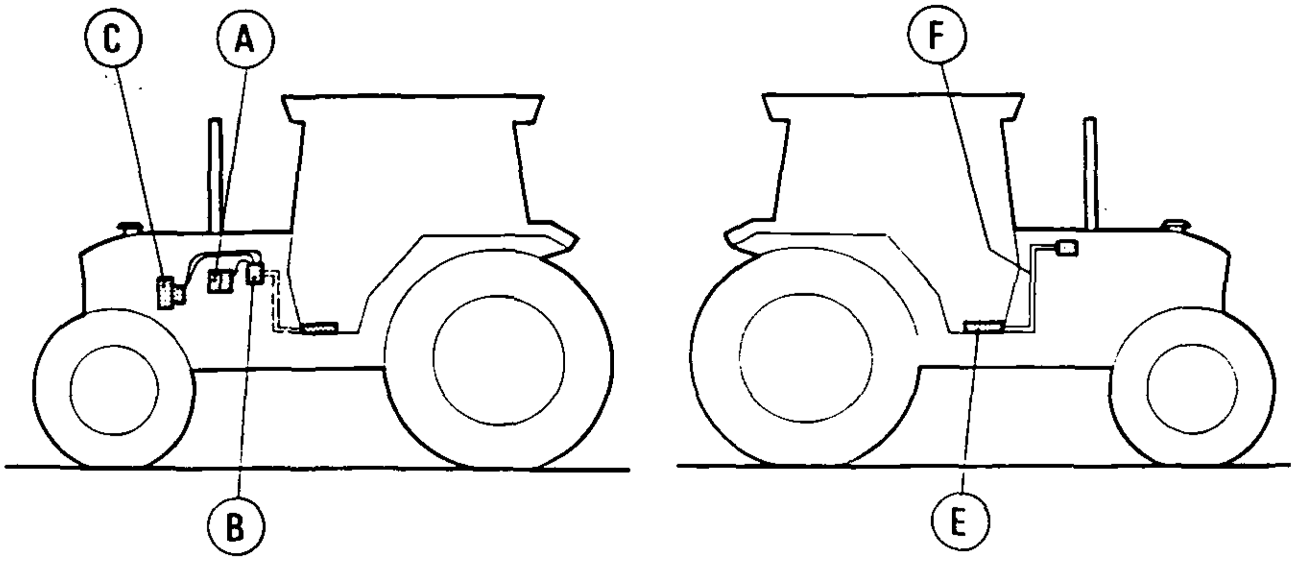
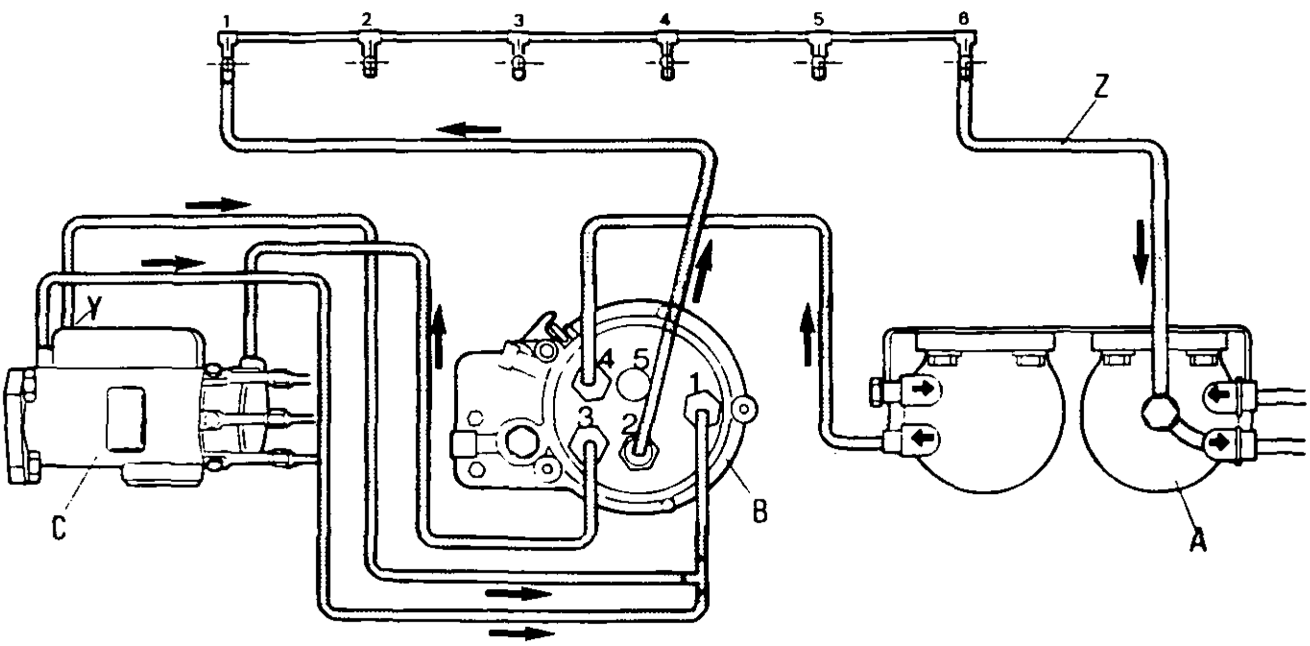


Fig. 21

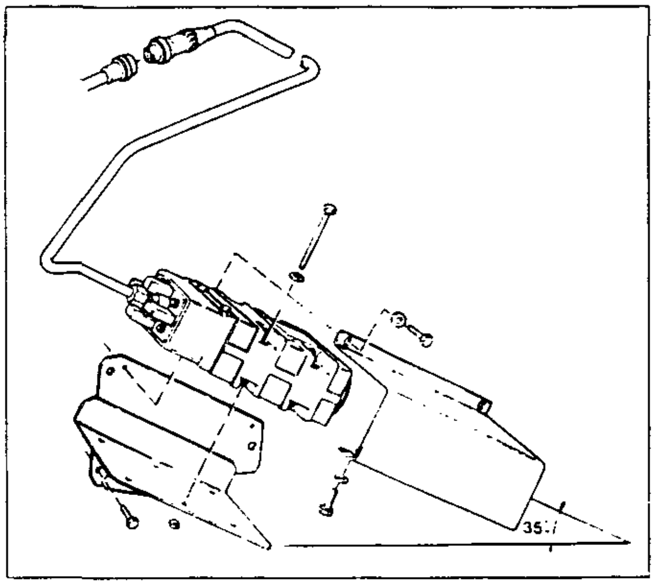
7 . Fitting of flowmeter on 1000 Series engines



(A) Fuel filters
(B) Flowmeter
(C) Injection pump
(Y) Automatic bleeding
(Z) Atomisers output

Fig. 22

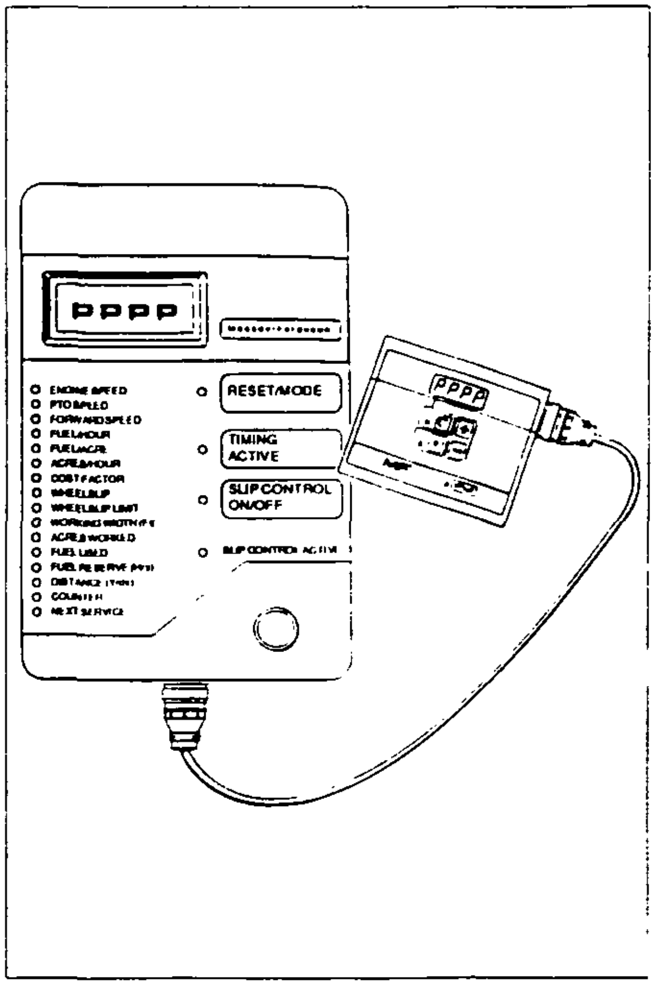
E . Radar



The angle of assembly is critical : 35° and should not be modified.
The tolerance of the radar is ± 3 %.
Never place equipment in the radar field.
The signal measured by the radar is the difference between the transmission frequency and the reception frequency. The latter varies according to the nature and conditions of the soil.
Minimum speed display : 1 Kph

Note : Never stay in the field of the radar (about 1m) when it is on. When working in the radar area switch the ignition off to avoid problems caused by microwave signals.

F . Programming



Note : To perform the programming procedure use the programmer-tester n° 3584003 M91.

The TPM can be programmed whilst it is installed in the tractor. This is done by connecting the programmer to the TPM unit, via the 14 pin connector, situated on the RH cab pillar. The TPM can also be programmed out of the tractor.

Programmer

The programming of the TPM is controlled by 5 switches on the face of the programmer. The programmer can be used to programm the TPM with 2 types of parameter.

Primary

Used to program definite information, for example to determine whether the TPM will display in Metric, Imperial or American units.

Secondary

Used to allow for variations in specification during the tractor's working life.

Datatronic - Use

The switches perform the following functions :

The «N» switch (circular arrow)
The programmer requires certain information at different stages. The «N» switch advances the programmer through the stages.

The «S» switch (upward arrow)
Switch enabling to advance the number of the secondary parameter.

The «+» switch
Increases the input value by 1, each time it is depressed. If depressed continually for more than 1.5 seconds, an auto function is engaged at a rate of 10 per second.

The «-» switch
Decrease the input value by 1, each time it is depressed. This button also has an auto function.

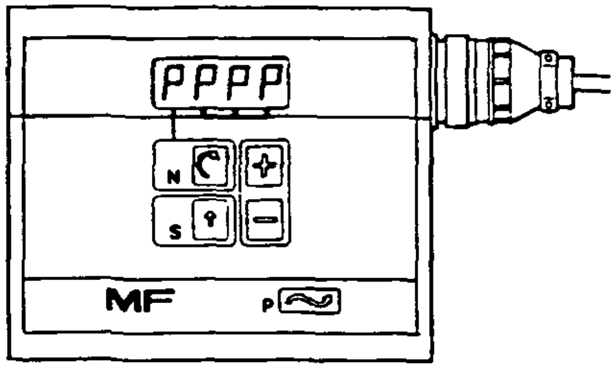
The program switch (bent arrow)
Programs the TPM with the information the user has supplied.

On power up, the programmer briefly shows a serie of rapidly flashing «3»s. If the display gets stuck in an apparently random state this indicates the programmer has detected a failure in the TPM memory circuits and will not respond to the operator's inputs. But, under normal circumstances, the display will show a single «8» advancing from left to right, thus indicating that the operator can now proceed by pressing the N button. The display reads « 10» and all the switches become functional. The programmer is in the Absolute function and is ready for the first input.

The Absolute is programmed in five stages. All five require an input before pressing the program switch.

Stage 1 - Tractor type
1 = 3050
2 = 3060 - 3065
3 = 3070
4 = 3080
5 = 3090 - 3095 - 3115 - 3125
6 = 3610
7 = 3630 - 3645
8 = 3650 - 3655 - 3670 - 3680 - 3690
9 = Test version

Stage 2 - Fuel flowmeter
1 = No fuel flowmeter
2 = Meter installed



Stage 3 - Ground speed radar
1 = No radar
2 = Radar installed

Stage 4 - Decal options
Program number in top right hand cover of decal, for example 01 on decal = 1
Note : Valid values are 1 - 3 at this stage. 1 and 2 are decal options, 3 is the code corresponding to the test procedure.

Stage 5 - Display units
1 = Metric
2 = Imperial (british)
3 = Imperial (USA)

When the user has adjusted all the inputs to the required values, then he presses the program button. This action will cause «**PPPP**» to be displayed on both the programmer and the TPM for approximately 20 seconds.

If the programming has succeeded the display on the programmer will return to its original state, prior to pressing the program button.

If the user has entered an unknown value or forgotten to adjust one of the inputs, then the programmer will not attempt to program but instead will flash the incorrect value on the display. The operator may use the «+» or «-» button to correct the input and re-try programming.

If the programmer display returns from programming with a flashing «0000» then it is indicating that a communication failure exists between the programmer and the TPM. This may be a result of a bad cable link between the two, or the TPM is sufficiently faulty to inhibit communications. Voltage should be good so try to program again with the engine running and alternator showing as charging.

Adjusting the secondary parameters

A . Radar signal (273 hz)

Should be reprogrammed when «total distance» display is different from actual total distance.
Calculate new value as follows :

$$A = \frac{\text{Displayed distance}}{\text{Actual distance}} \times 200$$

B . Radar simulation to implement

Should be reprogrammed when radar signal sent must be different from 278 Hz / 10 Kph.
Calculate new value as follows :

$$B = \frac{\text{Desired output frequency} \times 200}{278}$$

C . Fuel tank capacity

Should be reprogrammed when fuel tank capacity is different from capacity programmed in absolute parameter n° 1

Tractor type	Capacity for C = 200 (litre)	Actual capacity (litre)
1	148	148
2	148	
3	190	
4	190	173 except for 3125 = 220
5	190	
6	235	
7	235	246 for 3600 series (306 with add fuel tank)
8	235	
9	213	

Calculate new value as follows :

$$C = \frac{\text{New capacity} \times 200}{\text{Capacity programmed in absolute parameters}}$$

Apply C values according to chart

D . Cost factor

Apply values
D = 200 for 3000/3100 series and 3610-3630 3645 - 3650 - 3655
D = 217 for 3670 - 3680 - 3690 models

E . Cost factor

Apply values
E = 227 for 3115 - 3125 models
E = 200 for other models

F . Cost factor

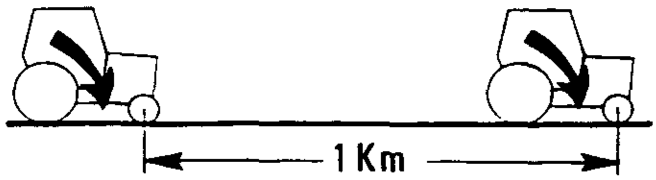
F = 200 for all models

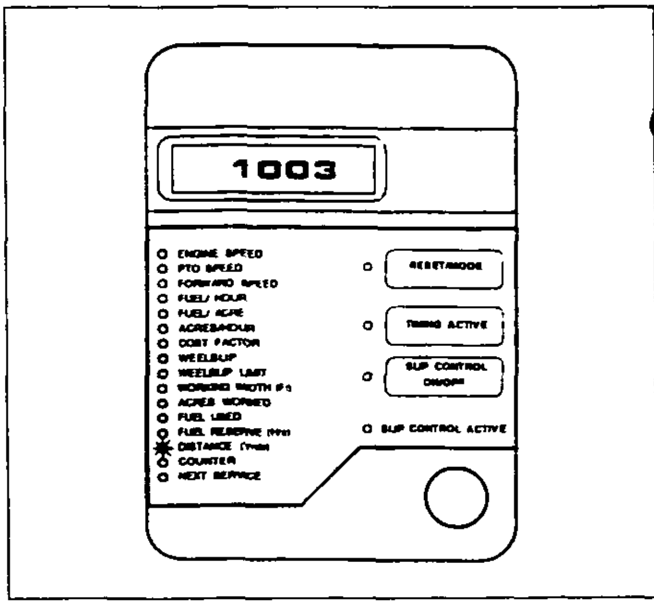
"C" Values / Models	Standard cab: Without additional fuel tank	Standard cab: With additional fuel tank	Forestry cab
3050 - 3060 - 3065	C200	-	C135
3070 - 3080 - 3090 - 3095 3115	C182	-	C105
3125	C231	-	C105
3610 - 3630 - 3645 - 3650 3655 - 3670 3680 - 3690	C209	C260	

G . Checking without tester

Function : Total distance

Select the function TOTAL DISTANCE
Reset to 0 (press the SELECTION key)
Move forward with the tractor over a set distance, for example between two kilometre posts or some other distance of your choice.
Note the information provided by the computer
The figure provided by the computer should be correct to ± 3 % in relation to the actual distance.
If the computer gives a figure which is outside the tolerance , follow programming procedure page 15.





13B01 Checking the TPM and the harness

CONTENTS

13B01.2 **Datatronic** - Checking TPM and harness

A . Checking with tester

Note : All the tests described in this section are to be performed with the Tester-Programmer n° 3584003M91.

General

The tester function of the programmer is used to establish that the TPM is correct and functioning properly. If the TPM fails to respond correctly to any of the test steps, then the unit should be considered damaged and returned to Massey Ferguson for repair. TPM illumination bulbs and batteries are available in service and can be replaced through the rear of the unit.

Procedure for tests of correct operation of computer (TPM)

Connect the programmer to the Tractor Performance Monitor using the larger of the two supplied harnesses. Ensure the red and black wires feed into the TPM and not the programmer. Apply power using the red and black wires connected to a charged battery.

- Red wire to + 12 V terminal
- Black wire to «-» terminal

Program the TPM in the Absolute function with the following values :

Stage	Value
1	9
2	2
3	2
4	3 (test code)
5	1

If the programming fails, there is a failure of the communication link between the programmer and TPM. This may be the result of a bad cable link between the two, or the TPM is sufficiently damaged to prevent communications and should therefore be returned for repair.

Test with decal of tractor

1 . Engine speed	9 . Wheelslip limit
2 . PTO speed	10 . Working width
3 . Forward speed	11 . Area worked
4 . Fuel/hour	12 . Fuel used
5 . Fuel/Area	13 . Fuel reserve
6 . *Area/hour*	14 . *Distance*
7 . Cost factor	15 . Counter
8 . Wheelslip	16 . Next service

1. The intensity of the lights on the face of the computer should change every 5 seconds. If this does not happen, there is a defect in the light circuit.

2. TIMING ACTIVE come on and go off alternately every 5 seconds. If this does not happen, there is fault in the warning light circuit or the switch.

3. Turn the function knob until the function 11 AREA WORKED has been selected. Press on the selection switch six times making sure that the selection warning light illuminates each time that the selection switch is pressed. If the display now shows «0003.0» with the furthest left digit flashing, the selection warning light and the selection switch have been checked.

4. With the furthest left digit always flashing, turn the knob ten times, checking that you can adjust each digit and that you can display all the numerical characters from 0 to 9. Return to the normal display «0030». This checks all the segments of the liquid crystal display in flashing mode. At this stage you have checked that the function choice knob is operational.

5. Press RESET/MODE twice.
   The 2nd most significant left digit of the display should flash.
   Repeat stage 4.

6. Press RESET/MODE twice.
   The 3rd significant left digit should flash.
   Repeat stage 4 for the following figure.

7. Press RESET/MODE.
   Repeat stage 4 to check the last figure.
   Press once, any flashing on the display should cease. The LCD display for REV/MIN has been checked.

8. Turn the function choice knob back and make sure that all the functions can be seen (corresponding warning light illuminated) thus checking that they function correctly.

9. Turn the function selection knob to select function 10 WORKING WIDTH. *Press on the key twice and* turn the knob until the REV/MIN display shows «0012» with the last two digits flashing. Press the key, the flashing should cease.

Datatronic - Checking TPM and harness

10. Turn the function selection knob until the function 8 WHEELSLIP has been selected. Press on the key and keep pressing for some seconds. The display should show dashes for some seconds, then it will, display «00». If this is not so, there is a fault in the «radar input» or «wheels input». Release the selection key.

11. Press the TIMING ACTIVE key. The warning light should illuminate or extinguish depending on its initial condition. If this is not the case, it means there is a fault in the work position warning light circuit or in the timing active selection key.
Repeat this operation several times to be sure that the transition which has been observed is not due to an oscillation on an external input.

12. Press the SLIP CONTROL key. The warning light should illuminate. If this does not happen, it means there is a fault in the warning light circuit; wheelslip control, or at the level of the wheelslip control selection key. The warning light SLIP CONTROL ACTIVE should remain extinguished ; if this is not the case, there is a fault in the circuits.
SLIP CONTROL should stay on for the following test procedure.

13. Turn the knob and select the function 3 FORWARD SPEED. The display should show $88 < V < 112$. If this is not the case, it means there is a fault associated with the engine speed sensor.

14. Select the function 4 FUEL/HOUR. The display should show. alternatively $92 < V < 117$ and $176 < V < 224$ every 5 seconds. If neither of these figures is found, it means that there is a fault of :
radar input
or radar output
or PTO input
If these figures do not alternate, there is a fault on the 540/1000 PTO input.
It is necessary to wait for 30 seconds after voltage supply because the radar output charges one capacitor to validate the PTO output.

15. Select the function 1 ENGINE SPEED and the display should show $6.5 < V < 8.3$. If this is not the case, there is a fault on one of the two following inputs : RADAR INPUT - WHEELS INPUT.

16. Select the function 2 PTO SPEED. The display should show $7.1 < V < 9.1$. If this is not the case, there is a fault on one of the following inputs : FUEL INPUT or ENGINE SPEED INPUT.

17. Select the function 16 NEXT SERVICE. The total displayed should increment every second or there is a fault in the counter input.

18. Press the S key of the programmer and keep it pressed. The warning light indicating that the wheelslip control is active should illuminate ; if this is not so, there is a fault in the signals circuit, or on the WARNING LIGHTS control, or on one of the following circuits :
- RADAR signal input circuit
- WHEELS signal input circuit

The warning lights cease their variation in luminous intensity, remaining in the condition of full intensity. If this is not the case, it means there is a fault in the light circuit or on the WARNING LIGHTS. The TIMING ACTIVE warning light must stay «ON».

19. Select the function 3 FORWARD SPEED. The display should indicate $105 < V < 130$ when pressing key S, holding on. If it does not do so, it means there is a fault on the circuit ENGINE INPUT signal.

20. Select the function 4 FUEL/HOUR. Press S key, the display should show $110 < V < 137$; if it does not do so, it means there is a fault on the PTO signal input or on the RADAR INPUT signal on even on the RADAR OUTPUT signal. If the figure shown is not constant, there is probably a short circuit on the 540 / 1000 PTO input.

21. Select the function 8 WHEELSLIP. Press S key, the display should show 15 or 16 : if it does not there is a fault on the WHEELS input signal.

22. Before returning the TPM to the tractor the unit must be re-programmed to the specification of the tractor to which it will be fitted. Please refer to the Absolute Programming section of this book to accomplish this (13 A01.F).

13B01.4 **Datatronic** - Checking TPM and harness

B . Harness test procedure

Purpose to test Datatronic tractor harness

Required equipment :
- 3389502 M1 : Tester
- MF 3005 : multimeter
- Test leads

Note :
All measurements are carried on tester connected between computer 24 pin circular R connector and tractor harness 24 pin female connector.

Key to abbreviations :
VAC : Volt Alternating Current
No : Test number
VDC : Volt Direct Current
Ω : Ohms

FUNCTIONS	INSTRUCTIONS	TERMINALS	VALUES	N°
	Engine stopped, ignition on			
Power supply (general)	Measure VDC between	02-23	11-13 VDC	01
Connector 14 pin		02-24	11-13 VDC	02
	Lights on			
Lighting	Measure VDC between	02-01	11-13 VDC	03
PTO selection	Set switch to 1000 Rpm			
	Measure VDC between	02-09	11-13 VDC	04
	Set switch to 540 Rpm			
	Measure VDC between	02-09	0	05
Timing active (external socket)	Measure VDC between	02-14	0	06
	Engine idling			
Fuel flow sensor	Read VDC between	13-19	0 / 12 V Alternately	07
Timing active (Transport position)	Set ELC switch to lift			
	Measure VDC between	02-04	0	08
	Set ELC switch to neutral. Measure VDC between	02-04	0	09
	Set ELC switch to lower			
	Measure VDC between	02-04	10 VDC	10
Radar	Measure VAC between	13-20	0	11
	Drive tractor up to 5 Kph			
	Measure VAC		06-07 VAC	
	Increase speed up to max. Check no change occurs.			
Slip control	Recalibrate 0 percent wheelslip as described in 13A01-4			
	Set ELC switch to lower position			
	Set depth control knob to obtain a reading of	02-17	5 VDC	
	Ensure lift/lower lights are off			
	Set wheelslip limit to six percent			
	Set intermix to full position control.			
	Switch on slip control.			
	Drive tractor forward on full left hand lock.			
	Check .			
	- lower links raise			
	- voltage increase	02-17	> 5 VDC	12
	Drive tractor forward in a straight line. Check			
	- *voltage decrease to 5 VDC*	02-17	5 VDC	13
	(note : Voltage will decrease as the speed of the tractor increases).			
	If slip control is found OK but problem remains. ELC should be checked			
	(see chapter 11).			
	Engine stopped			
	Disconnect the tester from the computer.			
Engine speed sensor	Measure resistance between	02-18	Approx. 450 Ω	14
PTO speed sensor	Measure resistance between	02-22	Approx. 450 Ω	15
Forward speed sensor	Measure resistance between	02-21	Approx. 450 Ω	16

Datatronic - Checking TPM and harness

C . Wiring diagram

Key to diagram

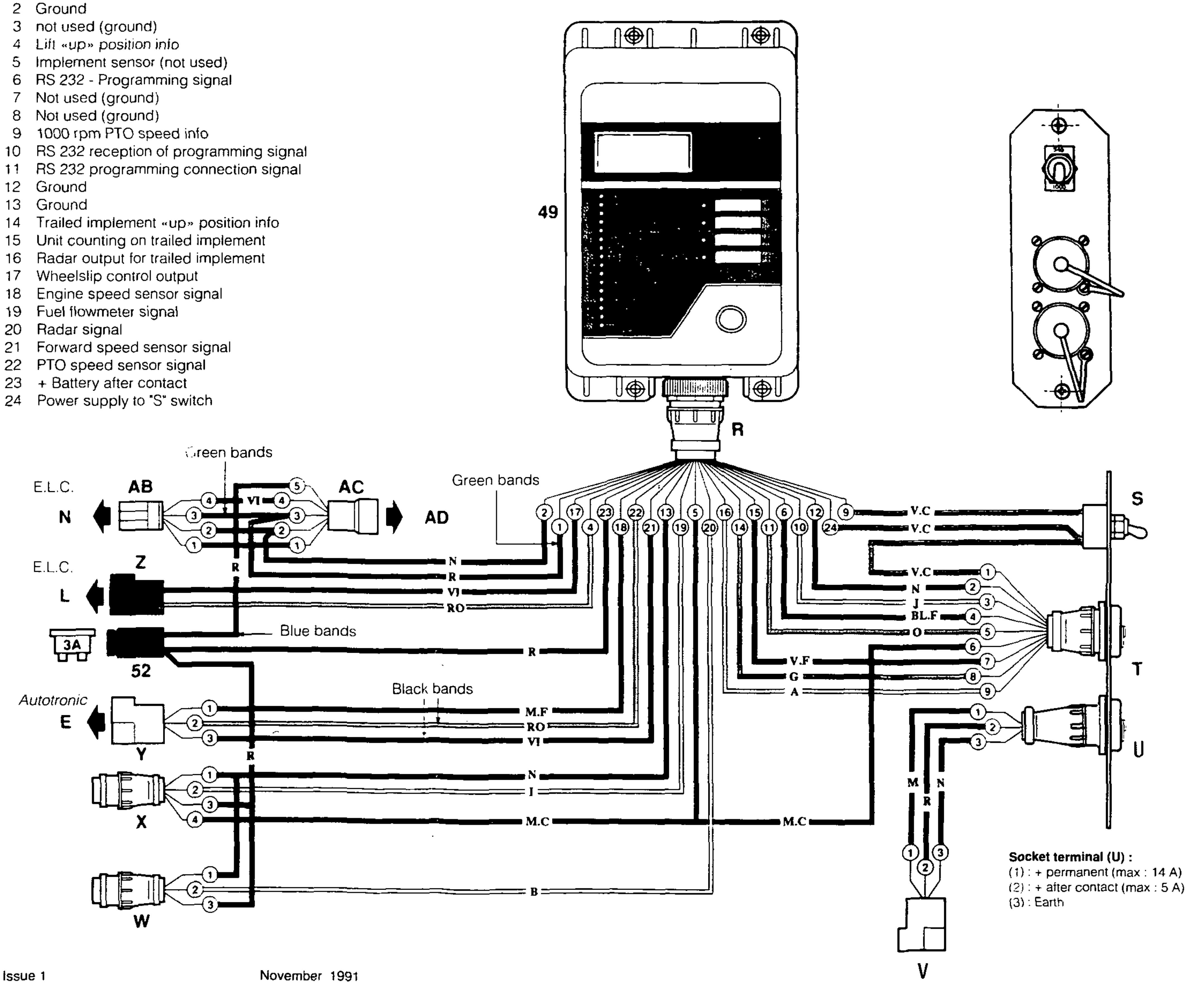
49 . Tractor performance monitor (TPM)
52 . Fuse 3 A
R . 24-way connector, junction with TPM
S . 540 or 1000 rpm PTO switch
T . External 14 pin socket
U : Internal socket
V : 3-way connector
W . TPM junction with radar harness
X . TPM junction with fuel flowmeter
Y . Datatronic junction with TCU and sensors harnesses (connector E)
Z . Datatronic junction with ELC harness (connector L)
AB . Datatronic junction with ELC harness (connector N)
AC . Datatronic junction with console harness (connector AD)

Colour code

A = Aluminium
B = White
BL = Blue
G = Grey
I = Ivory
J = Yellow
M = Brown
N = Black
O = Orange
R = Red
RO = Pink
V = Green
VI = Violet
F = Dark
C = Light

Terminal identification on 24-way connector R

1 + Lighting
2 Ground
3 not used (ground)
4 Lift «up» position info
5 Implement sensor (not used)
6 RS 232 - Programming signal
7 Not used (ground)
8 Not used (ground)
9 1000 rpm PTO speed info
10 RS 232 reception of programming signal
11 RS 232 programming connection signal
12 Ground
13 Ground
14 Trailed implement «up» position info
15 Unit counting on trailed implement
16 Radar output for trailed implement
17 Wheelslip control output
18 Engine speed sensor signal
19 Fuel flowmeter signal
20 Radar signal
21 Forward speed sensor signal
22 PTO speed sensor signal
23 + Battery after contact
24 Power supply to "S" switch



Socket terminal (U) :
(1) : + permanent (max : 14 A)
(2) : + after contact (max : 5 A)
(3) : Earth

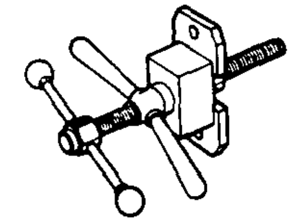
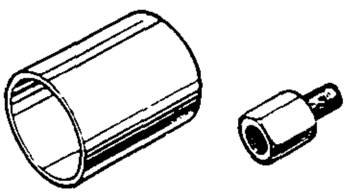
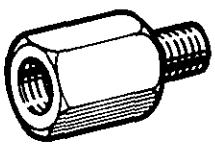
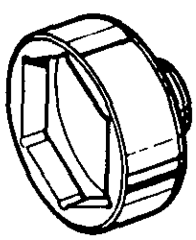
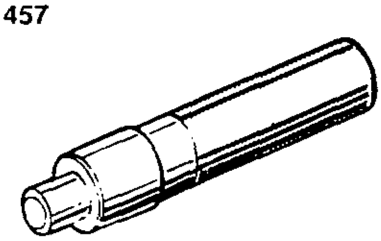
14

14 A01 Service Tools

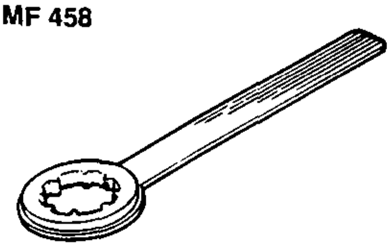
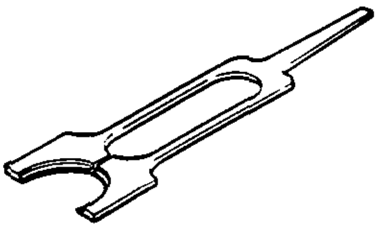
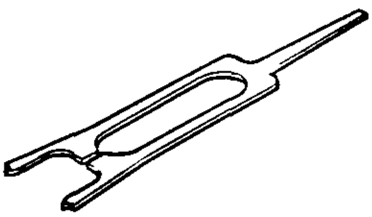
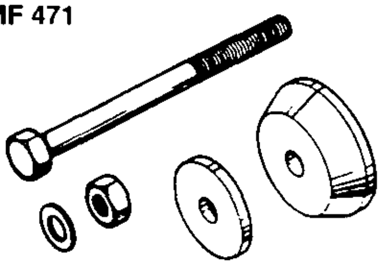
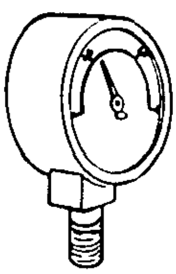
CONTENTS

Service Tools

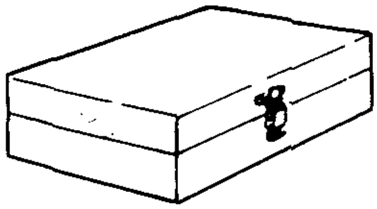
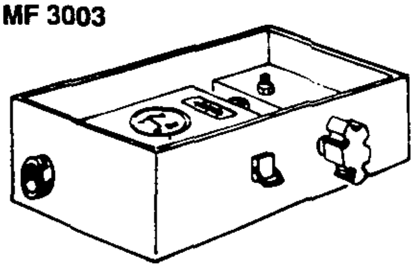
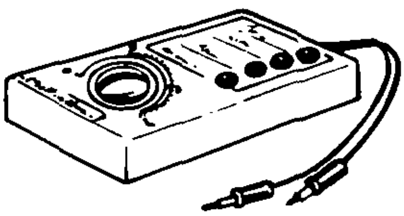
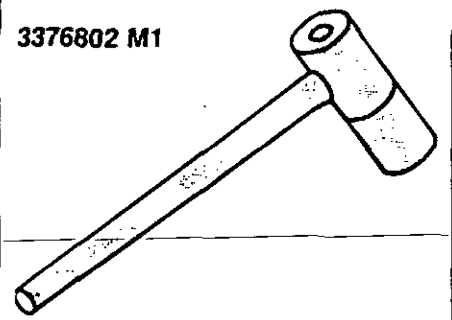
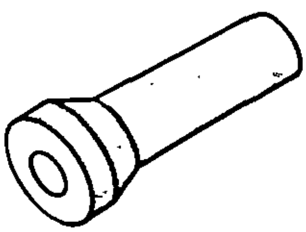
A . Service tools (engine excepted)

Tool Number	Description	Application
MF 195 C 	Bearing cup remover/replacer (main tool)	7 B01 - 8
MF 451 A 	4 W.D. swivel pin remover **Used with MF 195 C**	7 B01- 8
MF 451 B.2 (M14) **MF 451 B.3** (M18) 	Replacement swivel pin adaptor only **Used with MF 451 A**	7 B01- 8
MF 456 	Mainshaft nut socket (4x4)	5 A02 - 9 5 A02 - 11
MF 457 	Clutch centralizer	5 B01 - 5

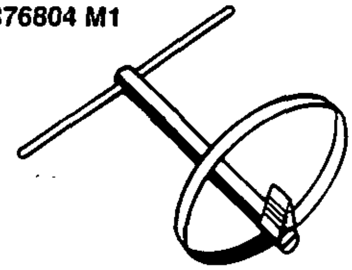
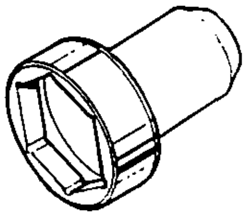
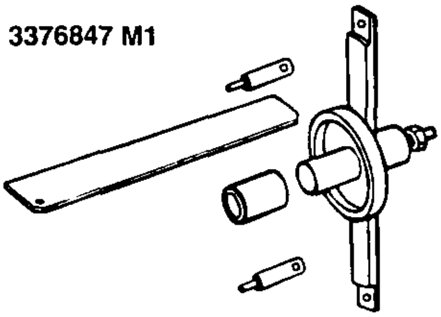
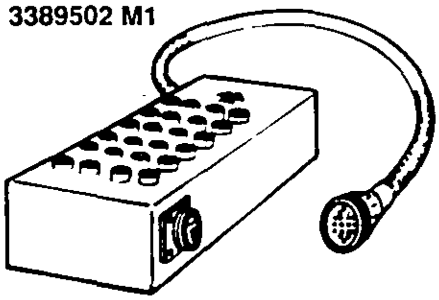
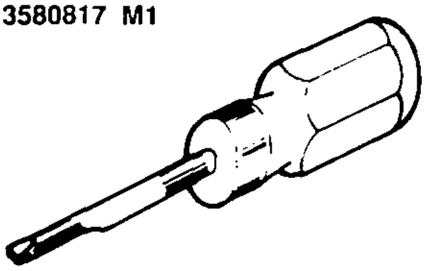
Service Tools

Tool Number	Description	Application
MF 458 	Mainshaft retaining tool	5 A02 - 8/11
MF 459 	Output shaft snap ring replacer	5 A02 - 16
MF 460 	Output shaft snap ring remover	5 A02 - 7
MF 471 	Hydralock differential lock spring compressor (front axle)	7 C01- 7
MF 3001 	Hydraulic pressure test equipment	8 J01

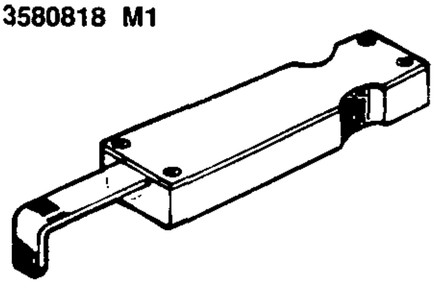
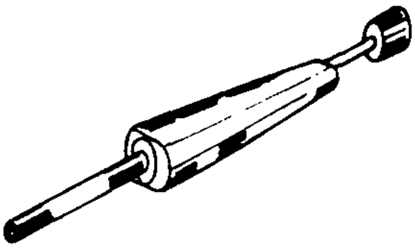
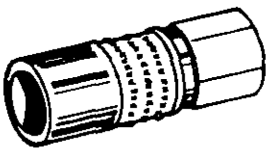
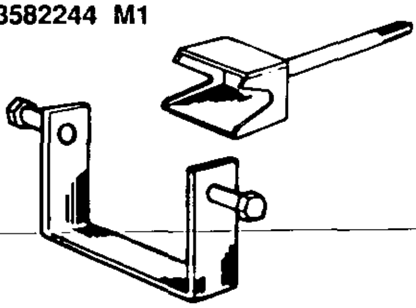
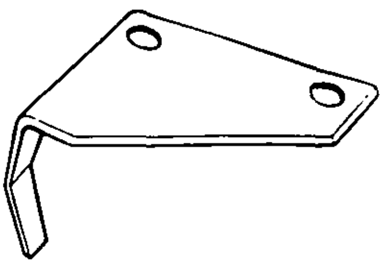
Service Tools

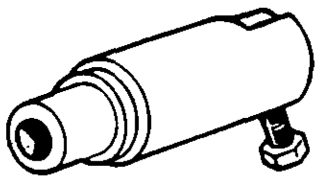
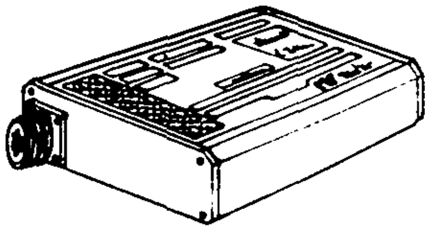
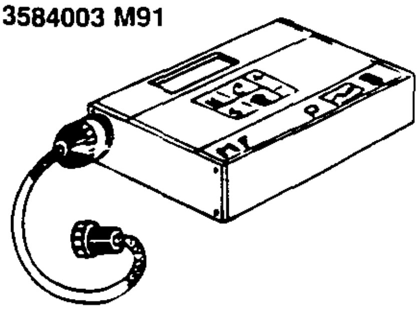
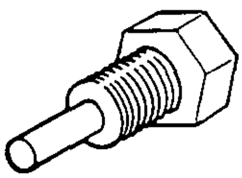
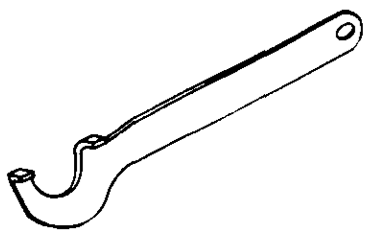
Tool Number	Description	Application
MF 3002 	Hydraulic flow test equipment	8 J01
MF 3003 	Hydraulic flowmeter	8 J01
MF 3005 	Multimeter for use with electronic test units	9 A01 11 C01 11 D01 12 B01 13 B01
3376802 M1 	Pull-clutch slave cylinder wedge	3 A02 - 3
3376803 M1 	Input hub seal depth setting tool	3 A01 - 3 3 A02 - 3

Service Tools

Tool Number	Description	Application
3376804 M1 	Pull-clutch seal compressing tool	5 C01 - 11
3376805 M1 	Mainshaft nut socket (4x2)	5 A02 - 8 5 A02 -13
3376847 M1 	Differential bearing pre-load gauge	6 J01 - 13
3389502 M1 	Electronic linkage control and datatronic break out test unit	11 C01 13 B01
3580817 M1 	Blade remover 724763-1	9 A01 12 B01

Service Tools

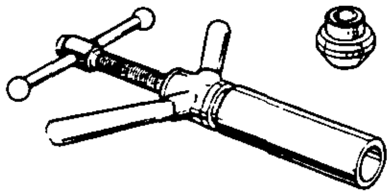
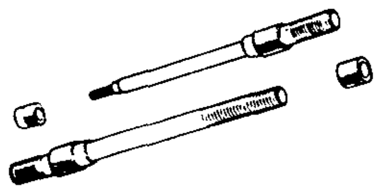
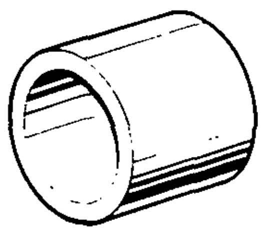
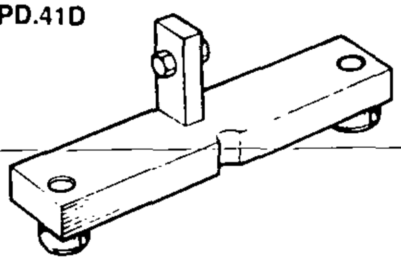
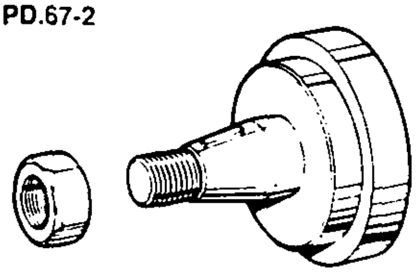
Tool Number	Description	Application
3580818 M1 	Female terminal remover 723735-1	11 C01 12 B01
3580820 M1 	Circular terminal remover 305183	11 C01 12 B01
3582045 M1 	Female hydraulic quick coupler PD 242	8 J01
3582244 M1 	Steering column repair tools	7 E01 - 3
3582434 M1 	Reverse shuttle setting gauge	5 A02 - 23

Tool Number	Description	Application
3583544 M1 	A/B range setting gauge (4x4)	5 K03 - 4
3584002 M92 	Transmission control test unit (Autotronic)	12 B01 - 3
3584003 M91 	Tractor performance monitor programmer and tester (Datatronic)	13 B01
3615053 M1 	Gearbox side cover locking tool	5 A02 - 24
3615334 M1 	Slotted nut wrench	5 A02 - 23 5 I01 - 11

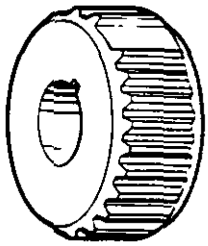
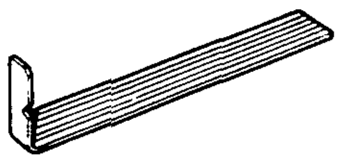
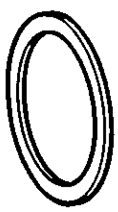
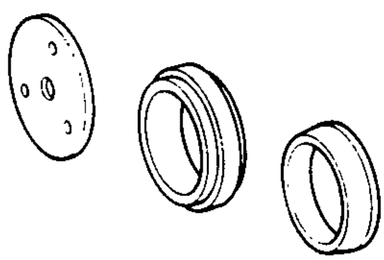
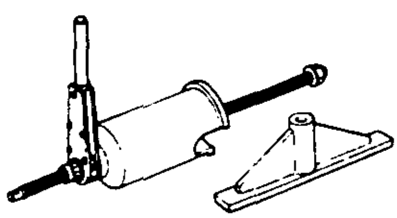
Service Tools

B . Engine Service tools

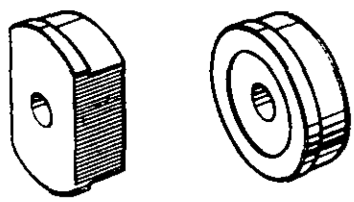
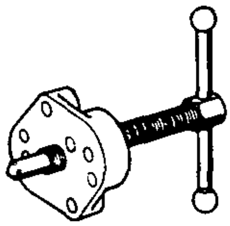
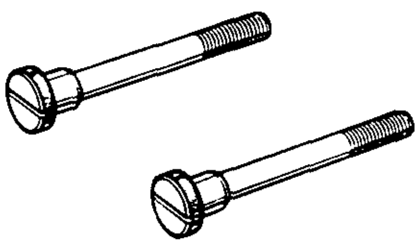
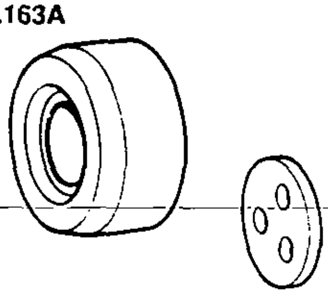
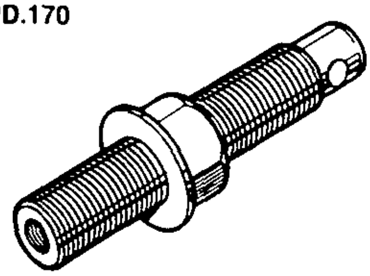
To use following tools refer to MF engine workshop manuals : 1646906M1 - 1856562M1.

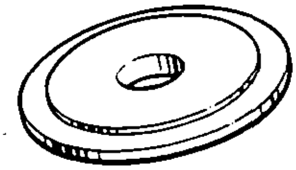
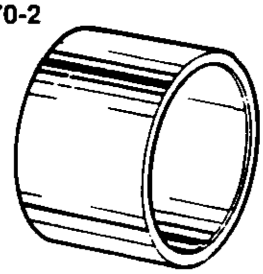
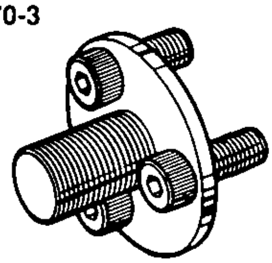
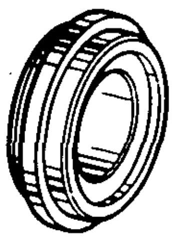
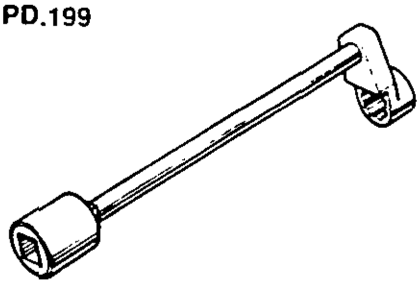
Tool Number	Description
PD.1D 	Remover/replacer for valve guides (main tool).
PD.1D-1A 	Adaptor for use with PD.1D.
PD.1C-6 	Adaptor for use with PD.1D and PD.1D-1A.
PD.41D 	Gauge for piston height, valve depth and cylinder liner flange for use with PD.208.
PD.67-2 	Drive adaptor for use MS.67B.

Service Tools

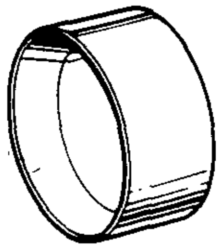
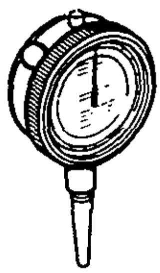
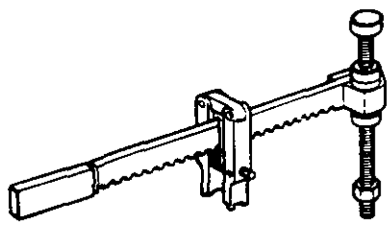
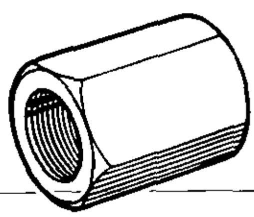
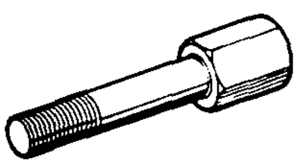
Tool Number	Description
PD.67-3 	Gear adaptor for use with MS.67B.
PD.67-4 	Pointer for use with MS.67B.
PD.67-5 	Distance piece for Bosch pumps : use with MS 67B.
PD.145D 	Crankshaft rear seal refitting tool.
PD.150B 	Remover/refitting tool for cylinder liner (main tool).

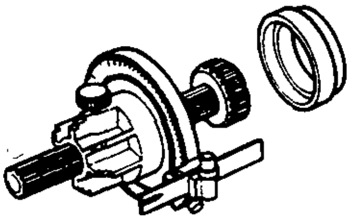
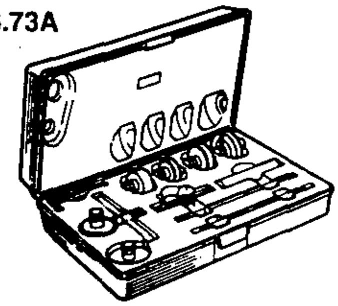
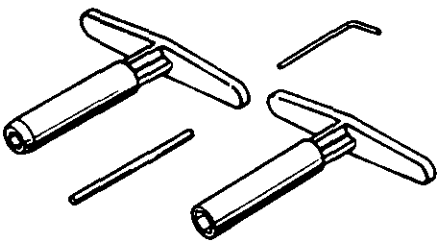
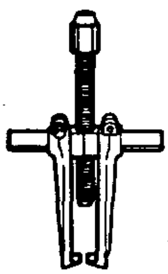
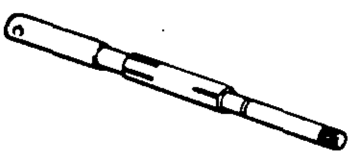
Service Tools

Tool Number	Description
PD.150B-17 	Adaptors for use with PD.150B.
PD.155B 	Basic puller for camshaft and fuel pump gears.
PD.155B-5 	Adaptors for use with PD.155B.
PD.163A 	Centralising tool for timing case cover.
PD.170 	Replacer tool for seal of timing case (main tool).

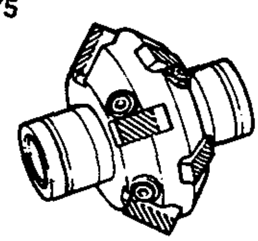
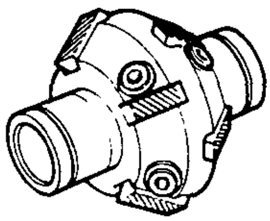
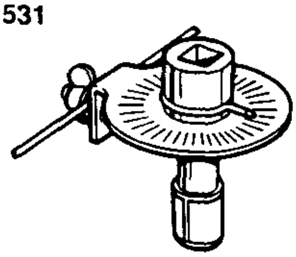
Tool Number	Description
PD.170-1 	Pressure plate for use with PD.170.
PD.170-2 	Fastener plate for use with PD.170.
PD.170-3 	Sleeve for use with PD.170.
PD.170-4 	Seal adaptor for use with PD.170.
PD.199 	Fuel injection pump flange nut spanner.

Service Tools

Tool Number	Description
PD.206 	Piston refitting tool.
PD.208 	Dial gauge for use with PD.41D.
PD.6118B 	Valve spring compressor.
PD.6118-7 	Stud adaptor for use with PD.6118B.
PD.6118-8 	Setscrew adaptor for use with PD.6118B.

Tool Number	Description
MS.67B 	Timing gauge.
MS.73A 	Set of adjustable cutters for valve seats.
MS.76B 	Handle set for valve seat cutters (also included in MS.73A).
MS.99 	Gear puller for water pump.
MS.150-9.5 	Adjustable pilot for valve seat cutters (also included in MS.73A).

Service Tools

Tool Number	Description
MS.275 	Cutter for exhaust valve seats (also included in MS.73A).
MS.281 	Cutter for inlet valve seats (also included in MS.73A).
MS.1531 	Angle gauge to tighten cylinder head setscrews.