VISIBLE-RESULTS

MF 4200 Series Tractor Workshop Service Manual

OPERATIONAL CONSIDERATIONS

- Stop the engine, if at all possible, before performing any service.
- Place a warning sign on self propelled equipment which, due for service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended and remove the key.
- DO NOT attempt to start the engine while standing beside the tractor or attempt to by-pass the safety start switch. Make a practise of checking that neutral start switches are functioning correctly.
- Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.
- Always turn the radiator cap to the first stop to allow pressure in the system to dissipate when the coolant is hot.
- Never work beneath a tractor which is on soft ground. Always take the unit to an area which has a hard level working surface - concrete is preferred.
- If it is found necessary to raise the equipment for ease of servicing or repair, make sure that safe and stable supports are installed, beneath axle housings, casings, etc., before commencing work.
- Certain repair or overhaul procedures may necessitate 'Separating the tractor', either at the engine gearbox or gearbox/rear axle locations. These operations are simplified by the use of the Tractor Splitting Kit/Stands (Use the Massey Ferguson MF.3012 Tractor Splitting Track, also available, MF.3013 Cab Stands). Should this equipment not be available, then every consideration must be given to stability, balance and weight of the components, especially if a cab is installed.
- Use footsteps or working platforms when servicing those areas that are not within easy reach.
- Cleanliness of the tractor hydraulic system is essential for optimum performance. When carrying out service and repairs plug all hose ends and component connections to prevent dirt entry.
- Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficiency and working life of a component and lead to costly replacement. Use of high pressure washer or steam cleaner is recommended.
- Before loosening any hoses or tubes connecting implements to remote control valves, etc., switch off the engine, remove all pressure in the lines by operating levers several times. This will remove the danger of personal injury by oil pressure.
- Prior to pressure testing, make sure all hoses and connectors not only of the equipment, but also those of the test equipment, are in good condition and tightly sealed. Pressure readings must be taken with the gauges specified. The correct procedure should be rigidly observed to prevent damage to the system or equipment, and to eliminate the possibility of personal injury.
- Hydraulic fluid escaping under pressure can have enough force to penetrate the human skin. To locate a leak under pressure, use a small piece of cardboard, never use your hands. If you are injected with hydraulic fluid seek medical help immediately.
- When equipment or implements are required to be attached to the hydraulic linkage, either for testing purposes or for transportation, the 'Position Control' should be used.
- Always lower equipment to the ground when leaving the tractor.
- If high lift attachments are installed on a tractor beware of overhead power, electric or telephone cables when travelling. Drop the attachment near to ground level to increase stability and minimise risks.
- DO NOT park or attempt to service the equipment on an incline. If unavoidable, take extra care and chock all wheels.
- Observe recommended precautions as indicated in this Service Manual when dismantling the air conditioning system as escaping refrigerant can cause frostbite.
- Prior to removing wheels and tyres from a tractor, check to determine whether additional ballast (liquid or weights) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly. Store the wheel so that they cannot fall over and cause injury.
- When inflating tyres beware of over inflation - constantly check the pressure. Over inflation can cause tyres to burst and result in personal injury.

Heed these safety precautions, and the ones found in this manual, and you will protect yourself accordingly. Disregard them and you may become injured for life.

SERVICING TECHNIQUES

Service Safety

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all farm machinery as well as the personal safety of the individual doing the work.

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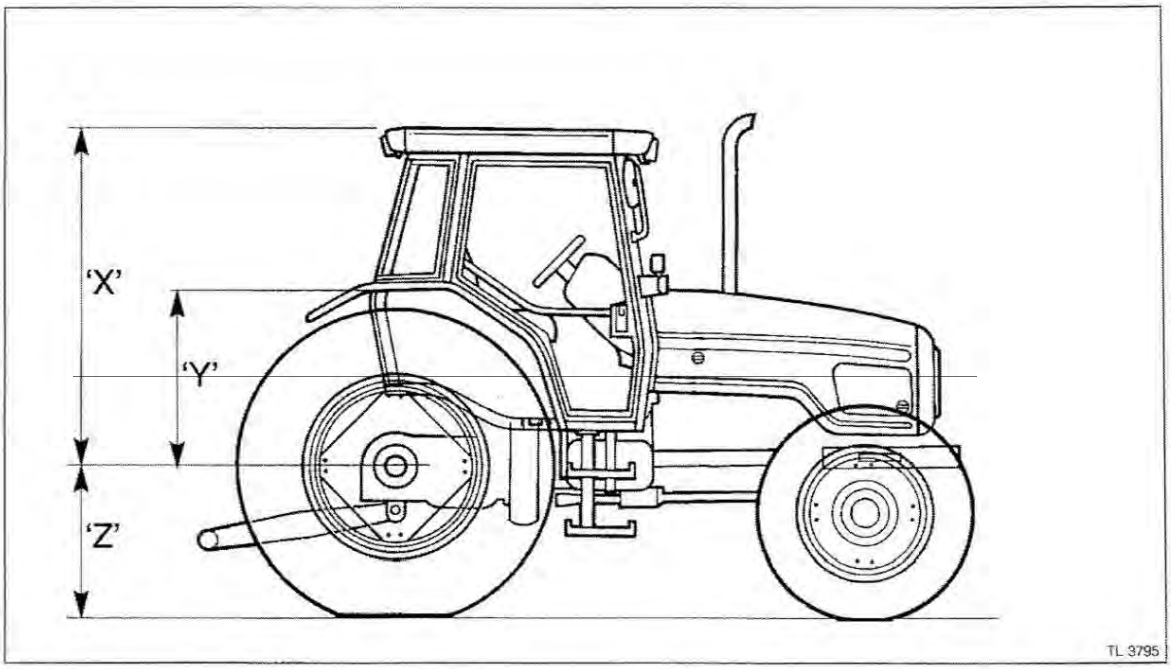


TRACTOR IDENTIFICATION and HEIGHT

The 4200 series tractors come in various types starting with the 'Standard Tractor'. This has a standard cab with a flat floor and standard roof with the heating and ventilating system installed, the hood is a normal type and size. The cab is set at two heights depending on the model and size of the rear wheels. The basic structure of all the cabs are the same size from the six cylinder down to the three cylinder.

The next type is similar to the first with a sloping hood used for loader and front mounted implement work.

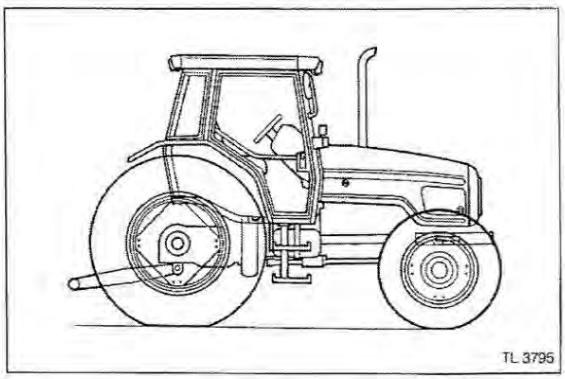
The third type is called 'Lo-Profile', the cab is set lower on the chassis and in the cab there is a tunnel around the transmission. This build only comes with a sloping hood. As an option, it can be fitted with a flat roof which further reduces the overall height of the tractor.

The last and fourth type is for tractors with three cylinder engines, it is only available with the Lo-Profile cab and sloping hood, the cab is set lower for the small wheels. It is also available with a four cylinder engine (4225). These models are available with a standard or flat roof cab for working in low buildings.

The following illustrations show the visual differences between the types of build and the changes in height depending on model and tyre size. The height of cab controls the size of fuel tank fitted.

4260, 4263 and 4270 Standard Tractors

6 cylinder engines.
Standard roof.
Standard cab with flat floor.
Standard hood.
Cab height 'X' = 1900 mm.
Mud guard height 'Y' = 990 mm.
'Z' = rolling radius of tyre.
Fuel tank capacity = 202 litres (two tanks).



Servicing the Tractor

Section 1 – Part D

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FOUR-WHEEL DRIVE FRONT AXLE

Specification:

Use Massey Ferguson Super Tractor Universal Oil 10W-30.
or
Massey Ferguson Super Premium Universal Oil 15W-30.
or
Massey Ferguson Universal Gear Oil EP 80W-90.
or
One of the alternative lubricants listed on page 1D-12 or its equivalent.

Capacity:

Axle (each side) - AG 66/75/85 (4215, 4220, 4225, 4235, 4243, 4245, 4255)	5,6 litres (1.2 gal)(1.5 US gal).
Axle (each side) - AG 105 (4253, 4255, 4260, 4263, 4270)	7,6 litres (1.7 gal)(2 US gal).
Epicyclic hub (each side) - AG 66 (4215, 4220, 4225, 4235)	0,8 litres (1.5 pts)(1.5 US pts).
Epicyclic hub (each side) - AG 75/85 (4235, 4243, 4245, 4255)	1,0 litres (1.8 pts)(1.8 US pts).
Epicyclic hub (each side) - AG 105 (4253, 4255, 4260, 4263, 4270)	1,2 litres (2.0 pts)(2.0 US pts).

BRAKE FLUID

Use Massey Ferguson LHM Mineral Brake Fluid part number 3405 389 M1 (1 litre bottle).
or
Mineral type oil as specified in the alternative lubricants listed on page1D-12.
DO NOT use vegetable type fluid. The correct fluid is colour coded GREEN.

GENERAL

Grease Points

Use Massey Ferguson Multi-Purpose Grease NLG1 EP2 or any multi-purpose lithium-based grease. Always clean the grease gun and fittings before and after use.

Grease points are located as follows:

Two-wheel drive tractors

Front wheel hubs	2 points.
Front axle swivel pins	2 points.
Steering ram pivot pin	1 point.

Four-wheel drive tractors

Universal joints	2 points.
Front axle swivel pins	4 points

All tractors

Front axle pivot bearing	2 points.
Adjustable lift rods	4 points.
Assistor rams top bearing	2 points.

With an oil can lubricate throttle and control linkage every 250 hours.

IMPORTANT: *Severe working conditions.*
Where tractors are operating arduous work cycles, or when working in areas where there are dusty conditions, paddy fields, deep water etc, coupled with a lack of maintenance care and low specification fuel and oil, the intervals of service should be halved, particularly for oil and filter changes.

CAUTION: *Tractor lubricants and greases:*
No significant hazard when properly used and in the application for which they were designed. Frequent and/or prolonged skin contact may give rise to skin irritations. Emergency treatment of acute effects:

- Ingestion: DO NOT induce vomiting. Administer 250 ml (1/2 pint) milk or 50 ml olive oil. Seek medical advice.
- Skin Contact: Remove by wiping, wash with soap and water.
- Inhalation: Saturated vapour non-toxic at room temperature. - Remove from exposure.
- Eye contact: Wash with copious amounts of warm water.

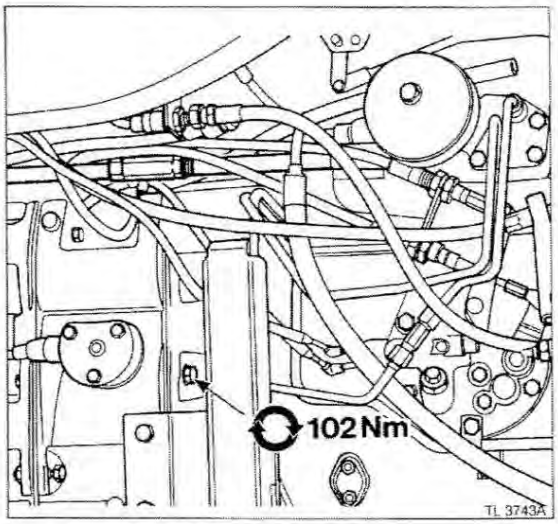
18. Disconnect the hydraulic pipe from steering unit to oil cooler, if fitted.
19. Disconnect the fuel leak-off pipe to tank at the fuel filter.
20. Disconnect the air conditioner couplings and fit blanking plug and cap, Massey Ferguson part number 3376 935 M1 to prevent the loss of refrigerant, if fitted.
21. Tractors with shuttle gearbox, remove the shift lever bracket fitted to the rear of the cylinder block.
22. Disconnect the fuel pipes and electrical connection to the fuel tank sender unit (the connection is in the cable NOT on the top of the tank).
23. Drain and remove the fuel tank(s), *(see operation 2-3C)*.
24. Remove the rear tank support.
25. Disconnect the wires to the PTO safety start switch, and range box indicator switch located in the cable.
26. Disconnect the clutch cable.

Right-hand Side

27. Clamp the two cab heater hoses at the base of the cab. Remove and drain off the coolant. Mark one of the pipes with tape to aid correct refitment.
28. Remove the gear lever.
29. Disconnect the hydraulic pipes from the manifold which run to the front of the tractor.
30. Disconnect the wires to the safety start switch on the gear lever housing, if fitted.

General

31. Remove the studs from the front cab mounts complete with large washers and nuts.
32. Assemble the MF.3012 Tractor Splitting Track, under the tractor. Place the stationary jack on the end of the track under the rear centre housing. Place the trolley under the gearbox placing wood between both jacks and the tractor. An additional length of track (three sections) will assist in splitting.
33. Place MF.3013 Cab Stands on each side of the cab. Screw up the stands so that the cab is lifted approximately 25 mm (1 in) clear of the mounts.
34. Remove the bolts and nuts around the range gearbox and centre housing flange.
35. Carefully withdraw the front axle, engine and gearbox forwards.
36. Discard the gasket.
37. Remove the drive shaft and PTO coupling.
38. The range gearbox or main gearbox can now be removed as required.



Refitment

39. Tension the fan belt tight so that the engine and transmission can be turned over using the fan.
40. Engage the main gear lever into high/3rd and the shuttle lever into forward.
41. Fit the drive shaft and PTO coupler.
42. Fit two guide studs to assist in alignment of the gearbox and centre housing.
43. Place a new gasket on the guide studs.
44. Push the front axle/engine/gearbox assembly towards the centre housing, align the guide studs in the range box with the corresponding holes in the centre housing. Turn the engine fan to align the splines and continue pushing until the two flanges meet.

IMPORTANT: *DO NOT fit and tighten any bolts until the two flanges meet, or serious damage may occur to the PTO and main drive components. To facilitate easy reassembly, the range box and centre housing flanges must be in alignment and parallel.*

45. Secure the two flanges with special bolts and nuts where fitted (dry), removing the guide studs. Use special tool MF.367B, Transmission Torque Wrench, using the 14 mm socket tighten to an initial torque of 50 Nm (35 lbf ft) working in sequence around the box.
46. Tighten all the bolts to a torque of 102 Nm (75 lbf ft). Finally, re-tighten the first bolt to ensure that the torque is correct.

Timing Case and Drive Assembly:

Setscrews, timing case to cylinder block	22 Nm (16 lbf ft).
Setscrews, bottom cover to timing case	22 Nm (16 lbf ft).
Setscrews, front cover to timing case	22 Nm (16 lbf ft).
Setscrews, front cover to timing case	9 Nm (7 lbf ft).
Setscrews, front cover to bridge piece, bottom cover	22 Nm (7 lbf ft).
Setscrews, camshaft gear	27 Nm (20 lbf ft).
Setscrews, idler gear - 1/2 UNF	65 Nm (48 lbf ft).
Setscrews, idler gear - M20	78 Nm (57 lbf ft).

Aspiration System:

Setscrews, inlet manifold to cylinder head	22 Nm (16 lbf ft).
Nuts, exhaust manifold to cylinder head	22 Nm (16 lbf ft).

Fuel System:

Nuts, high pressure fuel pipes	22 Nm (16 lbf ft).
Setscrews, fuel injectors	22 Nm (16 lbf ft).
Setscrews, fuel lift pump	22 Nm (16 lbf ft).
Setscrews, pump support bracket to cylinder block	22 Nm (16 lbf ft).
Nut, pump support bracket to fuel injection pump	22 Nm (16 lbf ft).
Nut, drive gear of fuel injection pump	80 Nm (59 lbf ft).
Nuts for flange of fuel injection pump	22 Nm (16 lbf ft).

Lubrication System:

Plug, lubricating oil sump	34 Nm (25 lbf ft).
Setscrews, oil pump to front bearing cap	22 Nm (16 lbf ft).
Setscrews, suction pipe to main bearing cap	9 Nm (7 lbf ft).
Nuts and setscrews, lubricating oil sump	22 Nm (16 lbf ft).
Setscrews, filter head	44 Nm (32 lbf ft).

Cooling System:

Setscrews, adaptor plate to timing case	22 Nm (16 lbf ft).
Setscrews and nuts, coolant pump to timing case, front cover and adaptor plate	22 Nm (16 lbf ft).
Setscrews, fan to coolant pulley	22 Nm (16 lbf ft).

Flywheel and Housing:

Setscrews, flywheel to crankshaft	105 Nm (77 lbf ft).
Setscrews, flywheel housing adaptor plate	44 Nm (32 lbf ft).

1000 SERIES LOW EMISSION ENGINE SPECIFICATIONS

Engine:	
Make	Perkins diesel.
Type	Water cooled direct injection
Engine build code:	
4260 tractor	YG 31315 ..... 6 cylinder - Naturally aspirated.
4263 tractor	YG 31300 ..... 6 cylinder - Naturally aspirated.
4270 tractor	YH 31302 ..... 6 cylinder - Turbocharged.
Nominal bore	100 mm (3.937 in).
Stroke	127 mm (5.000 in).
Cubic capacity six cylinder engines:	
4260, 4263 and 4270 tractors	6 litres (365 in^3).
Firing order six cylinder engines:	
4260, 4263 and 4270 tractors	1, 5, 3, 6, 2, 4.
Direction of rotation	Clockwise from the front.
Compression ratio	17.25:1
Power Ratings:	
Ratings are DIN ± 5%:	
4260 and 4263 tractors:	PS kW
Engine power at flywheel	100 ... 73.5
Nominal power at PTO at engine rated speed (manufacturers estimate varies with specification):	
12 x 4 and 12 x 12 gearboxes	92.7 .. 68.1.
18 x 6 gearbox	88.2 .. 64.8.
Maximum engine torque at 1400 rev/min	388 Nm (286 lbf ft).
4270 tractor:	PS kW
Engine power at flywheel	110 ... 80.9
Nominal power at PTO at engine rated speed (manufacturers estimate varies with specification):	
12 x 4 and 12 x 12 gearboxes	101.2 . 74.4.
18 x 6 gearbox	96.7 .. 71.1.
Maximum engine torque at 1400 rev/min	449 Nm (331 lbf ft).
Engine Speeds:	
Low idle speed	750 rev/min.
Rated speed	2200 rev/min.
Maximum no-load speed	2312 rev/min.
Fuel Injection Pump:	
	To be advised.
Fuel Injectors:	
	To be advised.
Valve Tip Clearance:	
Inlet (hot orcold)	0,20 mm (0.008 in).
Exhaust (hot or cold)	0,45 mm (0.018 in).
Valve Guides:	
Protrusion above bottom of recess for valve spring:	
Inlet and exhaust	14,85-15,15 mm (0.585-0.596 in).

Oil Cooler/Air Conditioner Condenser

9. If the tractor is fitted with either an oil cooler or air conditioner condenser or both, they can be moved to one side without disconnecting the pipes.
10. Disconnect the oil cooler from the radiator frame.
11. Remove the top runner retaining the condenser to the radiator.
12. Disconnect the panel above the radiator through which all the pipes and hoses pass.
13. Lift the oil cooler, condenser and all the pipes up and over so that they rest on top of the engine.

General

14. Disconnect the radiator stay.
15. Remove the fan cowl and hang it over the fan.
16. Disconnect the radiator and header tank hoses.
17. Remove the front hood support complete with air cleaner.
18. Remove the four radiator holding bolts.
19. Slide the battery tray or top plate, complete with batteries if fitted, forward to clear the radiator foot.
20. Lift out the radiator.

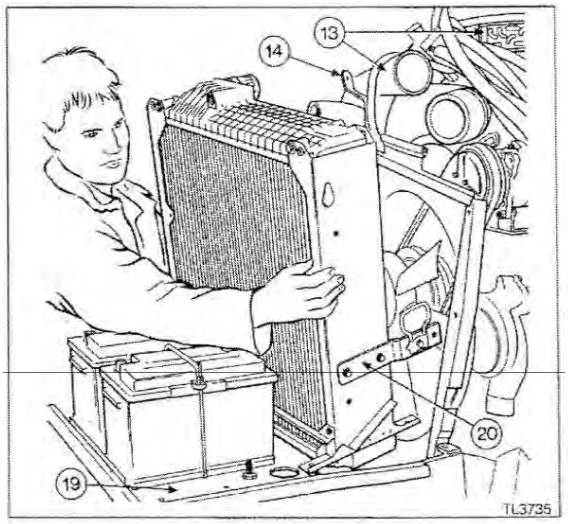
Refitment

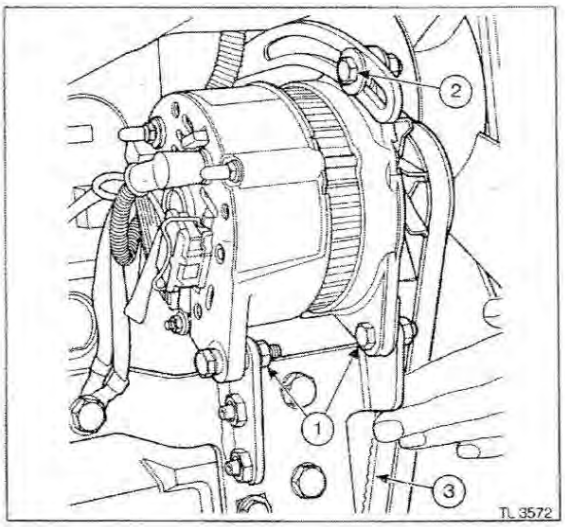
21. Reverse procedures 1 to 20 except:

b. Realign the hood latch frames on each side of the radiator.

c. Fill the cooling system with a 50% antifreeze/water solution.

d. Check for coolant leaks and level after a road test.





FAN BELT

Adjust **4–3B**

Procedure

WARNING: If the lower side panel (safety guard) is removed or loosened whilst checking the belt tension, it must be refitted and secured before restarting the tractor.

The illustration gives a typical tractor installation of the alternator/fan belt arrangement; your tractor may differ slightly in the positioning of the adjustment link.

Renew the belt if it is worn or damaged. If twin belts are fitted, they must be renewed together.

To check the deflection, press down the belt with the thumb at the centre of the longest free length. With moderate thumb pressure the correct deflection of the belt is 10 mm (3/8 in).

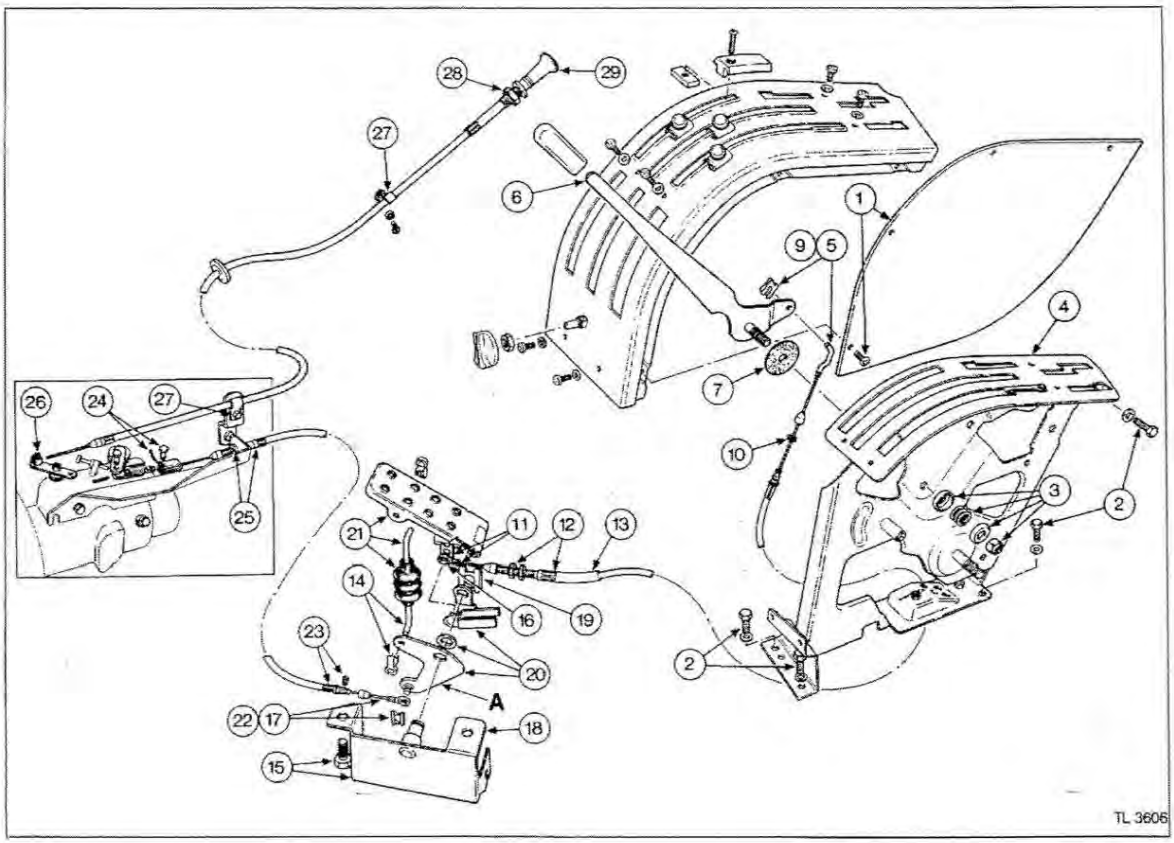
If a belt tension gauge is available, the correct tension is 35 N (8 lbf), DO NOT allow the tension to fall below 22 N (5 lbf).

If twin belts are fitted, check/adjust the tension on the tighter belt.

To adjust the belt tension:

1. Loosen the alternator pivot bolts (1) and the adjustment link bolt (2).
2. Change the position of the alternator to give the correct tension and re-tighten the bolts.
3. Recheck the belt tension to ensure that it is still correct.

NOTE: *If a new belt(s) is fitted, check/adjust the tension again after 25 hours of operation.*



THROTTLE CONTROL

Removal and Refitment **4–3C**

Removal

1. To gain access to the inside of the control assembly , remove the four cross head screws and the side panel.

Throttle Lever

2. Remove the mounting bolts.
3. Remove the Nyloc nut, cup washers and spring.
4. Tilt the console over to gain access to the outside.
5. Remove the clip and disconnect the cable.
6. Remove the throttle lever assembly from the frame.
7. Remove the friction washer.

Throttle Cable (Hand to Foot Pedal)

8. Remove the mounting bolts and tilt the console over to gain access to the throttle lever.
9. Remove the clip and disconnect the cable.
10. Remove the clip from the cable where is passes through the floor.
11. Remove the cable at the foot pedal end by removing the clip and disconnect the cable.
12. Remove the locknut and disconnect the cable from the foot pedal housing.
13. Pull the cable out from the tractor.

Foot Pedal Assembly

14. Remove the clip and disconnect the rod between the pedal and mechanism.
15. Remove the two bolts and lower the assembly away from the floor.
16. Disconnect the hand throttle cable.
17. Disconnect the engine throttle cable.
18. Remove the assembly to the bench.
19. Remove the clip.
20. Remove the two levers and washer.
21. If necessary, remove the foot pedal, rod and rubber cover.

Split Torque Clutch

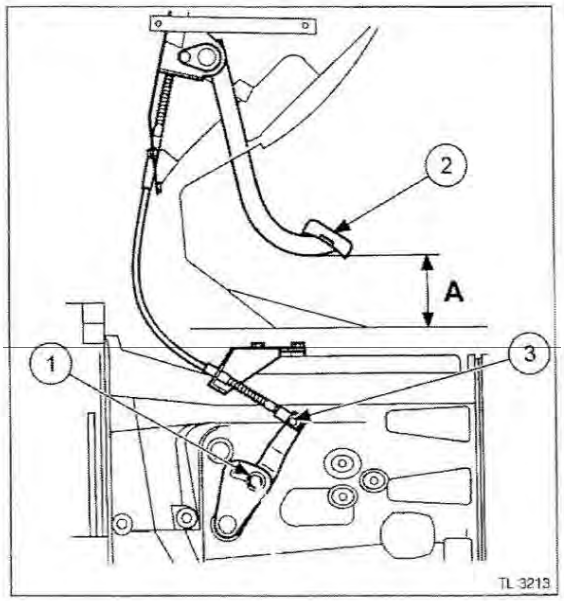
CLUTCH PEDAL HEIGHT

Adjust **1–4A**

Procedure

The tractor is fitted with a cable operated clutch with a constant running release bearing. This type of clutch does not require routine adjustment, the pedal will rise as the clutch wears. Occasionally, it will be necessary to readjust the clutch pedal cable to reset the pedal height when it becomes too high as follows:

1. Using the special spanner provided in the tool box, part number 3812 659 M1, slacken the adjusting screw (1) between the fuel tank and chassis.
2. Hold the pedal (2) off the flat part of the cab floor mat to a height of 155 mm (6.1/8 in) 'A', place it on a block of wood.
3. Pull the clutch release lever (3) down until the cable is taught and re-tighten the adjusting screw.



CLUTCH PEDAL LINKAGE

Removal and Refitment **2–4A**

Massey Ferguson recommend that the clutch cable is renewed every 3000 hours.

Removal

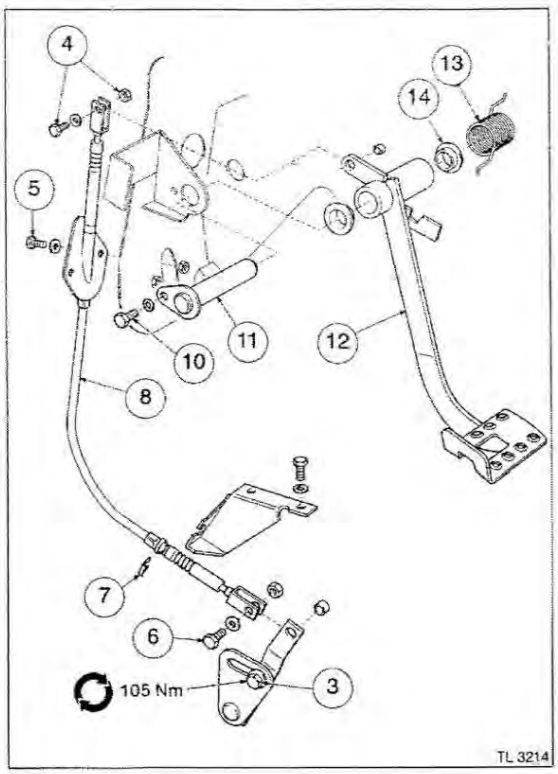
1. Remove the lower panel under the instrument panel to gain access to the clutch pedal shaft.
2. Open the left-hand hood panel.

Clutch cable

3. Slacken the clutch pedal adjusting bolt.
4. Remove the upper clutch cable nut, bolt, washer and spacer.
5. Remove the two bolts securing the cable to the front bulkhead.
6. Remove the lower cable nut, washer and spacer.
7. Remove the spring clip securing the cable to the lower bracket and disconnect the cable.
8. Remove the cable by pulling out from the front of the bulkhead.

Clutch pedal

9. Engage the forward gear to disconnect the interlock (shuttle transmissions).
10. Remove the bolt from the end of the pivot pin.
11. Withdraw the pivot pin.
12. Lift out the clutch pedal.
13. Remove the return spring.
14. If necessary, renew the clutch pedal bushes.



Refitment

15. Reverse procedures 1 to 12 except:
    a. Lubricate the pivot shaft and bushes with a lithium-based grease.
16. Adjust the clutch pedal height, *(see operation 1-4A)*.

12 x 12 Shuttle Gearbox

Section 5 – Part A

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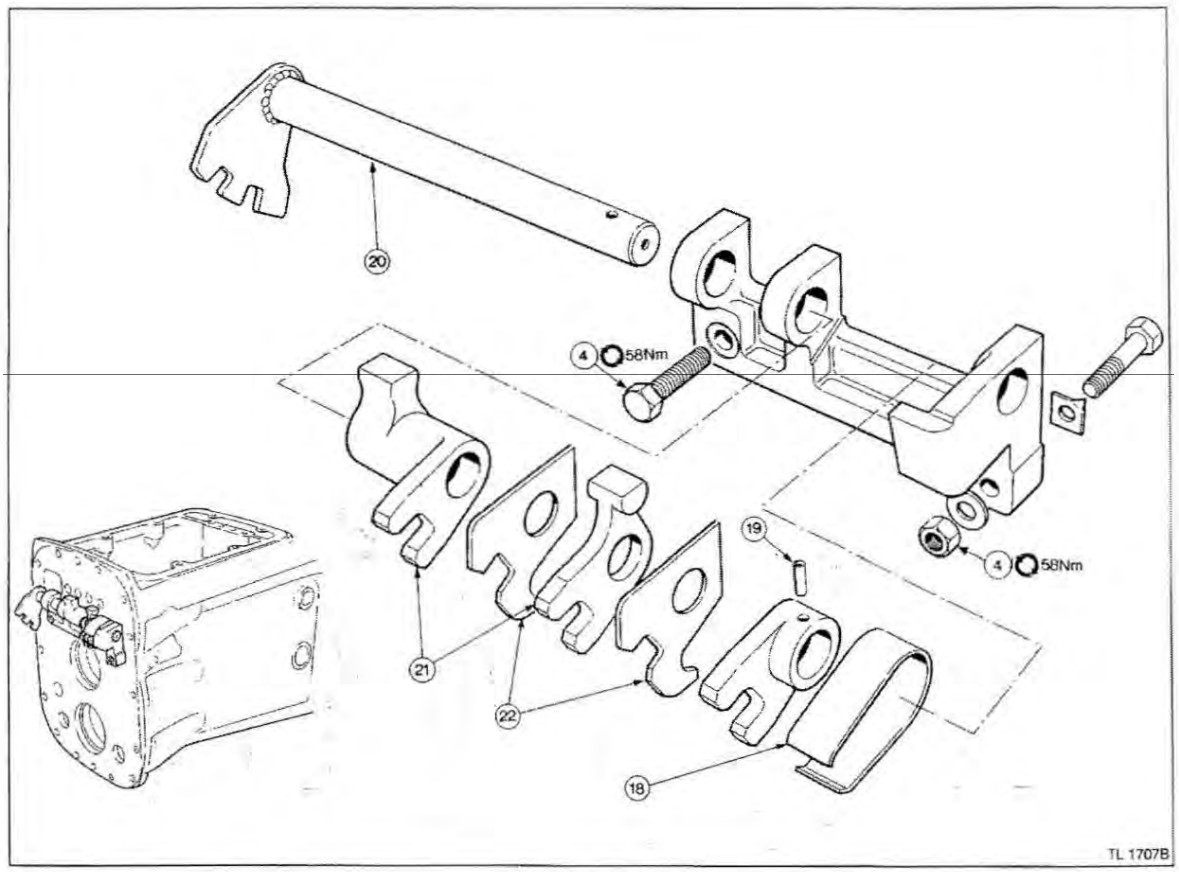


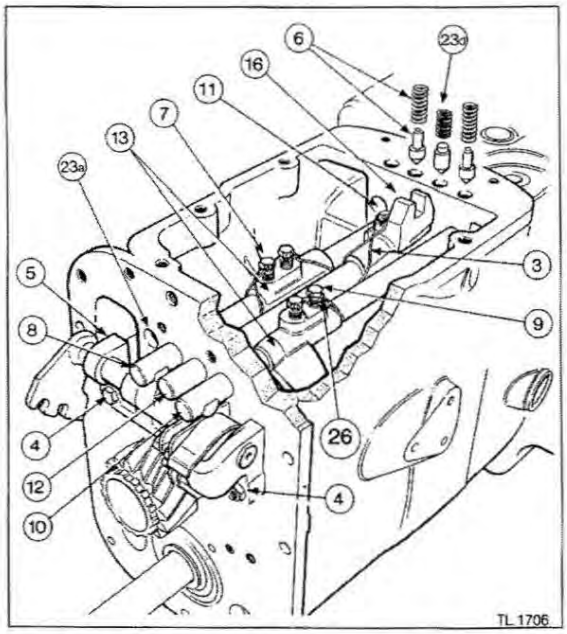
SELECTOR RAILS and FORKS

Removal and Refitment **5–5A**

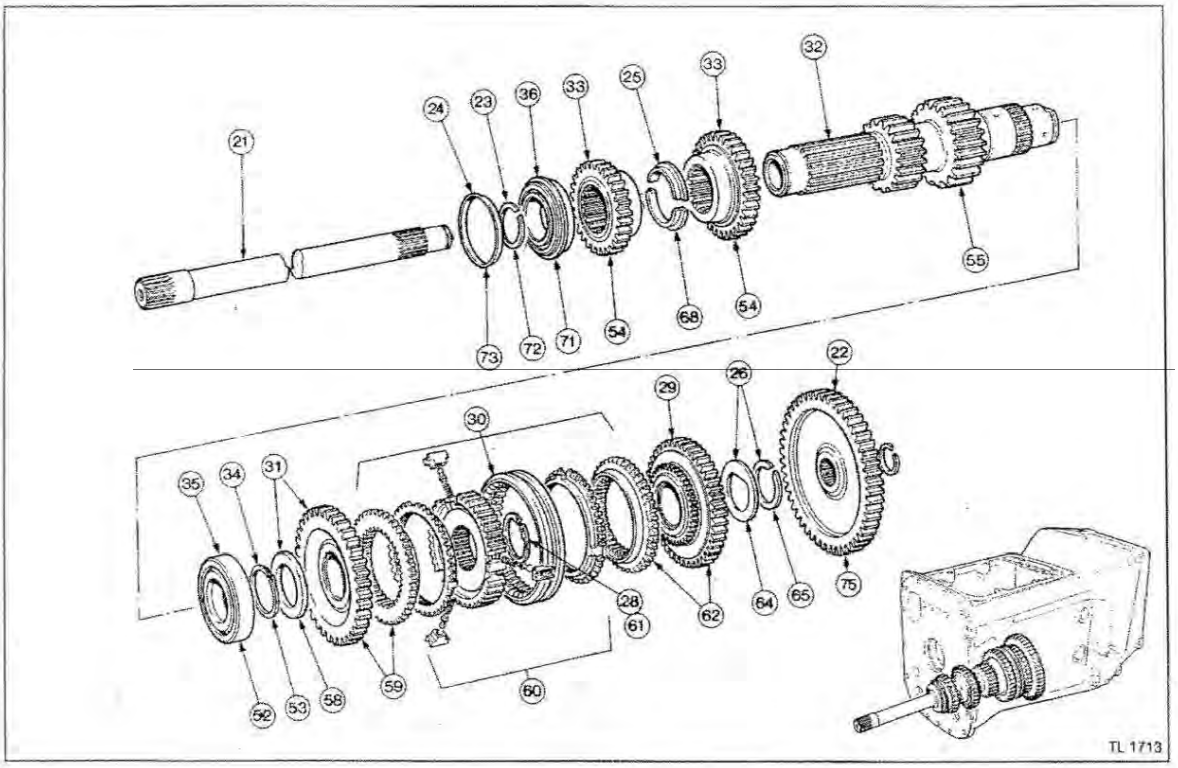
Special Tools:
MF.414 Synchromesh Setting Pin

Removal

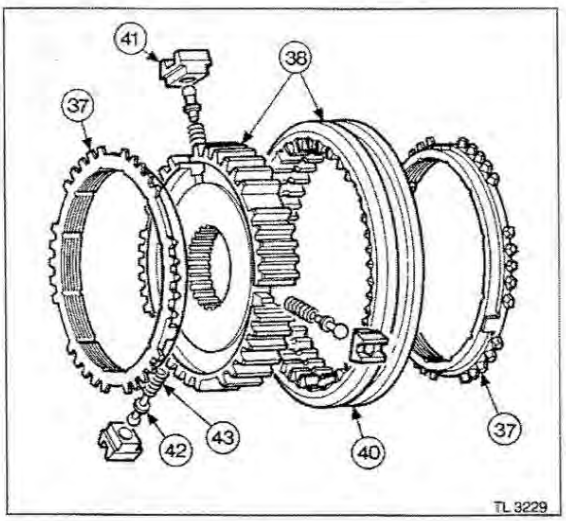
1. Remove the gearbox assembly from the tractor, *(see operation 1-5A)*.
2. Remove the gearbox top cover, *(see operation 4-5A)*.
3. Release the locking wires.
4. Remove the bolt and nut from the rear selector mechanism.
5. Remove the selector mechanism assembly.
6. Lift out the detent springs and plungers.
7. Loosen the two locking screws.
8. Slide the 1st/2nd rail rearwards out of the housing.
9. Loosen the two locking screws.
10. Slide out the 3rd/4th rail rearwards out of the housing.
11. Loosen the two locking screws.



12. Slide the forward/reverse rail rearwards out of the housing.



25. Drive the layshaft forwards and remove the two split rings between 3rd and 4th gear.
26. Remove the snap ring and thrust washer from the front of the layshaft.
27. Push the layshaft rearwards as far as possible.
28. Slide the reverse constant mesh gear fully forward. Remove the circlip with a pair of right-angled circlip pliers from the front of the synchromesh hub. Slide the circlip as forward along the layshaft as possible.
29. Push the layshaft rearwards as far as it will go and lift the reverse gear out through the top of the gearbox leaving the brass baulk ring on the synchromesh hub.
30. Remove the circlip and the synchromesh hub assembly with two brass baulk rings.
31. Remove the forward gear and thrust washer.
32. Remove the layshaft by pushing it out through the front of the gearbox.
33. Lift out the 3rd and 4th gear.
34. Remove the circlip.
35. Press the front layshaft bearing off the shaft, if necessary.
36. Remove the rear bearing from the casing.



Synchromesh Hub Assemblies

37. Remove the two baulk rings.
38. Remove the drive hub complete with the sliding coupler.
39. Wrap the hub and coupler in a cloth.
40. Remove the sliding coupler, take care not to lose pressure springs, ball pins and blocks.
41. Remove the three pressure blocks.

Refitment

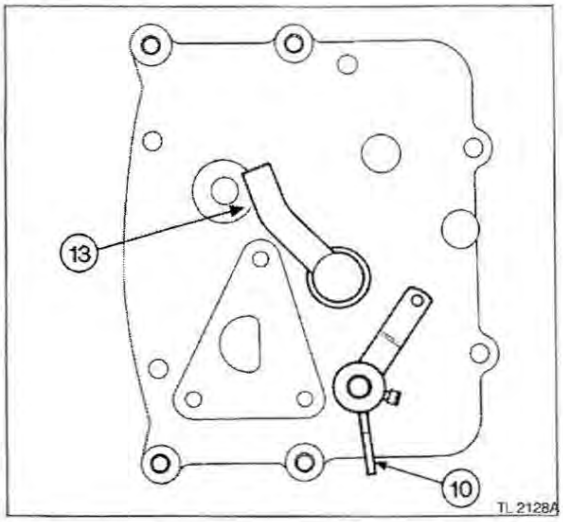
7. Ensure that the range unit is in LOW range and a forward main gear selected so that the gearbox can be rotated to assist in re-assembly.
8. Press the interlock back so that it contacts the selector forks.
9. Move the creeper selector collar on the input shaft forwards into the engaged position.
10. Move the selector fork on the creeper unit into the engaged position i.e. the upper 18 tooth sliding gear is in mesh.
11. Ensure that the two small bronze pivoting pads on the selector fork are in the vertical position.
12. Apply Massey Ferguson Instant Multi-Gasket (Loctite 573) to the top of the cover and the steel shim. Install the steel shim as shown in the illustration.
13. Position the shuttle lever in relation to the hole that takes the safety start switch as shown in the illustration.
14. With care install the creeper unit. It will fit back into the gearbox the same way it came out by a rolling action passing the gears round under the selector rails and then down into position. As the unit is finally lowered into place it may be necessary to slightly move the shuttle lever so that it engages with the jaw in the selector fork.
15. Fit the two dowel bolts first. Refit the remaining bolts and nuts, don't forget the switch bracket and wiring clips.
16. Check that the creeper and shuttle levers have engaged correctly. Turn the gearbox over and engage all gears in turn to ensure that it is correctly assembled.

IMPORTANT: *This check and adjustment is very important. The creeper gear must only be allowed to be engaged in LOW range. Engagement in any other range will result in a very serious failure of the gearbox.*

17. Check the operation of the creeper interlock, this prevents engagement of the creeper gear in any other range except LOW range as follows:

Range change check:

a. Select a LOW range.
b. Select 1st gear.
c. Select forward gear.
d. Engage creeper gear.
e. Move the range lever into MEDIUM range. The creeper gear should disengage. Check by rotating the gearbox input shaft. If disengagement does not take place the interlock rod length needs adjustment, *(see operation 3-5B procedures 68 to 71).*



Creep gear engagement check:

a. Select MEDIUM range.
b. Select 1st gear forward.
c. Creeper gear disengaged.
d. Try to select creeper or gear whilst rotating the input shaft. This must be prevented by the interlock. If engagement takes place the interlock rod length needs adjustment, *(see operation 3-5B procedures 68 to 71).*
e. Repeat the above check with a HIGH range, forward gear selected.

18. Tighten all the creeper unit and gearbox cover bolts to a torque of 112 Nm (82 lbf ft). Nuts to a torque of 60 Nm (44 lbf ft)
19. Install the gearbox assembly back into the tractor.
20. Reconnect the creeper operating cable and adjust, *(see operation 1-5B).*

18 x 6 Speedshift Gearbox

Section 5 – Part C

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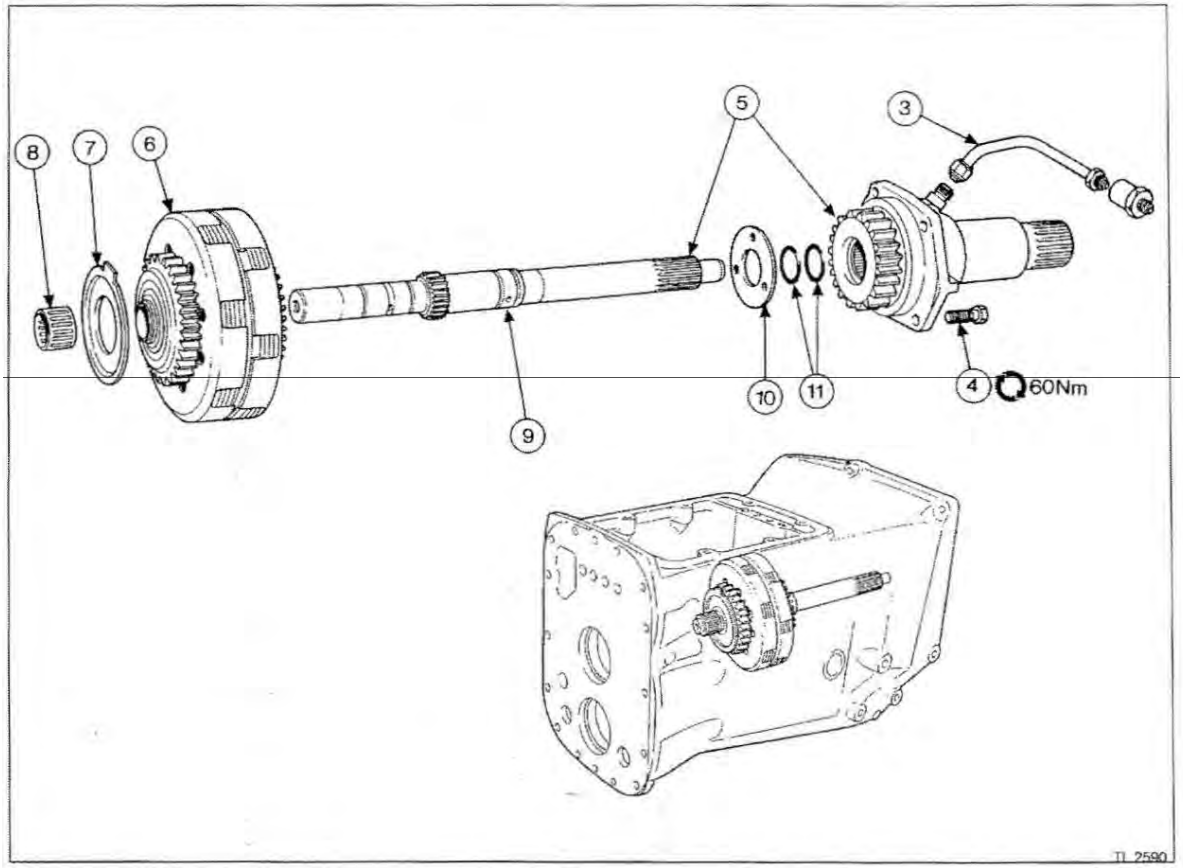
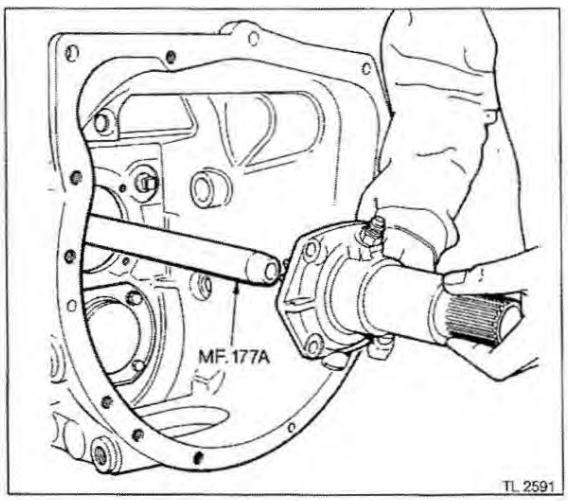


Refitment

If all the original components are being refitted it is not necessary to carry out the input shaft end float adjustment. When new components are fitted the procedure detailed *(see operation 6-5C)* must be carried out.

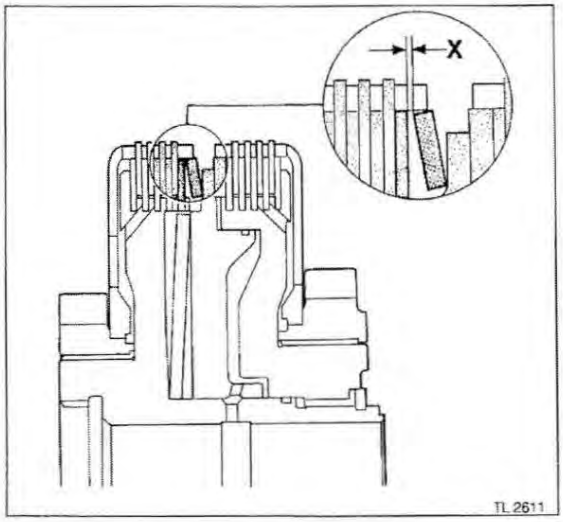
12. Refit the needle roller bearing in the gearbox main shaft and the stepped thrust washer.
13. On to the input shaft fit the variable thrust washer with stepped face facing forward.
14. Fit two new seal rings to the shaft and lightly lubricate with clean transmission oil the rings and thrust washer.
15. Wrap some plastic banding around the clutch and lower into the gearbox. Install the thrust washers and input shaft.
16. Place special tool MF.177A, Input Shaft Oil Seal Protector, over the main transmission input shaft on the gearbox. This is to protect the seal inside the PTO pinion from the splines on the shaft and prevent seal leakage.
17. Lightly oil the sleeve.
18. Carefully refit the input housing sliding it over the sleeve. Withdraw the sleeve when the housing is in place.

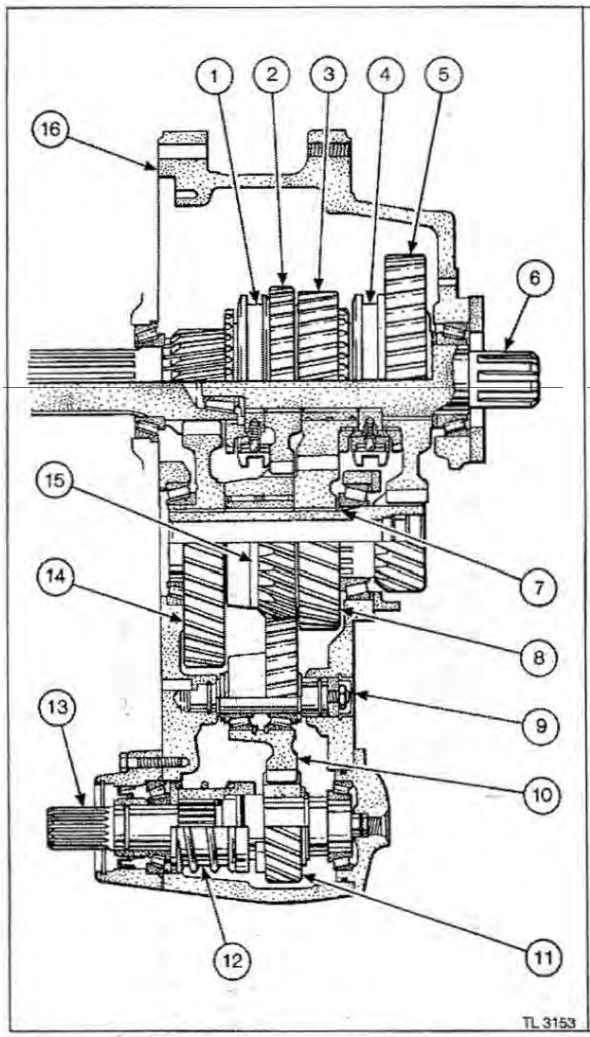


19. Lightly coat the threads of the bolts with Hylomar sealant and tighten to a torque of 60 Nm (45 lbf ft).
20. Reconnect the oil feed pipe.
21. Refit the clutch release mechanism, *(see operation 4-4A)*.

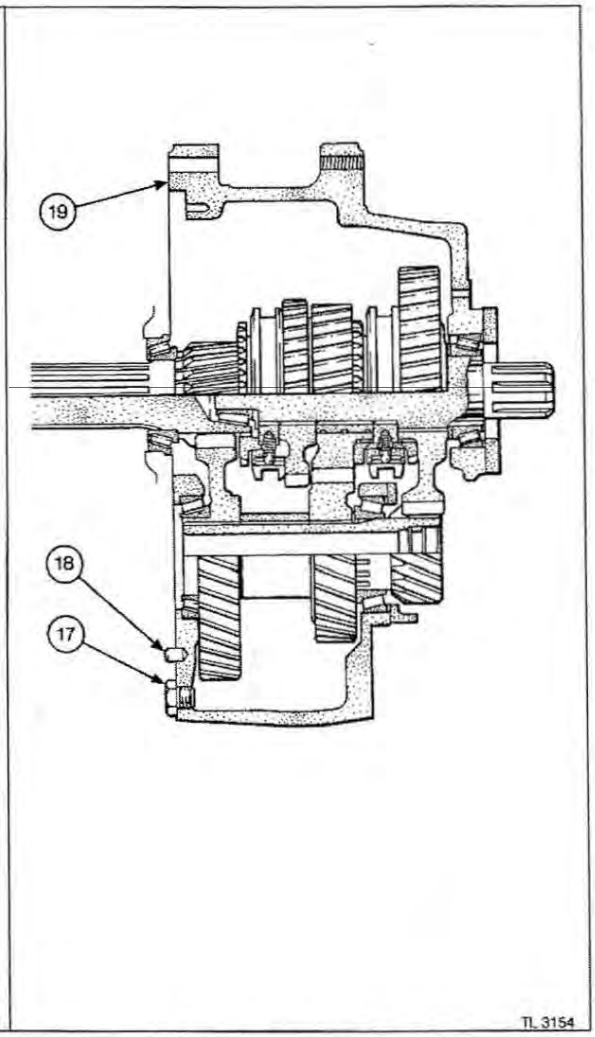
45. Check the clearance 'X' in at least eight positions around the clutch. Make a note of each reading, add the readings up and take an average. The average figure should be within 0,30-0,45 mm (0.012-0.018 in). If the reading is less than the tolerance a thinner shim is required, if greater a thicker one.

46. Re-install the clutch into the gearbox.



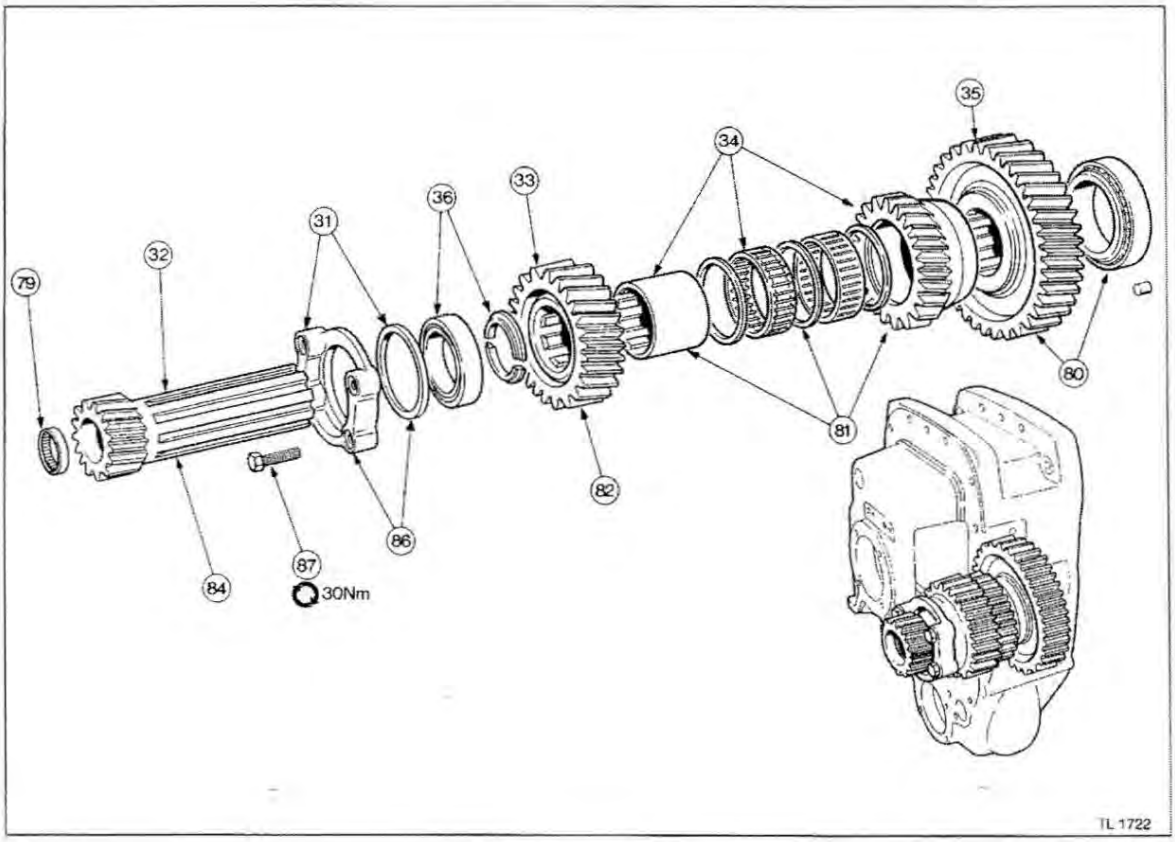


Four-wheel drive range gearbox



Two-wheel drive range gearbox

1. High range synchromesh coupler
2. Four-wheel drive gear (30 Teeth)
3. Medium range gear (27 Teeth)
4. Medium/low range synchromesh coupler
5. Low range gear (41 Teeth)
6. Main shaft - drive to rear axle
7. Layshaft
8. Medium range gear (26 Teeth)
9. Intermediate shaft
10. Four-wheel drive intermediate gear (27 Teeth)
11. Four-wheel drive shaft gear (18/16 Teeth)
12. Four-wheel drive clutch
13. Four-wheel drive shaft
14. Layshaft drive gear (39 Teeth)
15. Four-wheel drive intermediate gear (25 Teeth)
16. Four-wheel drive casing
17. Drain plug
18. Locating dowel
19. Two-wheel drive casing



80. Place the constant mesh gear, complete with taper roller bearing, in position in the gearbox.
81. Replace the four-wheel drive gear assembly complete with needle roller bearings and steel bush with the thrust side facing down.
82. Position the medium range gear over the four-wheel drive gear with the thrust side facing downwards.
83. Carefully align the splines in all the gears.
84. Fit the layshaft complete with bearing, threading it through all the gears.
85. If all the original components are being refitted to the layshaft shaft there is no need to reset the bearing pre-load, ignore procedure 89.
86. Fit the bearing cap with the spacer ring that was removed on dis-assembly.
87. Fit the four cap bolts and tighten to a torque of 30 Nm (22 lbf ft).
88. Rotate the shaft and lightly tap each end to ensure that the bearings are fully seated and that it rotates freely.

Four-wheel Drive Shaft

Section 5 – Part E

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14. Refit all the transmission case bolts (dry) and tighten to an initial torque to 50 Nm (35 lbf ft) working in sequence around the box as shown in the illustration. Use special tool MF.367B, Transmission Torque Wrench using the 14 mm socket.
15. Tighten all the bolts to a torque of 102 Nm (75 lbf ft). Finally, re-tighten the first bolt to ensure that the torque is correct.
16. Refit the gearbox assembly to the engine. Tighten the bolts around the clutch housing to a torque of 120 Nm (90 lbf ft).
17. Re-install the engine/gearbox assembly into the tractor.

FORWARD/REVERSE CONTROL LEVER

Overhaul 2–5F

Dis-assembly

NOTE: *The lower part of the shaft with the universal joint can only be removed when the tractor is split between the engine and clutch.*

1. Remove the lower panel under the instrument panel to gain access to the control mechanism.
2. Slacken the coupling bolts.
3. Remove the three 'C' clips on the upper part of the hand lever.
4. Withdraw the hand lever up out of the instrument panel.
5. Remove the washers and spherical bearing.
6. Remove the coupling complete with the clutch interlock.
7. Remove the split pin.
8. Remove the spring and interlock lever.
9. Remove the 'C' clip and pivot pin.
10. If removal of the lower part of the shaft is required, split the tractor between the engine and clutch, sufficiently to enable the shaft to be removed from the lower bearing and to clear the back of the cylinder block.
11. Disconnect the control rod ball joint.
12. Remove the lower bracket.
13. Remove the lower shaft and universal joint.
14. Remove the lower spherical bearing.

Re-assembly

15. Reverse procedures 1 to 14 except:

a. Adjust the length of the control rod so that the interlock engages with the clutch pedal when the pedal is in its normal position.

b. Lightly lubricate the spherical bearings.

c. Set the hand lever to a nine o'clock position before tightening the coupling bolts.

INPUT SHAFTS and HOUSING

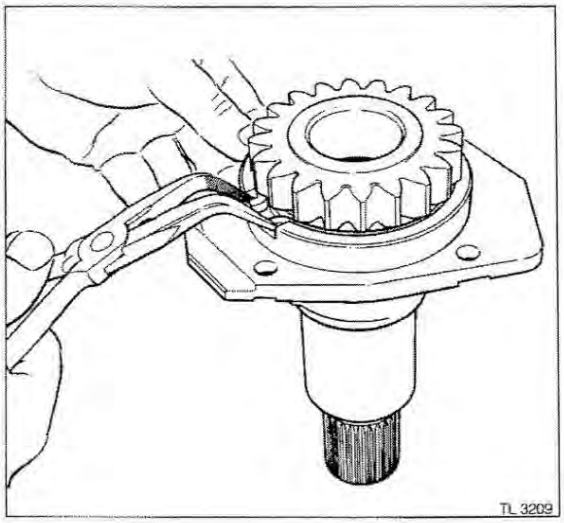
Removal and Refitment **10–5F**

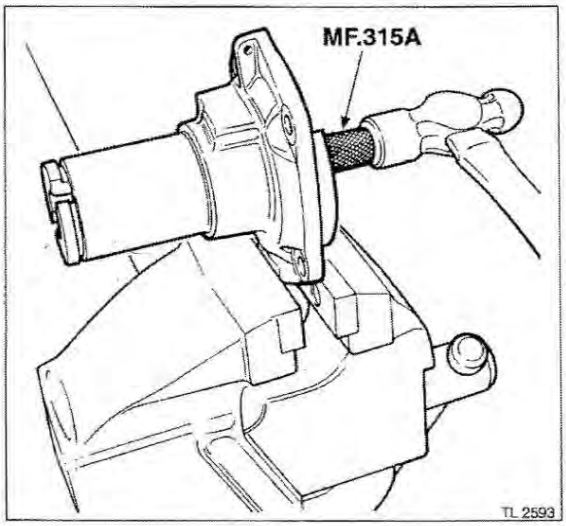
Special Tools:

MF.177A Input Shaft Oil Seal Protector
MF.255B PTO Input Shaft Oil Seal Replacer
MF.315A Needle Roller Bearing Remover/Replacer
MF.421 Needle Roller Bearing and Seal Replacer
MF.422A Bearing, and Seal Remover

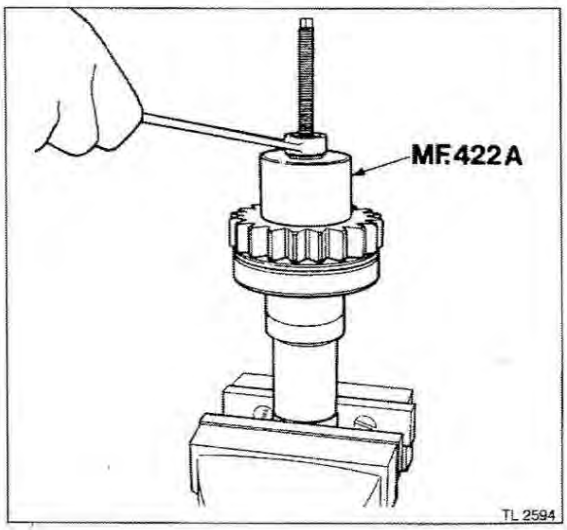
Removal

1. Remove the clutch mechanism, *(see operation 3-4A)*.
2. Remove the four bolts.
3. Withdraw the input housing complete leaving the main input shaft in position.
4. Open up the large circlip in its groove so that it is clear of the bearing.
5. Push the PTO input shaft, complete with ball-bearing, rearwards out of the housing.
6. If necessary, remove the circlip and ball-bearing after first removing the split ring seals.
7. Lever the seal out of the front of the housing.
8. Using special tool MF.315F, Needle Roller Bearing Remover/Replacer, drive the needle roller bearing out of the housing.





9. Using special tool MF.422A, Bearing and Seal Remover, remove the rear needle roller bearing. Carefully assemble the collets so that the step is located behind the bearing. Screw up the tapered nut so that the collets are held tight inside the bearing.
10. Fit the cap, lubricate the screw thread, fit the washer and nut.
11. Tighten the nut withdrawing the bearing from the shaft.
12. Repeat the operation using tool MF.422A to extract the oil seal. The step on the collets must be located fully behind the seal.
13. Remove and discard the 'O' ring.



12 x 4 Manual Gearbox

Section 5 – Part G

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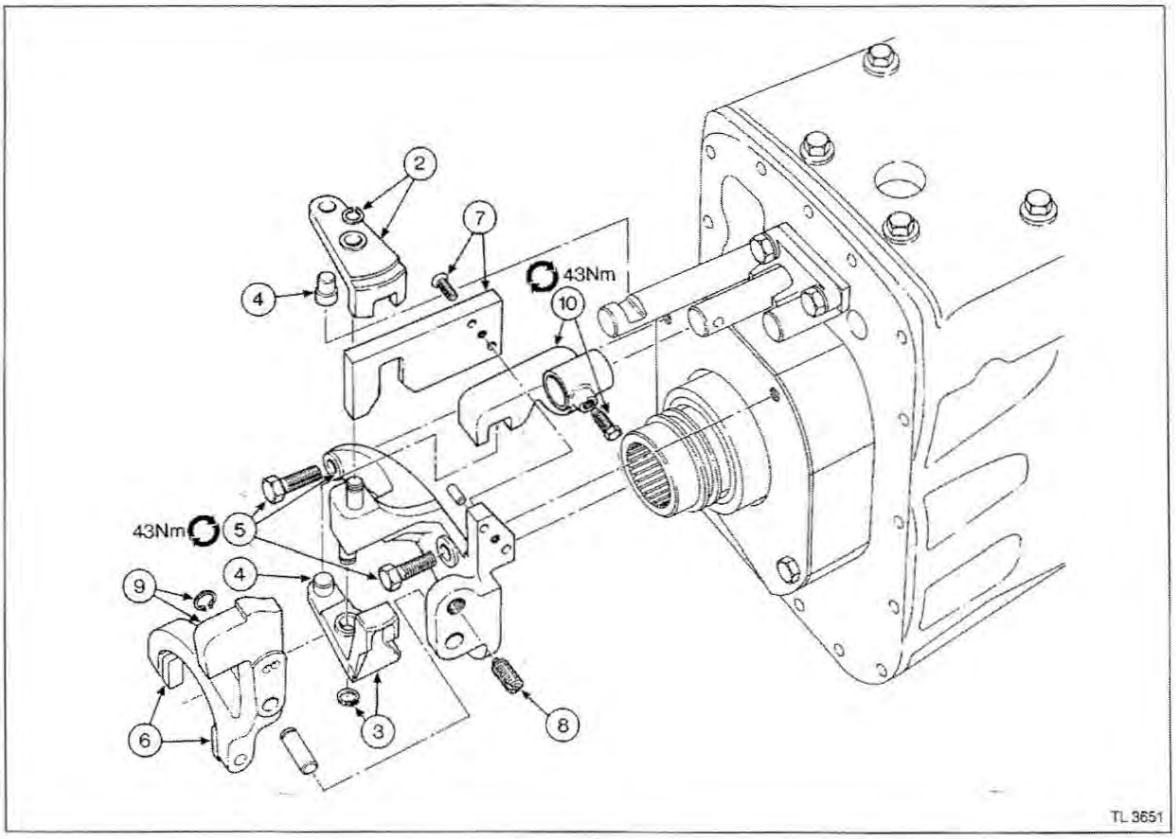

SELECTOR MECHANISM

Removal and Refitment 5–5G

Removal

1. Remove the four-wheel drive gearbox assembly, *(see operation 1-5H);* or spacer on two-wheel drive tractors.
2. Remove the circlip and 2nd/3rd selector lever.
3. Remove the circlip and 1st/reverse selector lever.
4. Remove the two selector pins.
5. Remove the two bolts and lift off the support assembly.
6. Remove the two pivot pads.
7. Remove the countersunk screw and the locking plate.
8. Unscrew the spring plunger.
9. Remove the circlip and the epicyclic selector fork
10. Loosen the screw and remove the 1st/reverse selector jaw.

Refitment

11. Reverse procedures 1 to 10 except:

a. Tighten the two support assembly bolts to a torque of 43 Nm (32 lbf ft).

b. Tighten the 1st/reverse selector jaw screw to a torque of 43 Nm (32 lbf ft).

c. Apply 2-3 drops of Massey Ferguson Studlock (Loctite 270) to the threads of the spring plunger. Screw fully home and then undo 1/4 turn.

d. Lightly lubricate the mechanism and check for free movement, rectify any stiff operation.

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Four-wheel Drive Gearbox

Section 5 – Part H

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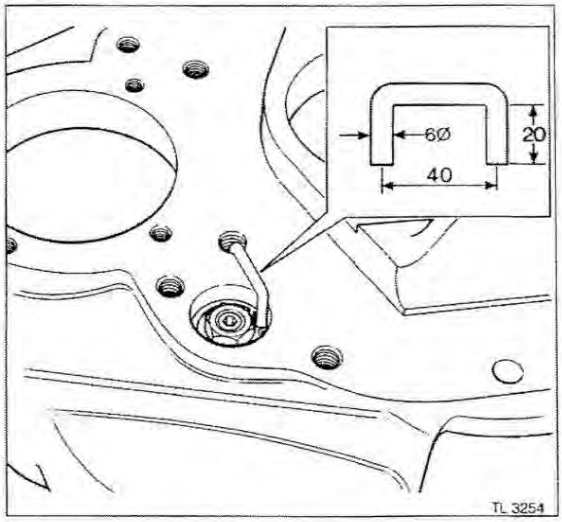
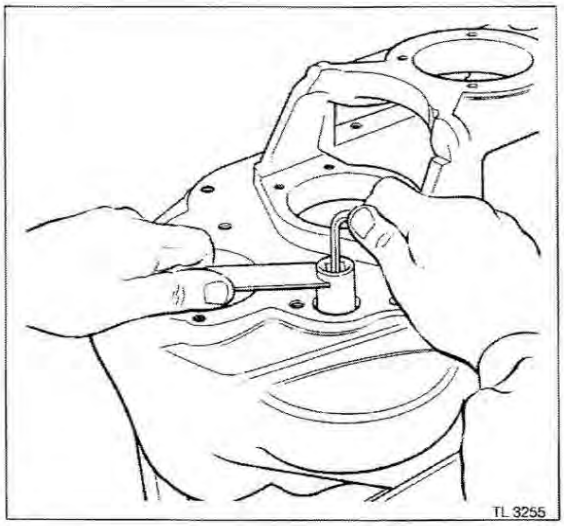
Idler Shaft Pre-Load

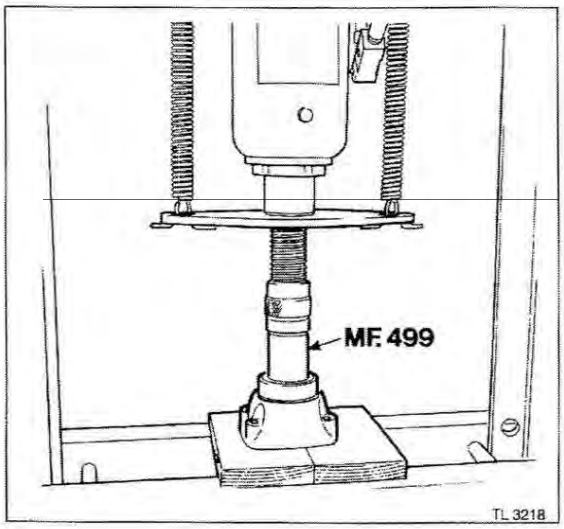
61. Make-up a small tool as shown in the illustration to prevent the disc from rotating during adjustment.
62. The correct pre-load is obtained by tightening up the hexagon screw and then locking in position with the locknut.
63. Fully tighten the hexagon screw until the gear is locked, this will ensure that the bearings are fully seated, then slacken off the screw.
64. Adjustment of the pre-load can be assisted by making a special wrench. Weld a handle to a 17mm across flats socket as shown in the illustration. This allows the hexagon wrench to hold the screw when tightening the locknut.
65. The correct pre-load for the idler shaft bearings is 0-0,05 mm. Tighten the screw carefully and slowly, rotating the gear. The pre-load should be correct when a slight resistance is felt when rotating the gear. To check that the pre-load is correct, repeat procedures 71 to 75. The reading should be 1200-2000 gm greater than with only the output shaft installed.
66. Apply a drop of Massey Ferguson Lock 'n' Seal (Loctite 222) to the locknut. Hold the screw with a hexagon wrench and tighten the locknut with the special wrench to a torque of 18 Nm (13 lbf ft). Re-check the pre-load, re-adjust if not correct.
67. Remove the holding tool.
68. Fit a new core plug to the casing so that it is > 0,25 mm (0.010 in) below the machined face of the casing.

Drive Shaft

69. Using special tool MF.499, Drive Shaft Oil Seal Installer, fit a new seal, with the lip facing inwards, to the front bearing housing. The seal should be positioned 7 mm (1/4 in) below the internal recessed face, *(see page 5D-24)*. The tool ensures that the seal is correctly positioned. Lubricate the seal with petroleum jelly.
70. Install a new seal on the rear of the drive shaft assembly, lubricate with oil.
71. Fit new 'O' rings to the front bearing housing and rear cover.
72. Reinstall the drive shaft assembly and refit the bearing cap with the selected spacer ring, apply Massey Ferguson Studlock (Loctite 270) to the bolts and tighten to a torque of 30 Nm (22 lbf ft).
73. Refit the bearing cap with the selected spacer ring, apply Massey Ferguson Studlock (Loctite 270) to the bolts and tighten to a torque of 30 Nm (22 lbf ft).







PARKING BRAKE HAND LEVER

Removal and Refitment 2–6A

Removal

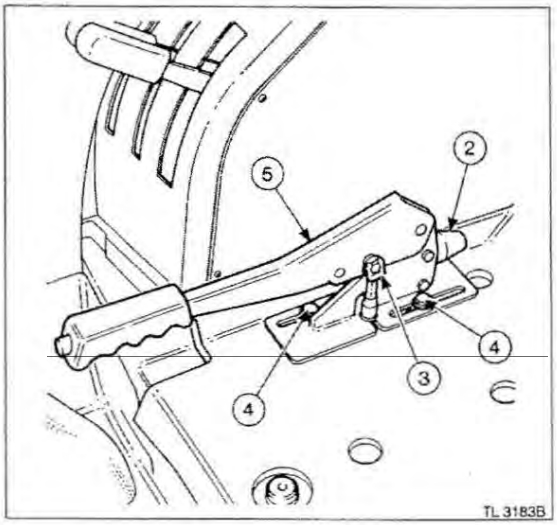
1. Slacken the brake cable adjusting nuts, *(see operation 1-6A)*.
2. Disconnect the plug from the warning light switch.
3. Remove the spring clip and slide the cable off the clevis pin.
4. Remove the two bolts securing the parking brake assembly to the floor.
5. Remove the parking brake assembly leaving the cable protruding through the hole.
6. Remove the switch from the bracket.

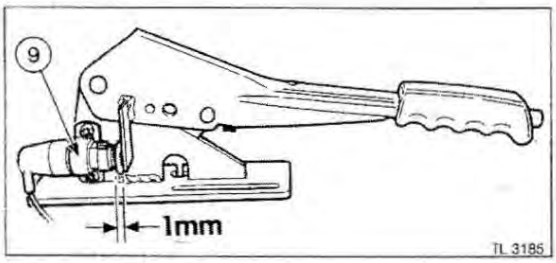
Refitment

7. Reverse procedures 1 to 6.
8. Ensure that the brakes operate freely.

Brake Switch Adjustment

9. Adjust the warning light switch. This is important, on four-wheel drive tractors, it operates four-wheel engagement to give four-wheel braking. Adjust as follows:
10. With the parking brake in the OFF position.
11. Press the brake switch plunger in.
12. Check the clearance between the plunger and the hand lever, it should be 1 mm (0.039 in).
13. If adjustment is required, slacken the two screws and re-set the position of the switch.
14. Adjust the brakes, *(see operation 7-6A)*.



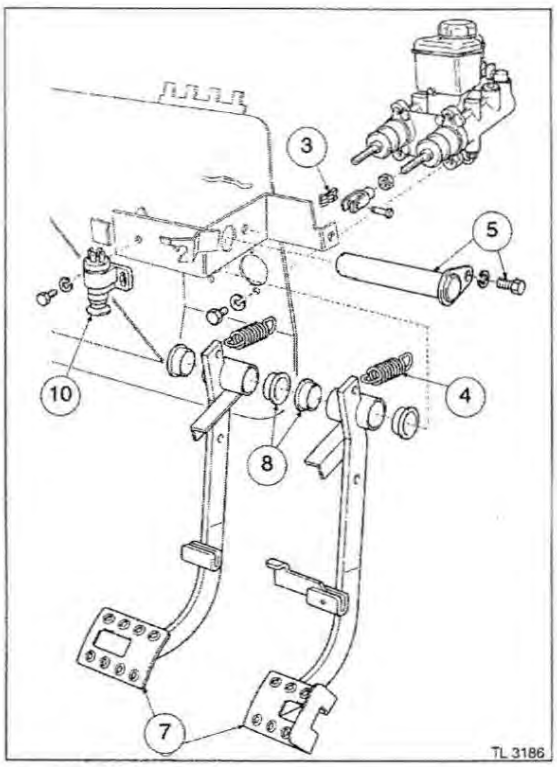


BRAKE PEDALS

Removal and Refitment 3–6A

Removal

1. Remove the panel under the instrument panel.
2. Remove the upper instrument panel cover.
3. Remove the two spring clips and clevis pins from the brake pedals.
4. Remove the two return springs.
5. Remove the bolt and pivot pin.
6. Withdraw both brake pedals from the support bracket.
7. If necessary, remove the bushes from the pedals.



Refitment

11. Lay the other actuator plate on top, ball seats downwards and with the lug on which the slave cylinder operates above the corresponding lug on the other plate. The illustration shows the correct assembly for the left-hand brake. The right-hand side will be the opposite hand.
12. Ensure that the balls are seated in the uppermost actuator plate and both plates will then be correctly located in relation to one another.
13. Attach the pull rod to the bellcrank.
14. Hook on new pull-off springs.
15. Fit a new bellcrank return spring to the actuator assembly. To do this hook it onto the actuator casting, twist then hook the other end over the bellcrank lever.
16. Reverse procedures 1 to 4 except:

a. Dip each friction plate, steel plate, and actuator unit in clean transmission oil before fitting them into the housing. IT IS VERY IMPORTANT to refit all plates in the order in which they were originally assembled.

b. If the brake plates have been mixed up or are being replaced, they are fitted into the axle housing in the following order:

4215 and 4220 tractors	All other tractors
3 friction discs per half axle	4 friction discs per half axle
Friction plate Steel plate Friction plate **Expander unit** Friction plate **Carrier plate**	Friction plate Steel plate Friction plate **Expander unit** Friction plate Steel plate Friction plate **Carrier plate**

c. Fit the actuator unit to the axle with the pull rod and bellcrank facing towards the tractor wheel.

d. Check that the small return spring is fitted between the bellcrank and the actuator plate.

17. Refit the axle housing and carrier plate, *(see operation 6-6C)*.
18. Refit the brake cover plate assembly, *(see operation 8-6A)*.
19. Remove air from the brake system, *(see operation 6-6A)*.
20. Adjust and balance the brakes, *(see operation 7-6A)*.

GENERAL MAINTENANCE

Servicing **11–6A**

Procedure

Hydraulic fluid

This fluid change should be carried out every 2000 hours or three years which ever comes first.

NOTE: *If the following procedure is adhered to, air will not enter the system and the time taken to change the fluid will be kept to a minimum.*

1. Proceed in the same manner and order as for removing air from the system, *(see operation 6-6A)*, and attach a clear plastic tube together with a glass bottle to a bleed screw.
2. Pump out most, but not all, of the fluid in the reservoir.

NOTE: *DO NOT allow the reservoir to empty.*

3. Top up the reservoir with new unused fluid of the recommended type.
4. Ensure the reservoir is kept topped up and pump out the system until the old and discoloured fluid is ejected and the new fluid can be seen in the plastic tube.
5. Repeat the procedure for the other brake.
6. Top up the reservoir and road test the tractor.

Brake Pipes and Flexible Hoses

This inspection should be carried out every 2000 hours or three years which ever comes first.

Periodically examine the brake pipes and flexible hoses for signs of fretting, damage and corrosion. Renew the parts as deemed necessary and take action to prevent any fretting or damage recurring.

Pinion – Two Speed

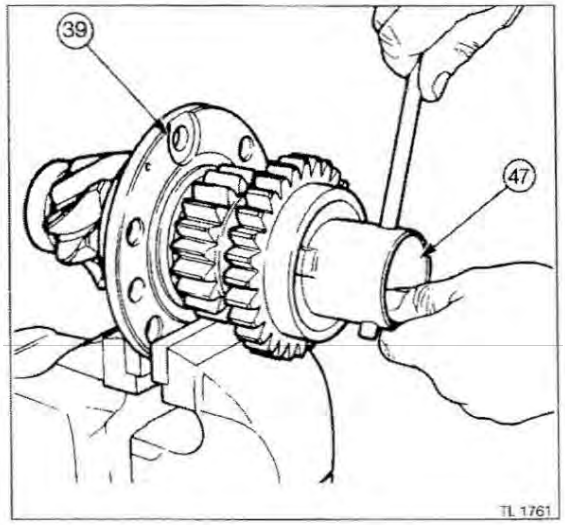
39. Hold the pinion housing in a vice.
40. Refit the thrust washer with the oil grooves and chamfered side of the lubrication holes facing towards the gear cluster.
41. Refit the sleeve with the sleeve keeper installed inside.
42. Refit the needle roller bearing, spacer, needle roller bearing and lightly lubricate with oil.
43. Slide the gear cluster over the bearings.
44. Install the thrust washer with the oil groove side facing the gear cluster.
45. Fit a new locking ring, hand tighten until some resistance is felt.
46. Tap the pinion firmly to centralise and seat the bearings in the housing.
47. Make a box spanner with four flats 51 mm (2.1/16 in) A/F out of a piece of 55 mm (2.1/8 in) internal diameter tube x 80 mm (3 in) long as shown in the illustration
48. Fit Special Tool FT.4062A, Bearing Pre-Load Gauge, to the pinion and tighten the locking ring to give a pre-load reading of 2-2,5 Nm (18-22 in lbf). Set the weight to the 20 mark on the bar.

    If a pre-load gauge is not available, wrap some string around the pinion shaft and attach the end to a spring balance. Pull the spring balance away from the shaft. the rolling resistance must be 10-11 kg (21-25 lbf) when the shaft is rotating.

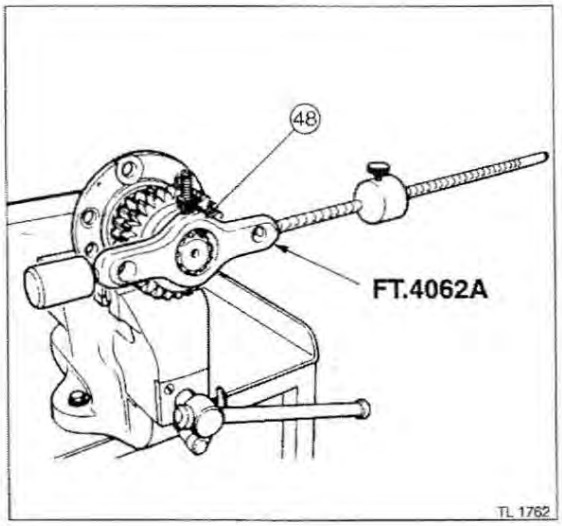
    Adjust the tension by tightening or loosening the locking ring. Set to the lower reading, when the locking rollers are fitted the tension will slightly increase.
49. Check that the intermediate gear cluster is free to rotate, there should be a 0,10 mm (0.004 in) clearance between the gear and the thrust washer.

All Models

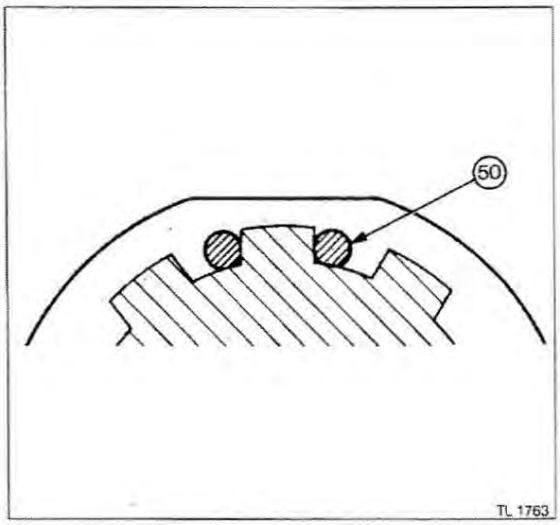
50. Secure the locking ring by driving a locking roller down either side of one of the pinion splines adjacent to one of the flats. The locking rollers must be driven flush with the locking ring.
51. Refit the pinion assembly in the centre housing ensuring that the locating pin in the back of the flange is correctly aligned. The recessed bolt hole in the flange is fitted at six o'clock.
52. Tighten the six pinion housing retaining bolts to a torque of 108 Nm (80 lbf ft).



TL 1761



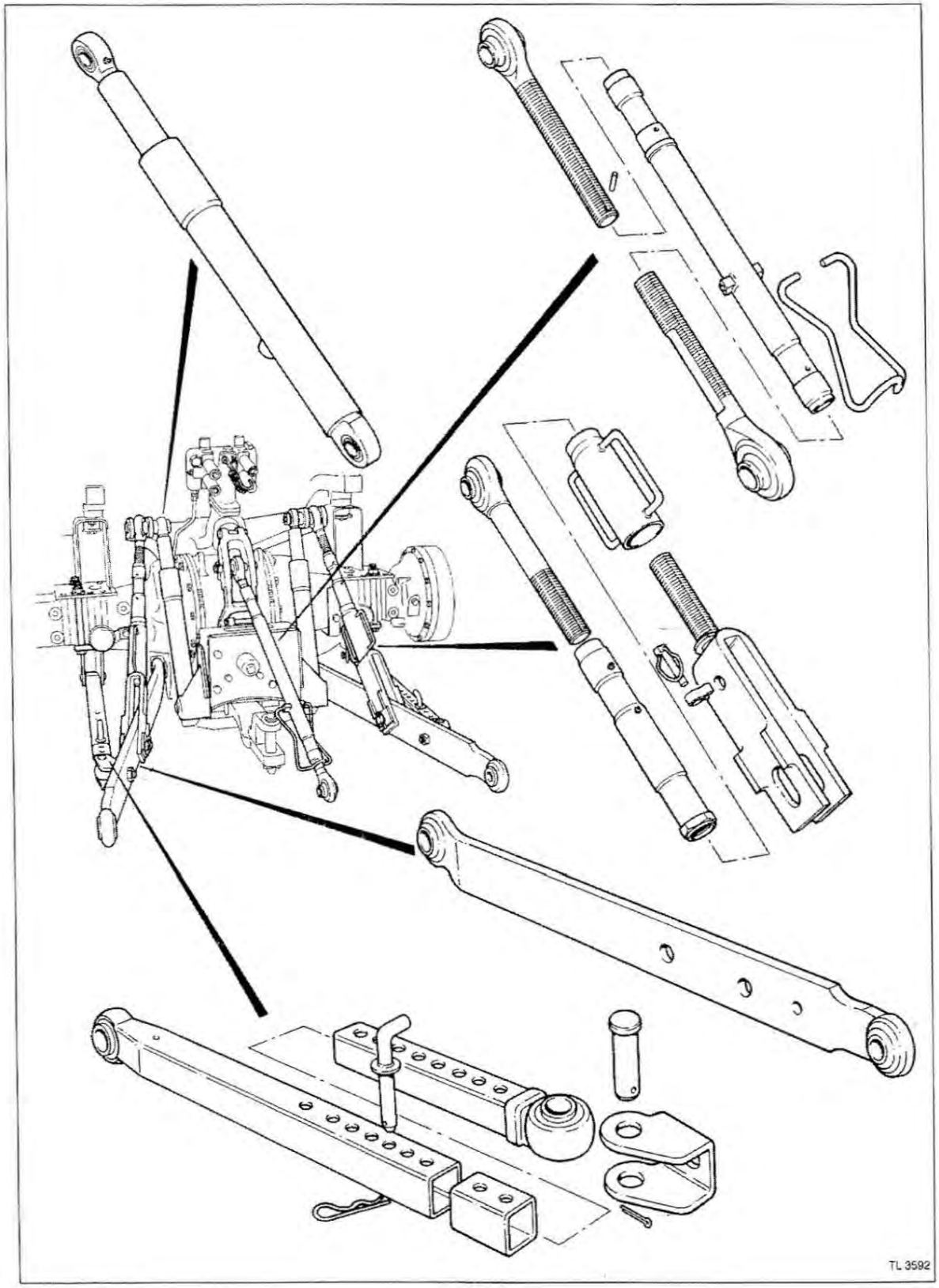
TL 1762



TL 1763

22. Refit the bearing cone onto the spigot on the epicyclic carrier.
23. Reassemble the planet gears and the sun gear in the epicyclic hub, *(see operation 3-6C)*.
24. Using the hydraulic press, drive the epicyclic carrier on to the axle shaft.
25. Apply a thin coating of Hylomar sealant to the bore of the axle housing, then fit a new inner seal. The open side of the seal faces outwards. Smear the lips of the seal with petroleum jelly.
26. Refit the axle half shaft.
27. Check the epicyclic pre-load, *(see operation 5-6C)*.
28. Fit the selected shim(s) in the bearing cavity in the axle housing.
29. Refit the inner bearing cup.
30. Refit the ring gear and housing assembly, *(see operation 2-6C)*.

Drawbar and Linkage



2. Move the rim stop to required track setting position (Fig.3) and secure it with the pin. If the wheel has two sets of stops, set one stop on each rail to same setting. Check which direction the wheel has to be turned to adjust the setting.
3. Remove rim clamp nuts (2 Fig.2) individually, oil threads and refit leaving slack by approximately three turns.
4. Start the tractor engine and using independent brakes, apply the brake opposite to the wheel being adjusted. Select a gear either forward or reverse as required (see procedure 2).
5. Release the clutch sharply and let the wheel run until the rim clamp comes up against the stop.
6. Stop the engine.
7. Refit the other rim stop against the clamp.

NOTE: *If the Maximum or Minimum setting is required then the spare rim clamp stop can be fitted to any convenient hole.*

8. Oil the ramps on the rim clamps and wheel disc.
9. Using diagonal selection, starting with the nut nearest to the bottom of the wheel tighten the clamp nuts (2) evenly to a torque of 70 Nm (52 lbf ft).
10. Drive the tractor slowly forward approximately three revolutions of the rear wheels and reverse the same amount.
11. Using diagonal selection, starting with the nut nearest the bottom of the wheel, tighten the clamp nuts (2) evenly to a torque of 140 Nm (103 lbf ft).
12. Using diagonal selection, starting with the nuts nearest the bottom of the wheel, tighten the clamp nuts evenly to a torque of 260 Nm (192 lbf ft).

NOTE: *If the wheels run-out after making the above adjustments proceed as follows:*

Drive the tractor forward or backward until the maximum wheel run-out is at the top, using the fender as a guide. Stop the engine and slacken the three lower clamp bolts by two turns. Retorque the remaining clamp bolts to 260 Nm (192 lbf ft) thus pulling the wheel towards the centre line of the tractor. Retorque the three lower clamp bolts to 260 Nm (192 lbf ft). Check the run-out again by driving the tractor. Repeat the adjustment if necessary.

NOTE: *Minimum track setting cannot be obtained on tractors fitted with wide tyres.*

Track Settings

Track setting	Wheel type	
	Normal-duty	Heavy-duty
1	1425 mm (56 in)	1525 mm (60 in)
2	1525 mm (60 in)	1625 mm (64 in)
3	1625 mm (64 in)	1725 mm (68 in)
4	1725 mm (68 in)	1830 mm (72 in)
5	1830 mm (72 in)	1930 mm (76 in)
6	1930 mm (76 in)	2030 mm (80 in)
7		2130 mm (84 in)

Table 1

DIAGNOSIS

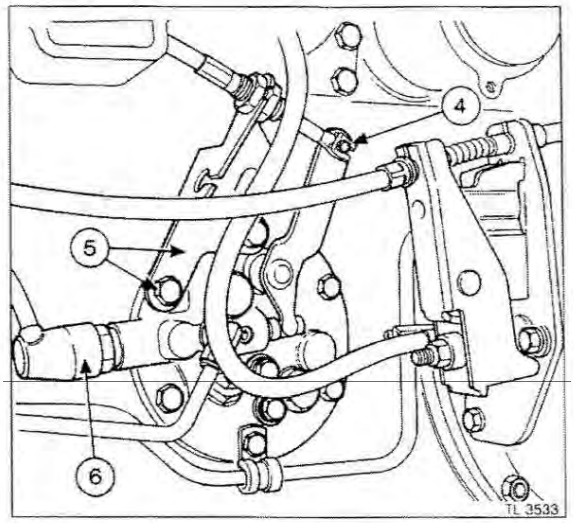
The Power Take-off hydraulic system is controlled by a valve block located on the left-hand transmission side cover and the hydraulic pump on the right-hand side. Before any repairs are made tests should be carried out to determine the condition of the hydraulic system. Refer to Section 9C for system diagnosis.

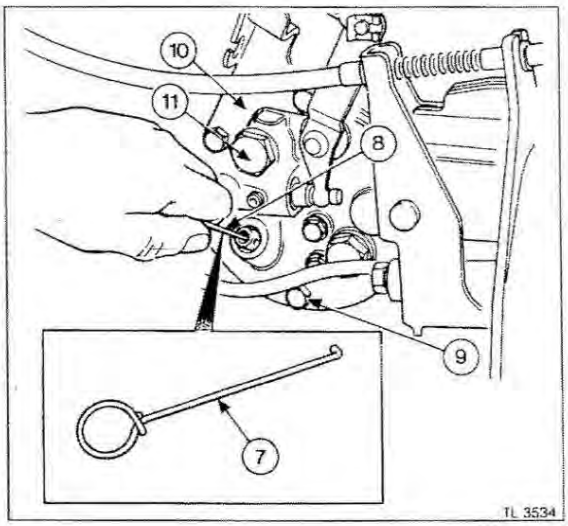
LEFT-HAND SIDE COVER

Removal and Refitment 1–7A

Removal

1. Remove the left-hand fuel tank, *(see operation 2-3C)*.
2. Drain the transmission below the LOW mark on the dipstick.
3. Disconnect the auxiliary and/or PTO hydraulic pipes from the side cover and remove as necessary.
4. Disconnect the PTO selector cable from the operating lever.
5. Remove the two bolts holding the brake and selector rail support bracket.
6. Disconnect the wires from the safety start switch.
7. Make from 3 mm (1/8 in) diameter wire a hook as illustrated.
8. Insert the hook into the end of the transfer pipe engaging it in the cross drilled hole, withdraw the pipe from the PTO clutch and side cover.
9. Remove the side cover bolts.
10. Remove the PTO cable anchor bracket.
11. Remove the side cover by lifting it vertically so that the selector arm clears the selector rail.





Refitment

12. Clean the mating faces between the side cover and the transmission.
13. Reverse procedures 1 to 11 except:

a. Replace the 'O' rings on the transfer pipe and the bolts holding the brake and selector rail bracket to the side cover.

b. Insert the transfer pipe with the cross drilled hole uppermost. Ensure that the pipe is pressed fully home.

c. Apply Massey Ferguson Multi-Gasket (Loctite 573 instant gasket to the face of the side cover.

d. Seal the six side cover bolts with Hylomar sealant.

Two-speed Power Take-Off

Section 7 – Part B

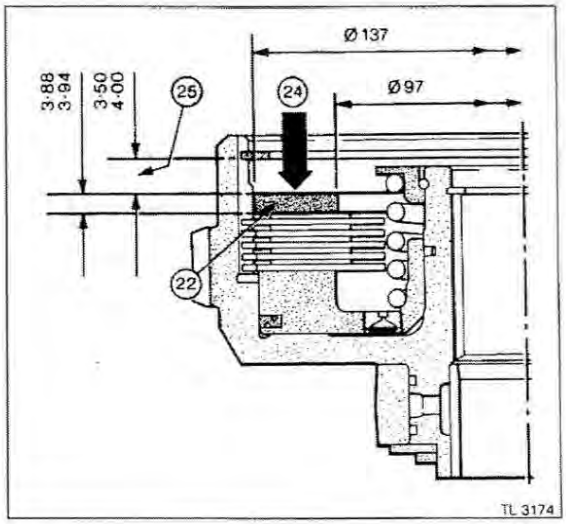
Table of Contents

Re-assembly

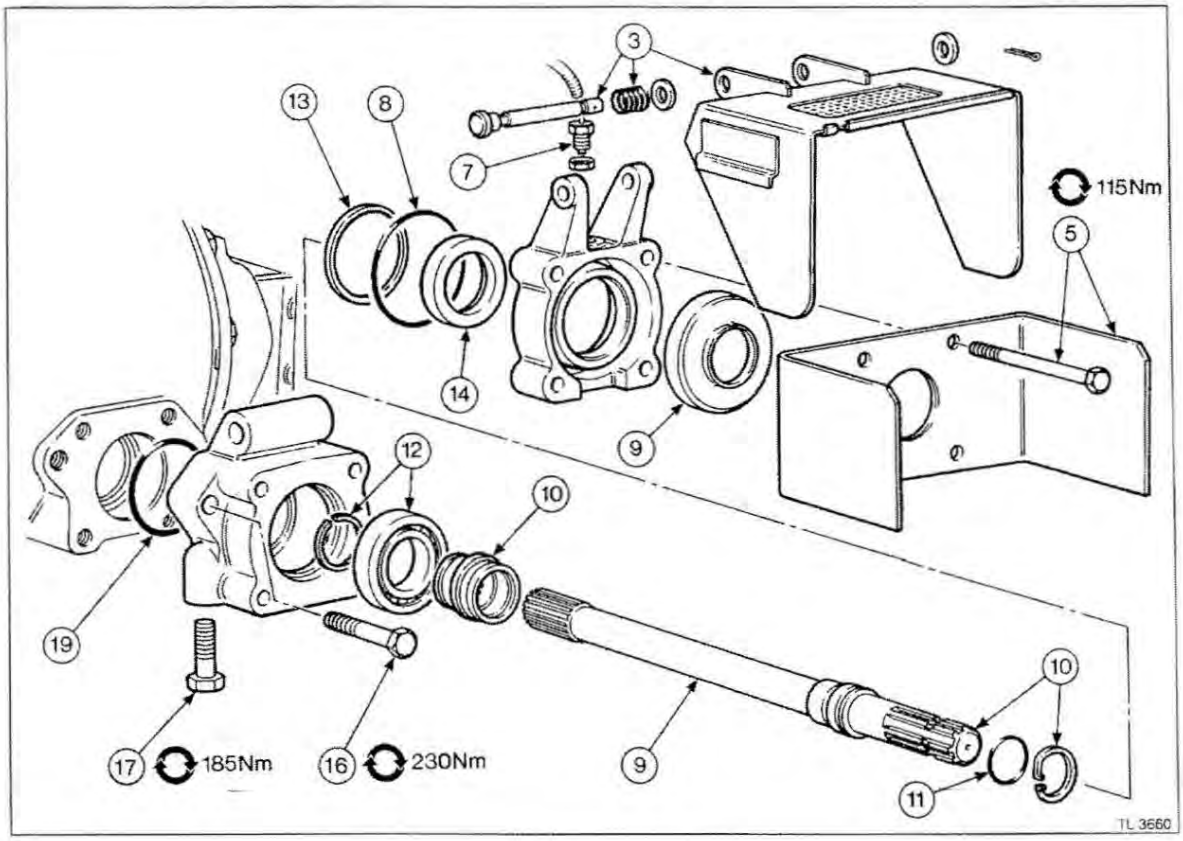
20. Check that the lubrication jet in the piston is not blocked, use compressed air to clear it.
21. Fit new internal and external piston rings, lubricate the piston with clean transmission oil and re-assemble into the clutch housing.
22. Make a steel ring as shown in the illustration to replace the retainer plate for checking the clutch plate clearance.
23. Assemble all the clutch plates, friction and steel, into the clutch housing, fit the tool described in procedure 22 and replace the spring ring. There are five friction and five steel plates, except 4260 and 4270 tractors, they have seven friction and seven steel.
24. Apply a pressure of approximately 5 kgf (11 lbf) to the clutch pack to compress all the plates.
25. Using a feeler gauge measure the gap between the plate and the underside of the spring ring. The distance should be 3,50-4,00 mm (0.138-0.157 in). If the gap is not correct add one or more shims between the discs and the retainer plate depending on the gap. Shims are available in the following sizes:

Clutch shim plates		
Part number	Metric	Imperial
1870 010 M1	0,51 mm	0.020 in
1870 011 M1	0,76 mm	0.030 in

26. Remove the spring ring, checking ring and clutch plates.
27. Refit the spring and retainer ring.
28. Place the clutch assembly under a hydraulic press and using the bridge piece compress the spring and replace the snap ring.
29. If new friction plates are being used they should be soaked in clean transmission oil for a minimum period of 30 minutes before assembly.
30. Re-assemble the plates starting with a steel plate, alternating with a friction plate, finally fitting the shim plate(s).
31. Refit the retainer plate and spring ring.
32. Fit new PTFE sealing rings to the feed ring.
33. Re-assemble the feed ring, thrust washer and snap ring.
34. If necessary, replace the needle roller bearing in the gear hub.
35. With the aid of some petroleum jelly retain the thrust washer inside the gear and hub.
36. Check that the spring ring (4) retaining the clutch plates is fully seated in its groove.



37. With the aid of two lengths of 3 mm (1/8 in) diameter rod carefully align and centre all the internal teeth of the friction discs.
38. With the aid of an air line pressurise the clutch pack so that all the plates are clamped tight.
39. Whilst still holding the pressure on the clutch pack insert the hub and drive gear so that it passes down through the pack of plates. When fully installed the gear will be within approximately 3 mm (1/8 in) of the clutch housing.
40. If the clutch is not being fitted immediately it is recommended that some form of security band is placed around the clutch to retain the hub and drive gear in place.
41. Refit the clutch assembly.



EXTENDED PTO SHAFT and OIL SEAL

Removal and Refitment **9–7B**

Special Tools:
MF.501 PTO Cassette Seal Installer
MS.550 Universal Handle

Removal

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

1. Place a drip tray under the rear PTO.
2. Remove the PTO cap.
3. Remove the split pin, pivot pin, spring, washers and PTO guard lid.
4. Disconnect the PTO speed sensor.
5. Remove the four horizontal bolts and the PTO guard.
6. Pull the PTO shaft assembly out of the rear of the tractor complete with the outer housing.
7. Remove the PTO speed sensor, if fitted.
8. Remove and discard the 'O' ring.
9. Carefully push the PTO shaft assembly out of the housing from back to front pushing the toothed count wheel off the shaft.
10. Remove the circlip and remove the PTO shaft from the retainer.
11. Remove the 'O' ring seal and discard.
12. Remove the front circlip and press the ball bearing off the retainer.
13. Remove the crush washer.
14. Remove the cassette seal from the housing.

Extension Housing

15. Remove the split pin, pin and disconnect the control beam.
16. Remove the two large horizontal bolts.
17. Remove the two vertical bolts through the drawbar bracket into the extension housing.
18. Remove the extension housing.
19. Remove the 'O' ring seal and discard.

Two-wheel Drive Front Axle - 1

SPECIFICATION

Model application	4215, 4220, 4225 and 4235.
Maximum static load	2600 kgf (5732 lbf).
Track settings	1245-1855 mm (49-73 in).
Track setting increments	101 mm (4 in).
Wheel camber angle	5°.
Wheel caster angle	4° 56'.
Spindle angle	9° 30'.
Front wheel toe-in	0-5 mm (0-3/16 in) at wheel rim.
Axle beam to support casting clearance	0,05-0,25 mm (0.002-0.010 in).
Steering arm to spindle housing clearance	0-0,05 mm (0-0.002 in).

Special Tools

MF.263A	Bearing remover - main tool.
MF.263-2	Bush remover and replacer (1.1/2 in diameter).
MF.264	Bush reamer and pilot - main tool.
MF.264-1	Bush reamer and pilot (1.1/2 in diameter).
MF.264-2	Bush reamer and pilot (1.7/8 in diameter).
MF.444	Pivot pin remover.
MS.550	Universal handle.

Bolt Torques

Track rod ball joint to steering arm	90 Nm (65 lbf ft) maximum torque to split pin 100 Nm.
Steering ram to steering arm	85 Nm (125 lbf ft).
Wheel hub nut	80 Nm (60 lbf ft).
Wheel bolts	110 Nm (80 lbf ft).
Steering arm to spindle bolt	145 Nm (105 lbf ft).
Track rod clamp bolts	50 Nm (40 lbf ft).
Spindle housing to axle beam bolts	205 Nm (150 lbf ft).

GENERAL DESCRIPTION

The normal-duty front axle is fitted to all tractors with three cylinder engines - 4215 and 4220. It can also be fitted to the 4225 and 4235 with four cylinder engines.

The axle assembly consists of an axle beam and two adjustable spindle housings, these can be bolted to the beam various positions to give a variable track of 1227 mm (48 in) to 1837 (72 in) in 101 (4 in) increments. The track rod is also adjustable to correspond with the axle beam.

The axle beam pivots on a pin which is locked to the beam and pivots in bushes in the support casting, grease lubrication is provided. The wheels are turned by two steering cylinders mounted on each end of the axle beam, they are positioned in accordance with the track setting.

Two-wheel Drive Front Axle - 2

SPECIFICATION

Model application:	
Heavy-duty	4225 to 4270.
Extra heavy-duty	4243 to 4270.
Maximum static load:	
Heavy-duty	3460 kgf (7628 lbf).
Extra heavy-duty	4360 kgf (9612 lbf).
Track settings	1315 mm (52 in) to 1820 mm (72 in).
Wheel camber angle	2.1/2°.
Wheel caster angle	0°.
Spindle angle	12°.
Front wheel toe-in	0-5 mm (0-3/16 in) at wheel rim.
Axle beam to support casting clearance	0,10-0,25 mm (0.004-0.010 in).
Steering arm to spindle housing clearance	0-0,05 mm (0-002 in).
Steering cylinder pivot to axle beam clearance	0,05-0,25 mm (0.002-0.010 in).

Special Tools:

MF.195C	Bearing puller - main tool.
MF.263A	Bush remover - main tool.
MF.263-5	Bush remover and replacer (1.3/4 in diameter).
MF.264	Bush reamer and pilot - main tool.
MF.264-8	Bush reamer and pilot (1.3/4 in diameter).
MF.500	Front axle bearing replacer.
MF.504	Steering pivot nut wrench.
MF.505	Steering cylinder wrench.
MF.509	Steering ball joint wrench.
MS.550	Universal handle.

Bolt Torques:

Track rod ball joint	100 Nm (75 lbf ft) maximum torque to split pin 120 Nm.
Track rod to ball joint clamp	45 Nm (35 lbf ft).
Track rod to steering cylinder clamp	140 Nm (105 lbf ft).
Steering arm clamp	408 Nm (300 lbf ft).
Steering cylinder ball joint nut	110 Nm (80 lbf ft) maximum torque to split pin 120 Nm.
Steering cylinder ball joint to cylinder	210 Nm (155 lbf ft).
Spindle housing to axle beam	395 Nm (290 lbf ft).
Wheel hub nut	80 Nm (60 lbf ft).
Wheel nuts	95 Nm (140 lbf ft).
Front axle trunnion bearing bolts	560 Nm (415 lbf ft).
Pivot lock nut to stop nut	200 Nm (148 lbf ft).

GENERAL DESCRIPTION

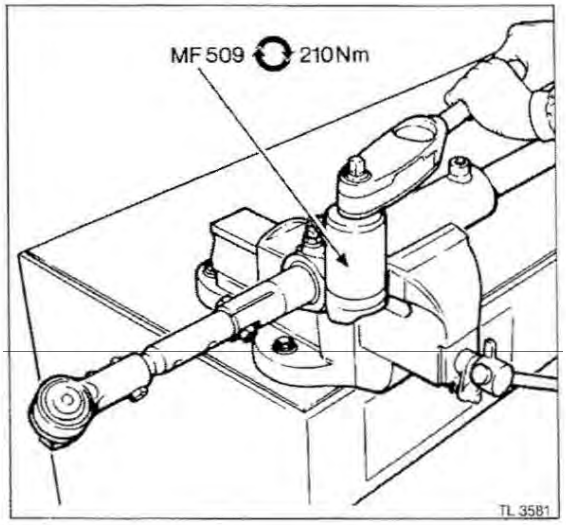
The front axle assembly consists of an axle beam and two spindle housing assemblies. The axle beam pivots on two bushes in the support casting and a front trunnion bearing block. The spindle housing assemblies can be bolted in alternative positions to provide front track adjustment.

The steering system is operated by an orbitrol hydrostatic steering unit controlling a double ended steering cylinder. The steering cylinder is centrally mounted behind the axle beam and is directly connected to each steering arm by a short adjustable track rod. The cylinder is mounted on a pivot pin and ball joint to allow alignment during turning. The short adjustable track rod is to allow adjustment of the front track.

Refitment

12. Reverse procedures 1 to 11 except:

a. Apply Massey Ferguson Studlock (Loctite 270) and using MF.509 tighten the ball joint into the cylinder to a torque of 210 Nm (155 lbf ft).



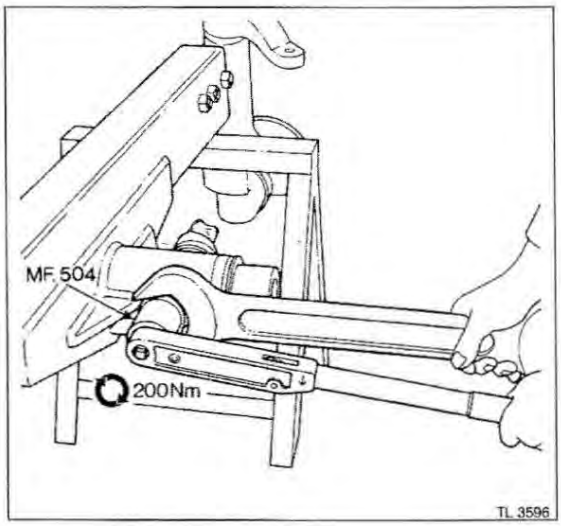
b. Set the running clearance of the cylinder pivot pin to 0,05-0,25 mm (0.002-0.010 in); to achieve this, tighten the stop nut and turn back by one flat.

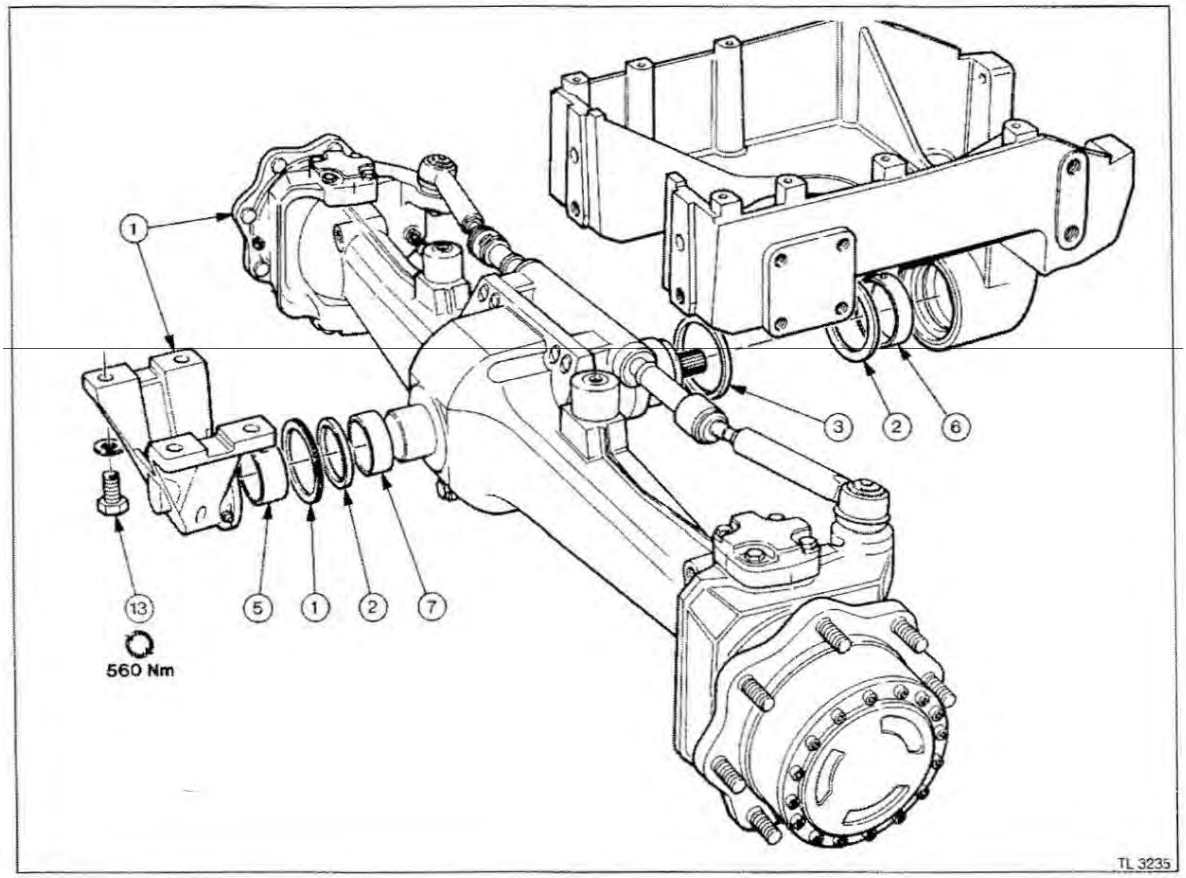
c. Tighten the lock nut against the stop nut using MF.504 to a torque of 200 Nm (148 lbf ft).

d. Tighten the steering cylinder ball joint nut to a torque of 110 Nm (80 lbf ft), tighten further to align the split pin hole, DO NOT exceed a torque of 120 Nm (88 lbf ft) to align the split pin.

e. Tighten the piston rod clamp bolt to a torque of 140 Nm (105 lbf ft).

f. Tighten the track rod ball joint to a torque of 100 Nm (75 lbf ft). DO NOT exceed 120 Nm (90 lbf ft) to align the split pin.





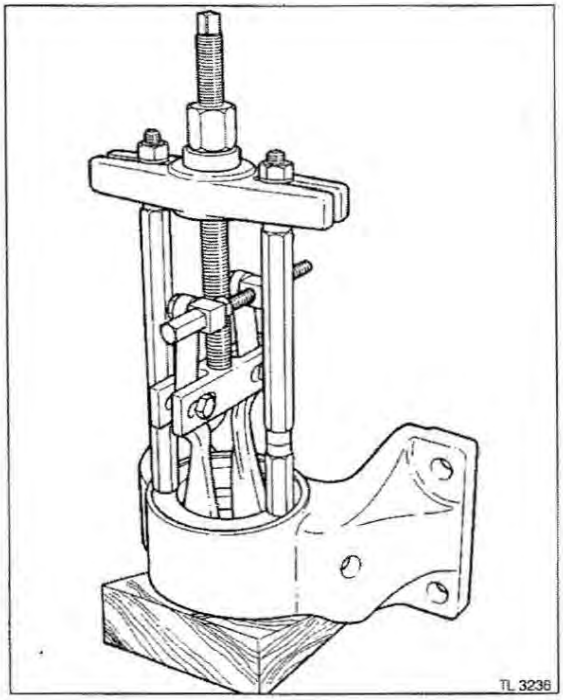
FRONT AXLE PIVOT PIN BEARINGS

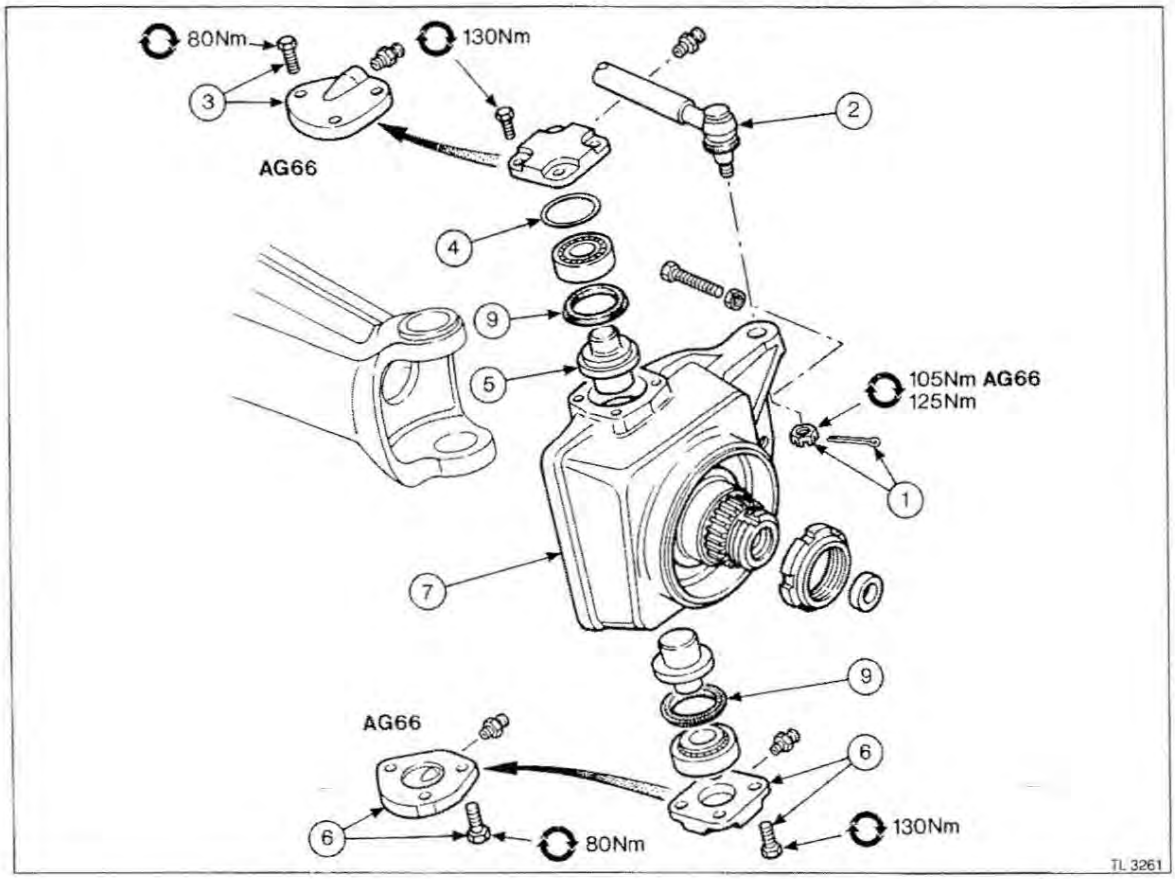
Overhaul **4–8C**

Special Tools:
MF.500 Front Axle Bearing Installer
MS.550 Universal Handle

Dis-assembly

1. Remove the front axle, *(see operation 3-8C).*
2. Remove the 'V' ring seal.
3. Remove the two thrust washers.
4. Remove the quad seal from the axle pinion housing.
5. With the aid of an internal bearing extractor (see illustration) remove the bush from the front bearing housing.
6. Repeat the procedure and extract the bearing from the rear bearing housing.
7. If necessary, remove the steel bearing from the front of the axle casing.





SWIVEL HOUSING and PINS

Removal and Refitment **8–8C**

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

Removal

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

IMPORTANT: *Lubricate all the threads of the forcing screw.*

6. Remove the bolts and cap from the lower bearing and repeat the extraction of the pivot pin.
7. The housing can now be removed from the axle complete with the drive shaft.
8. This procedure can now be repeated on the other side if the crownwheel and pinion assembly is to be removed.

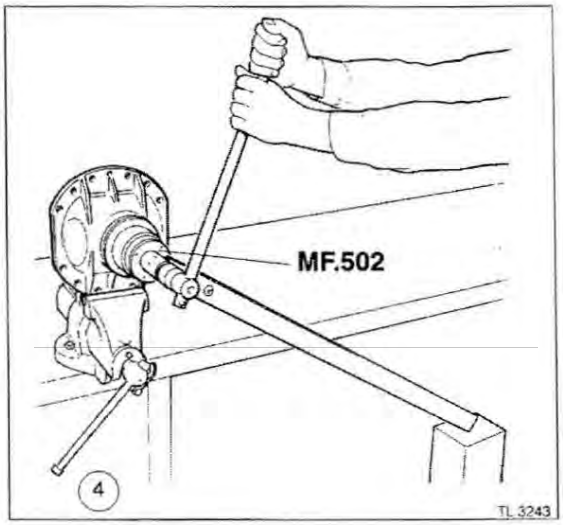
Examination

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

Refitment

9. Renew the seals on the pivot pins. Ensure that the seal is fitted to allow the grease to get out.
10. Fit the bearing cones to the pivot pins. DO NOT grease the bearings at this stage.
11. Coat the pivot pins and holes with a light application of grease or anti-seize compound.

5. Remove the 'O' ring inside the nut and discard.
6. With the aid of a soft faced hammer or press remove the pinion with bearings from the case.
7. Remove the outer bearing cone.
8. Remove the spacer (calibrated spacer on AG 66 axle only).
9. Remove the bearing pre-load shims and retain for re-assembly (AG 75, 85 and 105 axles only).
10. Remove the inner bearing cone with a bearing separator plate and press.
11. Remove the oil seal.
12. Remove the inner and outer bearing cups.
13. Remove the pinion depth of mesh shims.



Examination

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

Re-assembly

The crownwheel and pinion are only available as a matched set. If the crownwheel and pinion are not to be replaced the following instructions on setting the pinion may be disregarded. The two sets of shims must be retained for re-assembly.

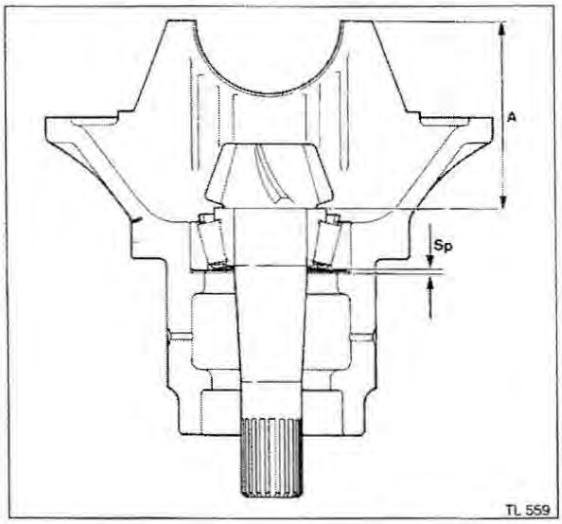
It is necessary to carry out a series of measurements, calculations and procedures to establish the exact position of the pinion in relation to the crownwheel and the pinion bearing pre-load. It is recommended that you work in the metric system for ease of calculation.

Pinion Settings – Depth of Mesh

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

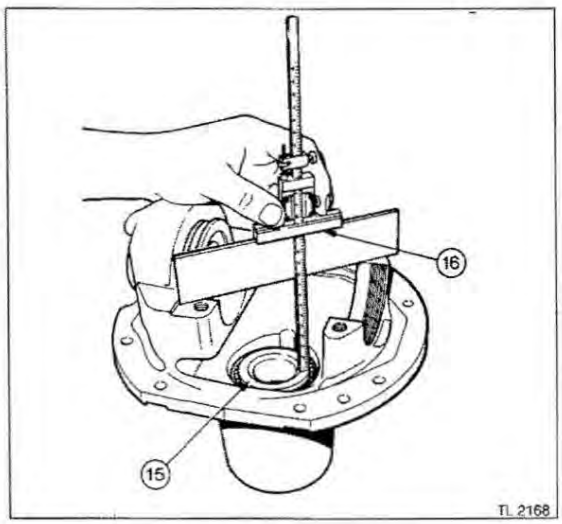
Sp = A- (D ± R)

Sp = Shim thickness.
A = Actual dimension from centre line of crownwheel to the top of the taper roller bearing without shims.
D = Nominal dimension of 91 or 118 mm.
R = Actual tolerance of dimension **'D'** etched on the bevel pinion. This value may be a positive (+) or a negative (-) to be added or subtracted from the nominal dimension **'D'**.



For the next series of procedures you will require a precession depth gauge and straight edge.

15. Fit the upper taper roller bearing cup and cone into the housing without shims.



GENERAL DESCRIPTION

General (Fig.1)

The Ferguson hydraulic system comprises a four cylinder scotch yoke pump (1) which delivers oil, through a vertical pipe (2) to the lift cylinder (3).

A connecting rod (4) from the cylinder piston (5) engages in the ram arm (6) which is splined on to the lift shaft (7) which carries the linkage lift arms.

When oil, under pressure from the pump is delivered to the ram cylinder (3), the piston is forced rearwards and pushes the ram arm upwards, causing the lift shaft to rotate and raise the lift arms.

Conversely, when the oil is allowed out of the cylinder, the piston moves back under load of the lift arms.

The hydraulic pump is driven by the PTO drive from the main clutch, via the constant mesh gears and the PTO drive shaft. It is therefore rotating whenever the engine is running.

Oil flow from the pump is controlled by an integral control valve on the suction side of the pump.

The pump control valve is moved by the quadrant levers, forces down the top link, or the cam on the cross shaft.

The lower speed of the linkage (when the control valve is in the discharge position) is controlled by the response unit.

Hydraulic Linkage Pump (Fig.2)

All 4200 series tractors fitted with the Ferguson Lift system and the linkage pump as shown. The linkage pump is driven by its own drive shaft which forms part of the PTO drive line.

At normal operating pressure the pump operates at:

- A low flow of 17 litre/min with a 540 PTO.
- A intermediate flow of 22 litre/min with a 540/540E PTO.
- A high flow of 28 litre/min when fitted with a 540/1000 rev/min PTO

The pressure relief valve is set at 227 bar.

The pump consists of two piston yokes (1) which ride on cam blocks located on eccentrics on a camshaft (2). The pistons reciprocate in opposed valve chambers (3), each housing two inlet (4) and outlet valves (5) and springs. A sealing plug and snap ring secure the valves in the chambers.

Front and rear pump body castings incorporate the oil galleries connecting the valve chambers, and house the control valve (6) and the control valve oscillator.

Attached to the rear body is the Response Control (7) and strainer housing (8) and also the pressure relief valve (9).

The pressure relief valve is adjustable and connected to the outlet port of the pump to the lift cylinder.

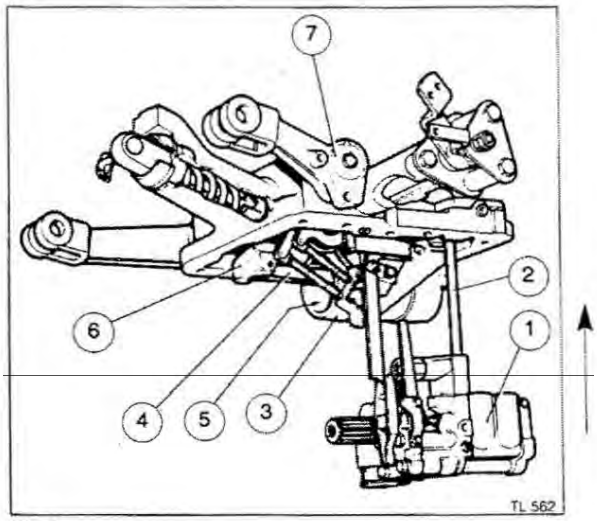


Fig.1

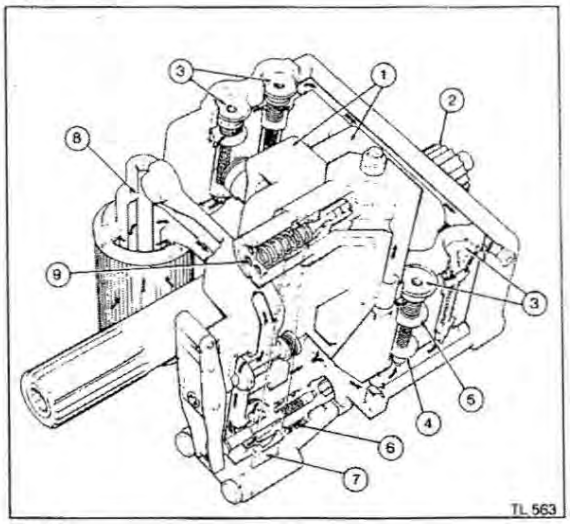


Fig.2

As each of the pump pistons moves in its cylinder it creates suction which lifts the inlet valve from its seat and draws in oil past the control valve (if open) along the intake gallery into the cylinder. During this inlet stroke the outlet valve is held closed by the spring acting on it. When the piston reaches the end of its inlet stroke, the suction ceases with the cylinder now full of oil, allowing the inlet valve to be closed by the inlet valve spring.

As the piston begins its compression stroke, the resultant pressure in the oil keeps the inlet valve closed and lifts the outlet valve, forcing the oil past the outlet valve into the high pressure gallery and up the stand pipe to the lift cylinder.

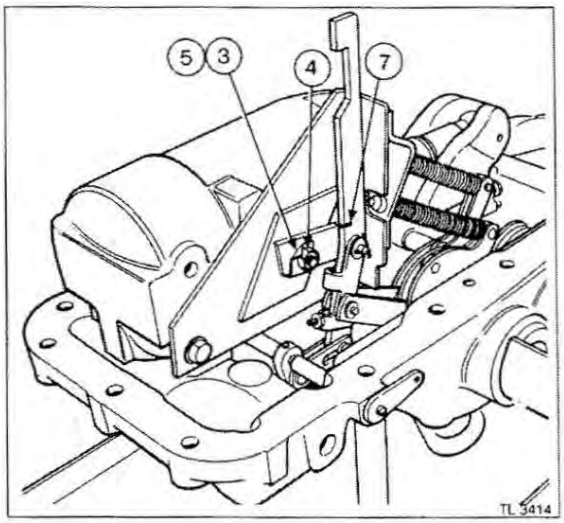
HYDRAULIC LIFT COVER

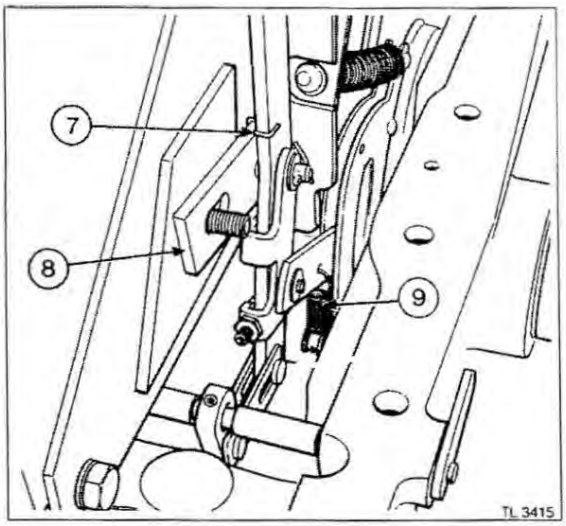
Overhaul **3–9A**

NOTE: *The illustration of the lift cover assembly is shown upside down: how it will be viewed when under repair.*

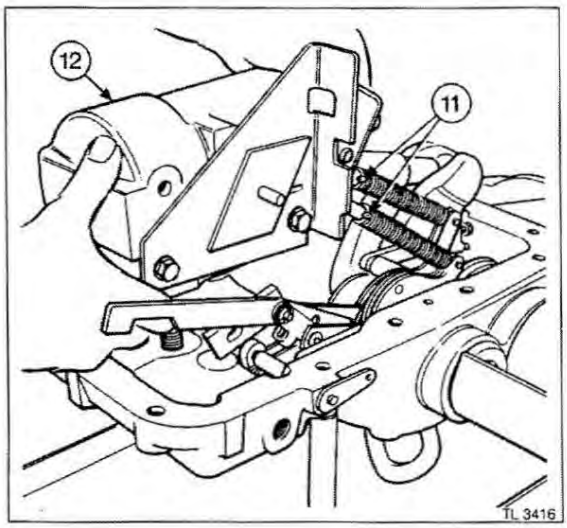
Dis-assembly

1. Remove the lift cover, *(see operation 2-9A).*
2. Turn the lift cover over so that it is upside down and place it on a bench.
3. Release the tab washer.
4. Remove the nut.
5. Remove the tab washer.
6. Remove the spacer.
7. Release the spring.
8. Release the sliding pivot from the bolt.
9. Remove the spring.





10. Select two new 3/32 in diameter split pins.
11. Compress the two springs and fit the pair of split pins to retain the springs. DO NOT open out.
12. Remove the four nuts securing the lift cylinder to the lift cover.
13. Remove the lift cylinder.
14. Remove and discard the 'O' ring between the cylinder and lift cover.



HYDRAULIC STATIC ADJUSTMENTS

Adjust **7–9A**

Special Tools:

MF.163	*Spring Retainer Wrench*
MF.273A	*Control Lever Setting Arm*
MF.333	*Draft Control Rod Gauge*
MF.356E	*Position & Draft Control Gauge*
MF.506	*Ram Arm Gauge - Position*
MF.507	*Ram Arm Gauge - Draft*

Procedure

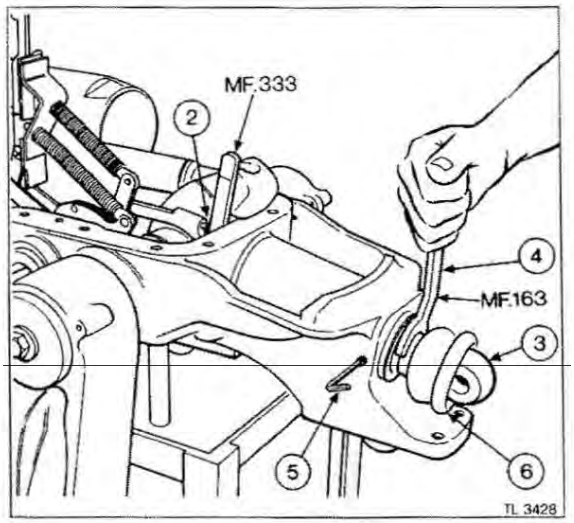
Control Spring External End Float

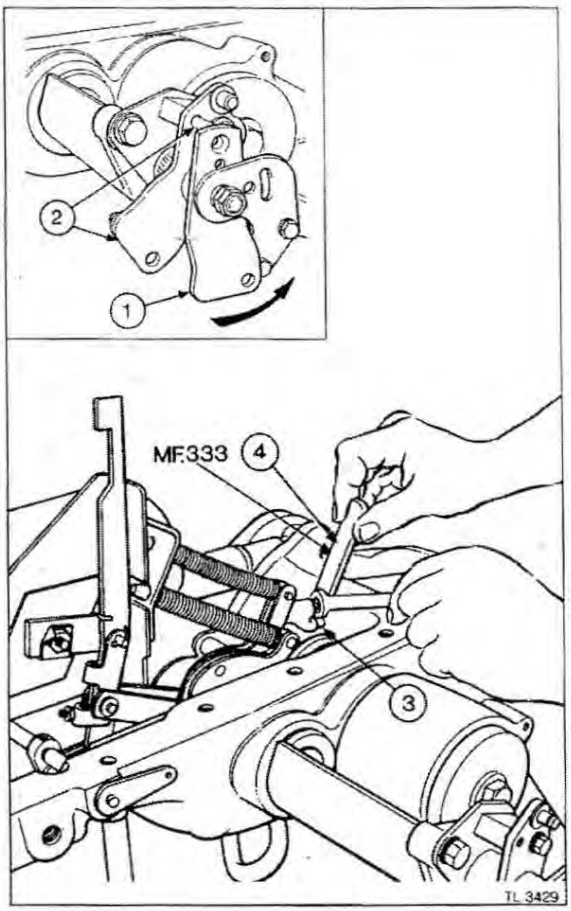
1. Set the control spring internal end float, *(see operation 1-9A).*
2. Ensure that the Draft Control rod cannot obstruct the control spring plunger. Use special tool MF.333 Draft Control Gauge. Fit it on its side, as shown in the illustration, between the draft rod adjusting bolt and the lift cover casting.
3. Refit the spring assembly into the lift cover housing.
4. Using special tool MF.163 Spring Retainer Wrench, tighten the retaining nut until the end float in the spring assembly has been removed. DO NOT over tighten as this will compress the spring and cause the end float to return.
5. Tighten the hexagon socket screw to a torque of 7 Nm (5 lbf ft).
6. Refit the rubber boot to prevent the ingress of water.
7. Remove the tool MF.333 from the control spring plunger.

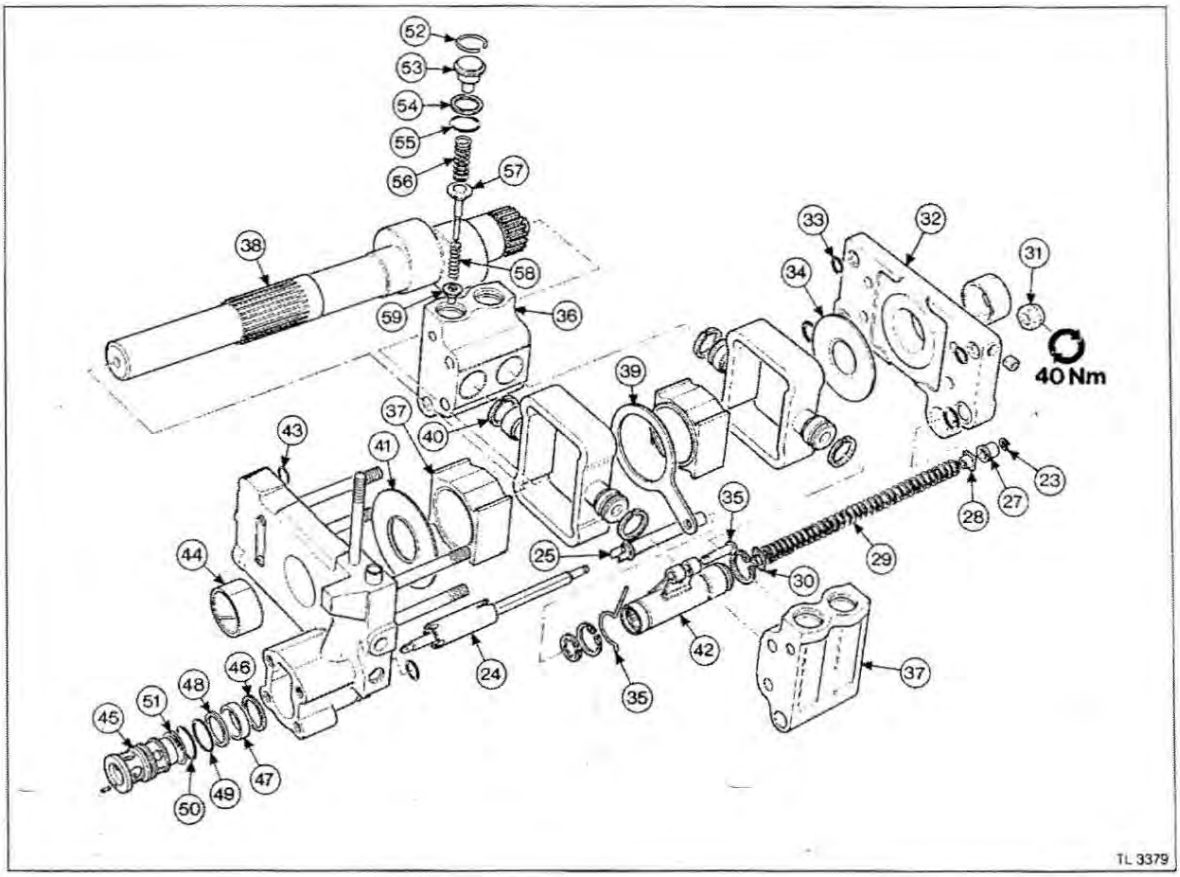
Draft Control Rod Adjustment

1. Set the Draft Control link to the fully UP position; rotate the control lever in a counter-clockwise direction.
2. Set the Position Control to the Transport position using a 6,4 mm (1/4 in) diameter pin.
3. Ensure that the Draft Control rod is held against the control spring plunger under the influence of the linkage return spring.
4. Using special tool MF.333 Draft Control Gauge, adjust the set screw on the Draft Control rod to obtain a clearance of 5,8 mm (0.230 in) between the setscrew and the lift cover casting.

NOTE: *If adjustment to the Central Spring is being made with the lift cover installed, it will be necessary to modify Special Tool MF.163 (See page 9A-39).*







Pump Body

31. Remove the four main pump body nuts.
32. Detach the front body.
33. Remove and discard the 'O' rings between the front body and the valve chambers.
34. Remove the thrust washer.
35. Remove the oscillator retainer clip and pin, cutting off the bent end of the clip.
36. Withdraw the two valve chambers off the studs from the rear body, complete with the camshaft, cam blocks, pistons and cam follower.
37. Separate the valve chambers from the pistons.
38. Remove the cam blocks from the pistons and withdraw the camshaft.
39. Remove the cam follower.
40. Remove the piston rings.
41. Remove the thrust washer.
42. Remove the oscillator tube.
43. Remove and discard the 'O' rings between the rear body and the valve chambers.
44. If necessary, remove the camshaft bushes for replacement.

Control Valve

45. Carefully drive out the control valve body from the rear housing.
46. Remove the washer.
47. Remove the spacer ring.
48. Remove and discard the nylon ring.
49. Remove and discard the 'O' ring.
50. Remove and discard the 'O' ring.
51. Remove and discard the back-up washer.

Hydraulic Steering

Section 9 – Part B

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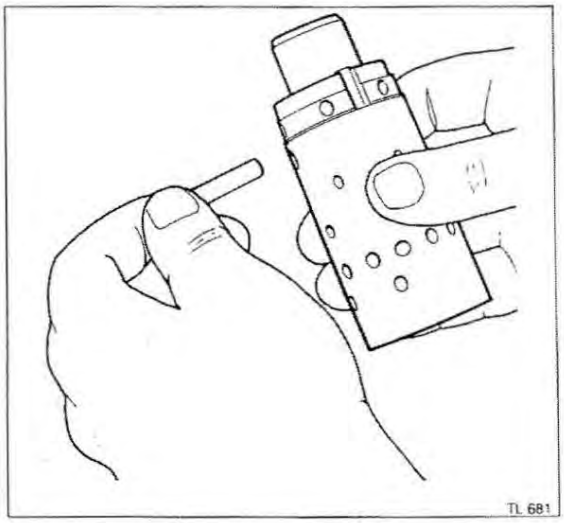
27. Insert the cross pin.

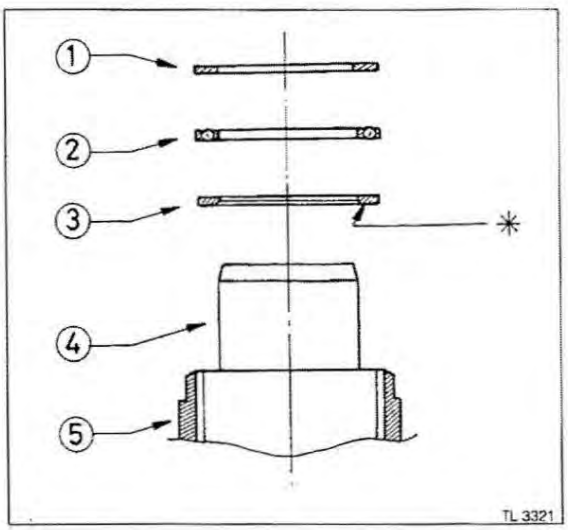


28. Fit the bearing races and needle bearing as shown in the illustration.

* The inside chamfer on the inner bearing race must face the inner spool.

Assembly pattern:

1. Outer bearing race
2. Needle bearing
3. Inner bearing race
4. Spool
5. Sleeve



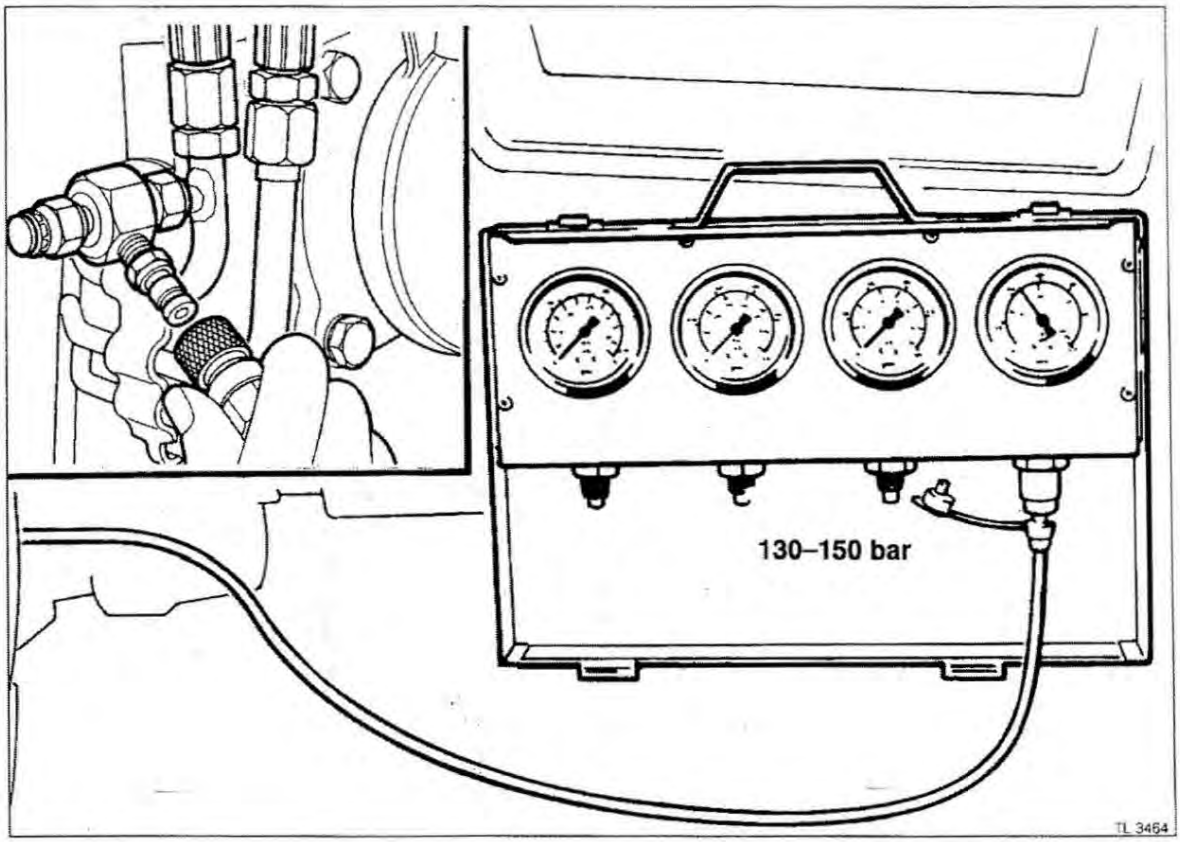
Auxiliary hydraulic control valves:	
Make	Kontak.
Type	Open centre.
Number of sections	1, 2, 3 or 4.
Type of sections available	Spring return to neutral.
	Detented with pressure kick-out.
	Detent with kickout plus float.
	Motor.
Kick-out pressure setting	172 bar (2500 lbf/in^2).
Combined Flow at quick release coupling at 2000 engine rev/min, 140 bar (2031 lbf/in^2) pressure:	
Combined flow 540 PTO (single speed)	49 litre/min (10.7 gal/min)(12.9 US gal/min).
Combined flow 540/540E PTO	53 litre/min (11.6 gal/min)(13.9 US gal/min).
Combined flow 540/1000 PTO	58 litre/min (12.8 gal/min)(15.3 US gal/min).
Pressure at quick release coupling with combined flow at 1200 engine rev/min	200-220 bar (2900-3190 lbf/in^2) maximum.
Trailer brake valve:	
Make	Bosch.
Ratio	4:1.
Piston diameter	12 mm.
Location	Right-hand axle housing.
Oil supply	First priority from auxiliary pump.
Maximum pressure to brakes	135 bar (1960 lbf/in^2).
Maximum oil flow to trailer brake	15 litre/min (3.3 gal/min)(4 US gal/min).

Special Tools:

MF.508	Pump drive sprocket remover.
MF.510	Back pressure test adaptor.
MF.3001A	Hydraulic pressure test kit.
MF.3002	Hydraulic flow meter hose kit.
MF.3003	Hydraulic flow meter.
MF.3011	PTO hydraulic test point.

Bolt Torques:

Hydraulic pump drive housing to rear axle casing	60 Nm (45 lbf ft).
Hydraulic pump to drive housing	60 Nm (45 lbf ft).
Strainer housing to rear axle casing	60 Nm (45 lbf ft).
Auxiliary system manifold	60 Nm (45 lbf ft).
Centrifugal filter central bolt	16 Nm (12 lbf ft).
Hydraulic pump body bolts	60 Nm (45 lbf ft).
Hydraulic control valve tie rods	20 Nm (15 lbf ft).
Hydraulic control valve screws	7 Nm (5 lbf ft).
Control valve tie rod nuts	20 Nm (15 lbf ft).
Control valve change over valve	22 Nm (17 lbf ft).
Control valve shoulder screw	7 Nm (5 lbf ft).
Control valve seal plate screws	7 Nm (5 lbf ft).
Solenoid valve body	10 Nm (7 lbf ft).
Solenoid valve coil	Finger tight.
Speedshift control valve bolts	60 Nm (45 lbf ft).



STEERING SYSTEM PRESSURE TEST

Check **1–9C**

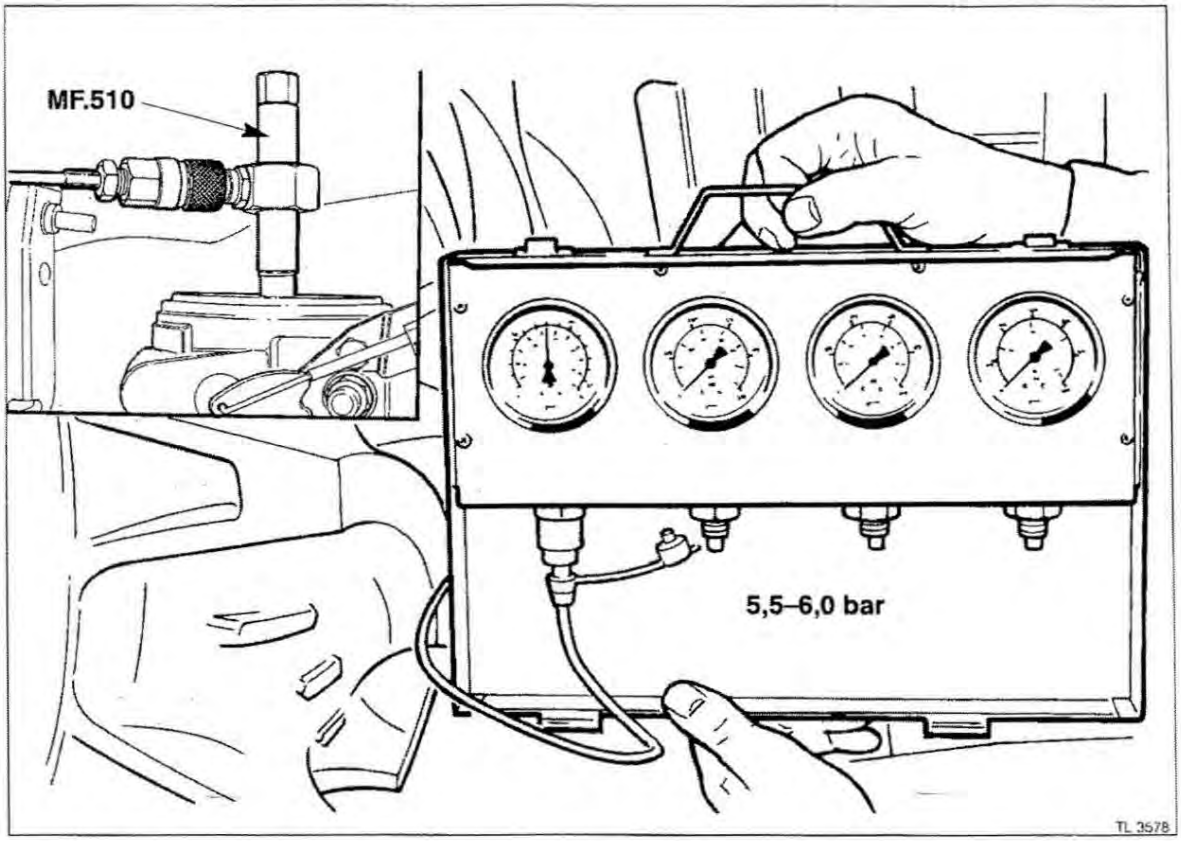
Special Tools:
MF.3001A Pressure Test Kit
MF.3002 Hose Kit

Procedure

1. Remove the plug from the tee on the right-hand side of the tractor in front of the cab.
2. Install the test tee and a cap from the test kit.
3. Connect the high reading pressure gauge in the MF.3001A Pressure Test Kit.
4. Start up the engine and warm up the hydraulic system. The oil temperature must be 50-60°C (120-140°F).
5. Set the engine speed to 1200-1250 rev/min.
6. Make a note of the back pressure on the gauge.
7. Turn the steering to full lock, the relief valve will open, make a note of the maximum pressure reading.
8. Take the back pressure reading from the maximum pressure reading. The result is the system pressure, this should be 130-150 bar (1886-2175 lbf/in^2).

Diagnosis

Symptom - Steering Pressure LOW		
Cause	Action	Operation No.
Steering pump performance down	Flow check pump	2-9C
Worn steering unit	Overhaul or replace steering unit	1-9B 2-9B
Relief valve faulty	Overhaul or replace steering unit	1-9B 2-9B
Shock valves faulty	Overhaul or replace steering unit	1-9B 2-9B
Leakage across steering cylinder	Overhaul steering cylinder	12-8A 15-8B



BACK PRESSURE VALVE TEST

Check **10–9C**

Special Tools:
MF.510 Back Pressure Test Adaptor
MF.3001A Pressure Test Kit

Procedure

NOTE: *Check the Pressure Maintaining Valve pressure first before undertaking this test.*

1. Start the tractor and set the engine to 1200-1250 rev/min. Warm up the hydraulic/transmission oil to a working temperature of 50-60°C (120-140°F).
2. After shutting the engine down, stand the tractor for a while to allow the oil in the hydraulics to drain back into the transmission.
3. Remove the housing and rotor from the centrifugal filter.
4. Install special tool MF.510 Back Pressue Test Adaptor over the spindle of the centrifugal filter. Ensure that the 'O' rings are in place on the special tool.
5. Screw into the side of the special tool a male M14 quick release coupling from the MF.3001A Pressure Test Kit.
6. Couple up to the low pressure gauge (11 bar) in the test kit.
7. Re-start the engine and run at 1200-1250 rev/min.
8. The pressure gauge should read 5,5-6,0 bar (80-87 lbf/in^2).

Diagnosis

Symptom - back pressure LOW		
Cause	Action	Operation No.
Back pressure valve stuck open	Replace relief valve	17-9C
Back pressure relief valve setting low	Re-set relief valve	17-9C

Dis-assembly

Pressure Maintaining Valve

1. Remove the plug.
2. Examine the 'O' ring for damage. Renew if necessary.
3. Remove the shims.
4. Remove the spring.
5. Remove the spool.
6. Remove the shroud.

Back Pressure Valve

7. Remove the plug.
8. Examine the 'O' ring for damage. Renew if necessary.
9. Remove the shims.
10. Remove the spring.
11. Remove the poppet valve.

Auxiliary Relief Valve

12. Remove the Plug.
13. Examine the 'O' ring for damage. Renew if necessary.
14. Remove the shims.
15. Remove the spring.
16. Remove the poppet valve.
17. Remove the cage.
18. Examine the sealing ring for damage. Renew if necessary.

Centrifugal Filter

19. Unscrew the cover nut and lift off the filter cover.
20. Examine the body seal for damage, renew if necessary.
21. Withdraw the rotor assembly from the spindle and allow oil to drain from the nozzles.
22. For servicing instructions, *(see operation 11-9C)*.

Response Control

23. Drive out the roll pin.
24. Remove the cam, spring and spacer.
25. Withdraw the spindle and lever assembly from the manifold.
26. Drive out the roll pin, remove the screw and dismantle the lever.
27. Remove and discard the 'O' ring.

Solenoid Valve

28. Unscrew the top nut and remove the coil.
29. Unscrew the valve from the block.
30. Remove and discard the 'O' rings.
31. Remove, if necessary, low pressure warning light switch.

Examination

The components of the manifold assembly are made to very fine limits, The work bench, hands and cleaning equipment must be very clean, even the smallest particle of dirt can affect the working of the valves.

Clean all or any of the components, inspect for wear and scoring, pay particular attention to the valve seats. Renew any components that are worn or suspect.

Re-assembly

32. Reverse the procedures for dis-assembly depending on the extent of the repair, except:

a. To adjust the pressure of the Pressure Maintaining Valve and Back Pressure Valve the following shims are available:

Part No.	Metric	Imperial
1679 210 M1	0,25	0.010
1679 211 M1	0,50	0.020
1679 212 M1	1,00	0.039

b. To adjust the pressure of the Auxiliary Pressure Relief Valve the following shims are available:

Part No.	Metric	Imperial
3001 843 X1	0,10	0.004
3009 049 X1	0,20	0.008
3008 449 X1	0,50	0.020

c. Apply Massey Ferguson Multi-Gasket (Loctite 573) to the face of the transmission housing.

d. Apply Hylomar to the threads of the bolts securing the manifold to the transmission case and tighten to a torque of 60 Nm (45 lbf ft).

e. Tighten the solenoid valve body to a torque of 10 Nm (7 lbf ft) and the solenoid valve coil nut to a torque of 4 Nm (3 lbf ft).

f. Tighten the auxiliary relief valve plug to a torque of 90 Nm (65 lbf ft).

ELECTRICAL SYSTEM

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Ignition Relay and Direction Indicator Flasher Unit

Mounted behind the instrument panel is the ignition relay (1, Fig. 7), this controls all circuits which are supplied with power through the ignition switch and are inactive when the key switch is OFF; for example, differential lock, four-wheel drive, warning systems etc.

The direction indicator flasher unit (2, red) is also mounted behind the panel.

For removal of the instrument panel, *(see operation 9-10A)*.

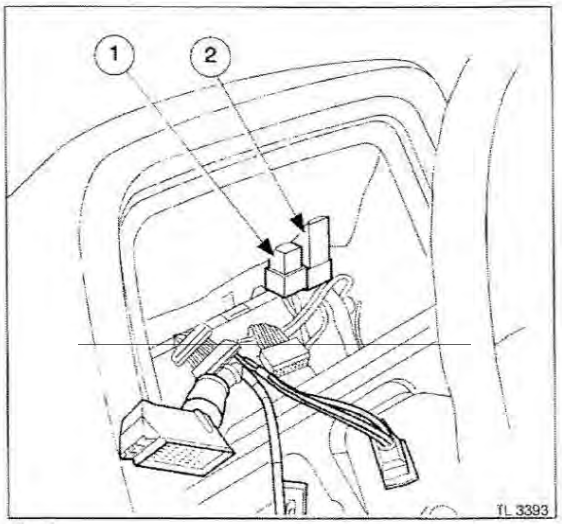


Fig.7

RELAYS

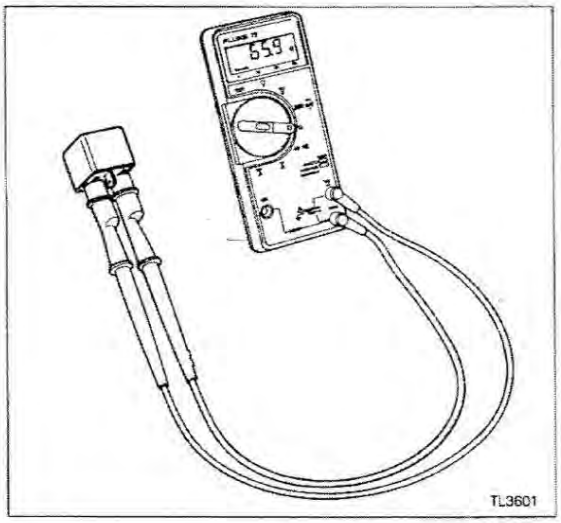
Removal and Refitment 2–10A

Test Equipment:
MF 3005 Digital Multimeter

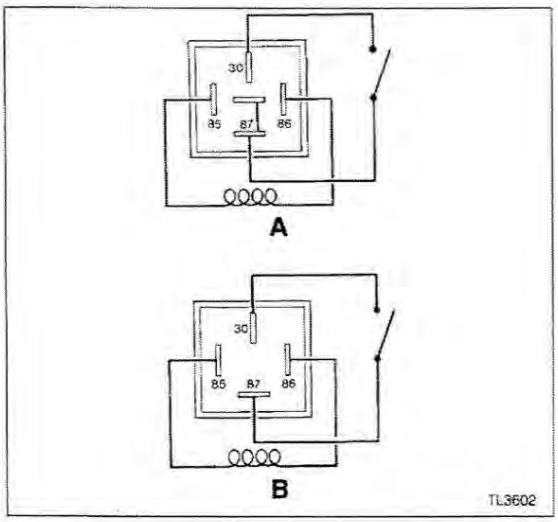
Test

Electrical relays are provided in the following services:

- **Ignition relay** - behind the instrument panel supplying all circuits around the instrument panel and engine and controlled by the key start switch. Relay type 'A' in illustration.
- **Work lights relay** - located behind the cover on the right-hand door pillar. Supplies all work lights around the cab roof and lower lights on the front cab posts. Relay type 'B'.
- **Cab roof relay** - Located behind the left-hand door pillar cover. Supplies all services, other than work lights, in the cab roof which are controlled by the key start switch. Relay type 'A'.
- **Air conditioning relay** - this relay will be found under the top roof hatch adjacent to the cab air filter housing. This controls the air conditioner magnetic clutch mounted on the compressor by the engine. Relay type 'A'.



The illustration shows the two types of relay used on the tractor, the pin lay-out, terminal numbers, and diagrammatically, the switch and coil connections. On relay type 'A' (40 amp) the centre pin and pin 87 are connected together. Relay type 'B', work lights, is rated at 70 amp.



Removal

1. Access and remove the suspect relay, *(see operation 1-10A)*.
2. Test the coil between terminals 85 and 86 with the MF 3005 Digital Multimeter set on ohms.
3. The reading should be approximately 85 ohms.
4. Terminals 30 and 87 is the switch which is normally open, closed when the coil is energised.

TEST 4. Cable Continuity (Fig.6)

Remove the main cable (brown) from the alternator and connect the negative lead of the voltmeter (V_1) to the battery earth, then connect the other lead to the main cable.

Next, remove the plastic plug and connect the lead to the small IND terminal, the starter switch must be ON (NOT engine cranking).

The voltmeter should read battery voltage, if a zero reading is obtained on the small terminal (IND) check for a faulty bulb in the charging indicator light in the instrument panel, third bottom row.

Diagnosis

Result	Action
Readings below battery voltage	Check all wiring and connections
Readings of battery voltage	Proceed to Test 5

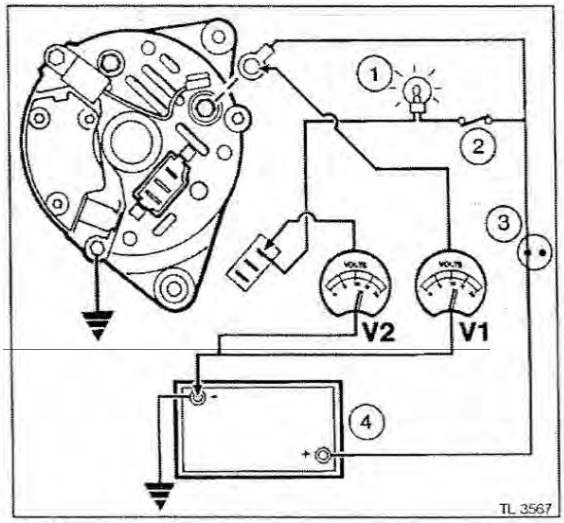


Fig.6

TEST 5. Alternator Output (Fig.7)

The alternator should be run for a few minutes to ensure that the tests are carried out at normal operating temperature. Then stop the engine.

1. Switch ON all lights and cab blower motor (except wipers) to create a load and discharge the battery for one minute.
2. Remove the main cable (Brown) from the back of the alternator.
3. Connect the ammeter between the large terminal and the brown cable. You will require an ammeter of at least 100 amp capacity.

IMPORTANT: *The clips or test probes on the ammeter MUST NOT touch the alternator casing before or during the test. A short circuit will result which will damage the alternator.*

4. Switch ON, check that the charge warning light comes ON.

NOTE: *There is a resistor built into the circuit across the charge warning light. In the event of a bulb failure, the alternator will still charge.*

5. Start the engine and slowly increase to maximum rated speed, the ammeter reading should equal the maximum rated output of the alternator of 70 amps

NOTE: *As the state of charge of the battery increases so the output of the alternator will decrease. The rated output of the alternator should be checked quickly.*

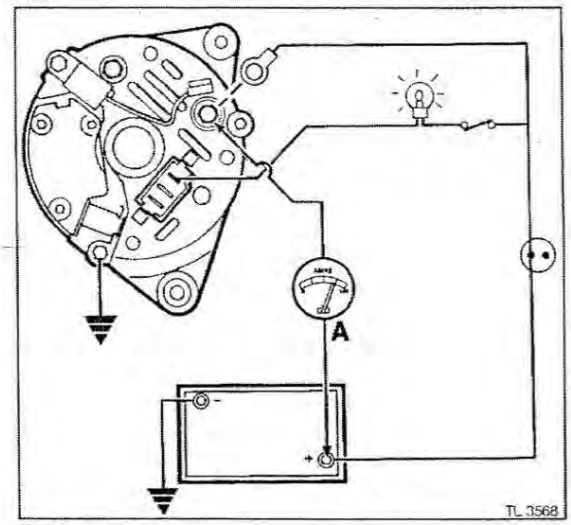


Fig.7

Diagnosis

Result	Action
Ammeter reading low	Replace or repair alternator *(see operation 9-10A)*.
Ammeter reading 65-70 amp.	Proceed to Test 6

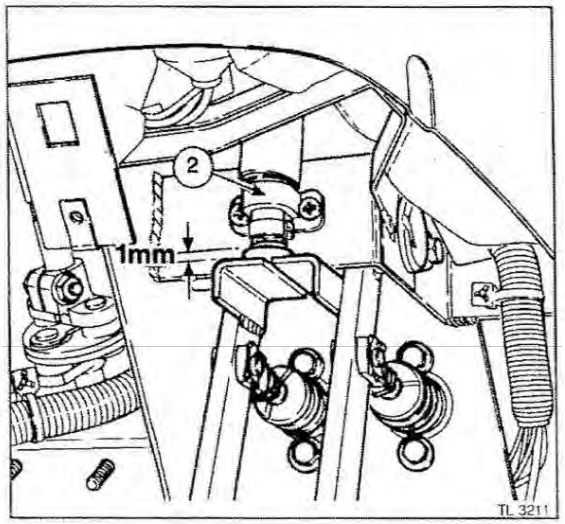
BRAKE SWITCHES

Removal and Refitment **16–10A**

Removal

Foot Brake Switch

1. Remove the panel under the instrument panel.
2. Disconnect the electrical plug from the switch.
3. Remove the two screws.
4. Remove the switch.



Parking Brake Switch

5. Disconnect the electrical plug from the switch.
6. Remove the two screws.
7. Remove the switch.

Refitment

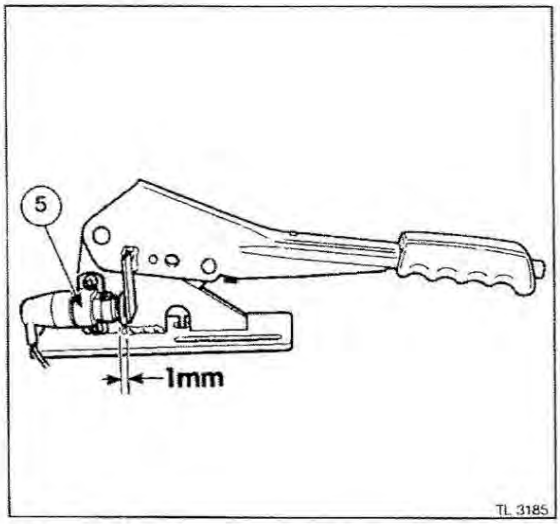
8. Reverse procedures 1 to 4 or 5 to 7 except:

a. With the foot brake or the parking brake in the OFF position:

b. Press the brake switch plunger IN.

c. Check the clearance between the plunger and the brake pedal or lever, it should be 1 mm (0.039 in).

d. If adjustment is required, slacken the two screws and re-set the position of the switch, or, slightly bend the operating lever.



STARTER SWITCH

Removal and Refitment **17–10A**

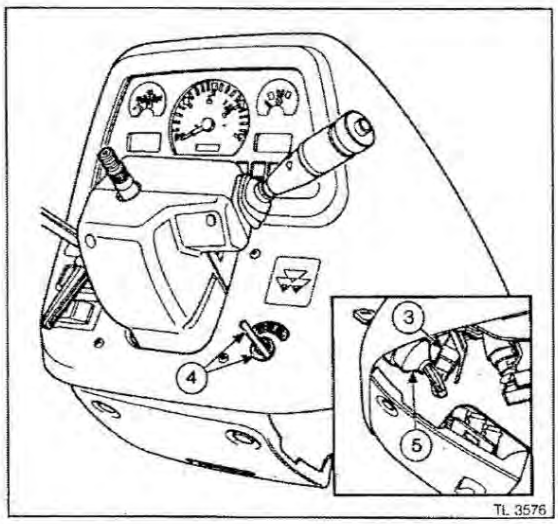
Removal

NOTE: *The steering wheel has been removed for clarity.*

1. Disconnect the battery negative lead (-).
2. Remove the lower right-hand console cover.
3. Behind the switch, disconnect the electrical plug.
4. Remove the key and unscrew the ring nut.
5. Remove the switch.

Refitment

6. Reverse procedures 1 to 4.
7. Ensure that the flat on the side of the thread is correctly located in the hole in the console.



Cab Wiring Diagrams

Engine, Console, Hydraulic and Cab Harness (Fig. 1)

1 Engine harness.
2 Console harness.
3 Hydraulic harness.
4 Cab harness.
5 Main fuse box.

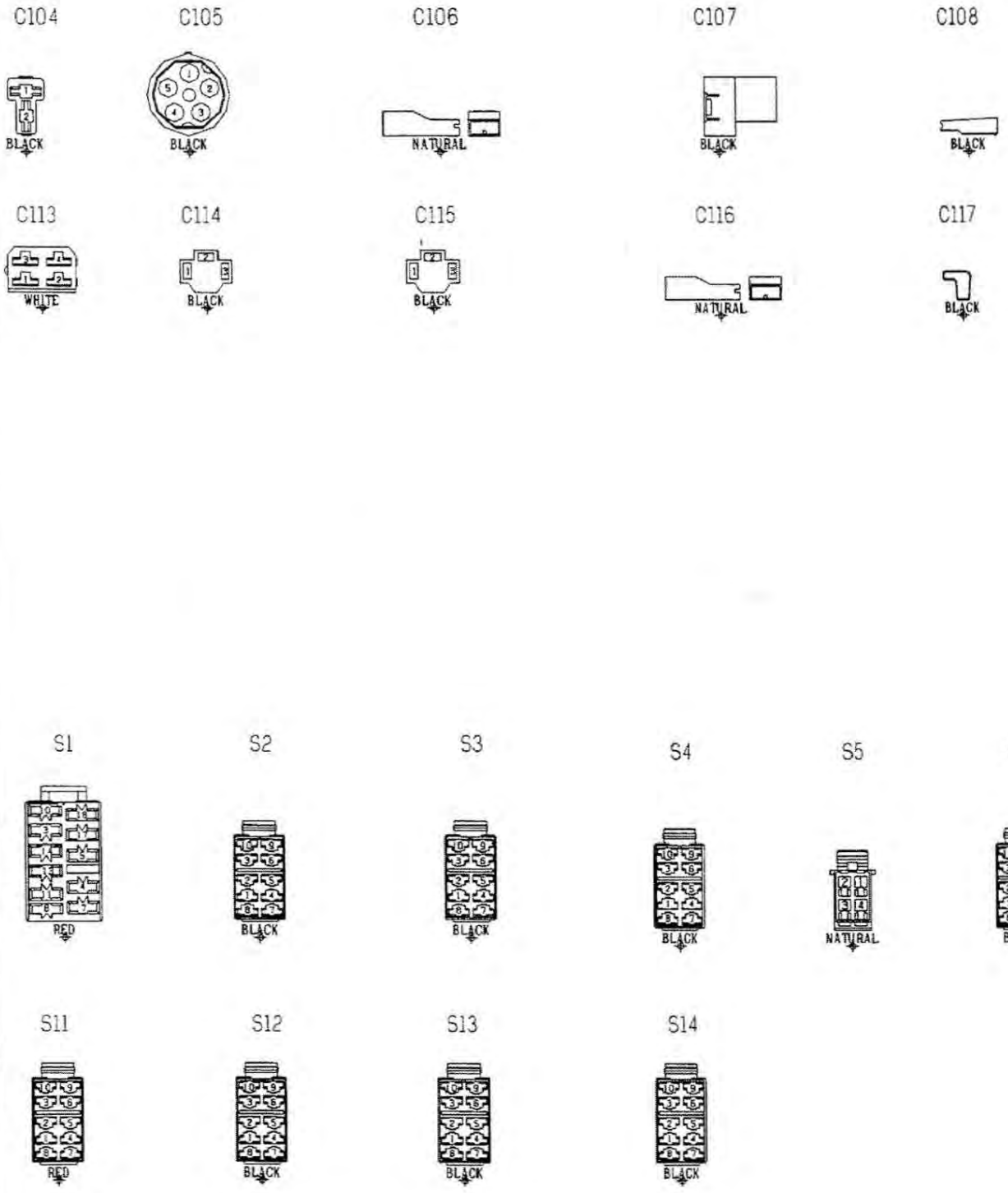
C1 Right-hand head light.
C2 Left-hand head light.
C3 Air cleaner indicator switch.
C4 Horn.
C5 Alternator (+).
C6 Air conditioner low pressure switch.
C7 Air conditioner magnetic clutch.
C8 Starter motor solenoid (+).
C9 Connector engine harness to console harness (gray).
C10 Connector engine harness to console harness (black).
C11 Plug instrument panel 25 pin (black), centre (A).
C12 Plug instrument panel (black), right-hand (B).
C13 Plug instrument panel ((light grey), left-hand (C).
C14 Key pad by instrument panel.
C15 Ignition key switch.
C16 Steering column switch.
C17 Steering column switch.
C18 Connector console harness to cab harness (light grey).
C19 Connector console harness to cab harness (light grey).
C20 Connector console harness to cab harness (brown).
C21 Connector console harness to cab harness (white).
C22 Connector console harness to hydraulic harness (light grey).
C23 Connector console harness to hydraulic harness (light grey).
C24 Connector console harness to hydraulic harness (natural).
C25 Connector console harness to hydraulic harness (white).
C26 Earth.
C27 Connector cab harness to cab roof harness (natural).
C28 Cab harness to cab roof harness (brown).
C29 Cab harness to cab roof harness (white)
C30 Cab harnesss earth.
C31 Engine harness earth.
C32 25 amp power socket.
C33 Right-hand rear lights.
C34 Electronic lift control.
C36 Suspension seat switch and compressor.
C37 Beacon socket.
C38 Connector hydraulic harness to roof harness (natural).
C39 Connector hydraulic harness to roof harness (white).
C40 Earth.
C41 Alternator body earth.
C42 Left-hand rear light.
C43 Speedometer sensor.
C44 Reversing light/bleeper.
C45 Front wash pump.
C46 Rear wash pump.
C47 Range indicator light switch.
C48 Connector harness to speedshift solenoid.
C49 Fuel tank sender unit.
C50 Switch speedshift gear lever.
C51 Tachometer speed sensor.
C52 Differential lock solenoid.
C53 Four-wheel drive solenoid.
C54 Transmission pressure switch.
C55 PTO speed sensor.
C56 Trailer socket.
C57 Differential lock switch.
C58 Reverse light/bleeper switch.
C59 Engine oil pressure switch.
C60 Fuel injection pump shut-off solenoid.
C61 Creeper engaged switch.
C62 Speedshift low warning light.
C63 Speedshift high warning light.
C64 Foot brake switch.
C65 10 amp auxiliary power socket.
C66 Key pad adjacent to fuse box.
C67 Parking brake switch.
C68 Alternator field connection.
C69 Starter positive.
C87 Speedshift solenoid.
C99 PTO safety start switch.
C111 Starter solenoid.
C112 Safety start switch gearbox.
C116 Water temperature sender.
C117 Thermostart.
C118 Engine oil pressure switch hydraulic lock (Japan).
C119 Hydraulic lift lock solenoid (Japan).
C120 Lower cab heater - adjacent to seat (flat roof cab).

HJ1 Header joint (green).
HJ2 Header joint (blue).
HJ3 Header joint (orange).
HJ4 Header joint (orange).
HJ5 Header joint (grey).
HJ6 Header joint (orange).
HJ7 Header joint (grey).
HJ8 Header joint (orange).
HJ9 Header joint (grey).

R1 Flasher unit.
R2 Ignition supply relay.
R7 Hydraulic lock relay.

S1 Hazard warning switch.
S2 Main/roof light switch (Germany).
S3 Master light switch side/head.
S4 Differential lock switch.
S5 18 x 6 Speedshift switch (side panel).
S6 Four-wheel drive switch.
S13 Engine stop switch (Forestry cab).
S14 Four-wheel drive switch (Japan).

Cab Wiring Diagrams



Issue 1

Figure 5

Power supply to Console Fuse Box Row 3-A to F (A, Fig. 8)

C8 Starter solenoid connection (battery +).

C15 Ignition switch - 4 pin natural.

FB3 Main fuse box below instrument panel row 3.

Power Supply to Console Fuse Box Row 4-A to F (B, Fig. 8)

C8 Starter solenoid connection (battery +).

FB4 Main fuse box below instrument panel row 4.

R2 Ignition supply relay - console behind instrument panel.

Power Supply to Console Fuse Box Row 5-A to F (C, Fig. 8)

C8 Starter solenoid connection (battery +).

C15 Ignition switch - 4pin natural.

FB5 Main fuse box below instrument panel row 5.

S3 Master light switch - side/head lights.

Power Supply to Console Fuse Box Row 5-A to F (D, Fig. 8)

North America only

C8 Starter solenoid connection (battery +).

C15 Ignition switch - 4 pin natural.

FB5 Main fuse box below instrument panel row 5.

S3 Master light switch - side/head lights.

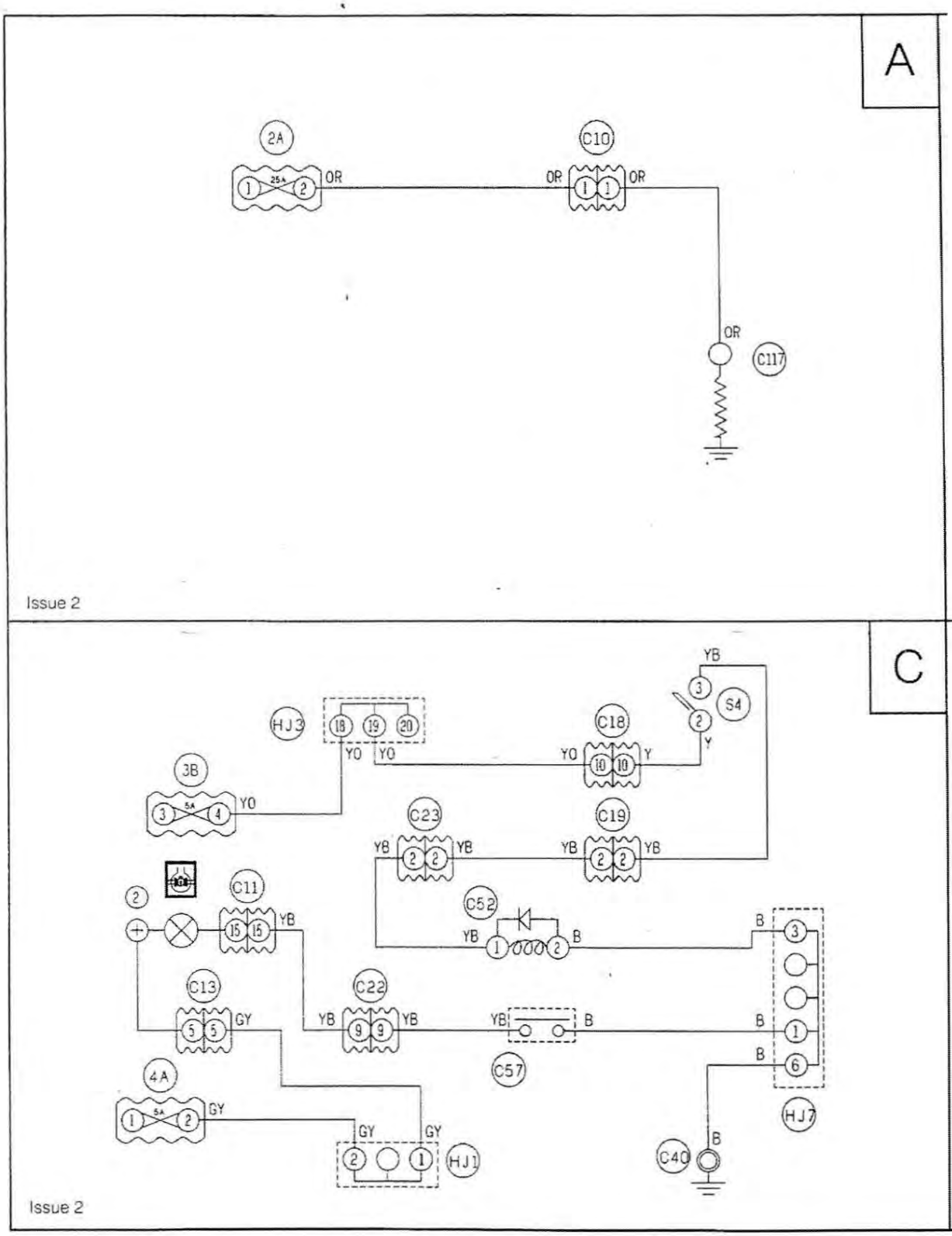

A
2A
C10
OR
OR
OR
OR
C117
Issue 2
C
YB
S4
HJ3
C18
3B
C23
C19
C52
C11
C13
C22
C57
4A
HJ1
HJ7
C40
Issue 2

Figure 10

Electronic Lift Control (A Fig. 13)

5A Fuse 5A in main fuse box below instrument panel.

C18 Console harness to cab harness - 20 pin light grey.

C19 Console harness to cab harness - 8 pin light grey.

C34 Electronic lift control - 4 pin natural.

HJ4 Behind instrument panel - orange.

Reverse Light/Bleeper (B Fig. 13)

5B Fuse 5B in main fuse box below instrument panel.

C23 Console harness to hydraulic harness - 12 pin light grey.

C40 Earth connection left-hand door pillar lower.

C44 Reverse light/bleeper - 3 pin black.

C58 Reverse light switch - 3 pin black.

HJ6 Under left-hand mud guard trim - orange.

Heater Flat Roof Cab (C Fig. 13)

C23 Console harness to hydraulic harness - 12 pin light grey.

C40 Earth connection left-hand door pillar lower.

C120 Lower heater flat roof cab - 2 pin natural.

FB5 Fuse C5 in main fuse box below instrument panel.

Right-Hand Side Light (D Fig. 13)

5D Fuse 5D in the main fuse box below instrument panel.

C18 Console harness to cab harness - 20 pin light grey.

C23 Console harness to hydraulic harness - 12 pin light grey.

C27 Cab harness to roof harness - 10 pin natural.

C30 Earth connection right-hand door pillar lower.

C33 Right-hand rear light - 4 pin natural.

C56 Trailer socket.

C70 Right-hand side light - 3 pin natural.

C100 Right-hand side light roof - 4 pin natural.

C102 Earth connection right-hand door pillar upper.

HJ3 Behind instrument panel - orange.

HJ8 Under right-hand mud guard trim - orange.

HJ9 Under right-hand mud guard trim - grey.

10 Trailer socket.

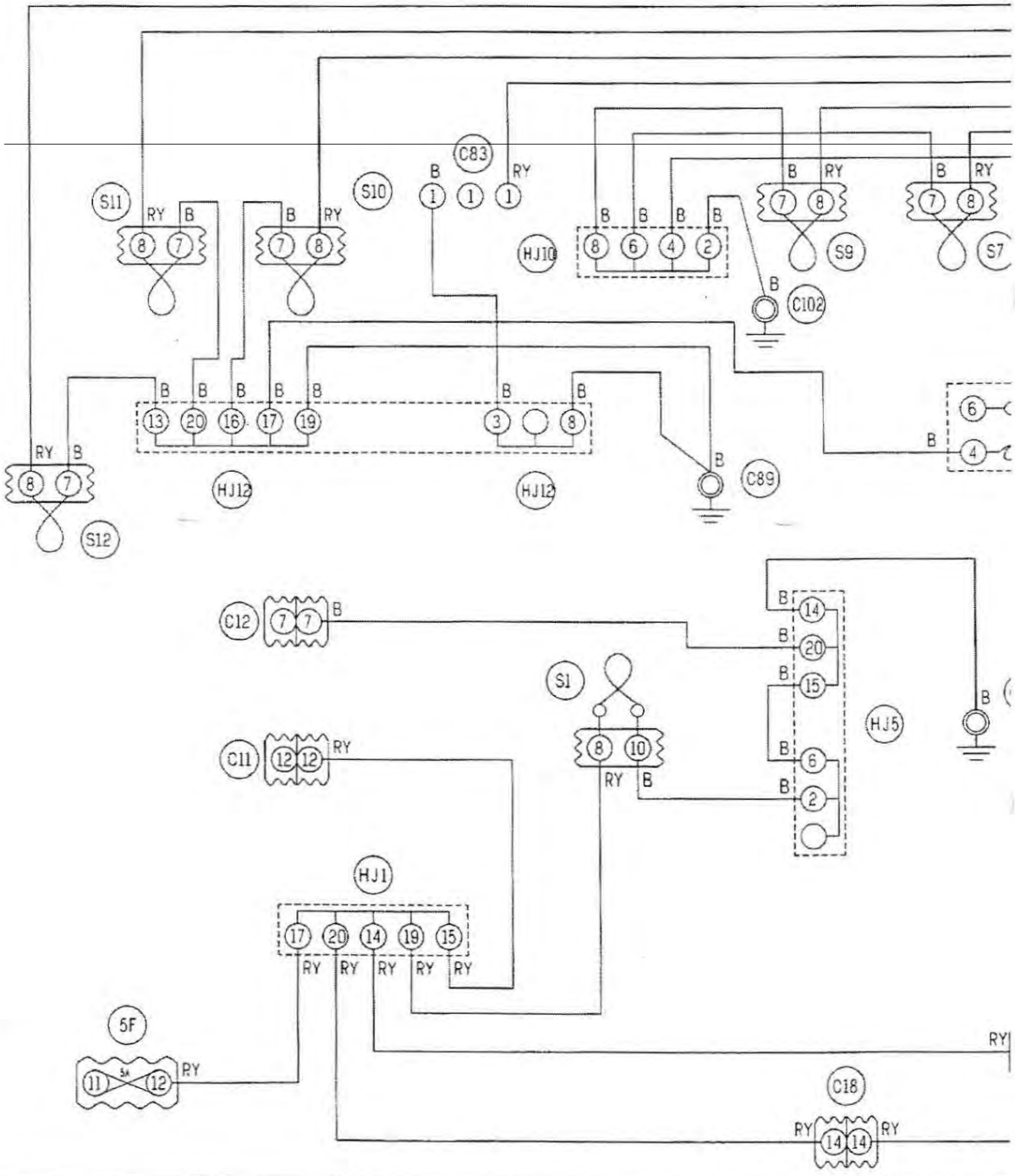
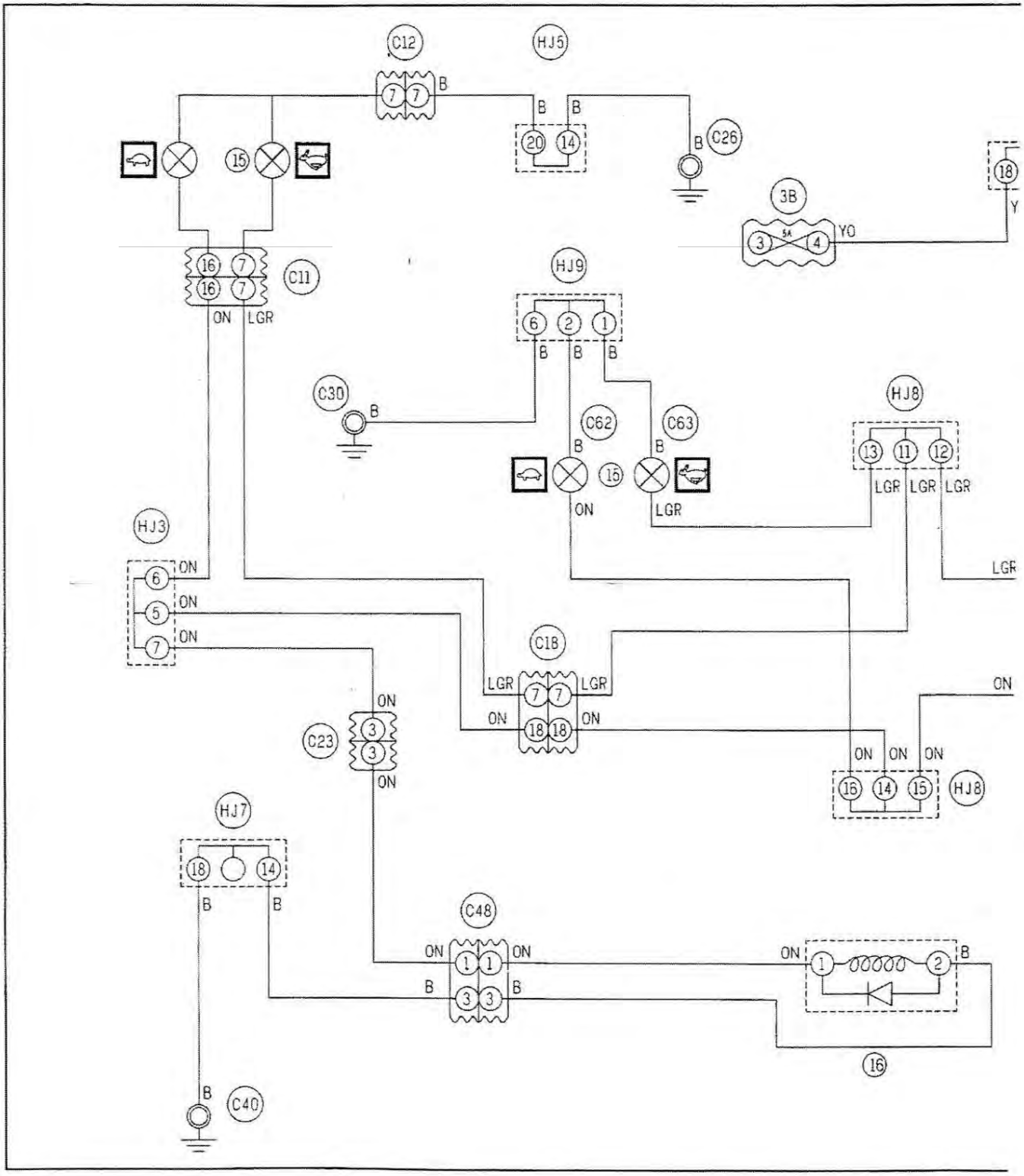

S11
S10
C83
S9
S7
HJ10
C102
C89
HJ12
S12
C12
C11
S1
HJ5
HJ1
5F
C18
RY
B

Figure 15

Switch And Instrument Panel Illumination (Fig 18)

Germany only

5F	Fuse 5F in main fuse box below instrument panel.
C11	Instrument panel plug - 25 pin black.
C12	Instrument panel plug - 7 pin black.
C18	Console harness to cab harness - 20 pin light grey.
C19	Console harness to cab harness - 8 pin light grey.
C26	Earth connection behind instrument panel.
C27	Cab harness to roof harness - 10 pin natural.
C28	Cab harness to roof harness - 7 pin brown.
C30	Earth connection right-hand door pillar.
C34	Cab heater switch.
C83	Clock.
C89	Earth connection left-hand side door pillar.
C102	Earth connection right-hand door pillar.
HJ1	Behind instrument panel - green.
HJ5	Behind instrument panel - grey.
HJ8	Under right-hand mud guard trim - orange.
HJ9	Under right-hand mud guard trim - grey.
HJ10	Roof right-hand side - grey.
HJ12	Roof left-hand side - grey.
S1	Hazard switch light - red LED.
S2	Roof Head light switch light - green LED.
S4	Differential lock switch light - green LED.
S6	Four-wheel drive switch light - green LED.
S7	Beacon switch light - green LED.
S8	Rear wiper switch light - green LED.
S9	Front wiper switch light - green LED.
S10	Rear work light switch light - green LED.
S11	Side work light switch light - green LED.
S12	Front work light switch light - green LED.
R4	Work light supply relay 70 amp left-hand door pillar.

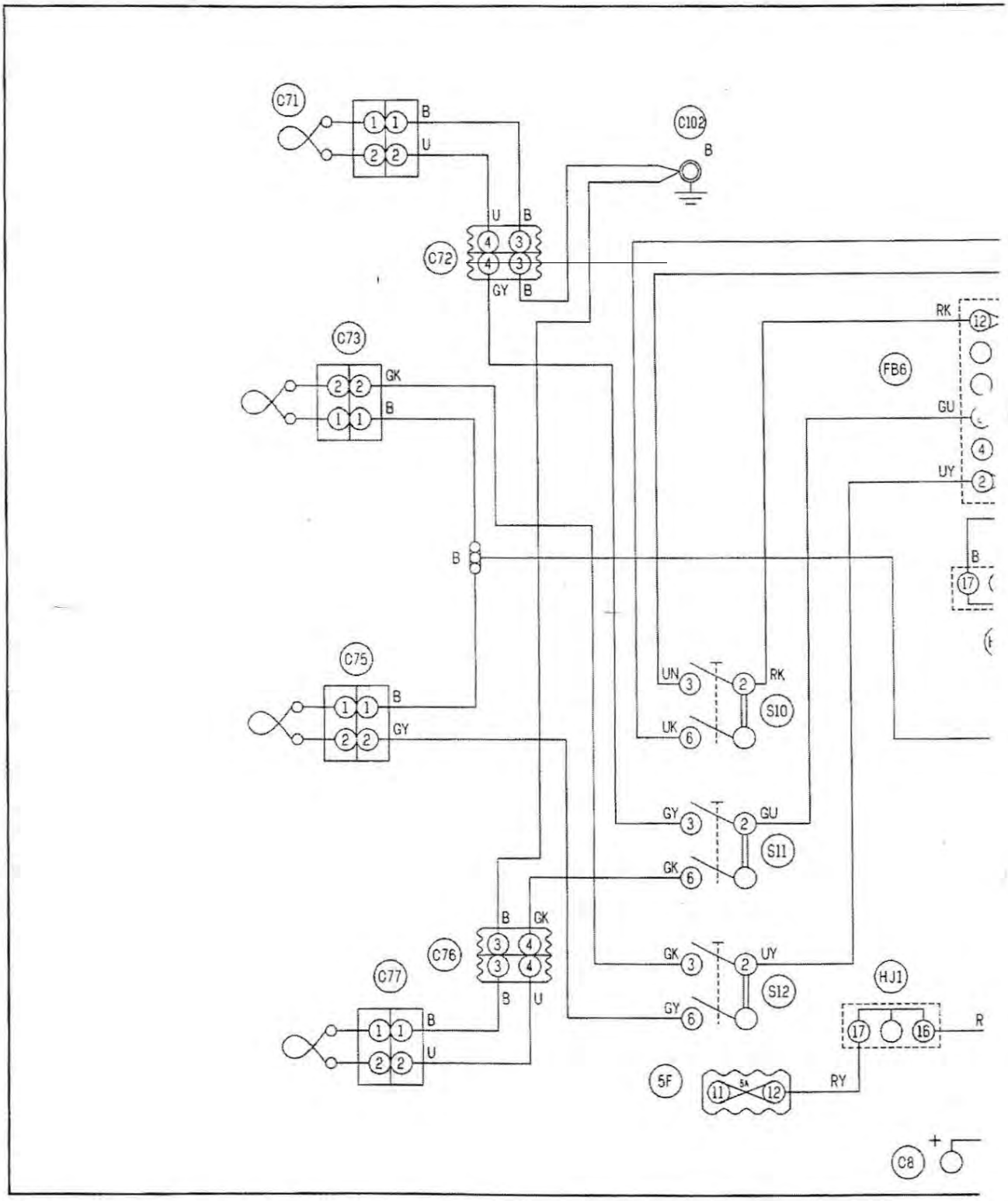


Issue 2

Figure 20

Blower Motor and Air Conditioner (Fig. 23)

7A	Fuse 7F in right-hand door pillar fuse box.
7F	Fuse 7A in right-hand door pillar fuse box.
F8	Fuse F8 air conditioner in cab roof.
C6	Air conditioner low pressure switch.
C7	Air conditioner compressor magnetic clutch.
C8	Starter solenoid connection (battery +).
C10	Engine harness to console harness - 2 pin black.
C18	Console harness to cab harness - 20 pin light grey.
C21	Console harness to cab harness - 1 pin white.
C27	Cab harness to roof harness - 10 pin natural.
C29	Cab harness to roof harness - 1 pin white.
C79	Blower motor and air conditioner - 7 pin brown.
C102	Earth connection right-hand door pillar from roof.
C106	Three speed blower motor switch.
C107	Thermostat temperature controller - air conditioner.
C108	Right-hand blower motor.
C109	Left-hand blower motor.
R5	Relay - air conditioner in cab roof.
1	Fusible link.



Issue 2

Figure 25

Hazard Warning and Direction Indicator (Fig. 28) 30

North America

1F Fuse 1F in main fuse box below instrument panel.

5F Fuse 5F in main fuse box below instrument pane..

C11 Instrument panel plug - 25 pin black.

C12 Instrument panel plug - 7 pin black.

C17 Steering column switch - 8 pin natural.

C18 Console harness to cab harness - 20 pin light grey.

C23 Console harness to hydraulic harness - 12 pin light grey.

C26 Earth connection behind instrument panel.

C28 Cab harness to roof harness - 7pin brown.

C30 Earth connection right-hand door pillar.

C33 Right-hand rear direction indicator - 4 pin natural.

C40 Earth connection left-hand door pillar.

C42 Left-hand direction front direction indicator pins 1 and 4 - 4 pin natural.

C56 Trailer socket left and right-hand direction indicator.

C70 Right-hand rear direction indicator - 3 pin natural.

C72 Right-hand rear direction indicator - 4 pin natural.

C76 Left-hand front direction indicator - 4 pin natural.

C78 Left-hand front direction indicator - 3 pin natural.

C102 Earth right-hand door pillar from roof.

D2 Diode -

D2 Diode -

HJ1 Behind instrument panel - green.

HJ2 Behind instrument panel - blue.

HJ3 Behind instrument panel - orange.

HJ4 Behind instrument panel - orange.

HJ5 Behind instrument panel - grey.

HJ6 Under left-hand mud guard trim - orange.

HJ7 Under left-hand mud guard trim - grey.

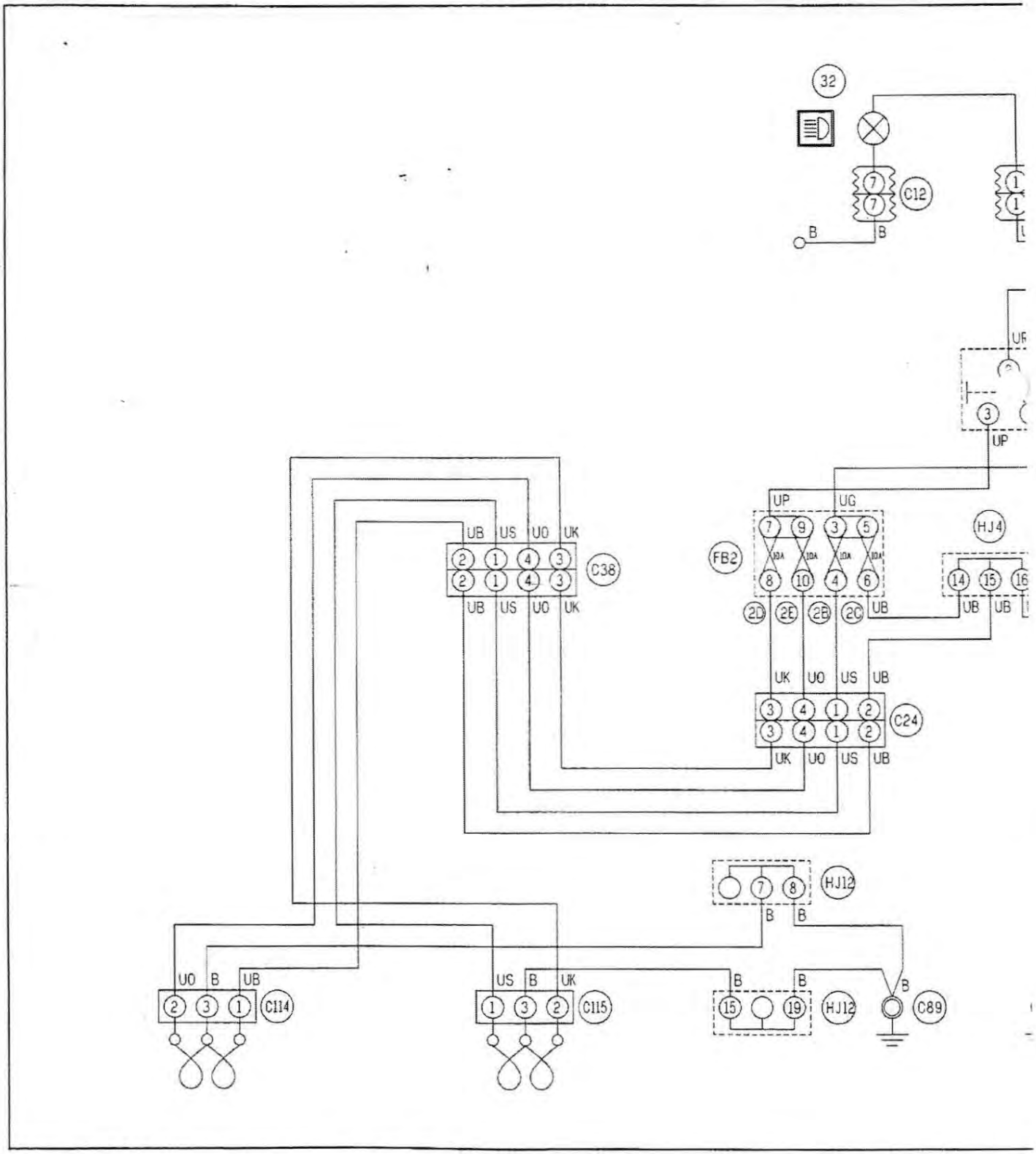
HJ8 Under right-hand mud guard trim - orange.

HJ9 Under right-hand mud guard trim - grey.

R1 Relay - Flasher unit.

S1 Switch - Hazard warning switch.

23 Direction indicator lights - instrument panel.



Issue 2

Figure 30

Engine Tachometer Sensor (A Fig. 33)

C12 Instrument panel plug - 7 pin black.

C13 Instrument panel plug - 7 pin light grey.

C22 Console harness to hydraulic harness - 20 pin light grey.

C40 Earth connection left-hand door pillar.

C51 Engine speed sensor.

HJ7 Under left-hand mud guard trim - grey.

41 Engine tachometer.

Fusible Link Supply to Fuse Box (B Fig. 33)

Fuse 1E, 1F and 2F

C8 Supply starter solenoid connection (battery +).

FB1 Main fuse box below instrument panel row 1.

FB2 Main fuse box below instrument panel row 2.

1 Fusible links.

Fusible Link Supply to Fuse Box (C Fig. 33)

Fuse 1A to 1D, 5D to 5F, 7A to 7F

C8 Supply starter solenoid connection (battery +).

C17 Steering column switch 8 pin natural.

C20 Console harness to cab harness - 3 pin brown.

C28 Cab harness to roof harness - 7 pin brown.

FB1 Main fuse box below instrument panel row 1.

FB5 Main fuse box below instrument panel row 5.

FB7 Fuse box right-hand door pillar.

R3 Ignition supply to roof - right-hand door pillar.

S3 Master light switch, side/head.

1 Fusible links.

Fusible Link Supply to Fuse Box (B Fig. 33)

Fuse 1A to 1D, 2B to 2E, 5D to 5F, 7A to 7F

Germany only

C8 Supply starter solenoid connection (battery +).

C17 Steering column switch 8 pin natural.

C20 Console harness to cab harness - 3 pin brown.

C28 Cab harness to roof harness - 7 pin brown.

FB1 Main fuse box below instrument panel row 1

FB2 Main fuse box below instrument panel row 2

FB5 Main fuse box below instrument panel row 5

FB7 Fuse box right-hand door pillar.

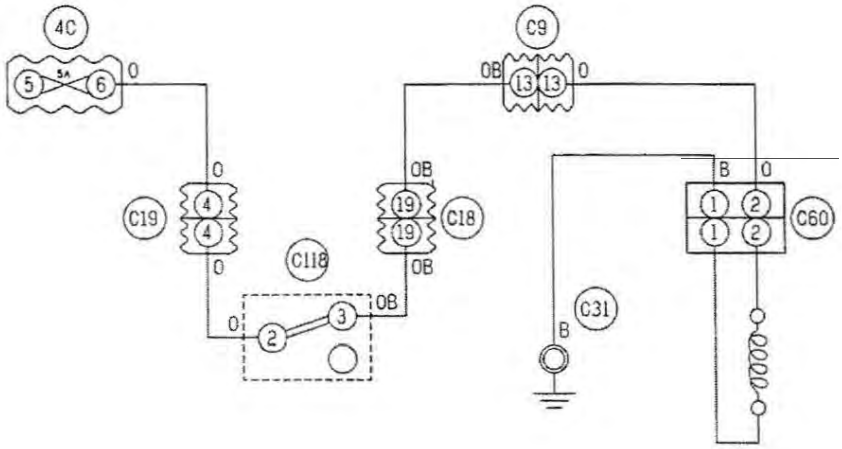
R3 Ignition supply to roof right-hand door pillar.

S2 Main/roof head light switch.

S3 Master light switch, side/head.

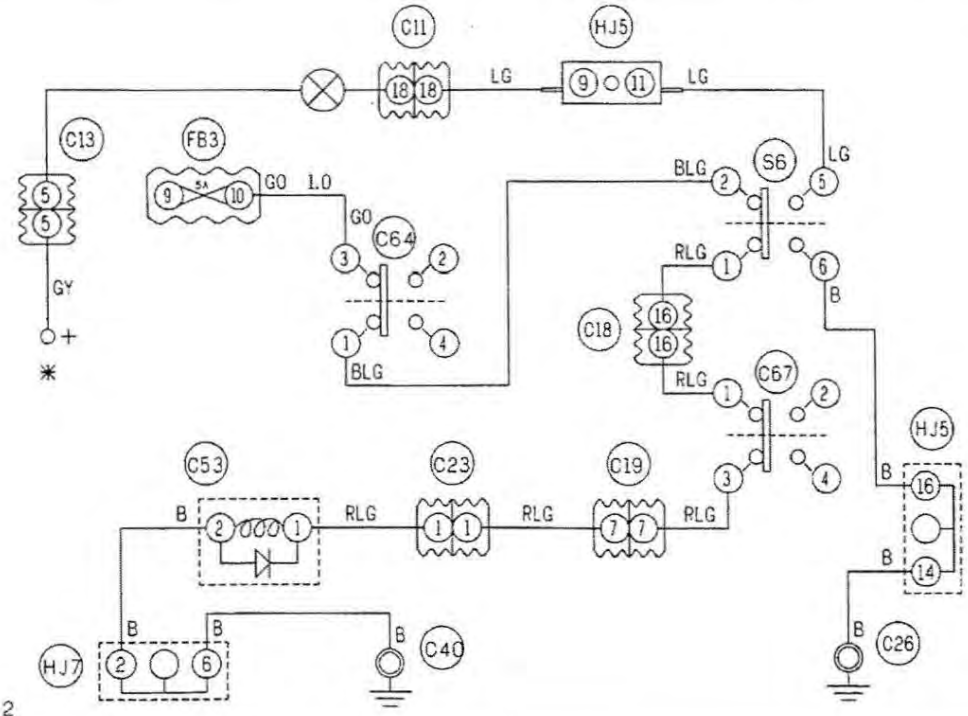
1 Fusible link.

A



Issue 2

C



Issue 2

SPEED SENSOR

Adjust **3–11A**

Procedure (Fig.3)

The speed sensor for the speedometer and performance monitor is located behind the left-hand rear wheel hub (1). It obtains the speed information from a magnetic track (2) fixed to the dirt deflector plate on the back of the hub.

Cleaning

From time to time it may be necessary to clean away any mud or dirt that may accumulate around the speed sensor. Wash away with clean cold water, DO NOT use powerful detergents or a hot water wash/steam cleaner.

Setting

The sensor should be set 1 mm (0.039 in) from the track, slacken the bolt (3) to make the adjustment.

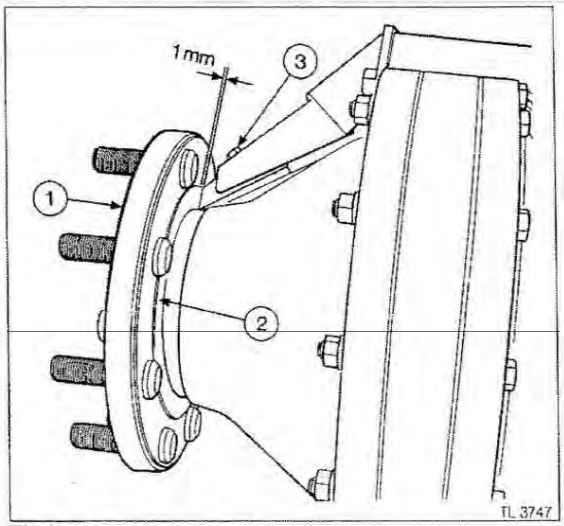


Fig.3

TRIP AREA/DISTANCE HOLD FACILITY

Install **4–11A**

Procedure

The performance monitor is equipped with a hold facility which will put the trip area or distance, when selected, into HOLD automatically when the implement is lifted out of the ground or operated by some other means.

A wire controlling the performance monitor will be found adjacent to the main fuse box terminating in a single connector (Fig.4). To put the trip area or distance into hold it is only necessary to earth the connection (close circuit). To restart the recording open the switch (open circuit).

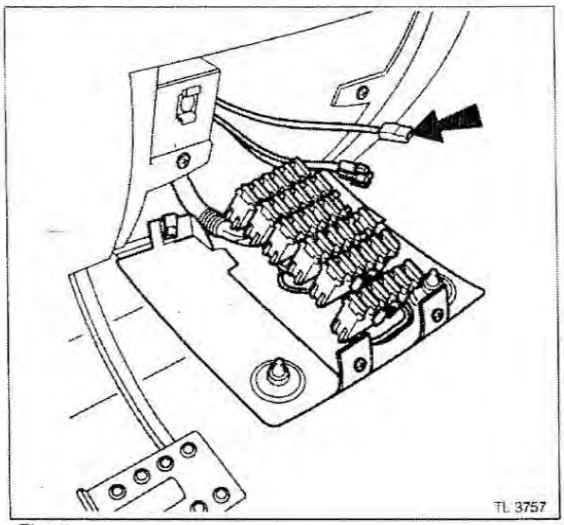


Fig.4

The installation of the switch to control the performance monitor must be of local manufacture, Massey Ferguson do supply a range of switches (Fig.5) which can be used as follows:

1. Pull switch, part No. 3405 985 M91.
2. Hydraulic pressure switch, part No. 3405 987 M91.
3. Magnet and reed switch, part No. 3405 986 M91.

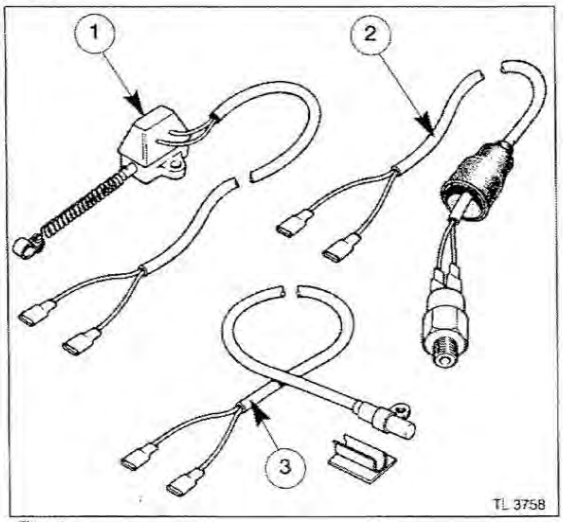


Fig.5

DOOR LOCK and HANDLE

Removal and Refitment 6–12A

Removal

1. Remove the screw and door lock cover.
2. Remove the two screws on the leading edge of the door.
3. Squeeze up the handle so it is inside the tube.
4. Pull the lock and handle assembly out of the tube and away from the door.
5. Remove the two screws and washers.
6. Remove the door handle.

Refitment

7. Reverse procedures 1 to 6.