T4020, T4030, T4040, T4050 STANDARD REPAIR MANUAL COMPLETE CONTENTS

The following pages are the collation of the contents pages from each section and chapter of the T4020, T4030, T4040, T4050 Standard Repair manual. Complete Repair part # 87758551.

The sections used through out all New Holland product Repair manuals may not be used for each product. Each Repair manual will be made up of one or several books. Each book will be labeled as to which sections are in the overall Repair manual and which sections are in each book.

The sections listed above are the sections utilized for the T4020, T4030, T4040, T4050 Standard Tractors.

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SECTION 27 – REAR AXLE MECHANICAL TRANSMISSION

BOOK 2 - 87758553

Chapter 1 – Rear Axle Mechanical Transmission

CONTENTS

SECTION 55 – ELECTRICAL SYSTEM

BOOK 3 - 87758554

Chapter 2 – Starting System

CONTENTS

SECTION 00 - GENERAL

Chapter 1 - General

CONTENTS

GENERAL WORKSHOP TOOLS AND EQUIPMENT

It is essential that all tools and equipment are maintained in good condition and the correct safety equipment used where required.

Never use tools or equipment for any purpose other than that for which they were designed.

Never overload equipment such as hoists, jacks, axle and chassis stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time that the equipment is used.

Do not use damaged or defective tools or equipment, particularly high speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning and cause serious injury.

Wear suitable eye protection when using grinding, chiselling or sand blasting equipment.

Wear a suitable breathing mask when using sand blasting equipment, working with asbestos based materials or using spraying equipment.

Glues - see Adhesives and Sealers.

High Pressure Air, Lubrication and Oil Test Equipment - see Lubricants and Greases.

Always keep high pressure equipment in good condition and regularly maintained, particularly at joints and unions.

Never direct a high pressure nozzle at the skin as the fluid may penetrate to the underlying tissue etc. and cause serious injury.

LEGAL ASPECTS

Many laws and regulations make requirements relating to health and safety in the use of materials and equipment in workshops.

Workshops should be familiar, in detail, with these and associated laws and regulations. Consult local factory inspectorate if in any doubt.

LUBRICANTS AND GREASES

Avoid all prolonged and repeated contact with mineral oils, especially used oils. Used oils contaminated during service (e.g. routine service change sump oils) are more irritating and more likely to cause serious effects including skin cancer in the event of gross and prolonged skin contact.

Wash skin thoroughly after work involving oil. Proprietary hand cleaners may be of value provided they can be removed from the skin with water. Do not use petrol, paraffin or other solvents to remove oil from the skin.

Lubricants and greases may be slightly irritating to the eyes.

Repeated or prolonged skin contact should be avoided by wearing protective clothing if necessary. Particular care should be taken with used oils and greases containing lead. Do not allow work clothing to be contaminated with oil. Dry clean or launder such clothing at regular intervals. Discard oil soaked shoes.

MINIMUM HARDWARE TIGHTENING TORQUES

IN NEWTON-METERS (FOOT POUNDS) FOR NORMAL ASSEMBLY APPLICATIONS

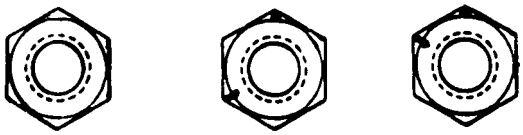
INCH NON-FLANGED HARDWARE AND LOCKNUTS

NOMINAL SIZE	SAE GRADE 2		SAE GRADE 5		SAE GRADE 8		LOCKNUTS		NOMINAL SIZE
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	GR.B w/GR5 BOLT	GR.C w/GR8 BOLT	
1/4	6.2 (55)*	8.1 (72)*	9.7 (86)*	13 (112)*	14 (121)*	18 (157)*	8.5 (75)*	12.2 (109)*	1/4
5/16	13 (115)*	17 (149)*	20 (178)*	26 (229)*	28 (250)*	37 (324)*	17.5 (155)*	25 (220)*	5/16
3/8	23 (17)	30 (22)	35 (26)	46 (34)	50 (37)	65 (48)	31 (23)	44 (33)	3/8
7/16	37 (27)	47 (35)	57 (42)	73 (54)	80 (59)	104 (77)	50 (37)	71 (53)	7/16
1/2	57 (42)	73 (54)	87 (64)	113 (83)	123 (91)	159 (117)	76 (56)	108 (80)	1/2
9/16	81 (60)	104 (77)	125 (92)	163 (120)	176 (130)	229 (169)	111 (82)	156 (115)	9/16
5/8	112 (83)	145 (107)	174 (128)	224 (165)	244 (180)	316 (233)	153 (113)	215 (159)	5/8
3/4	198 (146)	256 (189)	306 (226)	397 (293)	432 (319)	560 (413)	271 (200)	383 (282)	3/4
7/8	193 (142)	248 (183)	495 (365)	641 (473)	698 (515)	904 (667)	437 (323)	617 (455)	7/8
1	289 (213)	373 (275)	742 (547)	960 (708)	1048 (773)	1356 (1000)	654 (483)	924 (681)	1

NOTE: Torque values shown with * are inch pounds.

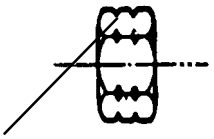
IDENTIFICATION
CAP SCREWS AND CARRIAGE BOLTS

SAE GRADE 2 SAE GRADE 5 SAE GRADE 8



REGULAR NUTS SAE GRADE 5 HEX NUTS SAE GRADE 8 HEX NUTS

LOCKNUTS



GRADE IDENTIFICATION
GRADE A NO NOTCHES
GRADE B ONE CIRCUMFERENTIAL NOTCH
GRADE C TWO CIRCUMFERENTIAL NOTCHES

GRADE IDENTIFICATION
GRADE A NO MARKS
GRADE B THREE MARKS
GRADE C SIX MARKS
MARKS NEED NOT BE LOCATED AT CORNERS

GRADE A NO MARK
GRADE B LETTER B
GRADE C LETTER C

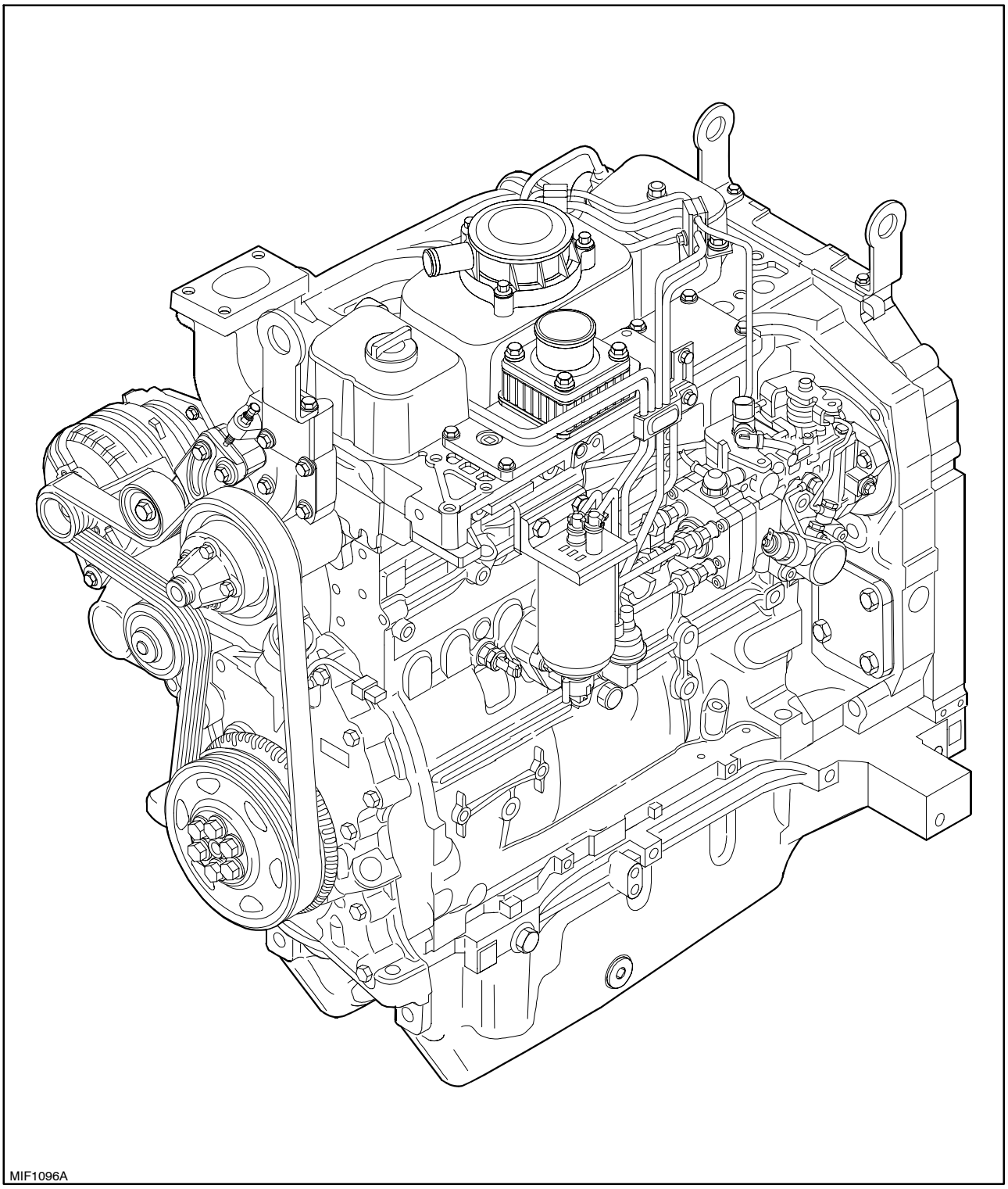
GRADE IDENTIFICATION

(overleaf)

GENERAL SPECIFICATIONS	
Cooling	coolant circulation
Radiator	4 lines of vertical pipes with copper fins
Fan, attached to the pulley	intake, in plastic with 11 blades
Coolant pump	centrifugal vane-type
Engine speed/coolant pump speed ratio	1:1.977
Coolant thermometer	coloured scale divided into three sections
Temperature ranges corresponding to each section:	
- Initial blue section	40° to 60 °C (104 to 140 °F)
- Middle green section (normal working conditions)	60° to 110 °C (140 to 230 °F)
- Final red section	110° to 120 °C (230 to 248 °F)
Temperature Control	via thermostat valve
- initial opening	81 ± 2 °C (178 ± 36 °F)
Valve Timing	overhead valves operated by tappets, rods and rocker arms via the camshaft located in the engine block; the camshaft is driven by the crankshaft using straight-tooth gears
Intake:	
- start: before T.D.C.	10° ± 30'
- end: after B.D.C.	10° ± 30'
Exhaust:	
- start: before B.D.C.	64°
- end: after T.D.C.	26°
Clearance between valves and rocker arms with engine cold:	
- intake mm (in.)	0.25 ± 0.05 (0.0098 ± 0.002)
- exhaust mm (in.)	0.50 ± 0.05 (0.0197 ± 0.002)
Power supply	
Air filtering	dual cartridge dry air filter, with clogged filter indicator with centrifugal pre-filter and automatic dust ejector
Fuel pump	with double diaphragm
Fuel filtration	through wire filter in fuel supply pump, and replaceable cartridge on delivery line to injection pump
Minimum fuel flow rate with pump shaft rotating at 1800 rpm	127.6 l/h (33.71 gal/h)
Cam operated	via engine timing

(continued)

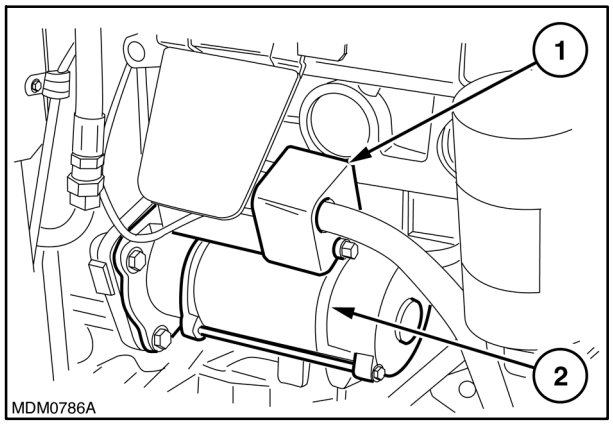
SECTIONAL VIEWS



1

Engine view

5. Remove the guard (1) and disconnect the cables from the starter motor (2).



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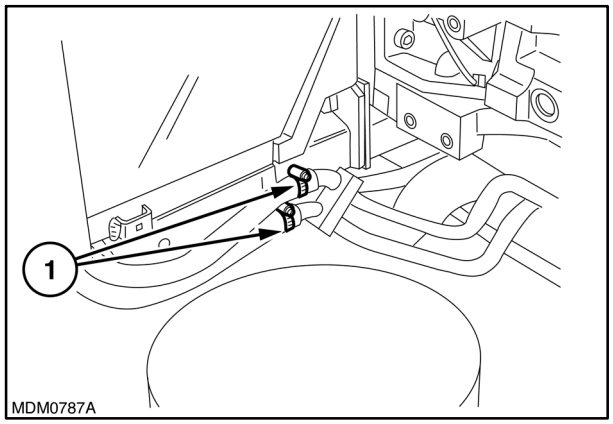
6. Disconnect the pipes (1) of the cab heating system and drain the engine cooling system.



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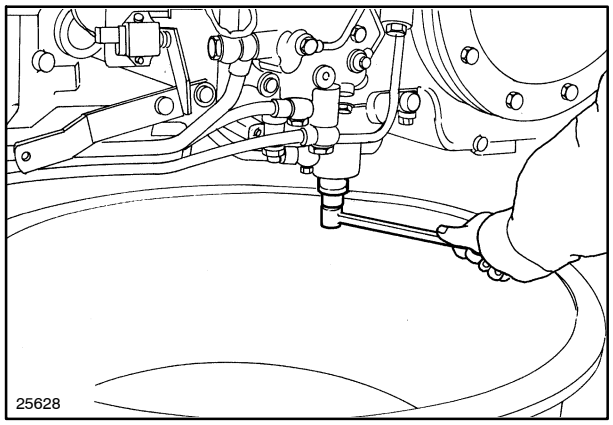
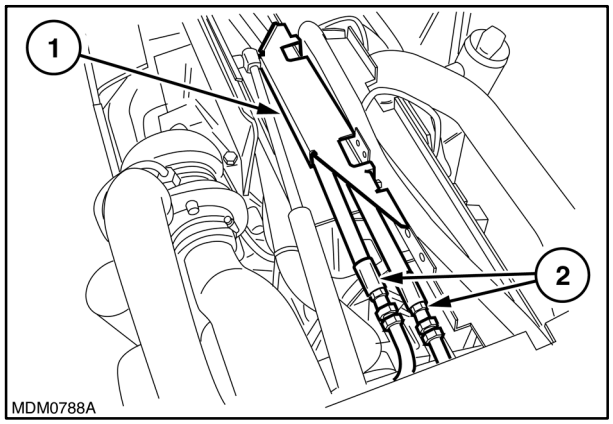
7. Unscrew the plug and drain the oil from the rear transmission casing (the prescribed quantity is 42 liters [11 gallons]).



11

8. Disconnect the power steering pipes (2), unscrew the related retaining bolts and remove the bracket (1).



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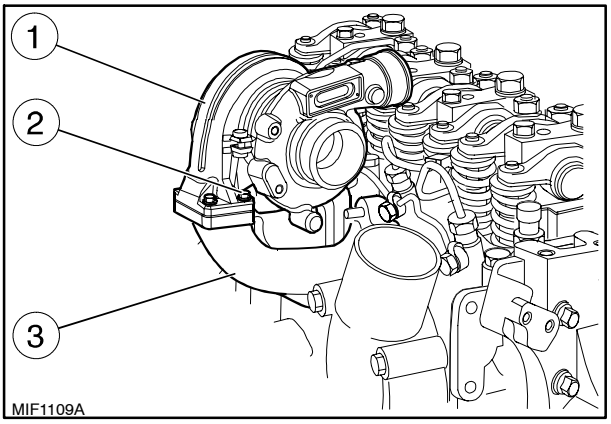
21. Remove the screws (2) and the turbine (1).
22. Remove the exhaust manifold (3).
23. Remove the belt (3, fig. 42) of the auxiliary members by loosening the tightener.



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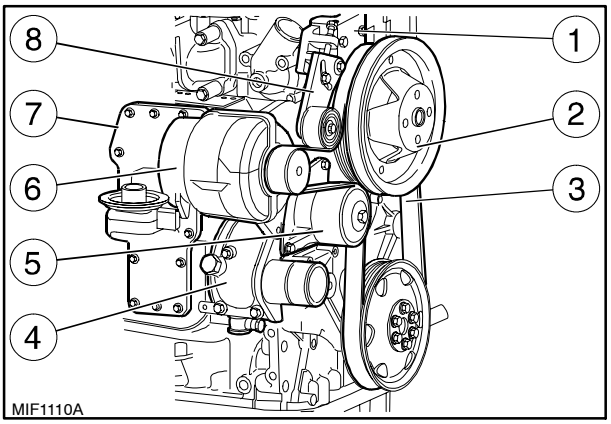
24. Remove the alternator (6), fan pulley (2) and the tightener (8). Remove the support (1) of the pulley (2) and the oil cooler (7).
25. Remove the coolant pump (5).
26. Remove the engine cooling system fitting (4) from the crankcase.

NOTE: *The coolant pump (5) cannot be overhauled. It must be replaced if there is any irregular operation.*



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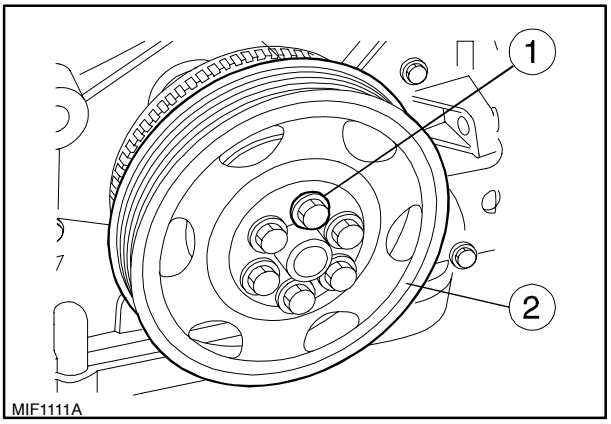
27. Lock the flywheel to stop it turning, remove the fixing screws (1) from the pulley (2).



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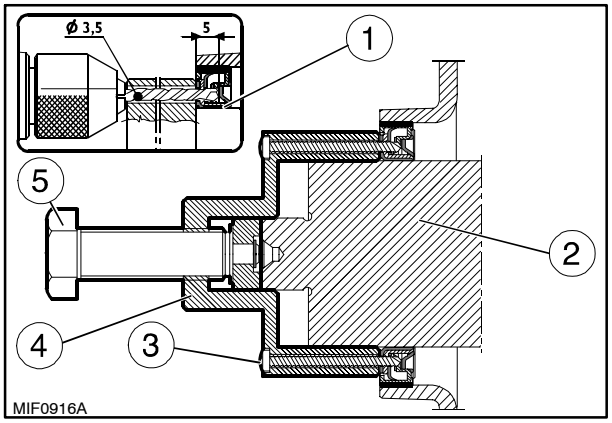
Removing the Crankshaft Front Seal (Op. 28. to 32.)

28. Apply tool **380000665** (4) on the front tang (2) of the crankshaft.
29. Perforate the inner seal (1) with a drill bit (Ø 3.5 mm) through the guide holes of the tool **380000665** (4), for a depth of 5 mm.
30. Secure the tool **380000665** (4) to the seal (1) with the screws (3) provided.
31. Extract the seal (1) by screwing down the screw (5).



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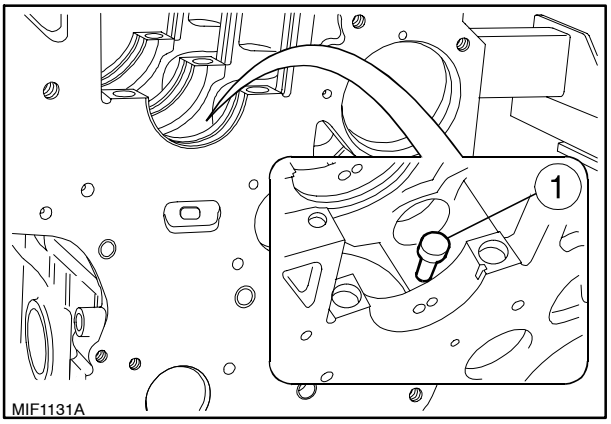
Fitting The Tappets

(Disassembly operation 66.)

- Lubricate the tappets (1) and fit them in their seats in the crankcase.



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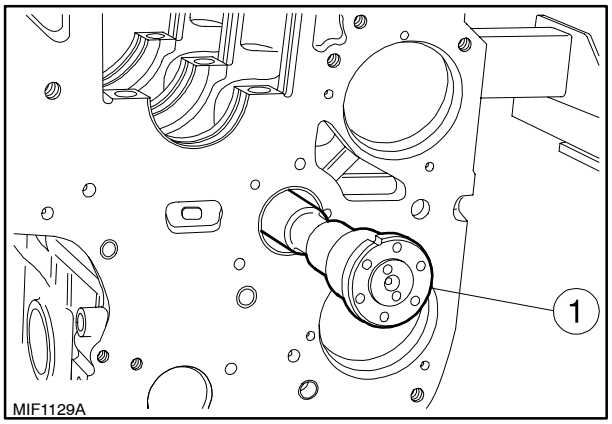
Fitting The Camshaft

(Disassembly operation 64. to 65.)

- Lubricate the bushings supporting the camshaft and mount the camshaft (1) taking care that, during this process, the bushings or the supporting seats do not get damaged.



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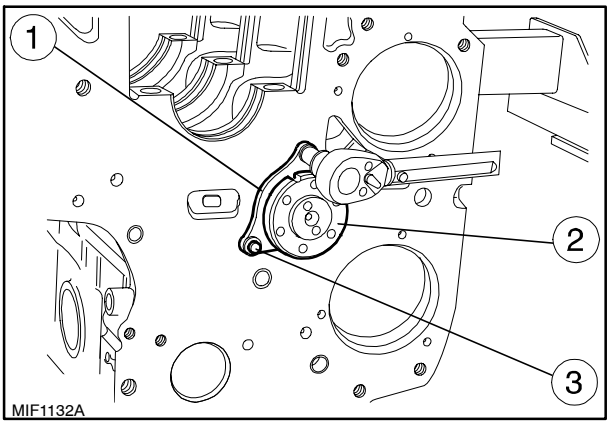
- Position the plate (1) retaining the camshaft (2) with the slot facing towards the top of the crankcase and the punchmark facing the operator. Tighten the screws (3) to the prescribed torque stated on page 13.



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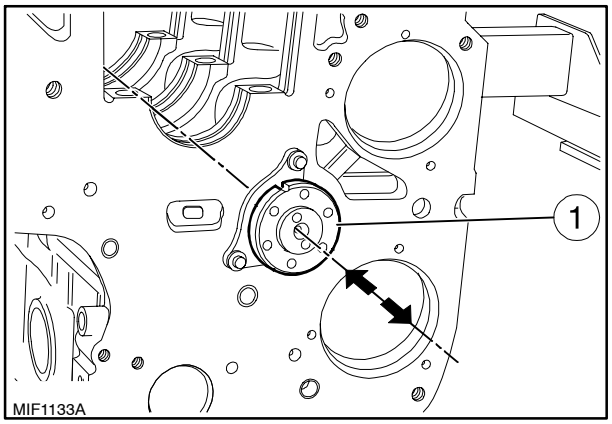
- Check that the end float of the camshaft (1) comes within the tolerance range prescribed in Main Data on page 6.



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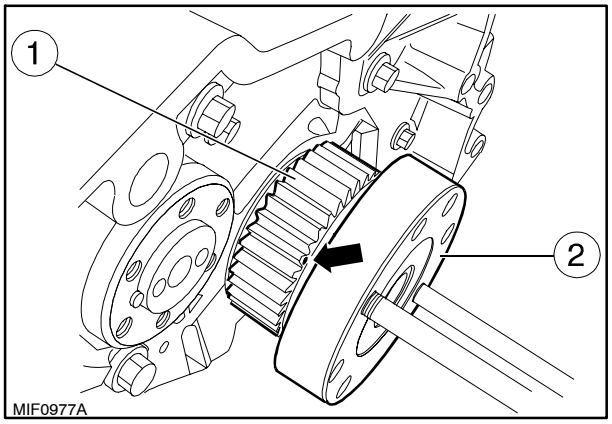
Fitting the Timing Gear

(Disassembly operation 46.)

- Use a marker pen to mark the tooth of the driving gear (1) mounted on the crankshaft (2) on the side of which the reference mark (→) is stamped for timing.



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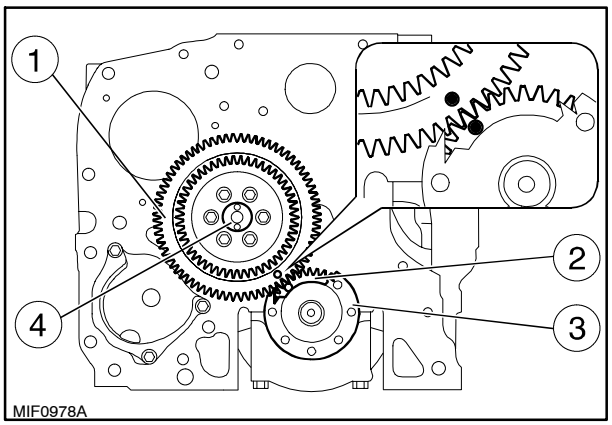
- Direct the crankshaft (3) and camshaft (4) so that when mounting the driven gear (1) on the camshaft, the marks stamped on the gears (1 and 2) coincide.



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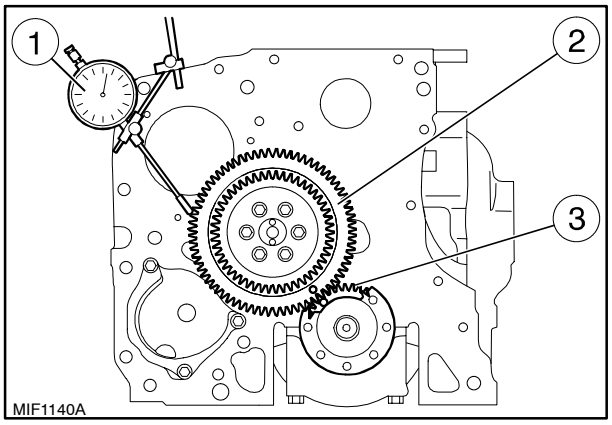
- Place the dial gauge (1) on the timing gear (2) and check that the clearance between the gears (2) and (3) is between 0.076 to 0.280 mm.



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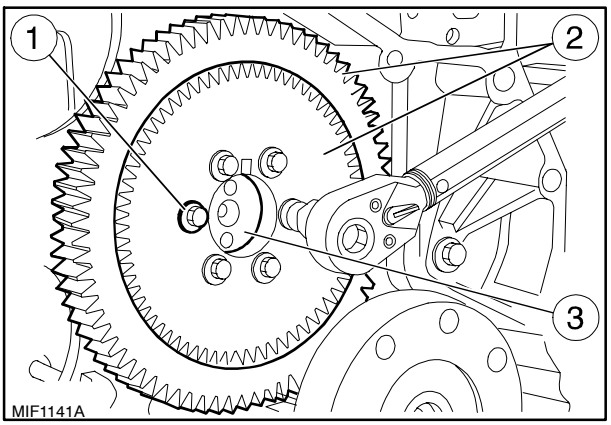
- Insert the screws (1) fixing the gears (2) to the camshaft (3) and tighten them to the torque prescribed on page 10.



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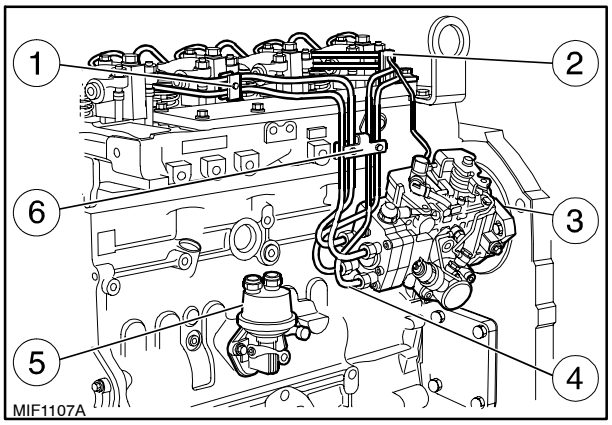
Fitting the Fuel Pump - Feed Pipes

(Disassembly operations 16. to 18.)

- Fit the fuel pump (5).
- Fit the injector feed pipes (4) of the injection pump (3), secure the brackets fixing the pipe assembly (1), (2) and (6) on the cylinder head.



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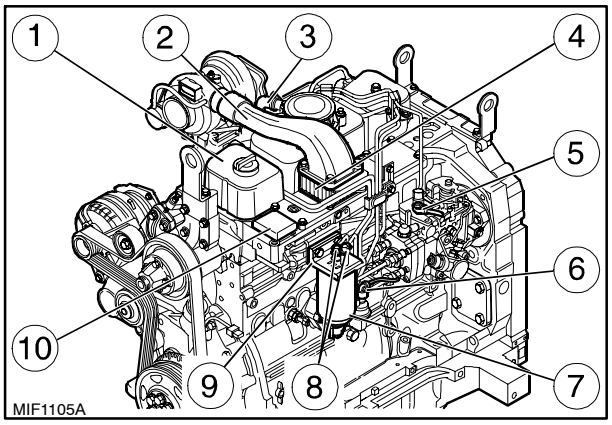
Fitting the Pipes Between the Fuel Supply and Injection Pumps, Pre-Heating System and Tappet Cover

- Fit the fuel filter mounting (9).
- Fit the control unit for the heater (10).
- Fit the heater (4).
- Fit the fuel filter (7).
- Fit the LDA system piping (5).
- Connect the pipes with the quick-fit coupling (6) and (8).
- Fit the tappet covers (1).
- Connect the engine oil vapor recovery pipe to the blow-by (3).
- Fit the intake manifold (2).



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WARNING

Handle all parts carefully.

Do not put your hands or fingers between parts.

Wear the prescribed safety clothing, including goggles, gloves and safety footwear.

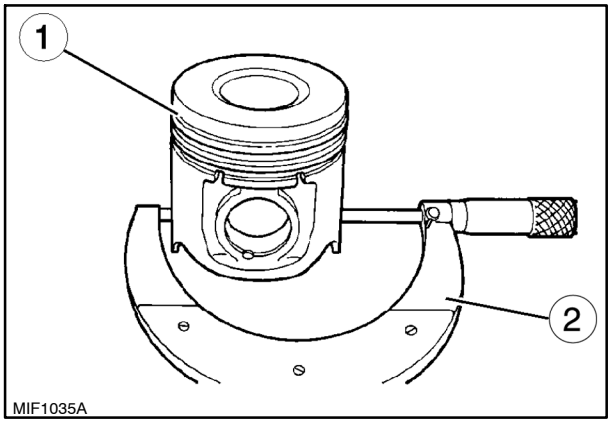
Clean all parts carefully before proceeding with any type of operation.

Measuring the Piston Diameter

Using a micrometer (2) measure the diameter of the piston (1), and check the cylinder liners to determine the state of wear of the liners and pistons (see Main Data on page 4).

If the clearance is not within the tolerances, it will be necessary to ream and rebore the liners and fit oversize pistons and rings (see Main Data on page 4).

NOTE: *The diameter must be measured at a distance of 61 mm from the base of the piston skirt.*



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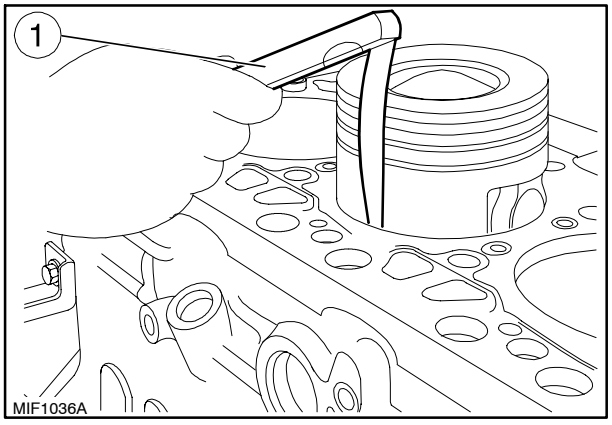
Clearance between the piston and the cylinder liner can be measured with a feeler gauge (1), as shown in the figure 169.



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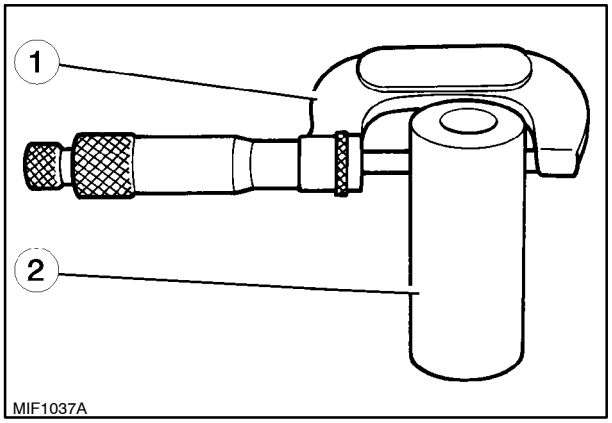
Piston Pins

Measuring the piston pin (2) diameter using a micrometer (1).

Fit the pins on the pistons checking that the clearance between the piston pin and its bore in the piston is within the tolerance specified in Main Data on page 6.



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Op. 10 102 70

CRANKSHAFT FRONT SEAL

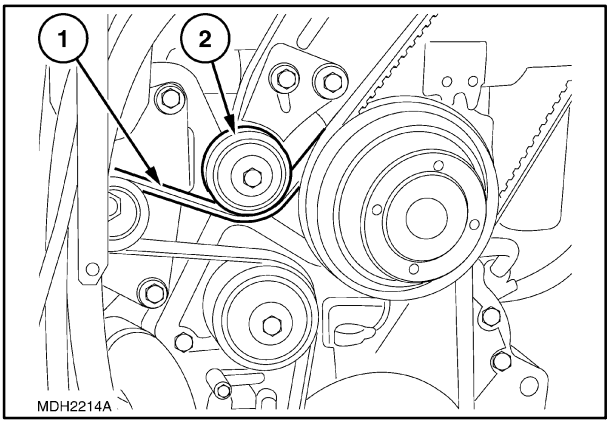
Replacement

DANGER

Lift and handle all heavy parts using suitable lifting equipment.
Make sure that assemblies or parts are supported by means of suitable slings and hooks. Ensure that no-one is in the vicinity of the load to be lifted.

To access the seal, proceed as follows:

1. Remove the hood as described in operation **90 100 22**.
2. Remove the engine radiator, as indicated in operation **10 406 10**.
3. Move the tightener (2) away to slacken the belt (1) and then remove it.



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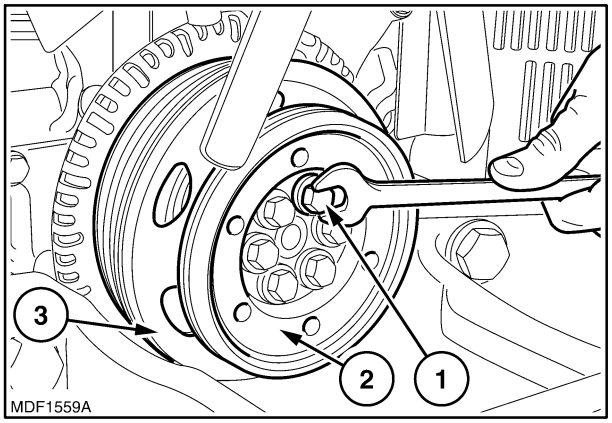
4. Remove the six retaining bolts (1), the pulley (2) governing the accessory assemblies and the fan-alternator-coolant pump pulley (3).



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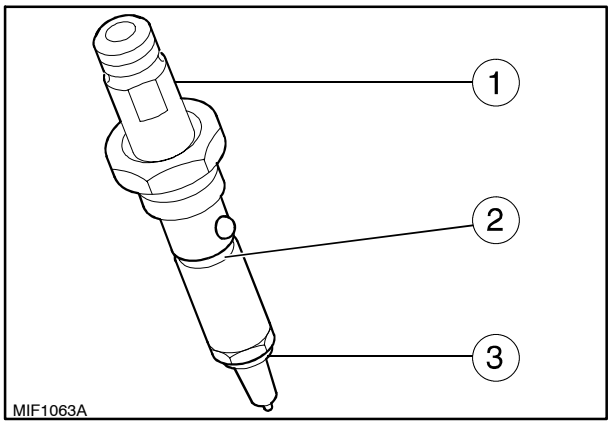
Installation

To refit the injector, proceed as follows.

WARNING

Use suitable tools to align the holes. NEVER USE FINGERS OR HANDS.

1. On the injector (1), mount a new seal (2) lubricated with Vaseline and a new washer (3).
2. Fit the injectors in the seats on the cylinder head and tighten them with a torque wrench to the torque prescribed on page 13.
3. Fit the new seals on the injector delivery pipe unions.
4. Connect the delivery pipes to the injectors.
5. Refit the tappet covers with their seals.
6. Reconnect the engine oil vapor recovery pipe to the blow-by.
7. Connect the injector fuel recovery pipe.
8. Position and secure the exhaust silencer.
9. Position the upper engine bracket with the heat guard and secure it, connect the power steering pipes.
10. Position the brake fluid tank and secure it to the upper engine bracket, connect the related electrical connection.
11. Install the hood as described in operation **90 100 22**.



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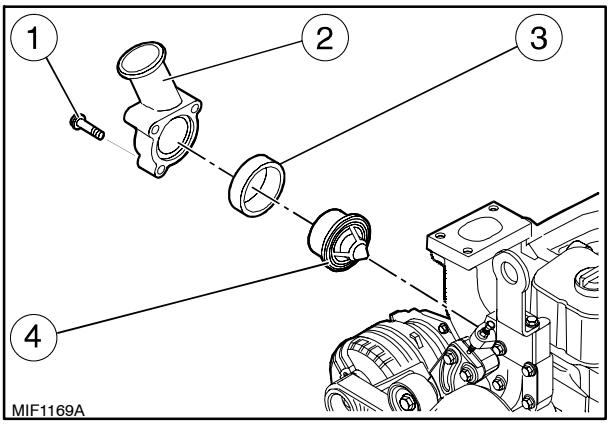
4. Remove the bolts (1) retaining the thermostat valve cover.
5. Remove the governor body (2), thermostat valve cover seal (3) and thermostat valve (4).



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Installation

To refit the thermostat valve, proceed as follows.

⚠ CAUTION ⚠

Use suitable tools to align the holes. NEVER USE FINGERS OR HANDS.

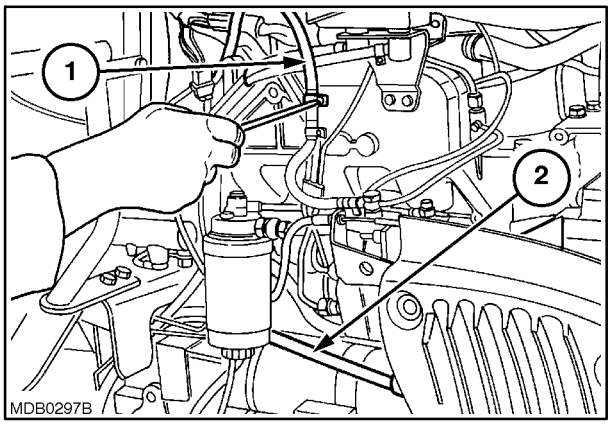
1. Respect the tightening torques prescribed on page 13.
2. Position the thermostat valve, seal and cover, lock it all with the screws.
3. Connect and secure the sleeve to the thermostat valve.
4. Screw the plug onto the lower union.
5. Position and secure the side grille.
6. Fill up the engine cooling circuit (see sect. 00, page 6 for the prescribed product and quantity).

(overleaf)

Valve Timing	overhead valves operated by tappets, rods and rocker arms via the camshaft located in the engine block; the camshaft is driven by the crankshaft using straight-tooth gears
Intake:	
- start: Before T.D.C.	19° ± 30'
- end: after B.D.C.	37° ± 30'
Exhaust:	
- start: before B.D.C.	61° ± 30'
- end: after T.D.C.	21° ± 30'
Clearance between valves and rocker arms with engine cold:	
- intake	0.25 ± 0.05 mm (0.0984 ± 0.0197 in.)
- exhaust	0.50 ± 0.05 mm (0.1969 ± 0.0197 in.)
Supply	
Air filtering	dual cartridge dry air filter, with clogged filter indicator with centrifugal pre-filter and automatic dust ejector
Fuel pump	with double diaphragm
Fuel filtration	through wire filter in fuel supply pump, and replaceable cartridge on delivery line to injection pump
Cam operated	via engine timing
BOSCH Injection pump	rotating distributor type
All-speed governor, incorporated in pump:	
BOSCH	centrifugal counterweights
Automatic advance regulator, incorporated in pump:	
BOSCH	hydraulic
Turbocharger:	
- type	HOLSET
Injection pump	rotating distributor with speed governor and advance variator incorporated
BOSCH pump:	
- mod. T4020 - type F5AE9484A*A	VE 4/12 F1150-504246316
- mod. T4030 - type F5AE9484B*A	VE 4/12 F1150-504246318
Direction of rotation	clockwise
Injection order	1-3-4-2 (for all models)

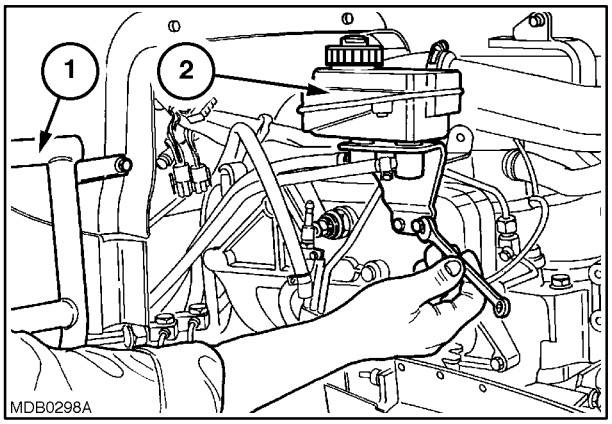
12. For models fitted with brakes on the front axle it is necessary to fill the relevant tank (see sect. 00, page 6 for the prescribed product and quantity) and bleed the braking system (see sect. 33).
13. Connect the fuel supply and return lines to the injection pump.
14. Connect the power steering return pipe.
15. Connect cables to the starter motor.
16. Connect: the hoses of the transmission oil cooler and the front axle differential lock pipe.
17. Position and secure the throttle control rod.
18. Connect the transmission oil delivery pipe.
19. Position the brake fluid tank, secure it and connect the related electrical connection.
20. Connect all the electrical connections between the platform and engine.
21. Position the radiator bracket and secure it.
22. Connect the steering control pipes and secure them.
23. Connect the top and bottom sleeves to the radiator and secure them.
24. Connect the clogged air filter sensor connection.
25. Position and secure the exhaust silencer and the pipe.
26. Screw the plug on the rear transmission casing and fill up with oil (see sect. 00 for the prescribed product and quantity).
27. Position and secure the side grille (on both sides).
28. Fill up the engine cooling system (see sect. 00 for the prescribed product and quantity).
29. Position and secure the ballast support.
30. Position and secure the ballast.
31. Install the hood as described in operation **90 100 22**.

8. Unscrew the relevant fixing clamp and detach the pipes (1 and 2) from the thermostarter and from the fuel pump.



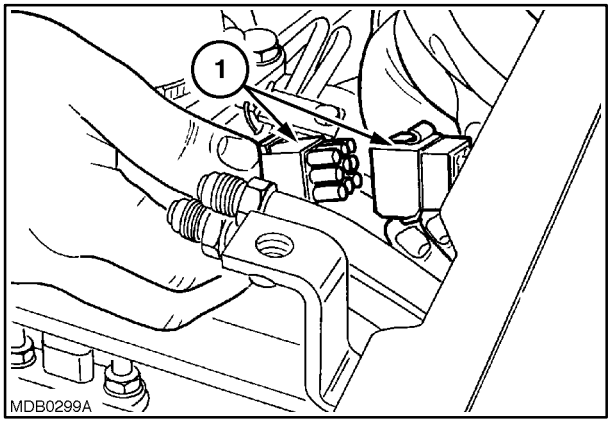
8

9. Unscrew the brake fluid tank retaining bolts (2), remove the tank and attach to the RH handrail (1).



9

10. Disconnect the engine electric connection (1).



10

CHECKS, MEASUREMENTS AND REPAIRS

DUAL DISK CLUTCH

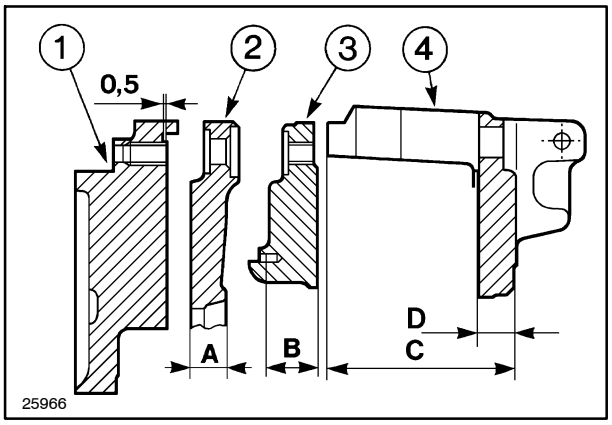
CAUTION

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

Minimum permissible dimensions after refacing of parts subject to wear in the 11"/11" dual clutch

A ≥ 15.5 mm; B ≥ 22.7 mm; D ≥ 15.8 mm
(≥ 0.6102 in.; B ≥ 0.8936 in.; D ≥ 0.6220 in.).

1. Flywheel.
2. PTO clutch pressure plate.
3. Main clutch pressure plate.
4. Clutch cover.



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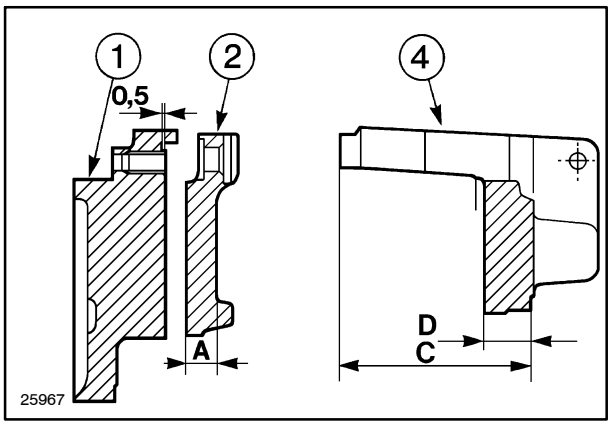
Minimum permissible dimensions after refacing of parts subject to wear in the 11" single clutch

A ≥ 15.5 mm; C ≥ 15.8 mm (≥ 0.6102 in.; D ≥ 0.6220 in.).

1. Flywheel.
2. PTO clutch pressure plate.
3. Clutch cover.



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- Check the degree of wear on the PTO (11, fig. 1 and 1, fig. 2) and gear (9) clutch disks, replacing them if the linings have worn down (or are nearly worn down) to the rivet heads.
- Replace the disk when the oil has soaked into the organic agglomerate surfaces.

Minimum permissible dimensions after refacing of parts subject to wear in the 11"/11" dual clutch and 11" single clutch.

- Check the friction surface conditions of the pressure plates and the clutch cover.
  Generally, by means of turning, up to 0.0393 in. (1 mm) of material can be removed from the cast iron friction surfaces of the clutch cover (3), the pressure plate ring (2) and the flywheel (see Section 10 Chapter 1, page 56).

When parts (1), (2), (3) and (4 figs. 34 and 35) are to be repaired by removing material, proceed as follows:

SPECIAL TOOLS

WARNING

The operations described in this section can only be carried out with **ESSENTIAL** tools indicated by an **(X)**.
To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this Section.

380000227 Clutch casing lift hook.

380000301 Rotating stand for overhaul operations.

X 380001614 Tool for gearbox driving and driven shafts adjustment.

X 380001615 Driving shaft rod for lifting unit.

X 380001616 Driven shaft retaining tool.

X 380001617 Pliers for gearbox shafts circlips.

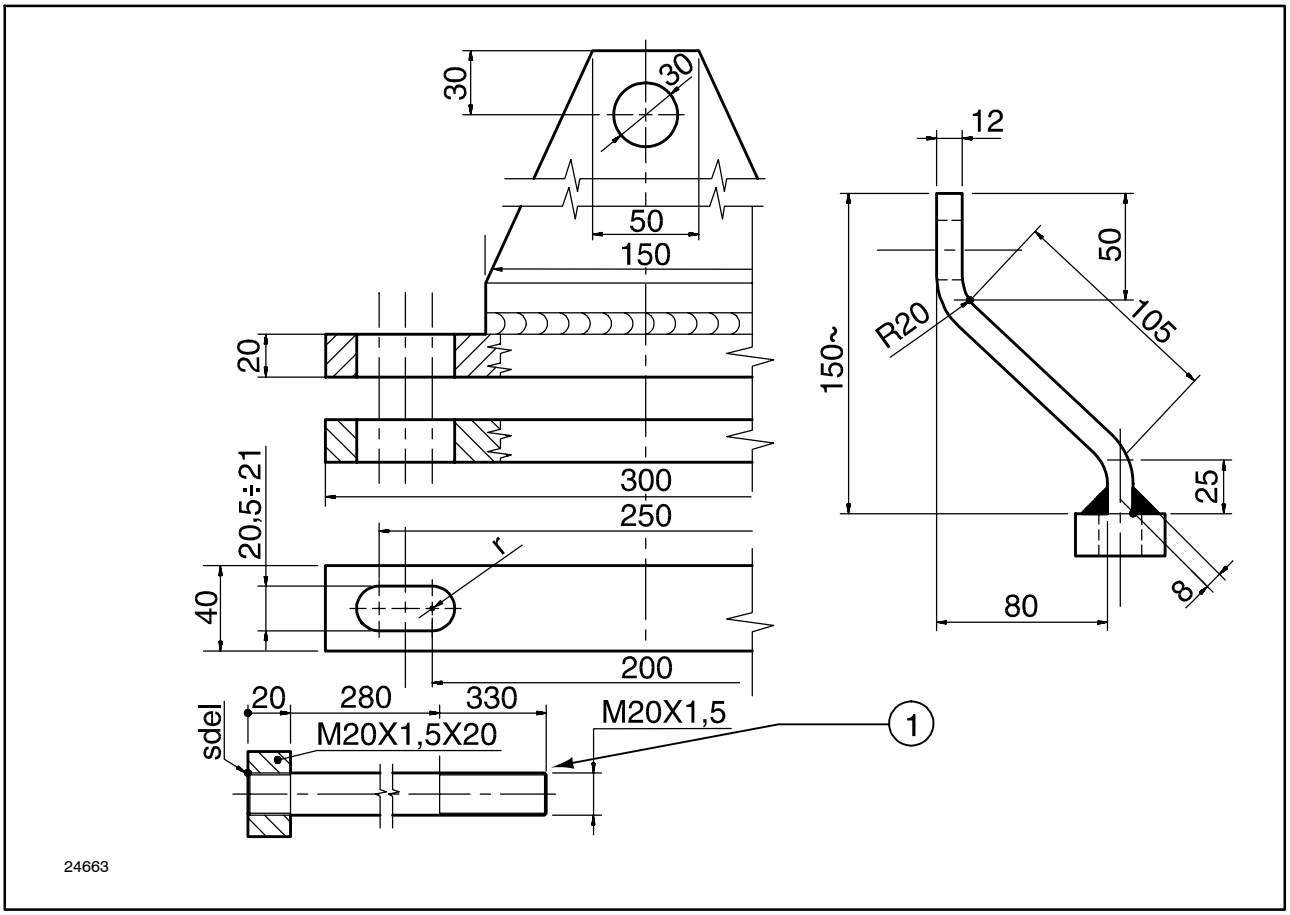
380001618 Driving shaft fitting guide.

X 380001619 Driven shaft fitting guide.

X 380001610 Adjuster handle (with **380001620** and **380001609**).

X 380001620 Power take-off drive shaft seal splining tool (with **380001610**).

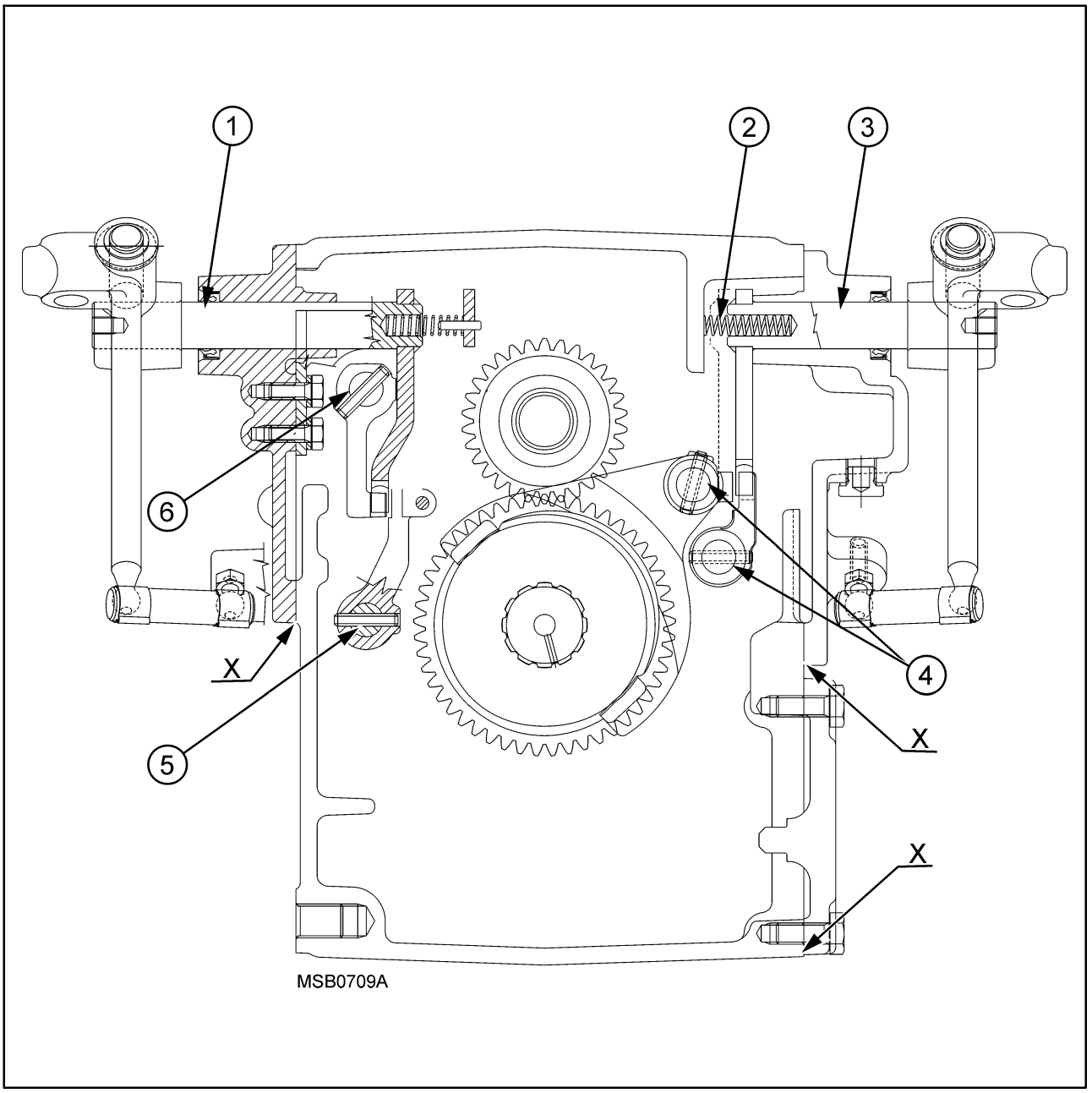
X 380001609 Power take-off drive shaft roller bearings splining tool (with **380001610**).



2

Tool to be made for disassembly-assembly of the final drives, to be used with 50114.
(Mark part with No. 50091 - Measurements in mm)

1. Make 2 tie-rods in C 40 bon material. - Make in Aq 42 D material.



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Cross-sectional view of gearbox with creeper (16 + 16)

1. Shuttle control external rod.
2. Gear control external rod spring.
3. Gear control external rod.
4. Gear selector internal rod.
5. Creeper selector internal rod.
6. Reverser selector internal rod.

NOTE: *On assembly apply a bead of sealing compound to the surfaces* ***X*** *as indicated on page 33.*

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GEARBOX TRANSMISSION CASING

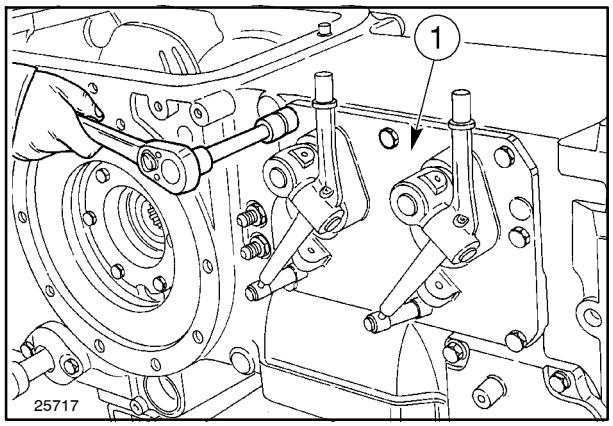
Disassembly

CAUTION

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

Proceed as follows.

1. Fix the gearbox -transmission casing to the rotating stand **380000301** using brackets **50157** (see figs. 4 and 5).
2. Carry out operation **23 101 40** or **23 202 50** Drive gear casing assembly, only removal (see Section 23, Chapter 1).
3. Unscrew the retaining bolts and remove the cover (1) with the gearbox lever and gear unit.
4. Detach the power take-off control shaft following the instructions in Section 31.



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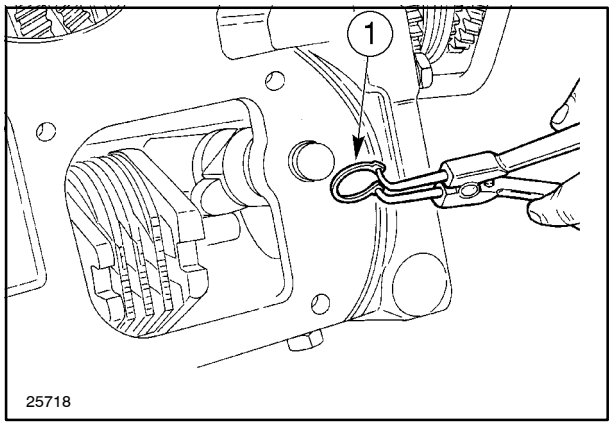
5. Remove the parking brake casing cover and extract the circlip (1) that secures the parking brake control lever.



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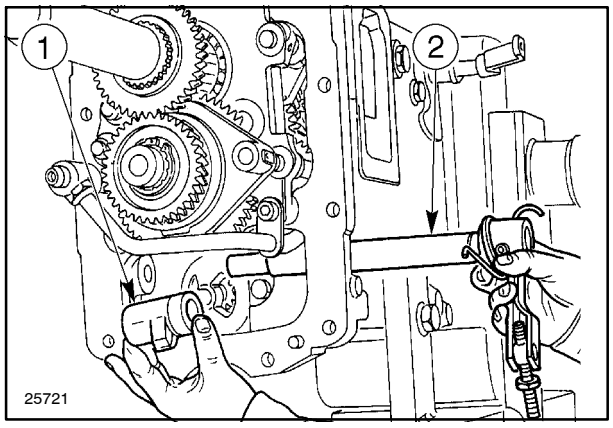
6. Extract the parking brake control lever (2) and recover the sleeve-cam (1).



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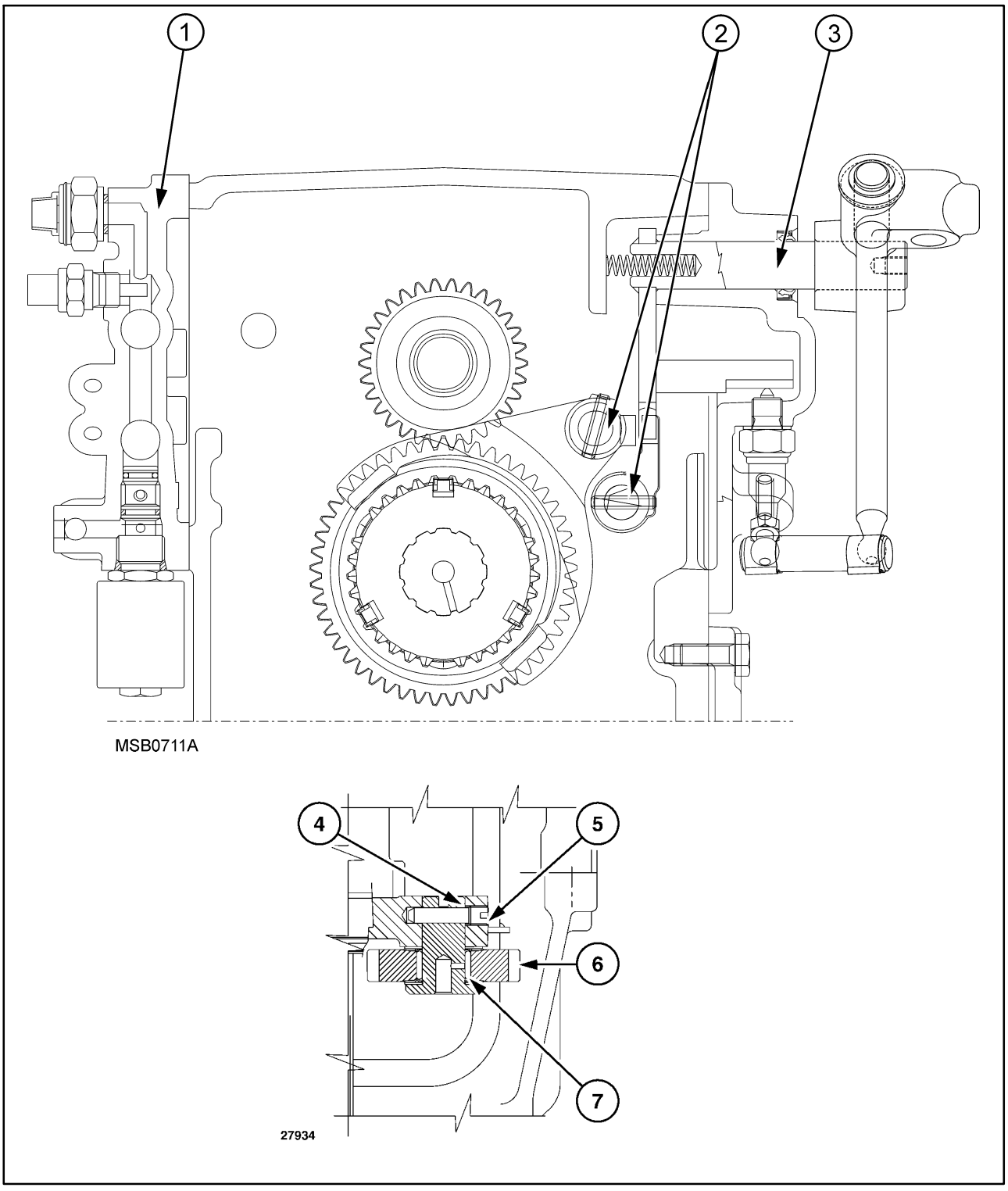
SECTION 21 - TRANSMISSIONS

Chapter 2 - Power Shuttle Transmission (16 + 16)

CONTENTS



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Cross-sectional views of Power Shuttle gearbox

1. Power Shuttle control valve.
2. Gear control internal rods.
3. Gear control external lever.
4. Pin.
5. Pin retaining bolt (4).
6. Reverse intermediate gear.
7. Needle bearing.

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ACCUMULATOR

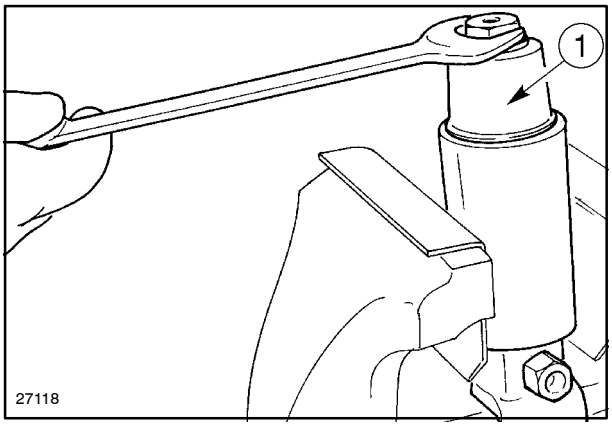
Disassembly

WARNING

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing – safety goggles, gloves and shoes.

With the accumulator on the workbench, proceed as follows.

1. Unscrew the cap (1) and recover the spring (2, fig. 30) and piston (3, fig. 30).



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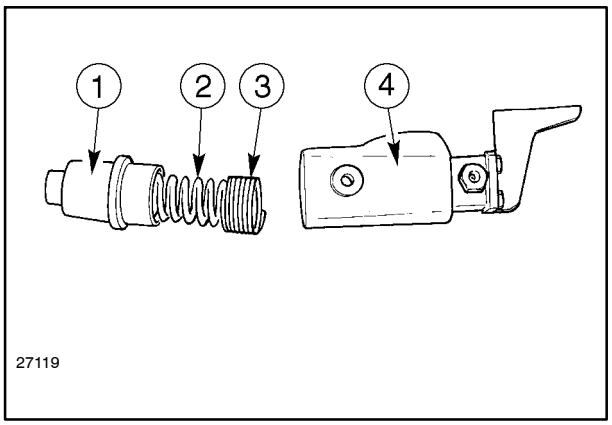
2. Accumulator parts: cap (1), spring (2), piston (3) and accumulator body (4).



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Assembly

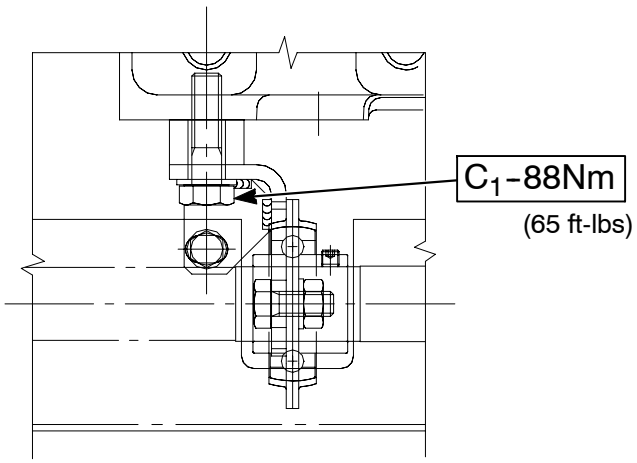
To re-fit the accumulator, proceed as follows:

WARNING

Always use appropriate tools to align fixing holes. NEVER USE FINGERS OR HANDS.

1. For the correct orientation of the various parts, refer to the illustrations on page 10.
2. Insert the piston and spring in the accumulator body.
3. Tighten the cap.

TORQUES



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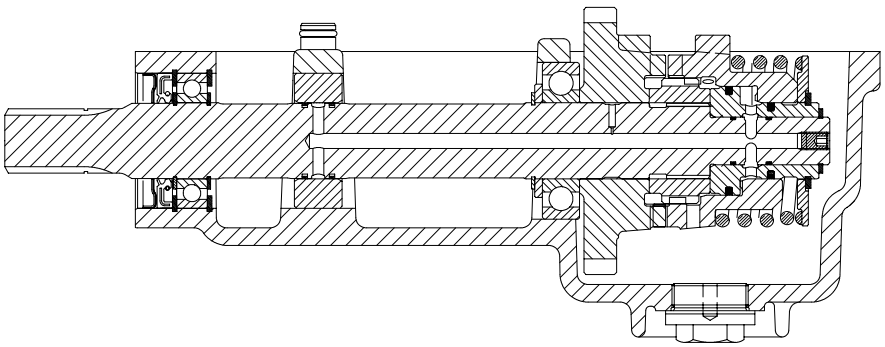

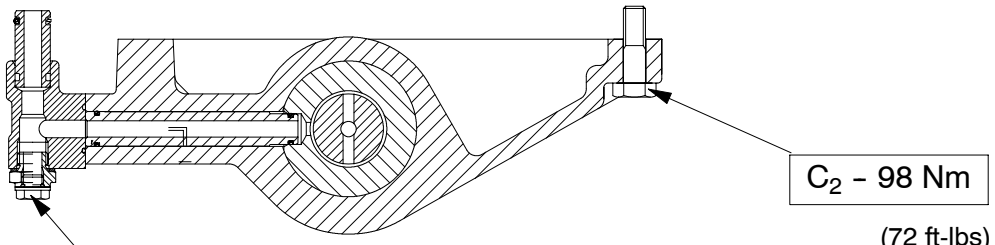

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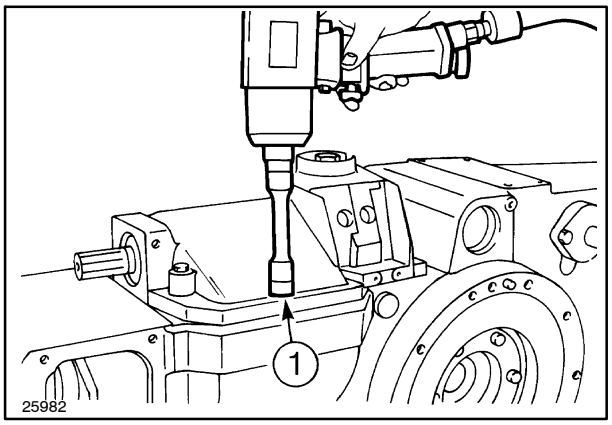
1

PARTS TO BE TIGHTENED	Thread	Tightening torque	
		Nm	ft-lbs
Propeller shaft central support retaining bolt (C_1)	M 12 x 1.5	88	65
Drive gear housing retaining bolt (C_2)	M 12 x 1.25	98	72
Control cylinder oil delivery union (C_3)	M 18 x 1.50	49	36

6. Unscrew the eight drive gear housing retaining bolts (1) on the transmission gearbox.



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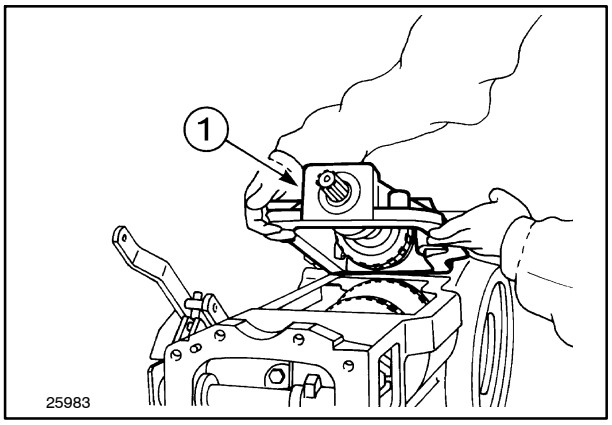
7. Remove the drive gear housing (1) from the transmission gearbox.



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Installation

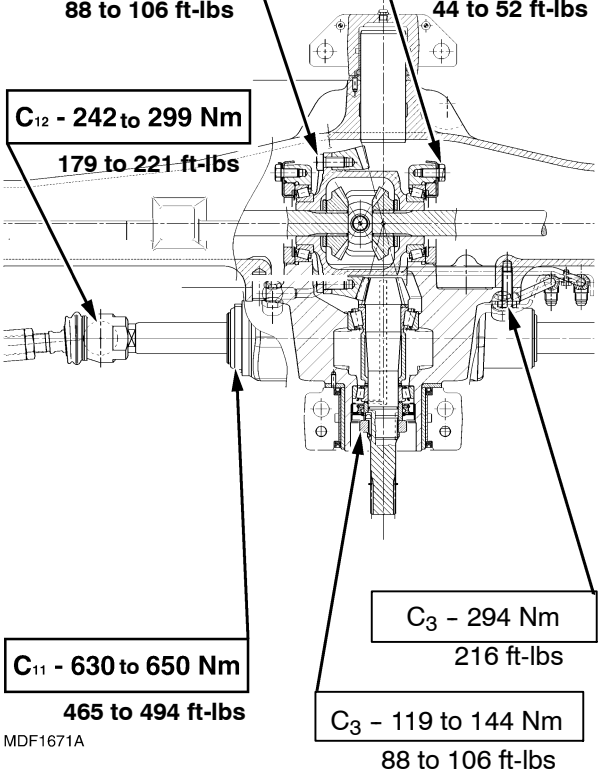
To re-fit the drive gear housing, proceed as follows.

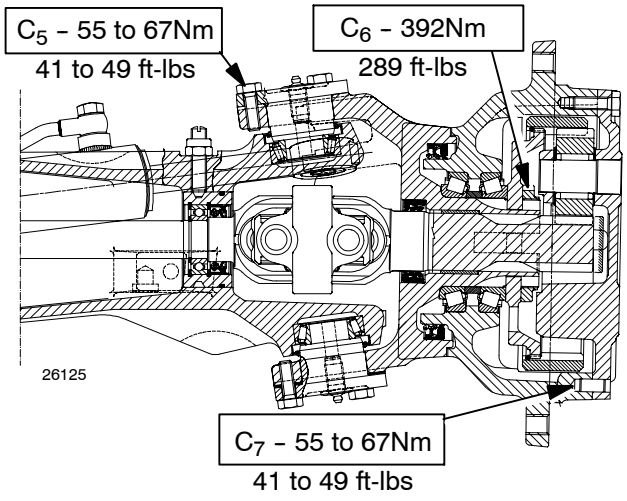
WARNING

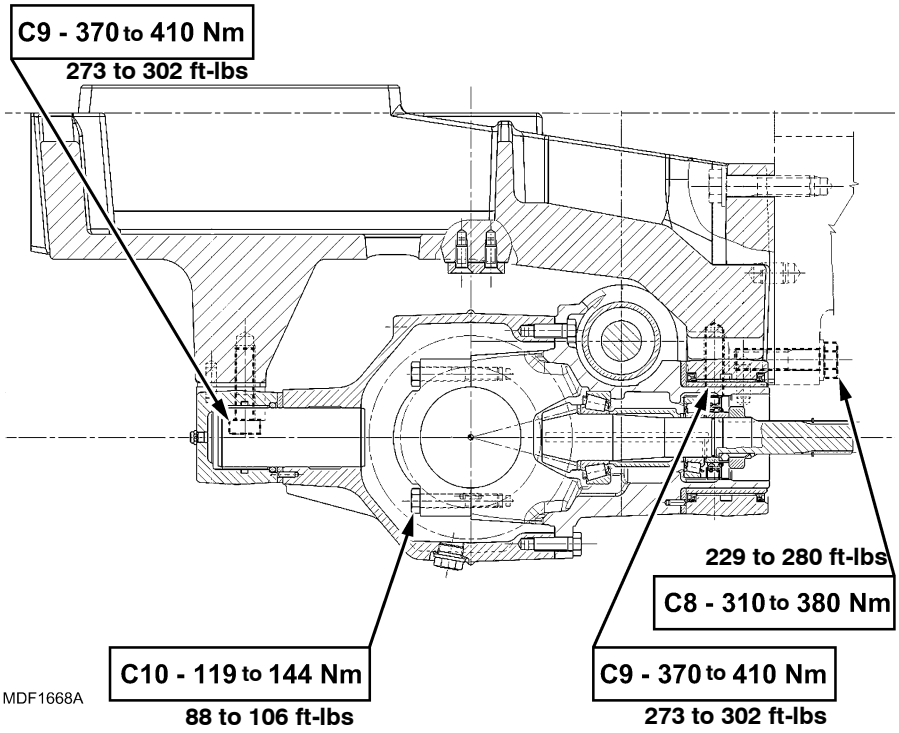
Always use appropriate tools to align fixing holes. NEVER USE FINGERS OR HANDS.

1. Respect the tightening torques prescribed on page 2.
2. Carefully clean the contact surfaces.
3. Apply the sealing compound (approx. 0.0787 in. (2 mm) in thickness), as shown in Section 27, Chapter 1.
4. Fit the drive gear housing on the transmission gearbox.
5. Re-fit the two speed sensors, securing in position with the two retaining bolts (electrohydraulic drive gear).
6. Connect the drive gear engagement control lever (mechanical drive gear).
7. Refit the transmission oil drainage plug.
8. Carry out operation **23 101 26** Propeller shafts and guard, only installation (see page 10).
9. Refill the rear transmission gearbox (for products and quantities, see Section 00, page 6).

TIGHTENING TORQUES







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FRONT AXLE

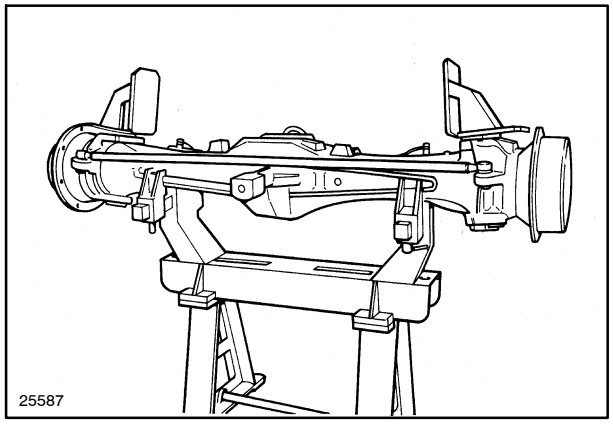
Disassembly

WARNING

Handle all parts carefully.
Do not put your hands or fingers between parts.
Wear suitable safety clothing - safety goggles, gloves and shoes.

Note *- Front axle overhaul operations must be carried out on stand no.* ***380000251****.*

1. Unscrew the plug (1) and drain the oil from the axle casing.



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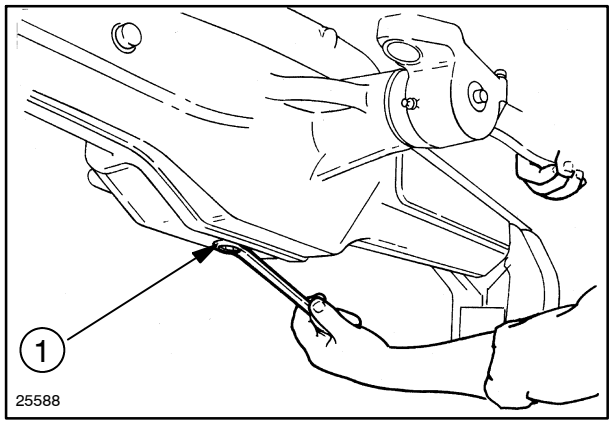

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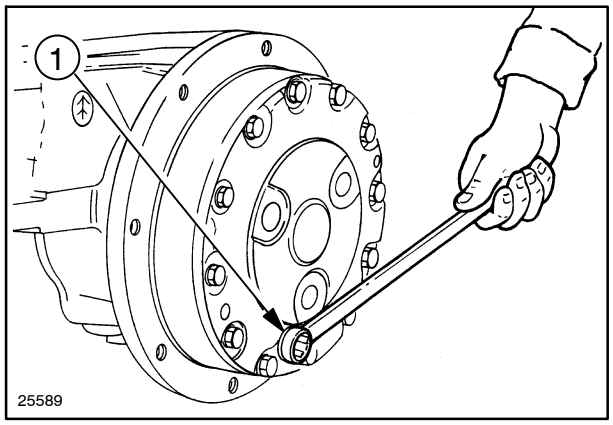
2. Unscrew plug (1) on the left-hand epicyclic final drive casing; repeat the same operation on the right-hand casing.



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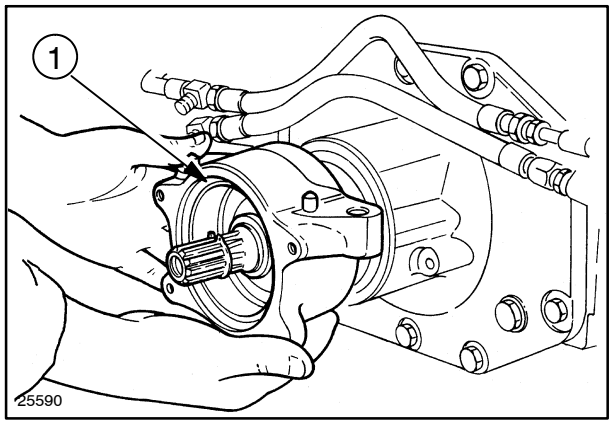
3. Remove the front axle rear support (1); remove the front support and washer.



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If necessary, round the adjustment shim (12) value up to the nearest 0.0019 in. (0.05 mm).

***Note** - On completing the adjustment, do not remove the adjustment tool from the bevel drive-differential housing: leave in place for adjustment of the bevel pinion position.*

Determining the thickness of the Bevel Pinion Position Adjustment Shim (11, fig. 9).

Proceed as follows.

1. Fit tool **380000249** (1) in the bevel drive-differential housing, complete with outer bearing rings, crown wheel bearings adjustment shim, circlip and differential housing caps.

2. Screw the cones (3) of tool **380000249** (1) in or out in order to position the micrometer shaft in the direction of the inner bearing ring (2) and eliminate end float between the cones and the outer rings of the bevel crown wheel bearings.

3. Adjust the micrometer so that the shaft is in contact with the inner bearing ring (2) and measure the distance (H_3).

4. Determine the correct distance (H_5) between the crown wheel axis and the large diameter base of the pinion:

   $$\mathbf{H_5 = H_4 \pm C}$$

   where:

   $\mathbf{H_4}$ = 3.7401 in. (95 mm). Nominal distance between the crown wheel axis and the large diameter base of the pinion (see fig. 9).

   C = correction value stamped on pinion preceded by a + or - sign (if other than 0), to be added to or subtracted from the nominal distance(H_4) according to the sign.

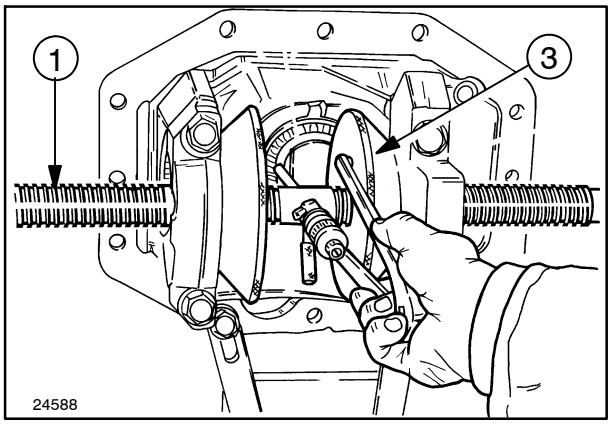
5. The thickness of the adjustment shim (11, fig. 9) will be given by:

   $$\mathbf{S = H_3 - H_5}$$

   where:

   $\mathbf{H_3}$ = micrometer reading;

   $\mathbf{H_5}$ = corrected nominal distance between the crown wheel axis and the large diameter base of the pinion.



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FRONT EPICYCLIC FINAL DRIVE

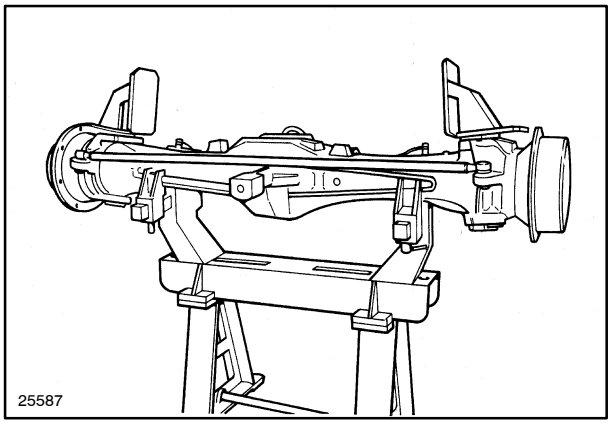
Disassembly

WARNING

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

Front epicyclic final drive removal and installation can be carried out with the axle detached and positioned on the stand **380000251**, or with the axle fitted on the tractor. If the operation is performed with the axle fitted on the tractor, a support stand must be positioned under the engine sump.

Proceed as follows



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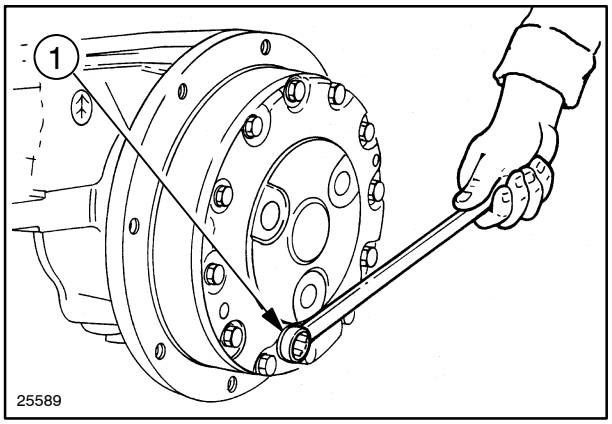
1. Remove the plug (1) and drain the oil from the epicyclic final drive.



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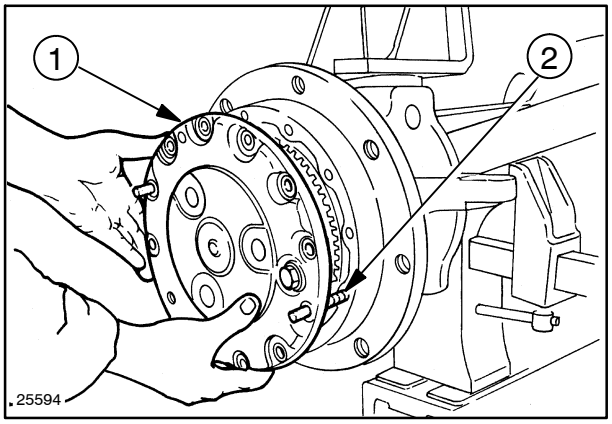
2. Unscrew the left-hand side gear cover (1) retaining bolts. Tighten two pins **50169** (2) and, using an extracting tool screwed into the oil drainage plug hole, remove the cover (1).



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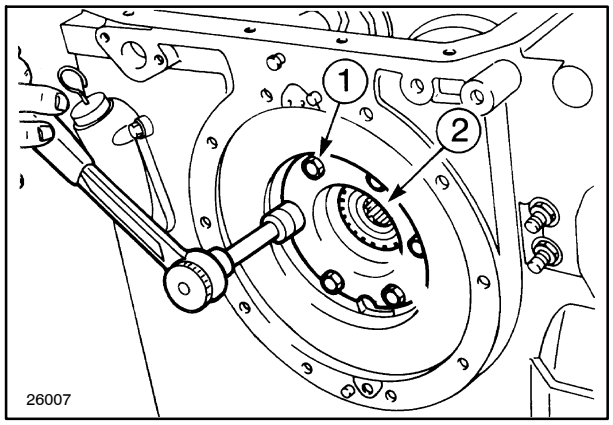
FINAL DRIVE DATA		
Type		epicyclic with three planet gears with straight toothing
Gear ratio		13:(13+65)= 1:6
Thickness of side pinion shim rings (8, fig. 8)	mm (in.)	1 (0.0393)
Adjusting end float of planet gear casing		see page 31
Thickness of axial clearance adjuster rings for side pinion casing (10, fig. 8)	mm (in.)	4.5 - 4.6 - 4.7 - 4.8 - 4.9 - 5.0 - 5.1 - 5.2 - 5.3 - 5.4 - 5.5 - 5.6 - 5.7 - 5.8 (0.1771 - 0.1811 - 0.1850 - 0.1889 - 0.1929 - 0.1968 - 0.2007 - 0.2047 - 0.2086 - 0.2125 - 0.2165 - 0.2204 - 0.2244 - 0.2283)

TORQUES

PARTS TO BE TIGHTENED	Thread	Tightening torque	
		Nm	ft-lbs
Transmission gearbox - clutch retaining bolts (C_1)	-	117 to 129	86 to 95
Transmission gearbox cover - PTO retaining bolts (C_2)	-	20 to 25	15 to 18
PTO driven shaft ring nut (C_3)	-	256 to 309	189 to 228
Transmission gearbox lower cover retaining bolts (C_4)	-	43 to 51	32 to 38
Bevel pinion shaft ring nut (C_5)	-	280 to 309	207 to 228
Gear driven shaft bearings retaining bolts (C_6)	-	84 to 93	62 to 69
Bevel crown wheel retaining bolt (C_7)	-	131 to 144	97 to 106
Reduction shaft bearings support retaining bolts (C_8)	-	47 to 51	35 to 38
Reduction gearbox - transmission gearbox retaining bolts (C_9)	-	135 to 149	100 to 110
Drive wheel axle retaining bolts (C_{10})	-	285 to 345	210 to 255
Plate disk - drive wheel hub retaining bolts (C_{11})	-	264 to 319	195 to 235
Plate disk - drive wheel rim ring nut (C_{12})	-	217 to 262	160 to 193

7. Unscrew the retaining bolts (1) that support the ring bevel gear (2), removing the supports and adjuster shims.



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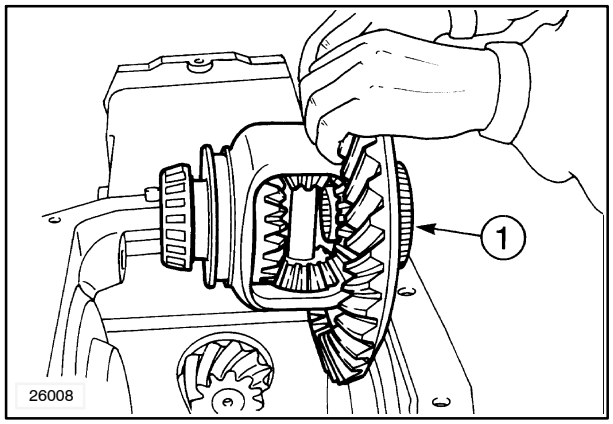
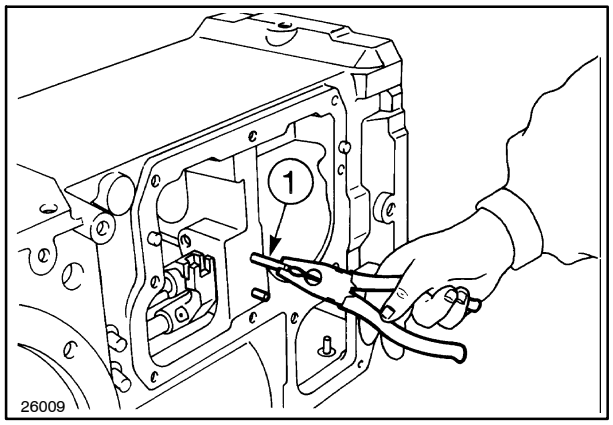
8. Remove the ring bevel gear (1) from inside the transmission gearbox.



13

9. Extract the two stop pins (1) of the final drive control.



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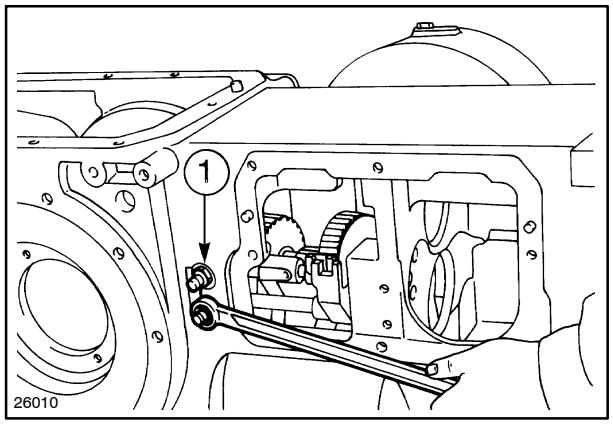
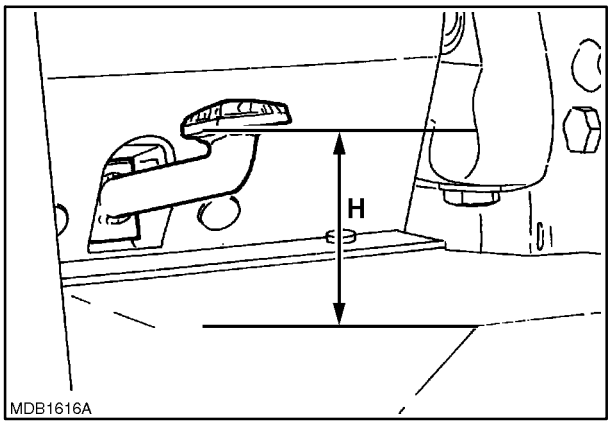
10. Unscrew the rod support retaining bolts (1).



15

Adjustment of the Differential Lock Control Pedal Stroke

The distance (H) between the pedal base and the end of the lining should be 58 to 62 mm (2.2834 to 2.4409 in.).



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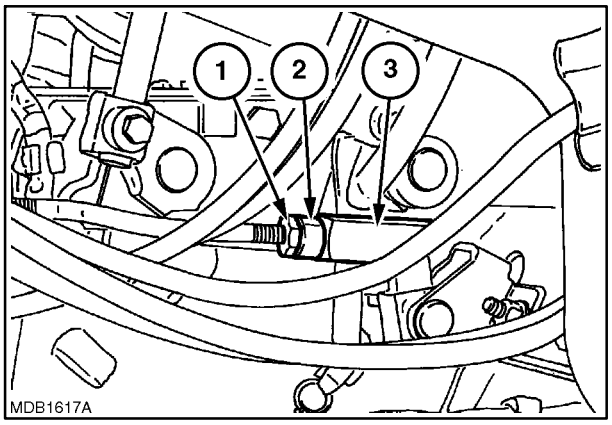
If not, proceed as follows:

1. Loosen the locknut (1), unhook and extract the stop spring (2).
2. Screw or unscrew the fork (3) until the required height for the differential lock pedal from the base is obtained.
3. Insert and hook-up the stop spring and tighten the locknut.



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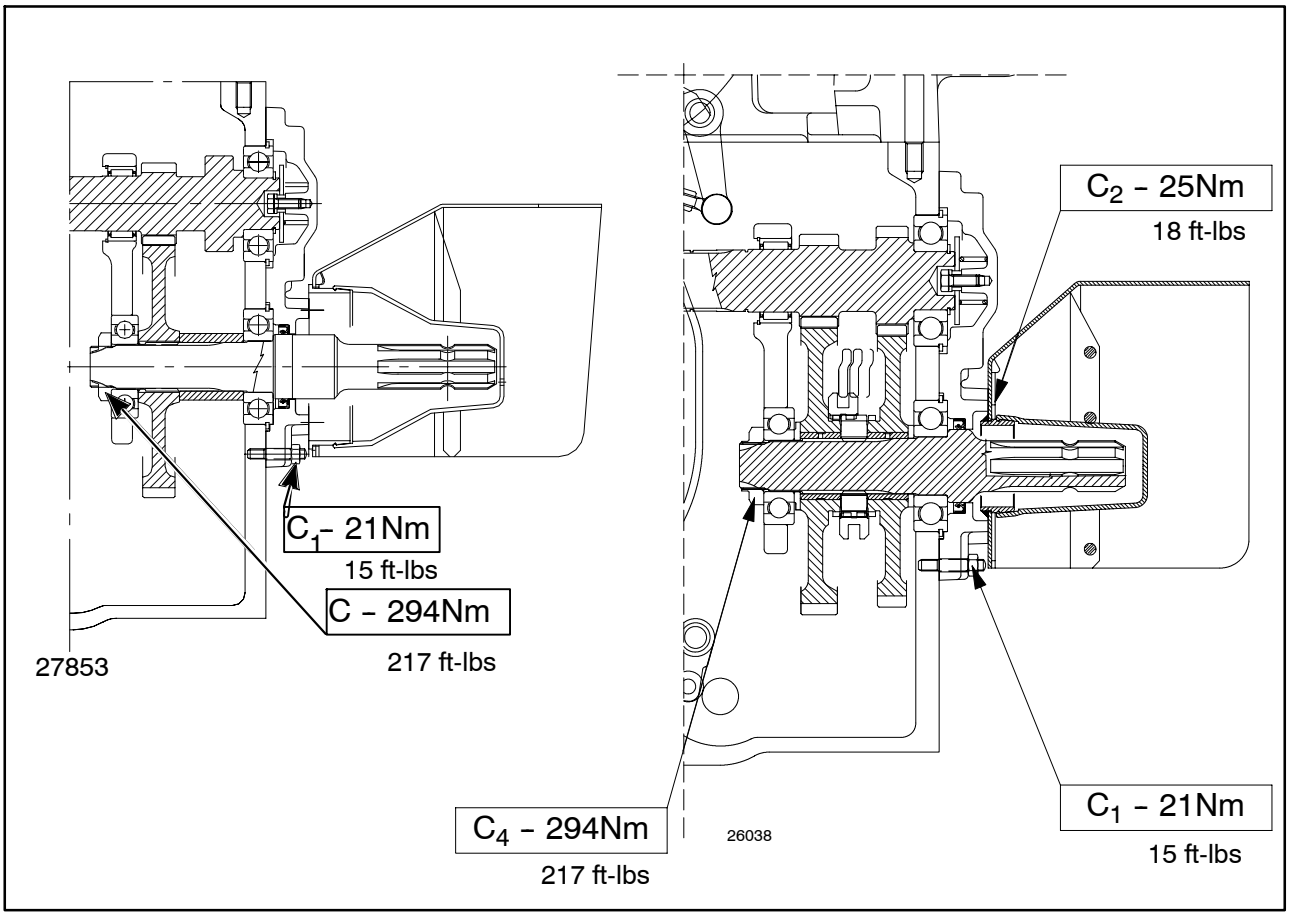
TORQUES



1

540 rpm power take-off **Power take-off - 540/540E rpm**

PARTS TO BE TIGHTENED	Thread	Tightening torque	
		Nm	ft-lbs
Bearing support retaining bolts	M 12 x 1.25	98	72
Self locking nuts for securing grooved terminal for PTO 540/1000 rpm	M 12 x 1.25	162	119
PTO cover retaining bolts (C_1)	-	21	15
PTO guard retaining bolts (C_2)	M 8 x 1.25	25	18
Driven gear shaft locknut: (C_4)	M 32 x 1.5	294	217

SECTION 33 - BRAKING SYSTEM

Chapter 1 - Brakes

CONTENTS

Op. 33 202 60

RIGHT OR LEFT HAND BRAKE

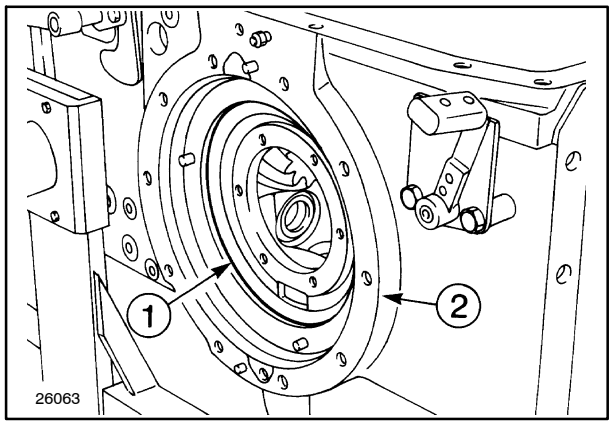
Removal

DANGER

Lift and handle all heavy parts using suitable lifting equipment.
Make sure that assemblies or parts are supported by means of suitable slings and hooks. Check that no one is in the vicinity of the load to be lifted.

Proceed as follows.

1. Carry out operation **27 120 10** or **27 120 20** Right or left-hand final drive casing, only removal (see Section 27, Chapter 1).
2. Remove the brake disk (1) from the seat in the transmission casing (2) and recover the control piston.



7

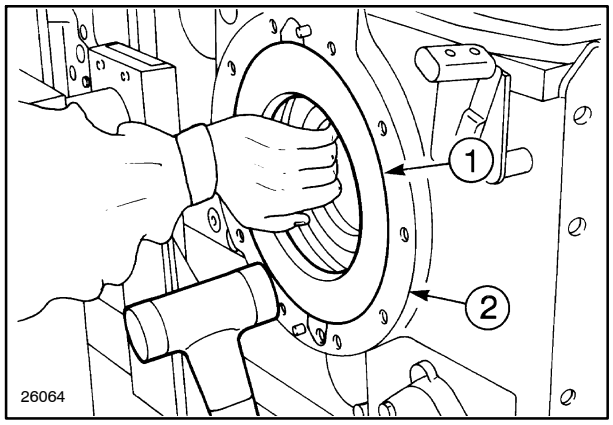
Installation

To refit the right or left-hand brake, proceed as follows.

WARNING

Always use appropriate tools to align fixing holes. NEVER USE FINGERS OR HANDS.

1. Check the control piston seals and replace, if necessary.
2. Fit the control piston (1) in the seat in the rear transmission casing (2), using a rubber mallet.
3. Fit the brake disk (1, fig. 7).
4. Carry out operation **27 120 10** or **27 120 20** Right or left-hand final drive casing, only installation (see Section 27, Chapter 1).



8

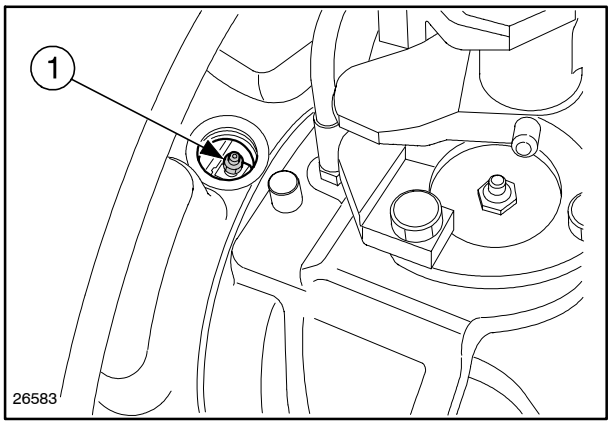
18. Keep the pedal pressed down, unscrew the bleeding screw (1), located inside the front final drive, by half a turn, allowing the oil/air bubble mixture to flow out.

19. Tighten the screw (1) and repeat the aforementioned operation until oil without air bubbles flows out.

20. Press the brake pedals again to put the circuit under pressure, i.e.: when the pedal travel returns to normal.

21. Repeat the aforementioned operation on the right-hand part of the brake circuit.

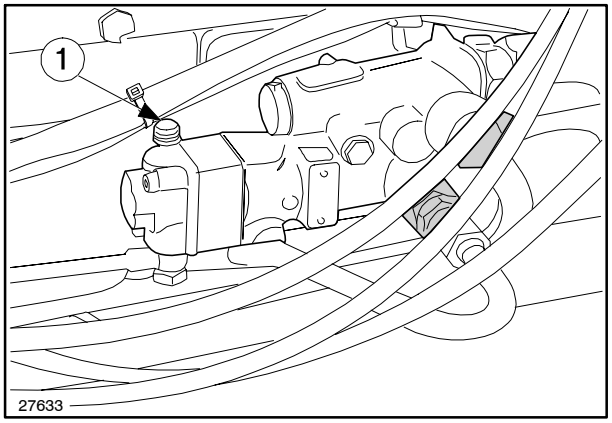
22. On completion of the operation, top up the oil level in the reservoir and tighten the caps (1).



30

NOTE: *To match the front brake bleed screw (1) fig. 30 with the front side final drive plug (1) fig. 29 place the latter in the vertical position.*

NOTE: *On tractors fitted with trailer brake valves, after bleeding operations on rear and front brakes, bleed the valve using the screw (1) in the manner previously described.*



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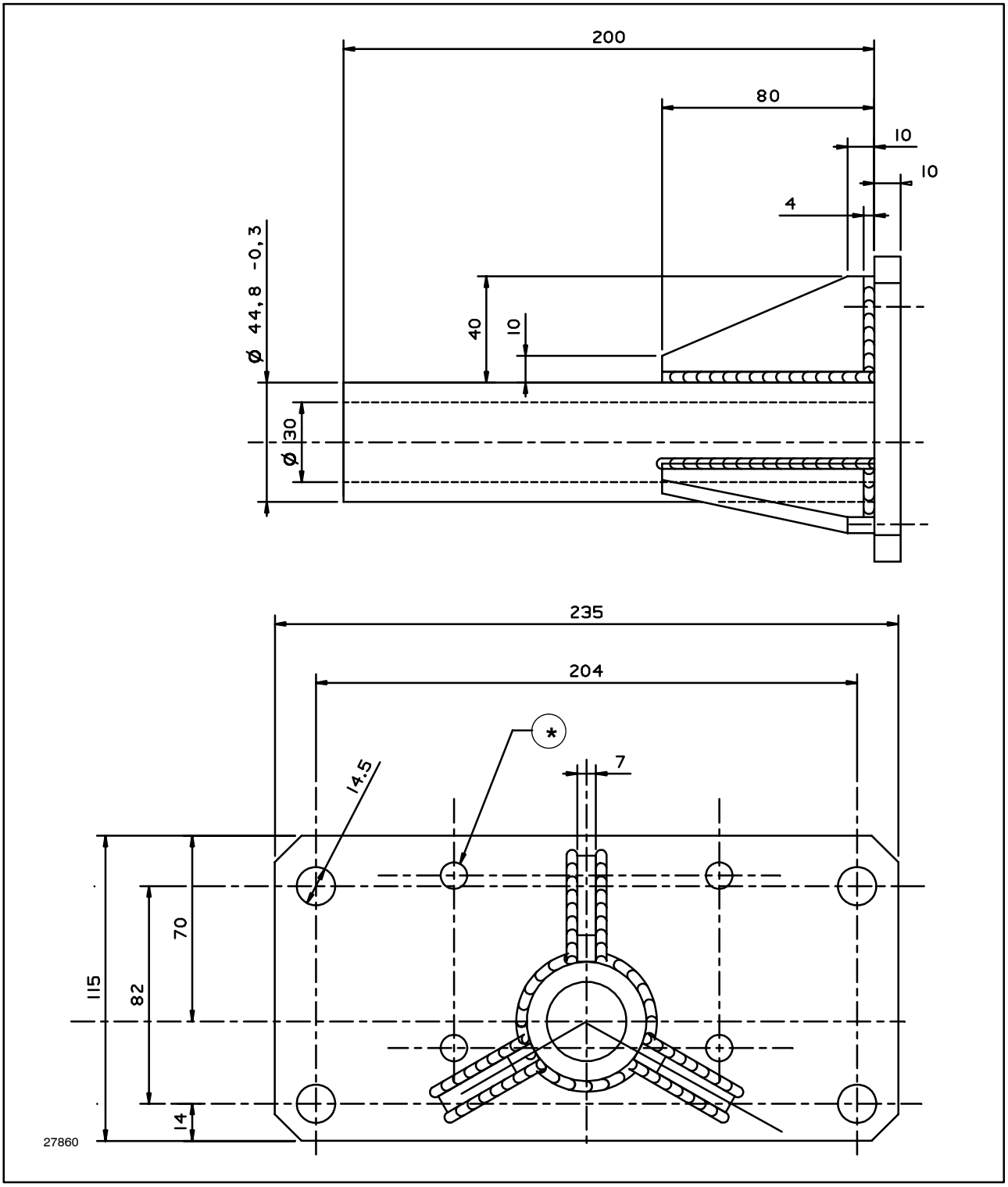


3

Adapter to use with hook 291359 (mark tool No. 50163 - Measurements in mm).

Make in Fe 42 C material

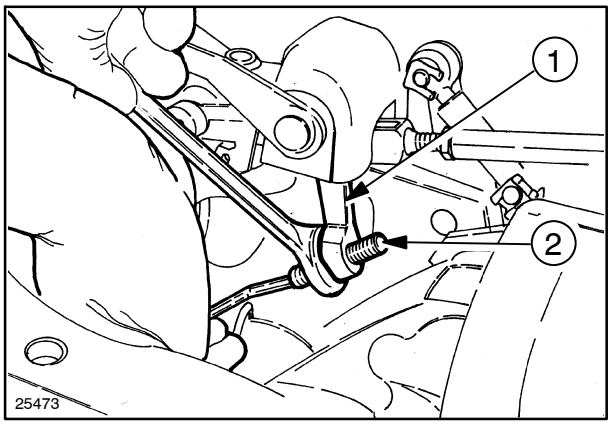
Note* (See tool no. 50155)

TROUBLESHOOTING

Problems	Possible Causes	Solutions
The lift does not rise.	Clogged oil filter.	Replace filter.
	Control valve jammed in discharge position.	Release control valve.
	Hydraulic pump faulty.	Overhaul or replace pump.
The lift moves in jerks.	Clogged oil filter.	Replace filter.
	Air in the pump suction line.	Check that the unions are airtight and the seals are efficient.
The lift rises too slowly.	Clogged oil filter.	Replace filter.
	Oil leaking past the seals resulting in pressure loss: piston seals or delivery union seals.	Replace all defective seals.
	Hydraulic pump faulty.	Overhaul or replace pump.
The lift lowers too slowly.	Arm descent speed set incorrectly.	Set correctly.
The lift lowers too quickly.	Arm descent speed set incorrectly.	Set correctly.

(continued)

6. Lock in position using the locknut.



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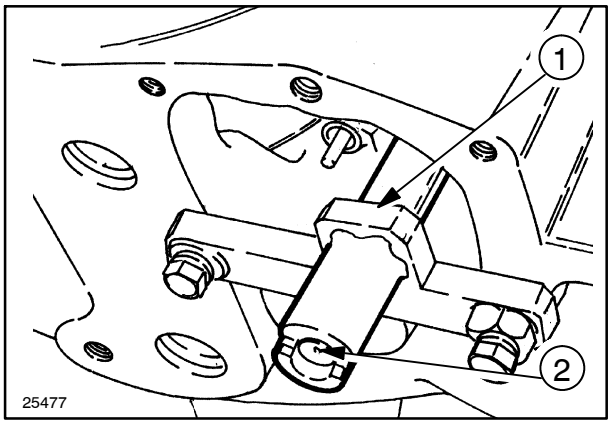

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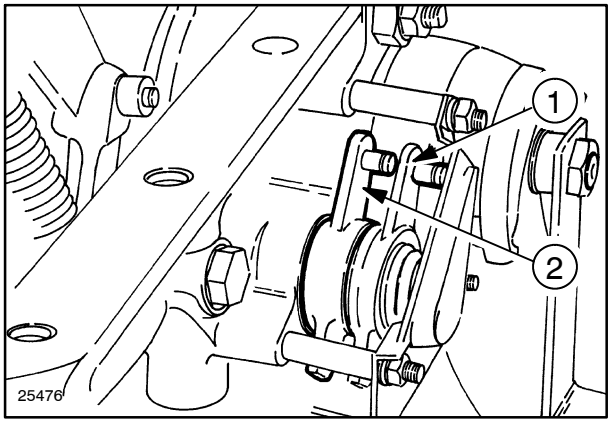
Draft Control

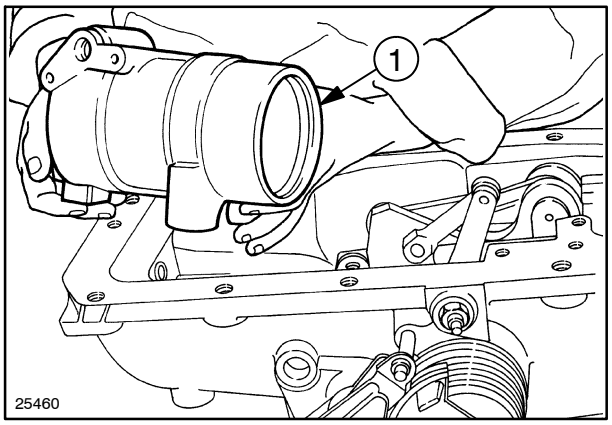
Proceed as follows:

1. Move the external position control (1) and draft control (2) levers completely backwards against the spacer.



37

3. Remove the lift control cylinder (1).



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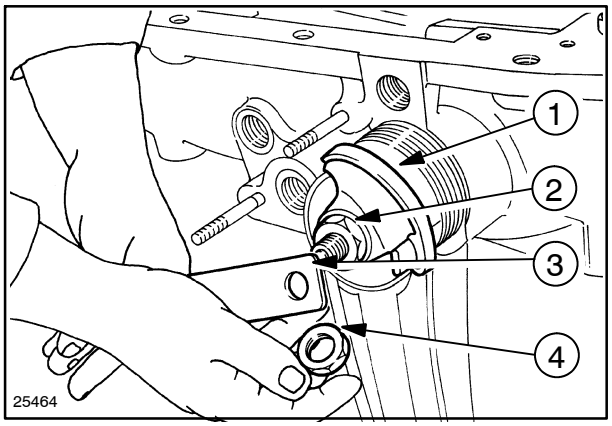
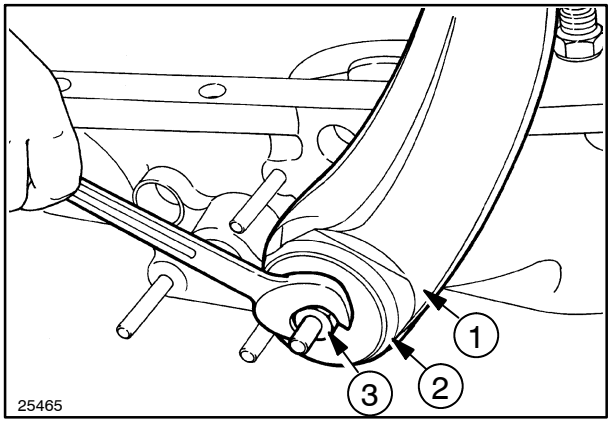
4. Loosen the nut (4) and recover the locking lever (3) on the lifting stroke limit cam (1), unscrew the nut (2) and remove the cam (1).



62

5. Unscrew the retaining bolt (3) and recover the thrust washer (2) and the lifting arm (1).

   Carry out this operation on both sides.



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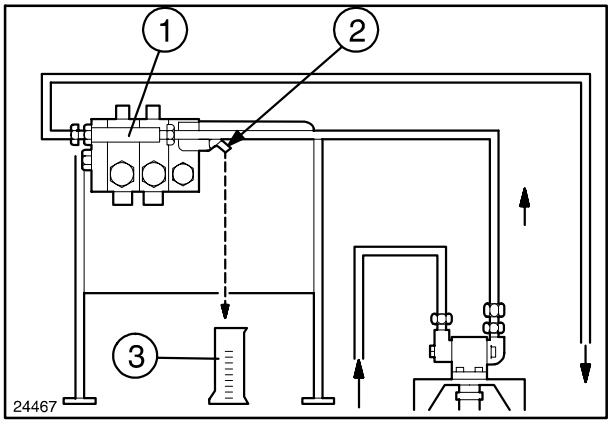
SECTION 35 - HYDRAULIC SYSTEMS

Chapter 2 - Open Center System Auxiliary Control Valves

CONTENTS

Diagram showing the installation of the tools and equipment required for the control valve stem leakage test



17

Valve Leakage Test

Install the auxiliary control valve stack and the test equipment as indicated in the diagram (fig. 17) bearing in mind that the 3-way union (1) must be connected to single and double acting control valves using suitable adapters.

After having made the connections indicated in the diagram, carry out the test as follows:

- start the hydraulic pump and gradually increase the pressure by turning the handwheel on the test equipment until a pressure of 147 bar (2131 psi) is shown on the pressure gauge;

- collect the leaked oil flowing from the union (2), in the burette provided (3) for a period of exactly one minute. Check that the quantity of oil collected does not exceed 25 cm^3/minute (1.5255 in^3/minute) in the case of a new control valve, or 60 cm^3/minute (3.6612 in^3/minute) for a used valve.

Repeat the test on each control valve, checking alternately the two delivery lines to the user cylinder.

ADJUSTMENT OF THE AUTOMATIC DETENT RELEASE PRESSURE

Connect the control valve to the test equipment.

Start the hydraulic pump and tighten the release pressure adjuster screw (26, fig. 1) until a pressure of 170 to 175 bar (2465 to 2537 psi) is obtained in front of the tapered cap (17).

Lock the screw (26) in position by tightening the locknut.

BOSCH 25	
Type	gear type with oil suction from rear transmission casing.
Location	on RH side of engine
Model	BOSCH 25
Construction	BOSCH
Operating system	driven by engine timing
Direction of rotation (as seen from drive side)	clockwise
Engine speed to pump speed ratio Maximum speed of rotation (with engine at maximum power 2300 rpm) rpm	1 : 1.08 2484
Corresponding rated output l/min (gal/min)	63.84 (16.87)
Rated out at 1000 rpm l/min (gal/min)	25.7 (6.79)

Filter	
Type	full-flow, with replaceable paper cartridge
Location	on pump intake

TORQUE

PARTS TO BE TIGHTENED	Thread	Tightening torque	
		Nm	ft-lbs
Pump control coupling hub locknut	7/16 20 UNF	29	21

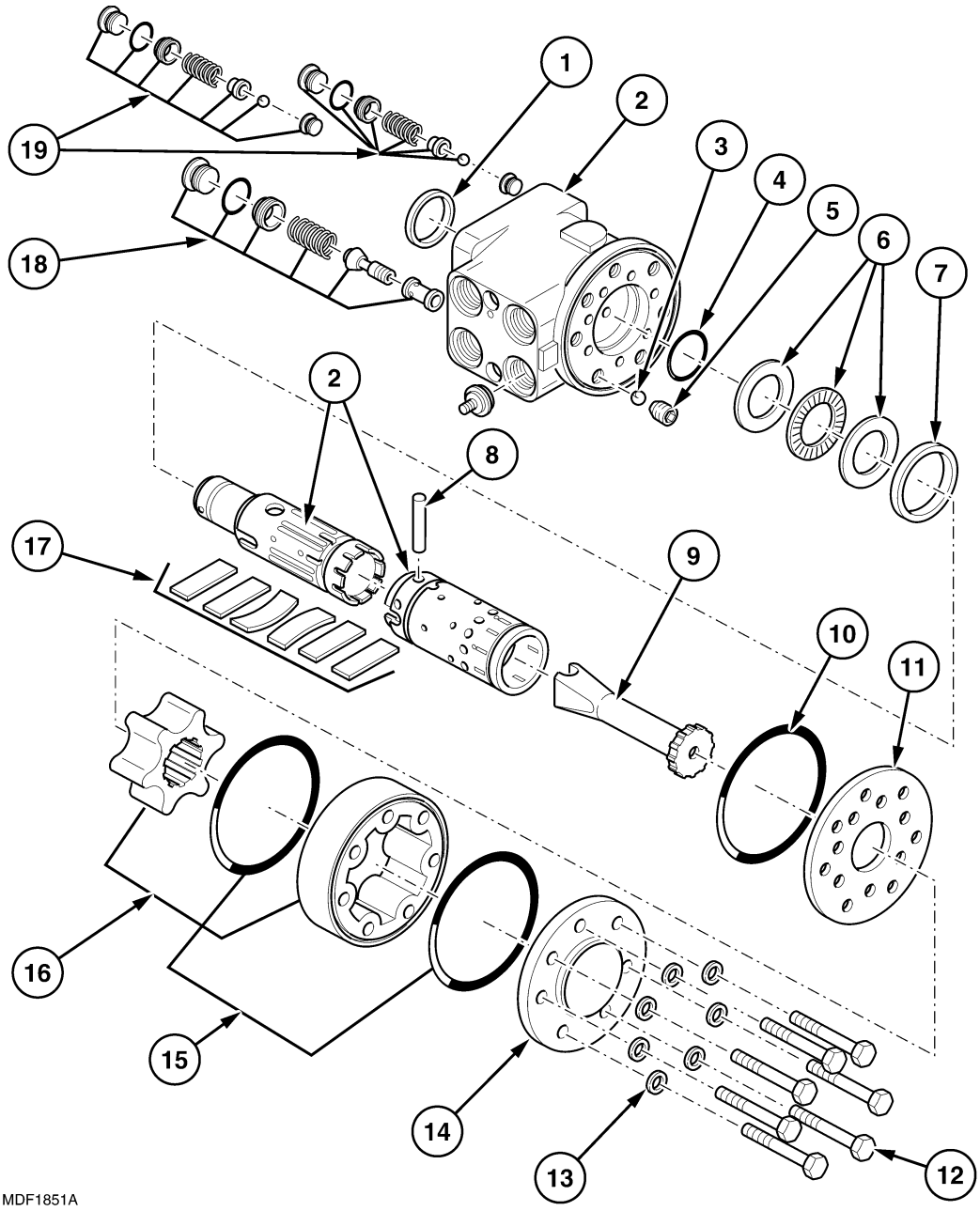
DESCRIPTION AND OPERATION

The front hydraulic pump serves the hydraulic lift, the trailer brake valve and the auxiliary control valves.

The different types of pump shown above are of the gear type with spur gears and function with non-stop flow according to the engine rpm.

They are fitted on the right hand engine support and are driven by a shaft gear unit.

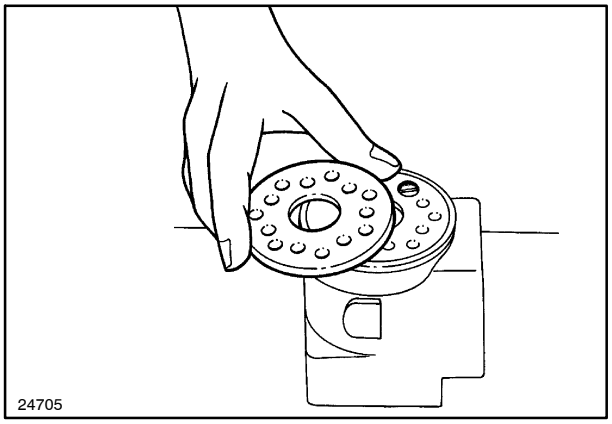
The oil is taken from the rear transmission casing, passing through a filter.



Hydrostatic steering control valve components

1. Dust ring.
2. Control valve body, rotary valve and rotary valve seat sleeve.
3. Non-return valve ball.
4. Seal.
5. Non-return valve threaded plug.
6. Thrust bearing components.
7. Retaining ring for springs (17) (Danfoss only).
8. Rotor drive shaft - sleeve trim pin.
9. Rotor drive shaft.
10. O-ring.
11. Shim ring.
12. Cover retaining screws.
13. Washers.
14. Cover.
15. O-rings.
16. Rotor and fixed ring for rotor.
17. Springs for returning sleeve to neutral **position**.
18. Pressure relief valve.
19. Cylinder safety valves.

6. Extract the thrust washer.



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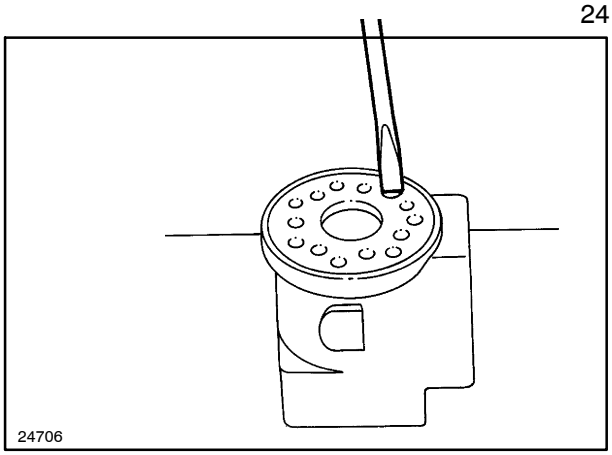
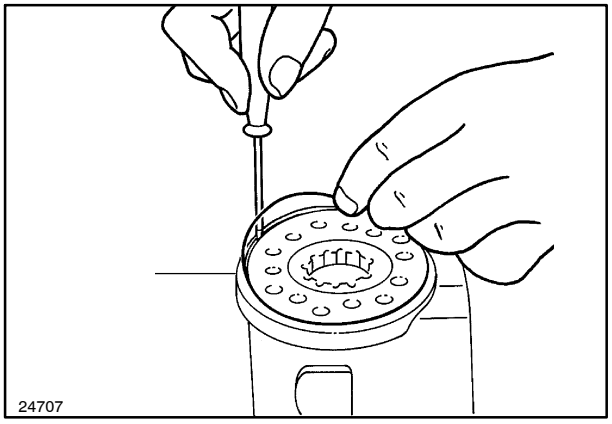
7. Remove the threaded plug on the non-return valve seat.



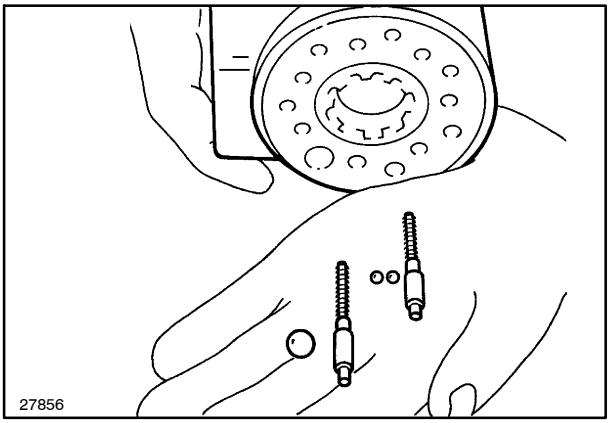
25

8. Extract the O-ring seal from the control valve body.



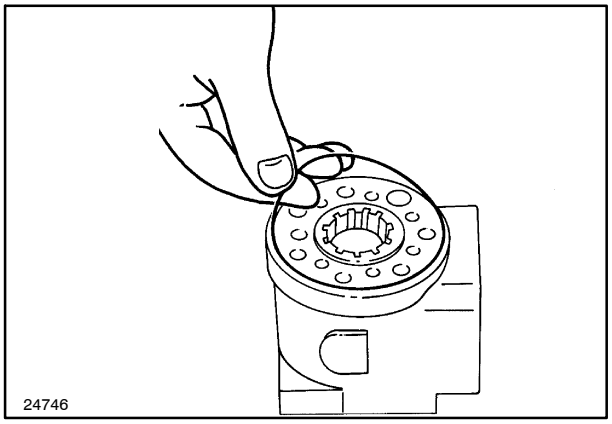
26

9. Rotate the control valve body and extract the non-return valve ball, the two balls with the relative pins and the backflow valve springs.



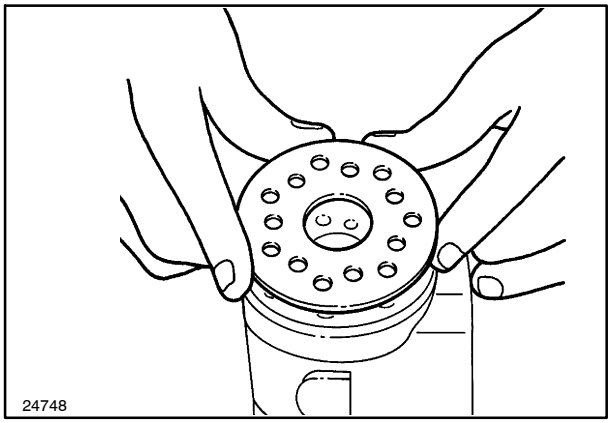
27

24. Lubricate the O-ring seal and insert in the seat on the control valve body.



63

25. Fit the thrust washer, so that the holes coincide with the holes on the control valve body.



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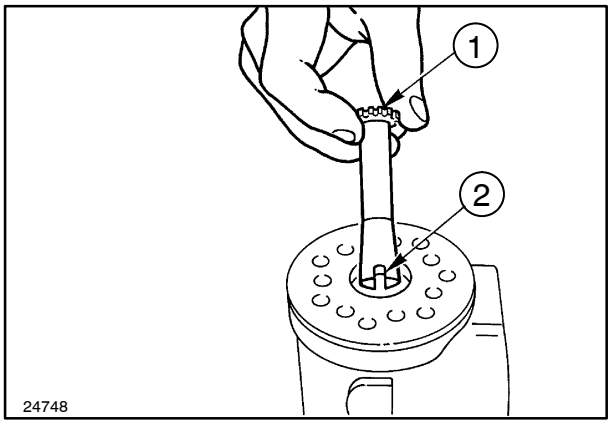
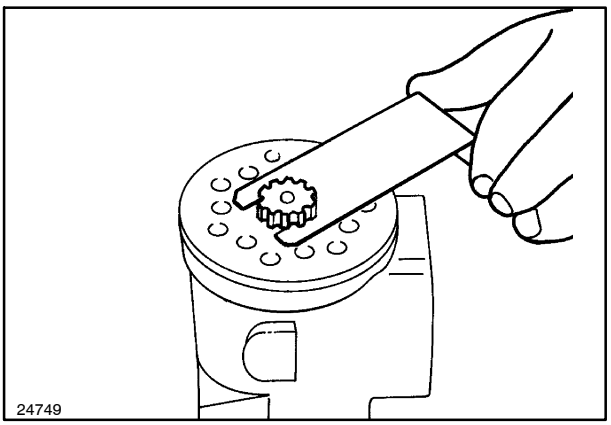
26. Make a reference mark on the upper part of the teeth (1), in line with the seat (2), to indicate the exact position of the valve-to-sleeve trim pin.



65

27. Fit the rotor drive shaft into the control valve body, insert tool **380000307** for retaining and centring the rotor drive shaft, between the rotor drive shaft and the thrust washer, rotating the shaft so as to facilitate coupling between the seat (2, fig. 65) and the trim pin installed on the sleeve.



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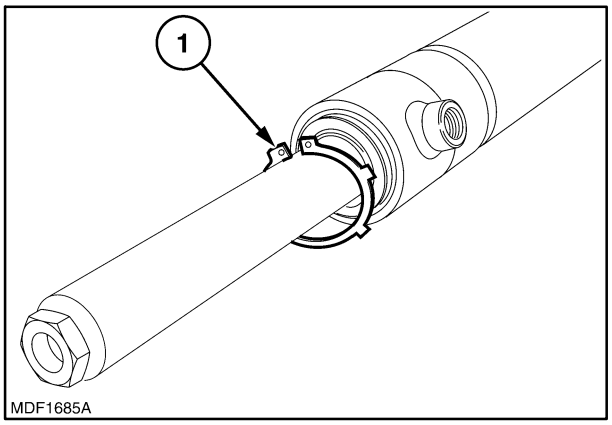
Disassembly

WARNING

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

Proceed as follows:

1. Remove the circlip (1).



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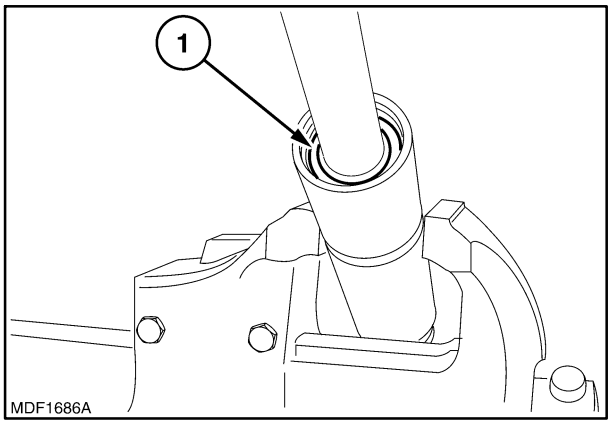
2. Push the ring (1) with the seals into the cylinder.



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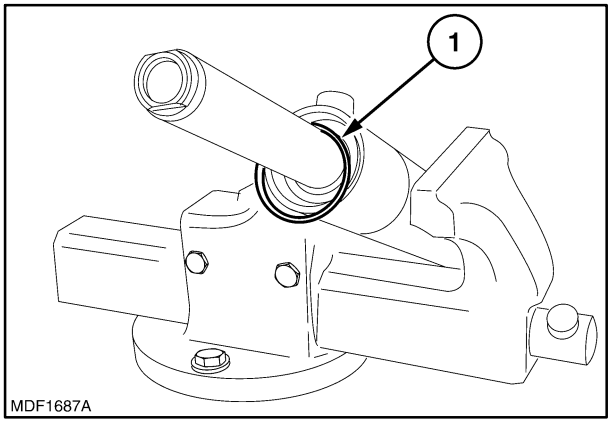
3. Remove retaining ring (1).



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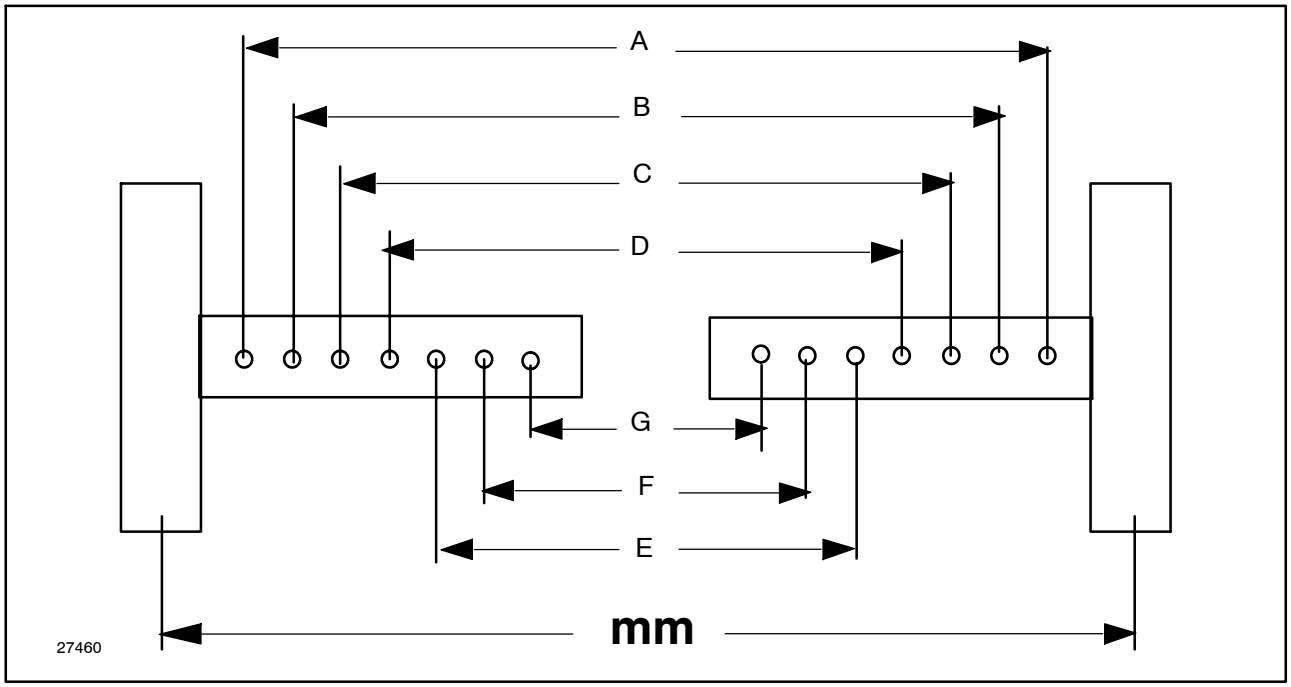
TIRE DATA

(cont)

Models	Tires	Wheel tracks mm (in.)						
		A	B	C	D	E	F	G
T4040 T4050	6.0016	1349 (53.1101)	1449 (57.0471)	1549 (60.9841)	1649 (64.9211)	1749 (68.8581)	1849 (72.7951)	1949 (76.7321)
	6.5-16							
	6.50-16 F2							
	7.50-16	1357 (53.525)	1457 (57.362)	1557 (61.299)	1657 (65.236)	1757 (69.173)	1857 (73.11)	1957 (77.047)
	7.50-16 F2							
	9.15L 15 F2	1431 (56.3384)	1531 (60.2754)	1631 (64.2124)	1731 (68.1494)	11831 (465.786)	1931 (76.0234)	2031 (79.9604)
	27X9.5-15 HF							
	11L-15 I1							
	11L-15 F3							
	25/10LLX15							
	25/10LLX15 TT							

2WD FRONT WHEEL TRACK DIAGRAM



1

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FRONT AXLE

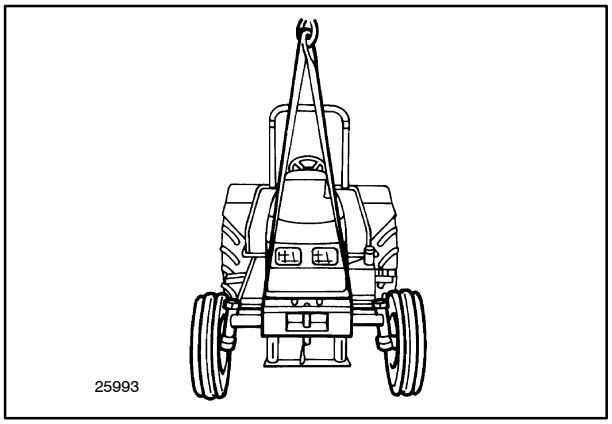
Removal

DANGER

Lift and handle all heavy parts using suitable lifting equipment.
Make sure that assemblies or parts are supported by means of suitable slings and hooks.
Check that no one is in the vicinity of the load to be lifted.

To totally remove the front axle from the tractor, proceed as follows.

1. Lock the rear wheels using suitable chocks.
2. Lift the front of the tractor.
3. Place a mechanical stand (1) under the engine sump and insert a wooden block between the engine sump and the stand.
4. Remove the front wheel retaining bolts (1).



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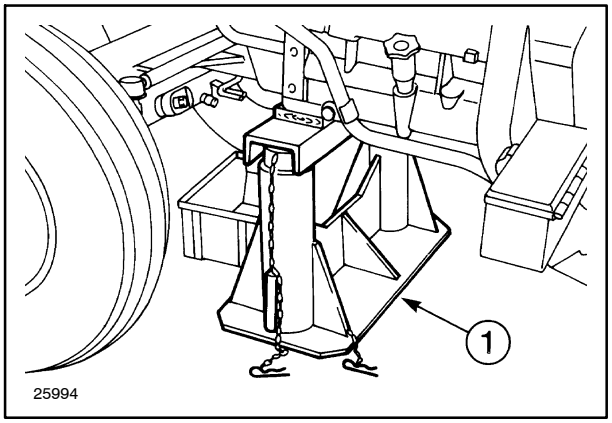

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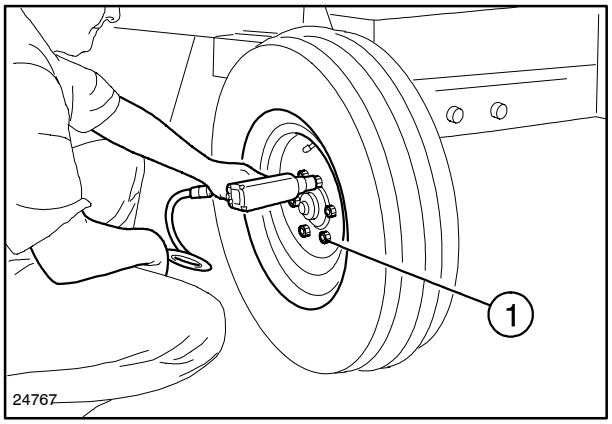

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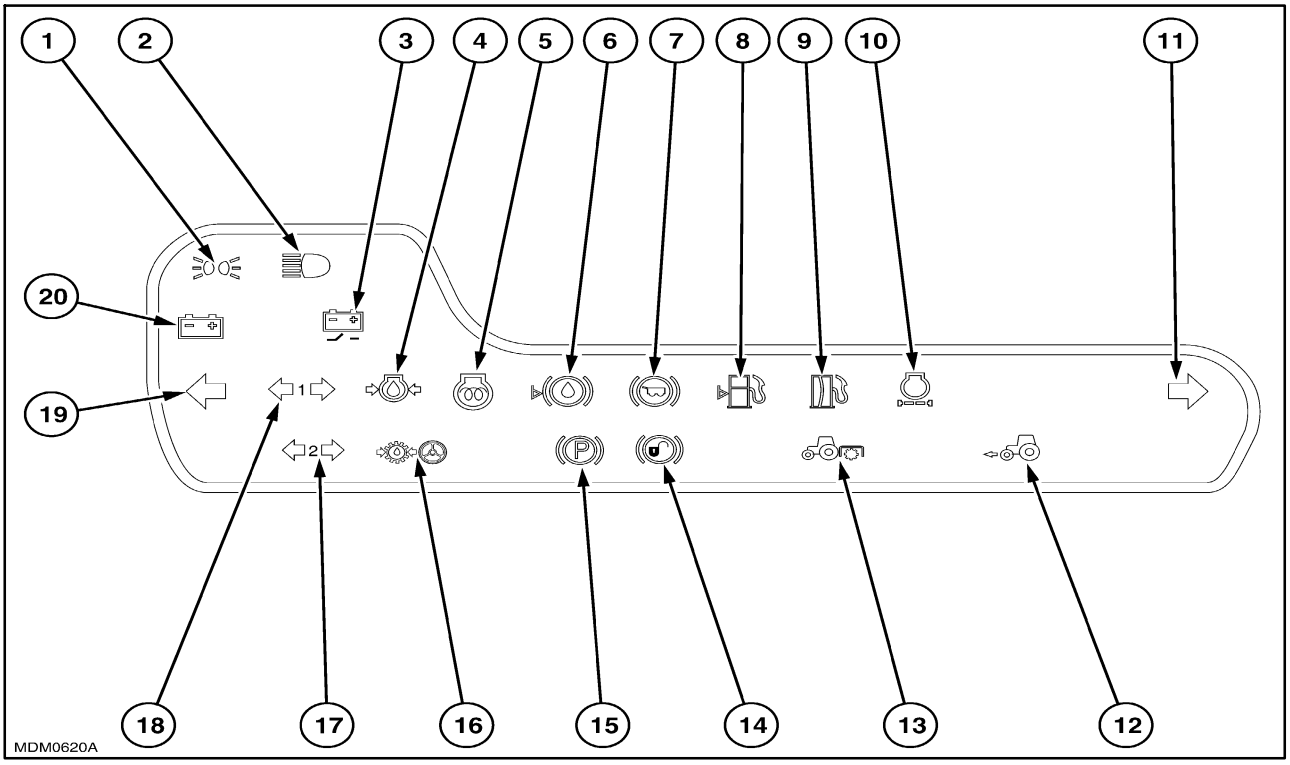
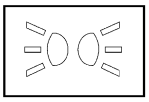
Indicator and Warning Lights



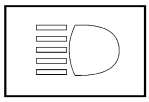
2

The indicator lights on the control panel inform you of the operational condition of the machine. There are 26 indicator lights of various colors. Some of them signal trouble, act promptly when they light up in order to resolve the problem and prevent serious problems with your machine.



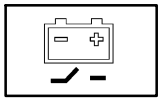
1. **Sidelights** (green)

Lights up when the sidelights are switched on



2. **Full beam headlights** (blue)

Lights up when the headlights are switched onto full beam.



3. **Battery cut-off** (amber) (variant not for all markets, fitted by the dealer

It stays on for 30 seconds with the ignition key on STOP unless the battery is cut off. It switches off within 30 second when the battery is cut off by pressing the specific button.

APPLICABLE TRANSMITTERS, SENSORS AND SWITCHES

Description

A. TRAILER BRAKE SAFETY PRESSURE SWITCH.
Activates when the trailer brake pressure circuit drops below 43.5 psi (3 bar). The warning lamp lights up.

B. BRAKE LIGHTS SWITCHES.
Activates when the brakes are applied.

C. ENGINE OIL PRESSURE SWITCH.
Activates when the engine oil pressure drops below 0.68 bar (9.86 psi). The warning lamp lights up.

D. ALTERNATOR.
Provides a square wave signal and recharges the battery. The alternator also provides power for the electrical devices on the tractor.

E. AIR FILTER CLOGGED SENSOR.
Activates when the vacuum in the air intake system exceeds a pre-stabilized value. The warning lamp lights up.

F. PARKING BRAKE SWITCH.
The switch closes when the parking brake is applied.

G. TRAILER BRAKE INDICATOR SWITCH.
Activates when the trailer brakes are applied. The warning lamp lights up.

H. GEARS IN NEUTRAL SWITCH.
Indicates when the gears are in neutral.

I. ENGINE COOLANT TEMPERATURE SENSOR.
The temperature transmitter resistance varies in proportion to the coolant temperature, generating a modulated voltage signal that is measured by the instrument.

J. REAR PTO INDICATOR SWITCH.
Activates when the PTO is engaged and enables starting when it is not.

K. FUEL LEVEL TRANSMITTER.
The transmitter potentiometer provides a signal that determines the level in the fuel tank. The level is shown on the gauge.

L. 4 WD INDICATOR SWITCH.
Activates when there is no oil pressure in the 4 WD control lines. The warning lamp lights up.

M. BRAKE OIL LEVEL SWITCH.
Activates when the brake fluid drops below the minimum level. The warning lamp lights up.

N. G1 GEAR SWITCH (North American version).
Indicates the range position.

O. C1 GEAR SWITCH (North American version).
Indicates the gear engaged (located in front of the G1 switch).

P. SPEED SENSOR (North American version).
Indicates the theoretical tractor ground speed.

Q. TRANSMISSION OIL TEMPERATURE SENSOR.
Indicates the oil temperature in the transmission unit.

R. STARTING ADVANCE THERMOMETRIC CUT-OUT SWITCH.

DESCRIPTION AND OPERATION

The type of starting system installed depends on the type of gearbox fitted on the tractor. All systems consist of an ignition key-switch, heavy-duty wiring, a starter motor with an electromagnet, a starter relay and gear, range gear and PTO control lever switches. These are the basic circuit components used on models with a mechanical gearbox. More sophisticated systems incorporate other components, which ensure that the engine can only be started in the correct conditions.

A 2.5 kW starter motor is series installed. This motor has four poles, four brushes with integrated electromagnet and positive mesh engagement control.

The electromagnet consists of two parallel-connected coils. The low resistance intake coil is grounded via the engine, whilst the high resistance hold coil is grounded via the electromagnet body.

When the key-switch contact is closed (with the gear and range gear in neutral and the PTO disengaged) the coils are energized and the plunger is magnetically drawn into the electromagnet. This movement, transmitted by an adjustable joint mechanism, makes the driving pinion engage the flywheel rim gear. When the pinion makes contact with the rim gear, the plunger closes a series of contacts in order to directly power-up all four field coils, thereby supplying full power to the starter motor.

At this stage, one end of the intake coil is connected to the positive battery pole through the starter switch, whilst the other end is connected to the positive battery pole through the solenoid valve contacts. In this manner the intake coil is by-passed, without absorbing power, and the hold coil exclusively maintains the electromagnet plunger in position.

The starter motor includes a series of contacts and a two-part electromagnet plunger that totally closes the contacts, even if the pinion teeth are not perfectly in line with the rim gear. When this happens, a clutch spring compresses the pinion, forcing it to connect completely as soon as the starter motor starts turning.

When the key-switch is released, power to the electromagnet and motor is cut off. The electromagnet return spring, acting on the adjustable joint mechanism, frees the driving pinion from the gear and re-opens the solenoid valve contacts.

A roller-type clutch mechanism is incorporated in the driving pinion unit. This prevents the pinion from overspeeding if it remains engaged in the flywheel crown wheel after the engine has started.

SECTION 55 – ELECTRICAL SYSTEM

Chapter 3 – Charging System

CONTENTS

Rotor and Regulator Field Circuit Test

The following testing devices are required:

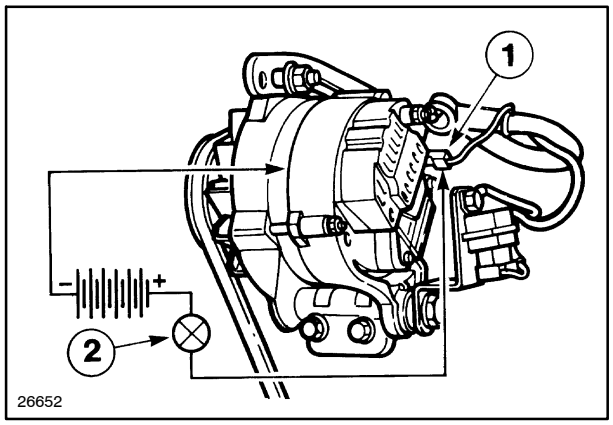
- 12 V battery
- multi-function tester
- 2 watt test lamp.

Refer to figure 14.

1. Disconnect all alternator wires.
2. Connect a 12 V battery and a 2.2 watt test lamp (2) in series between D+ (1) and the alternator casing (negative side of casing).
3. The test lamp should light up.

If the test lamp does not light up, then the rotor circuit is faulty. Check brushes, contact rings and rotor field winding continuity.

If the test shows that these components work satisfactorily, then the regulator may be faulty.

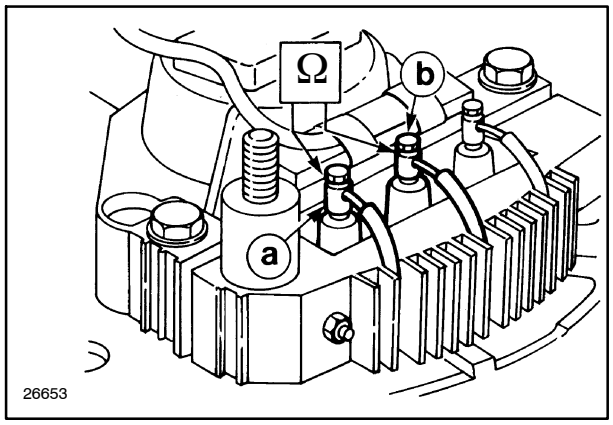


14

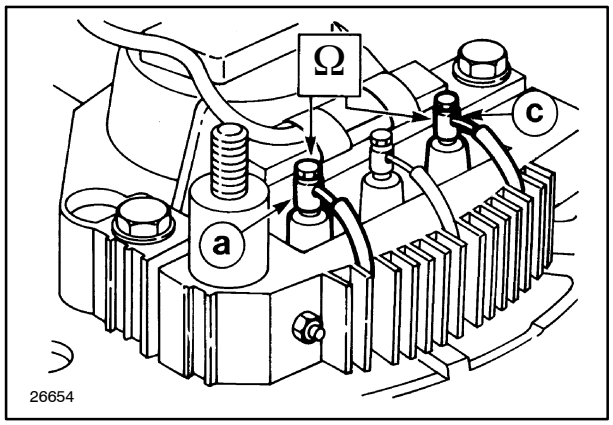
Checking the Continuity of Three Stator Windings

Position the points of an ohmmeter (regulated on the Ω x1 scale) so that they touch the stator phase ends (a - b - c) in the three possible ways shown in figs. 15 - 16 - 17. Each of the three readings should show the same resistance value.

If resistance is infinite or zero, the measured phase is either interrupted or short-circuited, therefore the stator will need to be replaced.



15



16

BATTERY MAINTENANCE

Relative Density

The relative density of the battery electrolyte shows the charge level of the battery. When the battery is fully charged, the relative density of the electrolyte, at 25°C, is at least 1.280.

Alternatively, approximate charge can be measured using a digital voltmeter (± 0.01 V) as follows:

less than	10.5 V unusable battery*
less than	11.8 V flat battery
less than	12.3 V half-charged battery
more than	12.6 V fully-charged battery

* See notes to paragraph "TESTS" for instructions on how to recuperate a slightly sulphurized battery.

Battery voltage must be registered on a flat battery considering the following:

A) the battery must be flat for at least 4 hours

B) if the vehicle has been used recently, or if the battery has been charged recently, switch the headlights on for 2 minutes.

When a battery is flat, the sulphuric acid in the electrolyte combines chemically with the plates and this decreases the relative density of the solution.

A battery densimeter will determine the relative density of the electrolyte in an element. A reduction in the amount of sulphuric acid in the solution will show the degree of charge of that element.

The lower the temperature at which the battery operates, the more necessary it is to keep the battery fully charged. For example, a battery with a relative density of 1.225 at 27°C (80°F) can start the engine at mild outside temperatures but might not do so at lower temperatures because of lower battery performance.

Table 1 shows the effect of temperature on battery performance.

Table 1

Temperature	Fully charged battery performance
25.0°C (77°F)	100%
-4.5°C (23.9°F)	82%
-24.0°C (-11.2°F)	64%
-27.5°C (-17.5°F)	58%
-31.0°C (-23.8°F)	50%
-34.5°C (-30.5°F)	40%
-37.5°C (-35.5°F)	33%

Maximum battery life can be obtained by paying the right attention and by carrying out regular checks. The energy capacity output must not be exceeded by constant overload and charging requirements must be respected.

Precautions

IMPORTANT: *Batteries contain sulphuric acid and generate a highly explosive hydrogen and oxygen mix during charging.*

- *Do not use devices producing flames or sparks to inspect the electrolyte level.*
- *Do not remove battery caps without protecting your hands and your eyes.*

During battery maintenance, follow the steps below:

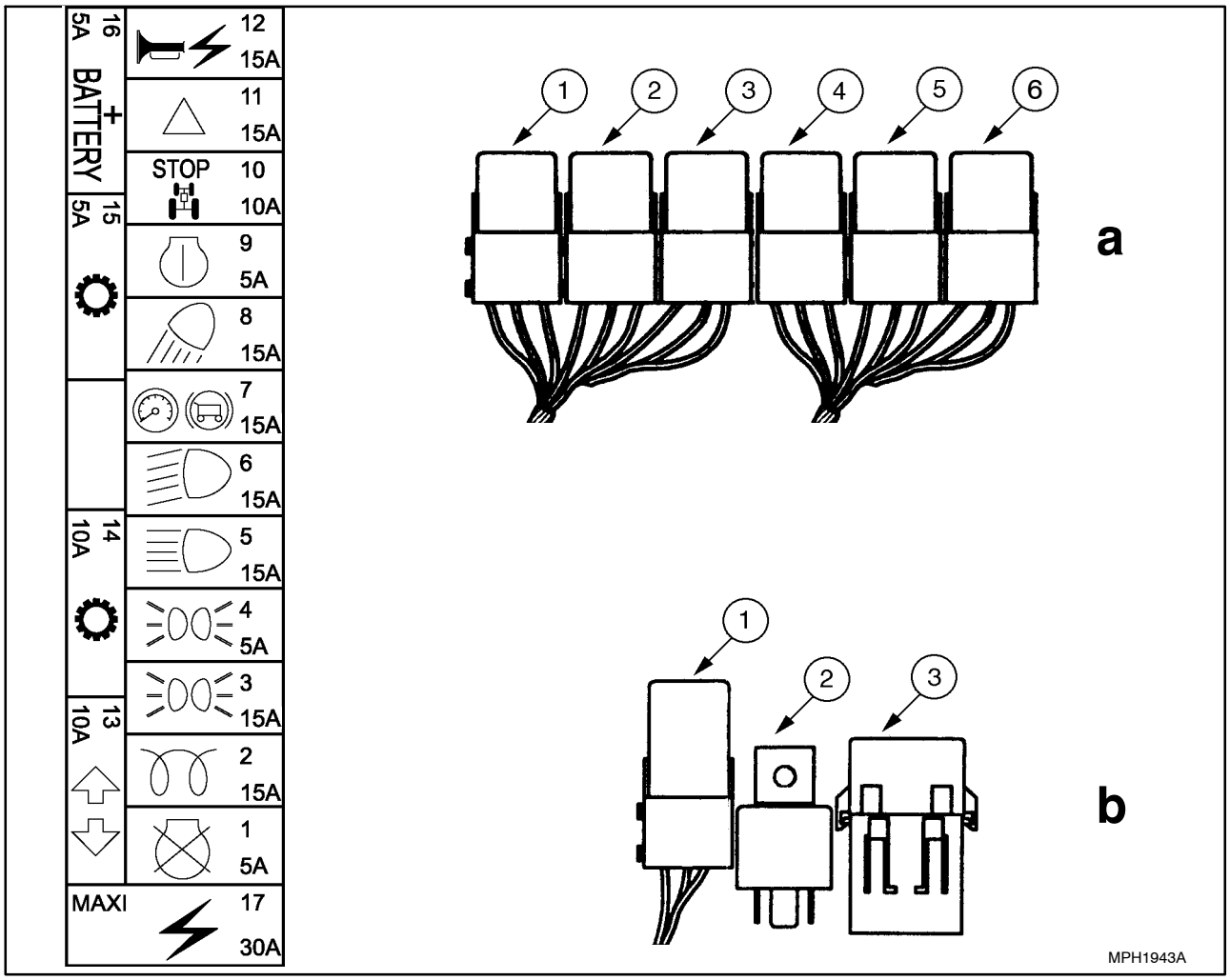
1. Keep the electrolyte level 17 mm over the plates. If this is not respected, the acid concentration will vary, which could damage spacers and cause a deterioration in plate performance.
2. Use distilled or de-mineralized water only. Never use tap water or rain water or water from any other source.
3. Keep the battery charged at least 75% to avoid plate sulphurization, performance loss and possible freezing at low temperatures.
4. Avoid overcharging the battery. Excessive charge will generate high internal heat which will cause grid deterioration and water loss.
5. During quick recharge, check the battery temperature does not exceed 50°C.
6. Do not add sulphuric acid to an element unless some electrolyte has been spilt. Before filling, check the solution has the correct relative density. Slow recharge is the only way to recharge the battery completely. You can use a high amperage battery charger to charge the battery with high current intensity for short periods of time. Use a slow charge to bring the battery to its full capacity.

DANGER

If electrical system relays need to be changed, check that correct spare parts are used and that they are fitted in the correct positions. The use of structurally or functionally different fuses - even if interchangeable - could seriously affect tractor control with dangerous results.

VERSION A (ISO-Power Shuttle unit)
Models with electro-hydraulic four-wheel drive fitted for:

- **Swivel position lights**
- **8A and 25A power sockets**
- **Italia trailer brake.**



1

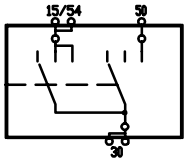
Relays and Control Units - LH Side (a)

1. 4WD relay.
2. 4WD relay.
3. Brake lights relay.
4. Trailer brake relay.
5. Trailer brake relay.
6. Trailer brake relay.

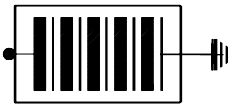
Relays and Control Units - RH Side (b)

1. Electronic flasher.
2. Starter relay.
3. 30 A Maxi-fuse.

SYMBOLS USED IN ELECTRICAL CIRCUITS



Starter switch



Battery

Fuse

Motor

Lights
and warning indicators

Switch relay

Switch relay

Pressure switch/Sensor

Indicator switch

Speaker

Diode

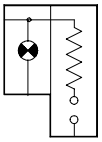
Connection

Connection

Thermostarter

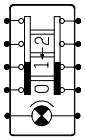
Horn

Variable resistor



Cigar lighter

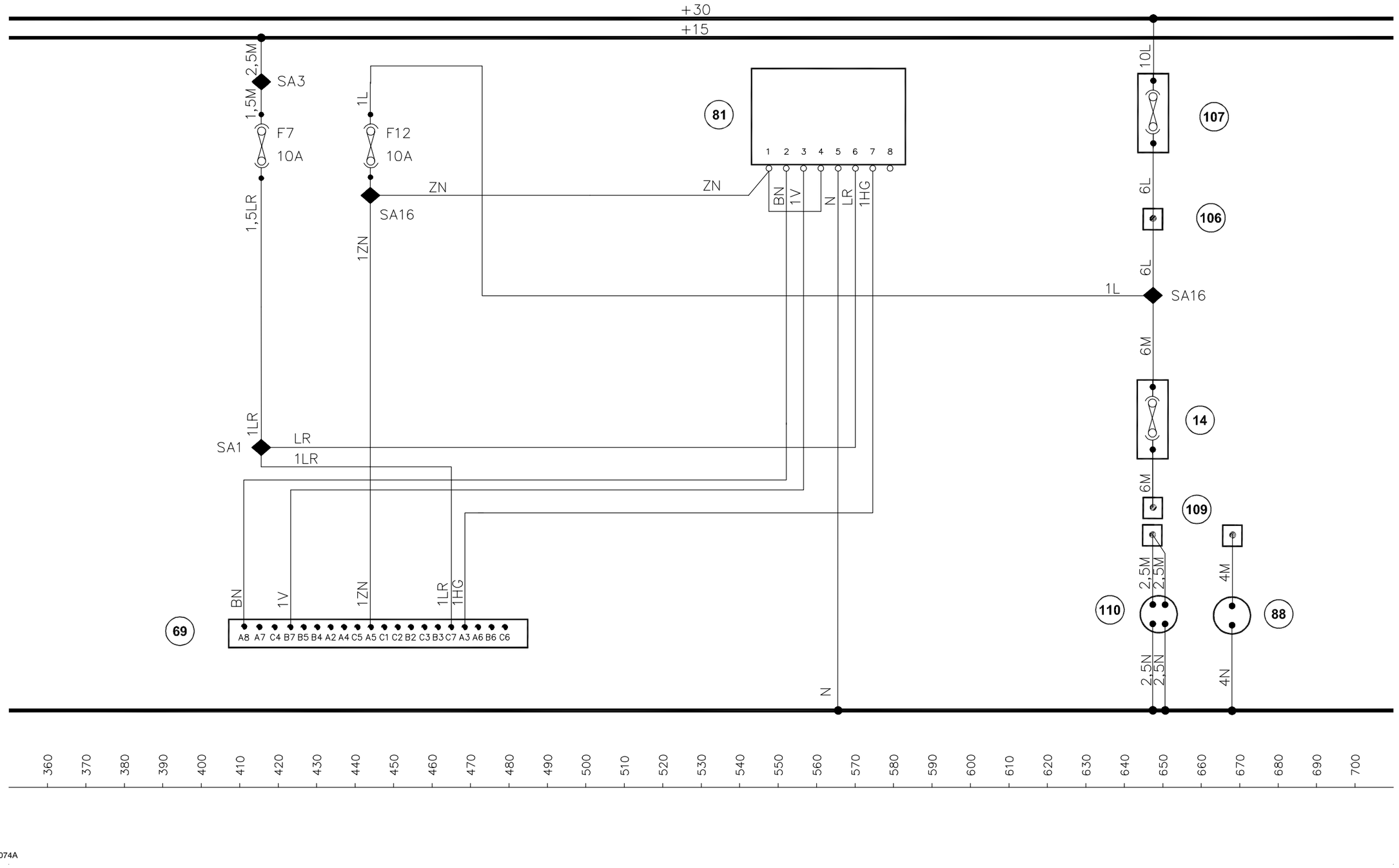
Power socket



Control switch

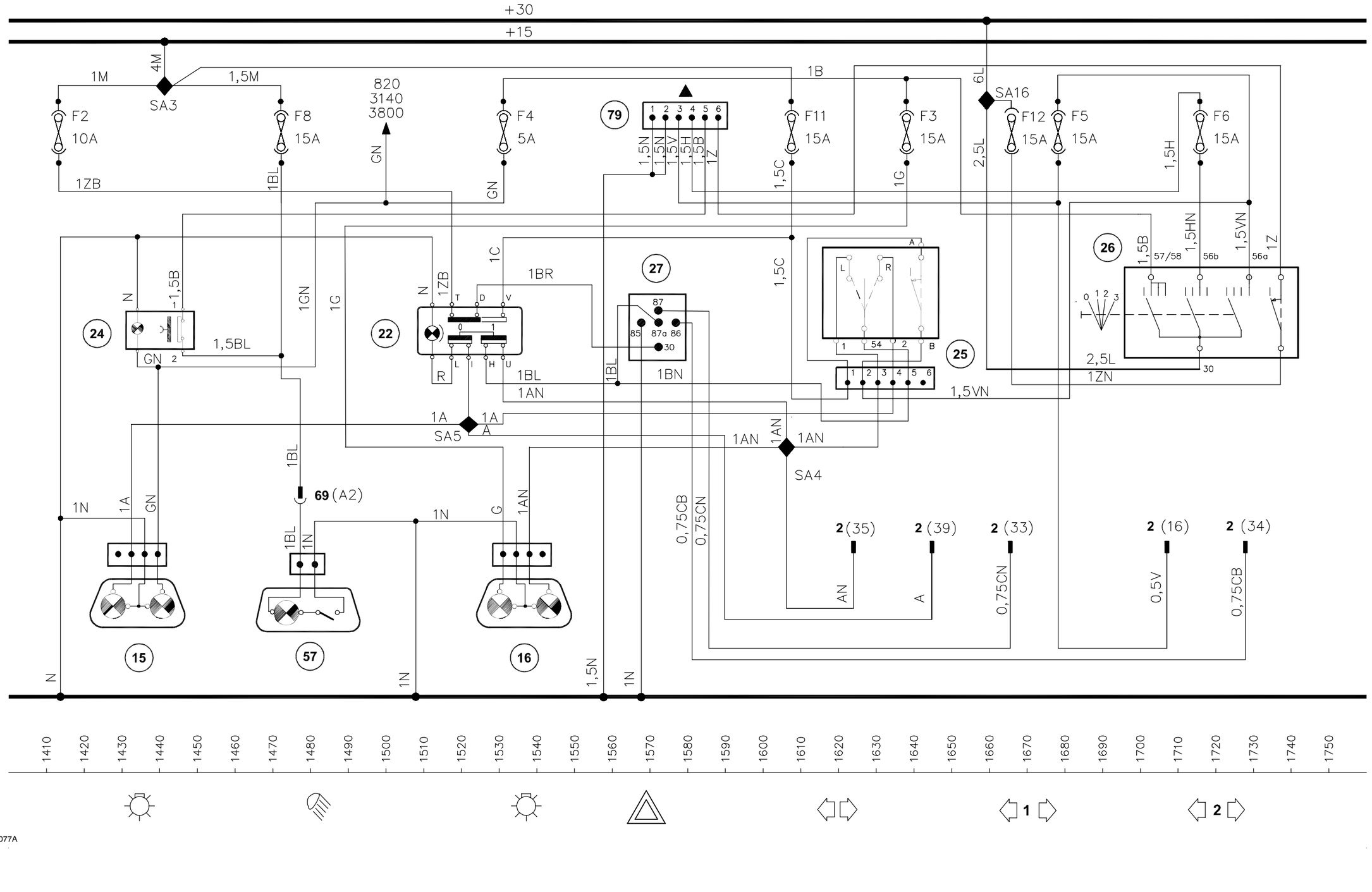
MPD2703A

POWER SOCKETS AND OPERATOR SAFETY CIRCUIT (North America version) - DIAGRAM B



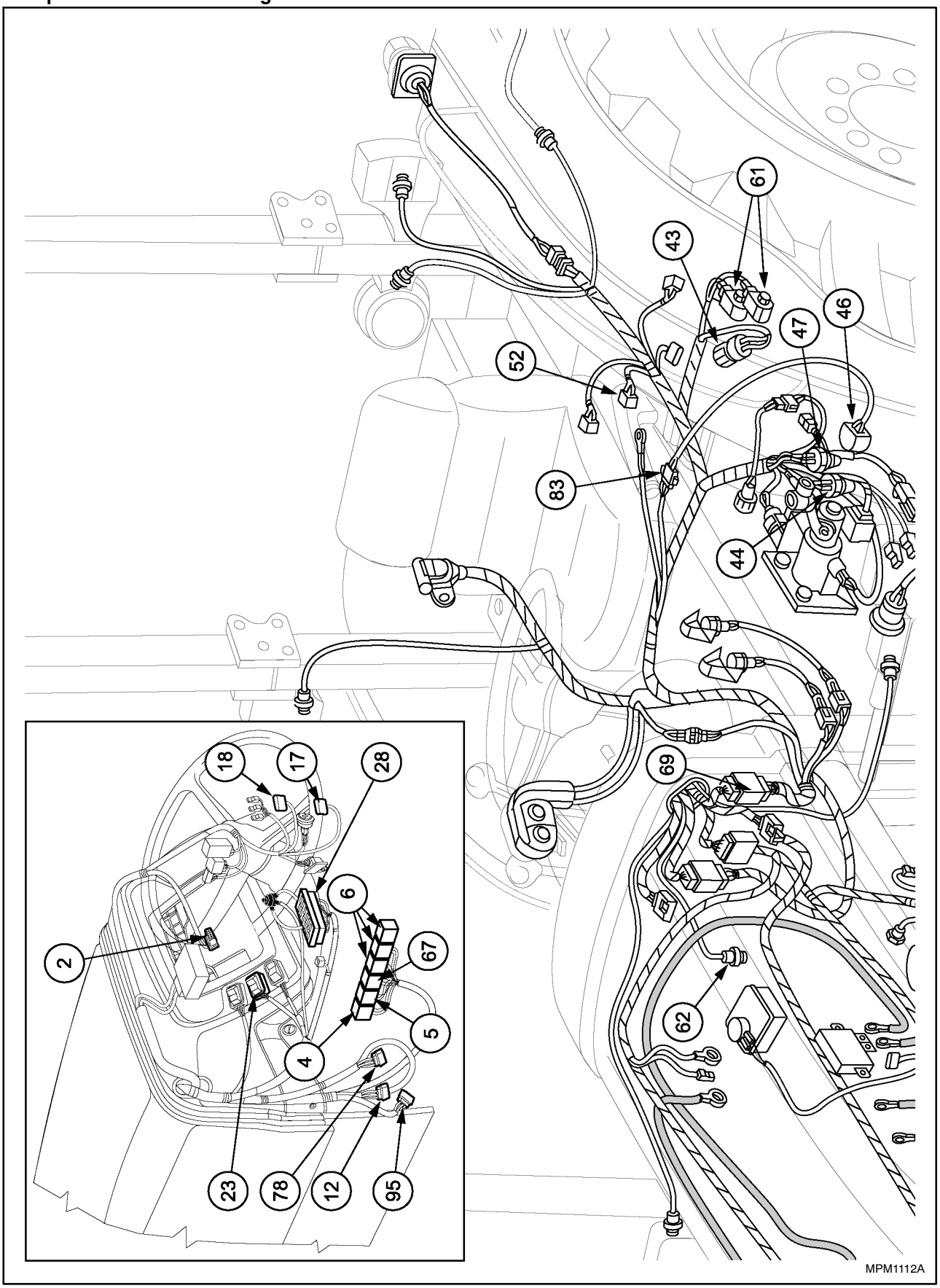
MPM1074A

FRONT LIGHTS CIRCUIT - DIAGRAM D/2

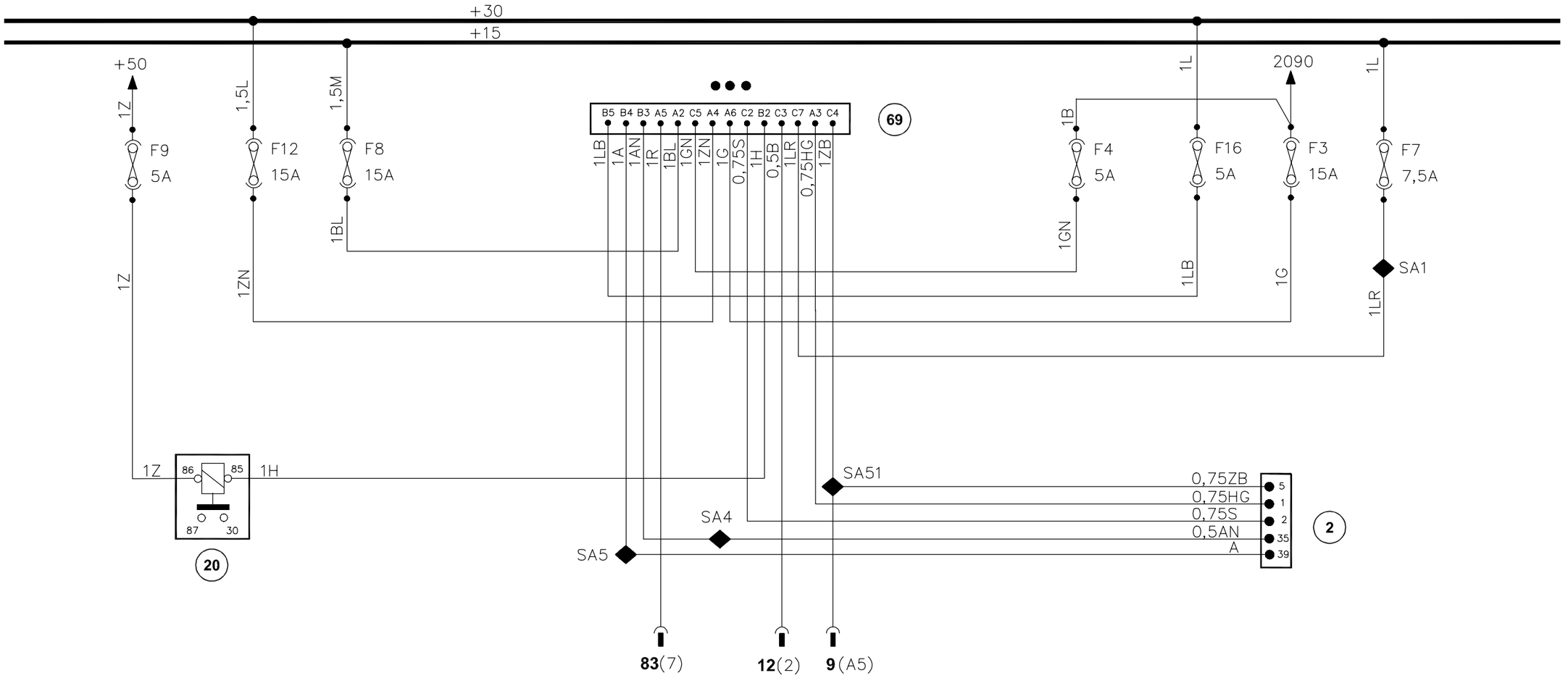


MPM1077A

Component Locations – Diagrams G and H



TRANSMISSION CIRCUIT (ISO version) - DIAGRAM L



3510 3520 3530 3540 3550 3560 3570 3580 3590 3600 3610 3620 3630 3640 3650 3660 3670 3680 3690 3700 3710 3720 3730 3740 3750 3760 3770 3780 3790 3800 3810 3820 3830 3840 3850

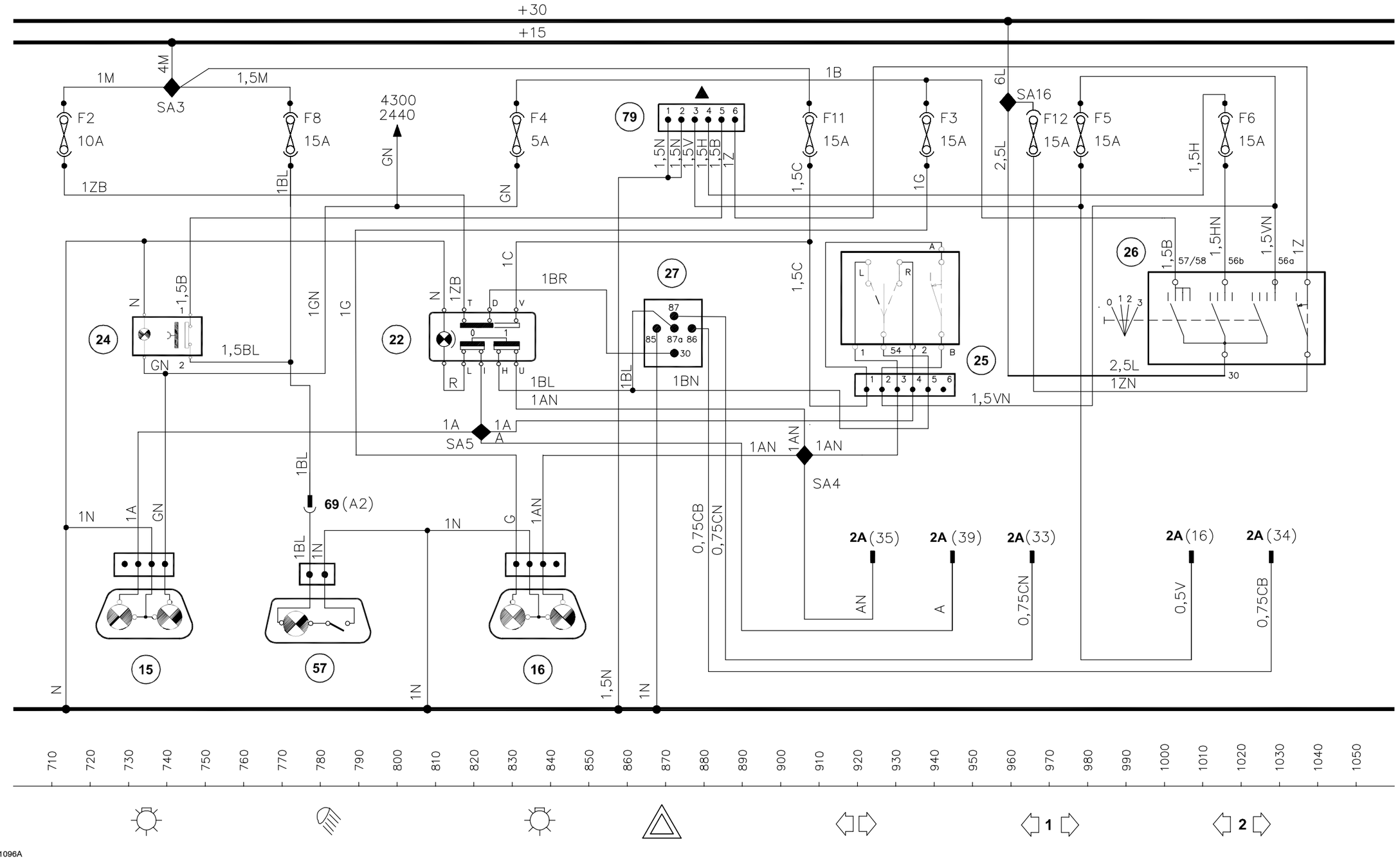
MPM1083A

POWER SHUTTLE VERSION (ISO-NORTH AMERICA)

INDEX TO ELECTRICAL CIRCUIT

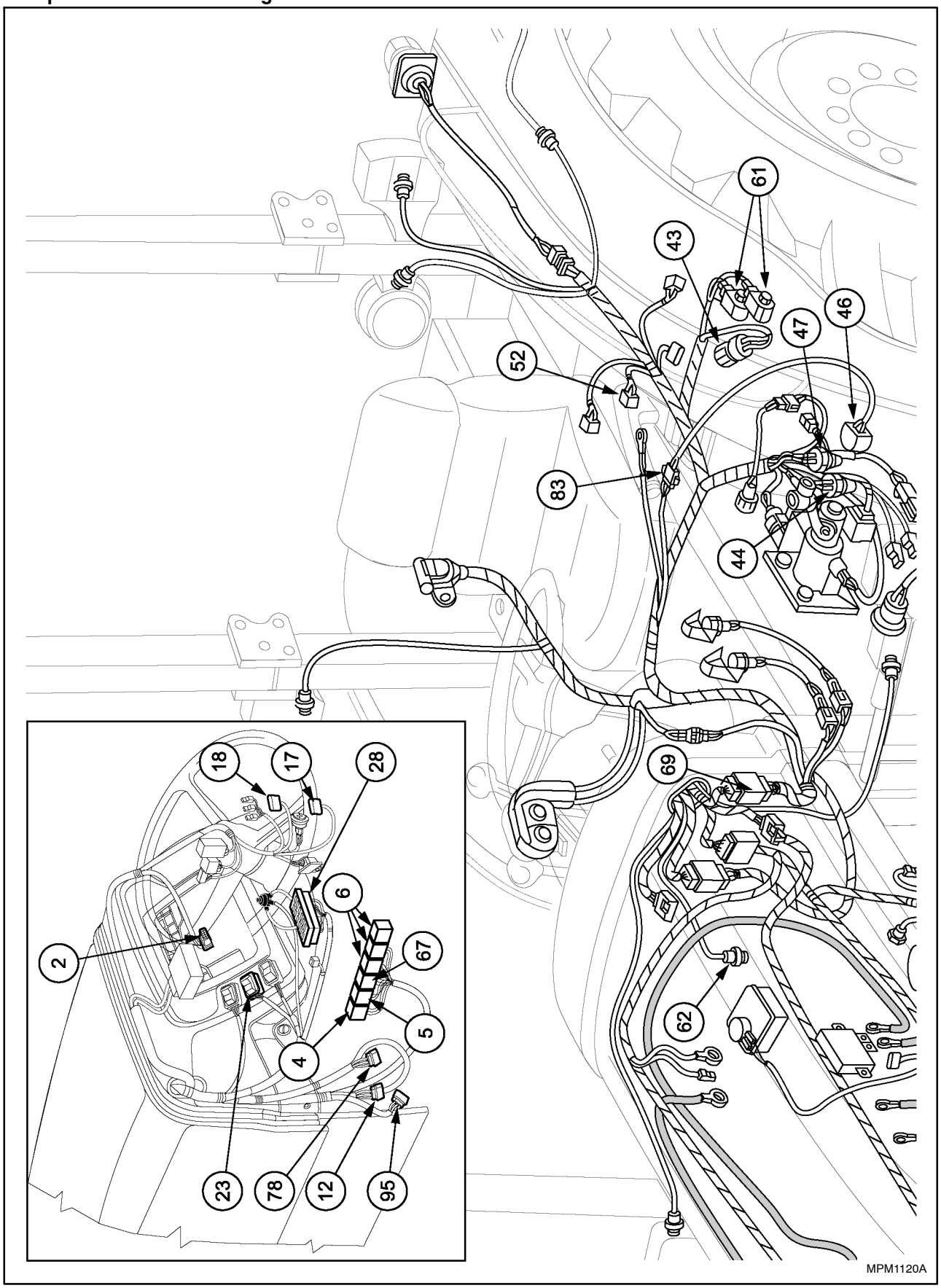
INDEX TO WIRING HARNESSES

FRONT LIGHTS CIRCUIT - DIAGRAM B/2

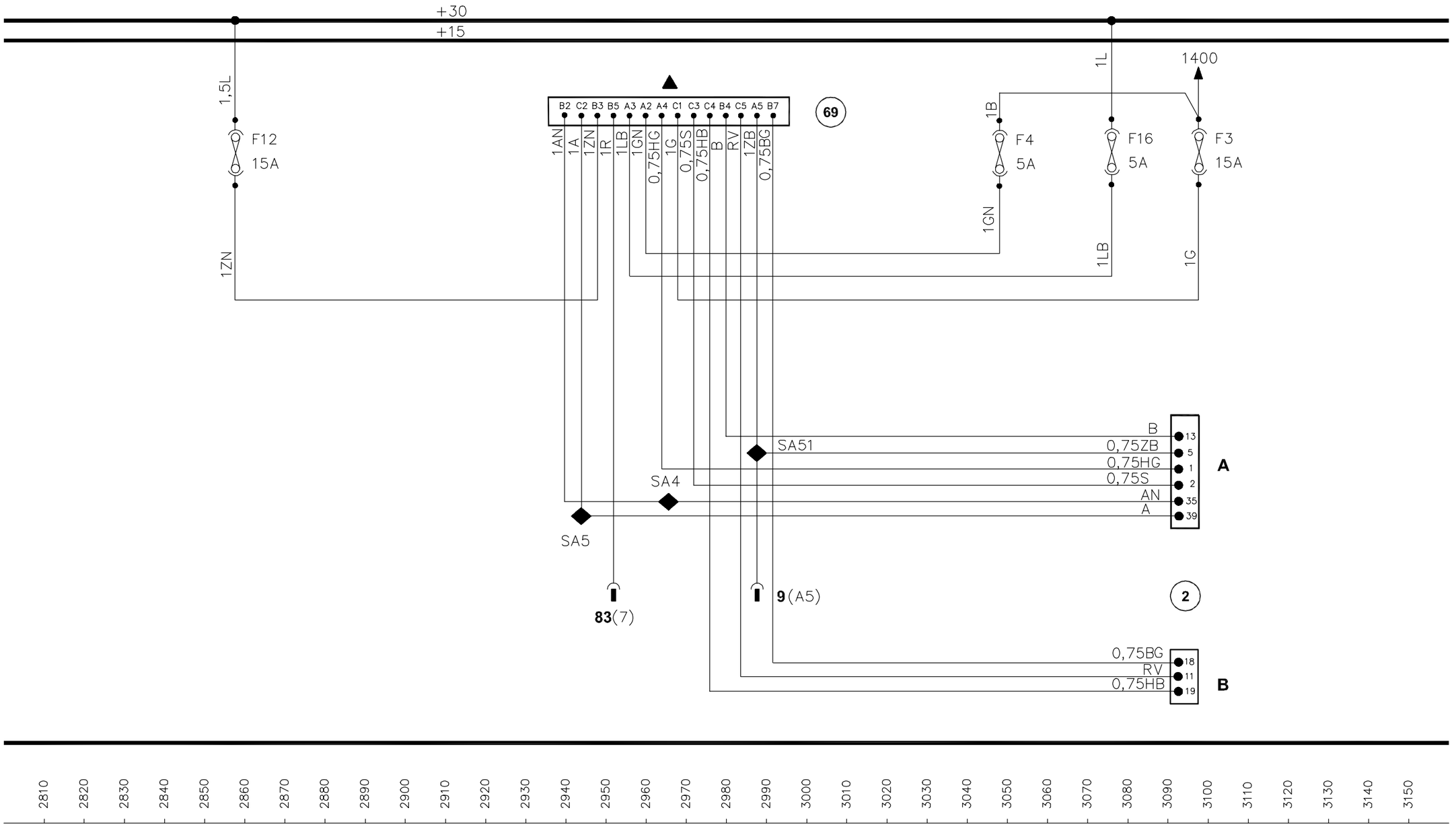


MPM1096A

Component Locations – Diagrams E and F

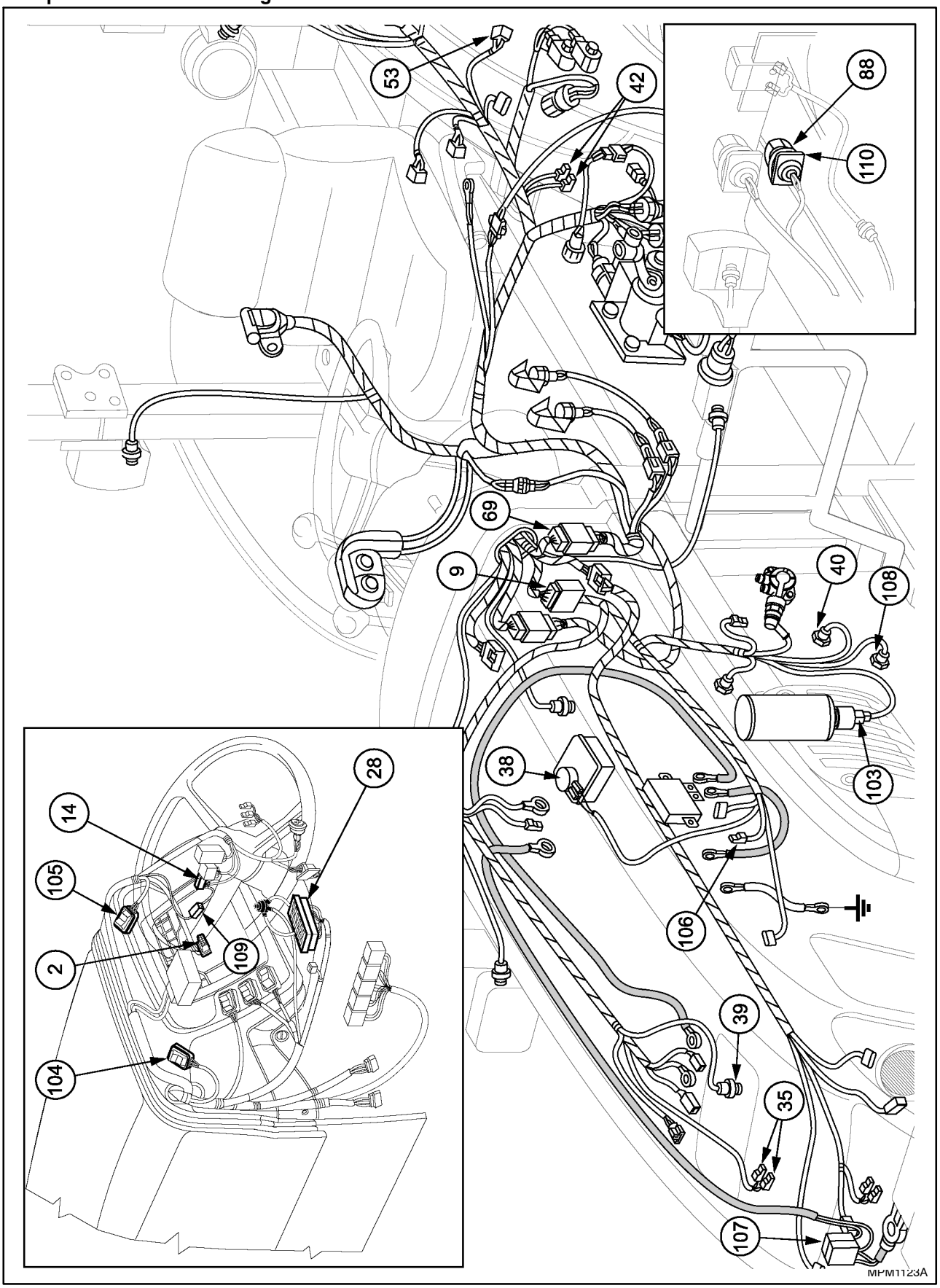


TRANSMISSION CIRCUIT (Version ISO) - DIAGRAM H



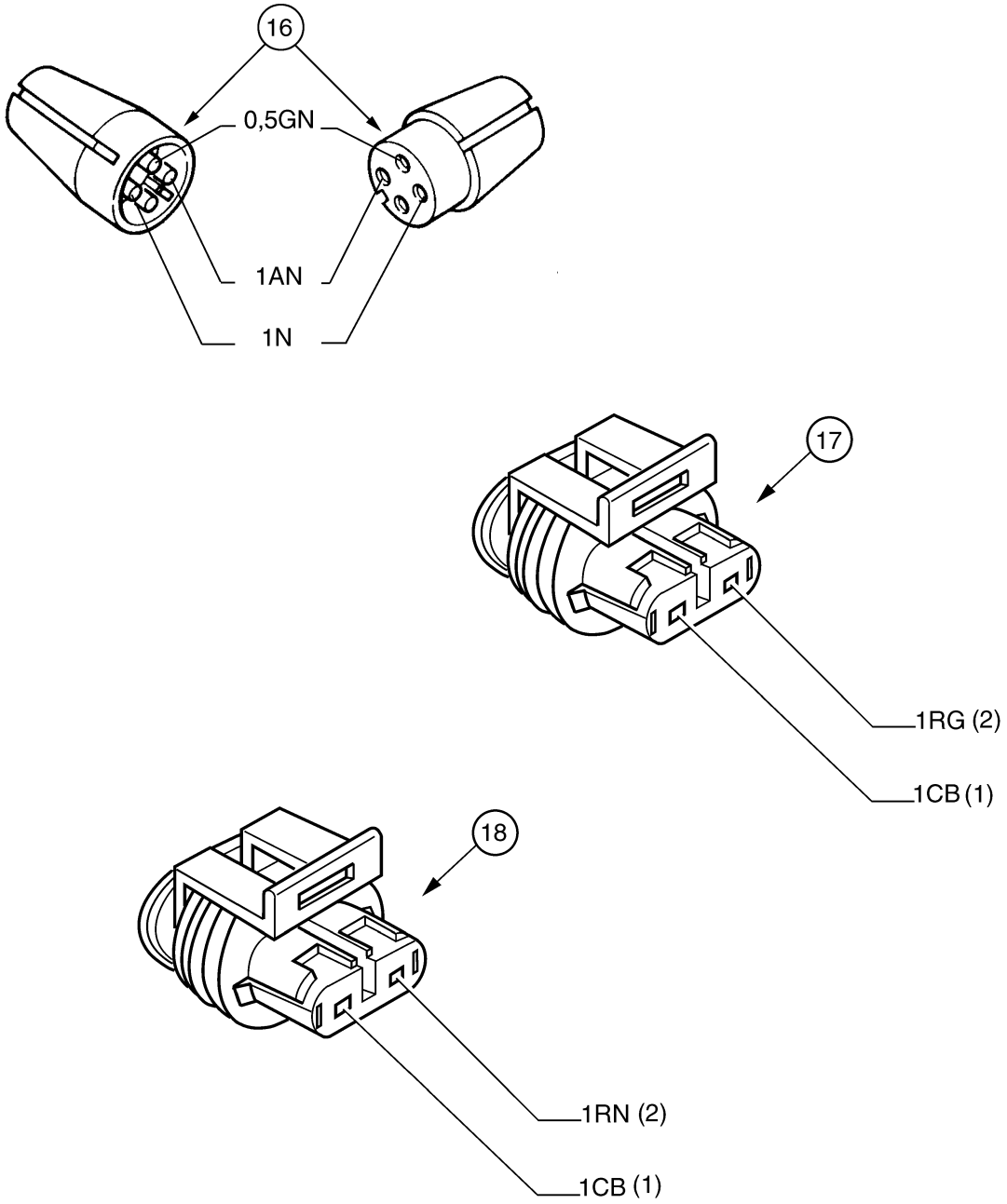
MPM1102A

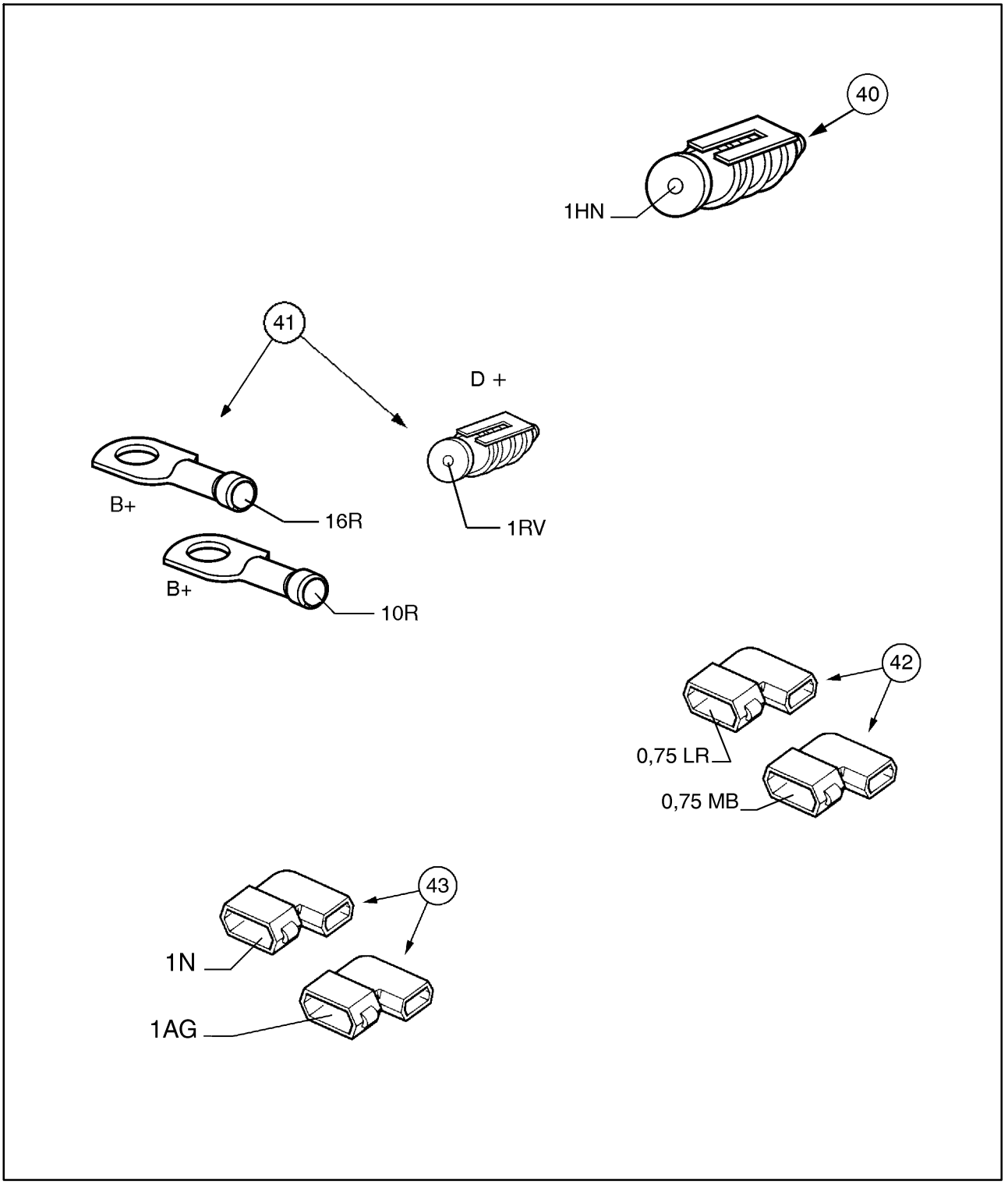
Component Locations – Diagram N

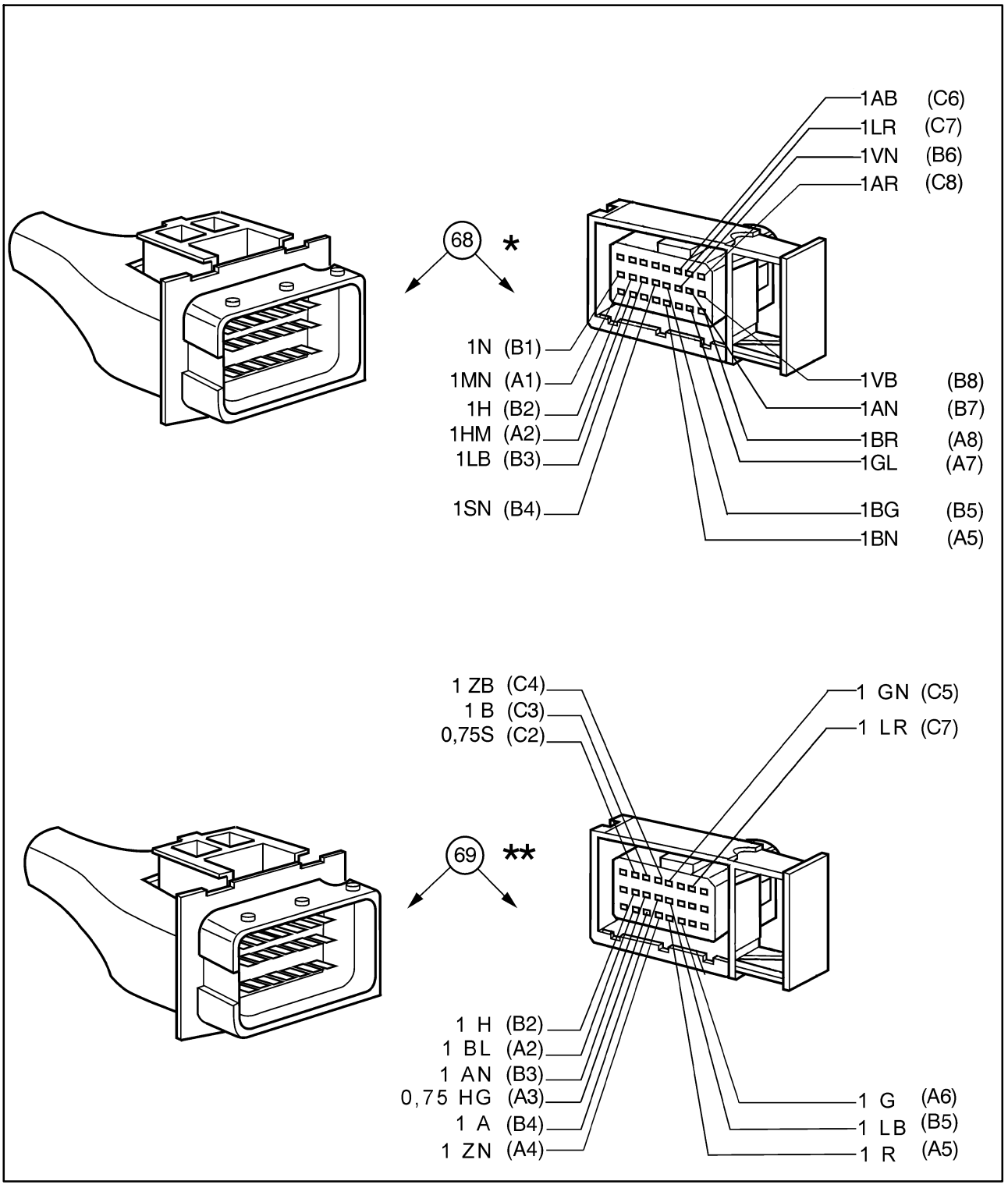


ELECTRICAL CIRCUIT COMPONENTS (Continued)

50 Splitter switch.
51 PTO indicator switch.
52 Parking brake switch.
53 Fuel gauge switch.
54 RH tail light
55 8A power socket.
56 7-pole connection.
57 Work light.
58 Number plate light.
59 LH tail light.
60 Rear ground
61 Trailer brake solenoid valves.
62 Trailer brake safety pressure switch.
63 LH two-faced headlight
64 RH two-faced headlight
65 Seat switch
67 Brake lights relay
68 Transmission connection
69 Transmission connection
70 G1 gear switch
71 C1 gear switch
72 Transmission oil temperature sensor
73 Transmission oil pressure switch
74 HIGH clutch control solenoid valve
75 LOW clutch control solenoid valve
76 Speed sensor
77 Dump solenoid valve
78 Trailer brake connection (4 PIN)
79 Front lights connection (6 PIN)
81 Operator safety circuit buzzer timer
83 4WD circuit connection
84 Connection for 7-pole connection
85 Power Shuttle control unit
86 Clutch pedal switch
87 Clutch pedal sensor
88 30A power socket (ISO)
89 Power Shuttle control unit troubleshooting connection
90 Power Shuttle control lever
91 Solenoid valve to cut out starting advance, depending on temperature
92 Starting advance thermometric cut-out switch
93 Left-hand front headlight (North America version)
94 Right-hand front headlight (North America version)
95 4WD circuit connection (12 PIN)
98 Inlet Grid Heater
99 Grid heater relay
100 Grid-heater control unit


16
0,5GN
1AN
1N
17
1RG (2)
1CB (1)
18
1RN (2)
1CB (1)


40
1HN
41
D +
B+
16R
1RV
B+
10R
42
0,75 LR
0,75 MB
43
1N
1AG



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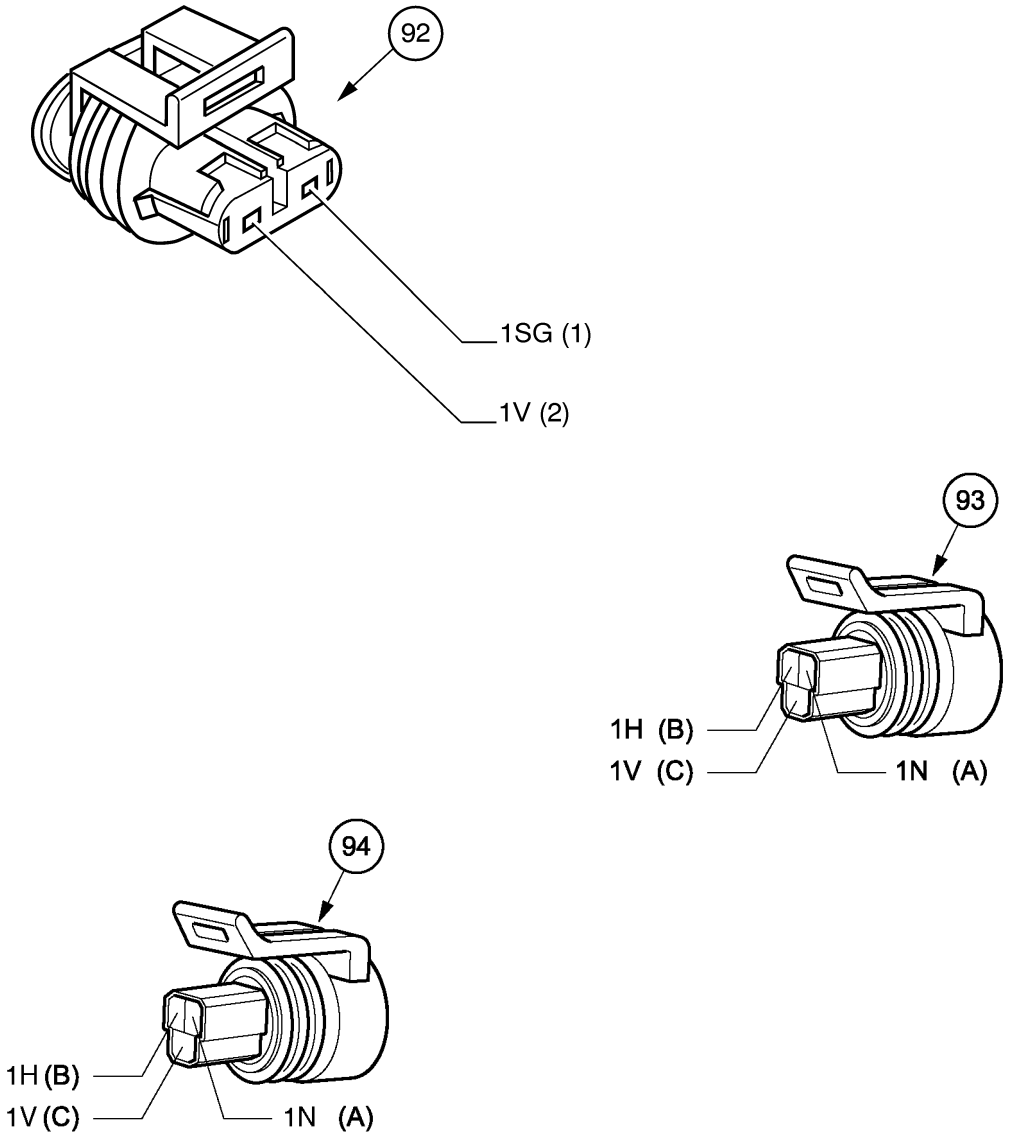
* Version with Power Shuttle (ISO - North America)

** Standard version (ISO)


92
1SG (1)
1V (2)
93
1H (B)
1V (C)
1N (A)
94
1H (B)
1V (C)
1N (A)

2021 - TRANSMISSION HARNESS DISCONNECTED

Control Module: Power Shuttle control unit

NOTE: *The tractor is not operative.*

Possible failure mode:

1. Faulty connectors
2. Wiring fault

Remedies:

NOTE: *When the cause of the fault code has been rectified, clear the fault code and test the system for normal operation.*

1. Check the transmission harness connector **68**.

   A. Ensure that the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

For the connectors, components and wiring diagrams affected, see (Connectors 68, sect. 55, chap. 6, page 33), (Components, diagram I-L-M. sect. 55, chap. 5, page 97), (Diagram I, sect. 55, chap. 5, page 99).

2059 – SHUTTLE LEVER SWITCHES DISAGREE

Control Module: Power Shuttle control unit

NOTE: *Open circuit between the neutral switch and the control unit, or the shuttle lever assembly is faulty. The control unit gives code N (put the shuttle lever into neutral) and transmission disabled.*

Possible failure mode:

1. Faulty connector
2. Faulty shuttle lever assembly
3. Wiring fault
4. ECU fault

Remedies:

NOTE: *When the cause of the fault code has been rectified, clear the fault code and test the system for normal operation.*

1. Check the other error codes.

   A. If error codes **2070**, **2071**, **2072** or **2073** are displayed, continue to these tests.

   B. If no other error code is displayed, continue to step 2.

2. Check shuttle lever connector **90** and controller connector **85**.

   A. Ensure that the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

3. Check the shuttle lever forward switch.

   A. Disconnect the shuttle lever connector **90**. Move the shuttle lever onto forward gear and measure the resistance in the connector:
   90 between pin **1** and pin **2**
   If the resistance indicated is not approximately 0.56 kOhm, and then in neutral approximately 2.76 kOhm, remove and replace the shuttle lever assembly.

   B. If the shuttle lever switch is okay, continue to step 4.

4. Check the shuttle lever reverse gear switch.

   A. Move the shuttle lever to reverse and measure the resistance in the connector:
   90 between pin **1** and pin **2**
   If the resistance indicated is not approximately 0.56 kOhm, and then in neutral approximately 2.76 kOhm, remove and replace the shuttle lever assembly.

   B. If the shuttle lever switch is okay, continue to step 5.

5. Check for a short between the wires carrying the forward and reverse gear switch signal to the control unit.

   A. Disconnect the connector of the control unit **85**. Check for a short on the connector between:
   85 pin **9** wire **(AN)** and **85** pin **15** wire **(A)**
   If a short circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, remove and replace the shuttle lever assembly. If the error is repeated, remove and replace the control unit.

For the connectors, components and wiring diagrams affected, see (Connectors 85 and 90 sect. 55, chap. 6, pages 40 and 42), (Components, diagram I–L–M. sect. 55, chap. 5, page 97), (Diagram I, sect. 55, chap. 5, page 99).

2353 - CLUTCH B SOLENOID SHORTED TO + 12 V

Control Module: Power Shuttle control unit

NOTE: *The tractor only runs forwards.*

Possible failure mode:

1. Wiring fault
2. ECU fault

Remedies:

NOTE: *When the cause of the fault code has been rectified, clear the fault code and test the system for normal operation.*

1. Check the clutch B solenoid valve connector **74**, the main connector **68**, and the connectors of the control unit **85**.

   A. Ensure that the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2

2. Check for a short to +12 volts.

   A. Disconnect connector **75**. Turn the key ON. Measure the voltage between connector:
   74 pin **A**, wire **(BR)** and **ground**
   74 pin **B**, wire **(BN)** and **ground**
   If voltage is indicated, turn the ignition key OFF. Disconnect the connector of the control unit **85**. Turn the key ON. If a voltage is still indicated, repair or replace the harness as required.

   B. If no voltage is indicated, download the correct level of software. If the error is repeated, remove and replace the control unit.

For the connectors, components and wiring diagrams affected, see (Connectors 68, 74 and 85 sect. 55, chap. 6, pages 33, 37 and 40), (Components, diagram I-L-M. sect. 55, chap. 5, page 97), (Diagram I, sect. 55, chap. 5, page 99).

2432 - OIL PRESSURE SWITCH JAMMED OFF

Control Module: Power Shuttle control unit

NOTE: *Fault that the control unit highlights a few seconds after the end of the start procedure, the tractor works (during the start procedure the tractor does not work).*

Possible failure mode:

1. Switch faulty.
2. Wiring fault.
3. ECU fault.

Remedies:

NOTE: *When the cause of the fault code has been rectified, clear the fault code and test the system for normal operation.*

1. Check the pressure switch connector **73**, the main connector **68** and the connector of the control unit **85**.

   A. Ensure that the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the transmission pressure switch.

   A. Disconnect the switch connector **73**. Check continuity with a tester between:
   73 pin **1** and pin **2**
   As it is a normally closed switch, with a lack of pressure there should be continuity. If there is no continuity, replace the switch.

   B. If the switch is okay, continue to step 3.
3. Check for an open circuit.

   A. Disconnect the connector of the control unit **85**, test continuity between:
   85 pin **20**, wire **(SN)** and **73** pin **1**, wire **(SN)**
   If an open circuit is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level software. If the error is repeated, remove and replace the control unit.

For the connectors, components and wiring diagrams affected, see (Connectors 68, 73 and 85 sect. 55, chap. 6, pages 33, 36 and 40), (Components, diagram I-L-M. sect. 55, chap. 5, page 97), (Diagram I, sect. 55, chap. 5, page 99).

14011 - ENGINE SPEED SENSOR SHORTED TO POSITIVE OR CIRCUIT OPEN

Control Module: Control panel control unit (ADIC)

Possible failure mode:

1. Faulty connector
2. Faulty engine speed sensor
3. Wiring fault
4. Faulty analog-digital instrument cluster (ADIC)

Remedies:

NOTE: *When the cause of the fault code has been rectified, clear the fault code and test the system for normal operation.*

1. Check the engine speed sensor connector **108**, instrument cluster (ADIC) connector **2A** and the main connector **9**.

   A. Ensure that the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the engine speed sensor.

   A. Check the connector:
   108 between pins **1** and **2**.
   If the indicated resistance is not between 850 and 950 Ohm at 20 degrees centigrade, remove and replace the sensor

   B. If the resistance indicated is okay, continue to step 3.

3. Check for an open circuit.

   A. Disconnect connectors **108** and **2A**. Check between:
   108 pin **1**, wire **(ZB)** and **2A** pin **5**, wire **(ZB)**
   108 pin **2**, wire **(HV)** and **2A** pin **7**, wire **(HV)**
   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicate, continue to step 4.

4. Check for short to a positive voltage.

   A. Turn the key start ON. Measure the voltage between the connector:
   108 pin **2**, wire **(HV)** and **ground**
   If a short to positive is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level software. If the fault occurs again, remove and replace the control panel (ADIC).

For the connectors, components and wiring diagrams affected, see (Connectors 2A, 9 and 108 sect. 55, chap. 6, pages 7 (P.S. ISO), 9 (P.S. NASO), 12 and 48], (Components, diagram N sect 55, chap. 5, page 105), (Diagram N, sect. 55, chap. 5, page 107).

14092 - TRANSMISSION OUTPUT SPEED SHORTED TO GROUND

Control Module: Control panel control unit (ADIC)

Possible failure mode:

1. Faulty connector
2. Faulty transmission speed sensor
3. Wiring fault
4. Faulty analog-digital instrument cluster (ADIC)

Remedies:

NOTE: *When the cause of the fault code has been rectified, clear the fault code and test the system for normal operation.*

1. Check the transmission speed sensor connector **76**, control panel connector (ADIC) **2A** and **2B**, main connector **69**.

   A. Ensure that the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.
2. Check the PTO speed sensor.

   A. Disconnect connector **76**. Measure the resistance in the connector:
   76 between pins **1** and **2**
   If the indicated resistance is not approximately 680 Ohm at 20 degrees centigrade, remove and replace the PTO speed sensor.

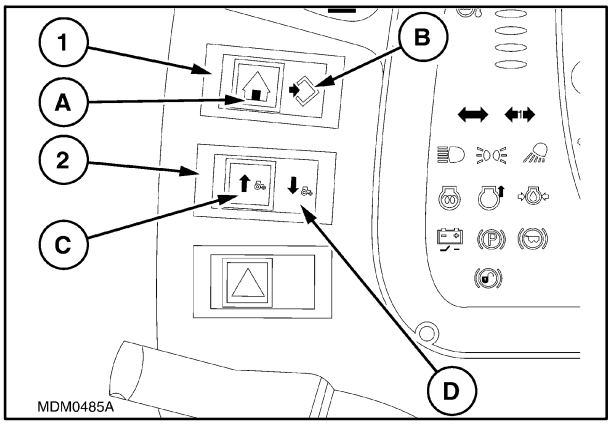
   B. If the speed sensor is okay, continue to step 3.
3. Check for a short to ground.

   A. Disconnect the connector **2B**. Check for a short to ground between connector:
   76 pin **2**, wire **(VN)** and **ground**
   If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level software. If the fault occurs again, remove and replace the control panel (ADIC).

For the connectors, components and wiring diagrams affected, see (Connectors 2A, 2B, 69 and 76 sect. 55, chap. 6, pages 7 and 34 (P.S. ISO), 9 and 35 (P.S. NASO) and 37], [Components, diagram G-H(P.S. ISO) and I-L-M (P.S. NASO) sect 55, chap. 5, pages 91 and 97], (Diagram G and M, sect. 55, chap. 5, pages 93 and 103).

4. Now, using the switch (2), it is now possible to select the module to examine. The modules are:
   ZA = Control panel.
   SB = Power Shuttle.



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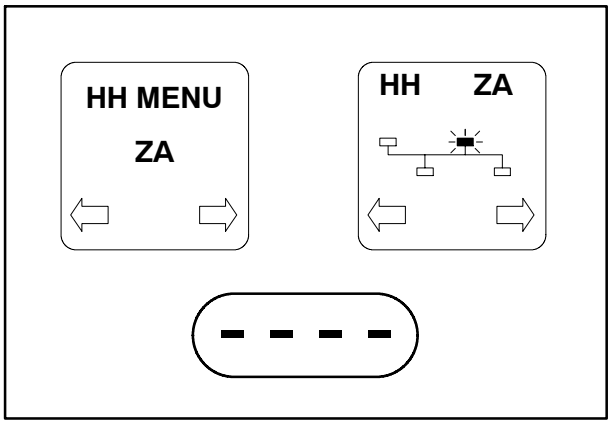
5. It is now possible to select the desired HH MENU by pressing the switch (2) into positions (C) to go forward or (D) to go back and lastly by pressing the switch (1) into position (B) to access it.

- The HH MENU that will be displayed are:
  - **H1** Displays all the calibration procedures.
  - **H2** Displays all the calibration values.
  - **H3** Options.
  - **H4** Displays the software revision level.
  - **H5** Switch operation test.
  - **H7** Service procedures,
  - **H8** Deletes all the stored data.
  - **H9** Voltmeter.
  - **HB** Displays the stored error codes.
  - **HC** Deletes all the stored error codes.
  - **HE** Displays all the speed inputs.
  - **HF** Displays the hardware information.



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If the same circuit has two consecutive status changes, the message on the display (2) changes to “d0” when the second change occurs. This menu also checks compatibility problems on the Forward, Neutral and Reverse push-buttons.

The neutral pushbutton cannot be checked separately with the number d, as the operator cannot cause a status change on the neutral switch without simultaneously changing the Forward or Reverse switches.

If the Shuttle lever is moved with the clutch raised, the neutral switch will also create a status change on the 12VD line used to control the clutch pedal.

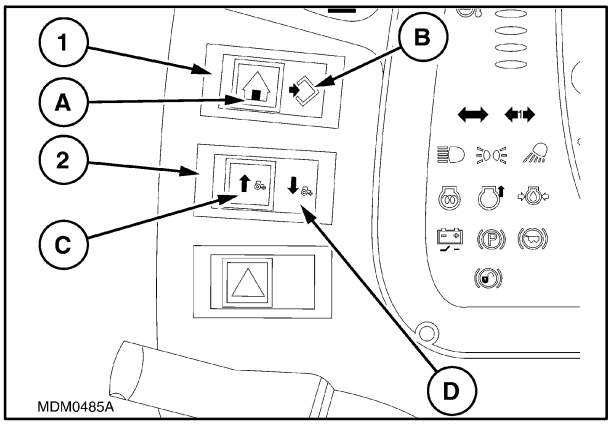
As a result of the interaction between these push-buttons, consider the following:

- The Forward and Reverse push-buttons must be checked with the clutch pedal lowered.
- The clutch pedal push-button must be checked with the Shuttle lever engaged.
- If the starter key (1) is turned to position C to start the engine, with the Shuttle lever in the neutral position and the clutch pedal lowered (normal starting procedure), a fault on the pushbuttons may occur (only in the diagnostics mode).

When there is a status change on the clutch pedal push-button (the pedal is released), the clutch pedal potentiometer calibration values are checked, together with push-button adjustment.

To check efficiently, proceed as follows:

1. Select the **H5** menu, as described on page 2 and with the clutch pedal fully raised.
2. Fully press down the clutch pedal and hold down for at least 1 second.
3. Release the clutch pedal slowly (taking at least 2 seconds to move from the pedal pressed *to the* pedal released *position*.



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SECTION 90 - PLATFORM, CAB, BODYWORK

Chapter 1 - Bodywork

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