SERVICE MANUAL

LB75.B
LB90.B
LB95.B
LB110.B
LB115.B 4WS
BACKHOE LOADERS

NEW HOLLAND
CONSTRUCTION

6036702103

CHAPTER 7 - Component Testing

SECTION 82 - LOADER

CHAPTER 1 - Loader Frame, Controls and Buckets for 2 and 4 Wheel Drive Only

CHAPTER 2 - Loader Frame, Controls and Buckets for 4 Wheel Steer Only

SECTION 84 - BACKHOE

CHAPTER 1 - Backhoe, Boom and Dipperstick assembly

MINIMUM HARDWARE TIGHTENING TORQUES

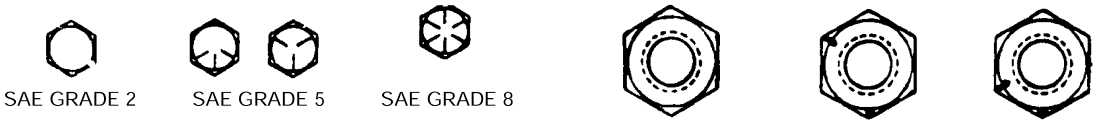
IN FOOT POUNDS - LBF. FT (NEWTON-METRES - Nm) FOR NORMAL ASSEMBLY APPLICATIONS

INCH 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	55* (6.2)	72* (8.1)	86* (9.7)	112* (13)	121* (14)	157* (18)	61* (6.9)	86* (9.8)	1/4
5/16	115* (13)	149* (17)	178* (20)	229* (26)	250* (28)	324* (37)	125* (14)	176* (20)	5/16
3/8	17 (23)	22 (30)	26 (35)	34 (46)	37 (50)	48 (65)	19 (26)	26 (35)	3/8
7/16	27 (37)	35 (47)	42 (57)	54 (73)	59 (80)	77 (104)	30 (41)	42 (57)	7/16
1/2	42 (57)	54 (73)	64 (87)	83 (113)	91 (123)	117 (159)	45 (61)	64 (88)	1/2
9/16	60 (81)	77 (104)	92 (125)	120 (163)	130 (176)	169 (229)	65 (88)	92 (125)	9/16
5/8	83 (112)	107 (145)	128 (174)	165 (224)	180 (244)	233 (316)	90 (122)	127 (172)	5/8
3/4	146 (198)	189 (256)	226 (306)	293 (397)	319 (432)	413 (560)	160 (217)	226 (306)	3/4
7/8	142 (193)	183 (248)	365 (495)	473 (641)	515 (698)	667 (904)	258 (350)	364 (494)	7/8
1	213 (289)	275 (373)	547 (742)	708 (960)	773 (1048)	1000 (1356)	386 (523)	545 (739)	1

NOTE: Torque values shown with * are inch pounds.

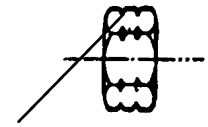
IDENTIFICATION
CAP SCREWS AND CARRIAGE BOLTS



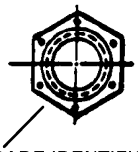
SAE GRADE 2 | SAE GRADE 5 | SAE GRADE 8

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

FAULT FINDING

IMPORTANT: When effecting a repair the cause of the problem must be investigated and corrected to avoid repeat failures.

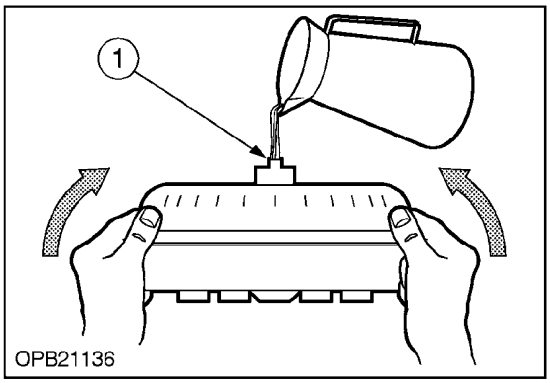
The following table lists problems and their possible causes with recommended remedial action.

PROBLEM	POSSIBLE CAUSES	CORRECTION
1. Low stall speed	Hydraulic clutch not releasing.	Replace Torque Convertor
	Stator support broken.	Replace Torque Convertor
	Defective torque converter.	Replace Torque Convertor
	Low engine power.	Check and correct output
2. High stall speed	Hydraulic clutch not applying or is slipping.	Replace
	Low line pressure.	Check pump output
	Sealing rings on rear input shaft broken.	Replace seals
	Defective torque converter.	Replace Torque Convertor

OVERHAUL

NOTE: To remove the torque convertor refer to the transmission section 21 000 for disassembly procedure.

The torque converter, is a welded unit and cannot be disassembled. The only maintenance performed on the converter, other than the stall test, is cleaning and visual inspection. A commercial torque converter cleaner may be used to clean the converter. However, if a commercial cleaner is not available, the converter should be cleaned as outlined below.



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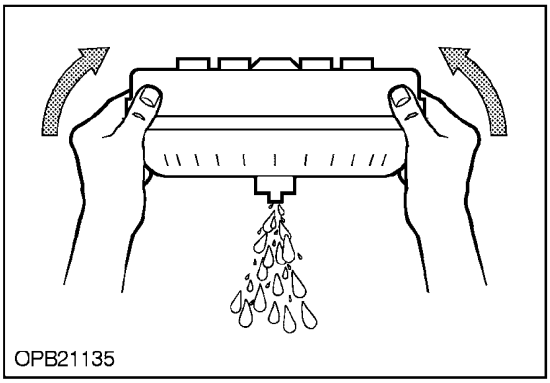
1. Drain as much oil as possible from the hub of the converter by tilting the converter in all directions.
2. Fill the converter about half full, through the hub (1), with paraffin base solvent or any cleaning solvent specified for cleaning transmissions.
3. Plug the opening in the hub, then circulate the solvent inside the converter by rotating and shaking.
4. Drain the solvent from the converter.
5. Repeat Steps 1 to 4, as required, until the solvent that is drained from the converter is clean.



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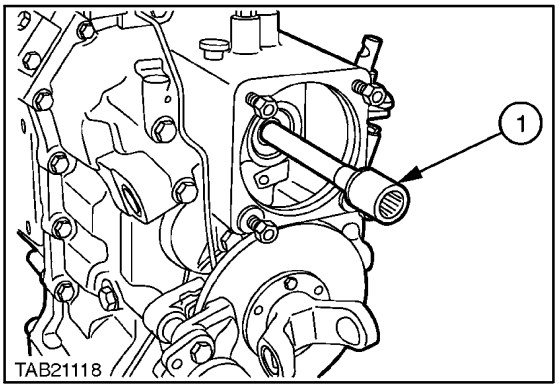
CO-AXIAL DRIVE VEHICLE HYDRAULIC PUMP (Op. 21 146)

A solid shaft connects the flywheel (via the torque converter impeller) to the vehicle hydraulic pump input shaft.

The pump drive shaft passes through the tubular input shaft and is supported at the rear by a bush. Accordingly, the main pump will run at engine speed regardless of the ratio or direction of the transmission.

An integral strainer in the transmission sump and spin on filter mounted to the left of the transmission at the top ensure that the oil remains clean between service intervals.



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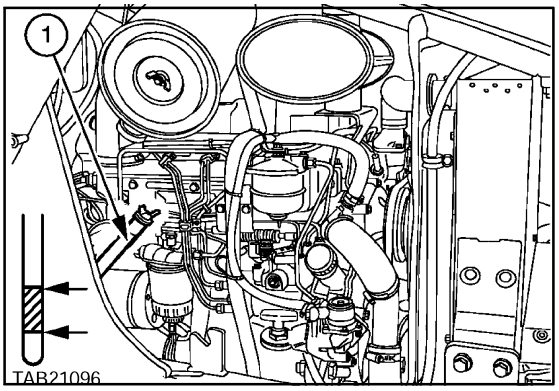
The dipstick/oil filler tube (1) is used for monitoring and maintenance of the oil level, in the transmission.



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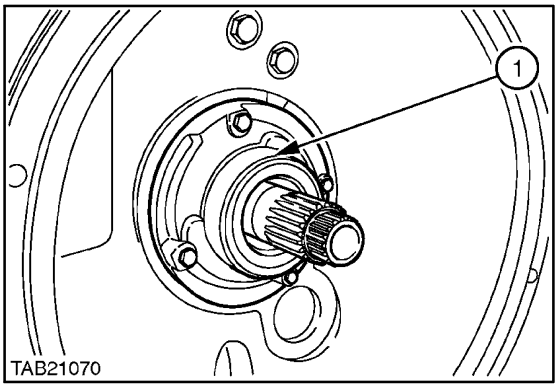
TRANSMISSION HYDRAULIC PUMP OIL SUPPLY (OP. 21 102)

The transmission case serves as an oil reservoir for the torque converter and clutch assemblies.

An integral hydraulic oil pump situated in the bell draws oil from the transmission sump to provide a pressurised flow which is continuously cooled by an external cooler.

Oil is picked up from the sump, via an internal strainer, through the inlet section of the pump plate by the action of the rotors, and is forced through the outlet section of the pump plate through the spin on pressure filter to the oil distributor.

A temperature sender provides a signal to the instrument panel warning light should the transmission oil become to hot.



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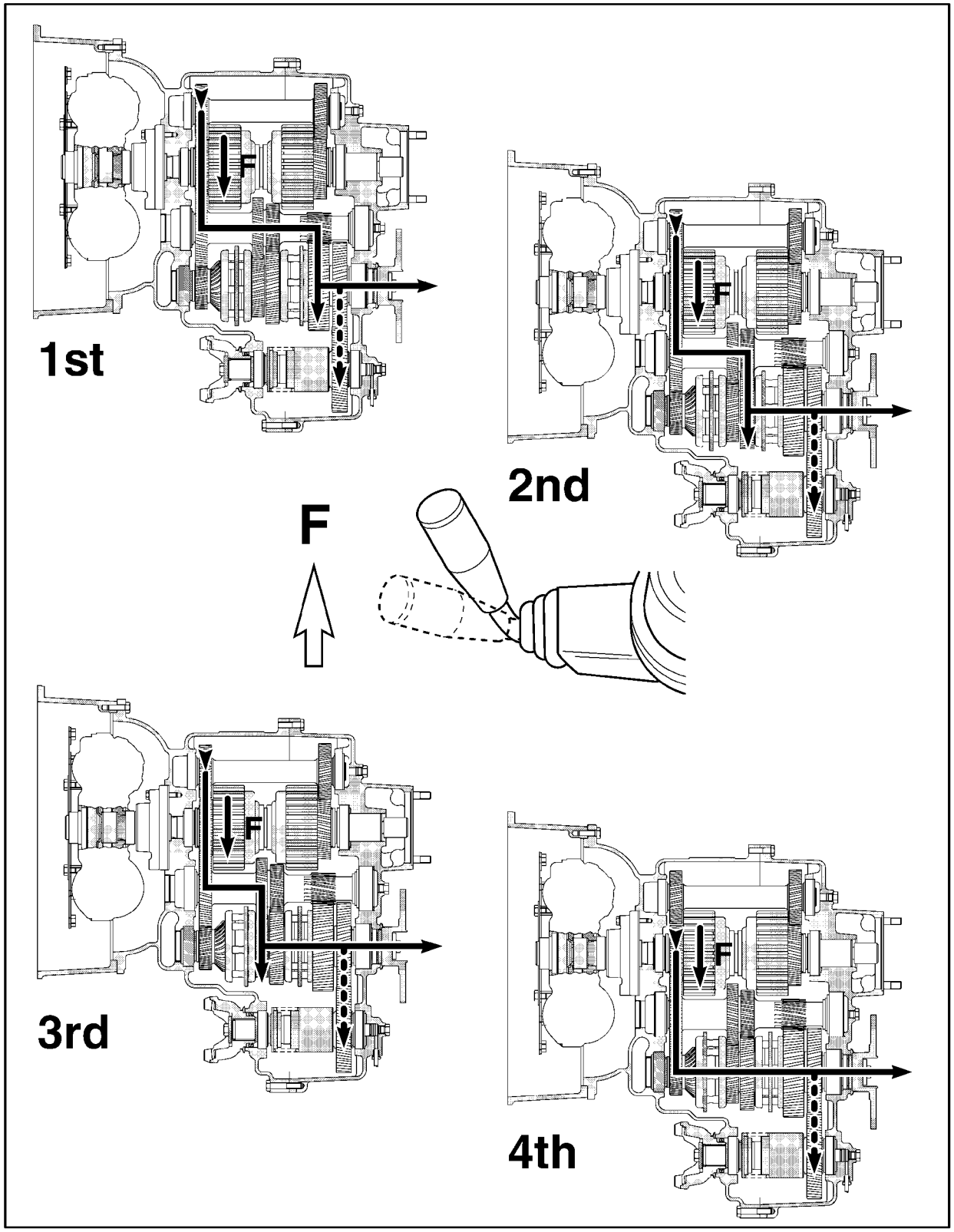
TRANSMISSION POWER FLOWS (FOUR WHEEL DRIVE VERSION SHOWN)



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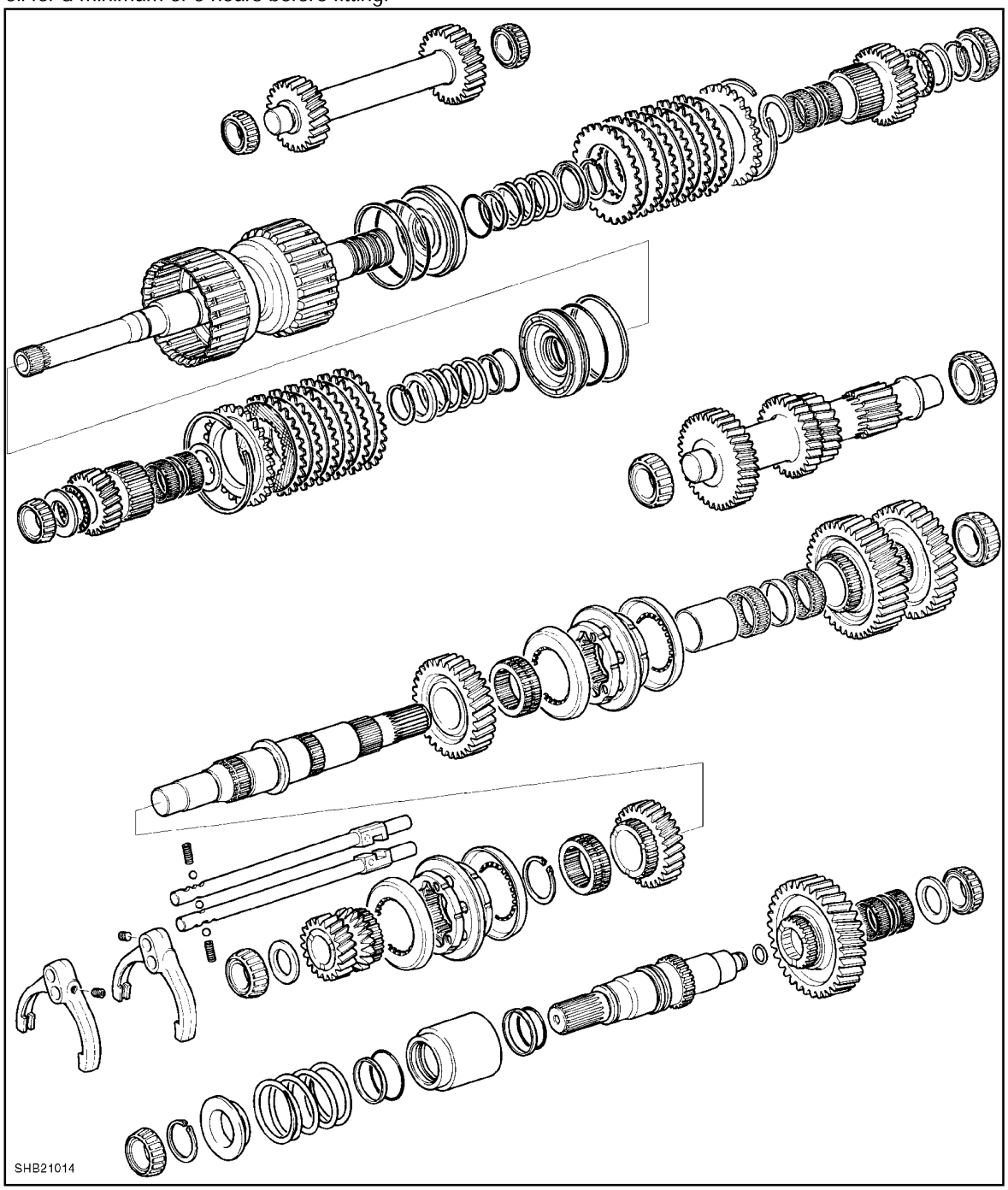
TRANSMISSION OVERHAUL

IMPORTANT: Before commencing any dismantling procedure it is essential to thoroughly clean the transmission and work area. If new clutch friction discs are to be installed it will be necessary to soak the discs in clean new oil for a minimum of 3 hours before fitting.



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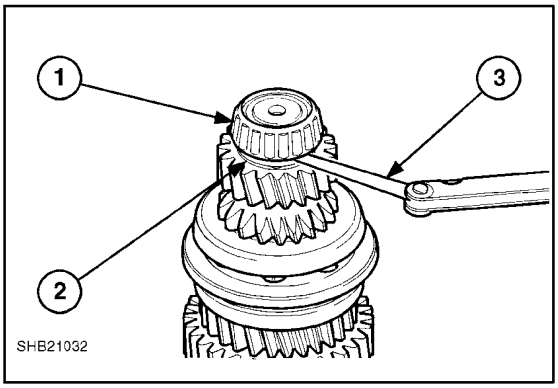
4x4 Power Shuttle

3. When the bearing is fully seated ensure the clearance between the 4th gear to washer is between 0.05–0.56mm (0.008–022 in).



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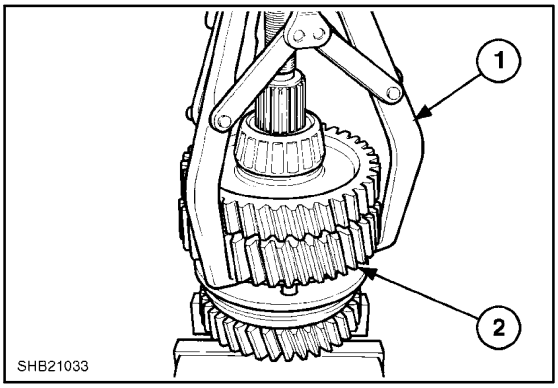
OUTPUT SHAFT DISASSEMBLY (REAR OUTPUT SHAFT END)

IMPORTANT: When using a bearing puller be very careful to ensure it does not touch the tip of the gear teeth as they may become chipped or broken.

1. Support the shaft vertically (front support end) in a soft jawed vice and attach a 3 legged puller to the underside of the 1st gear, Remove the bearing, output gear and 1st gear from the shaft.



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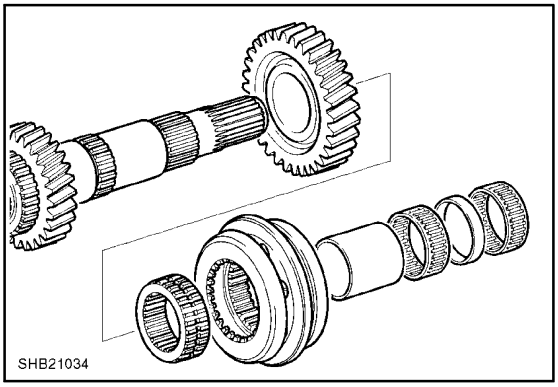
2. With the 1st gear removed withdraw the needle bearing, spacer, 2nd needle bearing, sleeve, bulk ring synchronizer, hub sleeve and 2nd gear. Inspect for scoring wear marks and or discolouration, replace suspect parts as necessary.



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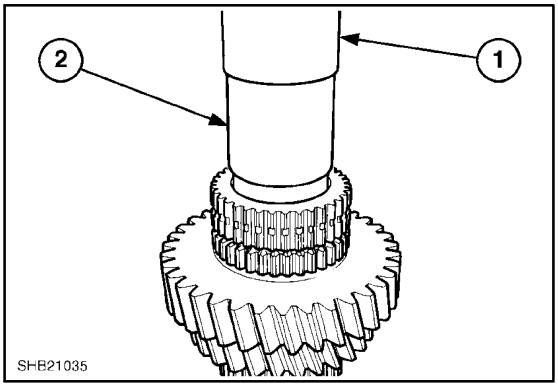
OUTPUT SHAFT RE-ASSEMBLY (REAR OUTPUT SHAFT END)

With the shaft supported vertically re-assembly is in reverse order of disassembly, ensure all parts are liberally coated in clean transmission oil before fitting.

3. Refit the 2nd gear to the shaft, along with the hub sleeve. Fit the spacer onto the shaft and using a sleeve tool press the sleeve down to the shoulder.



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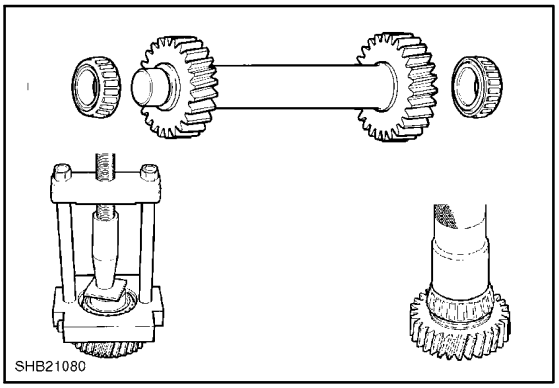
REVERSE IDLER SHAFT- DISASSEMBLY

1. The idler shaft support bearings can be removed by using a bearing puller. Inspect for scoring wear marks and or discolouration, replace suspect parts as necessary.
2. To refit the bearings use a press and 35mm tool



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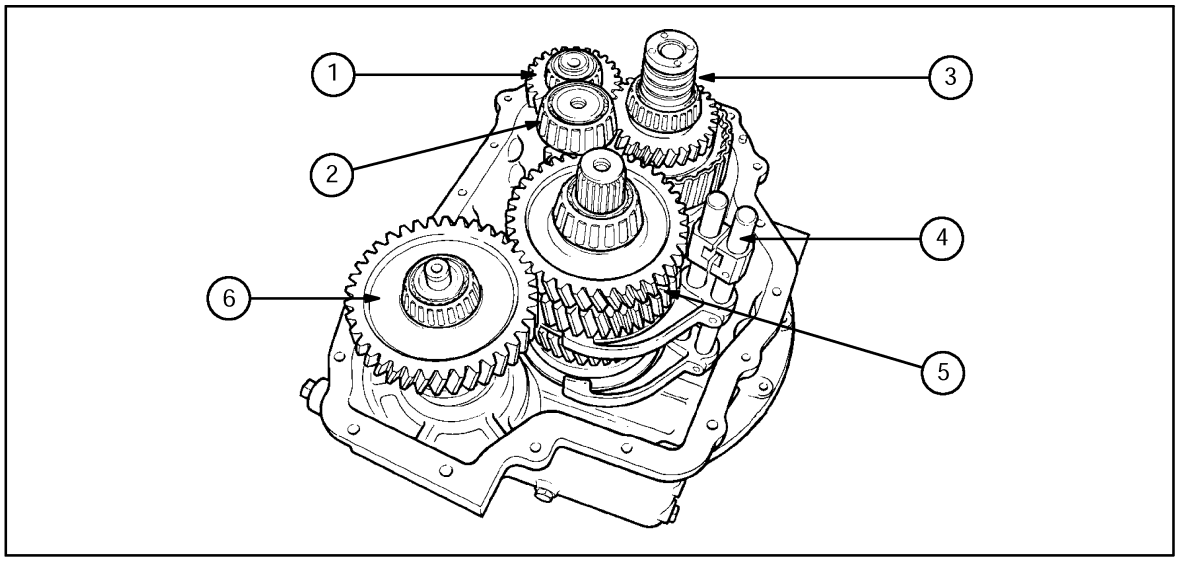
GEAR TRAIN RE-ASSEMBLY



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Gear train Re-assembly

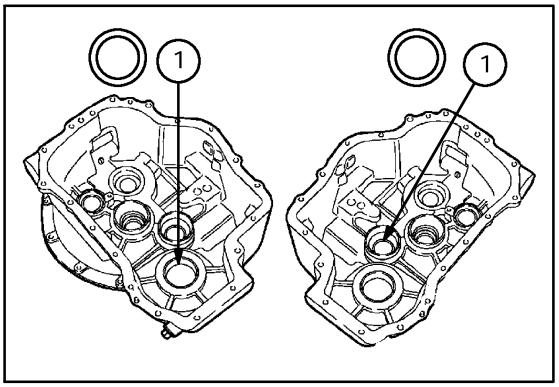
1. Reverse Idler Shaft
2. Counter Shaft
3. Input or Primary Shaft
4. Gear Selection Shafts and Forks
5. Output Gear Shaft
6. Front Wheel Drive Shaft (where fitted)

Transmission Re-assembly

IMPORTANT: Prior to re-assembly of the transmission ensure all parts are clean and oiled.

Where Four Wheel Drive is fitted change the lipped oil seal (1) in the front cover while it is disassembled. Push out the old seal and push in a new seal to seat on the shoulder.

Change the double lipped oil seal in the rear cover on the output shaft (2) while it is disassembled. Push out the old seal and push in a new seal to seat on the shoulder and fill the cavity between the seal double lips with a silicone grease.



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DESCRIPTION AND OPERATION

The transmission consists of a torque converter, an internal gerotor-type hydraulic pump, a solenoid control valve assembly, three speed / directional clutches, two range clutches and one four wheel drive clutch. A parking brake is also fitted to the transmission.

TRANSMISSION CONTROL

The transmission is operated via a control lever mounted on the left hand side of the steering column. This includes the processor which monitors and controls the clutch engagement. Directional changes are made by moving the lever forward and backwards, gears are selected by twisting the lever anti clock wise for a higher gear, and clock wise for a lower gear. The lever must always be twisted after a direction is selected if the lever has been in neutral for longer than 3 seconds.

Kick down from 2nd to 1st is achieved by depressing the button on the end of the control lever. This will only operate when the transmission is in 2nd gear.

Transmission disconnect is operated by depressing the red button on the loader lever, once the button is released the transmission will drive.

NOTE: For full instructions on the operation of the power shift transmission refer to the operators manual.

TORQUE CONVERTER

NOTE: The torque converter is a sealed unit and can not be serviced as individual parts.

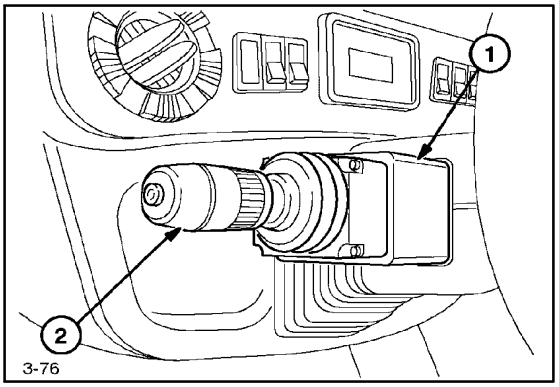
The torque converter which is a fluid coupling transmits drive from the engine to the transmission.

Attachment of the torque convertor to the flywheel is through a flexi-plate using bolts (1) to convertor and (2) bolts to flywheel.

The main parts of the torque converter are the impeller, the turbine, the stator and the front and rear covers. The impeller is integrated with the rear cover which is driven by the engine flywheel by means of a drive plate.

The torque converter must be full of oil to operate correctly. The oil must flow constantly through the converter to the oil cooler to prevent over heating.

When the engine is running the impeller pumps oil to the turbine this oil acts on the turbine and flows on to the stator which is fixed. As the flow increases the turbine starts to rotate at this point we get maximum torque increase. As the turbine speed increases the torque multiplication gradually decreases. When the turbine rotates at the same speed as the impeller oil now acts on the rear face of the stator blade. This unlocks the one-way clutch, permitting the stator to rotate in the same direction.



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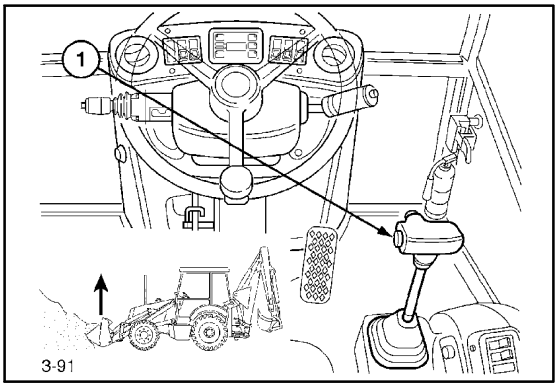

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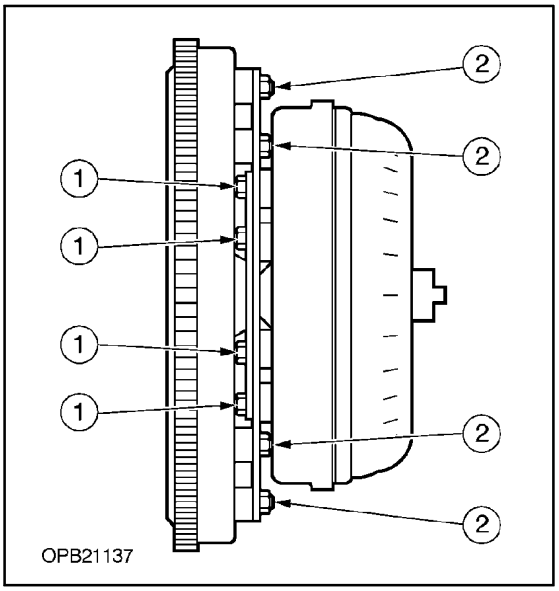

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Hydraulic Oil Flows

Oil flows to the pressure regulating valve, maintaining system pressure to the control valve and clutches at 20 bar (292 psi).

Excess oil flow is bleed off to the converter circuit which is protected by a 10 bar (145 psi) safety valve.

Oil enters the converter through the converter blade cavity and exits in the passage between the turbine shaft and pump drive. Oil then flow to the external cooler.

Across the converter and oil cooler circuit a by pass valve is fitted if the pressure difference is more than 4 bar (58 psi) the valve will open. Directing excess oil to the lubrication circuit. This protects the system during start up from cold oil or at high revs/min.

After leaving the cooler the oil is directed via a single fitting on the rear of the transmission to a series of tubes and passages, to lubricate and cool the transmission bearings and clutches.

Oil is drawn up from the sump, via an internal strainer, through the inlet port of the hydraulic pump. Oil is pumped out to the pressure filter. Across the oil filter is a filter by pass valve which will open if the pressure difference becomes higher than 4.3 bar (62.5 psi).

Oil then drains back by gravity to the transmission sump.

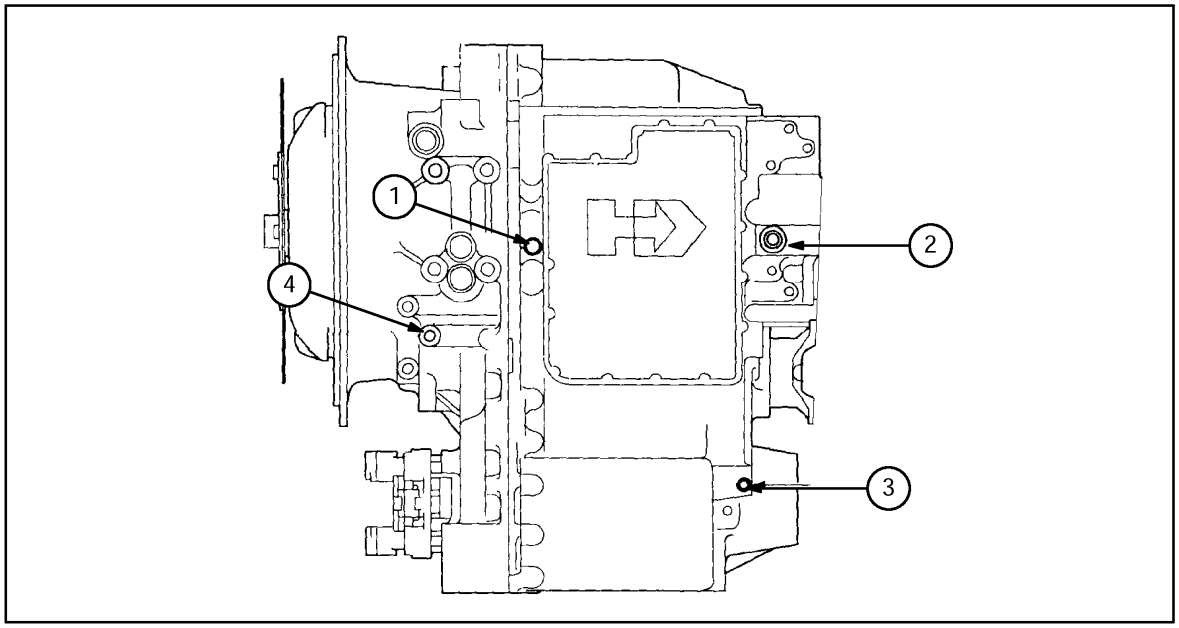
CONTROL VALVE OPERATION FORWARD, SECOND GEAR WITH FOUR WHEEL DRIVE ENGAGED.

Pressure oil from the system regulating valve flows to the pressure reducing valve. The pressure drops to 5.5 bar (80 psi). This oil flows to the 6 solenoids. Oil also supplies the modulation valve.

When the powershift lever lever is moved forward and twisted anti clock wise a electrical signal is sent to:-

1. Oil flows from the system pressure regulating valve at 20 bar through the four wheel drive spool to engage the 4WD clutch.
2. System pressure also flows through the range modulation valve, then through the 1st 2nd spool to engage the 2nd gear clutch.
3. The high low solenoid which energises allowing pilot oil to flow to the shift spool. this will allow oil to flow to the low clutch.
4. The neutral forward solenoid which energises allows pilot pressure to flow to the shift spool this will allow oil to flow on to the forward low shift spool.
5. The modulation valve has a reducing current from the microprocessor, pilot pressure gradually increases acting on the boost valve and it multiplies pilot pressure.
6. The oil from the boost valve is modulated allowing a steady increase of pressure to act on the forward low clutch pack which gradually takes up drive until clutch pressure reaches 20 bar (292 psi).

1. Transmission sump.
2. Transmission breather.
3. Suction strainer.
4. Gerotor oil pump.
5. Pressure oil filter.
6. Filter by pass valve 4.3 bar (62.4 psi).
7. System pressure test port.
8. System pressure regulating valve20 bar (290 psi).
9. Oil to converter circuit.
10. Pressure reducing valve 5.5 bar (80 psi).
11. 2nd / 1st Solenoid.
12. 2nd / 1st shift spool.
13. 2nd gear clutch.
14. 1st gear clutch.
15. Range modulation solenoid.
16. Range modulation spool.
17. Range modulation restriction.
18. Four wheel drive solenoid.
19. Four wheel drive shift spool.
20. Four wheel drive clutch.
21. High / low solenoid.
22. High / low shift spool.
23. Forward high clutch.
24. Forward low clutch.
25. Neutral reverse solenoid.
26. Neutral reverse shift spool.
27. Reverse clutch.
28. Neutral forward solenoid.
29. Neutral forward shift spool.
30. Electronic modulation valve 0 - 5.5 bar (0 - 80 psi).
31. Accumulator.
32. Pressure booster 0 - 20 bar(0 -292 psi).



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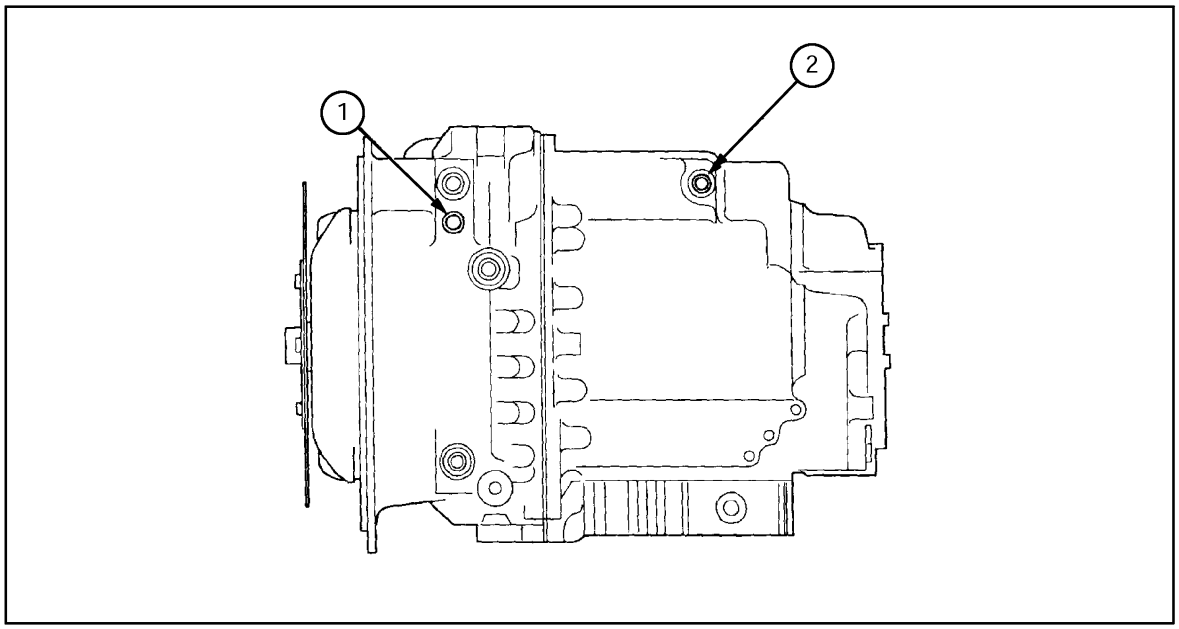
Left Hand Side View

1. Pressure Check Port Convertor in 5 - 11 bar (73 - 159 psi)
2. To Cooler
3. Pressure Check Port Four Wheel Drive 18.9 - 27.5 bar (270 - 397 psi)
4. Pressure Check Port 2nd Clutch (FWD 2nd, FWD 4th, Rev 2nd) 18.1 - 21.5 bar (265 - 312 psi)



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Top View

1. Pressure Check, Regulator Pressure 19.6 - 23.7 bar (290 - 340 psi)
2. Filter Plug M22 X 1.5

POWER SHIFT LEVER AND MICRO-PROCESSOR FUNCTIONS

Power Up:

Immediately after starting up (ignition on) LEDs T & N are switched on, in order to show they are operational.

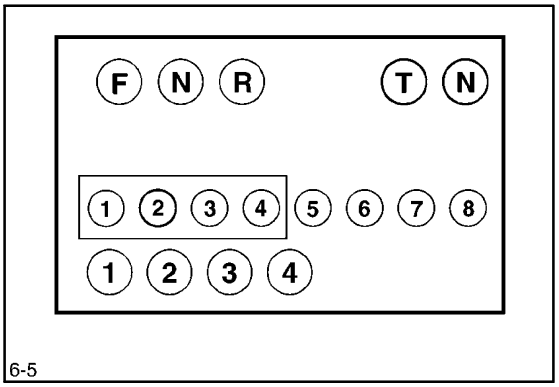
The microprocessor controls the transmission and self checks its own memory continuously to ensure that gear selection and range changes are always performed in a safe manner.

Should a fault occur in the wiring harness or in the solenoid of the control valve the Powershift lever microprocessor, will check if it is still safe to drive. If not the processor will default to a safe mode or lock state

Reset Mode:

When the microprocessor defaults to reset mode both the T and N LED's are displayed simultaneously to indicate that a reset has taken place.

If no critical faults are active the microprocessor selects N2 and goes to the Neutral lock state. Refer to, DRIVING WITH POWER SHIFT.



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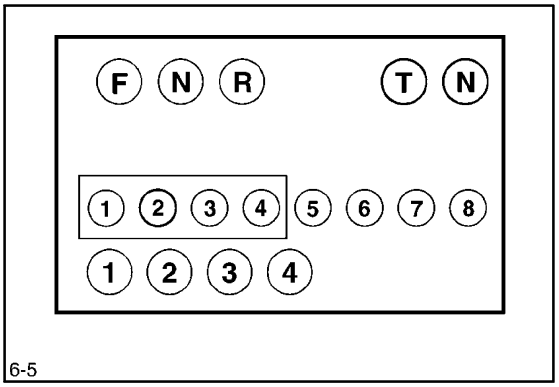
Limp home:

If a fault is detected at power up (ignition on) the limp home facility is automatically selected.

IMPORTANT: If limp home is active, only 1st and 2nd gear will be selectable but without modulation. This means that the take off will be abrupt.
Limp home active can be identified by the illumination of the following LEDs.



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T - LED	N - LED	CONDITION
Flashing	ON	Currently shown on display will be the last fault
Flashing	Flashes Slower	Input Fault Detected
Flashing	Flashes in Phase	Non Critical Output Fault Detected
Flashing	Flashes Faster	Safety Critical Output Fault Detected

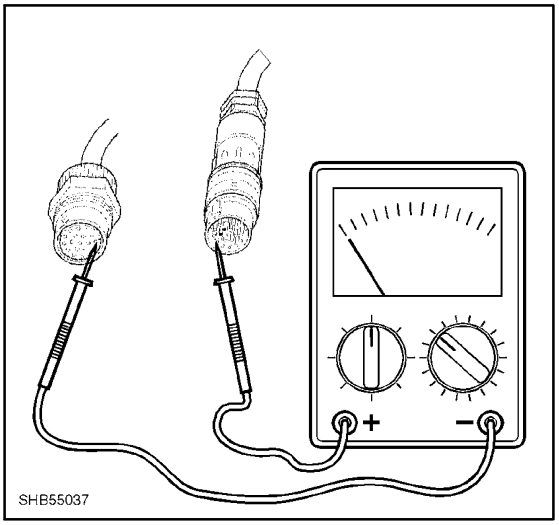
FAULT FINDING

Before attempting any fault finding ensure you have a suitable Multimeter for checking component continuity.

When fault finding remember that with an electrical concern it is often a minor fault that may have occurred and could be as simple as:

Poor continuity between connector pins
Condensation in the connectors
Disconnected cables
Damaged or broken wires all of which could result in a no drive situation but easily remedied when found and corrected.

It should also be remembered that mechanical problems could result in fault codes appearing on the LED display



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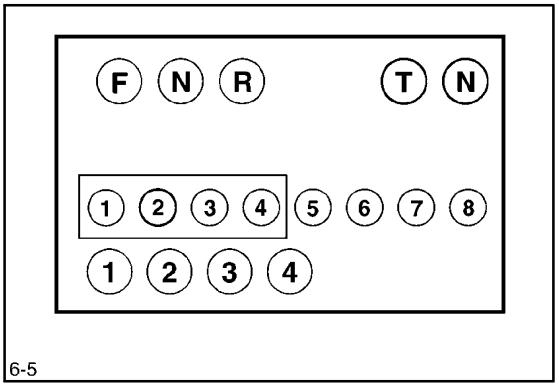
Indication of faults

In case a fault is present during normal operation and is detected by the microproccesor, both the T-led and N-led may be blinking in some way as shown in the table below.

NOTE: That on an open circuit or connection to battery plus on ON/OFF outputs can only be detected while the corresponding output is in the OFF position. Also a short to ground is only detected while the output is on.



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T-LED (Orange)	N-LED (Red)	Condition	Situation
Off	Off	Normal operation	-
Off	On	Normal operation - N selected	-
Off	Blinks	Normal operation - N selected / speed too high	-
On	Off	Diagnostic mode was activated at Power up	-
On	On	Controller in RESET - malfunction	Fault
On	Blinks	Self Calibration in Progress	-
Blinks	On	Last fault is currently shown on display	Fault
Blinks	Blinks slower	Input Fault detected	Fault
Blinks	Blinks in Phase	Non critical Output Fault detected	Fault
Blinks	Blinks Faster	Safety Critical Output Fault detected	Fault
Blinks Fast	Blinks out of phase	System Shutdown - Neutral till Power Down	Fault

FAULT CODE - F5 AND F6

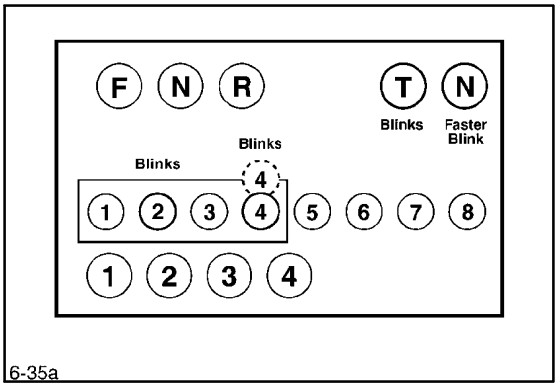
OUTPUT FAULT - STATUS BY LED COLOUR

OUTPUT TEST REQUIREMENTS: Powershift lever to be in forward position, twist clockwise to downshift and turn ignition on.

In this mode, driving is not possible, since all Microprocessor outputs remain off until the test mode is left.

The colour and number of the LED indicates its status:

COLOUR	STATUS
GREEN	Output OK
ORANGE	Output not connected or shorted to battery plus
RED	Output shorted to ground (or to another output)



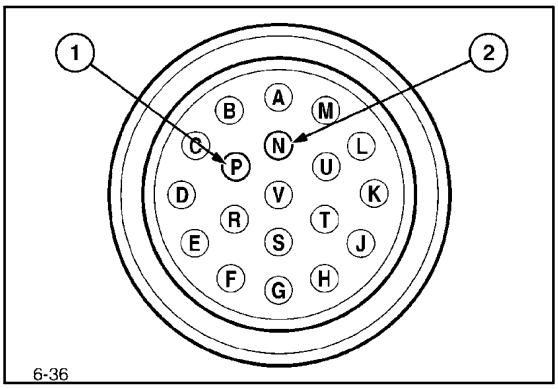
41

Output test - Fault by LED Number

The LED numbers correspond to the connector output wires as follows:

Example: LED 1 = Forward solenoid - colour Orange = (Output not connected or shorted to battery plus)

LED NUMBER	OUTPUT WIRE	OUTPUT FUNCTION
1	E06	Forward solenoid
2	E07	Reverse solenoid

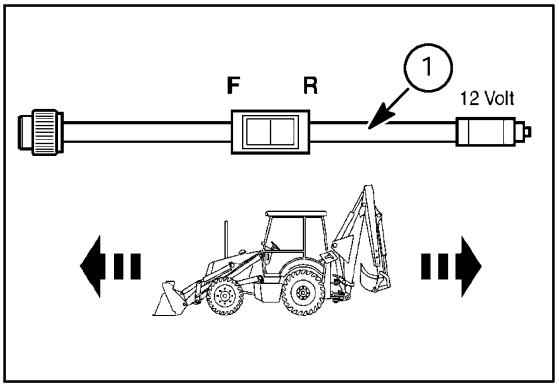


42

LIMP HOME LEAD

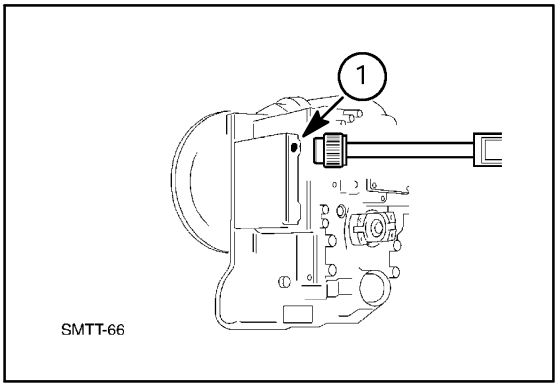
In the event of a total failure of the microprocessor such as a serious cab or loom fire the vehicle can be moved by using the limp home lead to bypass the microprocessor.

Tool No - 380000715



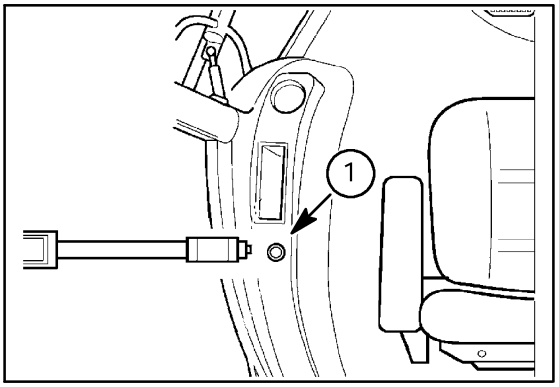
54

Mounted to the left hand side and to the top of the transmission is the microprocessor loom connector. Disconnect the damaged loom and connect the limp home lead in its place.



55

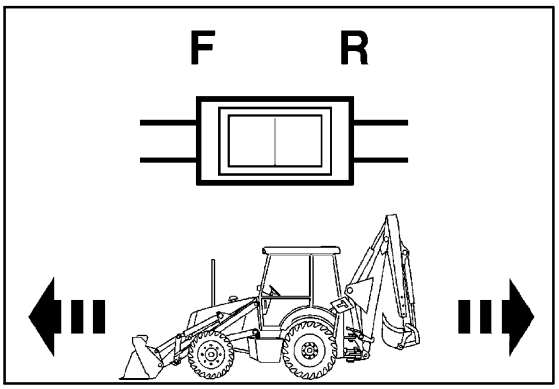
Connect the plug end into the 12 volt auxiliary socket or any available 12 volt supply



56

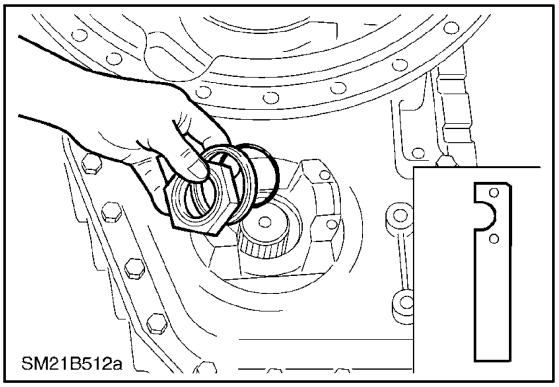
When seated in the cab start the engine and ensuring that all personnel are clear of the machine select either forward or reverse on the switch and the machine will move as requested.

NOTE: When using the limp home lead only 2nd gear (forward or reverse) is selectable no other gear change or modulation is available.



57

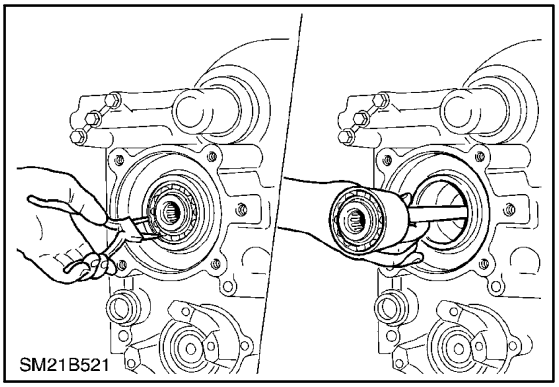
Using Tool and a thin wall 60mm socket remove upper output nut, washer, 'O' ring and flange.



10

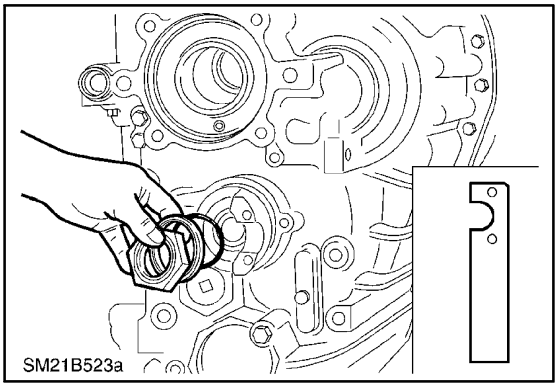
DISASSEMBLY OF THE TRANSMISSION

Remove the hydraulic pump screws and gasket detach the pump drive shaft rear bearing Circlip and remove the pump drive shaft and bearing as an assembly.



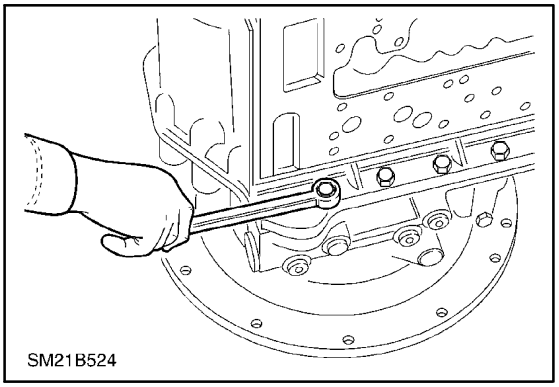
18

Using Tool no 380000708 to hold the flange steady remove the upper output nut, washer, 'O' ring and flange.



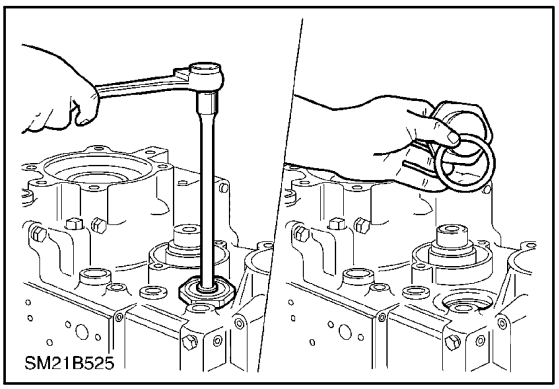
19

Remove converter housing to transmission case screws and lockwashers.



20

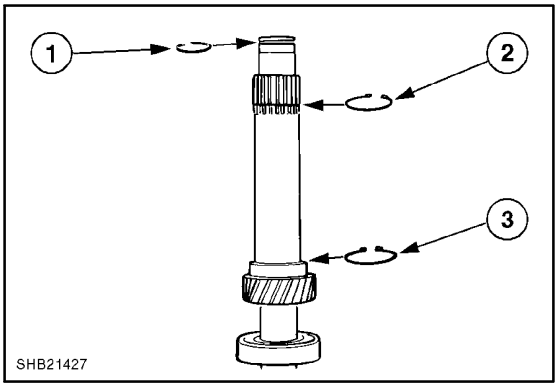
To gain access to the output shaft circlip remove the case plug and gasket.



21

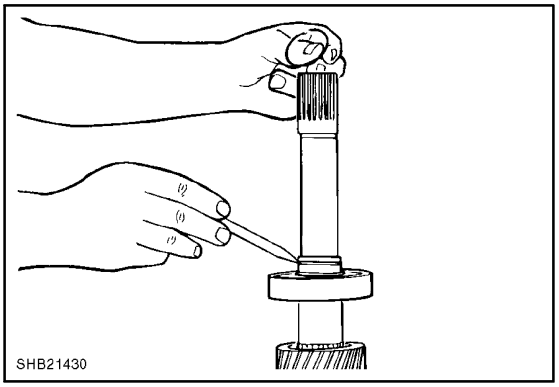
Disassembly input shaft

Remove input shaft rear sealing ring (1).
- forward high gear circlip (2).
- forward low gear circlip (3).



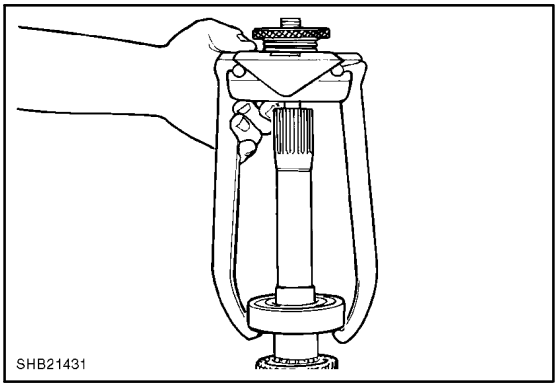
49

Remove input shaft front sealing ring.



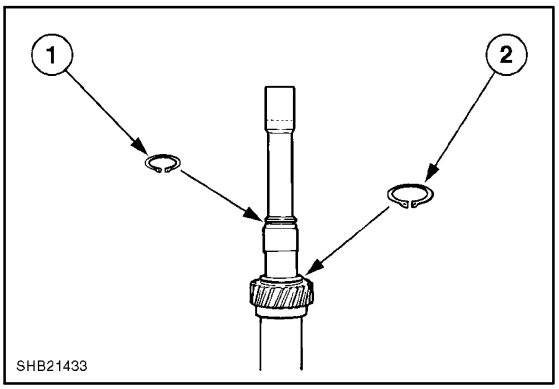
50

Use bearing puller to remove input shaft front bearing.



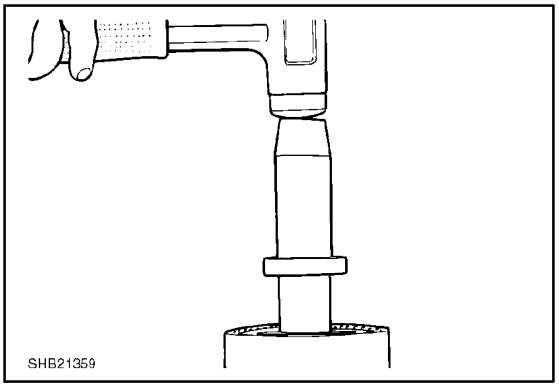
51

Remove input shaft front bearing circlip (1) and forward low gear circlip (2).



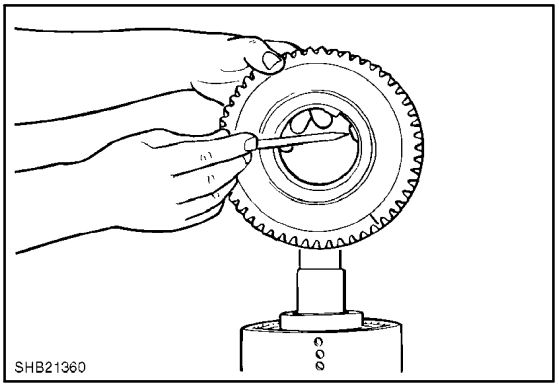
52

Tap steel bearing into place.



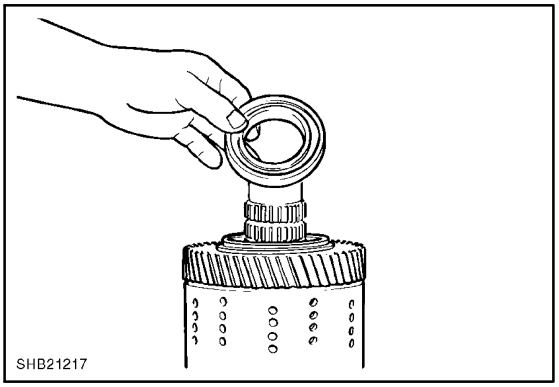
78

Install clutch gear bearing locating rings.



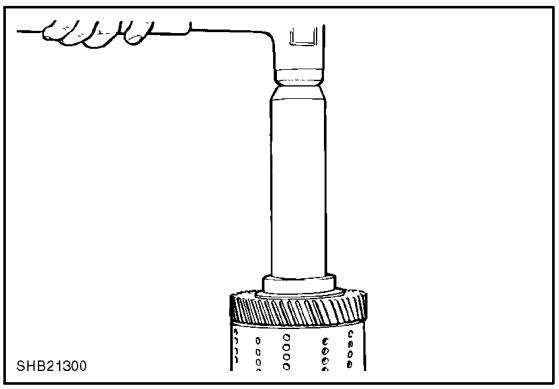
79

Install clutch gear bearing. Be sure that bearing shield is on the outside.



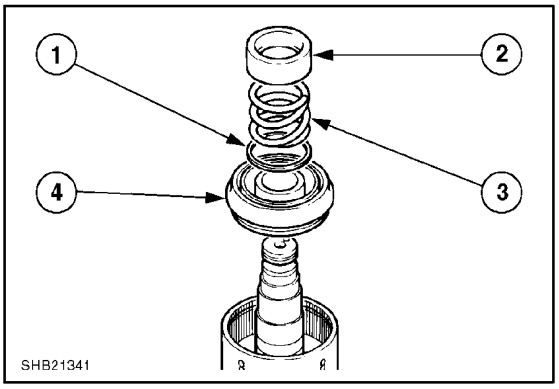
80

Tap bearing into place.



81

Remove clutch piston spring circlip (1).
- clutch piston spring (2).
- clutch piston wear plate (3).
- clutch piston (4)

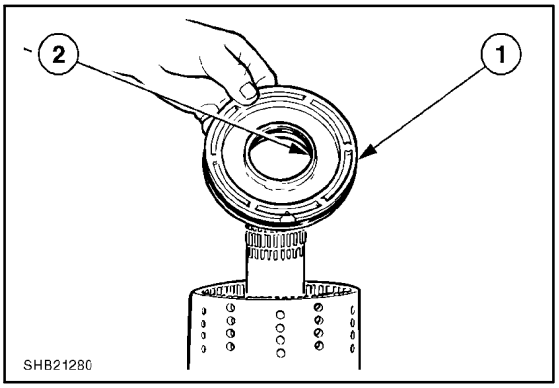


105

Reassembly reverse clutch

Install a new clutch piston friction seal.

NOTE: Ring must be sized before installing in clutch drum. Sealing ring must be flush with friction diameter of piston. Install clutch piston steel seal.

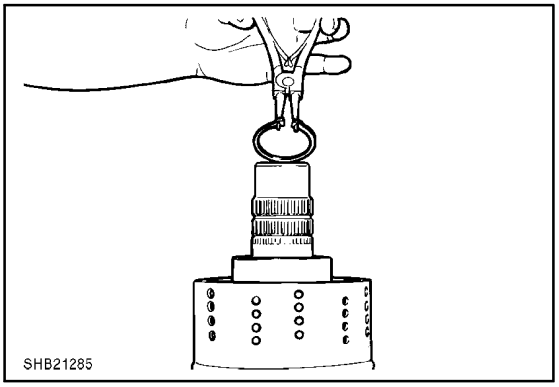


106

Reassemble in reverse order as for disassembly:

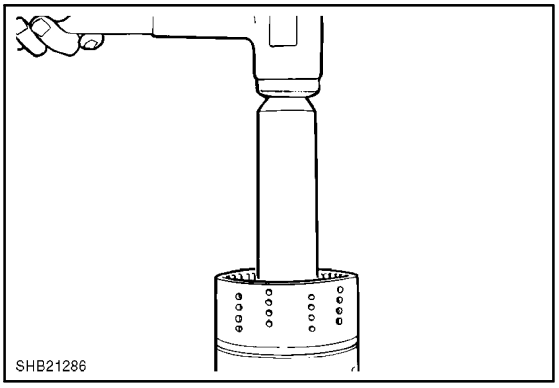
Install clutch piston in clutch drum, use caution as not to damage sealing rings and install:
- piston wear plate on piston (1).
- piston spring (2).
- piston spring retainer (3).

Install clutch spring circlip.



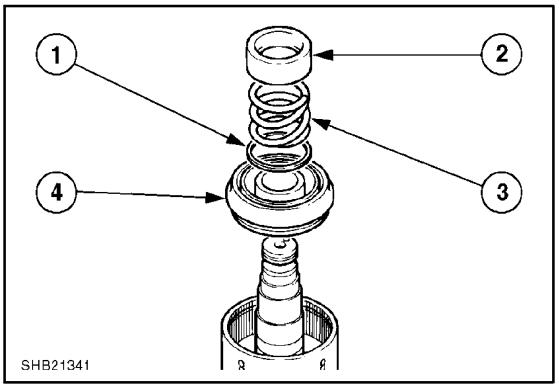
107

Using tool no 380000711 press spring and seat to fit circlip ring. Be sure ring is in full position in groove.



108

Remove spring circlip.
- spring retainer.
- clutch piston return spring.
- piston wear plate.
- Remove clutch piston assembly.

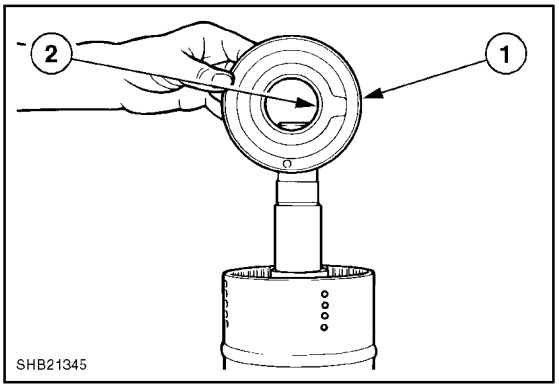


137

Reassembly 2nd clutch drum

Install piston friction seal.

NOTE: Ring must be sized before installing in clutch drum. Sealing ring must be flush with friction diameter of piston. Install clutch piston steel seal.

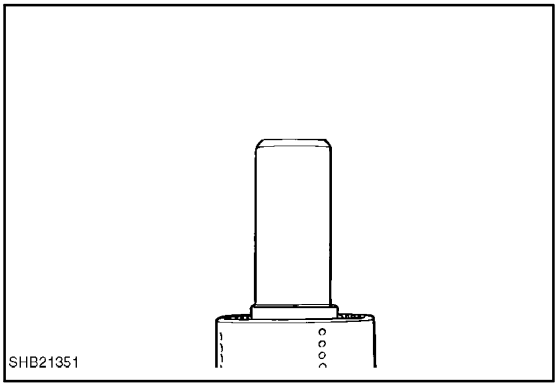


138

Reassemble in reverse order as for disassembly:

Install clutch piston in clutch drum.
Use caution as not to damage sealing rings and install:
- piston wear plate.
- piston return spring.
- spring retainer.
- spring retainer .
- snap ring

Using tool no 380000711 compress spring and seat retainer ring. Be sure ring is in full position in groove.



139

Install one friction half disc with friction material away from the piston.

Install one steel disc. Alternate friction and steel discs until the proper amount of discs are installed.

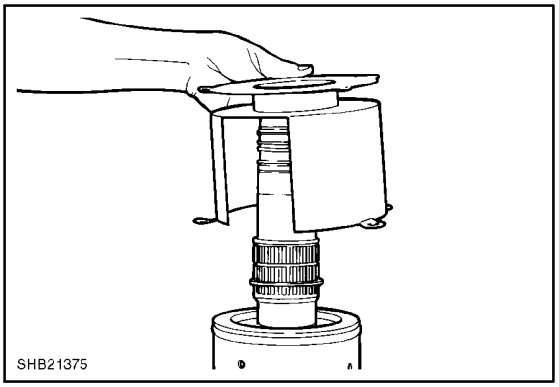
Install one friction half disc with friction material down.

Install Belleville with large diameter up to the backing plate.

Install backing plate.

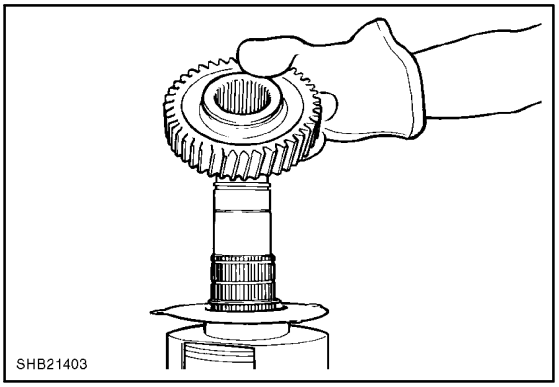
Install backing plate retainer ring.

Install oil baffle on output shaft.



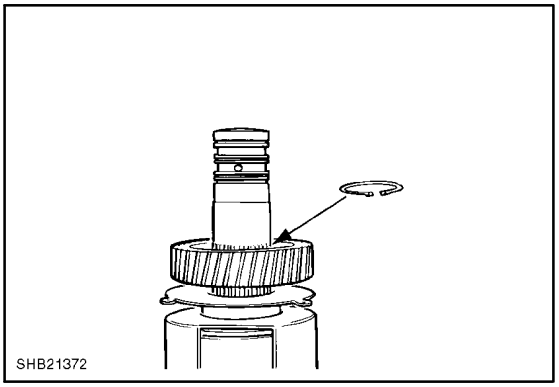
164

Warm gear to 150_ C (302 F),



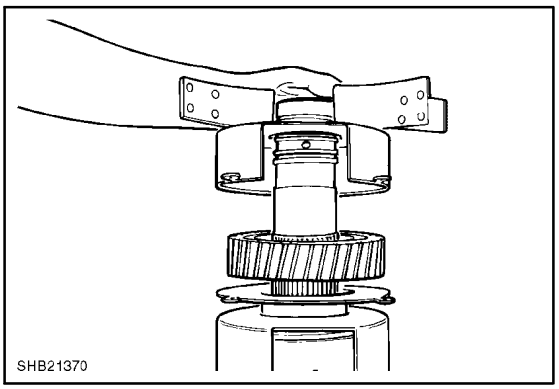
165

Install gear.Install output gear circlip.



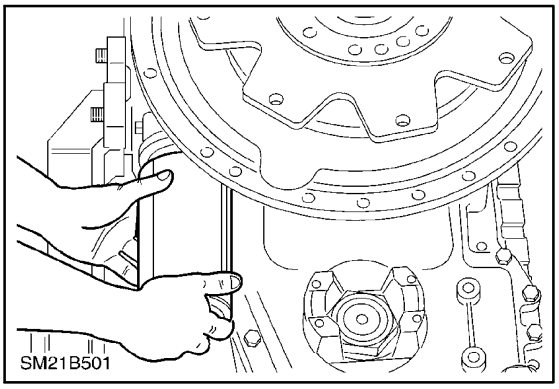
166

Install output shaft sealing rings and rear oil baffle on output shaft.



167

Install oil filter and tighten to 30 – 38 Nm (22,1 – 28 lb ft).



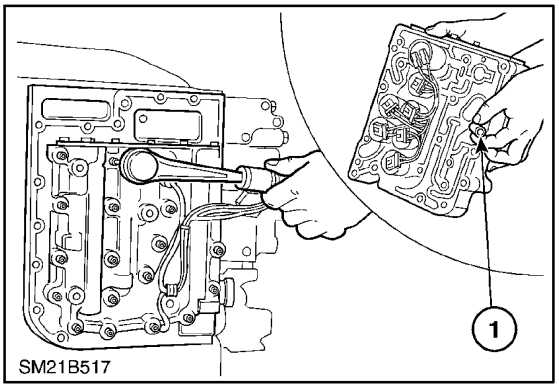
204

Reassembly of valve chest to transmission

Install pressure regulating valve spool into solenoid housing and spring into transmission case, position control valve on transmission case.
Install control valve mounting screws and lock-washers, tighten screws to specified torque.

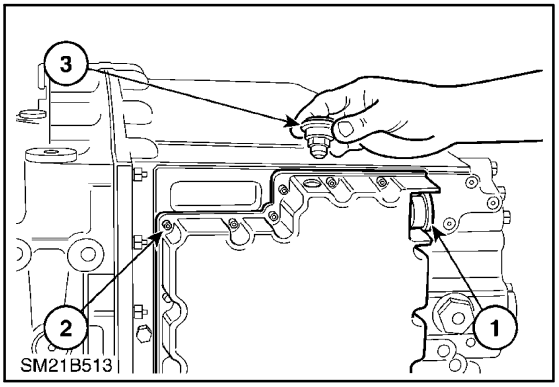
IMPORTANT: The torque procedure of the valve chest to transmission should be carried out in the following manner.

Torque form the centre of the valve body and alternate left to right of the centre line to the outside of the edge of the valve chest. this ensures that there is minimum distortion of the valve chest body.



205

Position wiring connector in valve protection cover(1). Install gasket and valve protection cover mounting screws (2) and tighten screws to specified torque.
Install air breather (3) and tighten to 34 – 41 Nm (25 – 30 lb ft). Install wiring connector nut and tighten to 6 – 8 Nm (4,4 – 5,9 lbft).

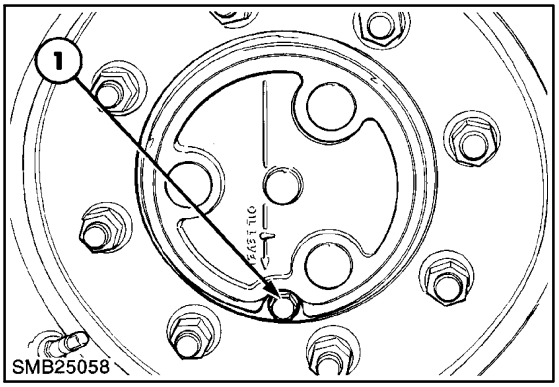


206

OVERHAUL

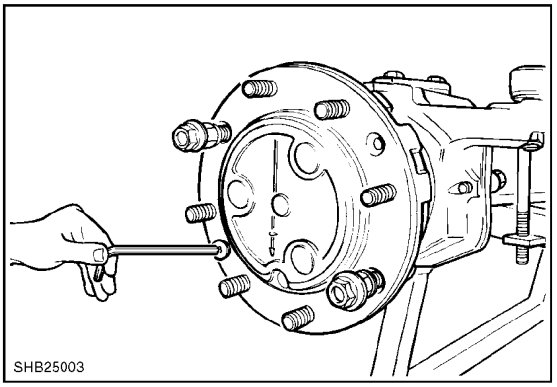
Planetary Reduction Assembly and Wheel Hubs

Turn the hub so that the filler/drain plug is at its lowest point and drain the hub oil.



16

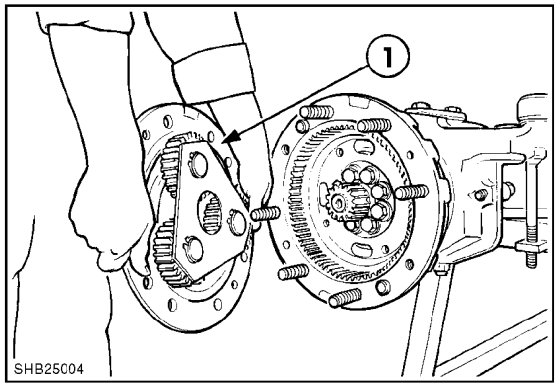
Remove the two 8mm socket screws and the two shouldered wheel studs, securing the planetary carrier assembly to the hub assembly.



17

Gently tap the planetary carrier with a soft face mallet and, using the slots provided, lever the carrier from the hub. Carefully withdraw the planetary carrier assembly.

1. Planetary Assembly



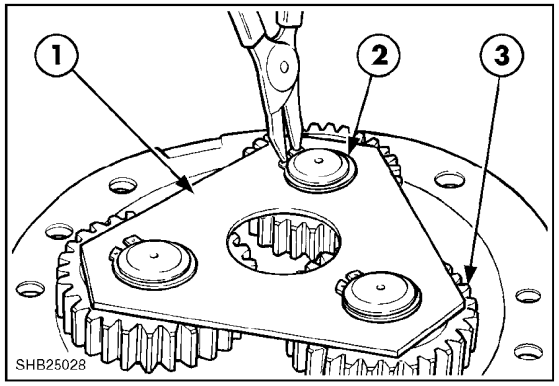
18

Remove the three snap rings and remove the retaining plate.

Remove planetary gears. Note: the needle roller bearings will fall out.

Finally, remove the thrust washer.

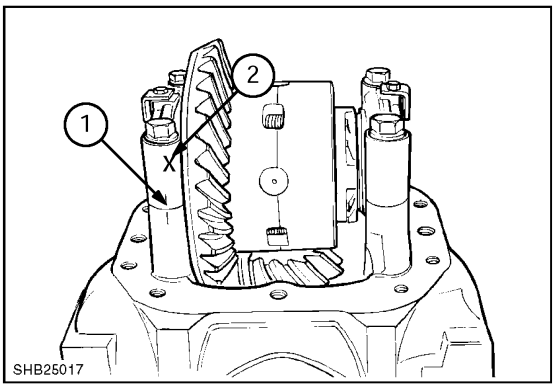
1. Retaining Plate
2. Snap Ring
3. Planetary Gear



19

Differential Disassembly

Before disassembly, mark each bearing cap (1) to ensure they are not interchanged during re-assembly. Also mark which side the crown wheel is in relation to the assembly (2).



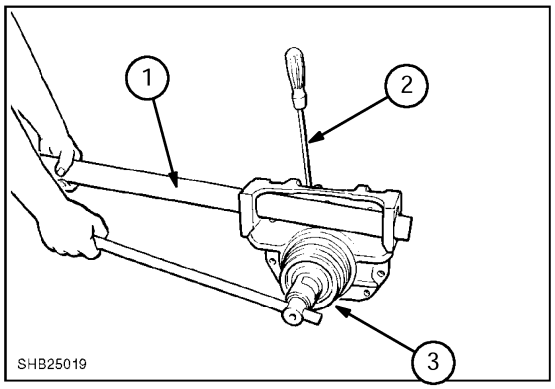
49

NOTE: Before differential disassembly loosen the pinion nut.

Place a bar (1) through the steering cylinder lugs to support the assembly.

Put a screwdriver (2) between the crown wheel and pinion teeth to hold the pinion still.

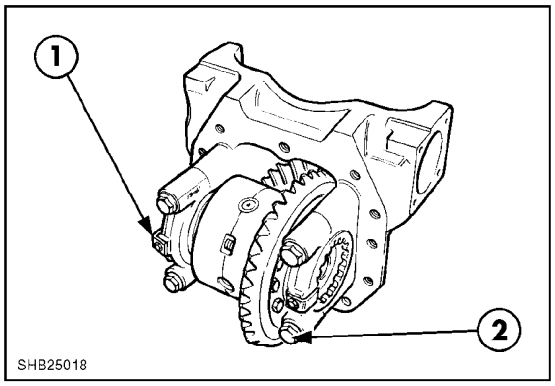
Loosen the pinion nut using special tool 297511 (3).



50

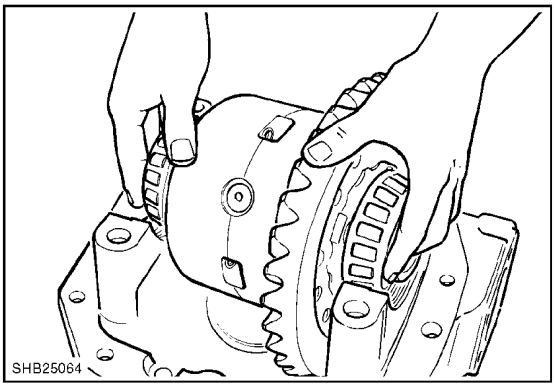
Remove the locking tabs (1) and cap retaining bolts (2).

NOTE: Fit new locking tabs upon re-assembly



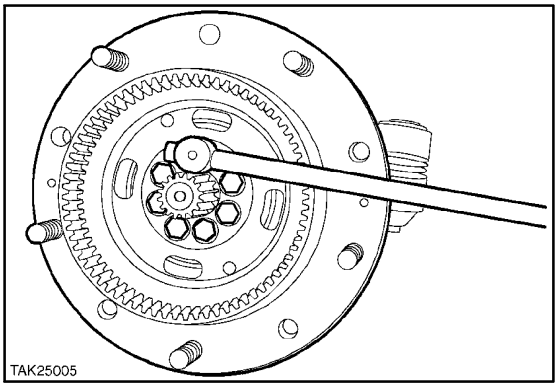
51

Remove the differential assembly from the housing and place on a clean bench prior to disassembly.



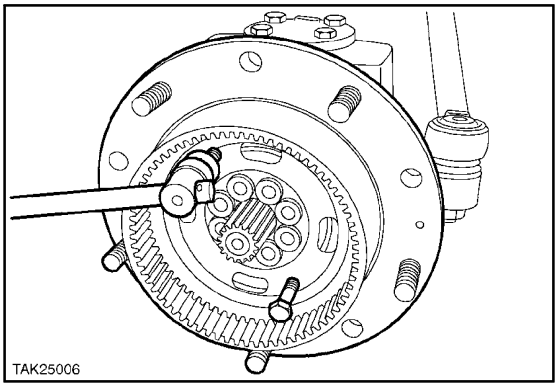
52

5. Remove the eight ring gear fixing bolts.



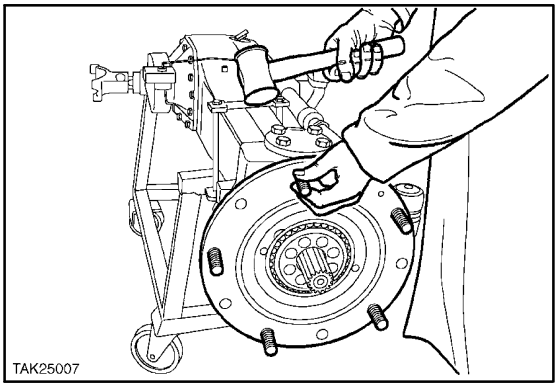
6

6. Using two of the fixing bolts, fit these to the outer threaded holes and tighten to push the ring gear away from the hub.



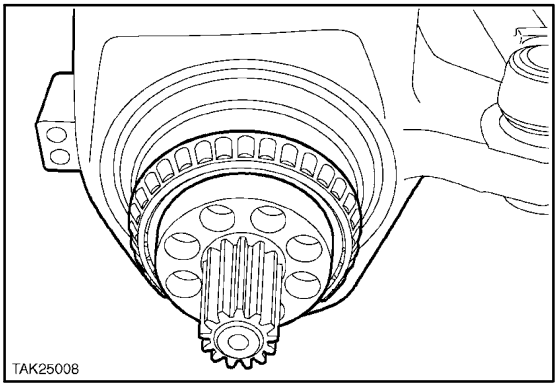
7

7. With a soft faced mallet hammer off the hub centre housing and also the outer conical bearing.



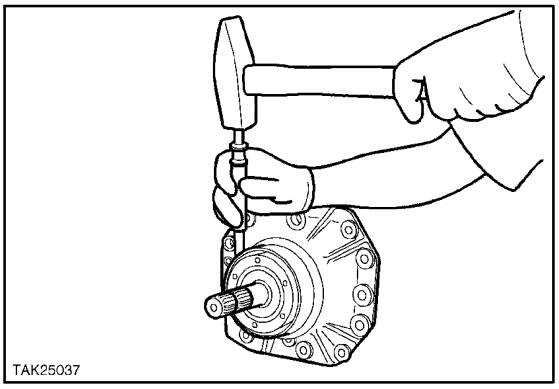
8

8. Then remove the inner conical bearing by hand.



9

Once the correct preload is obtained lock the pinion ring nut to the pinion shaft.

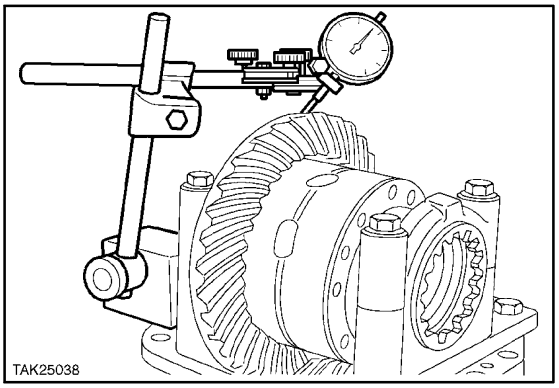


41

Crown Wheel Backlash

Position a magentic-base dial gauge on the differential carrier and record the backlash. Ensure the stylus touches the crown wheel teeth at 90° angle.

Backlash should be 0.18mm - 0.23mm.



42

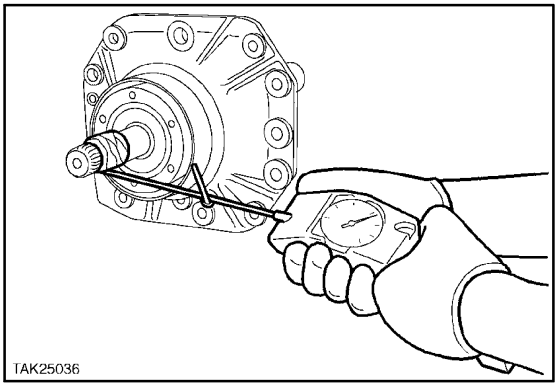
If the backlash is too small, loosen the locknut on the same side as the crown wheel and tighten the locknut on the opposite side by the same amount.

If the backlash is too big, loosen the locknut on the opposite side to the crown wheel and tighten the locknut on the same side as the crown wheel.

To check the combined differential and pinion preload perform the same test as before using the spring balance and string on the pinion shaft.

The combined preload should be Pinion Preload + (1.53 - 2.29N).

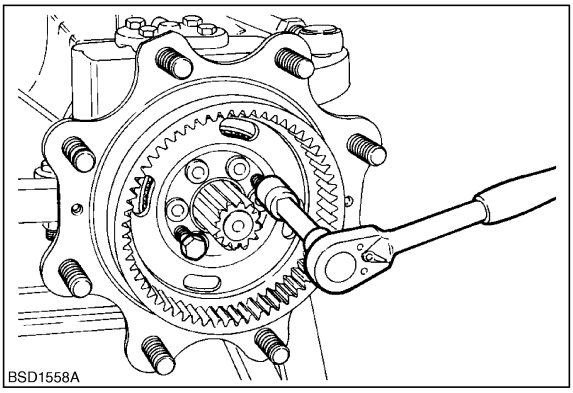
If the combined preload is below the minimum then tighten the locknuts on each side. If the combined preload is above the maximum, loosen both locknuts by equal amounts.



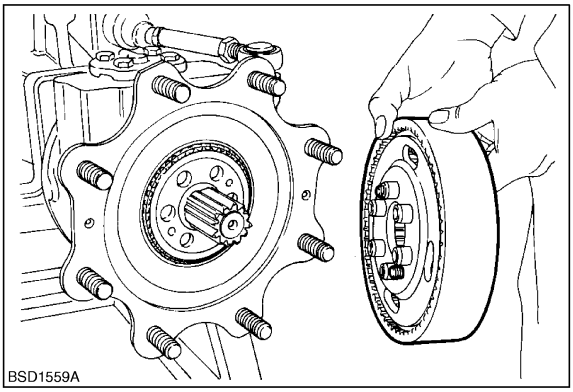
43

Remove the ring gear carrier by installing the extraction screws in the holes tapped in the ring gear.

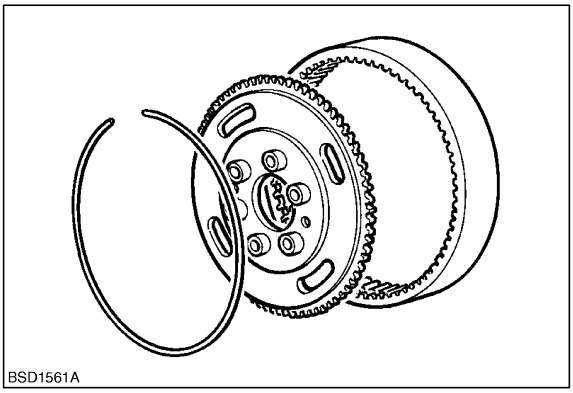
Tighten the extraction screws uniformly.


BSD1558A

Remove the large ring gear from the hub.

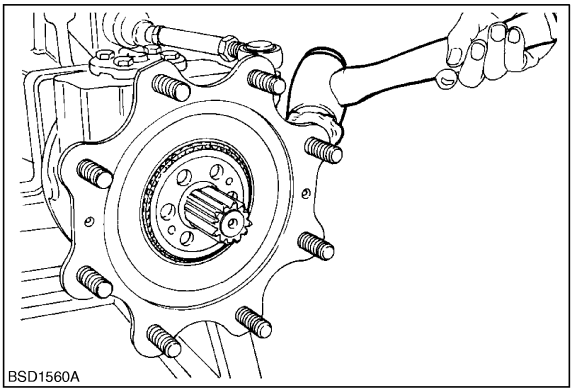

BSD1559A

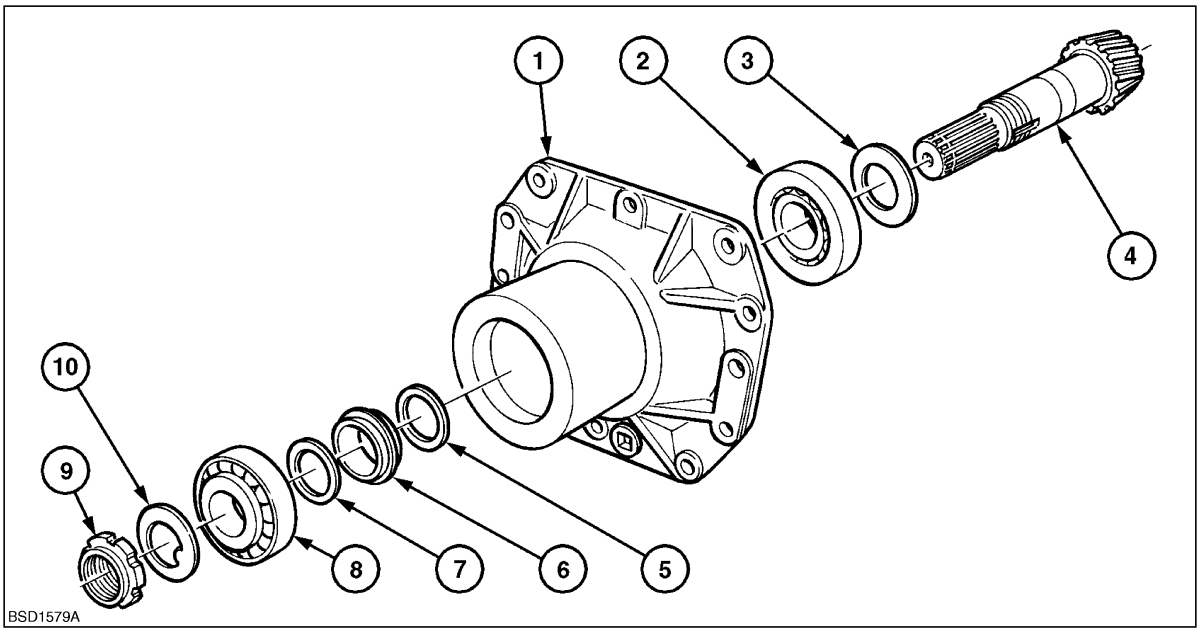
Remove the circlips and ring gear from the ring gear carrier.


BSD1561A

Remove the hub by striking it with a rubber-headed mallet.

Remove the large seal of the stub axle pivot.


BSD1560A



Drive pinion components

1. Differential housing
2. Bearing
3. Adjusting shim
4. Pinion
5. Washer
6. Collapsible spacer
7. Washer
8. Bearing
9. Nut
10. Washer

Inspection of differential components

In addition to the normal inspection of the bearings, pinions and ring gear, wear of the gear teeth and splines, inspect:

The thrust washers

The drive pinion nut

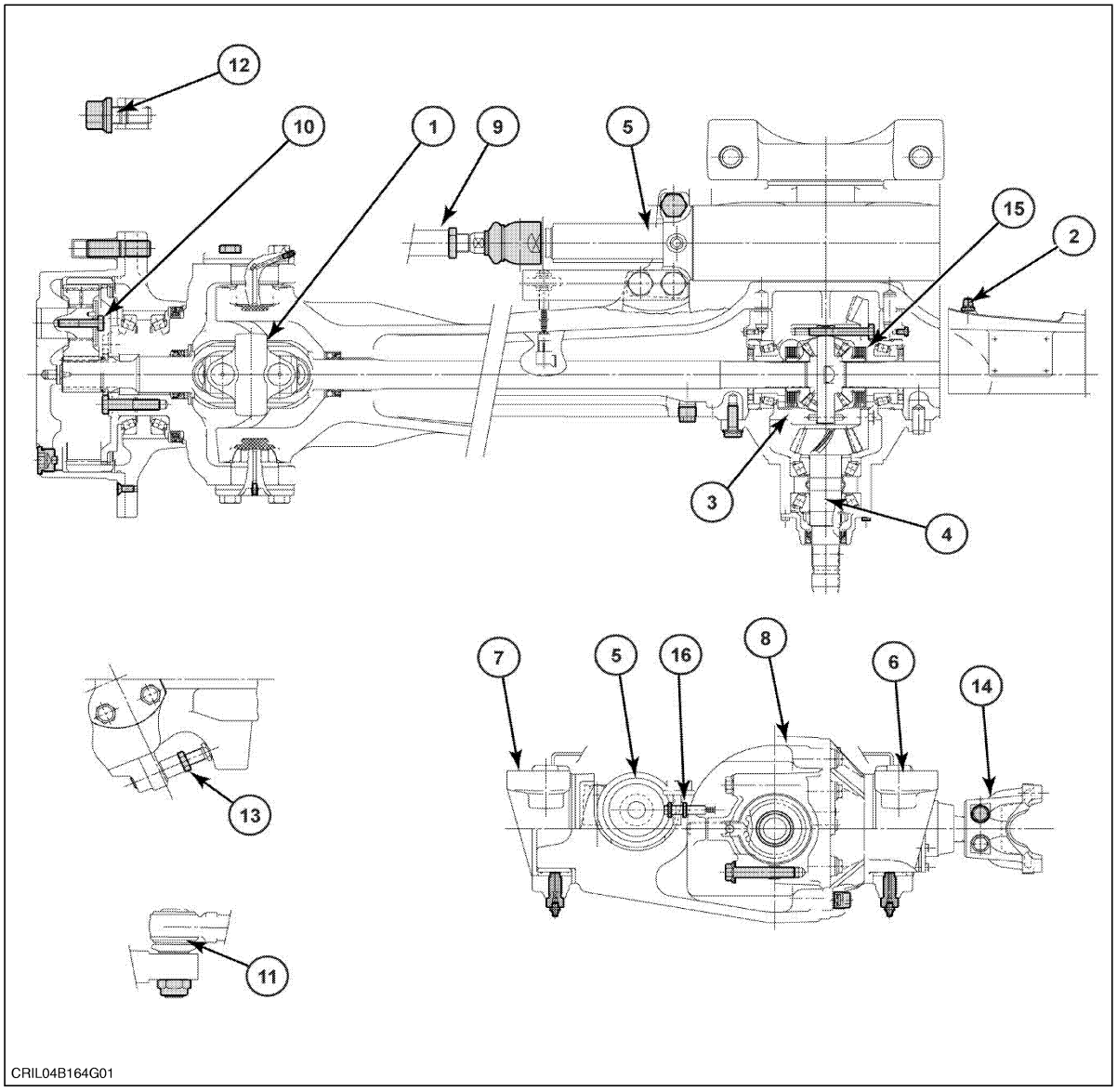
To reassemble the differential, proceed in the reverse order of disassembly. The following operations must nevertheless be performed:

If the ring gear and the drive pinion have to be replaced, adjust the crown and pinion and the tooth spacing.

The ring gear and drive pinion must be replaced together.

Replace the collapsible spacer at each disassembly.

Refer to the following description for this operation.



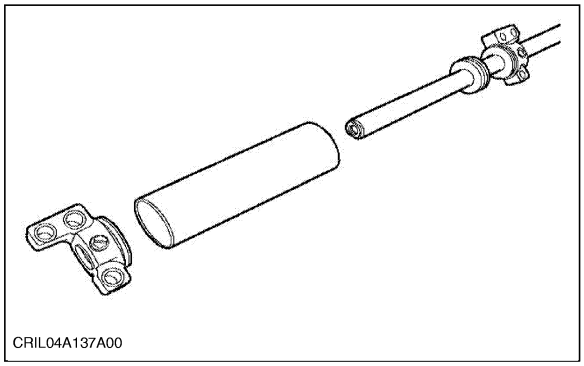
Front axle - Cross-sectional view

1. Universal joint double seal
2. Central housing breather
3. Ring gear and differential
4. Drive pinion
5. Steering cylinder
6. Rear axle pivot
7. Front axle pivot
8. Axle central housing
9. Tie rod
10. Hub and planetaries assembly
11. Steering ball joint
12. Stud bolt
13. Stop screw
14. Universal joint yoke
15. Friction discs (only on 85821298)
16. Steering lock detector

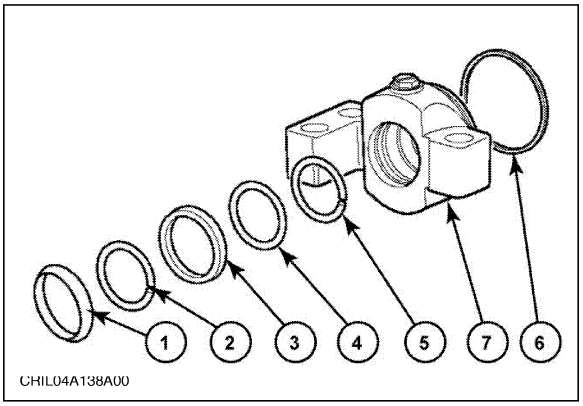
Disassembly of cylinder

Remove the RH bearing, the LH bearing and the cylinder rod.

Remove the cylinder.


CRIL04A137A00

Remove the dust seals (1), the friction ring (2), the oil seal (3), the backing seal (4), the friction seal (5), the RH bearing (7), and the seal (6).

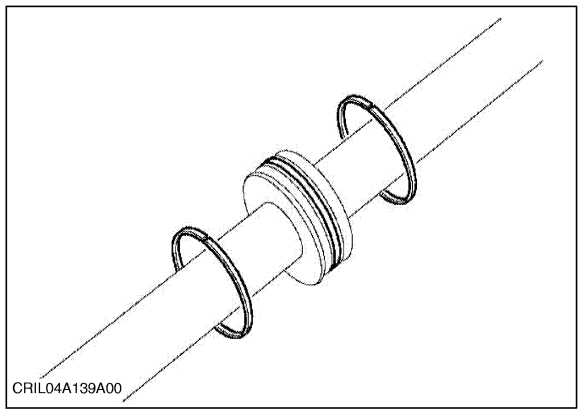


CRIL04A138A00

Remove the carrier seals and the seal ring from the cylinder piston.

Spare parts

The rod and cylinder are not available separately as spare parts. The seals and wear bushes are only supplied in complete kits.


CRIL04A139A00

Reassembly of the steering cylinder

Replace all the seals.

Wait for the new piston ring placed over the O-ring to shrink before introducing the piston and rod into the body.

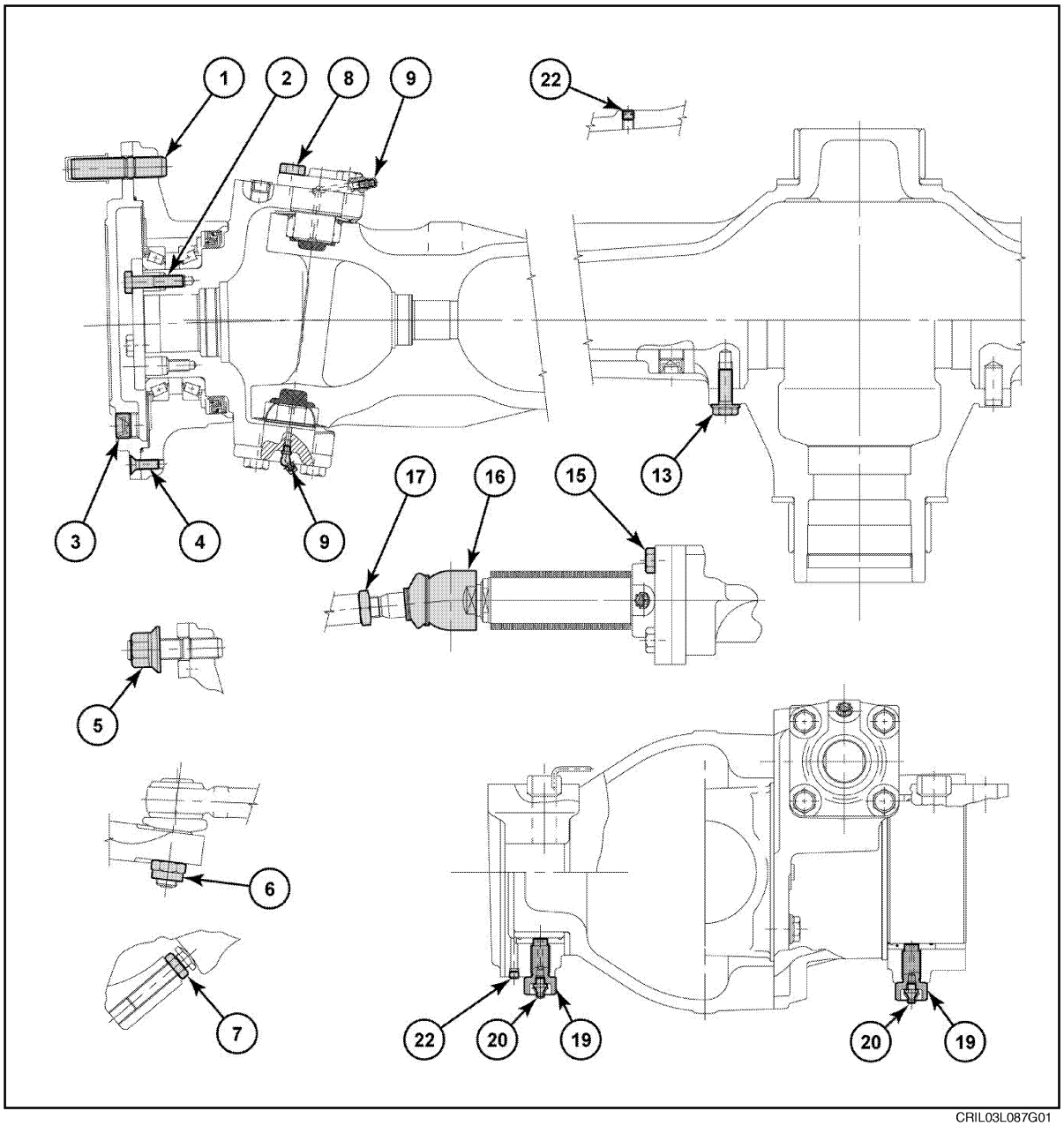
Reinstall the cylinder RH and LH bearings.

Put the steering cylinder back in place and tighten the screws to the required torque.

Reassemble the steering connections, proceeding in the reverse order of disassembly.

Adjust the toe-in of the wheels. This value must be obtained at the inside of each wheel and over the height of the hub.

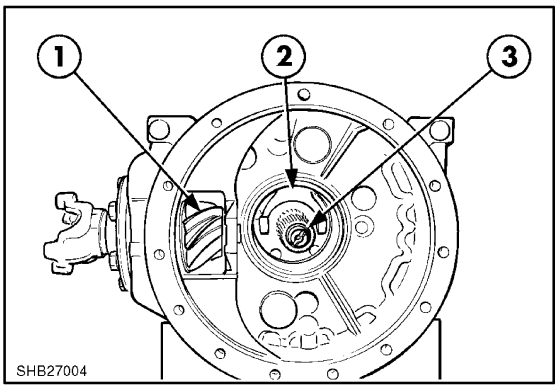
SPECIAL TORQUE SETTINGS



CRIL03L087G01

Pinion location in axle housing

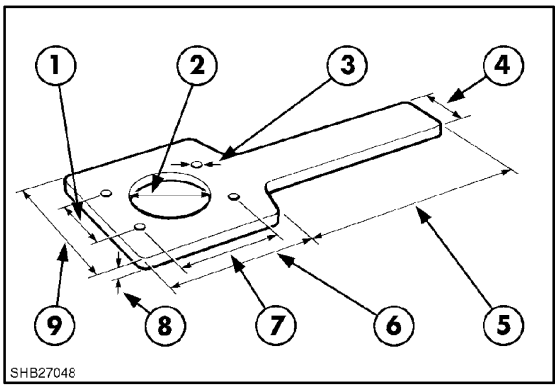
1. Pinion Shaft
2. Differential Lock Actuator
3. Half Shaft



14

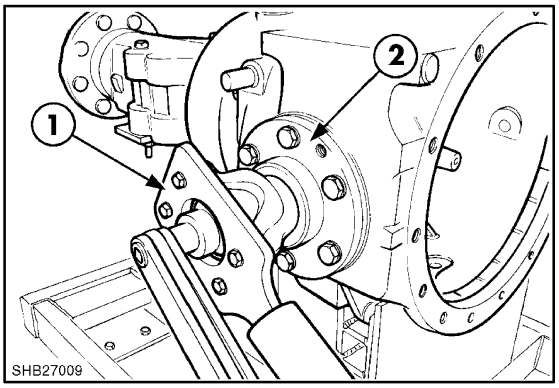
Loosen the pinion nut using a pre fabricated tool, the dimensions being:

1. 46mm (1.811in)
2. 65mm (2.559in)
3. 9mm (0.354)
4. 40mm (1.575in)
5. 220mm (8.66in)
6. 140mm (5.51in)
7. 95mm (3.74in)
8. 10mm (0.394in)
9. 110mm (4.33in)



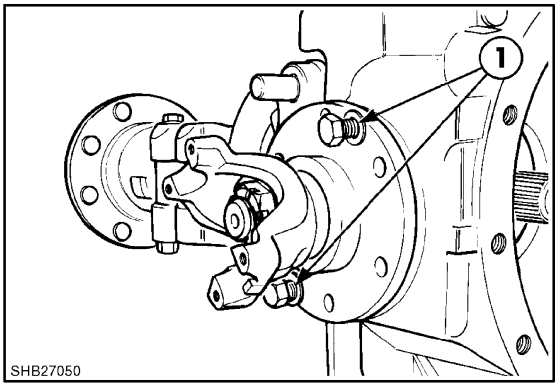
15

Using the special tool (1) hold the coupling steady while loosening the coupling retaining nut. Loosen the pinion housing bolts.



16

Leave 2 bolts in the position shown removing the remaining bolts and jack the pinion out evenly.

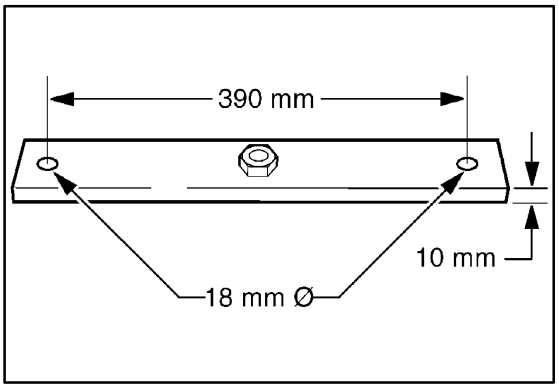


17

Axle Shaft Rolling Resistance

After fitting the correct shim to set the preload:

Manufacture a bridging bar to span opposing bolt holes to the dimensions shown.

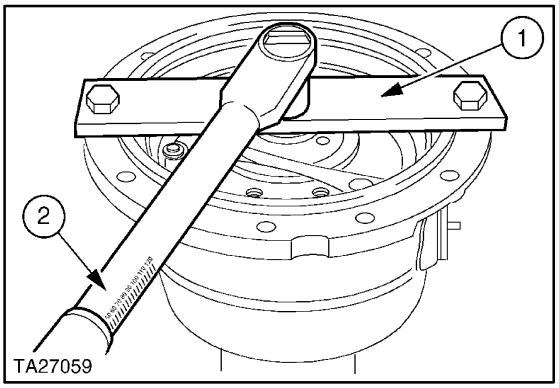


42

Fit bridging bar (1) across the rear axle housing flange and use a torque meter (2) to check rolling resistance which should be 2.3-10 Nm (20-80 lb in).

NOTE: *The brake housing, brake discs and 1/4 shaft should not be installed but all bearings well lubricated.*

If out of specification the shim should be adjusted and rolling resistance rechecked.



43

Differential bearing preload

This adjustment is made by shimming the right hand differential bearing cone using two methods:

If the left hand axle housing, ring gear or brake housing are replaced the following checks should be made:

Method 1

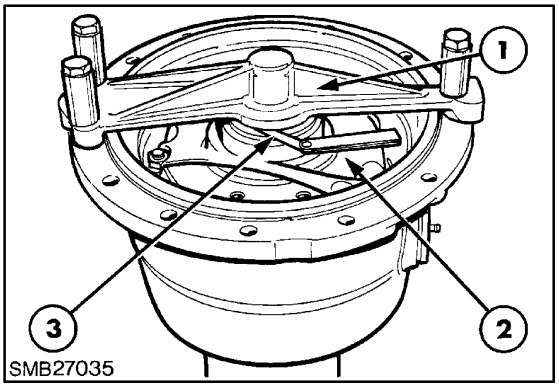
Remove the differential bearing cone and shim from the outer brake housing.

Place the gauge ring of tool **380000991** (1) into the vacant bearing location.

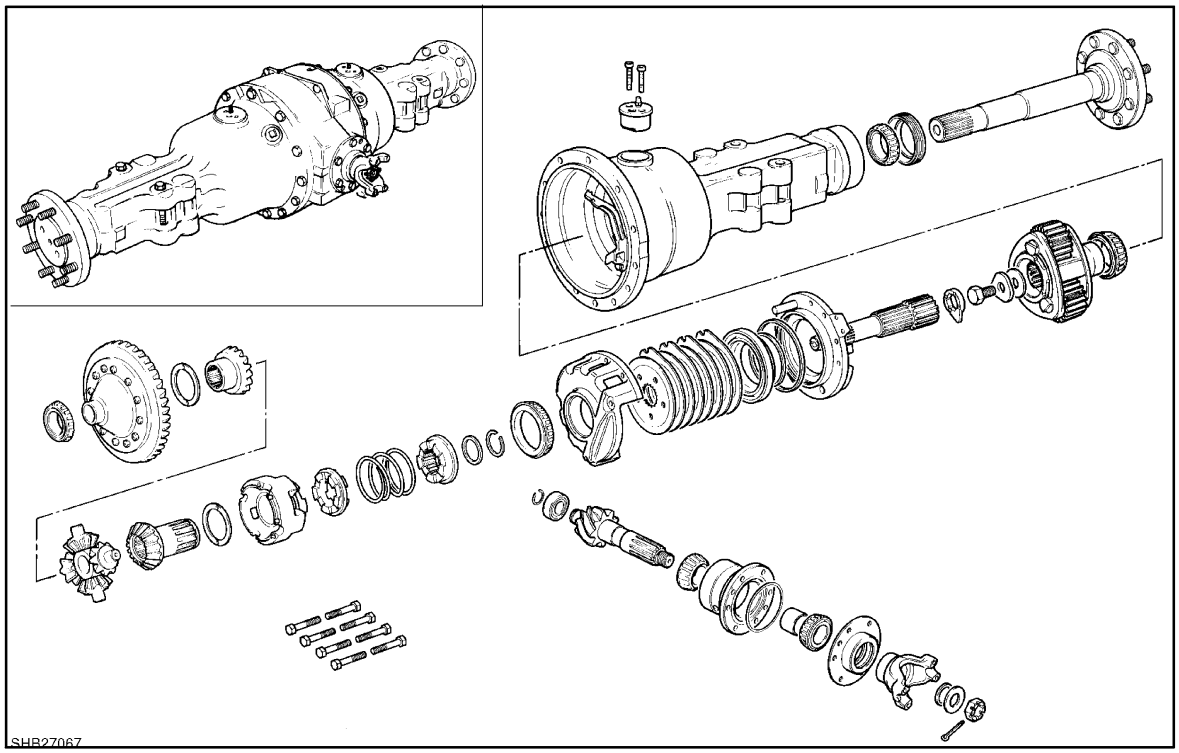
Bolt bridge tool **380000991** (1) across the rear axle housing flange with spacers (2) located between the axle housing flange and the tool.

Measure the gap between the bridge tool and the gauge ring using a feeler gauge (3).

Refer to the following table to determine the correct size shim which should be installed between the brake housing and bearing cone, thus preloading the bearing back to specifications.



44



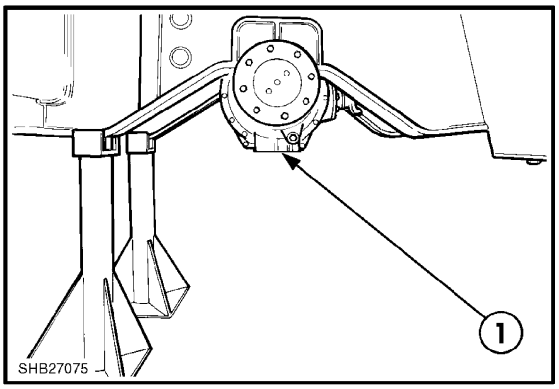
10

OVERHAUL

Rear Axle Removal

For servicing of any rear axle component the axle must be removed.

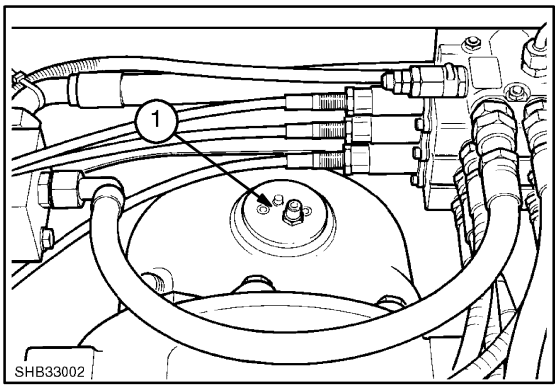
Prior to removal of the axle place a suitable clean container under the axle, capable of holding 26 litres (6.86 US. gals) and drain the oil from the plug at the base of the axle (1).



11

Disconnect the differential Lock hydraulic hose

Accessed from the top of the rear axle disconnect and drain the residual brake oil into a suitable clean container. Remove the pipes from both sides of the axle half shafts. Plug the brake pipes to prevent any dirt or contamination entering the brake system.



12

ADJUSTMENTS

Drive pinion preload

Axle shaft bearing preload

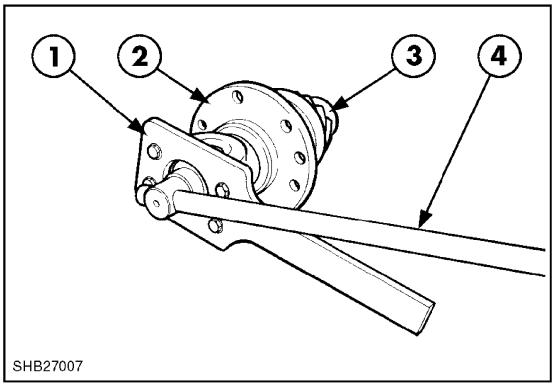
Differential bearing preload

NOTE: *Crown wheel to pinion backlash is preset by manufacturing tolerances in production.*

The pinion bearing preload is set by selecting the correct shim (spacer) which is placed between the bearings.

Re-assemble the pinion assembly, attach the fabricated spanner (1) to the assembly (2) and torque to 406-813 Nm (300-600 lbf ft) with spanner (4) to the locknut.

Shims Available:
From 2.5mm to 3.4mm, in increments of 0.1mm.



40

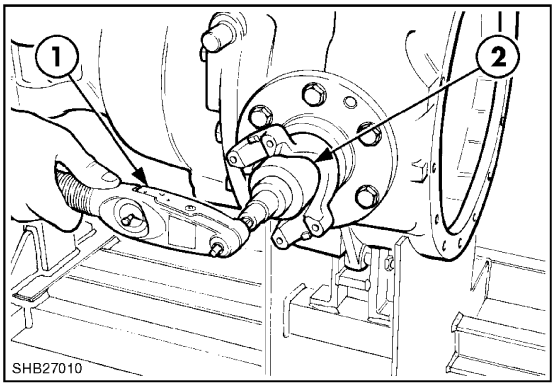
Use a torque meter (1) to check rolling resistance when the assembly is fitted back into the axle.
The rolling resistance should be: 1.3 Nm (10-40 lb in)

Leave pinion retainer bolts loose for this check.

If under specification, fit a smaller shim

If over specification, fit a larger shim

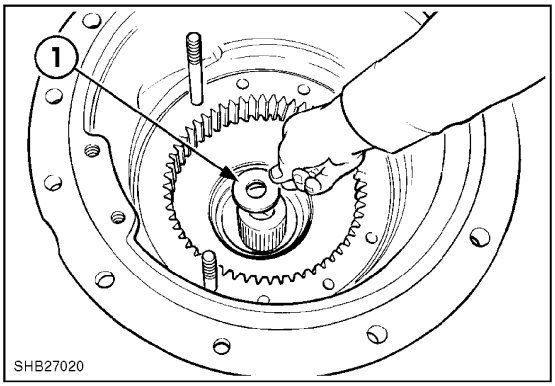
NOTE: *Make sure both bearings are well lubricated and, once preload is set, lock nut to pinion.*



41

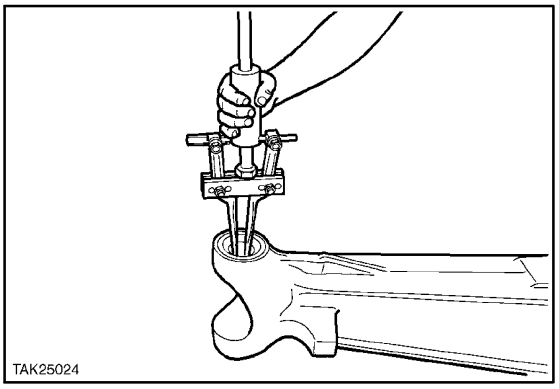
Axle shaft bearing preload

Adjustable shims (1) are located between the inner end of the axle shaft and carrier retainer.



42

17. Pivot bush removal.
    Remove the upper and lower pivot bushes using an internal puller and slide hammer.

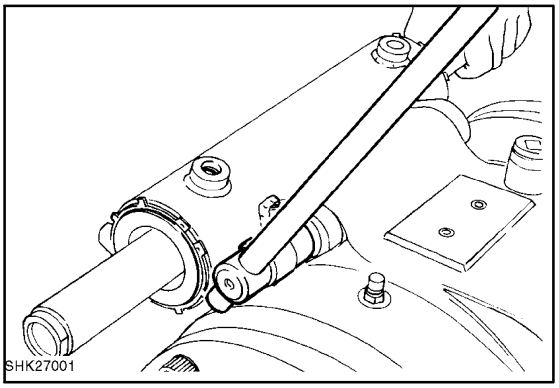


17

STEERING CYLINDER REMOVAL

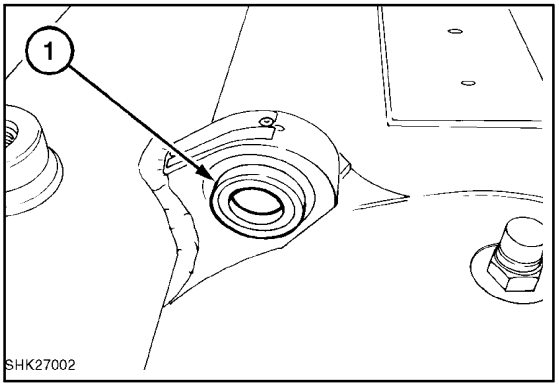
Undo the track rod ends from each side of the steering cylinder.

Remove the four retaining bolts.



18

Using a slide hammer with threaded end M18, remove the upper and lower bushes (1) on the left side.

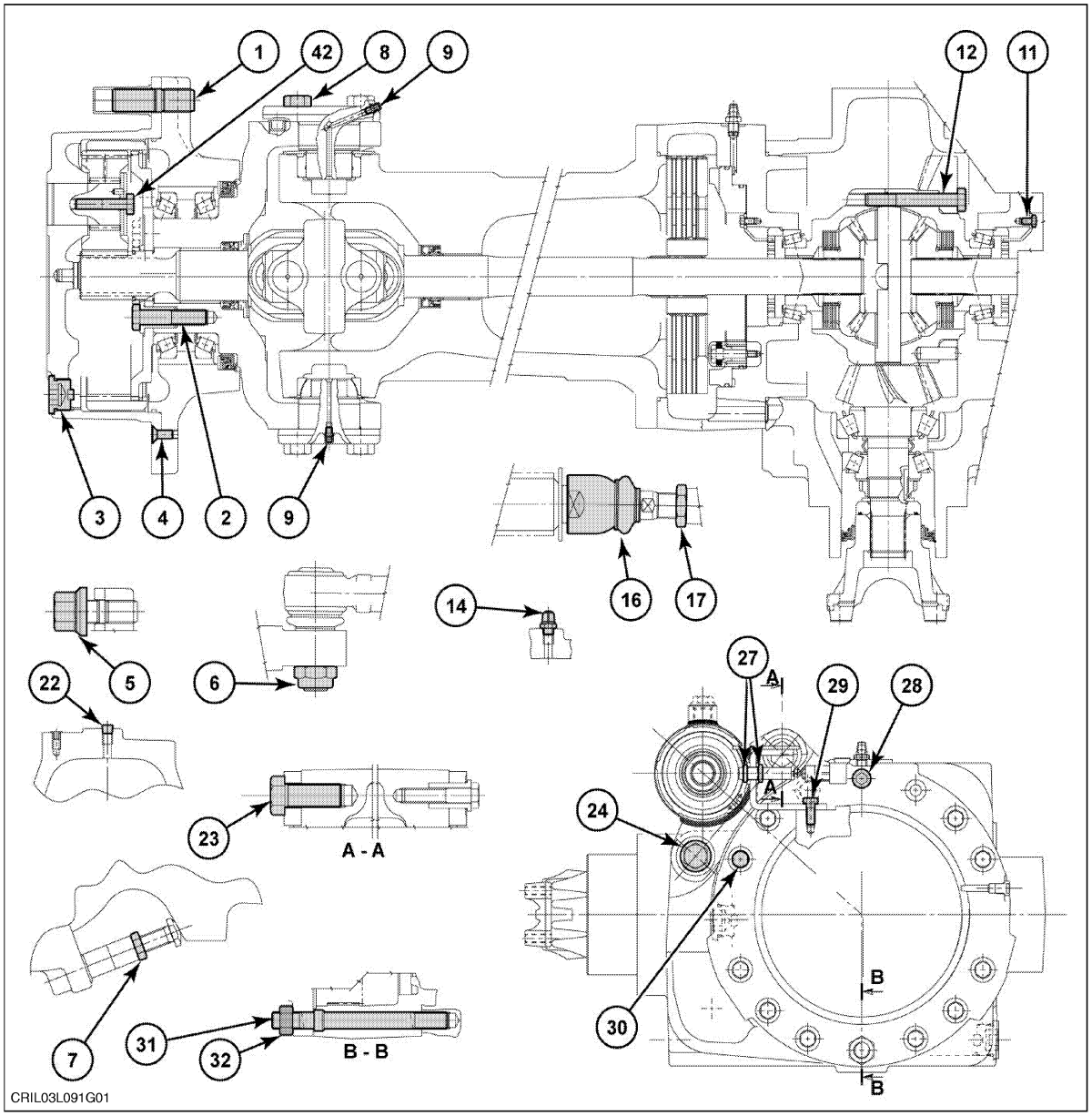


19

Lift off the complete assembly.

To disassemble the cylinder remove the circlip from each end then slide the piston to one end and tap out one gland, then slide it to the other end to remove the remaining gland block.

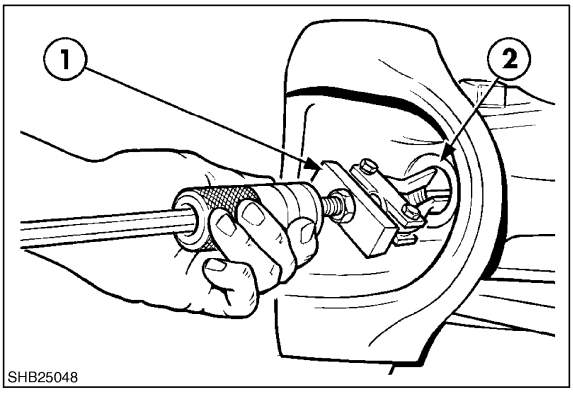
SPECIAL TORQUE SETTINGS



Remove the half-axle housing bush and seal

Use tool P/N **380000985** to extract the seal and bush from the half-axle housing.

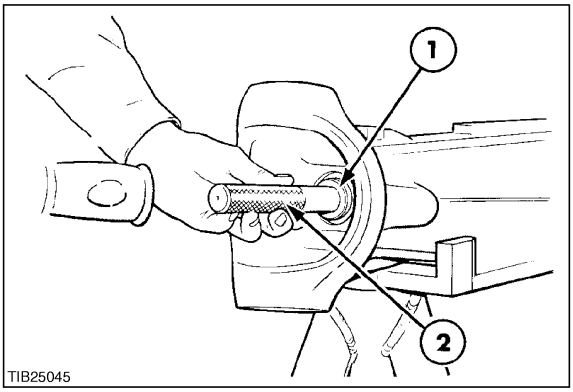
1. Extractor
2. Oil seal



Reinstallation of stub axle bush and seal

Thoroughly clean the stub axle housing before installing a new seal and bush. Use tool kit P/N **380000563** and strike gently with a rubber-headed mallet.

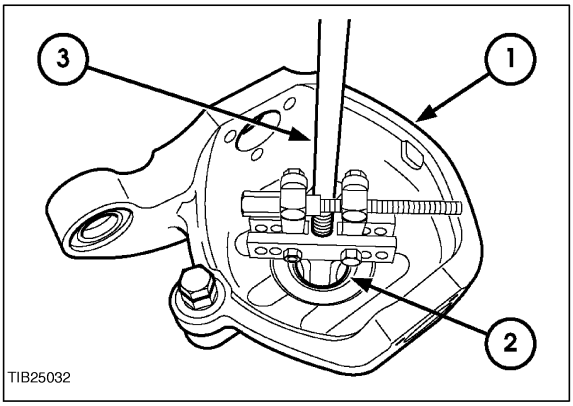
1. Bush installation tool
2. Tool handle



Removal of stub axle seal

Extract the seal and bush from the stub axle housing using tool P/N **380000986** and a hammer extractor P/N **380000987**.

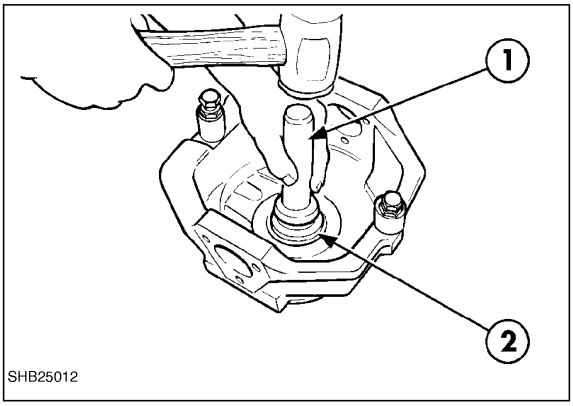
1. Stub axle
2. Union
3. Hammer extractor



Reinstallation of the stub axle seal and bush

Reinstall the seal and bush in the stub axle housing using tool P/N **380000563**.

1. Tool handle
2. Installation tool

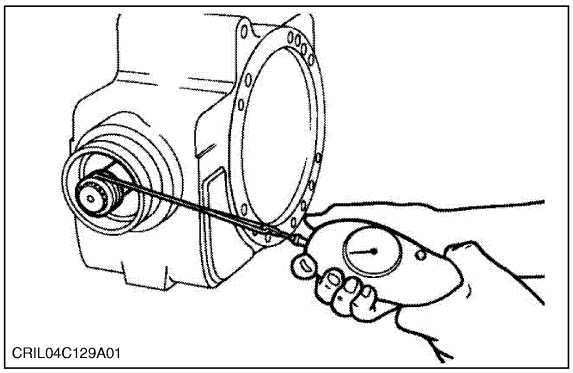


Drive pinion preload adjustment

NOTE: *This adjustment cannot be done until a new collapsible shim has been installed.*

Wind a rope around the drive pinion, install a torque meter, then pull the rope to rotate the pinion shaft and record the rotation torque value, tighten the drive pinion nut to obtain a torque P = **92** to **137** Nm.

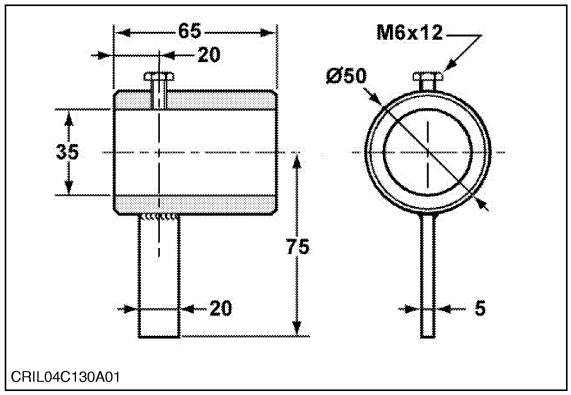
Use wrench P/N **380000021** to tighten the drive pinion nut, holding the shaft stationary with wrench P/N **380000020**.


CRIL04C129A01

Adjustment of ring gear and drive pinion backlash

TOOL TO BE MANUFACTURED LOCALLY (see drawing)

Position the differential equipped with the bearing inner cages in the housing and fit the brake housings with the bearing outer cages, install the two adjusting nuts and mount the tool on the drive pinion shaft.



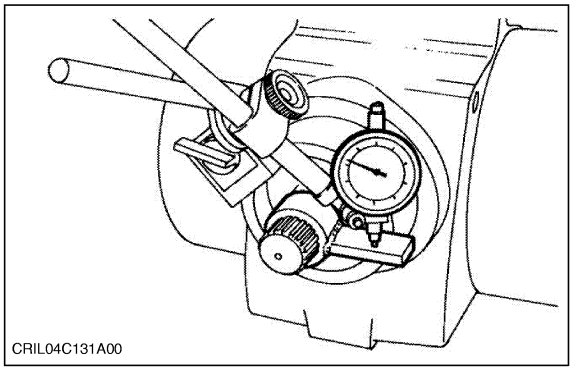
CRIL04C130A01

Measurement of backlash, new parts **0.17** - **0.22 mm**.

If reusing the drive pinion and gear ring, apply the value measured at disassembly.

Measure the backlash by placing the magnetic base of the dial gauge on the housing and its sensor on the flat surface of the tool. The tip of the sensor must be positioned about **39 mm** from the central axis of the drive pinion.

Tighten the adjusting bush (3) (with wrench P/N **380000406**) on the ring gear side to eliminate the play of the differential bearings.


CRIL04C131A00

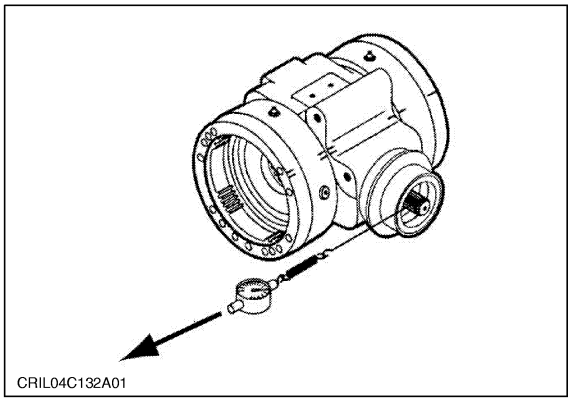
Adjust the backlash of the ring gear and drive pinion by turning the adjusting bushes (3) by the same amount in the opposite direction.

Take measurements at 90° intervals; if the measurements are not identical, adjust the backlash to the position that give the smallest dimension.

Preloading of the differential bearings

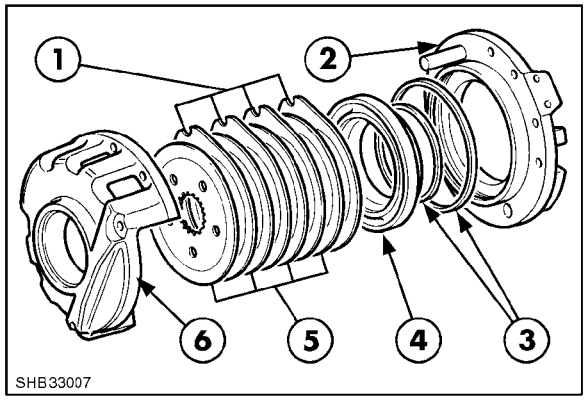
To determine the preload of the bearings of the differential (1), compare the rotation torque required to turn the drive pinion slowly at the same time as the differential with the rotation torque of the drive pinion bearings only (noted previously).
Gradually tighten bush (3) on the side opposite the ring gear until the rotation torque lies between the indicated values

Example:
Wind a rope around the drive pinion, install a torque meter, then pull the rope to rotate the pinion shaft and record the rotation torque value.


CRIL04C132A01

Brake Discs and Piston Layout

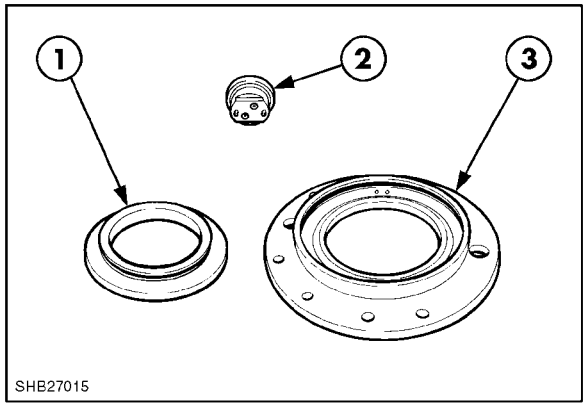
1. Steel Plates
2. Outer Brake Housing
3. Seals
4. Brake Piston
5. Friction Plates
6. Outer Brake Housing



9

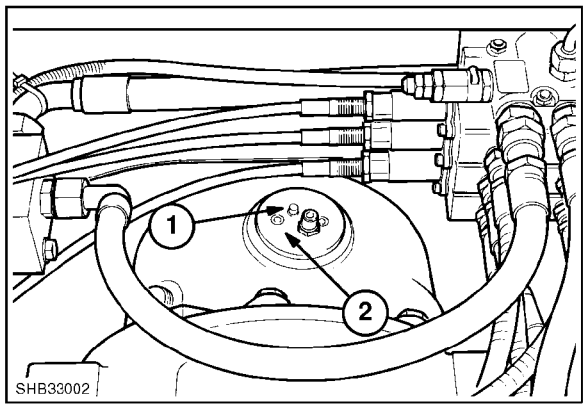
Brake Piston and Seals

1. Brake Piston
2. Brake Pipe fitting
3. Outer Brake Housing



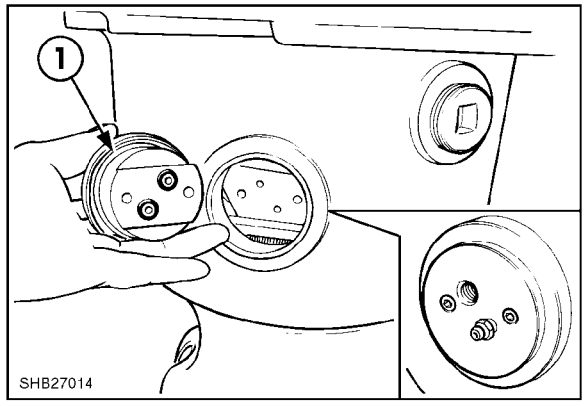
10

The brakes hydraulically operated are supplied oil from the brake pedal reservoir and into the axle by tubes into each half axle (1) through the mounted brake pipe fitting (2) which is sealed to the piston by two 'O' rings.



11

When the brake pipe fitting (1) is removed ensure the 'O' rings (2) are replaced with new



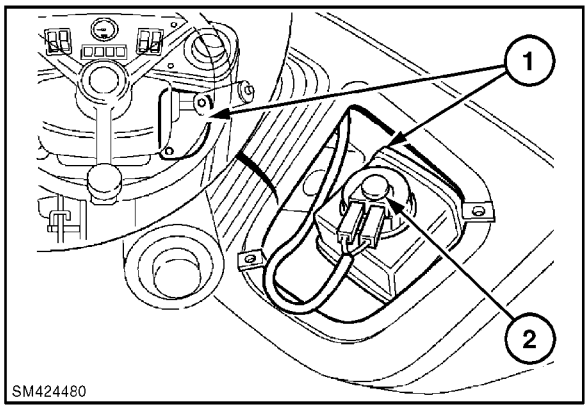
12

Overhaul

Brake Reservoir

1. Brake Reservoir
2. Low Level Test Switch

To test the low level switch on the reservoir cap place the handbrake in the OFF position and then press the button on the reservoir cap, the handbrake light should come on.



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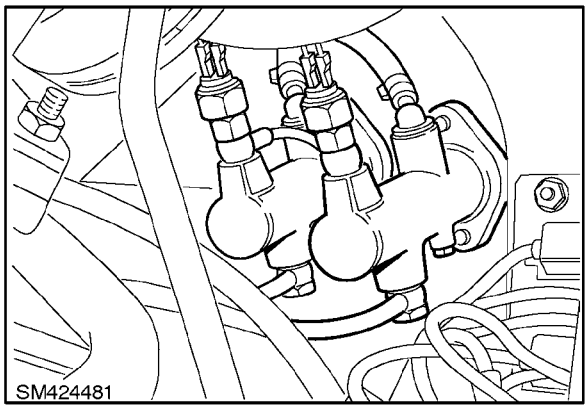
Brake master cylinders are accessible from the engine compartment.

The brake cylinders are linked by a balance pipe which supplies equal pressure to both brake pistons when both pedals are pressed.



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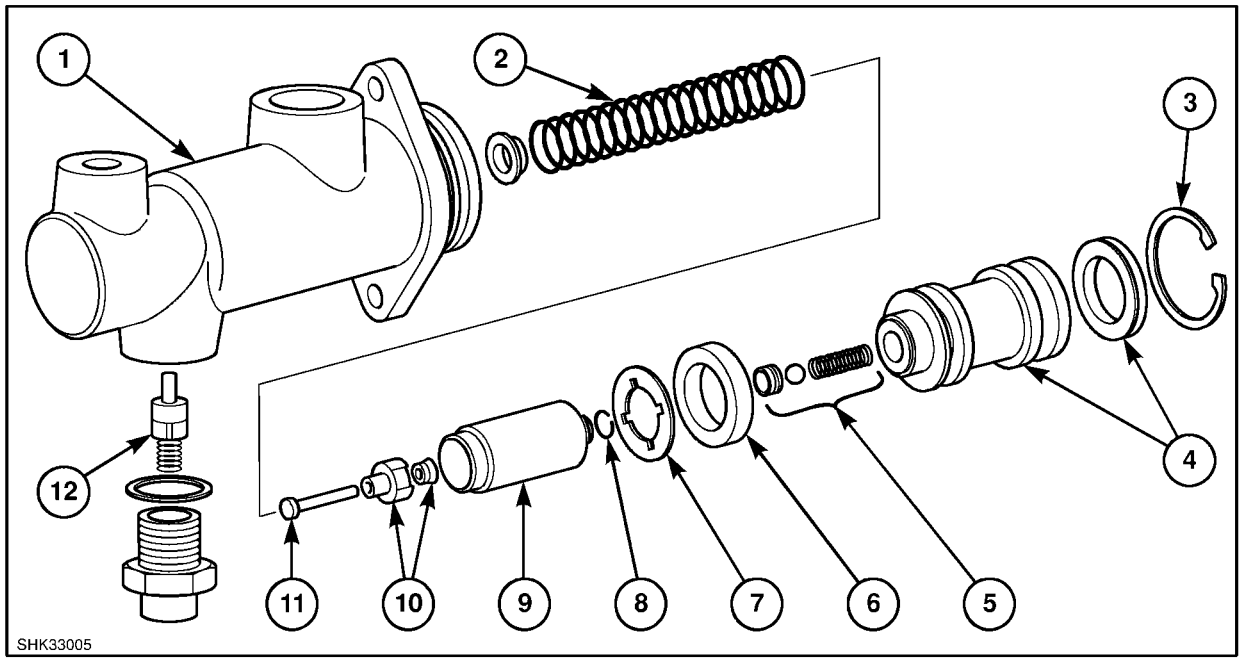
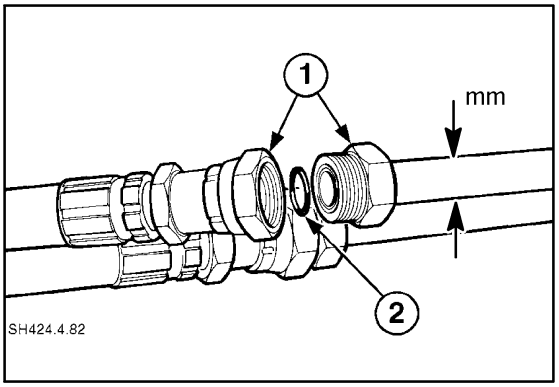


7

1. Master Cylinder Body
2. Piston Return Spring
3. Circlip
4. Piston and Lip Seal
5. Relief Valve Assembly
6. Piston Seal
7. Seal Retainer
8. Sleeve to Piston Retaining Ring
9. Sleeve
10. One Way Valve
11. Relief Valve Actuator
12. Balancer One Way Valve

Ensure that the correct 'O' ring seal (2) is properly placed in the face seal 'O' ring groove on the connector (1). Place the tube assembly against the fitting body so that the flat face of the sleeve comes in full contact with the 'O' ring. Thread the nut by hand and tighten to the specified torque.

Do Not Overtorque '0' Ring Face Seal Connectors'



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Steel Tube Outside Diameter (mm)	Nm	lbf ft
10	36	27
12	54	40
14-16	85	63
18-20	122	90
22-25	162	120

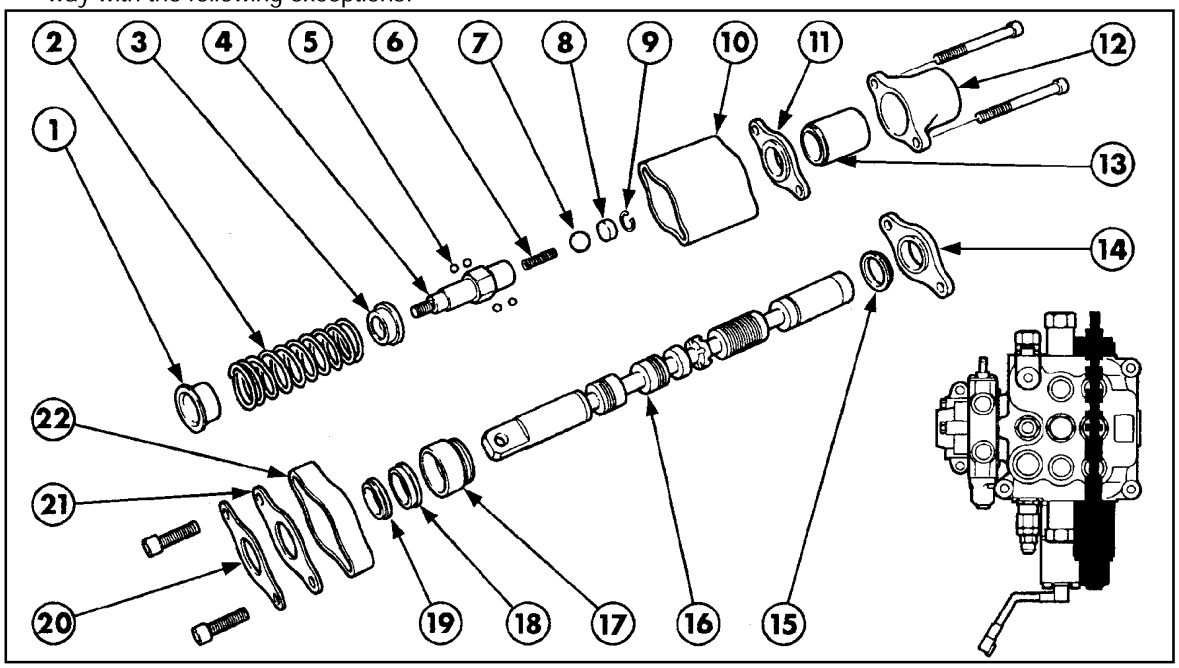
SPECIAL TOOLS

Description	V. L. Churchill Tool No
Circuit Relief Valve Test Block	297418
Control Valve Seal Insertion Tool	297419

11. Fit a new wiper ring with the lip facing outwards away from the seal.
12. Fit the seal plate onto the valve block using the two screws. Tighten the screws to 10 Nm.
13. Repeat this operation - steps 9 to 12 - for the spring end of the spool.
14. Fit the centring spring with retaining bolt (Item 18 Figure 17) into the end of the spool. Use Loctite 242 on the bolt threads before tightening to 10 Nm.
15. Fit the spring cap and screws through the seal plate and tighten to 10 Nm.
16. Reconnect the linkage to the spool end.
17. All hydraulic valve spools are sealed in the same way with the following exceptions.

a). Loader lift spool linkage end: The lip seal and wiper ring are mounted in a spacer (Item 17) which is then sealed into the valve block with an O ring. The spacer should be removed to allow the seal to be pushed out and the O ring should be replaced to ensure a good seal.

b). Loader lift spool spring end: The spool end cap contains the detent mechanism. Seal replacement involves the removal of the detent mechanism from the spool using the hexagonal portion on the detent plunger (Item 4). There is no wiper ring between the seal (Item 15) and the seal plate (Item 14).



19

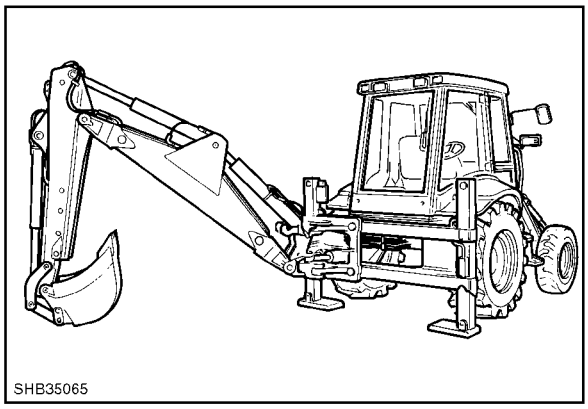
Loader Valve - Lift Spool Components

1. Centring Spring Seat.
2. Centring Spring.
3. Centring Spring Seat.
4. Detent Plunger.
5. Detent Balls (4).
6. Spring.
7. Steel Ball.
8. Cap.
9. Circlip.
10. Cover.
11. Spacer Plate.
12. End Cap.
13. Detent Collar.
14. Seal Plate.
15. Lip Seal.
16. Lift Spool.
17. Spacer.
18. Lip Seal.
19. Wiper ring.
20. End Cover.
21. Seal Plate.
22. Cover.

STABILISER AND EXTENDIBLE DIPPER CONTROL VALVE OVERHAUL (OP NO. 35 703)

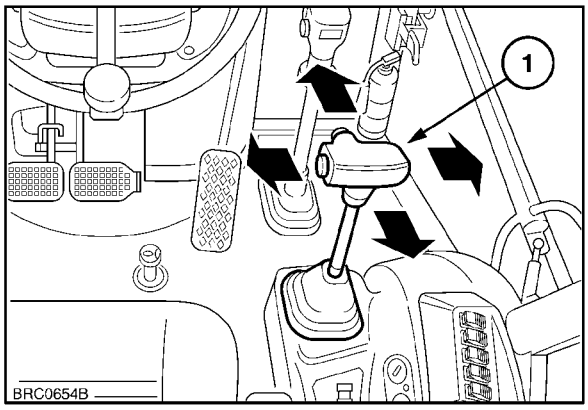
Removal

1. Lower loader to ground and position the dipstick in the vertical plane with bucket positioned firmly on the ground.



32

2. Stop the engine and relieve any residual pressure in the backhoe and loader circuits by moving the loader and backhoe control levers through all operating positions.



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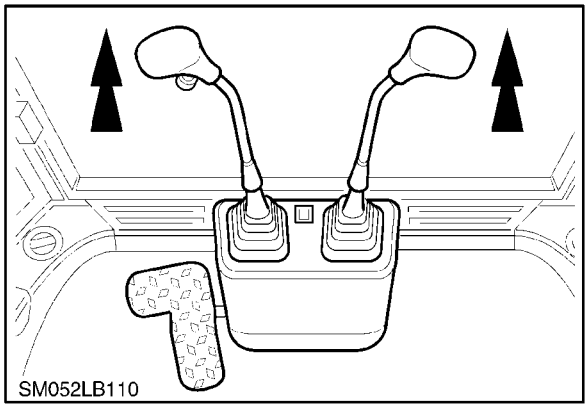

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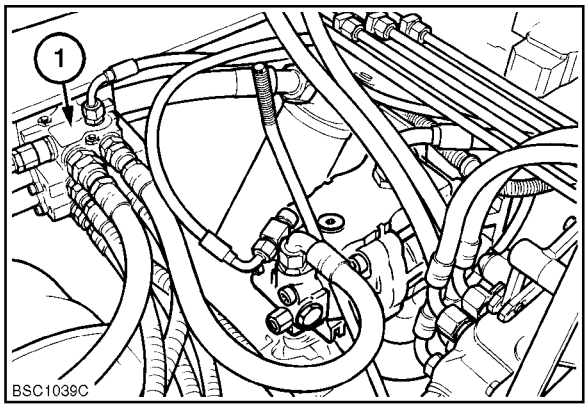
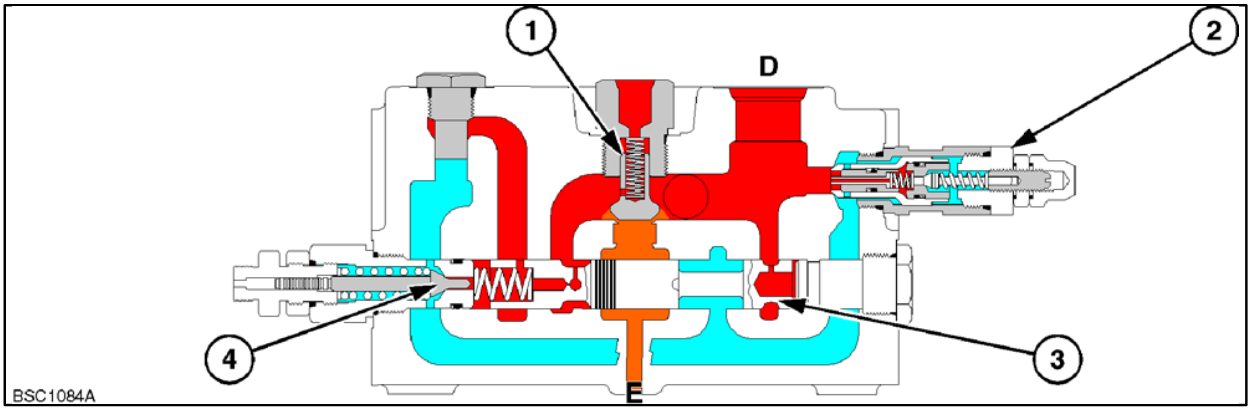
3. Disconnect the battery
4. Clean area around control valve
5. Disconnect each hose connection to the valve (1) and plug hose ends. The use of a drip tray will be required to catch oil draining from inside the hoses.



35

6. Remove valve from tractor.

Unload Valve Operation



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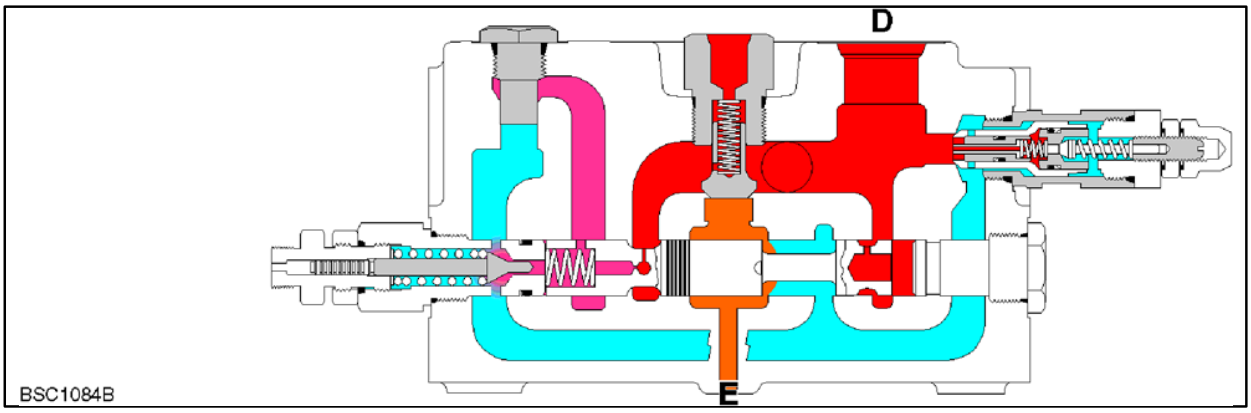
Oil Flow When Backhoe is in use



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Oil Flow when Loader only is in use

Front Pump Flow

Rear Pump Flow

Transfer Pressure

Return to Tank

D. Flow From Front Pump

1. Unload Valve

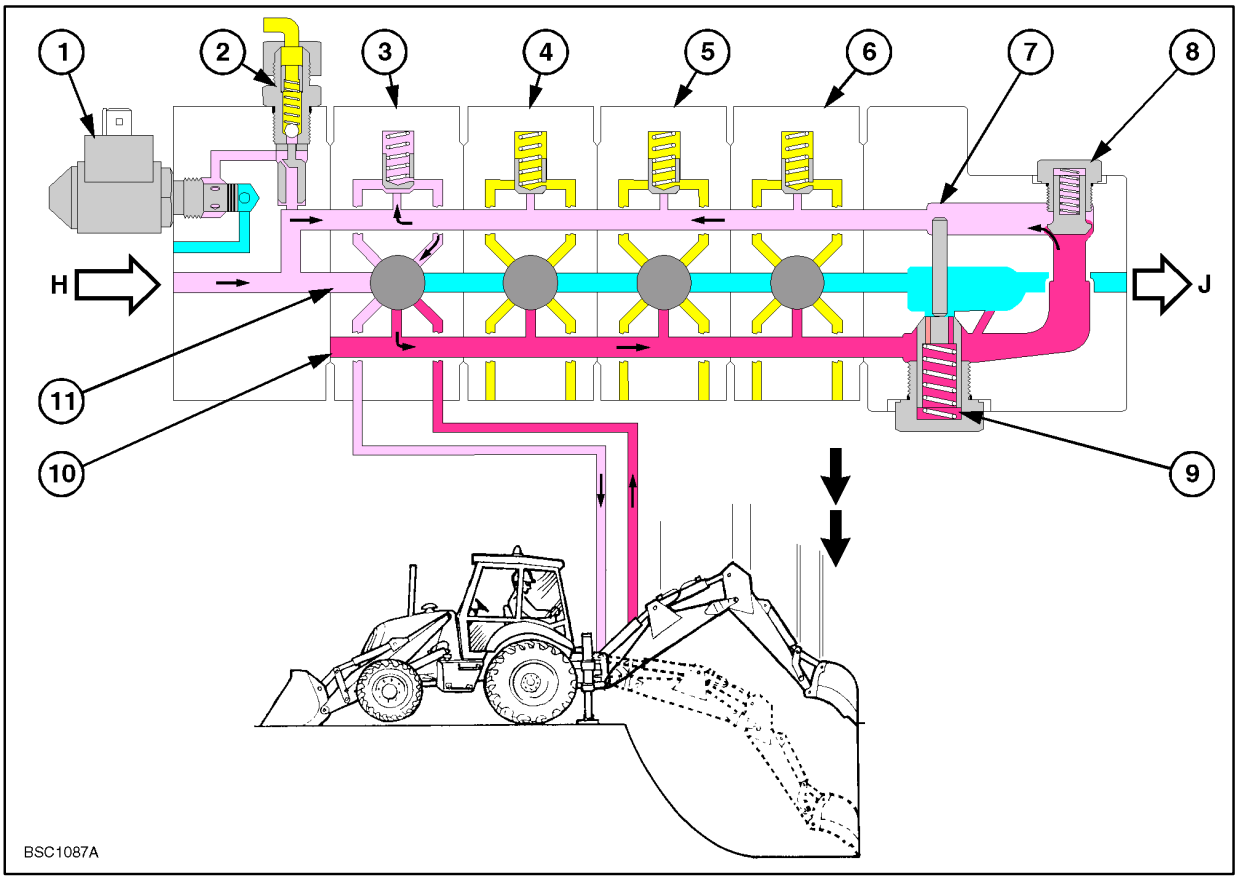
2. Combined Pump Flow Load Check Valve

E. Flow From Rear Pump

3. System Pressure Relief Valve

4. Unload Spool

NOTES



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Operation of Regenerative Check Valve

Pump Pressure Oil

Trapped Oil

Cylinder Exhaust Oil @ Higher than Pump Pressure

Return to Reservoir

Port H – Pump Flow from Loader Valve

1. Clamp System Dump Solenoid
2. Clamp System Check Valve
3. Boom Cylinder Control Valve
4. Swing Cylinder Control Valve
5. Bucket Cylinder Control Valve
6. Dipper Cylinder Control Valve

Port J – Return to Reservoir

7. Parallel Gallery
8. Regenerative Check Valve
9. Back Pressure Valve
10. Control Valve Exhaust Gallery
11. Staggered Open Centre Gallery

Regenerative Check Valve Operation

When a digging element is rapidly operated, for example the boom is quickly lowered into a trench, the situation can arise where, if engine speed is too low, pump output is insufficient to meet demand of the cylinder and the cylinder will cavitate.

This will result in a hydraulic void occurring in the piston (extending) side of the cylinder.

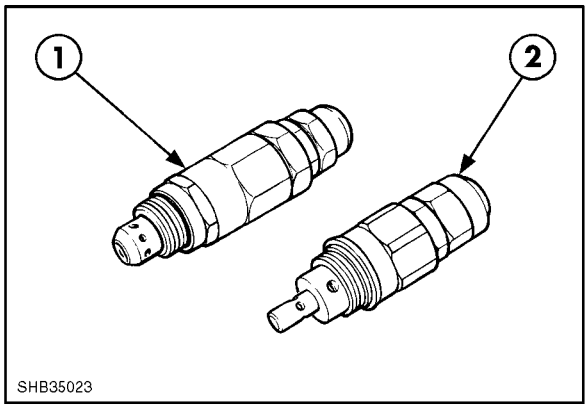
To overcome this situation the regenerative check valve is installed.

When cylinder exhaust pressure is higher than pump pressure, the flow of oil from the exhausting cylinder lifts the check valve of its seat allowing exhaust oil to flow past the check valve into the parallel gallery and supplement the insufficient flow from the pump to operate the cylinder and prevent the void from occurring.

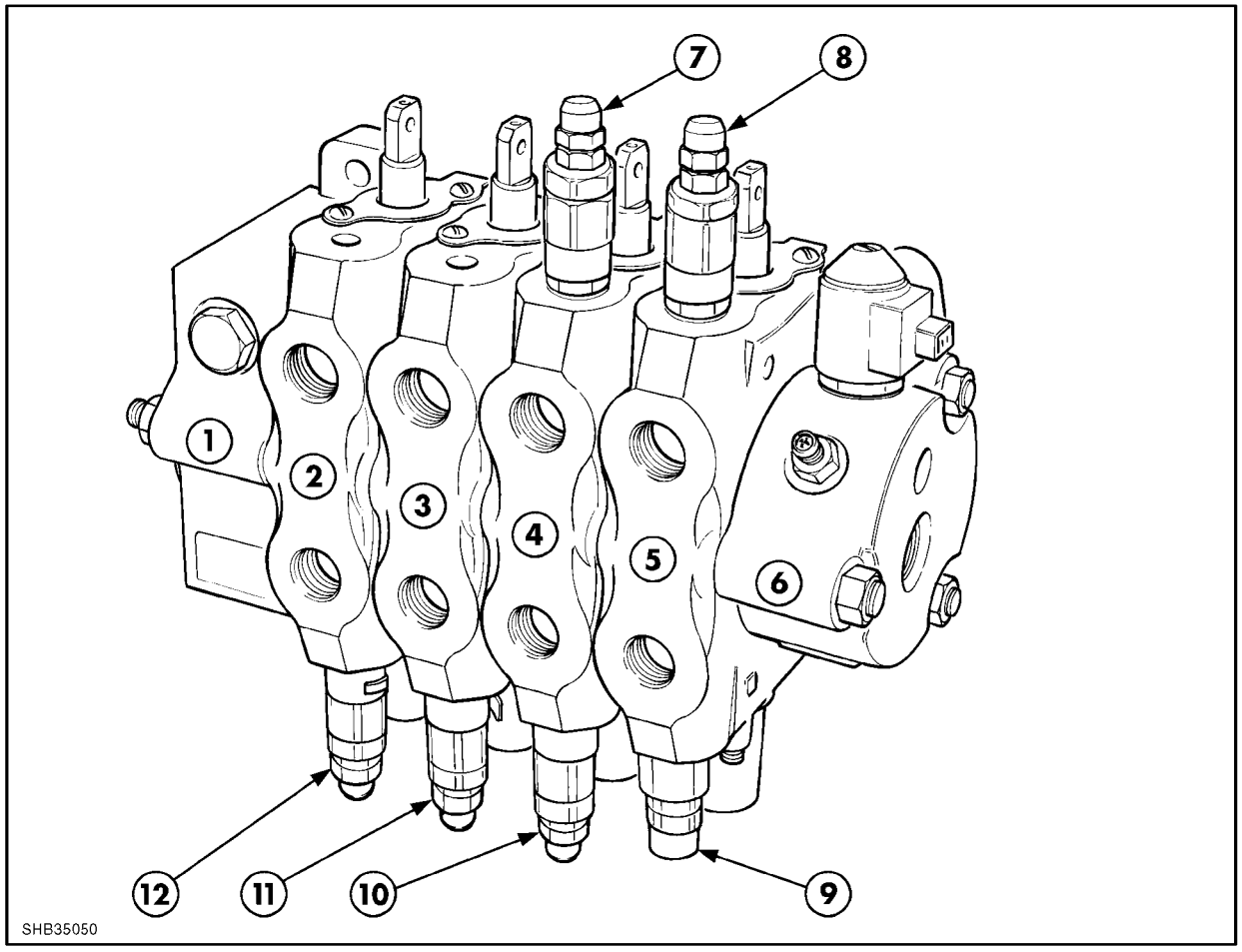
The back pressure valve will remain closed in this operation.

Circuit Relief Valves
Principle of Operation

The relief valves may be either pilot operated with anti-cavitation feature (1) or direct acting (2) and protect individual circuits from excessive pressure created by external cylinder overload.



122



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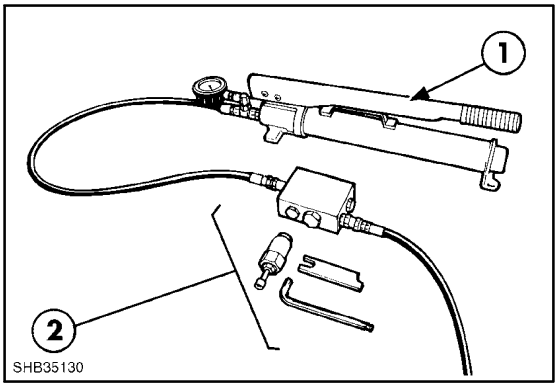
Relief Valve Identification

1. Outlet End Cover
2. Dipper Valve Section
3. Bucket Valve Section
4. Swing Valve Section
5. Boom Valve Section
6. Inlet End Cover
7. Swing Cylinder Cushioning Circuit Relief Valve* @ 207 bar (3000 psi)
8. Lift Cylinder Piston End Circuit Relief Valve* @ 241 bar (3500 psi)
9. Lift Cylinder Rod End Direct Acting Circuit Relief Valve @ 317 bar (4600 psi)
10. Swing Cylinder Cushioning Circuit Relief Valve* @ 207 bar (3000 psi)
11. Bucket Cylinder Rod End Circuit Relief Valve* @ 207 bar (3000 psi)
12. Dipper Cylinder Piston End Circuit Relief Valve* @ 241 bar (3500 psi)

*Pilot Operated with Anti Cavitation Feature

Circuit Relief Valve Adjustments

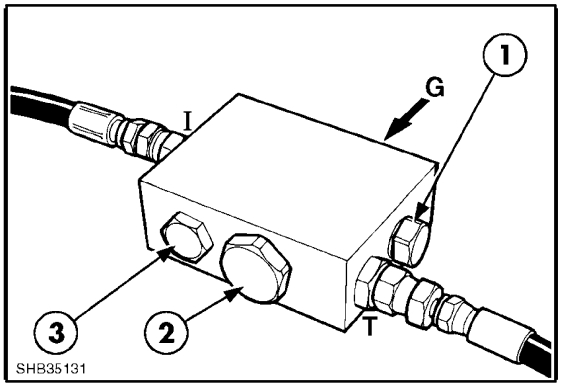
After overhaul the circuit relief valves must be tested and adjusted using a suitable hand pump (1), 275 bar (4000 psi) pressure gauge and V. L. Churchill test kit (2) Tool No 297418.



140

12. The hand pump must be attached to inlet port I and the drain hose to the outlet port T of test block using suitable $^{1}/_{2}$ inch BSP (British Standard Pipe) adaptors.

    The pressure gauge may be connected to either the hand pump as shown or to the $^{3}/_{8}$ UNF threaded port G in the test block.

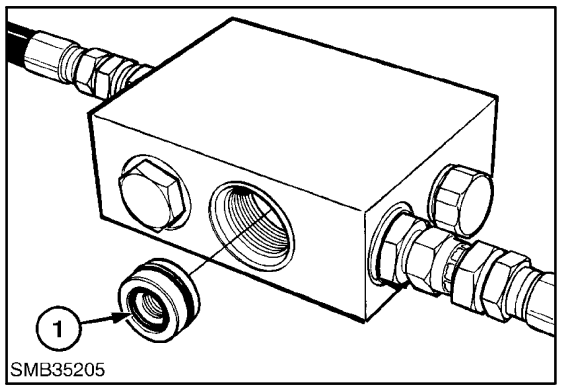


141

13. Remove plug and insert valve to be tested into the appropriate port in the test block as follows:-

1. Stabiliser and Backhoe Relief Valves
2. Loader Bucket Relief Valves
3. Unload Valve

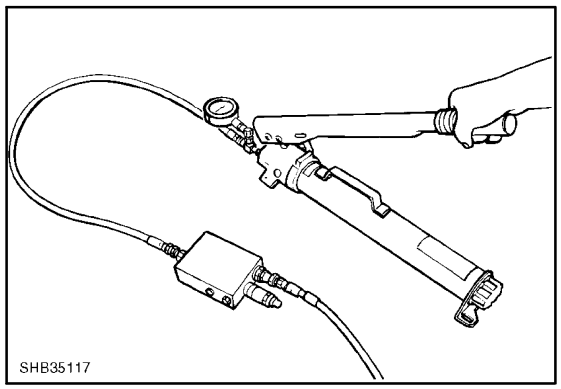
NOTE: A special removable insert which, is part of the test block, is installed in the bottom of the port used for testing the loader valve. If difficulty is experienced in screwing the loader valve into the test block, check that the insert is fully seated and correctly installed. When correctly installed the 'O' ring (1) on the face of the insert should be visible.



142

14. Operate hand pump and record maximum pressure reading on gauge. Compare pressure values with specifications shown in Figures 134, 135 and 136.

IMPORTANT: Before removing valve from test block release pressure in circuit using the vent valve on the hand pump



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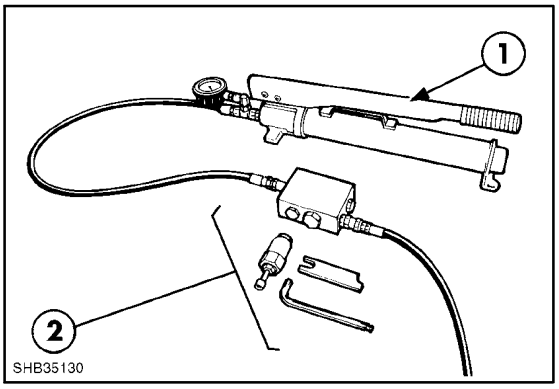
FAULT FINDING - BACKHOE (CONT.)

PROBLEM	POSSIBLE CAUSES	CORRECTION
Right or left direction swing fails to operate, is slow, or has loss of power.	Swing circuit relief valves not seating, set too low or seat is leaking.	Swing circuit relief valve test.
	Valve spool leakage.	Examine swing section of backhoe control valve assembly for wear or scoring.
	Piston seal leaking or cylinder barrel damaged.	Examine/reseal piston and gland.
Swing fails to slow (cushion arrest) at end of travel.	Integral sliding restrictor damaged.	Disassemble and inspect.
	Piston seal leaking or cylinder barrel damage.	Examine/reseal piston and gland.
Swing continues to move when control lever returned to neutral (one direction only).	Circuit relief valve (return side) stuck open, set too low or seat leaking.	Swing circuit relief valve test.
	Valve spool leakage.	Examine swing section of backhoe control valve assembly for wear or scoring.
Swing drifts, slow to respond, hesitates.	Circuit relief valve anti-cavitation function stuck/seized.	Disassemble and inspect.
	Restrictors seized/incorrectly positioned.	Disassemble and inspect.
Cylinders leak down (spools in neutral).	Internal valve leakage.	Examine appropriate valve section of backhoe control valve assembly for wear or scoring.
	Piston seal leaking or cylinder barrel damaged.	Examine/reseal piston and gland.
Any one circuit drops momentarily when signalled to raise.	Load check valve between control valve sections damaged.	Disassemble and inspect.

Circuit Relief Valve Pressure Testing Using Test Block 297418

After overhaul the circuit relief valves must be tested and adjusted using a suitable hand pump (1), 275 bar (4000 psi) pressure gauge and test kit (2) Tool No 297418.

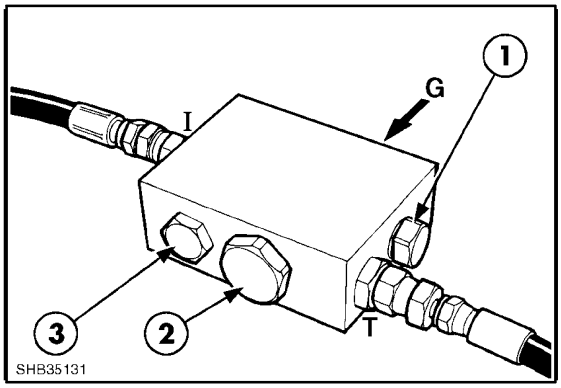


28

1. The hand pump must be attached to inlet port I and the drain hose to the outlet port T of test block using suitable $^{1}/_{2}$ inch BSP (British Standard Pipe) adaptors.

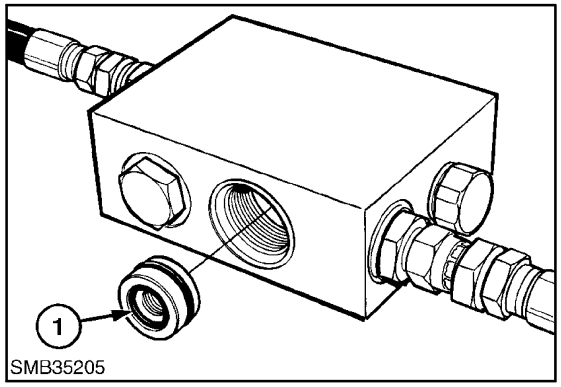
   The pressure gauge may be connected to either the hand pump as shown or to the $^{3}/_{8}$ UNF threaded port G in the test block.
2. Remove plug and insert valve to be tested into the appropriate port in the test block as follows:-

1. Stabiliser and Backhoe Relief Valves
2. Loader Bucket Relief Valves
3. Unload Valve



29

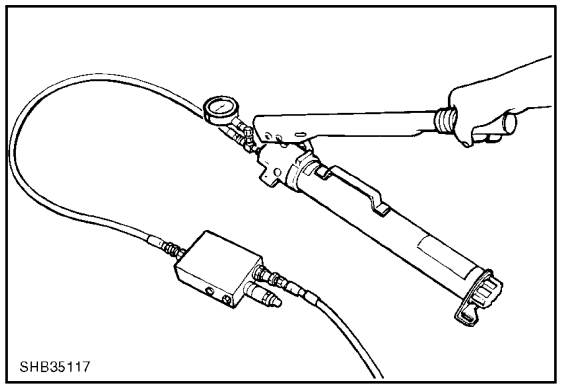
NOTE: A special removable insert which, is part of the test block, is installed in the bottom of the port used for testing the loader valve. If difficulty is experienced in screwing the loader valve into the test block, check that the insert is fully seated and correctly installed. When correctly installed the 'O' ring (1) on the face of the insert should be visible.



30

3. Operate hand pump and record maximum pressure reading on gauge. Compare pressure values with specifications shown in Figures 1, 2 and 3.

IMPORTANT: Before removing valve from test block release pressure in circuit using the vent valve on the hand pump.



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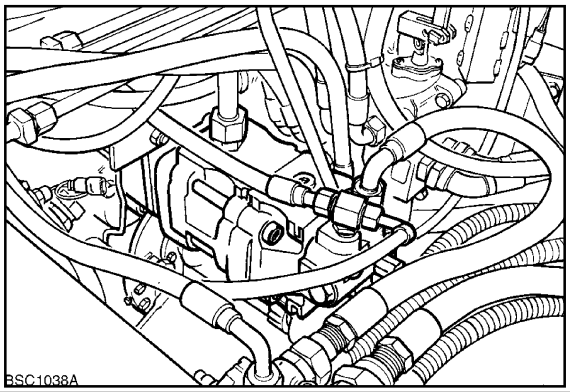
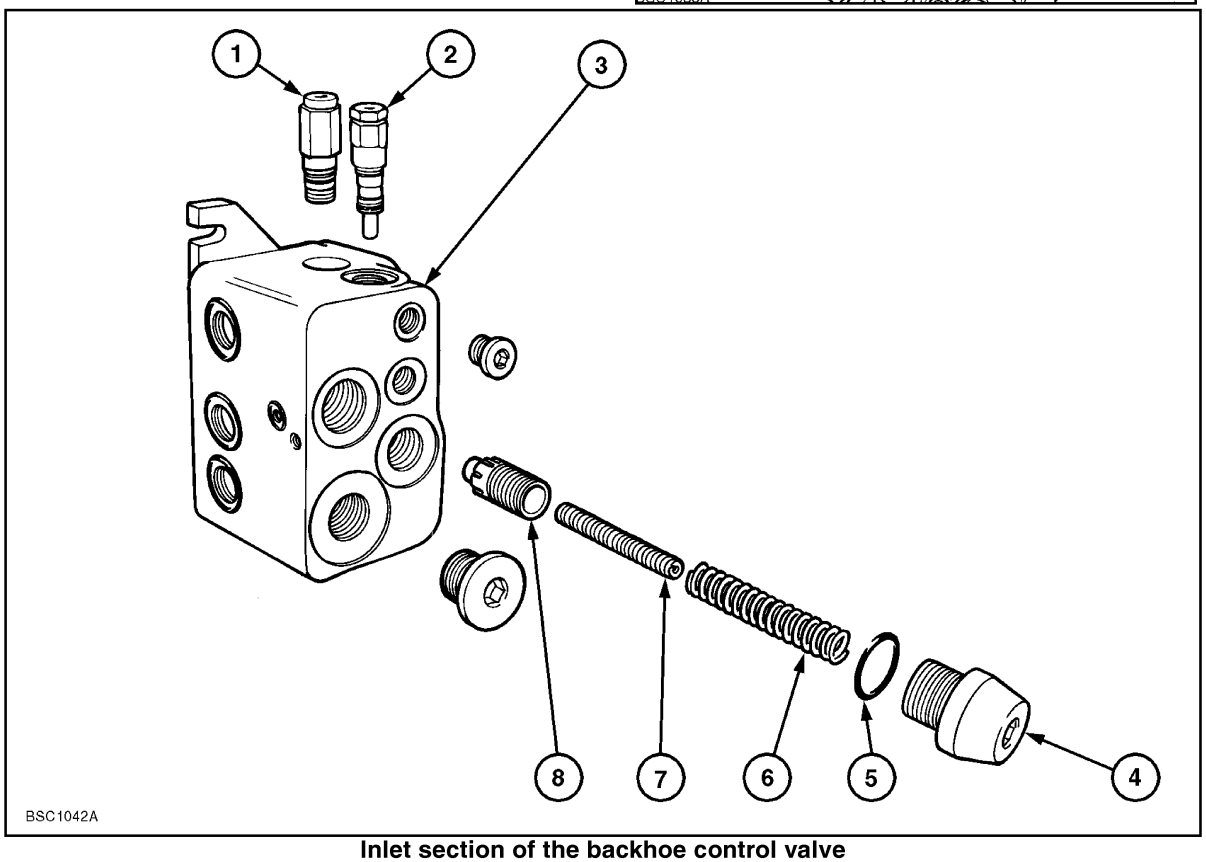
Backhoe control valve

The backhoe control valve is located at the rear of the chassis.

The control valve consists of a maximum of seven sections of spool control valves and provides the oil flow for operating the boom, the dipper, the bucket, the upperstructure, the stabiliser and the side shift clamp components of the backhoe assembly.





Inlet section of the backhoe control valve

Located within the inlet section (3) of the backhoe control valve are the load sensing limiter (system pressure relief valve) (2) and load sensing return to reservoir orifice (1) which allow load sensing pressure to vent to reservoir when hydraulic circuits are in neutral or when load sensing pressure exceeds the 210 bar maximum value due to a malfunction in the system.

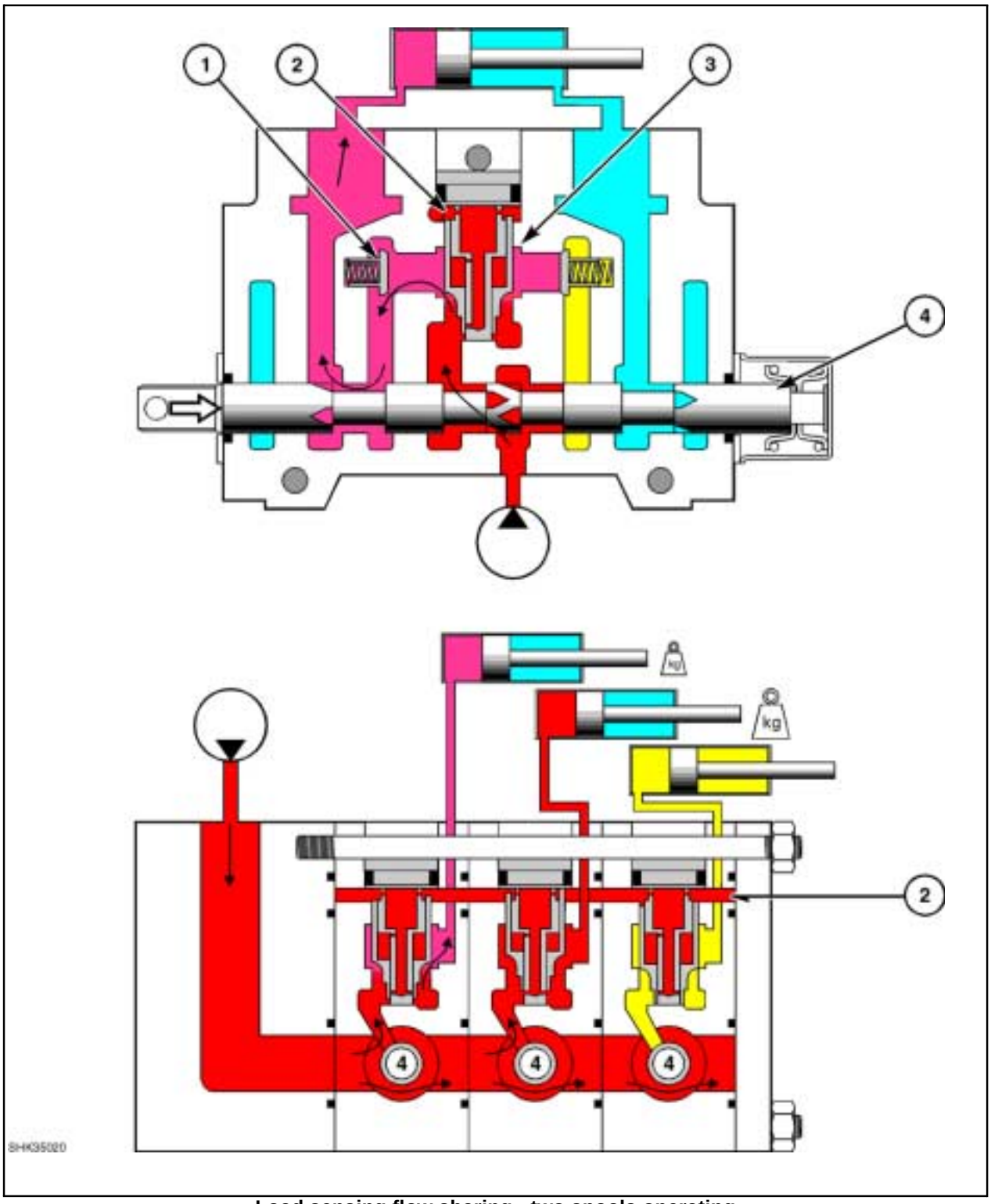
The pump flow balancer valve, items (4-8) controls the flow of oil from the hydraulic pump and diverts excess flow back to reservoir. The valve also maintains a back pressure of 17 bar in the circuit when all valve sections are in neutral and engine speed is 1000 rpm.

Back pressure will increase to 23 bar at an engine speed of 2200 rpm in the hydraulic circuit.

BACKHOE CIRCUIT WITH HYDRAULIC CONTROLS

1 Hydraulic reservoir
2a Hydraulic pump
2 x 34 cc with 95 HP engine
34 cc for rear pump and 38 cc for front pump with 115 HP engine
2b Steering flow divider and LS valve
3 Hydraulic hammer control valve (optional)
4 Loader control valve
5 Backhoe hydraulic hammer control valve (optional)
6 Backhoe control valve
6a Pump flow balance valve (15 bar)
6b Load sensing limiter (system pressure relief valve) (210 bar),
6c Telescopic dipper cylinder (piston end) circuit relief valve (165 bar)
6d Boom cylinder (rod end) circuit relief valve (315 bar)
6e Boom cylinder (piston end) circuit relief valve (240 bar)
6f Boom foot swing cylinder circuit relief valve (right swing) (205 bar)
6g Boom foot swing cylinder circuit relief valve (left swing) (205 bar)
6h Bucket cylinder (rod end) circuit relief valve (220 bar)
6i Dipper cylinder (piston end) circuit relief valve (240 bar)
7 Telescopic dipper cylinder (optional)
8 Boom cylinder
9 Boom foot swing cylinders
10 Bucket cylinder
11 Dipper cylinder
12 Left stabilizer cylinder
13 LH stabiliser cylinder pilot valve (European model)
14 RH stabilizer cylinder
15 RH stabiliser cylinder pilot valve (European model)
16 Side shift locking cylinders (European model)
17 Return manifold
18 LH control lever
19 RH control lever
20 Solenoid valves for changing configuration
21 Pilot pressure limiter
22 RH stabiliser control solenoid valves
23 LH stabiliser control solenoid valves
24 Telescopic dipper control solenoid valves
25 Pilot pressure solenoid valve
26 Solenoid valve for side shift locking cylinder control (European model)

FLOW PORTS
A1 / A4 / B4 / A5 / B5 150 l/min
B1 / A2 120 l/min
A3 / B3 80 l/min
A6 / B6 / A7 / B7 60 l/min (European model)



Load sensing flow sharing - two spools operating

1st spool operating pressure

2nd spool operating pressure

Trapped oil

Return to reservoir

1 Load check valve
2 Load sensing line
3 Pressure compensating valve
4 Spool

System Pressure Relief Valve

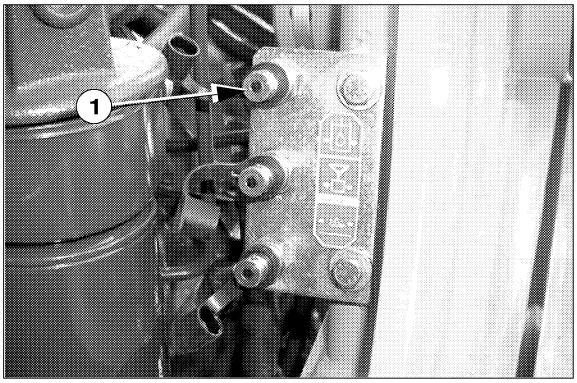
1. Install 0-300 bar (0 - 4351psi) pressure gauge into upper test port.
2. Set engine speed to 2200 rev/min.
3. Raise loader until bucket is approximately 0.5 metres (19 in) from the ground. This ensures that self levelling device does restrict movement of bucket during this test.
4. Hold the loader bucket control lever to the left causing the bucket to roll back.
5. Observe the reading on the upper gauge which will display the system pressure relief valve setting. Pressure reading should be 210 bar (3040 psi)
6. If relief valve is away from specification adjust to Specification.

Loader Bucket Relief Valve (Piston End)

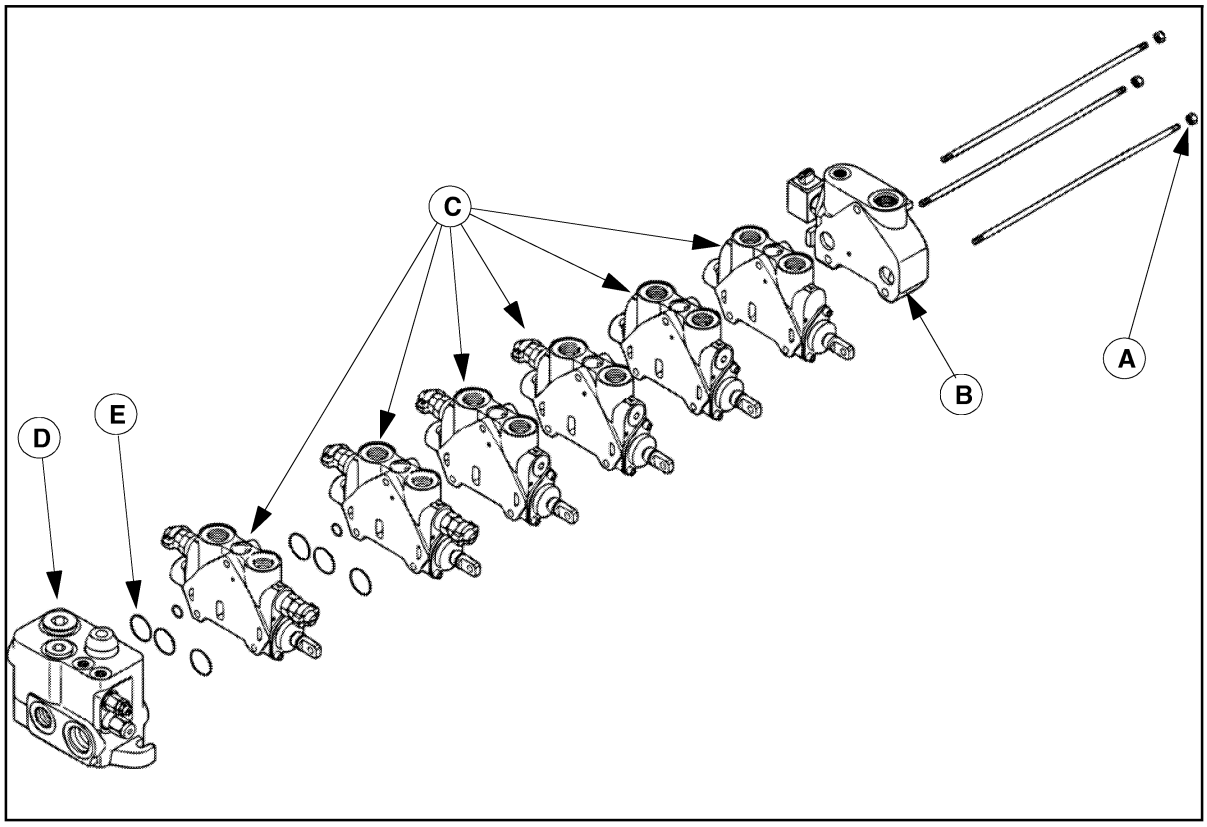
1. Set engine speed to 2200 rev/min
2. Hold the loader bucket control lever to the right causing the bucket to dump.
3. Observe the upper gauge which should read 160 bar (2300 psi) minimum and is the operating pressure of the loader bucket, piston end, relief valve. Values up to 190 bar are acceptable.
4. Adjust valve if not to specification.
5. To test rod end circuit relief valve hold lever to the left and curl in the bucket. If pressure reading is 210 bar the system relief valve is operating and it is an indication that relief valve which is set at 230 bar is set correctly.

Extendible Dipper Relief Valve (Piston End)

1. Set engine speed to 2200 rev/min
2. Fully extend the extendible dipper and continue to depress the control pedal.
3. Observe the reading on the gauge.
4. Pressure recorded is the extendible dipper relief valve setting and should read 165 bar (2375 psi) minimum. Values up to 200 bar (2900 psi) are acceptable.
5. Adjust valve if not to specification.



DISASSEMBLY OF THE CONTROL VALVE



Backhoe control valve with mechanical control

Disassembly

1. Remove the nuts (A).
2. Remove the outlet section (B).
3. Separate the working sections (C) from the Inlet section (D).
4. Replace the O-rings (E) located between the working sections, the inlet section and the outlet section.

Reassembly

1. Check the cleanliness of the section faces prior to reassembly.
2. Reassemble parts in reverse order.
3. Tighten nuts (A) from **32 to 38 Nm.**

ELECTRICAL DETENT SYSTEM SPOOL (7)

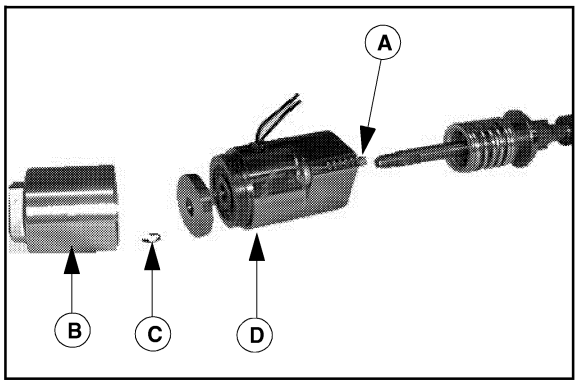
Removal

1. Remove the tongue and the cover sides (**see spool with spring return (5)**).

Solenoid replacement

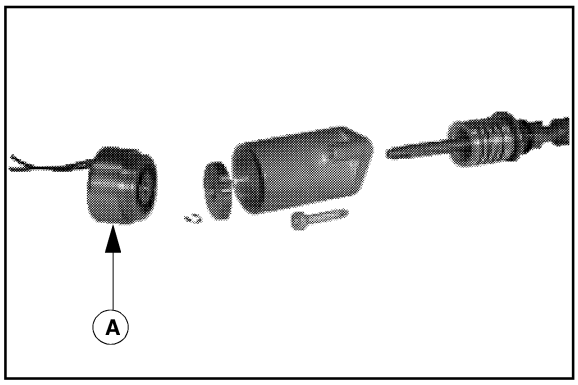
(Spool pulled out)

1. Remove the 2 mounting screws (A) and the detent system.
2. Unscrew the rear housing (B).
3. Remove the circlip (C), the spring and the coil.
4. Install a new solenoid (D).
5. Reassemble parts in reverse order.
   Tightening torque:
   Screws (A) - **9 to 11 Nm.**
   Rear housing (B) - **1,8 to 2,2 Nm**.

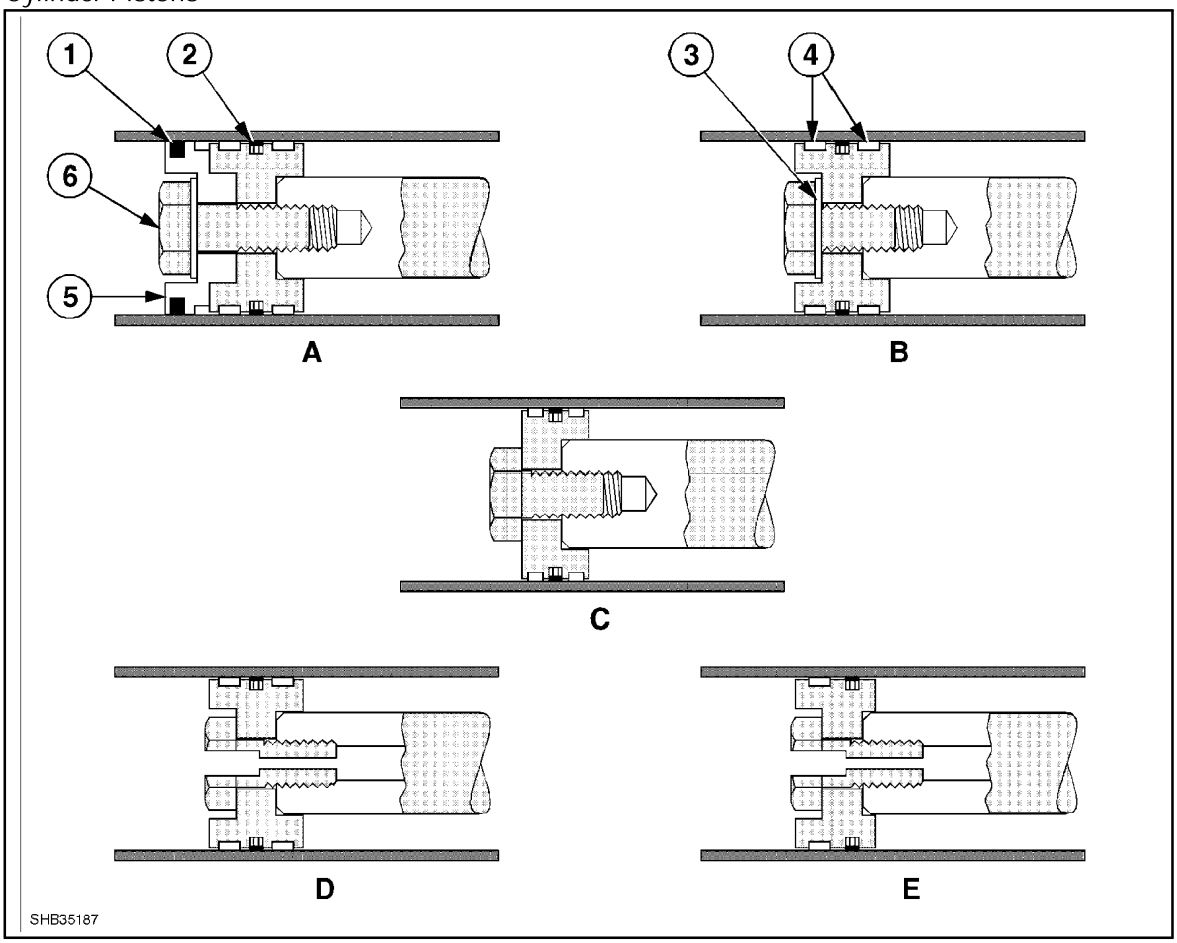


(Spool pushed in)

1. Remove the solenoid (A).
2. Install a new solenoid.
   Tightening torque - **18 to 22 Nm**.



Cylinder Pistons



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Hydraulic Cylinder Piston design and Application

1. Decelerator Ring
2. Piston Seals
3. Washer
4. Nylon Bonded Coated Bearing
5. Decelerator
6. Bolt

All cylinder pistons utilize a one piece leaded steel piston with either one or two glass filled nylon bonded coating bearings on the outer diameter to prevent metal-to-metal contact with the cylinder barrel. The piston bearings are not serviced separately, if damaged the piston must be replaced.

Piston sealing is accomplished using two ring seals positioned on top of each other. The bottom, or inner seal, is soft rubber and has pre-determined side play within the ring groove. When the cylinder is pressured, oil acts on the seal and expands it against the outer, rigid, glass-filled PTFE seal, forcing it outward against the barrel wall and against the piston groove, ensuring efficient sealing with minimum friction.

Figure 161 illustrates the various pistons used together with the appropriate method of attaching the piston to the cylinder rod.

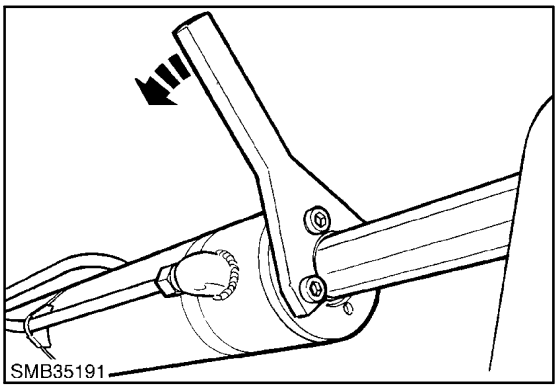
Piston Design	Cylinder
A	Backhoe Lift
B	Backhoe Crowd
C	Backhoe Bucket
D	Loader Bucket Loader Lift Extendible Dipper Sideshift Stabiliser Centre Pivot Stabiliser
E	Backhoe Swing

CYLINDER OVERHAUL

Backhoe and Loader Cylinders

1. Thoroughly drain oil from cylinder. Cap the ports and thoroughly clean the exterior so that the internal parts will not become contaminated.
2. Using the correct wrench as detailed on Page 1 remove the cylinder gland.

NOTE: A high torque is required to loosen the threaded type gland, It is therefore recommended that the attaching points on the machine are used to secure the cylinder when loosening the gland as described in cylinder removal



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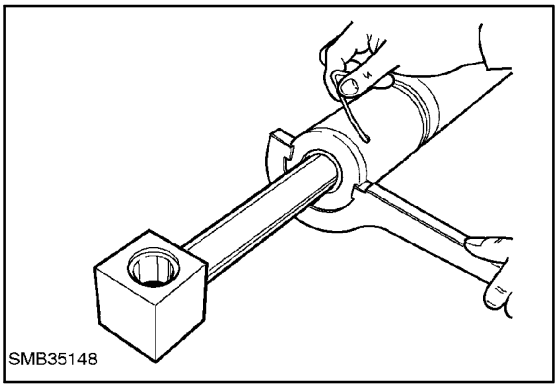
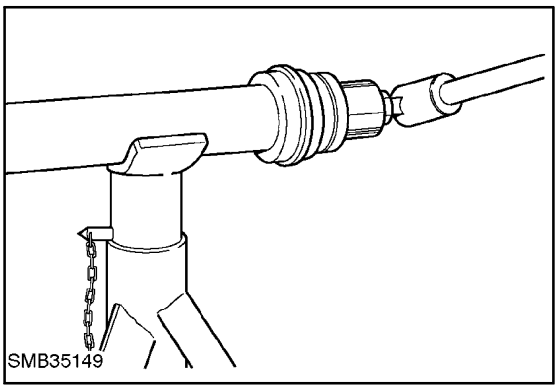
3. If the gland is the wired type rotate rotate the gland and withdraw the locking wire.



45

4. Pull the cylinder rod gland and piston assembly from the barrel.
5. Secure the cylinder rod trunnion in a vice or preferably secure to the cylinder anchor point on the machine and using a high quality socket and drive system unscrew the piston retaining bolt. A considerable torque may be required to loosen the bolt.



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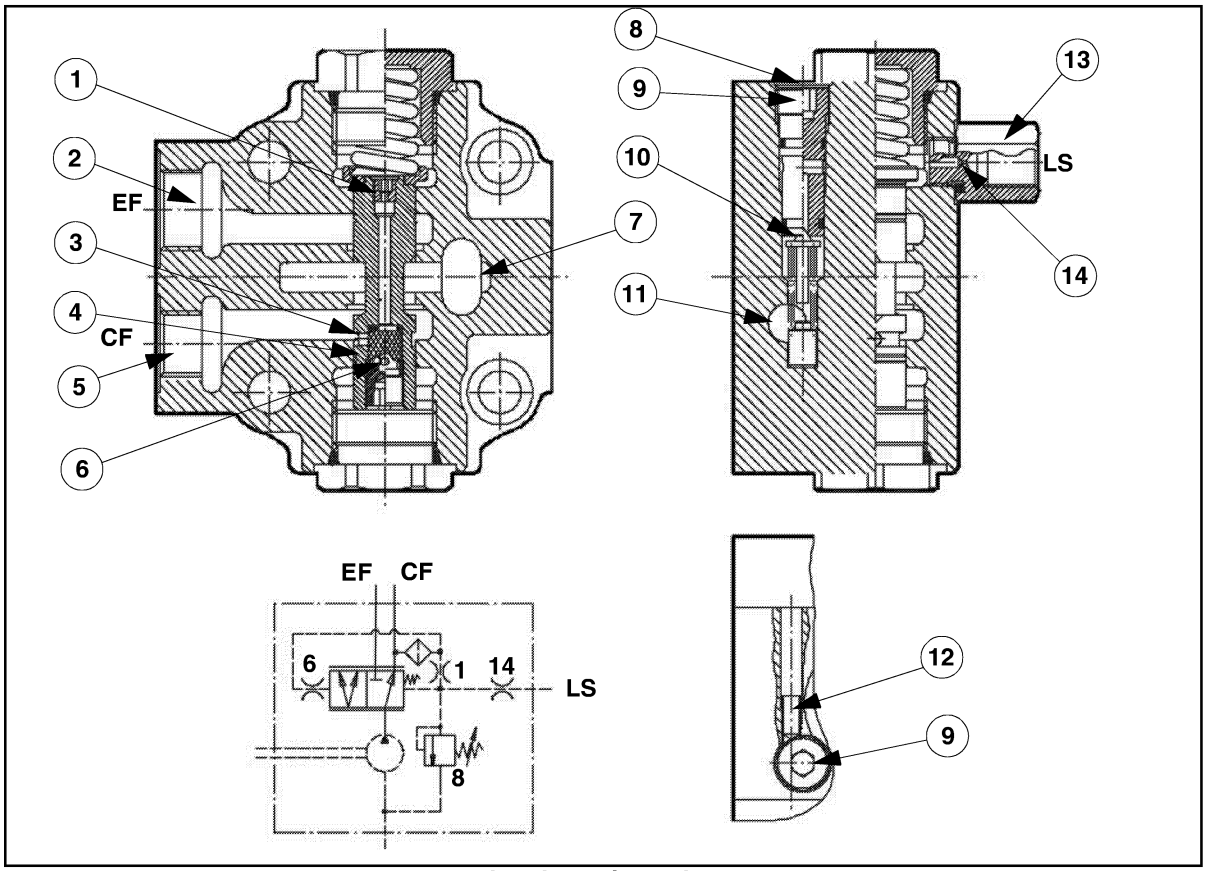
LOAD SENSING VALVE



Load sensing valve

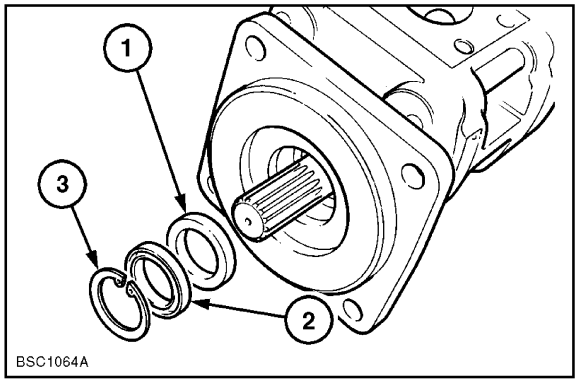
1. Orifice
2. Backhoe Circuits (EF)
3. Filter
4. Spool
5. To steering priority flow (CF)
6. Orifice
7. Inlet Port from Rear Pump (IN)
8. Steering Relief Valve
9. Relief Valve Adjuster
10. Poppet
11. Return to Inlet Pump Port
12. Lock Plug
13. Load Sensing Signal (LS)
14. Orifice

When the steering is in neutral the LS port is connected to the unload (through the steering) and the steering inlet port (CF) is open.

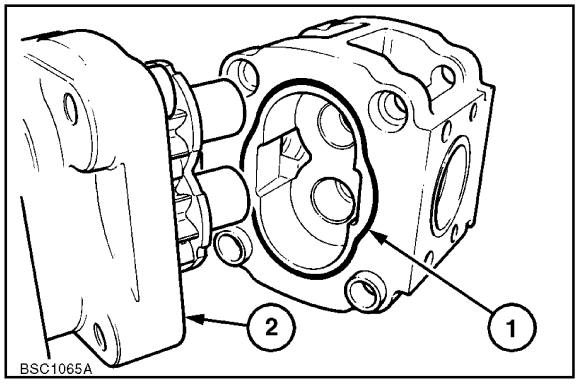
2. Assemble inner flange seal, (1), with spring and lip facing into pump. Install outer seal, (2), with garter spring and lip facing outwards and re-fit circlip (3).
3. Coat seals with high melting point grease.

NOTE: *Ensure seals are fitted back to back.*

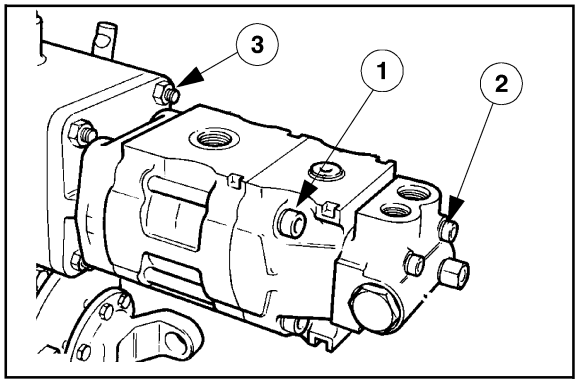
NOTE: *If the seal recess has been scored during seal removal coat outside diameter of seal with flexible gasket sealant 82995770 to prevent leakage.*



4. Install 'O' ring (1) in groove on body face.



5. Assemble pump sections and tighten bolts to specified torque.
   Bolts (1), **4 x 140 Nm (104 lbf ft)**
   Bolts (2), **4 x 70 Nm (52 lbf ft)**
6. Install pump and tighten retaining bolts to specified torque.
   Bolts (3), **4 x 45Nm (34 lbf ft)**



DESCRIPTION AND OPERATION

This section can be used as a quick reference for general disassembly of the machine and its components.

Where disassembly of a specific component is required refer to the relevant Repair Manual Section.

REPAIR MANUAL BY SECTION

Section 10 : Engine
Section 17 : Torque Convertor
Section 21 : Transmission
Section 25 : Front Axle (2, 4WD and 4WS)
Section 27 : Rear Axle (2, 4WD and 4WS)
Section 33 : Brake Systems
Section 35 : Hydraulic System
Section 39 : Vehicule Chassis
Section 41 : Steering Systems
Section 50 : Cab Heat And Air Conditioning
Section 55 : Electrical System
Section 82 : Loader
Section 84 : Backhoe
Section 90 : Cab

VEHICLE CHASSIS TYPE

The chassis of the Backhoe Loader is manufactured as a one piece unit on which the major assemblies are attached or supported from. Two chassis type's are available:

SIDESHIFT - Figure 1.

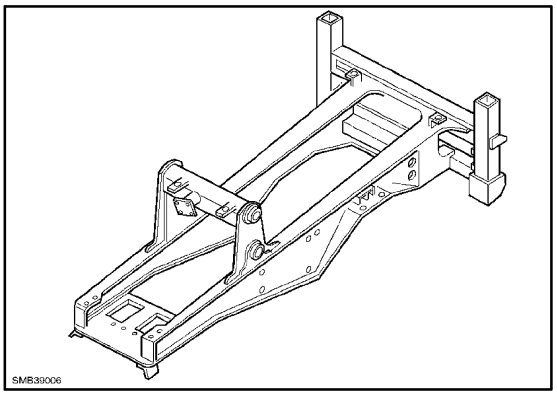
The backhoe on sideshift models is attached to a frame that is attached to the vehicle and can traverse the rear of the machine. For disassembly purposes the backhoe and its support frame can be removed from the machine.

CENTRE PIVOT - Figure 2.

On centre pivot models the backhoe is connected directly to the chassis and can be removed from the machine at that point.

In the following pages are the torque figures for the various assemblies that will may removed to affect repairs

IMPORTANT: Always ensure prior to carrying out repairs on the machine that the vehicle parking brake is on and the wheels are chocked.



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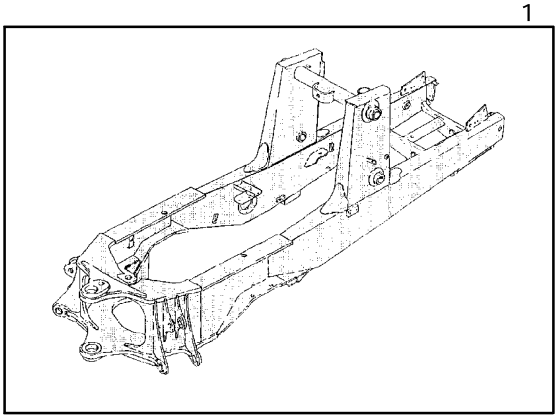


2

Section 39 : Vehicule Chassis

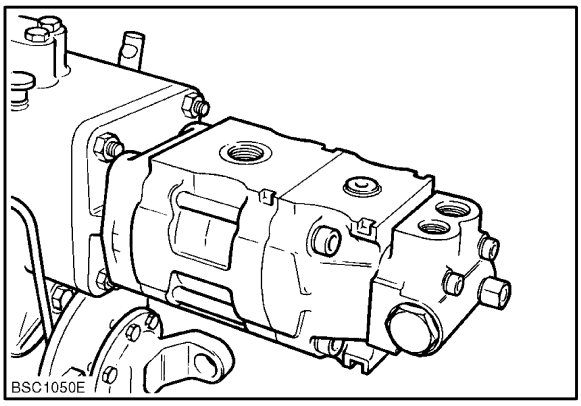
COMPONENTS	TORQUES
OIL RESERVOIR (1)	
Holding bolts	85 Nm (63 lbf ft)
Step attaching bolts	49 Nm (36 lbf ft)
Filter retaining plate to tank	12 Nm (8.8 lbf ft)
Drain plug	250 Nm (184 lbf ft)
Hose backhoe control valve to hydraulic oil reservoir	25 Nm (18 lbf ft)
Hoses oil filter to oil reservoir	190 Nm (140 lbf ft)
Hoses heat exchanger to oil reservoir	160 Nm (118 lbf ft)
Filler tube plate retaining bolts	12 Nm (8.8 lbf ft)
Power steering outlet to reservoir	55 Nm (40 lbf ft)
FUEL TANK (2)	
Holding bolts	85 Nm (63 lbf ft)
Step attaching bolts	49 Nm (36 lbf ft)
Fuel sender to tank	1.7 Nm (15 lbf in)
Fuel drain plug	250 Nm (184 lbf ft)
Hose connections to tank	500 Nm (369 lbf ft)
BALLAST	
Chin weight	500 Nm (369 lbf ft)

The backhoe loader is fitted with two hydraulic pumps mounted on the rear of the transmission. Both pumps are driven by a shaft running directly off the flywheel. Oil is drawn through the common inlet port into both pumping elements. The front pump flow is directed to the loader and backhoe control valves and side shift clamping system.

Rear pump flow passes through the flow divider valve which maintains priority oil flow to the steering system with remaining flow directed for stabilisers, loader and backhoe elements.

The flow divider, located on the rear of the pump, comprises a load sensing valve and steering system pressure relief valve.

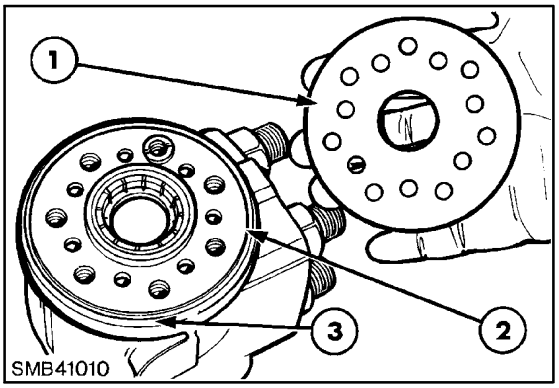
The valve ensures a priority oil flow to the steering system while the steering is operated, with the remaining flow directed to the stabiliser, loader and backhoe circuits.



2

Valve plate removal

1. Body
2. Valve Plate



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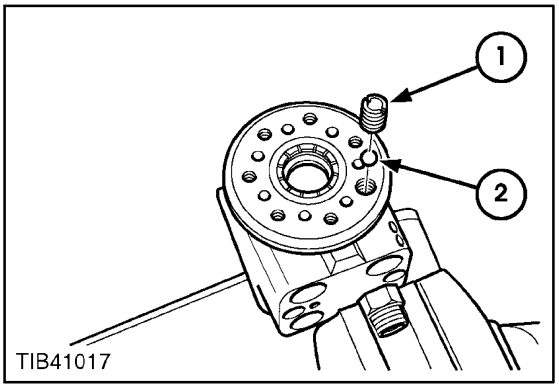
Check valve removal

1. Retainer cap
2. Check valve



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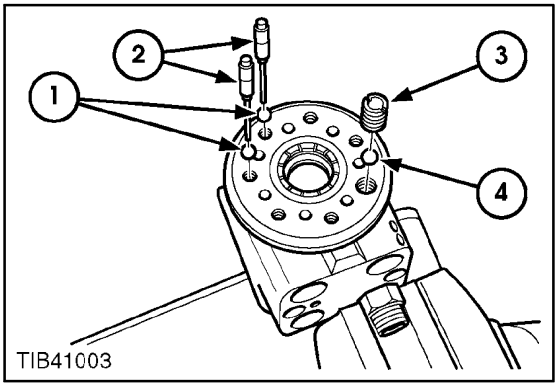
Suction and check valves

1. Suction valve balls
2. Suction valve rods
3. Retainer cap
4. Check valve



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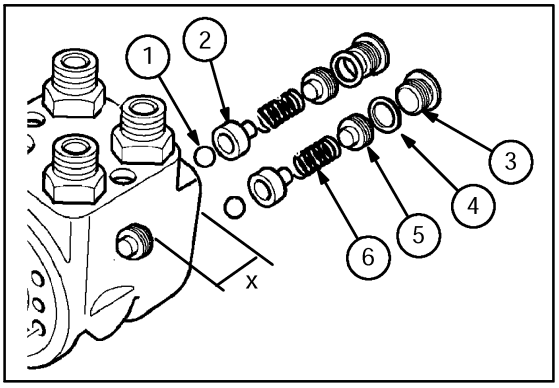
Cylinder Relief Valves

IMPORTANT: Before removal of the cylinder relief for cleaning valves if necessary remove the end plug and seal. Measure at, (x) using a depth gauge, the distance from the outer body to the head of the adjuster (5) and record the results. Upon re-assembly reset the adjuster to the exact depth previously recorded.

1. Ball
2. Seat
3. End Plug
4. Seal
5. Adjuster
6. Spring



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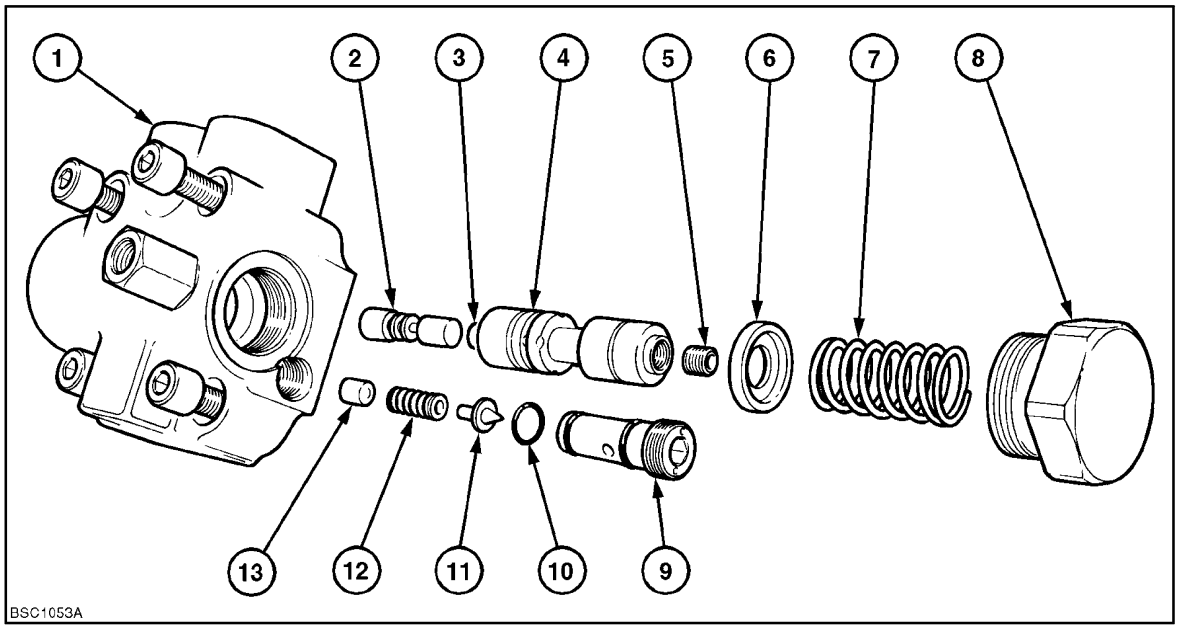
Flow Divider



7

Steering Flow Divider

1. Housing
2. Valve
3. O Ring
4. Spool
5. Adjuster
6. Spring Seat
7. Spring
8. Cap
9. Adjuster
10. O Ring
11. Relief Valve
12. Spring
13. Seat

The flow divider located on the rear of the pump comprises of a load sensed priority valve and steering system pressure relief valve.

The load sense valve ensures that a priority oil flow to the steering system is maintained while steering the vehicle, with remaining flow directed to the stabiliser, loader and backhoe circuits.

NOTE: Flow from the rear pump on entering the loader and backhoe circuits combines with the flow from the front pump to provide increased flow.

Operation

Flow from the rear pump enters the flow divider at inlet port (1).

The spring force on the end of the spool holds the spool to the left enabling flow to pass into steering port (3).

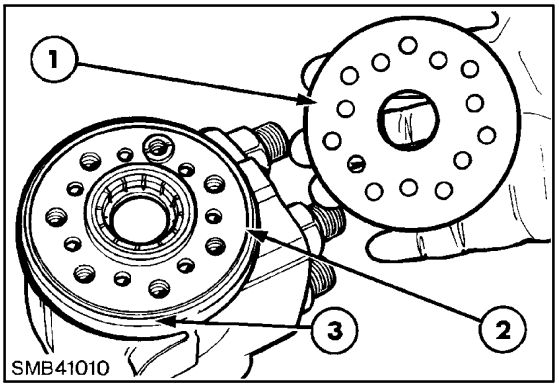
Pump flow also passes into centre of spool enabling pump pressure to be sensed through the orifice on the left hand end of the spool. A smaller orifice in the right hand end of the spool also senses pump pressure but acts as a damper to prevent erratic movement of the spool.

When the steering system is in neutral the spring holds the spool to the right until pump pressure reaches a minimum of 7 bar. The pump pressure sensed through orifice (12) can now overcome spring pressure and move the spool to the right restricting flow to the steering motor.

Flow from the rear pump is now directed to the stabiliser and loader/backhoe circuits through port (2) whilst maintaining the 7 bar standby pressure to the steering circuit.

Valve plate removal

1. Body
2. Valve plate



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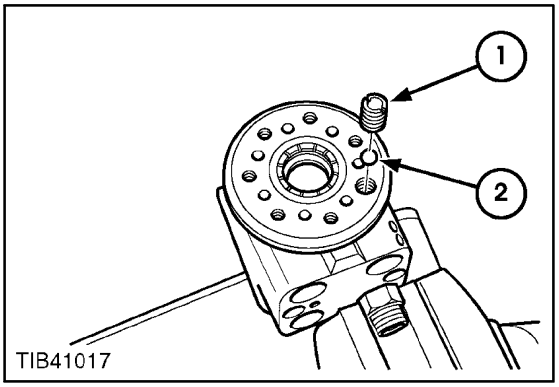
Check valve removal

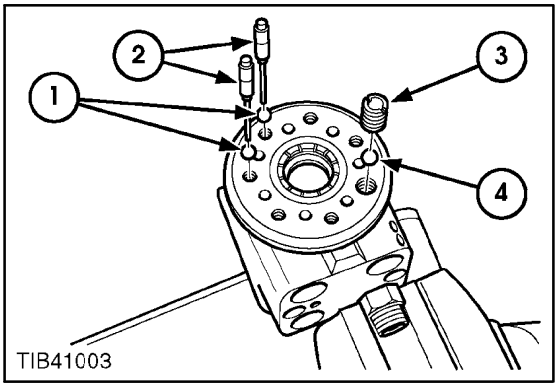
1. Retainer cap
2. Check valve



25

Suction and check valves

1. Suction valve balls
2. Suction valve rods
3. Retainer cap
4. Check valve



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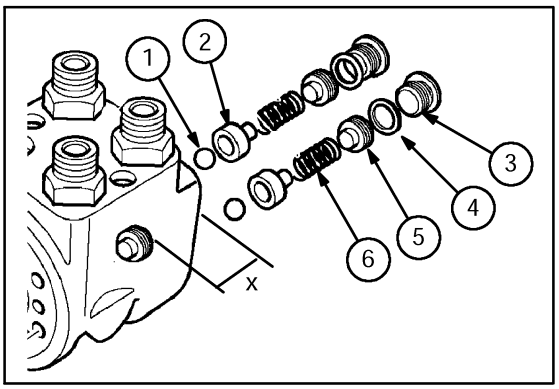
Cylinder relief valves

IMPORTANT: Before removal of the cylinder relief for cleaning valves if necessary remove the end plug and seal. Measure at, (x) using a depth gauge, the distance from the outer body to the head of the adjuster (5) and record the results. Upon re-assembly reset the adjuster to the exact depth previously recorded.

1. Ball
2. Seat
3. End Plug
4. Seal
5. Adjuster
6. Spring



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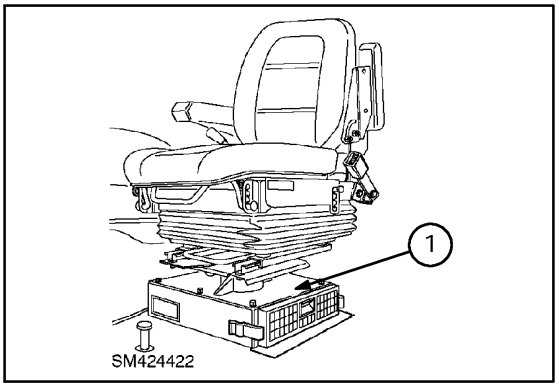
OVERHAUL

IMPORTANT: When overhauling the heating system remember that with the engine running or shortly after it is turned off that the system will be at engine temperature and therefore the water will be hot and under pressure.

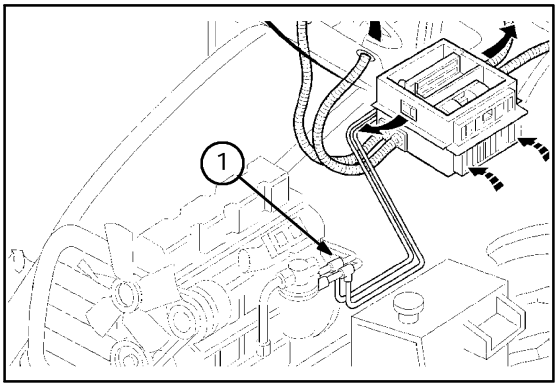
To effect repairs to the heater core or blower motor, it will be necessary to remove the attaching bolts from the seat and remove seat from the heater housing.



6

Draining the System

Too drain the cooling system down disconnect either hose at the 'T' junction found at the rear of the engine oil filter mounted to the right hand side of the engine.



7

Heater Radiator

With the system drained remove the heater radiator hose connections, attaching bolts and remove from the vehicle.

Inspect the Heater Radiator:

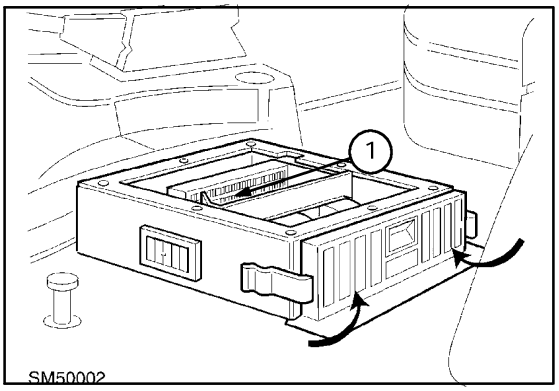
Check water flow through the heater pipe which should be free running, if not clear any blockage.

Fins should be free of all debris and not damaged clean and or repair.

Clean the heater radiator using compressed air not exceeding 7 bar (100 psi) taking care not to damage the radiator fins.

Ensure tbe radiator is not leaking under pressure, repair or replace as required.

Clean the chamber with a damp, cloth and re-assemble the housing filter element with the seal facing the inside of the cover.



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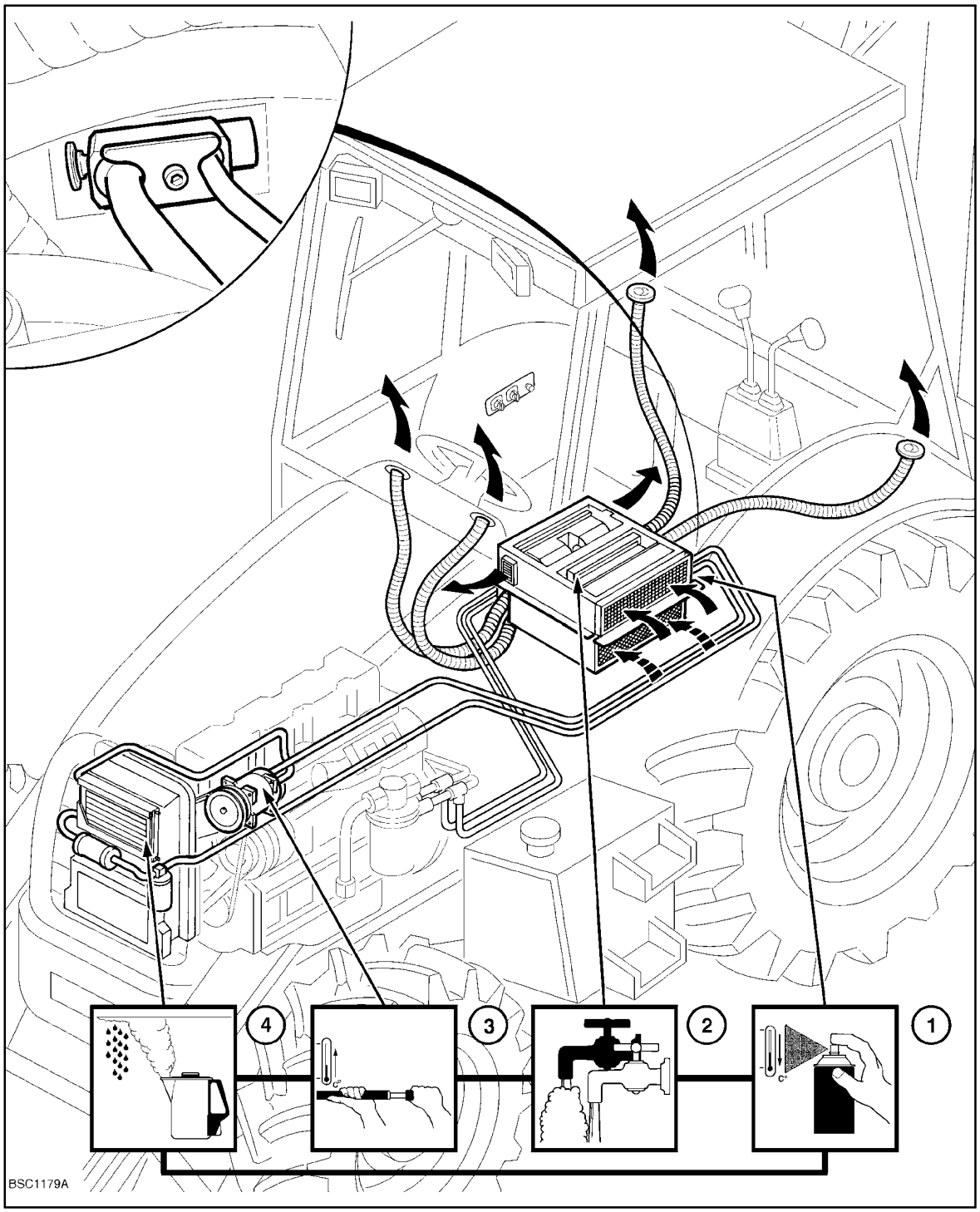
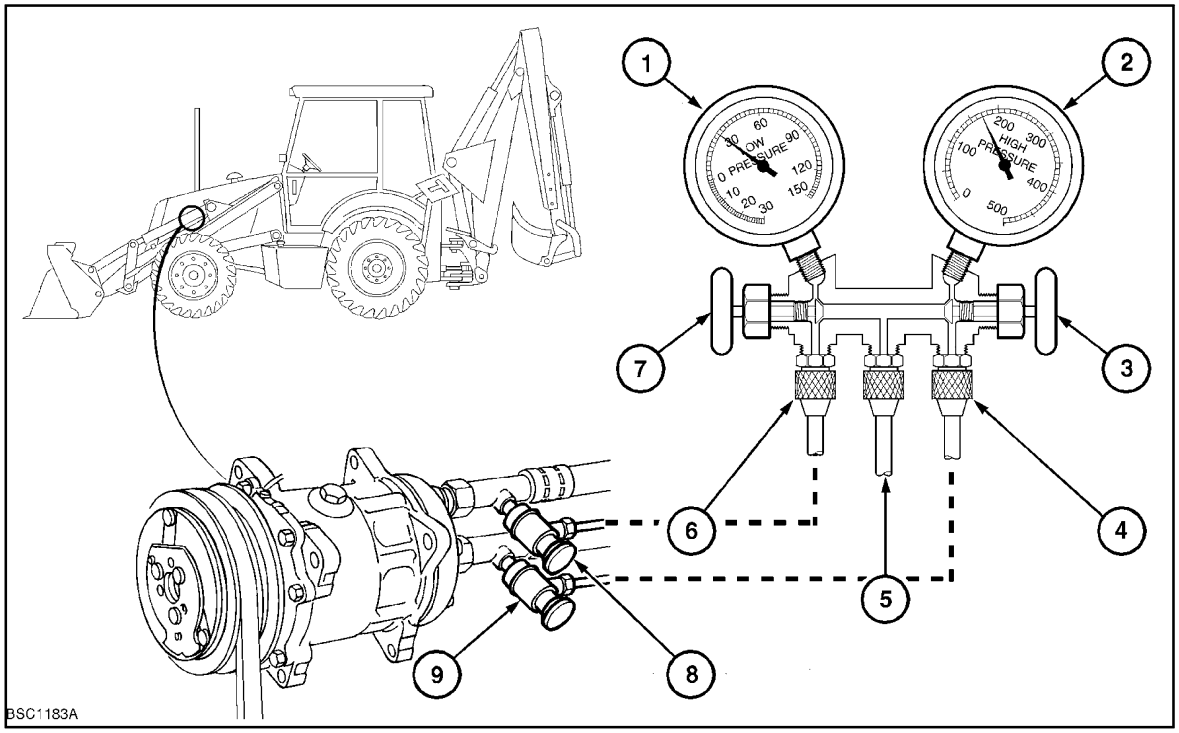


8

Air Conditioning Principle of Operation

1. Expansion Valve - Atomizes Liquid Refrigerant Before Passing to Evaporator
2. Evaporator- Absorbs Heat From Air In Cab
3. Compressor - Compresses and Raises Temperature Of Refrigerant Gas
4. Condenser and Receiver Dryer - Converts Refrigerant from Gas to a Liquid



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Attaching Manifold Gauge Set to the Tractor

1. Low Side Gauge
2. High Side Gauge
3. Shut-off Valve
4. Test Hose to High Side Service Connector
5. Centre Hose (Not Used)
6. Test Hose to Low Side Service Connector
7. Shut-off Valve
8. Low Pressure (Suction) Side Service Valve
9. High Pressure (Discharge) Side Service Valve

Performance Testing The Air Conditioning System

The manifold gauge set is the most important tool used in testing and servicing the air conditioning system.

NOTE: For Dealers who posses the latest design level of refrigerant recovery, recycling and recharging station, these gauges are an integral part of the machine.

The following instructions for performance testing the air conditioning system is based on the use of the gauge set shown. The principal of operation is however similar when testing the system using a recovery and recharging station with integral gauges.

When using this type of equipment always consult the manufacturers operating instructions.

Operating Precautions

IMPORTANT: Always ensure the shut-off valves are closed (turn clockwise until seated) during all test operations.

In the closed position, refrigerant circulates around the valve stems to the gauges. Therefore, when the manifold gauge set is connected into a system, pressure is registered on both gauges.

- NEVER open the HIGH SIDE shut off valve when the system is operating.
- ALWAYS open the LOW SIDE shutoff valve when adding refrigerant.

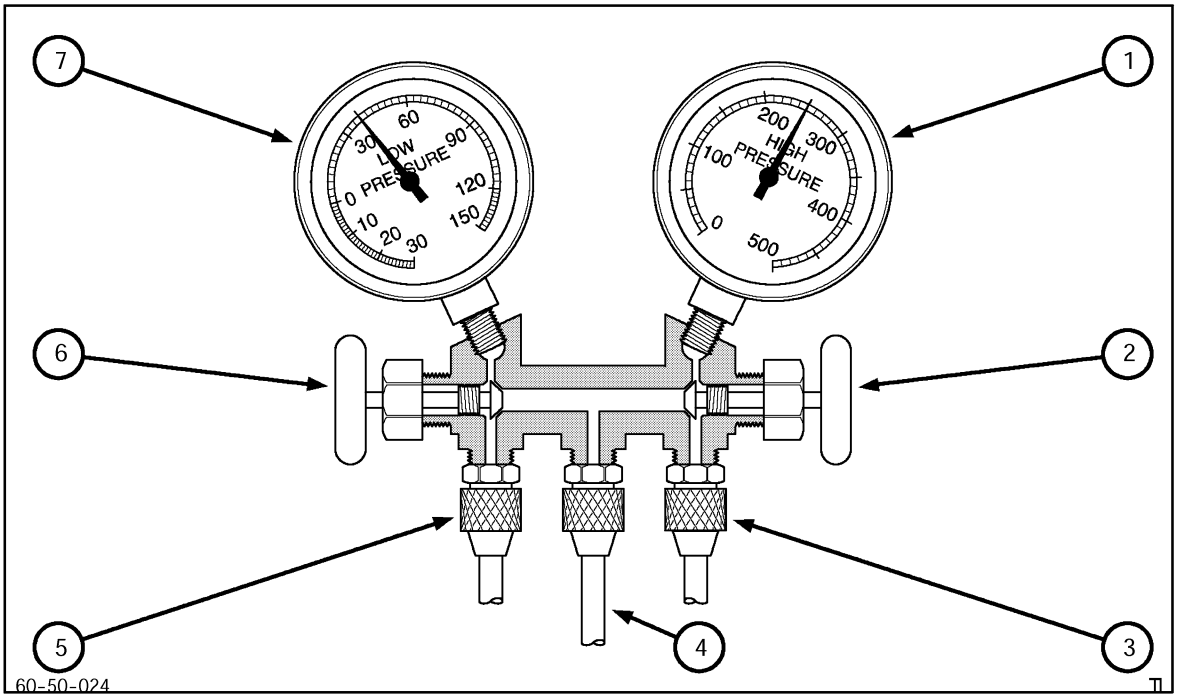
Attaching The Gauge Set To The Tractor

⚠ WARNING ⚠

To avoid personal injury, stop the tractor engine during connection of the manifold gauge set.

1. Check that the gauge set shut off valves are closed (turned fully clockwise).
2. Connect the high side gauge hose (normally red) to the high pressure (discharge) side service valve and the low side gauge hose (normally blue) to the low pressure (suction) side service valve on the tractor. Ensure the hose connections are fully tightened.

PERFORMANCE TEST EXAMPLE 6



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Performance Test Example 6

1. High Side Normal
2. High Side Hand Valve Closed
3. High Side Hose Connected to High Side Service Connector
4. Not Used
5. Low Side Hose Connected to Low Side Service Connector
6. Low Side Hand Valve Closed
7. Low Side Normal

PROBLEM:

Insufficient or no cooling.

CAUSE:

Large amount of air in system.

CONDITIONS*

Low side pressure too high. Gauge should read 1-2 bar (15-30 psi).

High side pressure too high. Gauge should read 13.3-14.8 bar (194-215 psi).

Evaporator air not cool.

CORRECTIVE PROCEDURES

1. Discharge and recover the refrigerant from the system.
2. Replace the receiver/dryer.
3. Evacuate the system.
4. Charge the system.
5. Performance test the system.

DIAGNOSIS: Air in system. This, and the moisture in the air, is contaminating the refrigerant, causing the system to operate improperly.

NOTE: * Test procedure based upon ambient temperature of 35°C (95° F). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart.

COMPONENT OVERHAUL (EXCLUDING COMPRESSOR)

GENERAL

⚠ WARNING ⚠

Before disconnecting components in the air conditioning system the refrigerant gas must be discharged and recovered using a certified recovery system. Refer to Discharging the system on Page 31. Do Not discharge the gas into the atmosphere.

If an air conditioning component is to be replaced during a system overhaul it is necessary to drain any refrigerant oil that has collected in the component being replaced into a clean calibrated container.

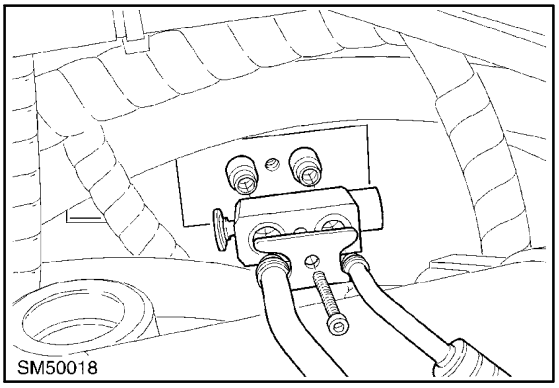
A volume of clean refrigerant oil equivalent to that removed from the replaced component must then be added to the new item before being installed onto the tractor.

Upon completion of the repair evacuate, recharge, leak test and performance test the system to ensure correct operation.

EXPANSION VALVE

The expansion valve is not a serviceable item and must be replaced if defective.

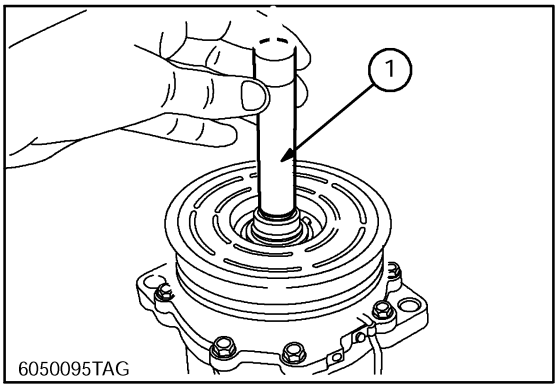
1. Fully discharge the air conditioning system.
2. Remove the seat to gain access to the valve.
3. To gain access to the expansion valve partially lift the evaporator core from its position in the cab floor.
4. Remove the Allen screw securing the inlet and outlet connections to the valve and pull valve from tubing.
5. Replace the 'O' ring seals and lubricate with refrigerant oil prior to installing the valve using disassembly procedure in reverse.
6. Evacuate, leak test and recharge the system.



40

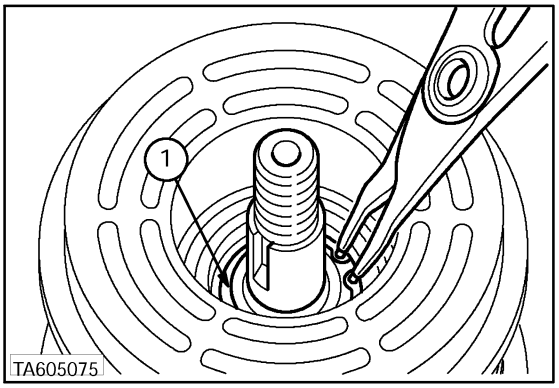
3. Insert the new seal fully into the hub.

NOTE: If remover/installer tool is not available, position the seal squarely in the hub and tap gently until fully seated.



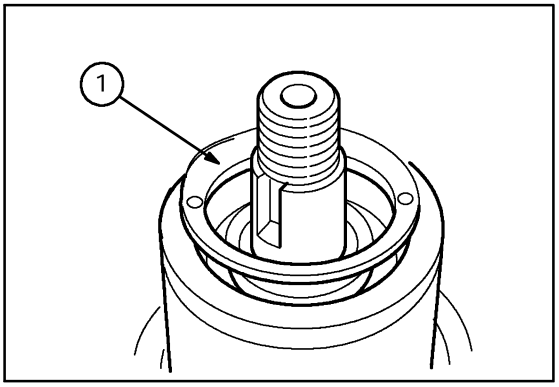
69

4. Install the seal snap ring. If the snap ring has a bevelled edge this should face outwards.



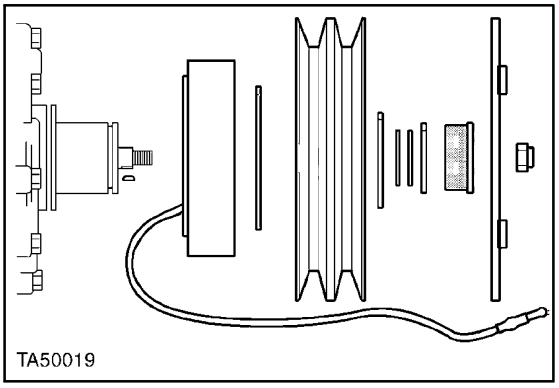
70

5. Install a new felt seal and push into position.



71

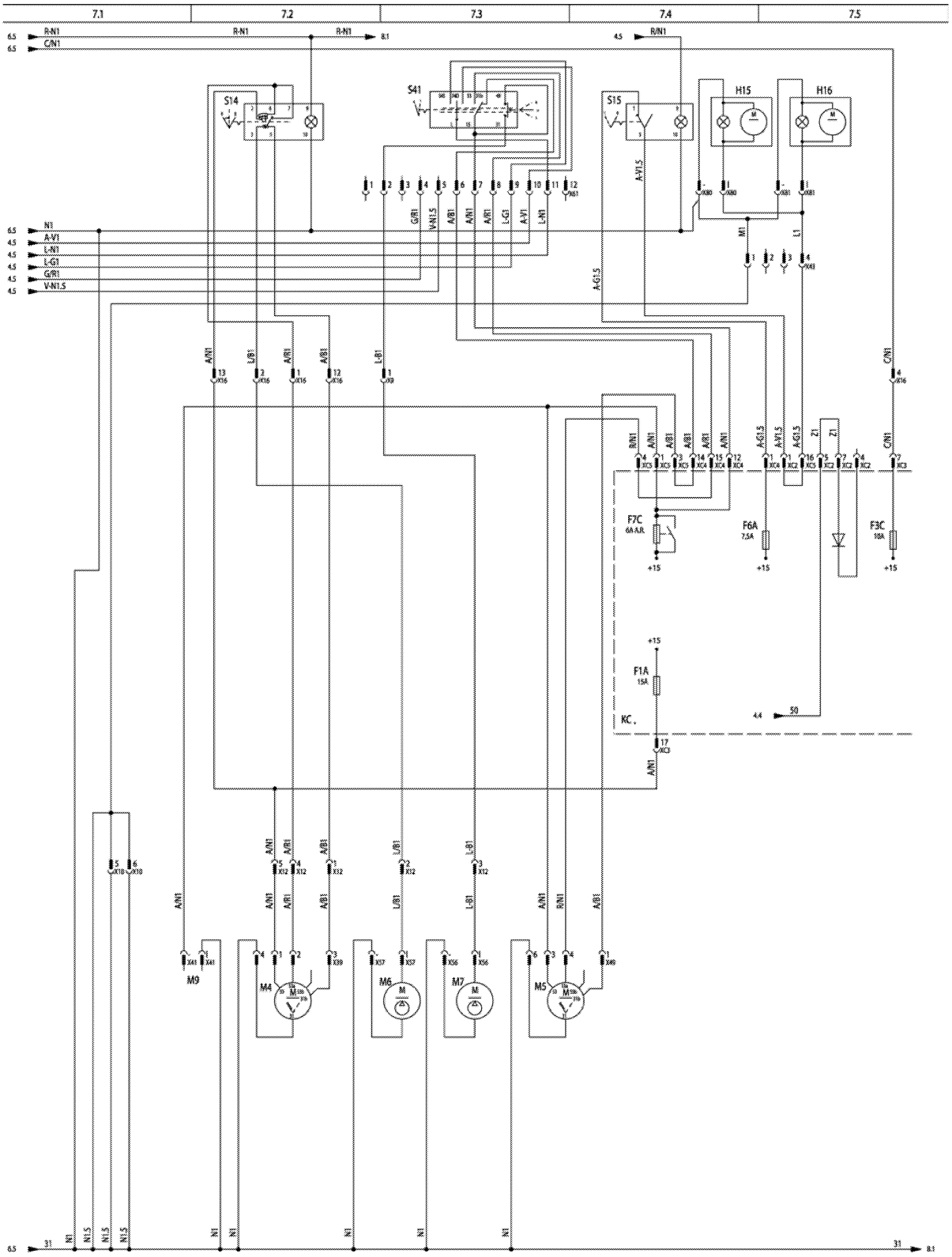
6. Position the shims over the shaft and refit the woodruff key.
7. Reinstall the clutch front plate as described in clutch reassembly.



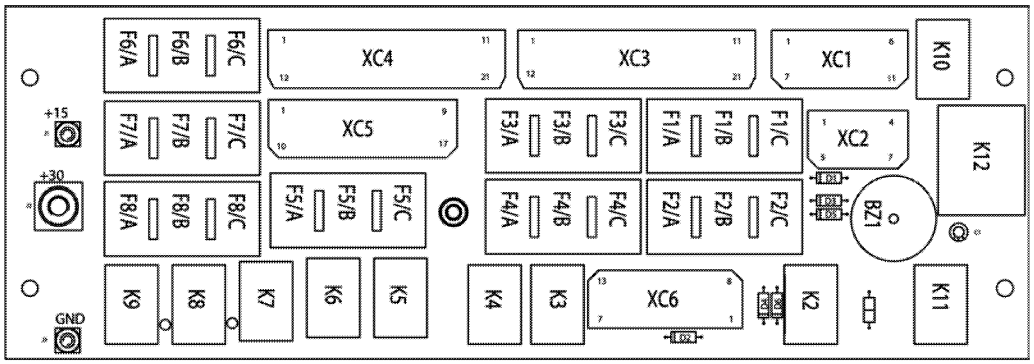
72

S42 Speedometer sender (optional)
S43 Radio (optional)
S44 Seat (optional)
S45 Conditioner and blower motor switch
S46 Auxiliary 12 V socket
S47 Main switch
S48 Thermostat
S49 Air conditioning pressure switch
S50 Seat safety switch
S60 Backhoe control switch
S61 Boom/dipper control switch
S62 Safety switch
S63 Telescopic dipper extend switch
S64 Horn switch (left control lever)
S65 Left stabiliser switch
S66 Right stabiliser switch
S67 Left stabilizer pressure switch
S68 Right stabiliser pressure switch
S69 Telescopic dipper retract switch
ST1 Side panel with optional diagnostics
ST2 Front panel

WINDSHIELD WIPER AND WASHER (SCHEMATIC No. 7) NA MODEL



FUSES AND RELAYS



Fuse No.	Rating	Colour	Circuit	Schematic N°
F1/A	15 A	Blue	Rear windshield wiper and washer (S14)	**7**
F1/B	7.5 A	Brown	Fuel shut-off, antitheft supply	**1**
F1/C	10 A	Red	Stop light switch (S33)	**5**
F2/A	15 A	Blue	Instrument power supply, switches lamps, brake oil level sensor, seat, buzzer	**4**
F2/B	15 A	Blue	Blower motor	**8**
F2/C	20 A	Yellow	Preheating	**1**
F3/A	3 A	Violet	Rear right and front left side lights, Instruments and air conditioning illumination	**4**
F3/B	3 A	Violet	Front right and rear left side lights, number plate light	**4**
F3/C	10 A	Red	S1, S4, S5, S6 and S11 switches	**7**
F4/A	7.5 A	Brown	EGS power supply, clutch shut off switch, 4WD switch (S2)	**2**
F4/B	10 A	Red	Rear ripper switch, clamshell level valve and sensor	**2**
F4/C	10 A	Red	Rear working light switch (S12) and rear travel lock switch (S7) (European model)	**6**
F5/A	15 A	Blue	Front working lights - internal	**6**
F5/B	10 A	Red	Side lights (European model)	**4**
F5/C	15 A	Blue	Main beam (European model)	**4**
F6/A	7.5 A	Brown	Rotary light	**7**
F6/B	7.5 A	Brown	Flasher (+15) (NA model)	**4**
F6/C	7.5 A	Brown	Hydraulic hammer, differential lock	**2**
F7/A	10 A	Red	Warning, horn (+30)	**4**
F7/B	10 A	Red	Auxiliary 12 V socket, radio, cab interior light	**8**
F7/C	6A	Black	Front windshield wiper (special bi metal, re-setting fuse)	**7**
F8/A	15 A	Blue	Rear working lights - external	**6**
F8/B	15 A	Blue	Front working lights - external	**6**
F8/C	15 A	Blue	Rear working lights - internal	**6**

RELAYS

N°	Circuit	Schematic N°	N°	Circuit	Schematic N°
K2	Speed alarm, hand brake	**2**	**K8**	Front working lights - external	**6**
K3	Starting	**1**	**K9**	Rear working lights - external	**6**
K4	Clamshell level solenoid valve	**2**	**K10**	Differential lock	**2**
K5	Dipped and main beam lights	**4**	**K12**	Warning, flasher	**4**
K6	Front working lights - internal	**6**			
K7	Rear working lights - internal	**6**			

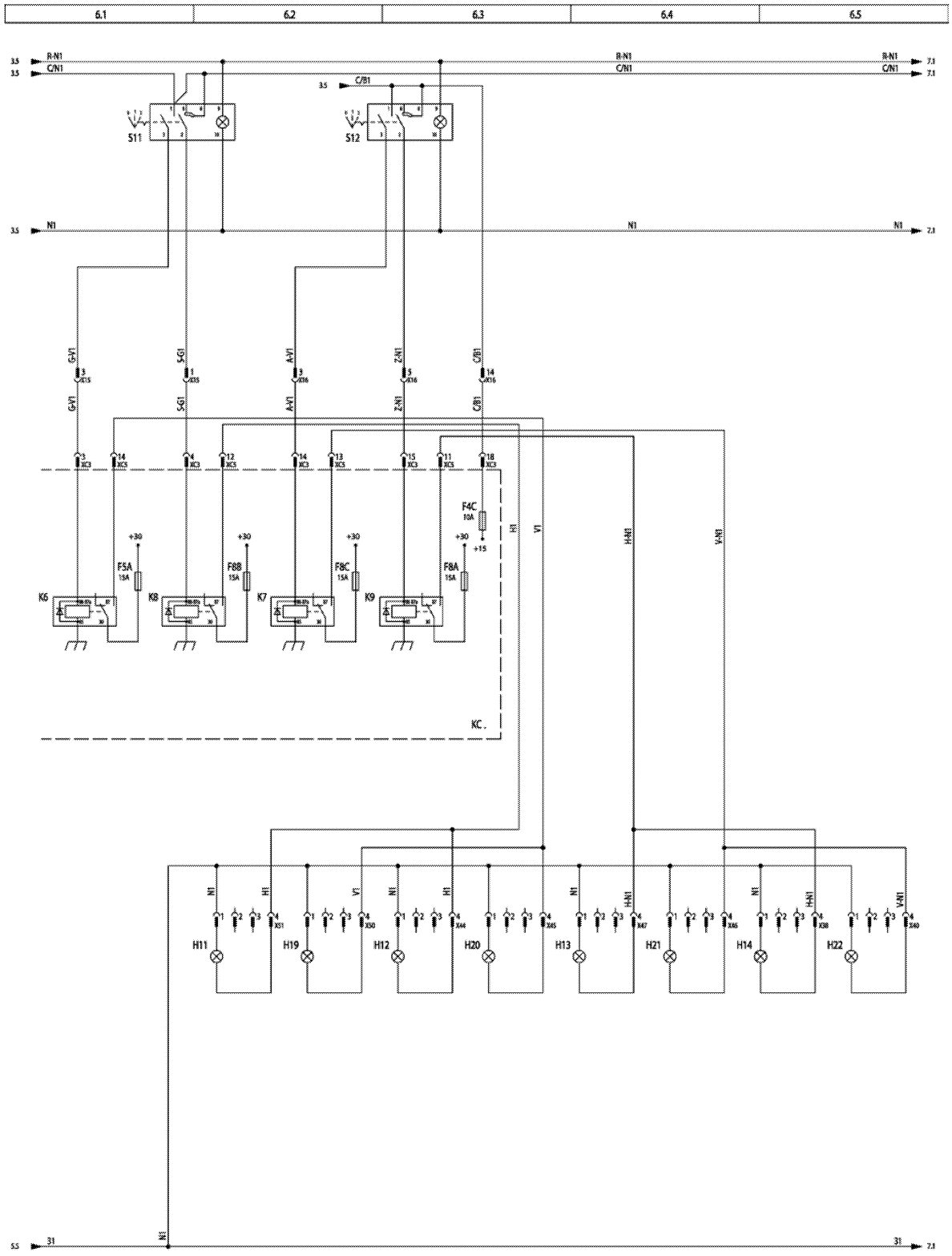
BUZZER

BZ1	Audible warning buzzer

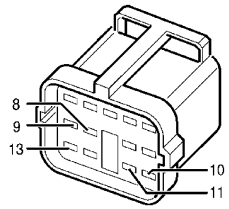
CONNECTORS

XC	Main harness connections into fuse board

WORKING LIGHTS (SCHEMATIC No. 6)

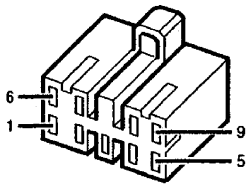


X76



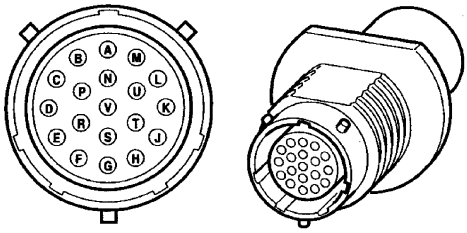
1	-	6	-	11	V-B 1
2	-	7	-	12	-
3	-	8	G-R 1	13	L-B 1
4	-	9	A-G 1		
5	-	10	Z 1		

X82



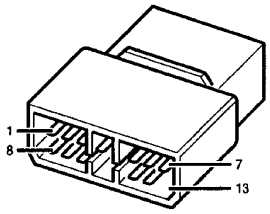
1	B-R 1	4	M-V 1	7	M-N 1
2	N 1	5	A-B 1	8	Z/N 1
3	A-R 1	6	M-B 1	9	-

X83



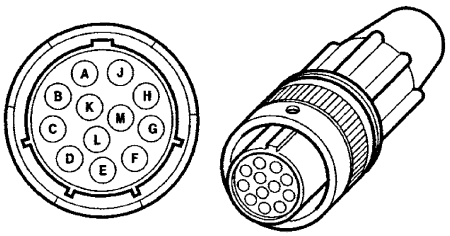
A	B-V 0.5	H	-	R	M 0.5
B	R 0.5	J	-	S	V 0.5
C	B-G 0.5	K	B-S 0.5	T	G 0.5
D	L 0.5	L	S 1	U	B-M 0.5
E	-	M	Z 0.5	V	B 0.5
F	L-B 0.5	N	N 0.5		
G	H-B 0.5	P	H 0.5		

X84



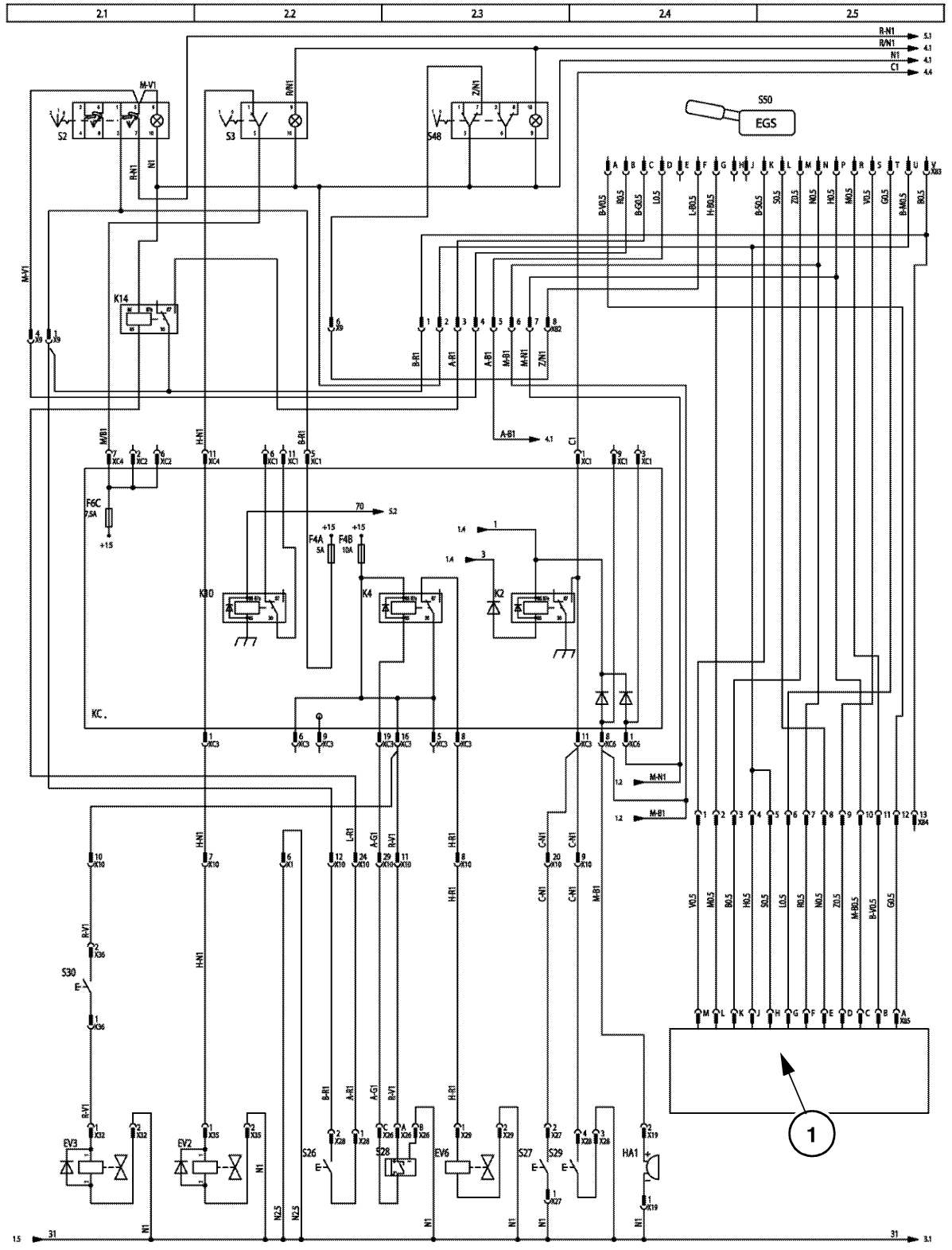
1	V 0.5	6	L 0.5	11	B-V 0.5
2	M 0.5	7	R 0.5	12	G 0.5
3	B 0.5	8	N 0.5	13	-
4	H 0.5	9	Z 0.5		
5	S 1	10	M-B 0.5		

X85



A	G 0.5	E	N 0.5	J	H 0.5
B	B-V 0.5	F	R 0.5	K	B 0.5
C	M-B 0.5	G	L 0.5	L	M 0.5
D	Z 0.5	H	S 1	M	V 0.5

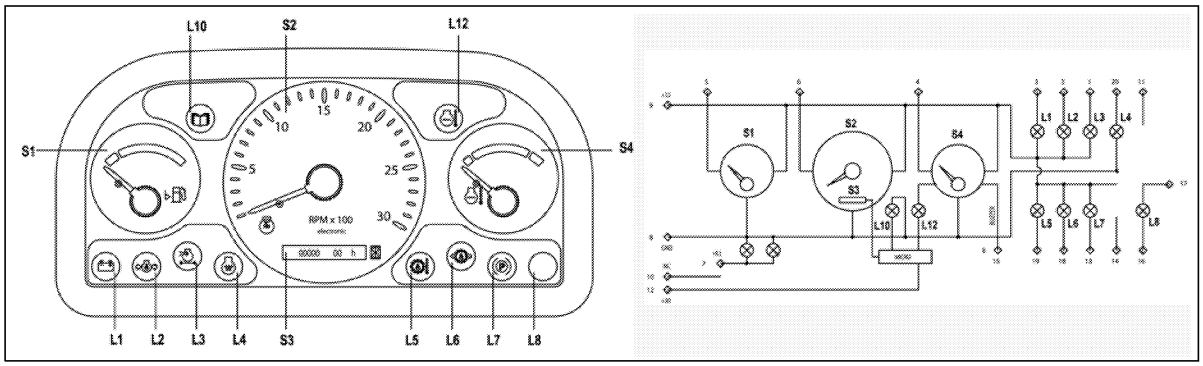
SOLENOID VALVES AND GEAR BOX (SCHEMATIC No. 2)



CRIL03L013H00

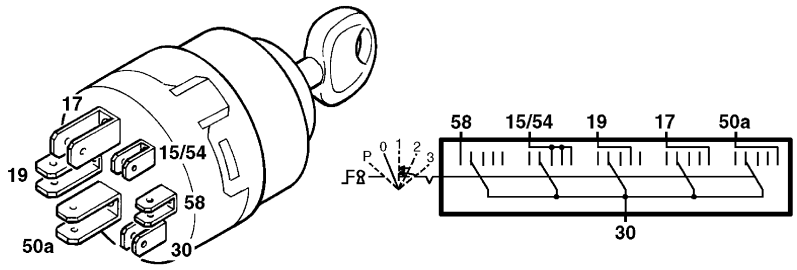
1 Gear box

SIDE INSTRUMENT PANEL



Pos.	Pin	Function	Signal	Pos.	Pin	Function	Signal
L3	**1**	Air cleaner indicator lamp	**-**		**11**	NC	
L2	**2**	Engine oil pressure indicator lamp	**-**	**+30**	**12**	Permanent supply voltage (+batt)	
L1	**3**	Alternator indicator lamp	**-**	**L7**	**13**	Handbrake indicator lamp	
S4	**4**	Water temperature gauge	**ohm**		**14**	NC	
S1	**5**	Fuel level gauge	**ohm**	**B**	**15**	External buzzer driving	
S2	**6**	Tachometer	**Hz**	**L8**	**16**	Neutral red indicator lamp	**+/-**
+ILL	**7**	Instrument lighting	**+ Lighting**	**L8**	**17**	Neutral red indicator lamp	**+/-**
GND	**8**	Negative		**L6**	**18**	Transm. oil pressure indicator lamp	**-**
+15	**9**	Positive (+key)		**L5**	**19**	Transm. oil temperature indicator lamp	**-**
	10	NC		**L4**	**20**	Engine preheating indicator lamp	**+**
L10		Service indicator lamp	**Int.**	**L12**		Hight water temperature indicator lamp	**INT.**

KEY-OPERATED START

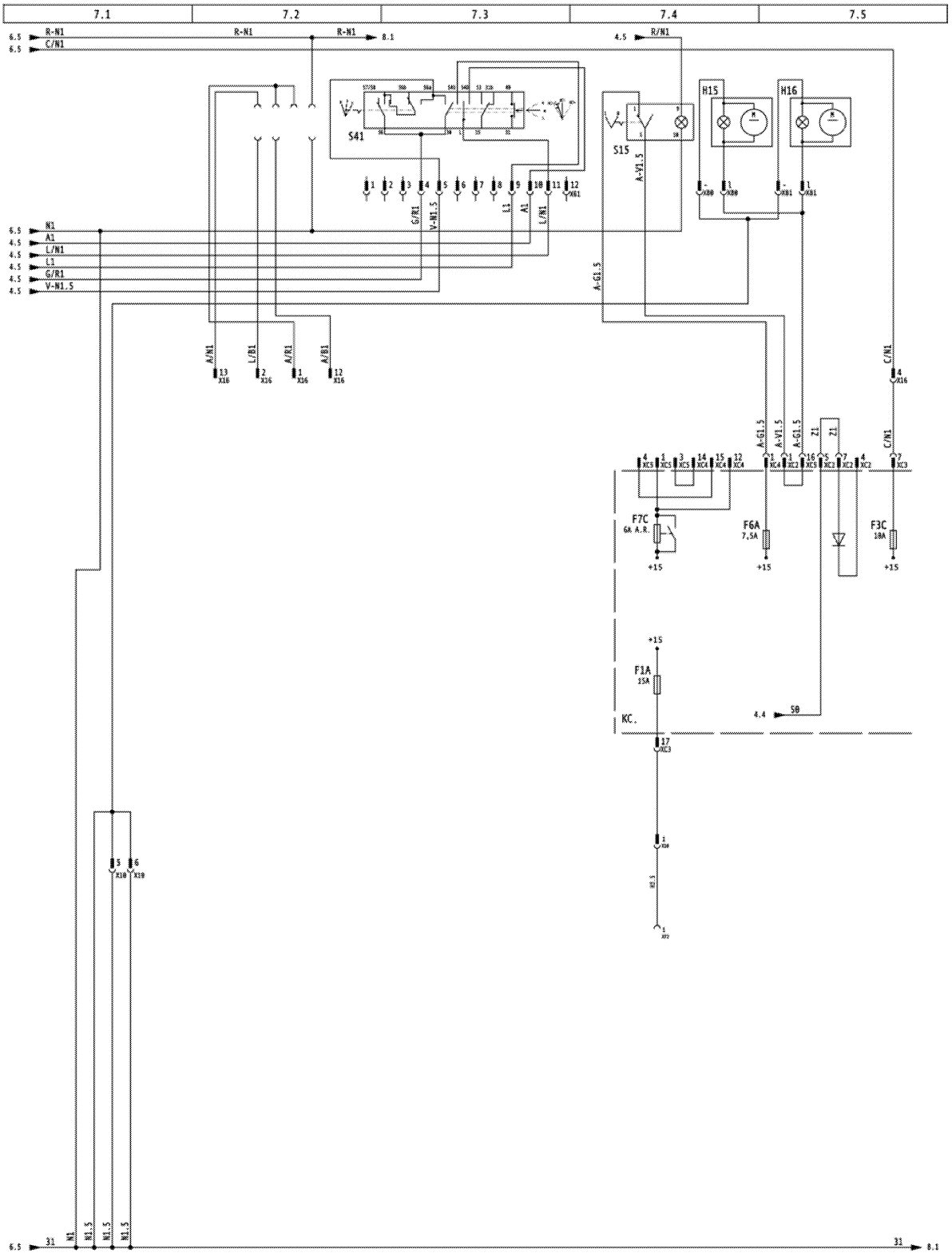


30 - 58	No connection
30 - 15/54	OFF
30 - 19	Accessories
30 - 17	Preheat and engine run
30 - 50a	Engine start

CONNECTORS

X1 General cable - Engine cable - 18 way connector
X2 Cold Start - 12 way connector
X3 Fuel shut off _ 1 way connector
X4 Air filter - 2 way connector
X5 Fuel level sender - 2 way connector
X6 Forward speed - 2 way connector
X7 Reverse speed - 2 way connector
X8 4WD - 2 way connector
X9 General cable - Front dashboard - 1 way connector
X10 Solenoid valves cable - General cable - 29 way connector
X11 1 way connector
X12 General cable - Cabin cable - 5 way connector
X14 General cable - side dashboard - 9 way connector
X15 General cable - side dashboard - 7 way connector
X16 General cable - side dashboard - 21 way connector
X17 Antithef - 11 way connector
X18 General cable - Rear lamps cable - 12 way connector (Europeen model)
X19 Reverse buzer - 2 way connector
X21 Seat - 4 way connector
X22 Side panel - 20 way connector
X23 Clutch shut off switch - 2 way connector
X24 Rear translation lock solenoid valve - 2 way connector
X25 Excavator rear lock solenoid valve - 2 way connector
X26 Grab sender - 3 way connector
X27 Horn switch - 2 way connector
X28 Clutch shut off switch - 2way connector
X29 Grab level - 2 way connector
X30 Double delivery solenoid valve -2 way connector
X31 Tools rapid connection solenoid valve - 2 way connector
X32 Rear hammer solenoid valve - 2 way connector
X33 Speedometer sender - 2 way connector
X34a Ride control solenoid valve - 2 way connector
X35 Hand hammer solenoid valve - 2 way connector
X36 Rear hammer button - 2 way connector
X37 Rear right light - 2 way connector (NA model)
X38 Rear right working light - 4 way connector
X40 Rear right working light (Opt) - 4 way connector
X42 Front right indicator - 4 way connector (NA model)
X44 Front right working light - 4 way connector
X45 Front right working light (Opt) - 4 way connector
X46 Rear left working light (Opt) - 4 way connector
X47 Rear left working light - 4 way connector
X48 Rear left light - 4 way connector (NA model)
X50 Front left working light (Opt) - 4 way connector
X51 Front left working light - 4 way connector
X52 Front left indicator - 4 way connector (NA model)
X59 Right light - 5 way connector (Europeen model)
X60 Horn / left light - 7 way connector
X61 Lights switch - 12 way connector
X62 Gear shift - 6 way connector
X63 Number plate light 2 way connector (Europeen model)
X64 Optional - 1 way connector
X65 Cold start switch - 1 way connector
X67 Generator - 3 way connector
X68 Engine water temperature sender - 3 way connector
X70 Front panel - 12 way connector
X71 Starting switch - 10 way connector
X72 Pilot control line - 1 way connector
X73 Engine oil pressure switch - 1 way connector
X75 Diagnostics - 5 way connector
X76 Diagnostics - 13 way connector
X77 Blower motor third speed - 1 way connector
X78 Left joystick - 2 way connector
X79 Horn jumper connection - 2 way connector
X80 Beacon lamp - 2 way connector
X81 Beacon lamp - 2 way connector (Europeen model)
X89 Front left lights - 6 way connector (Europeen model)
X100 Right joystick - 6 way connector
X101 Front right lights - 6 way connector (Europeen model)
X102 Controller - 10 way connector
X103 Relay - 2 way connector
X104 LVC unit - 23 way connector
X105 LH stab. pressure switch - 2 way connector
X106 RH stab. pressure switch - 2 way connector
X107 Pattern valve 1 - 2 way connector
X108 Pattern valve 2 - 2 way connector
X109 Mainfold power - 2 way connector
X110 RH tower line - 4 way connector
X111 Plug 4 LH Down - 2 way connector
X112 Plug 3 LH Up - 2 way connector
X113 Plug 6 RH Down - 2 way connector
X114 Plug 5 RH Up - 2 way connector
X115 Plug 7 Retract - 2 way connector
X116 Plug 8 Extend - 2 way connector
X117 LH stab. joystick - 3 way connector
X118 RH stab. joystick - 3 way connector
X119 Left joystick - 6 way connector

LIGHT SWITCH & BEACON (SCHEMATIC N°7) EUROPEEN MODEL



PRINCIPLE OF OPERATION

The system includes a key switch, reinforced cabling, a motor and a relay and solenoid assembly.

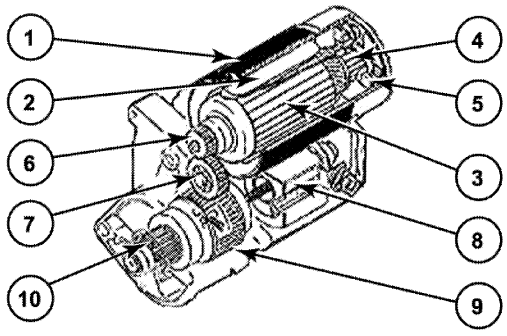
This is a starter motor with built-in solenoid and positive engagement drive system.

When the key switch is operated with the reverse travel lever in the neutral position, the solenoid windings are energised and cause the mobile core to be drawn inside the solenoid.

This movement causes the drive pinion to mesh with the ring gear on the engine flywheel. When the ring gear and the drive pinion are engaged, the mobile core of the solenoid closes a series of contacts enabling the battery to power the field coils directly and provide the entire power to the starter motor.

The starter motor contains only a single set of contacts and a mobile core, which closes the contacts completely, even if the teeth of the drive pinion and the gear are not aligned. In this case, a spring is compressed and forces the complete engagement of the pinion as soon as the starter motor starts rotating.

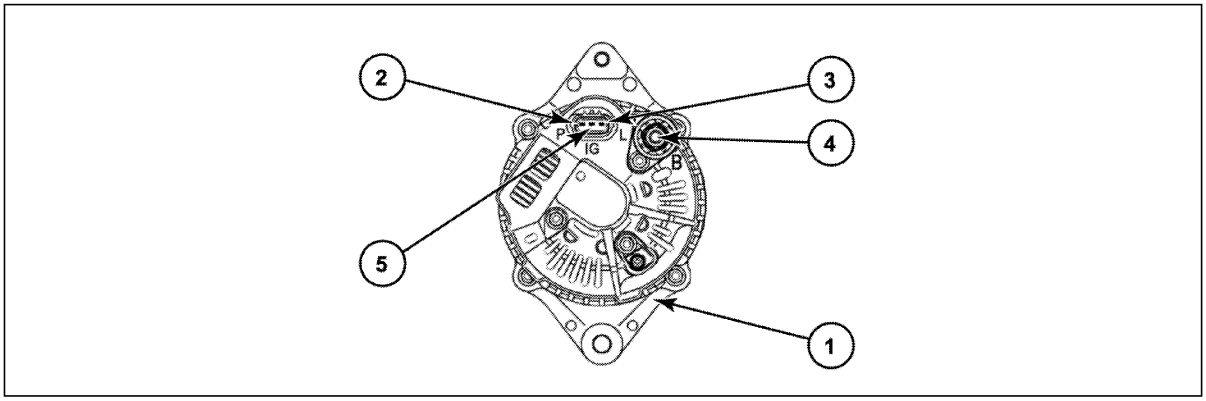
Once the ignition is turned off, the solenoid and the starter motor are de-energised. The solenoid's recoil spring causes the drive pinion to be uncoupled and the contacts of the solenoid to reopen.



CRIL03K011A01

1 Motor
2 Induction coils
3 Armature
4 Commutator
5 Brush assembly
6 Pinion gear
7 Intermediate pinion
8 Solenoid
9 Clutch
10 Drive pinion

DESCRIPTION AND PRINCIPLE OF OPERATION



CRIL03K020A01

1 Earth connection
2 Terminal **P**: motor tachometer
3 Terminal **L**: charge indicator
4 Terminal **B+**: charge +12V
5 Terminal **IG**: +12V after ignition (10A fuse)

The alternator, installed on the motor, on the front RH side of the vehicle, is driven by the crankshaft pulley with the help of a belt. The alternator contains built-in regulators.

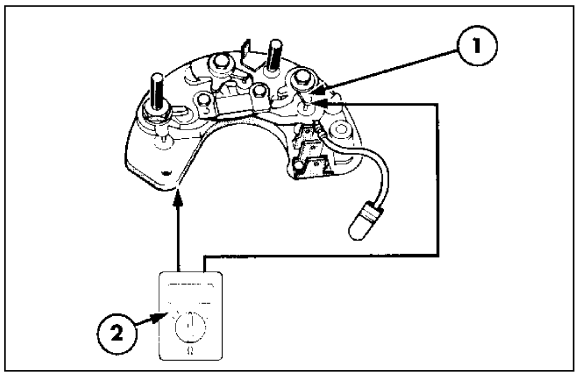
Current draw of the starter motor circuit:

When the ignition key is turned, a current of low intensity is sent by the battery to the field winding of the rotor (terminal IG).
At this stage, the indicator lamp (terminal L) comes on and the rotor is partially magnetised.
When the motor starts and the partially magnetised rotor rotates inside the stator, a three-phase alternating current is generated (terminal B+). A constant portion of this current is transformed into a direct current by three excitation diodes installed in the rectifier.
The direct current is sent as reinforcement through the field winding of the rotor.
Using this method an increase in the magnetic field of the rotor is obtained, as well as a rapid rise in the voltage and current generated at the output.
The luminosity of the indicator lamp decreases when the voltage generated at the output is increasing (terminal L). The indicator lamp goes out when the voltage at terminal "L" is equal to that of the battery.
The voltage continues to increase up to the value predefined by the regulator.
In case the alternator belt is broken, the voltage does not accumulate in the alternator and the load indicator lamp remains lighted to indicate the problem.

Rectifier - Checking the positive / negative diodes

Check each of the six diodes separately by proceeding as follows:

1. Connect a multimeter (2) in series with one of the diodes. Place one wire of the multimeter on the connecting pin (1) of the diode and the other wire on the plate where the diode is installed.
2. Note down the value of the resistance indicated by the multimeter. Reverse the wires of the multimeter.
3. The multimeter should indicate infinite resistance (open circuit) only during the first half of the test. If this check reveals that a diode is defective, replace the entire rectifier.

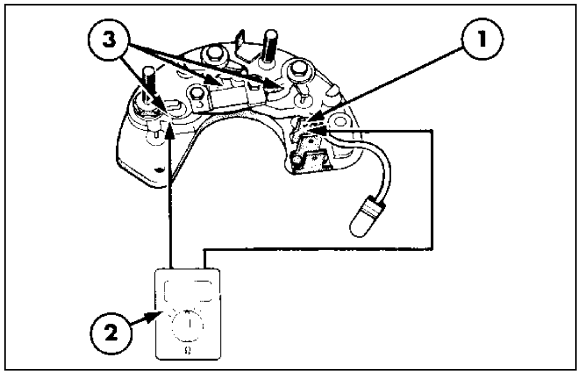


CRPH03K005A01

Rectifier - Checking the excitation diodes

Check each excitation diode separately by proceeding as follows:

1. Connect a multimeter (2) in series on the excitation diode module. Place the negative wire on terminal L (1) and the other wire on the connection of each excitation diode (3).
2. Note down the value of the resistance indicated by the multimeter. Reverse the wires of the multimeter.
3. The multimeter should indicate infinite resistance (open circuit) only during the first half of the test. If this check reveals that a diode is defective, replace the entire rectifier.

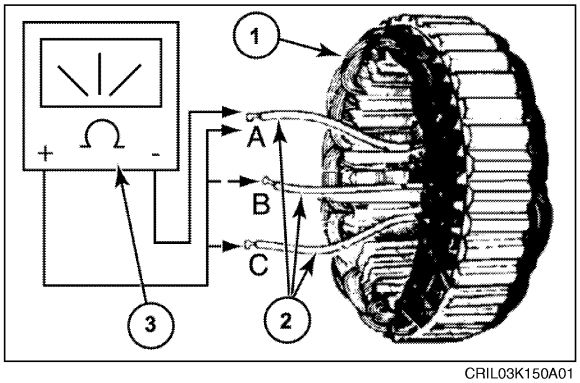


CRPH03K006A01

Stator - Checking the continuity of the winding

Check each excitation diode separately by proceeding as follows:

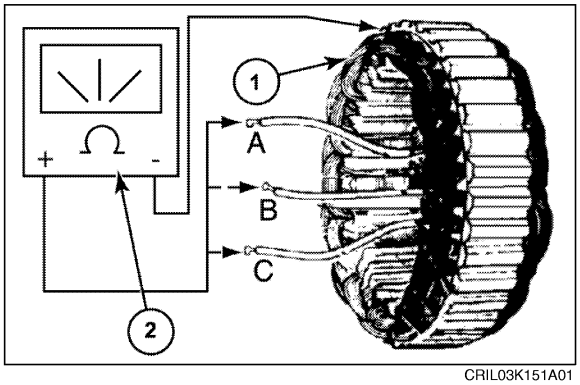
1. Connect the wires of the ohmmeter (3) between wires A, B and C (2). The resistance between each of the wires must be low (0.1 W). If the resistance is greater than this value, it indicates a possible break in the winding, i.e. an open circuit. A lower value (0.0 Ω for example) indicates a short circuit in the winding. If the result of this check is not satisfactory, replace the stator (1) and its casing.



CRIL03K150A01

Stator - Checking the insulation

1. Check the insulation of each winding with respect to the alternator casing. There must not be any continuity between the winding and the casing. If the ohmmeter (2) indicates any value other than an open circuit, replace the entire stator (1).

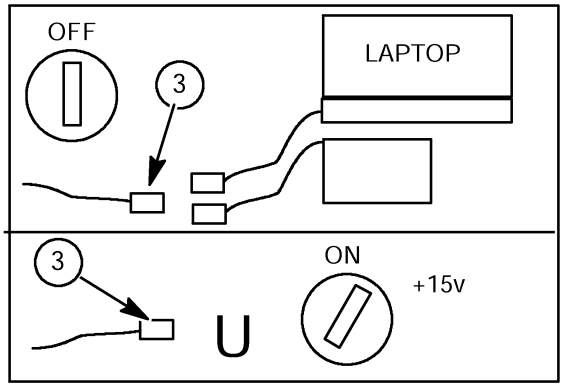


CRIL03K151A01

NOTE: When the warning lamps are not turned off ie maintenance not carried out the counting of the next 300 hours always begins again from the time the signalling began.

The light (2) can only be turned off via a laptop or bridging tool. The reading of the diagnostics programming must be done through the connector on the instrument panel and with the display key in the off position and NOT turned to the on +15 position.

When the connector with U Bolt is used the key must be turned to the ON +15, any lamps and the buzzer are turned off, but the cells recording the times of events cannot be reset to zero



3

ALARMS AND DIAGNOSTIC SIGNALLING

NOTE: For all machines fitted with diagnostic capability.

The malfunctioning data for the functions being diagnosed will be memorised on the micro processor and can be displayed by the technician through a serial line accessible through the 5 way 5238 molex connector (3).

The time of the malfunctioning of each individual function will be memorised in four cells in the following way.

The first malfunction will be memorised in the fourth cell and will remain there until the user cancels it by computer.

The next malfunction will be displayed in the first cell and then slip into the second cell when the third malfunction occurs until all 3 cells have been filled.

When the fifth malfunction occurs the data moves down, cancelling the second occurrence and memorising the most recent one in the first cell.

In twos way the very first and last three malfunctions remain in the memory.

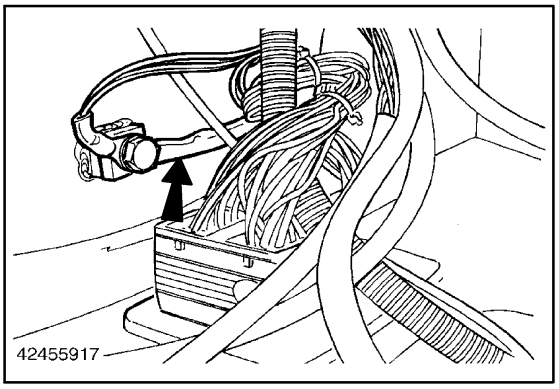
Each malfunction is memorised when it appears for the first time at successive Key offs and Key on if the same event occurs it will not be memorised as a new malfunction.

The time will be memorised only if there has been a rework of the service and a later anomaly

NOTE: The data can only be cancelled while the events are being visualised on the computer. There may be a small variance between times shown on the hour meter and those displayed by the diagnostics programming

Earth Point E - Right hand console (Cab main harness)

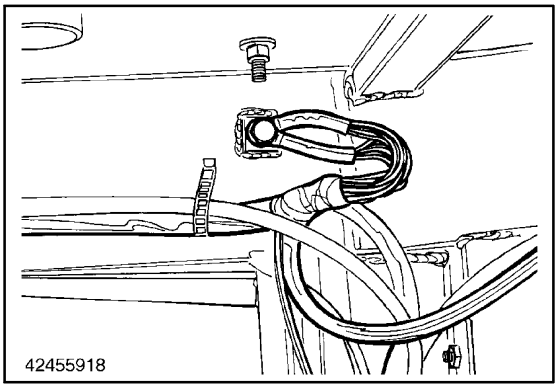
This is also a link to earth point B and C.



9

Earth Point F - Top right hand B pillar (roof harness)

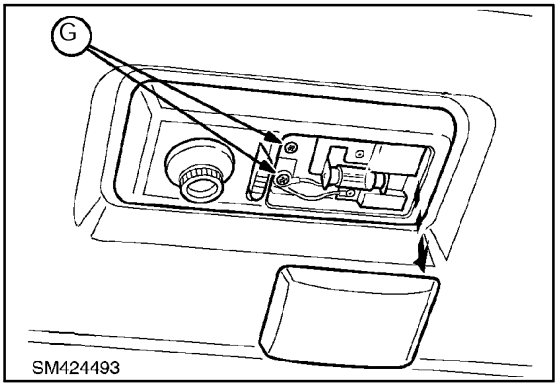
This is also linked to earth point G.



10

Earth Point G - Interior lamp

This is also linked to earth point F.



11

CAB

FRONT INSTRUMENT PANEL - X70 12 PIN

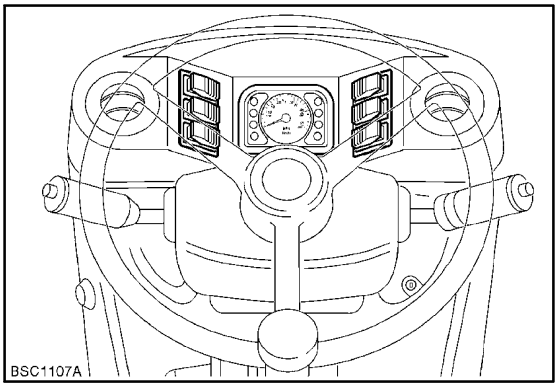
The front instrument panel is sent signals from the brake oil level sender, transmission speed sensor, light switch and indicator switch.

At the rear of the panels are connectors that are attached to the vehicle harness system.

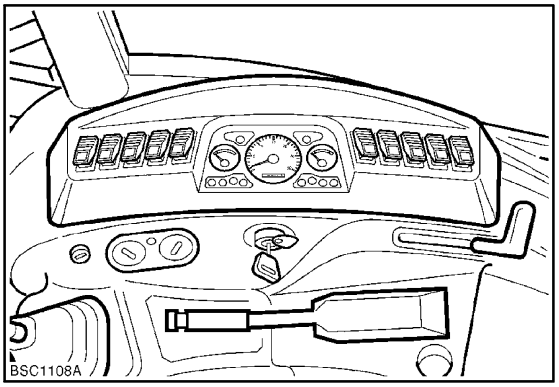
These connectors and functions are listed on the following pages

SIDE INSTRUMENT PANEL - X22 20 PIN

Receives signal from sensors to display, hours, engine RPM, oil pressure, fuel level and signals to warning and indicator lights.



36

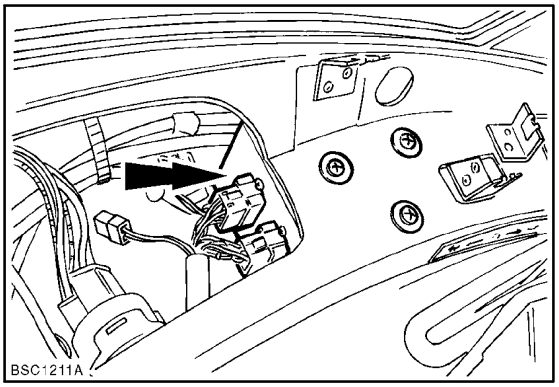


37

STEERING CONTROL UNIT

The Steering Control Unit controls the different steering functions that can be selected from the switch S47.

When changing steering mode, the light for the current mode is extinguished and the light for the new mode starts to flash. When movement of the steering wheel is detected, the light for the new mode remains steady.



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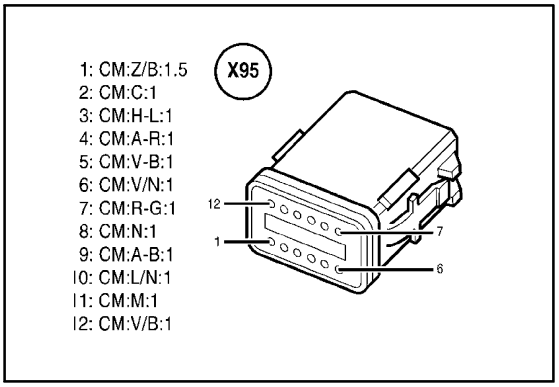
Connector Pin Out Description

12 pin connector - X95:

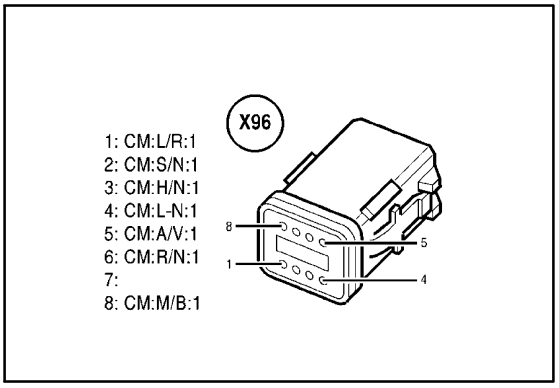
Pin	Function	Signal
1	Crab steering warning light	-
2	Buzzer configuration	-
3	Front alignment sensor input	+12
4	Crab steering control	+12
5	Buzzer output	-
6	Rod iron steering control	+12
7	Control unit supply	+12
8	Ground	-
9	Speed sensor input	-
10	Rear alignment sensor input	+12
11	2WS warning light	-
12	4WS warning light	-



62

8 pin connector - X96:

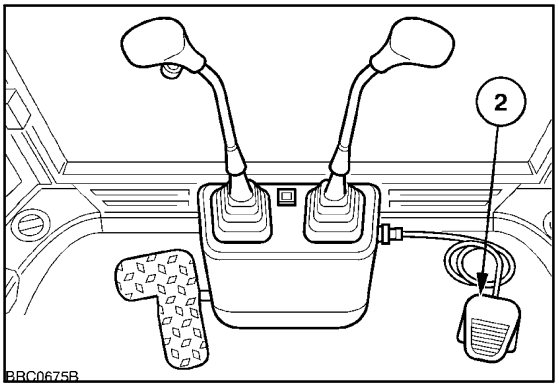
Pin	Function	Signal
1	EV2A output	+12
2	EV2B output	+12
3	EV3A output	+12
4	Ground	-
5	Front sensor supply output	+12
6	Rear sensor supply output	+12
7	Available optional output	+12
8	EV3B output	+12



63

BACKHOE HAMMER SWITCH - S30

At key start the foot switch should have 12 volts for operation of an attachment.



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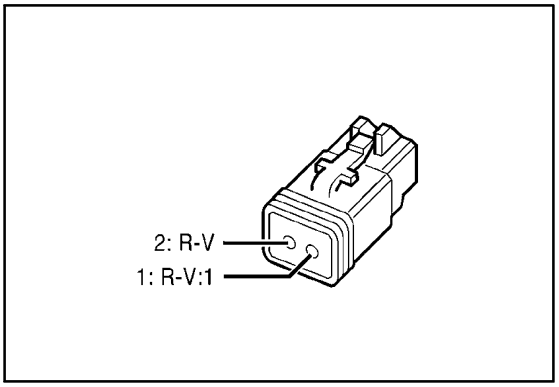
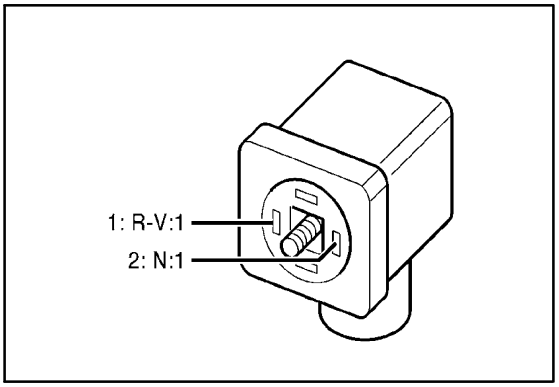
When switch is operated 12V should be found at Pin 2.



91

BACKHOE HAMMER SOLENOID - EV3

Pin No.	Solenoid	resistance
1	12V	7.5 Ω



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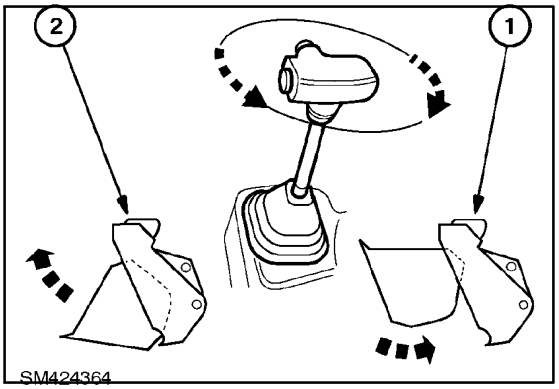
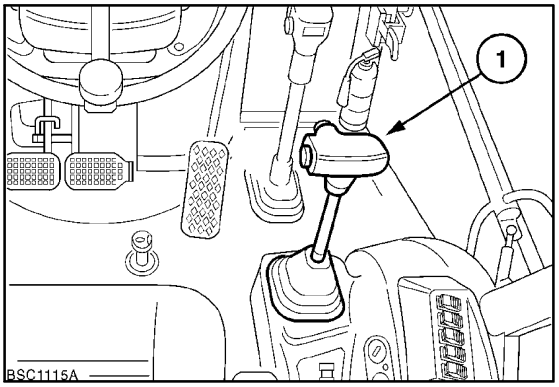
When a multi purpose bucket is fitted the loader lever can be twisted clockwise or counter clockwise to open and close the bucket clam.



8

OVERHAUL-LOADER CONTROLS

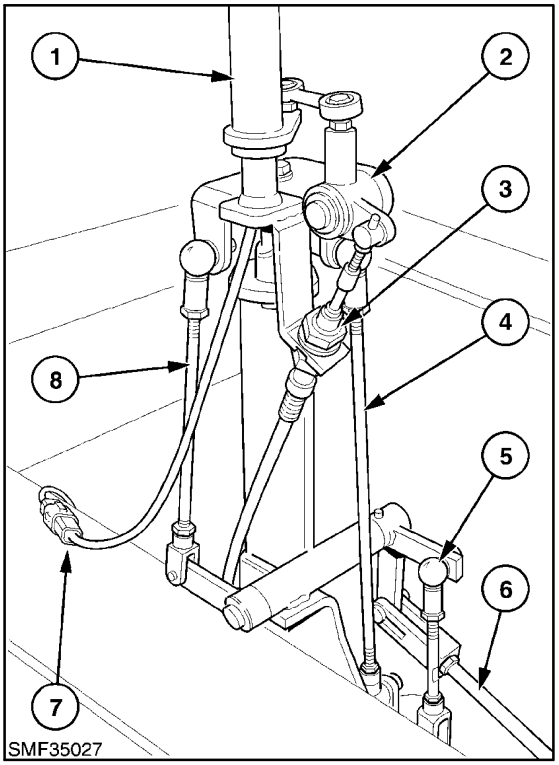
1. Remove covers at base of control lever.
2. Disassemble and examine linkage with reference to Figures 3 and 4.



9

Loader Control Lever Linkage
(With Auxiliary Multi Purpose Bucket Option)

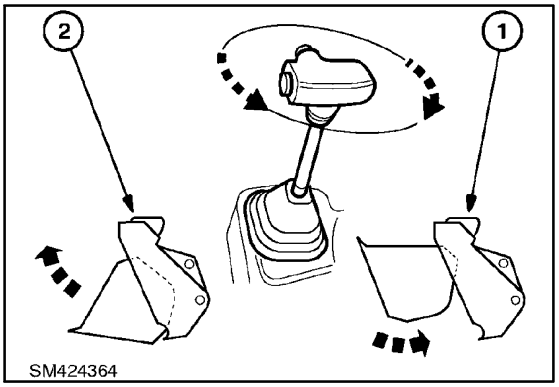
1. Control Lever
2. Multi Purpose Bucket Control Linkage
3. Auxiliary Bucket Control Cable
4. Bucket Control Link
5. Bucket Spool Link
6. Connection to Self Leveling Linkage
7. Transmission Dump Switch Connector
8. Loader Spool Link



10

3. Inspect linkage for wear and replace/adjust as necessary.
4. On re-assembly adjust auxiliary multi purpose bucket control cable to obtain full movement of the spool when the control lever is twisted clockwise or counter clockwise.
5. Adjust self levelling linkage as previously described.

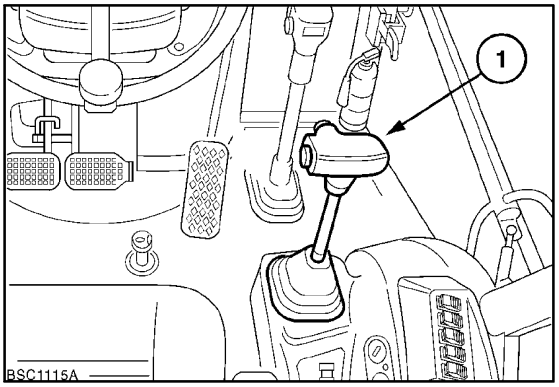
When a multi purpose bucket is fitted the loader lever can be twisted clockwise or counter clockwise to open and close the bucket clam.



4

OVERHAUL - LOADER CONTROLS

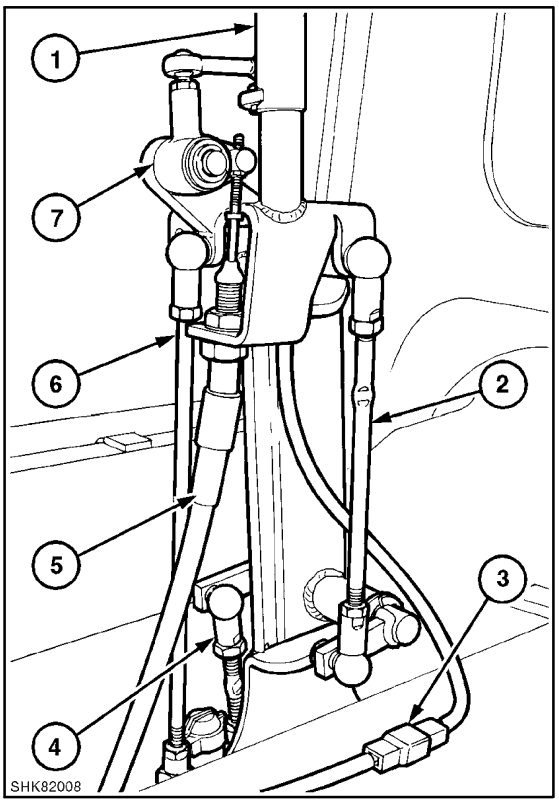
1. Remove covers at base of control lever (1).
2. Disassemble and examine linkage with reference to Figures 6 and 7.



5

Loader Control Lever Linkage
(with Auxiliary Multi Purpose Bucket Option)

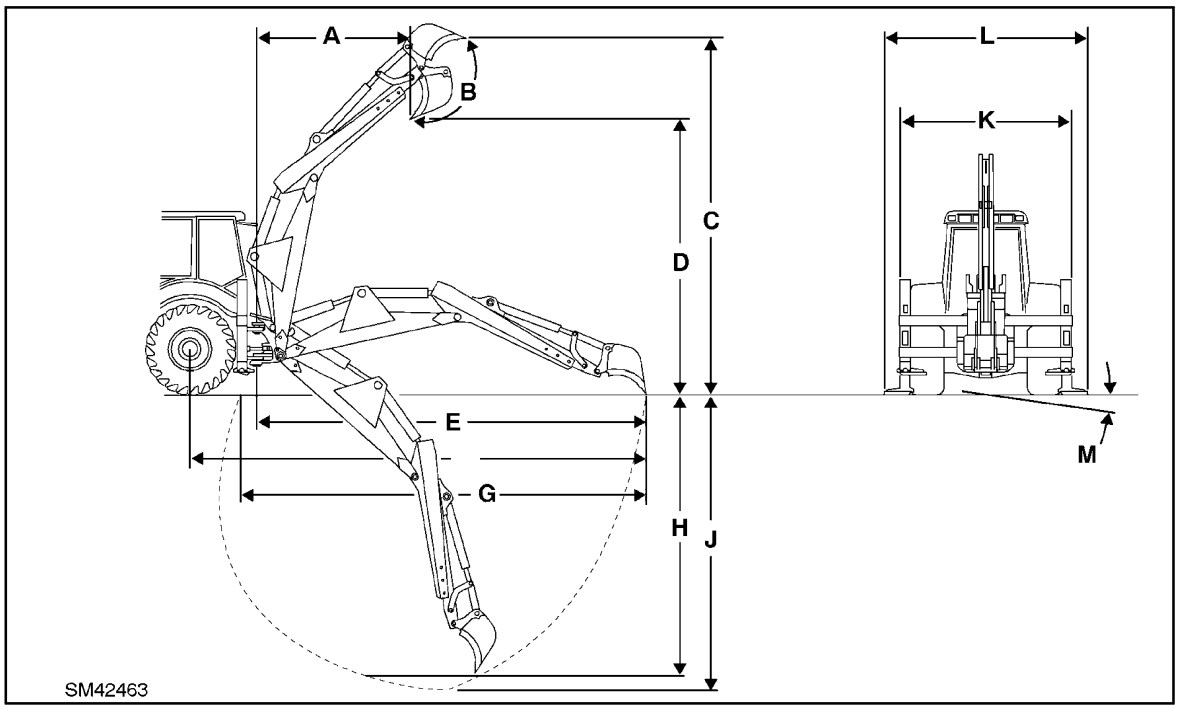
1. Control Lever
2. Bucket Control Link
3. Transmission Dump Switch Connector
4. Bucket Spool Link
5. Multi Purpose Bucket Control Cable
6. Loader Spool Link
7. Multi Purpose Bucket Control Linkage



6

3. Inspect linkage for wear and replace/adjust as necessary.
4. On re-assembly adjust auxiliary multi purpose bucket control cable to obtain full movement of the spool when the control lever is twisted clockwise or counter clockwise.

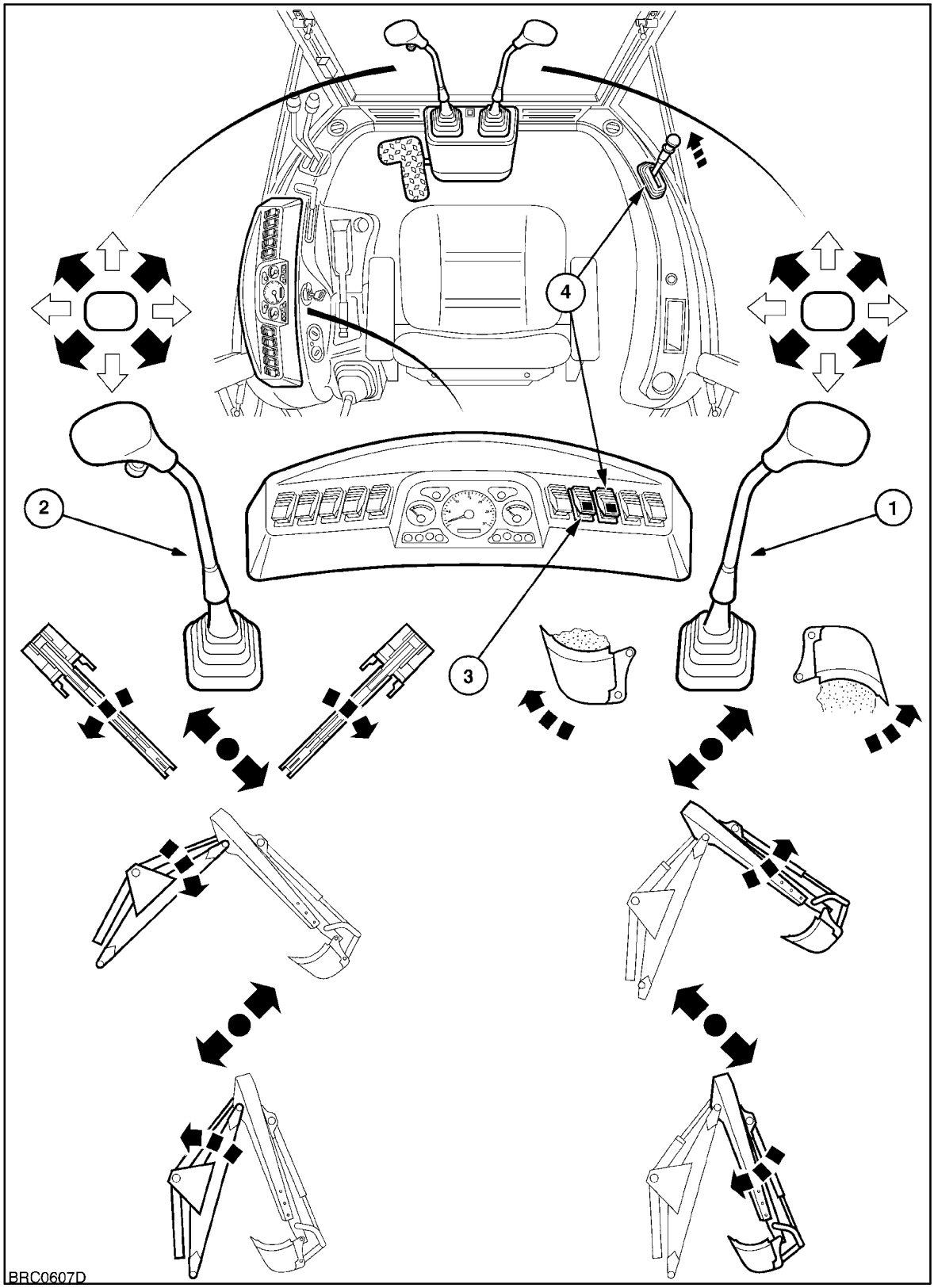
SIDESHIFT BACKHOE - DIMENSIONS AND PERFORMANCE MODELS 90.B, 95.B, 110.B, 115.B / B95, 100.2, 11.2, 200.2



3

(PER SAE J 732 C) WITH TYRES 4WD FRONT = 12.5/80-18 REAR = 18.4-26

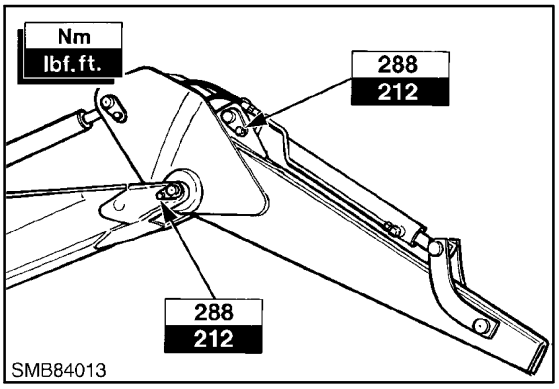
	Standard Dipper	H.E.D. (Extended)
A. Loading Reach	1877mm (6ft 1in)	2820mm (9ft 2in)
B. Bucket Rotation	204°	204°
C. Operating Height, Fully Raised	5777mm (18ft 8in)	6467mm (21ft 0in)
D. Loading Height Maximum	3946mm (12ft.8in)	4664mm (15ft.1in)
E. Reach from swing post	5868mm (19ft.1in)	6953mm (22ft.6in)
E. Reach from rear axle centre line	7913mm (25ft 7in)	8278mm (26ft 9in)
G. Maximum Length of Surface Excavation	6300mm (20ft 5in)	7380mm (23ft 10in)
H. Maximum Digging Depth		
To Achieve a 0.6m (2ft). Flat Bottom Trench	4565mm (14ft 8in)	5744mm (18ft 6in)
To Achieve a 2.4m (8ft). Flat Bottom Trench	4224mm (13ft 7in)	5474mm (17ft 8in)
J. Maximum Digging Depth	4594mm (14ft 9in)	5778mm (18ft 8in)
K. Stabilizer Spread - Transport	2280mm (7ft 5in)	2280mm (7ft 5in)
L. Stabilizer Spread - Working (pads reversed)	2790mm (9ft 2in)	2790mm (9ft 2in)
M. Stabiliser Pad Levelling Angle	14°	14°
- Swing Arc	180°	180°
- Maximum digging force (general purpose bucket) -		
crowd cylinder	3621 kg (7983 lbs)	2592 kg (5714 lbs)
bucket cylinder	5630 kg (12412 lbs)	5630 kg (12408 lbs)
- Lift capacity through dipper arc -	(SAE) 1865 kg (4115 lbs)	1380 kg (3045 lbs)
- Lift capacity, dipper 3.66m (12ft) above ground	(SAE) 1925 kg (4250 lbs)	1400 kg (3085 lbs)
- Lift capacity at 4.2m (14ft) above ground	(SAE) 1560 kg (3445 lbs)	1030 kg (2275 lbs)
- Extendible dipper extension length	-	1.05m (3ft.4in)


4
2
1
3
BRC0607D

Installation

Installation follows removal procedure in reverse. During installation observe the following:-

- Tighten pivot pin retaining bolts to torque of 288Nm (212 lbf.ft).
- Check all hoses for leaks.
- Check hydraulic reservoir oil level and add Ambra multi G 10W30 oil to specification NH410B or Hydrosystem bio-degradable oil to NH Specification NH646 H if applicable.
- Lubricate grease fittings.



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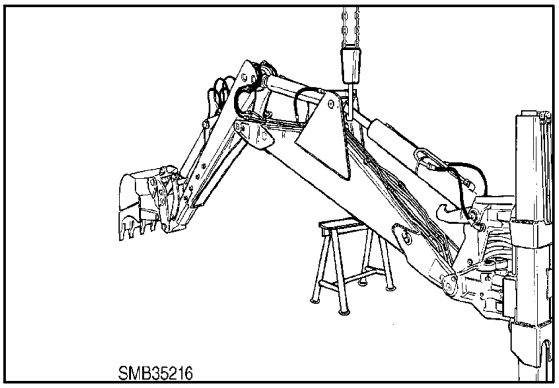
Swing Post Removal

1. Remove dipperstick and boom as described on Pages 13-15.



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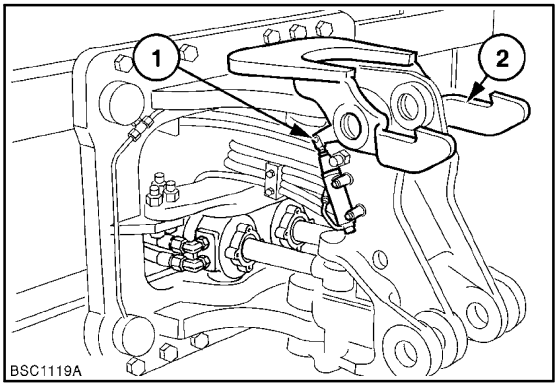
2. Disconnect control rod (1) and remove boom lock (2).



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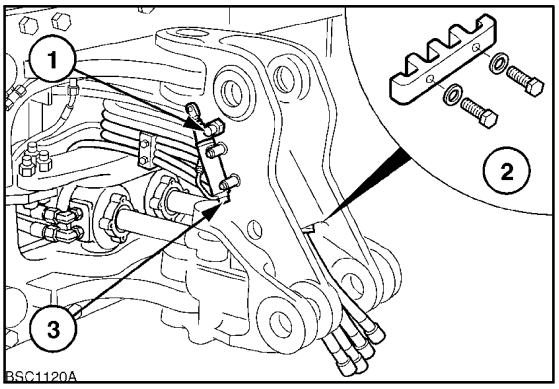
3. Disconnect hoses (1) from each side of swing post.
4. Remove swing post hose clamp (2).
5. Disconnect hose to boom lock valve (3) or mechanical lock linkage (where fitted)
6. Cap all hoses to prevent ingress of dirt.



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