

Wheeled Loading Shovel - 406/409

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Typical Transmission Plate

The transmission plate carries the following information:

Make, Model Number, Serial Number, Direction of Rotation, → [Fig 6.](#) ([□ 1-7](#)).

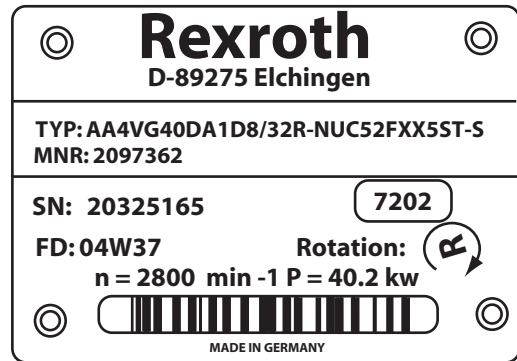


Fig 6.

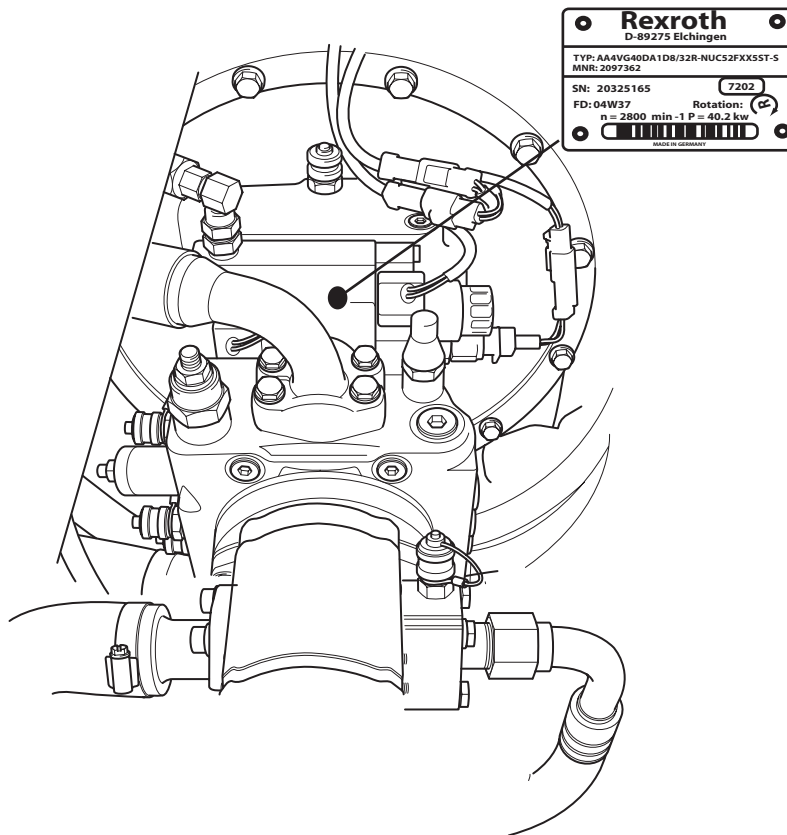


Fig 7. Transmission Serial Plate Location

Service Tools

Numerical List Section B - Body and Framework

The tools listed in the table are special tools required for removal and replacement of Body and Framework parts. These tools are available from JCB Service.

Note: Tools other than those listed will be required. It is expected that such general tools will be available in any well equipped workshop or be available locally from any good tool supplier.

Part Number	Description	Tool Detail Reference
4104/1310	Hand Cleaner	⇒ Fig 12. (□ 1-18)
826/01099	M6 x 16mm Rivet Nut	⇒ Fig 13. (□ 1-18)
826/01101	M6 x 19mm Rivet Nut	⇒ Fig 13. (□ 1-18)
826/01102	M8 x 21mm Rivet Nut	⇒ Fig 13. (□ 1-18)
826/01103	M8 x 18mm Rivet Nut	⇒ Fig 13. (□ 1-18)
826/01104	M10 x 23mm Rivet Nut	⇒ Fig 13. (□ 1-18)
826/01105	M10 x 26mm Rivet Nut	⇒ Fig 13. (□ 1-18)
892/00842	Glass Lifter	⇒ Fig 14. (□ 1-18)
892/00843	Folding Stand for Holding Glass	⇒ Fig 15. (□ 1-18)
892/00844	Long Knife	⇒ Fig 16. (□ 1-18)
892/00845	Cartridge Gun	⇒ Fig 17. (□ 1-19)
892/00846	Glass Extractor (Handles)	⇒ Fig 18. (□ 1-19)
892/00847	Nylon Spatula	⇒ Fig 19. (□ 1-19)
892/00848	Wire Starter	⇒ Fig 20. (□ 1-19)
892/00849	Braided Cutting Wire	⇒ Fig 21. (□ 1-19)
926/15500	Rubber Spacer Blocks	⇒ Fig 22. (□ 1-19)
992/07000	Peg Spanner for Q_Hitch Ram End Caps	⇒ Fig 25. (□ 1-20)
992/12800	Cut-Out Knife	⇒ Fig 23. (□ 1-20)
992/12801	'L' Blades	⇒ Fig 24. (□ 1-20)

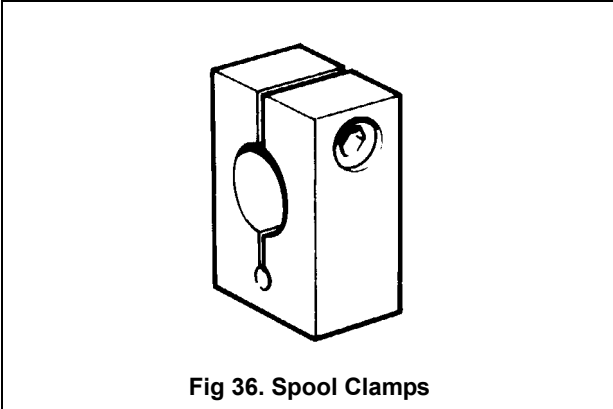


Fig 36. Spool Clamps

892/0039 Spool Clamp
992/10100 Spool Clamp

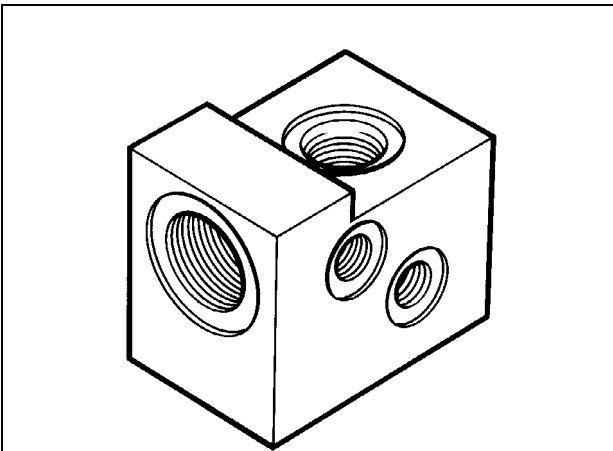


Fig 37. Test Block For ARV

892/00252 Test Block for ARV

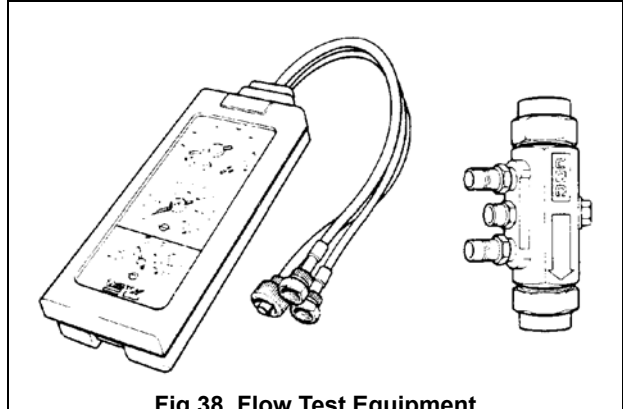


Fig 38. Flow Test Equipment

892/00268 Flow Monitoring Head
892/00269 Sensor Head 0 to 100 l/min (0 to 22 UK gal/min)
892/00270 Load Valve
1406/0006 Adaptor 3/4 in. M x 3/4 in. M BSP
1612/0006 Adaptor 3/4 in. F x 3/4 in. M BSP
816/20008 Adaptor 3/4 in. F x 1/2 in. M BSP
892/00275 Adaptor 1/2 in. F x 3/4 in. M BSP

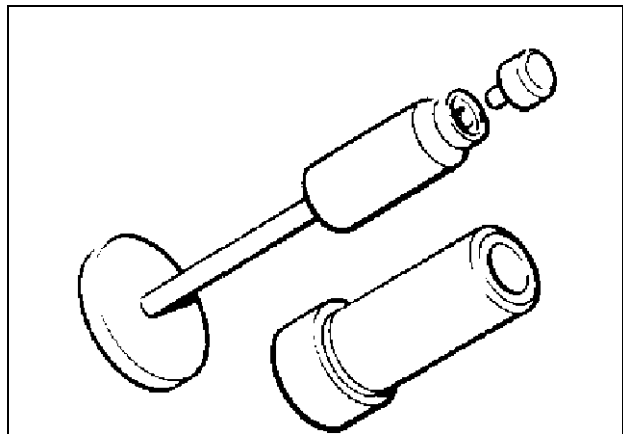


Fig 39. Seal Fitting Tool

892/00180 Seal Fitting Tool for 'O' Ring and Kin Ring for Danfoss Orbital Unit
892/00181 Replacement Plastic Boss

Care and Safety

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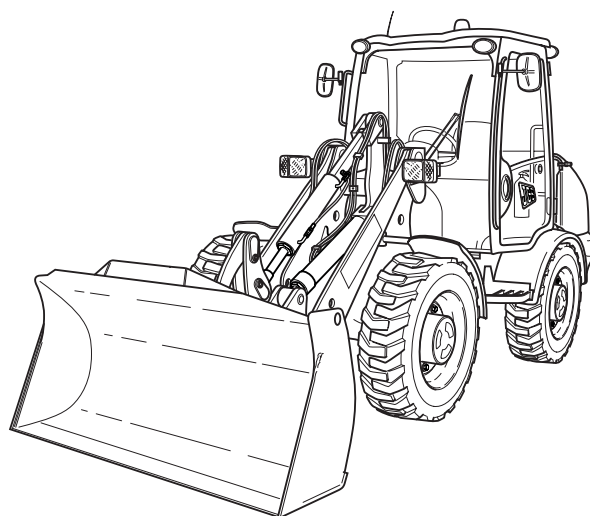
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Safety decals

Decals on the machine warn you of particular hazards. Each decal is attached close to a part of the machine where there is a possible hazard. Read and make sure you understand the safety message before you work with or on that part of the machine.

Keep all decals clean and readable. Replace lost or damaged decals. The decals and their attachment points are as illustrated. Each decal has a part number printed on it, use this number to order a new decal from your JCB dealer.

WARNING

If you need eye-glasses for reading, make sure you wear them when reading the safety decals. Decals are strategically placed around the machine to remind you of possible hazards. Do not over-stretch or place yourself in dangerous positions to read the decals.

INT-3-3-4_1

WARNING

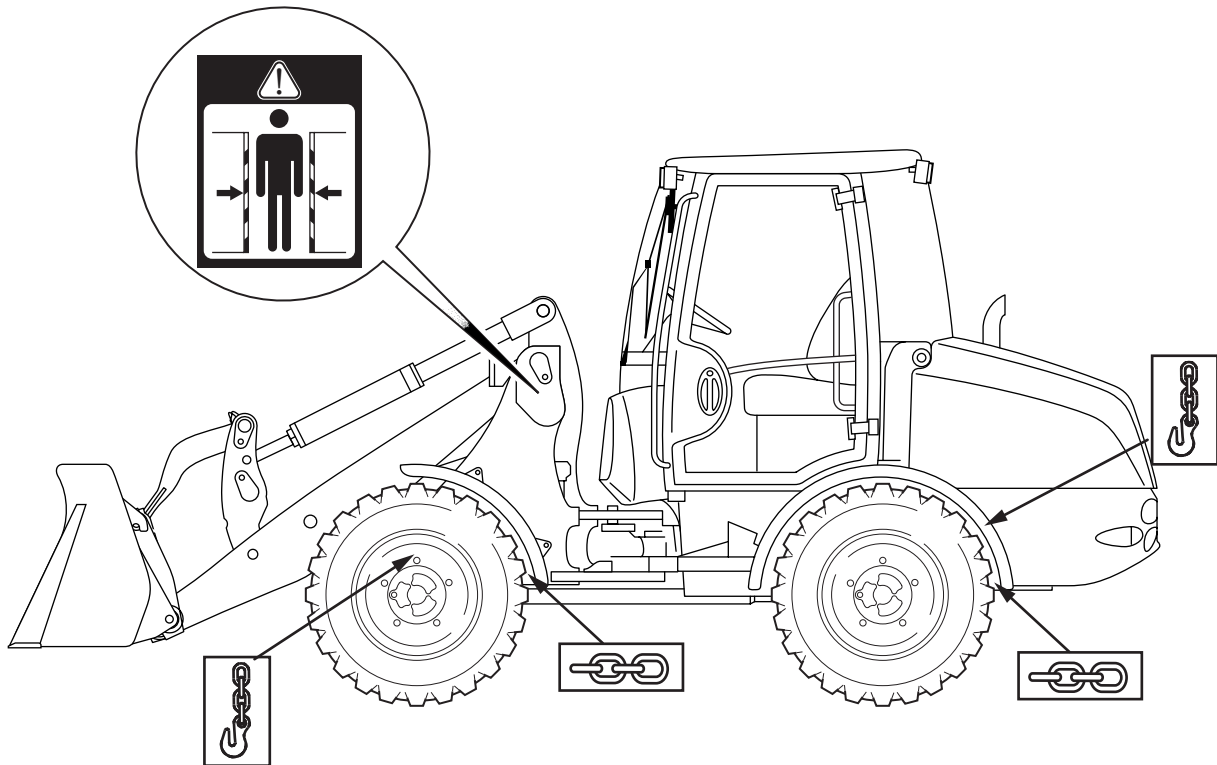
Decals

Decals on the machine warn you of particular hazards. You can be injured if you do not obey the decal safety instructions.

Each decal is attached close to a part of the machine where there is a possible hazard. Make sure replacement parts include warning decals where necessary.

Keep all decals clean and readable. Replace lost or damaged decals. Each decal has a part number printed on it, use this number to order a new decal from your JCB distributor.

INT-3-3-3_1



Warning Symbols

The following warning symbols may be found on the battery.

Symbol

Meaning



A289230-1

Keep away from children.

A289260-1



A289280

No smoking, no naked flames, no sparks.



A289250

Explosive Gas.



A289240

Battery acid.

A289270

Note operating instructions.

First Aid - Electrolyte

Do the following if electrolyte:

Gets into your eyes

Immediately flush with water for 15 minutes, always get medical help.

Is swallowed

Do not induce vomiting. Drink large quantities of water or milk. Then drink milk of magnesia, beaten egg or vegetable oil. Get medical help.

Gets onto your skin

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.

Tools

Tool Locations

The grease gun, oil drain tube and wheel brace are located under the lockable engine cover **A**. ⇒ [Engine Cover \(□ 3-34\)](#).

All tools must be secured in their correct positions when not in use.

Carrying Tools onto the Machine

When you carry tools onto the machine you must maintain three points of contact with the machine at all times. Lift tools onto the machine in intervals if necessary. Place the tools down before you adjust your grips on the machine. Do not try to adjust your grips on the machine while holding tools.

Greasing

Introduction

You must grease the machine regularly to keep it working efficiently. Regular greasing will also lengthen the machine's working life. Refer to the **Service Schedule** for the correct intervals.

T3-028_2

Note: *The machine must always be greased after pressure washing or steam cleaning.*

Greasing should be done with a grease gun. Normally, two strokes of the gun should be sufficient. Stop greasing when fresh grease appears at the joint. Use only the recommended type of grease. Do not mix different types of grease, keep them separate.

In the following illustrations, the grease points are numbered. Count off the grease points as you grease each one. Refit the dust caps after greasing.

Note: *Where applicable, refer to the manufacturers manual for instructions on the maintenance of optional attachments.*

CAUTION

Waxoyl contains turpentine substitute which is flammable. Keep flames away when applying Waxoyl. Waxoyl can take a few weeks to dry completely. Keep flames away during the drying period.

Do not weld near the affected area during the drying period. Take the same precautions as for oil to keep Waxoyl off your skin. Do not breathe the fumes. Apply in a well-ventilated area.

5-3-1-9

Preparing the Machine for Greasing

Make the machine safe before you start a greasing procedure. Refer to **Prepare the Machine for Maintenance**.

Important: *You can complete most of the greasing procedures with the loader arm lowered. If you lift the loader arm to get access for greasing, you must install the maintenance strut on the loader arm.*

Cleaning the Cab Heater Filter (machines with air conditioning)

⚠ CAUTION

The filter may be filled with dust. Wear goggles and a face mask when removing the filter.

2-3-3-6

- 1 Make the machine safe with the loader arm lowered. Refer to **Prepare the Machine for Maintenance**.
- 2 To gain access to the cab heater filter, unlock and open the right hand side cab panel.
- 3 Remove the thumb screw **A** and retaining plate **B**. Slide the filter **C** from its aperture.

Note: Do not wash out this type of filter element.

- 4 Shake out the loose dust from the filter. Replace the filter if severely blocked or the element is damaged.
- 5 Refit the filter, retaining plate and thumb screw and close and secure the access panel.

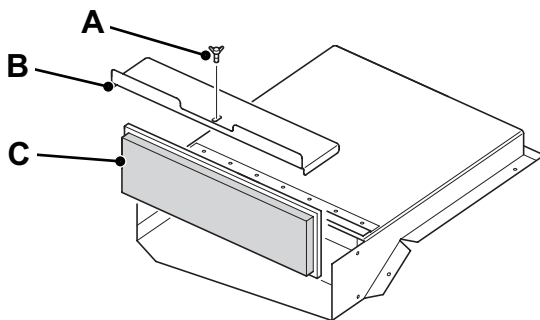


Fig 18.

C085540

Cleaning the Cab Re-circulation Filter

⚠ CAUTION

The filter may be filled with dust. Wear goggles and a face mask when removing the filter.

2-3-3-6

- 1 Make the machine safe with the loader arm lowered. Refer to **Prepare the Machine for Maintenance**.
- 2 To gain access to the filter, which is on the right side of the cab, at floor level alongside the seat.
- 3 Remove the thumb screw **A** and retaining plate **B**. Slide the filter **C** from its aperture.

Note: Do not wash out this type of filter element.

- 4 Shake out the loose dust from the filter. Replace the filter if severely blocked or the element is damaged.
- 5 Refit the filter, retaining plate and thumb screw and close and secure the access panel.

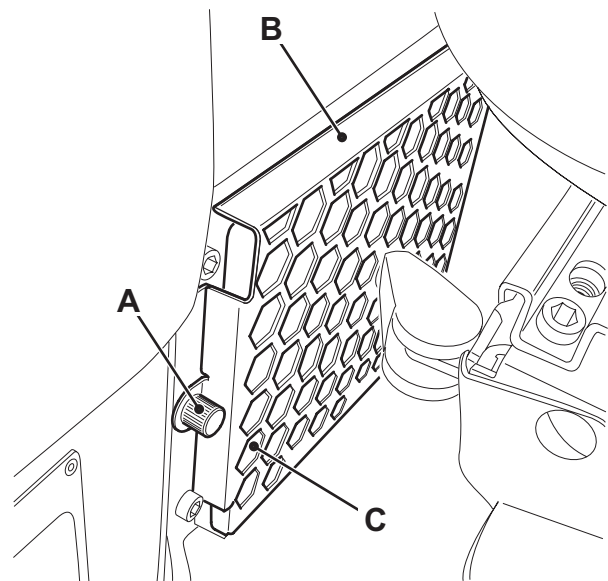


Fig 19.

T031950

Primary Fuses

Circuit(s) Protected	
1	<p>Starter switch</p> <p>Brake lights, instrumentation, instrument cluster, speed sensor, buzzer, radio, clock ESOS, solenoid</p> <p>Front wash-wipe, front wiper motor, front washer motor</p> <p>Direction indicators, left hand indicators, warning light</p> <p>Rear wash-wipe, rear wiper motor, rear washer motor</p> <p>Hydraulics: 3rd spool relay, 3rd spool solenoid, 4th spool solenoid, servo cut-off solenoid, Quickhitch switch</p> <p>SRS suspension, SRS solenoid, relay coils</p> <p>Glow plug relay, excess fuel solenoid, fuel pressure solenoid (409)/EGR valve (406)</p>
	50A

Circuit(s) Protected	
2	<p>Ignition relay 1</p> <p>Transmission: 2-speed creep speed, forward solenoid, reverse solenoid, reverse alarm, reverse lights, low speed solenoid, creep speed solenoid, SRS latching relay</p> <p>Servo control</p> <p>Air suspension seat, cigar lighter</p> <p>Hi-speed transmission (409 only)</p> <p>Hi-speed transmission (409 only), park brake</p> <p>Immobiliser</p> <p>Face fan</p>
	50A

Circuit(s) Protected	
3	<p>Heater relay</p> <p>Heater, heater motor, AC relay</p> <p>AC condenser clutch, AC condenser relay</p>
	50A

Circuit(s) Protected	
4	<p>Roadlight relay and side lights</p> <p>Left hand side lights</p> <p>Right hand side lights, number plate lights, instrument illumination</p> <p>Dipped-beam</p> <p>Main-beam</p> <p>Rear fog light</p>
	30A

Circuit(s) Protected	
5	<p>Work light relay</p> <p>Front work lights, side lights</p> <p>Rear work lights</p>
	40A

Circuit(s) Protected	
6	<p>Ancillaries</p> <p>Hazard indicators, direction indicators</p> <p>Beacon, horn</p> <p>Interior light, radio, clock</p> <p>Main-beam flash</p>
	40A

Circuit(s) Protected	
7	AC condenser fans
	40A

Circuit(s) Protected	
8	Blank
	-

Circuit(s) Protected	
9	Glow plugs (mega-fuse)
	60A

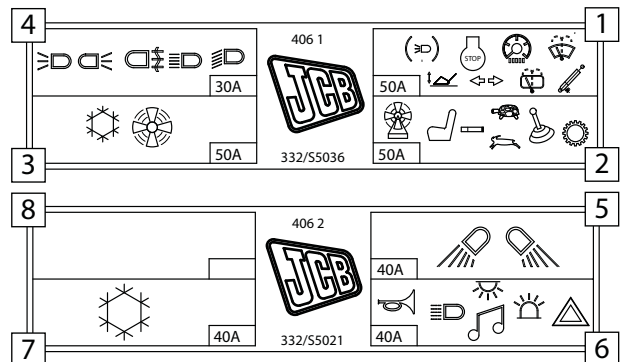


Fig 26.

T020410

Fuel Filter

Changing the Fuel Filter

- 1 Make the machine safe with the loader arm lowered. Refer to ***Prepare the Machine for Maintenance***.
- 2 Open the engine cover.
- 3 Unscrew the filter element **A**, the element is hand tight but may require a strap wrench to remove. The filter will be full of fuel.
- 4 Clean the filter head **B**.
- 5 Fill the new element with the recommended fuel (to assist the self bleed system). → [Fluids, Lubricants and Capacities \(3-13\)](#).
- 6 Lubricate the sealing ring **C** with clean fuel and screwed the filter on until the seal contacts the filter head.
- 7 Tighten the bowl a further quarter of a turn.

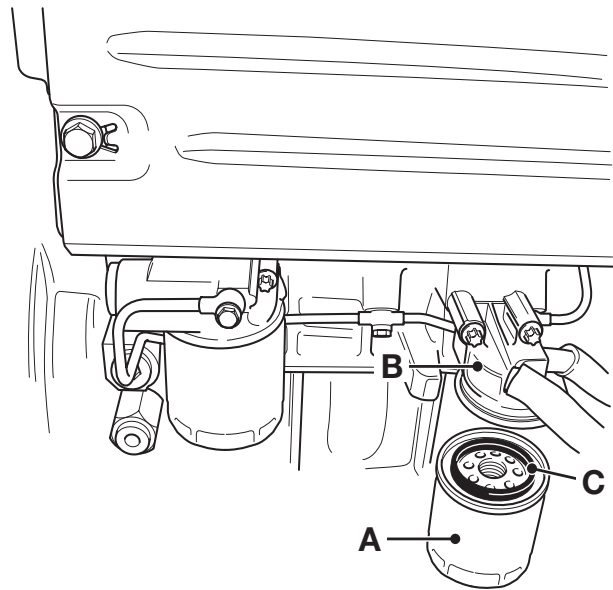


Fig 38.

C009330

CAUTION

Do not operate the starter motor for more than 20 seconds at one time. Let the starter motor cool for at least 2 minutes.

0124

- 8 Start the engine. If the engine does not fire within 20 seconds, wait at least two minutes before cranking the engine again.
- 9 Run the engine and check for leaks.
- 10 Close and secure the engine cover.

Axles

Checking the Differential Oil Level

⚠ CAUTION

The oil level must be checked with the machine level, otherwise a false indication of the amount of oil will be given.

16-3-5-3_2

- 1 Make the machine safe with the loader arm lowered. Refer to *Prepare the Machine for Maintenance*.
- 2 Clean the area around the fill/level plug **B**.
- 3 Remove the fill/level plug **B** and its seal, oil should be level with the bottom of the hole.
- 4 Top-up with the recommended oil as necessary. → [Fluids, Lubricants and Capacities \(□ 3-13\)](#)
- 5 Clean and refit the level/fill plug **B** and its seal. Tighten to 35 - 40 Nm (26 - 29 lbf ft).

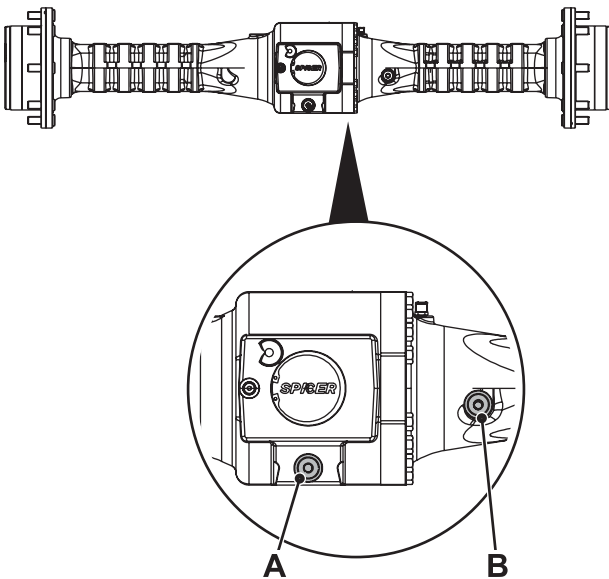


Fig 48.

C010320-2

Changing the Differential Oil

- 1 Make the machine safe with the loader arm lowered. Refer to *Prepare the Machine for Maintenance*.
- 2 Clean the area around the fill/level plug **B**.
- 3 Remove the fill/level plug **B** and its seal.
- 4 Place a suitable container beneath the drain plug **A** (to catch the oil).

⚠ CAUTION

Oil will gush from the hole when the drain plug is removed. Keep to one side when you remove the plug.

2-3-4-2

- 5 Remove the drain plug **A** and its seal.
- 6 Allow the oil to drain fully.
- 7 Clean and refit the drain plug **A** and its seal. Tighten to 35 - 40 Nm (26 - 29 lbf ft).
- 8 Fill the axle with the recommended oil, oil should be level with the bottom of the hole. → [Fluids, Lubricants and Capacities \(□ 3-13\)](#).
- 9 Clean and refit the fill/level plug **B** and its seal. Tighten to 35 - 40 Nm (26 - 29 lbf ft).

Optional Attachments

Quick Release Couplings

T4-001

Connecting and Disconnecting

Flat face quick release couplings allow the operator to remove and install attachments swiftly and efficiently. Generally, your machine pipework will have female couplings **A** fitted, and the optional attachment hoses will have male couplings **B** fitted. → [Fig 1. \(□ A-2\)](#).

The quick release couplings should be trouble free and relatively easy to connect and disconnect, provided they are kept clean and used correctly. The recommendations listed below should always apply when using flat face quick release couplings.

Finally, please read the correct fitting and releasing procedures before installing or removing any optional attachment fitted with quick release couplings.

Quick Release Couplings - Do's and Don'ts

- Do wipe the two faces of the coupling and make sure they are clean before connecting.
- Do make sure the outside sleeve (female coupling) is pulled back when disconnecting.
- Do connect and disconnect a new coupling two or three times to 'work' the PTFE seals - sometimes a new coupling will stick if the seals have not been 'worked'.
- Do use a spanner on the hexagon flats of the coupling when fitting adaptors.
- Do use a rubber or hide hammer to disconnect a coupling if it sticks - sticking may occur if there is dirt present in the coupling.
- Don't attempt to re-connect a damaged half coupling - this will destroy the seals and necessitate replacing both half couplings.
- Don't leave the coupling where it may be run over by a machine or otherwise crushed - this will distort the coupling sleeve and prevent correct connection and disconnection.
- Don't clamp on the smooth diameter of the coupling when fitting adaptors - always use the hexagon.
- Don't try to turn the sleeve (female coupling) when the coupling has been disconnected - the locking ball will

wedge underneath the sleeve and destroy the coupling.

- Don't damage the faces of the couplings - this can prevent connection and disconnection, or damage seals and cause leakage.
- Don't try to dismantle the couplings - they are non serviceable parts. If a coupling is damaged it should be replaced with a new one.

WARNING

Hydraulic fluid at pressure can injure you. Make the machine safe before connecting or disconnecting quick release couplings; stop the engine and then operate the attachment control a few times to vent residual hydraulic pressure in the attachment hoses.

2-4-1-11

WARNING

The external surfaces of the couplings must be clean before connecting or disconnecting. Ingress of dirt will cause fluid leaks and difficulty in connecting or disconnecting. You could be killed or seriously injured by faulty Quick Release Couplings.

2-4-1-15

Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses.

- a Pneumatic Knife. → [Fig 6. \(□ B-6\)](#). This provides one of the easiest methods of removing the sealant around laminated glass. The tool, powered by compressed air, should be sourced locally.

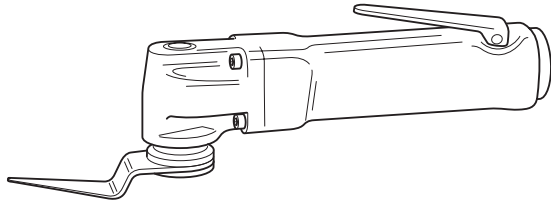


Fig 6. Pneumatic Knife

- i Press the handle to start the knife blade oscillating.

Important: This tool must not be used on toughened glass.

- ii Insert the knife blade into the sealant.
- iii Slowly move the knife along the sealant with the blade positioned as close to the glass as possible. Do not allow the knife blade to overheat or the sealant will melt.
- b Braided Cutting Wire and Handles. → [Fig 7. \(□ B-6\)](#). This method uses a 3-core wire, a wire starter tube and two handles.

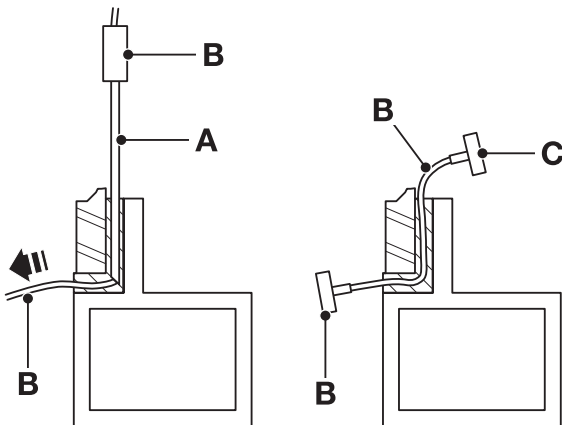


Fig 7. Braided Cutting Wire and Handles

- i Insert the steel tube **8-A** into the old sealant on the inside of the glass. → [Fig 7. \(□ B-6\)](#).

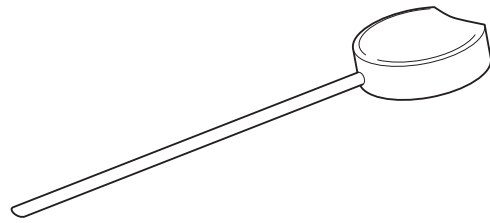


Fig 8.

- ii Insert the braided cutting wire **7-B** down the centre of the steel tube. If necessary, from the outside, cut out local sealant at the point of the tube to gain access to the wire.
- iii Using suitable pliers, pull the cutting wire through the sealant to the outer side of the glass.
- iv Secure each end of the braided cutting wire in the special handles **7-C**.
- v Move the cutting wire backwards and forwards in a sawing motion and at the same time gently push or pull the wire to cut through the old sealant.
- c Cut-out Knife. → [Fig 9. \(□ B-6\)](#). The cut-out knife can be used as a left handed or right handed tool.

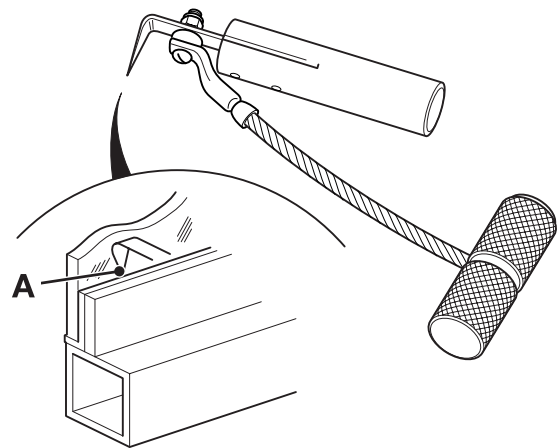


Fig 9. Cut-out Knife

- i Insert the knife blade into the sealant.
- ii Make sure that the blade of the knife is against the glass **9-A**.

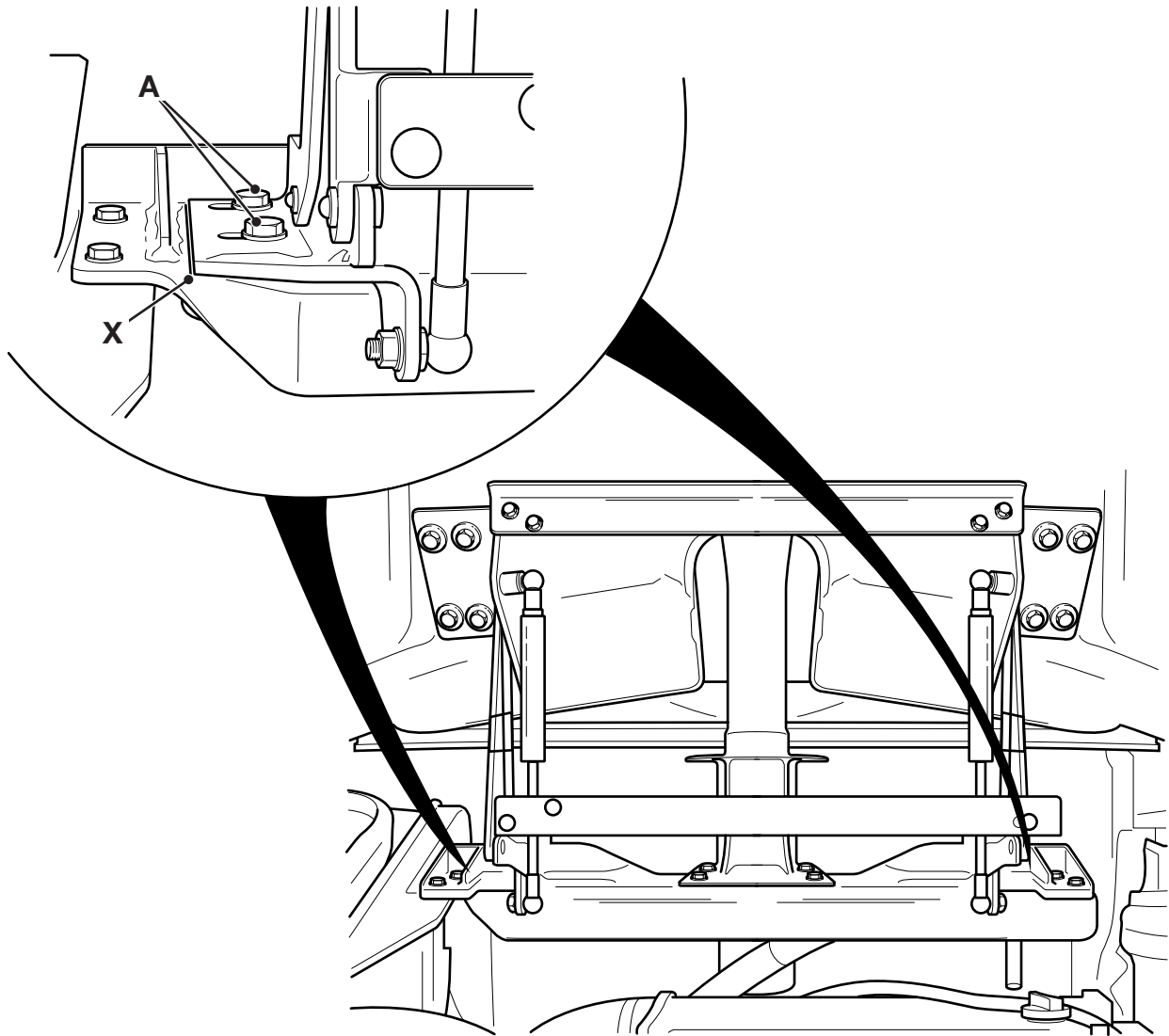


Fig 22.

Loader Arms

Removal and Replacement

Removal

For illustration, → [Fig 29.](#) ([□ B-28](#)).

WARNING

The loader arm interlevers are potentially dangerous, when pivoting about their centre they form a 'scissor' point with the loader arm. Make sure the interlevers are securely blocked when working in the loader arm area.

BF-2-1

Important: Label all hydraulic hoses before removal to aid correct refitting. Always plug the open hoses and all open ports to prevent the ingress of dirt or debris that may be harmful to the hydraulic system.

- 1 Remove any attachments from the quickhitch (shovel, forks etc).
- 2 Park the machine on firm level ground. Engage the parking brake and set the transmission to neutral. Lower the loader quickhitch onto a suitable support to leave the loader shovel ram in an approximately horizontal position.

WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11_2

- 3 Switch off the engine and vent the residual hydraulic pressure from the loader by operating the control levers back and forth several times.
- 4 Label, disconnect and plug the pipework to the quickhitch and crowd ram. Plug all open ports.

- 5 Release the clamps securing the hydraulic hoses to the loader arms.

- 6 Remove the loader shovel ram as detailed in **Section E - Hydraulics - Rams - Removal and Replacement.**

Note: The loader lift ram does not need to be fully removed to remove the loader arms.

- 7 Remove the rod end of the loader lift ram from the loader arm assembly and lower onto the front chassis. **Section E - Hydraulics - Rams - Removal and Replacement.**

WARNING

This component is heavy. It must only be removed or handled using a suitable lifting method and device.

BF-4-1_1

- 8 Attach slings to, and using suitable lifting equipment support the weight of the loader arms.
- 9 Remove the securing bolts **A** from the loader arm pivot pins and withdraw the pins.
- 10 Carefully lift the loader arms from the machine.

Replacement

Replacement is the reverse of the removal procedure.

Torque tighten all bolts. → [Table 6. Torque Settings](#) ([□ B-26](#)).

Table 6. Torque Settings

Item	Nm	Kgf/m	lbf/ft
A	158	18.8	135.7

- 3 Connect the red flying lead to the battery positive (+) terminal and the black flying lead to the battery negative (-) terminal.
- 4 Set the CHECK/LOAD switch 1-A to CHECK to read the battery no-load voltage which should be at least 12.4 volts.
- 5 Set the CHECK/LOAD switch 1-A to LOAD and hold down for 5-10 seconds until the meter reading stabilises. The reading should be at least 9 volts.

Note: Do not hold the switch in the LOAD position for more than 10 seconds.

- 6 ⇒ [Table 1. Fault Diagnosis \(C-4\)](#), if the foregoing tests are unsatisfactory.

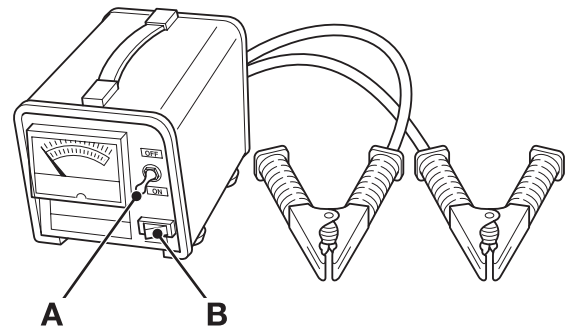


Fig 1. Battery Tester

Table 1. Fault Diagnosis

Battery Tester Readings	Remedy
1 CHECK: 0 - 12.6 Volts LOAD: less than 6 Volts	Renew battery
2 CHECK: 6 - 12.4 Volts LOAD: less than 9 Volts and falls steadily but remains in yellow zone.	Recharge and re-test. If tests still unsatisfactory renew battery.
3 CHECK: less than 10 Volts LOAD: less than 3 Volts	Indicates battery has been over-discharged and unlikely to recover. Renew battery.
4 CHECK: more than 11 Volts LOAD: 6 - 10 Volts steady	Charge battery which will probably recover.

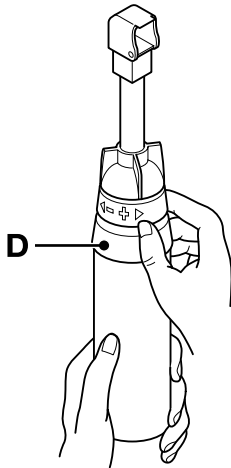


Fig 13.

- f Hold the heater vertically and, using a match or cigarette lighter, light the gas as shown.

Hold the heater vertically for 1 to 2 minutes until the catalytic reaction occurs. This is indicated when the blue flame fades and the ceramic element glows red. Then turn the small ring **14-E** until the air holes at **14-F** are completely open. The tool is ready for use.

Note: The fact that the sound of liquid cannot be heard when the cartridge is shaken does not mean it is empty. No sound will be heard even when the cartridge is full.

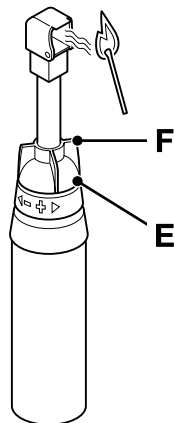


Fig 14.

- g The heater can be used in two modes:

- i Side wings **15-G** down, reflector head completely open. In this mode the infra-red heat waves are dominant (recommended for the light coloured plastic splices).



Fig 15.

- ii Side wings **16-G** up, reflector head opening reduced. In this mode the heating is done only by the hot gas (use for dark coloured plastic splices).

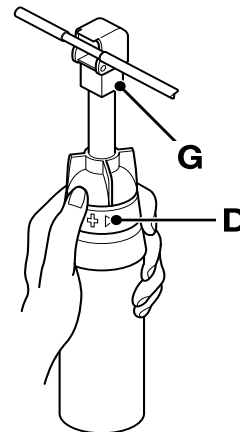


Fig 16.

- h To switch off the heater, turn the red ring **16-D** to the left (in the direction of the minus sign).

Instrumentation

Component Key: Sheet 2 of 10

[⇒ Fig 28. \(□ C-25\)](#)

- 1 Digital Clock (HF)
- 2 Buzzer (GG)
- 3 Instrument Cluster
- 4 Speed Sensor (FJ)
- 5 High Engine Oil Temperature Indicator Lamp
- 6 Low Engine Oil Pressure Indicator Lamp
- 7 Blocked Air Filter Indicator Lamp
- 8 Low Transmission Oil Pressure Indicator Lamp
- 9 High Transmission Oil Temperature Indicator Lamp
- 10 Alternator No Charge Indicator Lamp
- 11 Engine Oil Temperature Switch (MM)
- 12 Engine Oil Pressure Switch (MT)
- 13 Air Filter Blocked Switch (MS)
- 14 Transmission Oil Temperature Switch (MP)
- 15 Fuel Level Sender (CV)
- 16 Engine Oil Temperature Sender (ML)
- 17 Hourmeter
- 18 Fuel Gauge
- 19 Speedometer
- 20 Coolant Temperature Gauge
- 21 Park Brake Indicator Lamp
- 22 Glow Plug Indicator Lamp
- 23 2 Speed Indicator Lamp
- 24 Low Speed Indicator Lamp
- 25 SRS Indicator Lamp
- 26 Rear Fog Light Indicator Lamp
- 27 Main Beam Indicator Lamp

- 28 Direction Indicator Lamp
- 29 Hazard Indicator Lamp
- 30 Water in Fuel Indicator Lamp
- 31 ECU4 Fault Indicator Lamp
- 32 Low Coolant Level Indicator Lamp
- 33 Forward Drive Indicator Lamp
- 34 Reverse Drive Indicator Lamp
- 35 1st Trailer Indicator Lamp
- 36 Backlighting
- 37 Fuse A2

Connections:

- A [⇒ Fig 29. \(□ C-27\)](#)
- B [⇒ Fig 29. \(□ C-27\)](#)
- C [⇒ Fig 29. \(□ C-27\)](#)
- D [⇒ Fig 33. \(□ C-35\)](#)
- E [⇒ Fig 36. \(□ C-41\)](#)
- F [⇒ Fig 27. \(□ C-23\)](#)
- G [⇒ Fig 29. \(□ C-27\)](#)
- H [⇒ Fig 27. \(□ C-23\)](#)
- I [⇒ Fig 35. \(□ C-39\)](#)
- J [⇒ Fig 33. \(□ C-35\)](#)
- K [⇒ Fig 27. \(□ C-23\)](#)
- L [⇒ Fig 33. \(□ C-35\)](#)
- M [⇒ Fig 29. \(□ C-27\)](#)
- N [⇒ Fig 32. \(□ C-33\)](#)
- O [⇒ Fig 32. \(□ C-33\)](#)
- P [⇒ Fig 32. \(□ C-33\)](#)
- Q [⇒ Fig 32. \(□ C-33\)](#)
- R [⇒ Fig 32. \(□ C-33\)](#)
- S [⇒ Fig 32. \(□ C-33\)](#)
- T [⇒ Fig 33. \(□ C-35\)](#)
- U [⇒ Fig 33. \(□ C-35\)](#)

- V [⇒ Fig 32. \(□ C-33\)](#)
- W [⇒ Fig 32. \(□ C-33\)](#)
- X [⇒ Fig 27. \(□ C-23\)](#)
- Y [⇒ Fig 33. \(□ C-35\)](#)
- Z [⇒ Fig 30. \(□ C-29\)](#)
- AA [⇒ Fig 29. \(□ C-27\)](#)
- AB [⇒ Fig 34. \(□ C-37\)](#)
- AC [⇒ Fig 32. \(□ C-33\)](#)
- AD [⇒ Fig 33. \(□ C-35\)](#)
- AE [⇒ Fig 34. \(□ C-37\)](#)
- AF [⇒ Fig 34. \(□ C-37\)](#)
- AG [⇒ Fig 31. \(□ C-31\)](#)
- AH [⇒ Fig 31. \(□ C-31\)](#)
- AI [⇒ Fig 31. \(□ C-31\)](#)

F/N/R, High Speed and Creep Speed

I ⇒ [Fig 36.](#) (□ C-41)
J ⇒ [Fig 28.](#) (□ C-25)

Component Key: Sheet 7 of 10

⇒ [Fig 33.](#) (□ C-35)

- 1 Park Brake Relay (EF)
- 2 Neutral Relay (EG)
- 3 Diode (DW)
- 4 Fuse B3
- 5 Transmission Dump Relay (EG)
- 6 Park Brake Switch (EK)
- 7 Fuse B4
- 8 Joystick (EJ)
- 9 Forward Relay (EH)
- 10 Forward Solenoid (NS)
- 11 Retardation Solenoid (NU)
- 12 Reverse Relay (EH)
- 13 Reverse Solenoid (NT)
- 14 Reverse Alarm (NV)
- 15 2 Speed Switch (On-Off)(EL)
- 16 Fuse B6
- 17 Low Speed Solenoid
- 18 Creep Speed Switch (On-Off)(EM)
- 19 Creep Speed Solenoid (NX)

Connections:

- A ⇒ [Fig 28.](#) (□ C-25)
- B ⇒ [Fig 28.](#) (□ C-25)
- C ⇒ [Fig 35.](#) (□ C-39)
- D ⇒ [Fig 34.](#) (□ C-37)
- E ⇒ [Fig 27.](#) (□ C-23)
- F ⇒ [Fig 27.](#) (□ C-23)
- G ⇒ [Fig 29.](#) (□ C-27)
- H ⇒ [Fig 29.](#) (□ C-27)

Instrumentation

Component Key: Sheet 2 of 11 → [Fig 38. \(□ C-45\)](#)

CV	Fuel level sender	20	Hazard indicator lamp
FJ	Speed sensor	21	40 kph engaged
GG	Buzzer	22	Change available
HF	Digital clock	23	Transmission error
MP	Transmission oil temperature switch	24	Forward drive indicator lamp
ML+	Engine oil temperature sender and	25	Reverse drive indicator lamp
MM	temperature switch	26	First trailer indicator lamp
MS	Air filter blocked switch	27	Backlighting
MT	Engine oil pressure switch		
1	Instrument cluster		
2	High engine oil temperature indicator lamp		
3	Low engine oil pressure indicator lamp		
4	Blocked air filter indicator lamp		
5	Low transmission oil pressure indicator lamp		
6	High transmission oil temperature indicator lamp		
7	Alternator no charge indicator lamp		
8	Hourmeter		
9	Fuel gauge		
10	Speedometer		
11	Coolant temperature gauge		
12	Park brake indicator lamp		
13	Glow plug indicator lamp		
14	2-speed indicator lamp		
15	Low speed indicator lamp		
16	SRS indicator lamp		
17	Rear fog light indicator lamp		
18	Main beam indicator lamp		
19	Direction indicator lamp		

F/N/R, High Speed and Creep Speed

Component Key: Sheet 7 of 11

[⇒ Fig 43. \(□ C-55\)](#)

CT	Creep relay
DN	Creep speed solenoid
DWC	Buzzer diode
EG	Buzzer relay
EG1	Transmission dump relay
EH	Forward relay
EH1	Reverse relay
EJ	Joystick
EK	Park brake switch - 406 machines
EL	2-speed creep switch (On-Off)
EM	Park brake switch - 409 machines
NS	Forward solenoid
NT	Reverse solenoid
NU	Retardation solenoid
NV	Reverse alarm
NW	Low speed solenoid
PH	Park brake pressure switch



Section C - Electrics Schematic Circuits

Machines from 1300000 (406), 1302000 (409)

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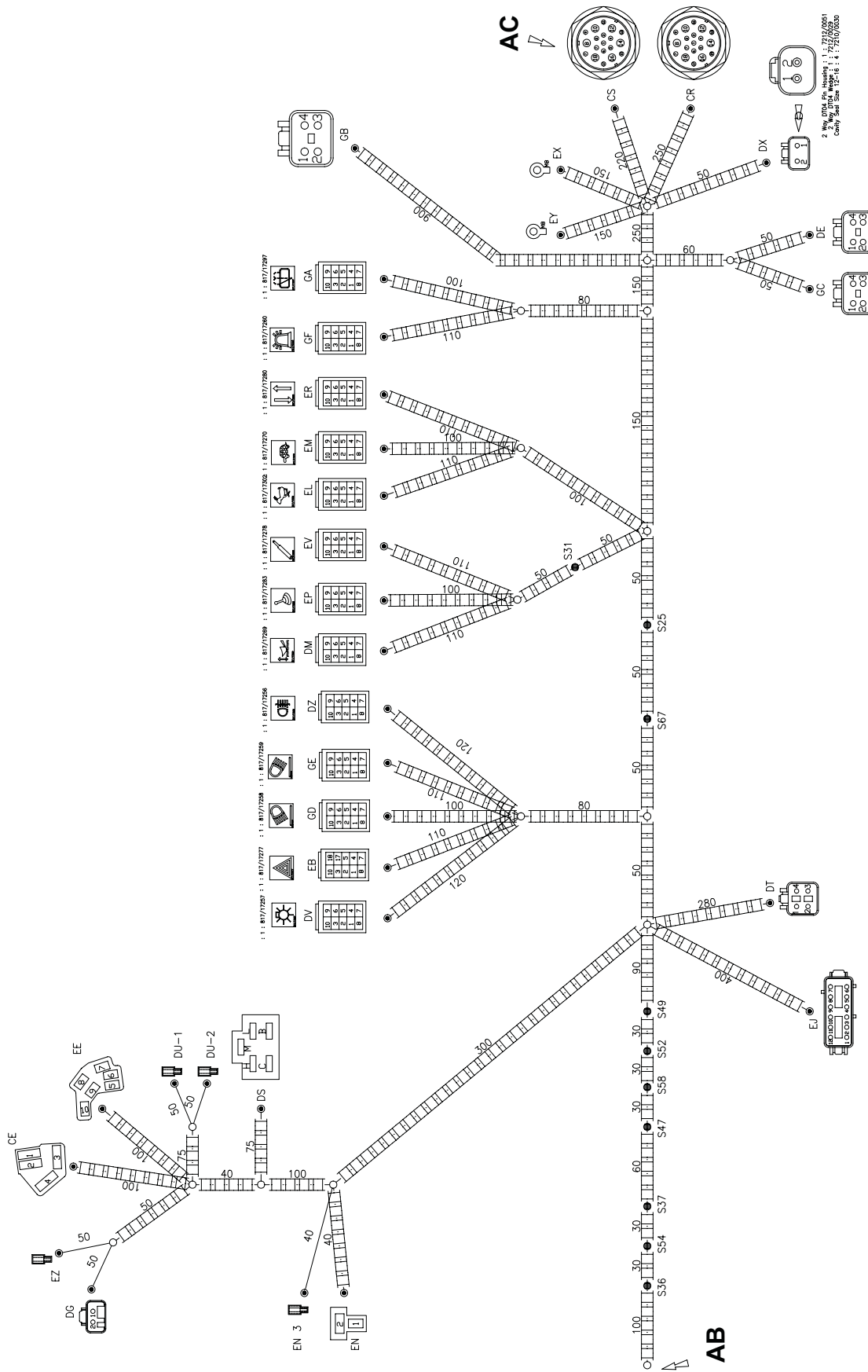


Fig 52.

Mainframe - 332/W8263-1 Issue 5

A to sheet 2A

B to sheet 2B

C from sheet 1A

D from sheet 1B

Key to Connectors:

MA	Permanant earth
MB	Cab connector 1
MC	Cab connector 2
MFW	Alt
MFD+	Alt
MG1	Glow relay coil 1
MG2	Glow relay coil 2
MH	Speed sensor
MJ	Starter motor
MK	Starter advance solenoid
ML	Oil temperature sender
MM	Engine oil temperature switch
MP	Transmission oil temperature
MR	Fuel pressure solenoid
MS	Air filter switch
MT	Engine oil pessure switch
MV	ESOS
MX	SRS solenoid
MW	EGR valve
MZ	Front washer pump
NA	Rear wash pump
NB-1	A/C high pressure switch
NB-2	A/C low pressure switch

Key to Connectors:

ND	A/C compressor
NF	Left hand rear comination lamp
NG	Left hand reverse lamp
NK	Rear hand rear combination
NL	Rear hand reverse lamp
NS	Forward solenoid
NT	Reverse solenoid
NU	Retardation solenoid (motor)
NV	Reverse alarm
NW	High speed solenoid
PB	Mainframe earth
PC	Primary fuse A
PD	Primary fuse B
PE	Primary fuse 5, 6
PF	Primary fuse 7, 8
PG	Temperature switch
PH	Brake pressure switch
PK	Fused earth
S50	Reverse
S59	Rear fog splice
S69	Earth 1
S72	Brakelight
S70	Earth 2



Section C - Electrics Alternator

Removal, Inspection and Installation

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Hydraulics

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[Section 2 - Care and Safety](#)

[Section 3 - Routine Maintenance](#)

[Section A - Attachments](#)

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Functional Descriptions

Main Hydraulic Pumps

The main hydraulic pump is a gear type pump. The basic operation of the pump depends on the engagement of the two spur-gears **A** and **B**. One spur-gear is engine-driven and the other is an idler. → Fig 1. (□ E-5).

The gears collect the oil on the inlet side of the pump, then moves it between the gear teeth and the pump body. As the gears engage, the oil is pushed under pressure through the pump outlet port.

Hydraulic oil supplies the pump lubrication, the movement of the engaged gears moves the oil sent around the unit, along special oil-routes.

Note: The description and the illustration show a single-pump. The 406 has a dual-pump. The section nearest the drive-gear is the main pump, which supplies the steering hydraulic pressure through a priority-valve and the loader-valve. The rear section (secondary pump) supplies hydraulic pressure for the cooling fan motor. The dual-pumps operate the same as the single pumps.

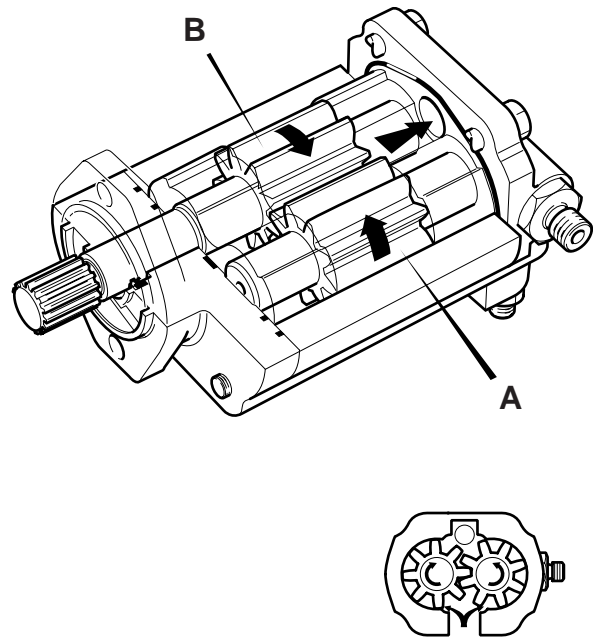


Fig 1.

Component Key

- A** Spur-Gear - Idler
- B** Spur-Gear - Driven

Loader Control-Valve

Description

The loader control-valve is a three/four spool valve block dependant on application (the normal being a 3-spool block).

Main Service Spools

⇒ [Fig 15. \(□ E-16\)](#) and ⇒ [Fig 16. \(□ E-17\)](#).

Oil from the pump, (if there is no steering demand), (refer to **Section H - Steering**), enters the control-valve block at **P** through the priority-valve.

When the spools **9B**, **9C**, **9D** and **9E** are in neutral, the oil moves through their central waists. The spool lands prevent the oil entering the service ports. At the end-housing the oil enters the exhaust gallery and is released back to the tank **T**.

The control-valve also includes three set-value Auxiliary Relief-Valves (A.R.V.'s) **11**, **12** and **13**. **11** and **12** operate on the crowd circuit and **13** operates on the loader arm circuit.

In the neutral position of the spools (as shown), the circuit to each of the rams is dead-ended by the spool, which traps the oil and prevents the ram from moving.

When a service spool is started by the operation of the control levers, oil from the pump moves into the service ports A or B, (dependant on the direction of lever movement) to operate the related hydraulic ram:

- crowd/dump **21**
- lift/lower **22**
- auxiliary service (1) **23**.
- auxiliary service (2)

When a control lever is released, spring pressure returns the spool to the neutral position.

To describe the operation of the control-valve, the service circuits are shown in a simplified format. Refer to the hydraulic schematic for the detailed service port connections.

Relief-Valves

⇒ [Fig 15. \(□ E-16\)](#), ⇒ [Fig 16. \(□ E-17\)](#) and ⇒ [Fig 17. \(□ E-18\)](#).

The loader control-valve has a Main Relief-Valve (M.R.V.) and three A.R.V.

The M.R.V. **10** is installed in the valve block after the port **P**. It limits the main services pump outlet pressure to a value which will not cause damage to the components in the system.

The A.R.V.s **11**, **12** and **13** are installed in the valve block working sections to limit potentially damaging pressures in specified services because of external loads. They can also be used to limit the maximum pressure in a specified service to less than the M.R.V. setting.

Note: *The lift ram A.R.V. (Port A) is set higher than the crowd/dump ram A.R.V.'s. and therefore should not be inter-changed.*

Basic Systems Operation

Introduction to Hydraulic Schematic Symbols

TE-001

General (Basic and Functional Symbols)

Complex hydraulic components and circuits can be described to the engineer by using graphical symbols. The following pages illustrate and give a brief description for some of the more common symbols used.

There are many symbols in use and it would be impossible to include them all here. However it should be noted that most are only variations or refinements on the basic principles explained here. If more detailed information is required you are recommended to obtain a copy of BS2917 or ISO1219.

Once familiar with the symbols, the engineer can use hydraulic circuit diagrams as an aid to fault finding. It will be possible to see the complete hydraulic circuit and decipher the relationship between hydraulic components.

Table 4. General

	Spring
	Flow restriction affected by viscosity
	Direction of flow
	Indication of rotation
	Indication of direction and paths of flow
	Variable control

Table 5. Rams

	Single acting
	Double acting
	Double ended
	Double acting with damping at rod area end

Table 6. Pumps and Motors

	Variable capacity pump two directions of flow
	Fixed capacity motor one direction of flow
	Fixed capacity motor two directions of flow
	Variable capacity motor one direction of flow
	Variable capacity motor two directions of flow

409 Machines (4-Spool)

The policy of JCB is for continuous improvement, therefore as products develop, there can be variations to the circuits.

Component Key: → [Fig 32.](#) (□ [E-36](#))

1	Steering Ram	20	Transmission Drive Motor
2	Steering Valve	21	Crowd Ram
2a	Steer Relief-Valve	22	Lift Rams
3	Check-Valves	23	Quickhitch
4	Filler - Breather	24	Manual Diverter Valve (Optional Solenoid Valve)
5	Suction Strainer	25	Creep Speed Valve (Option)
6	Tank	26	Smooth Ride System (Option)
7	Tandem Service - Fan Pumps	27a	Hose Burst Check-Valves (Option)
8	Fan Motor	27b	Hose Burst Check-Valves (Option)
9	Priority-Valve	27c	Hose Burst Check-Valves (Option)
10	4-Spool Valve Block	28	Servo Control-Valve
10a	Main Relief-Valve (MRV)	29	Servo Cut-off Valve
10c	Auxiliary 2 Section Spool	30	0.24 Litre Accumulator
10d	Lift - Lower Section Spool	31	Suction Line Filter
10e	Bucket - Dump Section Spool		
10f	Auxiliary 1 Section Spool		
11	Lift Ram Head End ARV		
12	Crowd - Dump Ram Head End ARV		
13	Crowd - Dump Ram Rod End ARV		
14	Oil Cooler		
15	Check-Valve (2 bar)		
16	Inboard Brake Pack		
17	Brake Valve		
18	Park Brake Valve		
19	Transmission Drive Pump		

Component Key → [Fig 39.](#) ([□ E-45](#))

- 11 Crowd Ram Rod End ARV
- 12 Crowd Ram Head End ARV
- 13 Lift Ram Head End ARV

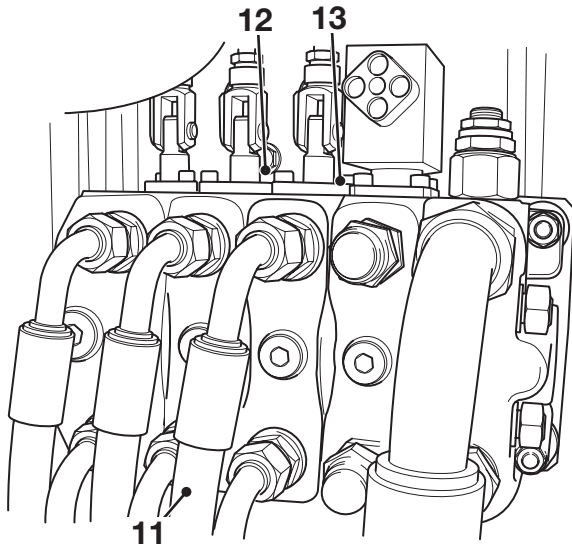


Fig 39.

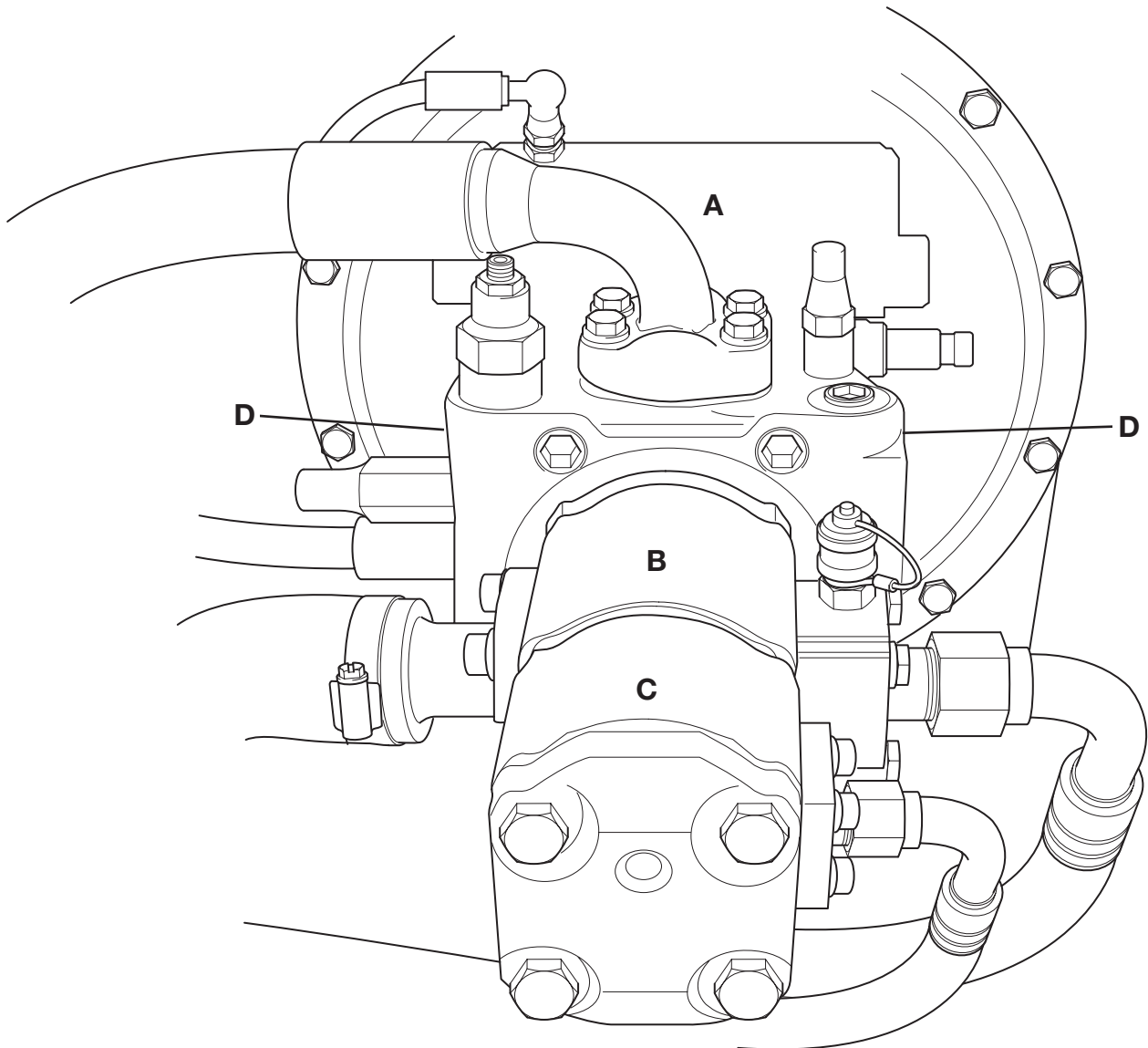


Fig 46. Transmission, Service and Fan Pump Set

Table 11. Torque Settings

Item	Nm	Kgf m	lbf ft
D	184	18.76	136

Transmission, Service and Fan Pump-Set

Removal

Refer to → [Fig 51.](#) ([E-66](#)).

WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses or couplings, vent the pressure trapped in the hoses in accordance with the instructions given in this publication.

HYD-1-5

- 1 Label all the hydraulic pipe-work to the transmission pump **A**.
- 2 Disconnect and cap all the pipe-work at the transmission pump and all the open ports.
- 3 Disconnect and cap all pipe-work at the service pump **B** and fan pump **C** and all the open ports.
- 4 Label and disconnect the electrical connectors at the transmission pump.
- 5 Attach suitable lifting equipment to the pump set.
- 6 Remove the two bolts **D** that attach the pump-set to the casing of the pump-engine coupling.
- 7 Remove the pump horizontally until the inner coupling is clear before lifting the pump-set from the engine-bay.

Installation

WARNING

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses and gloves. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10_3

The installation procedure is the reverse of the removal procedure:

- 1 Torque all the bolts. → [Table 15. Torque Settings](#) ([E-66](#)).

Note: *The hydraulic service-fan pumps can be removed from the transmission pump, but the transmission pump should not be disassembled further. It is not possible to service or adjust the pump. Replace a defective pump, or one that does not operate correctly.*

Important: *After the transmission pump is replaced, do not start the engine until the correct start-up the procedure is completed. A failure to do this procedure can cause damage to the transmission pump and drive-motor.*

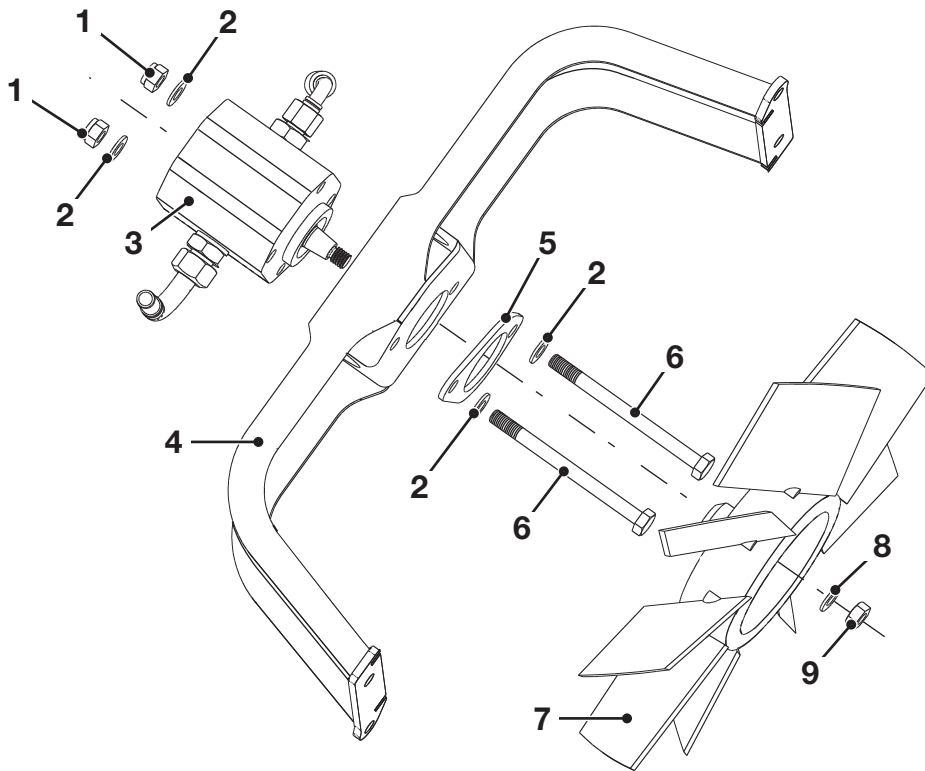


Fig 56. Fan Assembly Components

Table 18. Torque Settings

Item	Nm	kgf m	lbf ft
1	60	6.12	44.3
9	10	1.02	7.4

Disassembly and Assembly

Preparation

Refer to → [Fig 61.](#) ([□ E-87](#)).

Disassemble the loader control-valve to replace the:

- Inter-section seals.
- Load hold check-valves.
- Spool dust seals.
- MRV and ARV's.

The disassembly procedure must occur in a clean environment only.

Remove the ARV's to clean and examine them only. The ARV's are not adjustable. Replace a defective ARV's with one of the correct pre-set type.

Disassembly

- 1 Clean the outside of the valve assembly before the port plugs are removed. The port plugs were installed during the removal of the valve from the machine.
- 2 Remove the port plugs and drain all remaining fluid from the valve.
- 3 Put the valve on a clean flat work-bench.

Remove the Load Hold Check-Valves

- 4 Use a 6 mm Allen key to remove the load hold check-valve **2**.
- 5 Check the load hold check-valve seat for signs of damage or excessive wear. Replace the valve if the seat is cut or damaged.

Remove the Spool Dust Seals

- 6 Remove the two M5 Allen screws **11**, plate **12** and the seal **13**. Discard the removed parts as new screws, plate and seal are part of the repair kit.
- 7 Examine the seal mating-face on the spool for excessive wear. Clean the spool with clean hydraulic fluid.

Remove the MRV

- 8 Use a 27 mm wrench to remove the MRV **9** from the inlet section of the valve.
- 9 Check the MRV and its seat for damage.

Remove the ARV

Note: The ARV's are of different values, make sure the correct ARV is installed in the correct location.

- 10 Use a 13 mm wrench to remove the cap **4**, then remove the spring **6** and ARV **5** from its seat.

Remove the Inter-section Seals

- 11 Remove the three nuts **8** on the inter-section tie-rods **1**, and carefully separate the sections.
- 12 Carefully remove the inter-section seals **3** and examine the seal grooves for signs of damage.

Inspection

- 1 Clean and dry all the parts before inspection. Examine all the seal grooves and recesses, make sure there are no cuts or burrs.
- 2 Check the seats of all valves for cuts or damage.

Fault Diagnosis

Introduction

- With the machine stationary, the engine running and the park brake engaged the gear change icon **A** should be ON. → [Fig 62.](#) ([E-92](#)).
- With the machine stationary, the engine running and the park brake disengaged the gear change icon **A** should be OFF.
- With the machine moving in the hare or the 40kph mode, the gear change icon **A** should come ON at approximately 8kph.

A typical fault associated with the 40kph mode:

When you select the hare mode, if the maximum road speed on your machine is approximately 6kph, the problem can be the speed sensor.

If the gear change icon **A** does not come ON, the ECU is not receiving the correct signal from the speed sensor on the rear axle. The adjustment of the speed sensor is critical, refer to → [Table 27. Inputs](#) ([E-94](#)).

Also check the wiring from the speed sensor to the ECU.

Fault 1 - No Red Light and No Tortoise or Hare Light



T058820-4

No.	Potential Cause	Solution
1	No signal from gear-1	Check that the switches are all connected correctly, check the wiring diagram (332/S2005 sheet 7)
2		Check the switches operate correctly
3		Check that the correct switch base has been put into the cab (check 332/S2005 sheet 7)
4		Check that the tortoise / hare switch has been plugged into the 40kph harness Check the wiring diagram for reference (332/S2005 sheet 7)

Removal and Installation

Loader Shovel Ram

Removal

WARNING

The loader arm interlevers are potentially dangerous, when pivoting about their centre they form a 'scissor' point with the loader arm. Make sure the interlevers are securely blocked when working in the loader arm area.

BF-2-1

- 1 Remove the attachments from the Quickhitch (shovel, forks).
- 2 Stop the machine on hard, level ground. Apply the park brake and set the transmission to the neutral position.
- 3 Lower the Quickhitch onto a suitable support to put the loader shovel ram in an approximately horizontal position.

WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11_2

- 4 Stop the engine, then operate the loader arm controls to vent the remaining hydraulic pressure.
- 5 Label, then remove the hoses from the shovel ram. Cap all the open holes to prevent the loss of fluid and/or the entry of dirt into the system.

WARNING

This component is heavy. It must only be removed or handled using a suitable lifting method and device.

BF-4-1_1

- 6 Attach the lifting straps to the shovel ram, make sure that the full weight of the ram is supported by the straps.
- 7 Remove the nut and bolt **A** from the pivot-pin in the shovel ram head end, then remove the pivot-pin. [⇒ Fig 66. \(□ E-106\).](#)
- 8 Remove the flange-bolt **B** from the pivot-pin in the shovel ram rod end, then remove the pivot-pin.
- 9 Remove the shovel ram from the machine and lower it to the floor.

Installation

The installation procedure is the reverse of the removal procedure.

WARNING

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses and gloves. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10_3

Apply a layer of anti-rust lubricant to the pivot-pins before its installation.

Tighten the flange-bolt **B** to the specified torque. [⇒ Table 31. \(□ E-105\).](#)

Table 31. Torque Settings

Item	Nm	kgf m	lbf ft
B	158	18.8	135.7

Fault Finding

Main Hydraulic Services

This section will help you identify the common faults related to the main hydraulic services, their probable cause and how to correct the fault.

Before you start to fault find, read the Safety Information at the front of this manual.

When you find the fault, refer to the applicable disassembly, inspection and test instructions given in the Service Manual.

Fault(s):

⇒ [Table 34. Lack of power in all the hydraulic functions \(□ E-115\)](#)

⇒ [Table 35. All the hydraulic rams are slow to operate \(□ E-115\)](#)

⇒ [Table 36. One hydraulic service does not operate or is slow to operate. \(□ E-116\)](#)

⇒ [Table 37. The engine can stall when hydraulic system is under-load. \(□ E-116\)](#)

⇒ [Table 38. Ram creep. \(□ E-116\)](#)

Table 34. Lack of power in all the hydraulic functions

Possible Cause	Action
Insufficient hydraulic fluid.	Check for leaks and top-up as necessary.
Hydraulic leaks in system.	Check the hoses, replace as necessary.
Engine performance.	Check the engine performance.
M.R.V. setting is incorrect.	Check and adjust as necessary.
Low pump flow.	<ul style="list-style-type: none"> – Check for external leaks, replace the seals. – Charge/Priority-valve sticking. – Replace the pump.

Table 35. All the hydraulic rams are slow to operate

Possible Cause	Action
Neutral circuit or low pressure lines are leaking, damaged, trapped or kinked.	Check the pipe lines and replace as necessary.
M.R.V. setting is incorrect.	Check and adjust as necessary.
Low pump flow.	<ul style="list-style-type: none"> – Check pump flow. – Check for external leaks, replace seals. – Priority-valve sticking. – Replace the pump.

Action	Yes	No
4 Connect the test gauge to points MA/MB, Ps. At driving rpm, MA/MB should be 150 bar, Ps should be TBA bar. With the machine securely chocked, increase engine rpm until 150 bar is displayed on the gauge attached to MA/MB. Is this the same with the engine at low idle?	Go to 5	Adjust the adjustment screw on the pump.
5 Settings are OK. Fault lies with the machine.		
6 Pump defective. Replace the pump.		

Table 53. Machine movement delayed

Action	Yes	No
1 Is the machine on level ground?	Go to 2	Move the machine.
2 Check the oil viscosity and temperature. Is the oil at operating temperature? Is the oil the correct viscosity?	Go to 3	– Bring the oil to operating temperature and test. – Drain the oil and fill the system with oil of the correct viscosity.
3 Connect the test gauge to point Fs. Is the suction pressure Fs at least 0.8 bar at cold start? (falls to 0.5 bar in a short time.)	Go to 4	Go to → Table 51. No forward or reverse drive (E-123)
4 Connect the gauges to MA/MB, Ps & G At driving rpm, MA/MB should be 150 bar, Ps should be TBA bar.	Go to 5	– Check charge pressure. – Check inching-valve. – Adjust settings. Go to → Table 51. No forward or reverse drive (E-123)
5 Go to → Table 51. No forward or reverse drive (E-123) .		

Table 54. High motor pressure

Action	Yes	No
1 Does this occur when driving Unladen?	Go to 6	Go to 2.
2 Does this occur when driving laden?	Go to 3	
3 Connect test gauges to test points MA/MB. Are the readings at MA/MB the same in forward and reverse drive?	Go to 4	Interchange the valves. Does the fault move with the drive direction? If YES go to 7.
4 Is the high pressure cut-off set more than the MRV?	Go to 5	Adjust.

Service Tools

Numerical List

For the Service Tools necessary for the procedures refer to **Section 1 - Service Tools.**

Part No.	Description
TBA	Extractor (3 legged)
TBA	Extractor (2 legged)
TBA	Seal Fitting Tool
892/00224	Impulse Extractor
892/00225	Adapter (Impulse Extractor)
TBA	Pinion Bearing Shim Set-up Tool

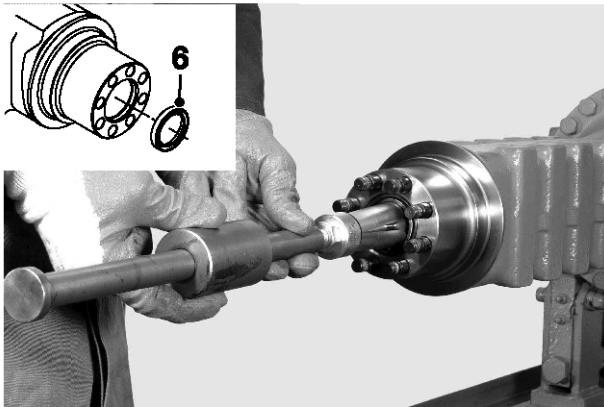


Fig 9.

- 12 Remove the circlips 15 that attach the planetary-gears 17 to the planetary gear-housing 21.
- 13 Use a suitable extractor to remove the planetary gears 17 from the planetary gear-housing. → Fig 10. (□ F-13).

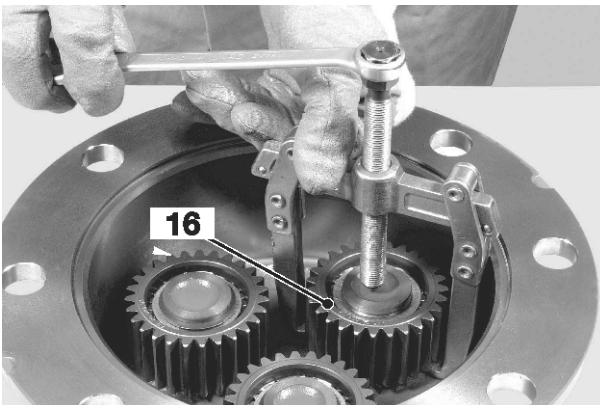


Fig 10.

Note: Make a record of the position of the planetary-gears. The bevel on the inner face of the bearing faces down to the housing. → Fig 11. (□ F-13).

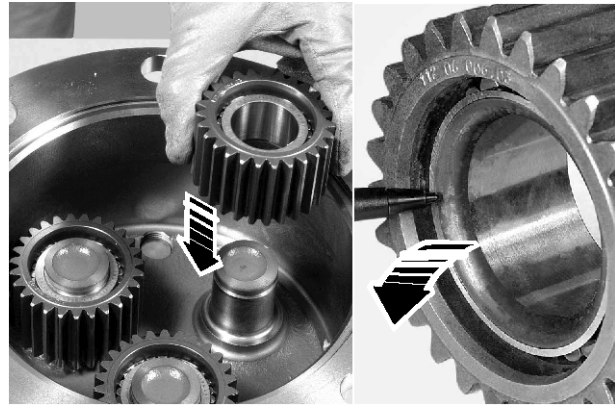


Fig 11.

- 14 Remove the inner hub-seal 7 from the hub.
- 15 Remove the inner-bearing 8 from the hub.
- 16 To replace the bearing-tracks (inner or outer), use a pin-punch to remove them from the hub. To prevent the track being trapped in the hub, use an alternate sequence to remove the tracks from the hub.

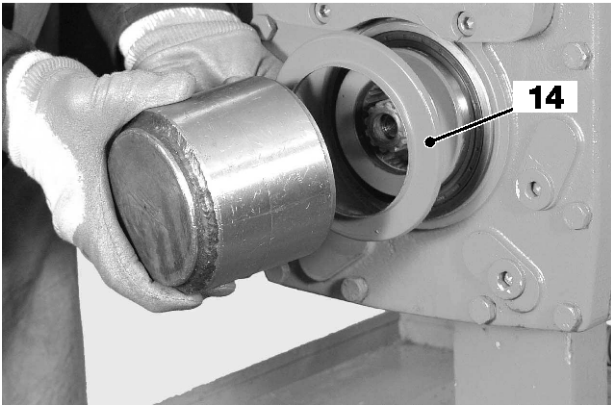


Fig 34.

- 18** Check the condition and position of the O-ring **19**. Replace a defective O-ring. → [Fig 35.](#) (□ [F-23](#)).

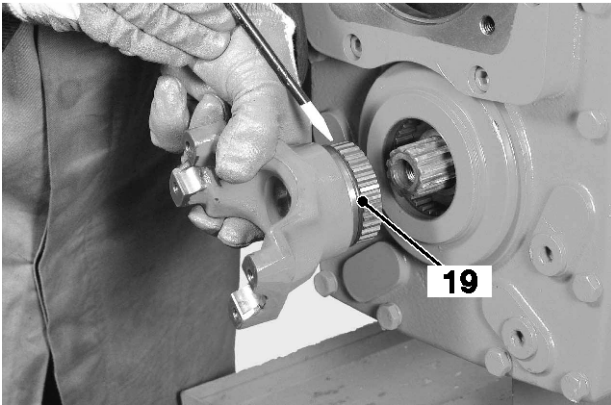


Fig 35.

- 19** Install the output-flange **18**. It may be necessary to apply light blows with a soft-faced hammer to put the flange in the correct position.
- 20** Attach the washer **16** to the bolt **17**. Make sure that the bevel on the face of the washer **16** is facing away from the bolt-head. → [Fig 36.](#) (□ [F-23](#)).

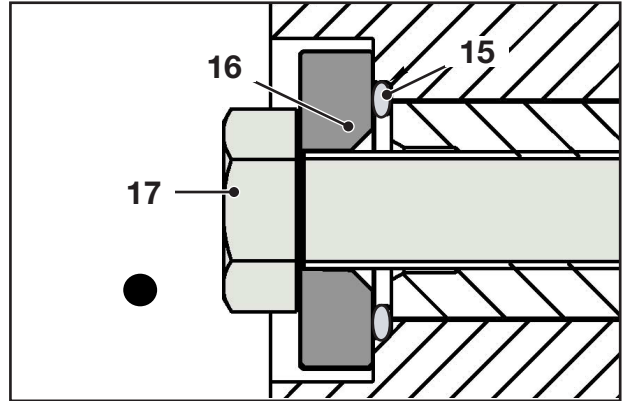


Fig 36.

- 21** Put the O-ring **15** into the end of the output-flange. Apply a coating of JCB Threadlocker and Sealer to the threads of the pre-assembled bolt **17** and install the bolt.
- 22** Use a flange trapper to hold the output-flange in position, then torque the flange-bolt **17**. → [Table 5.](#) [Torque Settings](#) (□ [F-23](#)).

Table 5. Torque Settings

Item	Nm	Kgf/m	lbf/ft
11	48 - 53	4.9 - 5.4	35.4 -
25	52 - 58	5.3 - 5.9	38.4 - 43
30	52 - 58	5.3 - 5.9	38.4 - 43
17	250 - 270	25.5 - 27.5	184.4 - 199

Second Gear Switch Adjustment

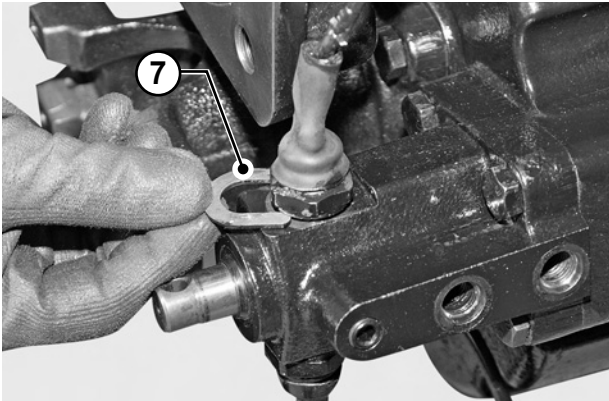


Fig 64.

DS367A-031

- 16** Insert a 1.5 mm calibrated 'U' washer **7** between switch and casing as shown. Connect test meter to switch contacts.

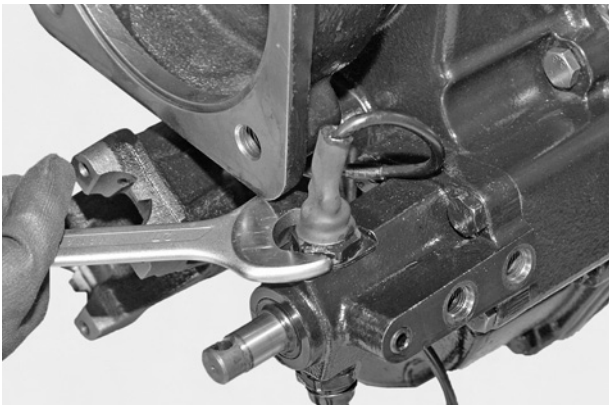


Fig 65.

DS367A-032

- 17** Torque tighten switch to 15-30 Nm.

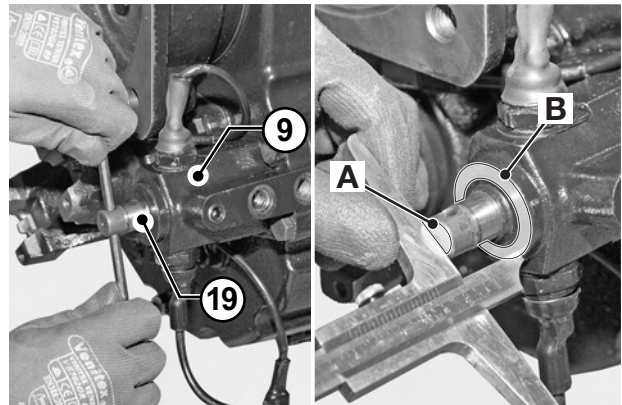


Fig 66.

DS367A-033

- 18** Operate selector rail to neutral position.
- 19** Accurately measure distance between face **A** of gear selector rod and machined flat **B** on the gearshift cylinder.

Example 28 mm

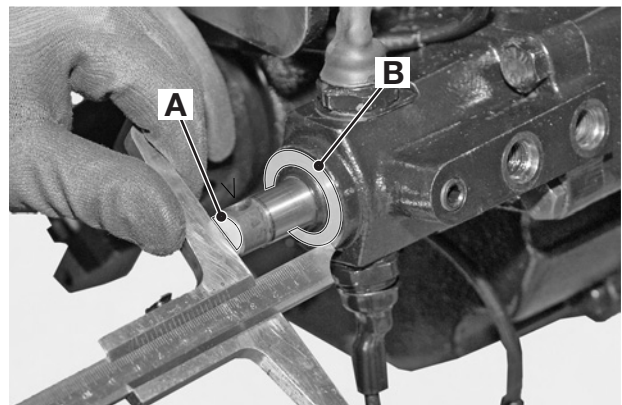


Fig 67.

DS367A-034

- 20** Operate the gear selector rod to a measured distance of 18 - 19.5 mm. Check with meter that switch **4** has closed.

Note: If the switch closes at a smaller measured distance than 18 mm, reduce the thickness of calibrated 'U' washer **7**.

Note: If the switch closes at a greater measured distance than 19.5 mm, select thicker calibrated 'U' washer **7**.

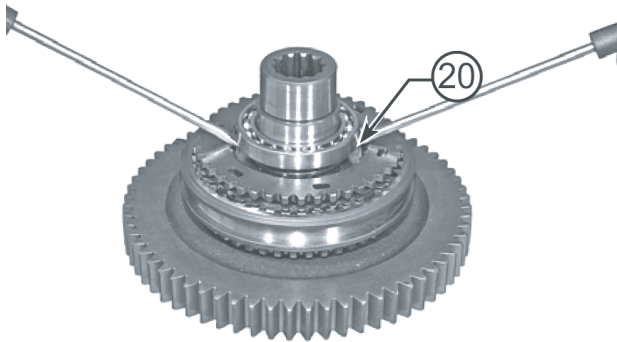


Fig 101.

DS367A-069

- 25** Lay output shaft assembly on bench, use two levers to pry off bearing **20**.

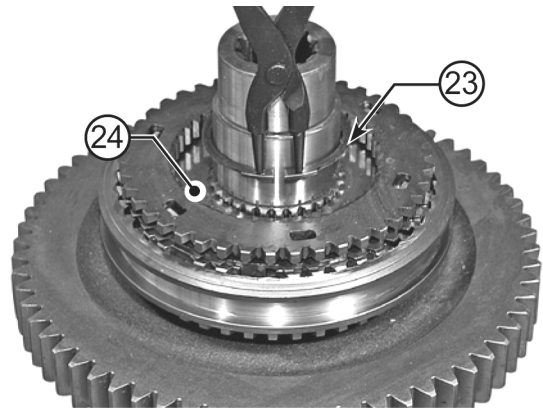


Fig 103.

DS367A-071

- 27** Remove snap ring **23** securibg synchroniser hub **24**.

Note: Take care not to bend snap ring.

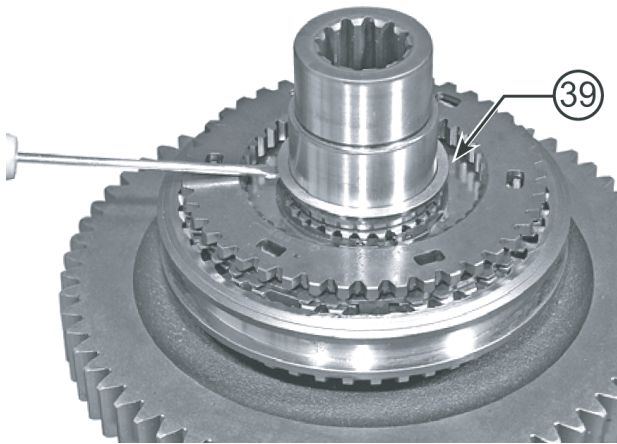


Fig 102.

DS367A-070

- 26** Remove distance piece **39**.

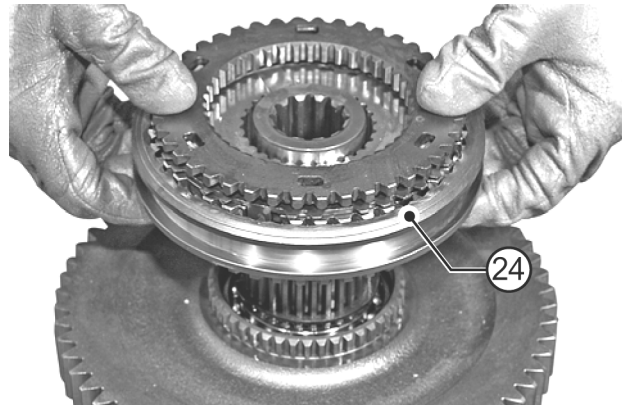


Fig 104.

DS367A-072

- 28** Remove complete synchroniser hub **24**.

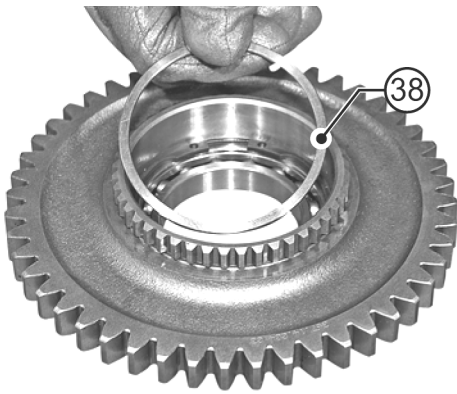


Fig 141.

DS367A-109

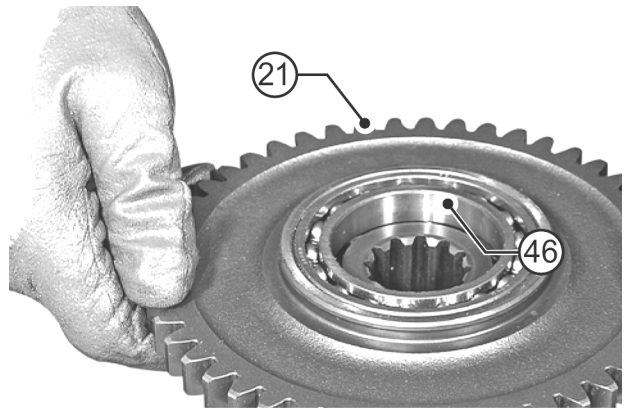


Fig 143.

DS367A-111

23 Install shim 38.

25 Fit gear 46 onto shaft 21.

Note: Ensure gear is mounted the correct way using marks made on dismantling.

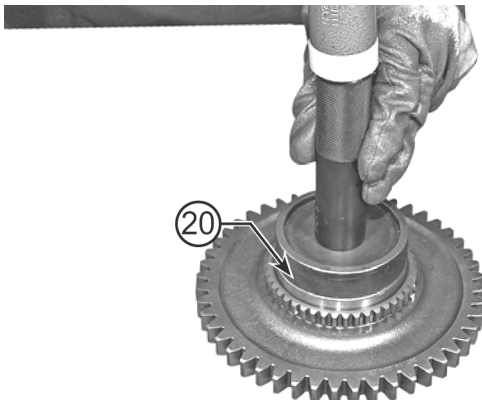


Fig 142.

DS367A-110

24 Using a tube of suitable diameter, tap bearing 20 until it is fully seated in its bore.

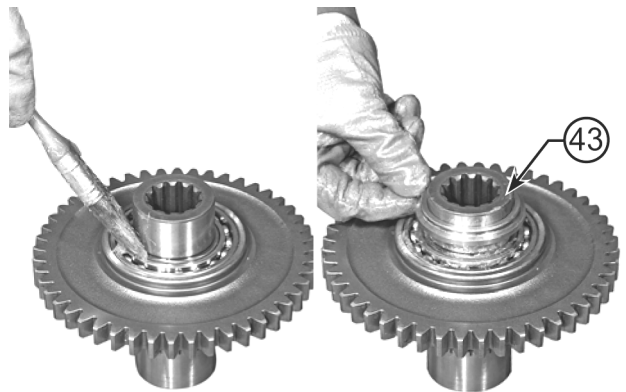


Fig 144.

DS367A-112

26 Grease shim 43 to ensure it remains in position.

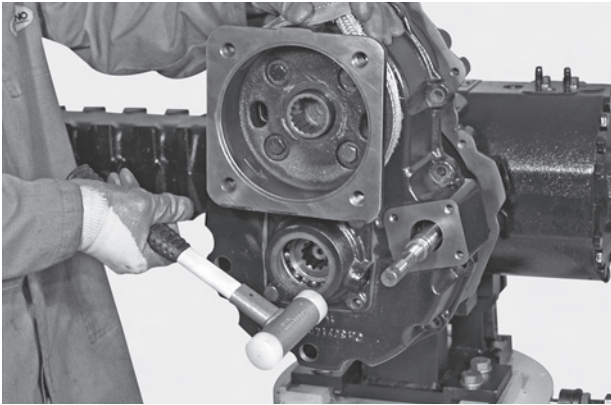


Fig 177.

DS367A-149

- 64** Tap the cover gently with a plastic mallet to seat correctly.

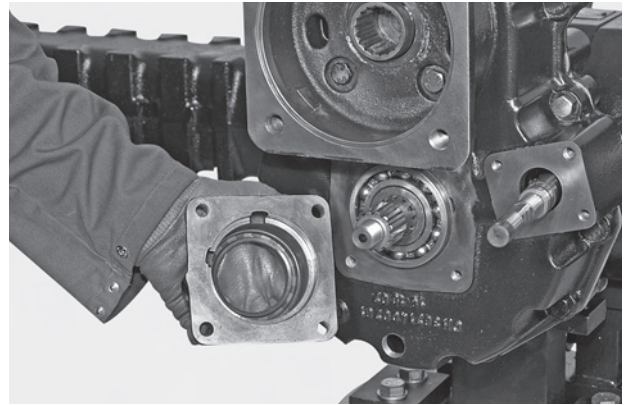


Fig 179.

DS367A-151

- 66** Remove cover 14.

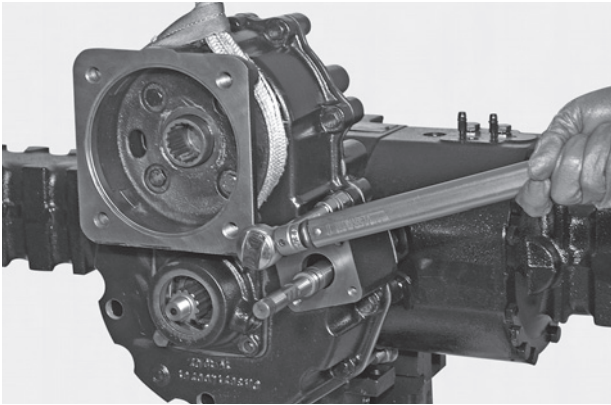


Fig 178.

DS367A-150

- 65** Apply Loctite 242 to threads of screws 28. Torque tighten screws to 48-53 Nm.

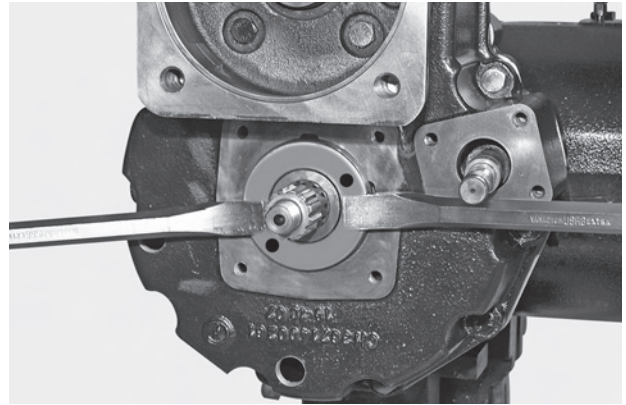


Fig 180.

DS367A-152

- 67** Using two pry bars as shown, remove special tool T2.

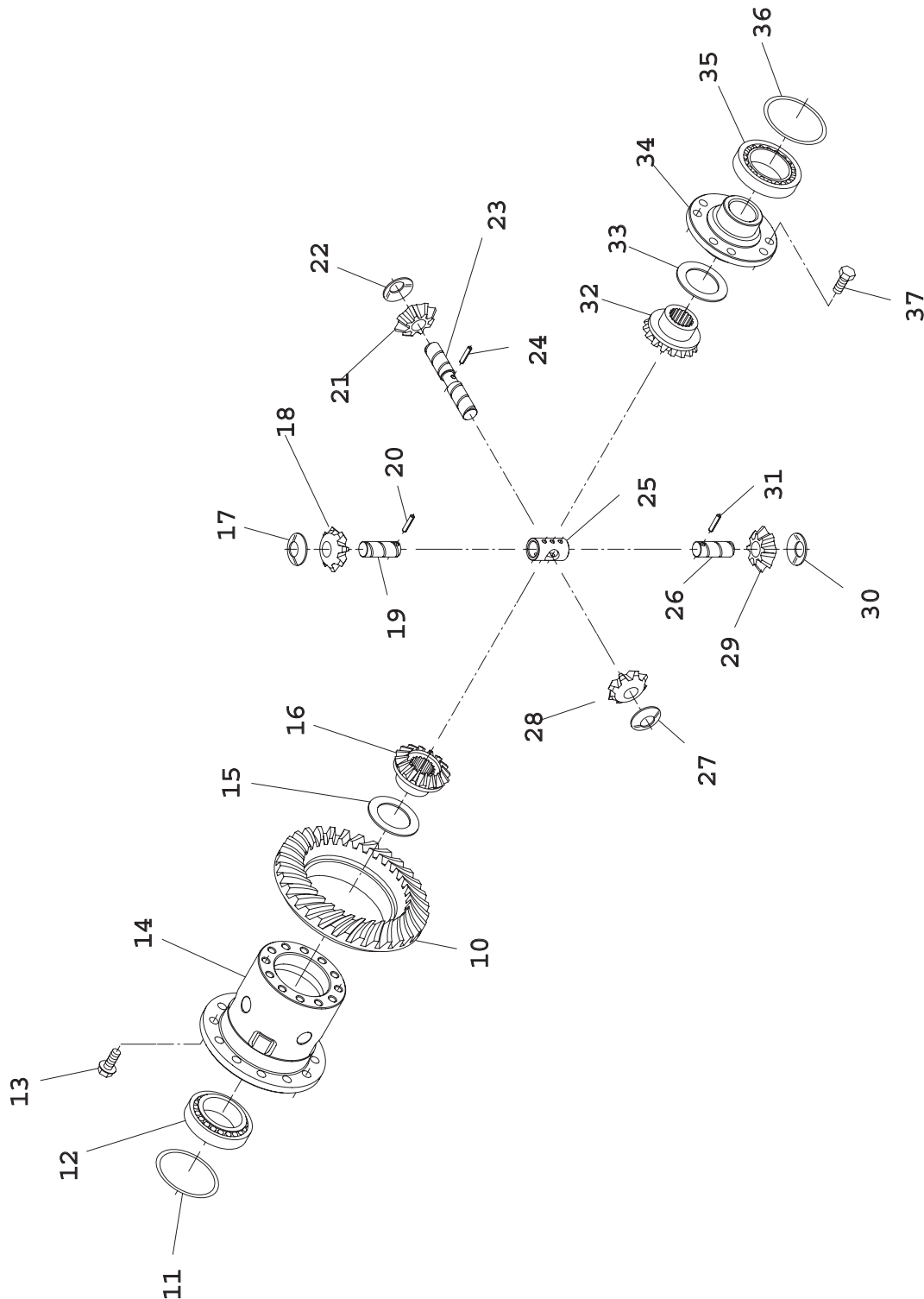


Fig 206. Standard Front Differential Components

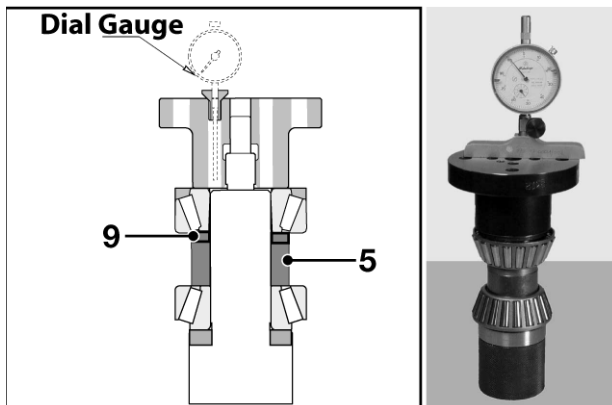


Fig 230.

- 13** Put the depth dial-gauge (set to zero) in position and measure the distance. Make a record of the value **B**.

Calculate the difference **H**.

$$H = A - B$$

For example $H = 0 - -0.07 = 2.93 \text{ mm}$

A = Value at step 10 (zero with a 3.0 pre-load)

B = Value at Step 13 -0.07

Note: In the above example the dial-gauge reads 2.93 this is 0.07 less than the pre-set of 3.00, to make the value **B** (0.07) for the calculation a minus value.

- 14** Calculate the thickness of the required shim **9** (S2):

For example $S2 = H + X = 3.01 \text{ mm}$

H = 2.93 (as calculated at step 13)

X = 0.07 to 0.08 standard deviation

WARNING

To avoid burning, wear protective gloves when handling hot components

GEN-9-4

- 15** Heat the inner-bearing **14** to 100 °C (212 °F), then push onto the pinion **11**.

- 16** Install the distance-ring **5** and the pre-calculated (S2) shim **9** onto the pinion, then install the pinion into the pinion-housing **12**. → Fig 231. (□ F-83).

Note: If a number of shims **9** were been used to assemble the shim pack S2, then position the finer shims between the thicker ones, or between the distance-ring and the thicker one.

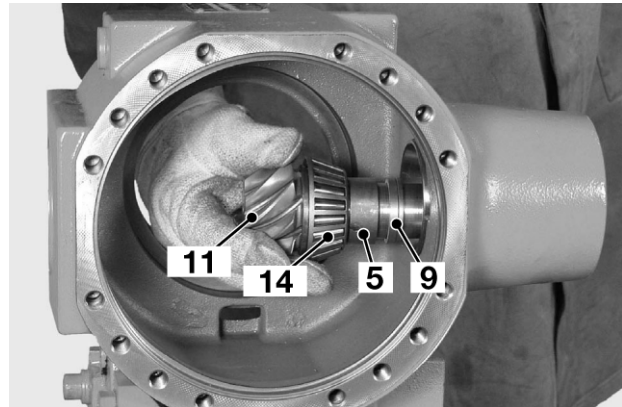


Fig 231.

WARNING

To avoid burning, wear protective gloves when handling hot components

GEN-9-4

- 17** Heat the external bearing **4** to 100 °C (212 °F), then install onto the pinion.

Pinion Set-up Non-Revolution Counter Version

- 1** Install the spacer-ring **8A**.
- 2** Install the pinion-flange **2**, but do not install the oil-seal **3**.
- 3** Install the flange nut **1**. Do not apply Threadlocker to the threads.
- 4** Attach a suitable flange holding device to the flange and torque the flange nut **1** to 260 - 300 Nm (192 - 221 lbf ft).
- 5** Apply a torque-meter to the pinion nut and check the rolling-torque, it must be 80 - 120 Ncm.

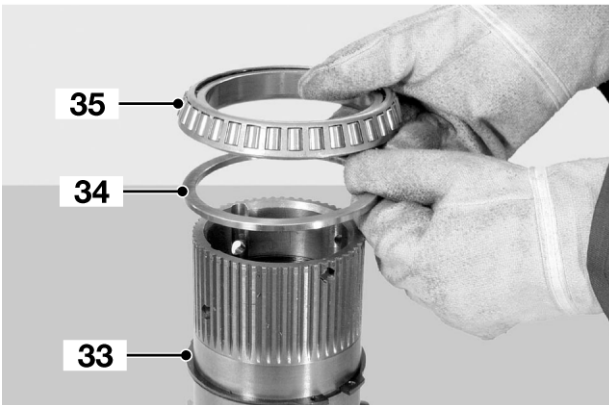


Fig 252.

Table 9. Torque Settings

Item	Nm	Kgf/m	lbf/ft
32	63.7 - 78.5	6.5 - 8.0	47 - 58

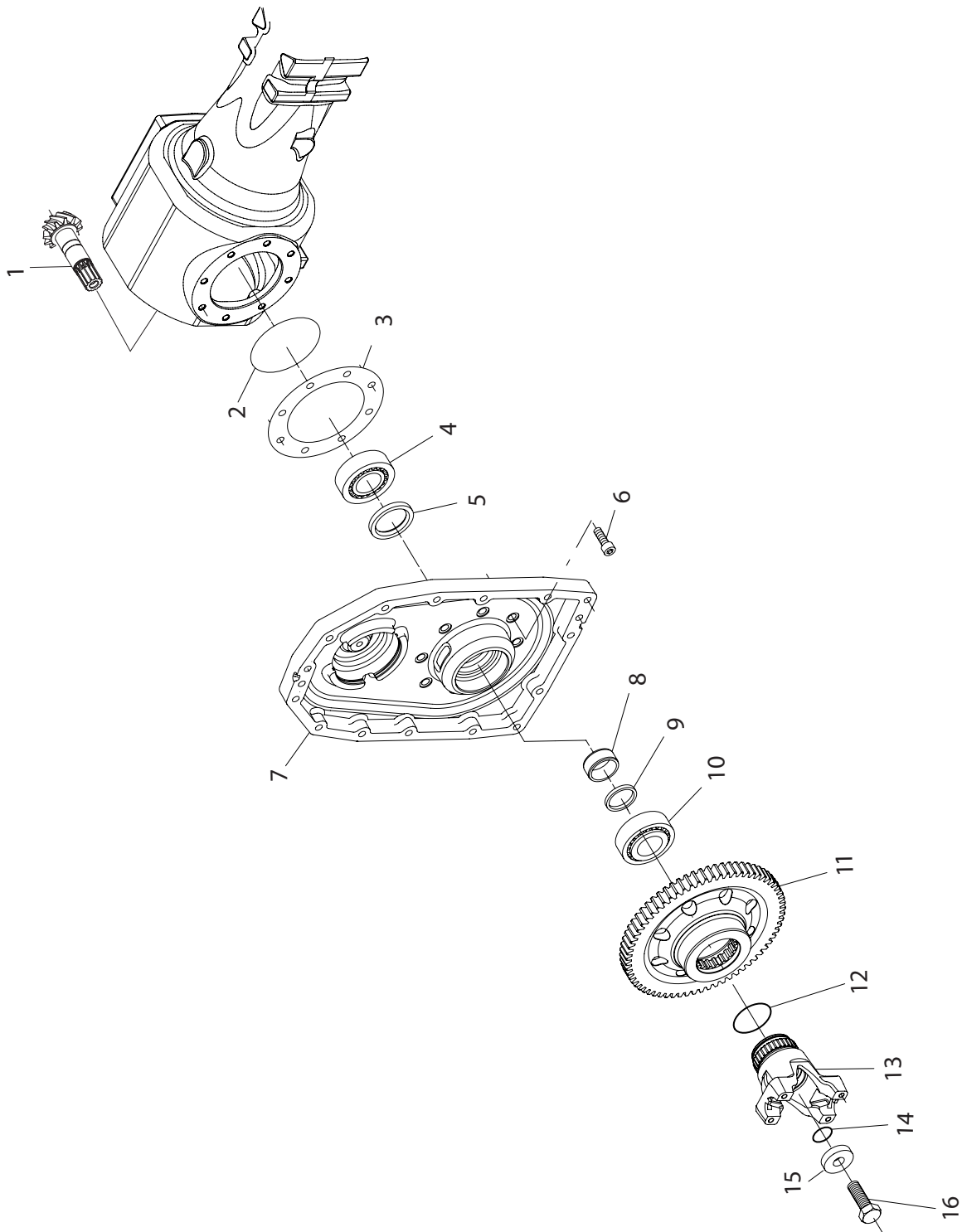


Fig 277. Pinion Components

Service Procedures

Bleeding the Brake System

WARNING

Before proceeding with the bleeding procedure it is important to ensure that the park brake is engaged and that one pair of wheels is blocked on both sides.

BRAK-1-2

Note: The service brakes are fed from a fluid reservoir located on the front bulkhead of the machine. It is most important that this reservoir is only filled with the correct fluid. Refer to **Section 3** for the type of fluid and the reservoir location.

There are two bleed points for the brake system. One on the rear axle adjacent to the park brake operating arm, the other is on the transmission pump at the inching valve. Both points must be bled to ensure all the air is removed from the system.

Bleed the system as follows:

- 1 Charge a suitable pressure bleeding station with the correct brake fluid and pressure medium (normally compressed air), to the correct level and pressure.
- 2 Connect the pressure bleeding station to the brake fluid reservoir using the correct fitting.
- 3 Attach a tube to the brake bleed screw **1A** on the rear axle. Ensure that the free end of the tube is placed in a suitable container to collect the displaced fluid.

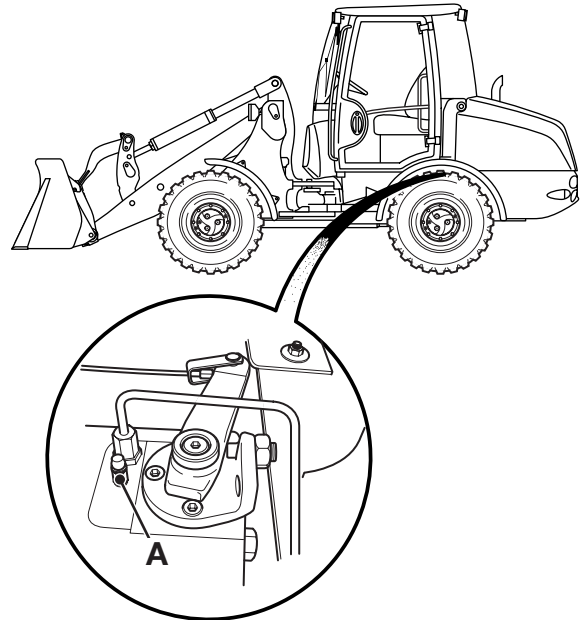


Fig 1.

- 4 Apply pressure to the system.
- 5 Open the bleed screw to release any trapped air, close the screw when the fluid flowing from the tube is air free.
- 6 Check the fluid level in the reservoir (the pressure bleeding station should hold more than sufficient fluid to bleed the system), if low refill the pressure bleeding station.

Note: If the reservoir fluid level has been allowed to drop below the minimum, then the whole procedure must be started again.

- 7 Attach a tube to the brake bleed screw on the inching valve **2A** on the transmission pump. Ensure that the free end of the tube is placed in a suitable container to collect the displaced fluid.

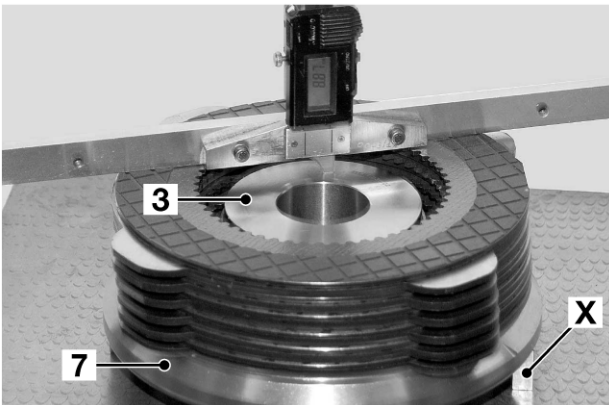


Fig 25.

- 7 Zero a depth gauge from the end of the differential brake disc carrier splines to the thrust bearing face of the differential friction pack. [⇒ Fig 26. \(□ G-12\).](#)

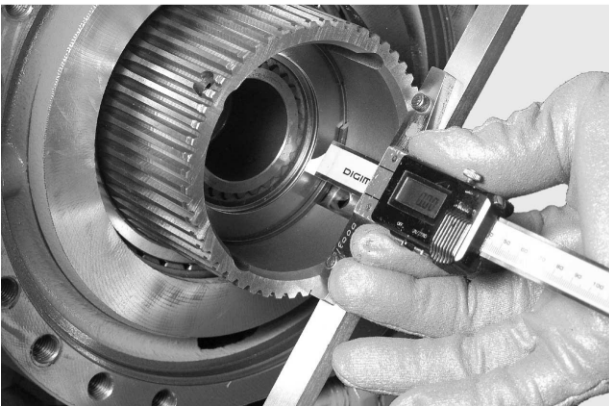


Fig 26.

- 8 Move the depth gauge onto the brake pack contact face on the differential carrier housing. Record the value "A". [⇒ Fig 27. \(□ G-12\).](#)

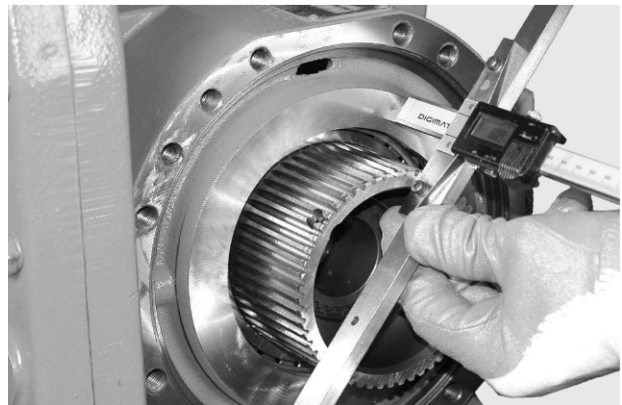


Fig 27.

- 9 Calculate the thickness of the required shim 6 (S) as follows:

$$S = (B + G) - (A + R)$$

$$\text{E.g. } S = (8.6 + 1.4) - (8 + 0.1) = 1.9$$

B = Value recorded at Step 6

G = Fixed Gap of 1.4 mm

A = Value recorded at Step 8

R = Fixed Gap of 0.1 mm

For detailed illustration of the above calculation. [⇒ Fig 35. \(□ G-16\).](#)

- 10 Remove the brake discs from the intermediate plate 7. Remove the coupling 3 from the intermediate plate and install the required shim 6 as calculated above.
- 11 Refit the coupling 3 with pre-determined shim 6 into the intermediate plate 7 and secure with the snap ring 14. [⇒ Fig 28. \(□ G-13\).](#)

Technical Data

System Type

Introduction

The system is a full power hydrostatic.

Oil is supplied from the main hydraulic pump through the priority valve to the steer unit valve, which contains the load-sense unit and integral relief valve.

A double-acting power-ram is installed between the front and rear chassis.

Steering Unit

⇒ [Fig 1. \(□ H-1\)](#)

Model	200 OSPC		
Volumetric Displacement	200 cc/rev		
Relief Valve	Fitted		
Check Valve	Fitted		
Shock Valve	Fitted		
Relief Valve Operating Pressure (at 1500 revs/min)	170 +/- 3 bar	173.4 +/- 3.5 kgf/cm ²	2465 +/- 50 lbf/in ²
Shock Valve Operating Pressure	225 bar	229.5 kgf/cm ²	3262.5 lbf/in ²

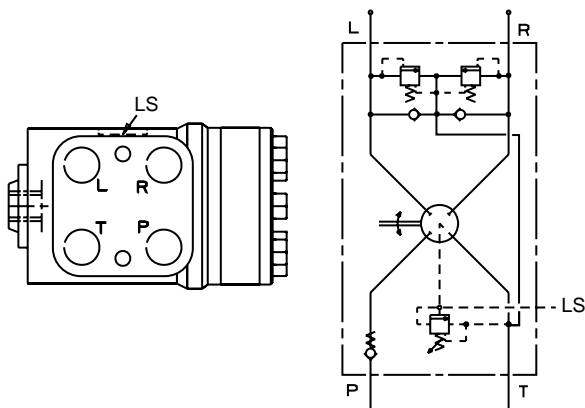


Fig 1.

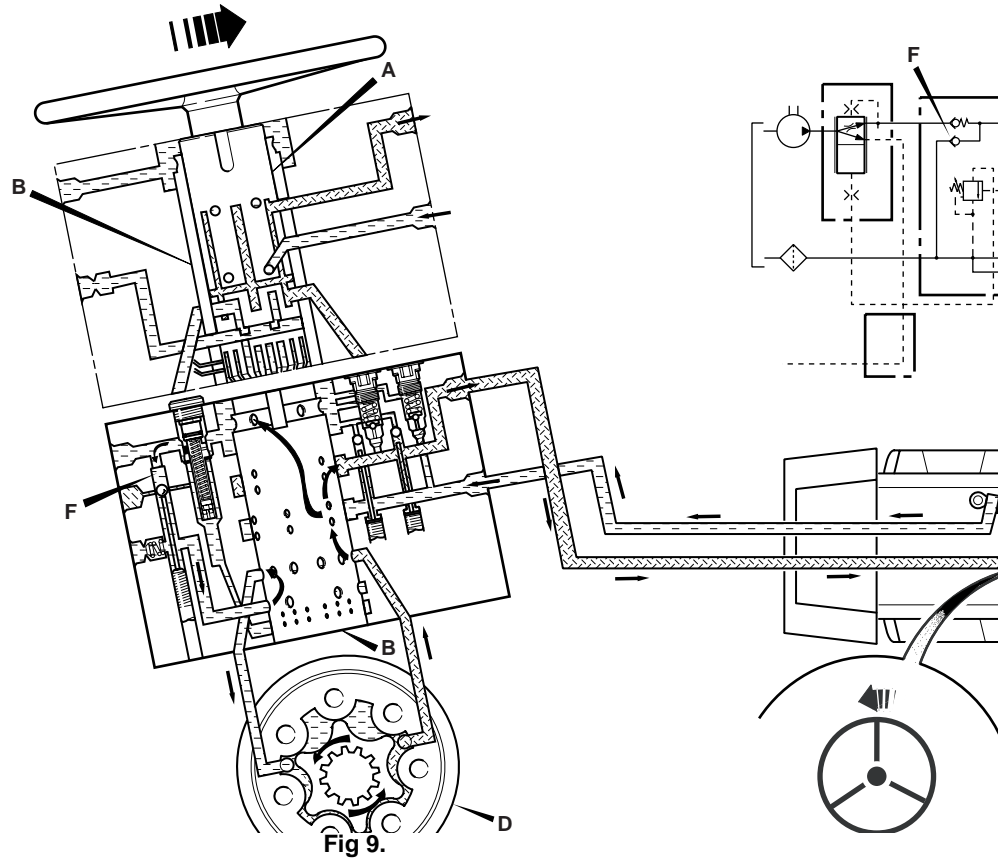
Left Turn - Unassisted

The illustration shows the circuit operation when the engine is stopped.

Move the steering wheel left to turn the inner-spool **A** until the cross-pin engages with and turns the outer-sleeve **B**,

to send the oil to the stator **D**, and pumps oil to the steering-ram **E** under manual pressure only.

As there is no supply from the pump, oil from one side of the steering-ram, supplemented by exhaust oil if necessary, is used to feed the other side through the non-return valve **F**. → [Fig 9. \(□ H-11\)](#).



Hydraulic Steering Unit

Removal and Installation

Removal

⚠ WARNING

Make sure the articulation lock is in the transport position before you transport the machine. The articulation lock must also be in the transport position if you are carrying out daily checks or doing any maintenance work in the articulation danger zone.

If the articulation lock is not in the transport position you could be crushed between the two parts of the chassis.

4-3-5-7

- 1 Make the machine safe with the loader arm lowered. Refer to **Section 3 - Prepare the Machine for Maintenance**.
- 2 Make sure that the steering wheel is in the straight-ahead position.
- 3 Remove the external cab panel that covers the wiper motor and steering unit.
- 4 Label, then disconnect the hydraulic hoses to the steering unit **A**. Cap the ports and the hoses to prevent the entry of dirt and the loss of hydraulic oil. → [Fig 16.](#) ([H-21](#)).
- 5 Remove the four bolts that attach the wiper motor panel to the cab, then remove the wiper motor.
- 6 Hold the steering unit in position and remove the four bolts **B**, then remove the steering unit.

Note: The lower steering column splines connect directly into the related splines in the steering unit. There is no intermediate coupling and there is no master-spline.

Installation

The installation procedure is the reverse of the removal procedure.

Note: The steering unit is spring loaded to the neutral position (for example straight-ahead). Make sure the steering wheel is in the straight-ahead position when the lower column is connected.

Tighten the bolts **B** to the specified torque.

Table 1. Torque Settings

Item	No. off	Nm	kgf m	lbf ft
B	4	47	4.8	35

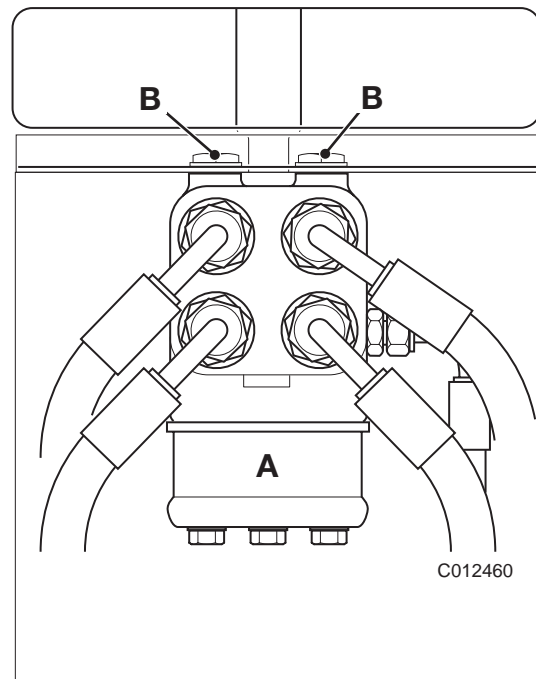


Fig 16.

Engine

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[Section 2 - Care and Safety](#)

[Section 3 - Routine Maintenance](#)

[Section A - Attachments](#)

[Section B - Body and Framework](#)

[Section C - Electrics](#)

[Section D - Controls](#)

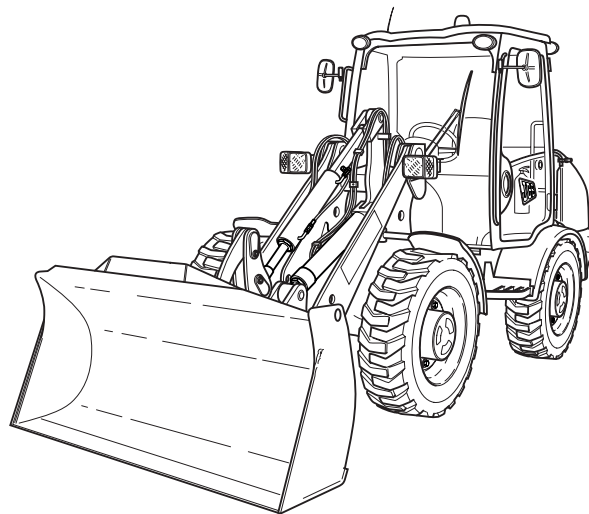
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[Section F - Transmission](#)

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[Section K - Engine](#)



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