SERVICE MANUAL

BACKHOE LOADER
3CXG

EN - 9813/4250 - ISSUE 6 - 03/2018

This manual contains original instructions, verified by the manufacturer (or their authorized representative).

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Foreword

The Operator's Manual

⚠

You and others can be killed or seriously injured if you operate or maintain the machine without first studying the Operator's Manual. You must understand and follow the instructions in the Operator's Manual. If you do not understand anything, ask your employer or JCB dealer to explain it.

Do not operate the machine without an Operator's Manual, or if there is anything on the machine you do not understand.

Treat the Operator's Manual as part of the machine. Keep it clean and in good condition. Replace the Operator's Manual immediately if it is lost, damaged or becomes unreadable.

Contents

4.2. Secure the strut in position with strap.

5. Lower the lift arm onto the strut.

5.1. Start the engine and slowly lower the lift arms onto the safety strut, stop the movement immediately when the weight of the lift arms are supported by the safety strut.

Removing the Lift Arm Safety Strut

1. Fully raise the lift arms to take the weight off the safety strut.
2. Stop the engine and remove the ignition key.
3. Remove the strut.

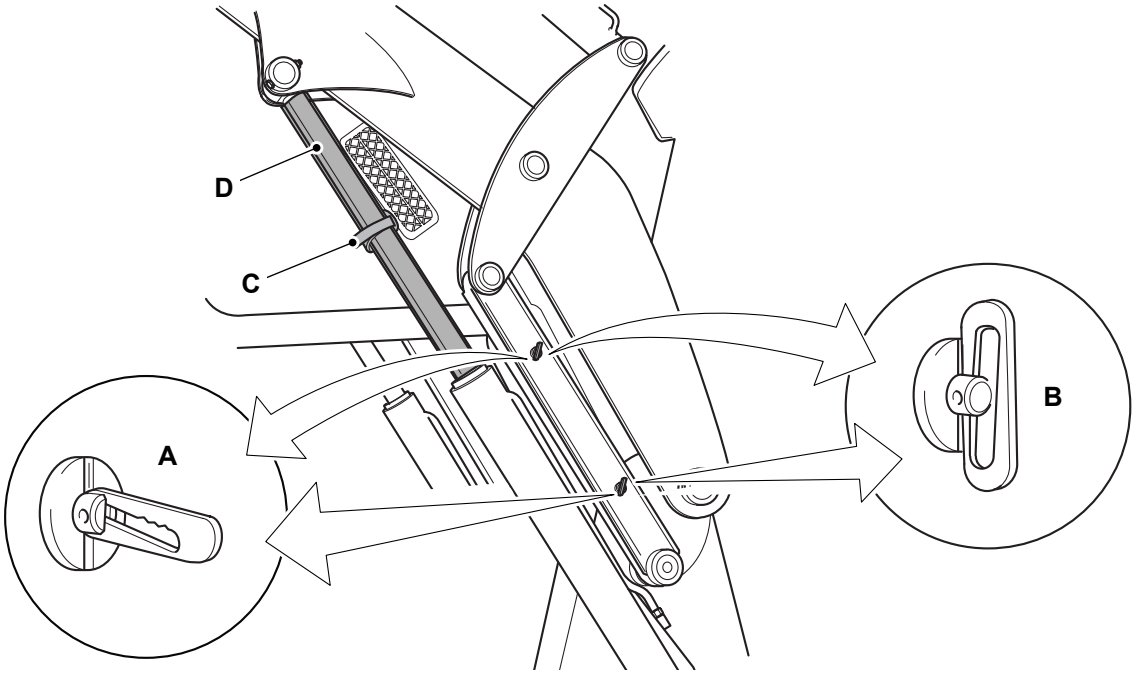
3.1. Loosen the strap.

3.2. Remove the strut from the ram piston rod.

4. Stow the strut.

4.1. Secure the strut in the stowage position with the fastener. Refer to Figure 4.

Figure 4.



A Fastener- unlock position
B Fastener- lock position
C Strap
D Safety strut

00 - Attachments

Contents **Page No.**

00 - General

Introduction

A hydraulic rockbreaker (also called hammer, breaker, pecker, hoe ram or hoe rammer) is a powerful attachment installed to the excavator for demolishing concrete structures or rocks. It is powered by the auxiliary hydraulic system from the excavator, which is installed with a valve for this purpose.

00 - General

Introduction

Access panels provide easy access to the machine major components test and service points and other parts which require routine testing, servicing, adjusting, replacement or repair.

Before you operate the machine, make sure that all of the access panels are in their operation position and secure.

03 - Boom

Remove and Install

Special Tools

Description	Part No.	Qty.
Slide Hammer Kit	993/68100	1

Remove

1. Make the machine safe.
   Refer to: PIL 01-03-27.
2. Remove the excavator bucket and put the excavator arm in the extended position. Refer to Figure 31.
3. Lower the stabilisers.
4. Turn the ignition switch to the OFF position.
5. Disconnect the battery from the machine.
   Refer to: PIL 33-03-00.
6. Operate the excavator control levers several times to remove the hydraulic pressure.
7. Disconnect the hydraulic hoses from the bulkhead plate. Refer to Figure 31.
   7.1. Put labels on the hoses to help identification for installation.
   7.2. Put caps on the open hoses and ports to prevent contamination.
8. Remove the dipper from the machine.
   Refer to: PIL 06-15-06.
9. Put a sling around the boom. Refer to Figure 31.
   9.1. Make sure that the sling is in tension and holds the weight of the boom, before you remove the pivot pins.
10. Put a suitable support below the boom ram. Refer to Figure 31.
11. Remove the thin nuts and bolt that attach the boom ram pivot pin. Refer to Figure 31.
    11.1. Use a slide hammer to remove the boom ram pivot pin.
    Special Tool: Slide Hammer Kit (Qty.: 1)
    Refer to: PIL 06-30-00.
12. Remove the locknuts, bolts and spacers that attach the boom pivot pin.
    12.1. Make a mark on the spacers (left side and right side) to help installation. Refer to Figure 31.
    12.2. Use a slide hammer to remove the boom pivot pin.
    Special Tool: Slide Hammer Kit (Qty.: 1)
    Refer to: PIL 06-30-00.
13. Lift the boom to remove from the kingpost assembly.

06 - Boom Horizontal Swing

Adjust

1. Make the machine safe. Refer to (PIL 01-03).
2. Lightly secure the boom stop block in its lowest position.
3. Use the control knob in the cab to raise the boom lock.
4. Fully raise the boom (i.e. the boom ram fully retracted), use the control knob in the cab to engage the boom lock.
5. With the engine switched OFF, operate the excavator control levers several times to release the hydraulic pressure from the boom ram.
6. Adjust the boom stop block until there is a gap of the specified value between the stop and the boom profile.

   Dimension: 3mm
7. Tighten the clamping bolt to the correct torque value.
8. Tighten the grubscrew and the locknut.
9. Switch ON the engine. Fully raise the boom (i.e. the boom ram fully retracted), use the control knob in the cab to raise the boom lock.
10. If the boom lock does not release adjust the stop block as follows:

    10.1. Loosen the locknut and loosen the grubscrew a further half turn.

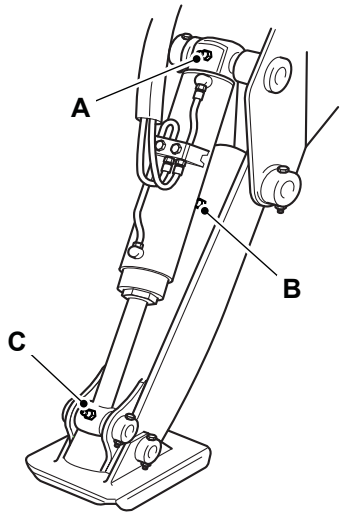
    10.2. Loosen the clamping bolt and position the stop block. Tighten the bolt and lock the grubscrew.
11. Operate the boom and check that the boom lock will engage and disengage correctly, use the control knob in the cab.

Lubricate

Centremount Machines

Apply grease to all the points and linkages.

Figure 44.

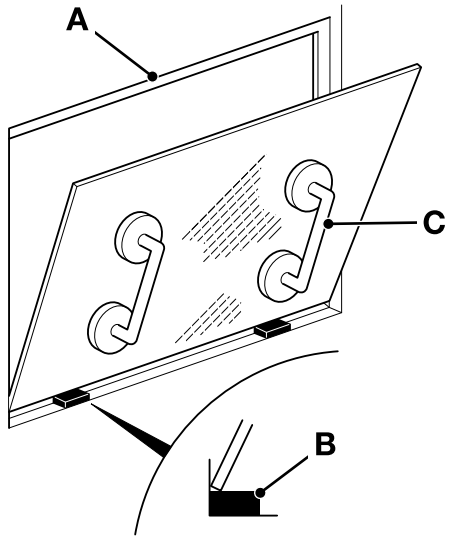


00 - General

Introduction

Before you start any service procedures on the machine, make sure that the relevant maintenance strut is installed in its correct position and secure. Refer to: PIL 01-03-27.

Figure 56.

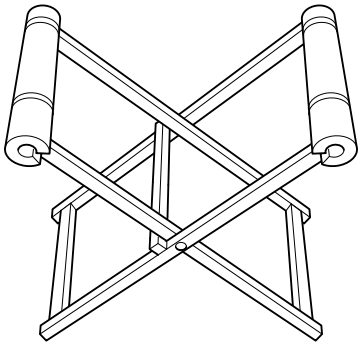


A Frame aperture
B Spacer blocks
C Glass lifters

2. After checking for size, remove the new glass and place it on a purpose made glass stand. Small panes of glass will need locating on a 600 x 700 mm x 15 to 19 mm thick plywood board, sourced locally to fit the glass stand. It is recommended that an access hole is cut in the board to accommodate the glass lifter, making it easier and safer to handle small panes of glass. The board should be covered with felt or carpet to give an anti-scratch surface. Resting the glass on four spacer blocks will ensure clearance of the cartridge nozzle tip during application of the polyurethane sealant.

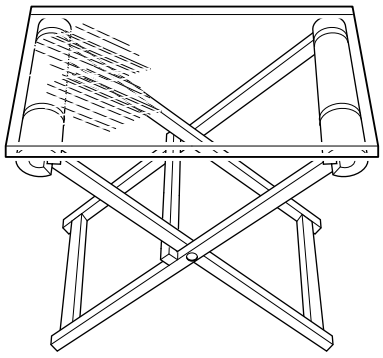
   Special Tool: Rubber Spacer Blocks (Qty.: 4)
   Special Tool: Folding Stand (Qty.: 1)

Figure 57.



3. Make sure the glass is positioned on the stand the correct way up (i.e. with the black ceramic ink band upwards) ready for application of primer etc.

Figure 58.



4. Clean the glass.

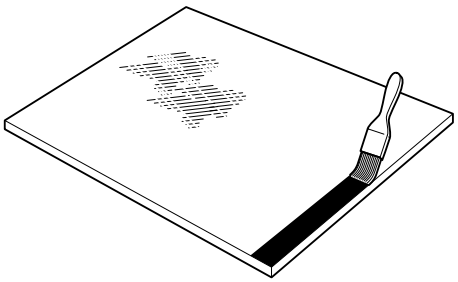
   4.1. Use surface cleaner to thoroughly clean and prime the black ceramic ink band printed on the glass (see Note). Use a lint free cloth to apply the cleaner, allow to dry. Important: Do not touch the glass after cleaning with the surface cleaner.

   Duration: 5min
   Consumable: Surface Cleaning Fluid

   4.2. If the glass does not have a black ceramic ink band, paint a band on the glass using Black Primer. Make sure that the band measures the correct width and that the edge is a neat straight line.

   Dimension: 25mm
   Consumable: Black Primer/Activator

Figure 59.



5. Install the Ultra Fast Adhesive cartridge into a suitable applicator gun:

   Special Tool: Static Oven (240V) (Qty.: 1)
   Special Tool: Mobile Oven (12V) (Qty.: 1)
   Special Tool: Cartridge Gun (Qty.: 1)
   Consumable: Polyurethane Adhesive

   5.1. Remove the aluminium disc cover from the base of the cartridge and discard the dessicant capsule.

   5.2. Make sure that the rolled edge of the cartridge is not damaged - if necessary, the edges should be pressed flat, otherwise it

03 - Lift Arm

Disassemble and Assemble

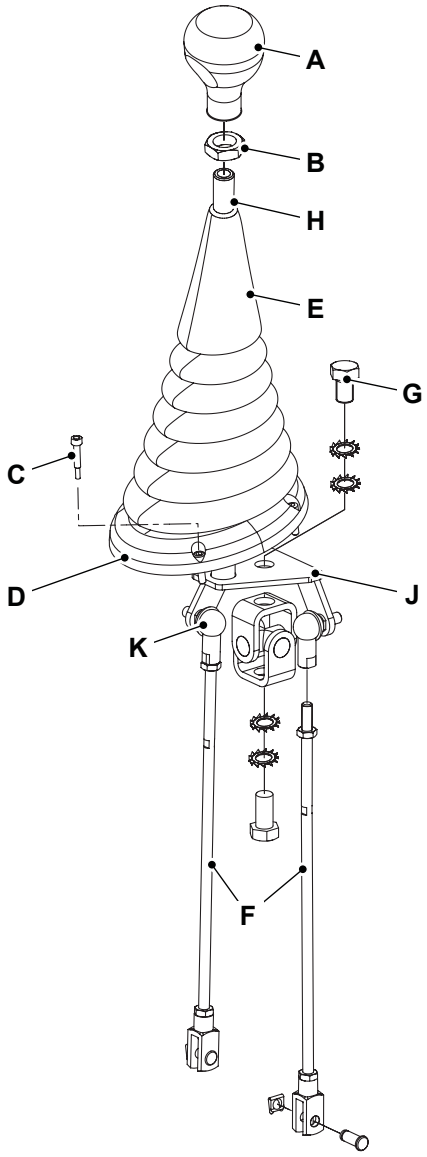
(For: Manual Controls, 1918307-1920000, 2416001-2416350, 2496751-2496950, 2615002-2616002)

The illustration shows the control rods and linkages for a 3 spool lift arm control valve, and is intended as a guide for disassembly and assembly.

Disassemble

1. Make the machine safe. Refer to (PIL 01-03).
2. Disconnect the electrical connector to the transmission dump switch and remove the wires from the connector.
   2.1. Use a screwdriver to release the wires and pins from the connector. You can also cut the wires and solder them during assembly.
3. Loosen the lock nut to remove the lift arm control lever knob.
4. Remove the control lever knob and the locknut.
5. Remove the capscrews that attach the clamp ring.
6. Remove the clamp ring and the gaiter.
7. Disconnect the control rods from the spools of the lift arm control valve.
8. Remove the bolts that secure the complete control lever assembly to the chassis.
9. Remove the control lever and the mounting bracket.

Figure 71.



A Knob
B Locknut
C Capscrew
D Clamp ring
E Gaiter
F Control rods
G Bolts
H Lift arm control lever
J Mounting bracket
K Universal joint

Assemble

1. Install the mounting bracket to the chassis.

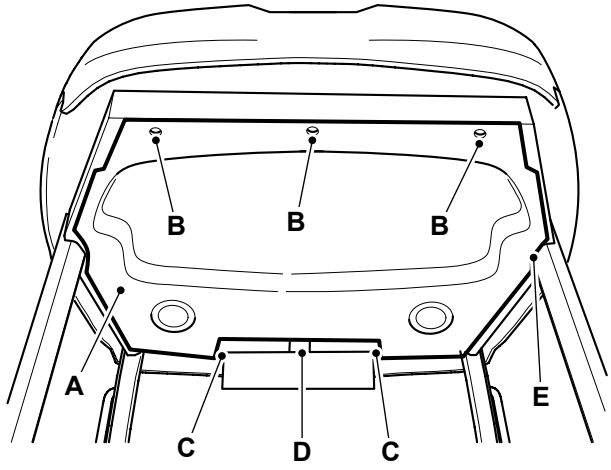
03 - Roof Trim

Remove and Install

Remove

1. Make the machine safe.
   Refer to: PIL 01-03-27.
2. Remove the B-Post trim from the machine.
   Refer to: PIL 09-30-31.
3. Make sure that the rear window is fully closed, before you remove the roof lining.
4. Support the roof lining.
5. Remove the fir tree trim panel clips from the rear side of the roof lining. Refer to Figure 78.
6. Remove the fir tree trim panel clips from the front side of the roof lining. Refer to Figure 78.
7. Remove the sun blind. Refer to Figure 78.
8. Carefully lower the roof lining.
   8.1. Disconnect the roof lining electrical harness connector from the top of the B-Post trim.
9. Lift the roof lining to remove from the machine.
10. Move the radio speakers, interior light and their harnesses to the new roof lining, if necessary.

Figure 78.



A Roof lining
B Fir tree trim panel clips 1
C Fir tree trim panel clips 2
D Sun blind
E B-Post trim

Install

1. The installation procedure is the opposite of the removal procedure.

3. Make sure that the mounts are installed in the correct locations.

   3.1. Make sure that the new components of the mounts are identified as follows, if you replace them.

   3.2. Front upper mounts - colour coded BLUE.

   3.3. Front lower mounts - colour coded BLACK.

   3.4. Rear upper mounts - colour coded GREEN.

   3.5. Rear lower mounts - colour coded RED.

4. Tighten all the locknuts to the specified torque value. Refer to Figure 83.Refer to Figure 84.

Table 20. Torque Values

Item	Nm
C	205
H	205

Discharge and Pressurise

IMPORTANT: This procedure requires specialist air conditioning equipment for refrigerant charging and discharging and must only be carried out by qualified service personnel who have received specialist training on the air conditioning system.

Refrigerant Recovery

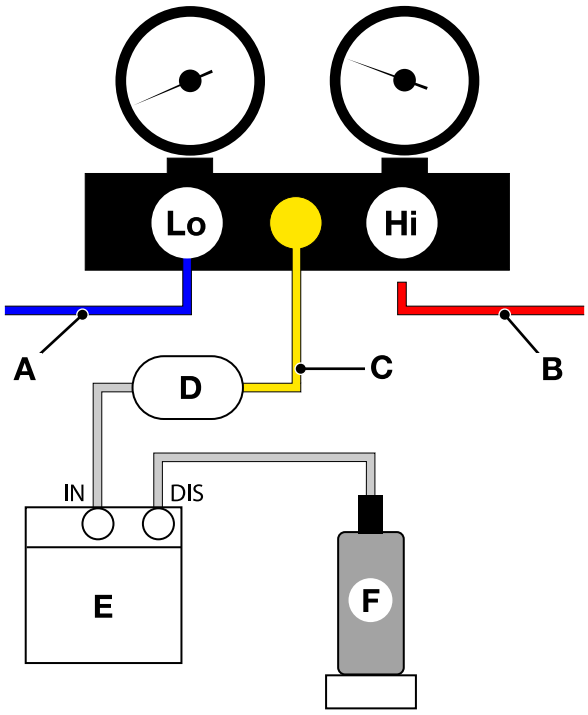
The recovery process clears the system refrigerant, prior to servicing or for refrigerant renewal.

Note: Do not re-use refrigerant unless you are aware of its purity.

Note: The JCB recommended Javac unit only recovers refrigerant as a gas. Other units can recover refrigerant as a liquid and/or gas. Always check the manufacturer's instructions before use.

1. Make sure that the engine is OFF and the engine is cool.
2. Remove the ignition key.
3. Connect the manifold to the system with the blue hose connected to the system low pressure port. Do not connect the red hose. Make sure that both valves are closed.
4. Connect the yellow hose to the Javac unit filter.
5. Connect the filter to the Javac unit.
6. Connect the Javac unit to an empty receiver bottle. Weigh the bottle before and after filling to assess the system capacity. Note: Do not fill the receiver bottle to more than 80% by weight.
7. Switch on Javac unit and open the low pressure manifold valve. Note: If the high pressure warning light on the Javac unit comes on, throttle back the manifold low pressure valve to provide a restriction.
8. The Javac unit will automatically switch off when a pressure balance exists between the system and the receiver bottle. Switch off Javac unit at main switch, but leave the system connected. Switch on after 10 minutes, the Javac unit will restart if residual pressure remains.
9. Close the valves and remove all equipment.

Figure 89.



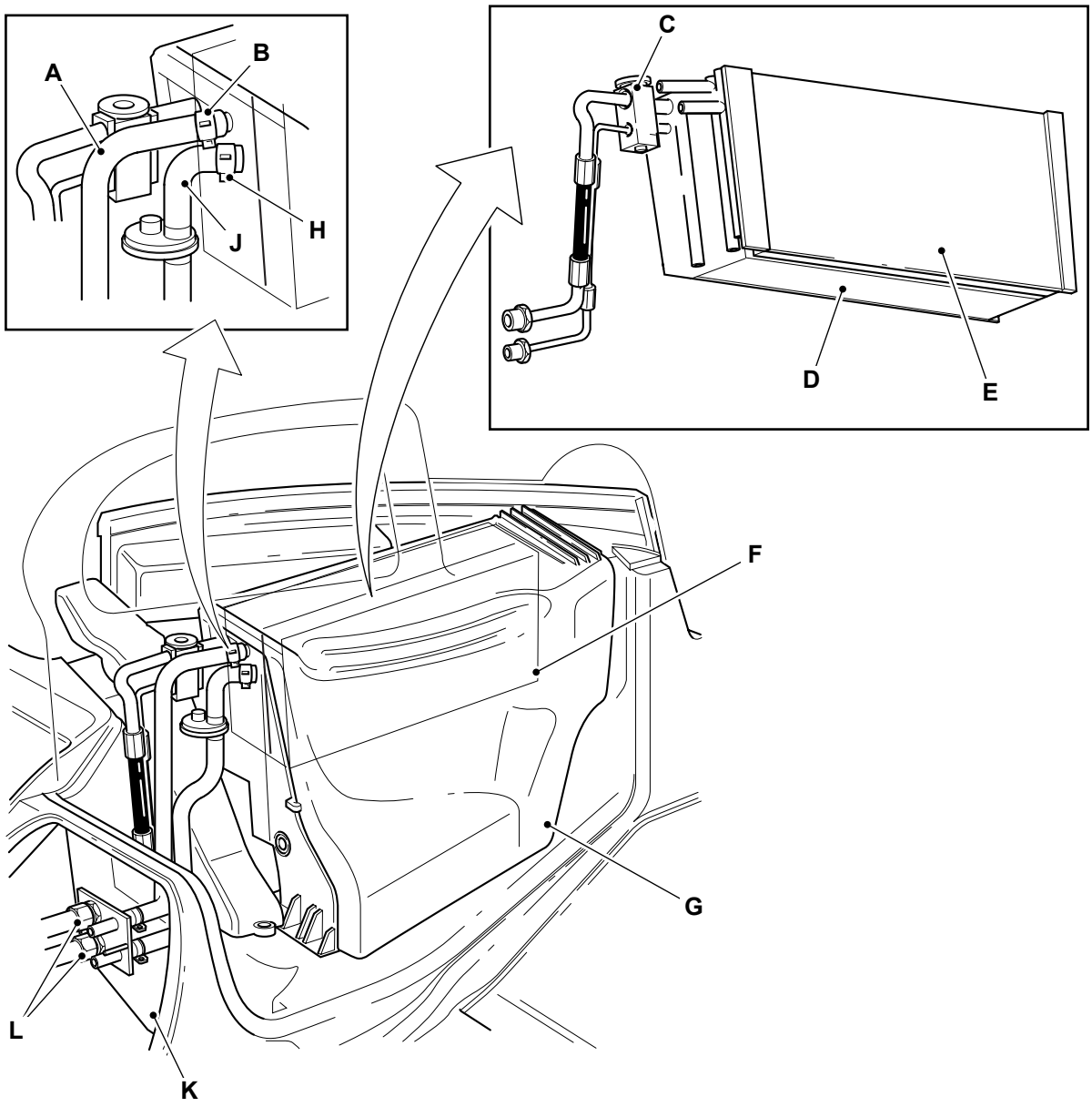
A Low pressure hose (blue)
B High pressure hose (red)
C Hose (yellow)
D Filter
E Javac unit
F Empty receiver bottle

Evacuate

This procedure follows on from the Recovery process and is necessary to make sure that the system is correctly refilled with refrigerant. To avoid leakage in the vacuum system itself, Do not use extensions to the yellow hose (use standard 2 metre length).

1. Recover all refrigerant from the system, refer to Refrigerant recovery.
2. Close all valves and connect the manifold. Connect the blue hose to the system low pressure port and the red hose to the high pressure port.
3. Connect the yellow hose to the vacuum pump. Note: If the Electronic vacuum gauge is used connected as shown. Refer to Electronic Vacuum Gauge for further information.
4. Open the manifold valves.
5. Switch on the vacuum pump until 740mm (29 in) mercury vacuum reads on both gauges. Note: achievable vacuum will vary with altitude.

Figure 107.



A Heater matrix hose 1
B Clamp - heater matrix hose 1
C Expansion valve
D Evaporator matrix
E Heater matrix
F Matrix assembly
G HVAC unit
H Clamp - heater matrix hose 2
J Heater matrix hose 2
K Bulkhead plate
L Air conditioning hoses

Install

1. The installation procedure is the opposite of the removal procedure.
2. After the cables have been installed, operate the heater controls and check for correct operation.

21 - Heater Valve

Contents **Page No.**

Health and Safety

Hot Components

Touching hot surfaces can burn skin. The engine and machine components will be hot after the unit has been running. Allow the engine and components to cool before servicing the unit.

Turning the Engine

Do not try to turn the engine by pulling the fan or fan belt. This could cause injury or premature component failure.

Notice: *The engine and other components could be damaged by high pressure washing systems. Special precautions must be taken if the machine is to be washed using a high pressure system.Make sure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system. Do not aim the water jet directly at bearings, oil seals or the engine air induction system.*

WARNING! *To bleed the injectors you must turn the engine. When the engine is turning, there are parts rotating in the engine compartment.Before starting this job make sure that you have no loose clothing (cuffs, ties etc) which could get caught in rotating parts.When the engine is turning, keep clear of rotating parts.*

Notice: *Clean the engine before you start engine maintenance. Obey the correct procedures. Contamination of the fuel system will cause damage and possible failure of the engine.*

Notice: *Do not exceed the maximum level of engine oil in the sump. If the maximum is exceeded, the excess must be drained to the correct level. An excess of engine oil could cause the engine speed to increase rapidly without control.*

WARNING! *The engine has exposed rotating parts. Switch off the engine before working in the engine compartment. Do not use the machine with the engine cover open.*

WARNING! *Hot oil and engine components can burn you. Make sure the engine is cool before doing this job.Used engine crankcase lubricants contain harmful contaminants. In laboratory tests it was shown that used engine oils can cause skin cancer.*

Notice: *A drive belt that is loose can cause damage to itself and/or other engine parts.*

WARNING! *Do not open the high pressure fuel system with the engine running. Engine operation causes high fuel pressure. High pressure fuel spray can cause serious injury or death.*

CAUTION! *It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants.Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.*

Cause	Remedy
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
ECM or electrical sensor fault.	Check the electronic fault codes. Check the electrical connections at the ECM and sensors.
One or more fuel injectors worn or malfunctioning.	Check the electronic fault codes. Check the electrical connections at the injectors.
Worn or malfunctioning high pressure fuel pump.	Check the electronic fault codes. Do all the necessary fault finding checks before removal of the high pressure fuel pump.

Table 57. Engine - Vibration Excessive

Cause	Remedy
Engine not running smoothly/misfiring.	See Also: Table 51. Engine - Poor Running at Idle
Oil level incorrect.	Check oil level.
Fan damaged or accessories faulty.	Check/replace the vibrating component. Refer to the machine's service manual for correct installation and torque figures.
Fan hub faulty.	Inspect/replace the fan hub. Refer to the machine's service manual for correct installation and torque figures.
Engine mounts over-tightened, damaged or loose.	Check/replace engine mounts.
Inlet and exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.
Engine compression low in one or more cylinders.	Check the engine compression.
Alternator bearing worn or damaged.	Check/replace the alternator.
Flywheel housing misaligned.	Check/repair flywheel alignment.
ECM or electrical sensor fault.	Check the electronic fault codes. Check the electrical connections at the ECM and sensors.
Drive line components worn or unbalanced.	Check and inspect drive line components such as propshafts. Refer to the machine's service manual for correct installation and torque figures.

Table 58. Engine - Exhaust Smoke Excessive (Black Smoke)

Cause	Remedy
Engine being lugged down.	Check for added loading from malfunctioning accessories or driven units, brakes dragging and other changes in vehicle loading. Disengage the hydraulic controls.
Air intake or exhaust system blocked.	Visually check the air intake and exhaust system for blockage or obstruction - remove as required. Check the air filter elements for signs of blocking - replace as required.
Air leak between the turbocharger and the intake manifold.	Check/repair leaks in the air crossover tube, hoses, or manifold cover. Visually inspect MAF (Mass Air Flow) sensor tube
Intercooler faulty.	Check for blocked cooler matrix.
Exhaust leak at the manifold or turbocharger	Check/repair leaks in the manifold or turbocharger gaskets. Look for a cracked manifold.
Turbocharger wastegate faulty.	Repair or replace turbocharger.

00 - General

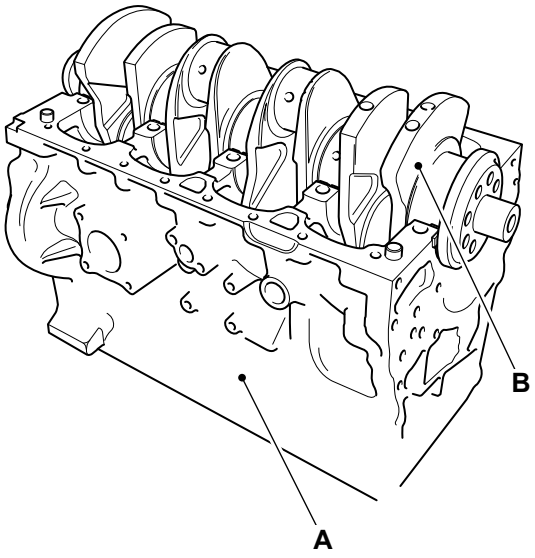
Introduction

The cylinder head is located above the cylinders on top of the crankcase. It closes in the top of the cylinder, forming the combustion chamber. This joint is sealed by a cylinder head gasket.

The cylinder head also provides the space for the passages that feed air and fuel to the cylinder and allow the exhaust to escape. The cylinder head is also used to mount the valves and fuel injectors.

Component Identification

Figure 148.

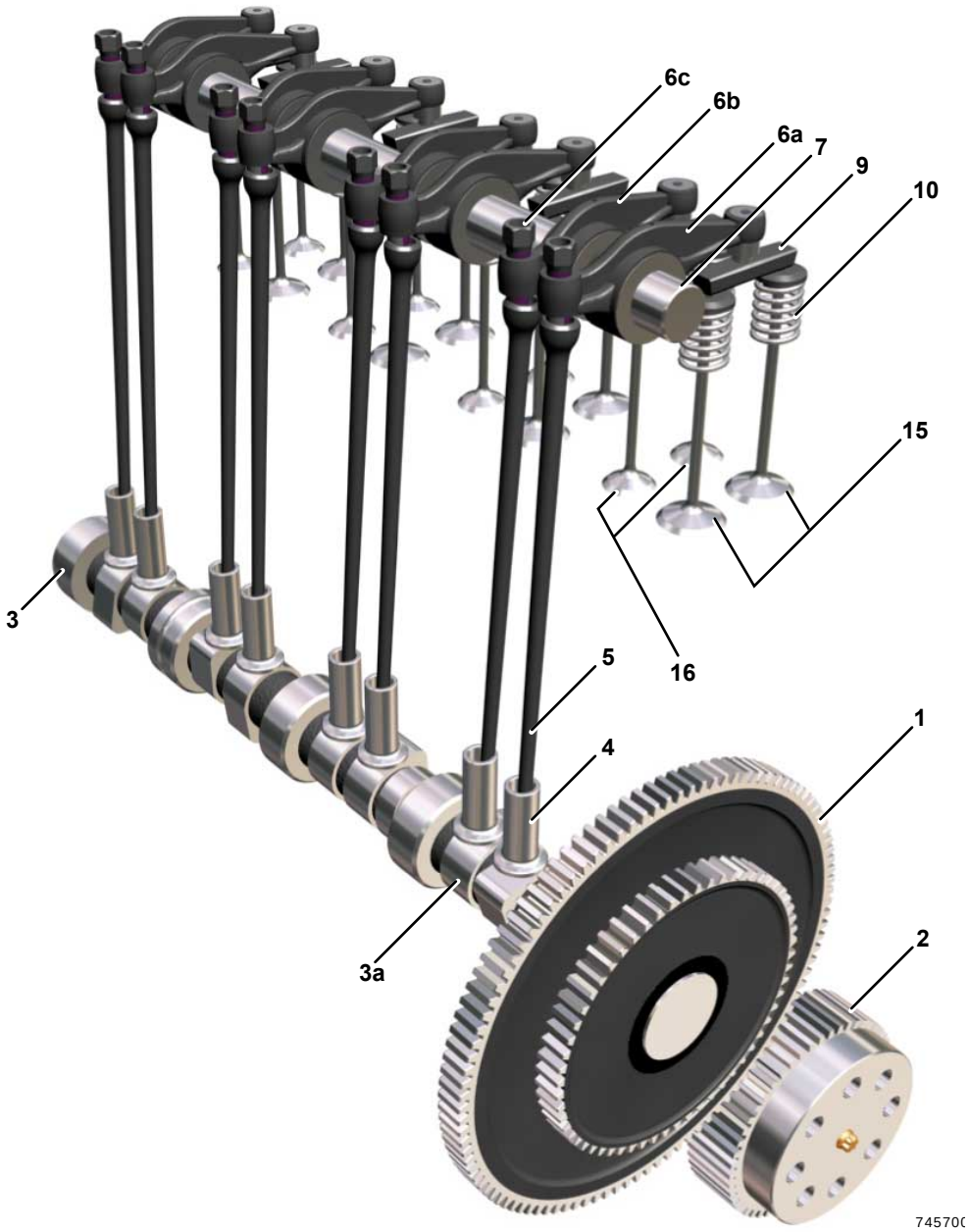


A Crankcase
B Crankshaft

00 - General

Introduction

Figure 170.



1 Camshaft drive gear
2 Crankshaft gear
3 Camshaft
3a Camshaft lobes

21 - Oil Filter

Contents **Page No.**

27 - Crankcase Ventilation Filter

Contents **Page No.**

00 - General

Introduction

The connecting rod connects the piston to the crankshaft. They form a simple mechanism that converts reciprocating motion into rotating motion.

Connecting rods are usually made of high strength steel. They are not rigidly fixed at either end, so that the angle between the connecting rod and the piston can change as the rod moves up and down and rotates around the crankshaft.

The small end of the connecting rod attaches to the piston pin which is a press fit into the connecting rod.

The big end of the connecting rod connects to the bearing journal on the crank throw, they run on replaceable bearing shells that are accessible via the connecting rod bolts which hold the bearing cap on to the big end.

There is a pinhole bored through the bearing and the big end of the connecting rod so that pressurised lubricating engine oil squirts out on to the thrust side of the cylinder wall to lubricate the travel of the pistons and piston rings.

Remove

The piston and connecting rod assemblies are removed through the top of the crankcase.

1. Use a suitable scraper and wire wool to clean off the carbon deposits from around the top of the cylinder bore. Take care not to scratch or damage the cylinder bore.
2. Use a hammer and a short length of wood to tap the piston from the connecting rod side. Take care not to scratch or damage the cylinder bore or the connecting rod bearing surface.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Make sure that all items are clean and free from damage and corrosion.
3. If the upper big end bearing shell has been removed replace it. Refer to (PIL 15-33-06).
4. Lubricate the cylinder bore with clean engine oil.
5. Use a suitable compressor tool to compress the piston rings.
6. Insert the piston and connecting rod assembly into the cylinder bore, make sure that the longest side of the connecting rod is on the exhaust side of the crankcase. Take care not to damage the cooling jets when you guide the connecting rod down the cylinder bore and over the crank pin diameter.

After Installation

1. Install the big end bearing caps. Refer to (PIL 15-33-06).
2. Carry out the procedures listed under Before removal in reverse order.

Remove

1. Get access to the engine.
2. Remove the high pressure fuel pipes. Refer to Fuel Pipes (PIL 18-96).
3. Remove the fuel bleed off fuel pipes. Refer to Fuel Pipes (PIL 18-96).
4. Disconnect the electrical connectors at the fuel injectors. Refer to Fuel Injection (PIL 18-18).
5. Disconnect the electrical connector at the coolant temperature sensor. Refer to Engine Sensors (PIL 15-84).
6. Move the electrical harness away from the rocker cover.
7. Remove the bolts and lift the rocker cover from the cylinder head.
8. Discard the gasket.
9. The rocker cover injector seals must be replaced. Refer to Injector seals (PIL 18-18).

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Remove all oil and sludge contamination from inside the rocker chamber.
3. Renew the injector seals. Refer to Injector seals (PIL 18-18).
4. Renew the rocker cover gasket.
5. Prevent damage to the seals. Put sleeves/covers on the four injectors. Apply a rubber lubricant to the seals and then install the rocker cover.
6. Tighten the bolts to the correct torque value.
7. Remove the sleeves/covers.

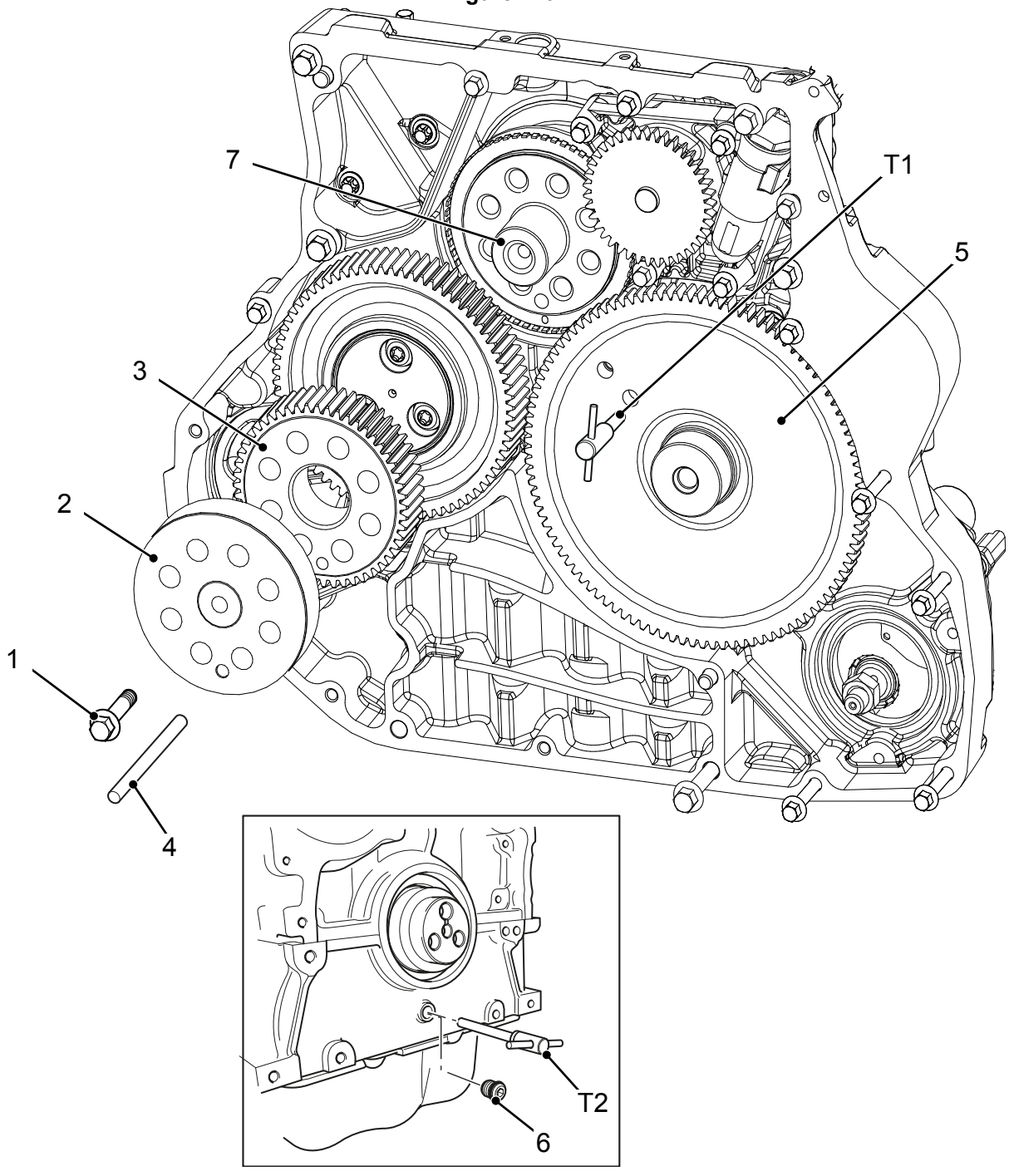
After Installation

1. The high pressure fuel pipes must be replaced with new parts. Refer to Fuel Pipes (PIL 18-96).
2. Start the engine and check for oil and fuel leaks.

Table 85. Torque Values

Item	Nm
B	24

Figure 229.



1 Drive gear and flywheel hub fixing bolt
2 Flywheel hub
3 Crankshaft gear
4 Location dowel
5 Camshaft drive gear
6 Blanking plug - crankcase
7 Crankshaft - gear location spigot
T1 Timing pin - camshaft
T2 Timing pin - crankshaft

Remove

1. Remove the flywheel hub fixing bolt and remove the flywheel hub.
2. Remove the crankshaft gear from the crankshaft. Make sure you retrieve the location dowel.

03 - Housing

Remove and Install

Special Tools

Description	Part No.	Qty.
Template for Sealant Flywheel Housing to Gear Case (4 Cyl Elec)	892/12349	1

Before Removal

The flywheel housing is integral with the drive gears front case. When the housing is removed the drive gears will be exposed. DO NOT attempt to remove the camshaft and the drive gears. Removing the camshaft with the engine in the upright position will cause the tappets to dislodge, requiring the engine block to be dismantled.

1. This procedure requires service parts. Make sure you have obtained the correct service parts before you start.
2. Remove the flywheel. Refer to (PIL 15-54).
3. Remove the starter motor. Refer to (PIL 15-75).

Removal

1. Remove the flywheel housing fixing bolts and then separate the flywheel housing from the gear case.
2. If required, undo the bolts and remove the access cover.
3. Remove and discard the crankshaft rear oil seal. Take care not to damage the seal bore in the housing.

00 - General

Introduction

Oil Cooler Assembly

The oil cooler and filter are incorporated in a housing that is bolted to the side of the crankcase. The housing allows transfer of lubricating oil from the crankcase to the oil cooler and filter head.

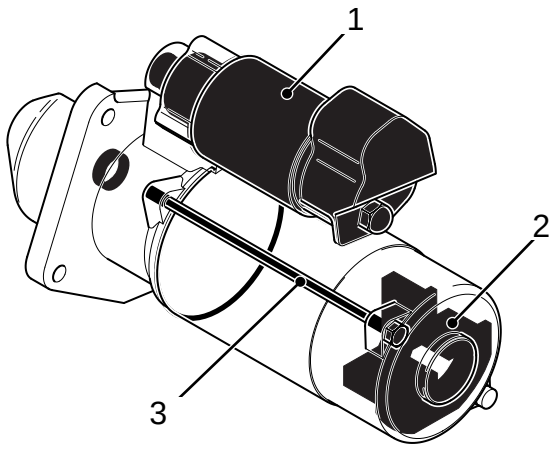
Some installations have a remote oil filter head. The oil cooler housing incorporates feed and return ports for hose connections to the filter head. A remote oil filter head is used when access to the engine is restricted.

Oil Cooler Matrix

The oil cooler matrix is a non-serviceable part and must not be removed from the housing. The housing/ cooler assembly is leak tested during manufacture to minimise the risk of cross contamination of coolant and lubricating oil.

Component Identification

Figure 252.



1 Solenoid
2 Brush gear
3 Tie bolts

Check (Condition)

Before carrying out the multimeter tests, check the battery condition and make sure that all the applicable electrical connections are clean and tight. Make sure that the starter motor fixing bolts are tightened to the correct torque.

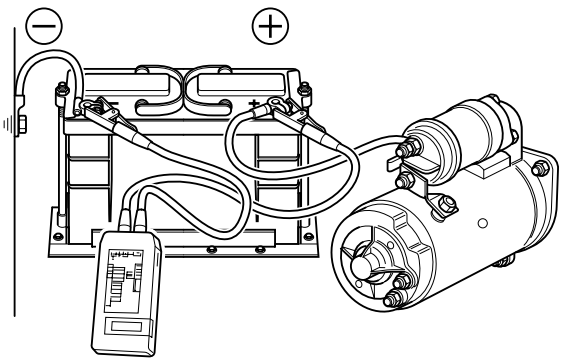
To prevent the engine starting during the tests make sure that the applicable engine stop fuse is removed.

Check the readings in the following sequence using a multimeter. Unless otherwise stated, the readings must be taken with the ignition switch held in the start position (HS) and the controls set to enable the starter motor. The readings are shown for both 12V and 24V systems. The highest values are for machines with 24V systems. Identify the applicable system before carrying out the tests.

Do not operate the starter motor for more than 20s at one time. Let the starter motor cool for at least 2min between starts.

1. Connect the multimeter across the battery terminals.

Figure 253.



1.1. Reading in start position approximately

Voltage: 10V
Voltage: 20V

1.2. Minimum permissible reading in start position

Voltage: 9.5V
Voltage: 18V

1.3. A low reading probably indicates a fault in the starter motor.

2. Connect the multimeter between the starter main terminal and the commutator end bracket. In the start position, the reading should not be below the reading obtained in 1 by any more than

Voltage: 0.5V
Voltage: 1V

Cause	Remedy
ECM connection fault	Disconnect the harness from engine ECM and inspect. Check seals are in place, check for signs of corrosion or contamination.
	If ECM pins are damaged, replace ECM and re-flash appropriate calibration (see Re-flashing an ECM.
	If harness is damaged, repair or replace as necessary.
	If no fault is found proceed to 'Sensor signals faulty'.
Sensor signals faulty	Check the sensor signals. If scope available, display Cam and crank signals on the scope. Change the sensor as necessary.
	If no fault is found, proceed to 'Sensor failure'.
Sensor failure	Check the sensor resistance (see relevant help file page). If sensor is out of specification replace.
	If no fault is found, proceed to 'Sensor target wheel fault'.
Sensor target wheel fault	Check the crankshaft position sensor target wheel if damaged, replace with a new crankshaft.
	If no fault is found raise Techweb Helpdesk call.

Table 114. Camshaft Position Sensor

Cause	Remedy
Sensor supply voltage fault	Disconnect the sensor, check sensor voltage supply at the harness connector (see relevant sensor help file for pin numbers or refer to engine electrical schematic). If voltage supply is faulty, replace the sensor.
	If sensor supply voltage is OK, proceed to 'Sensor connection faulty'.
Sensor connection faulty	Check the condition of sensor to harness connection, make sure the seals are in place, check for signs of corrosion or contamination. Repair as necessary.
	If no fault is found, proceed to 'Sensor failure'.
Sensor failure	Check the sensor resistance (see relevant help file page). If sensor is out of specification replace.
	If no fault is found, proceed to Step 4.
ECM connection fault	Disconnect the harness from engine ECM and inspect. Check seals are in place, check for signs of corrosion or contamination.
	If ECM pins are damaged, replace ECM and re-flash appropriate calibration (see Re-flashing an ECM.
	If harness is damaged, repair or replace as necessary.
	If no fault is found proceed to 'Sensor signals faulty'.
Sensor signals faulty	Check the sensor signals. If scope available, display Cam and crank signals on the scope. Change the sensor as necessary.
	If no fault is found, proceed to 'Sensor target wheel fault'.
Sensor target wheel fault	Check the Cam target wheel if damaged, replace with new camshaft.
	If no fault is found raise Techweb Helpdesk call.

Remove and Install

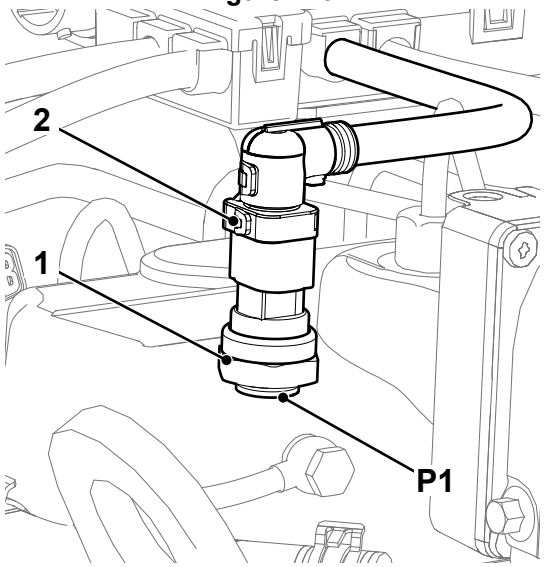
Special Tools

Description	Part No.	Qty.
Deep Socket	892/12351	1

Before Removal

1. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.

Figure 273.



1 Exhaust manifold pressure sensor
2 Electrical connector
P1 Sealing washer

Remove

1. Get access to the engine.
2. Disconnect the electrical connector at the exhaust manifold pressure sensor.
3. Use the special tool to remove the sensor from the exhaust manifold.

   Special Tool: Deep Socket (Qty.: 1)
4. Discard the sealing washer.

The exhaust manifold pressure sensor is a non-serviceable item. If the sensor is faulty or damaged it must be renewed.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Renew the sealing washer.
3. Use the special tool to tighten the exhaust manifold pressure sensor to the correct torque value.

Table 119. Torque Values

Item	Nm
1	22.5

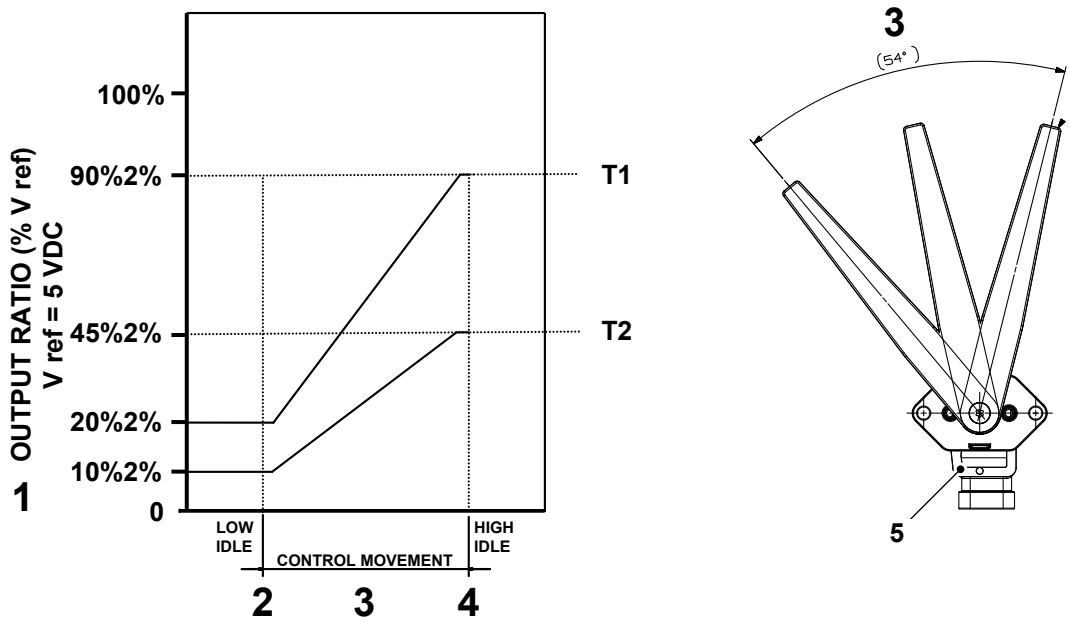
Operation

The hand throttle position sensor transmits an electrical signal for interpretation by the ECM (Engine Control Module).

When the throttle lever position changes a variable resistor within the throttle position sensor changes the voltage output in relation to the position of the lever.

Two signals are output from the unit, track 1 signal and track 2 signal. The track 1 signal is always approximately twice the track 2 signal. The ECM compares the two signals to make sure that the output from the throttle position sensor is valid.

Figure 285.



1 Output ratio -% of V ref. V ref = 5 V
2 Low idle position
3 Throttle lever movement
4 High idle position
5 Hand throttle position sensor
T1 Output - track 1
T2 Output - track 2

Operation

The oil pressure switch contacts open when the engine oil pressure is below 0.6bar.

Check (Operation)

1. For the full inspection and testing procedure, refer to the help files in ServiceMaster.

00 - General

Introduction

USE THE CORRECT FUEL. The potential for engine damage due to the use of incorrect or contaminated fuel is much greater with common rail injection technology than with mechanical injection systems. For information about fuel types and cleanliness requirements, refer to Consumable Products Refer to: PIL 75-00-00. Technical Data, Fuel, Acceptable and Unacceptable Fuels and Cleanliness Requirements.

For information about the fuel injection system. Refer to: PIL 18-18.

Common Rail Fuel Injection

The common rail fuel injection system enables the following advantages when compared with mechanical direct injection systems:

- Reduced engine noise.
- Reduced polluting emissions.
- Increased engine performance, higher torque at lower engine speeds in particular.

Unlike mechanical direct injection systems, common rail systems employ electrically operated computer controlled fuel injectors. The high pressure fuel injection pump no longer controls the point of injection but continually supplies pressurised fuel to a common fuel rail.

The injectors are connected to the common rail and inject fuel when supplied with electrical signals from the ECM (Engine Control Module).

Several electrical sensors supply the ECM with engine operating parameters such as engine speed, engine phase (firing order), engine temperature, inlet manifold air pressure and temperature, throttle position etc. Software in the ECM memory is used to interpret the data from the sensors and the fuel injection characteristics are adjusted accordingly.

Prevention of fuel system contamination is even more important than with mechanical direct injection systems. To combat fuel contamination, a water separator and pre-filter is installed in addition to the main filter.

Install

1. Installation is the opposite of the removal procedure.
2. If a new fuel tank is being installed, remove the fuel level sender from the old tank and install it to the new tank.
3. Make sure that the fuel return and feed hoses are attached to the correct connectors.
4. Tighten the drain plug to the correct torque value.
   4.1. Apply sealant to the threads of the drain plug.
   Consumable: JCB Threadseal
   4.2. Replace the drain plug O-ring with a new one.
5. Tighten the bolts to the correct torque value.
   5.1. Apply sealant to the threads of the bolts.
   Consumable: JCB High Strength Threadlocker
6. Fill the fuel tank with clean fuel.
7. Make sure that all the fuel tank connections are tightened correctly.
   7.1. Check the connections for leakage.

Table 137. Torque Values

Item	Nm
A	85
E	83

00 - General

Introduction

Fuel at rail pressure is continuously supplied to the injectors via high pressure fuel pipes.

The high pressure fuel injector fuel pipes consist of thick walled, seamless steel tubing. The ends of the tubes are formed with conical nipples for sealing in the sealing cones on the common rail and on the injector at port. It is essential that the tubes are maintained and installed correctly for safe and effective engine operation.

Important: If the high pressure fuel pipes are removed for any reason they must be renewed. Installing the original fuel pipes will cause fuel leaks at the pipe connections.

Fuel injection takes place when the solenoid coil is energised by the ECM (Engine Control Module).

Combustion

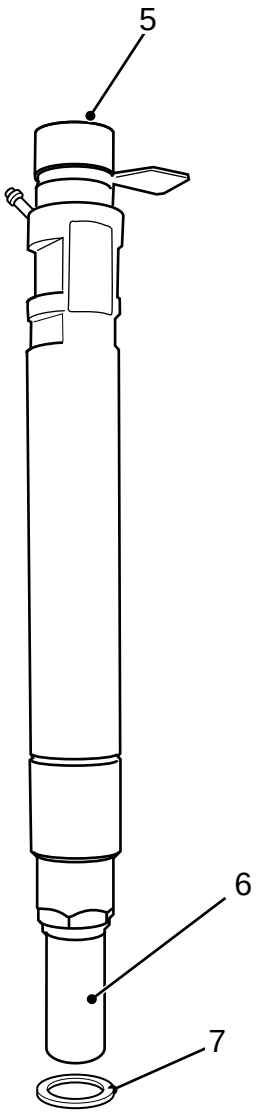
The engine employs a direct injection system. Fuel is injected directly into the cylinder, the mixing taking place in the combustion chamber which is recessed into the crown of the piston.

The process of mixing starts during the induction stroke and continues throughout the compression stroke. The inlet porting and combustion chamber are carefully designed to ensure that when the fuel is injected it is mixed thoroughly with the air.

The multi-point injector and high injection pressure ensure a good distribution of fuel throughout the air which aids mixing. The mixing process continues until combustion is complete.

To further enhance efficient combustion, the ECM initiates several separate injections of fuel during the compression stroke. The timing of the fuel injections is also varied by the ECM depending on engine operating parameters.

Figure 325.



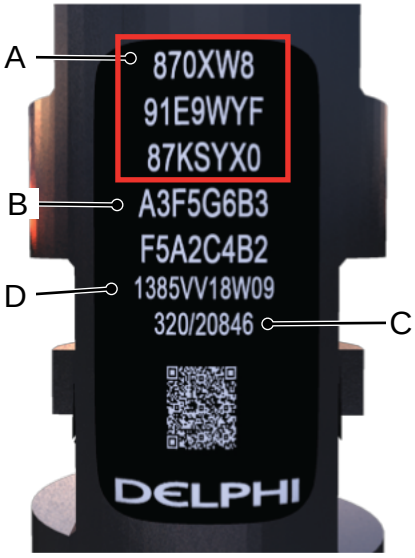
5 Protective cap
6 Protective cap
7 Sealing washer

Install

Important: The fuel injectors are not interchangeable between cylinders or other engines. Make sure you install the injectors in the same positions. If a new or different injector is installed, the engine electronic control unit (ECU) must be re-programmed. Refer to (PIL 33-45), Engine Electronic Control Unit, Vehicle Set Up Data.

When new or different injectors are installed, record the calibration code. Record which cylinder the injector is installed into. Refer to (PIL 33-45), Engine Electronic Control Unit, Vehicle Set Up Data.

Figure 326.



A Correction factor (20 characters)
B Manufacturers reference
C JCB part number
D Injector serial number

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Clean off any sludge or oil from the inner bore of the injector sleeve. Make sure you do not damage the surface of the bore. Any damage or surface contamination will cause the injector sealing O-ring to fail.
3. Install a new O-ring.
4. Install a new sealing washer.
5. Make sure that the injector is installed in the correct orientation, with the bleed-off port facing the right hand side (exhaust manifold) of the engine. Make sure the injector is pushed fully into the cylinder head.
6. Tighten the injector clamp bolt to the correct torque value.

After Installation

1. Replace the rocker cover, refer to (PIL 15-42).
2. Renew the high pressure fuel pipes, Refer to Fuel Pipes (PIL 18-96).
3. Replace the low pressure fuel pipes, Refer to Fuel Pipes (PIL 18-96).
4. Start the engine and check for fuel leaks.

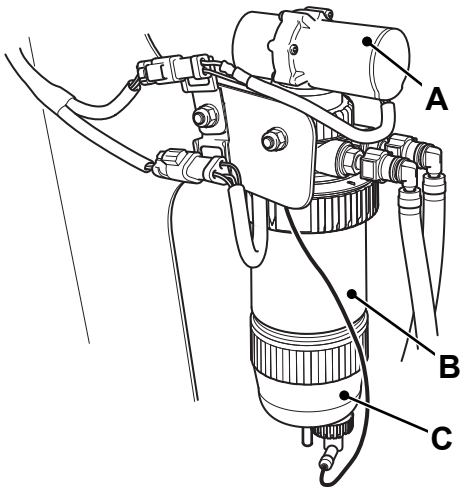
00 - General

Introduction

The fuel lift pump is a sealed electrical unit integral with the fuel pre-filter and water separator.

The fuel lift pump is a non-serviceable component. If any part is defective, replace the complete pump, filter and separator assembly.

Figure 346.



A Fuel lift pump
B Fuel pre- filter
C Water separator

Some lift pump installations are modified to operate from a 24V supply by means of an in-line voltage reducer.

27 - Exhaust Gas Recirculation (EGR)

Contents **Page No.**

36 - Variable Geometry Turbocharger (VGT)

Contents **Page No.**

06 - Low Pressure Pipe

Remove and Install

Before Removal

Obey all fuel system health and safety information. Refer to Fuel System, Health and Safety (PIL 18-00).

Low Pressure Fuel Pipes

Remove

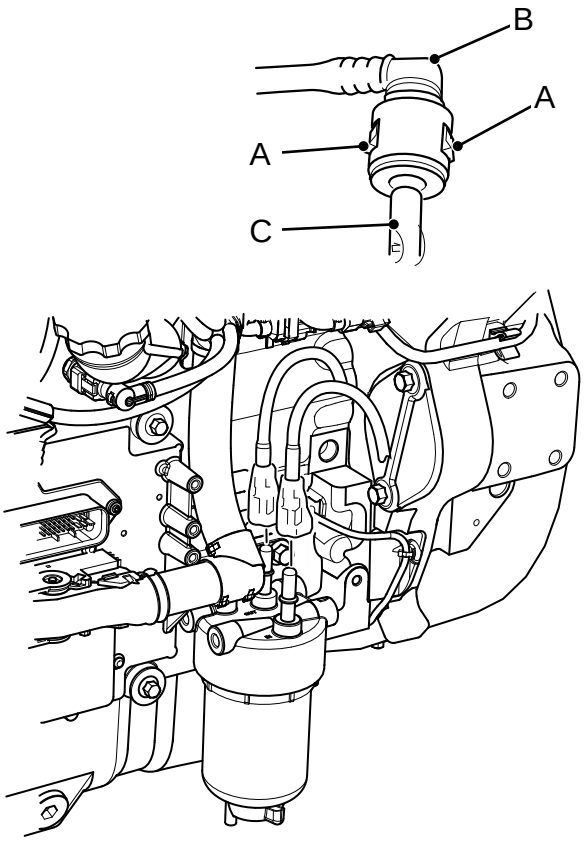
The low pressure fuel pipes have a nylon fitting attached to the pipe that replaces the nut and olive. The fittings are part of the pipe and not a separate item.

1. To release the fuel pipe, first press and hold the release buttons (one each side of the coupler). Push the coupler towards the connector spigot and then withdraw.
2. Cap all open ports to prevent ingress of dirt and debris.

Assemble

1. To install the fuel pipe, press and hold the release buttons. Push the coupler over the connector spigot and release the button. The connector will be heard to click when it is fully home and locked in place.
2. To check that the connection has been fully made, attempt to pull the connector from the connector spigot without releasing the lock mechanism. (A gentle pull is all that is required, if the connection is not correct the connector will release very easily.)

Figure 382.



A Release Buttons
B Coupler
C Spigot

After Assembly

1. Make sure that all the fuel pipes are correctly installed and located in the retaining clips as applicable. If retaining clips are missing or damaged, they must be replaced or renewed.
2. Start the engine and check for fuel leaks.

Injector Bleed-off Pipes

Before Removal

Obey all fuel system health and safety information. Refer to (PIL 18-00).

1. Make sure that the engine is safe to work on. The engine must cool and pressure in the fuel system must decay before you start work. If the engine has been running, wait at least one hour before you start work.
2. Clean the engine. Refer to Engine, Clean (PIL 15-00).
3. Remove the protective cover as follows.

Clean

The cooling pack is located in front of the engine, the pack consists of the engine cooling radiator, hydraulic oil cooler, intercooler and air-conditioning condenser (optional). If the cooler tubes/fins get clogged (by dirt and flies etc.) the radiator and coolers will be less efficient.

1. Remove the front grille.

   Refer to: PIL 06-06-21.

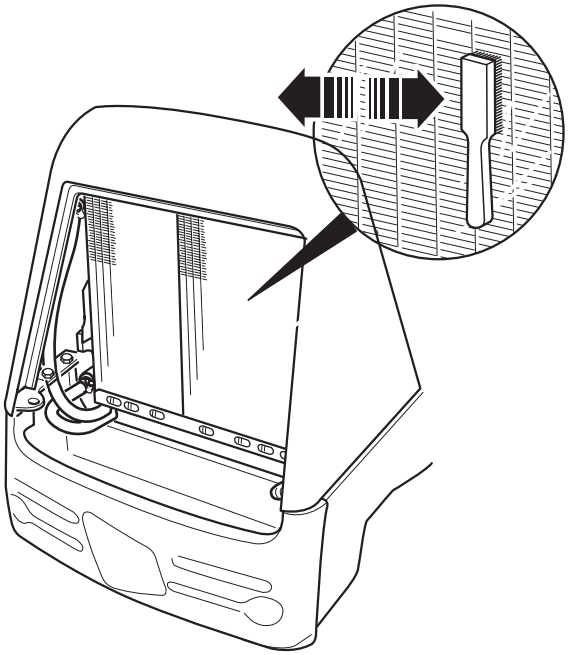
2. Brush off all debris from the cooler tubes and fins. Make sure the loosened material is brushed out of the cooler enclosure.

   2.1. When cleaning the matrix make sure that the brush follows the same direction as the fins are to avoid damaging them. Damaged fins will reduce the cooling efficiency of the matrix.

3. Install the front grille.

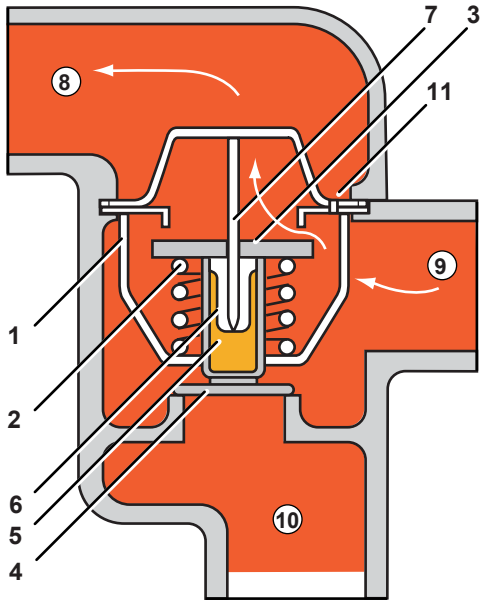
Machines with air conditioning have a condenser matrix installed in front of the oil cooler, the fins of the condenser matrix may get clogged. In this case, clean the tubes/fins of the condenser matrix as described above.

Figure 388.



diameter orifice allows trapped air to be expelled from the system.

Figure 396.



1 Thermostat
2 Spring
3 Top valve plate
4 Bottom valve plate
5 Wax pellet
6 Diaphragm
7 Actuating rod
8 Outlet port to the radiator top hose
9 Inlet port thermostat housing
10 Outlet port bypass gallery
11 1mm diameter orifice

Check (Condition)

1. If the thermostat is suspected of being faulty, perform a thermostat test, refer to Thermostat - Check Operation to confirm its serviceability. Note that the thermostat is a non-serviceable item. If the thermostat is faulty or damaged it must be renewed.
2. Inspect the seal for damage or splits. If necessary renew the seal. Make sure that the seal is correctly located.

00 - General

Fault-Finding

(For: Q-Brake)

Table 175. Oil leakage from protection boot.

Cause	Remedy
Damage on atmospheric seal.	Replace the damaged master cylinder. Check the mineral oil for cleanliness. If necessary, substitute the oil of the circuit in order to avoid contamination. Use only the JCB approved type of oils.

Table 176. Oil leakage from connections.

Cause	Remedy
Loosened connector fixing.	Tighten the connectors to the correct torque value.

Table 177. Oil leakage from master cylinder body.

Cause	Remedy
Breakage and /or cracks.	Replace the damaged master cylinder.

Table 178. Irregular pressure or operation failure.

Cause	Remedy
Master cylinder internal damage.	Identify the damaged master cylinder (left or right) and replace it.

Table 179. Single pedal goes to floor (no brake performance), but when both pedals are applied the brake performance is good.

Cause	Remedy
Internal compensating valve damaged	Identify the damaged master cylinder (left or right) and replace it. Make a note that the master cylinder damaged is the opposite of the master cylinder that is not working properly.

Table 180. Insufficient pressure or long stroke.

Cause	Remedy
Air in the brake circuit.	Bleed the brake system. Check that no siphons are present on the tank pipe.

Adjust

During normal operation little or no adjustment of the brake cable at the lever is required. In the event of poor brake performance it is likely that components have failed or, after extended service, friction material is worn away. Disassemble, inspect and replace components as required. Refer to (PIL 24-18-00).

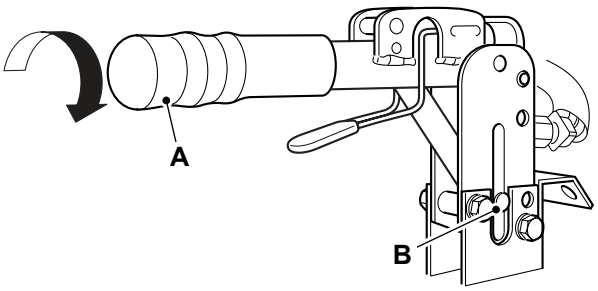
Adjustment at the park brake lever should only be required after renewal of the cable, brake components or extended service.

Before attempting to adjust the park brake after an emergency stop, remove and inspect the brake friction components. Replace components if necessary.

The park brake should be fully engaged when the lever is vertical. The park brake indicator light should come ON when the brake is engaged with the forward and reverse lever away from neutral (ignition switch at IGN).

1. Disengage the parking brake (lever in horizontal position).
2. Turn the handle grip half a turn in a clockwise direction. Refer to Figure 416.

Figure 416.

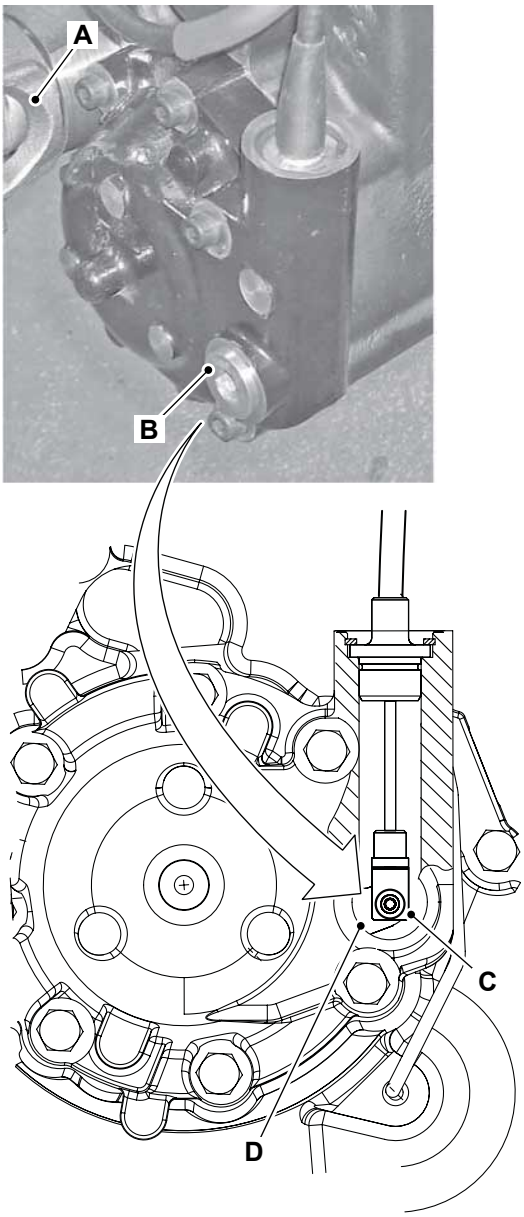


3. Test the park brake.
4. If the brake fails the test, do steps 1 to 3. If there is no more adjustment and the pin (Refer to Figure 416.) is at the end of its travel disassemble, inspect and replace park brake components as required.

Important: After adjusting the park brake lever the following steps MUST be carried out to confirm correct brake operation. Incorrect adjustment can result in damage to the brake components and excessive overheating of the brake assembly.

1. Put chocks under the wheels.
2. Remove the plug. Refer to Figure 417.

Figure 417.

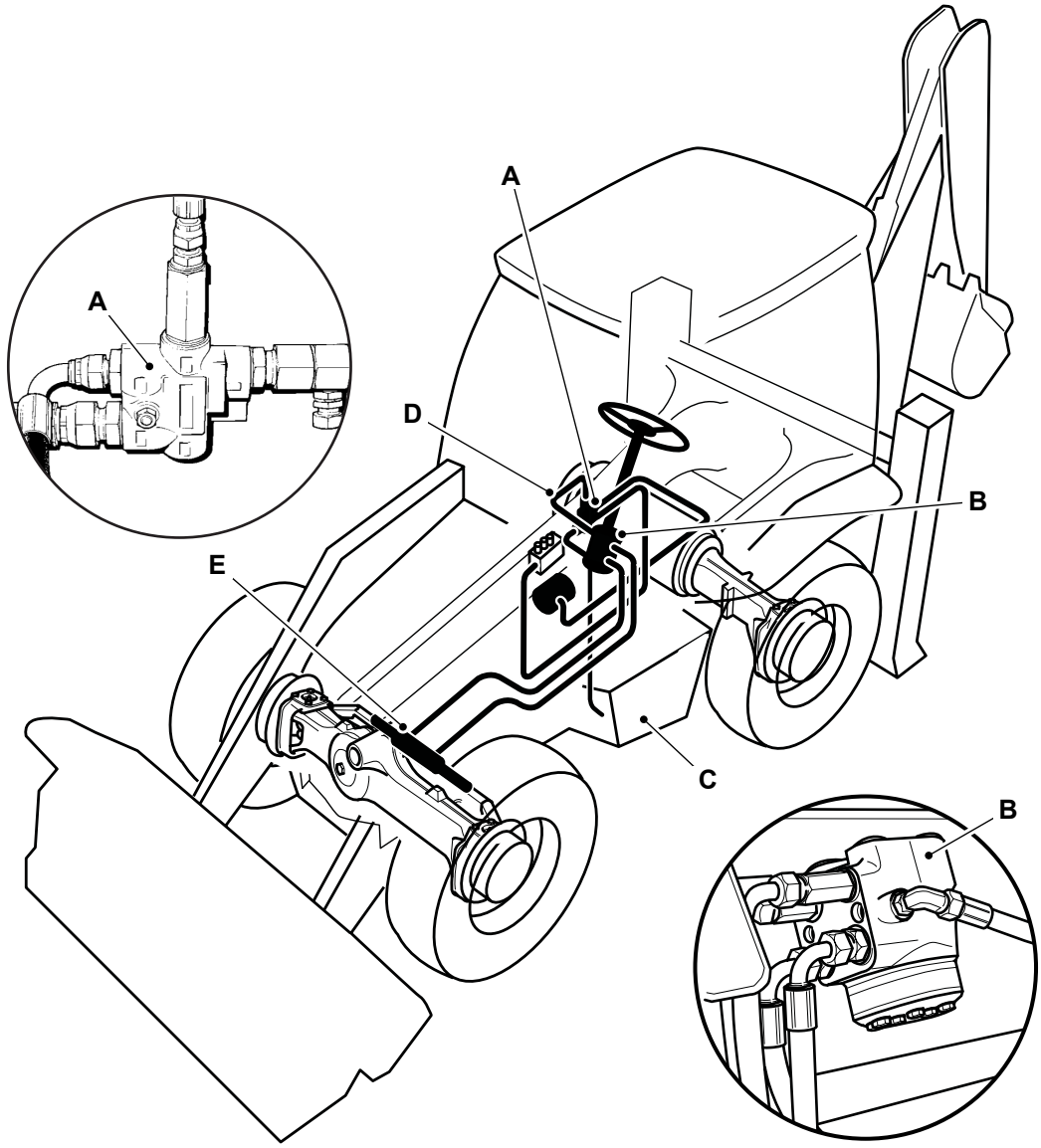


3. When the park brake is disengaged the clevis pin should be clearly visible and in the centre of the access port (Refer to Figure 417.). If necessary check that the park brake is disengaged as follows:
   - 3.1. Disconnect the rear axle propshaft at the gearbox. Refer to (PIL 27-48). Refer to Figure 417.
   - 3.2. Make sure that the output yoke turns by hand. If the yoke will not turn, check the park brake lever adjustment.
   - 3.3. If necessary disassemble, inspect and replace the park brake components as required.

Component Identification

(For: 2416001-2416350, 2496751-2496950, 2615002-2616002)

Figure 427.



A Priority valve
B Load sensing steer unit
C Hydraulic tank
D Load sensing line
E Hydraulic pump

06 - Steer Unit/Valve

Contents **Page No.**

17 Bearing (x2)
18 Thrust washer
19 Flexible coupling
20 Nut 2
21 Bolt 3

Assemble

1. The installation procedure is the opposite of the removal procedure.

00 - General

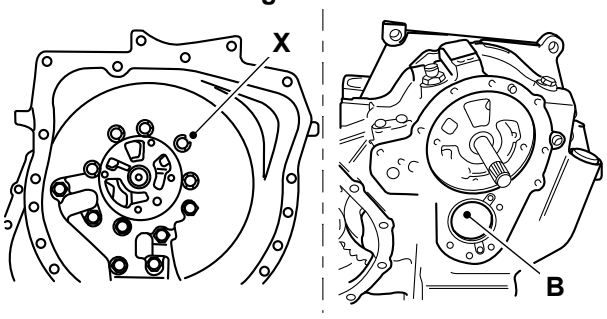
Introduction

A manual gearbox is a type of transmission used in motor vehicle applications. It uses a driver operated clutch, engaged and disengaged by a foot pedal, for regulating torque transfer from the engine to the transmission and a gear lever operated by hand.

A typical JCB manual transmission is called Synchro Shuttle, of which the following types exist:

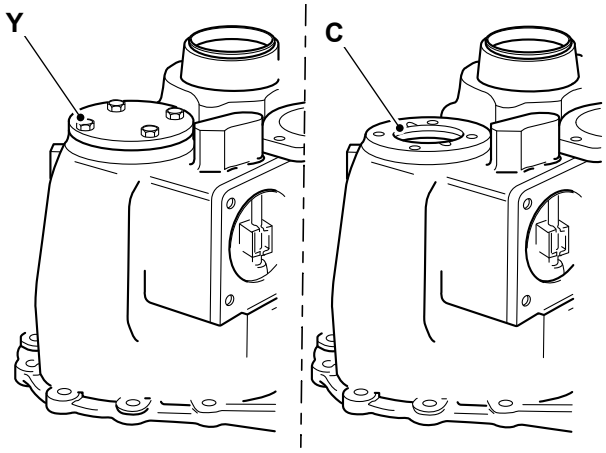
- SS500
- SS600
- SS620
- SS700
- SS750

Figure 480.



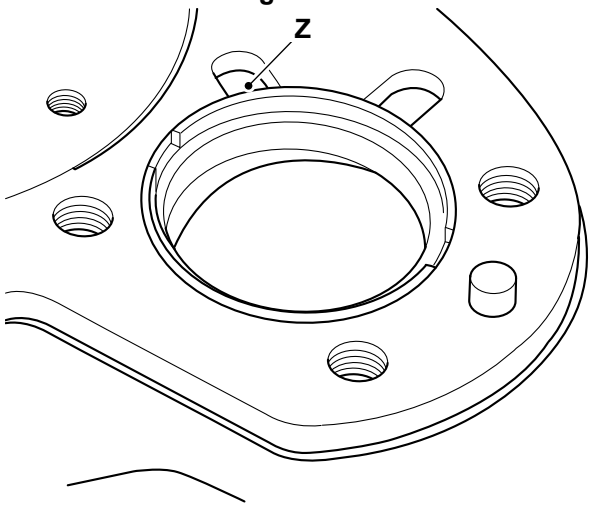
X Bolt
B Position

Figure 481.



Y Bolt
C Position

Figure 482.



Z Ring

4.1. Carefully prise out the staked section of the ring clear of the casing.

4.2. Using the special socket adaptor, unscrew and discard the ring. (Use adaptor for the layshaft ring and tool for main shaft).

Special Tool: Ring Socket Spanner (Qty.: 1)
Special Tool: Ring Socket Spanner (Qty.: 1)

4.3. Make sure to remove any shards of metal that may have fallen into the casing.

Important: Once removed, the setting rings must not be re-used. Discard the ring and obtain a new one. Note that the main shaft and layshaft setting rings are not interchangeable.

Inspection

Before assembling the gearbox make sure that a thorough inspection of all components is carried out. Remember that although a failed component may be easy to identify, the cause of that failure may be less easy to trace.

It is also possible that a failed component may have caused damage to other areas of the gearbox.

1. Carefully remove all traces of gasket compound from components as follows:

   1.1. Front and rear casing mating faces.

   1.2. Front casing and torque converter housing mating faces.

2. Clean the inside of the casings using a suitable degreasing agent.

3. Carefully inspect all gears, bearing and shafts for signs of excessive wear or damage. If wear or damage is evident, components must be renewed.

4. Make sure that all oil way cross drillings in the casings, shafts and gears are clear and free from debris. Blocked oil ways are a common cause of bearing failure. Use an air line to blow through cross drillings.

Important: If failure of the reverser unit or hydraulic 2WD/4WD unit is suspected, see the relevant dismantling and assembly procedure in this section.

1st/2nd Gear Synchromesh Unit

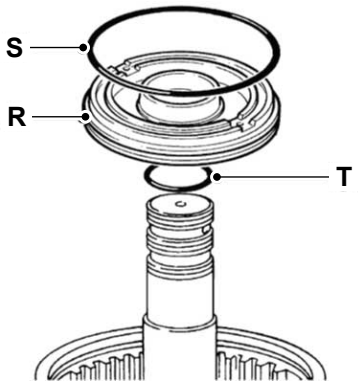
The 1st/2nd gear synchro unit must be checked for wear before assembly as follows:

1. Before dismantling the unit be aware that on assembly, the components must be kept in their original relationships.

2. Dismantle the unit by removing the cones and rings. Push off the sleeve taking care to retrieve the sets of balls, poppets and springs.

3. Inspect the mating faces of cones and rings. The wear indicator grooves must still be visible. As a further check, locate the cones and rings together and measure the clearance between them using feeler gauges.

Figure 521.



R Piston
S Piston O-ring
T Shaft O-ring

20. Remove and discard the piston O-ring and shaft O-ring. Refer to Figure 521.

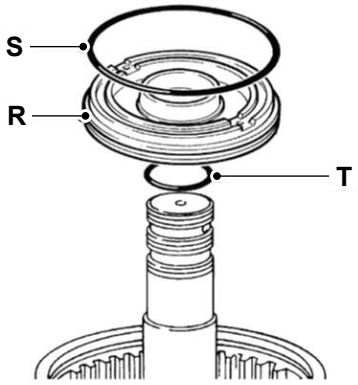
21. Do the step from 3 to 20 again, to disassemble the opposite side clutch.

Before you assemble the clutch assembly check the condition of the clutch assembly. Refer to Manual Gearbox, Clutch- Forward/Reverse, Check Condition (PIL 27-03-06).

Assembly

1. Install new O-rings to the piston and shaft. Lubricate the piston with oil and push fully into the bore of the clutch housing. Refer to Figure 522.

Figure 522.

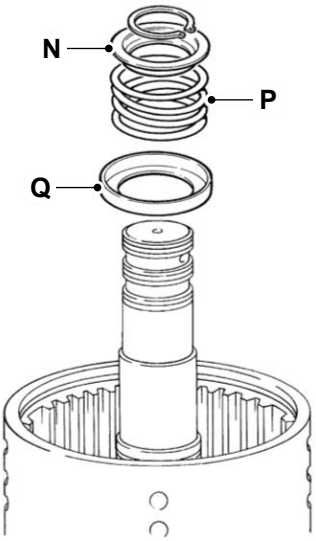


R Piston
S Piston O-ring
T Shaft O-ring

2. Install the oil baffle and the piston spring. Refer to Figure 523.

3. Make sure that the spring seats in the piston. Refer to Figure 523.

Figure 523.

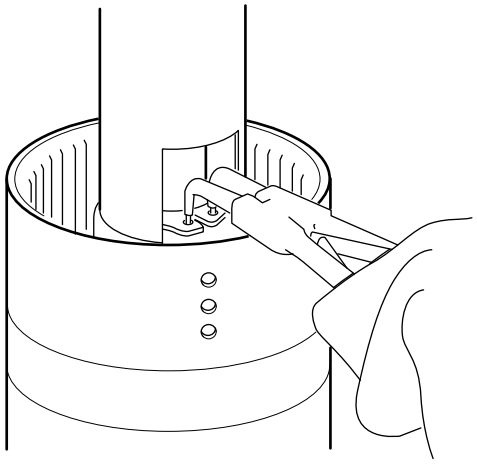


N Spring retaining plate
P Spring
Q Oil baffle

4. Install the spring retaining plate. Refer to Figure 523.

5. Compress the spring and install the circlip. Refer to Figure 524.

Figure 524.



6. Install the disc spring and then install the assembly so that the outer diameter curves are away from the clutch piston. Refer to Figure 525.

Check (Condition)

If damage to any component or distortion of the spool is evident the complete valve assembly must be renewed. Great care should be taken when dismantling and assembling the valve to avoid the following:

- Contamination
- Damage to spools
- Damage to seal grooves

Any of the above may result in possible problems with the operation of the valve.

Remove and Install

Consumables

Description	Part No.	Size
JCB Transmission Fluid EP SAE 30	4000/2601	5L
	4000/2605	20L
	4000/2603	200L

The procedure for the solenoid control valves is the same. The following procedure is for one valve. The gearbox shown has three solenoid valves, other gearbox variants may contain a different quantity of valves.

Remove

1. Tag and disconnect the electrical harness connector (if installed) at the solenoid coil.
2. Remove the two screws.
3. Clean the area around the valve stem and the gearbox case. Do not allow particles of grit to fall into the gearbox.
4. Remove the solenoid valve from the gearbox case.

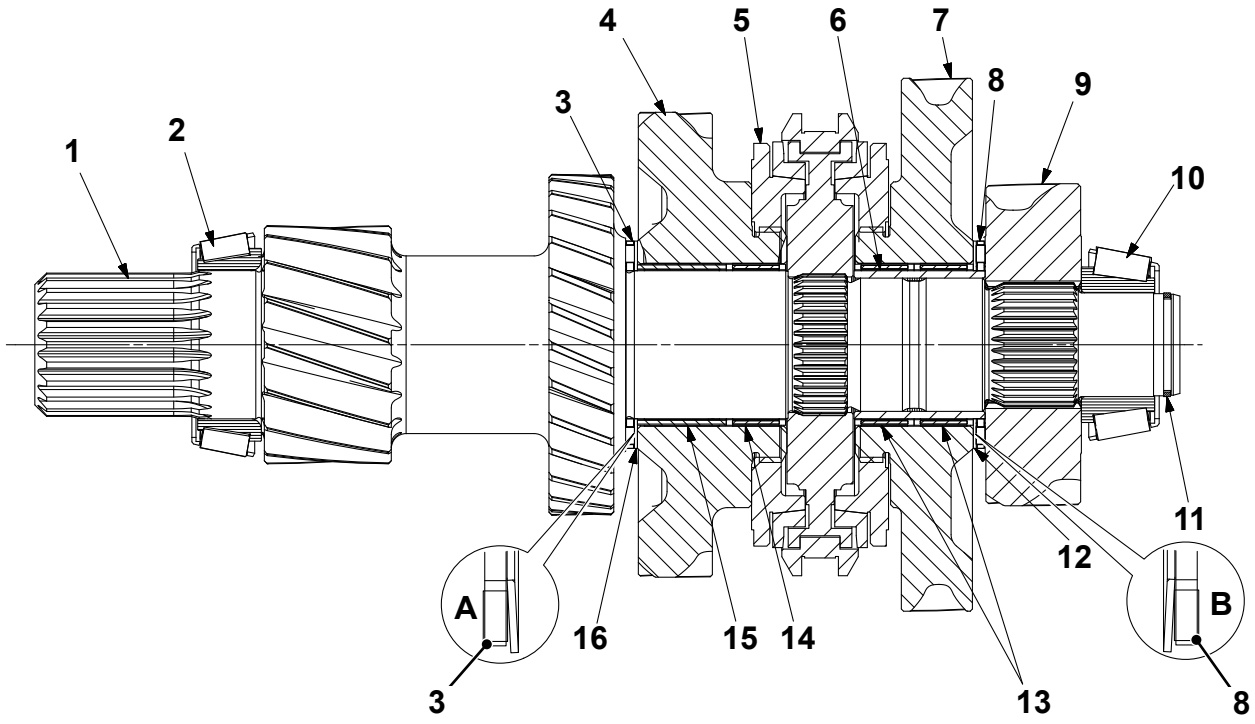
45 - Piston Ring Seal

Introduction

A piston ring is a split ring that fits into a groove on the outer diameter of a piston.

Assembly

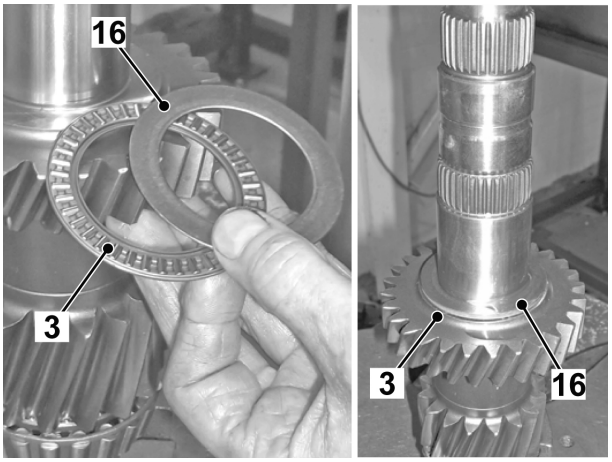
Figure 578.



1 Layshaft
2 Bearing 1
3 Thrust bearing 2
4 Gear 3
5 Synchro assembly
6 Track ring
7 Gear 2
8 Thrust bearing 1
9 Gear 1
10 Bearing 2
11 Piston seal ring
12 Bevelled thrust washer 1
13 Needle roller bearing 1
14 Needle roller bearing 2
15 Needle roller bearing 3
16 Bevelled thrust washer 2

1. Install the bearing thrust washer 2. Refer to Figure 579.

Figure 579.



3 Thrust bearing 2
16 Bevelled thrust washer 2

Disassemble and Assemble

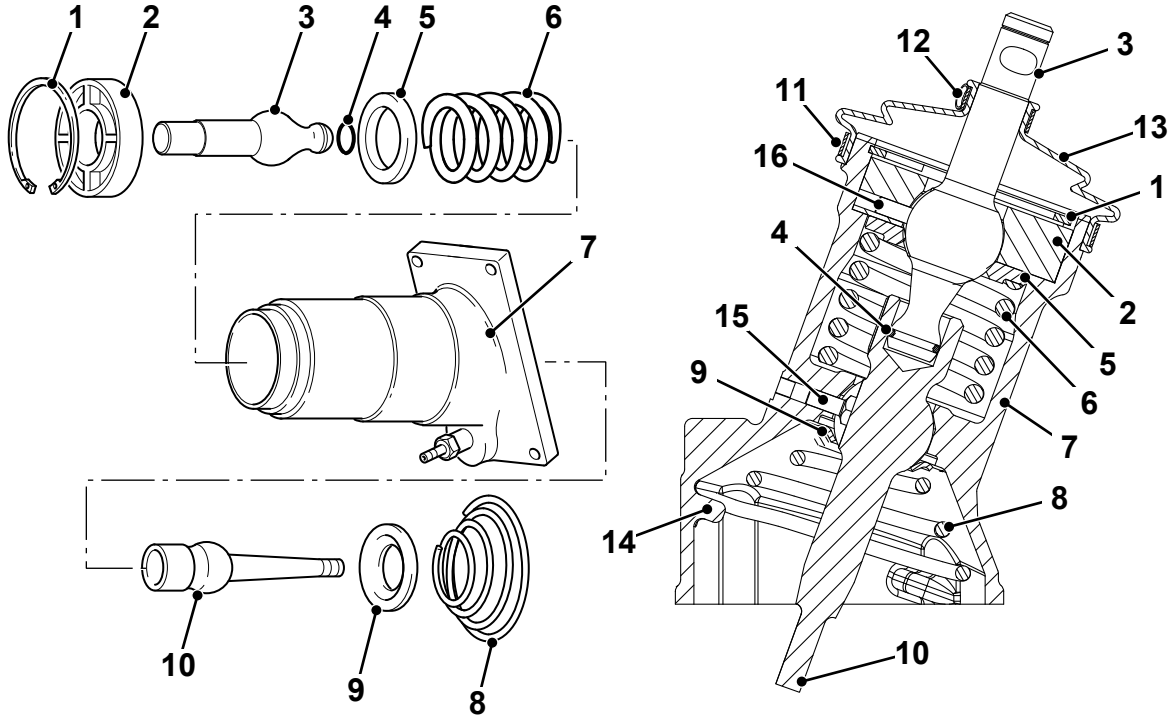
Disassemble

1. Remove the gear lever.
2. Slacken the worm drive clips. Remove the rubber gaiter.

   CAUTION! *Beware of spring pressure acting on the bush when the circlip is removed.*

3. Use a suitable press or clamp to carefully press the top lever down to compress the spring 6, to release pressure on the circlip 1.
4. Remove the circlip.
5. Slowly release the pressure from the top lever and remove it, together with the bush, washer and spring 6.
6. Rotate the spring 8 so as to disengage from the retaining tabs inside the gear lever turret. Be aware that the spring may suddenly disengage while still under pressure. Repeat this operation until all the coils are disengaged and the spring can be removed.
7. Remove the retainer and the lower lever.

Figure 599.



1 Circlip
2 Bush
3 Top lever
4 O-ring
5 Washer
6 Spring
7 Gear lever turret
8 Spring
9 Retainer
10 Lower lever
11 Worm drive clip
12 Worm drive clip
13 Gaiter
14 Retaining tabs
15 Turret peg
16 Turret peg

Replacement is the opposite of the removal procedure. During the replacement procedure do the following work:

Assemble

1. Lubricate liberally the working surfaces before assembling.
2. Make sure that the O-ring is free from damage. Install the O-ring correctly.

00 - General

Introduction

The torque converter is a type of fluid coupling that is used to transfer rotating power from the engine to a rotating driven load.

The torque converter normally takes the place of a mechanical clutch in a vehicle with an automatic transmission, allowing the load to be separated from the power source.

It is usually located between the engine flywheel and the transmission.

The key characteristic of a torque converter is its ability to multiply torque when there is a substantial difference between input and output rotational speed, thus providing the equivalent of a reduction gear. Some torque converters are equipped with a temporary locking mechanism which rigidly locks the engine to the transmission when their speeds are nearly equal, to avoid slippage and a resulting loss of efficiency.

20 - Axle

Contents **Page No.**

Figure 629.

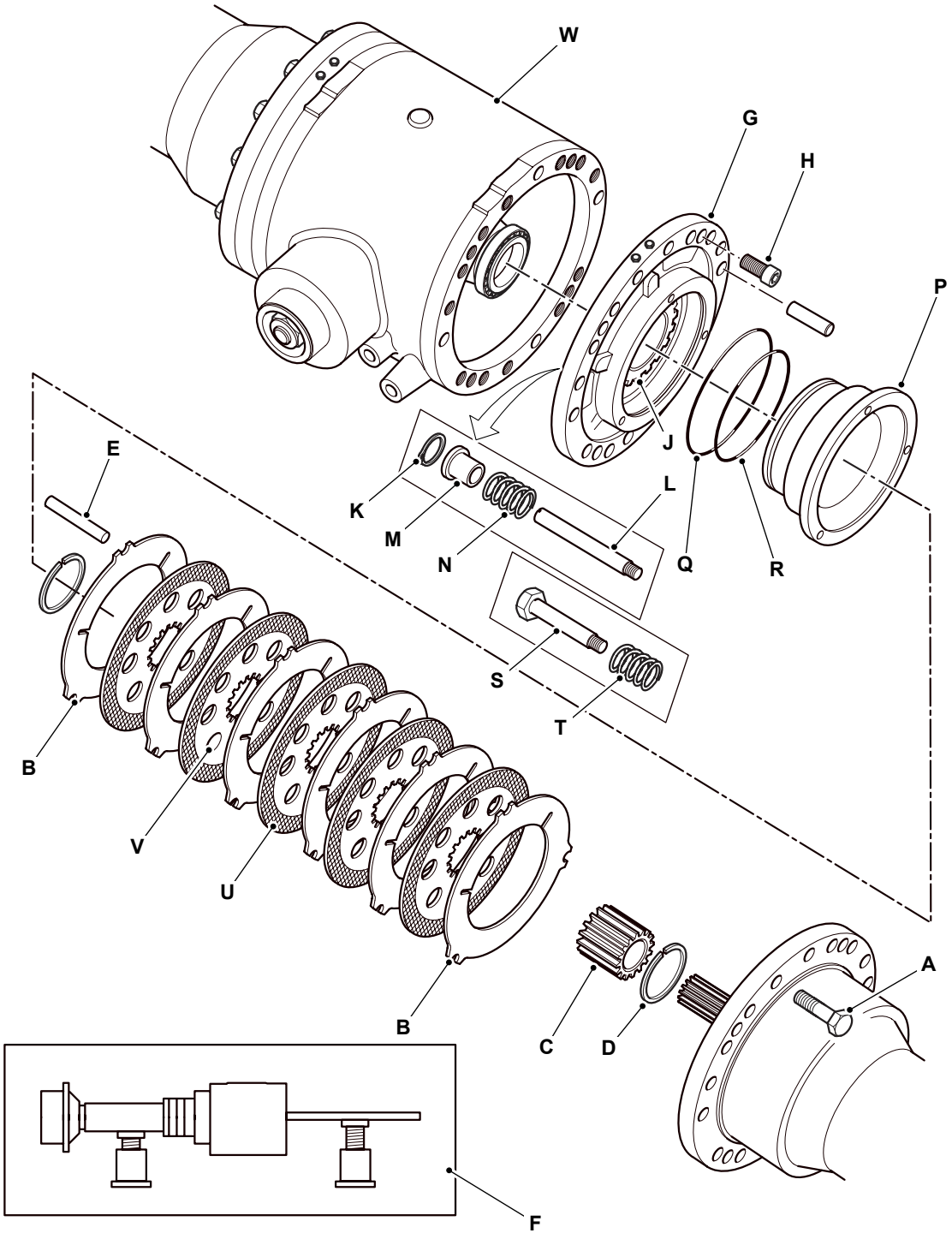


Table 227.

Item	Description
A	Bolt 1
B	Counter plate
C	Plate carrier
D	Circlip 1
E	Reaction pin
F	Support for differential
G	Brake piston housing
H	Capscrew

29 - Wheel

Contents **Page No.**

30 - Hydraulic System

Contents **Page No.**

Page 30-16

Figure 646. Service Operation

Page 30-17

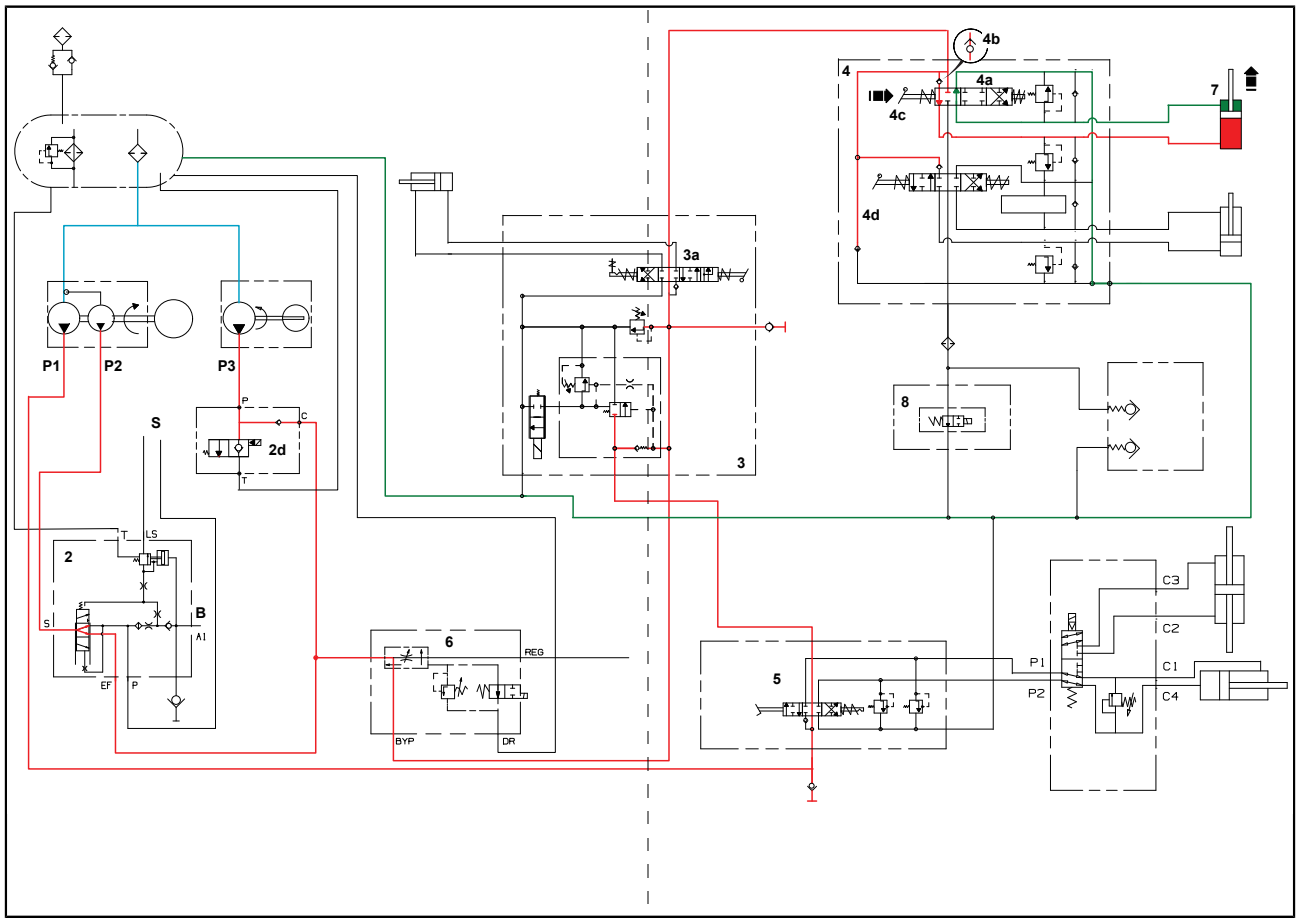


Figure 651.

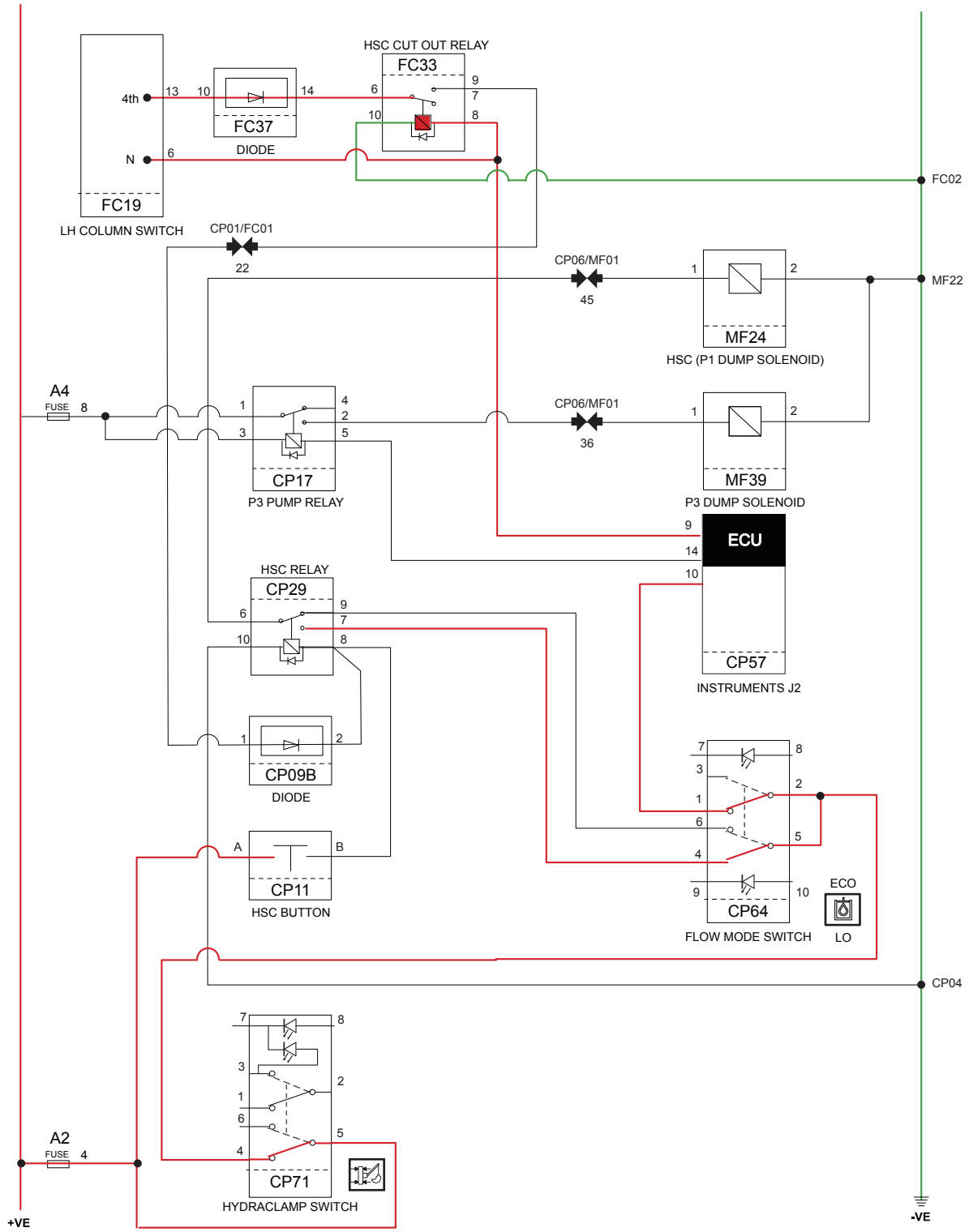
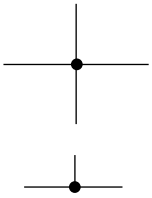
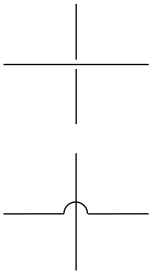
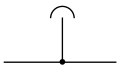
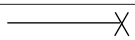
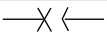
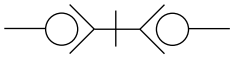
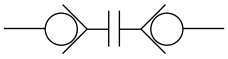
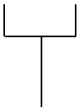
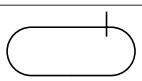
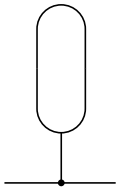

HSC CUT OUT RELAY
FC33
4th
13
10
14
FC37
DIODE
N
6
FC19
LH COLUMN SWITCH
CP01/FC01
22
FC02
CP06/MF01
45
MF22
MF24
HSC (P1 DUMP SOLENOID)
A4
FUSE
8
CP17
P3 PUMP RELAY
CP06/MF01
36
MF39
P3 DUMP SOLENOID
ECU
CP57
INSTRUMENTS J2
HSC RELAY
CP29
CP09B
DIODE
CP11
HSC BUTTON
CP64
FLOW MODE SWITCH
ECO
LO
CP04
A2
FUSE
4
CP71
HYDRACLAMP SWITCH
+VE
-VE

Table 255. Energy Transmissions and Conditioning

Symbol	Description
	Working line, return or feed
	Pilot control
	Drain lines
	Flexible pipe
	Line junction
	Crossing lines
	Air bleed
	Line plugged, also pressure test point
	Line plugged with take-off line
	QRC (Quick Release Coupling) - connected
	QRC - disconnected
	Tank - return line above fluid level
	Tank - return line below fluid level
	Header tank
	Pressure sealed tank
	Accumulator

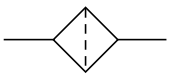
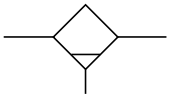
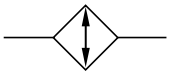
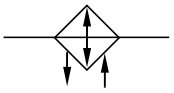
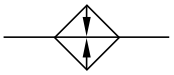
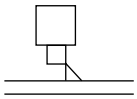
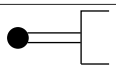
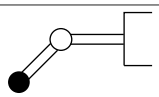
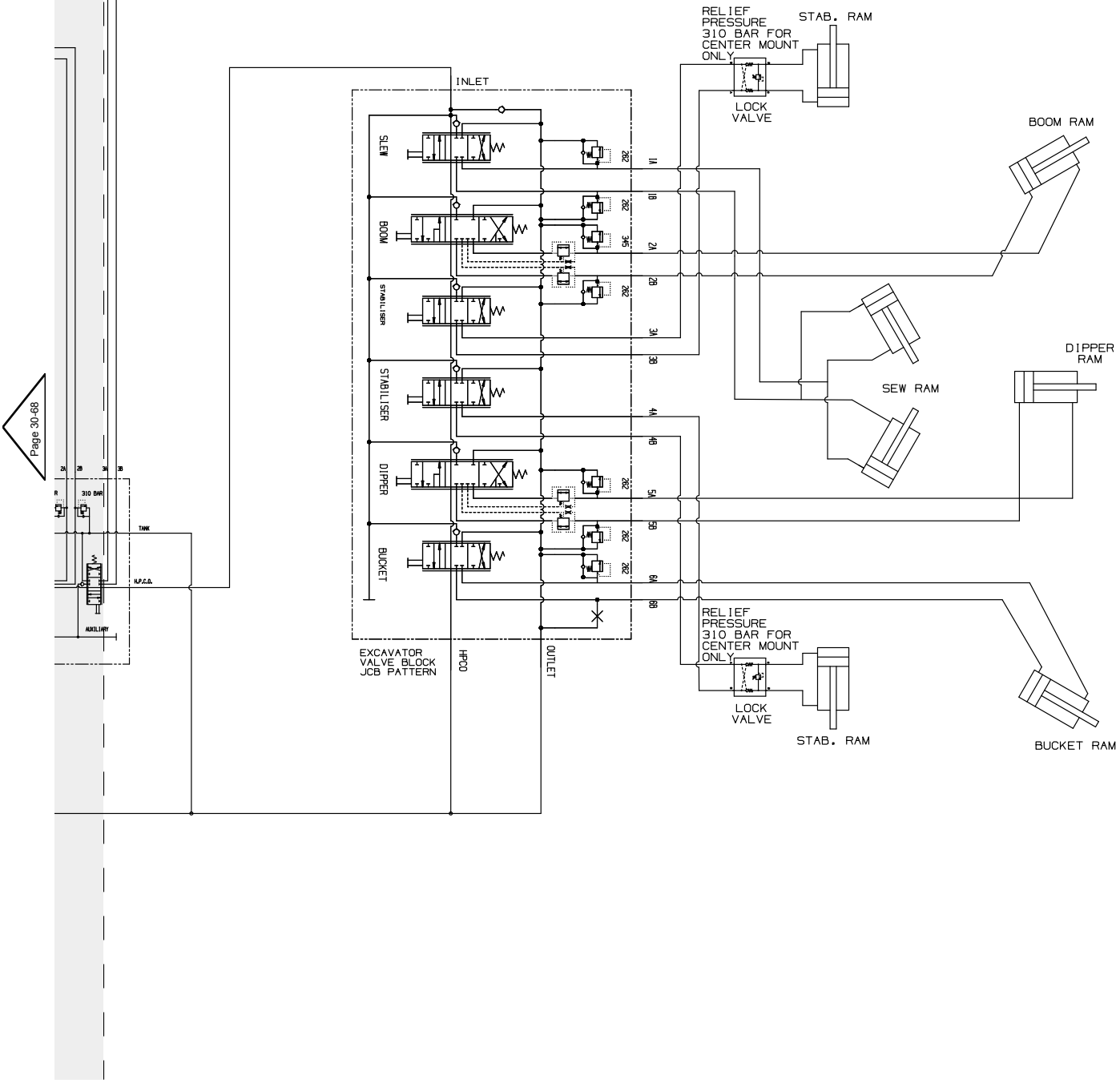
Symbol	Description
	Filter or strainer
	Water trap
	Cooler - with no indication of coolant flow
	Cooler - indicating direction of coolant flow
	Heater

Table 256. Control Mechanisms

Symbol	Description
	Rotating shaft - one direction
	Rotating shaft - two directions
	Detent
	Locking device
	Over centre device
	Simple linkage
	General control
	Push button operated
	Lever operated
	Pedal operated
	Stem operated
	Spring operated
	Roller operated
	Roller trip operated (one directional)
	Solenoid one winding
	Solenoid two windings

Page 30-68 Page 30-69

jure 665. (Part 2 of 2)

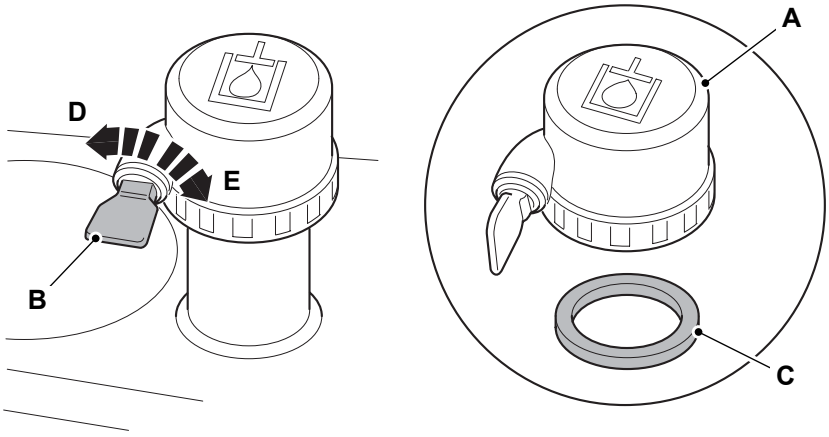


Remove and Install

Remove

1. Make the machine safe.
   Refer to: PIL 01-03-27.
2. Get access to the hydraulic tank filler cap. Refer to Figure 672.
3. Make sure that the area around the hydraulic tank filler cap is clean. Refer to Figure 672.
4. Insert the key and turn counterclockwise to remove the filler cap. Refer to Figure 672.
5. Remove the filler cap from the hydraulic tank.

Figure 672.

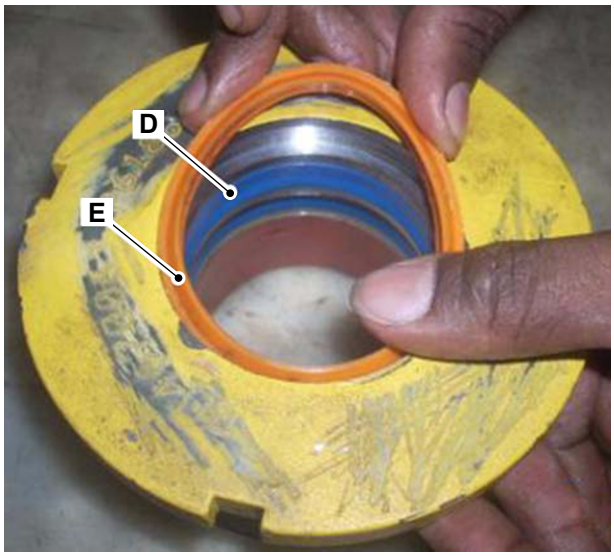


A Filler cap
B Key
C Seal
D Counterclockwise
E Clockwise

Assemble

1. When you assemble the gear pump, replace all the seals and O-rings.
   1.1. Use JCB Special Hydraulic Fluid to lubricate the seals and O-rings.
   Consumable: JCB Hydraulic Fluid HP 46
2. Install the shaft seals into the mounting flange.
   2.1. When you install the shaft seals, make sure that the orientation of the seal lip faces are correct, as recorded on disassembly.
3. Install the circlip into the flange groove.
   3.1. Apply a coat of high melting point grease to the seal lips.
   Consumable: Special MPL-EP Grease
4. If the seal recess of the mounting flange is scored, it is permitted to seal the recess outside diameter.
   4.1. Use JCB Multi-Gasket to seal the recess outside diameter of the mounting flange to prevent leakage.
   Consumable: JCB Multi-Gasket
5. Put the front body rear face on the workbench, install the seal and seal energiser along with the balance plate into the front body.
   5.1. Carefully put the balance plate into the front body bores. Make sure that the seals do not fall out.
   5.2. Make sure that both the holes of the balance plate are facing towards the low pressure side of the body (i.e. large 4 bolts port pattern side).
6. Engage the drive shaft and the driven gear into the existing bores of the front body.
7. Install the balance plate onto the drive shaft and gear stub.
   7.1. Put the seal and seal energiser into the balance plate.
8. Install the O-ring into the mounting flange groove.
9. Apply a small amount of JCB Multi-gasket to the front body face which seals the mounting flange (i.e. the face containing the clamping bolt holes).
   Consumable: JCB Multi-Gasket
10. Carefully put the mounting flange onto the drive shaft at the correct position, as marked on disassembly.
11. Use a soft faced hammer to tap the mounting flange to engage the spigots of the unit.
12. Put the flange face of the front side pump assembly on the workbench.
    12.1. Make sure that the drive shaft does not carry the weight of the unit.
13. Install the O-rings into the rear face grooves of the front body.
    13.1. Install the splined coupling to the front body.
14. Install the rear body onto the front body at the correct position, as marked on disassembly.
    14.1. Make sure that the rear body engages to all dowels.
    14.2. Make sure that all the holes of the clamp bolts are aligned.
15. Install the seal and seal energiser along with the balance plate into the rear body.
    15.1. Carefully put the balance plate into the rear body bores. Make sure that the seals do not fall out.
    15.2. Make sure that the holes of the balance plate are facing towards the low pressure side of the body (i.e. without port pattern side).
16. Install the drive gear into the bore of the rear body with installed splined coupling.
17. Install the driven gear into the bore of the rear body.
18. Install the balance plate onto the gear shafts.
    18.1. Put the seal and seal energiser into the balance plate.
19. Install the O-ring into the end cover.
20. Apply a small amount of JCB Multi-gasket to the rear body face which seals the end cover (i.e. the face containing the clamping bolt holes).
    Consumable: JCB Multi-Gasket
21. Install the end cover to the rear body at the correct position, as marked on disassembly.
22. Carefully put the bolts with the washers through the unit to assemble the pump.
    22.1. Tighten the bolts to the specified torque range.
    Torque: 90–100N·m
    22.2. Tighten the bolts equally in a diagonal sequence.

Figure 699.



7. Put the piston O-rings into the piston grooves. Refer to Figure 700.

Figure 700.

F O-rings

8. Put the piston seal into the piston groove. Refer to Figure 701.

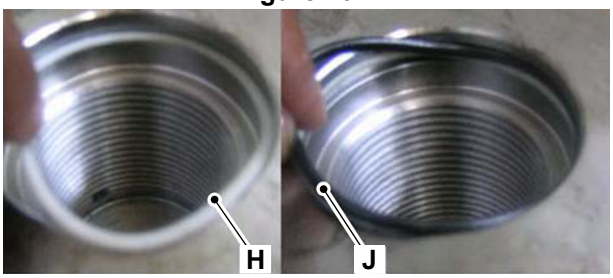
Figure 701.

G Piston seal

9. Make sure that the screwdriver does not have sharp edges which is used to install the seals.

10. Put the piston O-ring and the backing ring inside the piston head. Refer to Figure 702.

Figure 702.



H O-ring
J Backing ring

11. Use a cotton cloth to clean the piston rod. Refer to Figure 703.

Figure 703.

K Piston rod

21 - Swing

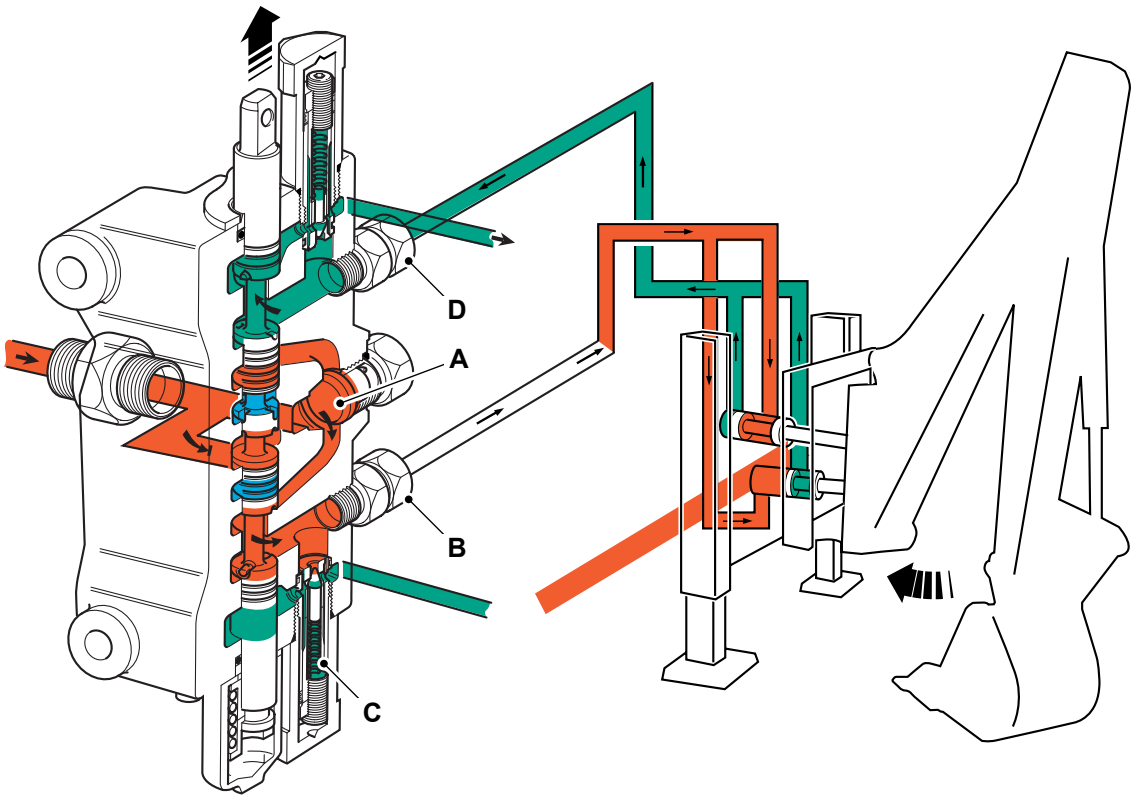
Operation

Slew Operation

The illustration shows the right hand swing selected. The lower port has been pressurised by the spool. Oil flows from the parallel gallery, out past the ARV (Auxiliary Relief Valve) to both the head side of the left hand swing ram and the rod side of the right hand swing ram.

The boom therefore swings to the right hand side of the machine. Displaced oil from the rod side of the left hand swing ram and from the head side of the right hand swing ram flows back through the upper service port and back to tank.

Figure 723.



A Parallel gallery
B Lower service port
C ARV
D Upper service port

34 - Steering

Disassemble and Assemble

For: 2000000-2019999, 2098876-2113876, 2254521-2274521 ..... Page 30-159

(For: 2000000-2019999, 2098876-2113876, 2254521-2274521)

Special Tools

Description	Part No.	Qty.
Ram Piston Nut Removal Installation Spanner 65mm A/F	993/99514	1
Ram Piston Nut Removal Installation Spanner 100mm A/F	993/99519	1

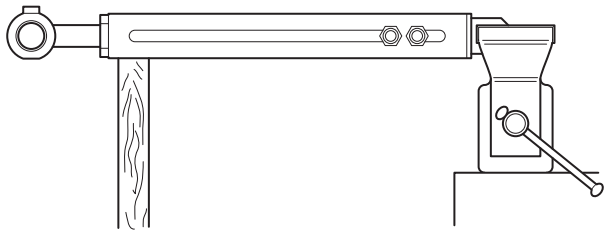
Consumables

Description	Part No.	Size
JCB Activator	4104/0251	0.2L
	4104/0253	1L
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L

Disassemble

1. Disassemble the cylinder ram in the numerical sequence. Refer to Figure 769.
2. Put the ram assembly in a vice. Refer to Figure 767.

Figure 767.



3. Use the special tool to loosen the end cap assembly to remove the cylinder of the steering ram.

   Special Tool: Ram Piston Nut Removal Installation Spanner 65mm A/F (Qty.: 1)
   Special Tool: Ram Piston Nut Removal Installation Spanner 100mm A/F (Qty.: 1)

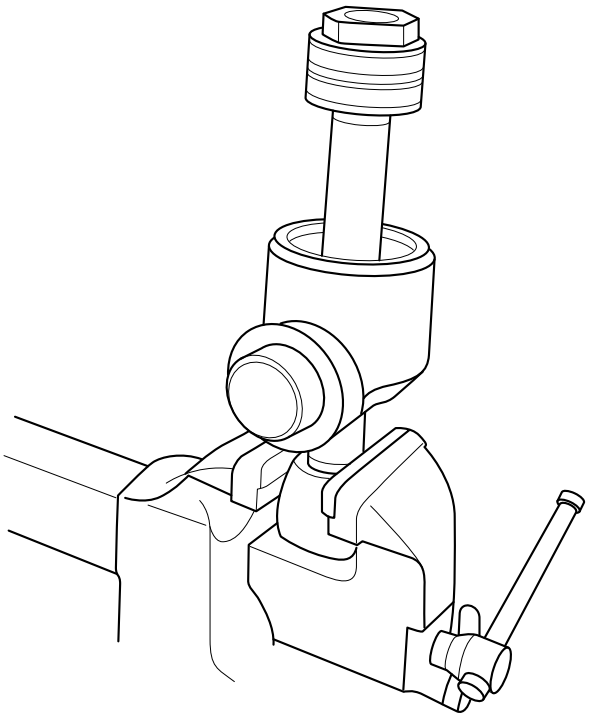
   3.1. Use a Nylon drift to tap the cylinder slightly to remove from the end cap assembly.

   CAUTION! *If air or hydraulic pressure is used to force out the piston assembly, ensure that the end cap is securely installed. Severe injury can be caused by a suddenly released piston rod.*

4. Put the piston rod assembly in a vice. Refer to Figure 768.

   4.1. Make sure that the piston rod assembly is attached to the vice in the vertical position at eye end.

Figure 768.



5. Remove the seals and wear rings from the piston head.
6. Use a metric screw (M3, M4 or M6 depends on the ram size) to remove the dowel from the piston head which is threaded into the extractor hole.
7. Use the special spanner to remove the piston head from the piston rod.
8. Remove the O-ring.
9. Remove the end cap assembly from the piston rod.

   9.1. Remove the O-ring, rod wiper seal and rod seal from the end cap assembly.

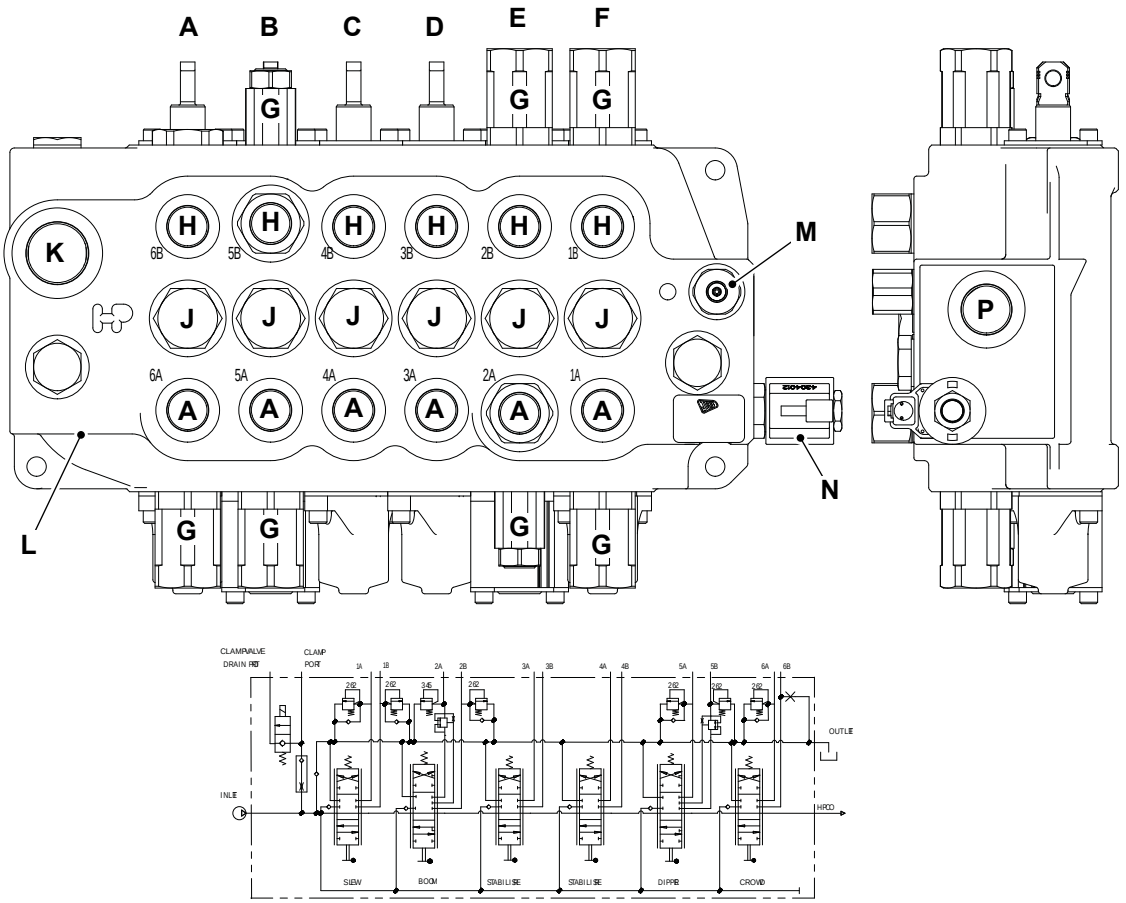
10. Check the end cap bearing for damage, scores or nicks.

Component Identification

For: Manual Controls, 2442701-2451000
..... Page 30-177

(For: Manual Controls, 2442701-2451000)

Figure 783.



A Bucket service
B Dipper service
C Stabiliser service
D Stabiliser service
E Boom service
F Slew service
G ARV (Auxiliary Relief Valve)
H Service ports
J Load hold check valve assemblies
K Tank port
L HPCO (High Pressure Carry Over) port
M Hydraclamp port (Sideshift)
N Hydraclamp solenoid (Sideshift)
P Inlet port

The system shown is for JCB plus pattern and JCB diagonal pattern. For ISO system, the boom and dipper spools change position, i.e. boom is position B and dipper is position E. The bottom ARV from spool E will also be swapped with the bottom ARV from spool B.

17.2. Use the special spanner slot to engage the nut at the end of the setting body, turn the nut counterclockwise to loosen the ARV adjusting screw locknut.

18. Carefully put an Allen key into the adjusting pin.

18.1. Push the adjusting pin down and make sure that it is engaged with the ARV adjusting screw.

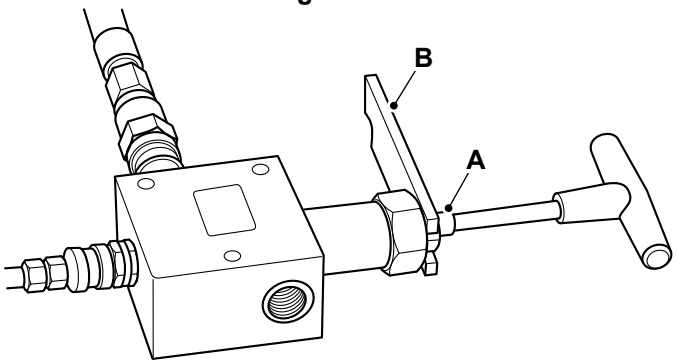
19. Turn the Allen key to adjust the ARV set pressure.

19.1. Turn the Allen key in a clockwise direction to increase the ARV set pressure.

19.2. Turn the Allen key in a counterclockwise direction to decrease the ARV set pressure.

20. After the ARV set pressure adjustment, use a special spanner slot to lock the ARV adjusting screw lock nut.

Figure 806.



A Adjusting pin
B Special spanner

20.1. Make sure that the pressure is kept at the valve inlet to tighten the locknut.

21. When you get the correct ARV set pressure, remove the pressure from the test block.

21.1. Remove the ARV sub-assembly with the setting body from the test block.

22. Disconnect the ARV sub-assembly from the setting body.

23. Install the ARV sub-assembly into the cap.

(For: Manual Controls, 2442701-2451000)

Some hydraulic services are installed with ARV.

ARVs are set at pressures less than, or more than, the MRV (Main Relief Valve) pressure setting depending on the applicable hydraulic service. This is to prevent damage to the machine and ensure the safe handling of loads.

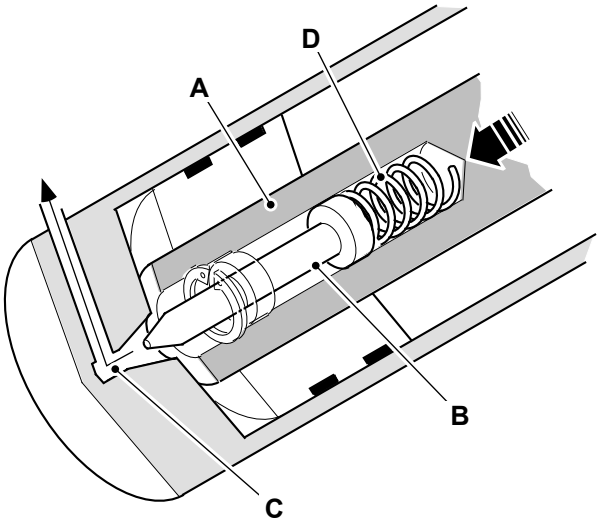
To identify possible faulty ARVs refer to the applicable fault finding tables (PIL 30-00).

The pressure setting of the auxiliary relief valves is not adjustable. If a faulty ARV is suspected replace it with a new one with the correct pressure setting. Refer to the applicable ARV procedure.

Slew Ram End Damping

As the ram nears the closed position, damping rod seats in cone, where it is held by spring. Tapered flutes on the end of the rod produce a restricting orifice, thus restricting the speed of the oil being exhausted from the ram. This provides a cushioning effect between the piston and the dump end of the ram, effectively damping out the shock loads which would otherwise occur when the boom reaches the end of its slewing arc.

Figure 818.



A Ram
B Damping rod
C Cone - rod seat
D Spring

Slew ARV and Anti-Cavitation Operation

The spool is in neutral but the momentum of the slewing excavator end creates back pressure in the head side of the right slew cylinder and in the rod side of the left slew cylinder. This opens slew rod ARV and dumps oil to exhaust. At this point the cylinders cavitate and exhaust oil pressure causes slew head ARV to open, allowing oil from the exhaust gallery to fill the left cylinder.

N Spool rod
P Circlip
Q Clapper
R Detent pin
S Lower cup
T Retainer spring
U Upper cup
V Spool cap

Disassemble and Assemble

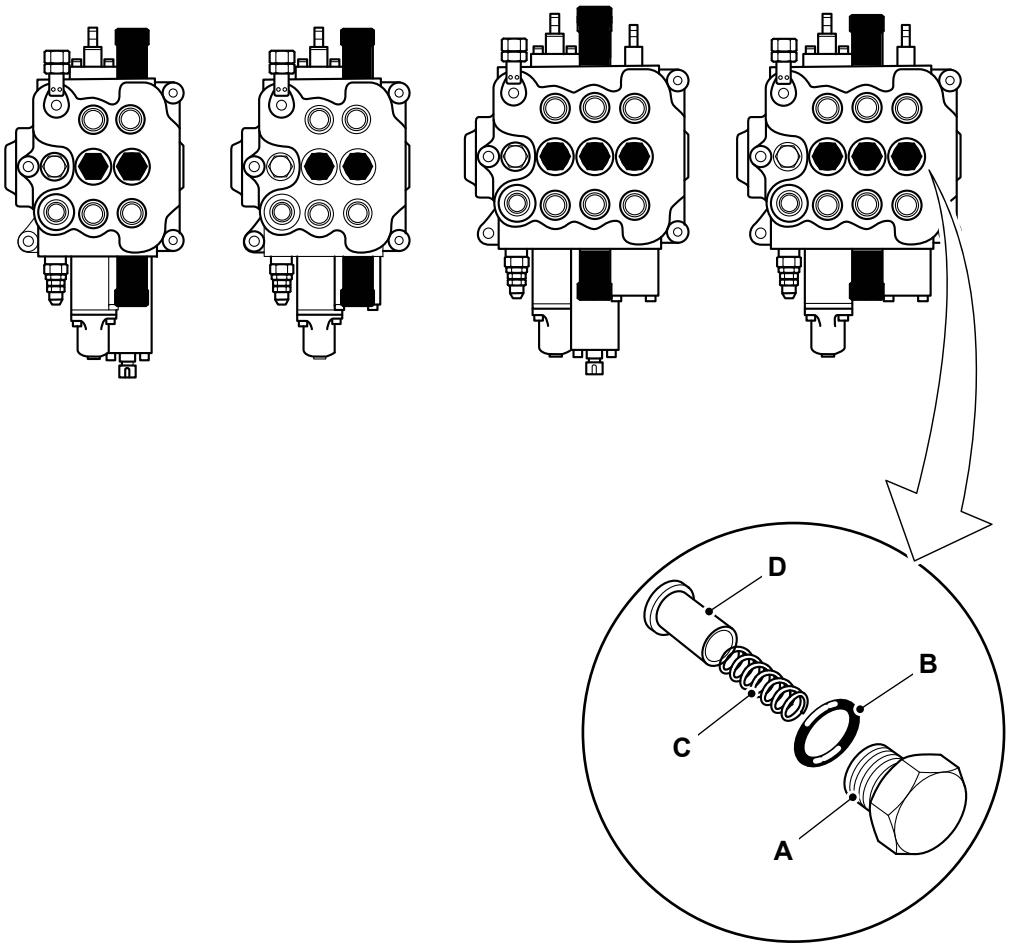
For: Manual Controls, 2442701-2451000
..... Page 30-249

(For: Manual Controls, 2442701-2451000)

Disassemble

1. Disassemble the load hold check valve in the alphabetical sequence shown. Refer to Figure 843.
2. Make sure of the following, when you disassemble the load hold check valve.
   - 2.1. Do not contaminate any of the load hold check valve components.
   - 2.2. Do not damage the spools.
   - 2.3. Do not damage the seal grooves.
   - 2.4. When you remove the O-rings and seals, use an appropriately rounded tool that will not cause any damage to the seal grooves.
   - 2.5. Discard all the O-rings and back up rings.
   - 2.6. Do not use worn or damaged items.
   - 2.7. Make sure that the seating faces on the poppet and the mating face of the valve block are in good condition.
   - 2.8. Inspect the valve components for scratches, nicks or any other type of damage. If necessary, replace the valve.

Figure 843.



A Nut
B O-ring
C Spring
D Poppet

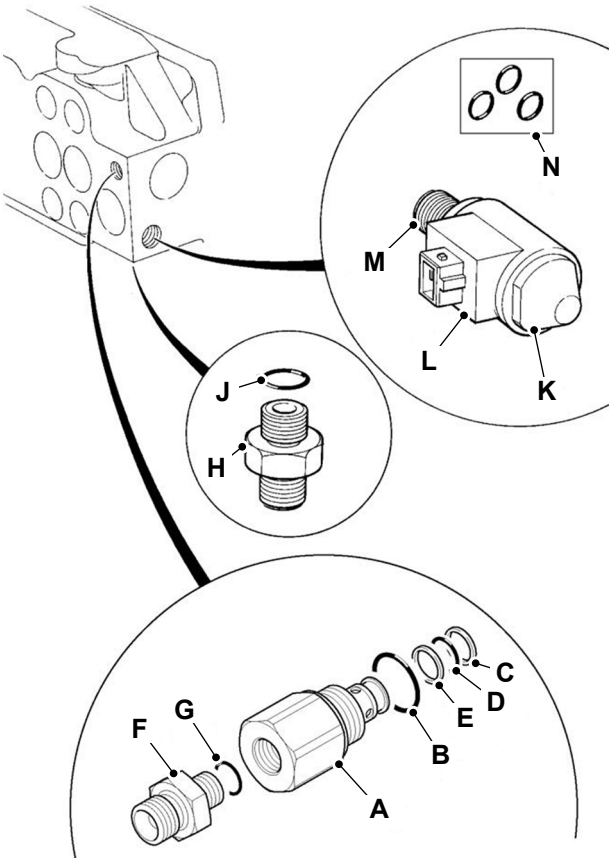
Remove and Install

(For: Manual Controls)

Remove

1. Make the machine safe. Refer to (PIL 01-03).
   1.1. Obey the safety instructions.
2. Remove the hydraulic pressure from the system. Refer to (PIL 30-00).
3. Disconnect the battery. Refer to (PIL 33-03).
4. Get access to the hydraclamp valve that is attached to the excavator valve block.
5. Disconnect the electrical connector from the valve solenoid.
6. Remove the solenoid valve from the excavator valve block.
7. Remove the O-rings from the solenoid valve and discard them.
8. Remove the adaptor from the excavator valve block.
9. Remove the O-ring from the adaptor and discard it.
10. Remove the hydraclamp valve from the excavator valve block.
11. Remove the O-rings from the hydraclamp valve and discard them.

Figure 852.

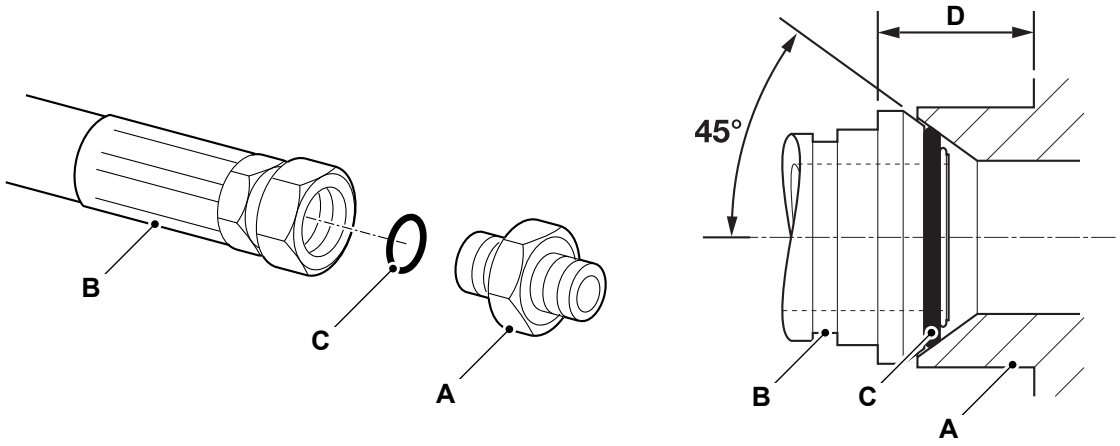


A Hydraclamp valve
B O-ring 1
C Washer 1
D O-ring 2
E Washer 2
F Adaptor - hydraclamp valve
G O-ring - 3
H Adaptor
J O-ring - 4
K Solenoid valve
L Solenoid connector
M Adaptor - solenoid valve

BSP Hose Size in	Nm	kgf m	lbf ft
1 1/4	305.0	31.0	225.0
1 1/2	305.0	31.0	225.0

Torque Stop Hose System

Figure 864.



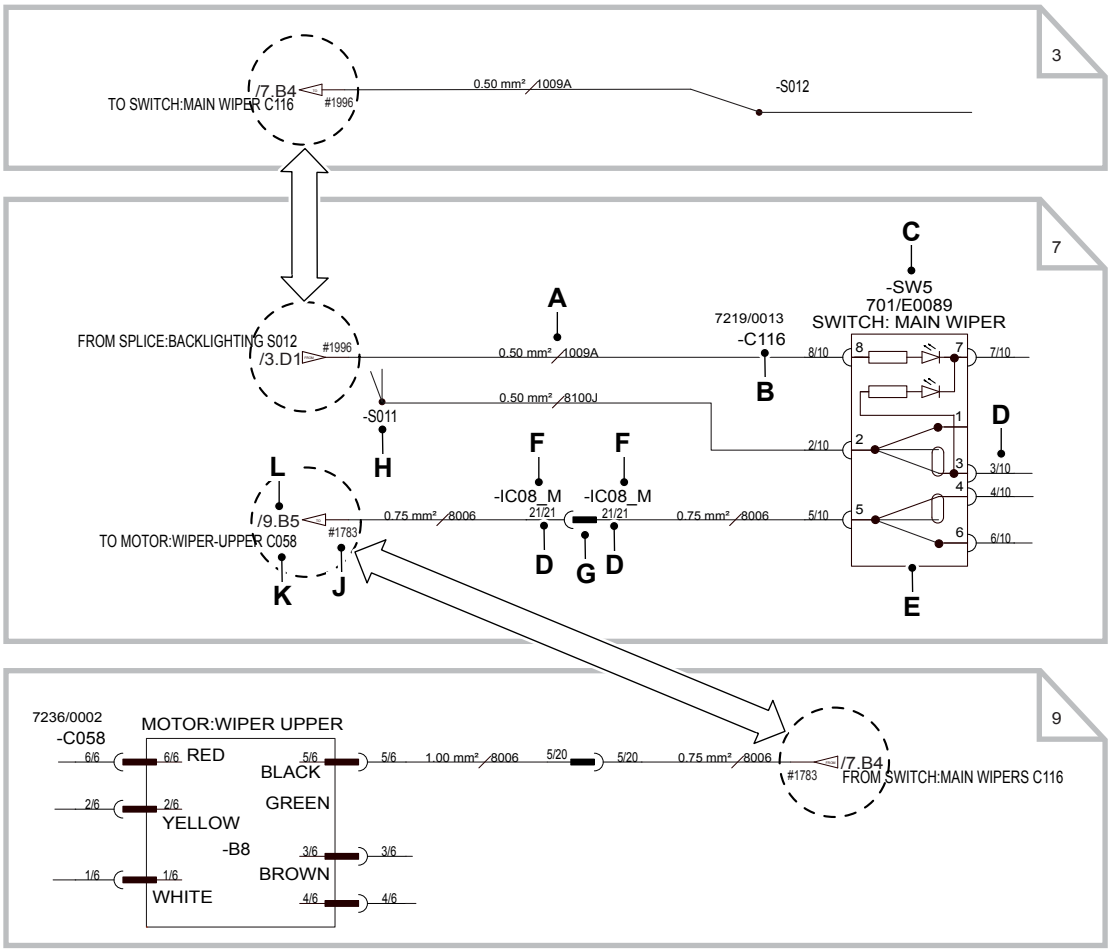
A Adaptor
B Hose
C O-ring
D Shoulder
E Minimum dimension fixed by shoulder.

Torque-Stop hoses installed into adaptors seal onto an `O' ring which is compressed into a 45° seat machined into the face of the adaptor port. To prevent the 'O' ring being damaged as a result of over tightening, Torque-Stop hoses have an additional shoulder, which acts as a physical stop.

Table 285. BSP `Torque Stop' Hose - Torque Settings

BSP Hose Size in.	Hexagon (A/F) mm	Nm	kgf m	lbf ft
1/8	14.0	14.0	1.4	10.0
1/4	19.0	27.0	2.7	20.0
3/8	22.0	40.0	4.1	30.0
1/2	27.0	55.0	5.6	40.0
5/8	30.0	65.0	6.6	48.0
3/4	32.0	95.0	9.7	70.0
1	38.0	120.0	12.2	89.0
1 1/4	50.0	189.0	19.3	140.0
1 1/2	55.0	244.0	24.9	180.0

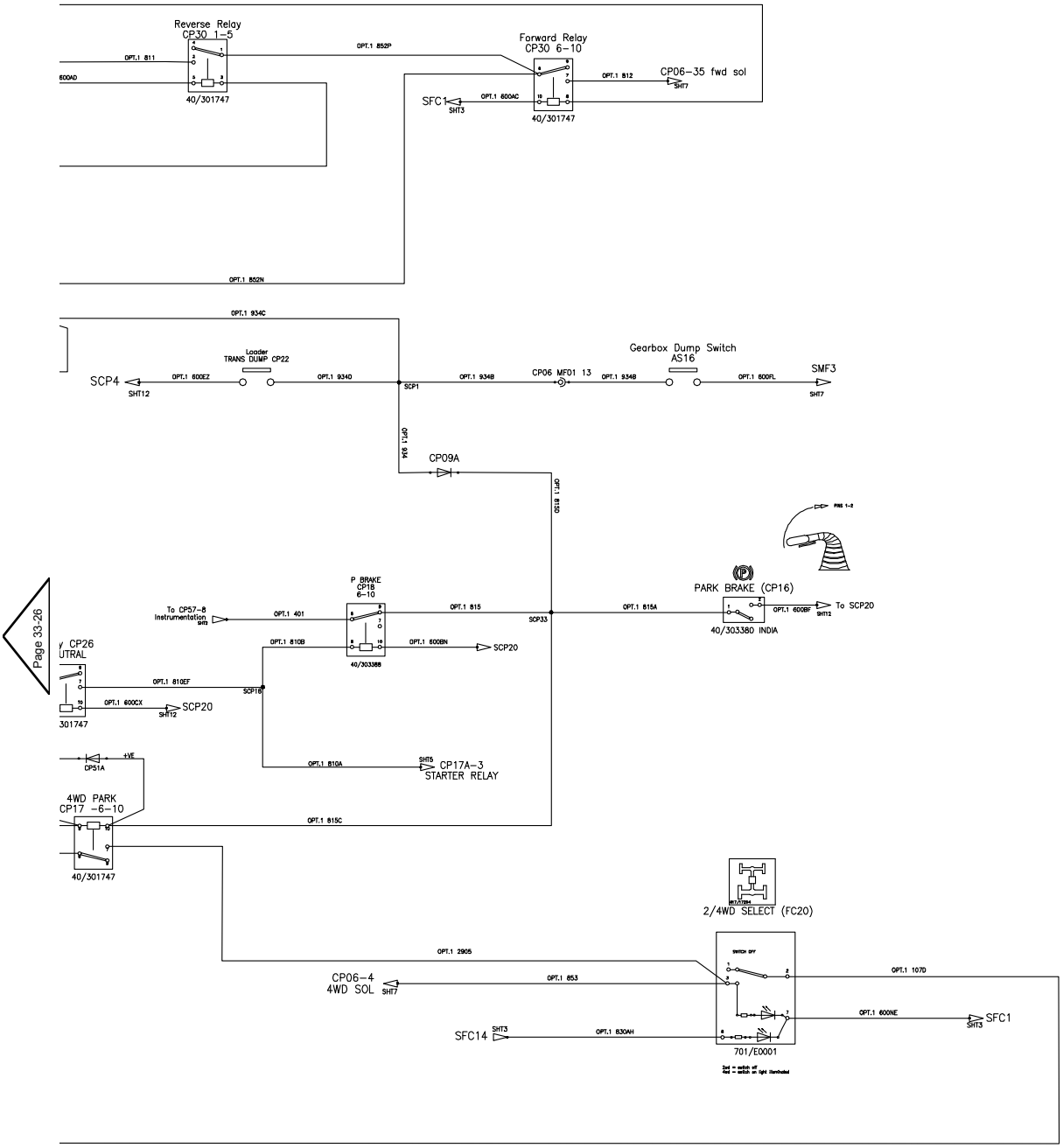
Figure 874.



A Wire size (area) and number
B Device harness connector code
C Device description
D Connector pin number (wire location / total)
E Device internal schematic
F Harness inter-connector codes
G Harness inter-connector symbol
H Splice code and symbol
J Destination reference number
K Destination (harness connector code)
L Destination (diagram sheet and grid)

To help locate a wire destination from other diagram sheets use the grid reference. This identifies the applicable location zone on the sheet in a similar way to a map reference.

Due to space limitations, the grid is sometimes omitted.



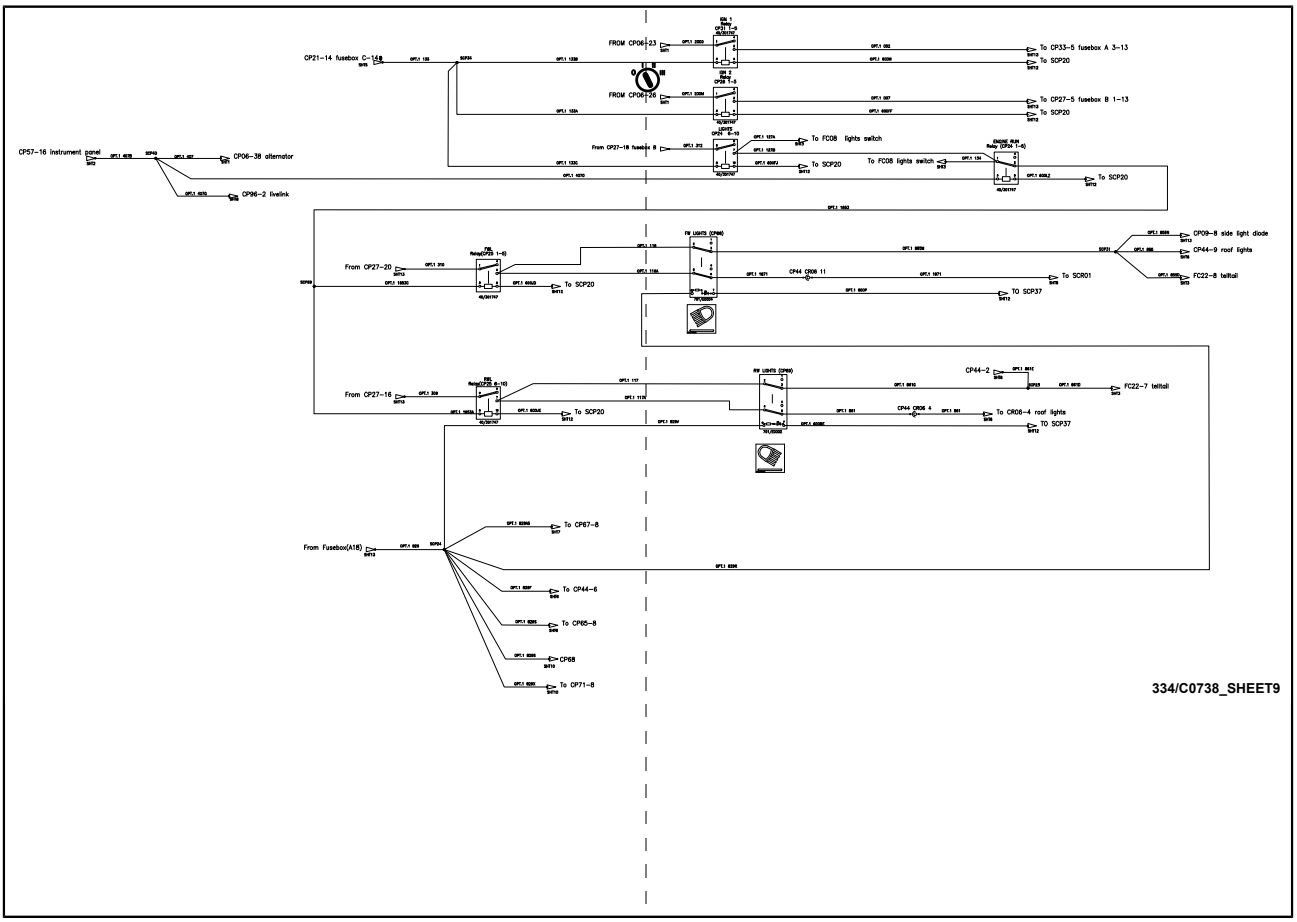
334/C0738_SHEET4

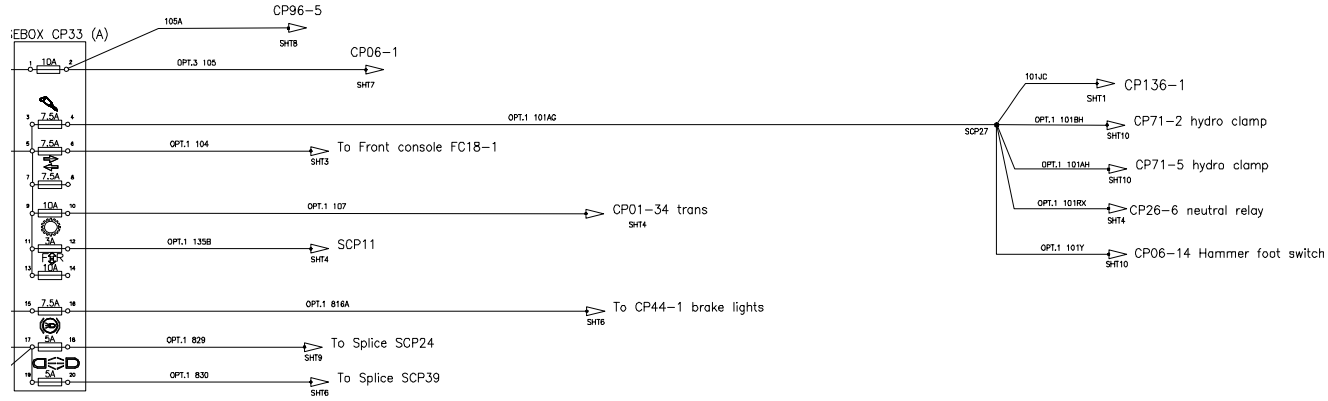
Page 33-26

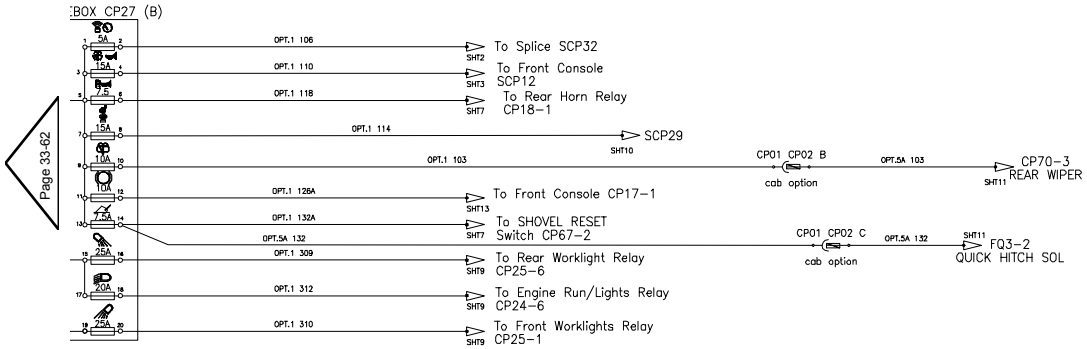
Page 33-46

Figure 884. 334/C0738_SHEET9

Page 33-47



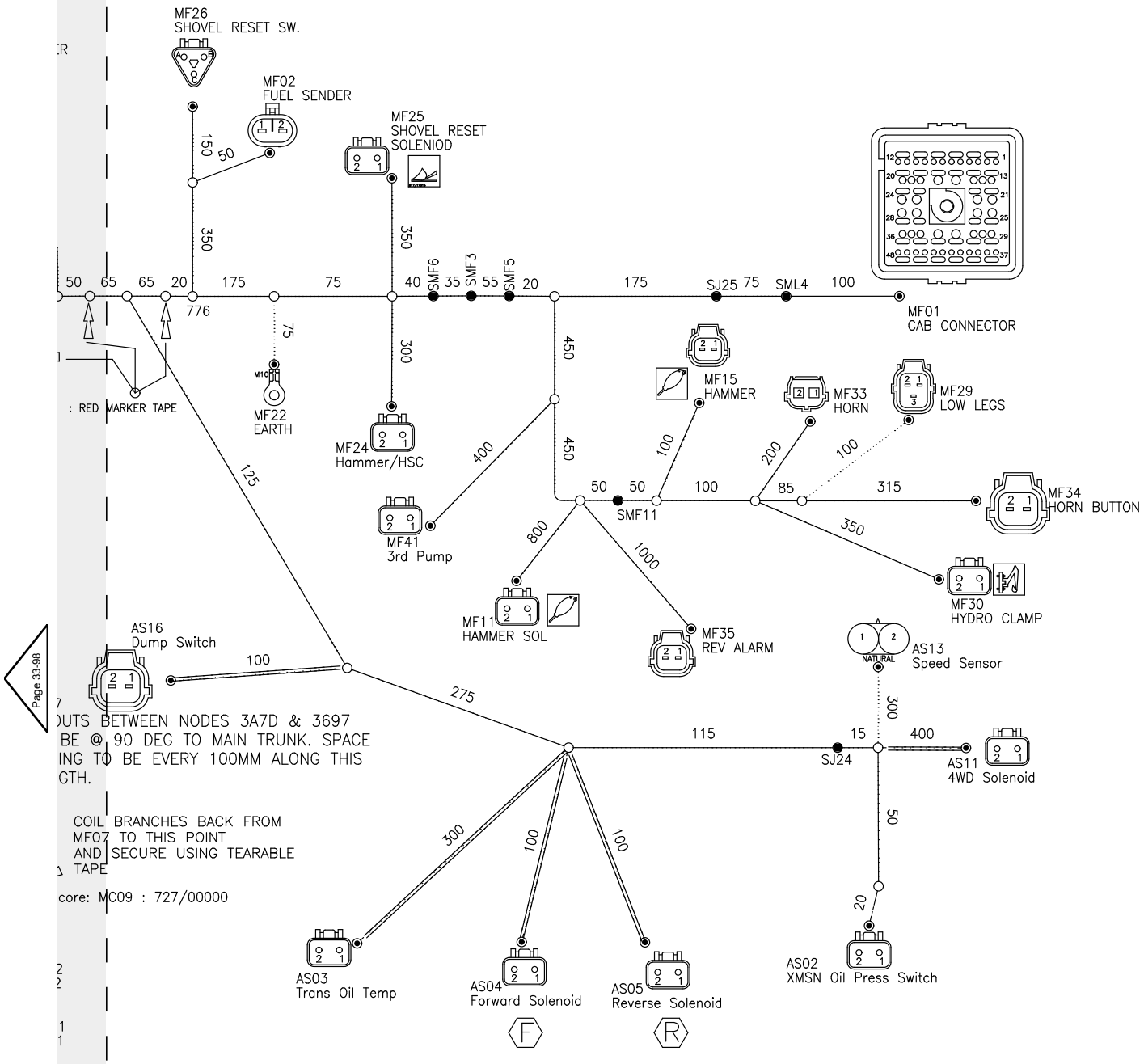




334/C0738_SHEET13

Fuse No.	Circuit(s) Protected	Rating
A10	Right hand side lights	5A
B1	Instruments, buzzer	5A
B2	Front horn, front washer/wiper	15A
B3	Rear horn	7.5A
B4	Heated seat, cigar lighter, face level fan	15A
B5	Rear washer/wiper	10A
B6	Brakes	10A
B7	Return to dig, SRS (Smooth Ride System)	7.5A
B8	Rear working lights	25A
B9	Headlights	20A
B10	Front working lights	25A
C1	Side lights	7.5A
C2	Hazard warning lights	15A
C3	Beacon, Interior light	10A
C4	Radio	5A
C5	Grid heater control	3A
C6	Heater blower	30A
C7	Ignition relay coils	3A
C8	Dipped beam	15A
C9	-	3A
C10	Main beam	15A
E1	GPS (Global Positioning System)	3A
E2	GPS	3A
E3	Spare	-
E4	Spare	-

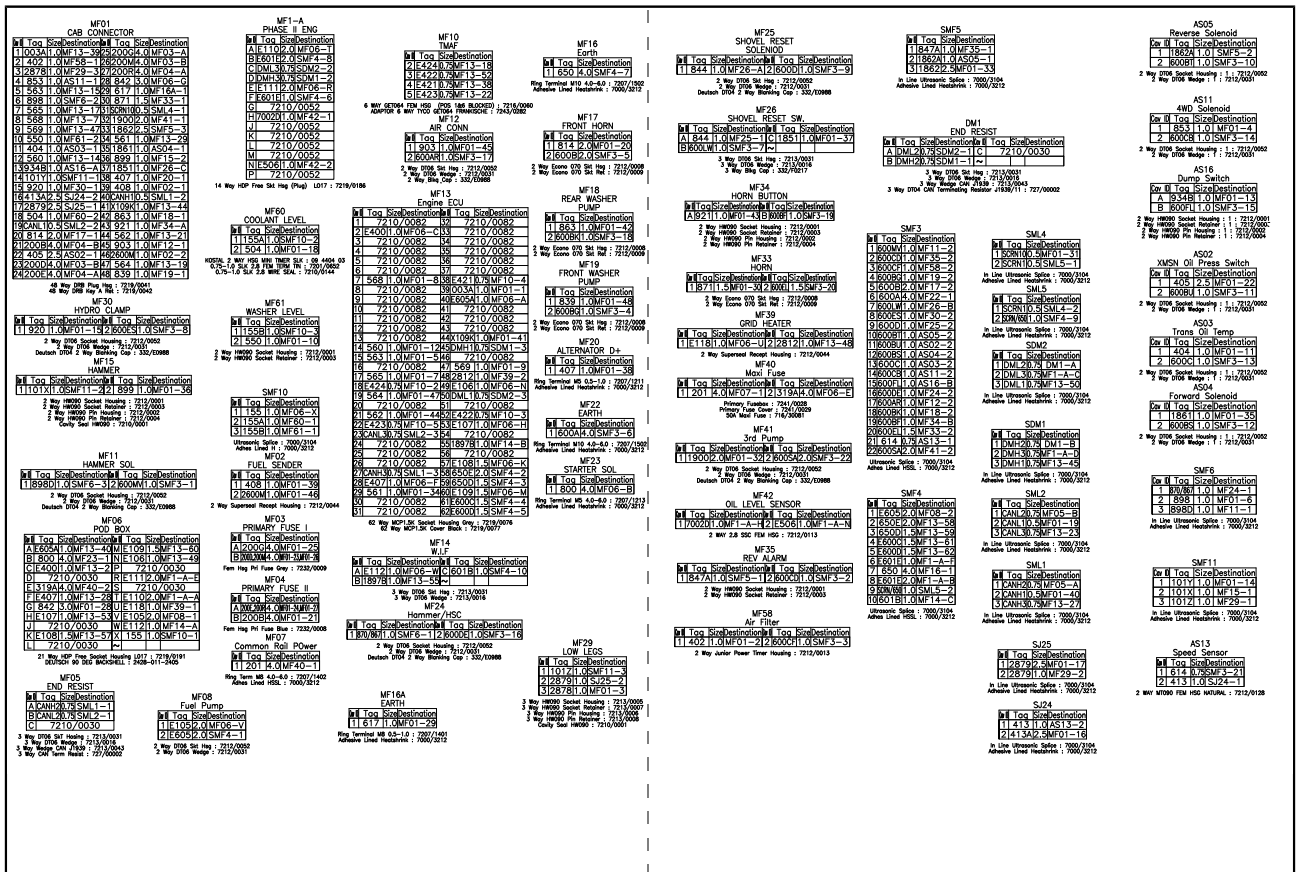
jure 913. (Part 2 of 2)

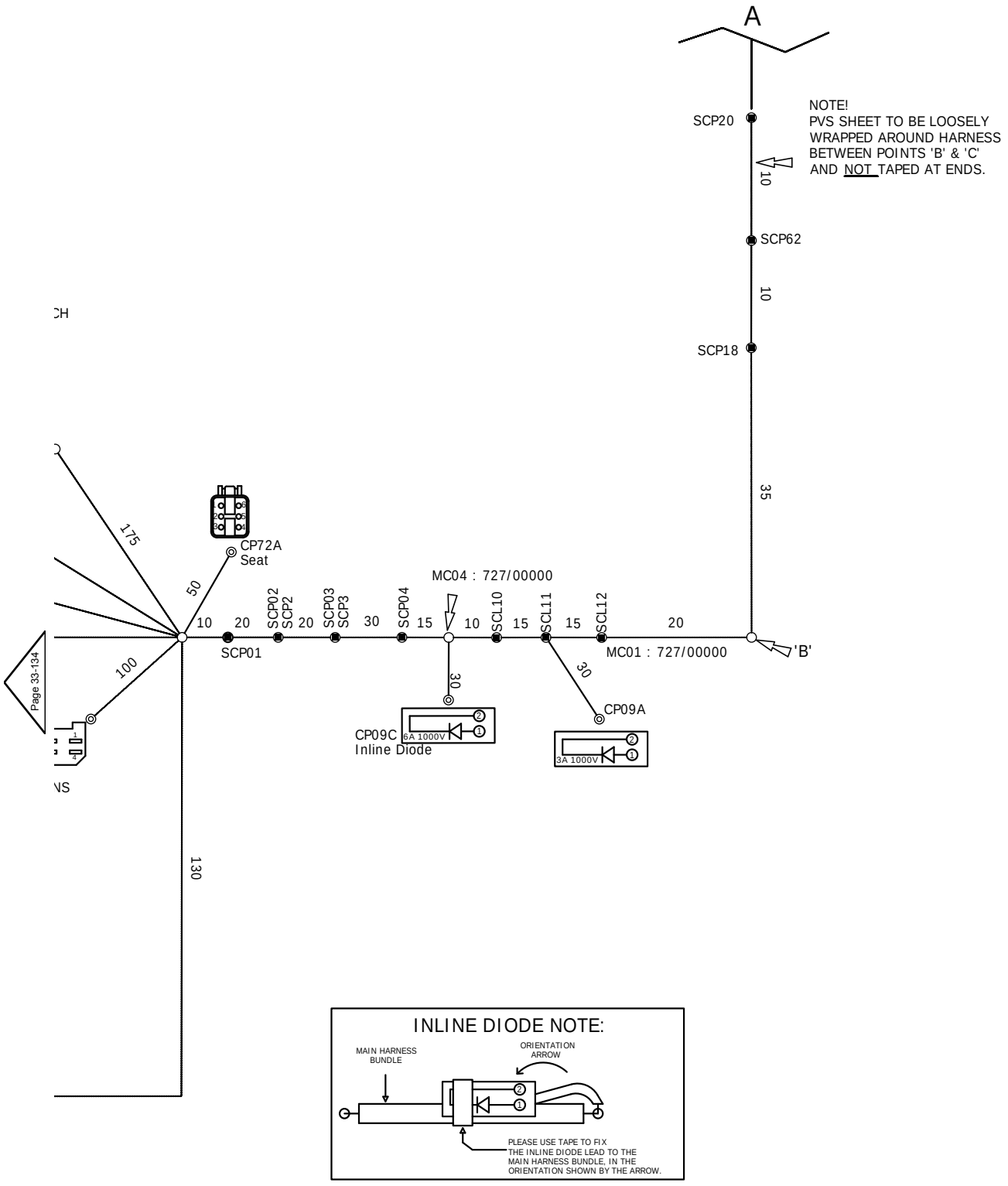


Page 33-118

Figure 918. 721/C0293_Sheet2

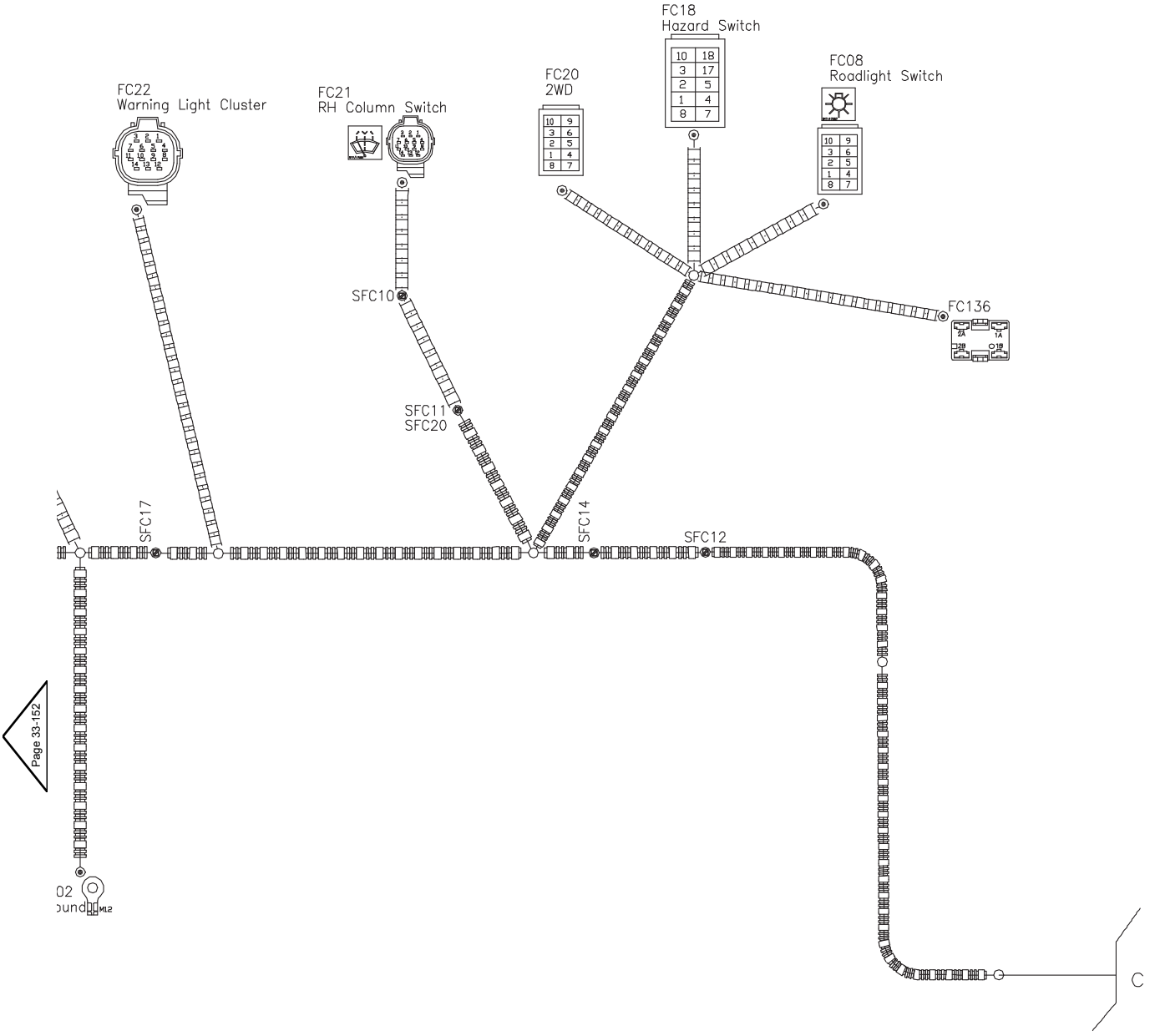
Page 33-119





721/E0065_SHEET2

Page 33-152 Page 33-153

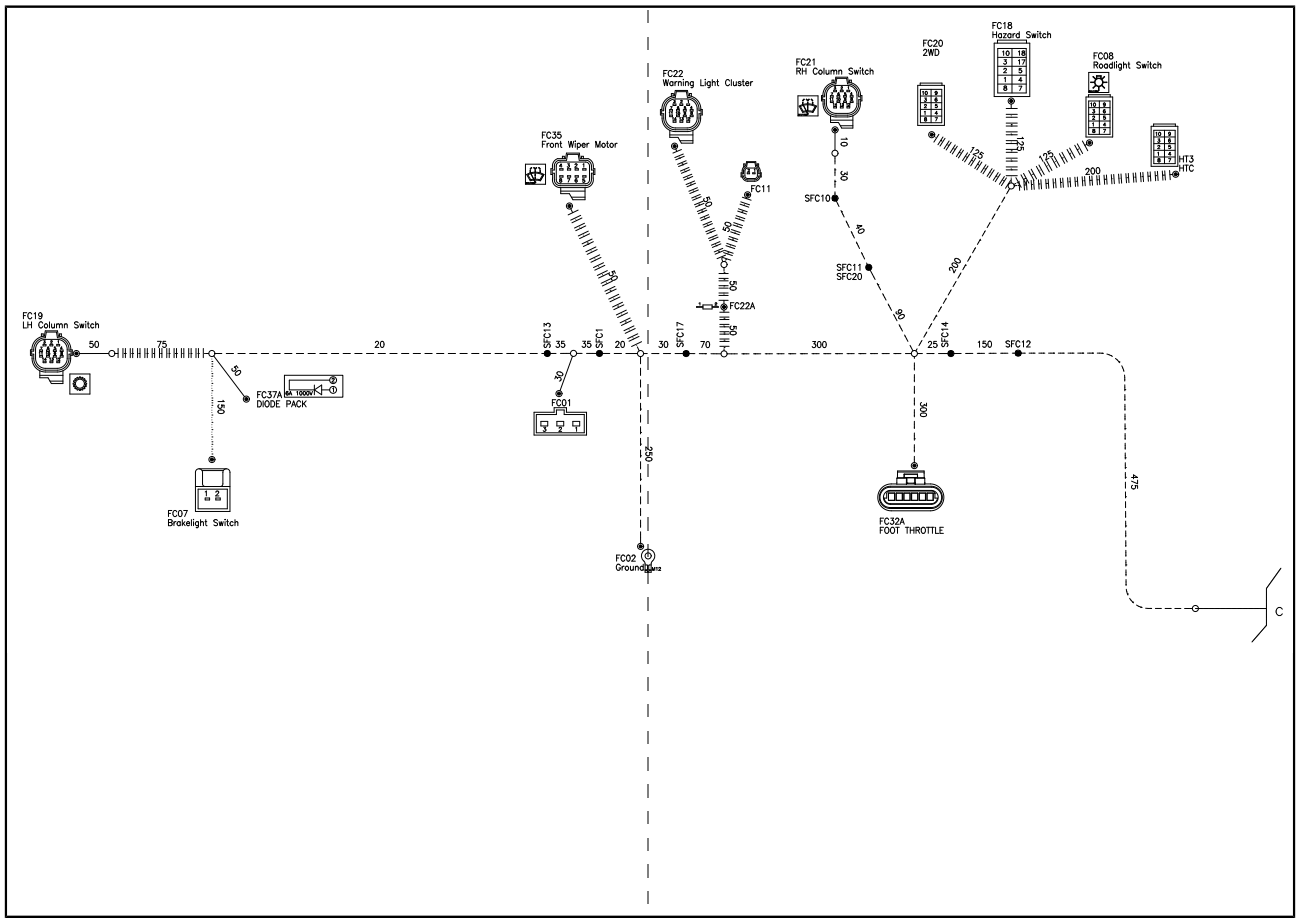


721/C0734_SHEET1

Page 33-172

Figure 935.

Page 33-173



CP30
RELAY

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	852P	1.0	OPT.1	CP30-6	6	852P,852N	1.0	OPT.1	CP30-1,CP29-9
2	811	1.0	OPT.1	SJ16-1	7	812,812A	0.75	OPT.1	CP29-3,CP57 J2-11
3	808	0.5	OPT.1	FC19-10	8	809	0.5	OPT.1	FC19-4
4					9				
5	600AD	0.5	OPT.1	SFC1-9	10	600AC	0.5	OPT.1	SFC1-13

Twin Micro Relay Base : 7241/0003

CP31
RELAY

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	107US	2.0	OPT.1	SFC13-7	6	898C	1.0	OPT.1	SCP52-1
2	1900	2.0	OPT.1	CP06-32	7	870/898	1.0	OPT.1	CP06-6
3	810	0.5	OPT.1	SCP18-8	8	899	1.0	OPT.1	CP06-36
4					9				
5	600US	0.5	OPT.1	SCP20-31	10	627A	1.0	OPT.1	SCP20-15

Twin Micro Relay Base : 7241/0003

CP32
RELAY

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	200D	4.0	OPT.1	CP06-23	6	140,140A	1.0	OPT.1	CP33-14,CP32-8
2	002	4.0	OPT.1	CP33-5	7	1900	1.0	OPT.1	CP34-1
3	133B	0.5	OPT.1	SCP34-4	8	140A	1.0	OPT.1	CP32-6
4					9				
5	600W	0.5	OPT.1	SCP20-7	10	2605	1.0	OPT.1	CP57 J2-14

Twin Micro Relay Base : 7241/0003

CP33
Fusebox A

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	013	1.0	OPT.1	CP55B-5	11	BUSBAR WITH	TERM 5		
2	119	1.0	OPT.1	CP96-5	12	135B	0.5	OPT.1	FC19-7
3	BUSBAR WITH	TERM 5			13	BUSBAR WITH	TERM 5		
4	101AG	2.0	OPT.1	SCP27-3	14	140	1.0	OPT.1	CP32-6
5	002	4.0	OPT.1	CP32-2	15	933	1.0	OPT.1	CP17-2
6	104	2.0	OPT.1	FC18-1	16	816A	1.0	OPT.1	CP44-1
7	BUSBAR WITH	TERM 5			17	828K,828	2.0	OPT.1	CP90C-2,CP08-3
8	109A	1.0	OPT.1	CP06-41	18	829	1.0	OPT.1	SCP24-8
9	BUSBAR WITH	TERM 5			19	BUSBAR WITH	TERM 17		
10	107	1.0	OPT.1	SFC13-6	20	830	1.5	OPT.1	SCP39-6

10 Way Sec Fusebox Hsg : 7241/0001
10 Way Sec Fusebox Ret : 7241/0002
CAV 1-2 & 11-12 3A ATO Fuse : 716/05701
CAV 17-18 & 19-20 5A ATO Fuse : 716/05703
CAV 5-6 & 7-8 & 15-16 7.5A ATO Fuse : 716/05704
CAV 3-4 & 9-10 10A ATO Fuse : 716/05705

CP34
ECO SOL

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	1900	1.0	OPT.1	CP32-7	2	602KC	1.0	OPT.1	SCP37-13

2 Way DT06 Socket Housing : 7212/0052
2 Way DT06 Wedge : 7212/0031

CP44
Cab Roof

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	816A	1.0	OPT.1	CP33-16	8	806D	1.0	OPT.1	SFC11-4
2	861E	1.5	OPT.1	SCP23-2	9	855	1.5	OPT.1	SCP31-2
3	894	1.5	OPT.1	CP65-3	10	837	1.5	OPT.1	CP21-20
4	861	2.0	OPT.1	CP69-6	11	1871	1.5	OPT.1	CP66-6
5	830F	1.0	OPT.1	SCP39-8	12	834	1.5	OPT.1	CP21-16
6	829F	1.0	OPT.1	SCP24-7	13	7210/0001			
7	805F	1.0	OPT.1	SFC10-1	14	7210/0001			

14 Way HW090 Socket Housing : 7219/0005
14 Way HW090 Socket Retainer : 7219/0007

CP51
Flyback Diode

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	+VE	0.5		CP29-10	2	-VE	0.5		CP29-8

BUTT DIODE ASSY 3A 1000V : 7514/0005
Adhesive Lined Heatshrink : 7000/3212

CP51A
Flyback Diode

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	+VE	0.5		CP17-10	2	-VE	0.5		CP17-8

BUTT DIODE ASSY 3A 1000V : 7514/0005
Adhesive Lined Heatshrink : 7000/3212

CP55A
Ignition Switch

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	200B	4.0	OPT.1	CP06-21	3	004	4.0	OPT.1	CP19-1
2	203N	4.0	OPT.1	SCP111-1	4				

4 Way Merit Fem Hsg : 7234/0003

CP55B
Ignition Switch

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
5	013	1.0	OPT.1	CP33-1	8				
6	001	4.0	OPT.1	CP21-11	9				
7	010	1.0	OPT.1	CP21-9	10				

6 Way Merit Fem Hsg : 7236/0003

CP57 J1
Grey Connector

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	7210/0205				11	304C	0.5	OPT.1	SCP38-1
2	407B	0.5	OPT.1	SCP40-3	12	600T	0.5	OPT.1	SCP37-7
3	7210/0205				13	CANH5	0.5	OPT.1	SCL4-3
4	7210/0205				14	CANL5	0.5	OPT.1	SCL5-3
5	408	0.5	OPT.1	CP06-39	15	7210/0205			
6	7210/0205				16	7210/0205			
7	401	0.5	OPT.1	CP18-6	17	7210/0205			
8	7210/0205				18	7210/0205			
9	504	1.0	OPT.1	CP06-18	19	106A	0.5	OPT.1	SCP32-2
10	106TF	1.0	OPT.1	SCP32-5	20	830AW	0.5	OPT.1	SCP39-7

20 Way MX150 Socket Housing Grey : 332/E3213

CP43
Headliner

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	860	1.0	OPT.1	CP61A-3	4	601	1.0	OPT.1	CP61A-6
2	601JD	1.5	OPT.1	SCP37-12	5	859	1.0	OPT.1	CP61A-5
3	304A	1.0	OPT.1	SCP38-3	6	602	1.0	OPT.1	CP61A-4

6 Way HW090 Socket Housing : 7216/0001
6 Way HW090 Socket Retainer : 7216/0003

CP57 J2
Black Connector

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	898H	1.0	OPT.1	SCP52-4	11	7210/0205			
2	404	0.75	OPT.1	CP06-11	12	2890	1.0	OPT.1	CP72A-5
3	402A	0.75	OPT.1	SCP62-1	13	413A	0.75	OPT.1	SJ22-1
4	7210/0205				14	2605	1.0	OPT.1	CP32-10
5	7210/0205				15	7210/0205			
6	920A	0.5	OPT.1	CP71-3	16	411	0.75	OPT.1	SCP17-1
7	550	1.0	OPT.1	CP06-10	17	003	0.75	OPT.1	CP21-10
8	7210/0205				18	405	0.75	OPT.1	SJ15-1
9	810P	0.75	OPT.1	SCP18-2	19	2600B	0.75	OPT.1	SCP3-2
10	812A	0.75	OPT.1	CP30-7	20	2800R	1.0	OPT.1	SCP2-2

20 Way MX150 Socket Housing : 332/C8190

CP60
Power Socket

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	114B	1.0	OPT.1	SCP29-2	2	600DB	1.0	OPT.1	SCP37-8

2 Way Pos Lock Hsg : 7232/0003

CP65
Beacon

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1					6				
2	303B	1.5	OPT.1	SCP28-1	7	600DY	0.5	OPT.1	SCP37-6
3	894	1.5	OPT.1	CP44-3	8	829S	0.5	OPT.1	SCP24-6
4					9				
5					10				

10 Way Sw Base : 7219/0013
Beacon Switch Decal : 817/17260

CP66
Front Work Lights

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1					6	1871	1.5	OPT.1	CP44-11
2	116	2.0	OPT.1	CP25-2	7	600P	0.5	OPT.1	SCP37-2
3	855M	2.0	OPT.1	SCP31-1	8	829R	0.5	OPT.1	SCP24-1
4					9				
5	116A	1.5	OPT.1	CP25-2	10				

10 Way Sw Base : 7219/0013
Front W/light Sw Decal : 817/17258

CP67
Shovel Reset

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1					6				
2	132A	1.0	OPT.1	CP27-14	7	600LY	0.5	OPT.1	SCP37-5
3	1851	1.0	OPT.1	CP06-37	8	829AS	0.5	OPT.1	SCP24-3
4					9				
5					10				

10 Way Sw Base : 7219/0013
Shovel Reset Decal : 817/17315

CP68
BI DIR/HAMMER

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1					6				
2	1830C,1830CC	1.0	OPT.1	CP71-4,CP68-5	7	600DF	0.5	OPT.1	SCP37-10
3	898L	1.0	OPT.1	SCP52-2	8	898J	0.5	OPT.1	SCP52-3
4	2846G	1.0	OPT.1	CP15-3	9	604S	0.5	OPT.1	SCP37-11
5	1830CC	1.0	OPT.1	CP68-2	10	829S	0.5	OPT.1	SCP24-10

10 Way Sw Base : 7219/0013

CP69
Rear Work Lights

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1					6	861	2.0	OPT.1	CP44-4
2	117	1.5	OPT.1	CP25-7	7	600BE	0.5	OPT.1	SCP37-3
3	861G	1.5	OPT.1	SCP23-1	8	829V	0.5	OPT.1	SCP24-2
4					9				
5	117A	2.0	OPT.1	CP25-7	10				

10 Way Sw Base : 7219/0013
Rear W/ight Sw Decal : 817/17259

CP71
Hydraclamp

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1					6				
2	101AH	1.0	OPT.1	SCP27-1	7	600FC	0.5	OPT.1	SCP37-4
3	920A,920	0.5,1.0	OPT.1	CP57 J2-6,CP96-15	8	829X	0.5	OPT.1	SCP24-9
4	1830C	1.0	OPT.2	CP68-2	9				
5	101BH	1.0	OPT.1	SCP27-2	10				

10 Way Sw Base : 7219/0013
S/shift Clamp Decal : 817/17300

CP72A
Seat

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	7210/0052				4	571	1.0	OPT.1	FC22A-1
2	2800S	1.0	OPT.1	SCP2-3	5	2890	1.0	OPT.1	CP57 J2-12
3	114D	1.0		SCP29-3	6	7210/0052			

6 Way DTM06 Socket Housing : 7216/0021
6 Way DTM06 Wedge : 7216/0022

CP93
DIODE

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	1896B	1.0	OPT.1	SCP6-1	3	402C	1.0	OPT.1	SCP62-3
2	420G	1.0	OPT.1	SCP61-1	~				

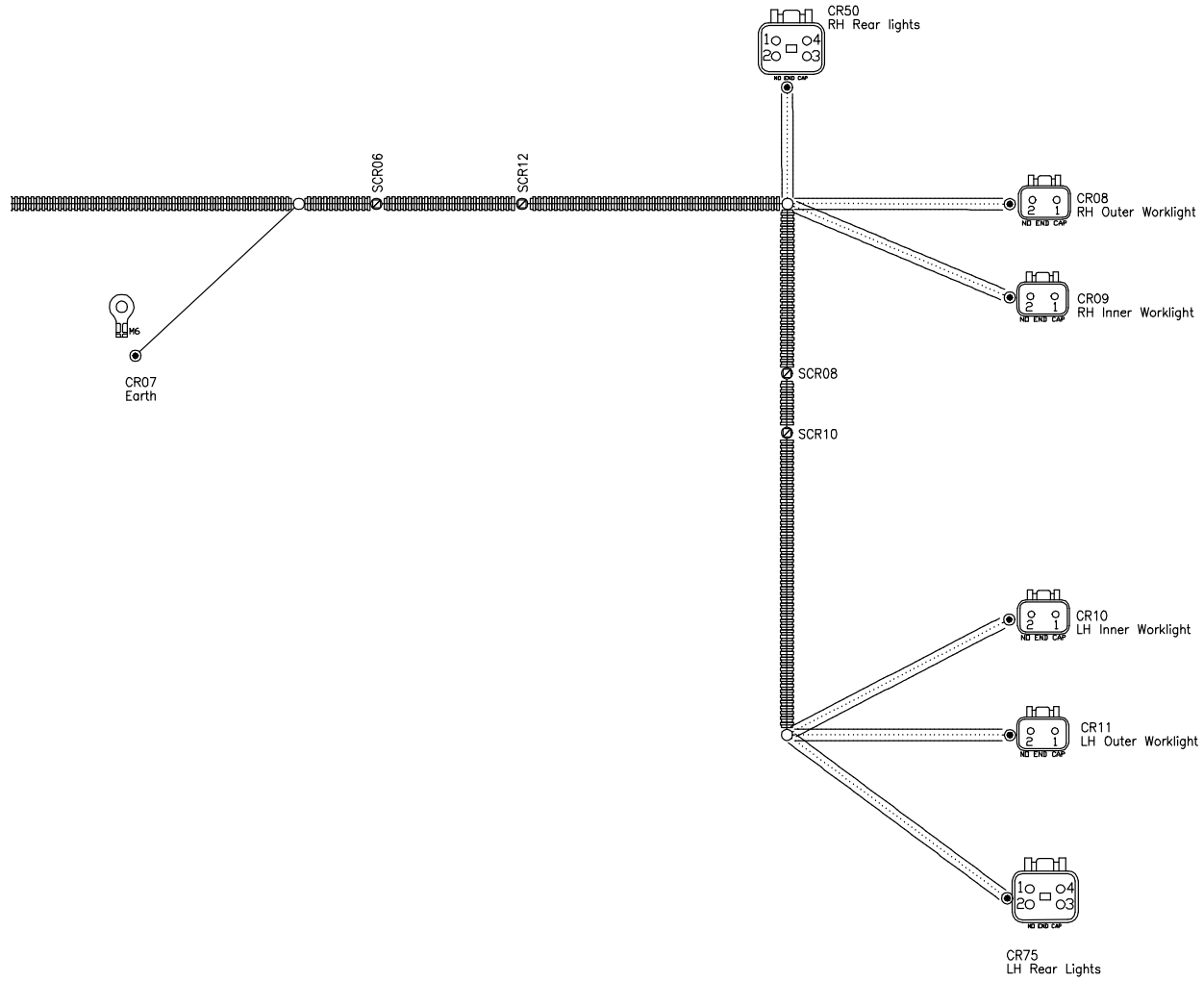
3 Way Diode Hsg : 7233/0014
Diode Plug In 2 Way : 704/50083

CP96
TELEMATICS

Cav ID	Tag	Size	Option	Destination	Cav ID	Tag	Size	Option	Destination
1	203M	1.0	OPT.1	SCP111-2	6	CANL5	0.5	OPT.1	SLL2-2
2	407G	1.0	OPT.1	SCP40-2	7	CANH5	0.5	OPT.1	SLL1-2
3	617	1.0	OPT.1	CP06-29	8	7210/0001			
4	620D	1.0	OPT.1	SCP37-9	9	106AK	1.0	OPT.1	SCP32-4
5	119	1.0	OPT.1	CP33-2	10	7210/0001			

10 Way HW090 Skt Hsg : 7219/0001
10 Way HW090 Skt Ref : 7219/0003
10 Way HW090 Pin Hsg : 7219/0002
10 Way HW090 Pin Ref : 7219/0004
Cavity Seal HW090 : 7210/0001

Page 33-188



Page 33-206

721/C0294_SHEET1

03 - Instrument Panel

Introduction

The instrument panel communicates information to the operator about the systems on the machine and warns of any abnormal conditions that may occur. The instrument panel houses all the gauges and warning lights on the machine i.e. fuel gauge, coolant warning, engine oil pressure warning light. For more detailed information refer to the operator manual.

01 ECM connector (Grey)
02 CAN (Controller Area Network) termination 1
03 Machine to engine interconnect
A Machine CAN termination 2
C Engine oil level switch
D Foot throttle position sensor
E Hand throttle position sensor
F TMAF (Temperature and Mass Air Flow) sensor (if installed)
G Fuel pressure sensor
H Cruise control (if installed)
J Engine speed control
K Brake light switch
N Low fuel switch
P Clutch switch (if installed)
Q Key switch (engine start/shut off)
R Lambda sensor
S Water in fuel switch
T Fuel pump
Y HVAC (Heating Ventilation Air Conditioning) Compressor (if installed)

Dashboard Page

Figure 992.

- Requested Gear: This is the demand from the operator.

- Selected Gear: This is the actual gear being selected by the ECU.

Note: The operator Requested Gear is not always the same as the Selected Gear, e.g. when the ECU blocks shifts when offering protection.

- Transmission Speed: This is the current transmission output speed which is directly related to the road speed (through axle ratio and tyre size). The transmission speed sensor is located next to the output gear and detects the passing of the gear teeth. The sensor has a fixed installation, no adjustment is necessary. This signal is used by the ECU to determine gear-shifting and protection strategies.

- ECU 2.2/2.3 only. The speed may be displayed as a frequency value or, alternatively, road speed in MPH or KPH. Use the Options Menu, Road Speed Settings to select the required units.

ECU Status Page

This page gives a detailed picture of how the ECU is operating.

Figure 993.

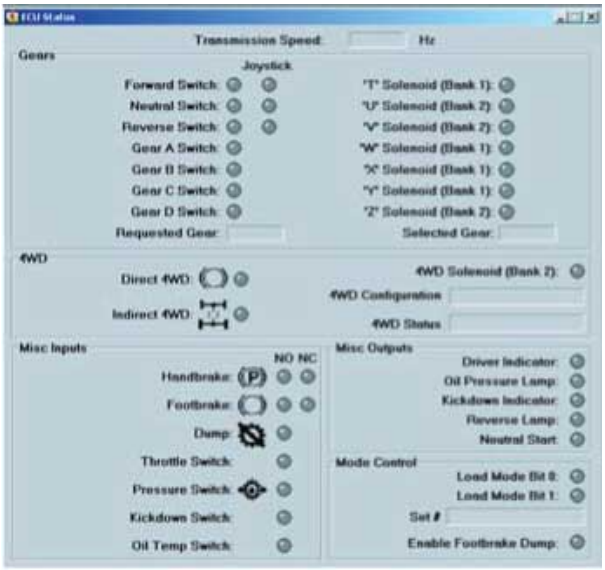
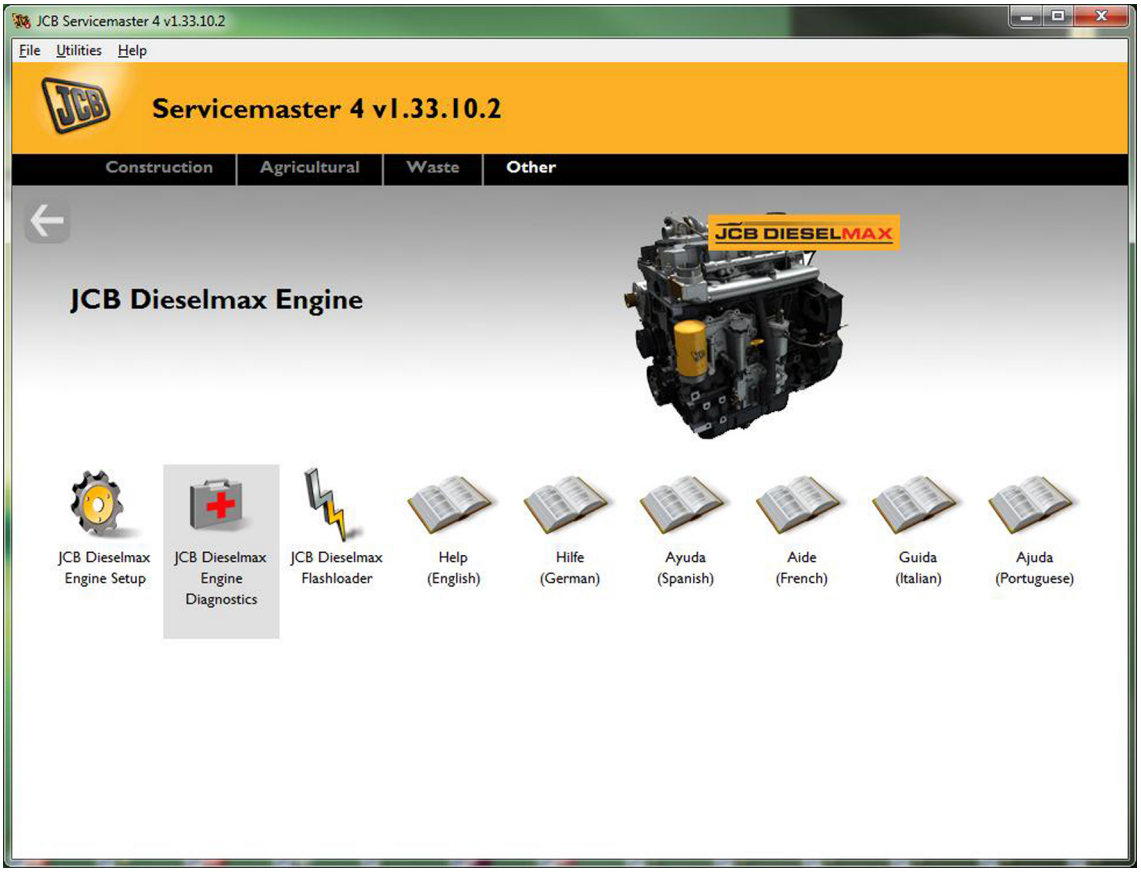


Figure 1041.



4. The standard diagnostic page will appear on the screen.
5. Click the green activation option at the top left corner of the screen. Refer to Figure 1042.

Fault Code	Description	Severity
P110600	Fault which is set when no MDP updates occur on Injector 2 due to environmental conditions (as defined by the update strategy)	Service
P110700	Fault which is set when no MDP updates occur on Injector 2 due to a fault within the update strategy	Service
P110800	Fault which is set when no MDP updates occur on Injector 4 due to environmental conditions (as defined by the update strategy)	Service
P110900	Fault which is set when no MDP updates occur on Injector 4 due to a fault within the update strategy	Service
P110A00	Fault which is set when no MDP updates occur on Injector 1 due to environmental conditions (as defined by the update strategy)	Service
P110B00	Fault which is set when no MDP updates occur on Injector 1 due to a fault within the update strategy	Service
P112086	Throttle Lock Status invalid	Service
P112087	Throttle Lock Status missing	Service
P112111	Throttle Lock Indicator - Shorted To Low Source [Ground]	Service
P112112	Throttle Lock Indicator - Shorted To High Source [Vbatt]	Service
P112211	HEST indicator (amber) - Shorted To Low Source [Ground]	Service
P112212	HEST indicator (amber) - Shorted to High Source [Vbatt]	Service
P112213	HEST indicator (amber) - Circuit Open	Service
P140000		Service
P140100		Service
P140200		Service
P150000	Foot pedal signal fault set (triggers limp home mode)	Service
P150100	Foot pedal signal fault set (triggers reduced torque mode)	Service
P150300	Hand pedal signal fault set (triggers limp home mode)	Service
P150400	Hand pedal signal fault set (triggers reduced torque mode)	Service
P150600	Pedal global limp home mode triggered	Service
P150900	CAN communication Error on TSC	Trivial
P160300	Functional Safety Fault	Critical
P160400	Functional Safety Fault	Critical
P160500	Functional Safety Fault	Critical
P160600	Functional Safety Fault	Critical
P170001	Gear selector logical error	Service
P170086	Transmission Selected Gear - Signal Invalid	Service
P170087	Transmission Selected Gear - Missing Message	Service
P170109	Column switch electrical fault	Service
P170209	Joystick electrical fault	Service
P170409	Foot brake pressure switch fault	Service
P170412	Footbrake Circuit - Shorted to High Source [Vbatt]	Service
P170501	T solenoid electrical fault	Service
P170601	W solenoid electrical fault	Service
P170701	U solenoid electrical fault	Service
P170801	V solenoid electrical fault	Service
P170901	X solenoid electrical fault	Service
P170A01	Y solenoid electrical fault	Service
P170B01	LUC solenoid electrical fault	Service
P170B86	Torque Convertor Lock Up - Signal Invalid	Service
P170B87	Torque Convertor Lock Up - Missing Message	Service
P170C01	Neutral start electrical fault	Service
P170D01	Reverse lamp electrical fault	Service

03 - Screws

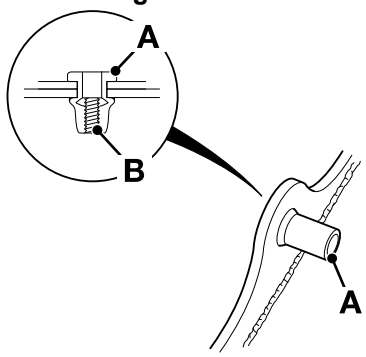
Contents **Page No.**

00 - General

Introduction

A threaded insert also known as a rivet nut is a one piece fastener installed blind from one side of the machine body/framework. The threaded insert is compressed so that a section of its shank forms an upset against the machine body/framework, leaving a durable thread.

Figure 1060.



A Threaded insert
B Durable thread

Threaded inserts are installed to various parts of the machine body and framework. They are used in a number of applications, for instance, hose clamp and hydraulic valve retention etc. Various sized threaded inserts are available, refer to technical data to determine the correct size of threaded insert to be used for particular applications.

If for any reason a new threaded insert is required, the correct installation procedure must be followed. Refer to: PIL 72-36-00.

Technical Data

Table 327.

Engine Code	Oil API Specification	Viscosity	Minimum Temperature°C (°F)	Maximum Temperature°C (°F)
SA, SB, SC, SK, SG, SD, SE, SF, DA, DB, DC, DE, DG, DD, DK, DF, EC, EE, EF, EK	CF/ CH-4	SAE 5W30	-30°C (-22.0°F)	30°C (86.0°F)
	CH-4	SAE 15W40	-5°C (23.0°F)	50°C (121.9°F)
	CH-4	SAE 10W40	-15°C (5.0°F)	46°C (114.7°F)
	CH-4	SAE 5W40	-30°C (-22.0°F)	46°C (114.7°F)

Table 328.

Engine Code	Oil API Specification	Viscosity	Minimum Temperature°C (°F)	Maximum Temperature°C (°F)
SL, SH, DH, DM	CH-4	SAE 5W40	-30°C (-22.0°F)	46°C (114.7°F)
	CJ-4	SAE 5W40	-30°C (-22.0°F)	46°C (114.7°F)
	CH-4	SAE 15W40	-5°C (23.0°F)	50°C (121.9°F)

Table 329.

Engine Code	Oil API Specification	Viscosity	Minimum Temperature°C (°F)	Maximum Temperature°C (°F)
SJ, DJ, FL	CJ-4	SAE 5W40	-30°C (-22.0°F)	46°C (114.7°F)
	CJ-4	SAE 5W30	-30°C (-22.0°F)	30°C (86.0°F)
	CJ-4	SAE 10W30	-15°C (5.0°F)	46°C (114.7°F)

Table 330. Capacity

Engine Code	Minimum	Maximum
SA, SB, SC, SK, SG, SD, SE, SF, DA, DB, DC, DE, DG, DD, DK, DF, SL, SH, DH, SJ, DJ, DM	11.5L	14L
EC, EE, EF, EK	20L	24L
FL	12.3L	14.5L

For information on how to identify the correct engine code. Refer to Operator Station, Identification Label, Engine (PIL 06-63-06).

Subsection	Commercial name	Product Number	Colour	Shelf life	Drying Time	Comments
Direct glazing	Sika activator	4104/2100	Clear	365d	10min minimum drying time	HIGHLY FLAMMABLE. A cleaning and activating agent specifically formulated for the treatment of bonded faces in direct glazing applications prior to applying the direct glazing adhesive.
Direct glazing	Sika remover 208 (use 4104/3600)	4104/1900	Transparent	-	-	A cleaning agent for removing contaminates on painted surfaces and glass.
Direct glazing	Sika cleaner 205 (use 4104/3600)	4104/1200	Clear	-	-	A cleaning agent for removing contaminates on painted surfaces and glass.
Direct glazing	Sika primer 209 (use 4104/3500)	4104/2300	Black	270d	Application temperature 10–35°C (50.0–95.0°F)	Used to prime painted surfaces and plastic substrates prior to bonding with Sikaflex products.
Direct glazing	Sika aktivator	4104/2400	Clear	365d	10min at more than 15°C (59.0°F) or 30min at less than 15°C (59.0°F)	Used to clean and give improved adhesion on glass, ceramic-coated glass, the cut face of old polyurethane adhesive beads, polyurethane coated windows glass and paints.
Active wipe for surface	Terostat 8560 AC-25	4104/3400	Colourless	270d	Minimum 30s and maximum 1h	Applied with a clean cloth to the surface, the adhesive may then be applied after the drying time. Applied to glass or ceramic coating but only in the bonding area.
Direct glazing	Terostat 8519 P	4102/3500	Black	0.1L bottle = 365d. 0.01L and 0.035L bottle = 540d	Approx. 2min	Used to promote adhesion in direct glazing to glass and glass ceramics.
Cleaner	Teroson FL cleaner	4104/3600	Clear	730d	Depending on conditions between 2–10min.	Used for degreasing and cleaning of substrates prior to application of adhesives and sealants.

Water

Water can enter fuel through poor storage or careless handling, and will almost inevitably condense in fuel tanks. The smallest amounts of water can result in effects that are just as disastrous to the fuel injection pump as dirt, causing rapid wear, corrosion and in severe cases, even seizure. It is vitally important that water is prevented from reaching the fuel injection equipment. The filter/water trap must be drained regularly.

Wax

Wax is precipitated from diesel when the ambient temperature falls below that of the fuel's cloud point, causing a restriction in fuel flow resulting in rough engine running. Special winter fuels may be available for engine operation at temperatures below 0°C (32.0°F). These fuels have a lower viscosity and limit wax formation.

Chemical Contamination

It should be noted that exposure of fuel to surfaces containing Copper (Cu), Zinc (Zn) or Lead (Pb) can adversely affect fuel quality and should be minimised.