SERVICE MANUAL

LOADER
TM320, TM420

EN - 9813/6850 - ISSUE 2 - 04/2018

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

www.jcb.com

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.

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09 - Lift Arm Quickhitch

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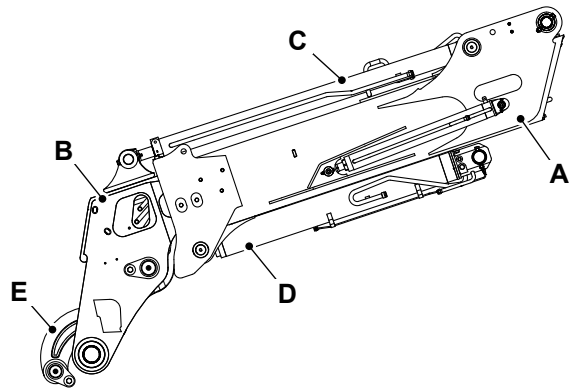
Notes:

Component Identification

(For: TM320 [T4F])

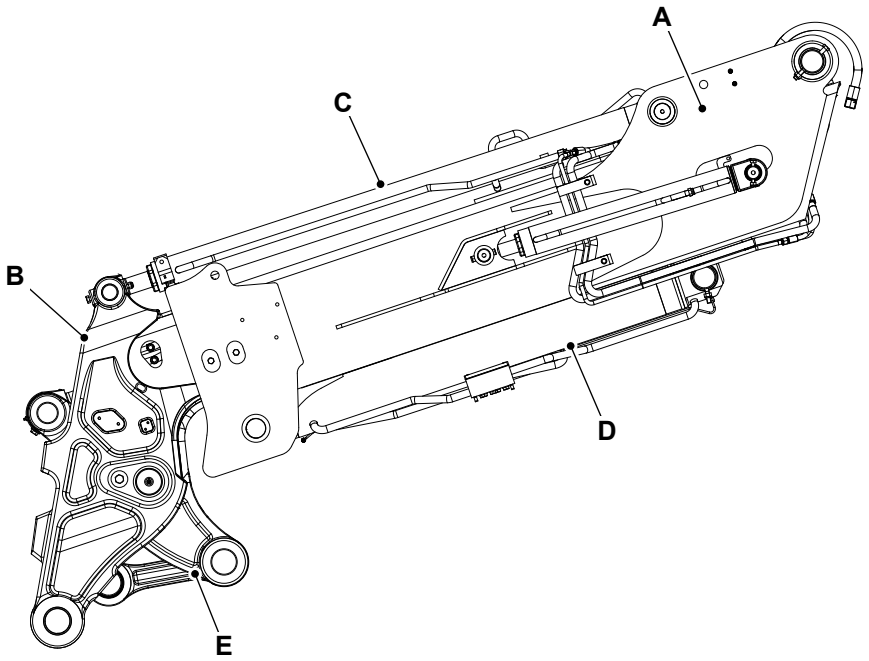
Figure 19.



A Outer lift arm
B Inner lift arm
C Lift extension ram
D Lift compensating ram
E Pivot link

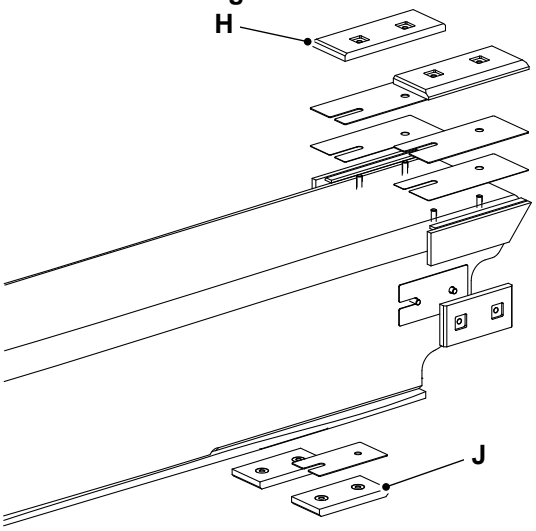
(For: TM420 [T4F])

Figure 20.



A Outer lift ram
B Inner lift arm
C Lift extension ram
D Lift compensating ram
E Pivot link

Figure 33.



H Rear wear pads and shims
J Rear wear pads and shims

Install

1. Lubricate all pins before attempting to install them. This will make ease the installation procedure and reduce damage.
2. After removal of the inner boom, replace the rear wear pads.
3. Install the rear wear pads.
4. Install the screws.
5. Apply the specified threadlocker to the screws.
   Consumable: JCB High Strength Threadlocker
6. Support the inner boom with suitable lifting equipment.
7. Place the inner boom into position within the outer boom.
8. Install the ignition key.
9. Start the engine.
10. Slowly extend the extension ram.
11. Stop the engine.
12. Remove the ignition key.
13. Install the inner boom and secure into position (Leave the lifting equipment in position to support the inner boom).
14. Install the ignition key.
15. Start the engine.
16. Slowly extend the extension ram to align the ram eye end with the inner boom boss.
17. Stop the engine
18. Remove the ignition key.
19. Install the pivot pin, nut and bolt.
20. Remove the caps.
21. Connect the front end hydraulics.
22. Connect the rear hoses.
23. Install the front wear pads.
24. Install the screws.
25. Apply specified threadlocker to the screws.
    Consumable: JCB High Strength Threadlocker
26. Retract the inner boom.
27. Remove the lifting equipment.
28. Check the hydraulic connections for leaks.
29. Check the boom alignment.

33 - Articulated Joint

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03 - Machine

Introduction

Machine Identification Plate

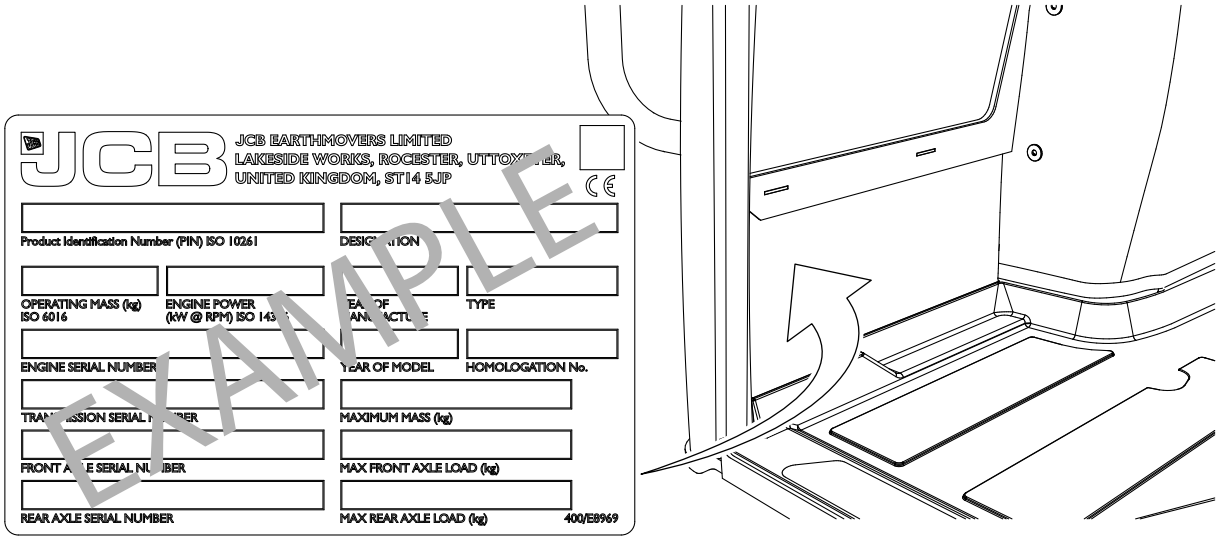
Your machine has an identification plate mounted as shown. The serial numbers of the machine and its major units are shown on the plate.

The machine model and build specification is indicated by the PIN (Product Identification Number). Refer to PIN.

The serial number of each major unit is also shown on the unit itself. If a major unit is replaced by a new one, the serial number on the identification plate will be wrong. Either get a replacement identification plate from your JCB Dealer or simply remove the old number. This will prevent the wrong unit number being quoted when replacement parts are ordered.

The machine and engine serial numbers can help identify exactly the type of equipment you have.

Figure 50.



Typical Product Identification Number

Table 8.

JCB	320	Z	S	D	01234567

Table 9. Explanation of the Product Identification Number

1-3	World Manufacturer Identification. For example, JCB = UK Build.
4-8	Machine type and model
9	Random check letter. The check letter is used to verify the authenticity of a machine's PIN.
10-17	Machine serial number

Each machine has a unique serial number.

09 - Operator Station

Contents **Page No.**

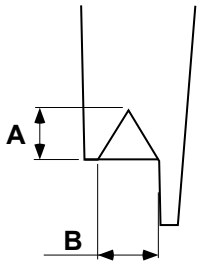
will be difficult to remove the cartridge from the applicator gun.

5.3. Pierce the front nozzle end of the cartridge to its maximum diameter.

5.4. Install the pre-cut nozzle.

5.5. Install the cartridge in the applicator gun. Note: Cold material will be very difficult to extrude. The cartridges must be pre-heated in a special oven for 1 hour to a temperature of 80°C (176°F). Pre-heating the cartridges makes the adhesive more workable and also brings the curing time down to 30 minutes.

Figure 88.

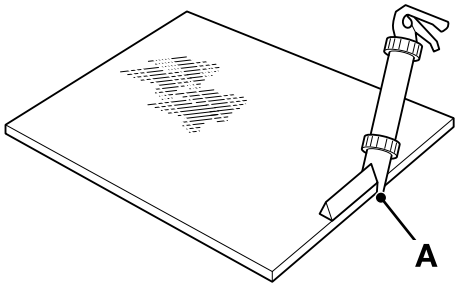


A 12.5 mm
B 9 mm

6. Apply the pre-heated adhesive to the glass (do not start in a corner). Keep the nozzle guide against the edge of the glass and make sure that the adhesive forms a continuous pyramid' shape. Note: Once the pre-heated adhesive has been applied to the glass, install the glass in the aperture as soon as possible. If you wait too long then the sealant will form a skin, this will prevent the glass from bonding.

   Duration: 10 min

Figure 89.



A Nozzle guide

7. After applying the adhesive, leave a small amount of sealant protruding from the nozzle. This will prevent any adhesive left in the cartridge from curing.

Remove and Install

Special Tools

Description	Part No.	Qty.
Glass Lifter	892/00842	2
Glass Extractor (Handles Only)	892/00846	1
Nylon Spatula	892/00847	1
Wire Starter	892/00848	1
Braided Cutting Wire	892/00849	1
Rubber Spacer Blocks	926/15500	2
Cut-Out Knife	992/12800	1
'L' Blades	992/12801	1

Consumables

Description	Part No.	Size
Black Polyurethane Sealant	4102/2310	0.31 L
Black Primer/Activator	4104/2304	0.1 L
Glass Replacement Kit	993/55701	-
Hand Cleaner	4104/1310	-
JCB Glass Cleaner	4006/3175	0.75 L
Surface Cleaning Fluid	4103/1204	1 L

Removal

1. Position the machine on level ground and apply the park brake. Stop the engine. Put protective covers over the cab seat and control pedestals.

2. If a laminated pane breaks it will stay in one piece even though the glass is cracked. A toughened pane will shatter and fall apart. The method of removal of the glass depends upon which type it is.

   2.1. Laminated glass - leave installed until the old sealant has been cut away, after which it will be possible to lift the broken screen away from its frame housing in one piece.

   2.2. Toughened glass - remove as much of the shattered glass as possible prior to cutting out the old sealant.

3. Cut out the old sealant, leaving approximately 1 to 2 mm on the cab frame. There are several tools and techniques for doing this:

   3.1. Pneumatic Knife - This provides one of the easiest methods of removing the sealant around laminated glass. The tool, powered by compressed air, should be sourced locally. Press the handle to start the knife blade oscillating. Important: This tool must not be used on toughened glass. Insert the knife blade into the sealant. Slowly move the knife along the sealant with the blade positioned as close to the glass as possible.

Field mode

Field mode configures the gearbox for field applications such as straw bale clearance.

Table 16.

Gear Select Position	Forward	Reverse
1	F3	R2
2	F4	R3
3	F5	R4
A	F4, F5	R3, R4
Gears selectable with kick down	F2, F3, F4(1)	Kick down is not available for reverse gears

(1) Only selected as a result of an up shift, (kick down button pressed a second time).

Road mode- eco (unladen)

Road mode- eco configures the gearbox for optimum road performance and fuel economy. Typically when the machine is unladen, including towing an unladen trailer.

When 'A' (auto) is selected, shifts occur at lower road speeds, ensuring that the machine is operating in the highest practical gear at all times.

Table 17.

Gear Select Position	Forward	Reverse
1	F1	R2
2	F2	R3
3	F3	R4
A	F4, F5, F6	R3, R4
Gears selectable with kick down	F1, F2, F3, F4(1)	Kick down is not available for reverse gears

(1) Only selected as a result of an up shift, (kick down button pressed a second time).

Road Mode- power (laden)

Road mode- power configures the gearbox for optimum shift points when the machine is laden and/or towing a laden trailer.

When 'A' (auto) is selected, up shifts only occur when the engine is producing maximum power and down shifts when the engine is producing maximum torque.

In this way the engine is always operating at its optimum RPM (Revolutions Per Minute) for maximum performance.

Table 18.

Gear Select Position	Forward	Reverse
1	F1	R2
2	F2	R3
3	F3	R4
A	F3, F4, F5, F6	R3, R4
Gears selectable with kick down	F1, F2, F3(1)	Kick down is not available for reverse gears

(1) Only selected as a result of an up shift, (kick down button pressed a second time).

Lock up torque converter operation

The lock up torque converter operates automatically between preset parameters when F5 or F6 gears are selected.

When field mode is selected, the lock up torque converter can be disabled. Refer to (PIL 27-14).

Drivepaths- 6 Speed

Forward

Table 19. 1st Gear Forward

Clutches Engaged		Solenoids Energised
X	6 speed	Xs
Z	Layshaft	Zs

Notes:

Table 39. Inadequate or no heat. (Discharge air only slightly warm, or neutral).

Cause	Remedy
Engine cooling system is low on coolant.	Check the engine coolant level per the manufacturer's recommendations. Add coolant as required.
Water valve stuck closed.	Refer to Water Valve-Check Operation.
Pinched heater hose or other system flow restriction.	Examine heater hoses from the engine cooling system to the heater core for pinches and kinks. Repair or replace as required. Visually examine the heater core for dented tubes. Check the core for free flow by circulating an outside water source through it. Replace the heater core if a restriction is observed.
Engine running cold. Engine thermostat stuck open.	Check machine engine coolant temperature specifications according to the manufacturer's recommendation. Repair if required.

Table 40. Blower operates on fan speed 3 only.

Cause	Remedy
Blower resistor failed	Replace resistor.

Table 41. Blower does not operate.

Cause	Remedy
Blower motor failed	Replace complete blower unit.
Fuse blown	Replace fuse and retest.

18 - Heater Coil

Introduction

The heater coil is a tube and fin construction, with the inlet and outlet on one end of the coil. Hoses connect the coil to the engine.

The heat energy for heating cab air comes from the hot engine coolant. The heater systems are designed to transfer heat energy from the engine coolant to the air in the cab.

15 - Engine

Contents **Page No.**

Four Stroke Cycle

Induction

As the piston travels down the cylinder, it draws filtered air through inlet valves into the cylinder.

Compression

When the piston reaches the bottom of its stroke the inlet valves close. The piston then starts to rise up the cylinder compressing the air trapped in the cylinder. This causes the temperature and pressure of the air to rise. Fuel is injected into the cylinder when the piston is near to TDC (Top Dead Centre).

Power

The piston continues to rise after the start of fuel injection causing a further increase in pressure and temperature.

The temperature rises to a point at which the fuel/air mixture ignites. A cylinder is said to be firing, when the fuel/air mixture ignites.

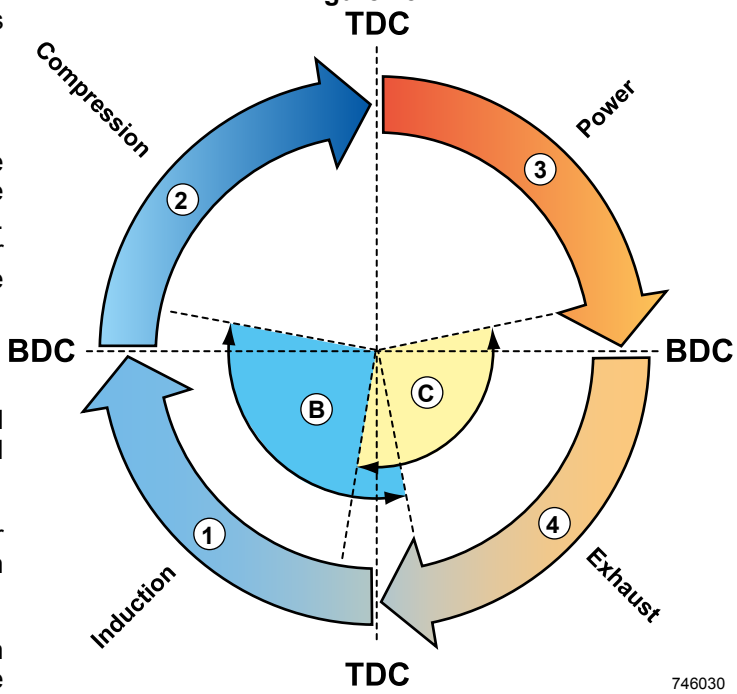
This combustion causes a very rapid rise in both temperature and pressure. The high pressure generated propels the piston downward turning the crankshaft and producing work.

Exhaust

Once the piston has reached the bottom of its travel, the exhaust valves open and momentum stored in the flywheel forces the piston up the cylinder expelling the exhaust gases.

In a running engine these four phases are continuously repeated. Each stroke is half a revolution of the crankshaft, thus, in one cycle of a four stroke engine, the crankshaft revolves twice.

Figure 154.



1 Induction stroke
2 Compression stroke
3 Power stroke
4 Exhaust stroke
A Camshaft
B Camshaft lobe - Inlet valve operation
C Camshaft lobe - Exhaust valve operation
BDC Bottom dead centre
TDC TDC

Store and Recommission

Engines should be stored in the original shipping packaging. Damaged or disturbed packaging should be made weatherproof immediately.

If an engine is shipped with oil, it should be stored in the correct (upright) position.

If an engine is shipped dry of oil, after 6 months it should be filled with oil to the correct level and re-inhibited, refer to hot test description.

All floor stock engines should be stored under cover in dry conditions and not subjected to extreme variations in temperature or humidity.

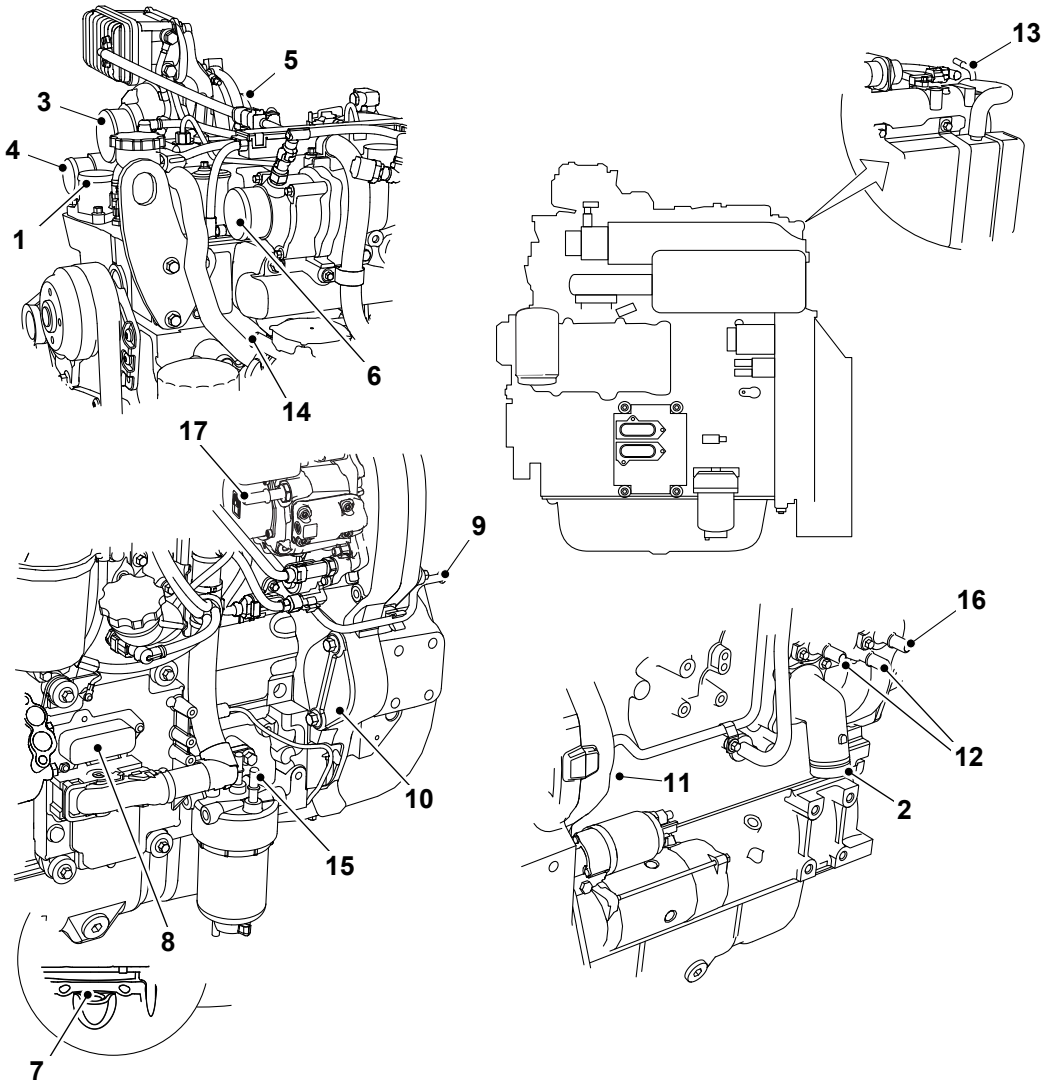
If an engine is to be placed into storage, all external signs of surface coating damage or corrosion should be cleaned and re-coated. Electrical connectors and components should be coated with a protective spray.

Capping Engine Openings

All openings on the engine must be suitably capped to prevent ingress of water and contamination by foreign particles.

Some engine configurations may differ in detail to the illustrations shown. Make sure you identify and cap all openings.

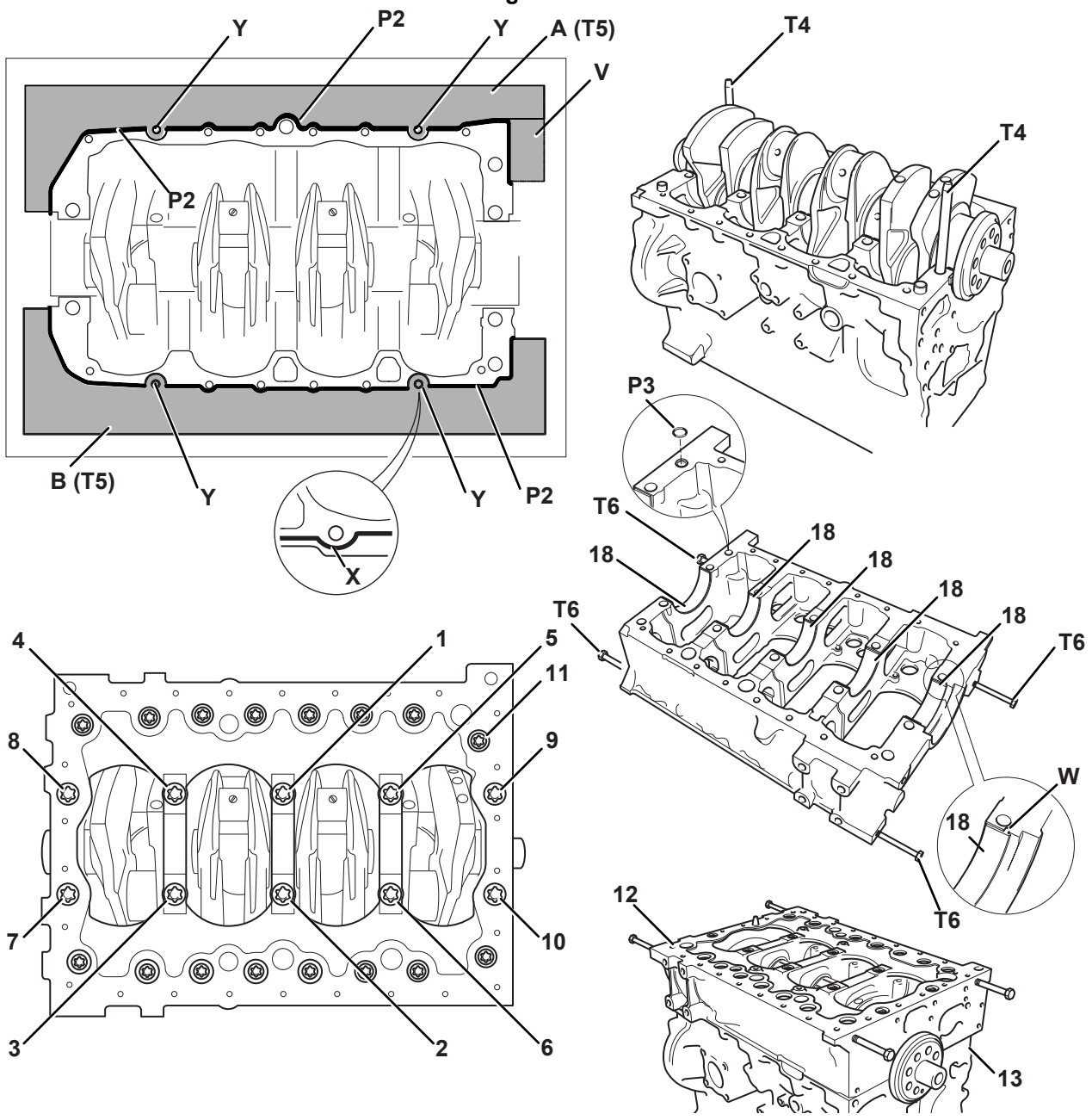
Figure 159. Typical engine



Remove

1. Remove the bedplate peripheral bolts.
2. Progressively remove the main bearing bolts in reverse order starting at bolt 10. The bolts MUST NOT be re-used. Discard the bolts.
3. Install the four temporary lifting bolts. Carefully separate the bedplate from the crankcase. Use suitable lifting equipment (if the bedplate is lifted manually, two people will be required). DO NOT use a lever to separate the bedplate.
4. Remove and discard the O-ring.
5. Carefully remove the upper bearing shells from the bedplate, remove the bedplate.

Figure 165.



1-10 Main bearing bolts
11 Bedplate peripheral bolts (x16)
12 Bedplate
13 Crankcase
18 Lower bearing shells (x5)
A Left side template
B Right side template
T3 Angle Gauge (obtain locally)

09 - Rear Oil Seal

Remove and Install

Special Tools

Description	Part No.	Qty.
Crankshaft Rear Oil Seal Installation Tool	892/01156	1
Crankshaft Rear Oil Seal Alignment Tool	892/01158	1

Note: The flywheel hub and crankshaft rear oil seal need to be replaced as a pair.

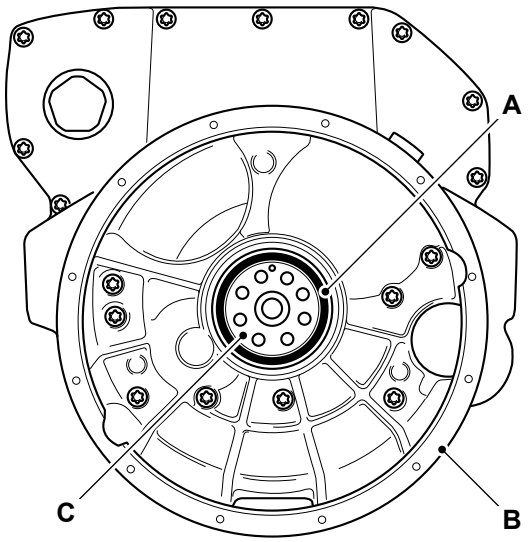
Before Removal

1. This procedure requires service parts. Make sure you have obtained the correct service parts before you start, refer to Parts Catalogue.
2. 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.
3. Get access to the engine.
4. Remove the flywheel, refer to (PIL 15-54).

Remove

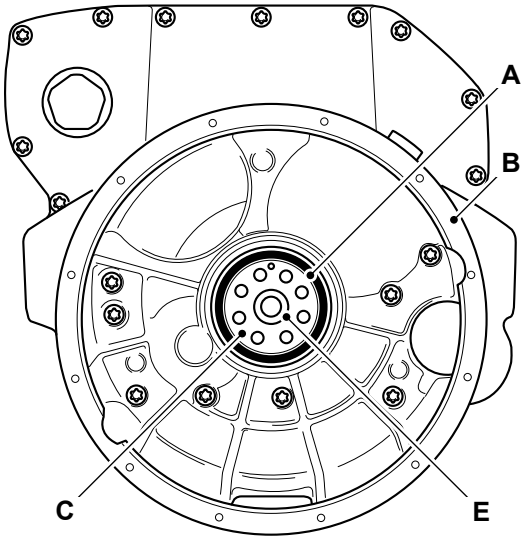
1. Use a suitable lever behind the lip of the seal to carefully prise out the rear oil seal from the counterbore in the flywheel housing. Take care not to scratch or damage the counterbore or the flywheel hub. Damaged or dirty sealing faces will cause the oil seal to fail.

Figure 181. 24mm Hub



A Crankshaft rear oil seal
B Flywheel housing
C Flywheel hub

Figure 182. 15mm Hub



A Crankshaft rear oil seal
B Flywheel housing
C Flywheel hub
E Fixing bolt

Install (24mm Hub)

1. Make sure that the counterbore and the flywheel hub are clean and free from damage and corrosion.

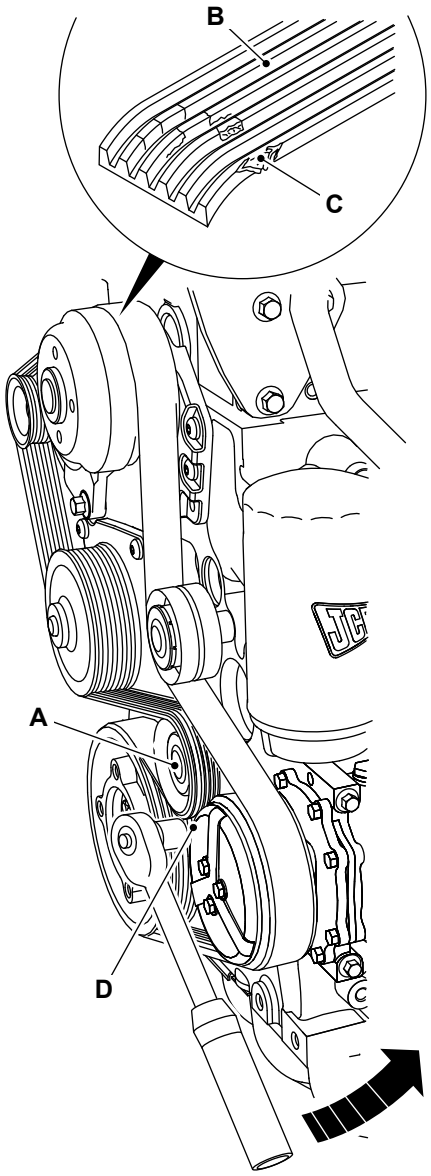
Remove and Install

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Stop the engine and let it cool down.
3. Use a socket of the specified size to locate on to the hexagon spigot nut, carefully rotate the tensioner against the spring force in the direction shown. Do not use excessive force or the tensioner will be damaged.

   Dimension: 16 mm
4. Keep holding the tensioner against the spring force and lift the belt off the drive tensioner pulley.
5. Slowly release the spring force by rotating the tensioner unit in the opposite direction.

Figure 199.



A Spring loaded tensioner
B Drive belt
C Example of frayed drive belt (refer to Check Condition)
D Spigot nut

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following step.
2. Before you install the new belt, check that the tensioner roller and the fan pulley rotate smoothly and that there is no play in the bearings.

00 - General

Introduction

The valve train system opens and closes the valves with correct timing in relation to the piston movements.

Each push rod has one end in a valve tappet and the other end under a rocker arm, or as applicable. The adjusting screw has a ball shaped end that locates in the push rod. The adjusting screw is used for setting the valve clearance.

The valves extend through the cylinder head. There are no sleeves or valve guides in the cylinder head. The valves are made from a special metal to provide a long service life. Damaged or worn valves cannot be lapped or reground and must be replaced with new ones. Each valve stem has an oil seal.

The Valve seat inserts are pressed into the cylinder head. The seat inserts are also made from a special metal to provide for a long service life. Damaged or worn seat inserts can be removed and replaced with new ones.

Technical Data

Table 88.

Engine	444	448
Gudgeon pin bore diameter		
- min.	40.01 mm	42.008 mm
- max.	40.015 mm	42.013 mm
Piston ring clearance		
- Top ring	Full keystone ring	Full keystone ring
- Middle ring	0.125 –0.08 mm	0.125 –0.08 mm
- Bottom (oil) ring	0.09 –0.05 mm	0.09 –0.05 mm
Piston ring gap		
- Top ring	0.3 –0.4 mm	0.3 –0.4 mm
- Middle ring	0.55 –0.8 mm	0.55 –0.8 mm
- Bottom (oil) ring	0.25 –0.5 mm	0.25 –0.5 mm
Piston height above crankcase (cold)	0.00025 –0.36825 mm(1)	0.00025 –0.36825 mm (1)
Piston groove width		
- Top ring	3.114 –3.134 mm	3.114 –3.134 mm
- Middle ring	2.575 –2.595 mm	2.575 –2.595 mm
- Bottom (oil) ring	4.04 –4.06 mm	4.04 –4.06 mm
Piston skirt	102.853 –102.871 mm	105.851 –105.869 mm
Piston pin	39.994 –40 mm	41.994 –42 mm

(1) Nominal measurement is 0.03325 mm

Check (Condition)

1. Check the rocker shaft and rocker bushings for signs of damage and excessive wear. Measure the rocker shaft diameter and rocker bearing bushes to confirm they are within service limits. Refer to Technical Data. Note: The rocker bearing bushes are not renewable. If a rocker bearing bush is damaged or worn the rocker must be renewed as a complete assembly.

   Refer to: PIL 15-42.

2. Make sure that all oil-ways and cross drillings in the rocker shaft, rocker arms and pedestals are clear and free from debris. Use an air line to blow through cross drillings.

51 - Timing Gear

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00 - General

Introduction

Flywheels are used to provide continuous energy in systems, where the energy source is not continuous. In such cases, the flywheel stores energy when torque is applied by the energy source, and it releases stored energy when the energy source is not applying torque to it.

In a reciprocating engine, a flywheel is used to maintain constant angular velocity of the crankshaft.

The flywheel, which is mounted on the crankshaft, stores energy when torque is exerted on it by a firing piston, and it releases energy to its mechanical loads when no piston is exerting torque on it.

Remove and Install

Special Tools

Description	Part No.	Qty.
Lifting Bracket Front	320/09062	1
Lifting Bracket Rear	320/09063	1

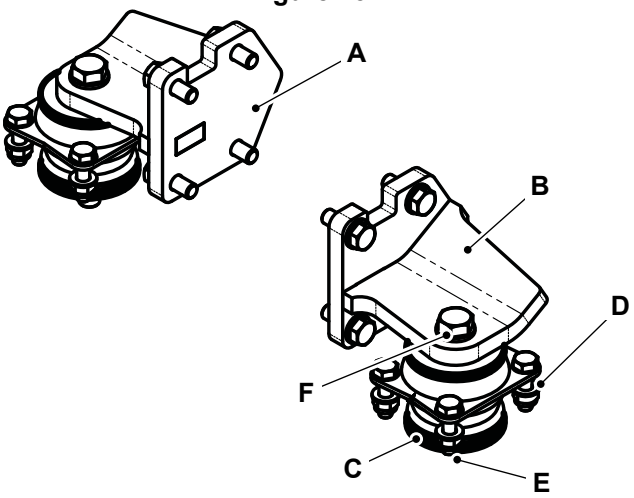
⚠ **CAUTION** This component is heavy. It must only be removed or handled using a suitable lifting method and device.

There are two front engine mounts. The gearbox mounts support the rear of the engine.

Remove

1. Make the machine safe. Refer to (PIL 01-03).
1. Remove the cooling pack. Refer to (PIL 21-03).
2. Drain the hydraulic tank. Refer to (PIL 30-03).
3. Disconnect the hoses at the hydraulic pump.
4. Disconnect the front and rear propshafts. Refer to (PIL 27-51).
5. Loosen the gearbox bolt 1.
6. If the engine lifting brackets are not installed then attach them to the engine.
7. Remove the nut (x4).

Figure 252.

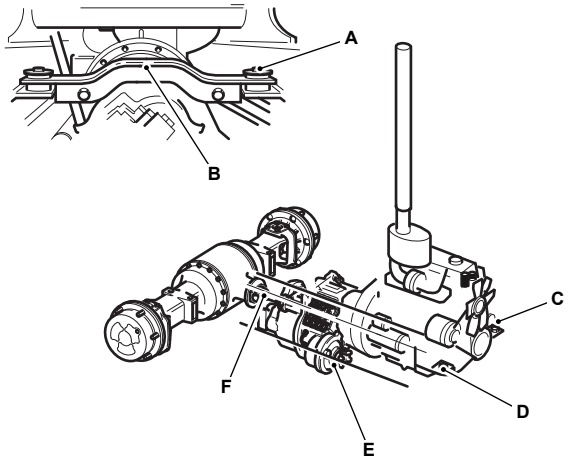


A Engine mount 1
B Engine mount 2
C Large washer
D Nut
E Nut
F Bolt 2

8. Remove the bolt 2 and washer.
9. Remove the nut, bolt 3, washer and large washer.
10. Make sure that the hydraulic hoses, the electrical harnesses and the park brake cable are clear or have sufficient movement to prevent damage, if installed.
11. Attach suitable lifting equipment to the engine lifting brackets.

    Special Tool: Lifting Bracket Front (Qty.: 1)
    Special Tool: Lifting Bracket Rear (Qty.: 1)
12. Carefully lift the front of the engine with the lifting equipment to access and remove the engine mounts.

Figure 253.



A Bolt 1
B Engine mount
C Large washer
D Engine mount
E Nut
F Bolt 3

Install

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

Table 100. Torque Values

Item	Nm
F	43

00 - General

Introduction

The electric starter motor is either a permanent-magnet or a series-parallel wound direct current electric motor with a starter solenoid mounted on to it. When the current from the battery is applied to the solenoid, through the key-operated ignition switch, the solenoid engages a lever that pushes out the drive pinion on the starter driveshaft and meshes the pinion with the starter ring gear on the flywheel of the engine.

The solenoid also closes high current contacts for the starter motor, which begins to turn. Once the engine starts, the key-operated ignition switch is opened, a spring in the solenoid assembly pulls the pinion gear away from the ring gear, and the starter motor stops. The starter motor pinion is clutched to the drive shaft through an overrunning clutch which permits the pinion to transmit drive in only one direction. Drive is then transmitted through the pinion to the flywheel ring gear, but if the pinion remains engaged (as for example because the operator fails to release the key as soon as the engine starts, or if there is a short and the solenoid remains engaged), the pinion will spin independently of the drive shaft, this prevents the engine driving the starter.

The starter motor is only designed for intermittent use, the electrical components are designed only to operate for a time period of 20 s before overheating.

Fault-Finding

Fault

Table 116. General Sensor Fault

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, disconnect all other sensors in turn until voltage supply returns.
	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/replace 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 faults is found, proceed to ECM (Engine Control Module) connection fault'.
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 'Wiring fault'.
Wiring fault	Check the harness continuity. Check the machine and engine earth contacts. Repair/ replace as necessary.
	If no fault is found, raise Techweb Helpdesk call.

Table 117. Water in Fuel Sensor Fault

Cause	Remedy
Sensor supply voltage fault	Check the presence of electrical supply on water 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/replace as necessary.
	If no fault is found, proceed to 'Sensor failure'.

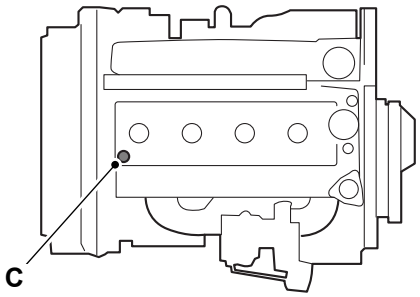
16 - Exhaust Manifold Pressure

Introduction

The exhaust manifold pressure sensor also known as the manifold absolute pressure sensor is a device that is used to calibrate the fuel delivery on an ECM (Engine Control Module) Controlled engine.

The sensor is mounted in the rear section of the rocker cover.

Figure 288.



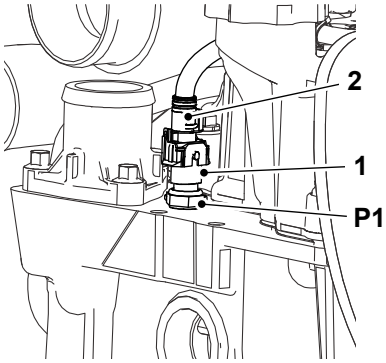
C Exhaust manifold pressure sensor

Remove and Install

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.
2. Drain the coolant, refer to (PIL 21-00).

Figure 300.



1 Coolant temperature sensor
2 Electrical connector
P1 Sealing washer

Remove

1. Get access to the engine.
2. Disconnect the electrical connector at the sensor.
3. Remove the sensor from the cylinder head.
4. Discard the sealing washer. Cap the open port with a blanking cap to prevent loss of fluid and ingress of dirt.

The coolant temperature sensor unit is a non-serviceable item. If the switch 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. Tighten the coolant temperature sensor to the correct torque value.
4. Refill the cooling system with the recommended coolant mixture, refer to Technical Data (PIL 21-00).
5. Start the engine and check for coolant leaks.

Table 130. Torque Values

Item	Nm
1	16

00 - General

Introduction

The engine electrical switches send signals to the ECM (Engine Control Module) to help the ECM to control the smooth running of the engine and related components. The ECM processes signals from the switches and its response will be based on an evaluation of the combination of the switches signals.

After removal from the engine, protect the switches from knocks, dampness and any high temperature sources. The switches are not serviceable, therefore they must be replaced in the event of damage.

Health and Safety

Fuel

Fuel is flammable, keep naked flames away from the fuel system. Stop the engine immediately if a fuel leak is suspected. Do not smoke while refuelling or working on the fuel system. Do not refuel with the engine running. Completely wipe off any spilt fuel which could cause a fire. There could be a fire and injury if you do not follow these precautions.

Fluid Under Pressure

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

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.*

Notice: *Do not allow dirt to enter the fuel system. Before disconnecting any part of the fuel system, thoroughly clean around the connection. When a component has been disconnected, for example a fuel pipe, always install protective caps and plugs to prevent dirt ingress. Failure to follow these instructions will lead to dirt entering the fuel system. Dirt in the fuel system will seriously damage the fuel injection equipment and could be expensive to repair.*

Notice: *The high pressure fuel system is extremely susceptible to damage if it is contaminated. Always clean the engine using the correct procedures before carrying out maintenance. Contamination of the fuel system can cause catastrophic failure of the engine.*

Notice: *Running the engine with air in the system could damage the fuel injection pump. After maintenance, the system must be bled to remove any air.*

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.*

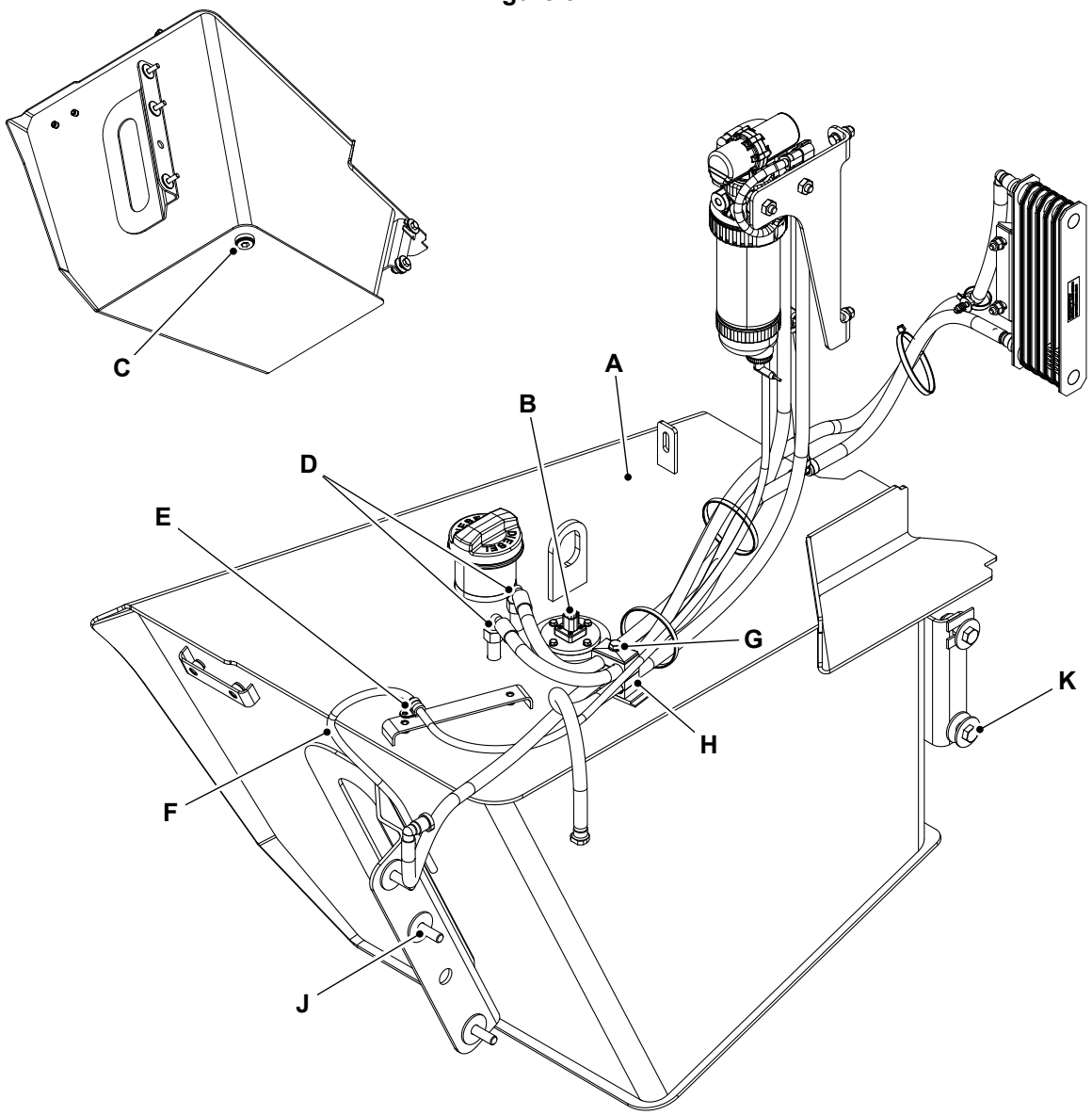
CAUTION! *It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.*

Technical Data

Table 134. Fuel System Data

High pressure pump type	Delphi DFP 4.2
Direction of rotation from drive end	Anti-clockwise
Fuel lift pump type	Electrically operated
Fuel filter micron rating	
Pre-filter	5 micron
Main filter	2 micron
Fuel filter restriction - maximum pressure drop	0.65 bar (9.4 psi)
Fuel return restriction - maximum	0.22 bar (3.2 psi)
Injector information	Electronically controlled solenoid actuated injectors. Each injector is marked with a unique calibration code.

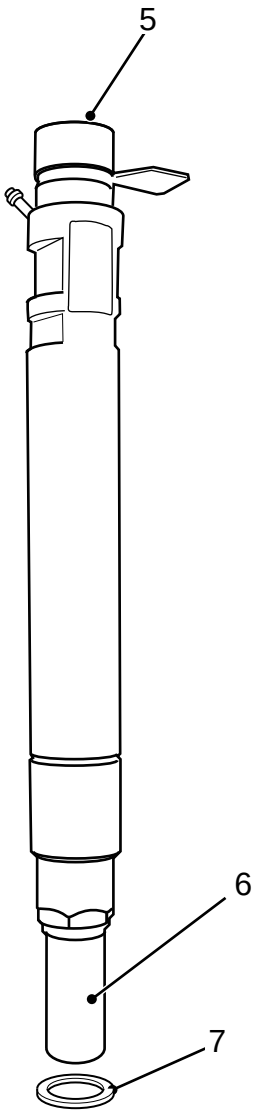
Figure 322.



A Fuel tank
B Fuel level sender
C Drain plug
D Hoses
E Bolt 1 and clip
F Breather hose
G Bolt 2
H Hose clamp
J Bolts 3 (x3)
K Bolts 4 (x2)

Notes:

Figure 341.



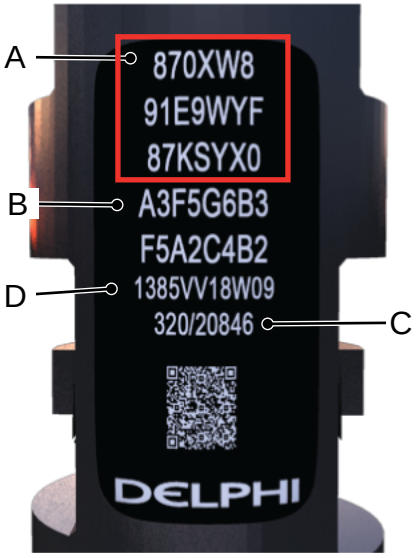
5 Protective cap
6 Protective cap
7 Sealing washer

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 342.



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.

Operation

The pump draws fuel from the tank, through the water separator, pumping it through the fuel filter and into the fuel injection pump. The pump has a built in protection against running dry and will shut down after 2 min if no fuel is present.

Check (Operation)

If the fuel lift pump is suspect, measure the delivery flow rate.

Flow Test

1. Make the machine safe.
2. Disconnect the fuel hose from the outlet of the pump/ filter assembly.
3. Connect a length of fuel hose from the pump outlet to a suitable fuel container.

   Volume: 5 L
4. Activate the fuel pump. Do not attempt to start the engine.
5. Run the pump. The fuel flow must be equal to or greater than the value shown.

   Duration: 1 min
   Flowrate: 2.5 L/min

Machines with Electronic Control Fuel Injection

When the ignition is set to ON the ECM (Engine Control Module) energises the fuel lift pump. If the engine is not started the pump is de-energised after a period of 24 s. A fuel pump flow test can be carried out during this period of time. Minimum expected fuel flow. 1 L in 24 s.

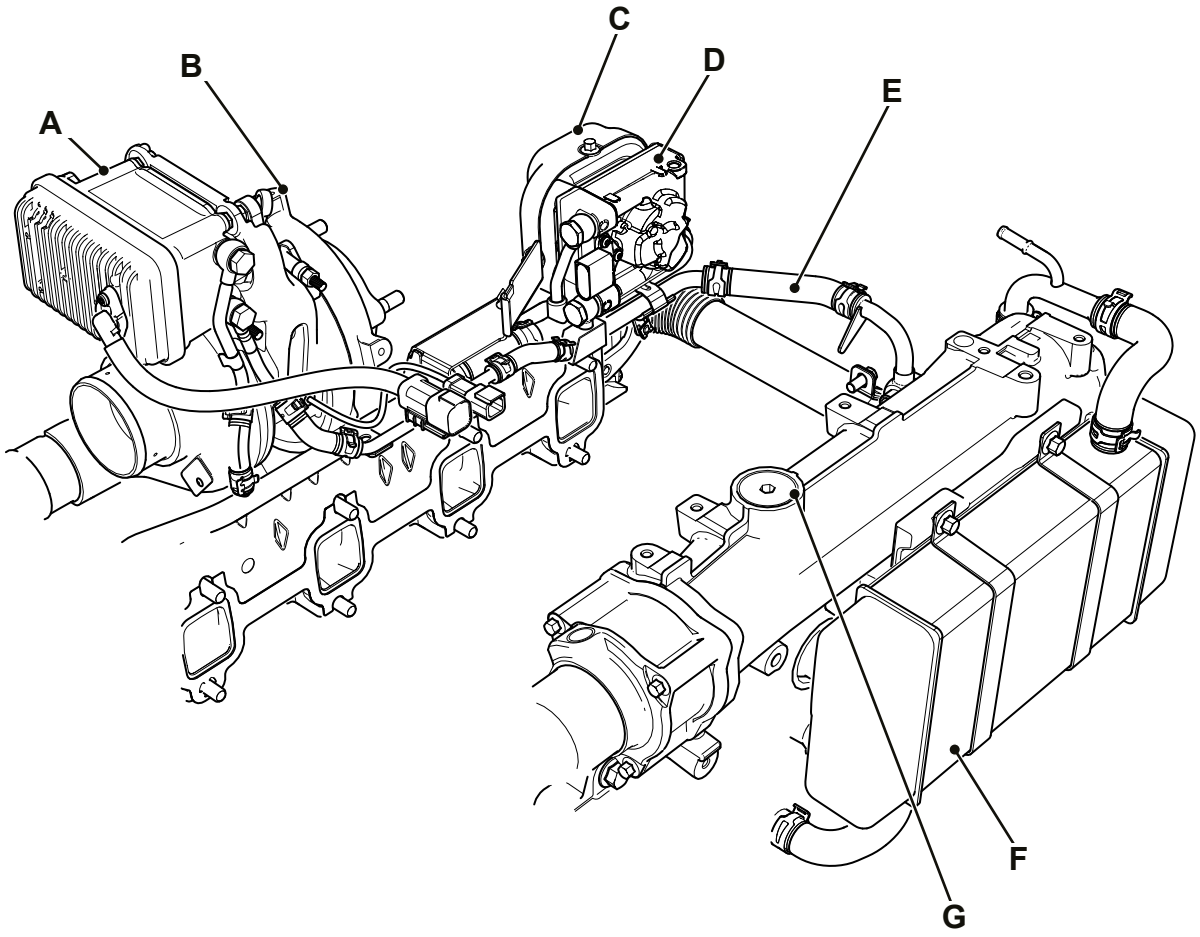
Alternatively use the JCB engine diagnostic tool within Servicemaster to energise the fuel pump (fuel lift pump test). After a 5 s delay the pump runs for a period of 24 s.

Remove and Install

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.
2. Get access to the engine.

Figure 373.

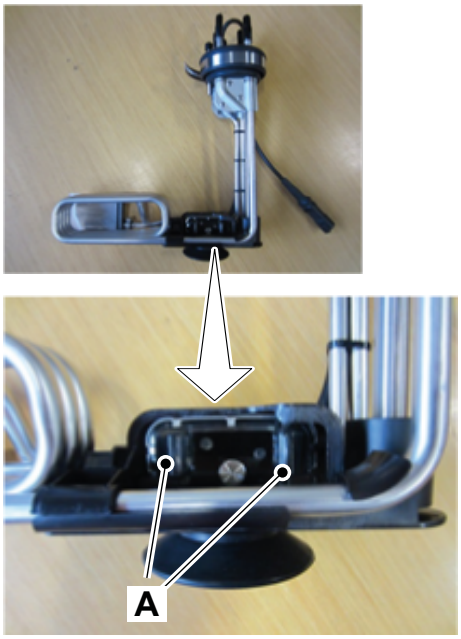


A VGT (Variable Geometry Turbocharger) actuator
B VGT
C EGR (Exhaust Gas Recirculation) actuator
D EGR valve
E EGR Intermediate Cooler
F Main Plate Cooler
G Mixer Tube

11. Clean the DEF filler cap with water and traffic film remover solution. Rinse thoroughly afterwards with clean water.
12. Drain the DEF tank.
13. With the DEF tank drain plug removed, thoroughly rinse the DEF tank through the filler cap with clean water from an open ended low pressure hose pipe.
14. Install the DEF tank drain plug. Tighten to the correct torque value.
15. Fill the DEF tank with clean water from an open ended low pressure hose pipe.
16. Drain the DEF tank.
17. Install the DEF tank drain plug. Tighten to the correct torque value.
18. Fill the DEF tank with clean good quality DEF.
19. Place the dosing metering module pressure line extension tube end into a clean container and perform the maximum pump flow DEF dosing quantity test routine within Service Master.
20. Replace the DEF filter and the DEF pre-filter located in the pump supply module. Refer to (PIL 18-30-06).
21. Perform the maximum pump flow DEF dosing quantity test routine within Service Master.
22. Disconnect the test equipment.
23. Install the dosing metering module. Make sure the metal gasket is replaced.
24. Start the engine.
25. Switch off the engine.

    Duration: 1 min
26. Start the engine. All faults and warnings should be cleared.
27. If contamination warnings remain further cleaning will be required. Carry out 28 to 32.
28. Remove the tank sensor. Refer to (PIL 18-30-09).
29. With the DEF tank drain plug removed, use a pressure washer to rinse the inside of the DEF tank.
30. Clean the tank sensor unit with water and traffic film remover solution.
31. Carefully wipe the DEF quality sensor lens and mirror with a clean, disposable soft wipe. Make sure that you do not to scratch or damage the quality sensor.

Figure 382.



A DEF quality sensor

32. Install the tank sensor unit.

If contamination warnings remain, the DEF tank and tank sensor unit may have to be replaced.

Table 165. Torque Values

Item	Nm
2	9

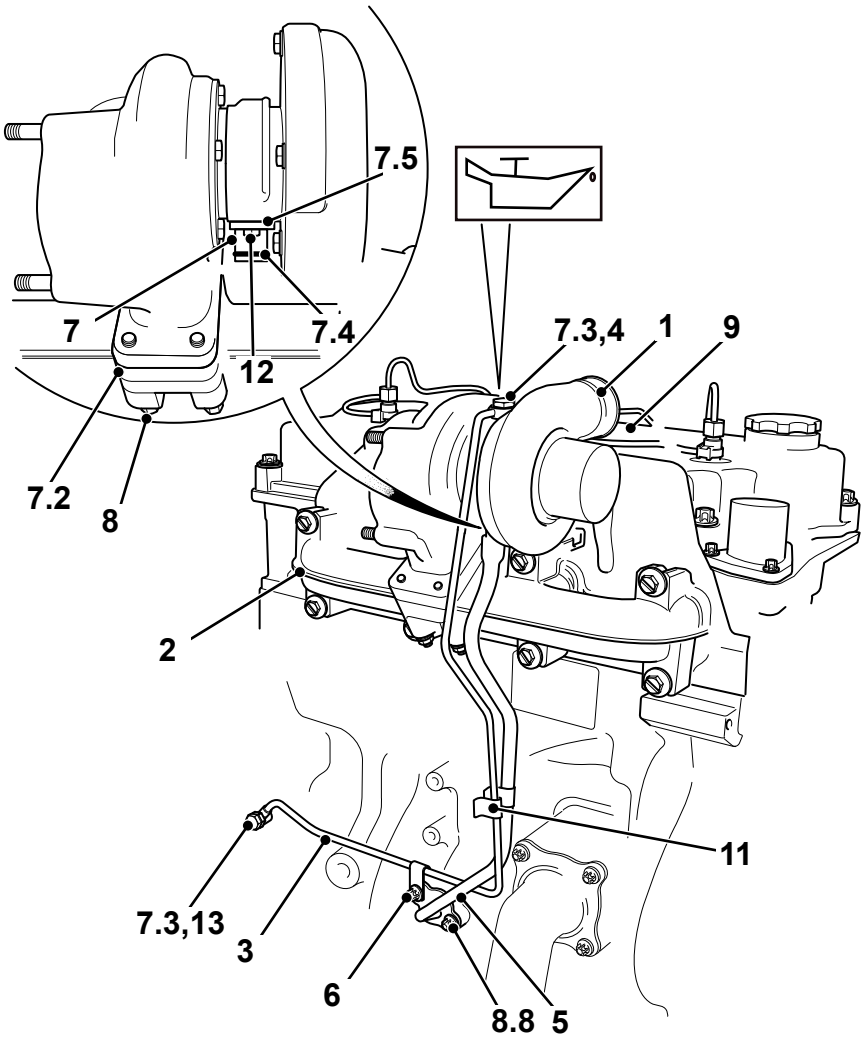
Operation

The dosing metering module is controlled by the SCR (Selective Catalytic Reduction) control module. The SCR control module uses information from the upstream and downstream NOx (Nitrogen Oxide) sensors to determine the quantity of DEF (Diesel Exhaust Fluid) needed to reduce the nitrogen emissions to the required level. The SCR control module will then send a signal to the dosing metering module which will inject DEF in to the exhaust gases.

The dosing metering module has engine coolant flowing through it so that the DEF is prevented from freezing when the machine is used in cold conditions.

Component Identification

Figure 406.



1 Turbocharger
2 Exhaust manifold
3 Oil feed pipe (turbo bearing)
4 Banjo bolts M12
5 Oil drain pipe (turbo bearing)
6 Fixing bolts (x2)
7 Pipe adaptor (oil drain connection)
8 Retaining nuts (x4)
11 Pipe clip
12 Bolt - pipe adaptor (oil drain connection)
13 Banjo bolts M16

00 - General

Introduction

Fuel at rail pressure is continuously supplied to the injectors via high pressure fuel pipes. The high pressure fuel injector 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 pipes are maintained and installed correctly for safe and effective engine operation.

The high pressure fuel pipes connect the injectors to the common rail. The injectors inject fuel in response to a supply of electrical current from the ECM (Engine Control Module). During fuel injection some fuel bleeds off the injectors and back to tank via the low pressure bleed off pipes.

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.

Notes:

00 - General

Introduction

Two different types of motors can be installed in the cooling fan.

- Uni-directional.
- Bi-directional.

The bi-directional motor used in the fan has a reverse option. The uni-directional motor can be clockwise or counterclockwise. The arrow and the word "Rotate" on the motor body indicates the manufactured direction of rotation.

The first letter of the code reference following the number stamped on the body also denotes the direction of rotation:

- A = Anti-clockwise (counterclockwise).
- C = Clockwise.
- ‘R’ = Bi-rotational.

Important: Rotation is always specified as viewed on the end of the driveshaft.

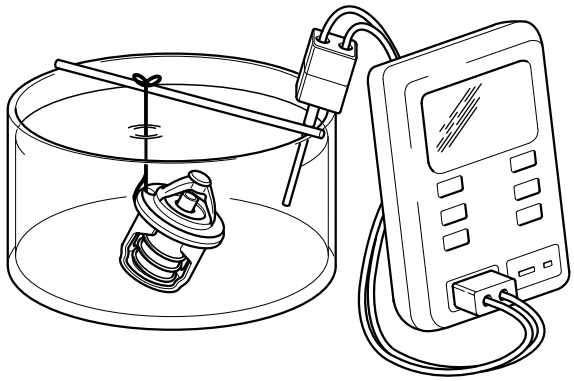
The inlet port is arrowed or stamped with the word ‘HP INLET’ for identification purposes.

Check (Operation)

A period of 3 –5 min before the thermostat valve starts to operate is normal because of the time required to heat soak the thermostat.

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.
2. Remove the thermostat housing and the thermostat. Refer to (PIL 21-12).
3. Suspend the thermostat in a suitable container of coolant. Use an external heat source to gradually increase the temperature of the coolant. Note: When working with boiling water, all the necessary safety precautions must be taken. Refer to Figure 451.

Figure 451.



4. Use a thermometer to measure the temperature of the coolant.
5. When the coolant reaches the operating range of the thermostat the valve should start to open, the movement of the valve plate should be evident.
6. Record the start to open temperature, the fully open temperature and the amount of valve lift travel when fully open. Compare this with the data in Technical Data (PIL 21-00).

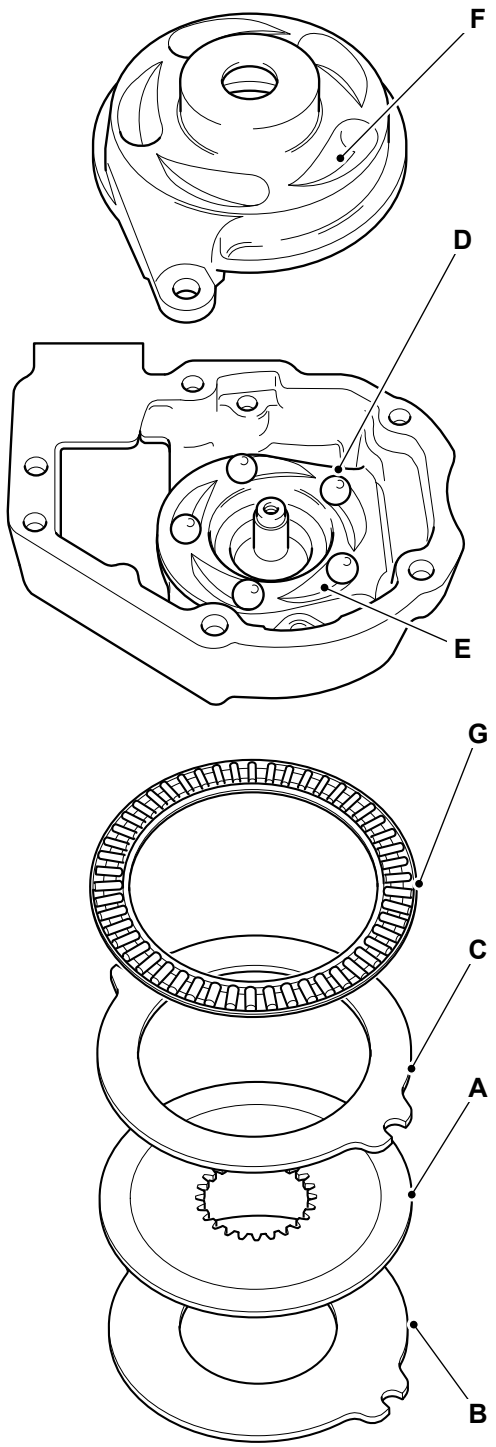
09 - Brake Valve

Introduction

The brake valve uses the vehicle's main hydraulic system. When the brake pedal is actuated, the hydraulic pump reduces the flow rate from the travel drive. Braking then takes place using the engine’s support torque. Only if the pedal is pressed harder does the brake valve ensure that the brake linings make contact.

8. Inspect the cable outer for signs of damage. Replaced the cable if it is damaged or stiff to operate.

Figure 471.



A Friction plate
B Counter plate
C Thrust plate
D Ball
E Cover
F Actuator plate
G Needle roller thrust bearing

Disassemble and Assemble

Disassemble

1. Make the machine safe. Refer to (PIL 01-03).
2. Remove the brake actuator. Refer to (PIL 24-18).
3. Carefully remove the screw.
   3.1. Make a note that the screw is under tension from spring 1 and spring 2.
4. Remove washer 1 and washer 2.
5. Remove spring 1 and spring 2.
6. Lift out the brake actuator plate and balls.

Assemble

1. The assembly procedure is the opposite of the disassembly procedure. Additionally do the following steps.
2. Apply a little grease to the ball locating slots in the cover and actuator plate.
3. Install balls in their slots in the cover.
4. Install the actuator plate.
5. Install the spring 1 and spring 2.
6. Install the washer 1 and washer 2.
7. Compress the springs.
8. Install the screw.
9. Tighten the screw to the correct torque value.

00 - General

Introduction

The steering column connects the steering wheel to the steering mechanism.

Technical Data

(For: PS764)

Table 185. PS763 3-speed

Description	Data
Type	Full electro-hydraulic transmission unit
Dry weight (2WD (Two Wheel Drive))	227 kg
Gear ratios (Forward/reverse)	
1st	7.967:1
2nd	4.290:1
3rd	1.857:1
4th	1.000:1
Torque converter	
Torque converter diameter	310 mm
Torque converter identification	W300
Torque multiplication at stall	2.02:1
Converter pressure (in neutral)	
Inlet pressure at 50 °C (121.9 °F) and 1000 RPM (Revolutions Per Minute)	1.4 –2.2 bar (20.3 –31.9 psi)
Inlet pressure at 50 °C (121.9 °F) and 2000 RPM	5.8 –6.9 bar (84.1 – 100.0 psi)
Inlet pressure at 100 °C (211.9 °F) and 1000 RPM	0.5 –1.3 bar (7.2 –18.8 psi)
Inlet pressure at 100 °C (211.9 °F) and 2000 RPM	2.5 –3.5 bar (36.2 –50.7 psi)
Outlet pressure at 50 °C (121.9 °F) and 1000 RPM	0.6 –1.6 bar (8.7 –23.2 psi)
Outlet pressure at 50 °C (121.9 °F) and 2000 RPM	2.8 –3.8 bar (40.6 –55.1 psi)
Outlet pressure at 100 °C (211.9 °F) and 1000 RPM	0.2 –1 bar (2.9 –14.5 psi)
Outlet pressure at 100 °C (211.9 °F) and 2000 RPM	1 –1.9 bar (14.5 –27.5 psi)
Inlet relief pressure	7.1 bar (102.9 psi)
Lubrication pressure (in neutral)	
Oil at 50 °C (121.9 °F) and 1000 RPM	0.2 –0.9 bar (2.9 –13.0 psi)
Oil at 50 °C (121.9 °F) and 2000 RPM	1.1 –2.1 bar (15.9 –30.4 psi)
Oil at 100 °C (211.9 °F) and 1000 RPM	0.1 –0.4 bar (1.4 –5.8 psi)
Oil at 100 °C (211.9 °F) and 2000 RPM	0.4 –1.4 bar (5.8 –20.3 psi)
Main line pressure (in neutral)	
Oil at 50 °C (121.9 °F) and 1000 RPM	11 –13 bar (159.4 – 188.4 psi)
Oil at 50 °C (121.9 °F) and 2000 RPM	13 –15.2 bar (188.4 – 220.3 psi)
Oil at 100 °C (211.9 °F) and 1000 RPM	10.2 –12.2 bar (147.8 – 176.8 psi)
Oil at 100 °C (211.9 °F) and 2000 RPM	11.4 –14.5 bar (165.2 – 210.1 psi)
Clutch pressure	All clutch pressures should be the same as main line pressure to within 0.7 bar (10.1 psi)
Flow rate (in neutral)	
Cooler flow rate at 50 °C (121.9 °F) and 1000 RPM	8.5 –11 L/min
Cooler flow rate at 50 °C (121.9 °F) and 2000 RPM	17 –25.1 L/min
Cooler flow rate at 100 °C (211.9 °F) and 1000 RPM	6.2 –9.5 L/min
Cooler flow rate at 100 °C (211.9 °F) and 2000 RPM	15 –19.5 L/min
Pump flow rate at 100 °C (211.9 °F) and 1000 RPM	11.5 –15.6 L/min
Pump flow rate at 100 °C (211.9 °F) and 2000 RPM	24 –33 L/min
Control solenoid valves	3 way, 2 position, normally closed, integral suppression diode.
Initial coil current draw	1.68 A @ 12 V and 20 °C (68.0 °F)

Forward and Reverse Clutch Operation

The forward and reverser clutch assembly transfers drive from the input shaft to either gear 1 or gear 2 depending on which of the two clutches is engaged, giving forward or reverse drive.

When neither clutch is engaged, neutral is selected.

The clutches are of the wet, multi plate type.

The clutch housings and input shaft are a one piece assembly. The assembly is permanently driven by the engine via the torque converter.

Clutch counter plates are also permanently driven via meshing teeth inside the clutch housings. Clutch friction plates are meshed with the gear plate carriers.

In the diagram, clutch for gear 1 is engaged.

The counter plates and friction plates are pressed together by a hydraulically actuated piston. Drive is then transmitted from the input shaft to the gear 1. Clutch for gear 2 is disengaged and no drive is transmitted to gear 2 plate carrier. The gear is also free to rotate on the input shaft assembly.

Actuation of the hydraulic pistons and is controlled via three position solenoid control valve.

When neutral is selected both solenoids are deactivated and the flow of pressurised oil to the clutches is blocked. The gear springs 1 and 2 move the pistons away from the clutch plates and oil from both pistons is vented to the sump.

When either forward or reverse is selected, the solenoid control valve diverts pressurised oil via cross drillings inside the input shaft to the appropriate clutch piston in the unit. Pressure from the other clutch is vented to the sump via the solenoid valve spool. Oil is prevented from leaking by seals on the pistons and ring seals on the input shaft.

Drain and Fill

Consumables

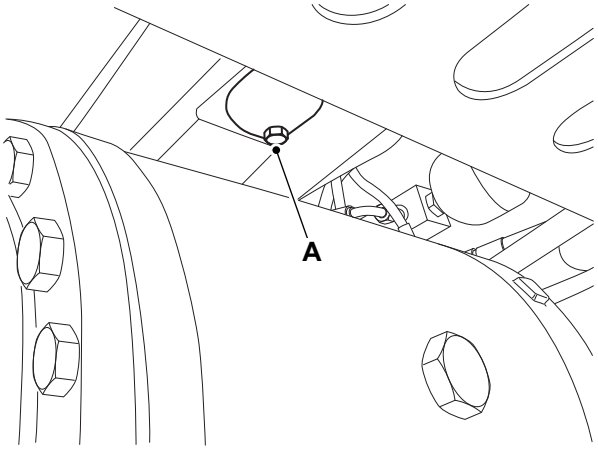
Description	Part No.	Size
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01 L
	4101/0251	0.05 L

⚠ **CAUTION** When the strainer is removed, oil will gush out. Keep to one side when you remove the strainer.

The transmission oil should be drained through the suction strainer aperture to flush out any particles which fall off the strainer during its removal.

1. Make the machine safe with the lift arm lowered. Refer to (PIL 01-03).
2. Put a suitable container below the suction strainer.
3. Remove the bolt 1.

Figure 511.



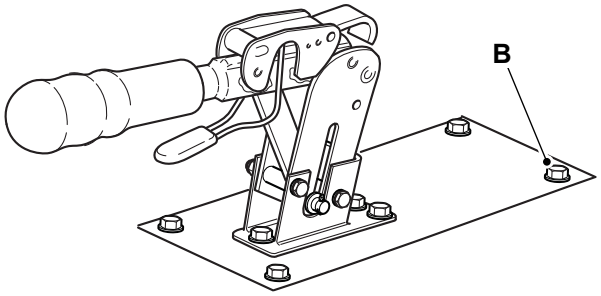
A Bolt 1

4. Carefully pull out the strainer with its gasket.
5. Let the oil drain into the container. Be aware that the oil may be hot.
6. Clean the strainer with a suitable solvent. Follow the solvent manufacturer's instructions on safety.
7. Install the strainer with its gasket.
8. Apply JCB Threadlocker and Sealer to the bolts before installation.

   Consumable: JCB Threadlocker and Sealer (Medium Strength)
9. Tighten the bolt to the correct torque value.
10. Get access to the filter.

    10.1. Remove the bolt 2 (x4).

Figure 512.



B Bolt 2 (x4)

    10.2. Carefully lift and move the park brake and its plate to the side.

    10.3. The filter is below the plate.

    10.4. Remove the filter.

11. Install the new filter

    11.1. Lubricate the seal with transmission oil.

    11.2. Install the seal on the filter.

    11.3. Attach the filter until it contacts the filter head.

    11.4. Turn the filter at least 3/4 of a turn.
12. Install the park brake and plate.
13. Fill the system with the recommended oil through the dipstick/filler.
14. Do not fill the system over the top mark on the dipstick.
15. Make sure that you only install the correct JCB filter to the system.
16. Check the system for leaks.
17. Close the engine compartment cover. Refer to (PIL 06-06).

Table 231. Torque Values

Item	Nm
A	10

06 - Clutch - Reverse

Introduction

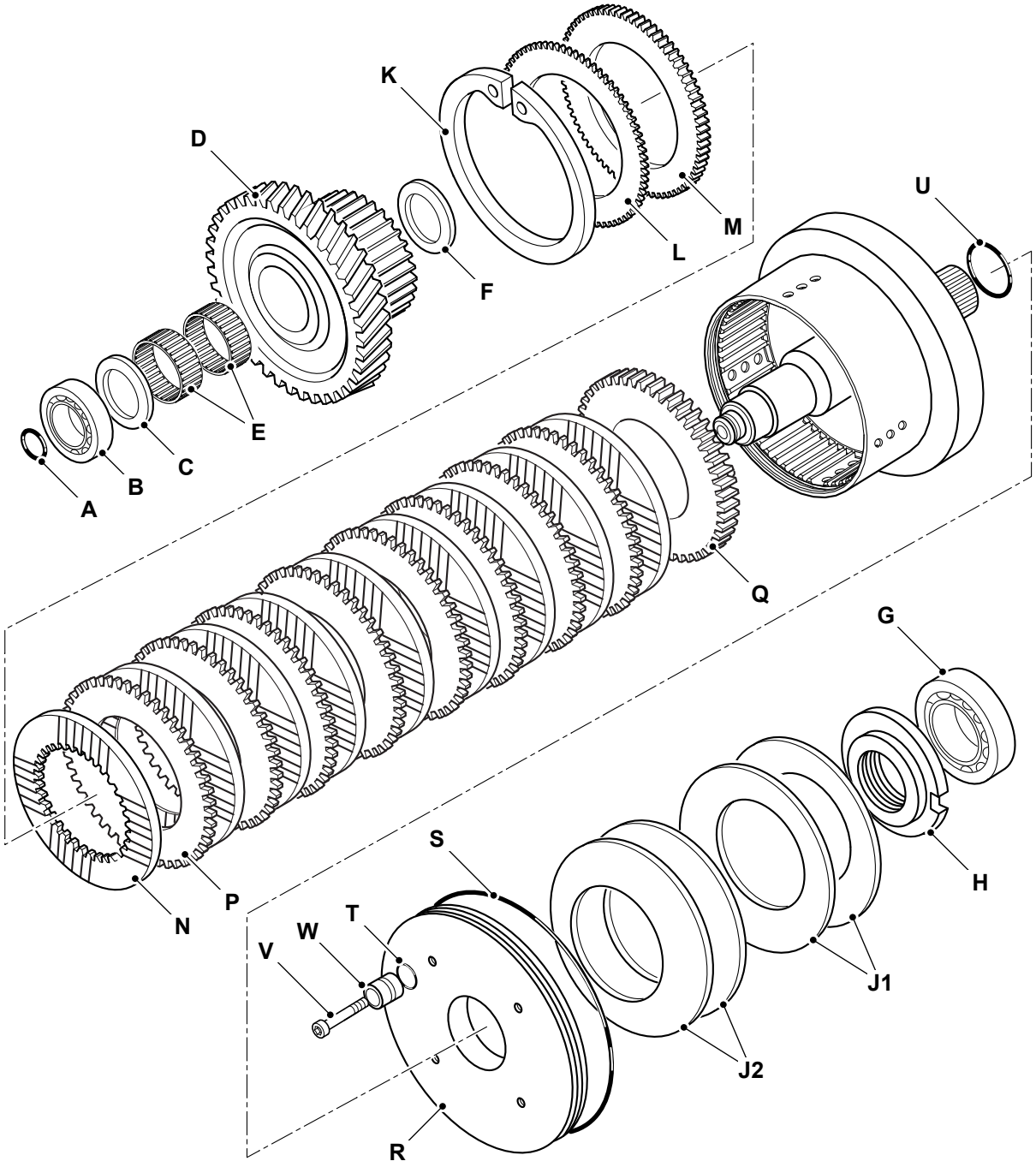
The clutch is a mechanical device that engages and disengages the transmission, from driving shaft to driven shaft. The clutch is located between the engine and the gearbox, as disengaging it is required to change gear.

The clutch is operated by a pedal using a hydraulic or cable connection from the pedal to the clutch mechanism.

The default state of the clutch is engaged, that is the connection between the engine and gearbox is always on unless the driver presses the pedal and disengages it.

If the engine is running with the clutch engaged and the transmission in neutral, the engine spins the input shaft of the transmission, but no power is transmitted to the wheels. Although the gearbox does not stop rotating during a gear change, there is no torque transmitted through it, thus less friction between gears and their engagement gears.

Figure 542. S1 - 4WD Spring ON



A Piston ring seal
B Taper roller bearing 1
C Thrust washer 1
D Gear and splined hub
E Needle roller bearings
F Thick thrust washer
G Taper roller bearing 2
H Locknut
J1 Disc spring
J2 Disc spring
K Friction and counter plates retaining circlip
L Shims
M Pressure end plate
N Friction plates
P Counter plates
Q Pressure end plate
R Piston
S O-ring 1
T O-ring 2
U O-ring 3

Check (Condition)

(For: PS763, PS764, PS766)

Do a visual check of the friction and counter plates:

Counter plates

1. Light scoring or polishing is permissible, plates that are not flat, worn or heavily marked or scored must be replaced with a new one.

Friction plates

1. The cross hatching should be clearly visible, plates that are not flat, have friction material damage or scoring must be replaced with a new one.
2. Do not change individual plates, if a plate is damaged or worn install a complete new set.
3. Needle roller bearings should slide into position freely, do not bend or distort the cage to install. If the cage has been distorted install new bearings.

The piston consists of a small check valve. Visually check the piston to make sure that the ball is in place and that the seat is free from contamination. If necessary clean the valve by blowing through with an air line. Do not use a wire rod (or screwdriver) as it can damage the valve seat.

Remove and Install

(For: PS763, PS764, PS766)

The layshaft clutch, 2WD / 4WD clutch, reverse clutch, mainshaft clutch and forward / input clutch are all part of the mainshaft assembly.

Refer to the mainshaft remove and install procedure. Refer to (PIL 27-06-54).

Table 241.

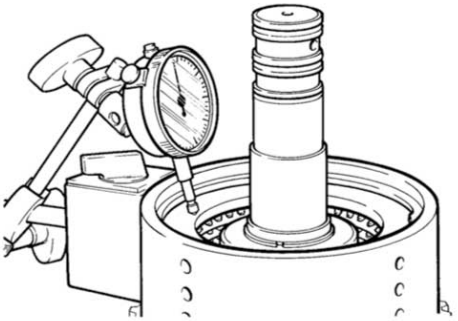
Item	Description
A	Piston ring seal1 (Forward and reverse clutch only)
B	Clutch end bearing 1
C	Gear
D	Thrust bearing 1
E	Thin thrust washer 1
F	Gear and splined hub 1
G	Needle roller bearing 1
H	Thick thrust washer 1
J	Thrust bearing 2
K	Thin thrust washer 2
L	Friction and counter plate retaining circlip
M	Shim
N	Pressure end plate
P	Friction plates
Q	Counter plates
R	Disc spring assembly
S	Circlip 1
T	Spring retaining plate
U	Spring
V	Oil baffle
W	Piston
X	Piston O-ring
Y	Shaft O-ring
Z	Piston ring seal 2
AA	Clutch end bearing 2
AB	Thick thrust washer 2
AC	Thrust bearing 3
AD	Thin thrust washer 3
AE	Gear and splined hub 2
AF	Needle roller bearing 2

Assembly

1. Install the new piston O-ring onto the piston.
2. Install the new shaft O-ring onto the shaft.
3. Lubricate the piston with oil and push fully into the bore of the clutch housing.
4. Install the oil baffle and the piston spring. Make sure that the spring is positioned properly in the piston.
5. Install the spring retaining plate.
6. Compress the spring with a cut away tube and secure with circlip 2.
7. Install the disc spring assembly.
   7.1. Make sure that the disc spring is installed with the teeth towards the clutch pack.
   7.2. Make sure that the teeth are not aligned with the lubrication slots in the housing.
   7.3. In PS760 variant no disc spring is installed.
8. Install one counter plate followed by one friction plate.
   8.1. Continue to install alternate counter and friction plates, finishing with a friction plate.
9. Install the pressure end plate. Make sure the chamfered face of the pressure end plate faces the clutch pack.
10. Make sure that the teeth are not aligned with the lubrication slots in the housing.
11. Do not install the shim at this stage.
12. Install the friction and counter plate retaining circlip.
13. Use a DTI (Dial Test Indicator) to measure the end float of the pressure end plate. For PS760 variant the value should be within the specified range.

    Dimension: 1.9 –2.5 mm

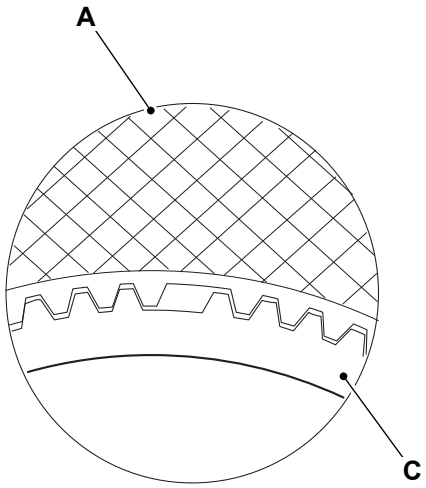
Figure 566.



14. If it is necessary to adjust the end float to bring it within tolerance, then you can choose either 6.0mm (0.23in) or 6.5mm (0.25in) thick pressure end plate, with either a shim or an extra counter plate between the retaining circlip and the pressure end plate.
15. Use an airline to check the operation of the clutch.
16. Install the thick thrust washer 1, thin thrust washer 2, and the thrust bearing 2.
17. Use a thin rod (or screwdriver) to carefully align the teeth of the clutch plates and install the gear and splined hub 1.
18. Install the needle roller bearing 1.

2. Friction plates should not be less than 3.5 mm thick or have oil grooves less than 0.1 mm deep. If the friction plate thickness is less then 3.5 mm then it needs to be changed for a new one.
3. Replace the plates in a set, not as a single piece.
4. Check the thrust washer for wear.
5. If the thickness is less than 2.9mm or the outside diameter is less than 90mm then replace the thrust washer.
6. Before you install new friction plates and a new thrust washer soak them in transmission oil for at least one hour.
7. Start the assembly with a friction plate followed by a counter plate and so on.
8. Note the correct orientation of oil slots in the friction plates relative to the plate carrier. Refer to Figure 587.

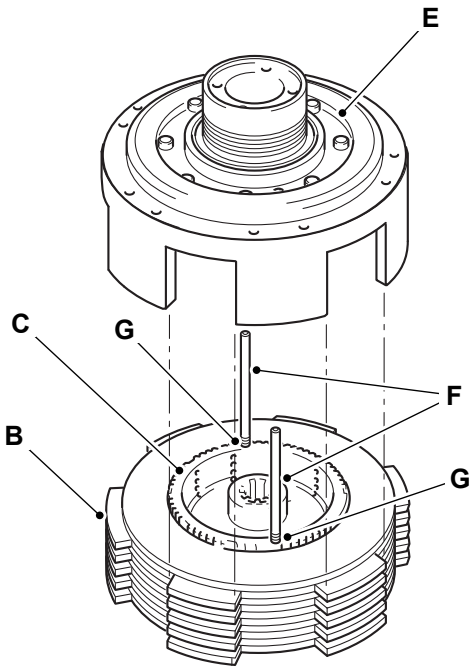
Figure 587.



A Friction plate
C Plate carrier

9. The counter plates should be positioned relative to the two threaded holes. Refer to Figure 588.

Figure 588.



B Counter plates
C Plate carrier
E Clutch drum and hub assembly
F Guide rods
G Threaded hole

10. It is not possible to replace the clutch drum and hub assembly inside the clutch housing unless it is first installed to the plates and plate carrier assembly.
11. Install the thrust washer to the plate carrier.
12. Install two suitable guide rods to the threaded holes in the plate carrier.

    Special Tool: Guide Rods (Qty.: 2)
13. Use suitable lifting equipment to carefully lower the drum and hub sub-assembly over the plates.
14. Make sure that the guide rods locate through the corresponding holes in the drum.
15. Make sure that the drive tangs on the counter plates engage with the cut-outs in the drum.
16. It may be necessary to rotate the drum and plates slightly to align them.
17. With the drum and hub fully lowered, remove the guide rods and install two special pack retainers to temporarily hold the assembly together.

    Special Tool: Clutch Pack Retainers (Qty.: 2)
18. Do not use bolts or screws, mistakenly they may be left in the place which can make the clutch inoperative.

Figure 606.

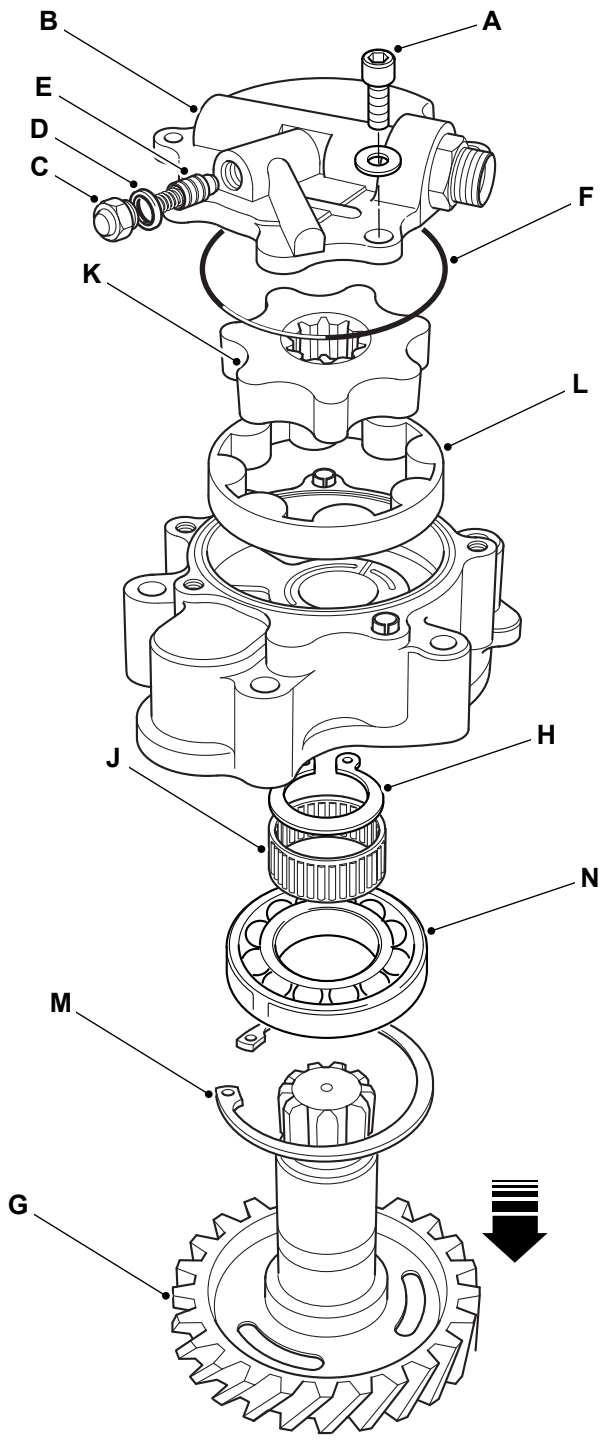


Table 255.

Item	Description
A	Capscrews
B	Cover
C	Plug
D	Bonded seal
E	Poppet valve
F	O-ring seal
G	Gear shaft
H	Circlip 1
J	Needle bearing race
K	Pump rotor
L	Annulus ring
M	Circlip 2
N	Ball bearing race.

Assemble

Assembly is the opposite of the disassembly procedure.

56 - Layshaft

Introduction

The layshaft is an intermediate shaft within a gearbox that carries gears, but does not transfer the primary drive of the gearbox either in or out of the gearbox.

Disassemble and Assemble

Special Tools

Description	Part No.	Qty.
Drive Coupling Spanner	892/00812	1

Consumables

Description	Part No.	Size
JCB Multi-Gasket	4102/1212	0.05 L

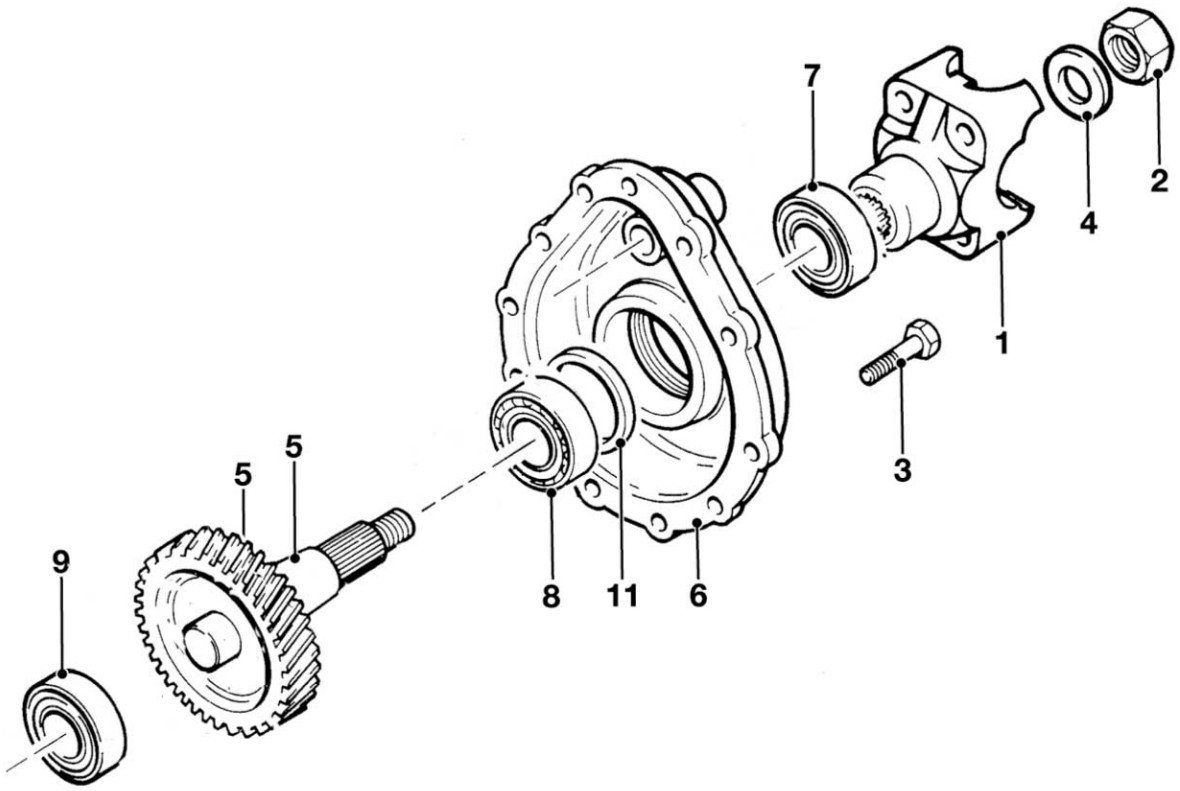
Disassemble

1. Use the tool 892/00812 to hold the output yoke, loosen the retaining nut.

   Special Tool: Drive Coupling Spanner (Qty.: 1)

2. Remove the housing bolts and withdraw the unit from the gearbox.
3. Remove the retaining nut, washer (if installed) and the yoke. Withdraw the shaft from the housing.
4. Remove the oil seal from the housing.
5. If the bearings are to be renewed, remove the inner cups from the shaft. Remove the outer cup of the bearing 8 from the housing and retrieve the spacer (if installed). Remove the outer cup of the bearing 9 from the main gearbox housing.

Figure 633.



1 Output yoke
2 Retaining nut
3 Housing bolts
4 Washer
5 Output shaft
6 Housing
7 Oil seal
8 Bearing
9 Bearing
11 Spacer

12 - Transfer Gearbox

Contents **Page No.**

Torque Converter Locked

When inputs to the gearbox ECU from the gear select lever and speed sensors are within pre-determined values, an output from the gearbox ECU energises solenoid control valve.

Oil enters the converter through the ports in the oil pump assembly and into the converter case nearest the gearbox.

Oil pressure forces the clutch assembly to move on its splined hub. This engages the clutch friction material with the inside of the torque converter case.

Drive from the engine is now transmitted from the converter case, through clutch and directly to the gearbox input shaft through the turbine.

Small bleed holes allow a small flow of oil past the clutch assembly through the converter. This provides oil cooling and prevent hydraulic locks.

The lubrication bypass valve is pushed off its seat and oil flows through the cooler and into the gearbox lubrication system in the normal way.

Component Identification

Component Identification

The illustration shows a typical steer drive front axle.

The front axle consist of a centre casing (drivehead) and two axle arms and swivel wheel hubs.

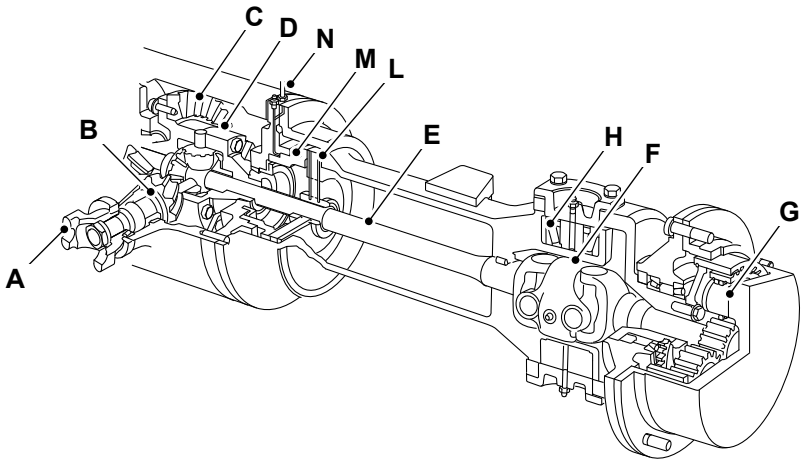
The drivehead houses the differential gearing and two oil-immersed disc brake units. (The SD70 axle has no oil immersed disc brake units).

The axle arms house the drive shafts. Specially shaped spider gears in the differential provide 'torque proportioning'. This means that drive power will be kept on one wheel if the other is slipping.

The wheel hubs are connected to the half shafts through universal joints which drive sun and planet gears inside the hubs.

The axle pin is mounted to the chassis (sway axle).

Figure 681.



A Yoke (drivehead)
B Pinion (drivehead)
C Crown wheel (drivehead)
D Differential unit (drivehead)
E Drive shaft
F Universal coupling
G Reduction gear hub
H Steer swivel trunnion bearings
L Inboard oil immersed multiplate disc brakes
M Brake actuation piston
N Hydraulic brake lines

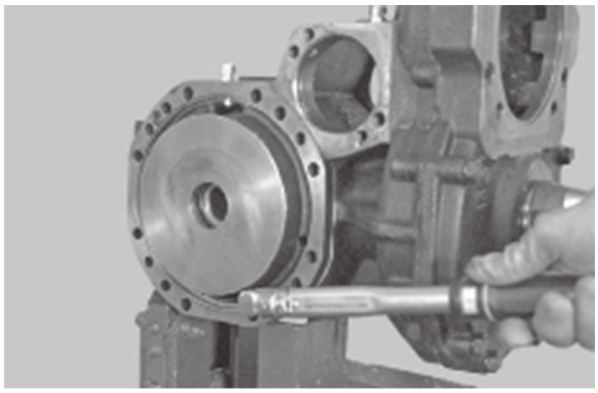
09 - Pinion Gear

Introduction

A pinion gear is a small gear that meshes with a larger crownwheel. They are mainly used in vehicles to maintain a forward movement.

25. Tighten the screw 4 to the correct torque value.

Figure 767.



26. Make sure that the seal ring is in contact with the arm.
27. Install the complete arm.
28. Install the applicable screws and washers.

Figure 768.

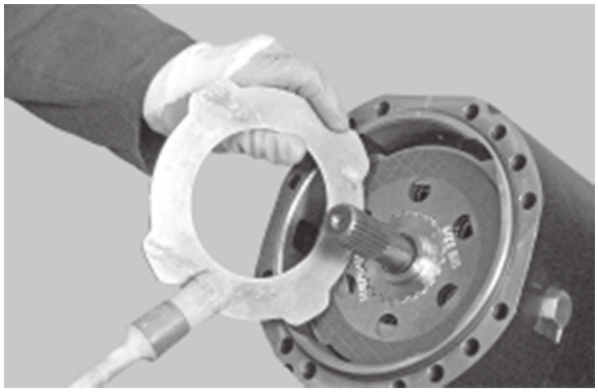


Table 282. Torque Values

Item	Description	Nm
R	Capscrew	122
R	Normal screw with Loctite 270	132
U	Screw 4	25

Health and Safety

⚠ **WARNING** If, for whatever reason, a wheel stud is renewed, all the studs for that wheel must be changed as a set, since the remaining studs may have been damaged.

WARNING Wheels and tyres are heavy. Take care when lifting or moving them. Store with care to ensure that they cannot fall and cause injury. Use suitable lifting equipment if necessary.

WARNING An exploding tyre can kill. Inflated tyres can explode if over-heated or over-inflated. Follow the instructions given when inflating the tyres. Do not cut or weld the rims. Use a tyre/ wheel specialist for all repair work.

WARNING Deflate the tyre you wish to change before removing the wheel from the machine. Air pressure in the tyres can cause the tyre and rim sections to explode causing serious injury or death. Never loosen the nuts that hold the inner and outer wheel halves together when there is air pressure in the tyre. Always wear safety glasses.

WARNING Wheels installed with semi-solid tyres are heavy. Removing and installing them requires special equipment and training. Have the work carried out by your JCB dealer or a tyre specialist.

WARNING Do not install pneumatic tyres on a wheel made for a solid tyre. Do not install a solid tyre on a wheel made for a pneumatic tyre. If you are unsure of the correct specification for your machine, contact your local JCB dealer or a trained specialist.

DANGER Run flat inserts may be installed in the rear wheels. These must remain installed to the rear wheels to ensure machine stability is not compromised in the event of a deflated tyre.

Make sure that all tyres are inflated to the correct pressure and have run flat inserts as required.

Where run flat inserts have been specified for use, ensure that replacement wheels also have run flat inserts to ensure the machine stability.

Technical Data

(For: TM320 [T4F], 2508700-2509499)

Table 287. Main hydraulic pump

Description	Data
Main hydraulic pump	
Type	Variable displacement
Reference	A10VO-63EKXDX/53R
Mounting	Gearbox
LS (Load Sense) pressure margin to pump pressure (Delta-P)	15 bar (217.4 psi)
Pump stand-by pressure (in neutral position)	25 bar (362.3 psi)
Pressure cut-off	250 bar (3,623.2 psi)
Maximum displacement	63cc/rev
Maximum flow at 2350 RPM (Revolutions Per Minute)	140 L/min
Flow in LS line	1 –5 L/min
Weight	35 kg
Brake charge valve	
Cut in pressure	140 bar (2,029.0 psi)
Cut out pressure	170 bar (2,463.8 psi)
Maximum brake line pressure	60 bar (869.6 psi)
Service flows	
Lift arm	130 L/min
Extension	125 L/min
Tilt	125 L/min
Auxiliary	90 L/min

Table 288. Auxiliary pump

Description	Data
Flow at 2420 x 1.625 RPM	22 L/min

Table 289. Control valve block

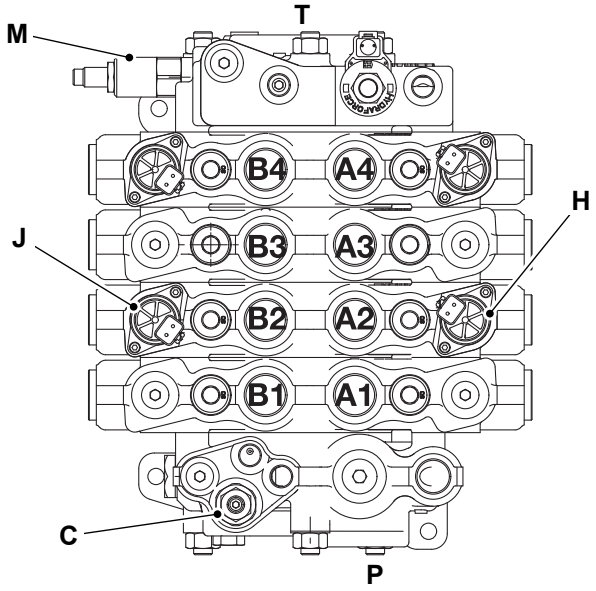
Description	Data
Type	4 Spool, LS - pressure compensated, double acting spools
Spool 1	Lift arm raise and lower service
Spool 2	Extend service
Spool 3	Carriage tilt service
Spool 4	Auxiliary service

Table 290. Relief valve pressures

Description	Data
LSRV (Load Sense Relief Valve)[1]	215 bar (3,115.9 psi)
Valve block inlet pressure[2]	230 bar (3,333.3 psi)
ARV (Auxiliary Relief Valve)	
Carriage tilt ram head side	240 bar (3,478.2 psi)
Carriage tilt ram rod side	240 bar (3,478.2 psi)
Pressure reducing valve	35 bar (507.2 psi)
LS pressure at steer relief	180 bar (2,608.7 psi)
Pump pressure at steer relief	200 -5/+5 bar (2,898.5 -72.5/+72.5 psi)

(1) Before testing theLSRV pressure, allow the hydraulic system to warm up to 50 °C (121.9 °F) to ensure an accurate reading.
(2) This value is always 15 bar (217.4 psi) higher than the LSRV pressure.

Figure 803.



C LSRV
H Carriage tilt ram rod side
J Carriage tilt ram head side
M Pressure reducing valve
P Valve block inlet pressure

Table 291. Maximum RPM cycle times

Description	Data
Lift	14.8 -5/+5
Lower	6 -5/+5
Crowd	2.8 -5/+5
Dump	2.8 -5/+5
Extend	3.5 -5/+5
Retract	2.7 -5/+5

03 - Smooth Ride System (SRS)

Introduction

The SRS (Smooth Ride System) is a hydraulic suspension system that is designed to enable a “cushion” effect for the loader lift rams, so that the ride will be smoother when you travel over rough terrain. The system is fully effective under all load conditions, from full payload to an empty shovel.

Nitrogen accumulators act through a stabilisation module valve to balance the oil displacement across the lift rams as the machine travels across rough terrain. The accumulators use hydraulic pressure on one side of a diaphragm, working against nitrogen gas pressure on the other, to damp out the forces felt in the loader lift arms, so keeping the machine steady at all times.

A manual override switch allows the system to be switched off if not necessary. The accumulators retain their charge at all times so that there is no possibility of the loader lift arm collapsing when the system is activated again.

50 - Schematic Circuit

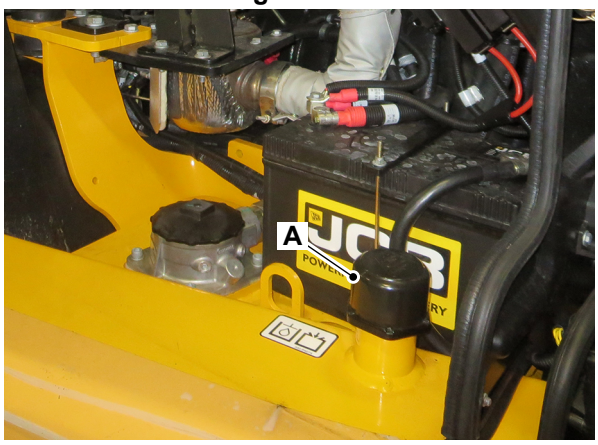
Introduction

A schematic wiring diagram is a simplified pictorial representation of the machines hydraulic circuit. It shows the components of the circuit as simplified hydraulic symbols, and the connections between the different components. The schematic diagram is used to troubleshoot problems and to make sure that all the connections have been made and that everything is present. Detailed schematics for individual systems are given in the relevant PIL section.

Drain and Fill

1. Make the machine safe with the lift arm lowered. Refer to (PIL 01-03).
2. Disconnect the battery. Refer to (PIL 33-03).
3. Open the engine compartment cover. Refer to (PIL 06-06).
4. Remove the filler cap from the hydraulic tank.
   4.1. Make sure that no foreign objects or contamination can enter the hydraulic tank.
5. Put a large suitable container below the drain plug of the hydraulic tank.

Figure 832.



A Filler cap

6. Remove the drain plug.
7. When the hydraulic tank is empty, check the drain plug.
   7.1. Clean the drain plug.
   7.2. Install the drain plug.
   7.3. If the drain plug is damaged, replace it.
8. Fill the hydraulic tank with clean fluid through the filler neck.
9. Check the hydraulic oil level. Refer to (PIL 30-00).
10. Install the filler cap.

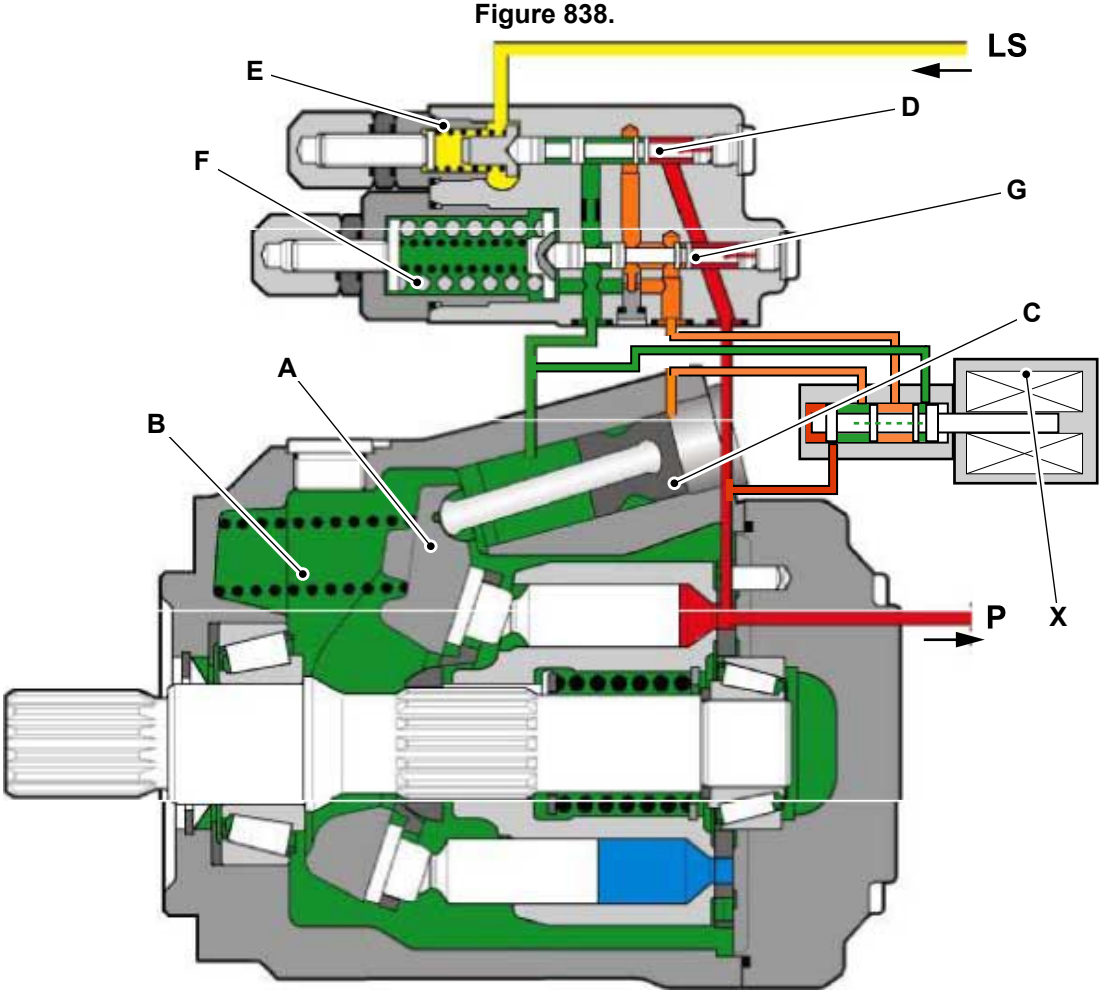
Operation

The pump output flow and operating pressure are controlled by varying the angle of the tilting swash plate.

The swash plate is moved in one direction by the force of the spring, and in the opposite direction by control pressure (orange) acting behind the swash control piston. The control pressure is derived from the pump operating pressure (red) by the action of the flow compensator spool.

The flow compensator spool regulates the angle of the swash plate automatically in response to changes in the hydraulic LS (Load Sense) pressure (yellow) from the hydraulic service.

Figure 838.



A Swash plate
B Spring
C Piston
D Compensator spool
E Spring
F Valve spring
G Cut-off spool
X Proportional solenoid valve
P Pump operating pressure

Flow compensator valve

When a hydraulic service is operated, for example boom lift, a pressure signal is generated in the LS from the control valve block.

The increase in the LS pressure, combined with the force of the spring pushes the flow compensator spool to the right, this in turn, allows some control pressure (orange) acting on the swash control piston to vent back to tank through the case drain (green).

The force of the spring increases the angle of the swash plate and the pump output flow increases proportionally.

5. Bleed the hydraulic system. Refer to (PIL 30-00).
6. Check the condition of the grease nipples.
   - 6.1. If the grease nipples are blocked then clean them.
   - 6.2. If the grease nipples are damaged then replace them.

00 - General

Introduction

A hydraulic accumulator is a pressure storage reservoir used to store hydraulic fluid, the non-compressible hydraulic fluid is held under pressure by a compressed nitrogen gas. It is designed to increase or relieve pressure in the hydraulic system.

Accumulators enable a hydraulic system to cope with extremes of demand using a less powerful pump, to respond more quickly to a temporary demand, and to smooth out pulsations.

It is not possible to disassemble the accumulators. The extent of permissible servicing is limited to checking the nitrogen gas pre-charge pressure. If an accumulator is suspected as being faulty it must be renewed as a complete assembly.

Make sure you have read and understood the Health and Safety implications. Refer to: PIL 30-18-00.

There are three different types of accumulator installed on JCB machines:

- Diaphragm (sealed for life) - Non Rechargeable.
- Diaphragm (with gas valve) - Rechargeable.
- Piston Bladder - Rechargeable.

Although some accumulators are identical in appearance, the accumulators are charged to different pressures. When renewing an accumulator make sure you know the correct charge pressure, refer to the applicable Technical Data.

Upon installation of a new accumulator the correct label stating the charge pressure must be attached. The original label which states a zero charge must be removed.

L Inlet gauge port

M Load sense port

00 - General

Introduction

Hydraulic hoses are used to connect different components in the hydraulic circuit. The hoses are graded by pressure, temperature, and fluid compatibility. Hoses are built up with rubber and steel layers. A rubber interior is surrounded by multiple layers of woven wire and rubber. The exterior is designed for abrasion resistance. The bend radius of a hydraulic hose is carefully designed into the machine, since hose failures can be deadly, and violating the hose's minimum bend radius will cause failure. Hydraulic hoses generally have steel fittings swaged on the ends.

ure 913. (Part 2 of 2)

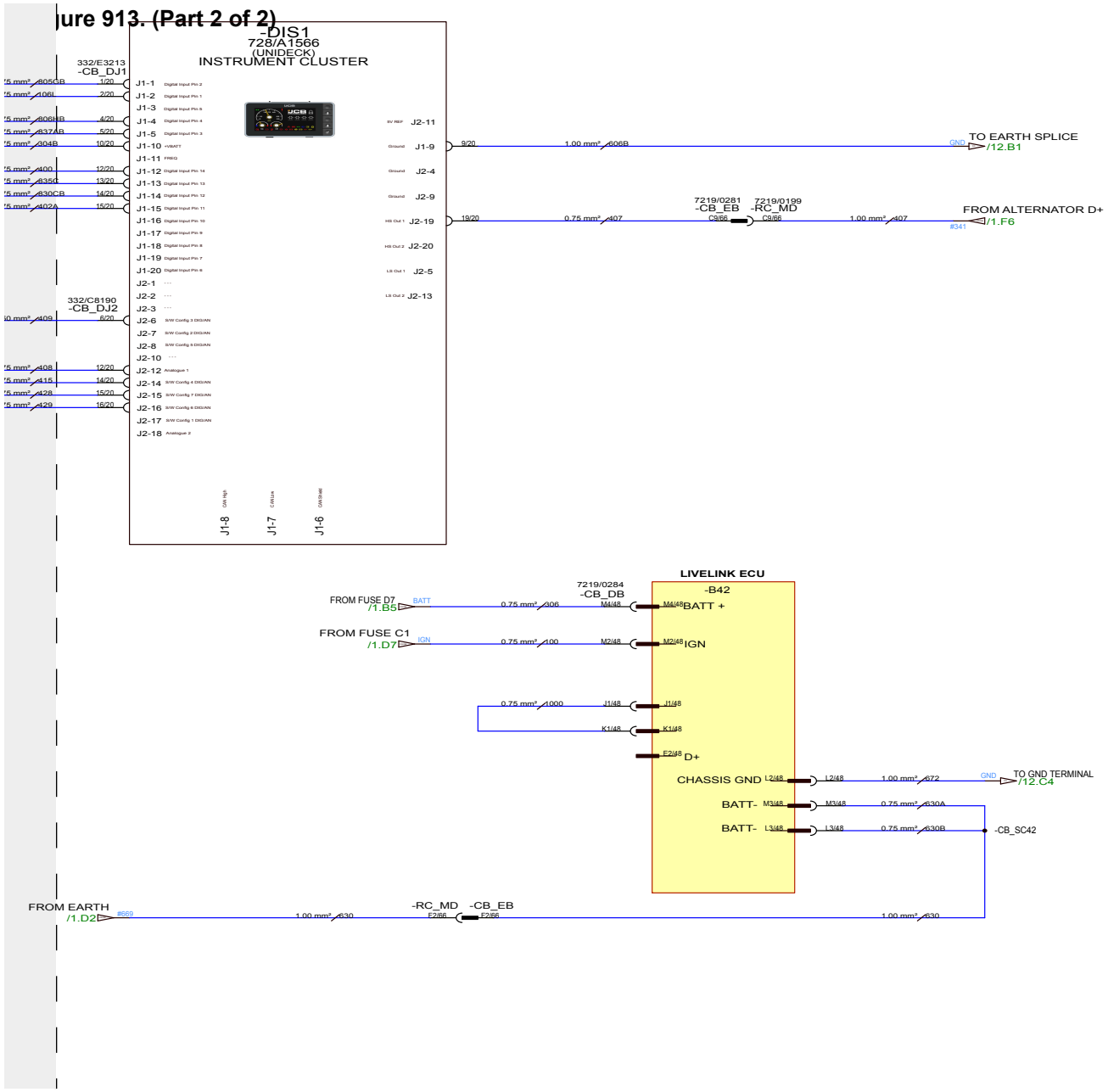


Figure 918. (Part 1 of 2)

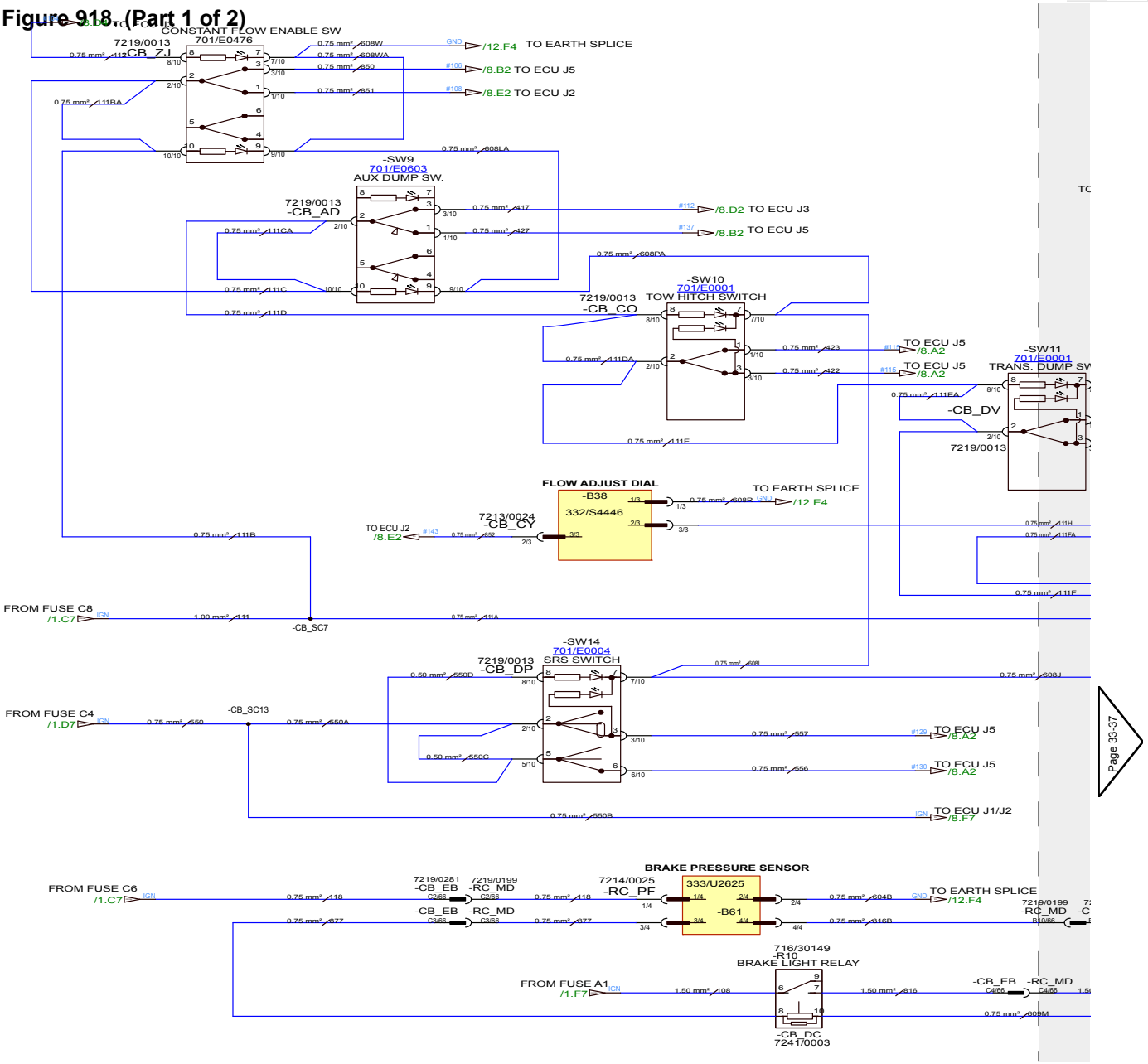


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Figure 923. Earth 336/
D6514_Issue 5 (Sheet 12 of 15)

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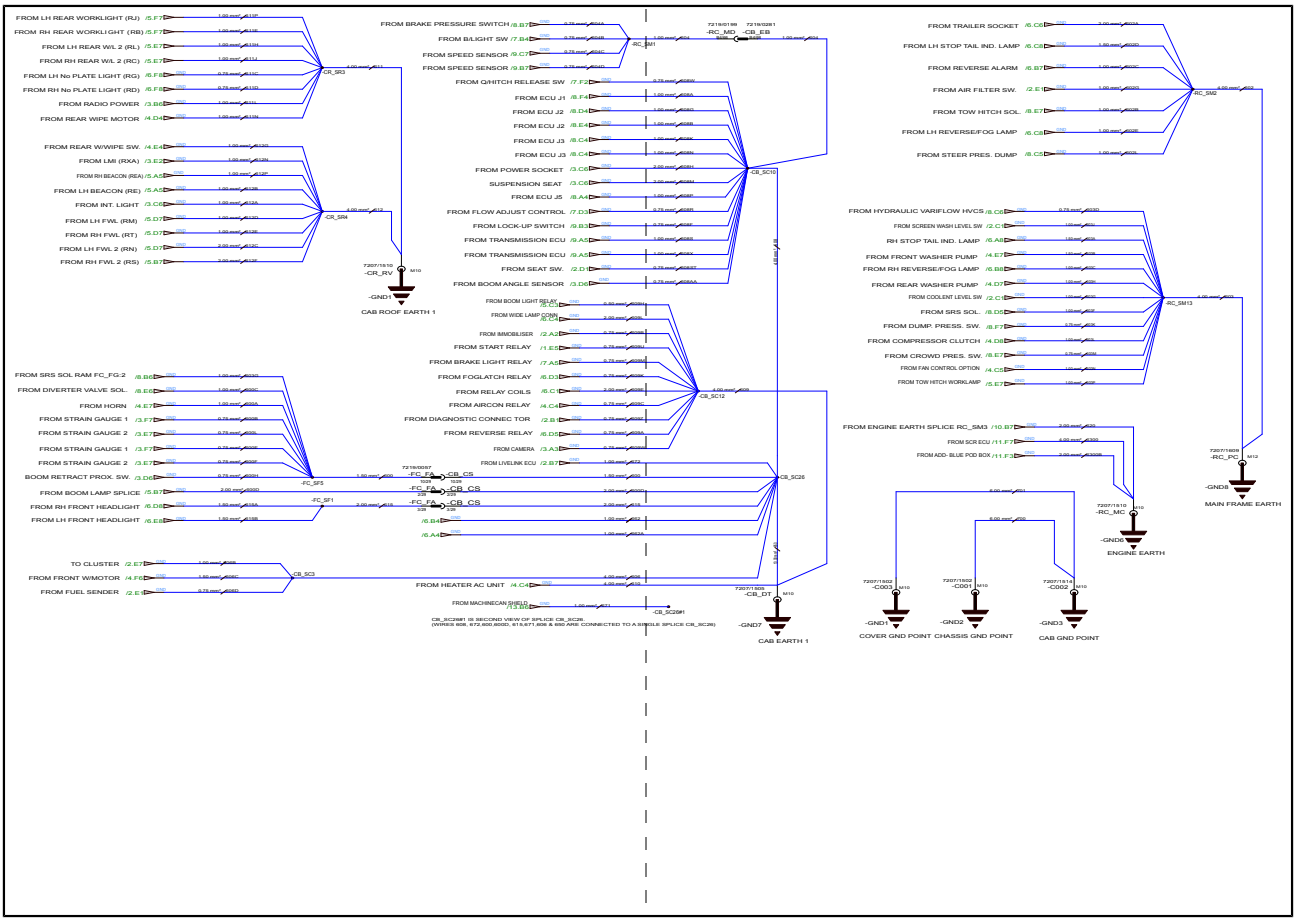

ure 932. (Part 2 of 2)

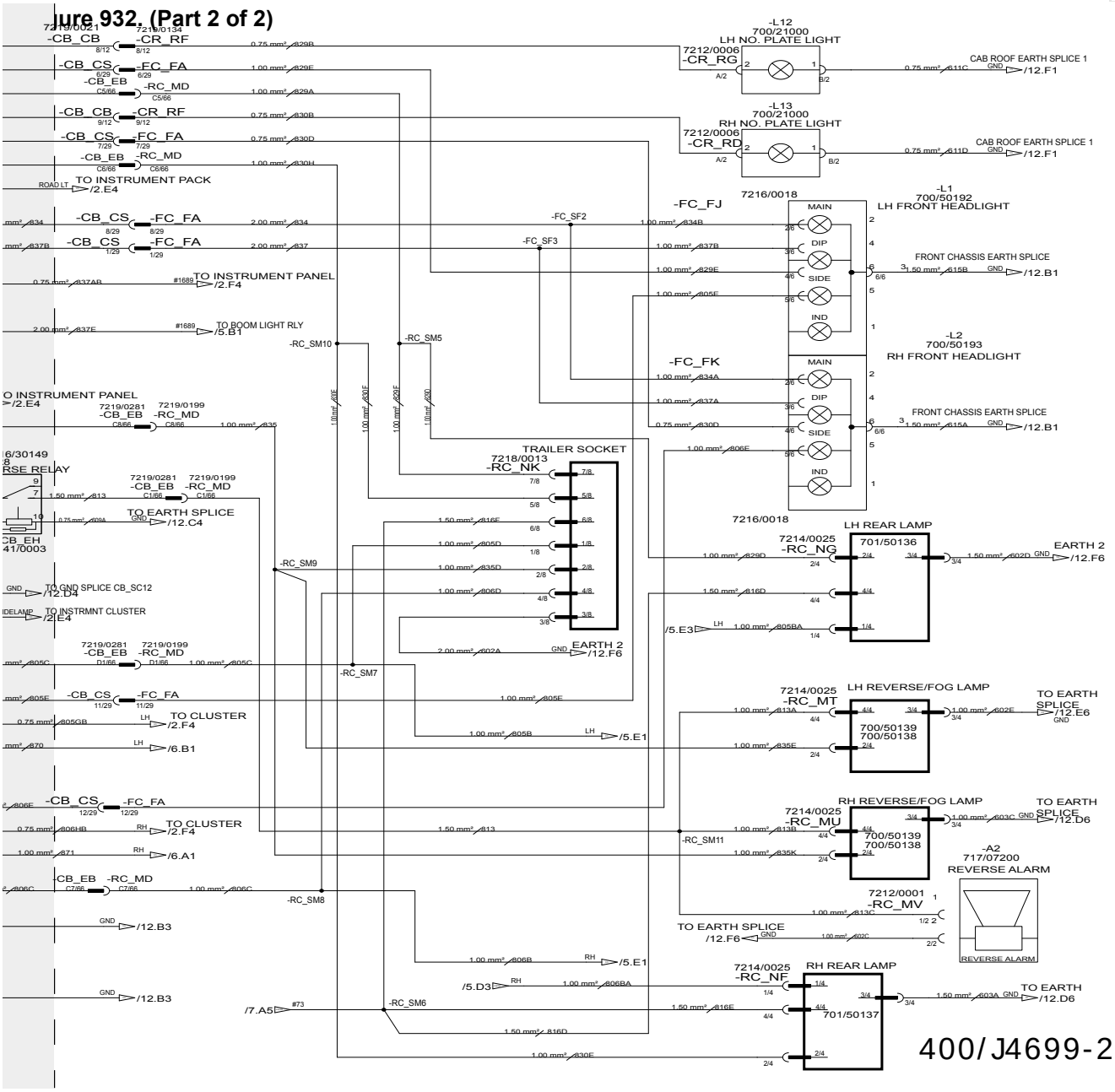

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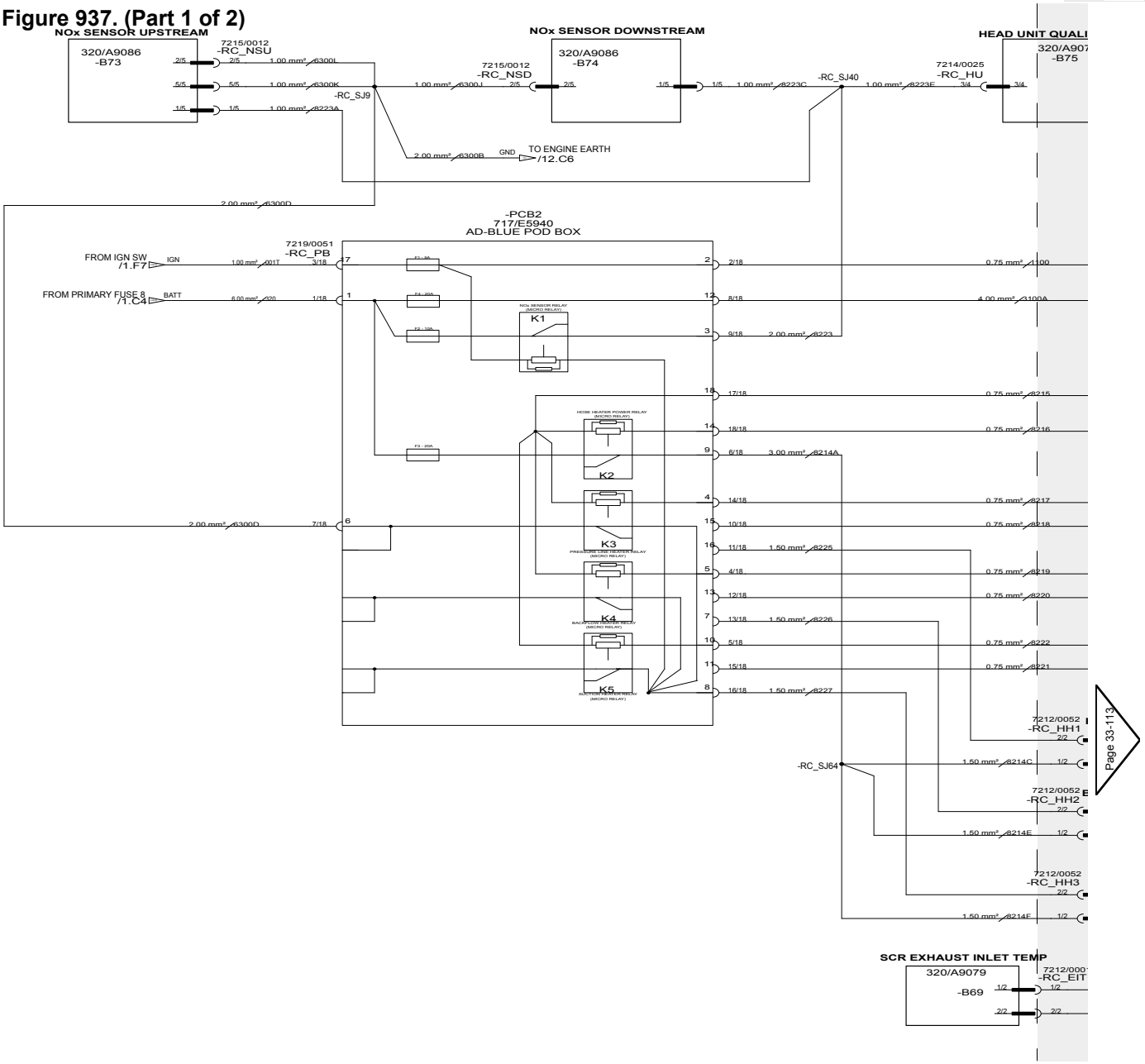
Figure 937. (Part 1 of 2)



03 - Battery

Contents **Page No.**

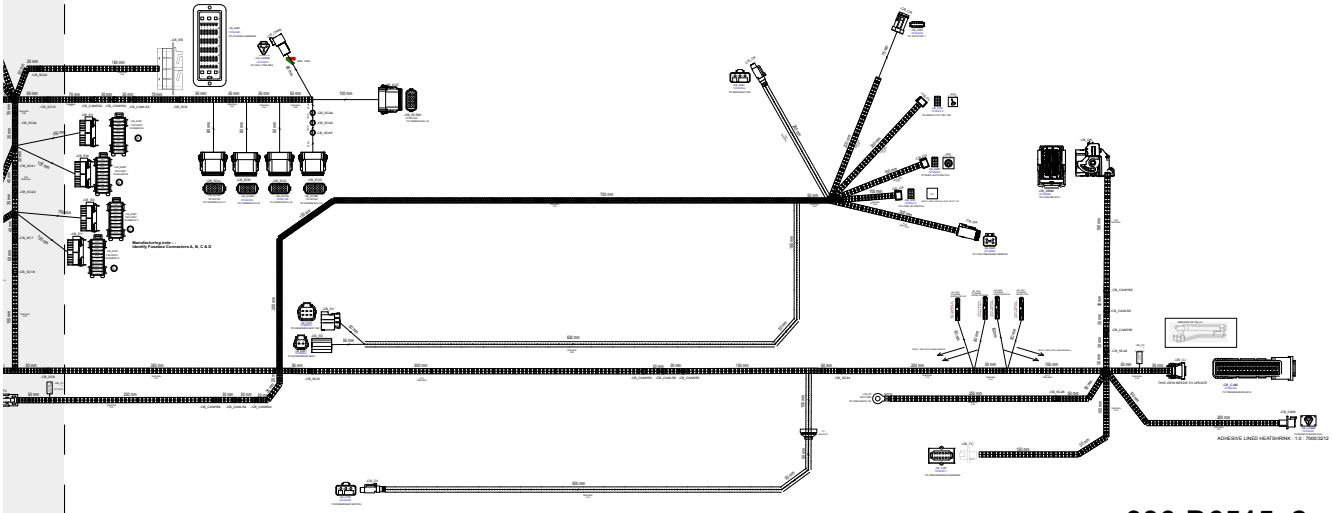
Table 339. Circuit(s) Protected

A1	Brake lights	15 A
A2	Instrumentation	5 A
A3	Horn, Front wash/wipe	15 A
A4	Direction indicators	10 A
A5	Rear wash/wipe	7.5 A
A6	Radio	5 A
A7	Ignition wakeup - Transmission ECU (Electronic Control Unit)	3 A
A8	Heater/Air conditioning	40 A
A9	Rear worklights - 2	20 A
A10	Boom worklights	15 A
B1	Left hand sidelights	5 A
B2	Right hand sidelights	5 A
B3	Ignition feed - Headlight	20 A
B4	Front worklights	20 A
B5	Front worklights	15 A
B6	Rear worklights - 1	15 A
B7	Reverse fan	5 A
B8	LMI (Load Moment Indicator)	5 A
B9	Immobiliser	3 A
B10	Rear fog lights	7.5 A
C1	LiveLink	3 A
C2	Auxiliary power 12	15 A
C3	Suspension seat	15 A
C4	SRS	3 A
C5	Reverse light	10 A
C6	Brake pressure sensors feed	3 A
C7	Ignition feed - Engine	5 A
C8	Ignition feed - ECU	7.5 A
C9	Transmission ECU - Power	7.5 A
C10	Transmission ECU - Power	7.5 A
D1	Diagnostic power	5 A
D2	Hazard warning lights	20 A
D3	Beacon	15 A
D4	Interior light, Radio	7.5 A
D5	Headlight flash	15 A
D6	LiveLink	3 A
D7	Sidelight feed - Switch	10 A
D8	Reverse fan	10 A
D9	Battery feed - ECU	20 A
D10	Immobiliser	3 A
G1	Camera	5 A
G2	Air conditioning compressor	7.5 A
G3	Ignition relays	7.5 A

(For: TM420 [T4F])

Notes:

jure 980. (Part 2 of 2)



336-D6515_2

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Figure 985. (Part 1 of 2)

-CB_ZK TO FRONT WIPER

Cav Id	Tag	Size	Destination	Cavity Seal
1	606C	1.50 mm²	-CB_SC3:S	
2	840	1.50 mm²	-CB_CMR:10	
3	844	1.50 mm²	-CB_CMR:13	
4	845	1.50 mm²	-CB_CMR:11	
5	841	1.50 mm²	-CB_CMR:12	
6	110M	2.00 mm²	-CB_SC2:S	
7	839B	1.50 mm²	-CB_SC5:S	
8				7210/0001

7218/0001 8 Way HW090 Socket Housing
Additional Components
7218/0003

-CB_SC1 SPLICE RH IND

Cav Id	Tag	Size	Destination	Cavity Seal
S	806E	1.00 mm²	-CB_CS:12	
S	806HB	0.75 mm²	-CB_DJ1:4	
S	806C	1.00 mm²	-CB_EB:C7	
S	806	1.50 mm²	-CB_CE:18	
S	806F	1.50 mm²	-CB_CMR:3	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC2 SPLICE FRON T WIPER

Cav Id	Tag	Size	Destination	Cavity Seal
S	110	2.00 mm²	-CB_EV:6	
S	110C	2.00 mm²	-CB_CML:8	
S	110B	2.00 mm²	-CB_CMR:8	
S	110M	2.00 mm²	-CB_ZK:6	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC3 SPLICE A CAB EARTH

Cav Id	Tag	Size	Destination	Cavity Seal
S	606B	1.00 mm²	-CB_DJ1:9	
S	606C	1.50 mm²	-CB_ZK:1	
S	606D	0.75 mm²	-CB_EB:F12	
S	606	4.00 mm²	-CB_SC26:S	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC4 SPLICE LH IND

Cav Id	Tag	Size	Destination	Cavity Seal
S	805C	1.00 mm²	-CB_EB:D1	
S	805E	1.00 mm²	-CB_CS:11	
S	805GB	0.75 mm²	-CB_DJ1:1	
S	805	1.50 mm²	-CB_CE:17	
S	805F	1.50 mm²	-CB_CMR:1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC5 SPLICE FRONT WASH

Cav Id	Tag	Size	Destination	Cavity Seal
S	839A	1.50 mm²	-CB_CMR:9	
S	839B	1.50 mm²	-CB_ZK:7	
S	839	1.50 mm²	-CB_EB:E1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC6 SPLICE ILLUMINATION

Cav Id	Tag	Size	Destination	Cavity Seal
S	106L	0.75 mm²	-CB_DJ1:2	
S	106H	0.75 mm²	-CB_DY:1	
S	106	0.75 mm²	-CB_EV:4	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC7 SPLICE FUSE C8

Cav Id	Tag	Size	Destination	Cavity Seal
S	111A	0.75 mm²	-CB_CL:8	
S	111B	0.75 mm²	-CB_ZJ:10	
S	111	1.00 mm²	-CB_EX:16	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC9 SPLICE ECU BATT SPLY

Cav Id	Tag	Size	Destination	Cavity Seal
S	109A	1.00 mm²	-CB_ECA:1	
S	109B	1.00 mm²	-CB_ECA:2	
S	109C	1.00 mm²	-CB_ECA:3	
S	109D	1.00 mm²	-CB_ECA:7	
S	109E	1.00 mm²	-CB_ECA:8	
S	109F	1.00 mm²	-CB_ECA:9	
S	109	3.00 mm²	-CB_EY:18	
S	109G	1.00 mm²	-CB_ECE:18	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC10 SPLICE C CAB EARTH

Cav Id	Tag	Size	Destination	Cavity Seal
S	608W	0.75 mm²	-CB_ZJ:7	
S	608A	1.00 mm²	-CB_ECA:12	
S	608G	1.00 mm²	-CB_ECB:11	
S	608B	1.00 mm²	-CB_ECB:12	
S	608K	1.00 mm²	-CB_ECC:11	
S	608N	1.00 mm²	-CB_ECC:12	
S	608M	2.00 mm²	-CB_ED:2	
S	608P	1.00 mm²	-CB_ECE:12	
S	608R	0.75 mm²	-CB_CY:1	
S	608F	0.75 mm²	-CB_CP:7	
S	608S	1.00 mm²	-CB_CJ:20	
S	608X	1.00 mm²	-CB_CJ:42	
S	608ST	0.75 mm²	-CB_DY:6	
S	608AA	0.75 mm²	-CB_CS:9	
S	604	1.00 mm²	-CB_EB:B4	
S	608H	2.00 mm²	-CB_CN:1	
S	608	4.00 mm²	-CB_SC26:S	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC11 SPLICE IGN

Cav Id	Tag	Size	Destination	Cavity Seal
S	001A	0.75 mm²	-CB_DN:6	
S	001L	0.75 mm²	-CB_EG:6	
S	001M	0.75 mm²	-CB_EJ:6	
S	001C	0.75 mm²	-CB_EK:6	
S	001B	1.00 mm²	-CB_EX:1	
S	001S	1.00 mm²	-CB_G3:2	
S	001T	1.00 mm²	-CB_EB:C12	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CB_SC12 SPLICE D CAB EARTH

Cav Id	Tag	Size	Destination	Cavity Seal
S	609U	0.75 mm²	-CB_EM:4	
S	609M	0.75 mm²	-CB_DC:10	
S	609K	0.75 mm²	-CB_EH:5	
S	609C	0.75 mm²	-CB_DC:5	
S	609Z	0.75 mm²	-CB_CG:A	
S	609A	0.75 mm²	-CB_EH:10	
S	609B	0.75 mm²	-CB_FC:11	
S	609L	2.00 mm²	-CB_DH:1	
S	609W	0.75 mm²	-CB_CT:1	
S	609E	2.00 mm²	-CB_DK:6	
S	609	4.00 mm²	-CB_DT:1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

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Figure 990. 400/J9686 (Sheet 4 of 7)

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-CB_DK FLASHER UNIT

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1						
2	803C	2.00 mm^2	YE	-CB_SC32:S	-W1	
3						
4	802A	2.00 mm^2	YE	-CB_SC39:S	-W1	
5						
6	609D	0.75 mm^2	YE	-CB_DN:4	-W1	
6	609E	2.00 mm^2	YE	-CB_SC12:S	-W1	
7						
8	400	0.75 mm^2	YE	-CB_DJ1:12	-W1	
8	400A	0.75 mm^2	YE	-CB_DH:3	-W1	
9						

7241/0005 9 Way Mini Relay Base
Additional Components
7241/0004;1 # Bottom Mount Bracket for Relay Housings

-CB_DN RLYBSE IGN 1

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1						
2	002	6.00 mm^2	YE	-CB_SC20:S	-W1	
3						
4	609F	0.75 mm^2	YE	-CB_EG:4	-W1	
4	609D	0.75 mm^2	YE	-CB_DK:6	-W1	
5						
6	001A	0.75 mm^2	YE	-CB_SC11:S	-W1	
7						
8	316	6.00 mm^2	YE	-CB_EB:G1	-W1	
9						

7241/0005 9 Way Mini Relay Base
Additional Components
7241/0004;1 # Bottom Mount Bracket for Relay Housings

-CB_DXB FRONT WL DIODE

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	855M	2.00 mm^2	YE	-CB_CB:10	-W1	
2	828M	2.00 mm^2	YE	-CB_EW:1	-W1	

7514/0006 BUTT DIODE ASSY 6A 1000V
Additional Components
7000/3212 ; 85
332/C5617
332/C5617

-CB_DJ1 TO INSTRMNT PANEL CONN 1

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	805GB	0.75 mm^2	YE	-CB_SC4:S	-W1	
2	106L	0.75 mm^2	YE	-CB_SC6:S	-W1	
3						7210/0205
4	806HB	0.75 mm^2	YE	-CB_SC1:S	-W1	
5	837AB	0.75 mm^2	YE	-CB_SC15:S	-W1	
6	CANS2	0.50 mm^2	YE	-CB_CANSS1:S	-TW3	
7	CANL2	0.50 mm^2	YE	-CB_CANLS1:S	-TW3	
8	CANH2	0.50 mm^2	YE	-CB_CANHS1:S	-TW3	
9	606B	1.00 mm^2	YE	-CB_SC3:S	-W1	
10	304B	0.75 mm^2	YE	-CB_EY:8	-W1	
11						7210/0205
12	400	0.75 mm^2	YE	-CB_DK:8	-W1	
13	835C	0.75 mm^2	YE	-CB_SC25:S	-W1	
14	830CB	0.75 mm^2	YE	-CB_SC18:S	-W1	
15	402A	0.75 mm^2	YE	-CB_EB:C10	-W1	
16						7210/0205
17						7210/0205
18						7210/0205
19						7210/0205
20						7210/0205

332/E3213 20 Way MX150 Skt hsg Grey Key B
Additional Components

-CB_DJ2 TO INSTRMNT PANEL CONN 2

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1						7210/0205
2						7210/0205
3						7210/0205
4						7210/0205
5						7210/0205
6	409	0.50 mm^2	YE	-CB_DH:2	-W1	
7						7210/0205
8						7210/0205
9						7210/0205
10						7210/0205
11						7210/0205
12	408	0.75 mm^2	YE	-CB_EB:B12	-W1	
13						7210/0205
14	415	0.75 mm^2	YE	-CB_DY:4	-W1	
15	428	0.75 mm^2	YE	-CB_EB:B5	-W1	
16	429	0.75 mm^2	YE	-CB_EB:B6	-W1	
17						7210/0205
18						7210/0205
19	407	0.75 mm^2	YE	-CB_EB:C9	-W1	
20						7210/0205

332/C8190 20 Way MX150 Skt Hsg Black Key A
Additional Components

-CB_DL TO HEATER SWITCH

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
B	102	4.00 mm^2	YE	-CB_SC41:S	-W1	
C	843	4.00 mm^2	YE	-CB_DM-1:1	-W1	
H	800B	4.00 mm^2	YE	-CB_DE:4	-W1	
L	800	4.00 mm^2	YE	-CB_DE:2	-W1	
M	800A	4.00 mm^2	YE	-CB_DE:3	-W1	

7235/0006 5 Way 6.3 Fem Hsg Heater Switch
Additional Components

-CB_DM-1 TO AC SWITCH

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	843	4.00 mm^2	YE	-CB_DL:C	-W1	

7201/0403 1 Way Pos Lock Housing Straight
Additional Components

-CB_DM-2 TO AC SWITCH

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	847	4.00 mm^2	YE	-CB_DE:6	-W1	
1	847A	2.00 mm^2	YE	-CB_EB:F9	-W1	

7201/0403 1 Way Pos Lock Housing Straight
Additional Components

-CB_DP TO SRS SWITCH

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1						
2	550C	0.50 mm^2	YE	-CB_DP:5	-W1	
2	550	0.75 mm^2	YE	-CB_EX:8	-W1	
2	550A	0.75 mm^2	YE	-CB_SC13:S	-W1	
3	557	0.75 mm^2	YE	-CB_ECE:9	-W1	
4						
5	550D	0.50 mm^2	YE	-CB_DP:8	-W1	
5	550C	0.50 mm^2	YE	-CB_DP:2	-W1	
6	556	0.75 mm^2	YE	-CB_ECE:11	-W1	
7	608L	0.75 mm^2	YE	-CB_CO:7	-W1	
7	608J	0.75 mm^2	YE	-CB_DV:7	-W1	
8	550D	0.50 mm^2	YE	-CB_DP:5	-W1	
9						
10						

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-CB_DT TO CAB EARTH 2A

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	650	10.00 mm^2	YE	-CB_SC26:S	-W1	
1	609	4.00 mm^2	YE	-CB_SC12:S	-W1	
1	610	4.00 mm^2	YE	-CB_DE:1	-W1	

7207/1505 Ring Terminal M10 16-25
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

-CB_DV TO TRANS. DUMP SW

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	512	0.75 mm^2	YE	-CB_ECC:16	-W1	
2	111EA	0.75 mm^2	YE	-CB_DV:8	-W1	
2	111F	0.75 mm^2	YE	-CB_CW:10	-W1	
3	514	0.75 mm^2	YE	-CB_ECB:5	-W1	
4						
5						
6						
7	608J	0.75 mm^2	YE	-CB_DP:7	-W1	
7	608T	0.75 mm^2	YE	-CB_CW:9	-W1	
8	111EA	0.75 mm^2	YE	-CB_DV:2	-W1	
8	111E	0.75 mm^2	YE	-CB_CO:2	-W1	
9						
10						

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-CB_DY TO GRAMMER SEAT SW

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	106H	0.75 mm^2	YE	-CB_SC6:S	-W1	
2						7210/0001
3						7210/0001
4	415	0.75 mm^2	YE	-CB_DJ2:14	-W1	
5						7210/0001
6	608ST	0.75 mm^2	YE	-CB_SC10:S	-W1	

7216/0001 6 Way HW090 Socket Housing
Additional Components
7216/0003

-CB_EB TO CHASSIS HARNESS

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
A1	310	4.00 mm^2	YE	-CB_SC16:S	-W1	
A2	004A	4.00 mm^2	YE	-CB_EM:8	-W1	
A3	317	8.00 mm^2	YE	-CB_SC27:S	-W1	
B1	455	1.00 mm^2	YE	-CB_ECB:1	-W1	
B2	418	1.00 mm^2	YE	-CB_ECD:1	-W1	
B3	465	1.00 mm^2	YE	-CB_ECB:18	-W1	
B4	604	1.00 mm^2	YE	-CB_SC10:S	-W1	
B5	428	0.75 mm^2	YE	-CB_DJ2:15	-W1	
B6	429	0.75 mm^2	YE	-CB_DJ2:16	-W1	
B7	1837C	2.00 mm^2	YE	-CB_CA:7	-W1	
B8	891	1.00 mm^2	YE	-CB_ECA:18	-W1	
B9	812	0.75 mm^2	YE	-CB_ECA:4	-W1	
B10	816B	0.75 mm^2	YE	-CB_CJ:53	-W1	
B11	460	0.75 mm^2	YE	-CB_ECB:2	-W1	
B12	408	0.75 mm^2	YE	-CB_DJ2:12	-W1	
C1	813	1.50 mm^2	YE	-CB_EH:7	-W1	
C2	118	0.75 mm^2	YE	-CB_EX:12	-W1	
C3	877	0.75 mm^2	YE	-CB_DC:8	-W1	
C4	816	1.50 mm^2	YE	-CB_DC:7	-W1	
C5	829A	0.75 mm^2	YE	-CB_SC24:S	-W1	
C6	830H	0.75 mm^2	YE	-CB_SC18:S	-W1	
C7	806C	1.00 mm^2	YE	-CB_SC1:S	-W1	
C8	835	1.00 mm^2	YE	-CB_SC25:S	-W1	
C9	407	0.75 mm^2	YE	-CB_DJ2:19	-W1	
C10	402A	0.75 mm^2	YE	-CB_DJ1:15	-W1	
C11	421	0.75 mm^2	YE	-CB_ECE:4	-W1	
C12	001T	1.00 mm^2	YE	-CB_SC11:S	-W1	
D1	805C	1.00 mm^2	YE	-CB_SC4:S	-W1	
D2	522B	1.00 mm^2	YE	-CB_ECC:1	-W1	
D3	980	1.00 mm^2	YE	-CB_ECC:13	-W1	
D4	896	1.00 mm^2	YE	-CB_ECC:2	-W1	
D5	107A	0.75 mm^2	YE	-CB_EX:14	-W1	
D6	107C	0.75 mm^2	YE	-CB_EV:14	-W1	
D7	425	0.75 mm^2	YE	-CB_CJ:34	-W1	
D8	426	0.75 mm^2	YE	-CB_CJ:36	-W1	
D9	553	1.00 mm^2	YE	-CB_ECC:6	-W1	
D10	403	1.00 mm^2	YE	-CB_ECA:17	-W1	
D11	895	1.00 mm^2	YE	-CB_ECA:13	-W1	
D12	498	1.00 mm^2	YE	-CB_ECA:6	-W1	
E1	839	1.50 mm^2	YE	-CB_SC5:S	-W1	
E2	863A	1.00 mm^2	YE	-CB_CA:3	-W1	
E3	964	1.00 mm^2	YE	-CB_DC:2	-W1	
E4	819	1.00 mm^2	YE	-CB_ECB:14	-W1	
E5	818	0.75 mm^2	YE	-CB_ECB:9	-W1	
E6	411	1.00 mm^2	YE	-CB_ECB:13	-W1	
E7	436	0.75 mm^2	YE	-CB_EN:6	-W1	
E8	435	0.75 mm^2	YE	-CB_EN:5	-W1	
E9	434	0.75 mm^2	YE	-CB_EN:4	-W1	
E10	433	0.75 mm^2	YE	-CB_EN:3	-W1	
E11	432	0.75 mm^2	YE	-CB_EN:2	-W1	
E12	431	0.75 mm^2	YE	-CB_EN:1	-W1	
F1	882	0.75 mm^2	YE	-CB_CH:1	-W1	
F2	630	1.00 mm^2	YE	-CB_SC42:S	-W1	
F3	550B	0.75 mm^2	YE	-CB_SC13:S	-W1	
F4	890	1.00 mm^2	YE	-CB_ECE:2	-W1	
F5	420	1.00 mm^2	YE	-CB_ECD:2	-W1	
F6	893	1.00 mm^2	YE	-CB_ECD:14	-W1	
F7	322	1.50 mm^2	YE	-CB_EY:16	-W1	
F8	125A	0.75 mm^2	YE	-CB_SC36:S	-W1	
F9	847A	2.00 mm^2	YE	-CB_DM-2:1	-W1	
F10	883	0.75 mm^2	YE	-CB_CH:3	-W1	
F11	881	0.75 mm^2	YE	-CB_CH:7	-W1	
F12	606D	0.75 mm^2	YE	-CB_SC3:S	-W1	
G1	316	6.00 mm^2	YE	-CB_DN:8	-W1	
G2	318	8.00 mm^2	YE	-CB_SC23:S	-W1	
G3	319	8.00 mm^2	YE	-CB_SC22:S	-W1	

7219/0281 66 WAY SRC SEALED MALE CONN
Additional Components

-CB_ECA TO CM3626 ECU J1

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	109A	1.00 mm^2	YE	-CB_SC9:S	-W1	
2	109B	1.00 mm^2	YE	-CB_SC9:S	-W1	
3	109C	1.00 mm^2	YE	-CB_SC9:S	-W1	
4	812	0.75 mm^2	YE	-CB_EB:B9	-W1	
5						7210/0030
6	498	1.00 mm^2	YE	-CB_EB:D12	-W1	
7	109D	1.00 mm^2	YE	-CB_SC9:S	-W1	
8	109E	1.00 mm^2	YE	-CB_SC9:S	-W1	
9	109F	1.00 mm^2	YE	-CB_SC9:S	-W1	
10	822	0.75 mm^2	YE	-CB_DA:3	-W1	
11	401	0.75 mm^2	YE	-CB_CS:25	-W1	
12	608A	1.00 mm^2	YE	-CB_SC10:S	-W1	
13	895	1.00 mm^2	YE	-CB_EB:D11	-W1	
14	525	1.00 mm^2	YE	-CB_CS:5	-W1	
15	505	0.75 mm^2	YE	-CB_CK:1	-W1	
16	405	0.75 mm^2	YE	-CB_CS:24	-W1	
17	403	1.00 mm^2	YE	-CB_EB:D10	-W1	
18	891	1.00 mm^2	YE	-CB_EB:B8	-W1	

7219/0193 18 WAY DT16 FEM HSG KEY A
Additional Components

-CB_ECB TO CM3626 ECU J2

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	455	1.00 mm^2	YE	-CB_EB:B1	-W1	
2	460	0.75 mm^2	YE	-CB_EB:B11	-W1	
3	852	0.75 mm^2	YE	-CB_CY:2	-W1	
4	817	0.75 mm^2	YE	-CB_DA:4	-W1	
5	514	0.75 mm^2	YE	-CB_DV:3	-W1	
6	535	1.00 mm^2	YE	-CB_CS:22	-W1	
7	499	1.00 mm^2	YE	-CB_CS:28	-W1	
8	851	0.75 mm^2	YE	-CB_ZJ:1	-W1	
9	818	0.75 mm^2	YE	-CB_EB:E5	-W1	
10						7210/0030
11	608G	1.00 mm^2	YE	-CB_SC10:S	-W1	
12	608B	1.00 mm^2	YE	-CB_SC10:S	-W1	
13	411	1.00 mm^2	YE	-CB_EB:E6	-W1	
14	819	1.00 mm^2	YE	-CB_EB:E4	-W1	
15	506	0.75 mm^2	YE	-CB_CK:2	-W1	
16	562	0.75 mm^2	YE	-CB_CR:7	-W1	
17						7210/0030
18	465	1.00 mm^2	YE	-CB_EB:B3	-W1	

7219/0105 18 Way DT16 Fem Hsg Key B
Additional Components

-CB_ECC TO CM3626 ECU J3

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	522B	1.00 mm^2	YE	-CB_EB:D2	-W1	
2	896	1.00 mm^2	YE	-CB_EB:D4	-W1	
3	541	0.75 mm^2	YE	-CB_CS:14	-W1	
4	511	0.75 mm^2	YE	-CB_CW:1	-W1	
5	560	0.75 mm^2	YE	-CB_CR:6	-W1	
6	553	1.00 mm^2	YE	-CB_EB:D9	-W1	
7	504	0.75 mm^2	YE	-CB_CL:1	-W1	
8	519	0.75 mm^2	YE	-CB_CS:16	-W1	
9	417	0.75 mm^2	YE	-CB_AD:3	-W1	
10	540	0.75 mm^2	YE	-CB_CS:15	-W1	
11	608K	1.00 mm^2	YE	-CB_SC10:S	-W1	
12	608N	1.00 mm^2	YE	-CB_SC10:S	-W1	
13	980	1.00 mm^2	YE	-CB_EB:D3	-W1	
14	412	0.75 mm^2	YE	-CB_ZJ:8	-W1	
15	500	0.75 mm^2	YE	-CB_CW:3	-W1	
16	512	0.75 mm^2	YE	-CB_DV:1	-W1	
17						7210/0030
18	575	1.00 mm^2	YE	-CB_CS:27	-W1	

7219/0106 18 Way DT16 Fem Hsg Key C
Additional Components

400/J9686-3

Page 33-284

Figure 1000. 400/K1514 (Sheet 3 of 3)

Page 33-285

-CR_RV- TO CAB ROOF EARTH

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	612	4.00 mm²	YE	-CR_SR4:S	-W1	
2	611	4.00 mm²	YE	-CR_SR3:S	-W1	
3	613	1.00 mm²	YE	-CR_SCA3:S	-W1	

7207/1510 Ring Terminal M10 6.0-10.0
Additional Components
7000/3212 ; 30

-CR_RW- TO FRONT WORKLIGHT SW.

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1						
2	116A	0.50 mm²	YE	-CR_RW:8	-W1	
3	116	2.00 mm²	YE	-CR_RF:2	-W1	
4	655	2.00 mm²	YE	-CR_SR1:S	-W1	
5						
6	171	2.00 mm²	YE	-CR_RF:12	-W1	
7	1838	2.00 mm²	YE	-CR_SR2:S	-W1	
8	612K	0.75 mm²	YE	-CR_RY:7	-W1	
9	612L	0.75 mm²	YE	-CR_DR:7	-W1	
10	116A	0.50 mm²	YE	-CR_RW:2	-W1	

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-CR_RXA- TO LMI

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	409	0.75 mm²	YE	-CR_RA:5	-W1	
2	463	0.75 mm²	YE	-CR_RF:5	-W1	
3	464	0.75 mm²	YE	-CR_RF:7	-W1	
4	461	0.75 mm²	YE	-CR_RA:5	-W1	
5	462	0.75 mm²	YE	-CR_RA:5	-W1	
6	612N	1.00 mm²	YE	-CR_SR4:S	-W1	

7216/0001 6 Way HW090 Socket Housing
Additional Components
7216/0003

-CR_RXB- TO LMI CAN

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
A	CAN1H4	0.50 mm²	YE	-CR_SCA1:S	-MC3	
B	CAN1L4	0.50 mm²	GN	-CR_SCA2:S	-MC3	
C	CAN1S4	0.50 mm²	7017	-CR_SCA3:S	-MC3	

7213/0015 3 WAY DT06 SOC HSG NO END CAP
Additional Components
7213/0043;1 # 3 Way DT06 Wedge CAN J1939

-CR_RY- TO REAR WORKLIGHT SW.

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1						
2	117A	0.50 mm²	YE	-CR_RY:8	-W1	
3	117	2.00 mm²	YE	-CR_RF:3	-W1	
4	861	2.00 mm²	YE	-CR_SR6:S	-W1	
5						
6	170	2.00 mm²	YE	-CR_RF:11	-W1	
7	1837	2.00 mm²	YE	-CR_SR7:S	-W1	
8	612K	0.75 mm²	YE	-CR_RW:7	-W1	
9	612H	0.75 mm²	YE	-CR_RZ:7	-W1	
10	117A	0.50 mm²	YE	-CR_RY:2	-W1	

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-CR_SA- TO RADIO SPEAKER

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1						
2						
3	481	0.75 mm²	YE	-CR_SC-1:1	-W1	
4	482	0.75 mm²	YE	-CR_SC-2:1	-W1	
5	483	0.75 mm²	YE	-CR_SB-1:1	-W1	
6	484	0.75 mm²	YE	-CR_SB-2:1	-W1	
7						
8						

7238/0002 8 Way MDK3 Radio Speaker Fem Hsg
Additional Components

-CR_RZ- TO REAR WIPE/WASH SW.

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	864	1.00 mm²	YE	-RC_RH:2	-W1	
2	862	1.00 mm²	YE	-RC_RH:4	-W1	
3	103J	1.00 mm²	YE	-CR_SR9:S	-W1	
4	103JA	0.75 mm²	YE	-CR_RZ:8	-W1	
5						
6	865	0.75 mm²	YE	-CR_RZ:10	-W1	
7	863A	1.00 mm²	YE	-CR_RA:3	-W1	
8	612G	1.00 mm²	YE	-CR_SR4:S	-W1	
9	612H	0.75 mm²	YE	-CR_RY:7	-W1	
10	103JA	0.75 mm²	YE	-CR_RZ:3	-W1	
11						
12	865	0.75 mm²	YE	-CR_RZ:5	-W1	

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-CR_SB-1- TO LH SPEAKER +Ve

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	483	0.75 mm²	YE	-CR_SA:5	-W1	

7201/0304 1 Way 4.8 Faston Fem Hsg
Additional Components

-CR_SB-2- TO LH SPEAKER -Ve

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	484	0.75 mm²	YE	-CR_SA:6	-W1	

7231/0011 1 Way 2.8 Faston Fem Hsg
Additional Components

-CR_SC-1- TO RH SPEAKER +Ve

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	481	0.75 mm²	YE	-CR_SA:3	-W1	

7201/0304 1 Way 4.8 Faston Fem Hsg
Additional Components

-CR_SC-2- TO RH SPEAKER -Ve

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	482	0.75 mm²	YE	-CR_SA:4	-W1	

7231/0011 1 Way 2.8 Faston Fem Hsg
Additional Components

-CR_SCA1- SPLICE CAN H

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	CAN1H4	0.50 mm²	YE	-CR_RXB:A	-MC3	
S	CAN1S	0.50 mm²	YE	-CR_CAN1:A	-MC1	
S	CAN1H3	0.50 mm²	YE	-CR_RA:2	-MC2	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SCA2- SPLICE CANL

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	CAN1L3	0.50 mm²	GN	-CR_RA:5	-MC2	
S	CAN1L4	0.50 mm²	GN	-CR_RXB:B	-MC3	
S	CAN1L5	0.50 mm²	GN	-CR_CAN1:B	-MC1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SCA3- SPLICE CANS

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	CAN1S3	0.50 mm²	7012	-CR_BA:11	-MC2	
S	CAN1S4	0.50 mm²	7017	-CR_RXB:C	-MC3	
S	613	1.00 mm²	YE	-CR_RV:1	-W1	
S	CAN1S5	0.50 mm²	7017	-CR_CAN1:C	-MC1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212:45 # Adhesive Lined Heatshrink

-CR_SR1- SPLICE FRONT WL

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	865	2.00 mm²	YE	-CR_RW:3	-W1	
S	865M	2.00 mm²	YE	-CR_RF:10	-W1	
S	865A	2.00 mm²	YE	-CR_RB:1	-W1	
S	865B	2.00 mm²	YE	-CR_RT:1	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR2- SPLICE FRONT WL 2

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	1838	2.00 mm²	YE	-CR_RW:6	-W1	
S	1838A	2.00 mm²	YE	-CR_RS:1	-W1	
S	1838B	2.00 mm²	YE	-CR_RS:1	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR3- SPLICE CAB ROOF EARTH 1

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	611P	1.00 mm²	YE	-CR_RZ:2	-W1	
S	611E	1.00 mm²	YE	-CR_RB:2	-W1	
S	611H	1.00 mm²	YE	-CR_RC:2	-W1	
S	611J	1.00 mm²	YE	-CR_RC:2	-W1	
S	611C	0.75 mm²	YE	-CR_RG:8	-W1	
S	611D	0.75 mm²	YE	-CR_RD:8	-W1	
S	611L	1.00 mm²	YE	-CR_RK:8	-W1	
S	611	4.00 mm²	YE	-CR_RV:1	-W1	
S	611N	1.00 mm²	YE	-RC_RH:1	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR4- SPLICE CAB ROOF EARTH 2

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	612G	1.00 mm²	YE	-CR_RZ:7	-W1	
S	612N	1.00 mm²	YE	-CR_RXA:6	-W1	
S	612A	1.00 mm²	YE	-CR_RR:2-1	-W1	
S	612	4.00 mm²	YE	-CR_RV:1	-W1	
S	612B	1.00 mm²	YE	-CR_RE:1	-W1	
S	612P	1.00 mm²	YE	-CR_REA:1	-W1	
S	612C	2.00 mm²	YE	-CR_RN:2	-W1	
S	612D	1.00 mm²	YE	-CR_RM:2	-W1	
S	612E	1.00 mm²	YE	-CR_RT:2	-W1	
S	612F	2.00 mm²	YE	-CR_RS:2	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR5- SPLICE INT LAMP

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	304D	1.00 mm²	YE	-CR_RR:1-1	-W1	
S	304E	1.00 mm²	YE	-CR_RR:4	-W1	
S	304A	1.00 mm²	YE	-CR_RF:1	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR6- SPLICE REAR WL

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	861B	2.00 mm²	YE	-CR_RJ:1	-W1	
S	861	2.00 mm²	YE	-CR_RY:3	-W1	
S	861A	2.00 mm²	YE	-CR_RB:1	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR7- SPLICE REAR WL 2

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	1837	2.00 mm²	YE	-CR_RY:6	-W1	
S	1837A	2.00 mm²	YE	-CR_RL:1	-W1	
S	1837B	2.00 mm²	YE	-CR_RC:1	-W1	
S	1837C	2.00 mm²	YE	-CR_RA:7	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR8- SPLICE IGN RADIO

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	115B	0.75 mm²	YE	-CR_RK:7	-W1	
S	115A	0.75 mm²	YE	-CR_RJ:8	-W1	
S	115	1.00 mm²	YE	-CR_RF:4	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR9- SPLICE WASH/WIPE SUPPLY

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	103	1.00 mm²	YE	-CR_RA:1	-W1	
S	103J	1.00 mm²	YE	-CR_RZ:3	-W1	
S	103F	1.00 mm²	YE	-RC_RT:3	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212 ; 45

-CR_SR10- SPLICE BEACON

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	894	2.00 mm²	YE	-CR_RJ:3	-W1	
S	894A	2.00 mm²	YE	-CR_RE:2	-W1	
S	894B	2.00 mm²	YE	-CR_REA:2	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212:45 # Adhesive Lined Heatshrink

-CR_SR11-

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
S	917	2.00 mm²	YE	-CR_DR:4	-W1	
S	917B	2.00 mm²	YE	-CR_DR:3	-W1	
S	917C	2.00 mm²	YE	-CR_RA:10	-W1	

7000/3104 In Line Ultrasonic Splice
Additional Components
7000/3212:45 # Adhesive Lined Heatshrink

400/K1514-3

(For: TM420 [T4F])

00 - General

Introduction

Modern machines use ECU (Electronic Control Unit) to control machine systems such as hydraulics, transmission and engine. In much the same way as office computers can be ‘networked’ to communicate with each other the machine ECU’s can be ‘networked’. Some advantages of networking are:

- Improved more intelligent control systems
- More comprehensive and reliable in-cab instrumentation
- Service software tools can be used for fault finding and machine control set up

The ECM (Engine Control Module) can communicate with other machine ECU using a CANbus network system.

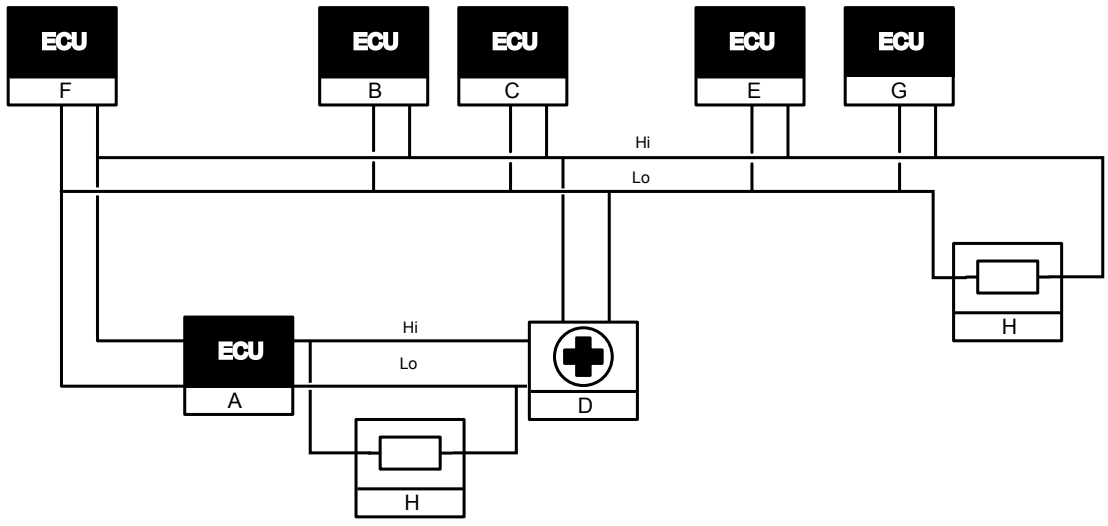
CANbus Communications System

CAN (Controller Area Network) is an electronic communications system that connects all the machine ECU to one pair of data wires, this is called the CANbus. Coded data is sent to and from the ECU on the CANbus. By connecting Servicemaster diagnostic software to the CANbus, data is seen and decoded for use by a service engineer.

CANbus System Schematic

A typical CANbus system architecture is shown for illustration purposes only below: Refer to Figure 1010.

Figure 1010. Typical CANbus architecture



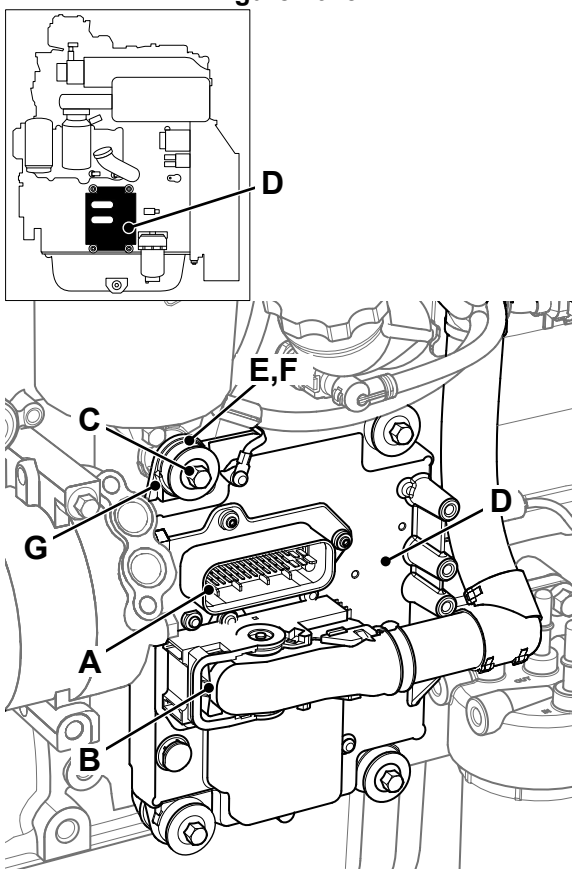
The CAN architecture may differ on your machine.
Refer to: PIL 33-00-50.

Remove and Install

Before Removal

1. Ensure that the engine is safe to work on. If the engine has been running let it cool before you start the service work.
2. Get access to the engine.

Figure 1025.



A Electrical connector (Grey) -ECM (Engine Control Module)
B Electrical connector (Black) - ECM
C Fixing bolts
D ECM
E Washer
F Bush
G Earth strap

Remove

1. Disconnect the battery.
2. Disconnect the electrical connectors at theECM. Do not touch the electrical connector pins on the ECM.
3. Undo the fixing bolts and carefully lift off the ECM together with the washers and mounting bushes. Note the position of earth strap. Note: The ECM is a non serviceable item. If the ECM is defective it must be replaced.

Important: Do not install an ECM from another engine. Although identical in appearance the internal configuration is unique to every ECM. If the ECM has been renewed it must be flashed with the correct set-up data files and programmed with the correct injector codes.

Carefully inspect the ECM housing. If it is defective replace it.

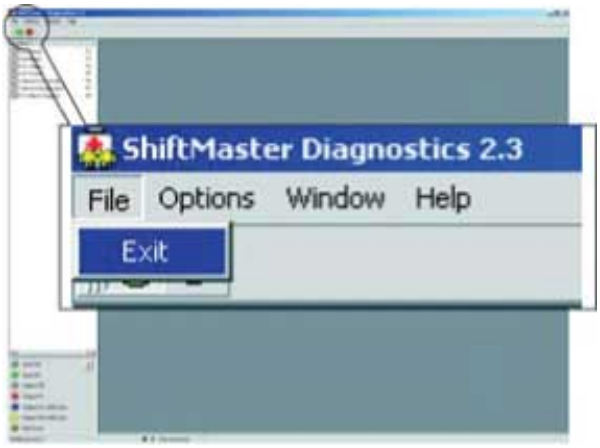
Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Make sure that the earth strap is correctly installed adjacent to the engine bedplate.
3. Tighten the bolts to the correct torque value.

Table 354. Torque Values

Item	Nm
C	24

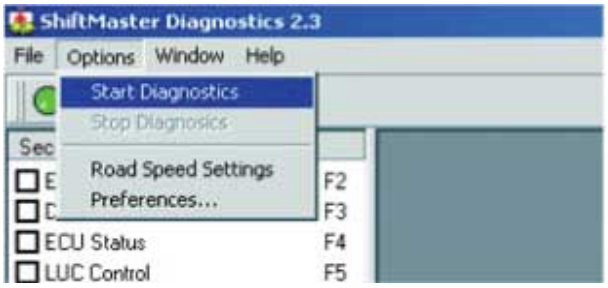
Figure 1042.



On exiting the program communications with both ECU and DLA are shut down.

Menu Bar-Options Menu

Figure 1043.



- Start Diagnostics to commence communications with the ECU.
- Stop Diagnostics to cease communications.
- Controller Status Click on the buttons to toggle ON or OFF the diagnostics connection with the machine CAN system.

Figure 1044.

- Preferences option opens up the Preference Dialogue.
- From the Preferences Dialogue there is support for multiple languages. Use the drop-down menu and scroll bar to chose the required language. Languages available are:
  - English (United Kingdom)
  - French (France)
  - German (Germany)
  - Spanish (International Sort)

Note: The language option only effects text within the Main Window (e.g. Page List, LED Status Key, etc). Language support is not available for the text within the page displays.

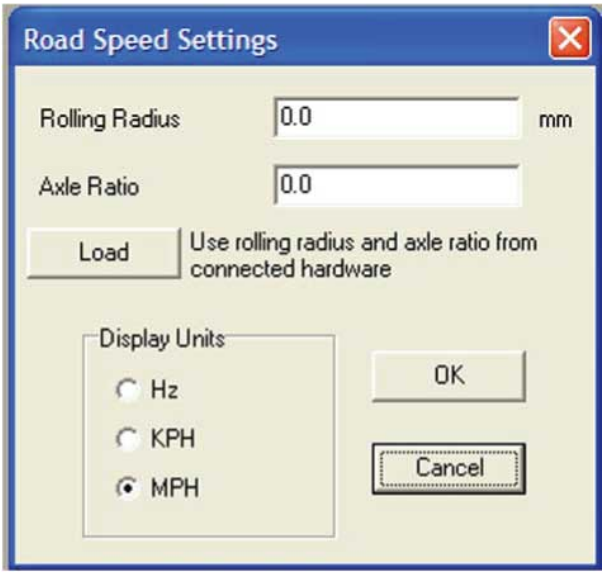
Once your preferences have been selected either:

Click on the OK button to apply them or click on the Cancel button to leave them unchanged.

Road Speed Settings.

- Open the road speed setting window.
- Press the Load button to upload the data from the ECU.
- If the rolling radius of the wheel has been changed (due to a tyre installation change for example) input the rolling radius and the associated axle ratio.
- To change the speed units displayed by the diagnostics software check the required button on the Display Units panel.
- Press the OK button to save the settings and close the window.

Figure 1045.



Menu Bar - Window Menu

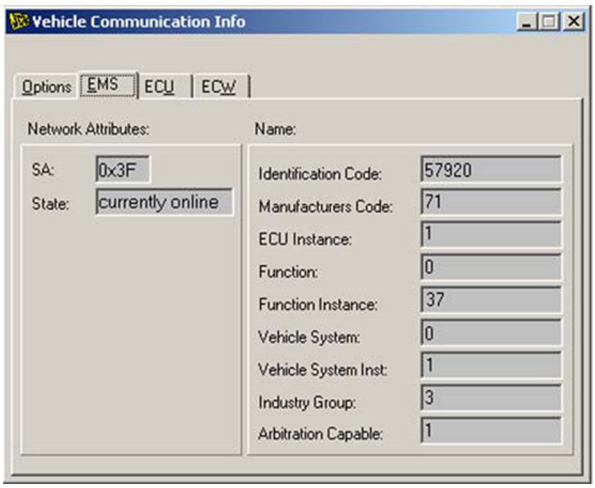
Like most other Windows based programs where there are multiple sub-windows or Pages used, there are usually options to organise how they are laid-out. Shiftmaster Diagnostics software is no different and offers the following options:

- Cascade

Figure 1085.

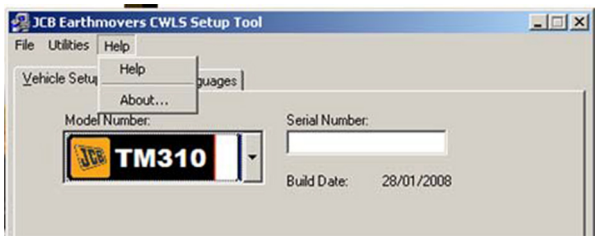
- Controller Status
  - Use this option to show that the ECU is online. When the ECU is online the machine codes are displayed. This diagram shows the actual settings read from a test machine. Refer to Figure 1086.

Figure 1086.



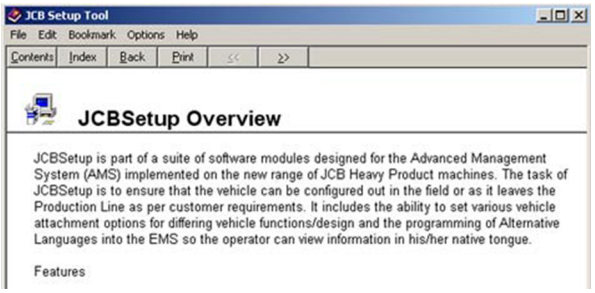
Menu Bar - Help Menu

Figure 1087.



- Help
  - Use this option to open the help program. Refer to Figure 1088.

Figure 1088.



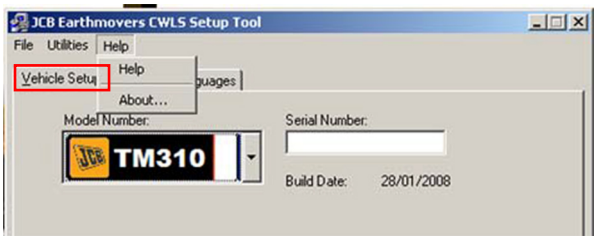
- About
  - Use this option to open the window that shows version number of the installed copy of the software. Refer to Figure 1086.

Figure 1089.

Vehicle Setup

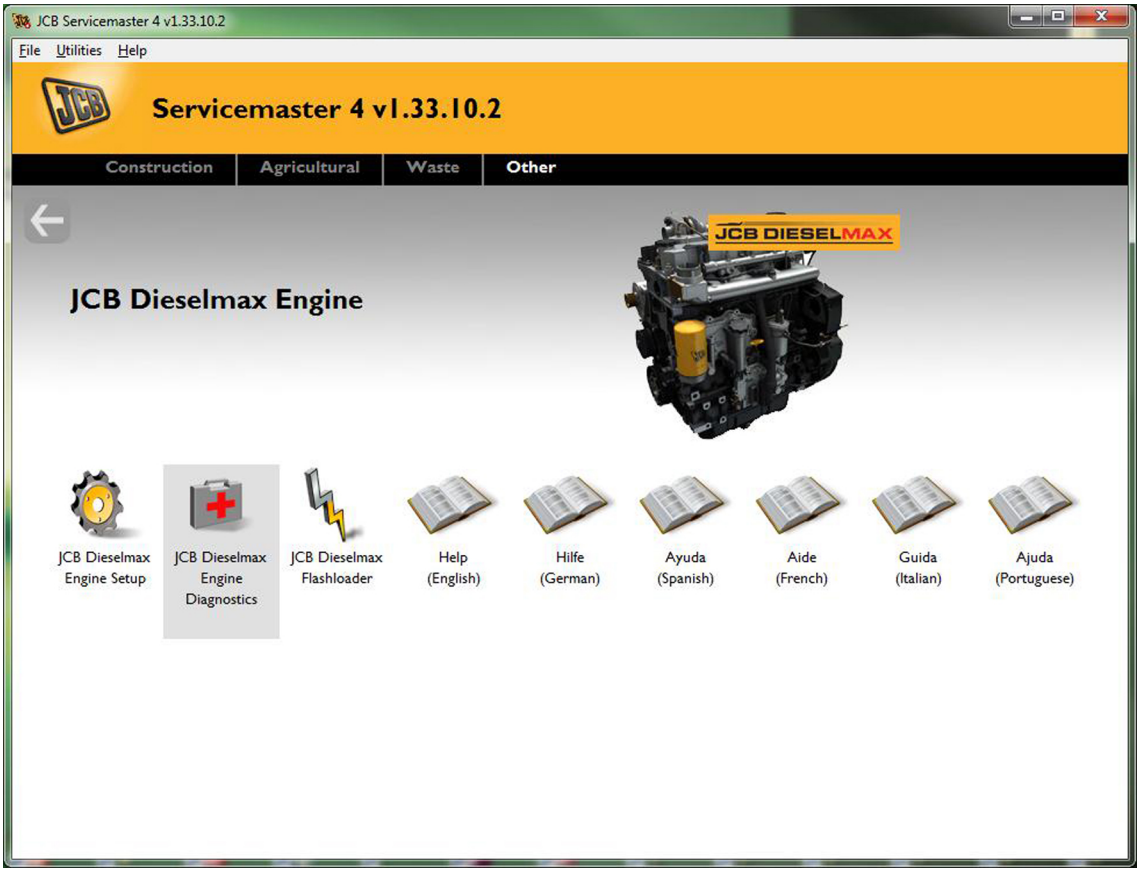
Use this screen to configure the instrument panel ECU. Refer to Figure 1090.

Figure 1090.



- Configure
  - Click the connect button to start the communication with the ECU.
  - Select the correct machine model. There is drop down list of machine models.
  - Enter the machine serial number to the VIN (Vehicle Identification Number) box.
  - Click Next to go to the Option screen.

Figure 1159.



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 1160.

Table 373. Engine errors

Fault Code	Description
P046D-2F	
P0405-23	
P0404-00	
P2620-2F	Throttle position feedback signal noisy fault
P2622-24	Throttle position feedback signal high fault
P2621-23	Throttle position feedback signal low fault
P2620-00	Throttle position feedback ADC fault
P2135-00	Foot pedal corrolation track 1 over track 2 fault detected
P0088-00	Rail pressure control undefined error (over max calibrated system pressure)
P0087-00	Rail pressure control error positive
P0088-00	Rail pressure control error negative
P0089-00	Rail pressure control error
P2265-64	Water in fuel sensor feedback signal 2 plausability fault
P2267-24	Water in fuel sensor feedback signal high fault
P2266-23	Water in fuel sensor feedback signal low fault
P2264-00	Water in fuel sensor feedback signal ADC fault
P250B-00	Oil level sensor signal global fault
P0523-68	Low oil pressure during engine running
P0096-2F	Intake manifold temperature sensor (M2) signal noise fault (Intake Manifold 2 temp)
P0235-00	Boosted air pressure sensor fault: ADC
P007E-2F	TMAP (Temperature Manifold Air Pressure) temperature element sensor noise fault
P007D-24	TMAP temperature element sensor high fault
P007C-23	TMAP temperature element sensor low fault
P007A-00	TMAP temperature element sensor fault (ADC)
P0106-24	Intake MAP (Manifold Absolute Pressure) sensor signal drift high fault
P0106-23	Intake MAP sensor signal drift low fault
P0106-64	Intake MAP sensor signal plausibility fault
P0116-64	Coolant sensor fault (plausibility)
P0118-24	Coolant sensor signal high fault
P0117-23	Coolant sensor signal low fault
P0100-11	AMF high side driver fault short circuit to ground (SC2G)
P0100-00	AMF electrical sensor fault (ADC)
P0194-00	Rail pressure sensor signal drop fault
P0193-24	Rail pressure sensor signal high fault
P0192-23	Rail pressure sensor signal low fault
P0087-23	Rail pressure build normal fault
P0089-00	Rail pressure positive control error during HPV (High Pressure Valve) control. PID controller not able to stabilise the RPC value
P0089-00	Rail pressure negative control error during HPV control. PID controller not able to stabilise the RPC value
P0089-00	Rail pressure positive control error during IC & HMV control. PID controller not able to stabilise the RPC value
P0563-24	Battery voltage monitoring signal high fault
P0562-23	Battery voltage monitoring signal low fault
P0113-24	Inlet Air Temperature (IAT) sensor signal high fault detected
P0112-23	Inlet Air Temperature (IAT) sensor signal low fault detected

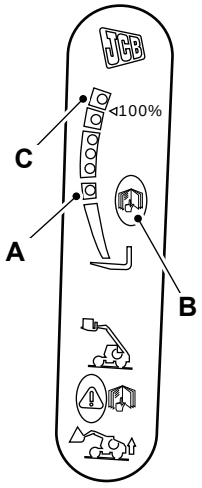
Check (Condition)

You must always complete a functional check of the LLMI (Longitudinal Load Moment Indicator)/LLMC (Longitudinal Load Moment Control) system before you use the machine.

1. Make the machine safe. Refer to (PIL 01-03).
2. Check the condition of the display.
   2.1. Make sure that the green LED (Light Emitting Diode) at the bottom of the display is ON.
   2.2. Press the display/test button.
   2.3. If the unit is functioning correctly, all the LED's on the display will flash and an audible alarm will sound.
3. Operate the machine so that the lift arm is in the horizontal position.
4. Extend the lift arm to the specified length.

   Length: 1 m
5. Press and hold the display test button. Make sure that all of the LED's flash and the alarm sounds. Do not release the display test button.
   5.1. Try to extend and lower the lift arm. Make sure that the lift arm does not move.
   5.2. Raise the lift arm. Make sure that the lift arm moves in this direction.
   5.3. Retract the lift arm. Make sure that the lift arm moves in this direction.
   5.4. Release the display test button.
6. Retract and lower the lift arm.

Figure 1173.



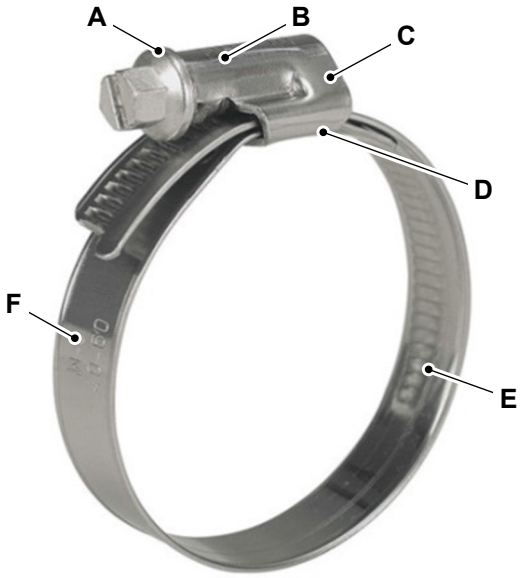
A Green LED
B Display/test button
C Section of LED

During operation the system continuously self checks for faults. If a system fault is detected, different combinations of LED will light to give a diagnostic fault code.

Notes:

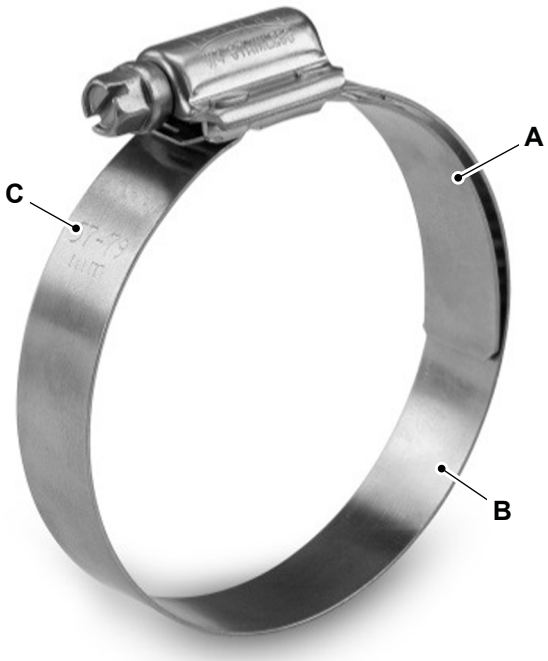
Component Identification

Figure 1195. Standard Worm Drive Clip



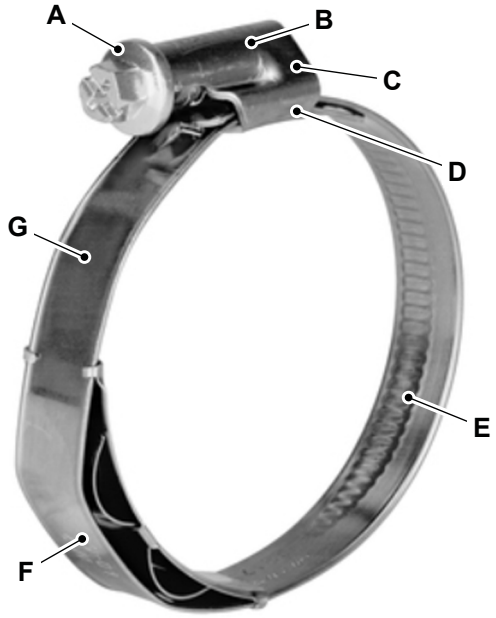
A Screw support flange
B Asymmetric housing
C Asymmetric extension
D Short housing saddle
E Stamped inside
F Identification of material/clamping range

Figure 1196. Heavy Duty Worm Drive Clip



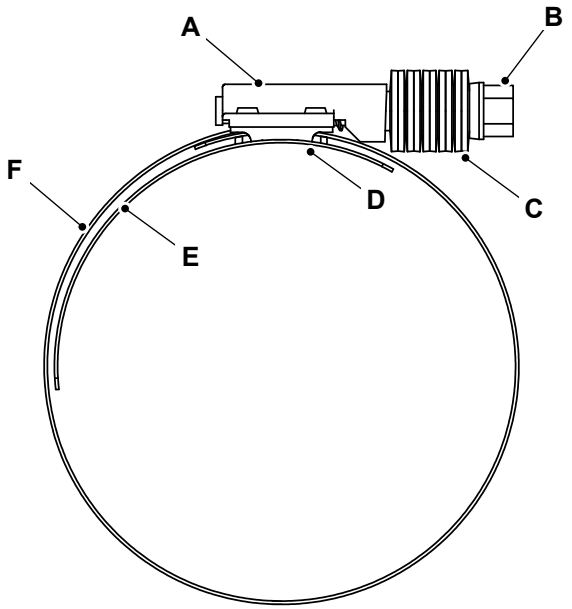
A Extended bridge
B Band width (16 mm)
C Identification of clamping range

Figure 1197. Spring Assisted Worm Drive Clip



A Screw support flange
B Asymmetric housing
C Asymmetric extension
D Short housing saddle
E Stamped inside
F Spring insert
G Identification of material/clamping range

Figure 1198. Constant Torque Worm Drive Clips



A Housing
B Screw
C Belleville spring
D Saddle
E Liner
F Band

03 - Engine

Introduction

New engines DO NOT require a running-in period. The engine/machine should be used in a normal work cycle immediately, glazing of the piston cylinder bores, resulting in excessive oil consumption, could occur if the engine is gently run-in. Under no circumstances should the engine be allowed to idle for extended periods; (e.g. warming up without load).

The choice of lubricant viscosity should be made based on the lowest ambient temperature at which the machine will be started and the maximum ambient temperature at which it will operate.

The technical data section provides guidance as to the temperature range that can be accommodated by standard oil viscosities and can be used to select an appropriate grade.

When selecting the oil viscosity grade, make sure that the oil conforms with or exceeds the recommended specification.