SERVICE MANUAL

ROLLER

JCB116, JCB116D, JCB116DD, VM116

EN - 9813/7700 - ISSUE 3 - 09/2017

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.

Contents

09 - General Safety

Introduction

Training

To operate the machine safely you must know the machine and have the skill to use it. You must abide by all relevant laws, health and safety regulations that apply to the country you are operating in. The operator's manual instructs you on the machine, its controls and its safe operation; it is not a training manual. If you are a new operator, get yourself trained in the skills of using a machine before trying to work with it. If you don't, you will not do your job well, and you will be a danger to yourself and others. In some markets and for work on certain jobsites you may be required to have been trained and assessed in accordance with an operator competence scheme. Make sure that you and your machine comply with relevant local laws and jobsite requirements - it is your responsibility.

Care and Alertness

All the time you are working with or on the machine, take care and stay alert. Always be careful. Always be alert for hazards.

Clothing

You can be injured if you do not wear the correct clothing. Loose clothing can get caught in the machinery. Keep cuffs fastened. Do not wear a necktie or scarf. Keep long hair restrained. Remove rings, watches and personal jewellery.

Alcohol and Drugs

It is extremely dangerous to operate machinery when under the influence of alcohol or drugs. Do not consume alcoholic drinks or take drugs before or while operating the machine or attachments. Be aware of medicines which can cause drowsiness.

Feeling Unwell

Do not attempt to operate the machine if you are feeling unwell. By doing so you could be a danger to yourself and those you work with.

Mobile Phones

Switch off your mobile phone before entering an area with a potentially explosive atmosphere. Sparks in such an area could cause an explosion or fire resulting in death or serious injury.

Switch off and do not use your mobile phone when refuelling the machine.

Lifting Equipment

You can be injured if you use incorrect or faulty lifting equipment. You must identify the weight of the item to be lifted then choose lifting equipment that is strong enough and suitable for the job. Make sure that lifting equipment is in good condition and complies with all local regulations.

Raised Equipment

Never walk or work under raised equipment unless it is supported by a mechanical device. Equipment which is supported only by a hydraulic device can drop and injure you if the hydraulic system fails or if the control is operated (even with the engine stopped).

Make sure that no-one goes near the machine while you install or remove the mechanical device.

Raised Machine

Never position yourself or any part of your body under a raised machine which is not correctly supported. If the machine moves unexpectedly you could become trapped and suffer serious injury or be killed.

Lightning

Lightning can kill you. Do not use the machine if there is lightning in your area.

Machine Modifications

This machine is manufactured in compliance with prevailing legislative requirements. It must not be altered in any way which could affect or invalidate its compliance. For advice consult your JCB dealer.

03 - Model and Serial Number

Introduction

This manual provides information for the following model(s) in the JCB machine range:

Model	From:	To:
JCB116	2492271	2492450
JCB116D	2492451	2492570
JCB116DD	2492271	2492450
VM116	2492271	2492450

00 - General

Introduction

⚠ **WARNING** When using cleaning agents, solvents or other chemicals, you must adhere to the manufacturer's instructions and safety precautions.

CAUTION To avoid burning, wear personal protective equipment when handling hot components. To protect your eyes, wear goggles when using a brush to clean components.

Notice: Cleaning metal parts with incorrect solvents can cause corrosion. Use only recommended cleaning agents and solvents.

Notice: The efficiency of the rams will be affected if they are not kept free of solidified dirt. Clean dirt from around the rams regularly. When leaving or parking the machine, close all rams if possible to reduce the risk of weather corrosion.

Notice: Never use water or steam to clean inside the operator station. The use of water or steam could damage the machine electrics and render the machine inoperable. Remove dirt using a brush or damp cloth.

Clean the product with water and/or steam. Do not let mud, debris etc. to collect on the product.

Before you do any service procedures that require components to be removed:

- The cleaning must be done either in the area of components to be removed, or in the case of major work, or work on the fuel system, the whole engine and the surrounding product must be cleaned.
- When cleaning is complete, move the product away from the wash area or alternatively, remove the material washed from the product.

When you remove components, be aware of exposure to dirt and debris. Cover any open ports and remove the deposits before proceeding.

Detergents

Do not use a full strength detergent. Always dilute the detergents as per the manufacturer's recommendations, or damage to the paint finish can occur.

Always obey the local regulations regarding the disposal of debris created from cleaning the product.

Pressure Washing and Steam Cleaning

⚠ **CAUTION** When using a steam cleaner, wear safety glasses or a face shield as well as protective clothing. Steam can cause personal injury.

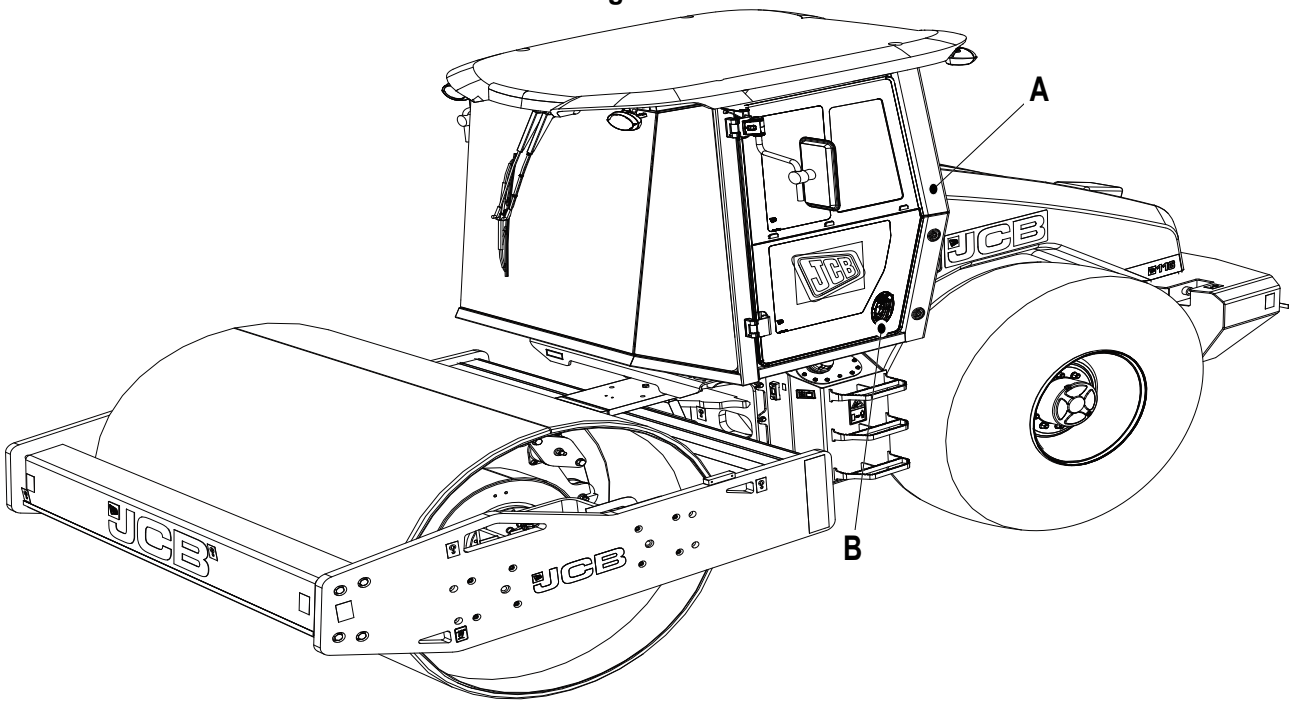
39 - Cab/Canopy

Introduction

Open

1. Make the machine safe.
   Refer to: PIL 01-03.
2. Stop the engine and remove the ignition key.
3. Use the ignition key to unlock the door.
4. Use the handle to release the catch. Open the door.

Figure 10.



A Door

B Latch

00 - General

Introduction

The machine has identification plates that contain important information relating to the specific machine details, for example VIN or PIN number and engine serial number. These serial numbers can help you identify exactly what equipment has been installed on the machine.

00 - General

Introduction

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

Remove and Install

Working Under the Machine

Make the machine safe before getting beneath it. Make sure that any attachments on the machine are correctly attached. Engage the park brake, remove the ignition key, disconnect the battery. If the machine has wheels use blocks to prevent unintentional movement.

Air Conditioning Maintenance

The air conditioning system is a closed loop system and contains pressurised refrigerant. No part of the system should be disconnected until the system has been discharged by a refrigeration engineer or a suitably trained person. You can be severely frostbitten or injured by escaping refrigerant.

Notice: *Make sure you label all hoses / pipes and electrical connectors (if installed) before removal to aid identification during subsequent installation.*

Remove

1. Make the machine safe.

   Refer to: PIL 01-03.

2. Discharge the hydraulic and brake pressure.

   Refer to: PIL 30-00.

3. Remove the battery cover and disconnect the battery.

   Refer to: PIL 33-03.

4. Disconnect the electrical connectors.

5. Disconnect all the hydraulic hoses from the steering unit.

   5.1. Put a label on the hoses to help installation.

   5.2. Plug all the open ports and hoses to prevent contamination.

6. Remove the hose clips and disconnect the heater hoses.

   6.1. Put a label on the hoses to help installation.

   6.2. Plug all the open ports and hoses to prevent contamination.

7. If the machine has air conditioning installed, do not attempt to disconnect any air conditioning hoses until the refrigerant has been discharged. Charging and discharging the system requires special equipment and training. If necessary, use the services of a specialist refrigeration engineer.

8. Disconnect the air conditioning hoses as follows (if applicable) after the air conditioning system has been discharged.

   8.1. Disconnect the air conditioning hoses at the TXV (Thermal Expansion Valve)

   8.2. Disconnect the condenser pipes at the condenser.

   8.3. Remove the hose clamps.

   8.4. Put a label on the hoses to help installation.

   8.5. Plug all the open ports and hoses to prevent contamination.

9. Disconnect the engine throttle cable.

10. Disconnect the throttle pedal sensor electrical connectors.

11. Make sure that all the wheels are blocked and release the park brake.

12. Disconnect the flexible brake pipe from the chassis connector.

    12.1. Plug the open ports and hose to prevent contamination.

13. Disconnect the cab earth strap.

14. Disconnect the hitch cable (if installed).

15. Disconnect the washer hoses.

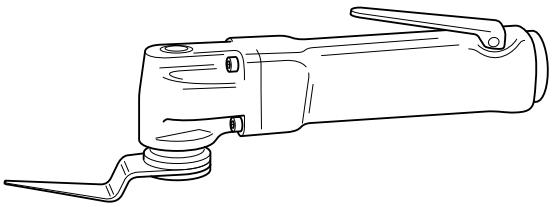
16. Remove the cab mounting bolts and nuts.

17. Attach appropriate lifting equipment to the ROPS (Roll-Over Protective Structure) and FOPS (Falling Object Protective Structure) cage.

18. Carefully lift the cab away from the machine. Make sure that all the connections are released and are clear of any obstruction.

Do not allow the knife blade to overheat or the sealant will melt.

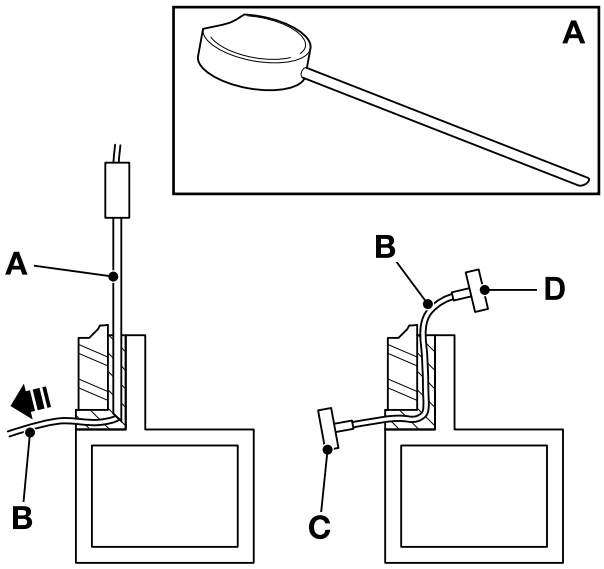
Figure 27.



3.2. Braided Cutting Wire and Handles - This method uses a 3-core wire, a wire starter tube and two handles. Insert the steel tube into the old sealant on the inside of the glass. Insert the braided cutting wire down the centre of the steel tube. If necessary, from the outside, cut out local sealant at the point of the tube to gain access to the wire. Using suitable pliers, pull the cutting wire through the sealant to the outer side of the glass. Secure the end of the braided cutting wire (found on the outer side of the glass) in the special handle. Slowly remove the steel tube. Secure the second end of the braided cutting wire in the special handle. Move the cutting wire backwards and forwards in a sawing motion and at the same time gently push or pull the wire to cut through the old sealant.

Special Tool: Wire Starter (Qty.: 1)
Special Tool: Glass Extractor (Handles Only) (Qty.: 1)
Special Tool: Braided Cutting Wire (Qty.: 1)

Figure 28.

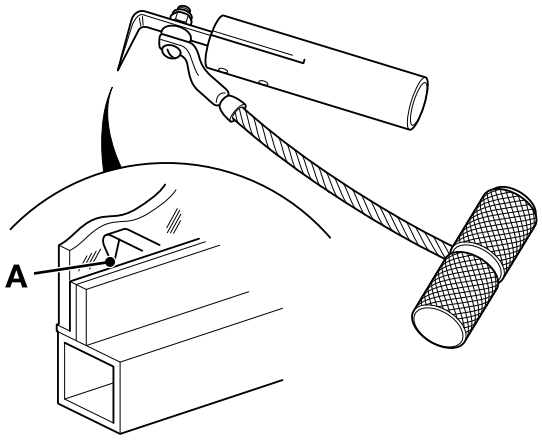


A Wire starter
B Braided cutting wire
C Glass extractor (handles)
D Glass extractor (handles)

3.3. Cut-out Knife - The cut-out knife can be used as a left handed or right handed tool. Insert the knife blade into the sealant. Make sure that the blade of the knife is against the glass. Use the 'pull-handle' to pull the knife along and cut out the old sealant.

Special Tool: 'L' Blades (Qty.: 1)
Special Tool: Cut-Out Knife (Qty.: 1)

Figure 29.



A Glass

3.4. Craft Knife - The blades are replaceable. Insert the knife blade into the sealant. Pull the knife along and cut out the old sealant.

00 - General

Introduction

The safety labels are strategically placed around the product to remind you of possible hazards.

If you need eye-glasses for reading, make sure you wear them when reading the safety labels. Do not over-stretch or put yourself in dangerous positions to read the safety labels. If you do not understand the hazard shown on the safety label, then refer to Safety Label Identification.

Keep all of the safety labels clean and readable. Replace a lost or damaged safety label. Make sure the replacement parts include the safety labels where necessary. Each safety label has a part number printed on it, use this number to order a new safety label from your JCB dealer.

Technical Data

Table 12. Binary pressure switch settings

Item	Specification (Kg/Cm²)	
	Out	In
Low pressure	2.0	2.1
Medium pressure	14	17
High pressure	32	26

Table 13. Refrigerant

Item	Specification
Type	R143a gas
Quantity	1.2kg

Check (Leaks)

The refrigerant is heavier than air and will leak downwards from the defective component. Check in still conditions but in a well ventilated area.

Hose or pipe connections are likely leakage points of any refrigerant circuit.

It is essential that an electronic leak detector is used to locate leaks accurately. However, if a leak detector is not available, an approximate source can be found by applying a soap solution to the suspect area.

To test for leaks in the high pressure side of the system i.e. from the compressor output to the expansion valve, run the air conditioning for a few minutes then switch off the engine and test for leakage using an electronic leak detector or soapy water.

To test for leakage in the low pressure side of the system, switch off the air conditioning and leave for a few minutes before testing.

Leaking Hoses

The refrigerant hoses have crimped ferrule end fittings. The hose connectors have an O-ring seal which compresses when the connection is tight, creating an air tight seal.

Hoses are used to connect the inlets and outlets of the compressor, condenser, receiver drier and expansion valve (the evaporator coil is connected to the expansion valve within the air conditioning unit using rigid pipes).

If leakage is detected from a hose connector, either by means of an electronic leak detector or soapy water, tighten the connector up and repeat the leakage test. If leakage is still evident, it will be necessary to discharge the system and renew the connector O-ring seal. Refer to: PIL 12-00-00.

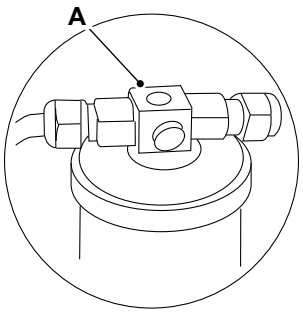
Check (Level)

The state of refrigerant at the receiver drier sight glass is an indication of the pressure in the system, i.e. the refrigerant charge level. The receiver drier is mounted beneath the engine cover towards the right-side on a vertical bulkhead at the rear of the engine.

Check the level of refrigerant as follows:

1. Make machine safe with the lift arm lowered. Refer to (PIL 01-03).
2. Open the engine cover.
3. Start the engine and run at idle.
4. Switch on the HVAC (Heating Ventilation Air Conditioning) system to circulate the refrigerant.
5. Stop the engine and check the level at the sight glass.

Figure 41.



A Sight glass

If the level of charge is correct the sight glass will be clear. If the charge is low bubbles will be visible. Bubbles may also be an indication of inadequate cooling, due to a restriction of air flow around the condenser coil. If the system is not providing adequate cooling, refer to fault-finding. Refer to (PIL 12-00).

When R143a refrigerant is used slight bubbles are visible at the system sight glass. This is normal for this type of refrigerant.

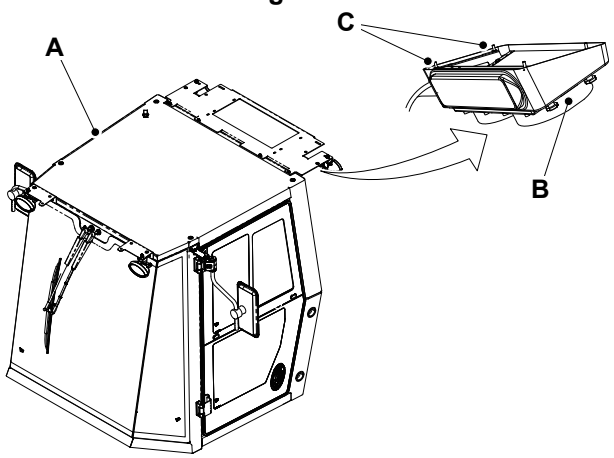
15 - Thermostat

Introduction

The thermostat is located within the HVAC unit next to the blower motor.

The thermostat monitors the external temperature of the evaporator so that the system's temperature is maintained near the desired setpoint. The thermostat does this by switching the heating or cooling devices on or off, or regulating the flow of the heat transfer fluid as needed, to maintain the correct temperature.

Figure 44.



A Cabin
B Condenser and fan module
C Bolt and Nut (x4)

Install

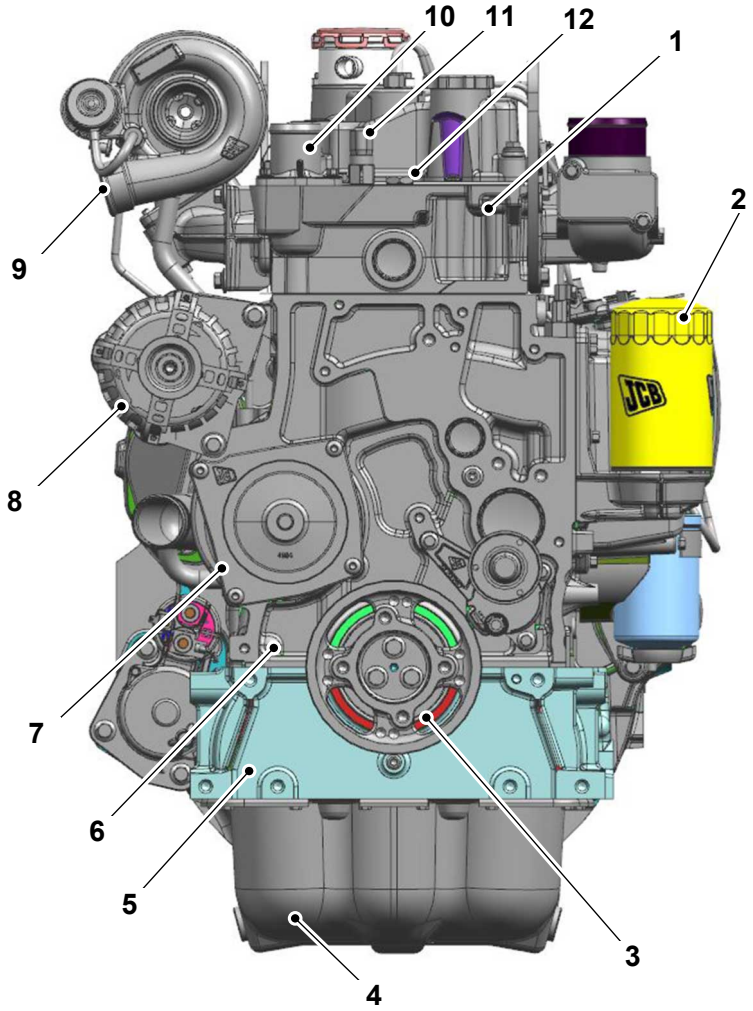
1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Charge the HVAC system.
3. Check the HVAC system for leaks.

   Refer to: PIL 12-00.

00 - Engine

Contents **Page No.**

Figure 50. Front End



1 Cylinder head
2 Lubrication oil filter
3 Crankshaft pulley
4 Lubrication oil sump
5 Bedplate
6 Crankcase
7 Coolant pump and drive pulley assembly
8 Alternator and drive pulley assembly
9 Turbocharger (turbocharged engine only)
10 Coolant thermostat housing/radiator hose connector
11 Coolant temperature sender
12 Cab heater water hose connector

Table 37. Engine - RPM Surges

Cause	Remedy
Fuel level low.	Check the level in the fuel tank, use sight gauge or dipstick. Replenish as required.
Pedal/ Hand Throttle position sensor (TPS) system defective.	Check the throttle assembly.
Fuel injection lines leaking.	Replace defective fuel lines. Do not repair defective fuel lines. If there is a fuel leak remove and discard the necessary components and install new ones.
Fuel tank cap vent/breather blocked.	Inspect and rectify as required. Replace cap if necessary.
Fuel is aerated.	Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system.
Electrical sensor fault.	Check the electrical connections at the sensors.
One or more fuel injectors worn or malfunctioning.	Check the electrical connections at the injectors.
Worn or malfunctioning high pressure fuel pump.	Do all the necessary fault finding checks before removal of the high pressure fuel pump.

Table 38. Engine - Vibration Excessive

Cause	Remedy
Engine not running smoothly/misfiring.	See Also: Table 32. Engine - Poor Running at Idle
Oil level incorrect.	Check oil level.
Fan damaged or accessories faulty.	Check/replace the vibrating component. Refer to the machine's service manual for correct installation and torque figures.
Fan hub faulty.	Inspect/replace the fan hub. Refer to the machine's service manual for correct installation and torque figures.
Engine mounts over-tightened, damaged or loose.	Check/replace engine mounts.
Inlet and exhaust valve clearances set incorrectly.	Set the valve clearances to the recommended clearances.
Engine compression low in one or more cylinders.	Check the engine compression.
Alternator bearing worn or damaged.	Check/replace the alternator.
Flywheel housing misaligned.	Check/repair flywheel alignment.
Electrical sensor fault.	Check the electrical connections at the sensors.
Driveline components worn or unbalanced.	Check and inspect driveline components such as propshafts. Refer to the relevant section of the service manual for correct installation and torque figures.

Table 39. Engine - Exhaust Smoke Excessive (Black Smoke)

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

Before Removal

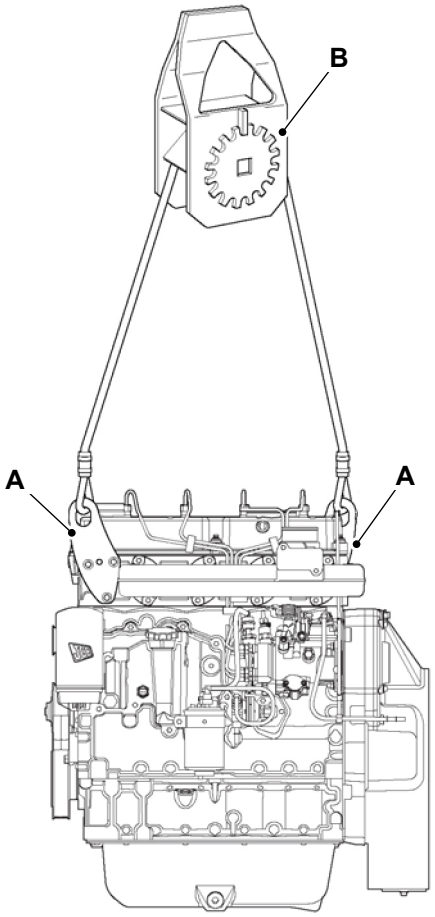
1. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
2. Position the machine on firm level ground. Make the machine safe, refer to (PIL 01-03).
3. Get access to the engine.

Remove

1. Disconnect and remove the battery, refer to (PIL 33-03).
2. Drain the engine oil, refer to (PIL 15-21).
3. Drain the engine coolant, remove the cooling pack refer to (PIL 21-03).
4. Discharge the hydraulic pressure, refer to (PIL 30-00).
5. Drain the hydraulic tank. Disconnect and plug the hydraulic suction and delivery lines at the transmission pump and gear pump. Label the hoses to ensure correct reassembly. refer to (PIL 30-00).
6. Disconnect and plug the hydraulic cooler hoses. Label the hoses to ensure correct reassembly
7. Disconnect the exhaust system.
8. Label the cab heater hoses at the engine block connectors. Release the hose clips and remove the hoses.
9. Disconnect the wiring connections from the starter motor, refer to (PIL 15-75).
10. Disconnect the wiring connections from the alternator, refer to (PIL 15-72).
11. Disconnect the wiring connections from the engine sensors and actuators, refer to (PIL 15-84).
12. Disconnect the electrical connector at the oil level sensor (if installed).
13. Disconnect the fuel supply line at the fuel lift pump and the spill line at the fuel injection pump. Cap all hoses and ports to prevent ingress of dirt.
14. Disconnect the electrical harness at the engine harness.
15. Uncouple the electrical harness at the ECM machine side connector. Important: Do not touch the connector pins on theECM or harness connectors. Cover the connectors to prevent contamination.
16. Ensure that all relevant harnesses and hoses are unclipped from the engine and tied out of the way.
17. Disconnect and plug the hoses at the hydraulic pump.
18. Disconnect the wiring to the hydraulic pump.
19. Remove the gearbox to engine retaining bolts, pull the transmission and converter clear of the engine, make sure that the converter stays mounted on the gearbox shaft.
20. Attach slings to the engine lifting eyes.

    Special Tool: Lifting Brackets (Qty.: 1)
21. Take the weight of the engine on the hoist and remove the engine mounting bolts.
22. Withdraw the engine in a level attitude until the hydraulic pump is clear of the chassis. Raise the engine to lift it clear of the machine.
23. Lower the engine into a suitable stand that is capable of supporting the weight of the engine.

Figure 57.



A Lifting bracket mounting bolts
B Lifting equipment

00 - General

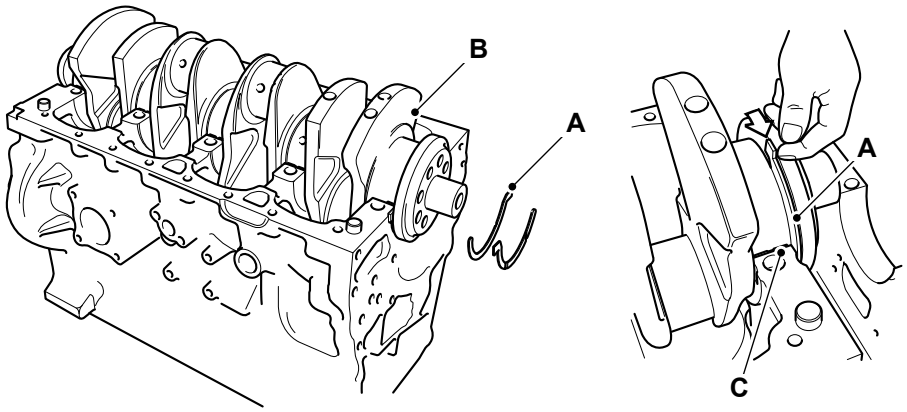
Introduction

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

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

T4 Guide pins (x2 obtain locally)
T6 Lifting bolts (x4 obtain locally)
W Bearing tab
Y Bearing location tab
P3 O-ring
T5 Sealant template
V Sealant template portion for removal
X Rear main bearing
P2 Anaerobic sealant

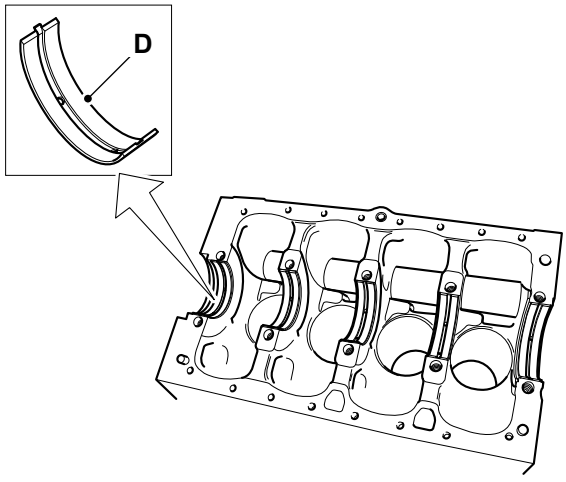
Figure 68.



A Thrust Washers
B Crankshaft
C Rear main bearing

2. Put labels on the thrust washers to make sure that they are installed in the correct positions during assembly.
3. Use suitable lifting equipment to carefully lift the crankshaft from the crankcase (if the crankshaft is lifted manually, two people will be required).
4. Carefully lift out the bearing shells.

Figure 69.



D Main bearing shells

5. It is recommended that the bearing shells are replaced. If however they are to be used again, put label on the shells to make sure that they are installed in their original positions during assembly.
6. Inspect the crankshaft and main bearings etc. for damage and excessive wear. Refer to Check Condition (PIL 15-12).

Before Installation

1. Clean off all traces of the old sealant compound from the crankcase and bedplate mating faces.
2. Use a suitable degreasing agent to carefully clean the main bearing saddles in the bedplate and crankcase. Take care not to block the oil ways or the piston cooling jets.

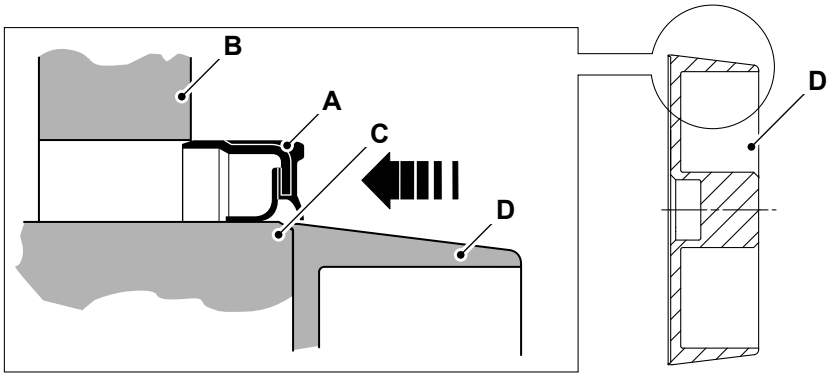
   Consumable: Cleaner/Degreaser - General purpose solvent based parts cleaner

Important: Cleanliness is of the utmost importance. Blocked oil-ways or oil jets will cause engine failure. Before you install the crankshaft make sure that ALL oil-ways and jets are clear and free from debris.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Make sure that all items are clean and free from damage and corrosion.
3. If removed or a new crankcase is being installed then install cooling J jets as follows:

Figure 81.



A Crankshaft rear oil seal
B Flywheel housing
C Flywheel hub
D Oil seal alignment tool

2. Install the new hub on to the crankshaft gear and install the old hub on the outside of the new hub to create a double thickness flywheel hub, install the fixing bolt as shown at A. Do not touch the PTFE seal lips of the crankshaft oil seal.

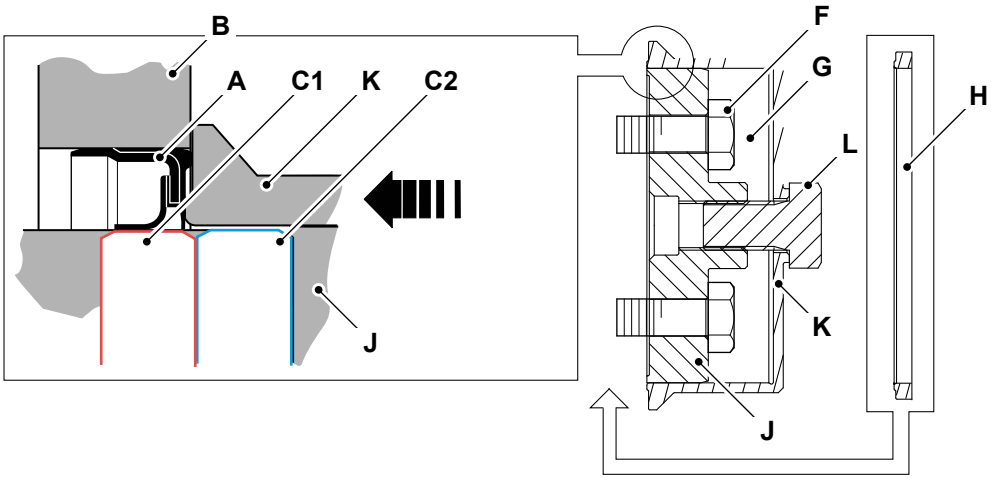
3. Make sure that you use the oil seal alignment tool to initially install the oil seal on to the flywheel hub to prevent damage to the seal lip. Locate the alignment tool over the end of the hub, carefully push the oil seal over the alignment tool as far on to the crankshaft hub as possible. Make sure that the seal is installed the correct way around.

Special Tool: Crankshaft Rear Oil Seal Installation Tool (Qty.: 1)
Special Tool: Crankshaft Rear Oil Seal Alignment Tool (Qty.: 1)

4. Apply the lubricant P80 around the seal outer rubber diameter.

5. Dismantle the oil seal installation tool. Use the two flywheel bolts to attach the centre body on to the flywheel hub. Assemble the outer sleeve on to the centre body include the extension ring and install the screw.

Figure 82.



A Crankshaft rear oil seal
B Flywheel housing
C1 New hub
C2 Old hub
F Flywheel bolts
G Oil seal installation tool
H Extension ring
J Centre body
K Outer sleeve
L Screw

6. Turn the screw to push the seal into position in the counterbore so that the screw will not turn.

After Installation

1. Note that the fuel injection pump drive gear fixing nut is torque tightened as part of the fuel injection pump replacement procedure. Refer to (PIL 18-18).
2. Do the procedures in Before Removal in reverse order.

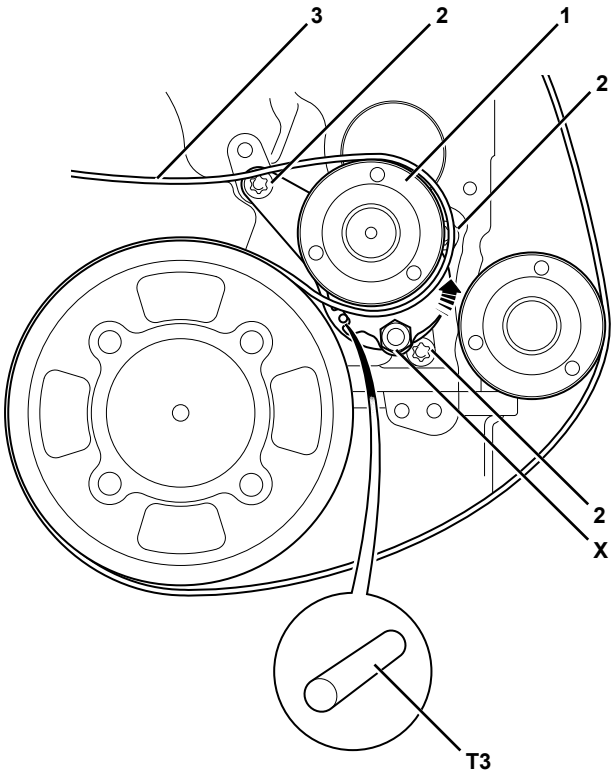
21 - Tensioner

Remove and Install

Before Removal

1. Make the machine safe. Refer to (PIL 01-03).
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 drive belt, refer to (PIL 15-18).

Figure 97.



1 Drive belt tensioner pulley
2 Fixing bolts (x3)
3 Drive belt
T3 Locking pin
X Spigot nut

Remove

The drive belt tensioner is a non-serviceable item. If the drive belt tensioner or the idler wheel is faulty or damaged it must be renewed as a complete assembly.

1. To remove the tensioner assembly, remove the bolts and lift the tensioner pulley from the cylinder block.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Tighten the bolts to the correct torque value.
3. Install the drive belt, refer to (PIL 15-18).
4. Make sure that the drive belt is under tension and the locking pin is removed before starting the engine. Refer to Drive Belt - Adjust (PIL 15-18).

Table 58. Torque Values

Item	Nm
2	24

00 - General

Introduction

Engine performance and durability will be severely affected if the quality of the air intake is poor.

A dirty and blocked air cleaner element will reduce the amount of air entering the combustion chamber which can cause engine mis-firing, black smoke and low output power.

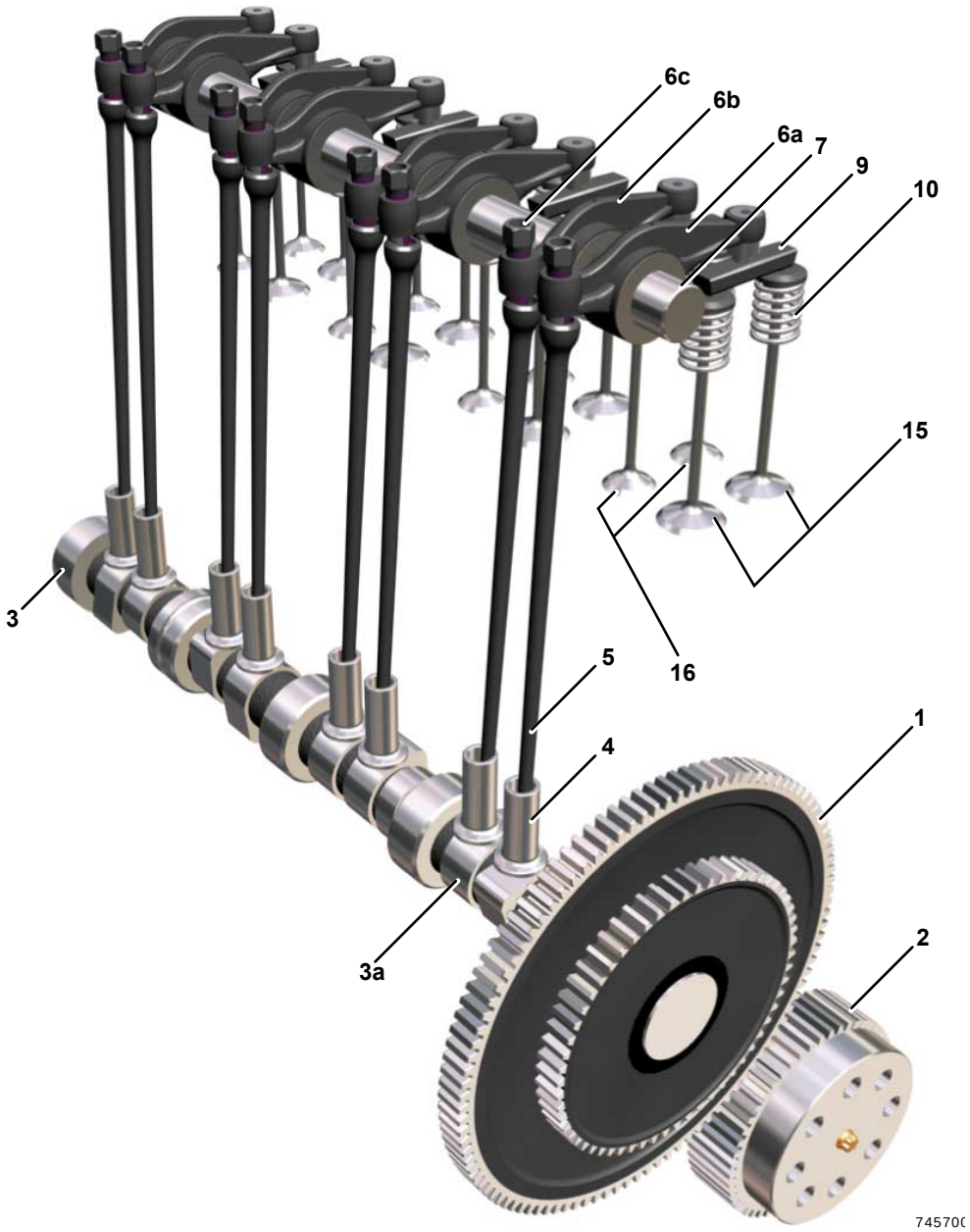
A dirty and blocked air filter can also lead to abrasion of the cylinder bores and valves (referred to as dusting). This will cause excessive oil consumption, black smoke, low output power and a reduced engine life.

In hostile environments, change the air filter elements more frequently.

In some applications, an air filter pre-cleaner can be installed.

Component Identification

Figure 106.



1 Camshaft drive gear
2 Crankshaft gear
3 Camshaft
3a Lobes
4 Tappets (x8)
5 Push rods (x8)
6a Rockers - inlet (x4)
6b Rockers - exhaust (x4)
6c Adjusting screws (x8)
6d Swivel tip - rockers
7 Rocker shaft
8 Wave washers (x8)
9 Bridge pieces (x8)
10 Valve springs (x16)
11 Retainer (x16)
12 Collets (x32)
13 Oil seal - valve stems (x16)
14 Valve seat inserts (x16)

00 - General

Introduction

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

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

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

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

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

Check (Condition)

1. Check the piston for signs of damage and excessive wear. Measure the piston skirt diameter, piston pin bore and the clearance in the piston ring grooves to confirm they are within service limits. Refer to Piston, Technical Data (PIL 15-36).
2. Check the piston pin for signs of damage and excessive wear. Measure the pin diameter to confirm it is within service limits. Refer to Piston, Technical Data (PIL 15-36).

The connecting rod small end bearing bush is not renewable. If the small end bearing bush is damaged or worn the connecting rod must be renewed as a complete assembly.

00 - General

Introduction

The engine manifold is split into two sections, refer to inlet manifold PIL 18-24-03 and exhaust manifold PIL 18-24-04 .

Disassemble

1. Lift out the rocker shaft fixing bolts, then slide the pedestals, rockers and wave washers off the rocker shaft as shown. Label the pedestals and rockers to make sure that they are installed in the correct positions on assembly.
2. Check the rocker shaft and rocker bushings for signs of damage and excessive wear. Refer to Check (Condition) (PIL 15-42).

Assemble

1. The assembly procedure is the opposite of the disassemble procedure. Additionally do the following steps.
2. Lubricate the rocker shaft and rocker bearing bushes with clean engine oil.
3. Make sure that the rockers and pedestals are installed in their original positions along the rocker shaft. Note the position of the oil feed pedestal.
4. Insert the rocker shaft fixing bolts to hold the rockers and pedestals loosely in position before fitting the assembly into the cylinder head. Note the position of the longer bolt.

After Assembly

1. Install the rocker assembly. Refer to (PIL 15-42).
2. Install the rocker cover. Refer to (PIL 15-42).

00 - General

Introduction

The lubrication system distributes oil around the engine by a system of galleries and drillings in the crankcase and cylinder head. The oil lubricates and seals the moving parts of the engine, reducing friction and wear. In addition the oil plays an important role in cooling the engine by carrying heat from the engine to the cooler. A piston cooling jet sprays oil onto the underside of the pistons to keep them cool, refer to (PIL 15-36).

Oil is drawn from the oil sump by the integral oil pump via the suction strainer. The strainer prevents any large particles of debris passing through, which may damage the pump.

The oil passes from the outlet side of the pump through a relief valve which limits the maximum oil pressure by venting oil back to the inlet side of the pump, refer to (PIL 15-36).

From the pump the oil passes through the oil cooler and filter, refer to (PIL 15-69 and PIL 15-21).

After cooling and filtering, the oil passes into the main oil gallery. An oil pressure switch senses the oil pressure. From the main gallery oil is delivered, via drillings, to the crankshaft main bearings, rocker assembly, camshaft and timing gears. Note that drillings are through the crankcase and cylinder head.

When the high pressure oil has passed through the bearings it reverts to sump pressure and splash lubricates the internal components such as rocker tips, cam lobes and timing gear teeth. Gravity drains the oil via drains into the cylinder head and crankcase, back into the oil sump. A drain slot allows the oil to drain from the timing case back to the oil sump.

03 - Crankshaft Gear

Remove and Install

Special Tools

Description	Part No.	Qty.
Crankshaft / Camshaft Timing Pin (444/448/672 Engine)	892/01148	2

Note: The illustrations show the engine inverted. If the drive gear components are being removed prior to crankshaft or camshaft removal the engine must be inverted. If the gear components only are being removed (for inspection/renewal) then the engine need not be inverted.

Before Removal

1. Remove the starter motor. Refer to (PIL 15-75).
2. Remove the flywheel. Refer to (PIL 15-54).
3. Remove the flywheel housing. Refer to (PIL 15-54).
4. Rotate the crankshaft until the camshaft locking pin can be inserted through the gear and into the aligning hole in the rear gear case. Note: The camshaft and crankshaft locking pins must be in position to lock the crankshaft and camshaft before removing the crankshaft gear.

   Special Tool: Crankshaft / Camshaft Timing Pin (444/448/672 Engine) (Qty.: 2)
5. Remove the taper blanking plug and insert the crankshaft locking pin.

54 - Flywheel

Contents **Page No.**

00 - General

Introduction

The oil pump is a rotor type pump located inside the timing gear case. The pump is driven by gears via the crankshaft.

The pump consists of two rotors, one running inside the other. The outer rotor has one more lobe than the inner rotor and turns on a different axis.

When rotated the gap between the inner and outer rotor lobes increases, drawing oil in through the inlet port. After a half rotation the gap reaches a maximum, the inlet port is closed and the outlet port opens.

Further rotation causes the gap between the lobes to diminish, forcing the oil out through the outlet port.

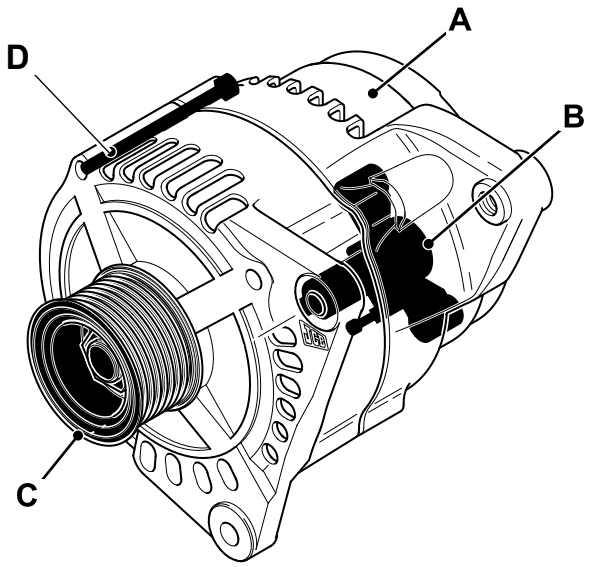
A pressure relief valve assembly is integral with the pump body. As oil pressure increases it acts on a spool to overcome the pressure of the spring. As the spool moves it uncovers a port allowing pressurised oil directly back to the inlet port. In practice the spool is continually opening and closing to maintain the correct oil pressure value. The valve is not adjustable.

69 - Oil Cooler

Contents **Page No.**

Component Identification

Figure 150.



A Alternator
B Regulator and brush assembly
C Drive pulley
D Tie bolts

Check (Condition)

Charging Circuit Test

1. Make sure that all the battery and alternator connections are in place, secure and making good metal - to - metal contact, especially the earth connections to chassis and engine.
2. Adjust the alternator drive belt tension if necessary and make sure that the battery is well charged.
3. Turn the ignition switch to the ON position. Oil pressure and "No Charge" warning lights should glow. If any light fails, re-check the connections.
4. Start the engine; all warning lights should extinguish rapidly. If the "No Charge" warning light remains ON, re-check the alternator drive belt tension and that the battery is charged. If the oil pressure warning remains on stop the engine Immediately and investigate the engine lubrication system.

Check 1

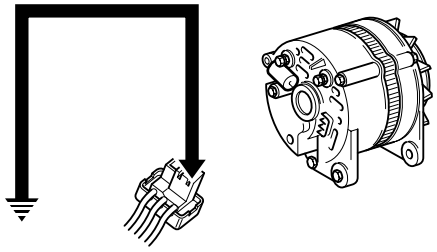
With the ignition switch ON, check that the heater motor and screen wiper will operate.

If they operate normally, check the warning light bulb for a blown filament.

Simultaneous failure of all items indicates a fault at the ignition switch. Check for cable disconnection before condemning the switch itself.

If the 'No Charge' warning bulb is in good order, withdraw the triple plug from the back of the alternator. Make a temporary connection between the small terminal in the plug and earth as shown below. If the 'No Charge' warning bulb still fails to light, check the cable for continuity. If the bulb now lights, check the alternator for a defective regulator.

Figure 151.

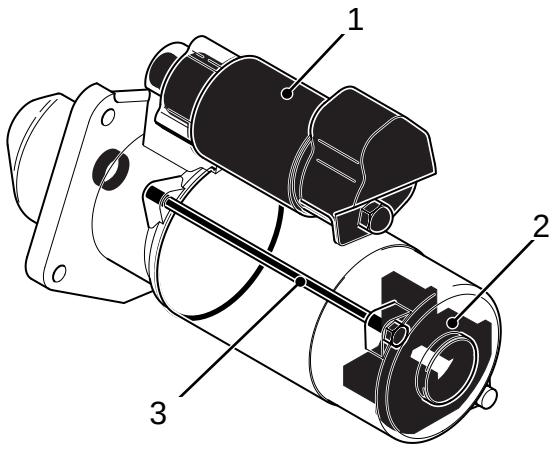


Check 2

The following checks should be made using an analogue (moving pointer) type Multimeter.

Component Identification

Figure 157.



1 Solenoid
2 Brush gear
3 Tie bolts

Check (Condition)

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

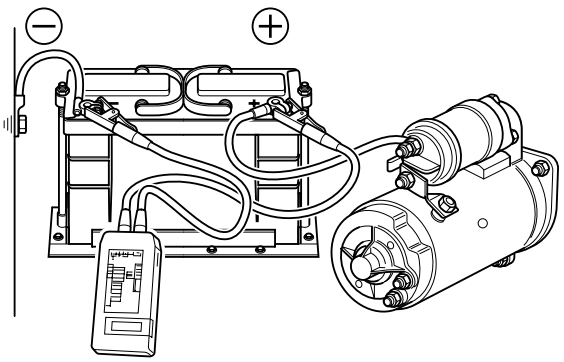
To prevent the engine starting during the tests make sure that the applicable engine stop fuse is removed.

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

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

1. Connect the multimeter across the battery terminals.

Figure 158.



1.1. Reading in start position approximately

Voltage: 10V
Voltage: 20V

1.2. Minimum permissible reading in start position

Voltage: 9.5V
Voltage: 18V

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

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

Voltage: 0.5V
Voltage: 1V

00 - General

Introduction

The cold start switch will send a signal to turn on the cold start advance solenoid at specific temperatures to help in cold starting conditions.

00 - Fuel and Exhaust System

Contents **Page No.**

- Ensure that workshop doors to the outside are kept closed. A gust of wind through an open door will easily blow sand particles into the air.
- Make sure your work wear is clean, non-flocking and lint free. If in doubt wear a new disposable environmental type suit.
- Use clean latex gloves (non-powdered).
- Before you start work make sure that all the required replacement parts and tools are on site. Make sure that the replacement parts are still sealed inside their packaging
- Cap all exposed ports and orifices immediately. Do not leave them open.
- High pressure fuel pipes MUST BE RENEWED if any pipe joint is loosened or disconnected. DO NOT re-use the original pipe.

18 - Injection

Contents **Page No.**

03 - Injector

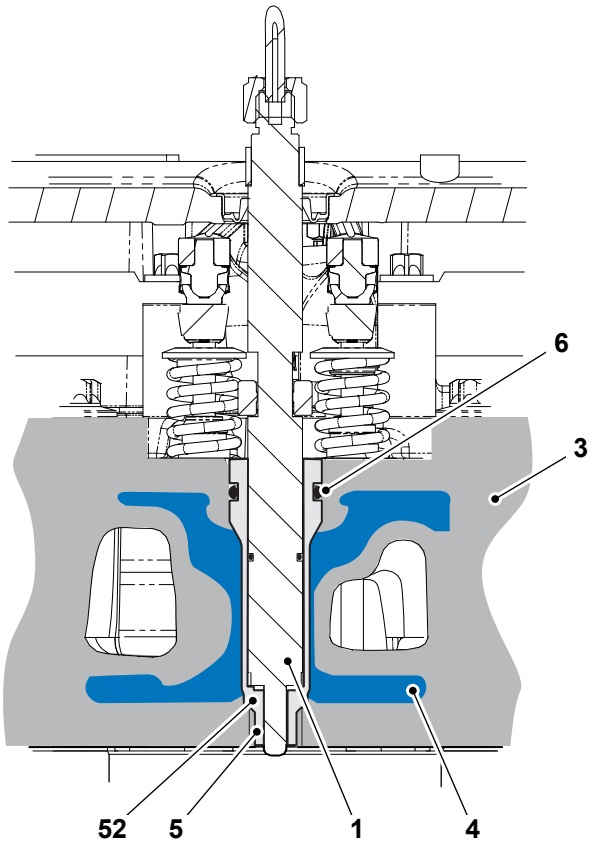
Introduction

The injectors are supplied with pressurised fuel by the high pressure fuel injection pump and when energised, the injector atomizes the fuel into a fine mist so that it can burn easily by the vehicle's engine.

The fuel injectors are mounted in the inlet manifold so that fuel is sprayed directly at the inlet valves.

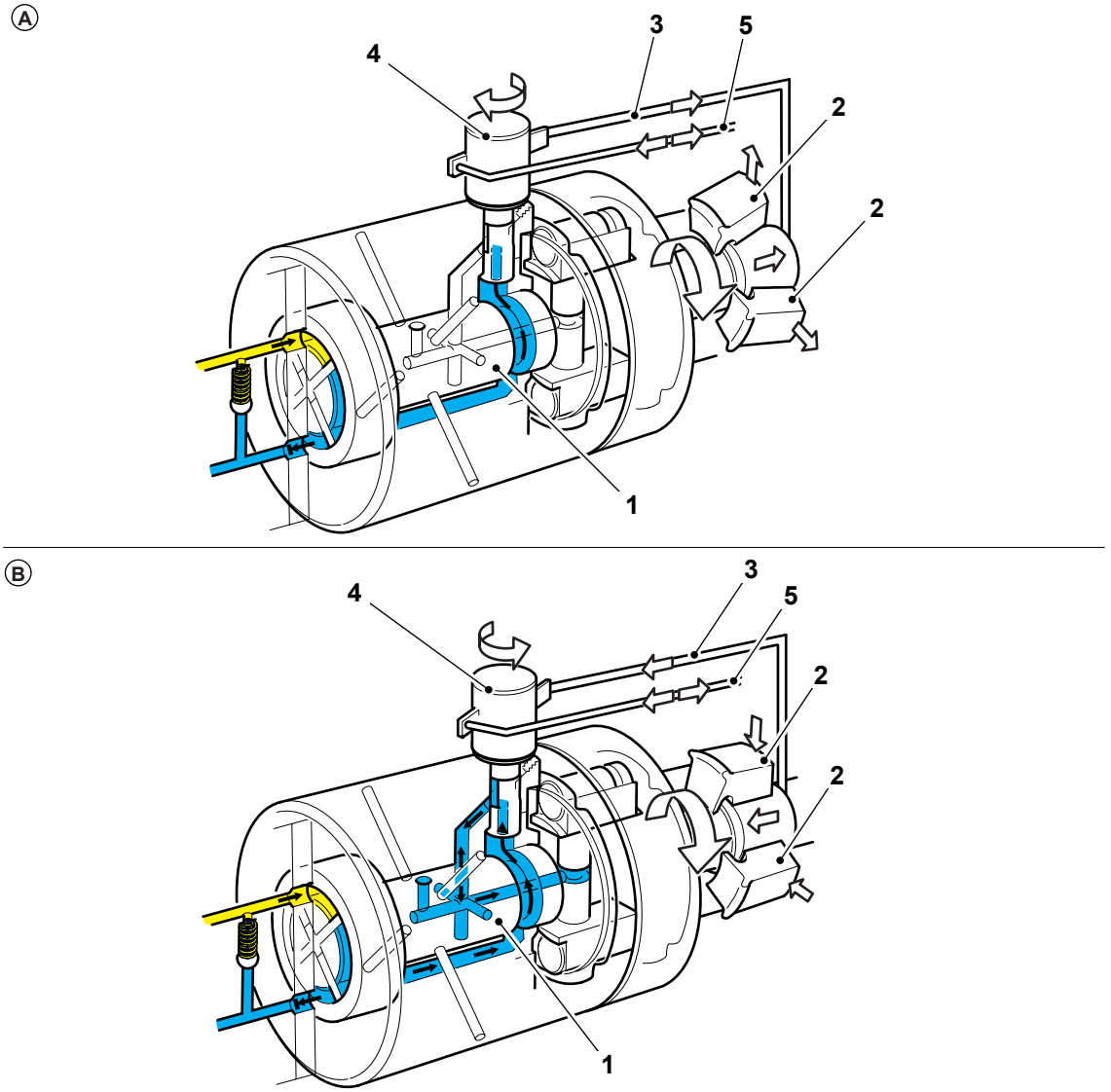
The injector tips are located inside the combustion chambers, so effective cooling is essential. A special thin walled sleeve is screwed into the cylinder head which allows a coolant jacket close to the injector. The coolant jacket is sealed at the bottom by sealant on the sleeve thread and at the top by O-ring.

Figure 184.



1 Injector
2 Sleeve
3 Cylinder head
4 Coolant jacket
5 Sleeve thread
6 O-ring

Figure 194.



1 Injection pump shaft (engine driven)
2 Governor weights
3 Governor linkage
4 IMV
5 Throttle linkage, governor linkage housing case
A Governor state - Increasing engine speed
B Governor state - Decreasing engine speed

Features of the DP210/DP310 Fuel Injection Pump

Refer to Figure 195.

The fuel pump incorporates several advanced design features to help improve engine performance and at the same time comply with the current emissions regulations.

Cold Start Advance

By changing the angular position of the cam ring, the timing of the fuel injection can be altered. This is useful as an aid to cold starting and is achieved hydraulically using the fuel pressure.

When the engine coolant is cold, the electrical switch closes, energising the cold advance solenoid. The solenoid plunger lifts from its seat allowing fuel pressure to act on the advance piston, moving the cam ring to the advance position. The cold advance solenoid is de-energised to return the cam ring to the hot running position.

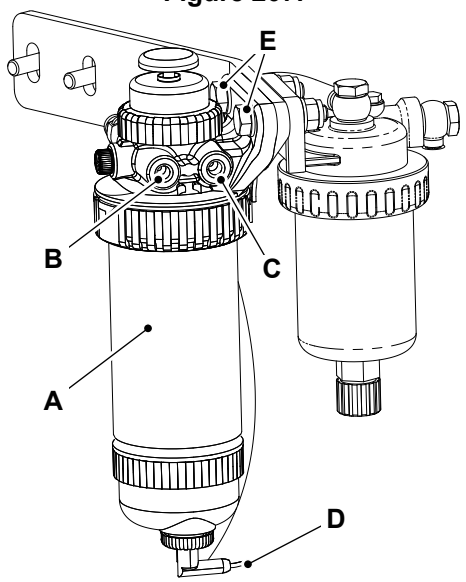
00 - General

Introduction

The fuel pump consists of fuel filter and its removable parts.

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

Figure 207.



A Fuel pump filter
B Inlet port
C Outlet port
D Harness electrical connector
E Bolt

04 - Outlet Manifold

Introduction

The exhaust outlet manifold collects the exhaust gases from the multiple cylinders and delivers it to the turbocharger or the exhaust pipe.

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Check the condition of the turbocharger. Refer to (PIL 18-35).
3. Prime the top of the turbocharger with 200ml of fresh clean engine oil. It is extremely Important not to run the new turbocharger dry.
4. Renew all O-rings, sealing washers and gaskets.
5. Note that the exhaust manifold gasket also functions as a heatshield. Be sure to position the gasket the correct way around.
6. Tighten the locknuts to the correct torque value.

21 - Cooling System

Contents **Page No.**

Drain and Fill

Consumables

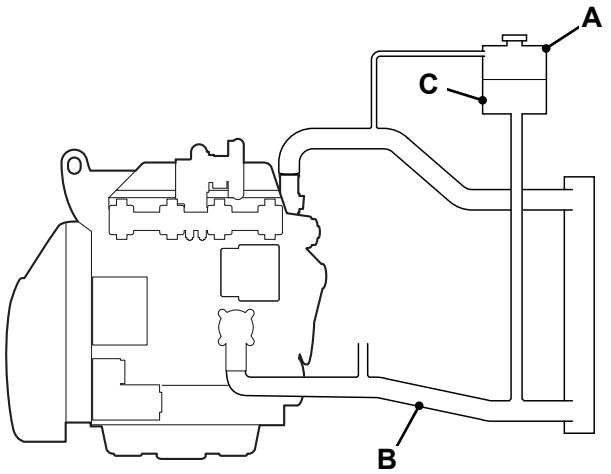
Description	Part No.	Size
Antifreeze HP/ Coolant ASTM D6210 Concentrate	4006/1101	5L
	4006/1120	20L
	4006/1103	200L

The graphic shows a typical engine cooling system, the system you are working on may look slightly different.

1. Make the machine safe. Refer to (PIL 01-03).
2. Stop the engine and let it cool down.
3. Get access to the engine.
4. Carefully loosen the cap just enough to let any pressure escape. Remove the cap when all pressure is released.
5. Disconnect the bottom radiator hose and allow the coolant to drain into a suitable container.
6. Flush the system by pouring clean water into the filler port.
7. Connect the bottom radiator hose.
8. Fill the expansion tank, using the necessary anti-freeze solution, to the level indicated.

   Consumable: Antifreeze HP/Coolant ASTM D6210 Concentrate
9. Run the engine for a while to raise the coolant to working temperature and pressure. Stop the engine and check for leaks. Check the level in the expansion tank and top up if necessary.

Figure 223.



A Cap
B Bottom radiator hose
C Expansion tank

Check (Level)

1. Make the machine safe.

   Refer to: PIL 01-03.
2. Get access to the coolant expansion tank.
3. Check the level of coolant in the coolant expansion tank. If necessary remove the filler cap and top up to the level indicated.
4. Install the filler cap and make sure it is tight.
5. Run the engine for a while to raise the coolant to working temperature and pressure.
6. Stop the engine and check for leaks.

00 - General

Introduction

The coolant pump is a centrifugal type located in the front of the crankcase, driven by the engine drive belt.

The impeller rotates to circulate the coolant through the cooling system. The pump shaft bearing and seal are not renewable.

Note The thermostat is a non-serviceable item. If the thermostat 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. Inspect the seal for damage or splits. If necessary use a new seal. Locate the seal correctly as shown.
3. Make sure you install the thermostat the right way up.
4. Tighten the bolts to the correct torque value.
5. Connect the radiator hose at the housing.

After Installation

1. Fill the cooling system with the recommended coolant mixture. Refer to (PIL 21-03-03).
2. Start the engine and check for coolant leaks.

Table 93. Torque Values

Item	Nm
2	24

00 - Brake System

Contents **Page No.**

00 - Steering System

Contents **Page No.**

Remove and Install

Remove

1. Make the machine safe.
   Refer to: PIL 01-03-27.
2. Stop the engine and let it cool down.
3. Discharge the hydraulic pressure.
   Refer to: PIL 30-00-00.
4. Disconnect the hoses from the steer unit
5. Put a label on the hoses to help installation.
6. Plug all the open ports and hoses to prevent contamination.
7. Remove the bolts and washers.
8. Remove the steer unit. Refer to Figure 242.

00 - General

Introduction

Axles are an integral component of a wheeled vehicle. The axle transmits a driving torque to the wheel, as well as maintaining the position of the wheels relative to each other and to the vehicle body.

Item	Description
J	Nut
K	Circlip 2
L	Back off pin 1
M	Tension bush
N	Spring 1
P	Brake piston
Q	Seal 1
R	Seal 2
S	Back off pin 2
T	Spring 2
U	Cross hatching
V	Oil flow holes
W	Drivehead housing

Assemble

Brake piston and seals- Controlled retraction type

1. Remove all traces of the old sealant from the mating faces of the drivehead and the brake piston housing.
2. Install a new seal 1 and seal 2. Make sure that they are seated squarely in their grooves.
3. Apply sealant to the threads of the back off pin 1. Screw the back off pin 1 into the brake piston.

   Consumable: JCB Threadlocker and Sealer (Medium Strength)
4. Carefully push the piston all the way into the housing. Make sure that the brake back off holes are aligned with the housing.
5. Install the spring 1 over the back off pin 1.
6. Put the tension bush over the back off pin 1.
7. Use a suitable tool to drive the tension bush onto the back off pin 1, use a soft faced hammer until the circlip 2 is installed.
8. Apply JCB multigasket to the drivehead mating surface and then install the brake piston housing assembly. Make sure that they are aligned against the marking, made at the time of disassembly.

   Consumable: JCB Multi-Gasket
9. Install the capscrews, tighten the screws to the correct torque value.Refer to Table 101.
10. Remove the differential support.

Brake piston and seals- Positive retraction type

1. Remove all traces of the old sealant from the mating faces of the drivehead and the brake piston housing.
2. Install a new seal 1 and seal 2. Make sure that they are seated squarely in their grooves.
3. Carefully push the piston all the way into the housing. Make sure that the brake back off holes are aligned with the housing.
4. Apply sealant to the threads of the back off pin 2. Install the spring 2 over the back off pin 2. Screw the back off pin 2 into the brake piston.

   Consumable: JCB Threadlocker and Sealer (Medium Strength)
5. Apply JCB multigasket to the drivehead mating surface and then install the brake piston housing assembly. Make sure that they are aligned against the marking, made at the time of disassembly.

   Consumable: JCB Multi-Gasket
6. Install the capscrews, tighten the capscrews to the correct torque value.
7. Remove the differential support.

Brake pack

1. In the controlled retraction piston type, If new brake and friction plates are installed then a new brake back off pin 1 and tension bushes also need to be installed. Failure to do so could result in the brake being permanently on.
2. Assemble the five friction plates and six counter plates onto the brake carrier. If the original brake pack is reinstalled then return the plates to their original positions.
3. Soak the new friction plates in JCB Special Gear Oil before assembly.

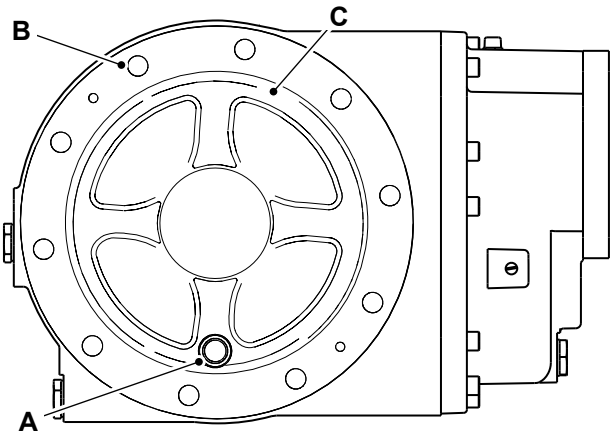
   Consumable: JCB Gear Oil HP
4. Install the circlip 1.
5. At the time of assembly of the brake packs, the oil flow holes must be aligned with each other when installed to the brake pack carrier.
6. Put the three reaction pins into their grooves and lubricate them.
7. Push the pins fully into their location holes in the housing. Makes sure they stay in place.
8. Install one counter plate into the housing, lubricate it and then the other counter plate.

Remove and Install

Remove

1. Make the machine safe, refer to (PIL 01-03).
2. Position the drain/filler plug. Place a suitable container under the plug to catch the oil.
3. Remove the plug and drain the oil.
4. Remove the screws and washers.
5. Lift the hub from the axle flange.
6. Remove the hub.

Figure 256.



A Drain/filler plug
B Screw and Washer (x10)
C Hub

Install

1. The installation procedure is the opposite of the removal procedure.
2. Fill the oil to the recommended level and check the level. Refer to (PIL 75-00).

Technical Data

Technical data

Table 107. Tyre Specification

Item	Description
Tyre size	23.1 - 26
Recommended rim	DW20B - 26
Ply	8
Profile	Industrial traction
Tyre pressure	1.1 ± 0.05bar (15.9 ± 0.7psi)

Table 108. Tyre Ballast

Item	Description
Water	430L

Install

1. Carefully roll the drum into position in the machine's front frame.
2. The drum must be positioned for alignment of the drive motor bracket to the left side frame bolt holes.
3. Install the bolts, disc spring washers and the nuts in the front and rear buffer brackets on the right side of the machine.
4. This will allow the machine frame to be lowered or raised as needed to complete alignment of the drive motor bracket on the left side of the machine.
5. To complete alignment of the left side gearbox and plate you would require to connect the machine's brake system and use the hand pump to release the brake on the gearbox. (to release the brakes for towing refer the Operators Manual).
6. Tighten the motor bracket and buffer bracket bolts to the correct torque value.
7. Fill all motor ports with clean hydraulic oil.
8. Install the hydraulic hoses on both the vibration and drive motors.
9. Start the machine engine and allow the hydraulic systems to develop charge pressure.
10. Allow the engine to run at low idle for several minutes without loading to fill and flush the system.
11. It may be necessary to bleed the brake system at the brake ports.

Table 109. Torque Values

Item	Nm
A	410

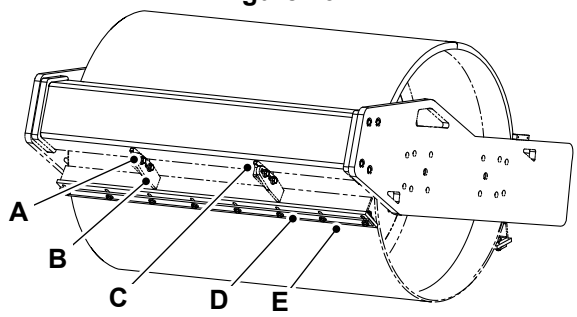
Remove and Install

The procedure is for the front scraper. Follow the same procedure for the rear scraper.

Remove

1. Make the machine safe.
   Refer to: PIL 01-03.
2. Put chocks on both sides of the drum and wheels.
3. Remove the screws, washers, and the plate from the scraper mounting bracket.
4. Remove the scraper.

Figure 267.



A Screw and Washer (x4)
B Scraper mounting bracket
C Plate
D Front scraper
E Scraper blade

Install

1. Put the scraper blade in position against the scraper mounting bracket.
2. Make sure that the scraper mounting bracket is between the scraper blade and the supporting gusset.
3. Attach the plate and scraper mounting bracket with the screws and the washers.
4. Do not tighten the screws at this stage.
5. Check the clearance between the drum and the scraper blade.
6. Tighten the screws to the correct torque value.

Fault-Finding

Table 113. Engine stalls when vibrator engaged

Cause	Remedy
Engine is cold and hydraulic oil is cold	Allow engine to warm up before using vibrator
Poor engine performance	Check engine performance

Table 114. Vibrator does not rotate / reduced vibrator performance

Cause	Remedy
Engine speed low	Adjust to correct rpm setting
Engine is cold and hydraulic oil is cold	Allow engine to warm up before using vibrator
Poor engine performance	Check engine performance
Oil level low or oil is contaminated	Fill reservoir to correct level or change oil
Air trapped in hydraulic system	Bleed the hydraulic system
Inlet leak	Check all external lines and connections to pump inlet
Inlet strainer clogged	Clean Inlet strainer
Suspected internal damage to hydraulic system	Check pump by performing a flow test
Excessive loading on vibrator drive system	Remove cause of excessive loading
Control linkage bent, loose or out of adjustment	Repair, adjust or replace linkage
Associated pipework or hoses leaking, damaged, trapped or kinked	Inspect and replace as required
Pressure relief valve out of adjustment or defective	Replace pressure relief valve (Non adjustable)

00 - General

Contents **Page No.**

49 - Schematic Symbols

Introduction

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

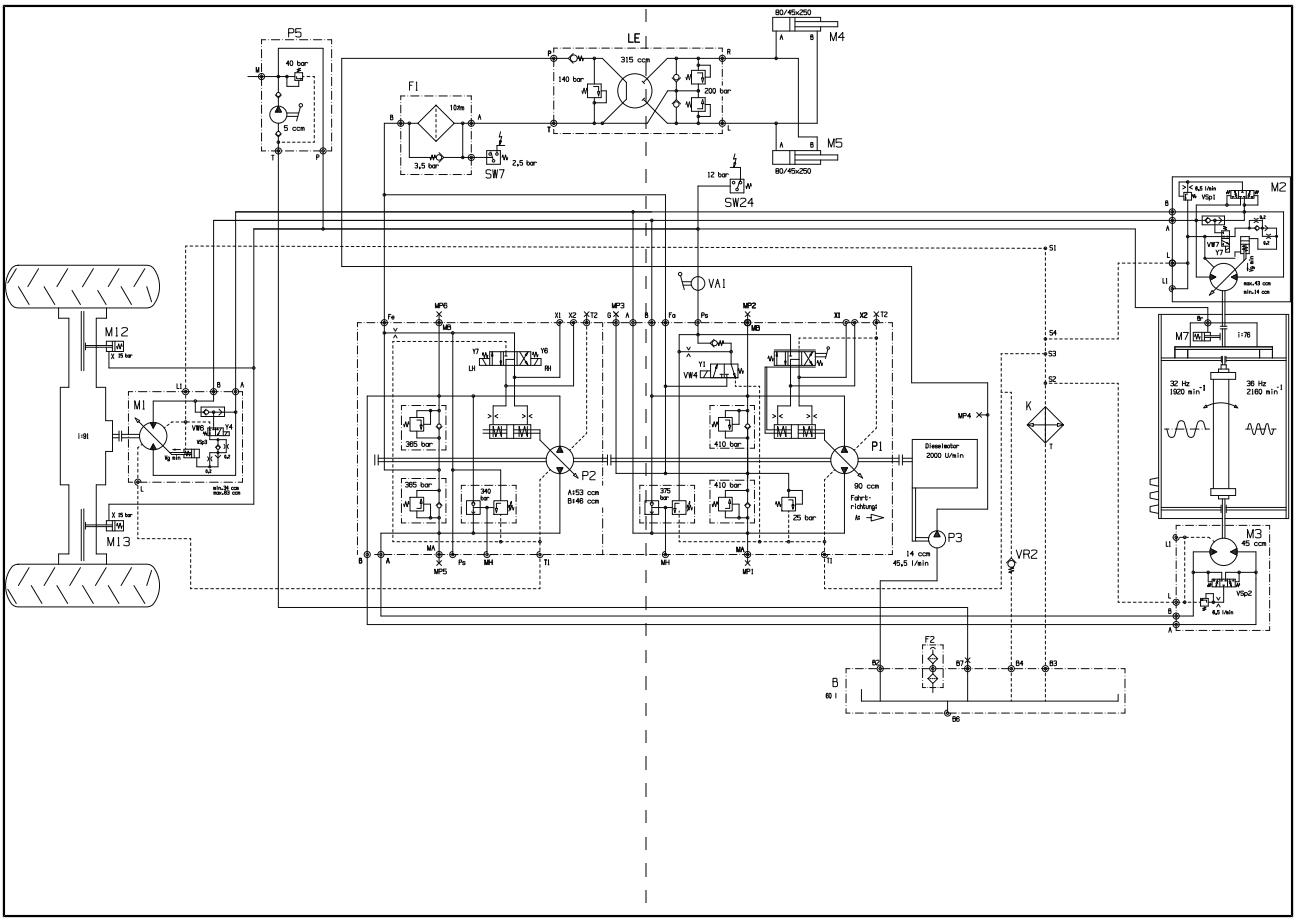
There are many symbols in use and it would be impossible to include them all here. However it should be noted that most are only variations or refinements on the basic principles explained here. If more detailed information is required you are recommended to obtain a copy of BS2917 or IS01219.

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

Page 30-22

Figure 292. 336/D1758 Hydraulic Schematic Drum Drive

Page 30-23



04 - Filter

Contents **Page No.**

11 - Gear Pump

Contents **Page No.**

00 - General

Introduction

The most common variable displacement pump used in vehicle technology is the axial piston pump. This pump has several pistons in cylinders arranged parallel to each other and rotating around a central shaft. A swashplate at one end is connected to the pistons. As the pistons rotate, the angle of the plate causes them to move in and out of their cylinders.

A rotary valve at the opposite end from the swashplate alternately connects each cylinder to the fluid supply and delivery lines. By changing the angle of the swashplate, the stroke of the pistons can be varied continuously. If the swashplate is perpendicular to the axis of rotation, no fluid will flow. If it is at a sharp angle, a large volume of fluid will be pumped.

Some pumps allow the swashplate to be moved in both directions from the zero position, pumping fluid in either direction without reversing the rotation of the pump.

Piston pumps can be made variable-displacement by inserting springs inline with the pistons. The displacement is not positively controlled, but decreases as the back-pressure increases.

15 - Cylinder / Ram

Contents **Page No.**

Remove and Install

⚠ **WARNING** Make sure the articulation lock is in the transport position before you transport the machine. The articulation lock must also be in the transport position if you are carrying out daily checks or doing any maintenance work in the articulation danger zone. If the articulation lock is not in the transport position you could be crushed between the two parts of the chassis.

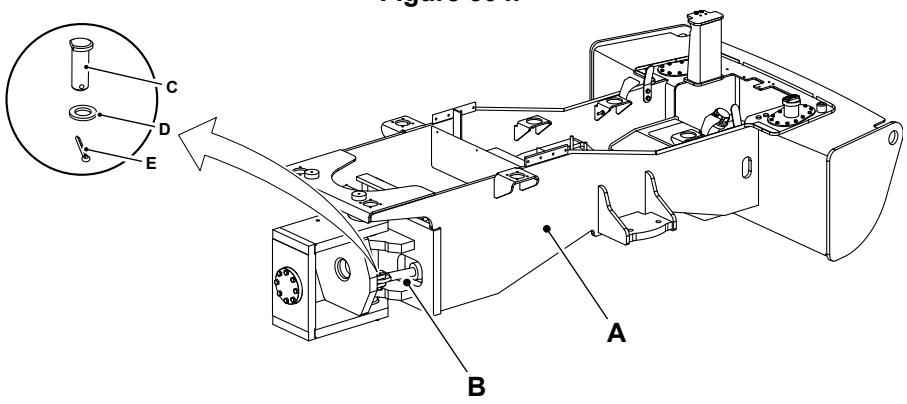
Before removal

1. Park the machine on level ground.
2. Make the machine safe.

Remove

1. Remove the cotter pin from the centre joint side.
2. Remove the pivot pin with the washer from the centre joint side.
3. Run the engine at idle speed, slowly retract the swing arm until the eye end is away from the centre joint.
4. Operate the swing ram in both directions to release any hydraulic pressure. Refer to (PIL 30-00).
5. Stop the engine.
6. Get access to the cylinder end pivot pin from the bottom of the machine.
7. Remove the cylinder end cotter pin from the bottom of the machine.
8. Remove the pivot pin with the washer from the machine body.
9. Disconnect the hoses from the swing ram.
10. Remove the swing ram.

Figure 304.



A Rear Chassis
B Swing ram
C Pivot pin
D Washer
E Cotter pin

Install

1. Connect the hoses to the swing ram.
2. Support and align the swing ram pivot pin with the mating location in the machine body.
3. Attach the swing ram with the pivot pin and the washer.
4. Make sure that the washer is installed at the cotter pin side.
5. Secure the pivot pin with a new cotter pin.
6. Make sure that the flat side of the pivot pin head is correctly installed on the machine body.
7. Run the engine at idle speed, slowly extend the arm until the eye end is engaged in the centre joint.
8. Stop the engine.
9. Install the washer between the swing ram and the lower lug of the centre joint.
10. Attach the swing ram to the centre joint with the pivot pin.
11. Make sure that the flat side of the pivot pin head is correctly installed on the centre joint.
12. Secure the pivot pin with a new cotter pin.

00 - General

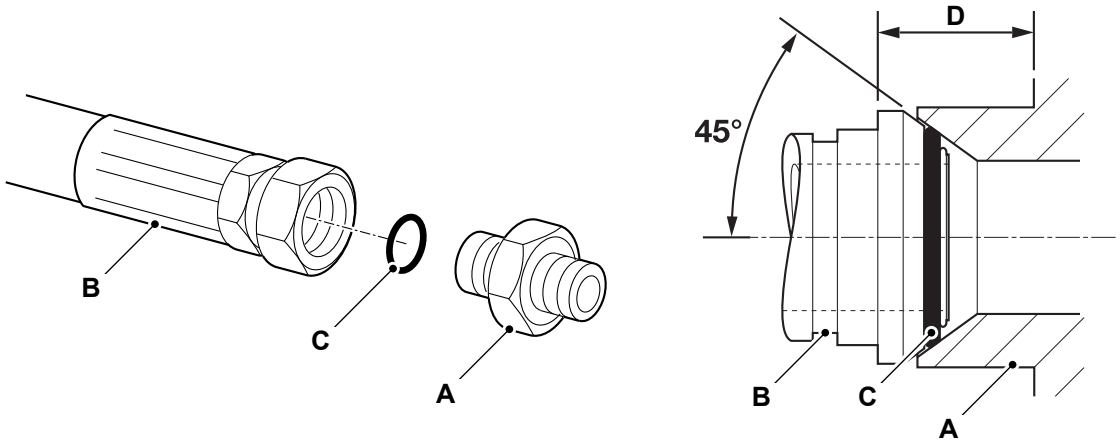
Introduction

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.

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

Torque Stop Hose System

Figure 327.



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

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

Table 133. BSP `Torque Stop' Hose - Torque Settings

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

33 - Electrical System

Contents **Page No.**

Figure 339.

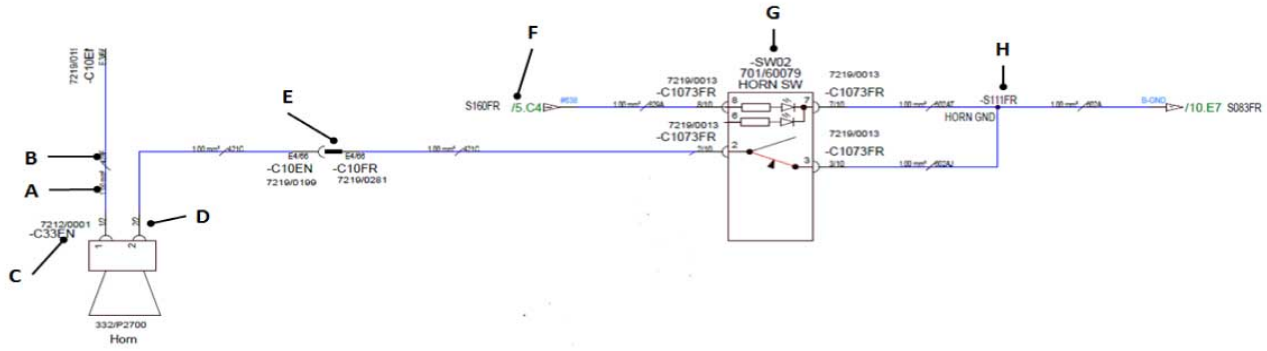


Table 138.

Item	Description	Example
A	Wire gauge	1.00 mm2
B	Wire number	428F
C	Connector number	C33EN
D	Pin number	2/2 (Pin 2 of 2)
E	Interconnection	C10EN to C10FR
F	Sheet number and location	5.C4 for sheet no. 5 and location C4 as per sheet grid
G	Device number and name	SW02 for horn switch
H	Splice	S111FR

Figure 342. (Part 2 of 2)

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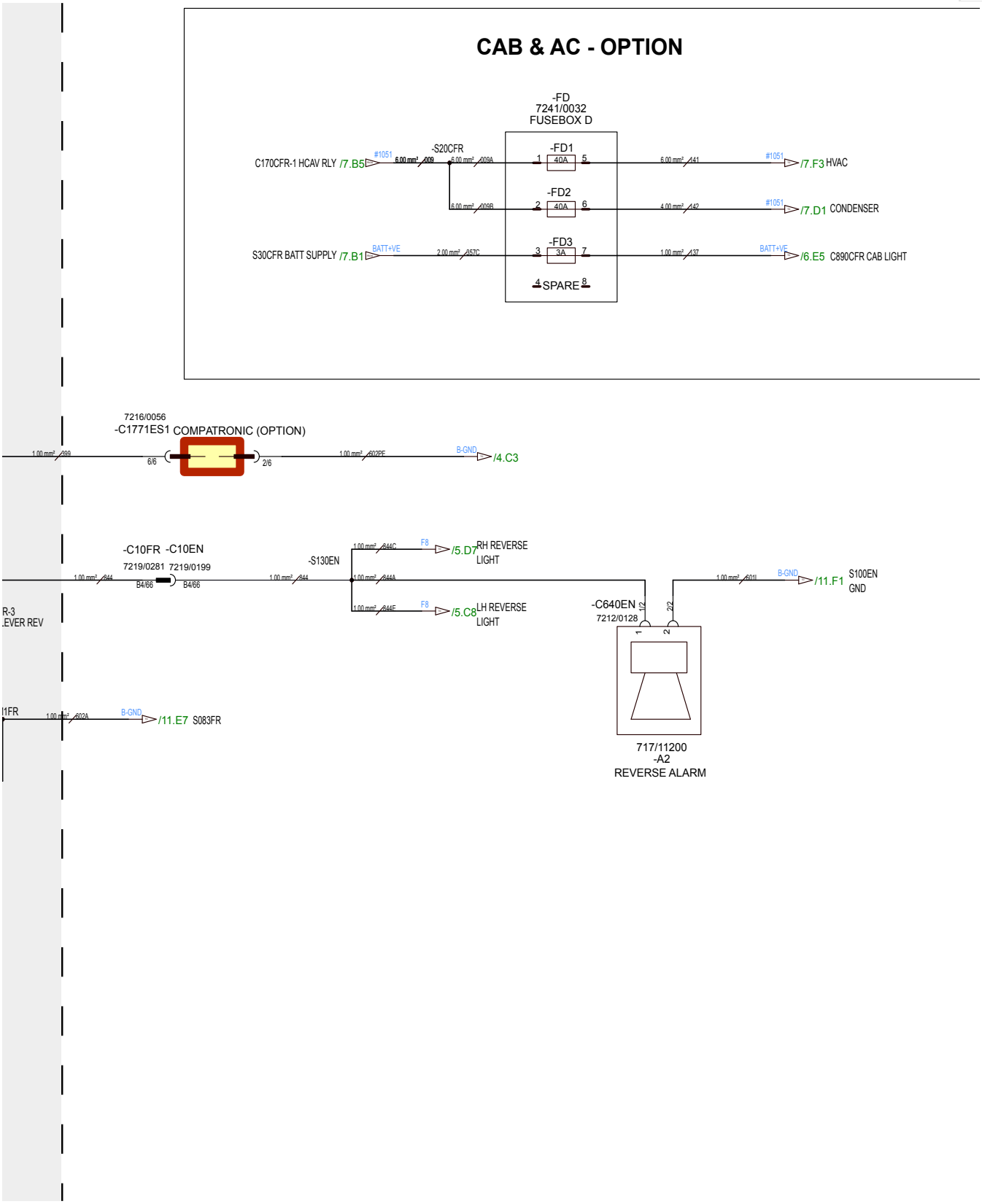

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Figure 345. 336/C3065 Issue 9 Sheet (5 of 12) - Lighting

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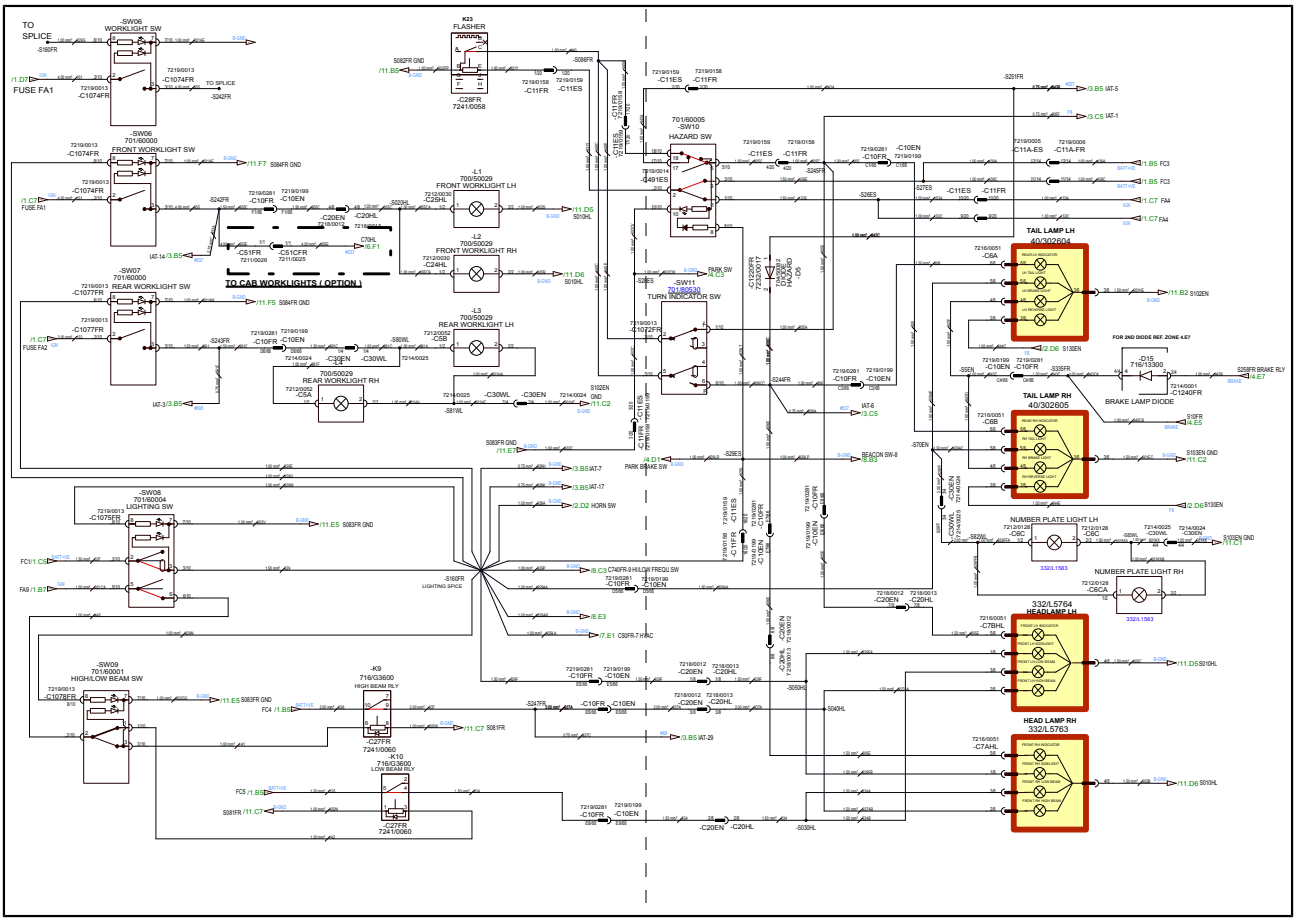

Figure 347. (Part 2 of 2)

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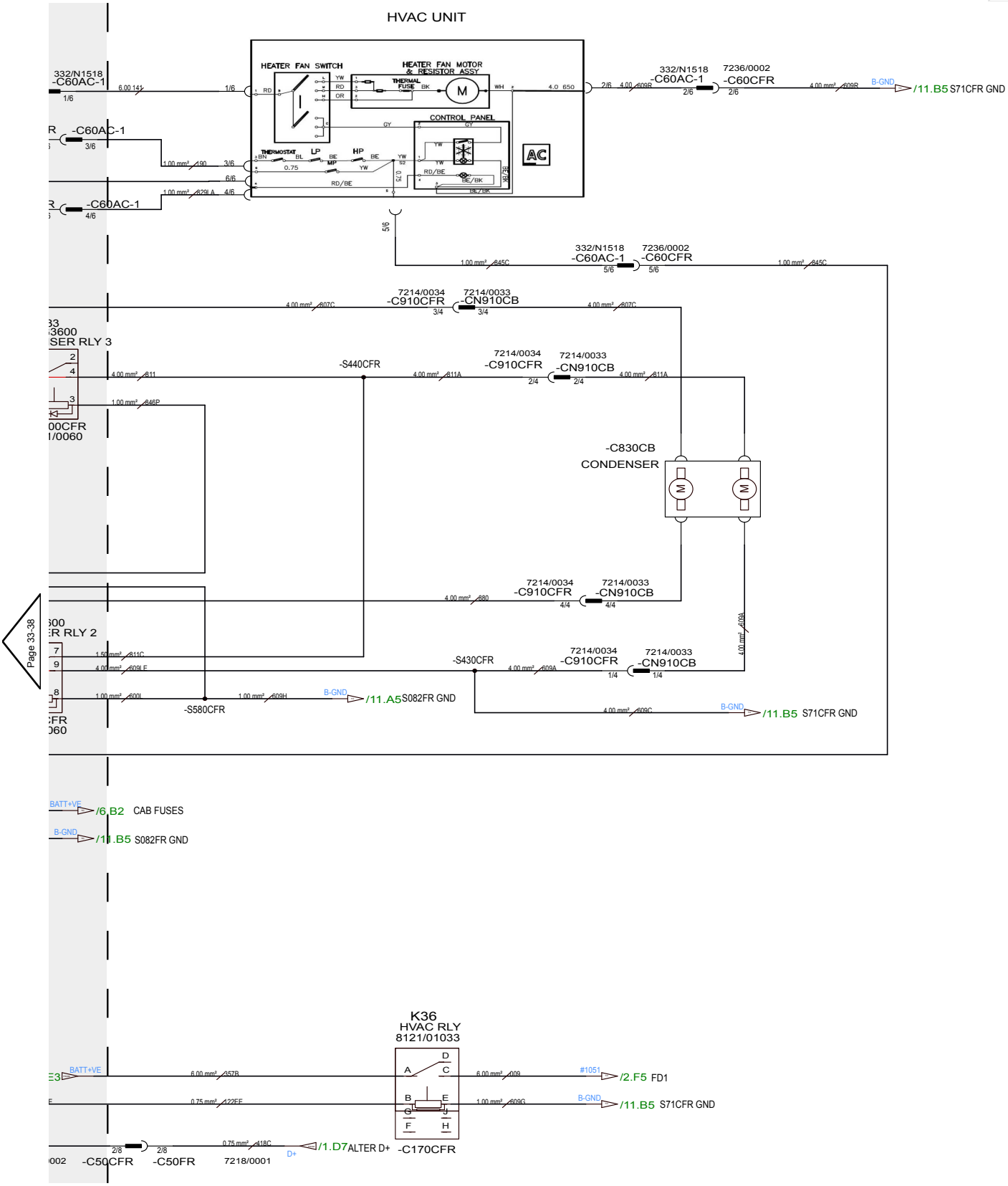

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Figure 350. 336/C3065 Issue 9 Sheet (10 of 12) - Cab Roadlight only

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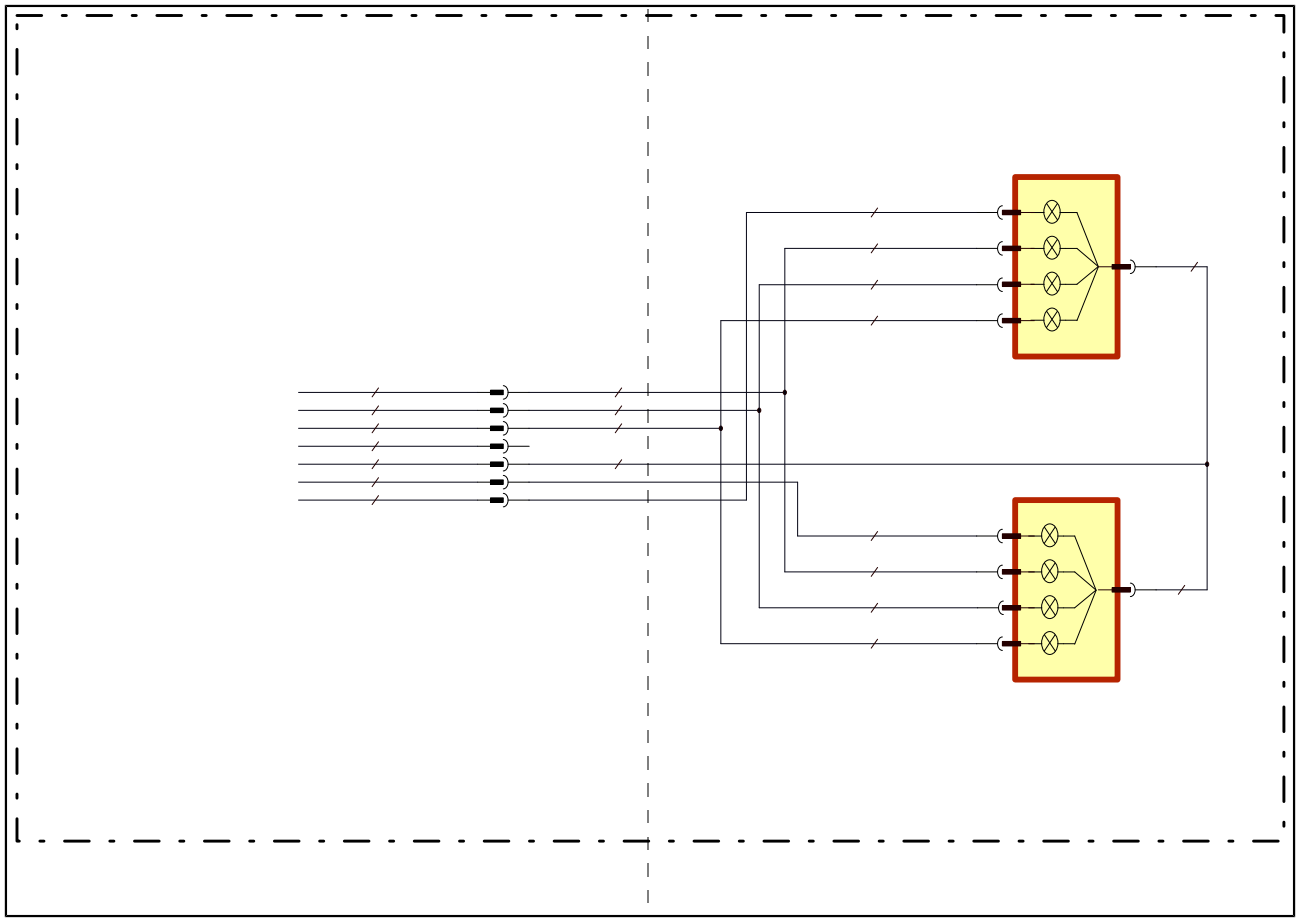

03 - Battery

Contents **Page No.**

09 - Power Distribution

Contents **Page No.**

00 - General

Introduction

Harness Drawings

Drawings are reproduced from production electrical harness drawings. Each harness drawing includes tables showing wire connections and destinations for all the connectors on the harness. To identify the correct harness drawing for a particular machine refer to the relevant Harness Interconnection page for the machine serial number range.

03 - Main Frame

Diagram

Figure 378. 400/B1318 Main Harness Layout

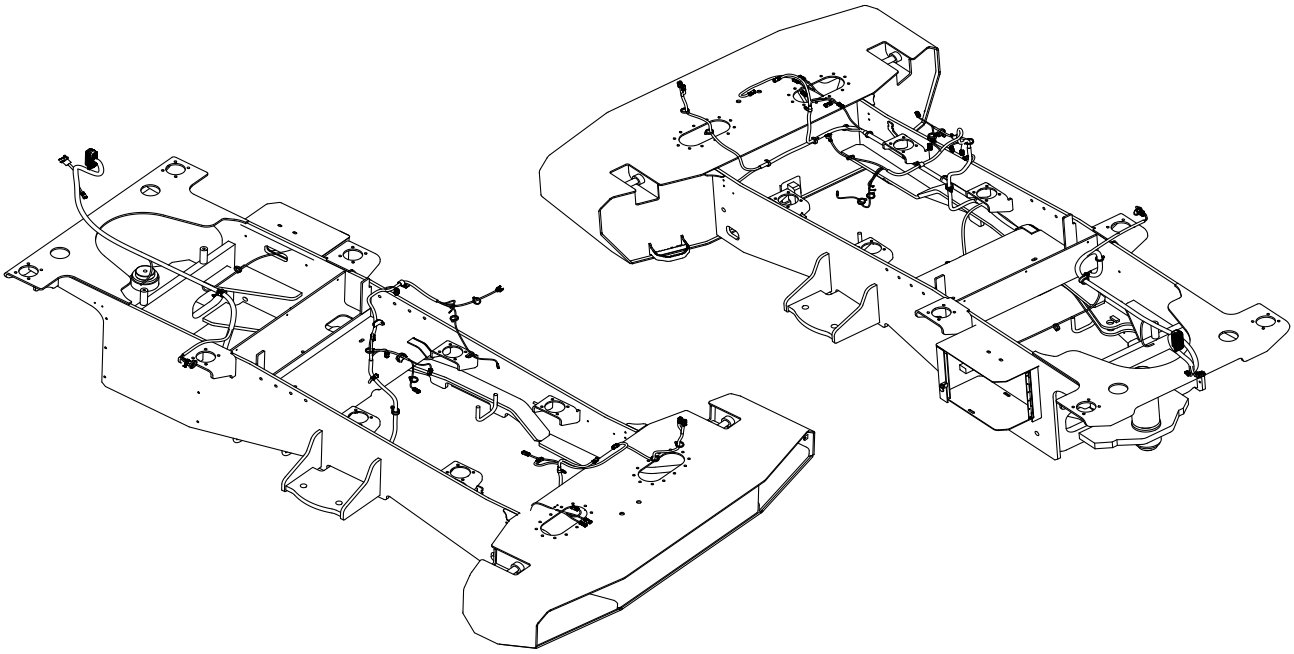

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Figure 381. 336/C2883 (Sheet 3 of 3) - Chassis Harness

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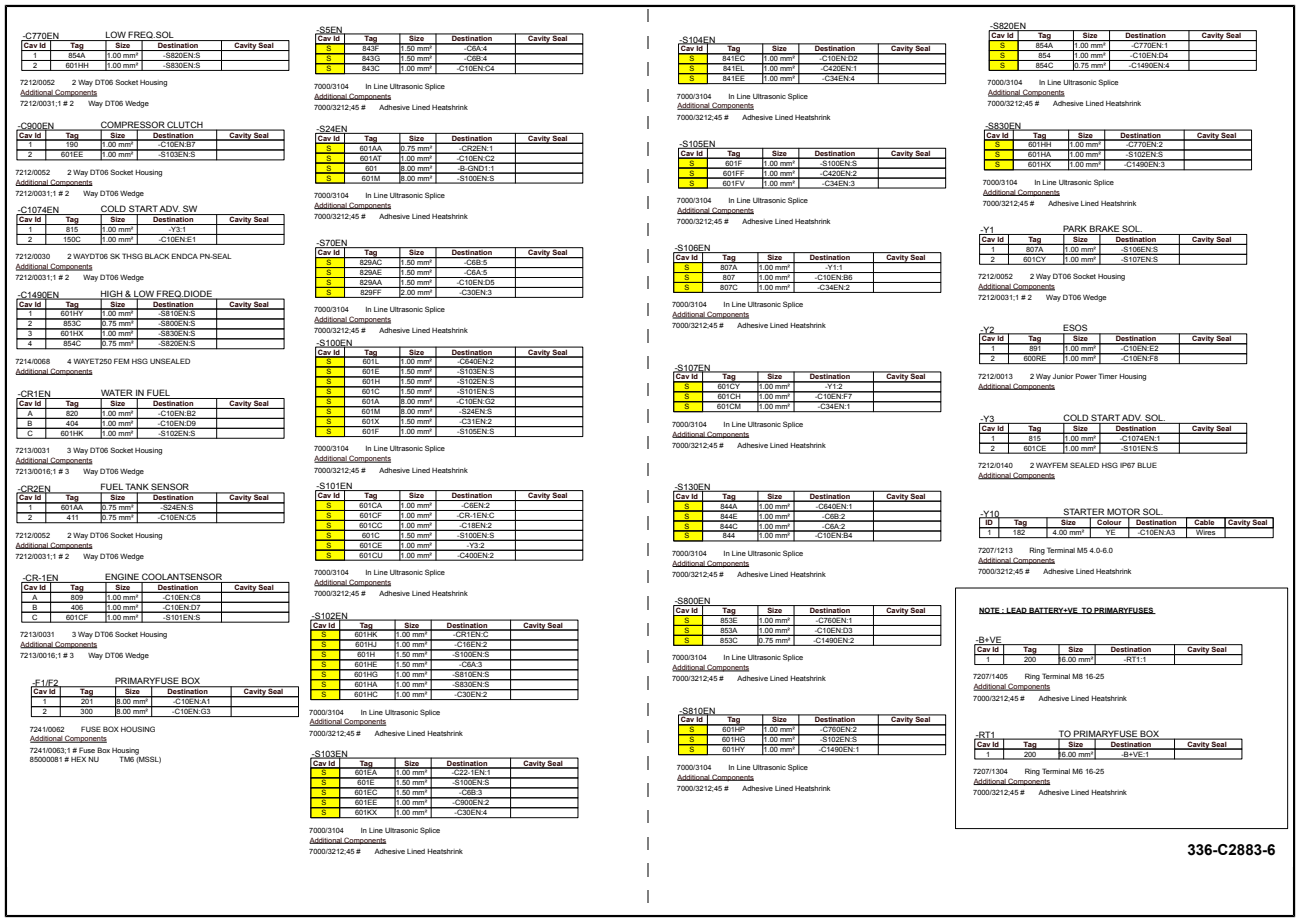

-C770EN LOW FREQ.SOL

Cav Id	Tag	Size	Destination	Cavity Seal
1	854A	1.00 mm²	-S820EN:S	
2	601HH	1.00 mm²	-S830EN:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C900EN COMPRESSOR CLUTCH

Cav Id	Tag	Size	Destination	Cavity Seal
1	190	1.00 mm²	-C10EN:B7	
2	601EE	1.00 mm²	-S103EN:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C1074EN COLD START ADV. SW

Cav Id	Tag	Size	Destination	Cavity Seal
1	815	1.00 mm²	-Y3:1	
2	150C	1.00 mm²	-C10EN:E1	

7212/0030 2 WAYDT06 SK THSG BLACK ENDCA PN-SEAL
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C1490EN HIGH & LOW FREQ.DIODE

Cav Id	Tag	Size	Destination	Cavity Seal
1	601HY	1.00 mm²	-S810EN:S	
2	853C	0.75 mm²	-S800EN:S	
3	601HX	1.00 mm²	-S830EN:S	
4	854C	0.75 mm²	-S820EN:S	

7214/0068 4 WAYET250 FEM HSG UNSEALED
Additional Components

-CR1EN WATER IN FUEL

Cav Id	Tag	Size	Destination	Cavity Seal
A	820	1.00 mm²	-C10EN:B2	
B	404	1.00 mm²	-C10EN:D9	
C	601HK	1.00 mm²	-S102EN:S	

7213/0031 3 Way DT06 Socket Housing
Additional Components
7213/0016;1 # 3 Way DT06 Wedge

-CR2EN FUEL TANK SENSOR

Cav Id	Tag	Size	Destination	Cavity Seal
1	601AA	0.75 mm²	-S24EN:S	
2	411	0.75 mm²	-C10EN:C5	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-CR-1EN ENGINE COOLANTSENSOR

Cav Id	Tag	Size	Destination	Cavity Seal
A	809	1.00 mm²	-C10EN:C8	
B	406	1.00 mm²	-C10EN:D7	
C	601CF	1.00 mm²	-S101EN:S	

7213/0031 3 Way DT06 Socket Housing
Additional Components
7213/0016;1 # 3 Way DT06 Wedge

-F1/F2 PRIMARYFUSE BOX

Cav Id	Tag	Size	Destination	Cavity Seal
1	201	8.00 mm²	-C10EN:A1	
2	300	8.00 mm²	-C10EN:G3	

7241/0062 FUSE BOX HOUSING
Additional Components
7241/0063;1 # Fuse Box Housing
85000081 # HEX NU TM6 (MSSL)

-S5EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	843F	1.50 mm²	-C6A:4	
S	843G	1.50 mm²	-C6B:4	
S	843C	1.00 mm²	-C10EN:C4	

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

-S24EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601AA	0.75 mm²	-CR2EN:1	
S	601AT	1.00 mm²	-C10EN:C2	
S	601	8.00 mm²	-B-GND1:1	
S	601M	8.00 mm²	-S100EN:S	

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

-S70EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	829AC	1.50 mm²	-C6B:5	
S	829AE	1.50 mm²	-C6A:5	
S	829AA	1.50 mm²	-C10EN:D5	
S	829FF	2.00 mm²	-C30EN:3	

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

-S100EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601L	1.00 mm²	-C640EN:2	
S	601E	1.50 mm²	-S103EN:S	
S	601H	1.50 mm²	-S102EN:S	
S	601C	1.50 mm²	-S101EN:S	
S	601A	8.00 mm²	-C10EN:G2	
S	601M	8.00 mm²	-S24EN:S	
S	601X	1.50 mm²	-C3:EN:2	
S	601F	1.00 mm²	-S105EN:S	

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

-S101EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601CA	1.00 mm²	-C6EN:2	
S	601CF	1.00 mm²	-CR-1EN:C	
S	601CC	1.00 mm²	-C1BEN:2	
S	601C	1.50 mm²	-S100EN:S	
S	601CE	1.00 mm²	-Y3:2	
S	601CU	1.00 mm²	-C400EN:2	

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

-S102EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601HK	1.00 mm²	-CR1EN:C	
S	601HJ	1.00 mm²	-C16EN:2	
S	601H	1.50 mm²	-S100EN:S	
S	601HE	1.50 mm²	-C6A:3	
S	601HG	1.00 mm²	-S810EN:S	
S	601HA	1.00 mm²	-S830EN:S	
S	601HC	1.00 mm²	-C30EN:2	

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

-S103EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601EA	1.00 mm²	-C22-1EN:1	
S	601E	1.50 mm²	-S100EN:S	
S	601EC	1.50 mm²	-C6B:3	
S	601EE	1.00 mm²	-C80DEN:2	
S	601KX	1.00 mm²	-C30EN:4	

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

-S104EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	841EC	1.00 mm²	-C10EN:D2	
S	841EL	1.00 mm²	-C420EN:1	
S	841EE	1.00 mm²	-C34EN:4	

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

-S105EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601F	1.00 mm²	-S100EN:S	
S	601FF	1.00 mm²	-C420EN:2	
S	601FV	1.00 mm²	-C34EN:3	

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

-S106EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	807A	1.00 mm²	-Y1:1	
S	807	1.00 mm²	-C10EN:B6	
S	807C	1.00 mm²	-C34EN:2	

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

-S107EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601CY	1.00 mm²	-Y1:2	
S	601CH	1.00 mm²	-C10EN:F7	
S	601CM	1.00 mm²	-C34EN:1	

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

-S130EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	844A	1.00 mm²	-C640EN:1	
S	844E	1.00 mm²	-C6B:2	
S	844C	1.00 mm²	-C6A:2	
S	844	1.00 mm²	-C10EN:B4	

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

-S800EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	853E	1.00 mm²	-C760EN:1	
S	853A	1.00 mm²	-C10EN:D3	
S	853C	0.75 mm²	-C1490EN:2	

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

-S810EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601HP	1.00 mm²	-C760EN:2	
S	601HG	1.00 mm²	-S102EN:S	
S	601HY	1.00 mm²	-C1490EN:1	

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

-S820EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	854A	1.00 mm²	-C770EN:1	
S	854	1.00 mm²	-C10EN:D4	
S	854C	0.75 mm²	-C1490EN:4	

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

-S830EN

Cav Id	Tag	Size	Destination	Cavity Seal
S	601HH	1.00 mm²	-C770EN:2	
S	601HA	1.00 mm²	-S102EN:S	
S	601HX	1.00 mm²	-C1490EN:3	

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

-Y1 PARK BRAKE SOL.

Cav Id	Tag	Size	Destination	Cavity Seal
1	807A	1.00 mm²	-S106EN:S	
2	601CY	1.00 mm²	-S107EN:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-Y2 ESOS

Cav Id	Tag	Size	Destination	Cavity Seal
1	891	1.00 mm²	-C10EN:E2	
2	600RE	1.00 mm²	-C10EN:F8	

7212/0013 2 Way Junior Power Timer Housing
Additional Components

-Y3 COLD START ADV. SOL.

Cav Id	Tag	Size	Destination	Cavity Seal
1	815	1.00 mm²	-C1074EN:1	
2	601CE	1.00 mm²	-S101EN:S	

7212/0140 2 WAYFEM SEALED HSG IP67 BLUE
Additional Components

-Y10 STARTER MOTOR SOL.

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	182	4.00 mm²	YE	-C10EN:A3	Wires	

7207/1213 Ring Terminal M5 4.0-6.0
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

NOTE : LEAD BATTERY+VE TO PRIMARYFUSES

-B+VE

Cav Id	Tag	Size	Destination	Cavity Seal
1	200	16.00 mm²	-RT1:1	

7207/1405 Ring Terminal M8 16-25
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

-RT1 TO PRIMARYFUSE BOX

Cav Id	Tag	Size	Destination	Cavity Seal
1	200	16.00 mm²	-B+VE:1	

7207/1304 Ring Terminal M6 16-25
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

336-C2883-6

Figure 383. (Part 2 of 2)

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-C16EN AIR CLEANER

Cav Id	Tag	Size	Destination	Cavity Seal
1	410	1.00 mm²	-C10EN:C9	
2	601HJ	1.00 mm²	-S102EN:S	

7212/0013 2 Way Junior Power Timer Housing
Additional Components

-C18EN HYD.FILTER

Cav Id	Tag	Size	Destination	Cavity Seal
1	405	1.00 mm²	-C10EN:C7	
2	601CC	1.00 mm²	-S101EN:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C20EN TO HEAD LAMPHARNESS

Cav Id	Tag	Size	Destination	Cavity Seal
1	829F	1.50 mm²	-C10EN:E5	
2	834	1.50 mm²	-C10EN:E9	
3	837A	2.00 mm²	-C10EN:E6	
4	855C	1.50 mm²	-C10EN:F1	
5	602K	1.50 mm²	-C10EN:F2	
6	806E	1.50 mm²	-C10EN:E7	
7	805E	1.50 mm²	-C10EN:E8	
8				7210/0030

7218/0012 8 Way DT04 Pin Housing
Additional Components
7218/0007;1 # 8 Way DT04 Wedge

-C22-1EN BRAKE PRESS SW

Cav Id	Tag	Size	Destination	Cavity Seal
1	601EA	1.00 mm²	-S103EN:S	

7201/0403 1 Way Pos Lock Housing Straight
Additional Components

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-C22EN BRAKE PRESS SW

Cav Id	Tag	Size	Destination	Cavity Seal
1	670	1.00 mm²	-C10EN:C6	

7201/0403 1 Way Pos Lock Housing Straight
Additional Components

-C23-1EN ALTERNATOR B+

Cav Id	Tag	Size	Destination	Cavity Seal
1	407	0.75 mm²	-C10EN:D8	

7207/1211 Ring Terminal M5 0.5-1.0
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

-C23-2EN ALTERNATOR D+

Cav Id	Tag	Size	Destination	Cavity Seal
1	408	1.00 mm²	-C10EN:B1	

7207/1211 Ring Terminal M5 0.5-1.0
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

-C30EN TO REAR WORK LAMPHARNESS

Cav Id	Tag	Size	Destination	Cavity Seal
1	861C	1.50 mm²	-C10EN:D6	
2	601HC	1.00 mm²	-S102EN:S	
3	829FF	2.00 mm²	-S70EN:S	
4	601KX	1.00 mm²	-S103EN:S	

7214/0024 4 Way DT04 Pin Housing
Additional Components
7214/0014;1 # 4 Way DT04 Wedge

-C31EN TO BEACON INTERCONNECT

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	136B	1.00 mm²	YE	-C10EN:F5	-W1	
2	601X	1.50 mm²	YE	-S100EN:S	-W1	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C33EN HORN

Cav Id	Tag	Size	Destination	Cavity Seal
1	428F	1.00 mm²	-C10EN:E3	
2	421C	1.00 mm²	-C10EN:E4	

7212/0001 2 Way HW090 Socket Housing
Additional Components
7212/0003;1 # 2 Way HW090 Socket Retainer

-C34EN BRAKE & GEAR AXLE DIODE

Cav Id	Tag	Size	Destination	Cavity Seal
1	601CM	1.00 mm²	-S107EN:S	
2	807C	1.00 mm²	-S106EN:S	
3	601FV	1.00 mm²	-S105EN:S	
4	841EE	1.00 mm²	-S104EN:S	

7214/0068 4 WAYET250 FEM HSG UNSEALED
Additional Components

-C35EN AVC SENSOR

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
A	900	0.50 mm²	YE	-C10EN:B3	Wires	
B	601HM	0.50 mm²	YE	-S102EN:S	Wires	
C	820B	0.50 mm²	YE	-S840EN:S	Wires	

7213/0031 3 Way DT06 Socket Housing
Additional Components
7213/0016;1 # 3 Way DT06 Wedge

-C400EN TO DRUM HARNESS

Cav Id	Tag	Size	Destination	Cavity Seal
1	840A	1.00 mm²	-C10EN:F4	
2	601CU	1.00 mm²	-S101EN:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C420EN GEAR AXLE SOL

Cav Id	Tag	Size	Destination	Cavity Seal
1	841EL	1.00 mm²	-S104EN:S	
2	601FF	1.00 mm²	-S105EN:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C640EN REV.ALARM

Cav Id	Tag	Size	Destination	Cavity Seal
1	844A	1.00 mm²	-S130EN:S	
2	601L	1.00 mm²	-S100EN:S	

7212/0128 2 WAYMT090 FEM HSG N ATURAL
Additional Components

-C760EN HIGH FREQ.SOL.

Cav Id	Tag	Size	Destination	Cavity Seal
1	853E	1.00 mm²	-S800EN:S	
2	601HP	1.00 mm²	-S810EN:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

401-C2883-1

36 - Work Lights

Diagram

Figure 387. 336/C2210 Issue 2 (Sheet 1 of 2) - Rear Worklight Harness

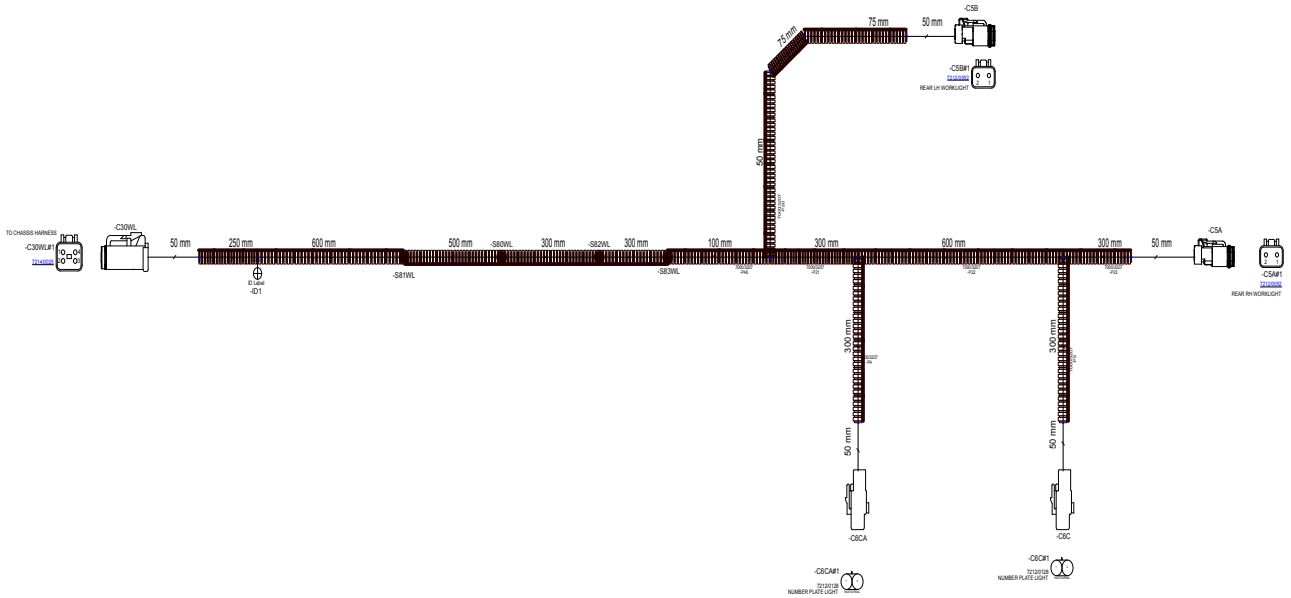

Figure 388. 336/C2210 Issue 2 (Sheet 2 of 2) - Rear Worklight Harness

-S80WL

Cav Id	Tag	Size	Destination	Cavity Seal
S	861A	1.00 mm²	-C5B:1	
S	861C	1.00 mm²	-C30WL:1	
S	861F	1.50 mm²	-C5A:1	

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

-S81WL

Cav Id	Tag	Size	Destination	Cavity Seal
S	601HH	1.00 mm²	-C5A:2	
S	601HA	1.00 mm²	-C5B:2	
S	601HC	1.00 mm²	-C30WL:2	

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

-S82WL

Cav Id	Tag	Size	Destination	Cavity Seal
S	829FFA	1.00 mm²	-C6C:1	
S	829FFB	1.00 mm²	-C6CA:1	
S	829FF	2.00 mm²	-C30WL:3	

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

-S83WL

Cav Id	Tag	Size	Destination	Cavity Seal
S	601KXA	1.00 mm²	-C6C:2	
S	601KXB	1.00 mm²	-C6CA:2	
S	601KX	1.00 mm²	-C30WL:4	

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

-C5A REAR RH WORKLIGHT

Cav Id	Tag	Size	Destination	Cavity Seal
1	861F	1.00 mm²	-S80WL:S	
2	601HH	1.00 mm²	-S81WL:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C5B REAR LH WORKLIGHT

Cav Id	Tag	Size	Destination	Cavity Seal
1	861A	1.00 mm²	-S80WL:S	
2	601HA	1.00 mm²	-S81WL:S	

7212/0052 2 Way DT06 Socket Housing
Additional Components
7212/0031;1 # 2 Way DT06 Wedge

-C6C NUMBER PLATE LIGHT

Cav Id	Tag	Size	Destination	Cavity Seal
1	829FFA	1.00 mm²	-S82WL:S	
2	601KXA	1.00 mm²	-S83WL:S	

7212/0128 2 WAY MT090 FEM HSG NATURAL
Additional Components

-C6CA NUMBER PLATE LIGHT

Cav Id	Tag	Size	Destination	Cavity Seal
1	829FFB	1.00 mm²	-S82WL:S	
2	601KXB	1.00 mm²	-S83WL:S	

7212/0128 2 WAY MT090 FEM HSG NATURAL
Additional Components

-C30WL TO CHASSIS HARNESS

Cav Id	Tag	Size	Destination	Cavity Seal
1	861C	1.00 mm²	-S80WL:S	
2	601HC	1.00 mm²	-S81WL:S	
3	829FF	2.00 mm²	-S82WL:S	
4	601KX	1.00 mm²	-S83WL:S	

7214/0025 4 Way DT06 Socket Housing
Additional Components
7214/0016;1 # 4 Way DT06 Wedge

Figure 392. (Part 2 of 2)

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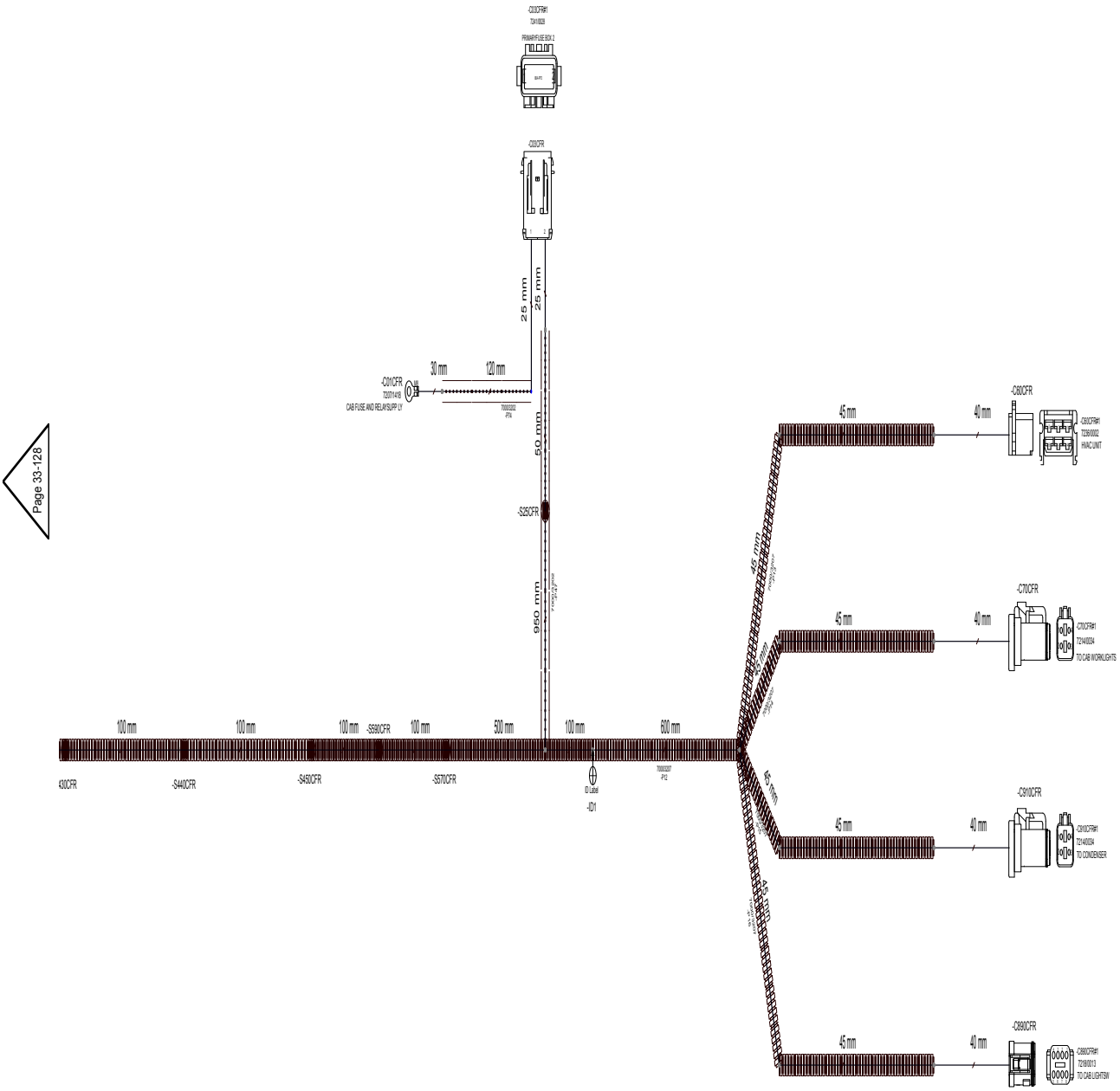

336-C5368-3

Page 33-140

Figure 400. 336/C1136 Issue 6 (Sheet 1 of 5) - Fuse Relay and Instrument Panel Harness

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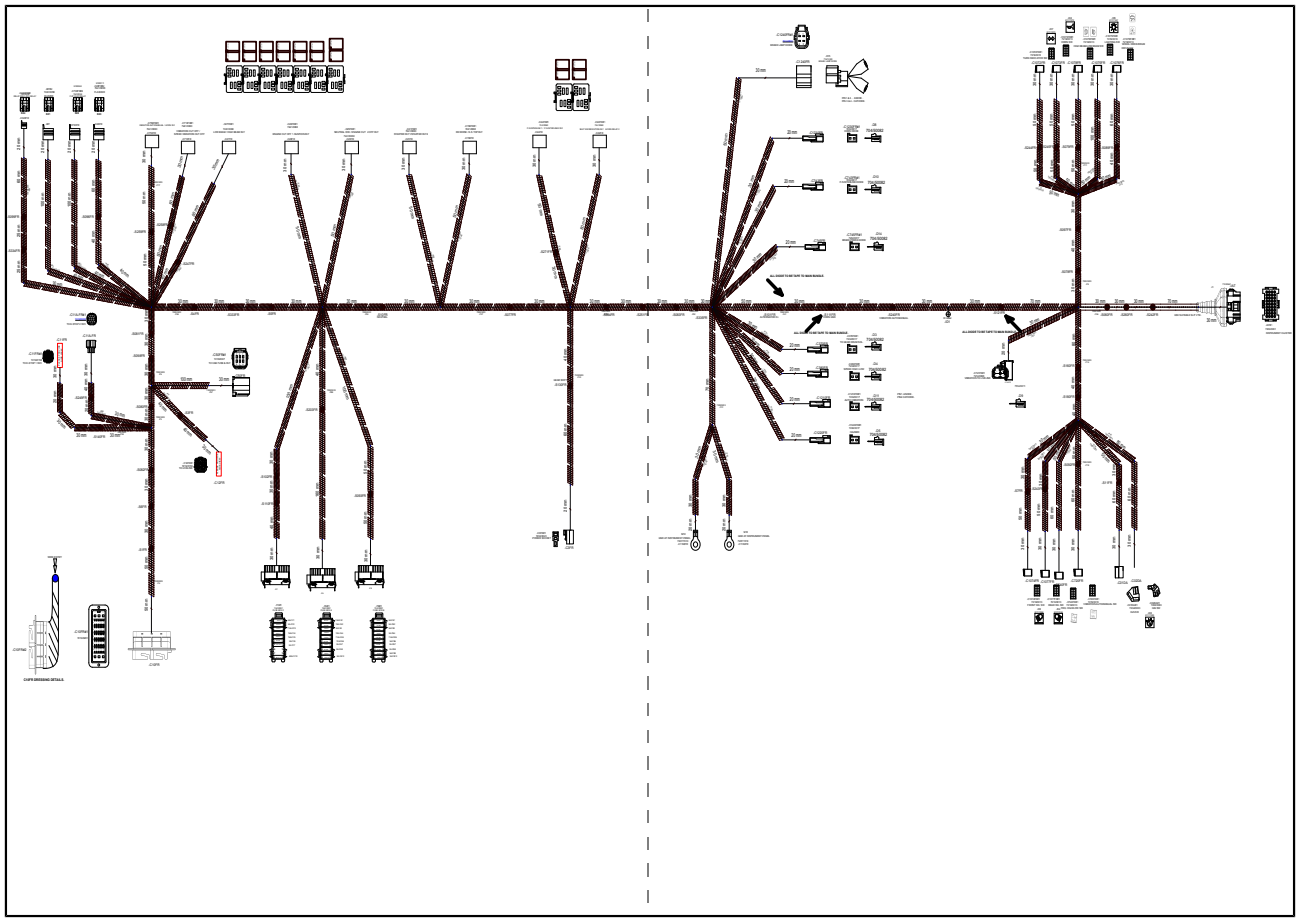

Figure 402. (Part 2 of 2)

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-C1076FR WHEELDRIVE/DRUM DRIVE

Cav Id	Tag	Size	Destination	Cavity Seal
1	840TA	1.00 mm²	-S078FR:S	
2	888TA	1.00 mm²	-S089FR:S	
3				
4				
5	860TB	1.00 mm²	-S089FR:S	
6	841A	1.00 mm²	-S079FR:S	
7	602FA	1.00 mm²	-S097FR:S	
8	841	1.00 mm²	-S079FR:S	
9	602FC	1.00 mm²	-S097FR:S	
10	840TC	1.00 mm²	-S078FR:S	

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-C1077FR REAR W/LSW

Cav Id	Tag	Size	Destination	Cavity Seal
1				
2	152	2.00 mm²	-FA:4	
3	861	1.50 mm²	-S243FR:S	
4				
5				
6				
7	601AM	1.00 mm²	-S084FR:S	
8	829E	1.00 mm²	-S160FR:S	
9				
10				

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-C1078FR HIGH BEAM/LOW BEAM SW

Cav Id	Tag	Size	Destination	Cavity Seal
1	142	1.00 mm²	-C27FR:3	
2	445	1.00 mm²	-C1075FR:6	
3	141	1.00 mm²	-C27FR:6	
4				
5				
6				
7	602GG	1.00 mm²	-S083FR:S	
8	829N	1.00 mm²	-S160FR:S	
9				
10				

7219/0013 10 Way 6.3 Fastin Switch Hsg
Additional Components

-C1138FR GND ATINSTRUMEN T PANEL

Cav Id	Tag	Size	Destination	Cavity Seal
1	601AC	6.00 mm²	-S084FR:S	

7207/1510 Ring Terminal M10 6.0-10.0
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

-C1139FR GND ATINSTRUMEN T PANEL

Cav Id	Tag	Size	Destination	Cavity Seal
1	602X	6.00 mm²	-S081FR:S	

7207/1510 Ring Terminal M10 6.0-10.0
Additional Components
7000/3212;45 # Adhesive Lined Heatshrink

-FA FUSE BOX A

Cav Id	Tag	Size	Destination	Cavity Seal
1	873	4.00 mm²	-C26FR:4	
2	151	2.00 mm²	-C1074FR:2	
3				
4	152	2.00 mm²	-C1077FR:2	
5				
6	105	1.00 mm²	-C11FR:5	
7				
8	153	2.00 mm²	-S203FR:S	
9	005	6.00 mm²	-C02DA:5	
10	154	2.00 mm²	-C150FR:5	
10	154A	1.00 mm²	-C22FR:6	
11				
12	155	1.00 mm²	-C3FR:2	
13				
14	122	1.00 mm²	-C50FR:1	
15				
16	127	1.00 mm²	-S140FR:S	
17				
18	201CA	1.00 mm²	-C1075FR:5	
19				
20	124	1.00 mm²	-C12FR:8	

7241/0001 10 Way Sec Fusebox Housing
Additional Components
7241/0002;1 # 10 Way Sec Fusebox Retainer
7241/0026;1 # 10 Way Sec Fusebox Cover

-FB FUSE BOX B

Cav Id	Tag	Size	Destination	Cavity Seal
1	890	4.00 mm²	-C150FR:9	
2	435	1.00 mm²	-C11FR:18	
3				
4	150	1.00 mm²	-S093FR:S	
5				
6	860	1.00 mm²	-C11A-FR:7	
7	005F	6.00 mm²	-C02DA:6	
8	820	1.00 mm²	-C10FR:B2	
9				
10	885	1.00 mm²	-C11FR:13	
11				
12	432C	1.00 mm²	-IBT:C	
13				
14	402	1.00 mm²	-C26FR:3	
15				
16	154C	0.75 mm²	-IAT:9	
17				
18	391	1.00 mm²	-C710FR:10	
19				
20	399	1.00 mm²	-C11FR1:11	

7241/0001 10 Way Sec Fusebox Housing
Additional Components
7241/0002;1 # 10 Way Sec Fusebox Retainer
7241/0026;1 # 10 Way Sec Fusebox Cover

-FC FUSE BOX C

Cav Id	Tag	Size	Destination	Cavity Seal
1	201LL	6.00 mm²	-S110FR:S	
2	337	1.50 mm²	-C1075FR:2	
3				
4	428F	1.00 mm²	-C10FR:E3	
5				
6	439	2.00 mm²	-S102FR:S	
7				
8	336	2.00 mm²	-C27FR:10	
9				
10	335	1.50 mm²	-C27FR:5	
11	201LN	6.00 mm²	-S110FR:S	
12	334	0.75 mm²	-IAT:12	
13				
14	201AK	1.00 mm²	-C12FR:4	
15				
16				
17				
18				
19	003	4.00 mm²	-C02DA:7	
20	331	4.00 mm²	-C21FR:10	

7241/0001 10 Way Sec Fusebox Housing
Additional Components
7241/0002;1 # 10 Way Sec Fusebox Retainer
7241/0026;1 # 10 Way Sec Fusebox Cover

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Figure 405. 401/C1136 Issue 1 (Sheet 1 of 6) - Fuse Relay and Instrument Panel Harness

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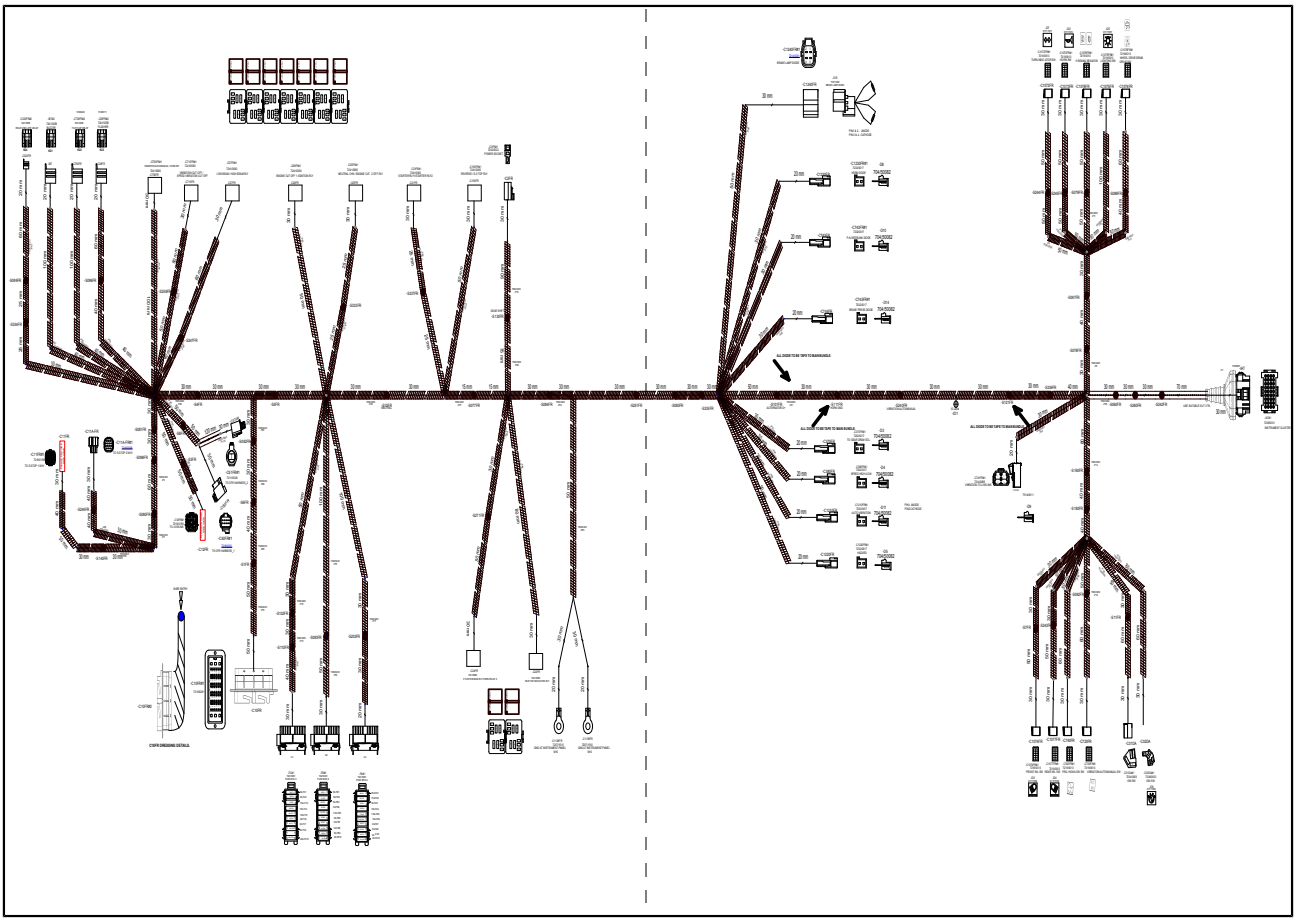

Figure 407. (Part 2 of 2)

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-C10FR

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
A1	201	8.00 mm²	YE	-S110FR:S	-W1	
A2						7210/0200
A3	182	4.00 mm²	YE	-C21FR:9	-W1	
B1	418	1.00 mm²	YE	-S101FR:S	-W1	
B2	820	1.00 mm²	YE	-FB:8	-W1	
B3	900	0.50 mm²	YE	-C750FR:3	-W1	
B4	844	1.00 mm²	YE	-C150FR:4	-W1	
B5						7210/0205
B6	807	1.00 mm²	YE	-C11FR:19	-W1	
B7	190	1.00 mm²	YE	-C50FR:3	-W1	
B8	311B	1.00 mm²	YE	-S337FR:S	-W1	
B9	340	1.00 mm²	YE	-FC:16	-W1	
B10						7210/0205
B11						7210/0205
B12						7210/0205
C1	805	1.00 mm²	YE	-S245FR:S	-W1	
C2	601AT	0.75 mm²	YE	-IAT:16	-W1	
C3	806	1.00 mm²	YE	-S244FR:S	-W1	
C4	843C	1.00 mm²	YE	-S335FR:S	-W1	
C5	411	0.75 mm²	YE	-S060FR:S	-W1	
C6	670	1.00 mm²	YE	-C745FR:1	-W1	
C7	405	0.75 mm²	YE	-IAT:22	-W1	
C8	409	0.75 mm²	YE	-IAT:13	-W1	
C9	410	0.75 mm²	YE	-IAT:21	-W1	
C10						7210/0205
C11						7210/0205
C12						7210/0205
D1	403	1.00 mm²	YE	-S3FR:S	-W1	
D2	841EC	1.00 mm²	YE	-S121FR:S	-W1	
D3	853A	1.00 mm²	YE	-S6FR:S	-W1	
D4	854	1.00 mm²	YE	-S7FR:S	-W1	
D5	829AA	1.00 mm²	YE	-S160FR:S	-W1	
D6	861C	1.50 mm²	YE	-S243FR:S	-W1	
D7	406	1.00 mm²	YE	-S4FR:S	-W1	
D8	407	0.75 mm²	YE	-S1FR:S	-W1	
D9	404	1.00 mm²	YE	-S5FR:S	-W1	
D10						7210/0205
D11						7210/0205
D12						7210/0205
E1	150C	1.00 mm²	YE	-S093FR:S	-W1	
E2	891A	1.00 mm²	YE	-S271FR:S	-W1	
E3	428F	1.00 mm²	YE	-FC:4	-W1	
E4	421C	1.00 mm²	YE	-C1073FR:2	-W1	
E5	829F	1.50 mm²	YE	-S160FR:S	-W1	
E6	837A	2.00 mm²	YE	-S247FR:S	-W1	
E7	806E	1.50 mm²	YE	-S244FR:S	-W1	
E8	805E	1.50 mm²	YE	-S245FR:S	-W1	
E9	834	1.50 mm²	YE	-C27FR:4	-W1	
E10						7210/0205
E11						7210/0205
E12						7210/0205
F1	855C	1.50 mm²	YE	-S242FR:S	-W1	
F2	602K	1.50 mm²	YE	-S083FR:S	-W1	
F3						7210/0205
F4	840A	1.00 mm²	YE	-S092FR:S	-W1	
F5	136B	1.00 mm²	YE	-S8FR:S	-W1	
F6	620	1.00 mm²	YE	-C12FR:5	-W1	
F7	601CH	1.00 mm²	YE	-C11FR:12	-W1	
F8	600RE	1.00 mm²	YE	-C25FR:5	-W1	
F9						7210/0205
F10						7210/0205
F11						7210/0205
F12						7210/0205
G1						7210/0200
G2	601A	8.00 mm²	YE	-S084FR:S	-W1	
G3	300	8.00 mm²	YE	-S11FR:S	-W1	

7219/0281 66 WAYSRC SEALED MALE CONN
Additional Components

-C11A-FR TO E-STOP2 W/H

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	127A	1.00 mm²	YE	-S140FR:S	-W1	
2	602NN	1.00 mm²	YE	-S080FR:S	-W1	
3	858	1.00 mm²	YE	-C150FR:3	-W1	
4	859	1.00 mm²	YE	-S10FR:S	-W1	
5	800FA	1.00 mm²	YE	-C730FR:C	-W1	
6	800C	1.00 mm²	YE	-S180FR:S	-W1	
7	860	1.00 mm²	YE	-FB:6	-W1	
8	843	1.00 mm²	YE	-S258FR:S	-W1	
9	842E	1.00 mm²	YE	-S077FR:S	-W1	
10	842	1.00 mm²	YE	-S077FR:S	-W1	
11	439C	1.00 mm²	YE	-S102FR:S	-W1	
12	439A	1.00 mm²	YE	-S102FR:S	-W1	
13	888T	1.00 mm²	YE	-S089FR:S	-W1	
14						7210/0001

7219/0006 14 Way HW090 Pin Housing
Additional Components
7219/0008;1 # 14 Way HW090 Pin Retainer

-C11FR TO E-STOP1 W/H

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	831Y	1.00 mm²	YE	-C28FR:E	-W1	
2	842A	1.00 mm²	YE	-S251FR:S	-W1	
3	602C	1.00 mm²	YE	-S083FR:S	-W1	
4	805C	1.00 mm²	YE	-S245FR:S	-W1	
5	105	1.00 mm²	YE	-FA:6	-W1	
6	889AX	1.00 mm²	YE	-C150FR:6	-W1	
7	127E	1.00 mm²	YE	-S140FR:S	-W1	
8	516	1.00 mm²	YE	-S099FR:S	-W1	
9	153C	1.00 mm²	YE	-S203FR:S	-W1	
10	153A	1.00 mm²	YE	-S203FR:S	-W1	
11	399	1.00 mm²	YE	-FB:20	-W1	
12	601CH	1.00 mm²	YE	-C10FR:F7	-W1	
13	885	1.00 mm²	YE	-FB:10	-W1	
14	602AA	1.00 mm²	YE	-S083FR:S	-W1	
15	136	1.00 mm²	YE	-S8FR:S	-W1	
16	829L	1.00 mm²	YE	-S160FR:S	-W1	
17	440A	1.00 mm²	YE	-S096FR:S	-W1	
18	435	1.00 mm²	YE	-FB:2	-W1	
19	807	1.00 mm²	YE	-C10FR:B6	-W1	
20	666F	1.00 mm²	YE	-S249FR:S	-W1	

7219/0158 20 Way DL040 Male Sealed
Additional Components

-C12FR TO LIVELINK

ID	Tag	Size	Colour	Destination	Cable	Cavity Seal
1	403C	1.00 mm²	YE	-S3FR:S	-W1	
2	602J	1.00 mm²	YE	-S081FR:S	-W1	
3	406C	1.00 mm²	YE	-S4FR:S	-W1	
4	201AK	1.00 mm²	YE	-FC:14	-W1	
5	620	1.00 mm²	YE	-C10FR:F6	-W1	
6	602NE	1.00 mm²	YE	-S080FR:S	-W1	
7	407C	1.00 mm²	YE	-S1FR:S	-W1	
8	124	1.00 mm²	YE	-FA:20	-W1	
9	411A	1.00 mm²	YE	-S060FR:S	-W1	
10	602NT	1.00 mm²	YE	-S080FR:S	-W1	
11						7210/0173
12	404C	1.00 mm²	YE	-S5FR:S	-W1	
13						7210/0173
14						7210/0173
15	856	1.00 mm²	YE	-C741FR:3	-W1	
16	418E	1.00 mm²	YE	-S101FR:S	-W1	
17						7210/0173
18						7210/0173
19						7210/0173
20						7210/0173

7219/0159 20 Way DL040 Fem Sealed
Additional Components

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99 - Exterior Fittings

Diagram

Figure 411. 335/A3013 Issue 2 Head Lamp Harness

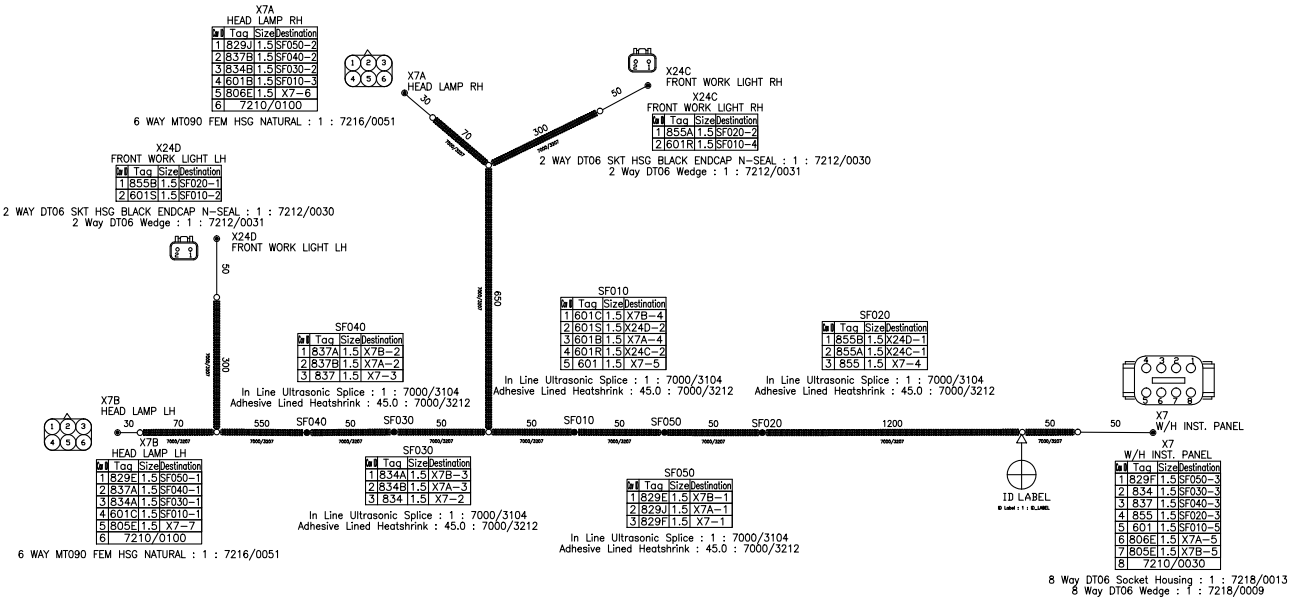
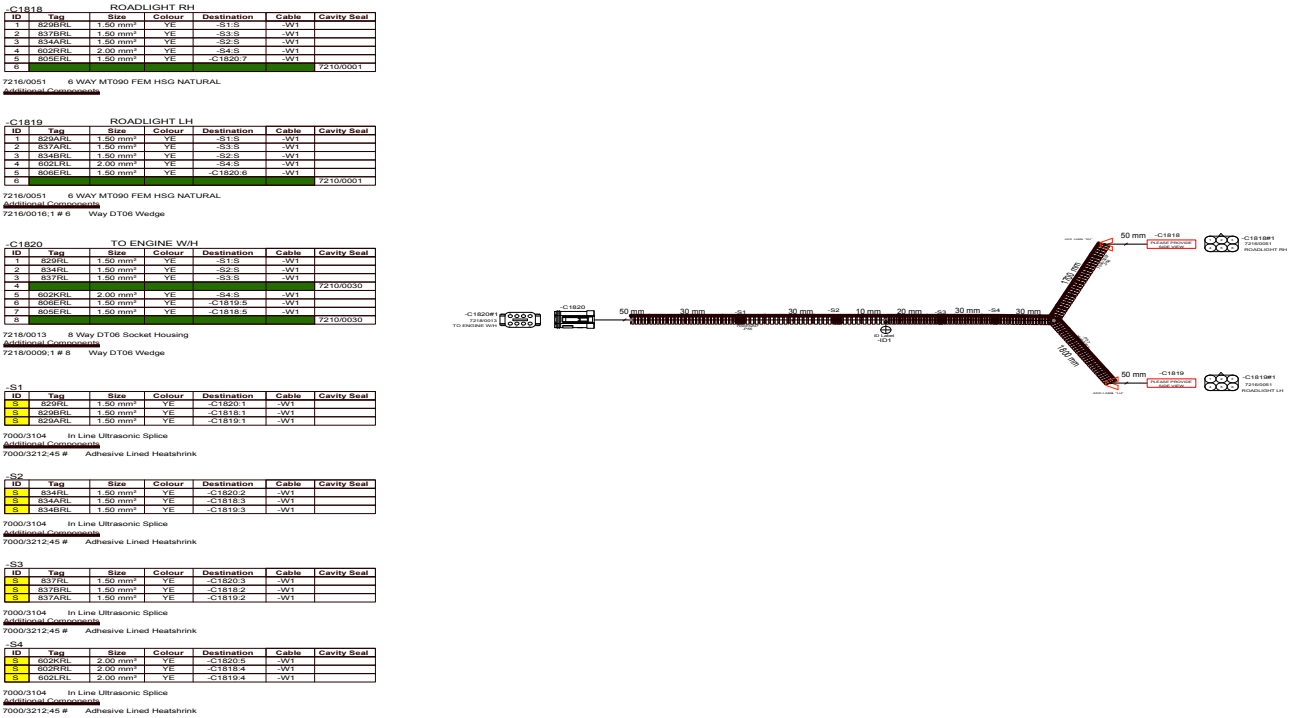


Figure 412. 400/J7374 Issue 3 Road Light Harness



to avoid contamination of the materials of each layer.

The relative value achieved on the test track will be the target value to the operator for the entire compaction project for the same parameters mentioned above. Once the target value is reached by high amplitude mode, the operator can shift to low amplitude mode to finish the compaction.

On the actual track, the same sequence of operating modes needs to be followed which was done during calibration on the test track which is mandatory to make sure of correct functioning of compatronics.

Remove and Install

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Open the operator door.
3. Disconnect the electrical connection to the washer/wipe pump.
4. Disconnect the washer/wipe tank hose.
5. Drain the tank, refer to Washer/Wipe tank-Drain and Fill (PIL 33-54)
6. Support the tank, remove the bolts.
7. Remove the washer/wipe tank.

Install

1. Replacement is a reversal of the removal procedure.
2. Fill the tank with a recommended washer fluid, refer to Washer/Wipe tank - Drain and Fill (PIL 33-54)

Figure 447.

To install these applications you need to take the following steps:

1. On the front end, click the other tab.
2. Click on general.
3. Click onto "extra applications".
4. Choose the relevant tool which you require to be installed and run the installer.

Once the installer has been run, the icon should have changed within the machine tool page. e.g. the above icon has now become:

Figure 448.

Diagnostics Tool - User Guide

Introduction

The diagnostics software tool is part of the JCB Servicemaster software suite. The diagnostics software is designed to be an easy to use fault finding tool.

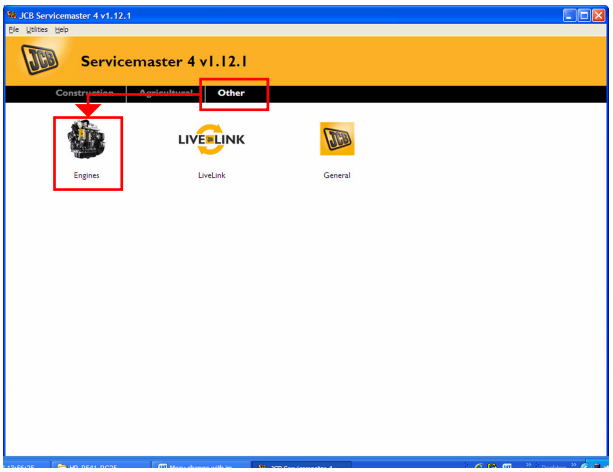
Connecting the Diagnostics

To use Diagnostics your laptop computer must be connected to the machine CAN bus.

Starting the Diagnostics

1. Turn ON the machine ignition and additionally start the engine if required (taking normal precautions).
2. Start JCB Servicemaster on the laptop computer.

Figure 449.



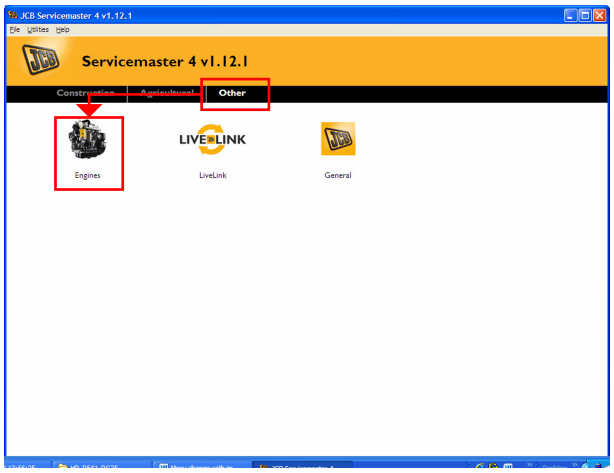
3. Make sure that the correct DLA (Data Link Adaptor) is selected in the chooser. Click on Utilities, DLA Setup. The DLA chooser window opens. Check the button to match to the current device. Click Apply.

Figure 450.

Diagnostics Overview

There are several key elements to the diagnostics tool. These can be seen labelled below. Each element is explained in detail in later sections.

Figure 468.



3. Make sure that the correct DLA is selected in the chooser. Click on Utilities, DLA Setup. The DLA Chooser window opens. Check the button to match to the Current Device. Click Apply.

4. Select the required machine range.

Figure 469.

5. The Flashloader tool will then open.

Figure 470.

Using Flashloader

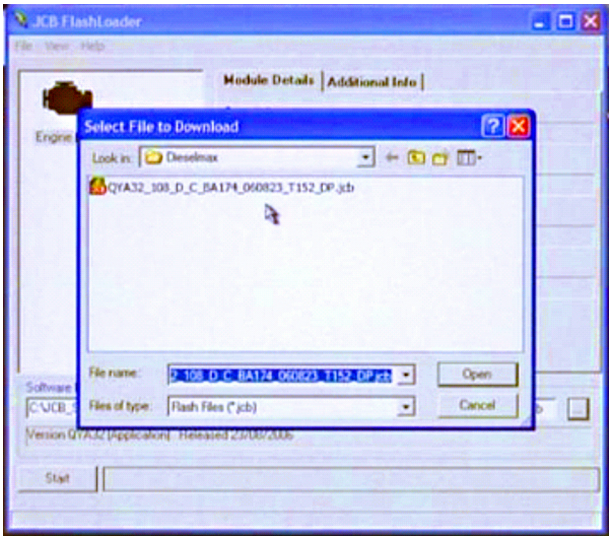
Important: Do not turn off the ignition or isolate the system by accidentally engaging the operators seat isolation switch when using the flashloader. This will interrupt the flash signal to the ECM and will irreparably damage the ECM.

1. Make sure that the machine ignition switch is set to ON but do not start the engine.

2. Click on the ECM icon.

3. Click on the Browse button and select the correct data file. Click Open.

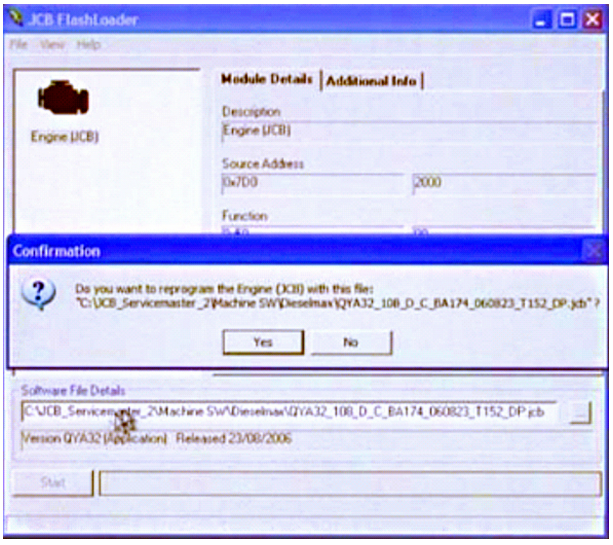
Figure 471.



4. Click on the Start button. A confirmation window will appear. Click on the Yes to start the reprogramming of the ECM. The progress bar is displayed.

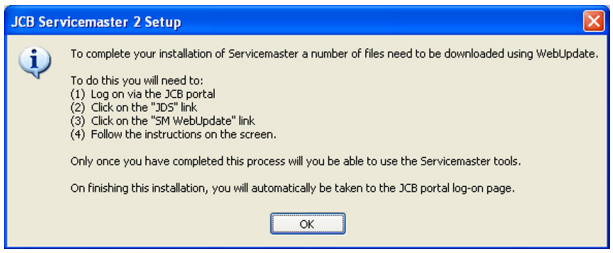
5. When the programming is complete switch the machine ignition to the OFF position. Important: Re-flashing the ECM changes the base programme. Re-flashing the ECM does not configure the machine settings such as fuel injector calibration codes, and other machine specific options.

Figure 472.



6. Before starting the engine make sure that the machine setup data is correct. You must check that all other relevant machine settings are correctly configured. Use the setup software tool.

Figure 500.

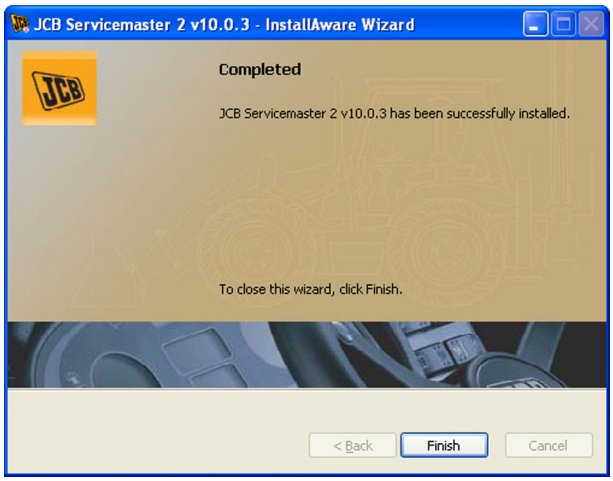


14. A new "Completed" message will appear on the "JCB Servicemaster_2V10.0.3 Installation Wizard" screen. Refer to Figure 501.

    14.1. Click the "Finish" option.

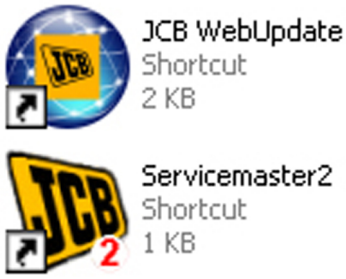
    14.2. The JCB portal will open for Servicemaster web update, after the installation.

Figure 501.



15. The two program shortcuts will be created on the computer desktop. Refer to Figure 502.

Figure 502.



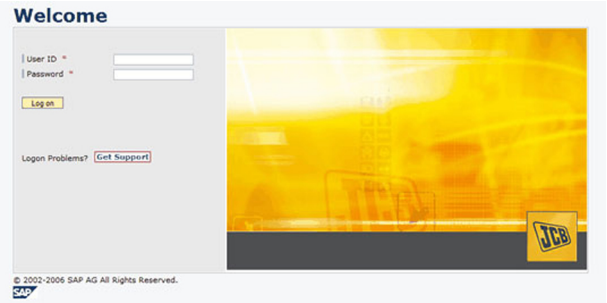
JCB Servicemaster Web Update - New Installation

Once you installed JCB Servicemaster on your laptop/PC you will need to keep it updated. JCB Servicemaster is updated through the "JCB Web Update" program. Do the below steps to download and install the JCB web update.

1. Use the web address www.business.jcb.com to install JCB web update.

2. A web page will open on the screen. Refer to Figure 503.

Figure 503.



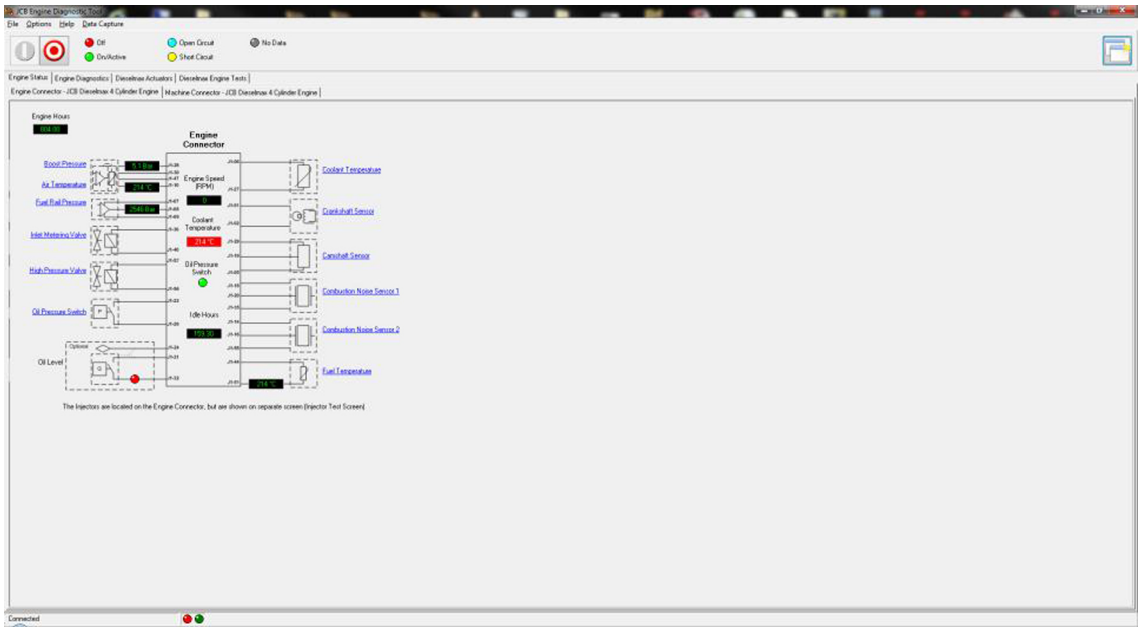
3. If you do not already have a User ID and Password, click the "Get Support" option.

    3.1. Apply for an account to get access to JDS (JCB Distribution System) and SPP (Service Parts Pro).

4. Once you logged in, you will find a link "JDS" on the left side tool bar. Refer to Figure 504.

    4.1. Click the "JDS" link.

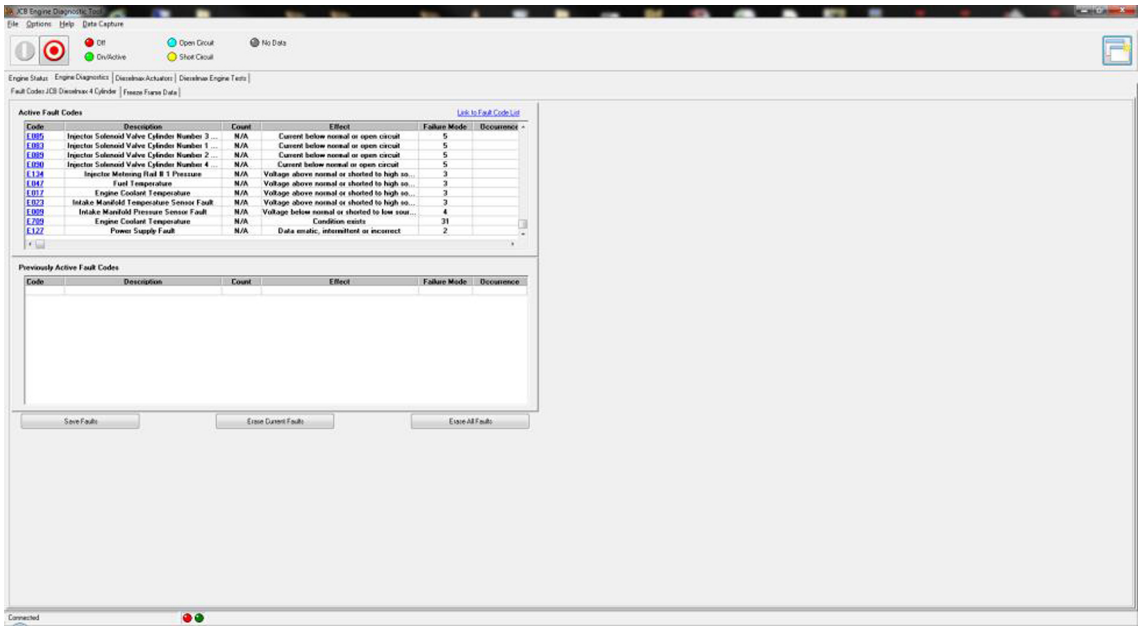
Figure 531.



10.1. The data will appear on the diagnostic page.

11. The active fault codes will see on the diagnostic page. Refer to Figure 532.

Figure 532.



72 - Fasteners and Fixings

Contents **Page No.**

06 - Bolts

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A	B	C	D	H	J	K
Clamping range	**Band thick-ness**	**Housing width**	**Band width**	**Hex size across flats**	**Bolt and housing length**	**Bolt and housing overall height**
Heavy duty worm drive clips						
172–206mm	0.7mm	23.1mm	16mm	7mm	37mm	13mm

Torque Values

Table 167. Standard Worm Drive Clip

Clamping range	Part number	Torque values
8–16mm	2201/0001	2 -0/+0.5N·m
12–22mm	2201/0003	3 -0/+0.5N·m
16–27mm	2201/0005	5 -0/+0.5N·m
20–32mm	2201/0006	5 -0/+0.5N·m
25–40mm	2201/0007	5 -0/+0.5N·m
35–50mm	2201/0008	5 -0/+0.5N·m
40–60mm	2201/0010	5 -0/+0.5N·m
50–70mm	2201/0012	5 -0/+0.5N·m
60–80mm	2201/0013	5 -0/+0.5N·m
70–90mm	2201/0014	5 -0/+0.5N·m
80–100mm	2201/0015	5 -0/+0.5N·m
90–110mm	2201/0016	5 -0/+0.5N·m
100–120mm	2201/0021	5 -0/+0.5N·m
120–140mm	2201/0017	5 -0/+0.5N·m
130–150mm	2201/0018	5 -0/+0.5N·m
150–170mm	2201/0019	5 -0/+0.5N·m
160–180mm	2201/0020	5 -0/+0.5N·m

Table 168. Heavy Duty Worm Drive Clip

Clamping range	Part number	Torque values
172–194mm	2201/0022	10 -0/+0.5N·m
184–206mm	2201/0023	10 -0/+0.5N·m

Table 169. Spring Assisted Worm Drive Clip

Clamping range	Part number	Torque values
16–27mm	2206/1627	5 -0/+0.5N·m
20–32mm	2206/2032	5 -0/+0.5N·m
25–40mm	2206/2540	5 -0/+0.5N·m
30–45mm	2206/3045	5 -0/+0.5N·m
35–50mm	2206/3550	5 -0/+0.5N·m
40–60mm	2206/4060	5 -0/+0.5N·m
50–70mm	2206/5070	5 -0/+0.5N·m
60–80mm	2206/6080	5 -0/+0.5N·m
70–90mm	2206/7090	5 -0/+0.5N·m

00 - Consumable Products

Contents **Page No.**

00 - General

Introduction

New Oil

There are no special precautions needed for the handling or use of new oil, besides the normal health and safety practices mentioned in the relevant section of this service manual.

Used Oil

Used engine crankcase lubricants contain harmful contaminants. Here are precautions to protect your health when handling used engine oil:

1. Avoid prolonged, excessive or repeated skin contact with used oil.
2. Apply a barrier cream to the skin before handling used oil.
3. Note the following when removing engine oil from skin:
   - 3.1. Wash your skin thoroughly with soap and water.
   - 3.2. Using a nail brush will help.
   - 3.3. Use special hand cleansers to help clean dirty hands.
   - 3.4. Never use petrol, diesel fuel, or paraffin for washing.
4. Avoid skin contact with oil soaked clothing.
5. Don't keep oily rags in pockets.
6. Wash dirty clothing before re-use.
7. Throw away oil-soaked shoes.

First Aid

EYES - In the case of eye contact, flush with water for 15 minutes. If irritation persists, get medical attention.

SWALLOWING - If oil is swallowed do not induce vomiting. Get medical advice.

SKIN - In the case of excessive skin contact, wash with soap and water.

SPILLAGE - Absorb on sand or a locally approved brand of absorbent granules. Scrape up and remove to a chemical disposal area.

FIRES - Extinguish with carbon dioxide, dry chemical or foam. Firefighters should use self-contained breathing apparatus.