# SERVICE MANUAL

EXCAVATOR

**JS115, JS115 [T2/3],**
**JS130, JS130 [T2/3], JS145**

EN - 9813/7050 - ISSUE 1 - 04/2018

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



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# Foreword

## The Operator's Manual

⚠

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

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

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

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# 24 - Risk Assessment

## Introduction

It is the responsibility of the competent people that plan the work and operate the machine to make a judgement about the safe use of the machine, they must take into account the specific application and conditions of use at the time.

It is essential that a risk assessment of the work to be done is completed and that the operator obeys any safety precautions that the assessment identifies.

If you are unsure of the suitability of the machine for a specific task, contact your JCB dealer who will be pleased to advise you.

The following considerations are intended as suggestions of some of the factors to be taken into account when a risk assessment is made. Other factors may need to be considered.

A good risk assessment depends on the training and experience of the operator. Do not put your life or the lives of others at risk.

### Personnel

- Are all persons who will take part in the operation sufficiently trained, experienced and competent? Are they fit and sufficiently rested? A sick or tired operator is a dangerous operator.
- Is supervision needed? Is the supervisor sufficiently trained and experienced?
- As well as the machine operator, are any assistants or lookouts needed?

### The Machine

- Is it in good working order?
- Have any reported defects been corrected?
- Have the daily checks been carried out?
- Are the tyres still at the correct pressure and in good condition and is there sufficient fuel to complete the job (if applicable)?

### The Load

- How heavy is it? Is it within the capabilities of the machine?
- How bulky is it? The greater the surface area, the more affected it will be by wind speeds.
- Is it an awkward shape? How is the weight distributed? Uneven loads are more difficult to handle.
- Is there a possibility of the load shifting while being moved?

### Loading/Unloading Area

- Is it level? Any slope of more than 2.5% (1 in 40) must be carefully considered.
- Is more than one direction of approach to the load possible? Approaching across the slope must be avoided, if possible.
- Is the ground solid? Will it support the weight of the machine when loaded?
- How rough is the ground? Are there any sharp projections which could cause damage, particularly to the tyres?
- Are there any obstacles or hazards in the area, for example, debris, excavations, manhole covers, power lines?
- Is the space sufficient for safe manoeuvring?
- Are any other machines or persons likely to be in or to enter the area while operations are in progress?

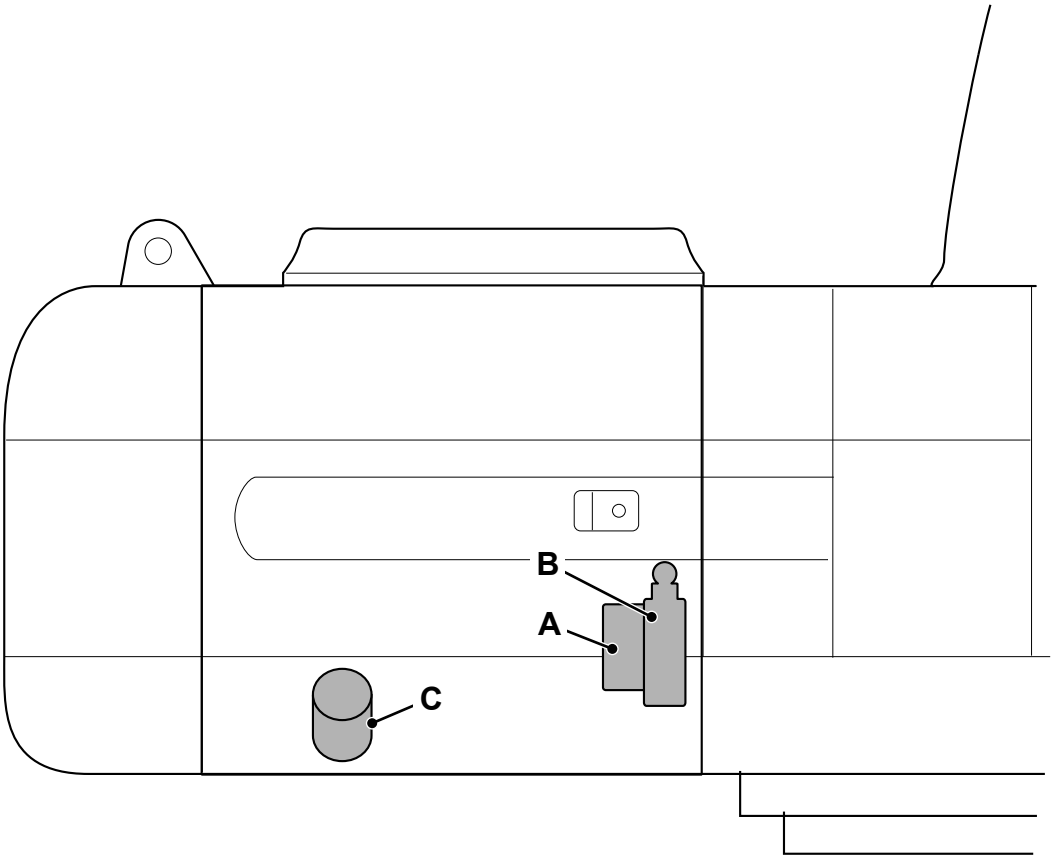
### The Route to be Travelled

- How solid is the ground, will it provide sufficient traction and braking? Soft ground will affect the stability of the machine and this must be taken into account.
- How steep are any slopes, up/down/across? A cross slope is particularly hazardous, is it possible to detour to avoid them?

### Weather

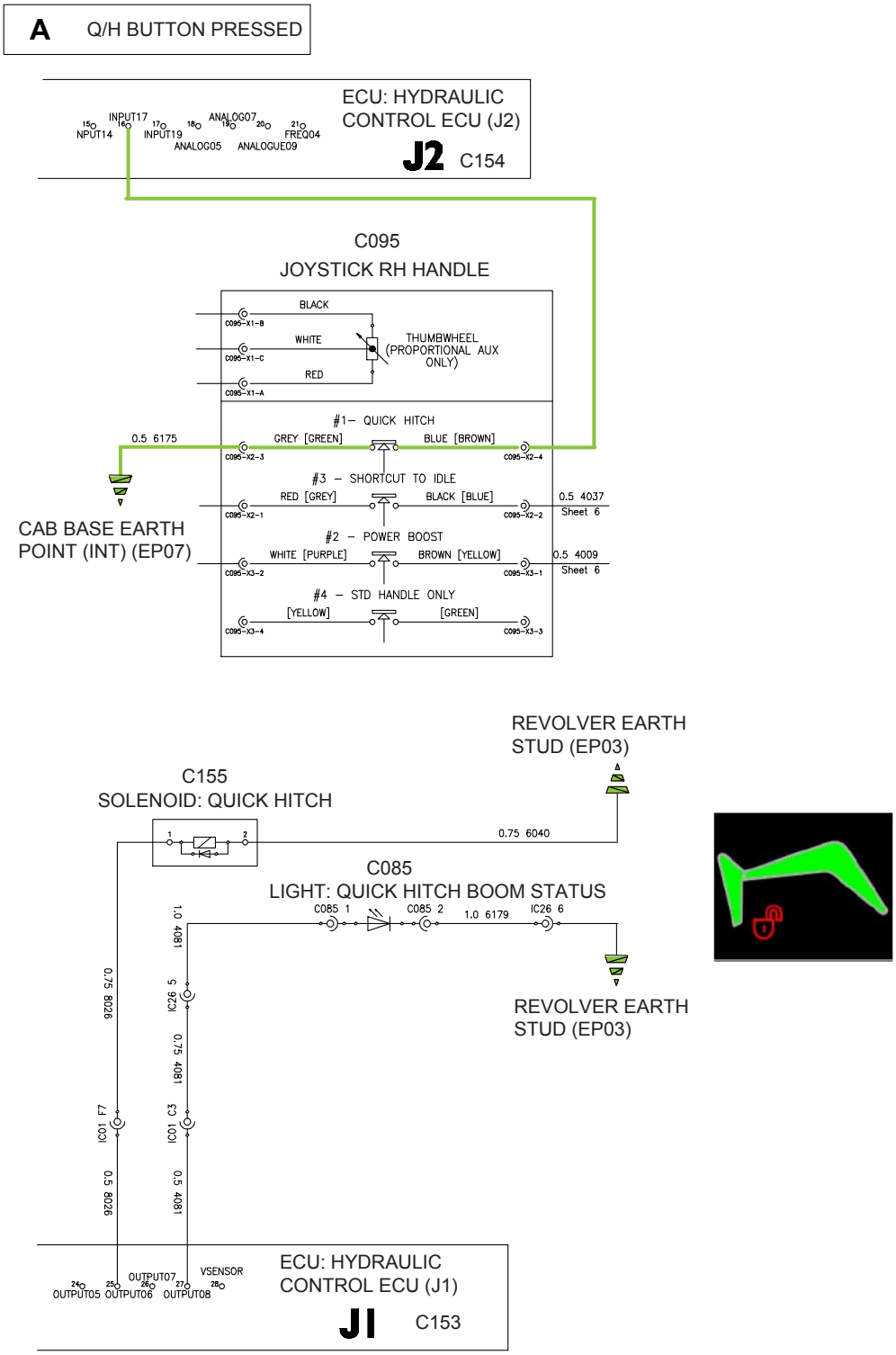
- How windy is it? High wind will adversely affect the stability of a loaded machine, particularly if the load is bulky.
- Is it raining or is rain likely? The ground that was solid and smooth when dry will become uneven and slippery when wet, and it will not give the same conditions for traction, steering or braking.

**Figure 9. Hydraulic compartment - T4f**



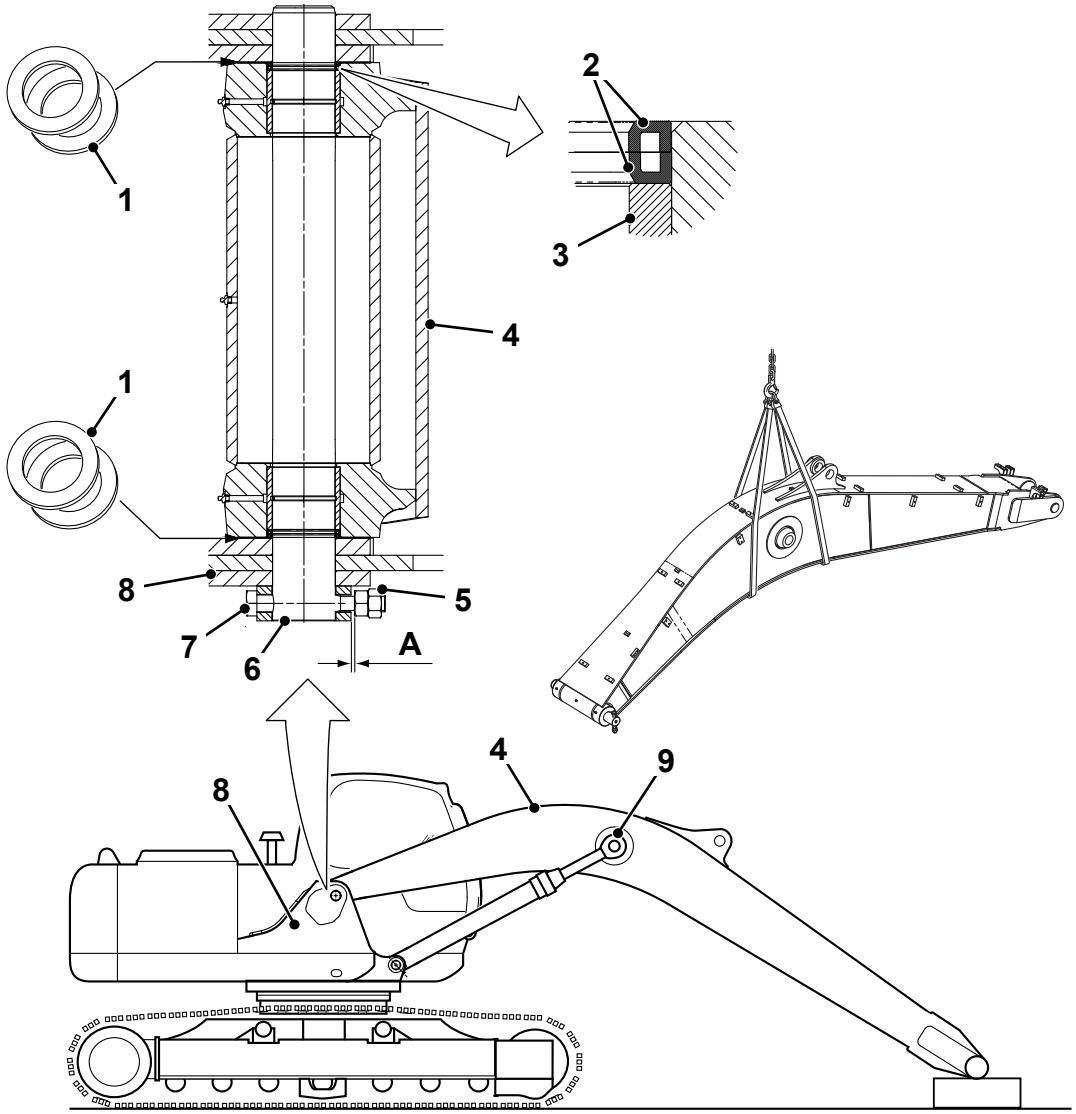

**A** Engine fuel filter
**B** Main fuel filter
**C** Engine oil filter

**Figure 17. Electrical Schematic- Quickhitch Unlocked**




| | | | |
|---|---|---|---|
| **A** | Quickhitch joystick control switch pressed | **C095** | Joystick control switch - quickhitch |
| **C153** | HECU-connector J1 | **C154** | HECU-connector J2 |
| **C155** | Solenoid - quickhitch control valve | | |

**Figure 22.**




**1** Shims
**2** Dust seals
**3** Bush
**4** Boom
**5** Locknuts
**6** Boom pivot pin
**7** Bolt
**8** Revolving chassis
**9** Boom rams pivot pin
**A** Bolt clearance dimension

# 00 - General

## Introduction

The slew ring bearing is a rotational rolling-element bearing that supports the heavy but slow-turning upper structure. They often use three race elements, such as an inner ring and two outer ring halves that clamp together axially. Slew ring bearings are made with gear teeth integral with the inner or outer race, used to drive the platform relative to the base.

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# 30 - A-Post Trim

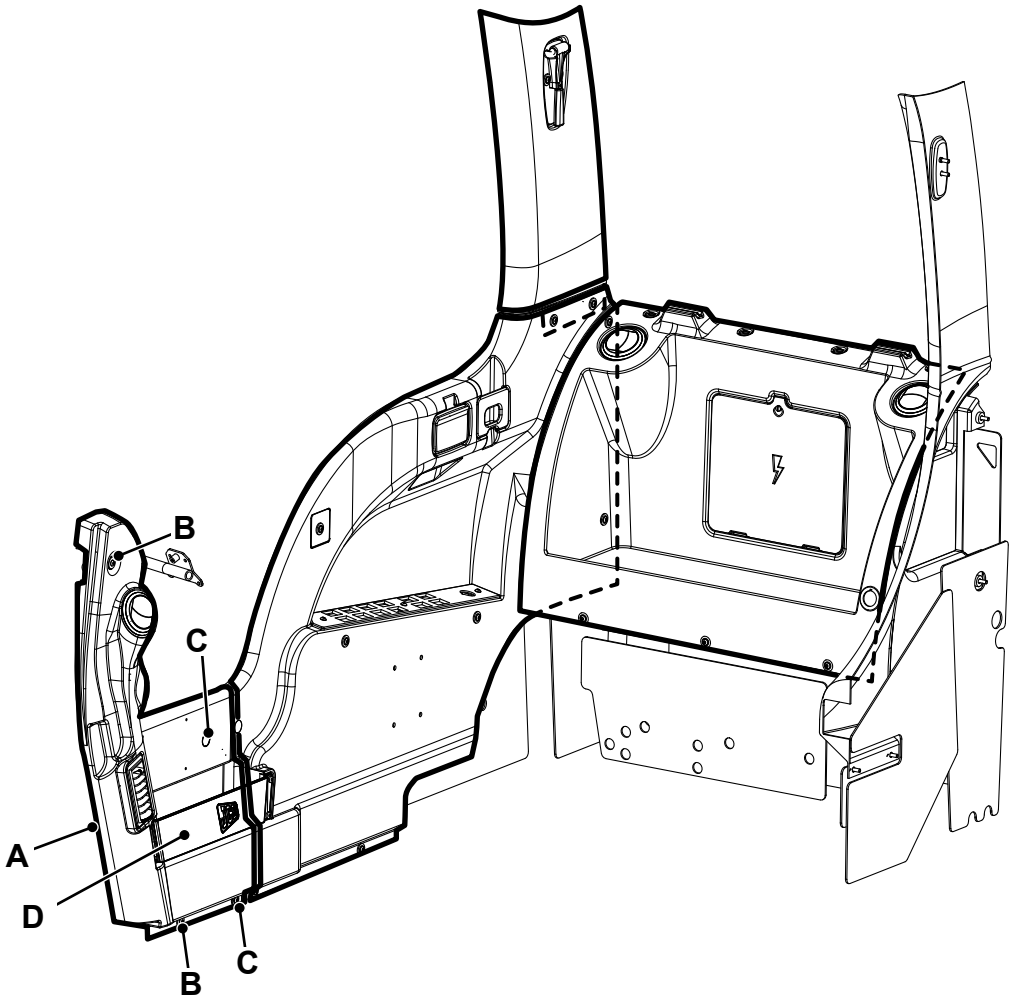
## Remove and Install

Components, such as electrical switches, locate in some of the cab trim panels. During removal and installation be sure to disconnect and reconnect the applicable harness connectors.

### Remove

1. Make the machine safe.
   Refer to: PIL 01-03.
2. Remove the stowage plate
3. Remove the instruments.
4. Remove two screws and associated nylon washers.
5. Remove two bolts and associated nylon washers.
6. Lift off the A-post trim panel.

**Figure 79.**




**A** A-post trim panel
**B** Bolts
**C** Screws
**D** Stowage plate

6.1. Do not force the trim panels away from the cab frame, be sure to remove all the fixings.

# Operation

## Air Conditioning Operation

To maintain optimum operator comfort in warm climates or during seasons of high ambient temperature, the air conditioning system re-circulates, clean, dehumidified air into the cab. Cooling is provided by passing the recirculated air, over an evaporator coil in the air conditioning unit.

The air conditioning system is a closed circuit through which the refrigerant is circulated, its state changing from gas to liquid and back to gas again, as it is forced through the system.

The major components of the system are the compressor, condenser, receiver drier, expansion valve and evaporator matrix.

Air conditioning system power is generated from the engine, via an electromagnetic clutch to the compressor.

The compressor, draws in low pressure refrigerant gas from the suction line (evaporator to compressor) and increases refrigerant pressure through compression. This process also increases the refrigerant temperature.

High pressure refrigerant is forced from the compressor to the condenser, which is mounted on the radiator on the side of the engine. Ambient air is drawn across the condenser by the engine-driven cooling fan. In the condenser, the refrigerant changes state to a high pressure, high temperature liquid but with a lower heat content.

The refrigerant passes through the receiver drier, which contains a desiccant to remove moisture from the system. The receiver drier serves as a reservoir for refrigerant and also includes a filter to remove foreign particles from the system.

The high temperature, high pressure refrigerant is forced by compressor action into the expansion valve, which meters the amount of refrigerant entering the evaporator. In the expansion valve the refrigerant instantaneously expands to become a low pressure, low temperature liquid.

The refrigerant is drawn through the evaporator matrix, by the suction of the compressor. The temperature of refrigerant is now considerably below that of the air being drawn across the evaporator matrix by the blowers. Heat is transferred from the ambient and re-circulated air to the refrigerant, causing the low pressure liquid to vaporise and become a low pressure gas. Moisture in the air condenses on the evaporator matrix and is drained away via condensate.

Cool de-humidified air is emitted through air vents into the cab.

The low temperature, low pressure, high heat content refrigerant gas, is now drawn by suction back to the compressor, where the cycle is completed.

## ATC Control Panel (User Interface)

The ATC (Automatic Temperature Control) system includes an electronic control system that protects the system components if a problem occurs. The control panel (user interface) lets the operator control the cab temperature, blower fan speed and air flow direction. The system status is shown on the LCD (Liquid Crystal Display). The control panel (user Interface) is connected to the ATC electronic control unit. The ATCunit monitors the inputs and controls the outputs in the system as selected by the operator and as the temperature conditions change. If a system problem occurs, the LCD shows an error code.

**Figure 84. Control Panel (User Interface)**


## ATC System Inputs

### High Pressure Switch

The high pressure switch is on the receiver drier. The switch is an input used to monitor the fluid pressure in the high pressure side of the system. The switch tells the control panel when the high pressure is abnormal.

### Low Pressure Switch

The low pressure switch is in the HVAC (Heating Ventilation Air Conditioning) unit. The switch is used to monitor the low pressure gas on the low pressure side of the system. The switch tells the control panel when the low pressure is abnormal.

### Evaporator Temperature Sensor

The evaporator temperature sensor is in between the evaporator cores in the HVAC unit in the cab. The sensor tells the control panel the evaporator temperature. This temperature is for control of the compressor clutch and output to stop the evaporator cores freezing.

# Remove and Install

## Remove

Before removing the HVAC (Heating Ventilation Air Conditioning) unit, the air conditioning system must be discharged.

1. Make the machine safe.

   Refer to: PIL 01-03.

2. Working in the cab, remove the operator seat from its runners.

3. Remove the rear trim panel and get access to the HVAC unit.

   Refer to: PIL 09-30-39.

4. Remove the fixings and lift the bracket together with harness connectors clear of the HVAC unit.

   4.1. Depending on the machine variant, other components may be installed on the HVAC unit casing. Move components clear as necessary.

5. Disconnect the HVAC electrical harness connector.

6. Disconnect the air ducts at the HVAC unit.

7. Label the heater hoses (if applicable) and disconnect them at the HVAC unit.

8. Label the air conditioning hoses (if applicable) and disconnect them at the HVAC unit.

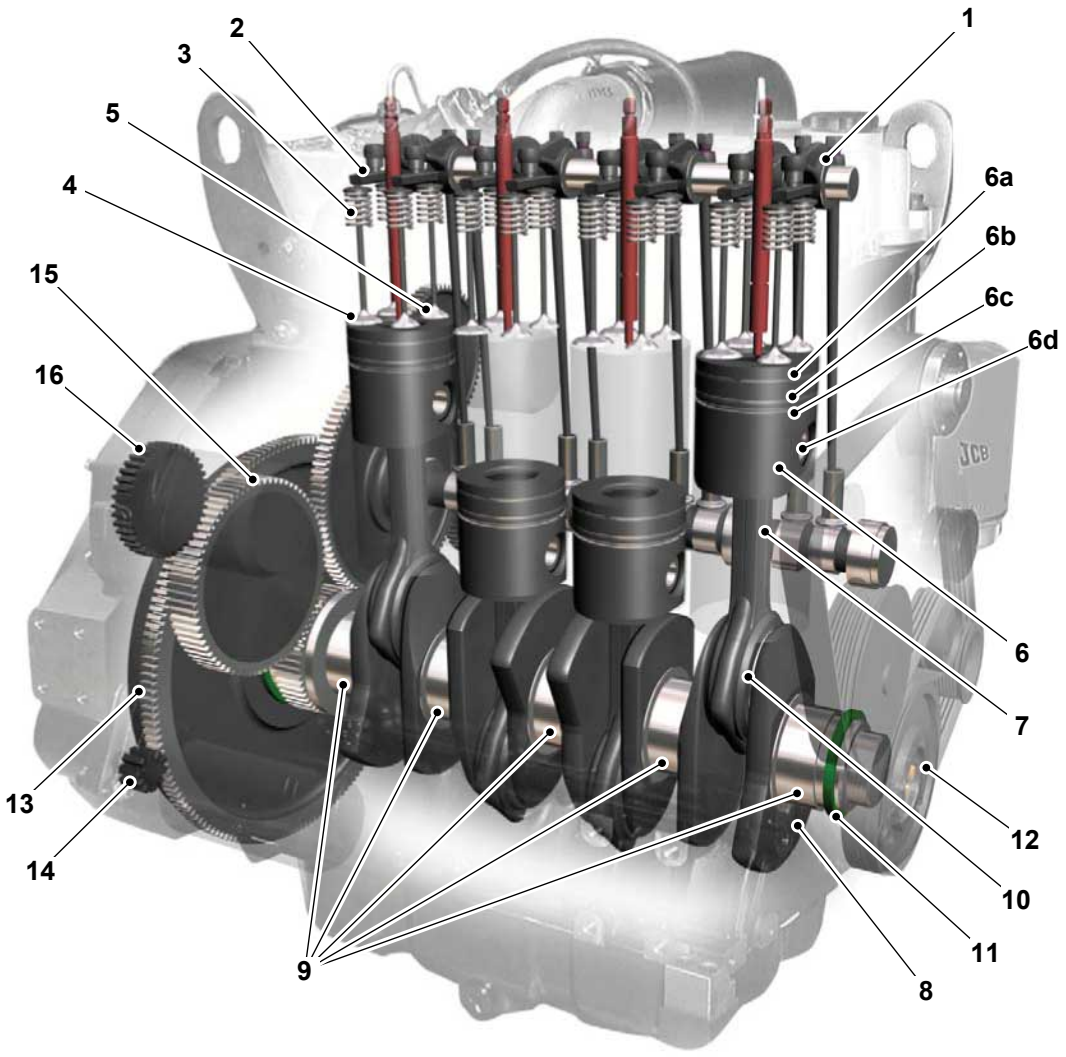
9. Remove four mounting screws from both sides of the HVAC unit and lift the unit from the machine.

## Internal

As viewed on the right hand side. Refer to Figure 93.

The following identifies the main internal components of a typical engine assembly. Some variants may differ in detail.

**Figure 93.**




**1** Rocker assembly
**2** Valve bridge piece (x8)
**3** Valve spring (x8)
**4** Inlet valve (x8)
**5** Exhaust valve (x8)
**6** Piston assembly (x4)
**6a** Piston ring - top compression (x4)
**6b** Piston ring - 2nd compression (x4)
**6c** Piston ring - oil control (x4)
**6d** Gudgeon pin (x4)
**7** Connecting rod assembly (x4)
**8** Crankshaft
**9** Main bearing - crankshaft (x5)
**10** Big end bearing - crankshaft/connecting rod (x4)
**11** Front crankshaft oil seal
**12** Front end drive belt pulley
**13** Flywheel
**14** Starter motor pinion

| Cause | Remedy |
|---|---|
| Fuel filter(s) blocked, fuel supply restricted. | Check/replace the fuel filter(s). Check fuel lines for restriction. |
| Fuel is aerated. | Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system. |
| Fuel lift pump not operating correctly (fuel supply inadequate). | Check that the lift pump is operating and delivering fuel to the injection pump. Check fuses. |
| 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. |
| One or more fuel injectors worn or malfunctioning. | Check the electrical connections at the injectors. |
| Exhaust leak at the manifold or turbocharger. | Check/repair leaks in the manifold or turbocharger gaskets. Look for a cracked manifold. |
| Extra injector sealing washer installed under injector. | Remove extra injector sealing washer. |
| Inlet and exhaust valve clearances set incorrectly. | Set the valve clearances to the recommended clearances. |
| Worn or malfunctioning high pressure fuel pump. | Do all the necessary fault finding checks before removal of the high pressure fuel pump |
| Engine compression low in one or more cylinders. | Check the engine compression. |
| Electrical sensor fault. | Check the electrical connections at the sensors. |
| Excessive exhaust back pressure | Inspect Catalyst. Check Exhaust pressure readings using Servicemaster. |

**Table 47. Engine - Will Not Reach Maximum RPM**

| Cause | Remedy |
|---|---|
| Tachometer faulty. | Verify engine speed with hand tachometer. Repair as required. |
| Engine overloaded. | Verify high idle speed without load. Investigate operation to be sure correct gear is being used. |
| Pedal/ Hand Throttle position sensor (TPS) system defective. | Check the throttle assembly. |
| Fuel is aerated. | Check the fuel system for loose connections and possible air ingress points. Rectify and bleed the fuel system. |
| Fuel lift pump not operating correctly (fuel supply inadequate). | Check that the lift pump is operating and delivering fuel to the injection pump. Check fuses. |
| Fuel is contaminated or incorrect grade diesel fuel used. | Stop the engine. Replace the fuel filters. Operate the engine with a temporary supply of the correct grade of clean fuel. Monitor the engine performance. Dirty fuel will cause damage to the high pressure fuel pump and injectors. |
| Fuel filter(s) blocked, fuel supply restricted. | Check/replace the fuel filter(s). Check fuel lines for restriction. |
| Turbocharger wastegate actuator diaphragm ruptured. | Repair or replace turbocharger. |
| 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. |

## 00 - General

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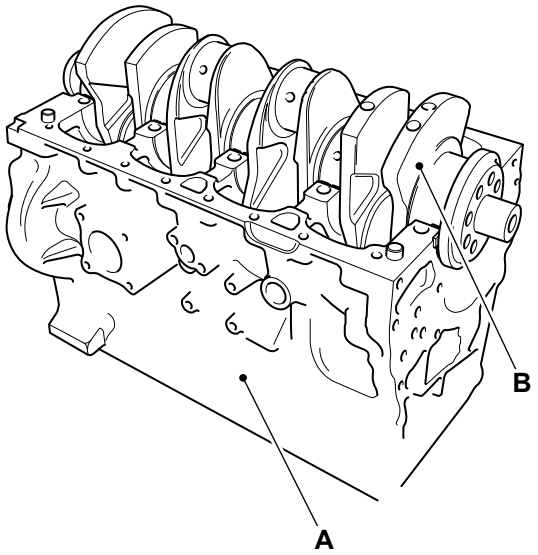
## Introduction

The crankcase is the housing for the crankshaft. The enclosure forms the largest cavity in the engine and is located below the cylinders. It is integral with the cylinder bank and forms an engine block. It has an opening in the bottom to which an oil sump is attached with a gasket and bolted joint.

The crankcase protects the crankshaft and connecting rods from foreign objects it also keeps the engine oil contained and allows the oil to be pressurised and also provide the rigid structure with which to join the engine to the transmission.

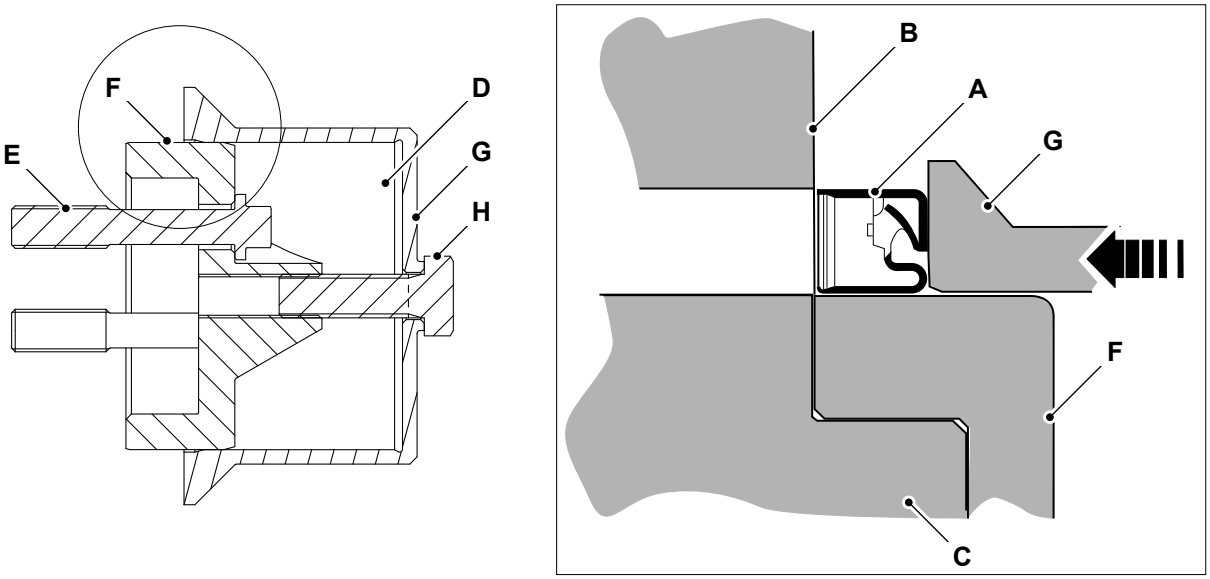
**Figure 105.**




**A** Crankcase
**B** Crankshaft

**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 123.

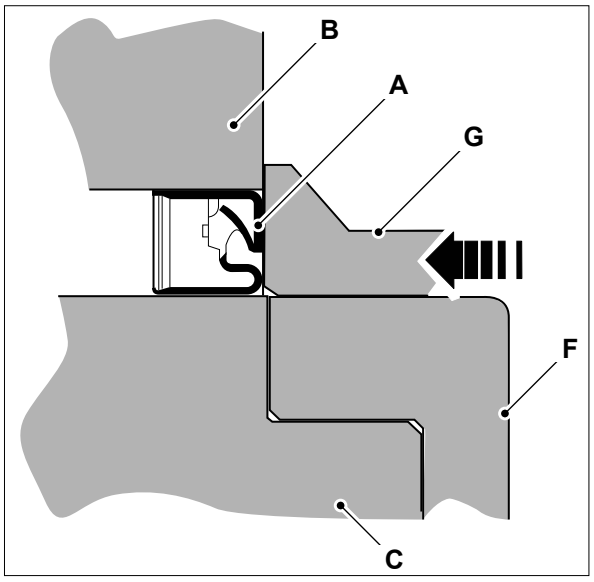



**A** Crankshaft oil seal
**B** Crankcase
**C** Crankshaft hub
**D** Seal installation tool
**E** Fixing bolts (x3)
**F** Centre body
**G** Outer sleeve
**H** Screw

4. Turn the screw to push the seal squarely into the counterbore until the outer sleeve comes up against the front edge of the counterbore. When correctly installed, the front face of the seal should be flush with the edge of the counterbore within the specified tolerance. Refer to Figure 124.

   Dimension: -0.5 -0/+0.5 mm

Figure 124.




**A** Crankshaft oil seal
**B** Crankcase
**C** Crankshaft hub
**F** Centre body
**G** Outer sleeve

5. Remove the seal installation tool.

## 00 - General

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## Introduction

A crankshaft pulley is used to drive a FEAD (Front End Accessory Drive) belt. The belt drives the coolant pump. Depending on the machine application, the belt is configured to drive engine mounted accessories, such as the alternator, cooling fan and air conditioning compressor.

Some applications have a second pulley on the crankshaft which drives a dedicated fan belt. The belt drives an engine mounted cooling fan.

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## Introduction

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

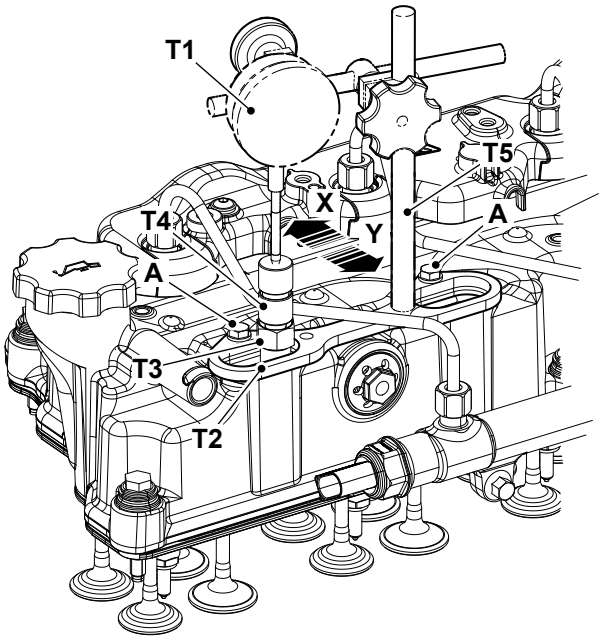
A dirty and blocked air cleaner element will reduce the amount of air entering the combustion chamber which can cause engine mis-firing, black smoke and low output power.

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.

Figure 160.




**A** Screws
**T1** Dial Test Indicator (DTI)(obtain locally)
**T2** Adaptor plate (part of valve clearance service kit)
**T3** Adaptor sleeve (part of valve clearance service kit)
**T4** Lock bar (part of valve clearance service kit)
**T5** DTI Support (obtain locally)

9. Pull the lock bar in the direction of arrow Y and turn the DTI to zero.

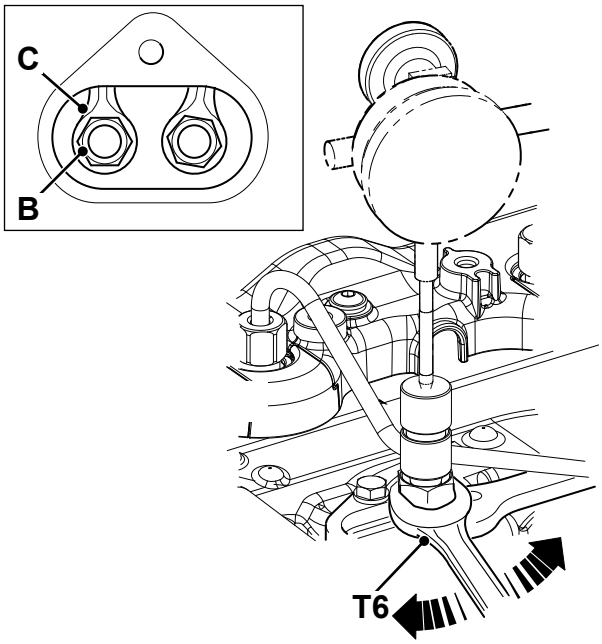
10. Push the lock bar in the direction of arrow X and record the DTI indication.

11. Compare the valve clearance measurement with the correct clearances. If an adjustment is necessary:

    11.1. Turn the tappet adjuster using an open ended spanner on the adaptor sleeve. Turn the sleeve clockwise to reduce the clearance and counterclockwise to increase the clearance.

    11.2. Important: The tappet adjusters are set in position by thread friction with the rockers. Make sure that the torque to turn the tappet adjusters is more than the minimum necessary. If any of the adjusters show a lower torque value then the adjuster and its related rocker must be replaced.

Figure 161.




**B** Tappet adjusters
**C** Rockers
**T6** Spanner open ended (obtain locally)

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## Introduction

The piston is acted upon by the pressure of the expanding combustion gases in the combustion chamber space at the top of the cylinder. This force then acts downwards through the connecting rod and on to the crankshaft.

The pistons are cast from aluminium alloys for increased strength and improved fatigue life.

The connecting rod is attached to the piston by a swivelling piston pin. This pin is mounted within the piston, The pin itself is of hardened steel and is fixed in the piston, but free to move in the connecting rod. The pins are prevented from moving sideways and the ends of the pin digging into the cylinder wall by circlips.

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## Introduction

The rocker assembly is an indirect valve actuating system consisting of rocker arms and a shaft.

The rocker arm is an oscillating lever that conveys radial movement from the cam lobe into linear movement at the poppet valve to open it. One end is raised and lowered by a rotating lobe of the camshaft via a tappet and push rod while the other end acts on the bridge piece which is connected to the valve stem.

# 45 - Oil Sump

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# 06 - Camshaft Gear

## Remove and Install

The camshaft drive gear is an interference fit on the end of the camshaft and cannot be removed individually. If the gear is damaged or worn the complete camshaft and gear assembly must be replaced. Refer to Camshaft- Remove and Install (PIL 15-15).

# 03 - Housing

## Remove and Install

**Special Tools**

| Description | Part No. | Qty. |
|---|---|---|
| Template for Sealant Flywheel Housing to Gear Case (4 Cyl and 6 Cyl Elec) | 892/01176 | 1 |

### Before Removal

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

1. This procedure requires service parts. Make sure you have obtained the correct service parts before you start.
2. Remove the flywheel.
   Refer to: PIL 15-54-00.
3. Remove the starter motor.
   Refer to: PIL 15-75-00.

### Remove

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

## Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Use suitable adhesive to retain the lower rubber in the applicable mounting casting.
3. Apply retaining compound to bolts 3 and bolts 4.

   Consumable: JCB Threadlocker and Sealer (Medium Strength)
4. Tighten bolts 1, bolts 2, bolts 3 and bolts 4 to the correct torque value.

**Table 86. Torque Values**

| Item | Nm |
|---|---|
| A | 529 |
| B | 271 |
| C | 125 |
| D | 125 |

## Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. It is not necessary to adjust the position of the alternator in order to tension the drive belt, as the accessory drive belt arrangement is self-tensioning.
3. Tighten the alternator securing bolts to the correct torque value.
4. Make sure you reconnect the electrical leads to the alternator in the correct positions and tighten to the correct torque.

**Table 90. Alternator securing bolt torque**

| Item | Torque Value |
|---|---|
| A | 47 N·m |
| B | 47 N·m |

**Figure 215.**

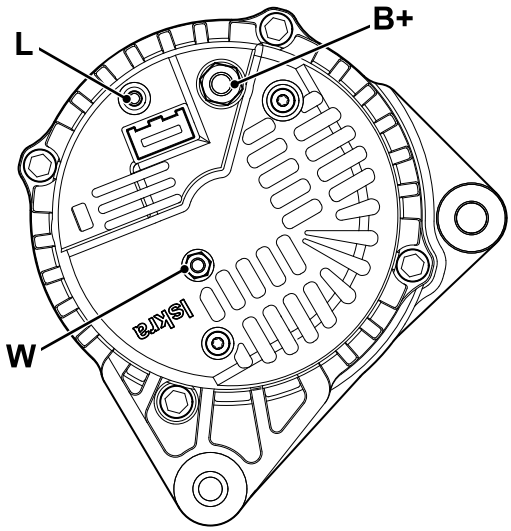


**Table 91. Alternator electrical connection torque**

| Item | Torque Value |
|---|---|
| B+ | 9 –13 N·m |
| L | 2.7 –3.8 N·m |
| W | 2.7 –3.8 N·m |

# Disassemble and Assemble

## Voltage Regulator and Brushes

1. The voltage regulator and brush set is a combined assembly. Refer to (PIL 15-72-06).

## Drive Pulley

1. Refer to (PIL 15-72-03).

# 33 - Coolant Temperature

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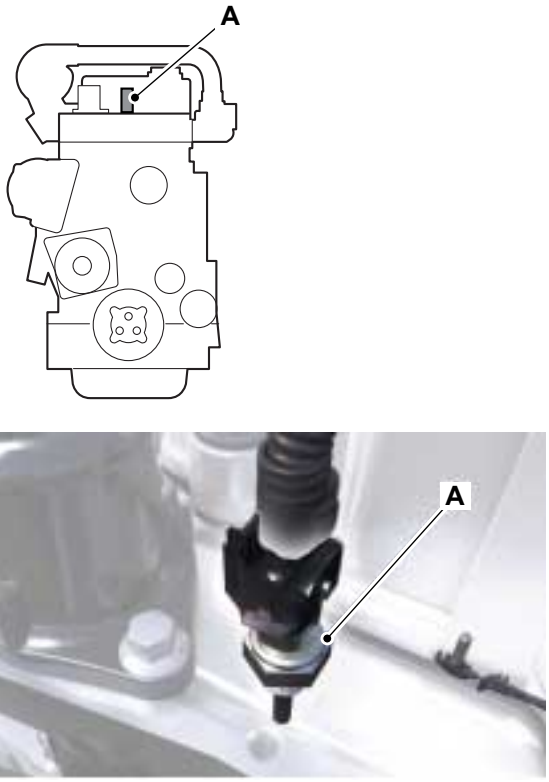
## Introduction

The coolant temperature sensor is located on the cylinder head at the drive belt end.

**Figure 226.**




**A** Coolant temperature sensor

## Check (Condition)

1. If a faulty switch is suspected, use a suitable multimeter to check that the correct supply voltage is present at the switch electrical connector.
2. Carry out tests on the machine electrical circuits to check for possible wiring faults. The fault may be caused by failure of other components within the electrical system.

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- 18-18-15 Pump ..... 18-62

18-21 Fuel Pump
- 18-21-00 General ..... 18-69

18-22 Refuel Pump
- 18-22-00 General ..... 18-77

18-24 Exhaust
- 18-24-00 General ..... 18-83
- 18-24-03 Inlet Manifold ..... 18-85
- 18-24-04 Outlet Manifold ..... 18-89

18-35 Turbocharger
- 18-35-00 General ..... 18-95

18-96 Fuel Pipe
- 18-96-00 General ..... 18-99
- 18-96-03 High Pressure Pipe ..... 18-103
- 18-96-06 Low Pressure Pipe ..... 18-105

# Technical Data

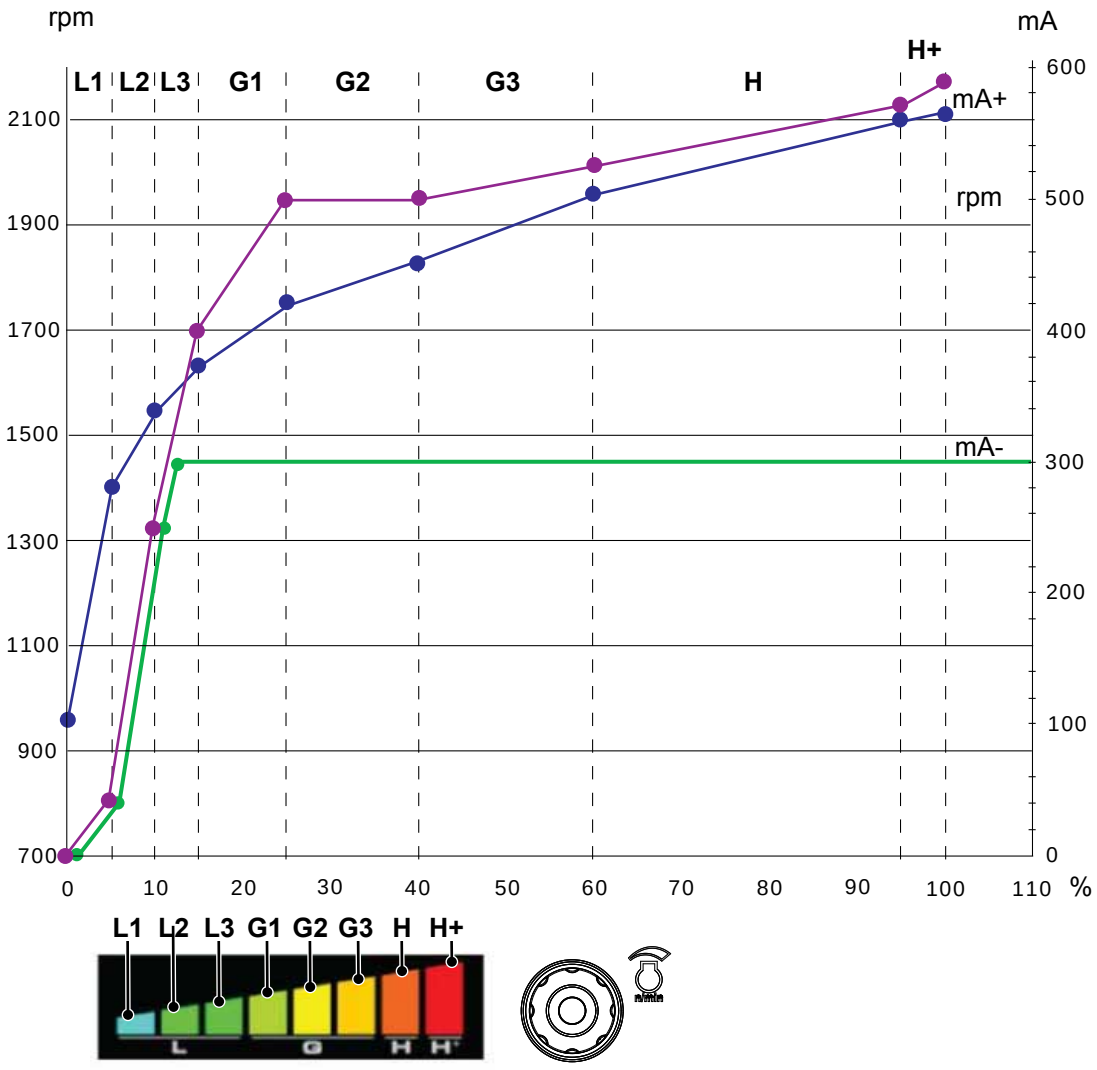
(For: JS130 [T2/3], JS145 [T2/T3])

## Power Map Data

Each machine model is mapped with the most applicable engine RPM (Revolutions Per Minute) and corresponding hydraulic pump output.

The applicable graphs show the no load engine RPM and output in mA to the pump proportional solenoid valve. The mA+ line is the output when the machine hydraulic services are operating. The mA- line shows the minimum output under maximum load. Refer to Operation (PIL (Parts Identification List) 18-00-30).

**Figure 249. JS130, JS145, T3 mechanial F.I.**



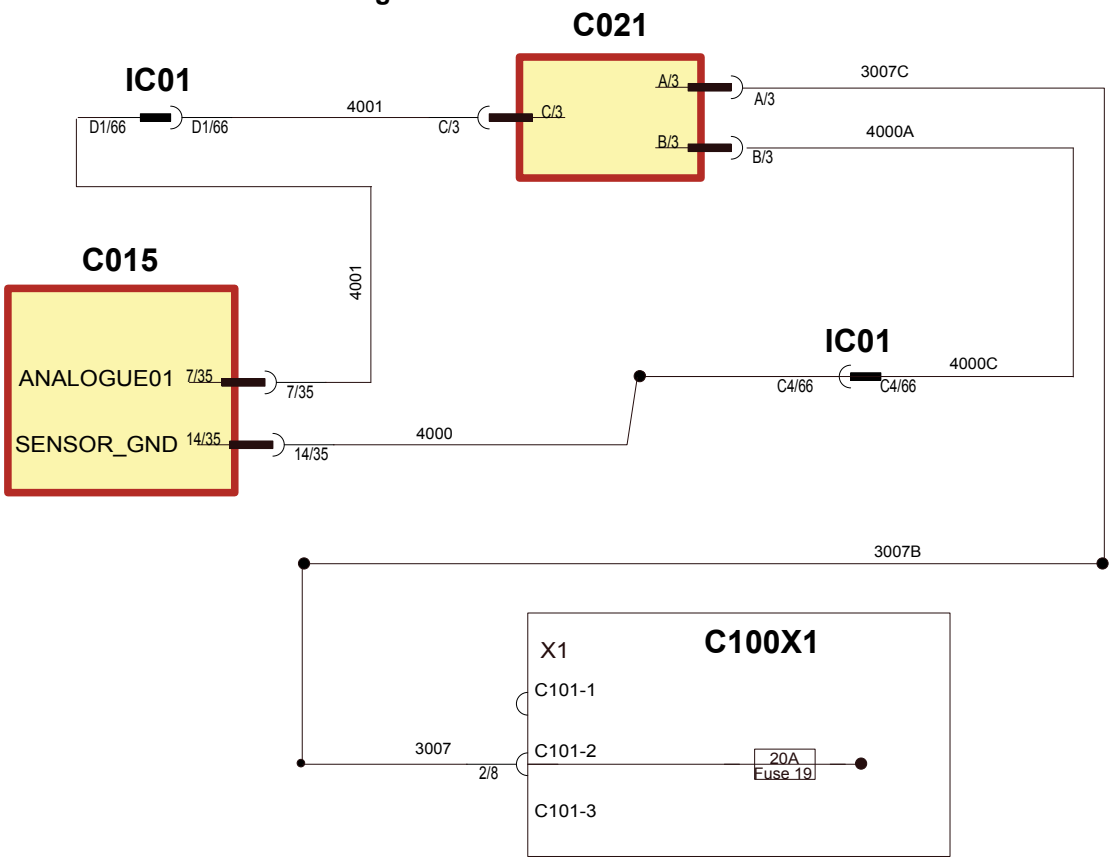

## Maximum Flow Cut

When the L1, L2 or L3 power band is selected, the maximum flow cut solenoid energises. This keeps the maximum pump flow to 60%.

For more information about the operation of the maximum flow cut solenoid refer to PIL (30-12).

## Diagram

**Figure 261. Electrical Schematic**




| | | | |
|---|---|---|---|
| **C015** | MECU (Machine Electronic Control Unit) J1 | **C021** | Fuel level sensor |
| **C100X1** | Fuse and relay PCB (Printed Circuit Board) | **IC01** | Cab and Revolver harness interconnect |

# 18 - Injection

**Contents** **Page No.**

18-18-00 General ..... 18-49
18-18-03 Injector ..... 18-57
18-18-07 Injector Seal ..... 18-60
18-18-15 Pump ..... 18-62

# Remove and Install

**Special Tools**

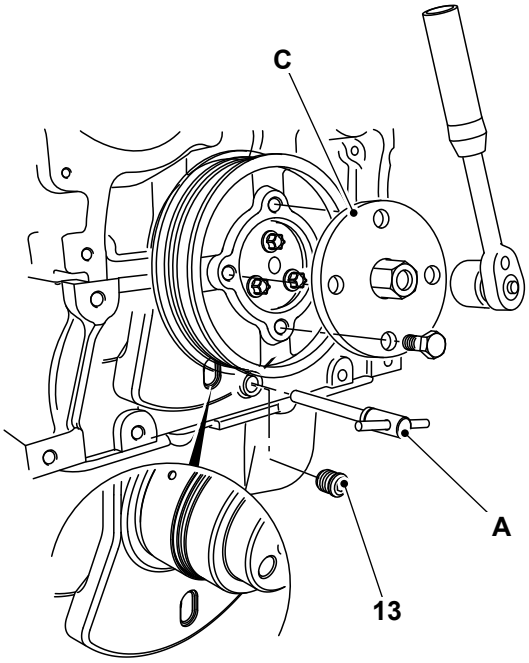
| Description | Part No. | Qty. |
|---|---|---|
| Crankshaft Turning Tool (95.25mm PCD)- JCB 4 Cylinder Ecomax and Dieselmax | 892/01147 | 1 |
| Crankshaft / Camshaft Timing Pin (444/448/672 Engine) | 892/01148 | 1 |
| Tamper proof Cover Removal Tool | 892/01154 | 1 |
| Pump Gear Removal Tool | 892/01155 | 1 |
| TDC Setting tool, Dieselmax 4 Cyl | 892/01169 | 1 |

## Remove

1. Make the machine safe, refer to (PIL 01-03).
2. Make sure the battery is isolated. Refer to (PIL 33-03-03).
3. Label, disconnect and cap all fuel lines. Make sure that no debris enter the fuel system.
4. Disconnect the electrical connectors at the shut-off solenoid.
5. Disconnect the throttle cable.
6. Install the crankshaft turning tool:

   Special Tool: Crankshaft Turning Tool (95.25mm PCD)- JCB 4 Cylinder Ecomax and Dieselmax (Qty.: 1)

**Figure 283. Install Crankshaft Turning Tool**




**A** Timing pin
**C** Crankshaft turning tool
**13** Taper blanking plug

   6.1. Remove the taper blanking plug.

   6.2. Bolt the turning tool to the crankshaft pulley.

   6.3. Locate a suitable socket and ratchet drive on the tool.

7. Set number 1 piston to top dead centre (compression stroke):

# Operation

## Automatic refill mode

When the refuelling pump switch is pressed for less than two seconds, there is an output from pin 2 to the wake up diode. A ‘wake up’ signal is sent via the diode to an input on the MECU (Machine Electronic Control Unit) at connector J1 pin 22. The DECU (Display Electronic Control Unit) turns on.

A signal is also sent to an input on the MECU at connector J2 pin 19.

The MECU monitors the fuel quantity. If the fuel quantity is at or below the pre-set ‘auto refuel percentage’ the refuelling pump relay (R5) energises through an output from the MECU at connector J1 pin 27. The refuelling pump operates.

When the fuel reaches the ‘auto refuel percentage’, the MECU will de-energise the refuelling pump relay and refuelling pump will stop.

If during automatic refuelling the fuel quantity does not increase by at least 5% within 30 min (because the source of fuel has run out or there is a blocked filter for example) the MECU will de-energise the refuelling pump relay and the refuelling pump will stop.

The MECU will not energise the refuelling pump relay if the engine is cranking or running. If the engine is started during automatic refuelling the MECU will de-energise the refuelling pump relay and refuelling will stop.

If there are active fault codes related to the fuel level sensor the MECU will de-energise the refuelling pump relay and the refuelling pump will stop.

A second short press of the fuel pump momentary switch will turn off the automatic refuelling mode and refuelling will stop.

## Manual mode

When the refuelling pump switch is pushed and held for more than 2 s the MECU sets the refuelling pump operation to manual mode.

When the refuelling pump switch is pushed and held there is an output from pin 2 to the wake up diode. A ‘wake up’ signal is sent via the diode to an input on the MECU at connector J1 pin 22. The DECU turns on.

A signal is also sent to an input on the MECU at connector J2 pin 19.

As long as the refuelling pump switch is held down the refuelling pump relay energises through an output from the MECU at connector J1 pin 27. The output remains on until the refuelling switch is released. The MECU will de-energise the refuelling pump relay and manual refuelling will stop.

If manual mode is entered from automatic mode, then automatic mode is not resumed when the refuelling pump switch is released.

## 00 - General

Introduction ..... 18-95
Check (Condition) ..... 18-96
Check (Operation) ..... 18-97

## Introduction

The turbocharger (turbo) is a turbine driven forced induction device that makes an engine more efficient and helps to produce more power for its size.

Engine exhaust gasses drive a turbine, which in turn drives a compressor via a common shaft. The shaft bearings are lubricated by a feed from the engine lubrication system.

A turbocharged engine is more powerful and efficient than a naturally aspirated engine because the turbine forces more air, and proportionately more fuel, into the combustion chamber than atmospheric pressure alone.

Some variants incorporate a wastegate assembly. A flap type valve is housed in the turbocharger body. The valve is actuated by a diaphragm type actuator via an actuator rod. When the pressure generated by the turbocharger compressor reaches a pre-set value the actuator opens the valve, some exhaust gas is diverted back to the exhaust manifold and the turbocharger turbine speed reduces. In this way the pre-set maximum boost pressure from the turbo charger is not exceeded, regardless of engine speed.

# 00 - General

Introduction ..... 21-3
Health and Safety ..... 21-4
Technical Data ..... 21-4
Component Identification ..... 21-5
Drain and Fill ..... 21-7

## Introduction

During the working cycle of the engine a great deal of heat is generated. It is important that the engine is kept at its normal operating temperature to achieve maximum efficiency. It is the function of the cooling system to allow the engine to reach this temperature quickly and then maintain it.

## 00 - General

Introduction ..... 21-19
Check (Level) ..... 21-20

## Introduction

The expansion tank maintains a positive head of coolant for the engine coolant system.

As the machine runs, the temperature of the coolant circulating around the system increases, this causes the pressure to increase in the cooling system. The expansion tank allows expansion of the coolant and prevents coolant loss.

# 21 - Inlet

**Contents** **Page No.**

21-21-00 General ..... 21-37

# Fault-Finding

**Fault**

| | | |
|---|---|---|
| Tracking not linear | Table 128. | Page 27-7 |
| Poor tractive effort | Table 129. | Page 27-7 |
| Loss of slow speed mode | Table 130. | Page 27-7 |
| Loss of fast speed mode | Table 131. | Page 27-8 |
| Defaults to fast speed mode | Table 132. | Page 27-8 |


**Table 128. Tracking not linear**

| Cause | Remedy |
|---|---|
| Main hydraulic pump fault | Test the negative control signal. Refer to (PIL 30-12) |
| | Test the pump pressures. Refer to (PIL 30-12) |
| Track drive motor fault | Check the track drive motor relief valve pressures. Refer to Check (Operation) (PIL 27-38-00) |
| | Check the track drive motor speeds (cycle times). Refer to (PIL 30-00) |
| | Fault find the track drive motors. Refer to (PIL 27-38-00) |

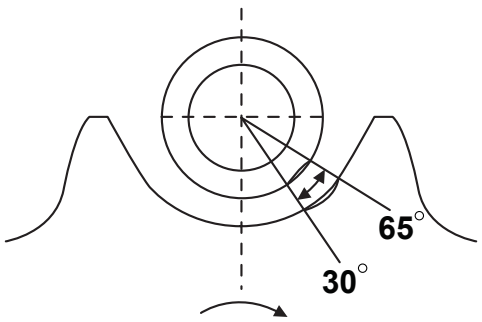
**Table 129. Poor tractive effort**

| Cause | Remedy |
|---|---|
| Main hydraulic pump fault | Test the negative control signal. Refer to (PIL 30-12) |
| | Test the pump pressures. Refer to (PIL 30-12) |
| Track drive motor fault | Check the track drive motor drain line rates. Refer to Check (Operation) (PIL 27-38-00) |
| | Check the track drive motor relief valve pressures. Refer to Check (Operation) (PIL 27-38-00) |
| | Fault find the track drive motors. Refer to (PIL 27-38-00) |

**Table 130. Loss of slow speed mode**

| Cause | Remedy |
|---|---|
| Main hydraulic pump fault | Test the maximum flow cut signal. Refer to (PIL 30-12) |
| | Check the track drive motor speeds (cycle times). Refer to (PIL 30-00) |
| Pressure switch fault | Check pressure switch operation. Refer to (PIL 33-90-00) |
| Travel speed solenoid - electrical fault | Carry out the low speed tracking test. Refer to Check (Operation) (PIL 27-38-00) |

Figure 355.

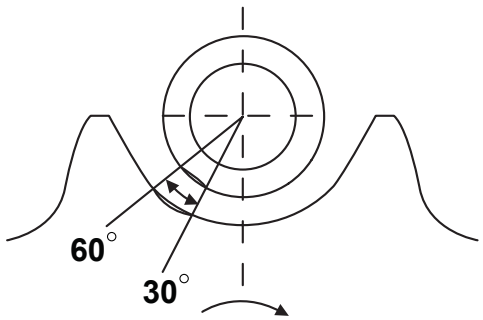



**Forward Side Drive Wear**

When the machine operates in forward travel direction the bush wears at its mating face with the gearbox sprocket between 30 –60 ° from vertical as shown. Excessive wear can cause cracks in the bush. Internal wear in the same position can cause the bush to wear completely through.

Measure the bush external wear status. Measure the track pitch. Check the track chain tension.

Figure 356.



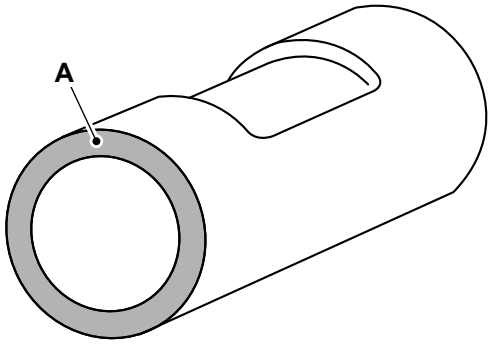

**End Wear**

The ends of the bushes are worn. Typically caused by abrasive material between the bush and the seals or high side loading from frequent traversing the side of steep slopes.

Check the shoe plate width is compatible with the operating environment.

When turning the bushes for extended service life, lubrication sealing may be defective.

Figure 357.

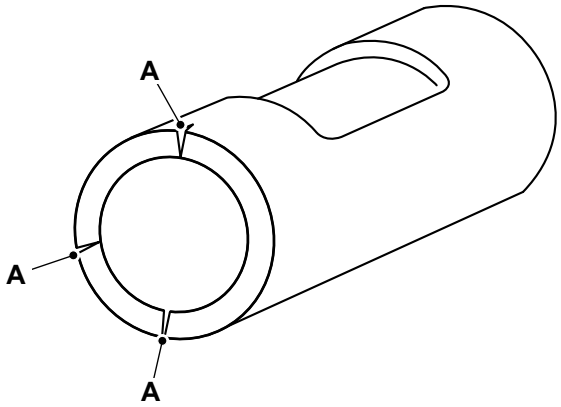



**A** Wear

**End Cracks**

The ends of the bushes have cracks. Typically cased by impact with the counterbore due to internal wear or track snaking. Repair not recommended.

Figure 358.




**A** Cracks

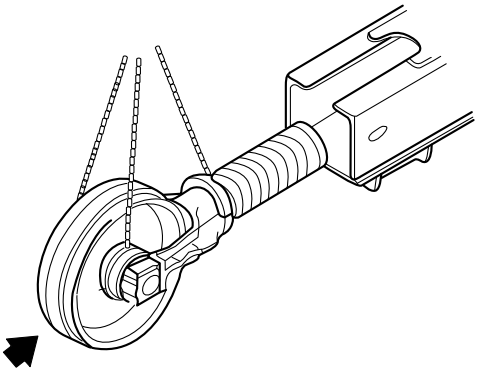
**Counterbore Wear**

The bush is worn at the ends of the outer diameter on its reverse drive side. This is caused by internal wear. As the pitch increases the bushes wear against the track links on the reverse drive side.

Check the track pitch.

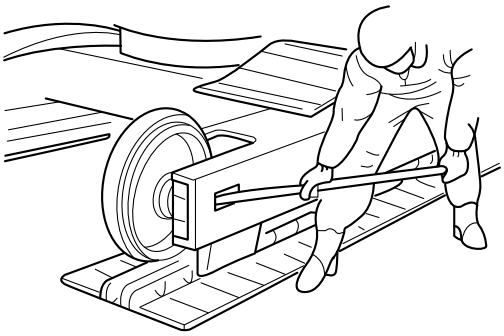
When turning the bushes for extended service life, lubrication sealing may be defective.

Figure 395.



3. Position the idler wheel in the undercarriage using a bar.

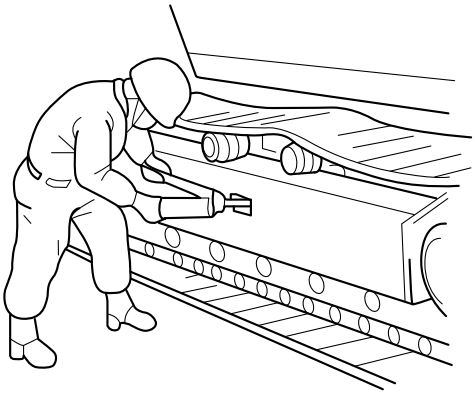
Figure 396.



4. Connect the track link. Apply grease through the check valve to adjust the track tension.

Refer to: PIL 27-36-03.

Figure 397.

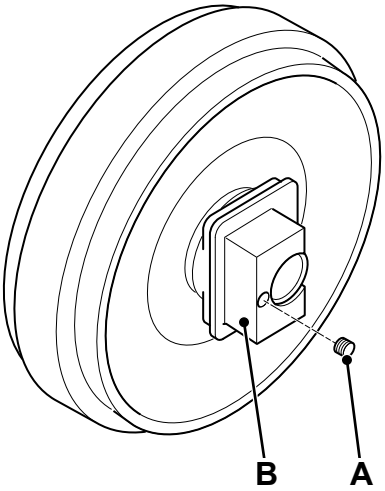


# Disassemble and Assemble

## Disassemble

1. Clean the idler wheel with a suitable solvent. Remove the plug from the hub and drain the oil.

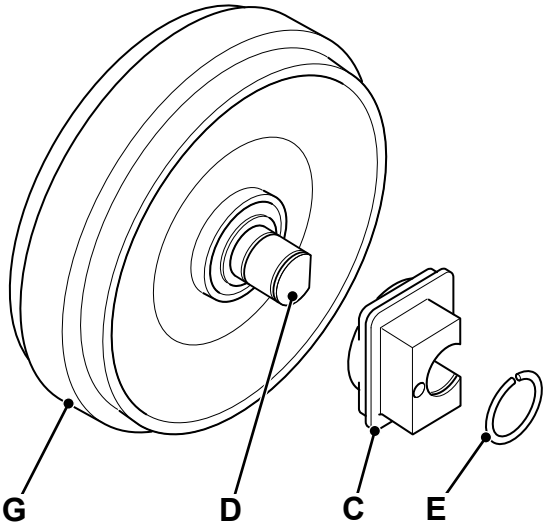
Figure 398.




**A** Plug
**B** Hub

2. On one side of the unit only, remove the wire clip or roll pin (later machines) and separate the hub from the shaft.

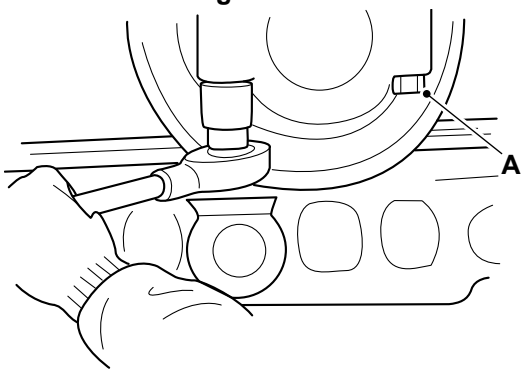
Figure 399.




**C** Hub
**D** Shaft
**E** Wire clip
**G** Idler wheel

3. Remove the O-ring from the shaft. Pull out the shaft from the idler wheel.

Figure 440.




**A** Bolt

5. Apply grease through the check valve to adjust the track tension.

   Refer to: PIL 27-36-03.

Figure 441.

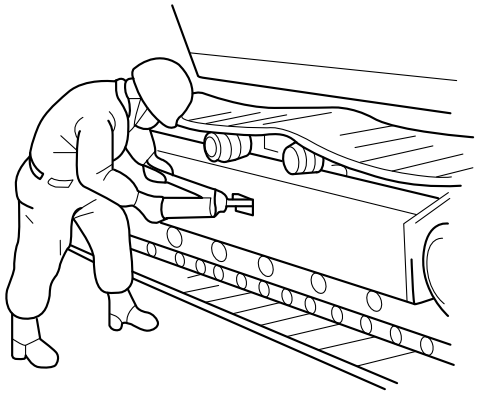


Table 142.

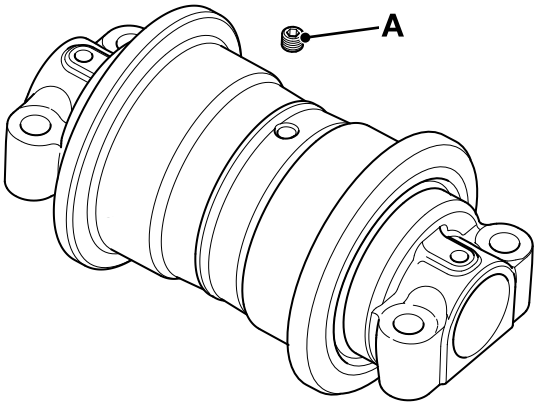
| Item | Bolt Size | Torque N·m |
|---|---|---|
| A | M12 | 104 |
| A | M16 | 290 |
| A | M18 | 400 |
| A | M20 | 506 |

# Disassemble and Assemble

## Disassemble

1. Clean the roller with a suitable solvent. Remove the plug and drain the oil.

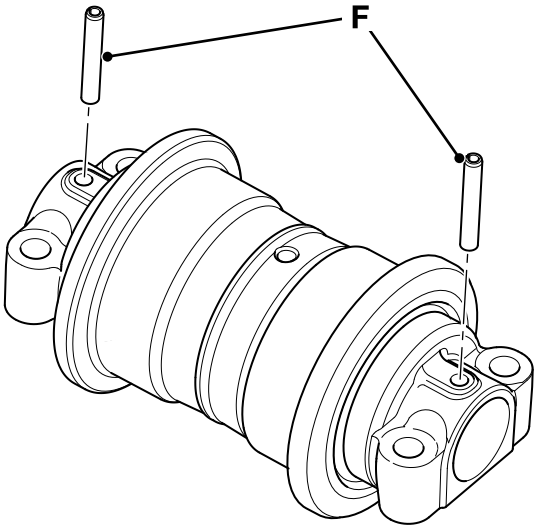
Figure 442.




**A** Plug

2. Remove locking pins from each end of assembly.

Figure 443.




**F** Pin

3. Remove the mounting brackets from the shaft.
4. Using a pry bar, remove the floating seals from the brackets and discard.

- The check valve which will allow full flow to the spool end. This is the normal path for the oil to take.

The counterbalance spool is selected at 8.4 –12.4 bar ( 121.7 –179.7 psi) which in turns diverts the flow of oil to the track motor in two directions as follows:

- Oil can flow over the spool and direct to the motor. This is also available to the motor ARV and the two speed travel spool that is in the neutral position. Once the brake is lifted the motor will start to turn.
- Also diverted to the track motor brake via a restrictor.

If the pressure in the brake rises to 14 bar ( 202.9 psi) the brake is released. This flow of oil also crosses the brake piston and is available at the end of the two speed travel spool and along with the assistance of a spring, holds the two speed spool in the low speed position. With the two speed spool in this position the swash plate angle piston head is vented to the tank port and the motor stays on maximum displacement. (low speed).

Once the pressure rises to 343 bar ( 4,971.0 psi) the motor'sARVs will open and allow excess pressure to be exhausted to the return side. The ARVs are of the shockless type to reduce harsh starting and stopping. When travel is deselected by the driver the P2 port loses pressure. Pressure is also lost to the end of the counterbalance spool which is cushioned to reduce the shock when stopping. The cushioning is achieved by the check valve trapping the pressure at the spool end and only allows it to vent through the restrictor, allowing the counterbalance spool to return slowly. Returning oil from the motor is slowly blocked in its path to tank and as the back pressure rises, braking occurs.

Once the counterbalance spool is in the neutral position any additional pressure within the motor due to inertia (motor pumping function) above 343 bar ( 4,971.0 psi) is relieved through the ARV and is fed back to the opposite side to prevent cavitation. The pressure in the brake piston is also released slowly due the restrictor in the brake line restricting the flow, so the brake remains off initially to allow the motor to stop by hydraulic breaking, to protect the brakes components from damage.

## Remove and Install

**Consumables**

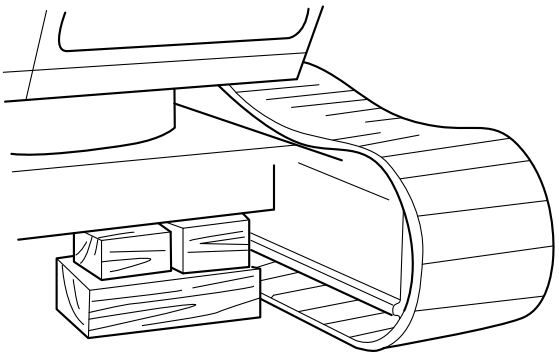
| Description | Part No. | Size |
|---|---|---|
| JCB Threadseal | 4102/1951 | 0.05 L |

The track drive motor is removed and installed complete with its gearbox and sprocket.

### Remove

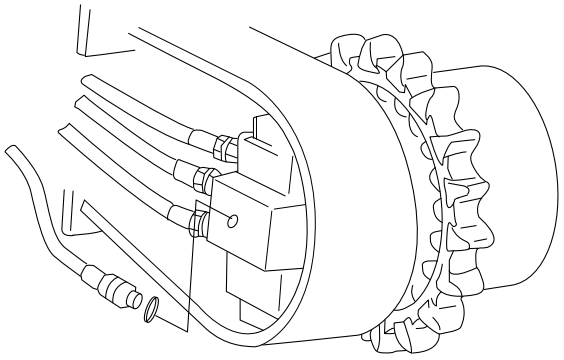
1. Remove the applicable track.
   Refer to: PIL 27-36-03.
2. Lift the side of the undercarriage high enough to permit drive sprocket removal. Support with wooden blocks. Refer to Figure 473.

**Figure 473.**



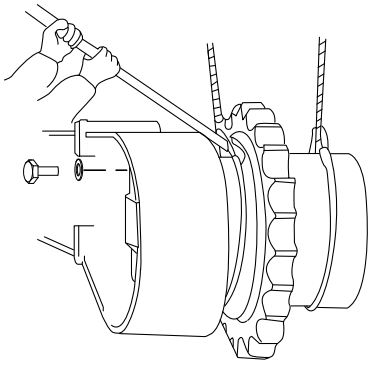
3. Discharge the pressure in the hydraulic system.
   Refer to: PIL 30-00-00.
4. Remove the track drive motor cover, attach identification tags to the motor hoses, disconnect the hoses from the motor and install plugs and caps to prevent the loss of oil and ingress of dirt.

**Figure 474.**



5. Use suitable lifting equipment to support the track drive motor, then remove the motor installation bolts.
6. Use the lifting equipment to remove the track motor from the machine.

**Figure 475.**



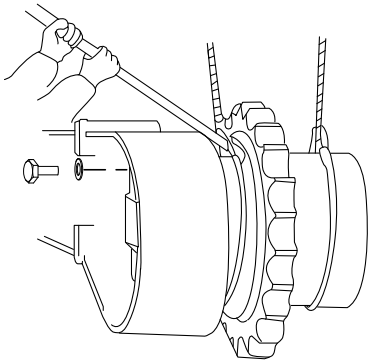
### Install

Before installation of the track drive motor do the following:

- Check the overall condition of the track drive motor.
- Check for loose parts.
- Check than all hydraulic ports are completely sealed so that contaminants cannot enter the axial piston.
- Clean the track drive motor and gearbox assembly.

1. Use the lifting equipment to position the track drive motor assembly on the undercarriage.

**Figure 476.**



2. Install the bolts and washers, using sealant on the bolt threads.
   Consumable: JCB Threadseal

## Store and Recommission

Before operating a track drive motor after installing, proceed as follows.

### Start-Up

1. Remove the hose from the drain port.

   Refer to: PIL 27-38-00.

2. Fully fill the motor case with clean hydraulic oil at the drain port.
3. Bleed air from each part of the piping.
4. Make sure all hoses are correctly installed.
5. Check hydraulic fluid level, top up if necessary.

   Refer to: PIL 30-03-00.

6. Check the track motor gearbox oil level.

   Refer to: PIL 30-08-03.

7. Start the track motor at a low speed and gradually increase it after having verified that it is functioning correctly without any noises or vibrations.

   7.1. The presence of residual air in the hydraulic circuit will manifest itself with the presence of foam in the tank and will lead to a jerking of the motor as well as excessive noise coming from the motor and the valves.

### Running In

During the running-in stage follow the steps as follows:

1. Check the correct revolution and direction of rotation.
2. Make sure that the motor is functioning correctly, with out any excessive noises and vibrations.
3. Make sure that the oil temperature does not exceed the specified value.

   Temperature: 90 °C ( 193.9 °F)

After having completed this first running-in, follow the steps as follows:

1. Check that there are no oil leaks.
2. Check the track motor gearbox oil level.

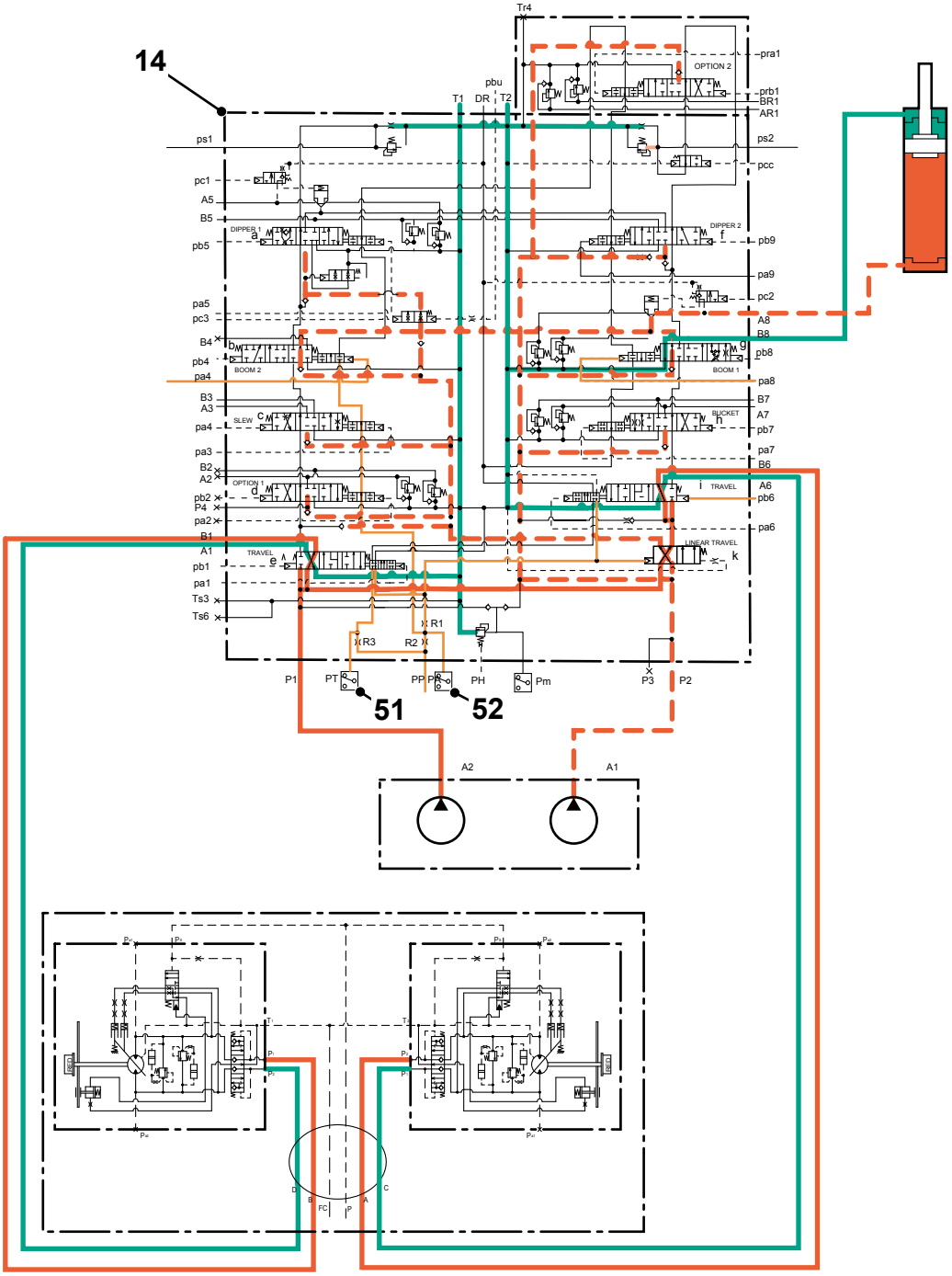
   Refer to: PIL 30-08-03.

3. The opening action of the track drive motor park brake could be slowed down due to the presence of air during the first start-up. It is advised to repeat the opening and closing function of the brake by starting and stopping the motor several times.
4. Check that track drive motor and the park brake operate correctly in all modes.

## Straight line travel

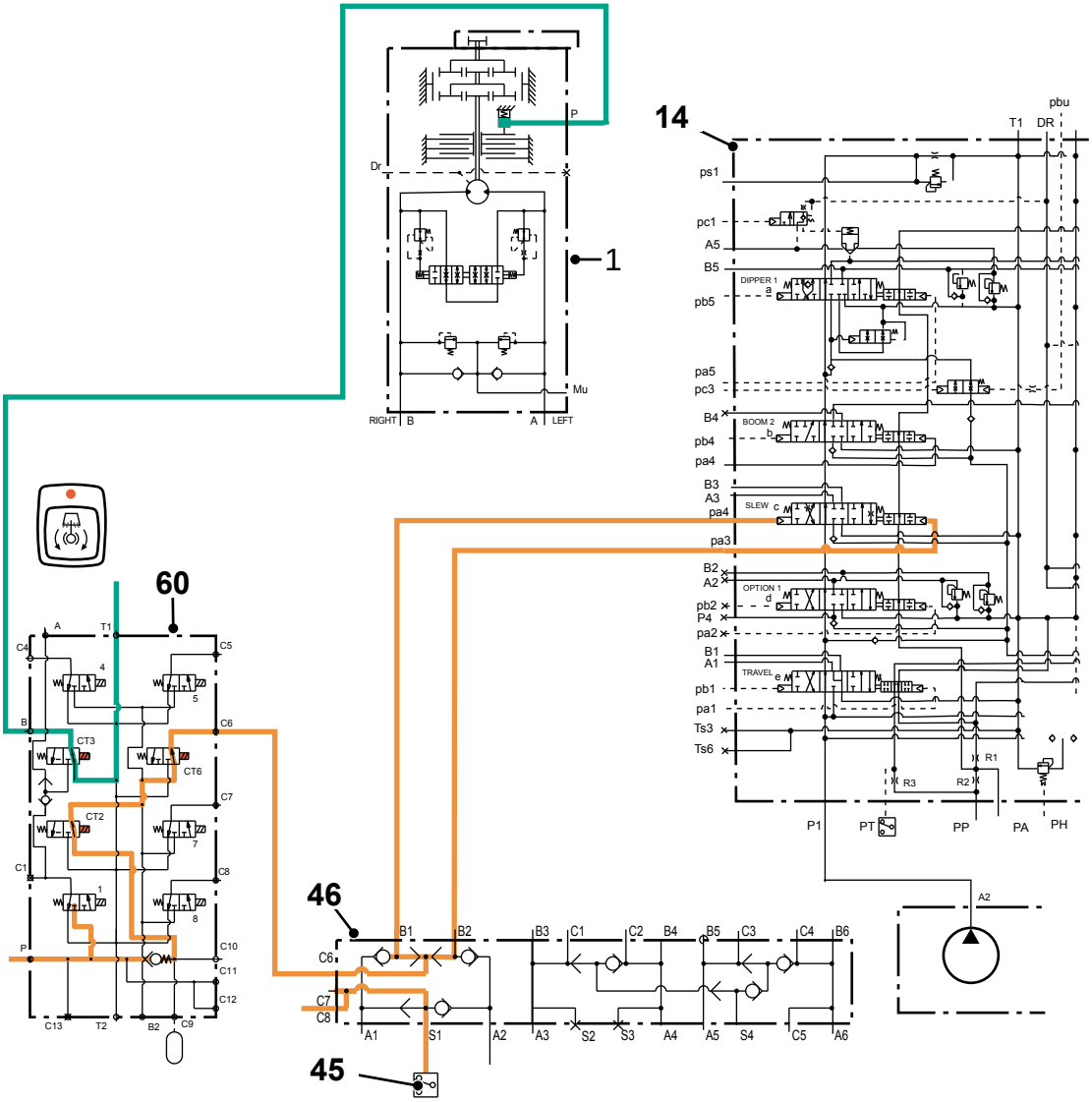
Servo pressure entering at port Pp on the main control valve is blocked from the tank port by the travel spools and the boom2 spool, this causes back pressure which selects the travel and excavator pressure switches and selects the linear travel spool.

**Figure 552. Hydraulic schematic - straight line travel**




**14** Main control valve
**52** Excavator pressure switch
**b** Boom2 spool
**d** Option spool
**f** Dipper2 spool
**h** Bucket spool
**51** Travel pressure switch
**a** Dipper1 spool
**c** Slew spool
**e** Travel (left) spool
**g** Boom1 spool
**i** Travel (right) spool

**Figure 561. Hydraulic schematic - 100% slew lock**




**14** Main control valve
**46** Shuttle valve
**c** Slew spool
**CT3** Slew lock solenoid valve
**45** Slew pressure switch
**60** Servo system control valve block
**CT1** Slew brake solenoid valve
**CT6** Slew shut off solenoid valve

The slew brake solenoid valve is de-energised as soon as the slew lock button is pressed.

The slew lock solenoid valve is energised either, 5 s after the button is operated, or 5 s after the slew pressure switch opens, depending on which is last to operate. This allows the slew to come to a standstill on the cross line relief valves, before the brake is applied.

# Component Identification

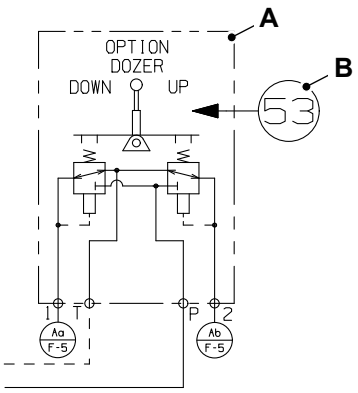
The hydraulic schematics represent the complete machine hydraulic system. For this reason they can seem complex. The following explains how to identify hydraulic components and connections on the schematics.

## Components

Hydraulic components are shown using symbols. The symbols conform to a common standard. Refer to: PIL 30-00-49.

A description for each component is linked to a numerical annotation.

**Figure 577.**



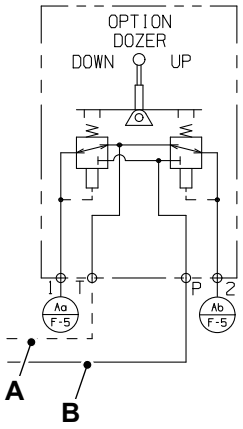

**A** Hydraulic component symbol
**B** Numerical annotation

## Hydraulic Lines and System State

The hydraulic components are connected by hydraulic lines. In reality these are usually hoses or pipes. These are shown by the use of continuous lines or dashed lines.

The hydraulic system is shown in its neutral state (no services operating) with the engine, and therefore the hydraulic pumps, running. Continuous lines show where there is system pressure and dashed lines show where lines are connected to tank.

**Figure 578.**




**A** Hydraulic line - connected to tank
**B** Hydraulic line - system pressure

## Grid Reference

Each schematic sheet has a grid. A grid reference is used to identify the applicable location zone on the sheet in a similar way to a map reference.

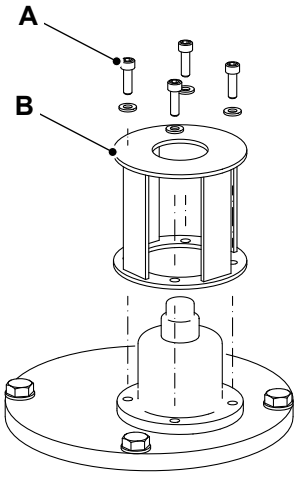
To reduce complexity some hydraulic lines are not shown. Instead a code is given together with a grid reference for the destination of the hydraulic line.

Where the destination is on a different sheet the sheet number is also given.

## Remove and Install

1. Make the machine safe.
   Refer to: PIL 01-03.
2. Discharge the hydraulic pressure.
   Refer to: PIL 30-00-00.
3. Get access to the hydraulic tank breather.

**Figure 585. Breather cover**



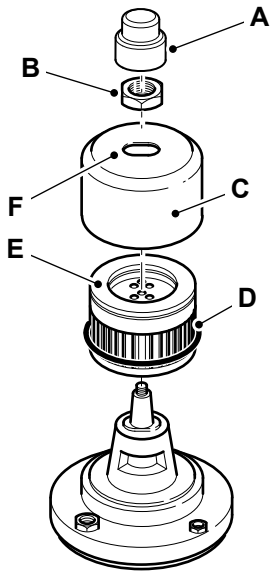

**A** Screw
**B** Breather cover

3.1. Remove the four screws followed by the breather cover (if installed)

3.2. Temporarily install the four screws.

4. Replace the hydraulic tank breather element.

**Figure 586.**




**A** Rubber boot
**B** Locknut
**C** Filter cover
**D** Breather element
**E** Sponge packing
**F** Cover slot

4.1. Remove the rubber boot, locknut and filter cover.

4.2. The cover will only fit in one of two positions by means of the cover slot. The slot locates over a similar shaped protrusion on the mounting stud.

4.3. Remove the old element together with the sponge packing.

4.4. Replace the old element, with a new one.

4.5. When you install the new element place the sponge packing on the element.

5. Install the filter cover.

5.1. Adjust the cover so that it fits over the stud, and install the locknut and the rubber boot.

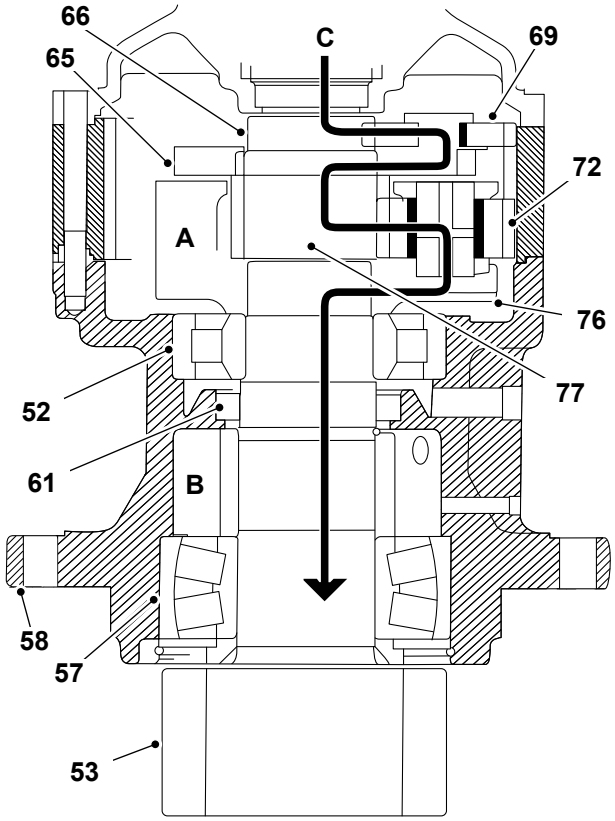
6. Install the breather cover (if applicable).

## Operation

Power transmitted by the hydraulic motor output shaft is transmitted to the second sun gear through the first sun gear, planetary gear 1 and the holder 1. Power is then transmitted to the output shaft through the second sun gear, the planetary gear 2 and the holder 2. The output shaft is constructed with an integral pinion and is supported in the gear case by bearing 1 and bearing 2.

Due to the severe conditions under which the output shaft operates, an oil seal is provided in the centre of the gear case to protect the bearings from metal waste worn from the gears. The bearing in the chamber is lubricated with gear oil and the bearing in the chamber with grease

**Figure 598.**




**52** Bearing 1
**53** Output shaft
**57** Bearing 2
**58** Gear case
**61** Oil seal
**65** Holder 1
**66** First sun gear
**69** Planetary gear 1
**72** Planetary gear 2
**76** Holder 2
**77** Second sun gear

**A** Chamber
**B** Chamber
**C** Torque path

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Disassemble and Assemble ..... 30-114

## Introduction

The variable displacement pump is mounted to the engine by a flange. It is driven by the engine via an inner coupling mounted to the engine flywheel. The coupling drives the pump drive shaft.

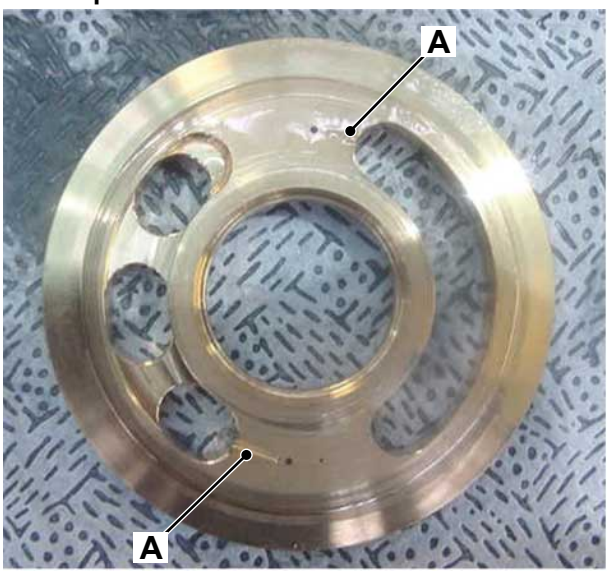
The pump is a variable displacement axial piston type. The pump output flow is controlled by varying the angle of the internal tilting swash plate mechanism. The angle of the swash plate is controlled by a hydraulic regulator unit. The regulator unit responds to hydraulic pilot signals from the machine hydraulic and electrical control systems.

The pump consists of two separate piston pump and regulator assemblies. The two pumps are mounted in tandem and driven by the same drive shaft. Output from the two pumps can be controlled independently.

A small fixed displacement gear pump is mounted on the end of the pump body and is driven by the pump drive shaft. The gear pump provides oil for the machine servo pilot control circuit. A pressure relief valve is mounted in the pump body which controls the maximum servo pressure.

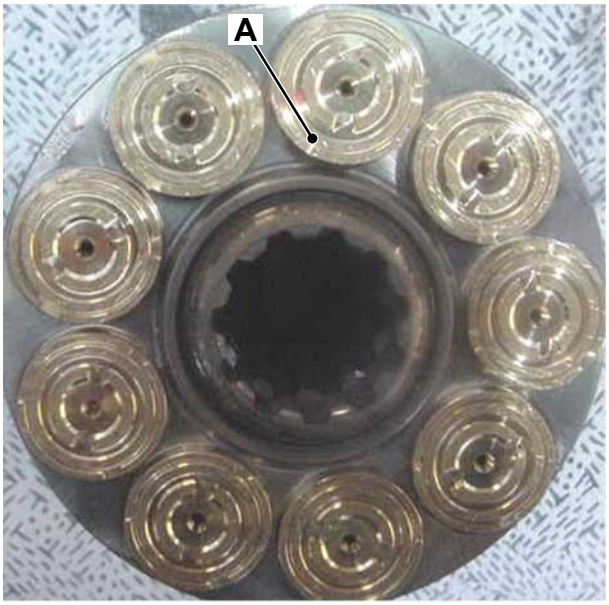
On some pumps the pump drive shaft can also drive a PTO (Power Take-Off) gearbox mounted on the pump body. Typically this is for operation of a gear pump. The pump supplies oil to an optional low flow hydraulic circuit.

**Figure 642. Example of valve plate defect due to contamination**




**A** Scoring

**Figure 643. Example of piston shoe defect due to contamination**




**A** Scoring

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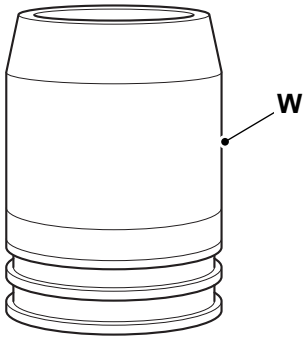
## Introduction

A hydraulic cylinder ram is a mechanical actuator that is used to give a unidirectional force through a unidirectional stroke. It is used in many applications, the cylinder gets the power from pressurised hydraulic oil. The hydraulic cylinder consists of a cylinder barrel, in which a piston connected to a piston rod moves back and forth.

The barrel is closed on one end by the cylinder cap and the other end by the cylinder head where the piston rod comes out of the cylinder. The piston has sliding rings and seals. The piston divides the inside of the cylinder into two chambers, the bottom chamber (cap end) and the piston rod side chamber (rod end / head end).

8. Carefully attach the slipper seal insertion tool onto the piston. Refer to Figure 692.

**Figure 692.**




**W** Tool (slipper seal insertion)

8.1. Make sure that the slipper seal insertion tool is free from damage.

8.2. Burrs or marks on the tool may damage the seals and cause leakage. Carefully check the outside surface of the tool for defects.

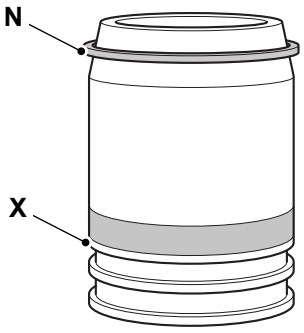
9. Use the slipper seal insertion tool to install a new slipper seal into the piston groove. Refer to Figure 693.

9.1. Heat the slipper seal to the specified temperature.

Temperature: 200 °C ( 391.7 °F)

9.2. Be careful not to scratch the slipper seal surfaces when you install it.

**Figure 693.**

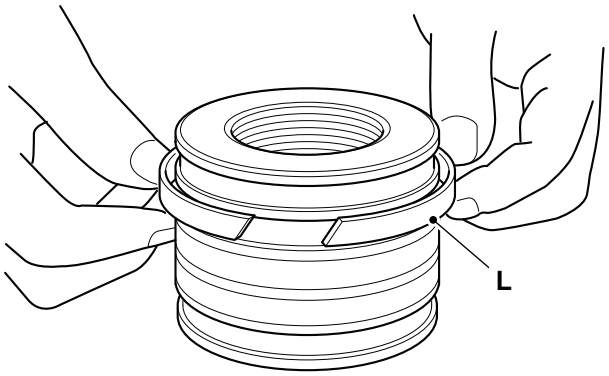



**N** Slipper seal
**X** Slipper seal groove

10. Install a new top back-up ring onto the piston.

11. Install new wear rings onto the piston grooves. Refer to Figure 694.

**Figure 694.**

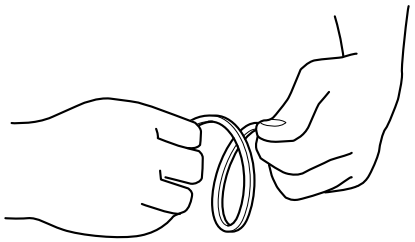



**L** Wear ring

12. Install new slide rings onto the piston grooves.

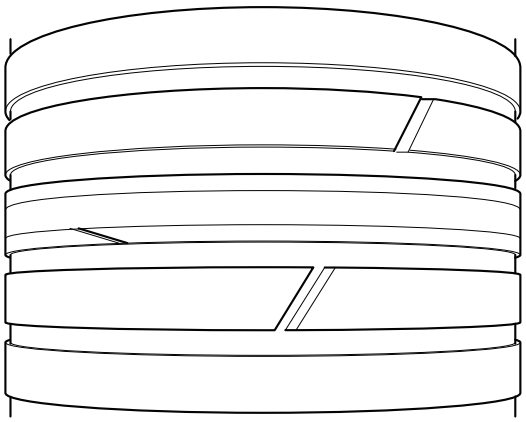
12.1. Twist the slide rings before you install them. Refer to Figure 695.

**Figure 695.**



13. Make sure that the wear and slide rings slits are not aligned each other. Refer to Figure 696.

**Figure 696.**

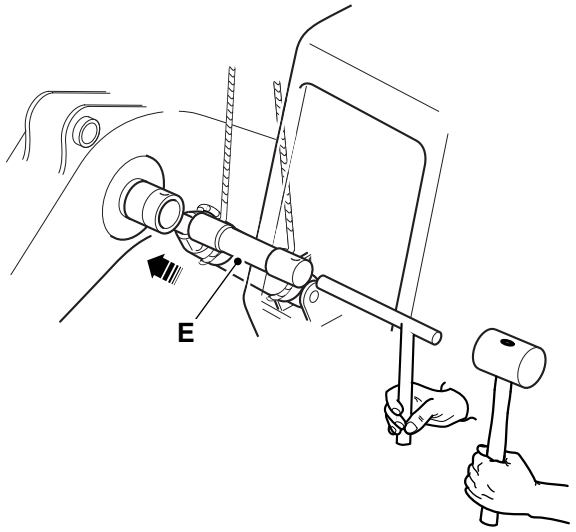


14. Check that the assembly tools are free from defect. Clean tools before starting. Clean cylinder head before assembly. Check that grooves are clean and not damaged.

15. Locate a new bush to cylinder head and push into place using a press. Refer to Figure 697.

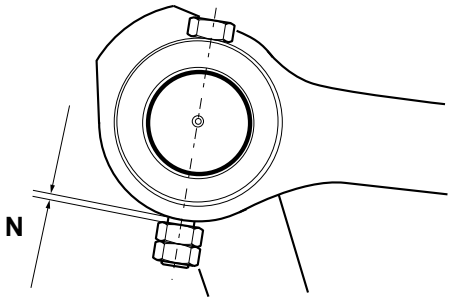
16. Fit the bush retaining ring.

**Figure 753.**




**E** Pivot pin (piston rod end)

**Figure 754.**




**N** 3 mm

7. Connect the grease tube.
8. Operate the boom ram to bleed air.
   8.1. Check the boom ram for oil leakage.

## 00 - General

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## Introduction

The hydraulic oil cooler consists of an air blast radiator matrix.

The hydraulic oil cooler is part of the cooling system cooling pack. Refer to: PIL 21-03.

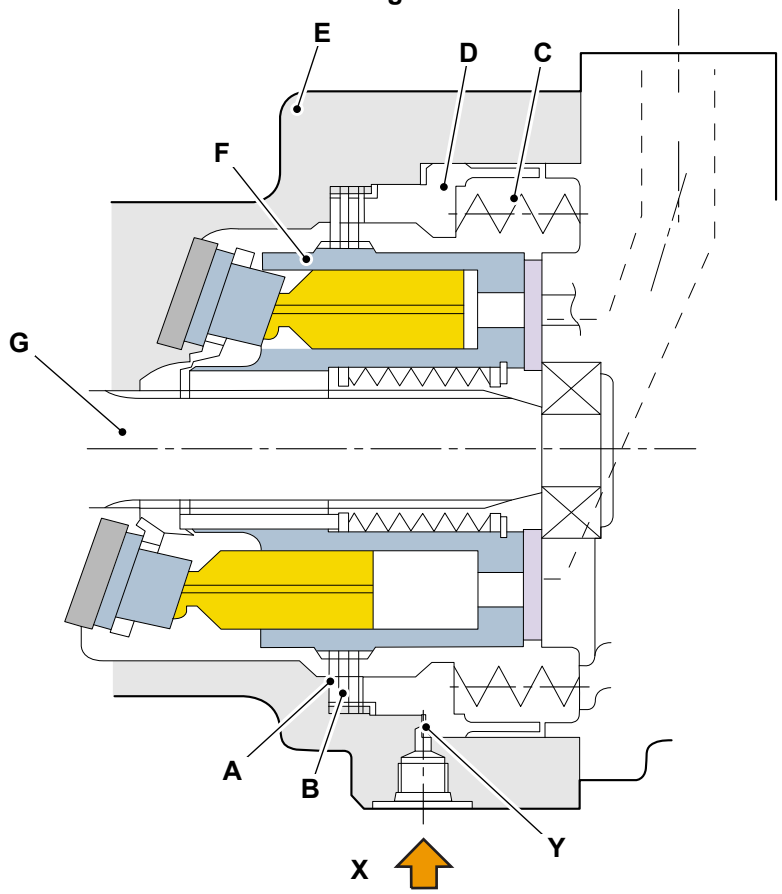
## Slew Brake

The cylinder block is splined to the output shaft. Two friction plates are splined to the outer edge of the cylinder block and are interleaved between three counter plates which are fixed to the slew motor casing.

The brakes are applied when the hydraulic pressure at port X is zero. Spring pressure forces piston down to press the friction plates and the counter plates together, thereby locking cylinder block and casing and preventing rotation.

The brakes are released when hydraulic pressure is applied to port X. Oil enters the chamber and pushes brake piston up, against the pressure of spring, to release the previously locked friction plates and counter plates. Cylinder block is now free to rotate within casing.

**Figure 800.**




**A** Friction plates
**B** Counter plates
**C** Spring
**D** Piston
**E** Casing
**F** Cylinder block
**G** Drive shaft
**X** Port X
**Y** Chamber

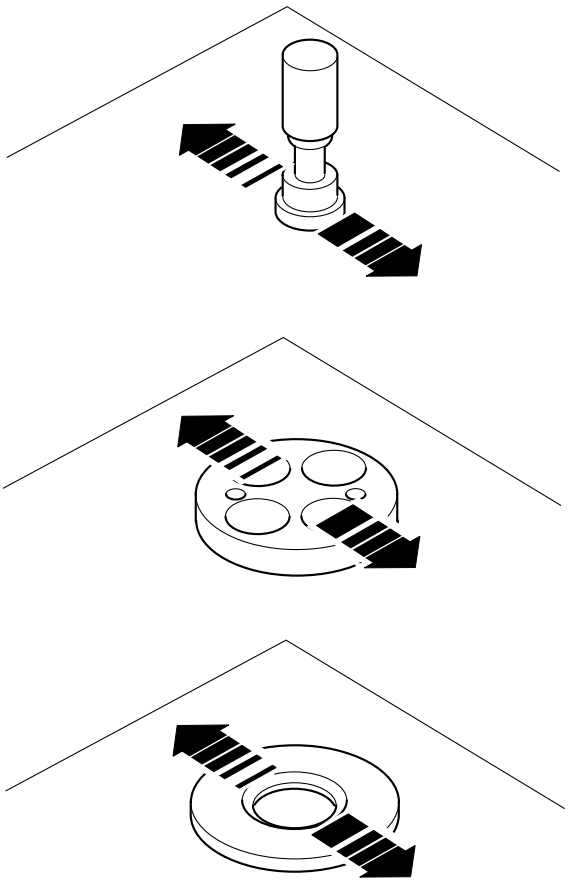
The function of the slew brake is to operate as a slew park brake. When the operator de-selects the slew function the slew motor cross line relief valves operate to bring the slew motion to a stop. The swing brake does not operate until the slew motion stops.

The slew brake releases automatically when the operator selects the slew function.

When the slew function is de-selected the slew pressure switch (C080) opens. The MECU (Machine Electronic Control Unit) keeps the slew brake solenoid (C053) energised for a further 5 seconds, sufficient time for the slew motion to stop. The MECU then de-energises the slew brake solenoid. Hydraulic pressure in the slew brake is released and the slew brake is applied.

When the operator selects the slew function the slew pressure switch closes. The input at connector J2, pin 14 on the MECU connects to earth. The MECU responds with a 24V output at connector J2 pin 13

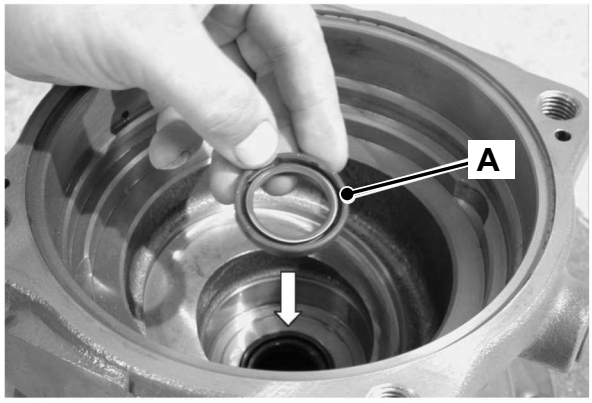
**Figure 837.**



4.1. Use fine paste to lap the sliding contact faces of the piston assemblies, balance plate and swash plate together.

5. Install a new sealing ring into its seat in the motor housing. Use a drift and soft faced hammer to tap the seal against the seat shoulder.

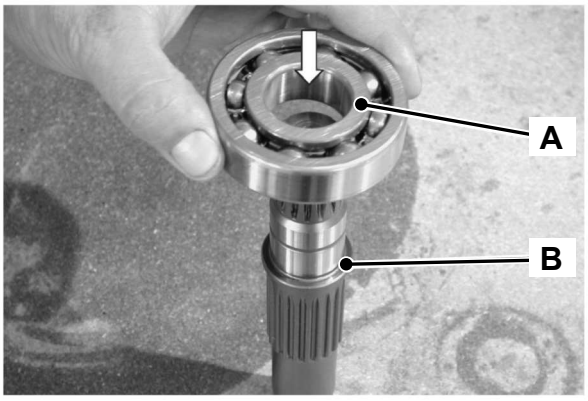
**Figure 838.**




**A** Seal ring

6. Position the bearing on the motor shaft and use a hollow drift and soft faced hammer to seat it on the motor shaft shoulder.

**Figure 839.**

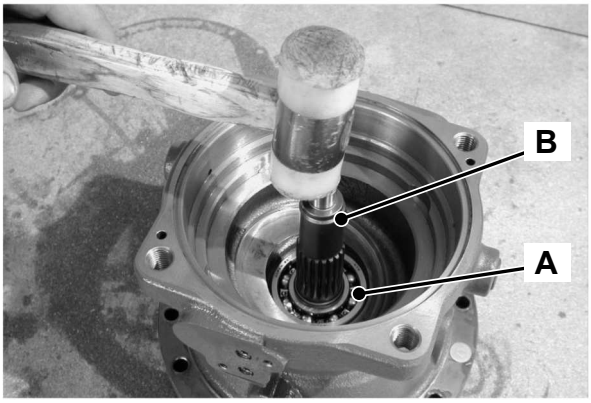



**A** Bearing
**B** Motor shaft

7. Before inserting the motor shaft into the motor housing, make sure that the sealing ring is well lubricated.

8. Insert the motor shaft and bearing assembly into the motor housing. Use a soft faced hammer to push the assembly against the housing shoulder

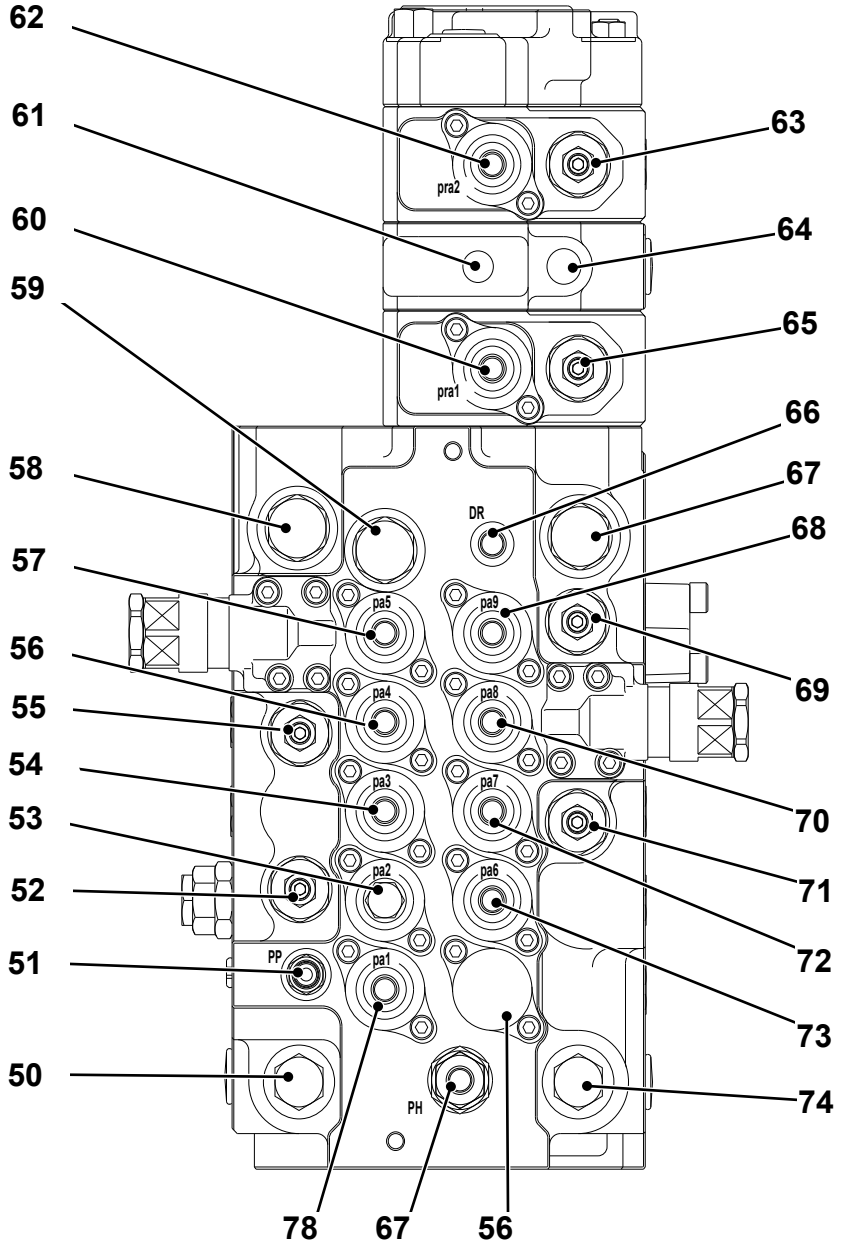
**Figure 840.**




**A** Bearing
**B** Motor shaft

9. Install the thrust plate into the motor housing

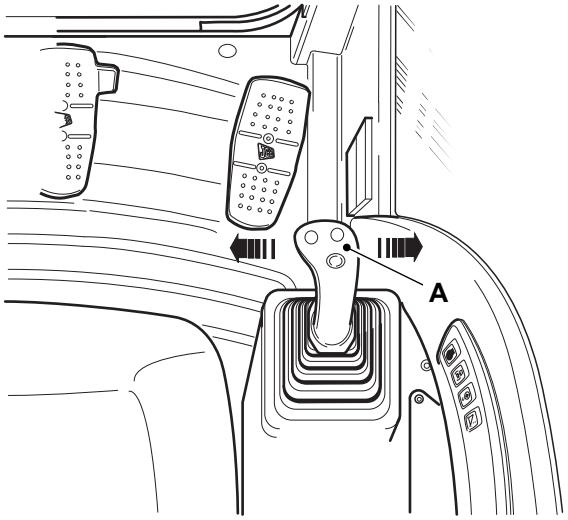
**Figure 879. Main control valve viewed from front of machine**




**50** MRV check valve
**51** Pressure switch feed (PP)
**52** ARV option
**53** Option (pa2)
**54** Slew spool (pa3)
**55** ARV dipper out
**56** Boom 2 spool (pa4)
**57** Dipper out spool (pa5)
**58** P1 negative control valve
**59** Dipper regeneration spool
**60** Option (pra1)
**61** Option feed
**62** Option spool (pra2)
**63** ARV option
**64** Blank
**65** ARV option
**66** Drain line (DR)
**67** P2 negative control valve
**68** Dipper 2 out spool (pa9)
**69** ARV boom up
**70** Boom 1 spool (pa8)
**71** ARV bucket
**72** Bucket (pa7)
**73** Travel (pa6)
**74** MRV check valve
**75** Linear travel spool
**76** MRV (PH)
**77** Travel (pa1)

4.2. Open the bucket fully and then continue to operate the control lever1 fully to the right.

**Figure 900.**




**A** Control lever

4.3. The pressure gauge reading (bucket open) should be compared to the technical data for the applicable hydraulic system. If it is more than the limits, adjust the ARV.

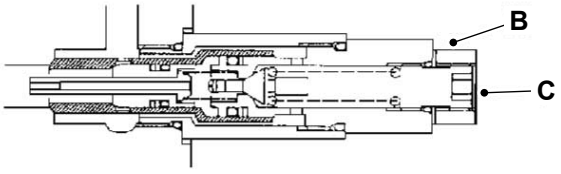
4.4. Close the bucket fully and then continue to operate the control lever1 fully to the left.

4.5. The pressure gauge reading (bucket closed) should be compared to the technical data for the applicable hydraulic system. If it is more than the limits, adjust the ARV.

5. For accurate pressure setting, the pressure should be adjusted up to the required level.

5.1. Release the lock nut.

**Figure 901.**




**B** Lock nut
**C** Setting screw

5.2. Adjust setting screw to a pressure below the required level and then bring the pressure back up for final setting.

5.3. Tighten the lock nut.

6. Restore original MRV pressure.

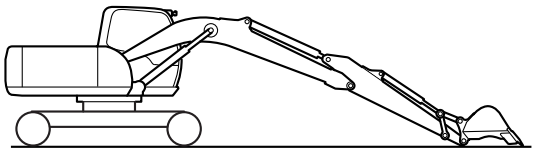
Refer to: PIL 30-50-03.

**Auxiliary relief valve (mono boom) (optional)**

1. Prepare the machine.

1.1. Operate the dipper out and lower the boom to set the bucket on the ground.

**Figure 902.**

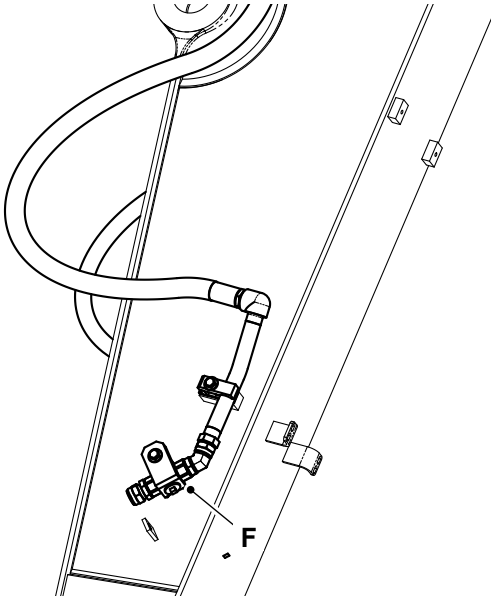


1.2. Make the machine safe.

Refer to: PIL 01-03.

1.3. For machines with shut-off valves, close the shut-off valve (x2) on the dipper.

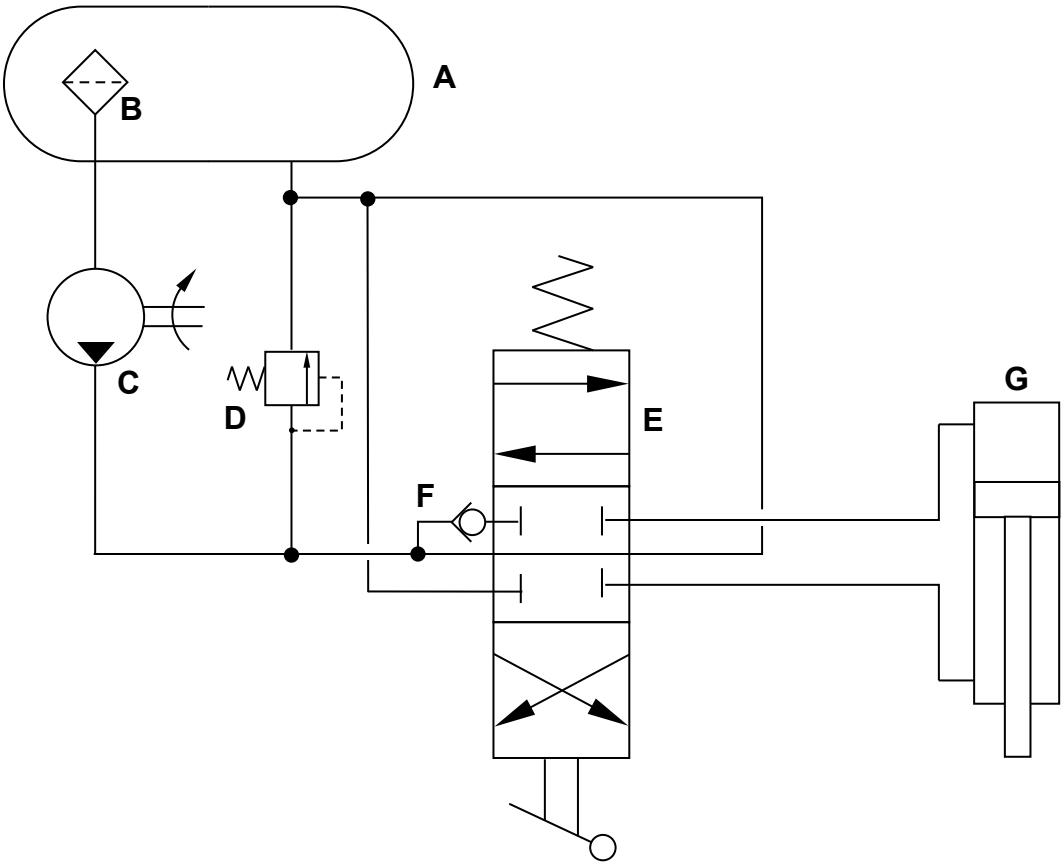
**Figure 903.**




**F** Shut-off valve

1.4. For machines without shut-off valves or quick release couplings, install the caps (x2) to the option pipes on the dipper.

**Figure 916. Simple Schematic Circuit Example**




**A** Hydraulic tank
**B** Strainer
**C** Fixed displacement pump
**D** Relief valve
**E** Spool
**F** One way valve
**G** Double acting hydraulic ram

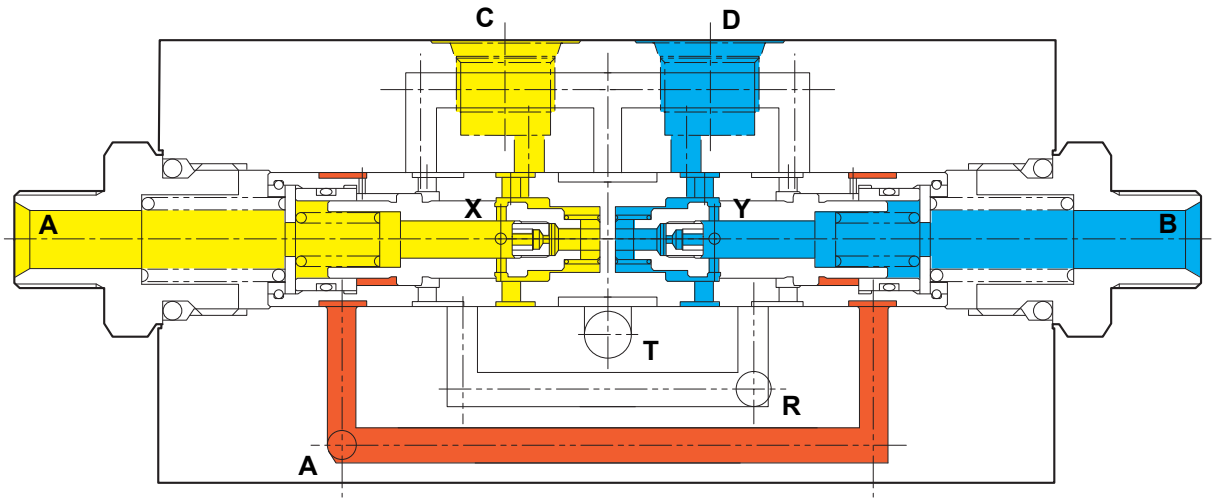
Some of the symbols described on the preceding pages have been arranged into a simple schematic circuit.

The hydraulic tank is a pressurised tank with an internally mounted strainer on the suction line to the fixed displacement pump. System pressure is limited to the setting of relief valve.

The valve spool is an open-centre spool that is in neutral position; flow from the pump passes through the spool and returns to the hydraulic tank.

If the lever operated spool is moved away from neutral position hydraulic fluid is directed to either head side or rod side of hydraulic ram. Notice that the fluid must first open one way valve before flowing to the ram.

**Figure 927.**

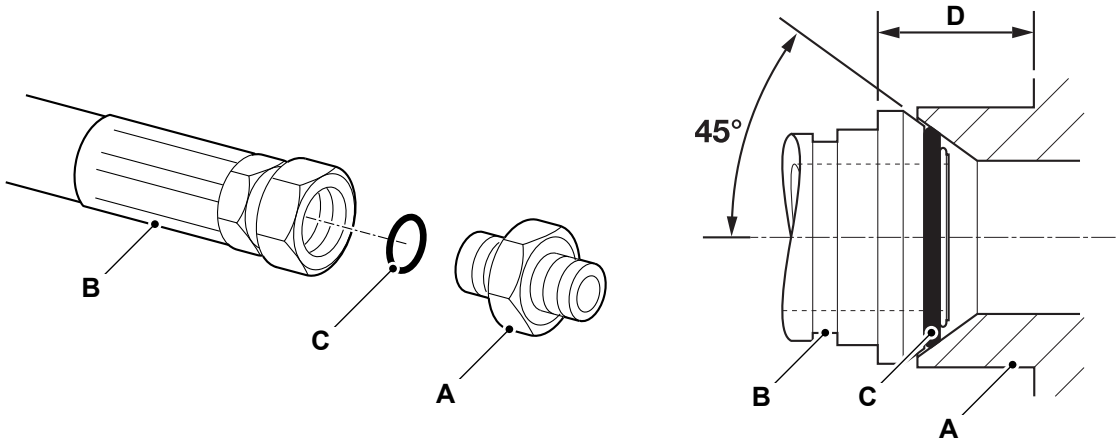



**A** Port A
**B** Port B
**C** Port C
**D** Port D
**E** Gallery E
**F** Gallery F
**G** Gallery G
**H** Gallery H
**J** Gallery J
**K** Gallery K
**R** Port R
**S** Port S
**T** Port T
**Y** Gallery Y

| 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 935.**




**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 245. BSP `Torque Stop' Hose - Torque Settings**

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

# 00 - General

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## Introduction

It is important that the electrical system on the machine is in a sound state of repair.

Make sure that all the health and safety warnings in this section are followed. The machine must be safe with the battery isolated before you attempt to disconnect any electrical connections or work in the engine compartment.

Page 33-20

**Figure 949. 333/K8349 issue 4 - sheet 4 of 18 - Secondary Fusing / Power Distribution**

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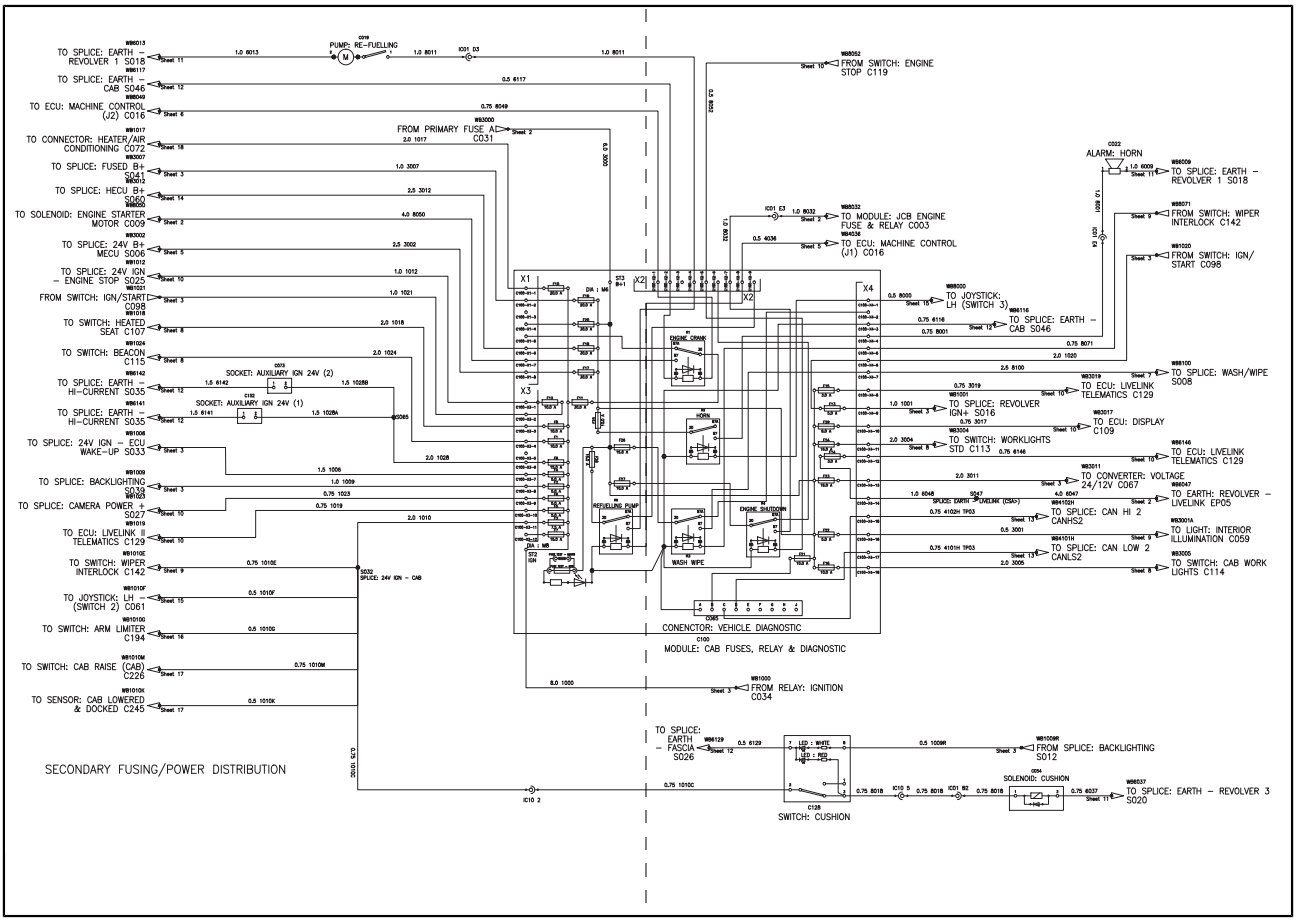

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**Figure 953. 333/K8349 issue 4 - sheet 8 of 18 - Worklights / Beacon, Seats**

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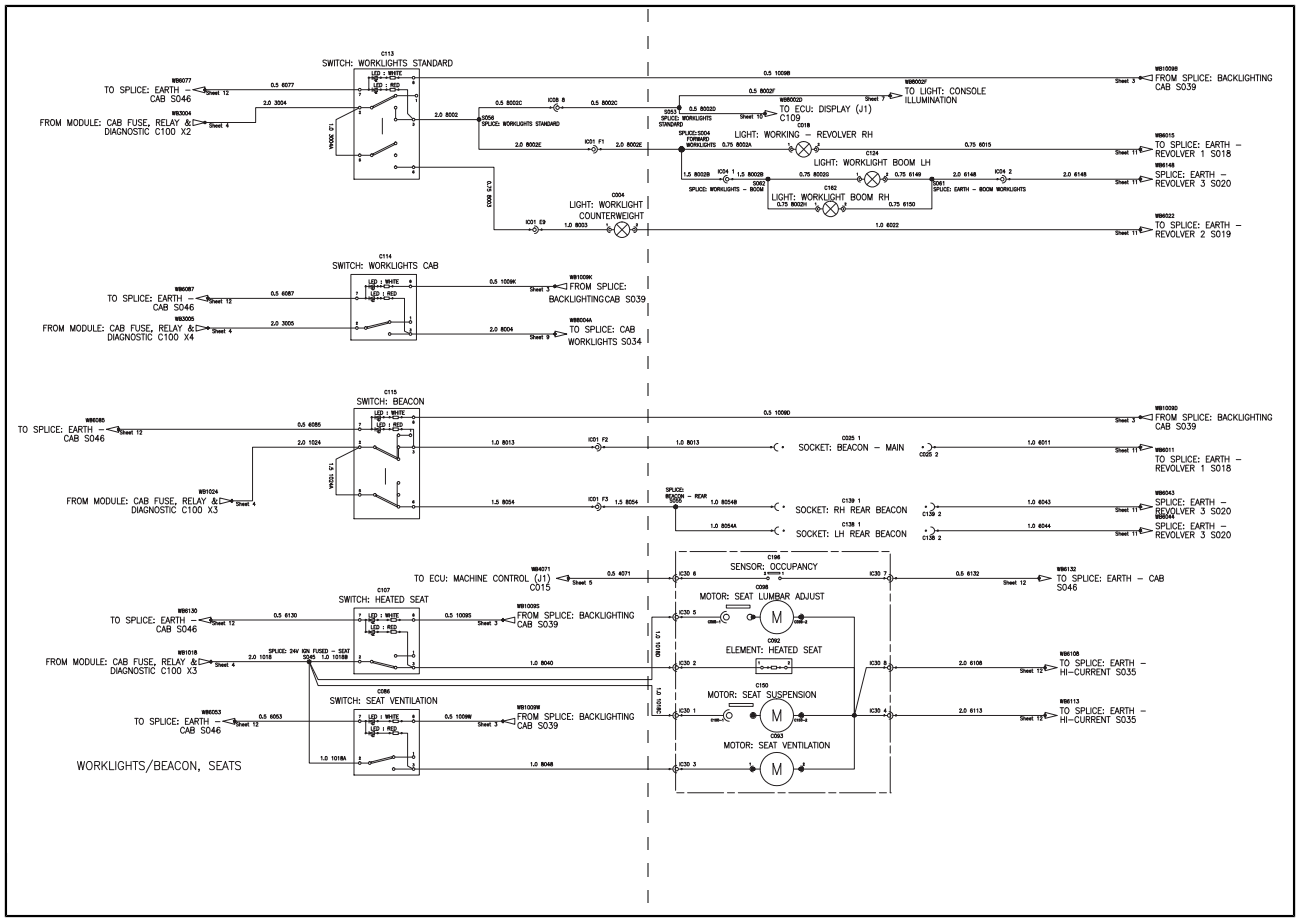

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**Figure 957. 333/K8349 issue 4 - sheet 12 of 18 - Cab Earthing**

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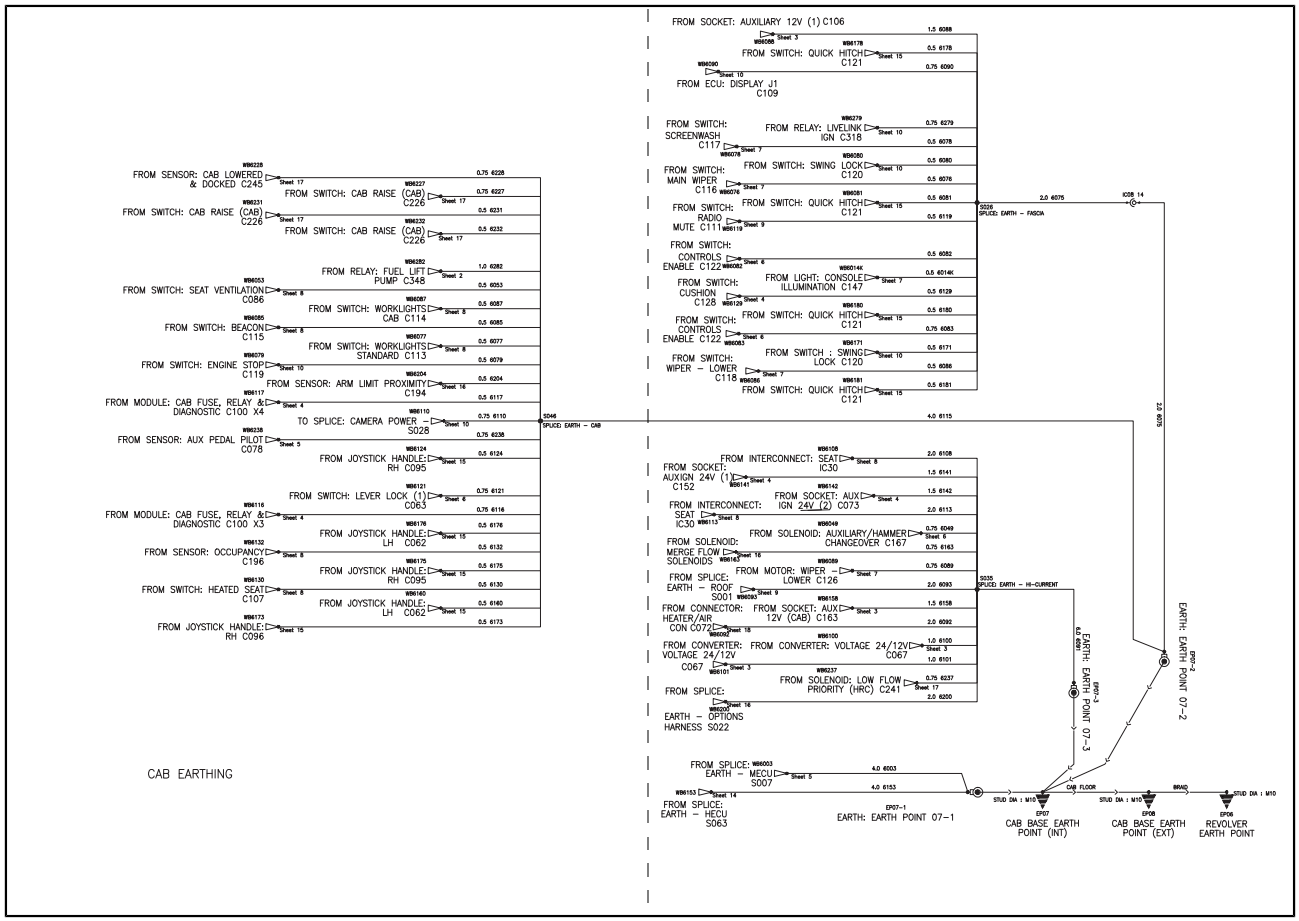

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**Figure 961. 333/K8349 issue 4 - sheet 16 of 18 - Options - Arm Limiter, Dual ISO/SAE Controls, Auxiliary Hydraulics, Hydraulic Raise Cab**

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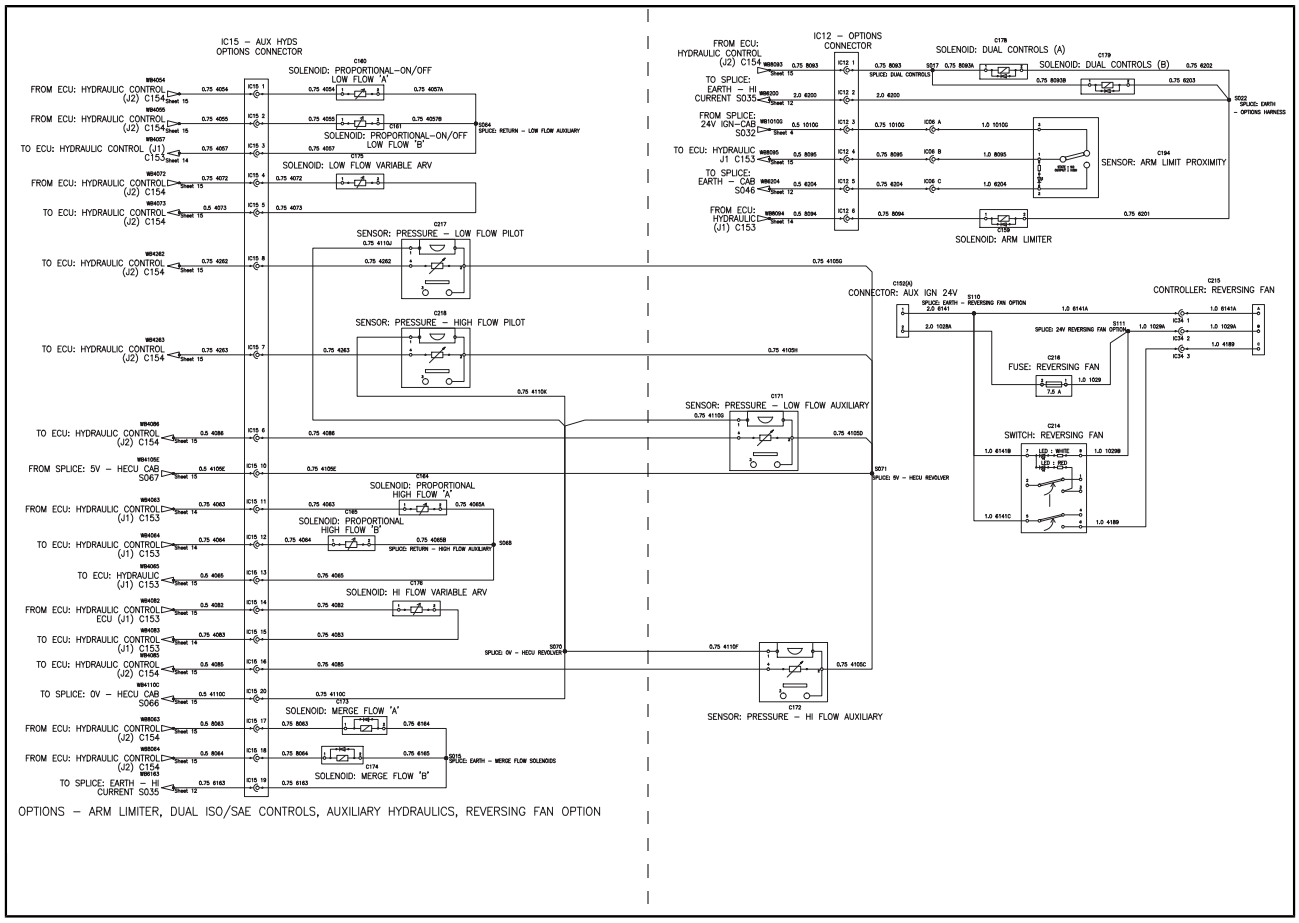


| Splice Code | Function | Main Wire | Harness Location | Sheet |
|---|---|---|---|---|
| S012 | Splice: Backlighting - Fascia | 1009 | Fascia Harness | 3 |
| S014 | Splice: Screenwash - Pump | 8008 | Cab Harness | 7 |
| S016 | Splice: 24V Ignition - Revolver | 1001 | Revolver Harness | 3 |
| S017 | Splice: Dual Controls | 8093 | Options Harness | 16 |
| S019 | Splice: Earth - Revolver 2 | 6020 | Revolver Harness | 11 |
| S020 | Splice: Earth - Revolver 3 | 6033 | Revolver Harness | 11 |
| S021 | Splice: Earth - JCB Engine | 6054 | Revolver Harness | 11 |
| S022 | Splice: Earth - Options Harness | 6200 | Options Harness | 17 |
| S023 | Splice: 12V B+ Fused | 3009 | Revolver Harness | 2 |
| S024 | Splice: 12V Ignition - Fused | 1008 | Fascia Harness | 3 |
| S025 | Splice: 24V Ignition - Engine Stop | 1012 | Cab Harness | 10 |
| S026 | Splice: Earth - Fascia | 6075 | Fascia Harness | 12 |
| S027 | Splice: Camera Power + | 1023 | Camera Harness | 10 |
| S028 | Splice: Camera Power - | 6110 | Camera Harness | 10 |
| S029 | Splice: Earth - Heater Only | 6092 | Heater Harness | 17 |
| S030 | Splice: 24V Ignition - Fascia | 1006 | Fascia Harness | 10 |
| S031 | Splice: 12V Heater Only | 1008 | Heater Harness | 17 |
| S032 | Splice: 24V Ignition - Cab | 1010 | Cab Harness | 4 |
| S033 | Splice: 24V Ignition - ECU Wake Up | 1006 | Cab Harness | 3 |
| S034 | Splice: Cab Worklights | 8004 | Roof Harness | 9 |
| S035 | Splice: Earth - Hi- Current | 6091 | Cab Harness | 12 |
| S039 | Splice: Backlighting Cab | 1009 | Cab Harness | 3 |
| S041 | Splice: 24V B+ - Re-Fuelling/Ignition Switch | 3007 | Cab Harness | 3 |
| S042 | Splice: Crank | 4023 | Cab Harness | 3 |
| S053 | Splice: Worklights Standard | 8002 | Fascia Harness | 8 |
| S056 | Splice: Worklights Standard | 8002 | Cab Harness | 8 |
| S057 | Splice: Lighting - Interior | 8005 | Cab Harness | 5 |
| S060 | Splice: 24V B+ - HECU | 3012 | Cab Harness | 14 |

# Disconnect and Connect

## Disconnect

If the machine has an electronically controlled engine, you must wait a period of time before you isolate the battery. This is to allow the ECM (Engine Control Module) to shutdown correctly. The time period starts when you turn the ignition off. Check the isolator switch label and the operators manual for the correct time period.

In the event of an emergency, if required, remove the isolator key without waiting.

If a radio is installed, you may lose any settings.

1. Make the machine safe.
   Refer to: PIL 01-03.
2. Turn the ignition key to the off position.
3. Wait for the engine ECM to shutdown correctly (if applicable).
4. Get access to the isolator key.
   Refer to: PIL 33-03-03.
5. Turn the battery isolator key in the indicated direction and remove.

## Connect

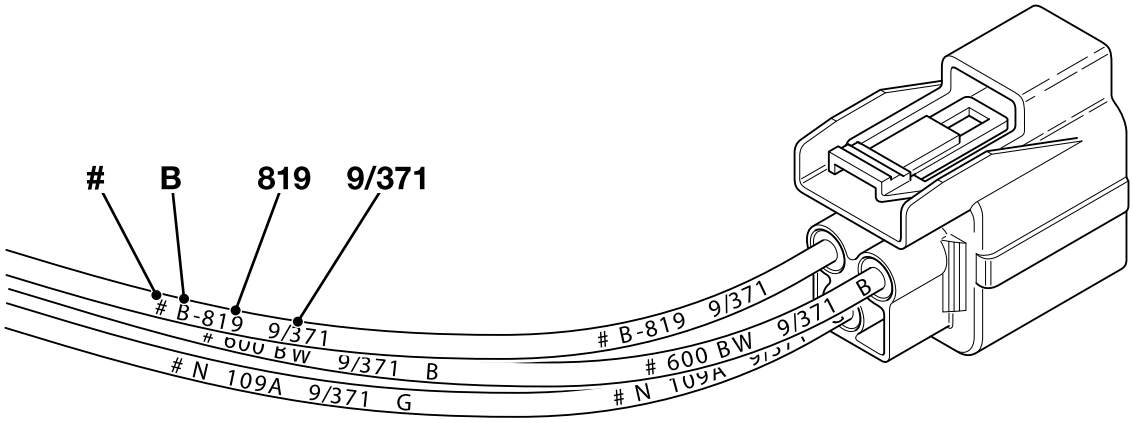
1. Make sure the ignition is set to off.
2. Insert the battery isolator key and turn in the indicated direction.

# Component Identification

## Wire and Harness Number Identification

This section details the allocation of wire numbers and the identification of wires in the wiring harness.

**Figure 978.**




The illustration shows a typical connector and wires. Each wire has an individual identification number permanently marked on it, at regular intervals along it's length. The number stamped on the wire identifies the following:

**Table 262. Wire and Harness Number Identification**

| Identification Number | Description |
|---|---|
| # | The # indicates the start of the identification number. It is always printed to the left of the identification number. |
| B | If applicable - The colour of the flying lead that the harness wire should mate with. For instance, if wire 819 from harness 719/37100 mated with a flying lead coloured black (colour code B) then the number printed on the wire would be B-819 9/371. |
| 819 | The wire's unique identification number. The wire functions and numbers allocated to them are consistent through out the JCB range of products. Refer to Wire Numbers and Functions. |
| 9/371 | If applicable - The part number of the harness that the wire originates from. If the harness part number is 719/37100, the number printed on the harness wires will be 9/371 (71 and 00 are common numbers and therefore deleted). |

## Wire Numbers and Functions

**Table 263. Wires 000-199, 1000-1999 (These numbers are reserved for ignition feeds, heater start circuits and start circuits)**

| Wire Number | Description |
|---|---|
| Wires 000 - 099 | Unfused ignition feeds |
| Wires 100 - 199 and 1000 -1999 | Fused ignition feeds (feeds via ignition relays are also classed as ignition feeds). Power supplies output by a control module. |

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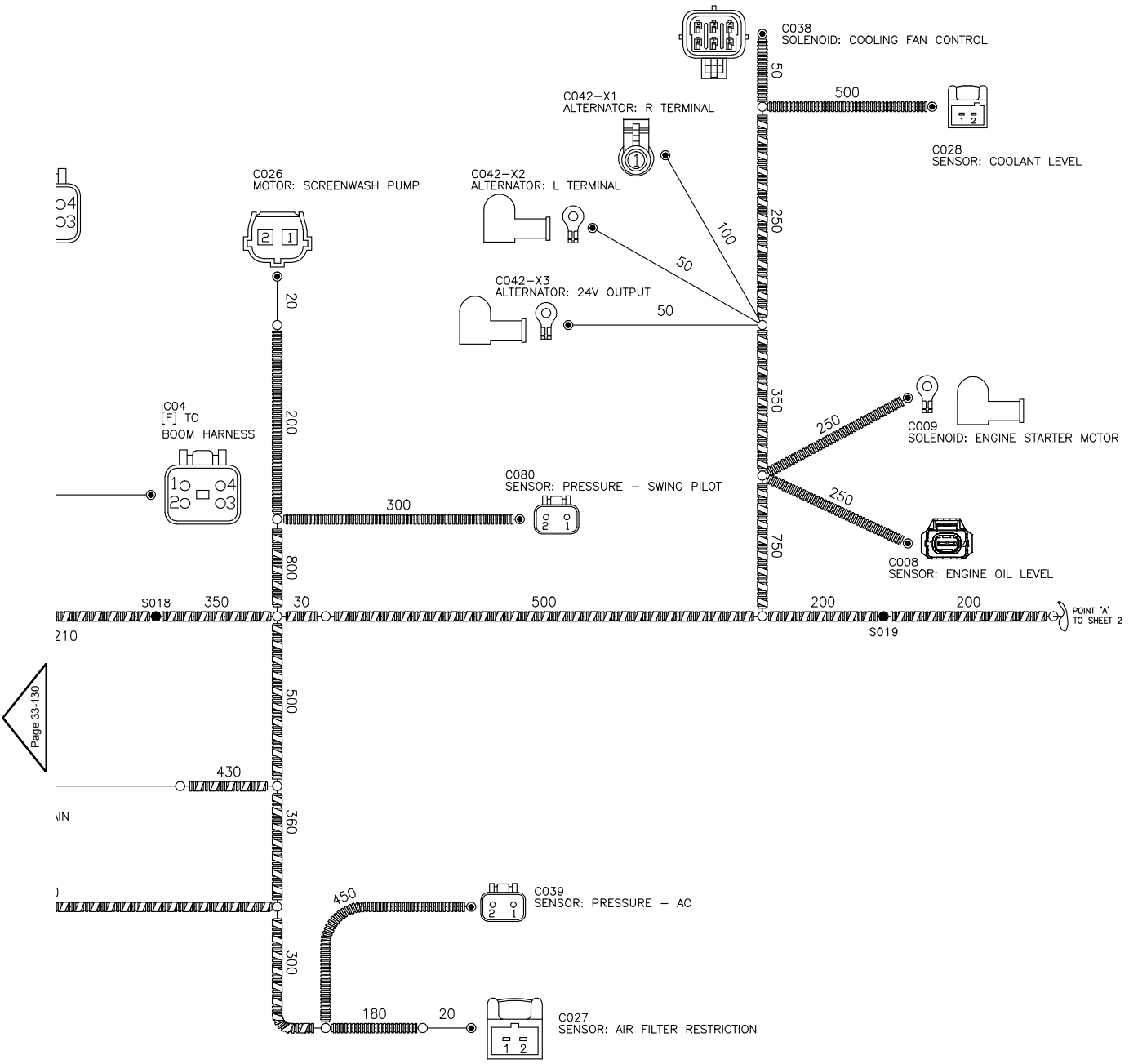

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**gure 1000. (Part 2 of 2)**

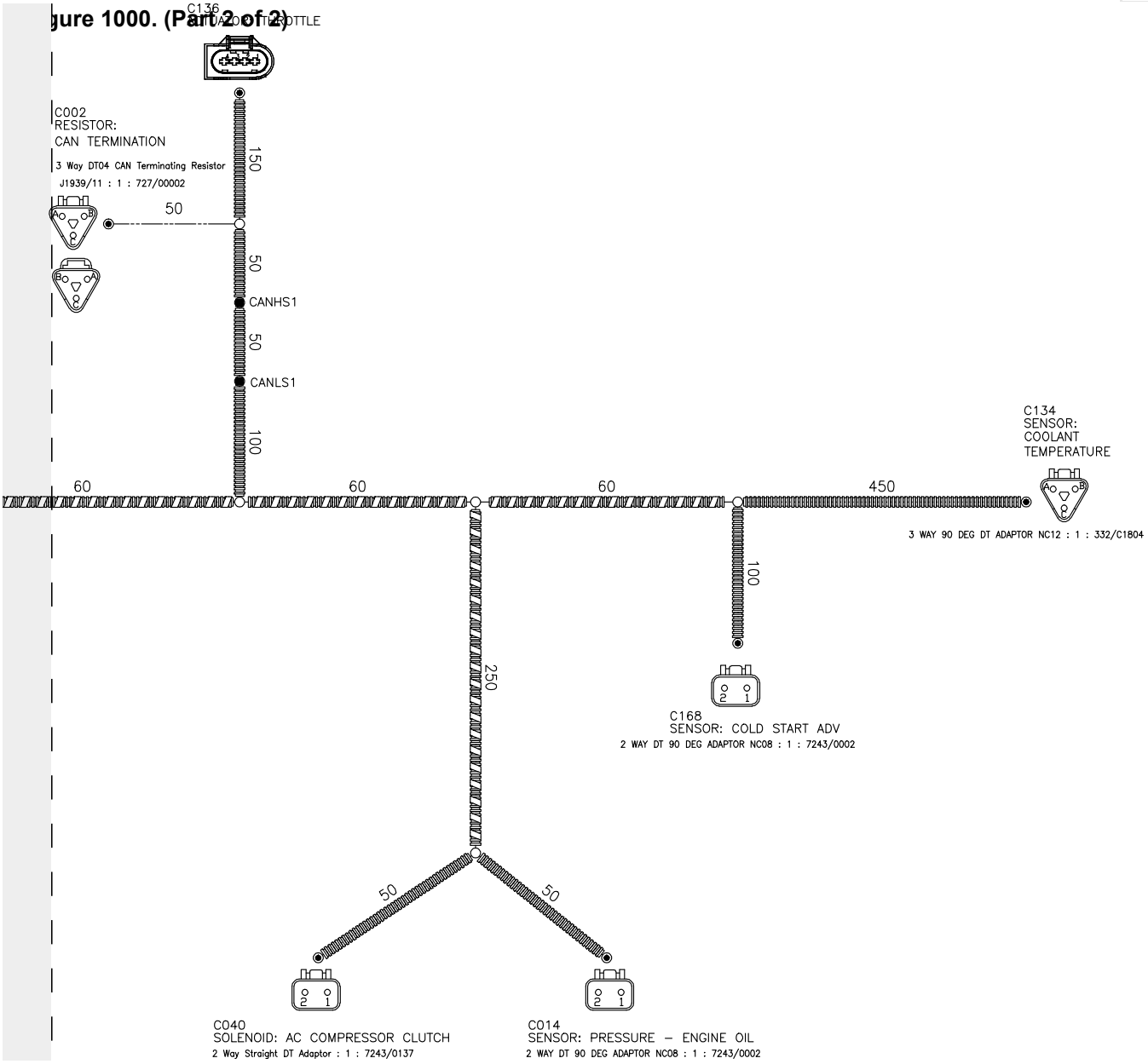


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Figure 1005. 333/K8486-3-Sheet 4

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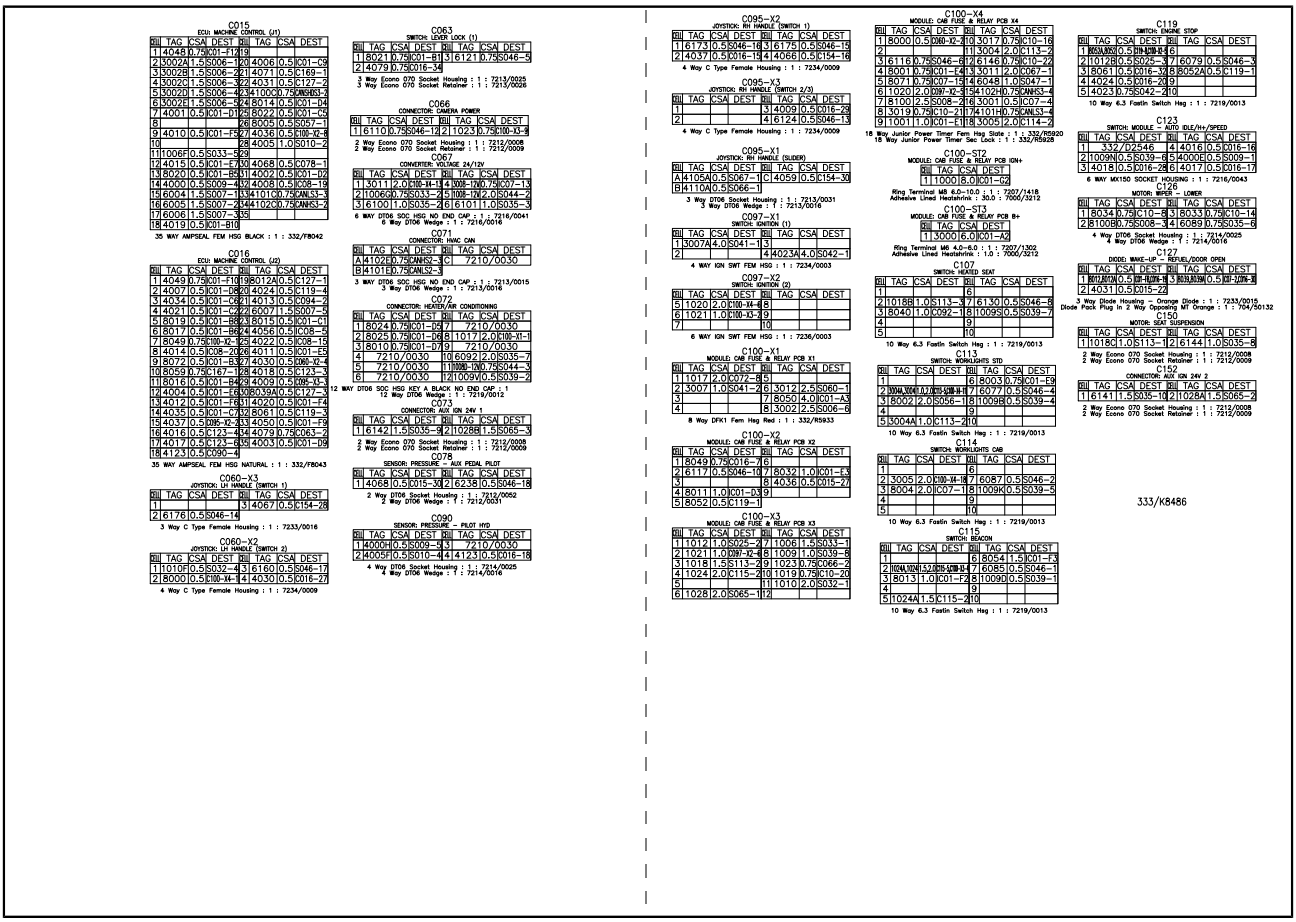

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Figure 1009. 334/J4255-1-Sheet 2

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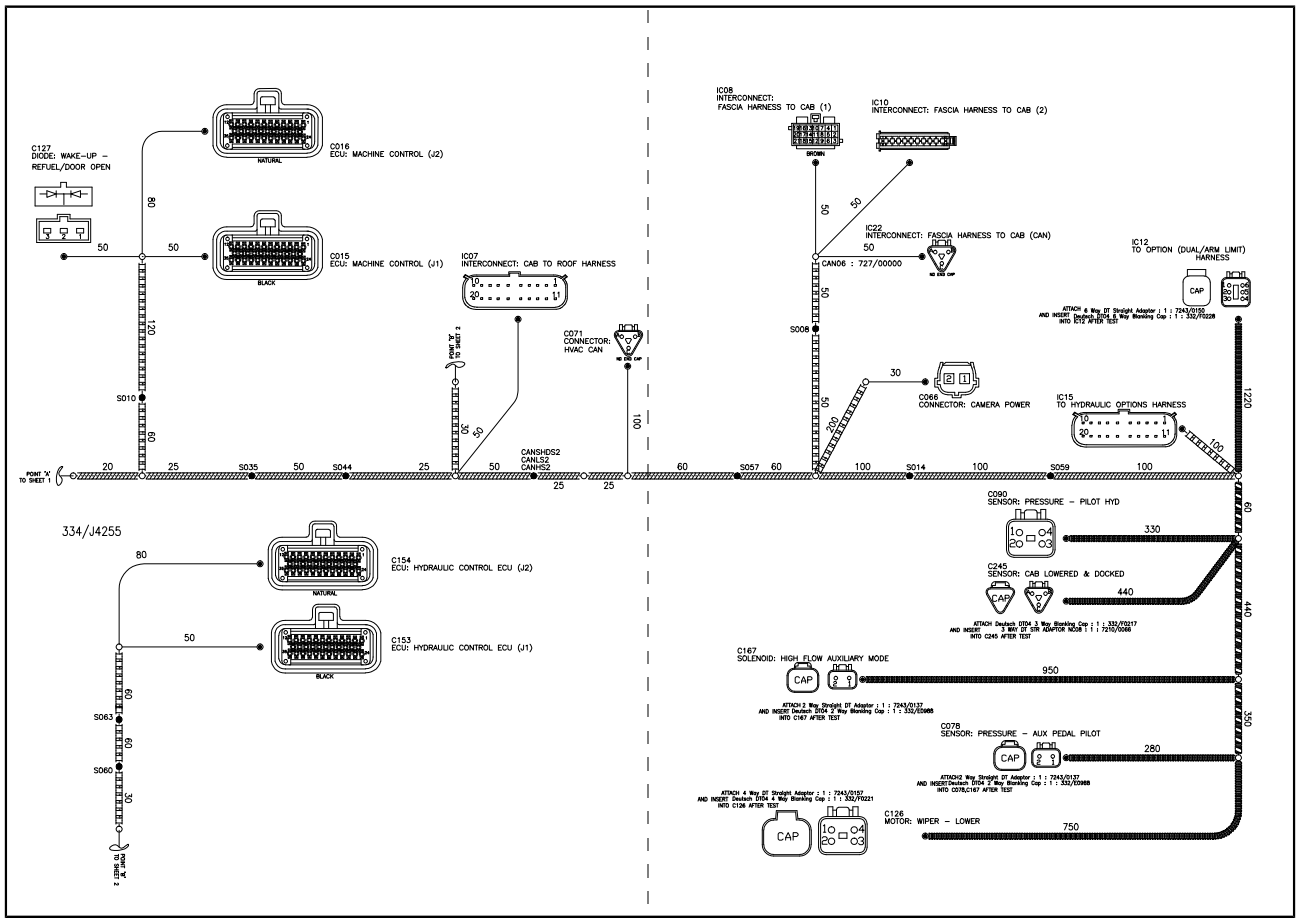

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Figure 1013. 334/J4255-1-Sheet 6

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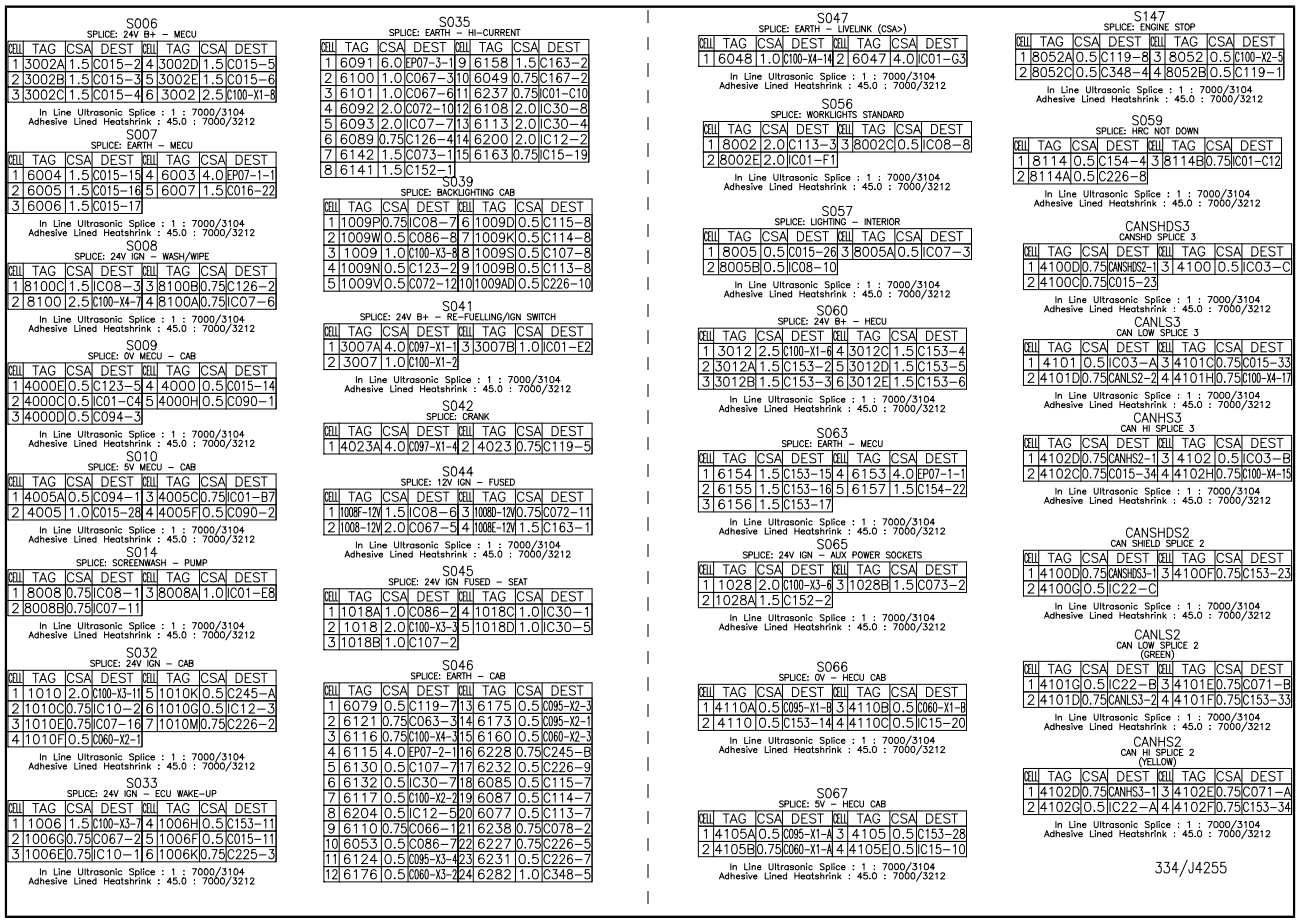

S006
SPLICE: 24V B+ – MECU

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 3002A | 1.5 | C015–2 | 4 | 3002D | 1.5 | C015–5 |
| 2 | 3002B | 1.5 | C015–3 | 5 | 3002E | 1.5 | C015–6 |
| 3 | 3002C | 1.5 | C015–4 | 6 | 3002 | 2.5 | C100–X1–8 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S007
SPLICE: EARTH – MECU

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 6004 | 1.5 | C015–15 | 4 | 6003 | 4.0 | EP07–1–1 |
| 2 | 6005 | 1.5 | C015–16 | 5 | 6007 | 1.5 | C016–22 |
| 3 | 6006 | 1.5 | C015–17 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S008
SPLICE: 24V IGN – WASH/WIPE

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8100C | 1.5 | IC08–3 | 3 | 8100B | 0.75 | C126–2 |
| 2 | 8100 | 2.5 | C100–X4–7 | 4 | 8100A | 0.75 | IC07–6 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S009
SPLICE: 0V MECU – CAB

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4000E | 0.5 | C123–5 | 4 | 4000 | 0.5 | C015–14 |
| 2 | 4000C | 0.5 | IC01–C4 | 5 | 4000H | 0.5 | C090–1 |
| 3 | 4000D | 0.5 | C094–3 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S010
SPLICE: 5V MECU – CAB

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4005A | 0.5 | C094–1 | 3 | 4005C | 0.75 | IC01–B7 |
| 2 | 4005 | 1.0 | C015–28 | 4 | 4005F | 0.5 | C090–2 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S014
SPLICE: SCREENWASH – PUMP

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8008 | 0.75 | IC08–1 | 3 | 8008A | 1.0 | IC01–E8 |
| 2 | 8008B | 0.75 | IC07–11 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S032
SPLICE: 24V IGN – CAB

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 1010 | 2.0 | C100–X3–11 | 5 | 1010K | 0.5 | C245–A |
| 2 | 1010C | 0.75 | IC10–2 | 6 | 1010G | 0.5 | IC12–3 |
| 3 | 1010E | 0.75 | IC07–16 | 7 | 1010M | 0.75 | C226–2 |
| 4 | 1010F | 0.5 | C060–X2–1 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S033
SPLICE: 24V IGN – ECU WAKE–UP

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 1006 | 1.5 | C100–X3–7 | 4 | 1006H | 0.5 | C153–11 |
| 2 | 1006G | 0.75 | C067–2 | 5 | 1006F | 0.5 | C015–11 |
| 3 | 1006E | 0.75 | IC10–1 | 6 | 1006K | 0.75 | C225–3 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S035
SPLICE: EARTH – HI–CURRENT

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 6091 | 6.0 | EP07–3–1 | 9 | 6158 | 1.5 | C163–2 |
| 2 | 6100 | 1.0 | C067–3 | 10 | 6049 | 0.75 | C167–2 |
| 3 | 6101 | 1.0 | C067–6 | 11 | 6237 | 0.75 | C01–C10 |
| 4 | 6092 | 2.0 | C072–10 | 12 | 6108 | 2.0 | IC30–8 |
| 5 | 6093 | 2.0 | IC07–7 | 13 | 6113 | 2.0 | IC30–4 |
| 6 | 6089 | 0.75 | C126–4 | 14 | 6200 | 2.0 | IC12–2 |
| 7 | 6142 | 1.5 | C073–1 | 15 | 6163 | 0.75 | IC15–19 |
| 8 | 6141 | 1.5 | C152–1 | | | | |

S039
SPLICE: BACKLIGHTING CAB

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 1009P | 0.75 | IC08–7 | 6 | 1009D | 0.5 | C115–8 |
| 2 | 1009W | 0.5 | C086–8 | 7 | 1009K | 0.5 | C114–8 |
| 3 | 1009 | 1.0 | C100–X3–8 | 8 | 1009S | 0.5 | C107–8 |
| 4 | 1009N | 0.5 | C123–2 | 9 | 1009B | 0.5 | C113–8 |
| 5 | 1009V | 0.5 | C072–12 | 10 | 1009AD | 0.5 | C226–10 |

S041
SPLICE: 24V B+ – RE–FUELLING/IGN SWITCH

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 3007A | 4.0 | C097–X1–1 | 3 | 3007B | 1.0 | IC01–E2 |
| 2 | 3007 | 1.0 | C100–X1–2 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S042
SPLICE: CRANK

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4023A | 4.0 | C097–X1–4 | 2 | 4023 | 0.75 | C119–5 |

S044
SPLICE: 12V IGN – FUSED

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 1008F–12V | 1.5 | IC08–6 | 3 | 1008D–12V | 0.75 | C072–11 |
| 2 | 1008–12V | 2.0 | C067–5 | 4 | 1008E–12V | 1.5 | C163–1 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S045
SPLICE: 24V IGN FUSED – SEAT

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 1018A | 1.0 | C086–2 | 4 | 1018C | 1.0 | IC30–1 |
| 2 | 1018 | 2.0 | C100–X3–3 | 5 | 1018D | 1.0 | IC30–5 |
| 3 | 1018B | 1.0 | C107–2 | | | | |

S046
SPLICE: EARTH – CAB

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 6079 | 0.5 | C119–7 | 13 | 6175 | 0.5 | C095–X2–3 |
| 2 | 6121 | 0.75 | C063–3 | 14 | 6173 | 0.5 | C095–X2–1 |
| 3 | 6116 | 0.75 | C100–X4–3 | 15 | 6160 | 0.5 | C060–X2–3 |
| 4 | 6115 | 4.0 | EP07–2–1 | 16 | 6228 | 0.75 | C245–B |
| 5 | 6130 | 0.5 | C107–7 | 17 | 6232 | 0.5 | C226–9 |
| 6 | 6132 | 0.5 | IC30–7 | 18 | 6085 | 0.5 | C115–7 |
| 7 | 6117 | 0.5 | C100–X2–2 | 19 | 6087 | 0.5 | C114–7 |
| 8 | 6204 | 0.5 | IC12–5 | 20 | 6077 | 0.5 | C113–7 |
| 9 | 6110 | 0.75 | C066–1 | 21 | 6238 | 0.75 | C078–2 |
| 10 | 6053 | 0.5 | C086–7 | 22 | 6227 | 0.75 | C226–5 |
| 11 | 6124 | 0.5 | C095–X3–4 | 23 | 6231 | 0.5 | C226–7 |
| 12 | 6176 | 0.5 | C060–X3–2 | 24 | 6282 | 1.0 | C348–5 |

S047
SPLICE: EARTH – LIVELINK (CSA>)

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 6048 | 1.0 | C100–X4–14 | 2 | 6047 | 4.0 | IC01–G3 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S056
SPLICE: WORKLIGHTS STANDARD

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8002 | 2.0 | C113–3 | 3 | 8002C | 0.5 | IC08–8 |
| 2 | 8002E | 2.0 | IC01–F1 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S057
SPLICE: LIGHTING – INTERIOR

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8005 | 0.5 | C015–26 | 3 | 8005A | 0.5 | IC07–3 |
| 2 | 8005B | 0.5 | IC08–10 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S060
SPLICE: 24V B+ – HECU

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 3012 | 2.5 | C100–X1–6 | 4 | 3012C | 1.5 | C153–4 |
| 2 | 3012A | 1.5 | C153–2 | 5 | 3012D | 1.5 | C153–5 |
| 3 | 3012B | 1.5 | C153–3 | 6 | 3012E | 1.5 | C153–6 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S063
SPLICE: EARTH – MECU

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 6154 | 1.5 | C153–15 | 4 | 6153 | 4.0 | EP07–1–1 |
| 2 | 6155 | 1.5 | C153–16 | 5 | 6157 | 1.5 | C154–22 |
| 3 | 6156 | 1.5 | C153–17 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S065
SPLICE: 24V IGN – AUX POWER SOCKETS

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 1028 | 2.0 | C100–X3–6 | 3 | 1028B | 1.5 | C073–2 |
| 2 | 1028A | 1.5 | C152–2 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S066
SPLICE: 0V – HECU CAB

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4110A | 0.5 | C095–X1–B | 3 | 4110B | 0.5 | C060–X1–B |
| 2 | 4110 | 0.5 | C153–14 | 4 | 4110C | 0.5 | IC15–20 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S067
SPLICE: 5V – HECU CAB

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4105A | 0.5 | C095–X1–A | 3 | 4105 | 0.5 | C153–28 |
| 2 | 4105B | 0.75 | C060–X1–A | 4 | 4105E | 0.5 | IC15–10 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S147
SPLICE: ENGINE STOP

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8052A | 0.5 | C119–8 | 3 | 8052 | 0.5 | C100–X2–5 |
| 2 | 8052C | 0.5 | C348–4 | 4 | 8052B | 0.5 | C119–1 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S059
SPLICE: HRC NOT DOWN

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8114 | 0.5 | C154–4 | 3 | 8114B | 0.75 | IC01–C12 |
| 2 | 8114A | 0.5 | C226–8 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

CANSHDS3
CANSHD SPLICE 3

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4100D | 0.75 | CANSHDS2–1 | 3 | 4100 | 0.5 | IC03–C |
| 2 | 4100C | 0.75 | C015–23 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

CANLS3
CAN LOW SPLICE 3

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4101 | 0.5 | IC03–A | 3 | 4101C | 0.75 | C015–33 |
| 2 | 4101D | 0.75 | CANLS2–2 | 4 | 4101H | 0.75 | C100–X4–17 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

CANHS3
CAN HI SPLICE 3

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4102D | 0.75 | CANHS2–1 | 3 | 4102 | 0.5 | IC03–B |
| 2 | 4102C | 0.75 | C015–34 | 4 | 4102H | 0.75 | C100–X4–15 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

CANSHDS2
CAN SHIELD SPLICE 2

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4100D | 0.75 | CANSHDS3–1 | 3 | 4100F | 0.75 | C153–23 |
| 2 | 4100G | 0.5 | IC22–C | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

CANLS2
CAN LOW SPLICE 2
(GREEN)

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4101G | 0.5 | IC22–B | 3 | 4101E | 0.75 | C071–B |
| 2 | 4101D | 0.75 | CANLS3–2 | 4 | 4101F | 0.75 | C153–33 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

CANHS2
CAN HI SPLICE 2
(YELLOW)

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 4102D | 0.75 | CANHS3–1 | 3 | 4102E | 0.75 | C071–A |
| 2 | 4102G | 0.5 | IC22–A | 4 | 4102F | 0.75 | C153–34 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

334/J4255

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Figure 1017. 333/K5337-1-Sheet 4

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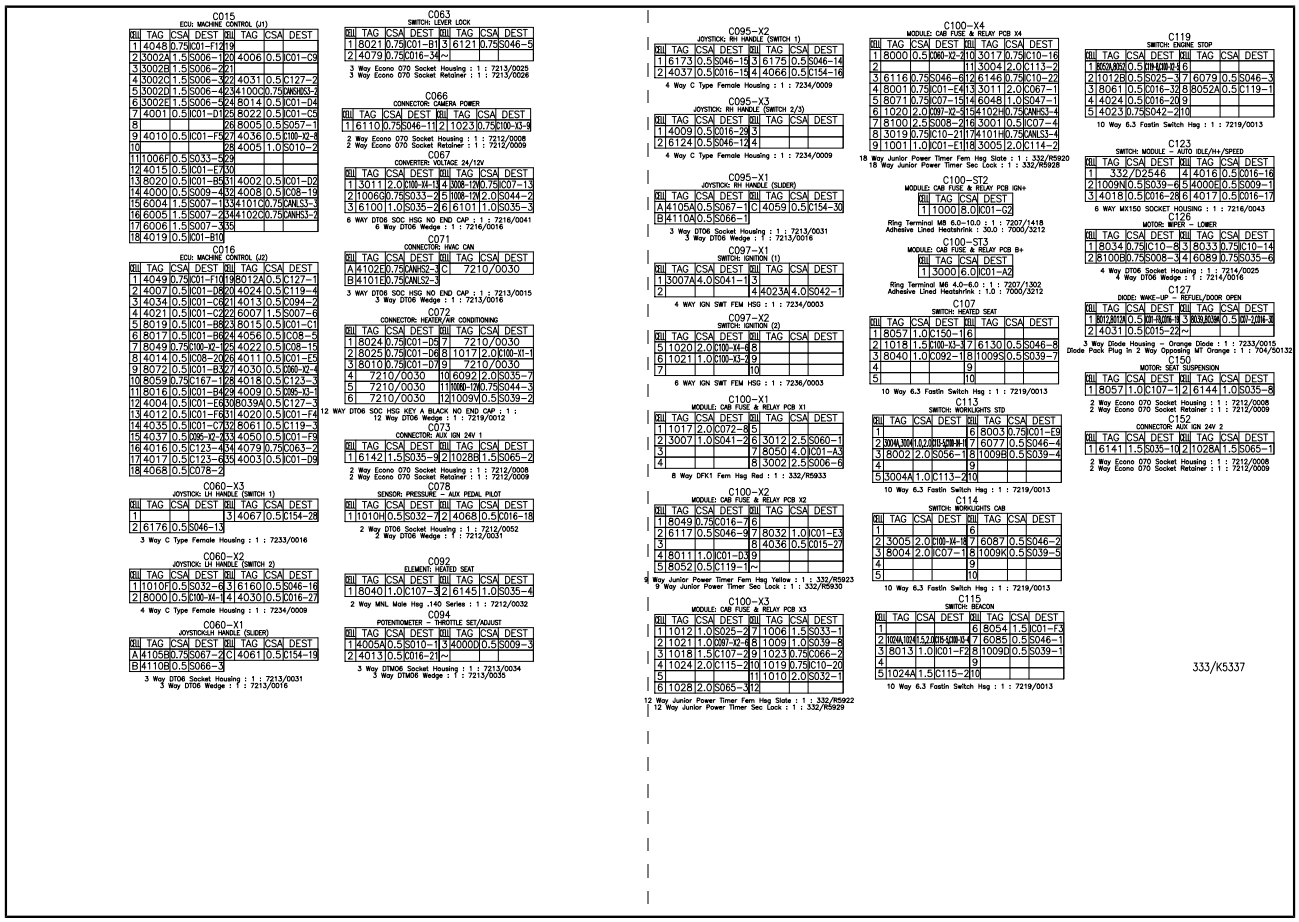

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**Figure 1021. 334/J2060-1-Sheet 2**

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IC01–CAB
INTERCONNECT: REV HARNESS TO CAB HARNESS

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| A1 | 1A1 | 4.0 | IC01-REV-A1 | D4 | 1D4 | 2.0 | IC01-CAB-D4 |
| A2 | 1A2 | 6.0 | IC01-REV-A2 | D5 | 1D5 | 2.0 | IC01-REV-D5 |
| A3 | 1A3 | 4.0 | IC01-REV-A3 | D6 | 1D6 | 2.0 | IC01-REV-D6 |
| B1 | 1B1 | 2.0 | IC01-REV-B1 | D7 | 1D7 | 2.0 | IC01-REV-D7 |
| B10 | 1B10 | 2.0 | IC01-REV-B10 | D8 | 1D8 | 2.0 | IC01-REV-D8 |
| B11 | 1B11 | 2.0 | IC01-REV-B11 | D9 | 1D9 | 2.0 | IC01-REV-D9 |
| B12 | 1B12 | 2.0 | IC01-REV-B12 | E1 | 1E1 | 2.0 | IC01-REV-E1 |
| B2 | 1B2 | 2.0 | IC01-REV-B2 | E10 | 8113A | 2.0 | S091–2 |
| B3 | 1B3 | 2.0 | IC01-REV-B3 | E11 | 8111A | 2.0 | S090–2 |
| B4 | 1B4 | 2.0 | IC01-REV-B4 | E12 | 1E12 | 2.0 | IC01-REV-D12 |
| B5 | 1B5 | 2.0 | IC01-REV-B5 | E2 | 1E2 | 2.0 | IC01-REV-E2 |
| B6 | 1B6 | 2.0 | IC01-REV-B6 | E3 | 1E3 | 2.0 | IC01-REV-E3 |
| B7 | 1B7 | 2.0 | IC01-REV-B7 | E4 | 1E4 | 2.0 | IC01-REV-E4 |
| B8 | 1B8 | 2.0 | IC01-REV-B8 | E5 | 1E5 | 2.0 | IC01-REV-E5 |
| B9 | 1001M | 2.0 | C246–2 | E6 | 1E6 | 2.0 | IC01-REV-E6 |
| C1 | 1C1 | 2.0 | IC01-REV-C1 | E7 | 1E7 | 2.0 | IC01-REV-E7 |
| C10 | 6237 | 2.0 | C240–2 | E8 | 1E8 | 2.0 | IC01-REV-E8 |
| C11 | 8112A | 2.0 | S089–2 | E9 | 1E9 | 2.0 | IC01-REV-E9 |
| C12 | 8114B | 2.0 | C246–8 | F1 | 1F1 | 2.0 | IC01-REV-F1 |
| C2 | 1C2 | 2.0 | IC01-REV-C2 | F10 | 1F10 | 2.0 | IC01-REV-F10 |
| C3 | 1C3 | 2.0 | IC01-REV-C3 | F11 | 8110A | 2.0 | S088–2 |
| C4 | 1C4 | 2.0 | IC01-REV-C4 | F12 | 1F12 | 2.0 | IC01-REV-F12 |
| C5 | 1C5 | 2.0 | IC01-REV-C5 | F2 | 8013 | 2.0 | C025–1 |
| C6 | 1C6 | 2.0 | IC01-REV-C6 | F3 | 1F3 | 2.0 | IC01-REV-F3 |
| C7 | 1C7 | 2.0 | IC01-REV-C7 | F4 | 1F4 | 2.0 | IC01-REV-F4 |
| C8 | 6230C | 2.0 | S052–5 | F5 | 1F5 | 2.0 | IC01-REV-F5 |
| C9 | 1C9 | 2.0 | IC01-REV-C9 | F6 | 1F6 | 2.0 | IC01-REV-F6 |
| D1 | 1D1 | 2.0 | IC01-REV-D1 | F7 | 1F7 | 2.0 | IC01-REV-F7 |
| D10 | 1D10 | 2.0 | IC01-REV-D10 | F8 | 1F8 | 2.0 | IC01-REV-F8 |
| D11 | 1D11 | 2.0 | IC01-REV-D11 | F9 | 1F9 | 2.0 | IC01-REV-F9 |
| D12 | 1D12 | 2.0 | IC01-REV-D12 | G1 | 1G1 | 4.0 | IC01-REV-G1 |
| D2 | 1D2 | 2.0 | IC01-REV-D2 | G2 | 1G2 | 8.0 | IC01-REV-G2 |
| D3 | 1D3 | 2.0 | IC01-REV-D3 | G3 | 1G3 | 4.0 | IC01-REV-G3 |

66 WAY SRC SEALED FEMALE CONN : 1 : 7219/0199

IC03–CAB
INTERCONNECT: REV HARNESS TO CAB HARNESS (CAN)

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| A | CANL | 0.5 | IC03-REV-A | C | CANS | 0.5 | IC03-REV-C |
| B | CANH | 0.5 | IC03-REV-B | | | | |

3 Way DT06 Socket Housing : 1 : 7213/0031
~~3 Way DT06 Wedge : 1 : 7213/0016~~ DO NOT FIT
3 Way DT06 Wedge CAN J1939 : 1 : 7213/0043

C025
SOCKET: BEACON – MAIN

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8013 | 2.0 | IC01-CAB-F2 | 2 | 6011 | 2.0 | S052–4 |

2 Way Pos Lock Housing T Type : 1 : 7232/0003

C231
DIODE: HRC CAB LOW FLOW PRIORITY

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8110C | 1.0 | S088–4 | 3 | 8112C | 1.0 | S089–4 |
| 2 | 8116 | 1.0 | C240–1 | | | | |

3 Way Diode Housing – Orange Diode : 1 : 7233/0015

C240
SOLENOID: LOW FLOW PRIORITY (HRC)

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8116 | 1.0 | C231–2 | 2 | 6237 | 2.0 | IC01-CAB-C10 |

C243
SOLENOID: HRC RAISE

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8111 | 1.0 | S090–1 | 2 | 8110 | 1.0 | S088–1 |

2 Way Junior Power Timer Housing : 1 : 7212/0013

IC01–REV
INTERCONNECT: REV HARNESS TO CAB HARNESS

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| A1 | 1A1 | 4.0 | IC01-CAB-A1 | D4 | 1D4 | 2.0 | IC01-CAB-D4 |
| A2 | 1A2 | 6.0 | IC01-CAB-A2 | D5 | 1D5 | 2.0 | IC01-CAB-D5 |
| A3 | 1A3 | 4.0 | IC01-CAB-A3 | D6 | 1D6 | 2.0 | IC01-CAB-D6 |
| B1 | 1B1 | 2.0 | IC01-CAB-B1 | D7 | 1D7 | 2.0 | IC01-CAB-D7 |
| B10 | 1B10 | 2.0 | IC01-CAB-B10 | D8 | 1D8 | 2.0 | IC01-CAB-D8 |
| B11 | 1B11 | 2.0 | IC01-CAB-B11 | D9 | 1D9 | 2.0 | IC01-CAB-D9 |
| B12 | 1B12 | 2.0 | IC01-CAB-B12 | E1 | 1E1 | 2.0 | IC01-CAB-E1 |
| B2 | 1B2 | 2.0 | IC01-CAB-B2 | E10 | 7210/0205 | | |
| B3 | 1B3 | 2.0 | IC01-CAB-B3 | E11 | 7210/0205 | | |
| B4 | 1B4 | 2.0 | IC01-CAB-B4 | E12 | 1E12 | 2.0 | IC01-CAB-E12 |
| B5 | 1B5 | 2.0 | IC01-CAB-B5 | E2 | 1E2 | 2.0 | IC01-CAB-E2 |
| B6 | 1B6 | 2.0 | IC01-CAB-B6 | E3 | 1E3 | 2.0 | IC01-CAB-E3 |
| B7 | 1B7 | 2.0 | IC01-CAB-B7 | E4 | 1E4 | 2.0 | IC01-CAB-E4 |
| B8 | 1B8 | 2.0 | IC01-CAB-B8 | E5 | 1E5 | 2.0 | IC01-CAB-E5 |
| B9 | 1001L | 2.0 | C246–2 | E6 | 1E6 | 2.0 | IC01-CAB-E6 |
| C1 | 1C1 | 2.0 | IC01-CAB-C1 | E7 | 1E7 | 2.0 | IC01-CAB-E7 |
| C10 | 7210/0205 | | | E8 | 1E8 | 2.0 | IC01-CAB-E8 |
| C11 | 7210/0205 | | | E9 | 1E9 | 2.0 | IC01-CAB-E9 |
| C12 | 7210/0205 | | | F1 | 1F1 | 2.0 | IC01-CAB-F1 |
| C2 | 1C2 | 2.0 | IC01-CAB-C2 | F10 | 1F10 | 2.0 | IC01-CAB-F10 |
| C3 | 1C3 | 2.0 | IC01-CAB-C3 | F11 | 7210/0205 | | |
| C4 | 1C4 | 2.0 | IC01-CAB-C4 | F12 | 1F12 | 2.0 | IC01-CAB-F12 |
| C5 | 1C5 | 2.0 | IC01-CAB-C5 | F2 | 7210/0205 | | |
| C6 | 1C6 | 2.0 | IC01-CAB-C6 | F3 | 1F3 | 2.0 | IC01-CAB-F3 |
| C7 | 1C7 | 2.0 | IC01-CAB-C7 | F4 | 1F4 | 2.0 | IC01-CAB-F4 |
| C8 | 6230 | 2.0 | S052–1 | F5 | 1F5 | 2.0 | IC01-CAB-F5 |
| C9 | 1C9 | 2.0 | IC01-CAB-C9 | F6 | 1F6 | 2.0 | IC01-CAB-F6 |
| D1 | 1D1 | 2.0 | IC01-CAB-D1 | F7 | 1F7 | 2.0 | IC01-CAB-F7 |
| D10 | 1D10 | 2.0 | IC01-CAB-D10 | F8 | 1F8 | 2.0 | IC01-CAB-F8 |
| D11 | 1D11 | 2.0 | IC01-CAB-D11 | F9 | 1F9 | 2.0 | IC01-CAB-F9 |
| D12 | 1D12 | 2.0 | IC01-CAB-D12 | G1 | 1G1 | 4.0 | IC01-CAB-G1 |
| D2 | 1D2 | 2.0 | IC01-CAB-D2 | G2 | 1G2 | 8.0 | IC01-CAB-G2 |
| D3 | 1D3 | 2.0 | IC01-CAB-D3 | G3 | 1G3 | 4.0 | IC01-CAB-G3 |

66 WAY SRC SEALED MALE CONN : 1 : 7219/0200

IC03–REV
INTERCONNECT: REV HARNESS TO CAB HARNESS (CAN)

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| A | CANL | 0.5 | IC03-CAB-A | C | CANS | 0.5 | IC03-CAB-C |
| B | CANH | 0.5 | IC03-CAB-B | | | | |

C244
SOLENOID: HRC LOWER

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8113 | 1.0 | S091–1 | 2 | 8112 | 1.0 | S089–1 |

C246
SWITCH: CAB RAISE (REVOLVER)

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8110B | 2.0 | S088–3 | 6 | 8113B | 2.0 | S091–3 |
| 2 | 1001L,1001M | 2.0 | [illegible] | 7 | 6230B | 2.0 | S052–3 |
| 3 | 8112B | 2.0 | S089–3 | 8 | 8114B | 2.0 | IC01-CAB-C12 |
| 4 | 8111B | 2.0 | S090–3 | 9 | | | |
| 5 | 6230A | 2.0 | S052–2 | 10 | | | |

10 Way 6.3 Fastin Switch Hsg : 1 : 7219/0013

S052
SPLICE: EARTH HRC TOWER

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 6230 | 2.0 | IC01-REV-C8 | 4 | 6011 | 2.0 | C025–2 |
| 2 | 6230A | 2.0 | C246–5 | 5 | 6230C | 2.0 | IC01-CAB-C8 |
| 3 | 6230B | 2.0 | C246–7 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S088
SPLICE: HRC RAISE +

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8110 | 1.0 | C243–2 | 3 | 8110B | 2.0 | C246–1 |
| 2 | 8110A | 2.0 | IC01-CAB-F11 | 4 | 8110C | 1.0 | C231–1 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S089
SPLICE: HRC RAISE –

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8112 | 1.0 | C244–2 | 3 | 8112B | 2.0 | C246–3 |
| 2 | 8112A | 2.0 | IC01-CAB-C11 | 4 | 8112C | 1.0 | C231–3 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S090
SPLICE: HRC LOWER +

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8111 | 1.0 | C243–1 | 3 | 8111B | 2.0 | C246–4 |
| 2 | 8111A | 2.0 | IC01-CAB-E11 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

S091
SPLICE: HRC LOWER –

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 8113 | 1.0 | C244–1 | 3 | 8113B | 2.0 | C246–6 |
| 2 | 8113A | 2.0 | IC01-CAB-E10 | | | | |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

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Figure 1025. 333-K9798-1-SHEET-2

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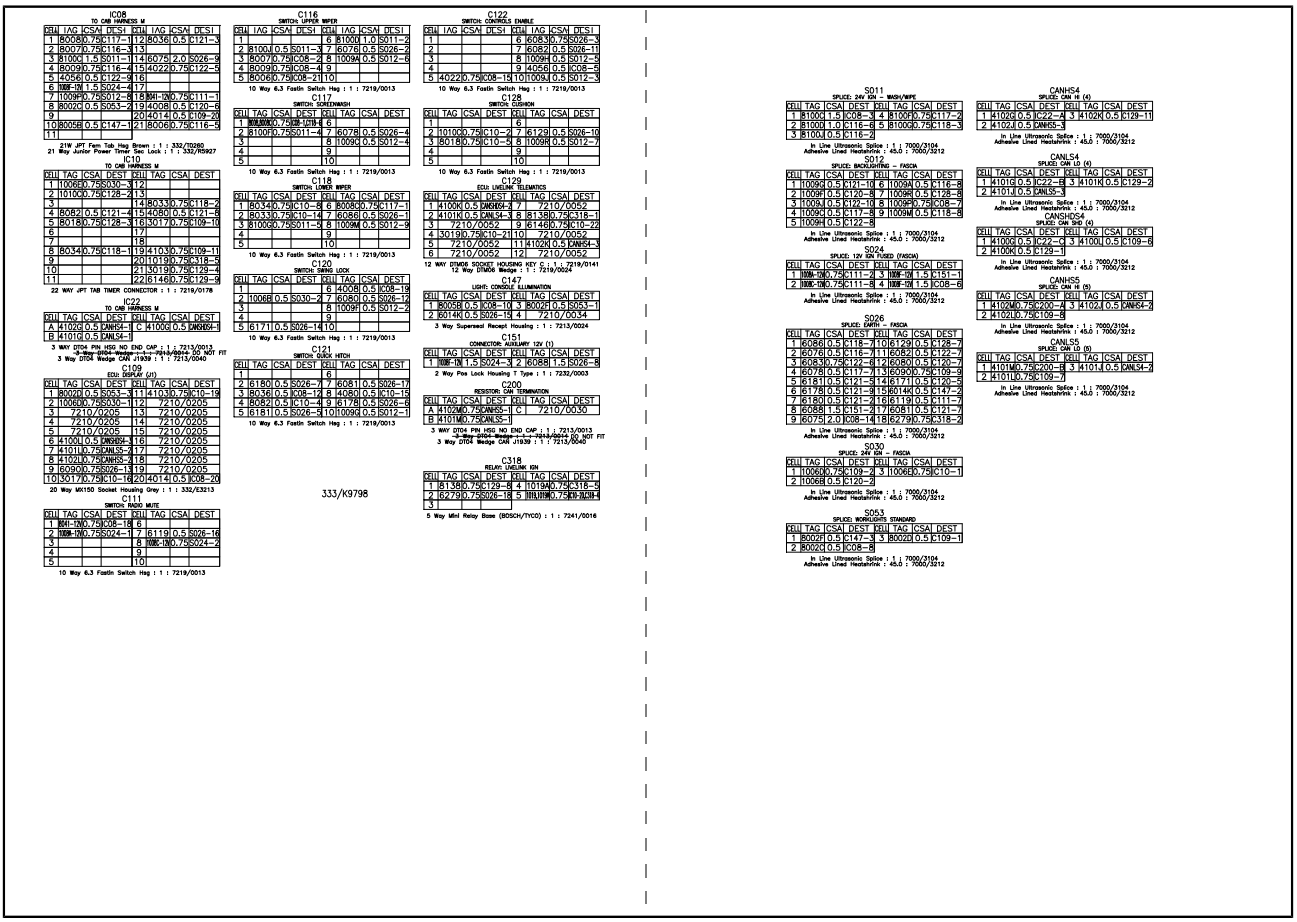

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**Figure 1029.**

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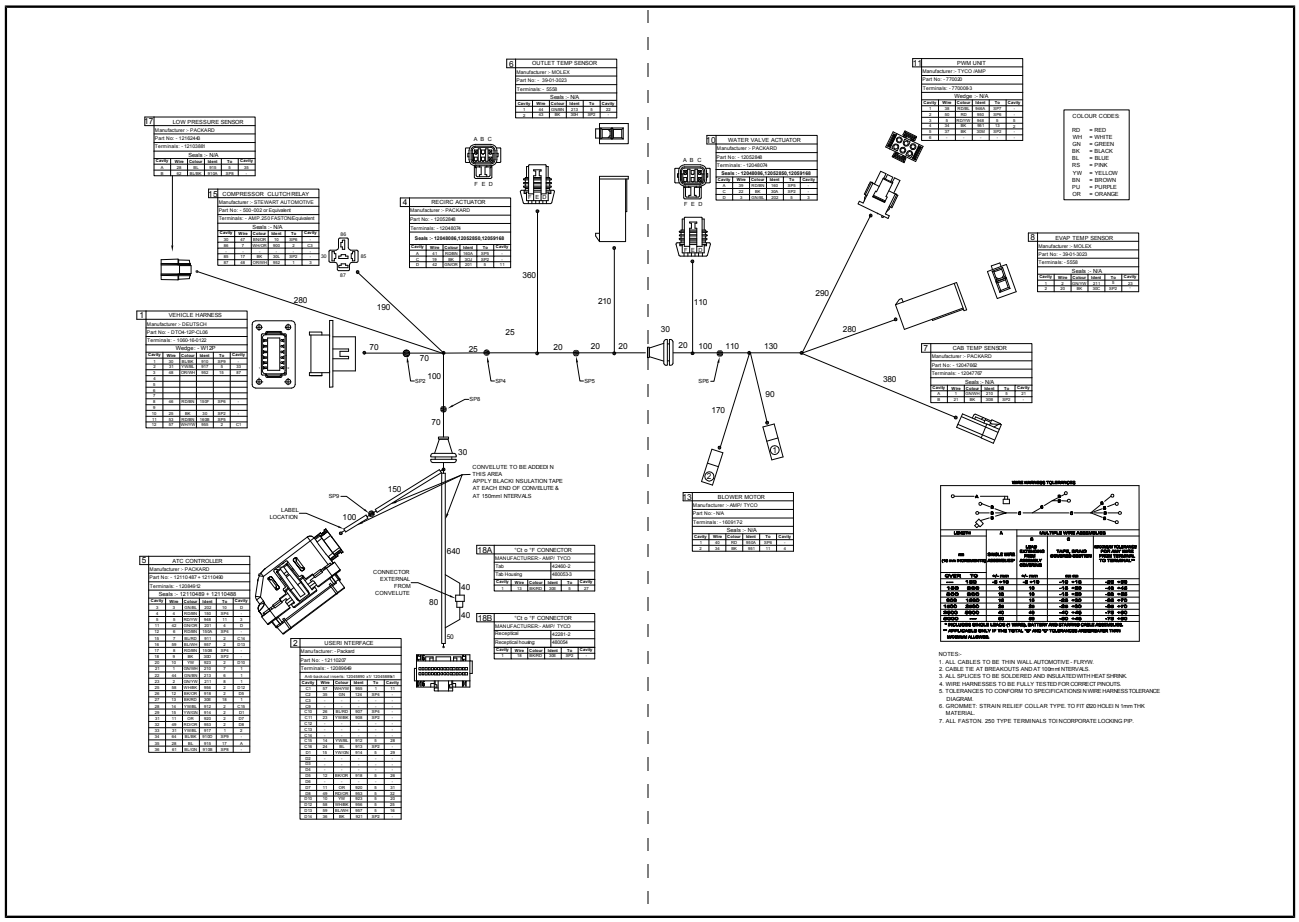


**e 1032. (Part 2 of 2)**

SCREEN SPLICE
SPLICE INTO OUTER SCREEN

| CELL | TAG | CSA | DEST |
|---|---|---|---|
| 1 | 6110 (W) | 0.75 | C066-1 |
| 2 | 6110A (W) | 0.75 | C068-4 |
| 3 | SCREEN 1 | 0.75 | MAIN SCREEN SPLICE-1 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

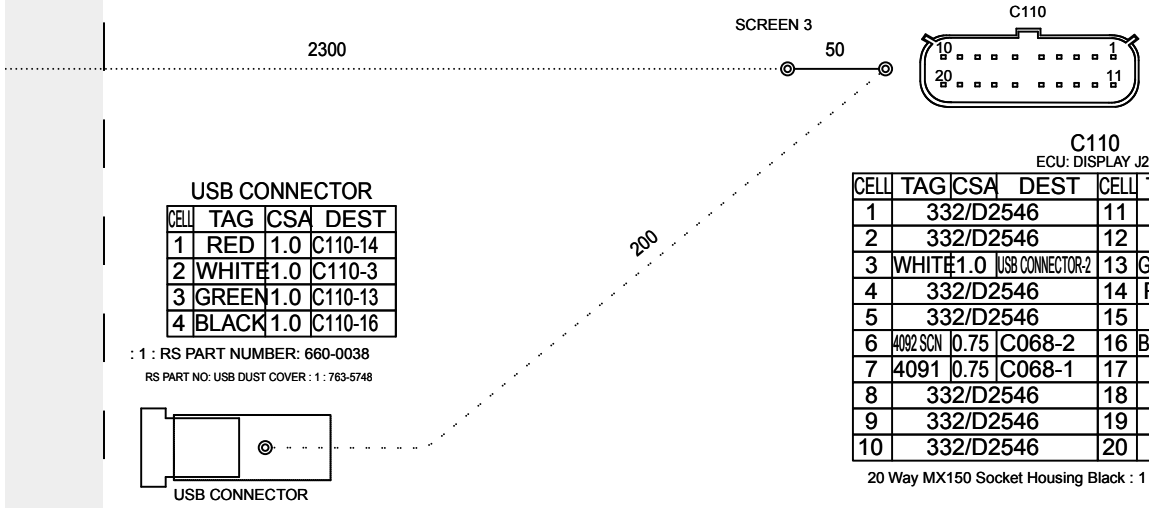
MAIN SCREEN SPLICE
SPLICES ALL OUTER SCREENS

| CELL | TAG | CSA | DEST |
|---|---|---|---|
| 1 | SCREEN 1 | 0.75 | SCREEN SPLICE-3 |
| 2 | SCREEN 2 | 0.75 | SCREEN 2-1 |
| 3 | SCREEN 3 | 0.75 | SCREEN 3-1 |

In Line Ultrasonic Splice : 1 : 7000/3104
Adhesive Lined Heatshrink : 45.0 : 7000/3212

SCREEN 3

| CELL | TAG | CSA | DEST |
|---|---|---|---|
| 1 | SCREEN 3 | 0.75 | MAIN SCREEN SPLICE-3 |




| CELL | TAG | CSA | DEST |
|---|---|---|---|
| 1 | RED | 1.0 | C110-14 |
| 2 | WHITE | 1.0 | C110-3 |
| 3 | GREEN | 1.0 | C110-13 |
| 4 | BLACK | 1.0 | C110-16 |

C110
ECU: DISPLAY J2

| CELL | TAG | CSA | DEST | CELL | TAG | CSA | DEST |
|---|---|---|---|---|---|---|---|
| 1 | 332/D2546 | | | 11 | 332/D2546 | | |
| 2 | 332/D2546 | | | 12 | 332/D2546 | | |
| 3 | WHITE | 1.0 | USB CONNECTOR-2 | 13 | GREEN | 1.0 | USB CONNECTOR-3 |
| 4 | 332/D2546 | | | 14 | RED | 1.0 | USB CONNECTOR-1 |
| 5 | 332/D2546 | | | 15 | 332/D2546 | | |
| 6 | 4092 SCN | 0.75 | C068-2 | 16 | BLACK | 1.0 | USB CONNECTOR-4 |
| 7 | 4091 | 0.75 | C068-1 | 17 | 332/D2546 | | |
| 8 | 332/D2546 | | | 18 | 332/D2546 | | |
| 9 | 332/D2546 | | | 19 | 332/D2546 | | |
| 10 | 332/D2546 | | | 20 | 332/D2546 | | |

20 Way MX150 Socket Housing Black : 1 : 332/C8190

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# 15 - Hand Throttle Control

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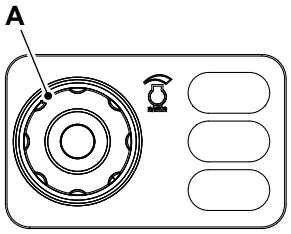
Component Identification ..... 33-292
Operation ..... 33-292
Diagram ..... 33-294
Remove and Install ..... 33-295

## Introduction

The throttle control knob enables selection of the machine power band. The power band setting displays on the applicable instrument panel.

The throttle control knob forms part of the throttle control system. Refer to: PIL 18-00.

**Figure 1043.**




**A** Throttle control knob

## Component Identification

**Figure 1057. Harness connector (C123)- Mode switches**

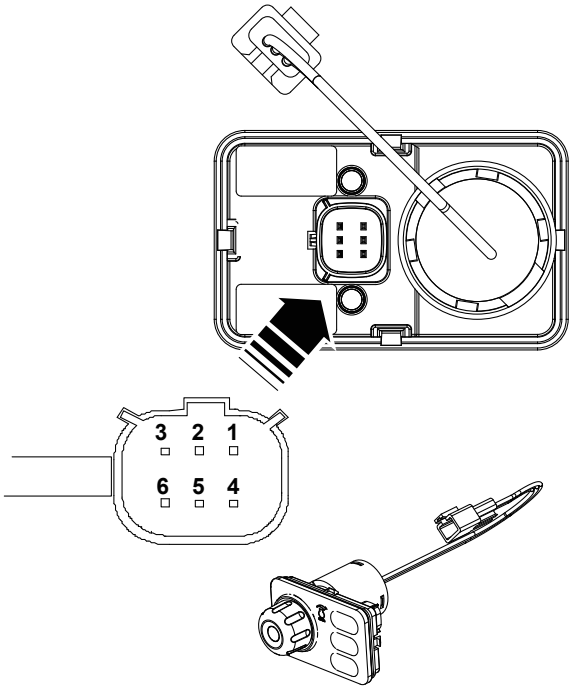



**Table 280. Harness connector (C123)- Mode switches**

| Pins | Details |
|---|---|
| 1 | Not used |
| 2 | Switch illumination power |
| 3 | Maximum power mode switch (low side output) |
| 4 | Travel speed mode select switch (low side output)[1] |
| 5 | Common earth |
| 6 | Auto idle switch (low side output) |

*(1) Not applicable to all machines.*

**Table 286.**

| Pins Refer to: PIL 33-27-51. | Resistance Ω |
|---|---|
| C to B | 8400 |
| A to B | 4200 |
| A to C | 4200 |

## Check the Wires and Connectors

Do not use a multimeter on ECU (Electronic Control Unit) pins. Only use the multimeter on harness connector pins.

1. Stop the engine.
2. Disconnect the applicable thumb wheel connector from the harness connector.

   Refer to: PIL 33-27-51.
3. Disconnect the harness connectors at the HECU.
4. Use a multimeter to check for continuity between the thumb wheel harness connector and destination pins in the HECU.

   Refer to: PIL 33-27-51.

   4.1. The resistance should be as specified.

   Resistance: 0.3 ± 0.2 Ω

# 33 - Console Switch

**Contents** **Page No.**

33-33-00 General ..... 33-341
33-33-09 Work Lights ..... 33-344
33-33-22 Beacon ..... 33-348
33-33-26 Front Window Washer/Wiper ..... 33-351
33-33-36 Control Lever Lock ..... 33-355
33-33-50 Radio Mute ..... 33-356
33-33-86 Engine Stop ..... 33-357
33-33-88 Slew Lock ..... 33-358
33-33-90 Cushion ..... 33-362

# 36 - Control Lever Lock

## Introduction

The control lever lock switch is part of the controls isolation system. Refer to: PIL 09-27.

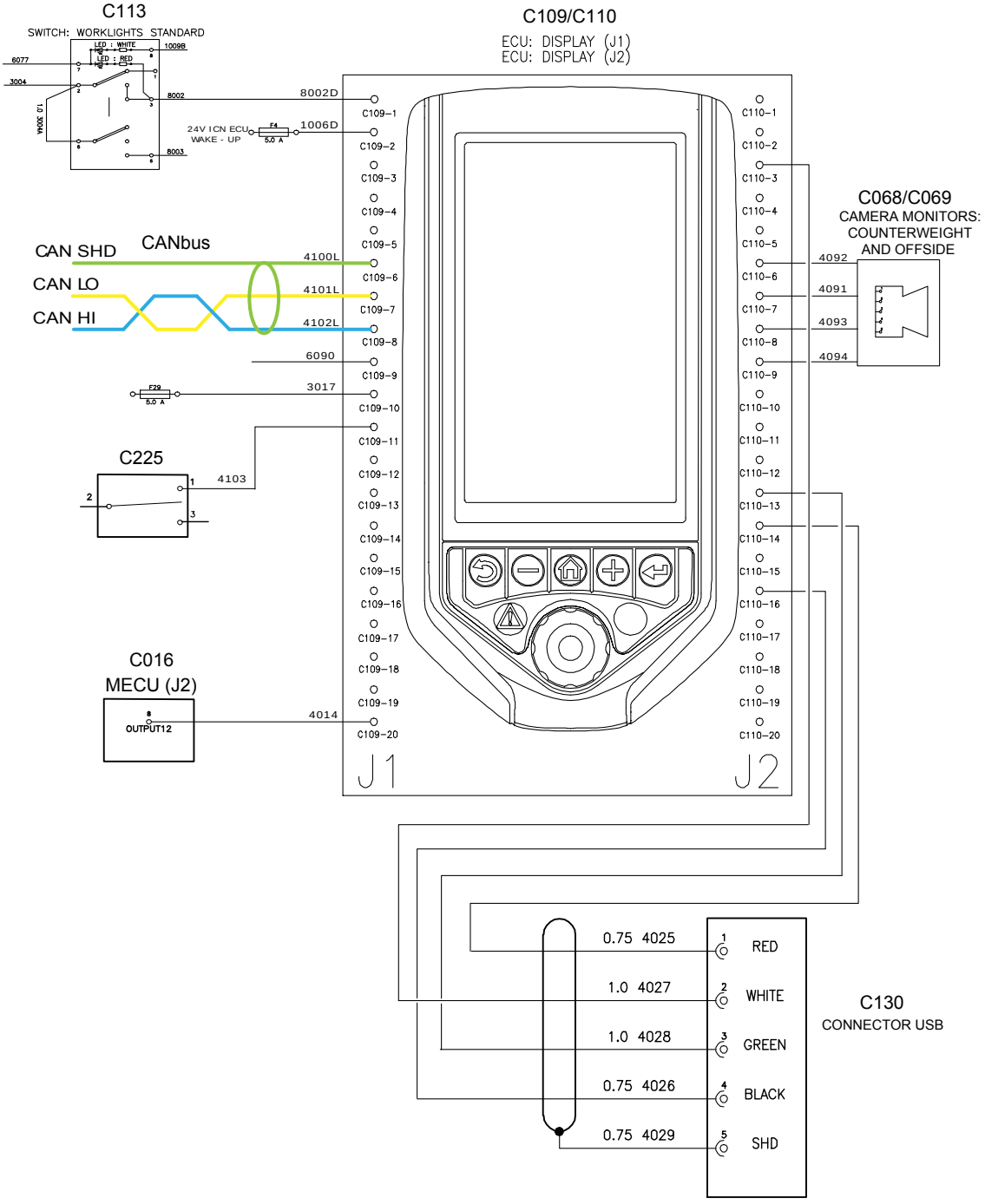
# 00 - General

## Introduction

Make sure the bulbs are replaced with the same type and rating as the damaged bulb.

# Diagram

**Figure 1130. Electrical Schematic**




**C068** Camera monitor
**C069** Camera monitor
**C109** DECU (Display Electronic Control Unit)
**C110** DECU
**C130** USB connector
**C225** Lever lock switch

# 03 - Radio

## Introduction

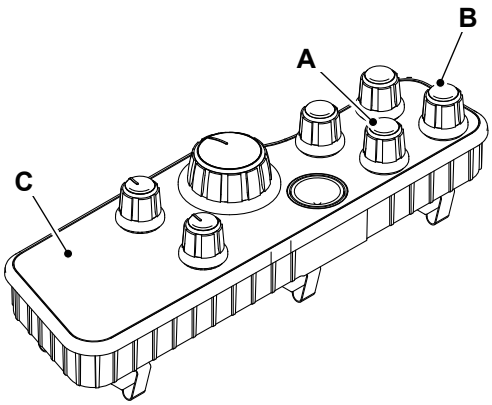
The radio operates on a 12 V supply from the machine (cab) voltage converter. Refer to: PIL 33-81-03.

The radio head unit is CAN (Controller Area Network) enabled.

The audio volume, input source and track can be selected by remote control switches, The switches are part of the control module in the right side console.

When a control is operated a message is sent on the CAN.

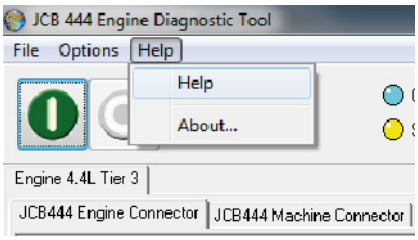
**Figure 1143.**




**A** Audio track / source select switch
**B** Audio volume / mute select switch
**C** Control module

### Manu Bar - Help Menu

**Figure 1159.**

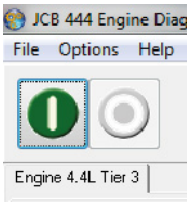



- About: Opens a window showing the part number and the version number of the installed copy of the Diagnostics software
- Help: Opens a help file about the software.
- For example Engine Help opens a help file containing information about the engine sensor and actuator devices for engine control.

### Start and Stop Buttons

These offer the same function as the Start Diagnostics and Stop Diagnostics options within the Options Menu. To start the Diagnostics tool communicating with the gearbox ECU simply click on the Start Button (large green LED) at the top of the Main Window. Similarly, click on the Stop Button (large red LED) to cease communications.

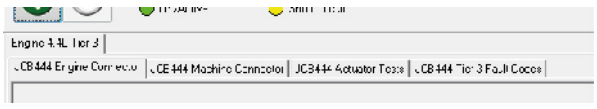
**Figure 1160.**




### Page List

In the top left corner of the main window is displayed a list of pages which can be displayed.

**Figure 1161.**



Clicking in the box next to the required page will make that page appear in the main window display area. (A tick will also appear in the box to show it is being displayed.) At any time the user may swap between displayed pages simply by clicking in the check box of the required page in the page list. The function keys, F2, F3 etc. can also be used to select pages as required.

### Status Bar

There are 2 items of interest displayed on the Status Bar, which is located along the bottom of the Diagnostics main window.

**Figure 1162.**


Connected ECU: The type of ECU connected to the Diagnostics tool is indicated on the far left side of the Status bar.

CAN communications: Two small LEDs indicate data being transmitted (red) and received (green) over the CAN communications link.

These LEDs can be seen to be flashing rapidly as data is transported. This can be another useful aid to determining the state of any established communications.

Connection Status: Indicates if the diagnostics software is connected, connecting or not connected to the ECU.

Information Window: Displays information about data on the diagnostics pages when the mouse is rolled over the fields.

### LED Status Key

Displays a key for the colour status of the LEDs shown on the diagnostics pages. The LEDs change colour dependant on the electrical signal.

**Figure 1163.**

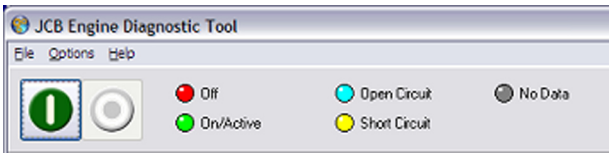



**Table 297.**

| LED Colour | Electrical signal status |
|---|---|
| Red | Off |
| Green | On/Active |
| Blue | Open circuit |
| Yellow | Short Circuit |
| Grey | No data |

8. A new window "Driver Installer" will open. Refer to Figure 1206.

   8.1. Obey the window instructions to the complete the DLA driver software installation.

**Figure 1206.**

V1.7 USB DLA
Win 7-Vista-XP
SP2 Drivers

## DLA Type and Communications Port - Configuration

When you use Servicemaster first time on your laptop/PC (which is newly installed with Servicemaster software) make sure that the correct DLA and laptop/PC port is selected to communicate with the DLA. Do the below steps to configuration the DLA with the laptop/PC.

1. Once you complete the DLA configuration, it will not require to do again on your laptop/PC.
2. Open Servicemaster on your laptop computer.
3. Click the "Other" tab to get access to the "General Support" icon.
4. Click the "General Support" icon to get access to the "DLA" icon.
5. Click the "DLA" icon.
6. Select and open the "COM Port Chooser" icon. Refer to Figure 1207.

**Figure 1207.**

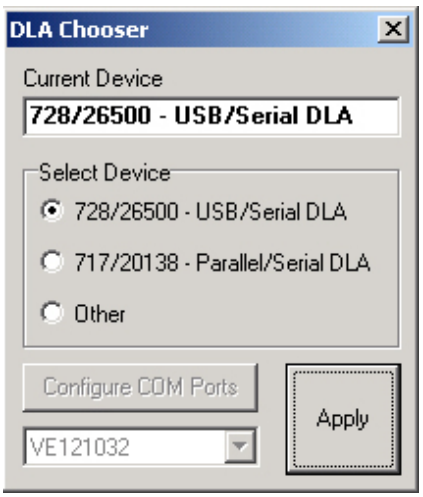
COM Port
Chooser

7. A new "DLA Chooser" window will open. Refer to Figure 1208.

   7.1. Select the USB /Serial DLA" device and click the "Apply" option to confirm.

   7.2. Make a note that the older DLA and laptop computers may not be compatible with the USB ports. Select the "Parallel/Serial DLA" device in the DLA chooser.

**Figure 1208.**




## DLA Firmware File - Check

The DLA has software embedded in its own flash memory. This file must be replaced with a new one when new firmware is released. You will only have to Check the DLA firmware file version if you receive a new Servicemaster version or use a different DLA.

1. Make sure that the DLA is connected to the laptop computer.
2. Open Servicemaster on your laptop computer.
3. Click the "Other" tab to get access to the "General Support" icon.
4. Click the "General Support" icon to get access to the "DLA" icon.
5. Click the "DLA" icon.
6. Select and open the USB DLA Flashloader" icon. Refer to Figure 1209.

   6.1. Make a note that the older DLA and laptop computers may not be compatible with the USB ports. Select and open the "Flashloader for Serial/Parallel DLA" icon.

**Figure 1209.**

USB DLA
Flashloader

| Fault Code | Machine Reaction | Fault Description |
|---|---|---|
| U040F | T4F Inducement | Engine rating mismatch |
| U059E | T4F Inducement | CAN bus message error from NOx sensor |
| U1100 | | Data logs full |
| U1300 | Machine Immobilised | ECU binding fault |
| U1308 | Engine Idle | MECU has lost CAN Communication with Throttle Actuator |
| U1800 | Machine Immobilised | ECU binding fault |
| U1900 | | LiveLink - Vehicle Battery Voltage Below Normal |
| U1901 | | LiveLink - Internal Voltage Below Normal |
| U1904 | | LiveLink - ECU Above Temperature Threshold |
| U1905 | | LiveLink - ECU Below Temperature Threshold |
| U1906 | | LiveLink - Accelerometer Internal Failure |
| U1907 | | LiveLink - Modem Jammed |
| U1908 | | LiveLink - GPS (Global Positioning System) Antenna fault |
| U1909 | | LiveLink - No Comms with GPS Module |
| U190A | | LiveLink - SIM Card Failure |
| U190B | | LiveLink - No Comms with GSM Module |
| U190C | | LiveLink - GSM Network Registration Failure |
| U2106 | | CAN Timeout Fault |

(For: JCB Tier 2/3 Mech Engine 4 Cyl)

This machine has no diagnostic capability and therefore there are no fault codes.

## 00 - General

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## Introduction

The electrical system detects operation of the different hydraulic services by means of servo pressure switches.

The switches are located in the applicable servo circuit.

When a hydraulic service is selected oil pressure in the applicable servo circuit increases and the servo pressure switch contacts close. A digital signal is sent to the applicable electrical control component.

## 00 - General

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## Introduction

Use the torque setting tables (Technical Data) only where no torque setting is specified in the text. Note: Dacromet fasteners are lubricated as part of the plating process, do not lubricate. Torque settings are given for the following conditions:

**Table 311. Up to September 2017**

| Type | Condition 1 | Condition 2 |
|---|---|---|
| no coating | Unlubricated fasteners | Zinc flake silver (Dacromet) fasteners. |
| 2 (obsolete from September 2017). | Zinc fasteners | Lubricated zinc and yellow plated fasteners. |
| 3, 4 (obsolete from September 2017). | Yellow plated fasteners | Where there is a natural lubrication. For example, cast iron components. |

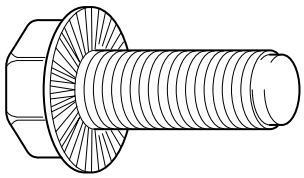
**Table 312. From September 2017**

| Type | Condition 1 | Condition 2 |
|---|---|---|
| no coating | Unlubricated fasteners | Dacromet) fasteners. |
| 1 | Zinc flake - silver | Zinc flake silver (Dacromet) fasteners. |
| 5 | Zinc and heavy trivalent with seal | |
| 7 | Zinc nickel - silver | |
| 8 | Zinc nickel - black | |
| 9 | Zinc flake - black | |

### Verbus-Ripp Bolts

Torque settings for these bolts are determined by the application. Refer to the relevant procedure for the required settings.

**Figure 1238.**



# 00 - Consumable Products

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# 00 - General

## Introduction

**Special Tools**

| Description | Part No. | Qty. |
|---|---|---|
| Grease Gun Attachment | 892/00913 | 1 |
| Grease Gun | 992/11300 | 1 |

**Consumables**

| Description | Part No. | Size |
|---|---|---|
| EP Hammer Grease | 4003/2107 | 0.4 kg |
| | 4003/2106 | 12.5 kg |
| Extreme Performance Moly Grease | 4003/1327 | 0.4 kg |
| | 4003/1326 | 12.5 kg |
| JCB Autogrease | 4003/2305 | 0.5 kg |
| Special HP Grease | 4003/2020 | 0.5 kg |
| | 4003/2017 | 0.4 kg |
| | 4003/2006 | 12.5 kg |
| | 4003/2005 | 50 kg |
| Special Hammer Grease | 4003/1119 | 0.4 kg |
| Special MPL-EP Grease | 4003/1501 | 0.4 kg |
| | 4003/1506 | 12.5 kg |
| | 4003/1510 | 50 kg |
| Special Slew Pinion Grease | 4003/1619 | 0.4 kg |
| Special Slide Grease | 4003/1115 | 0.4 kg |

There are various greasing points on the machine. You must grease the machine regularly to keep it working efficiently. Regular greasing will also lengthen the machine's working life. You must grease the machine as stated in the maintenance schedule. Refer to: PIL 78-24.

JCB grease is manufactured to provide significant load protection for your machine. It is recommended to use only JCB grease on your machine because they are specifically designed for the particular application. The list of JCB greases comprises:

1. JCB Special HP Grease
   Consumable: Special HP Grease
2. JCB Special MPL-EP Grease
   Consumable: Special MPL-EP Grease
3. JCB Extreme Performance Moly Grease
   Consumable: Extreme Performance Moly Grease
4. JCB Special Slide Grease
   Consumable: Special Slide Grease
5. JCB Autogrease
   Consumable: JCB Autogrease
6. JCB EP Hammer Grease
   Consumable: EP Hammer Grease
7. JCB Special Hammer Grease
   Consumable: Special Hammer Grease
8. JCB Special Slew Pinion Grease
   Consumable: Special Slew Pinion Grease

### Greasing Procedure

1. Make the machine safe.
   Refer to: PIL 01-03.
2. If necessary, install any maintenance or articulation struts.
3. Make a note of the following:
   3.1. The machine must always be greased after pressure washing or steam cleaning.
   3.2. Greasing must be done with a grease gun. Normally, two strokes of the gun should be sufficient.
   Special Tool: Grease Gun (Qty.: 1)
   Special Tool: Grease Gun Attachment (Qty.: 1)
   3.3. Stop greasing when fresh grease appears at the joint.
   3.4. Use only the recommended type of grease.
   3.5. Do not mix different types of grease, keep them separate.
4. Count off the grease points as you grease each one.
5. Install the dust caps after greasing (if installed).

### JCB Special HP Grease

JCB Special HP grease is a premium quality, extreme pressure grease. It is recommended for use in arduous operating conditions, such as high temperatures, excessive loading and extensive exposure to water. The sophisticated additive package combines with excellent adhesive properties to give high performance protection to your machine.

**Table 331. JCB Special HP Grease Properties**

| Description | Data |
|---|---|
| Colour | Blue |
| Soap type | Lithium complex |

# 00 - General

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## Introduction

All adhesives should be used at all times in line with the manufacturer's recommendations.

Adhesives are used for the bonding of a number of engineering materials used in production at JCB. Many types are available on the market but in the interests of variety reduction and economy only a limited selection is purchased for regular use.

### Types of adhesive

Various types of adhesive are covered by JCB Standards:

1. General purpose adhesives for bonding laminated plastics, wood, rubber etc. to themselves and to each other.
2. The more expensive cyanoacrylate adhesives for use where high strength, resistance to many chemicals and fast cure times are required.
3. Adhesives specially developed for bonding of foam rubber to painted metal surfaces.

### Additional health and safety for cyanoacrylates

These adhesives require very careful handling on account of their exceptional properties. They bond together strongly and rapidly to most surfaces including body tissue, the curing process being initiated by surface moisture. For further information on cyanoacrylates refer to the Manufacturer's recommendations.

### Approved adhesives

The tables shown in Technical Data are the approved adhesives available to use on JCB machines. The tables also provide basic details to help with the selection of adhesives. More up to date information can be found on the manufacturer's website.

- Make sure that 1 in 5 fuel tank fills use standard diesel to EN590 specification, this will help to prevent `gumming'.
- Make sure regular oil sampling is completed (look for excessive unburnt fuel content, water or wear particles.
- Make sure regular oil sampling is completed (look for excessive unburnt fuel content, water or wear particles.
- Change the engine oil and filter more frequently (as a minimum half the recommended intervals), or as indicated by oil sampling.
- Change the fuel filters more frequently (as a minimum half the recommended intervals), or if there are engine performance related issues.
- Make sure the fuel is stored correctly, care must be taken to make sure no water enters the machine fuel tank (or the storage tank). Water will encourage micro-bacterial growth.
- Make sure that the fuel pre-filter is drained DAILY (not every week as currently advised).
- Use heater kits in low ambient temperature territories.
- The biodiesel must meet the following standards: ASTM D6751, DIN 51606, ISO 14214

If necessary use a test kit to confirm the fuel specification. Testing kits are available (not from JCB currently), use the internet as a source for the kits.

If performance related issues are to be reported to JCB Service, and the engine has been run on biodiesel, then the fuel system must be filled with standard diesel (at least 2 x tank fills) to EN590 specification and relevant stall speeds recorded prior to making the report.

## Warranty

JCB have shown a commitment to support the environment by approving the use of biodiesel blended fuels.

Using a B20 blend of biodiesel requires caution and additional servicing of the engine is required. Refer to:-Service Requirements for use of B20 Biodiesel.

Failure to follow the additional recommended service requirements may lead to a warranty claim being declined.

Failures resulting from the incorrect use of biodiesels or other fuel additives are not defects of the JCB Ecomax engine workmanship and therefore will not be supported by JCB Warranty.

## Usage and Effects of Fuels

### Acceptable Fuels

- Ultra Low Sulphur Diesel (EN590) - Available throughout the UK, Europe and North America since March 1999. This fuel has a maximum sulphur content of 0.001% (0.0015% in North America) by weight and a further reduction in the natural lubricity and aromatic content than experienced with low sulphur diesel. Major oil producers will add lubrication improvers and also maintain the total aromatic content to an acceptable level.
- B20 Biodiesel - 7 –20 % - Biodiesel refers to pure fuel before it is blended with diesel fuel. When biodiesel is blended with diesel fuel it is referred to as B5, B20 etc., where the number indicates the percentage of biodiesel in the fuel, for example B5 contains 5 % biodiesel. Biodiesel has different characteristics than mineral based fuels, this could lead to seals swelling, fuel system corrosion and seal damage. Biodiesels will `cloud' at higher temperatures than mineral based fuels. To explain Cloud Point - the lowest temperature at which fluid can flow and performs its functions is referred to as Pour Point. Just prior to reaching its Pour Point the diesel fluid becomes `cloudy' due to crystallization of waxy constituents - this is know as Cloud Point. Using diesel at temperature below its cloud point can result in filter clogging. To prevent this happening preheating will be required. Using B20 biodiesel can result in unburnt fuels accumulating in the engine oil, ultimately this can affect the engine oil efficiency and lead to engine damage (with standard diesel any unburnt fuel evaporates off the lubricating oil). The natural properties of biodiesel make it a good medium for micro bacterial growth, these microbes can cause fuel system corrosion and early fuel filter blocking. Biodiesels must be stored to exclude water absorption and oxidation. It will be necessary to consult and seek advice from your fuel supplier, the effectiveness of conventional antibacterial additives when used in biodiesel is still being investigated in the fuel industry. A high percentage biodiesel mixture (> 20 %) can lead to fuel gelling and filter blocking in low temperature operation, it may also effect the power and performance of the engine. To minimise the risk of engine damage when using a B20 mix, there are additional service requirements. If the recommended actions are not taken there may be the following consequences:- low temperature filter clogging- injectors lacquering / stickingdeterioration of seals and rubber hoses- corrosion of metal parts in the fuel system- engine performance problems. These risks will be increased if the

# 81 - Clothing and Personal Protective Equipment (PPE)

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