

# SERVICE MANUAL

COMPACT EXCAVATOR  
15C-1, 16C-1, 18Z-1, 19C-1, 19C-1 PC

EN - 9813/7900 - ISSUE 2 - 05/2018

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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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## 12 - Maintenance Safety

### Introduction

#### Raised Machine

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

#### Air Conditioning Maintenance

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

#### Compressed Air

Compressed air is dangerous. Wear personal protective equipment. Never point a compressed air jet at yourself or others.

#### Springs

Always wear personal protective equipment when dismantling assemblies containing components under pressure from springs. This will protect against eye injury from components accidentally flying out.

#### Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or copper drift to remove and install metal pins. Always wear personal protective equipment.

#### Communications

Bad communications can cause accidents. If two or more people are working on the machine, make sure each is aware of what the others are doing. Before starting the engine make sure the others are clear of the danger areas. Examples of danger areas are: the rotating blades and belt on the engine, the attachments and linkages, and anywhere beneath or behind the machine. People can be killed or injured if these precautions are not taken.

#### Repairs

If your machine does not function correctly in any way, get it repaired straight away. Neglect of necessary repairs could result in an accident or affect your health. Do not try to do repairs or any other type of maintenance work you do not understand. To avoid injury and/or damage get the work done by a specialist engineer.

#### Hydraulic Pressure

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

#### 'O' rings, Seals and Gaskets

Badly installed, damaged or rotted 'O' rings, seals and gaskets can cause leakages and possible accidents. Renew whenever disturbed unless otherwise instructed. Do not use Trichloroethane or paint thinners near 'O' rings and seals.

#### Arc Welding

To prevent the possibility of damage to electronic components, disconnect the battery and the alternator before arc-welding on the machine or attached implements.

If the machine is equipped with sensitive electrical equipment, i.e. amplifier drivers, electronic control units (ECUs), monitor displays, etc., then disconnect them before welding. Failure to disconnect the sensitive electrical equipment could result in irreparable damage to these components.

Parts of the machine are made from cast iron, welds on cast iron can weaken the structure and break. Do not weld cast iron. Do not connect the welder cable or apply any weld to any part of the engine.

Always connect the welder earth (ground) cable to the same component that is being welded to avoid damage to pivot pins, bearings and bushes. Attach the welder earth (ground) cable a distance from the part being welded no more than 0.6 m.

#### Counterweights

Your machine may be installed with counterweights. They are extremely heavy. Do not attempt to remove them.

#### Accumulators

The accumulators contain hydraulic fluid and gas at high pressure. Prior to any work being carried out on systems incorporating accumulators, the system pressure must be discharged by a JCB dealer, as the sudden release of the hydraulic fluid or gas may cause serious injury or death.

#### Hot Components

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

#### Soft Ground

A machine can sink into soft ground. Never work under a machine on soft ground.



## 09 - Description

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## 00 - General

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## Introduction

A wide range of optional attachments are available to increase the versatility of your machine. Only JCB approved attachments are recommended for use with your machine. Consult your JCB Distributor for the full list of approved attachments available.

Some attachments are supplied complete with instructions on safety, installing and removing, operation and maintenance. Read and fully understand the information before fitting, using and servicing the attachment. If there is anything you do not understand, ask your JCB Distributor.

Before using any attachment, read Working With The Machine in the Operator Manual and consider how the attachment is going to affect operational safety. With the attachment installed, there may be changes in the machine's centre of gravity or overall dimensions. This could have an effect on, for example, machine stability, the gradients on which it is safe to operate or the safe distance from power lines.

Practice using attachments off the job before working with them for the first time.

JCB attachments are designed and manufactured specifically to suit the machine's hydraulic system, mounting arrangements and safe load requirements. Attachments which are not designed for use with this machine may cause damage and create safety hazards for which JCB cannot be held responsible. In addition the machine's warranty and any other legislative compliance may be affected by the use of non JCB approved attachments.

If your machine needs the hydraulic system adapting to facilitate the use of auxiliary attachments, you must consult your distributor. Only suitably qualified personnel must reroute hydraulic hoses.

All optional attachments will have limits on their operation. i.e. lifting capacity, speeds, hydraulic flow rates, etc. Always check in the literature supplied with the attachment or in the Specification section of this manual. Some specification limits may also be displayed on the attachments Data/Rating Plate.

**Important:** Do not operate or work with attachments until the machine hydraulic oil has reached its normal working temperature.



## 27 - Bucket

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## Remove and Install

**▲ WARNING** The attachment will move when released. Stand clear and to one side when releasing the attachment.

**WARNING** The rockbreaker must be positioned correctly before attempting to release it from the quickhitch. If incorrectly positioned, the rockbreaker could swing or fall suddenly from the machine when releasing the quickhitch latch hook.

**WARNING** Always install the quickhitch latch hook locking pin (mechanical only). Failure to install the pin will result in possible failure of the latching mechanism. Such a failure could result in the sudden release of an attachment from the machine and you or others could be killed or seriously injured.

To prevent premature wear, failure and breakage, the Quickhitch assembly must be used with a rockbreaker for short periods only. If the machine is to be used for rock breaking for a long period of time,

it is recommended that the rockbreaker is installed directly on the machine.

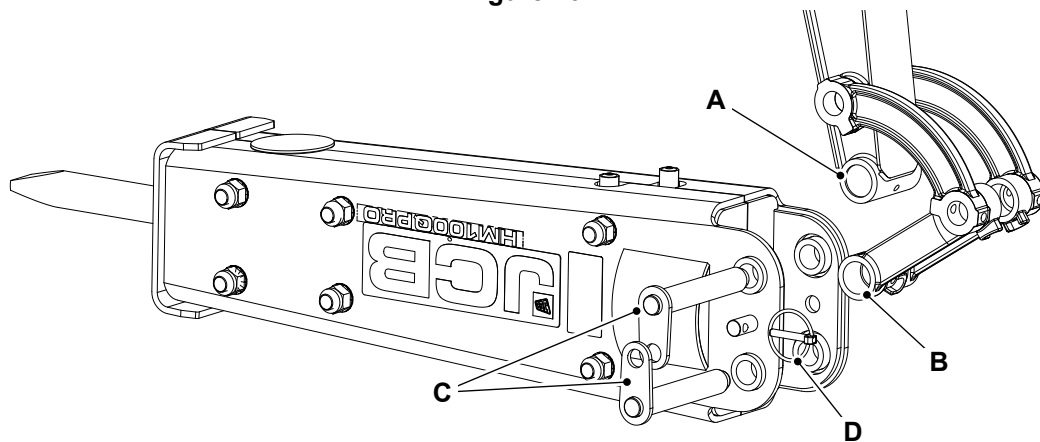
When using a rockbreaker, it must be curled towards the machine (as a typical digging operation).

Do not use the rockbreaker as a lever as this causes excessive loads on the locking mechanism.

### Installation

1. Set the rockbreaker on solid, level ground. Use safe and correct lifting equipment to move the rockbreaker.
2. Carefully align the holes in the dipper and bucket link with the rockbreaker. If necessary move the machine to align the pivot pin holes. Refer to Figure 20.
3. Install the pivot pin and lynch pin.
4. Connect the attachment hydraulic hoses to the excavator.

Figure 20.



**A** Hole (dipper ram)  
**C** Pivot pins

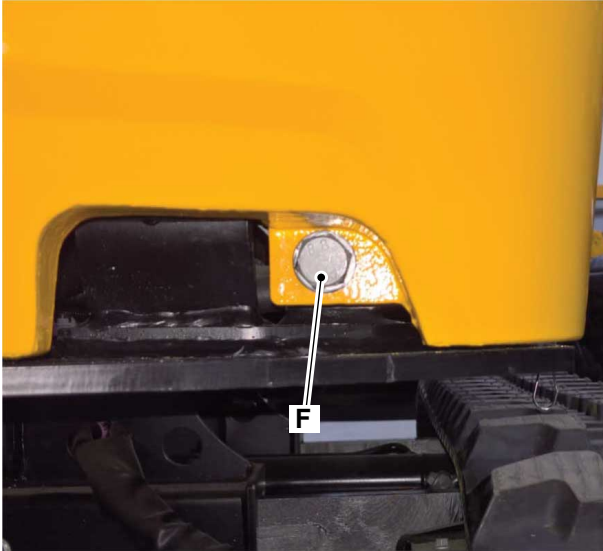
**B** Hole (bucket link)  
**D** Lynch pin

### Removal

1. When possible, put the attachments on solid, level ground to make the removal procedure safe and easier.
2. Park the machine on solid, level ground.
3. Position the rockbreaker on the ground. Refer to Figure 21.

6. Pull the quick release latch lever.
7. If installed, remove the bolt.

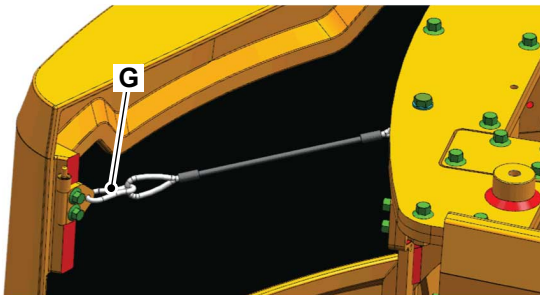
**Figure 28.**



**F** Bolt

8. Open the rear counterweight and side cover assembly.
9. If installed disconnect the rear counterweight retaining strap.

**Figure 29.**



**G** Retaining strap

- 9.1. Make sure that the operator station door is closed before disconnecting the retaining strap.

**Close**

1. The close procedure is the opposite of the open procedure.

(For: 15C-1 [T3], 16C-1 [T3])

**Open**

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

**WARNING** Airborne particles of light combustible material such as straw, grass, wood shavings, etc. must not be allowed to accumulate within the engine compartment or in the propshaft guards (when installed). Examine these areas frequently and clean at the beginning of each work shift or more often if required. Before opening the engine cover, make sure that the top is clear of debris.

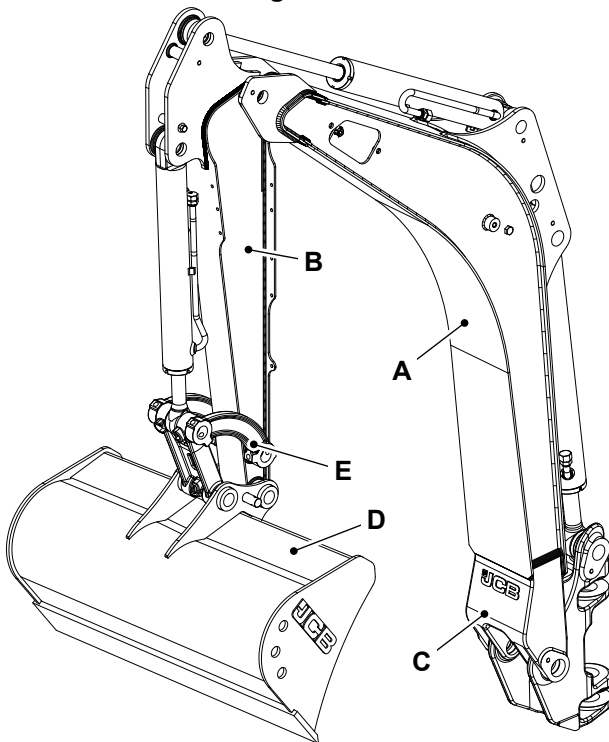
**WARNING** Make sure that the machine is parked on the solid, level ground before opening the rear counterweight door. Opening the rear counterweight door while machine is parked on an inclined surface can cause a stability hazard.

**WARNING** Do not operate the machine with rear counterweight door opened. Safety hazard could occur.

**WARNING** Make sure that the operator station door is closed (not latched in open position) and operating area is clear of people before opening the rear counterweight door otherwise damage to the machine or personnel injury could occur.

The engine is covered by a rear counterweight door. Before opening the rear counterweight door, make sure that the machine is parked on solid, level ground. Opening the rear counterweight door while machine is parked on an inclined surface can cause a stability hazard.

1. Make the machine safe with the excavator arm lowered.  
**Refer to: Unresolved link (id=22325).**
2. Use the ignition key to unlock the door.
3. To release the latch, pull the handle.
4. If necessary the hydraulic compartment cover can now be opened.

**Component Identification****Figure 39.**

- A** Boom
- B** Dipper
- C** Kingpost
- D** Bucket
- E** Tipping linkage



**00 - General**

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**Introduction**

The dozer blade is a heavy, broad steel blade mounted on the front of the machine. It is used to push quantities of soil, sand, rubble, earth or rocks or other such material during road building, farming, construction or conversion work.

The blade may be lifted and forced down by hydraulic rams.

For excavating, the blade is held below the surface level, for transporting, it is held at the surface level, and for spreading, it is held above the surface level, as the machine moves forward.



## 00 - General

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## Introduction

Pivot pins are a short shaft or pin that supports something that turns. Pivot pins are installed in numerous positions on the machine. There is usually a greasing point associated with the pivot pin. Make sure that the pivot points are greased at regular intervals. Refer to the Machine Maintenance Schedules. [Refer to: PIL 78-24.](#)

## Slide Hammer Kit

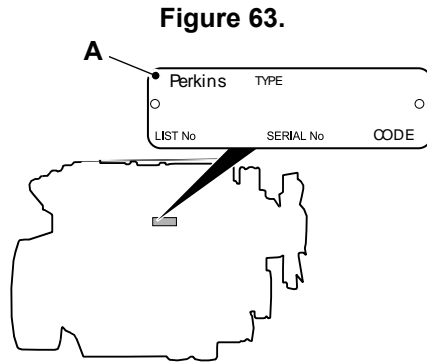
The slide hammer kit is used to remove pivot pins that must be extracted, i.e. cannot be 'knocked through'. The purpose of this description is to explain how the kit and the various components are used to remove the pivot pins.

The adaptors that form part of the kit have a screwed thread at each end. One of the threads will always be M20 size, this is to accommodate the end stops. The other end of the adaptor will have varying thread sizes to suit the different size of threads in the pivot pins.

## 06 - Engine

### Introduction

The engine data label is located on the cylinder block as shown.



**A** Engine data label

The data label includes the engine identification number. The engine identification number has 15 digits and must be read from left to right. For example, GN82691U969759B.

**Table 12. Explanation of the engine identification number**

| Digit   | Description                  |
|---------|------------------------------|
| 1 to 2  | Engine family and type code. |
| 3 to 7  | Build list number.           |
| 8       | Country of manufacture code. |
| 9 to 14 | Engine serial number.        |
| 15      | Year of manufacture code.    |

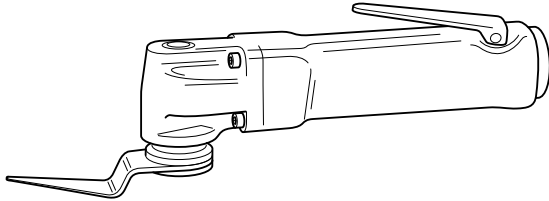


## 00 - Operator Station

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

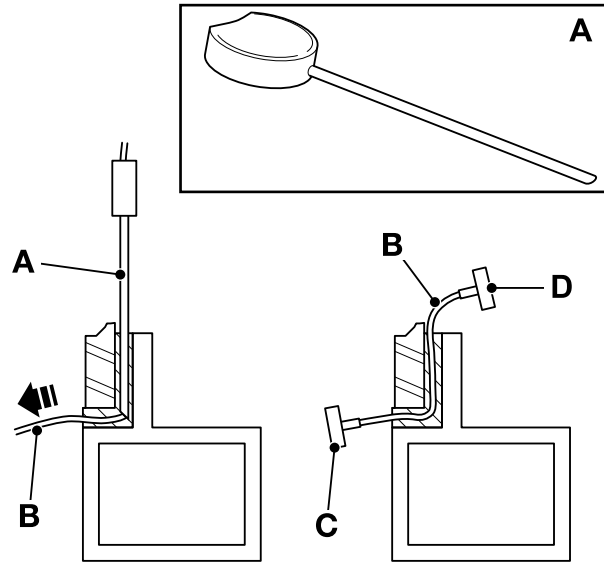
Figure 81.



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

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

Figure 82.

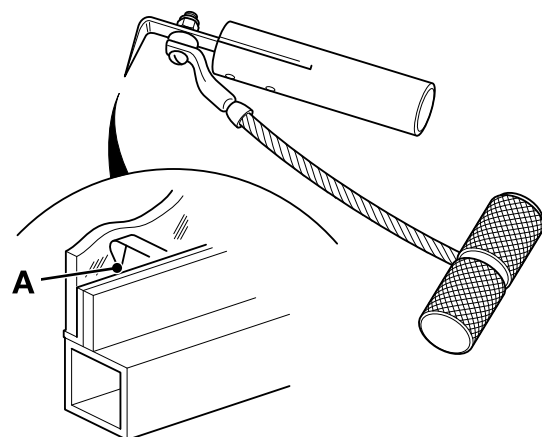


A Wire starter  
 B Braided cutting wire  
 C Glass extractor (handles)  
 D Glass extractor (handles)

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

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

Figure 83.



A Glass

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



**00 - General**

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**Introduction**

The main controls inside the operator station are covered in detail in the relevant operator manual.

## Remove and Install

### Remove

1. Lower the dozer to the ground.
2. Make the machine safe.  
[Refer to: PIL 01-03.](#)
3. Open the right hand side cover.  
[Refer to: PIL 06-06-13.](#)
4. Disconnect the electrical connector from the dozer lever (two-speed machines).
5. Remove the knob from the dozer lever.
6. Remove the clip and disconnect the dozer lever cable.
7. Remove the bolt that attaches the dozer lever to the machine frame.
8. Remove the dozer lever.

### Install

1. Installation is the opposite of the removal procedure.



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# 12 - Heating, Ventilating and Air-Conditioning (HVAC)

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## 09 - Recirculation

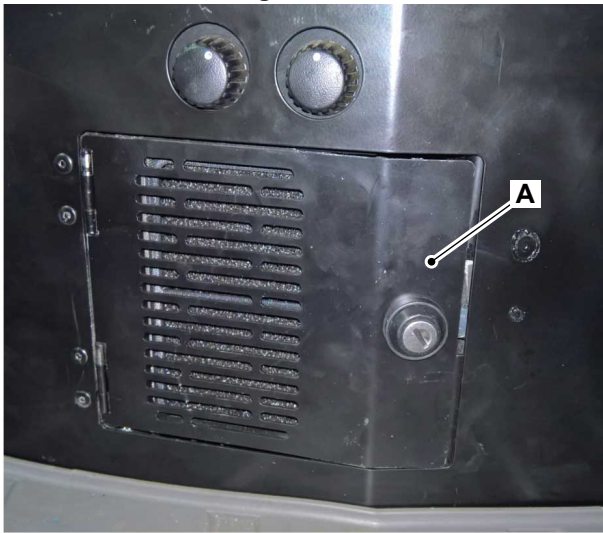
### Remove and Install

(For: 15C-1 [T3], 16C-1 [T3], 19C-1 PC [T3], 19C-1 [T3], 19C-1 [T4F], Cab)

#### Remove

1. Make the machine safe.  
[Refer to: PIL 01-03.](#)
2. Open the filter access panel.

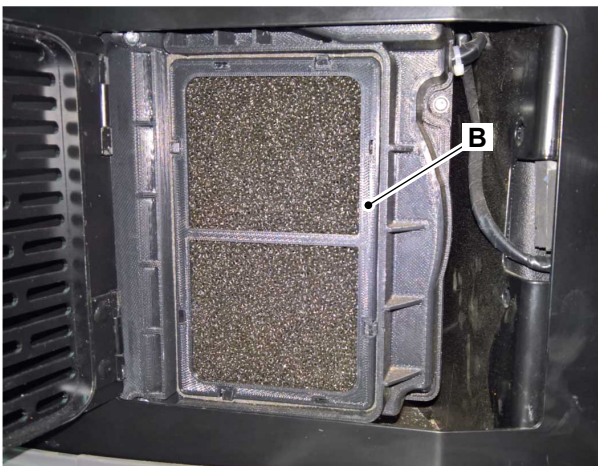
**Figure 114.**



**A** Filter access panel

3. Remove the filter element.

**Figure 115.**



**B** Filter element

4. If required, clean the area around the heater unit.

#### Install

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



*accordance with local regulations. Use authorised waste disposal sites.*

## Clean

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

**Notice:** The engine and other components could be damaged by high pressure washing systems. Special precautions must be taken if the machine is to be washed using a high pressure system.

Make sure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system. Do not aim the water jet directly at bearings, oil seals or the engine air induction system.

Before carrying out any service procedures that require components to be removed, the engine must be properly cleaned.

Cleaning must be carried out either in the area of components to be removed or, in the case of major work, or work on the fuel system, the whole engine and surrounding machine must be cleaned.

Stop the engine and allow it to cool for at least one hour. DO NOT attempt to clean any part of the engine while it is running.

1. Make sure that the electrical system is isolated.
2. Make sure that all electrical connectors are correctly connected. If connectors are open install the correct caps or seal with water proof tape.
3. Cover the alternator with a plastic bag to prevent water ingress.
4. Seal the engine air intake, exhaust and breather system.
5. Make sure that the oil filler caps and dipstick are correctly installed.
6. Use a low pressure water jet and brush to soak off mud or dirt.
7. Apply an approved cleaning and degreasing agent with a brush. Obey the manufacturers instructions.
8. Use a pressure washer to remove the soft dirt and oil. Important: DO NOT aim the water jet directly at oil seals or electrical and electronic components such as the engine electronic control unit (ECU), alternator or fuel injectors. DO NOT place the jet nozzle closer than the specified distance to any part of the engine.

Distance: 600 mm

9. When the pressure washing is complete, move the machine away from the wash area, or alternatively, clean away the material washed from the machine.
10. Before working on specific areas of the engine, use a compressed air jet to dry off any moisture. When the area is dry, use a soft clean brush to remove any sand or grit particles that remain.
11. When removing components, be aware of any dirt or debris that may be exposed. Cover any open ports and clean away the deposits before proceeding.

Additional cleaning must be carried out prior to working on the high pressure fuel system. Refer to Fuel System, General, Clean.



## 06 - Cylinder Head

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## 03 - Main Bearing

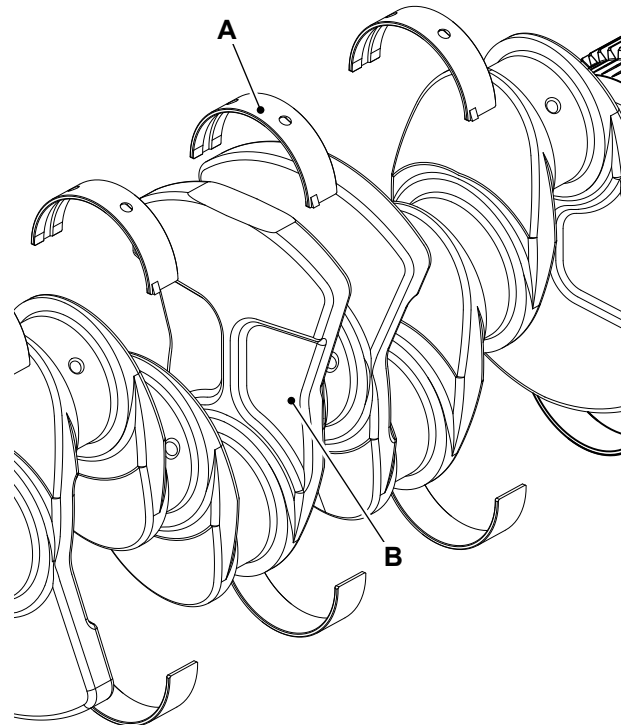
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## Introduction

In a piston engine, the main bearings are the bearings on which the crankshaft rotates.

The bearings hold the crankshaft in place and prevent the forces created by the piston and transmitted to the crankshaft by the connecting rods from dislodging the crankshaft, instead forcing the crank to convert the reciprocating movement into rotation.

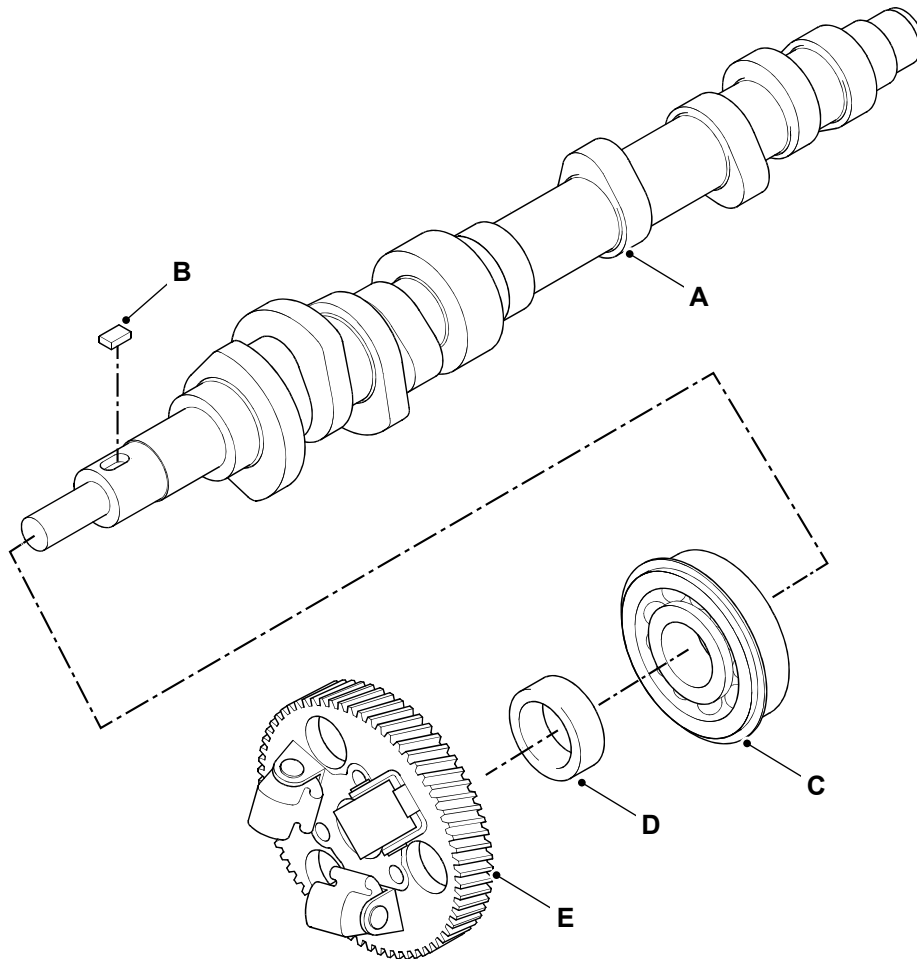
**Figure 141.**



- A** Main bearing
- B** Crankshaft

## Component Identification

Figure 156.



A Camshaft  
C Bearing  
E Gear

B Woodruff key  
D Spacer

## Check (Condition)

At the recommended service interval, visually inspect the drive belt for damage.

1. Make the machine safe.  
[Refer to: PIL 01-03-27.](#)
2. Stop the engine and let it cool down.
3. Replace the drive belt if it has cracks or if it is frayed or has pieces of material missing.

## 00 - General

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## Introduction

### Introduction

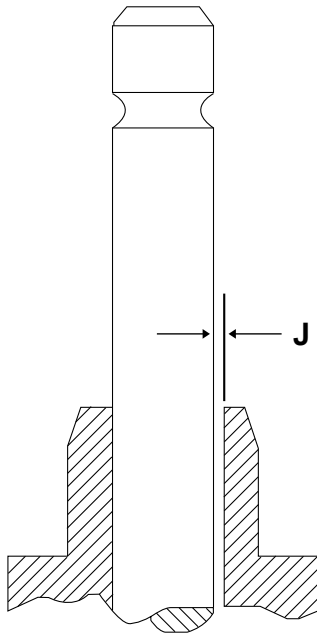
Engine performance and durability will be severely affected if the quality of the air intake is poor.

A dirty and blocked air filter will reduce the amount of air entering the combustion chamber which can cause engine misfiring, 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.

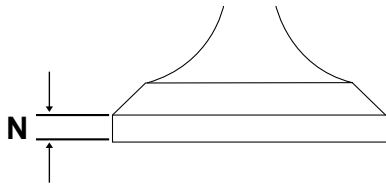
This is a dry-type air filter with a replaceable paper filter cartridge.

Figure 171.



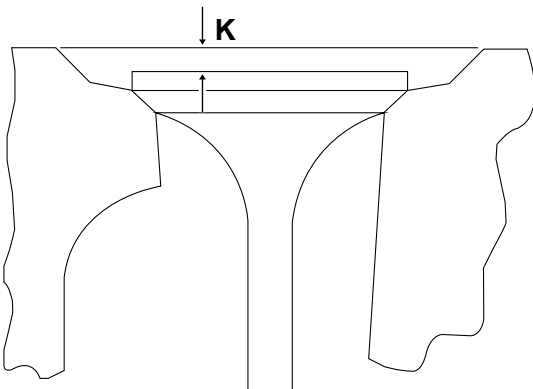
J Valve - valve guide clearance

Figure 172.



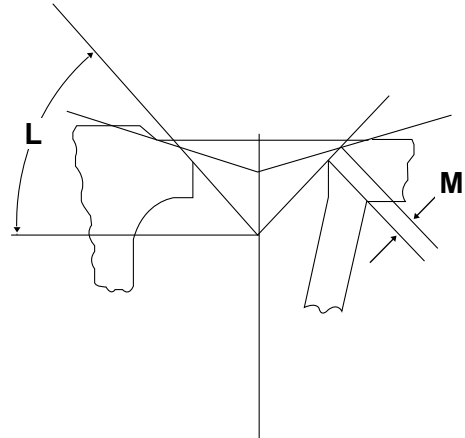
N Valve head thickness

Figure 173.



K Valve depth

Figure 174.



L Valve seat angle  
M Contact face

## 00 - General

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## Introduction

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

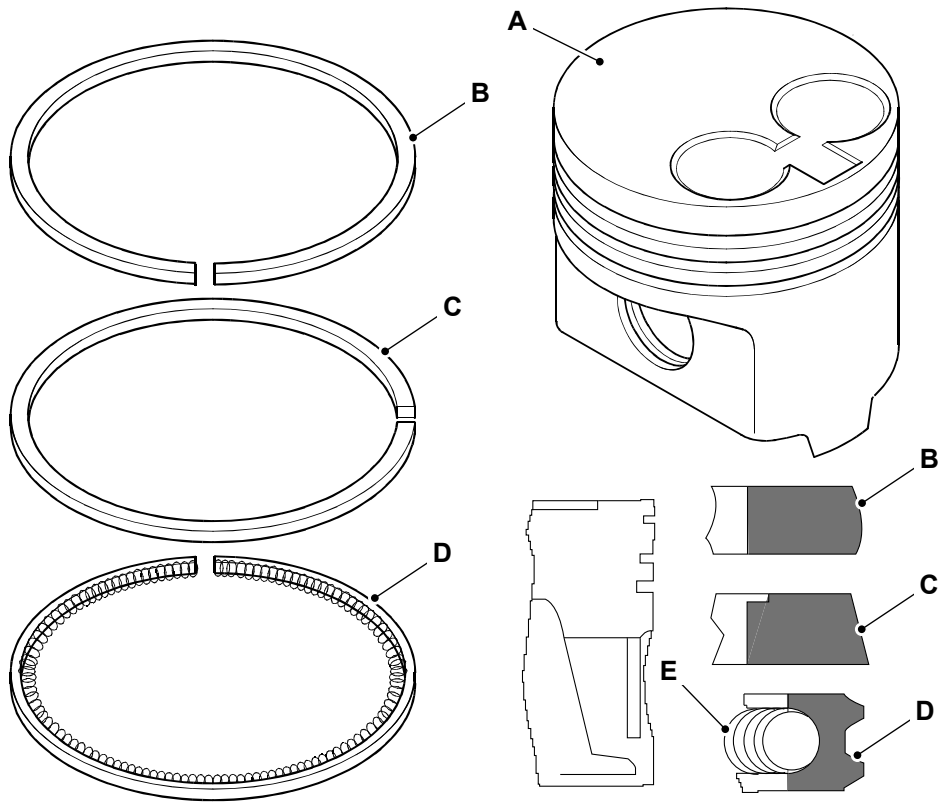
Connecting rods are usually made of high strength steel. They are not rigidly fixed at either end, so that the angle between the connecting rod and the piston can change as the rod moves up and down and rotates around the crankshaft.

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

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

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

**Figure 189.**



- A** Piston
- C** Intermediate ring
- E** Spring

- B** Top ring
- D** Oil control ring



## **39 - Manifold**

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## **01 - Rocker Arm**

### **Remove and Install**

Refer to Rocker Assembly-Remove and Install. [Refer to: P/L 15-42-00.](#)

## Remove and Install

### Remove

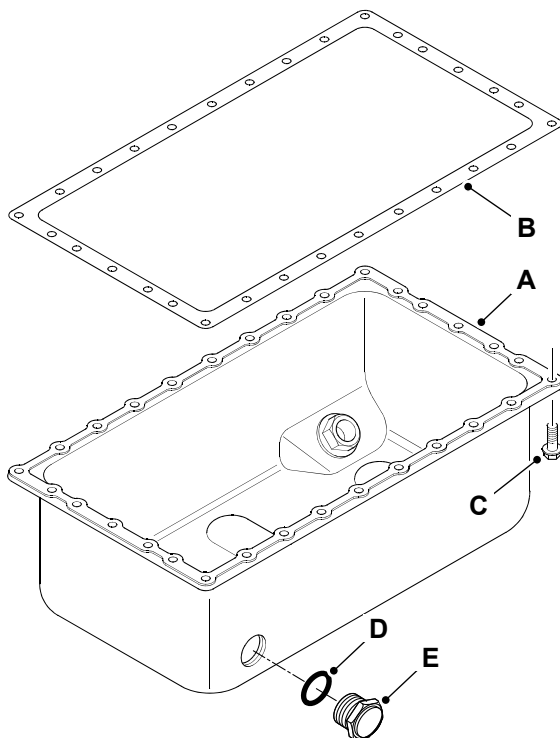
1. Make the machine safe.  
[Refer to: PIL 01-03-27.](#)
2. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
3. Drain the oil from the engine.  
[Refer to: PIL 15-00-00.](#)
4. Remove the sealing washer from the drain plug.
5. Remove the bolt from the engine oil sump.
6. Remove the engine oil sump from the engine.
7. Remove the joint.

2. Make sure that the engine oil sump is clean and free from damage. Clean the mating surface of the crankcase.
3. Tighten the fasteners to the correct torque value.

**Table 69. Torque Values**

| Item | Description | Nm |
|------|-------------|----|
| C    | Bolt        | 11 |
| E    | Drain plug  | 34 |

**Figure 215.**



- A Engine oil sump
- B Joint
- C Bolt
- D Sealing washer
- E Drain plug

### Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.

## 00 - General

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## Introduction

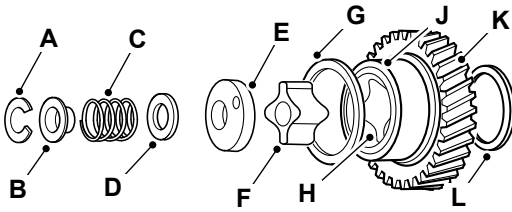
Flywheels are used to provide continuous energy in systems, where the energy source is not continuous. In such cases, the flywheel stores energy when torque is applied by the energy source, and it releases stored energy when the energy source is not applying torque to it.

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

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

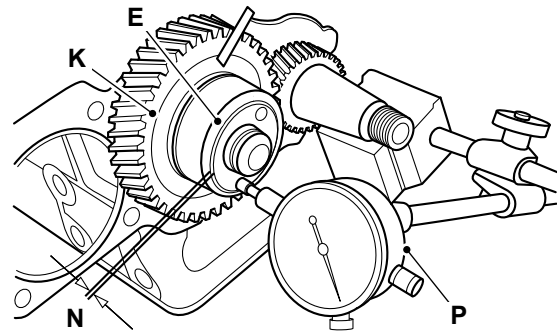
### Component Identification

**Figure 242.**



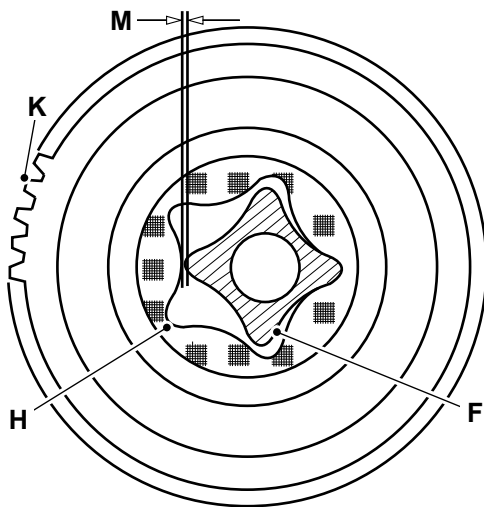
- A Circlip
- B Collar
- C Spring
- D Shim
- E Oil pump cover
- F Inner rotor
- G Spring
- H Outer rotor
- J Bushing
- K Idler gear
- L Thrust washer

**Figure 244.**



- E Oil pump cover
- K Idler gear
- N Distance between the face of oil pump cover and the face of the idler gear
- P Dial indicator

**Figure 243.**



- F Inner rotor
- H Outer rotor
- K Idler gear
- M Clearance between inner and outer rotor

## Remove and Install

### Remove

1. Make the machine safe.  
[Refer to: PIL 01-03-27.](#)
2. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
3. Drain the cooling system.  
[Refer to: PIL 21-00-00.](#)
4. Drain the engine oil.  
[Refer to: PIL 15-00-00.](#)
5. Remove the oil filter element with a strap wrench (if required).
6. Loosen the hose clamps and disconnect the hoses.
7. Make a note of the positions of the coolant inlet and the coolant outlet to help installation.
8. Remove the adaptor.
9. Remove the oil cooler from the crankcase.
10. Mark the oil cooler to show its orientation to help installation.
11. Remove the O-ring seal from the oil cooler.

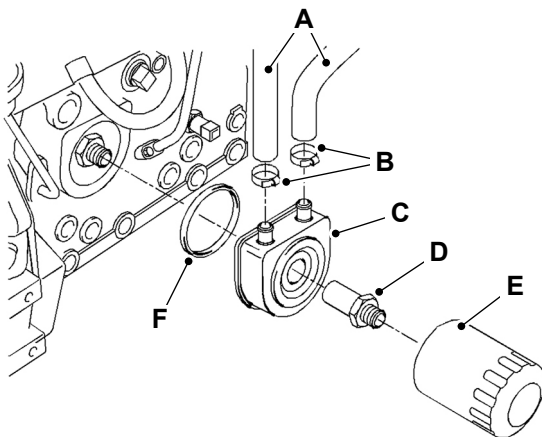
### Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Tighten the adaptor to the correct torque value.
3. Fill the cooling system.  
[Refer to: PIL 21-00-00.](#)
4. Fill the engine oil.  
[Refer to: PIL 15-00-00.](#)

**Table 81. Torque Values**

| Item | Description | Nm |
|------|-------------|----|
| D    | Adaptor     | 34 |

**Figure 256.**



- A** Hoses
- B** Hose clamps
- C** Oil cooler
- D** Adaptor
- E** Oil filter element
- F** O-ring seal

(For: Perkins T3 403D-07 Nat Asp)

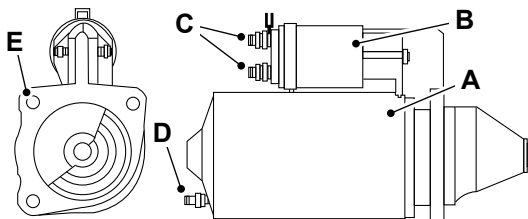
**Table 87.**

| Description  | Data    |
|--|---------|
| Power rating   | 1.2 kW  |
| Minimum average cranking RPM                               | 130 RPM |
| Solenoid pull-in current                                   | 54.5 A  |
| Solenoid hold-in current                                   | 10.5 A  |
| Maximum cable resistance (at 20 °C ( 68.0 °F) and at 12 V) | 0.04 Ω  |

**Table 88.**

| No load conditions at 25 °C ( 77.0 °F) |                  |
|--|------------------|
| Description                            | Data             |
| No load RPM                            | 4000 to 6000 RPM |
| Maximum current                        | 540 A            |
| Current draw with no load              | 130 A            |
| Voltage                                | 11.5 V           |
| Rated voltage                          | 12 V             |

**Figure 263.**



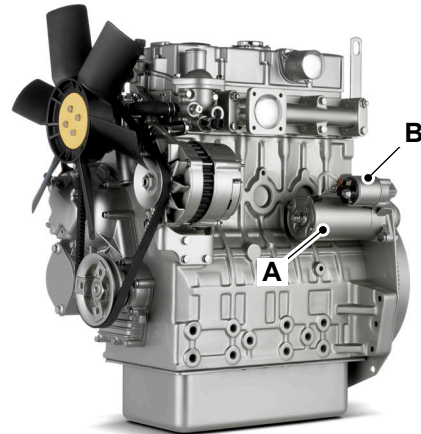
- A** Starter motor
- B** Solenoid
- C** Battery terminal nut
- D** Switch terminal nut
- E** Starter mounting bolt

**Table 89. Torque Values**

| Item | Description           | Nm  |
|------|-----------------------|-----|
| C    | Battery terminal nut  | 15  |
| D    | Switch terminal nut   | 1.2 |
| E    | Starter mounting bolt | 50  |

## Component Identification

**Figure 264.**



- A** Starter motor
- B** Starter motor solenoid



## **00 - General**

[Introduction](#) ..... [15-209](#)  
[Technical Data](#) ..... [15-210](#)

## **Introduction**

The engine sensors continually send signals to the ECM (Engine Control Module) to help the ECM to control the smooth running of the engine and related components.

The ECM processes signals from the sensors continually and its response will be based on an evaluation of the combination of sensor signals.

After removal from the engine, protect the sensors from knocks, dust and water ingress and any high temperature sources.

The sensors are not serviceable, therefore they must be replaced in the event of damage.

## **00 - General**

### **Introduction**

The engine electrical switches will send a signal to the instrument panel to alert the operator if the switches are outside the specified limits. After removal from the engine, protect the switches from knocks, dampness and any high temperature sources. The switches are not serviceable, therefore they must be replaced in the event of damage.



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# 18 - Fuel and Exhaust System

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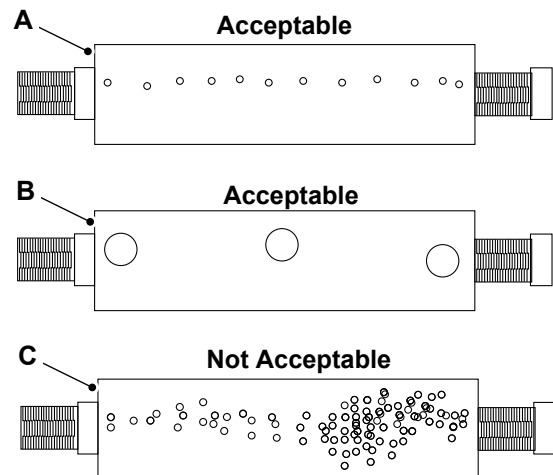
## Check (Operation)

The operation check of the fuel system checks for air in the fuel system. The procedure also helps to find the source of the air in the system.

1. Examine the fuel system for leaks.
2. Make sure that the fuel pipe fittings are properly tightened.
  - 2.1. Air can enter the fuel system on the suction side between the fuel pump and the fuel tank.
3. Check the fuel level in the fuel tank.
4. Install a suitable fuel flow tube with a visual sight gauge in the fuel return line.
5. When possible, install the sight gauge in a straight section of the fuel line that is at least as long as the specified length.  
Length: 304.8 mm
6. Do not install the sight gauge near the following devices that create turbulence:
  - 6.1. Elbows.
  - 6.2. Relief valves.
  - 6.3. Check valves.
7. Observe the fuel flow during engine cranking.
  - 7.1. Look for air bubbles in the fuel.
  - 7.2. If there is no fuel present in the sight gauge, bleed the fuel system.  
[Refer to: PIL 18-00-00.](#)
  - 7.3. If the engine starts, check for air in the fuel at varying engine speeds.
  - 7.4. When possible, operate the engine under the conditions which have been suspect.
8. If excessive air is seen in the sight gauge in the fuel return line, install a second sight gauge at the inlet to the fuel pump.
  - 8.1. If a second sight gauge is not available, move the sight gauge from the fuel return line and install the sight gauge at the inlet to the fuel pump.
  - 8.2. Observe the fuel flow during engine cranking.
  - 8.3. Look for air bubbles in the fuel.
  - 8.4. If the engine starts, check for air in the fuel at varying engine speeds.

9. If excessive air is not seen at the inlet to the fuel pump, air is entering the system after the fuel pump.
10. If excessive air is seen at the inlet to the fuel pump, air is entering through the suction side of the fuel system.
11. Pressurize the fuel tank to the specified pressure.  
Pressure: 0.35 bar ( 5.1 psi)
  - 11.1. Do not use more than the specified pressure to pressurize the fuel tank, to avoid damage.  
Pressure: 0.55 bar ( 8.0 psi)
  - 11.2. Check for leaks in the fuel lines between the fuel tank and the fuel pump.
  - 11.3. Repair any leaks that are found.
  - 11.4. Check the fuel pressure to make sure that the fuel transfer pump is operating properly.
12. If the source of the air is not found, disconnect the supply line from the fuel tank and connect an external fuel supply to the inlet of the fuel pump.
13. If this corrects the problem, repair the fuel tank or the stand pipe in the fuel tank.

**Figure 290.**



## 09 - Pre-Filter Element

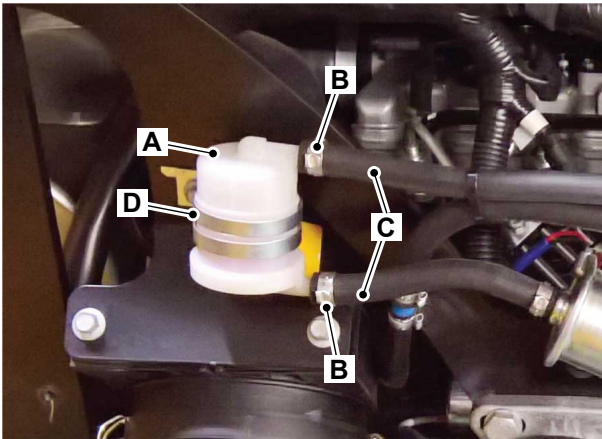
### Remove and Install

(For: 18Z-1 [T3], 18Z-1 [T4F], 19C-1 PC [T3], 19C-1 [T3], 19C-1 [T4F])

#### Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Open the engine compartment cover. Refer to (PIL 06-06-06).
3. Remove the hose clamps.

**Figure 299.**



- A** Fuel pre-filter
- B** Hose clamps (x2)
- C** Fuel hoses (x2)
- D** Pre-filter mounting

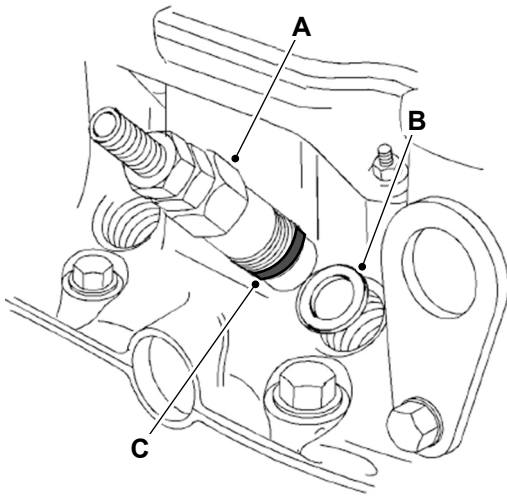
4. Disconnect the fuel hoses.
  - 4.1. Make sure that you clean up any spilled fuel immediately.
5. Loosen the fuel pre-filter mounting.
6. Remove the fuel pre filter.

#### Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following step.
2. Bleed the fuel system. Refer to (PIL 18-00-00).

## Component Identification

**Figure 304.**

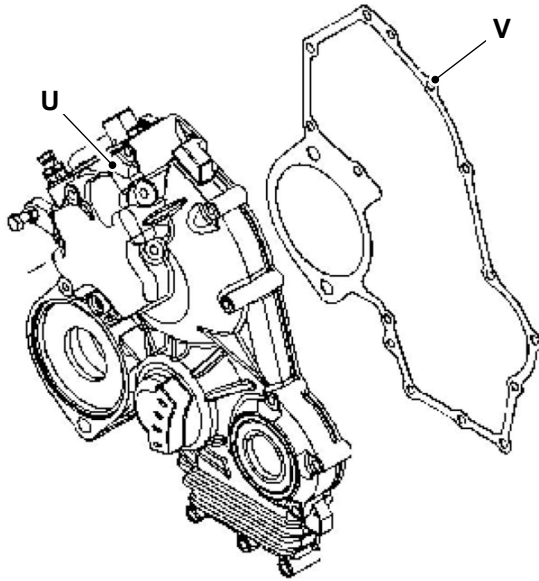


- A** Fuel injector
- B** Sealing washer
- C** Tooling bead

## Clean

1. Remove the fuel injector from the engine.  
Refer to: [PIL 18-18-03](#).
2. Remove any loose carbon from the tip of the fuel injector.
3. Do not use abrasives or a wire brush to clean the fuel injector.
4. Remove all the dirt or contamination from the fuel injector.
  - 4.1. Take extra care when you handle the fuel injector to prevent damage to the tip of the fuel injector.
  - 4.2. A scratch or a burr could cause needle leakage or spray distortion.
  - 4.3. Dirt in the orifices of the nozzle tip can damage engine components.
  - 4.4. Dirt can distort the spray pattern of the nozzle.

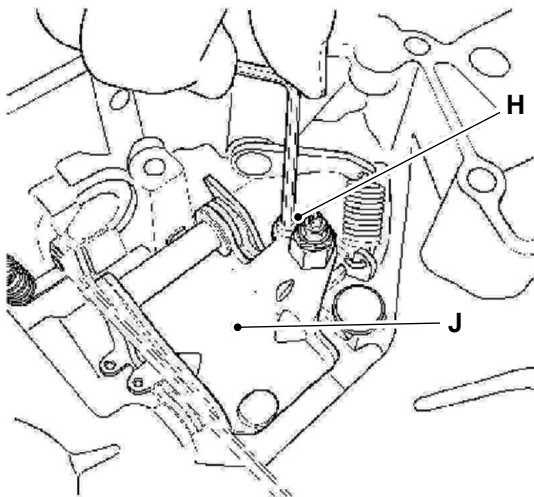
**Figure 319.**



**U** Front case  
**V** Gasket

4. Remove the gasket. Make sure that the face of the front plate is clean.
5. Install the Allen head screw to the lever assembly. Tighten the Allen head screw to the correct torque value.

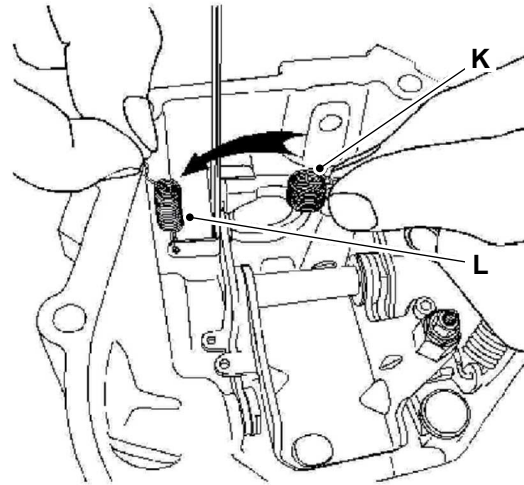
**Figure 320.**



**H** Allen head screw (M4 x 20 mm x 0.70)  
**J** Lever assembly

6. Remove the start spring and replace the start spring with a calibration spring.

**Figure 321.**



**K** Calibration spring  
**L** Start spring

7. Install the front case.  
[Refer to: PIL 15-51-21.](#)
  - 7.1. Do not install a gasket. Refer to Figure 319.
8. Install the fuel injection pump.  
[Refer to: PIL 18-18-03.](#)
  - 8.1. Install the original shim.
9. Install the crankcase adaptor into the crankcase.
10. Install the DTI (Dial Test Indicator) holder into the crankcase adaptor.
  - 10.1. The DTI must be graduated to the specified dimension.  
Dimension: 0.01 mm
11. Assemble the DTI and the extension to the specified dimension.  
Dimension: 20 mm



## 00 - General

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## Introduction

The exhaust system is used to guide exhaust gases away from the controlled combustion inside the engine by means of an exhaust pipe. Depending on the machine design, the exhaust gas may flow through the following components:

- Cylinder head and exhaust manifold.
- Turbocharger to increase the engine power (if installed).
- A catalytic converter or EGR (Exhaust Gas Recirculation) system to reduce air pollution (if installed).
- SCR (Selective Catalytic Reduction) (if installed). In SCR system exhaust gases pass through the DEF (Diesel Exhaust Fluid) injection chamber to lower the NOx (Nitrogen Oxide) concentration in the exhaust gases.
- A silencer or muffler to reduce noise (if installed).

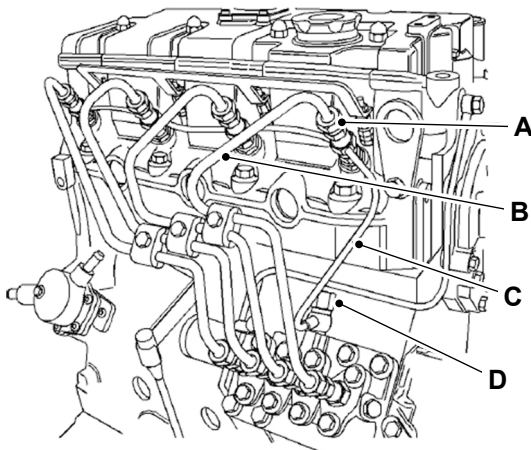
The exhaust pipe carries the toxic and noxious gases away from the users of the machine. Note machines or generators that work indoors can quickly fill an enclosed space with carbon monoxide or other poisonous exhaust gases if they are not properly vented to the outdoors.

## Remove and Install

### Remove

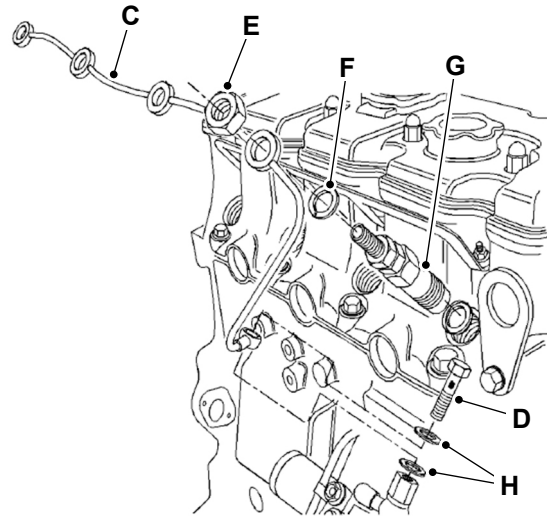
1. Make the machine safe.  
[Refer to: PIL 01-03.](#)
2. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
3. Turn the fuel supply to the OFF position.
4. Remove the nut 1 from the fuel injector pipe.
5. Remove the fuel injection pipes from the engine.
6. Cap all the open ports of the pump immediately.
7. Remove the banjo bolt and washer 1.
8. Remove the nut 2 from the fuel injector.
9. Make sure that the fuel pipes are not distorted when you loosen the nut.
10. Remove the fuel return pipes and the washer 2 from the fuel injector.
11. Cap all the open fuel injector ports to prevent contamination.

**Figure 332.**



- A** Nut 1
- B** Fuel Injector pipes
- C** Fuel return pipes
- D** Banjo bolt

**Figure 333.**



- C** Return line
- D** Banjo bolt
- E** Nut 2
- F** Washer 1
- G** Fuel injector
- H** Washer 2

### Install

1. Installation is the opposite of the removal procedure. Additionally do the following steps:
2. Tighten the nuts to the correct torque value.
3. Use a special tool to tighten the nut 1 at the fuel injector. Refer to Table 113.
4. Bleed the fuel system.  
[Refer to: PIL 18-00-00.](#)

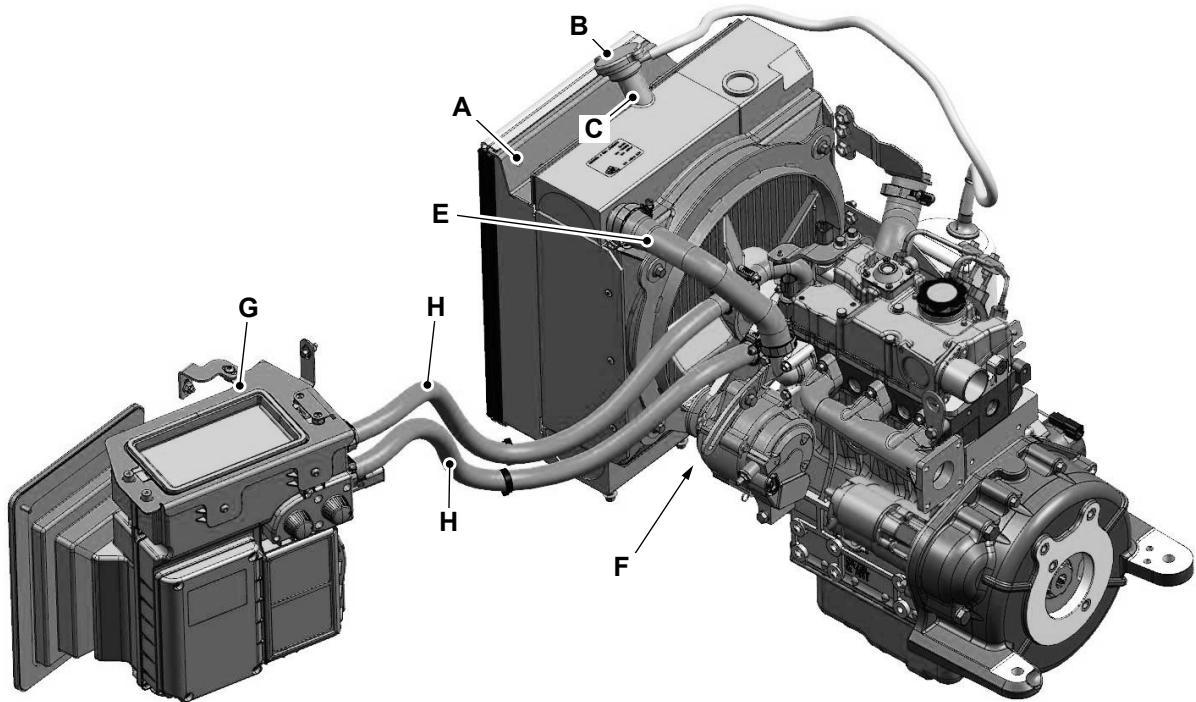
**Table 113. Special tool**

|             |                        |
|-------------|------------------------|
| Part number | 27610294               |
| Part name   | Injector pipe nut tool |
| Qty.        | 1                      |

**Table 114. Torque Values**

| Item | Nm |
|------|----|
| A    | 23 |
| E    | 27 |

Figure 338.



- A Cooling pack
- C Filler neck
- E Top radiator hose
- G Heater unit

- B Filler cap
- D Expansion tank
- F Bottom radiator hose
- H Heater hoses



## 00 - General

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## Introduction

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

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



## 00 - General

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## Introduction

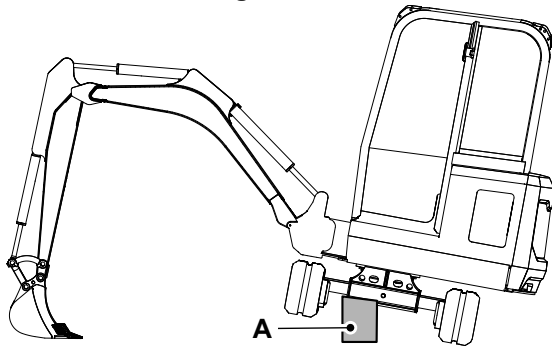
The engine cooling hoses are essential parts of the cooling system. They carry the liquid coolant between the engine and the radiator/cooling pack.

## Adjust

**▲ WARNING** A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it. Disconnect the battery, to prevent the machine being started while you are beneath it.

1. Operate the tracks backwards and forwards several times.
2. Stop the machine after operating the tracks forwards.
3. Set the machine in the position shown with the track to be checked raised from the ground and supported. Add a support under the machine.

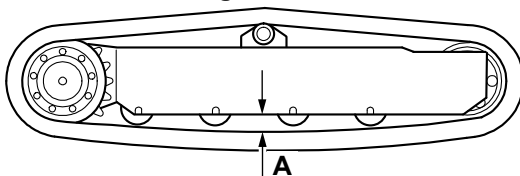
**Figure 348.**



**A** Support block

4. Make the machine safe.  
[Refer to: PIL 01-03.](#)
5. Check that the tension measurement is correct.  
[Refer to: PIL 27-36-00.](#)
- 5.1. If the measurement is not within the specified amount, adjust the track tension.

**Figure 349.**



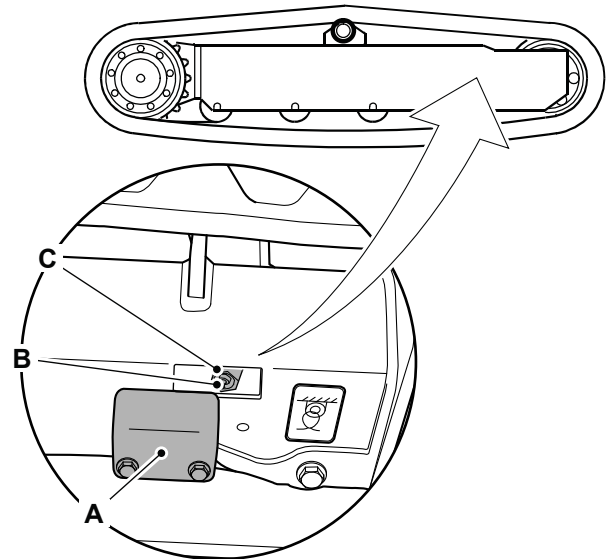
**A** Tension measurement

## Grease Track Tension

### Tighten the Track

1. Remove the cover plate.

**Figure 350.**



**A** Cover plate (if installed)  
**B** Grease nipple  
**C** Adjusting screw

2. Add grease through the nipple in the adjusting screw until track tension is correct.
3. Rotate the track. Track tension will increase during rotation.
4. Check the track tension at its tightest point to avoid over tensioning.
5. Install the cover plate.

### Loosen the Track

1. Remove the cover plate.
2. Loosen adjusting screw until track tension is correct.
3. Rotate the track. Track tension will increase during rotation.
4. Check the track tension at its tightest point to avoid over tensioning.
5. Install the cover plate.

## Manual Track Tensioner

### Tighten the Track

1. Remove the cover plate.
2. Loosen the locking nut.

## Remove and Install

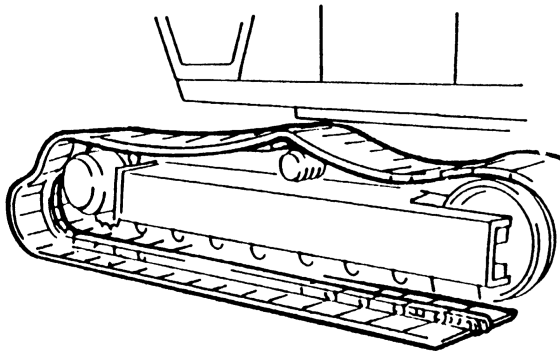
### Consumables

| Description                                 | Part No.  | Size   |
|---|-----------|--------|
| JCB Threadlocker and Sealer (High Strength) | 4101/0550 | 0.01 L |
|   | 4101/0552 | 0.2 L  |

### Remove

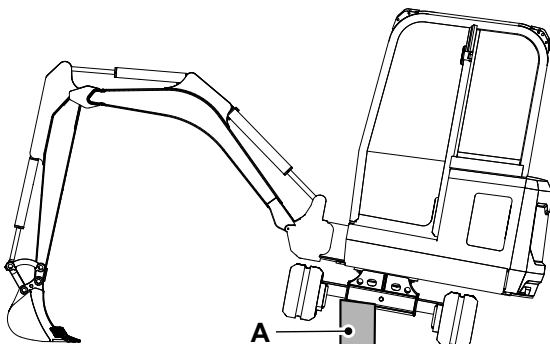
1. Make the machine safe.  
 Refer to: PIL 01-03.
2. Loosen the track tensioner.  
 Refer to: PIL 27-36-00.
3. Remove the master pin to disconnect the track link.  
 Refer to: PIL 27-36-05.
4. Drive the machine forward to remove the track.  
 Refer to Figure 379.

**Figure 379.**



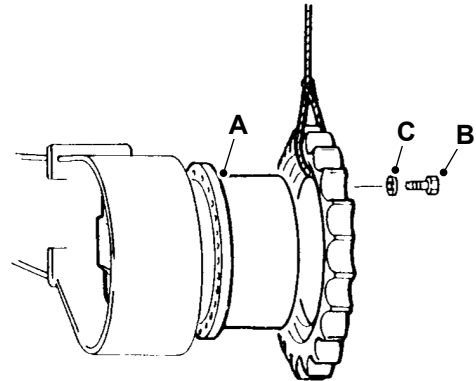
5. Remove the track from the sprocket.
6. Raise the side of the machine using the boom and dipper operations. Refer to Figure 380.
7. Put wooden blocks below the frame to support the machine. Refer to Figure 380.

**Figure 380.**



8. Support the drive sprocket and remove the bolts that attach the drive sprocket to the gearbox. Refer to Figure 381.
9. Move the drive sprocket away from the gearbox unit. Refer to Figure 381.

**Figure 381.**



- A** Drive sprocket
- B** Bolts
- C** Washers

- 9.1. Remove the drive sprocket.

### Install

1. Support the drive sprocket and put the drive sprocket on the gearbox.
2. Apply the JCB Threadlocker and Sealer on the bolts.  
 Consumable: JCB Threadlocker and Sealer (High Strength)
3. Install the bolts and washers to attach the drive sprocket to the gearbox. Refer to Figure 382.



## 28 - Grease Cylinder

|                                |       |
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## Remove and Install

Refer to: PIL 27-36-27.

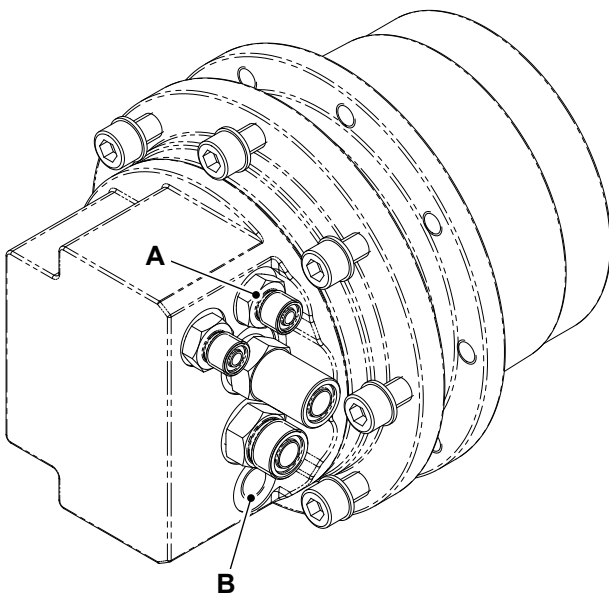
## Bleed

1. Bleed the motor whenever you install the track motor.
2. If you install the track gearbox assembly attached with the motor to the machine.  
[Refer to: PIL 27-38-00.](#)
3. When you install the track motor to the machine gearbox, bleed the motor by one of the three methods. Refer to the sub-sections.
4. Method 1 will take considerable time as air in the motor is very difficult to remove. Methods 2 or 3 will be quicker.

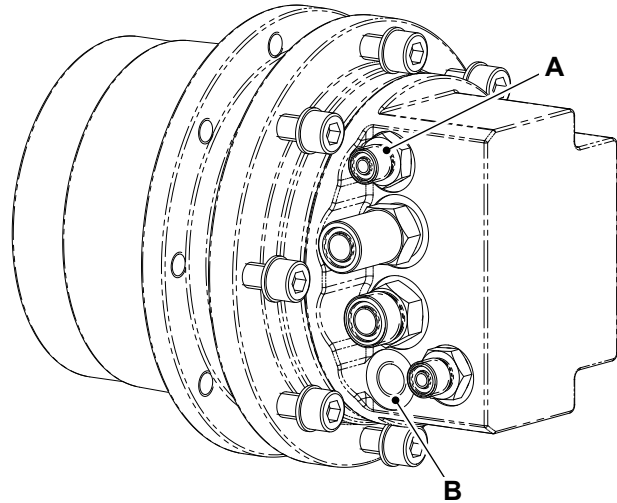
### Method 1

1. After the motor installation and before hose connection, remove the cap from the upper drain port.
  - 1.1. Make sure that a steel cap is attached to the lower drain port.
2. Fill the specified hydraulic oil to the motor through the upper drain port.
3. Connect the hoses to the motor.

**Figure 404. Left hand track motor**



**Figure 405. Right hand track motor**



- A** Upper drain port  
**B** Lower drain port

### Method 2

1. Attach the motor to the undercarriage.
2. Connect all the hoses to the motor except the two drain ports.
3. Remove the plug from the upper drain port.
  - 3.1. Make sure that a steel cap is installed to the lower drain port.
4. Start the engine and gently operate the track control lever so that the sprocket does not turn.
  - 4.1. If necessary, use a steel bar or tube to insert in the track to prevent the sprocket turning.
5. Back the track control lever to the neutral when air free oil flows from the upper drain port.
6. Connect the drain hoses to the motor.

### Method 3

1. Attach the motor to the undercarriage.
2. Connect all the hoses to the motor.
3. Use a steel bar or tube to insert in the track to prevent the sprocket turning.
4. Start the engine and fully operate the track control lever for the specified time.  
 Duration: 1 min
  - 4.1. This operation will fill the motor case with oil.

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## 00 - General

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| 30-00-49 Schematic Symbols ..... | 30-15    |
| 30-00-50 Schematic Circuit ..... | 30-19    |

## Check (Pressure)

### Special Tools

| Description                | Part No.  | Qty. |
|----------------------------|-----------|------|
| Pressure Gauge (0-400 Bar) | 892/00279 | 1    |
| Pressure Gauge (0-70 Bar)  | 892/00346 | 1    |

**▲ WARNING** Do not operate any machine controls from outside the machine. You or others could be injured or killed by movement of the machine or its working tools or attachments.

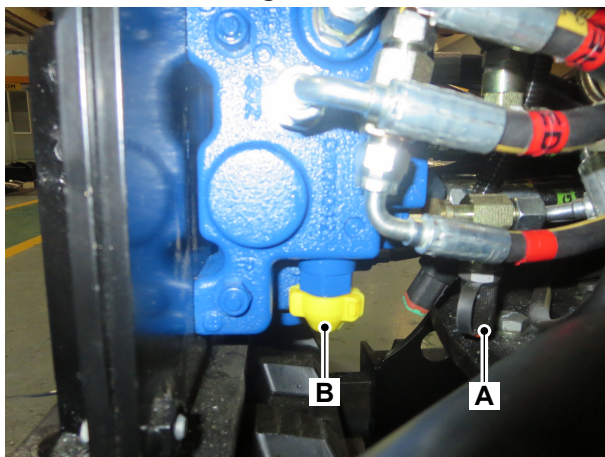
### Before Pressure Check

1. Make sure that the hydraulic oil is above the specified temperature.  
Temperature: 50 °C ( 121.9 °F)
2. Make the machine safe.  
[Refer to: PIL 01-03.](#)
3. Remove the left side cover.  
[Refer to: PIL 06-06-13.](#)

### Servo Pressure Test

1. Connect the pressure gauge to the servo pressure test point.  
[Special Tool: Pressure Gauge \(0-70 Bar\) \(Qty.: 1\)](#)

**Figure 429.**



**A** Servo pressure test point  
**B** PMV (Pressure Maintenance Valve)

2. Start the engine and set it to maximum RPM (Revolutions Per Minute).
3. Operate the dig end service to dead end the bucket service and generate full system pressure.

4. Check that the pressure is within the specified limits.

[Refer to: PIL 30-00-00.](#)

5. If it is outside the specified tolerance, adjust the servo pressure as follows:
  - 5.1. Remove the plastic cover.
  - 5.2. Remove the cartridge cap.
  - 5.3. Loosen the lock nut.
  - 5.4. Turn the adjusting screw clockwise to increase the pressure or anticlockwise to decrease the pressure.
  - 5.5. Tighten the lock nut.
  - 5.6. Repeat 2 to 5.
6. Install the cartridge cap.
7. Install the plastic cover.
8. Disconnect the pressure gauge.

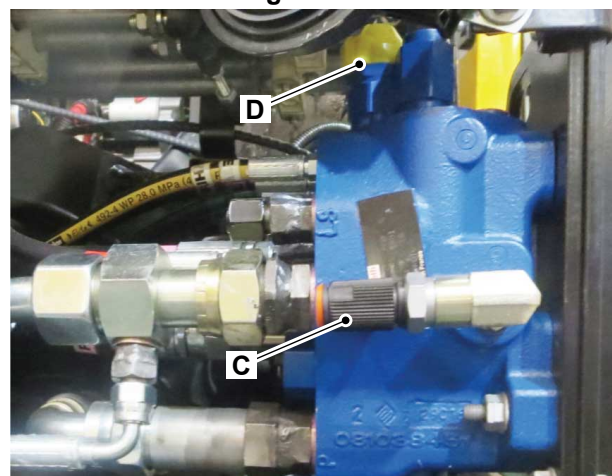
### MRV Pressure Test

There is only one MRV (Main Relief Valve), any service can be operated and dead ended to achieve full system operating pressure. If there is a significant difference between services it could indicate ram seal leakage or ARV (Auxiliary Relief Valve) contamination on the service selected.

1. Connect the pressure gauge to the MRV test point.

[Special Tool: Pressure Gauge \(0-400 Bar\) \(Qty.: 1\)](#)

**Figure 430.**



**C** MRV test point  
**D** MRV

2. Start the engine and set it to maximum RPM.

Page 30-26

Figure 433. 18Z-1 and 19C-1 Retractable Under Carriage 400/M2801 Issue 1

Page 30-27

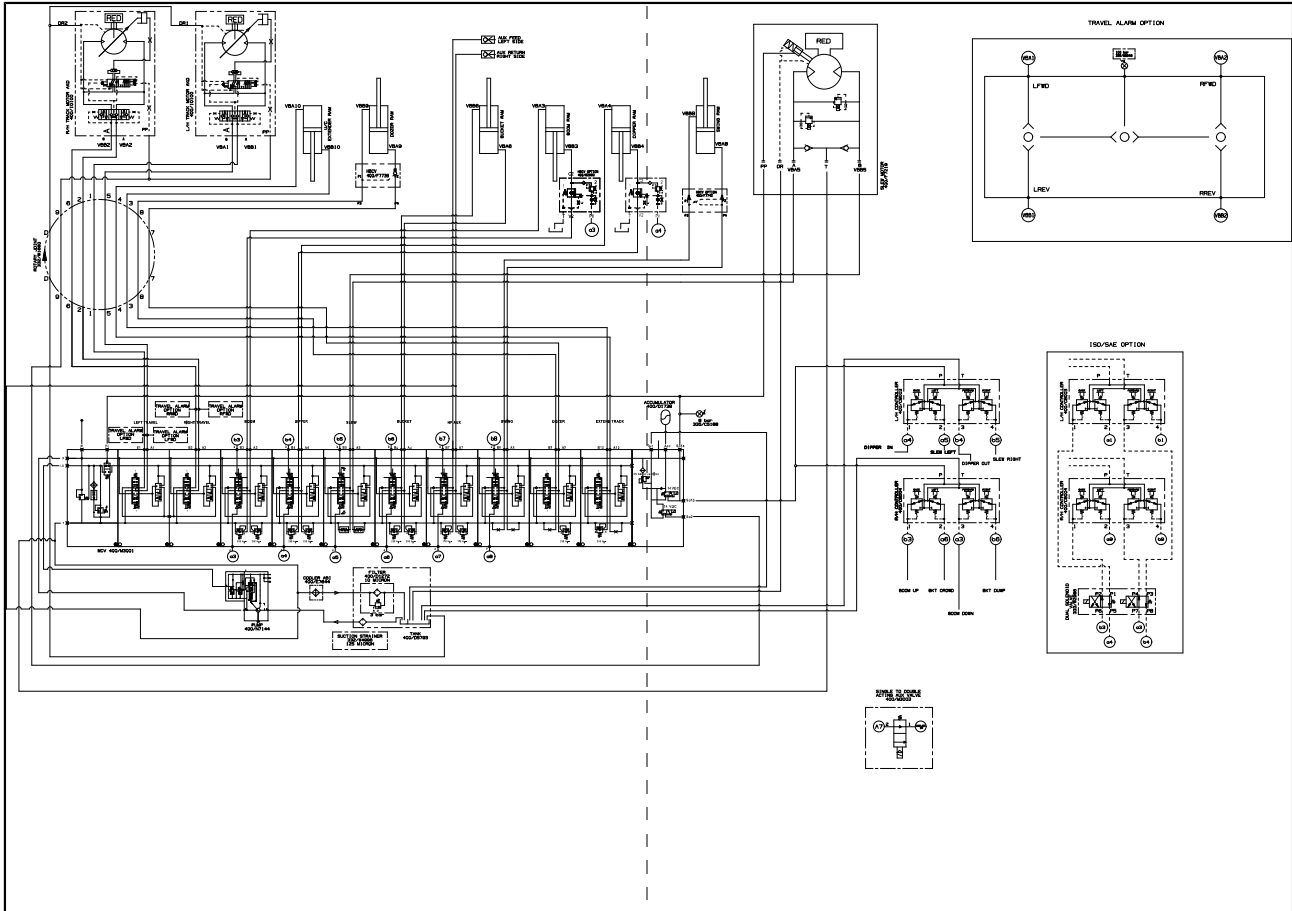
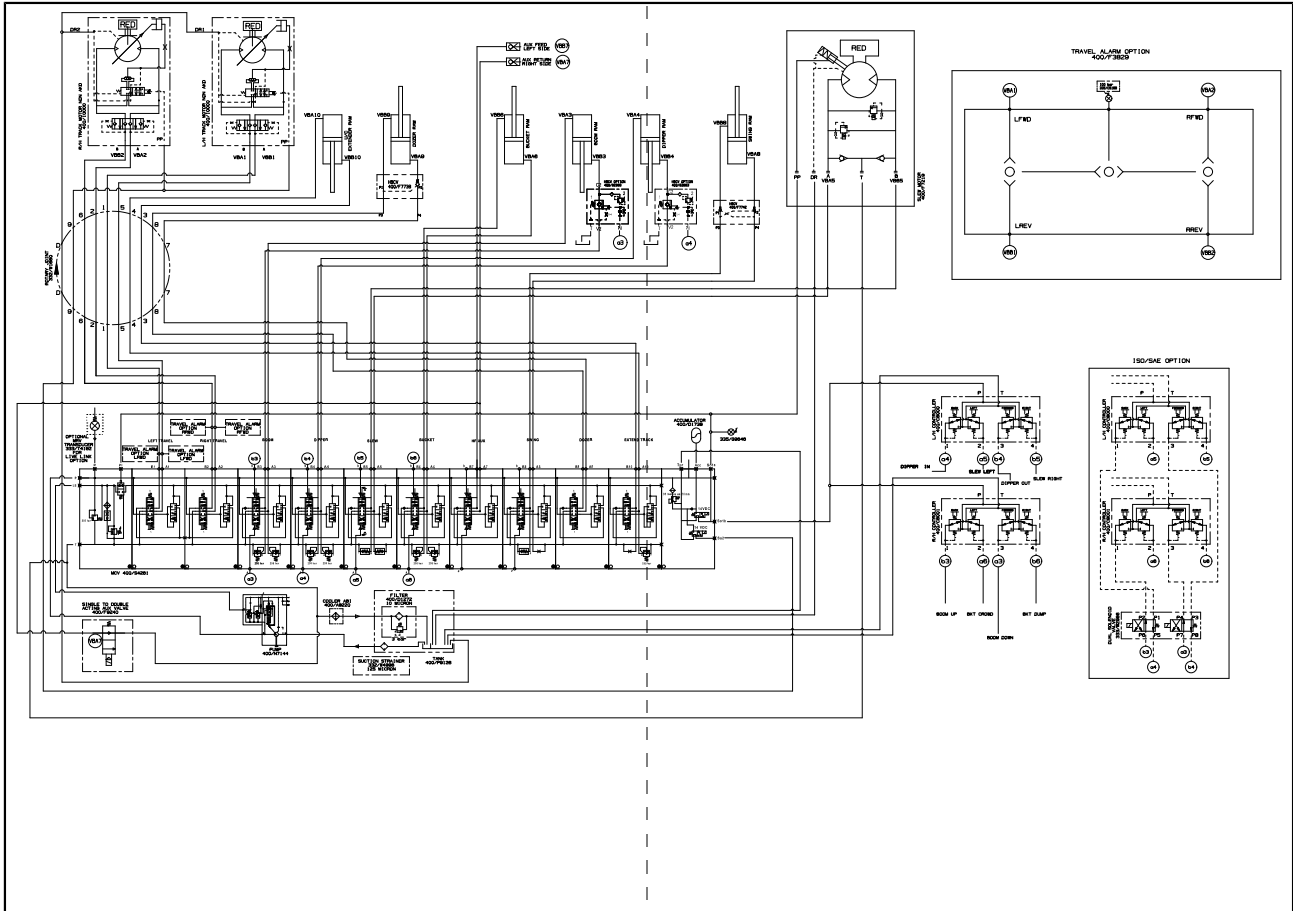


Figure 436. 16C-1 Retractable Under Carriage 400/T6709 Issue 2





## 04 - Filter

| Contents                   | Page No. |
|----------------------------|----------|
| 30-04-00 General .....     | 30-51    |
| 30-04-09 Return Line ..... | 30-52    |

## Drain and Fill

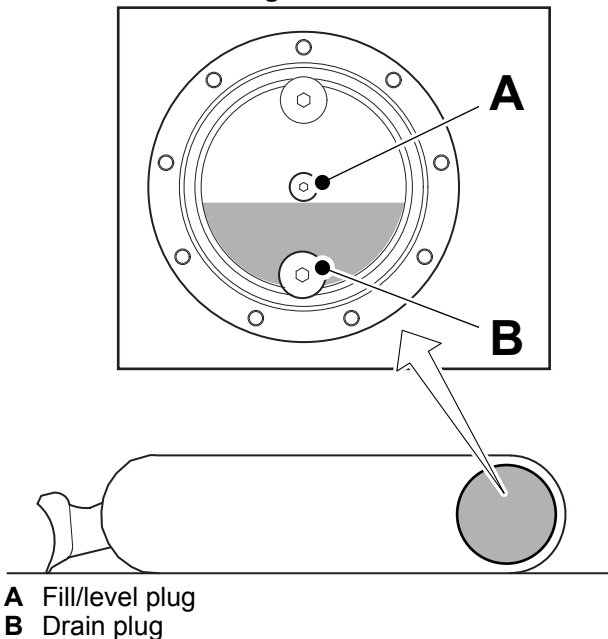
**▲ CAUTION** Oil will gush from the hole when the drain plug is removed. Keep to one side when you remove the plug.

1. Make sure that the gearbox plugs are positioned as shown. Refer to Figure 444.
2. Make the machine safe.  
[Refer to: PIL 01-03.](#)
3. Clean the area around the drain and fill/level plugs.
4. Put a suitable container under the drain plug to collect the oil.
5. Remove the level/filler plug.
6. Remove the drain plug. Allow the oil to drain out.
7. Wipe the drain plug clean. Make sure that you remove all metal particles.
8. Install the drain plug and make sure that it is tight.
9. Fill with the correct new oil through the fill/level plug hole until the oil runs from the hole.  
[Refer to: PIL 75-00-00.](#)
10. Run the machine, operate the track controls and make sure that there are no leaks.

## Check (Condition)

1. Clean and check the needle bearings for scoring, wear, pitting and corrosion.
2. Clean and check the condition of all gear wheel teeth and mating surfaces, especially for wear and corrosion.
3. Clean and examine all parts for wear, corrosion or damage.

**Figure 444.**





**00 - General**

**Technical Data**

Technical Data ..... 30-73  
Remove and Install ..... 30-74

(For: 15C-1)

**Table 165.**

| Specification         |   |
|-----------------------|---|
| Type                  | Fixed gear pump                                 |
| Displacement          | 10 CC/rev                                       |
| Direction of rotation | Clockwise                                       |
| Maximum flow rate     | 38.5 L/min at 3500 RPM (Revolutions Per Minute) |
| Maximum Pressure      | 210 ( 3,043.5 )                                 |

## Disassemble and Assemble

### Consumables

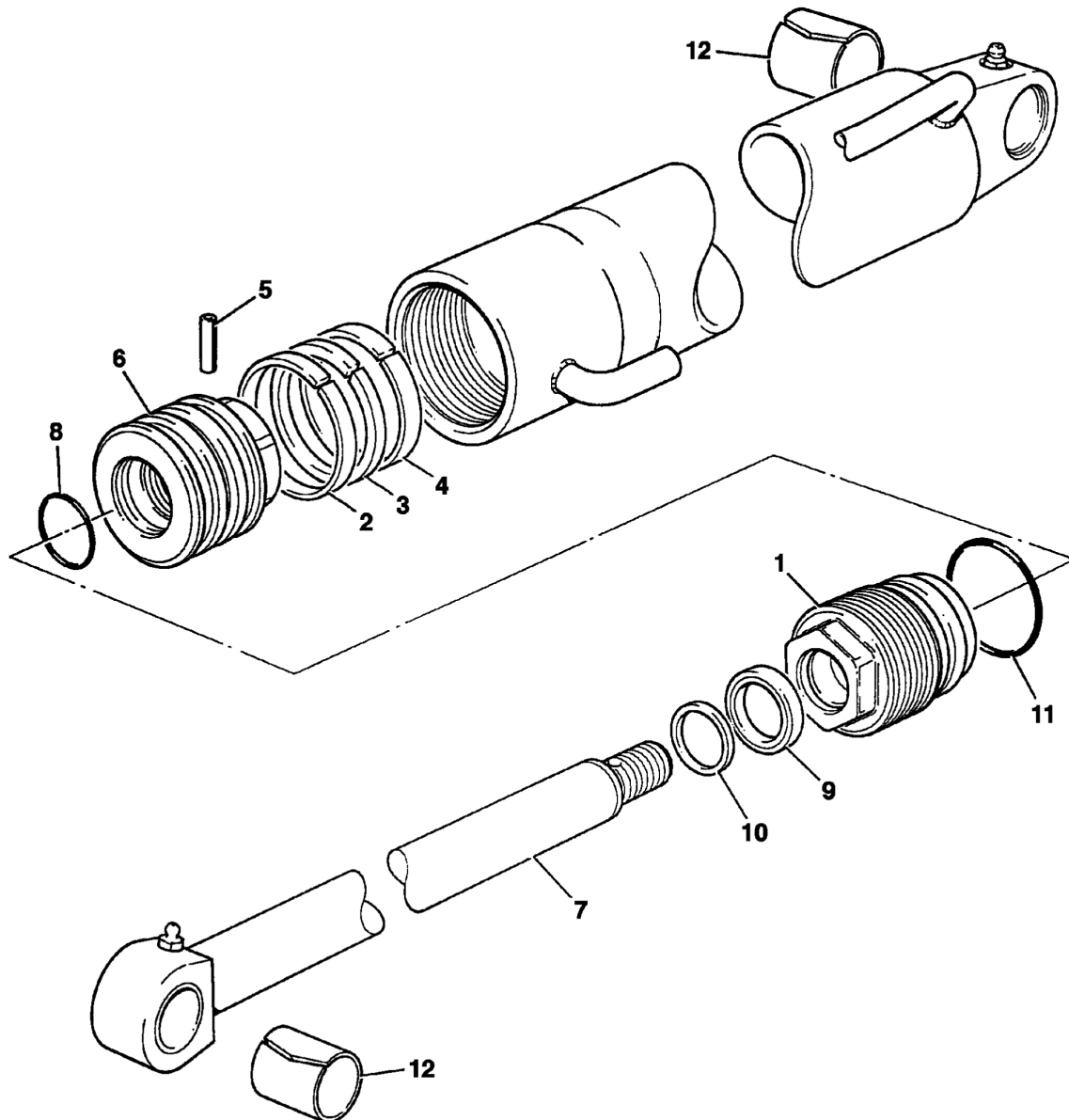
| Description  | Part No.  | Size   |
|--|-----------|--------|
| Cleaner/Degreaser<br>- General purpose<br>solvent based parts<br>cleaner | 4104/1557 | 0.4 L  |
| JCB Activator  | 4104/0251 | 0.2 L  |
|  | 4104/0253 | 1 L    |
| JCB Threadlocker<br>and Sealer (Medium<br>Strength)                      | 4101/0250 | 0.01 L |
|  | 4101/0251 | 0.05 L |

Disassemble and assemble the rams as follows:

- Bucket crowd. Refer to: PIL 30-15-12.
- Dipper ram. Refer to: PIL 30-15-15.
- Boom ram. Refer to: PIL 30-15-18.
- Swing ram. Refer to: PIL 30-15-21.
- Dozer ram. Refer to: PIL 30-15-42.

The numerical sequence shown on the illustration is intended as a guide to disassembly.

**Figure 452. Typical Cylinder Ram**



1 End cap

2 Seal

## 21 - Swing

Remove and Install ..... 30-97  
 Disassemble and Assemble ..... 30-98

## Remove and Install

### Special Tools

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

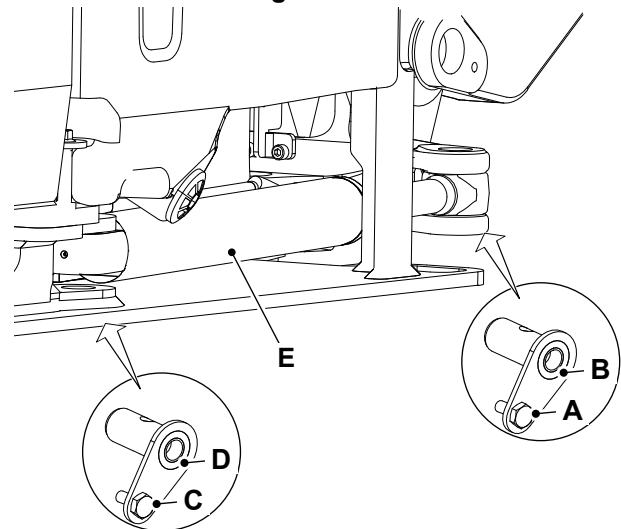
### Consumables

| Description           | Part No.  | Size    |
|-----------------------|-----------|---------|
| Special MPL-EP Grease | 4003/1501 | 0.4 kg  |
|                       | 4003/1506 | 12.5 kg |
|                       | 4003/1510 | 50 kg   |

## Remove

1. Make the machine safe.  
 Refer to: PIL 01-03.
2. Discharge the hydraulic pressure.  
 Refer to: PIL 30-00-00.
3. Open the right side cover.  
 Refer to: PIL 06-06-13.
4. Disconnect the hydraulic hoses.

Figure 463.

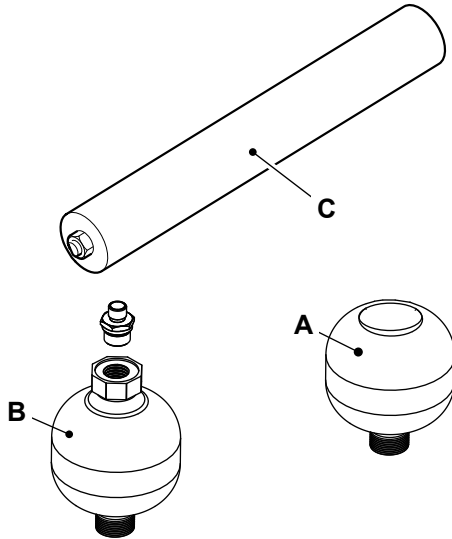


- A Bolt 1
- B Pivot pin 1
- C Bolt 2
- D Pivot pin 2
- E Swing ram

- 4.1. Plug all the open ports and hoses to prevent contamination.
- 4.2. If necessary, put a label on the hoses to help installation.
5. Remove the bolt 1.
6. Remove pivot pin 1 from the machine.  
 Special Tool: Slide Hammer Kit (Qty.: 1)

## Component Identification

Figure 477.



- A** Diaphragm (sealed for life)-Non Rechargeable
- B** Diaphragm (with gas valve)-Rechargeable
- C** Piston Bladder-Rechargeable

## Discharge and Pressurise

### Special Tools

| Description                            | Part No.  | Qty. |
|--|-----------|------|
| Accumulator Charging Kit (Piston Type) | 892/00239 | 1    |

### General

The accumulator charging kit is required to check the pre-charge pressure of an accumulator and to fill and vent the nitrogen. The charging kit is screwed into the accumulator's gas valve and connected to a nitrogen source with the hose supplied. If only the pre-charge pressure is to be checked or reduced the hose is not required.

Note: Some accumulators are factory sealed for life and cannot be serviced, if they do not have a gas recharging point, replace the accumulator if faulty. This procedure only applies to accumulators with a gas charging point.

Note: The threads on the top of the nitrogen gas bottles can vary widely worldwide, you may need to source an adaptor locally, for specifications and further details, refer to [www.hydac.com.au](http://www.hydac.com.au)

### Pressurise

1. Make the machine safe.  
[Refer to: PIL 01-03.](#)
2. Remove the relevant accumulator from the machine.
3. Remove the protective cap from the accumulator gas valve.
4. Connect the nitrogen charging tool kit and adaptor to the accumulator gas valve.  
[Special Tool: Accumulator Charging Kit \(Piston Type\) \(Qty.: 1\)](#)
5. Connect the charging tool flexible hose to a bottle of compressed nitrogen gas installed with a pressure regulator valve, set to the minimum pressure.
6. Screw the spindle three turns anti-clockwise to open the accumulator gas valve.
7. Open the charging tool bleed valve. Carefully open the nitrogen gas bottle valve and confirm that nitrogen gas flows freely. Close the gas bottle valve and the bleed valve.
8. Carefully open the nitrogen gas bottle valve and watch the gauge, allow nitrogen to flow by increasing the pressure regulator setting until the



## **50 - Excavator Control Valve Block**

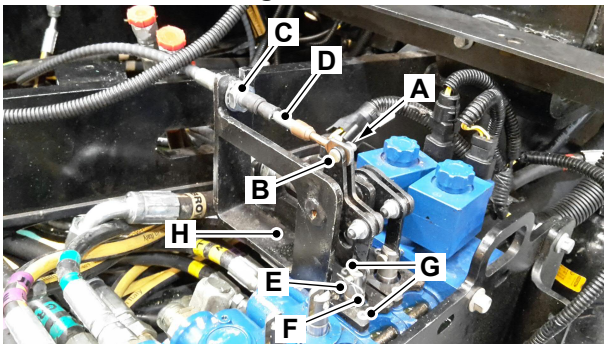
| <b>Contents</b>                             | <b>Page No.</b> |
|---|-----------------|
| 30-50-00 General .....                      | 30-123          |
| 30-50-03 Main Relief Valve (MRV) .....      | 30-136          |
| 30-50-06 Auxiliary Relief Valve (ARV) ..... | 30-138          |
| 30-50-24 Flow Regulator .....               | 30-141          |
| 30-50-27 Pressure Compensator Valve .....   | 30-142          |
| 30-50-36 Load Hold Check Valve .....        | 30-143          |
| 30-50-45 Flushing Valve .....               | 30-144          |
| 30-50-80 Spool .....                        | 30-145          |

## Remove and Install

### Remove

1. Make the machine safe.  
 Refer to: PIL 01-03.
2. Discharge any remaining hydraulic pressure.  
 Refer to: PIL 30-00-00.
3. Remove the left side cover.  
 Refer to: PIL 06-06-13.
4. Remove the floor plate.  
 Refer to: PIL 09-78-00.
5. Disconnect the control cables.
  - 5.1. Remove the R-clip 1.

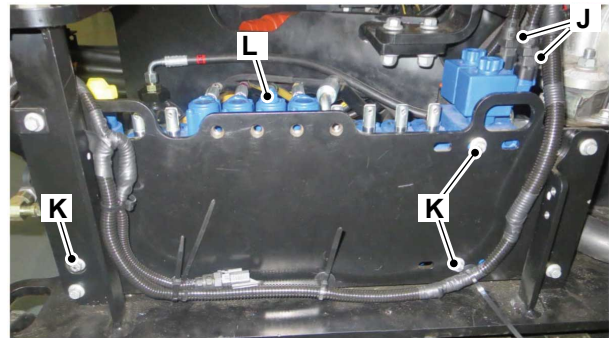
**Figure 487.**



- A** R-clip 1
- B** Clevis pin 1
- C** Nut
- D** Cable
- E** Clevis pin 2
- F** R-clip 2
- G** Cap screws (x2)
- H** Cable actuator assembly

- 5.2. Remove the clevis pin 1.
- 5.3. Remove the nut.
- 5.4. Remove the cable from the valve block.
- 5.5. Remove the R-clip 2.
- 5.6. Remove the clevis pin 2.
- 5.7. Remove the cap screws (x2).
- 5.8. Remove the cable actuator assembly.
6. Disconnect the hydraulic hoses.
  - 6.1. Make a note of the hose order to aid installation.
7. Disconnect the electrical connectors (x2).

**Figure 488.**



- J** Electrical connectors (x2)
- K** Bolts (x3)
- L** Excavator control valve block

8. Remove the bolts (x3) and remove the excavator control valve block from the machine.

### Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. Tighten the cap screws to the correct torque value.
3. Check the hydraulic oil level and top up to the correct level.
4. Check the operation of all the hydraulic services.

**Table 190. Torque Values**

| Item | Nm |
|------|----|
| G    | 3  |

## 80 - Spool

### Remove and Install

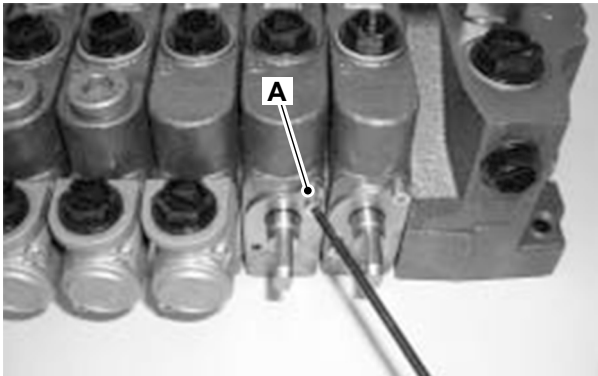
**⚠ CAUTION** To avoid burning, wear personal protective equipment when handling hot components. To protect your eyes, wear goggles when using a brush to clean components.

#### Spool with spring return removal

##### Remove

1. Make the machine safe.  
[Refer to: PIL 01-03.](#)
2. Discharge the hydraulic pressure.  
[Refer to: PIL 30-00-00.](#)
3. Drain the hydraulic system.  
[Refer to: PIL 30-00-00.](#)
4. Get access to the excavator control valve block.
5. For tongue side, do the steps from 5.1 to 5.3.
  - 5.1. Loosen the screw 1 (x2).

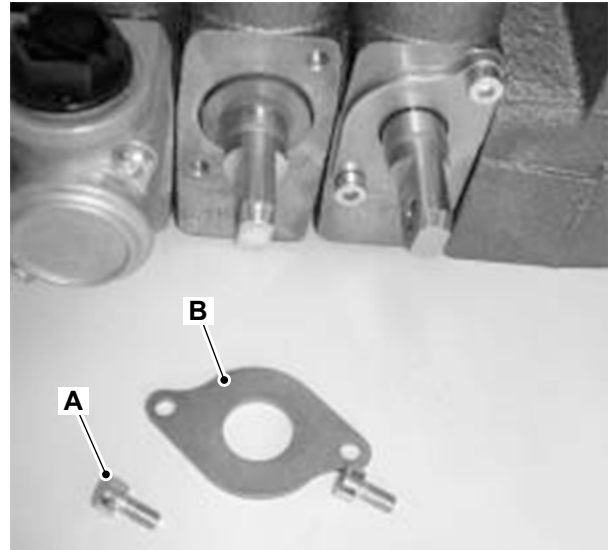
**Figure 504.**



**A** Screws 1 (x2)

- 5.2. Remove the screws 1 (x2) and the plate 1.

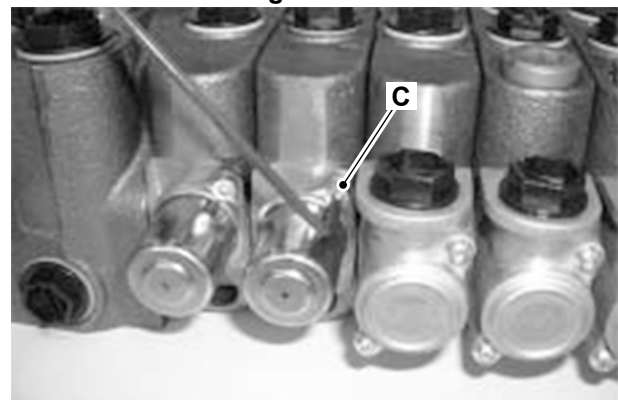
**Figure 505.**



**A** Screws 1 (x2)  
**B** Plate 1

- 5.3. Remove the wiper ring and O-ring.
6. For cover side, do the steps from 6.1 to 6.2.
  - 6.1. Loosen the screws 2 (x2).

**Figure 506.**

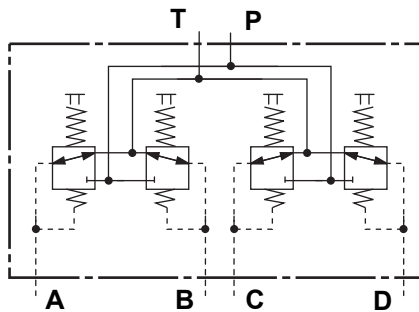


**C** Screws 2 (x2)

- 6.2. Remove the screws 2 (x2) and the cover.

**Diagram**

**Figure 526.**



**Table 199. RH (Right Hand) Control**

| Item | Connection   |
|------|--------------|
| A    | Boom         |
| B    | Bucket       |
| C    | Boom         |
| D    | Bucket       |
| P    | Pilot supply |
| T    | Tank return  |

**Table 200. LH (Left Hand) Control**

| Item | Connection   |
|------|--------------|
| A    | Dipper       |
| B    | Slew         |
| C    | Dipper       |
| D    | Slew         |
| P    | Pilot supply |
| T    | Tank return  |

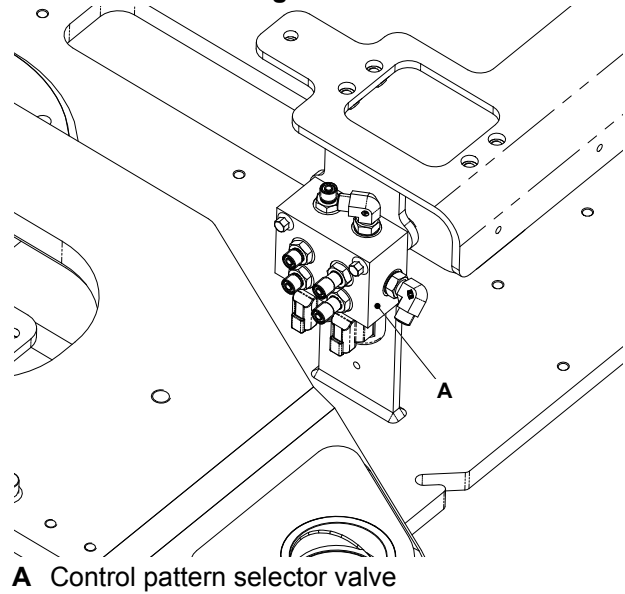
## 96 - Control Pattern Selector

Introduction ..... 30-169  
Component Identification ..... 30-170  
Remove and Install ..... 30-170

## Introduction

The control pattern selector valve changes the controls between ISO (International Organization for Standardization) and SAE (Society of Automotive Engineers) layouts. It is located under the operator station.

**Figure 533.**



- Periodically lubricate the internal locking balls on the female half of the coupling with silicone grease.

### Essential Don'ts

- Never try to reconnect using a damaged half coupling as this will destroy the seals in the mating half and necessitate replacement of both halves.
- Do not leave the coupling where it may be run over by a machine or otherwise crushed, this will distort the sleeve and prevent connection and disconnection.
- Never try to turn the sleeve when the coupling is disconnected as this will cause the locking ball to jam under the locking sleeve and damage the coupling.
- Never try to strip the coupling down, there are no user serviceable parts. If the coupling is damaged it must be replaced with a new one.
- Never hit the centre poppet of the coupling to try and release the locked in pressure. This can cause irreparable damage to the coupling and serious injury.
- When connecting the couplings, never clamp on the sleeve of the female or nose of the male, this will cause distortion and/or damage.
- Never subject the couplings to external forces, especially side load. This can decrease the life of the coupling or cause failure.
- Never allow the torsional forces transmitted from the hoses to unscrew/screw together the couplings.
- Never use a coupling as a plug.
- Do not connect and disconnect with pressure in the line unless the coupling type is specifically designed to do so.

## Disconnect and Connect

Some attachments are hydraulically powered. The following procedures show how to connect and disconnect the hydraulic hoses safely.

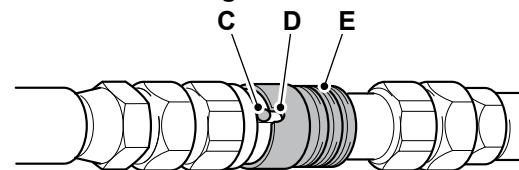
### Connect

- Make the machine safe.  
[Refer to: PIL 01-03.](#)
- Discharge the hydraulic pressure.  
[Refer to: PIL 30-00-00.](#)
- Wipe the two faces of the male and female couplings and make sure they are clean.
- Make sure that the ball in the female coupling is located in one of its slots.
- Connect the male coupling into the female coupling.
- Where applicable, rotate the sleeve half a turn and make sure that the locking ball does not align with the slot.

### Disconnect

- Make the machine safe.  
[Refer to: PIL 01-03.](#)
- Discharge the hydraulic pressure.  
[Refer to: PIL 30-00-00.](#)
- Where applicable, align the slot with the ball.
- Pull back the sleeve to release the coupling.

**Figure 541.**



- C** Ball
- D** Slot
- E** Sleeve



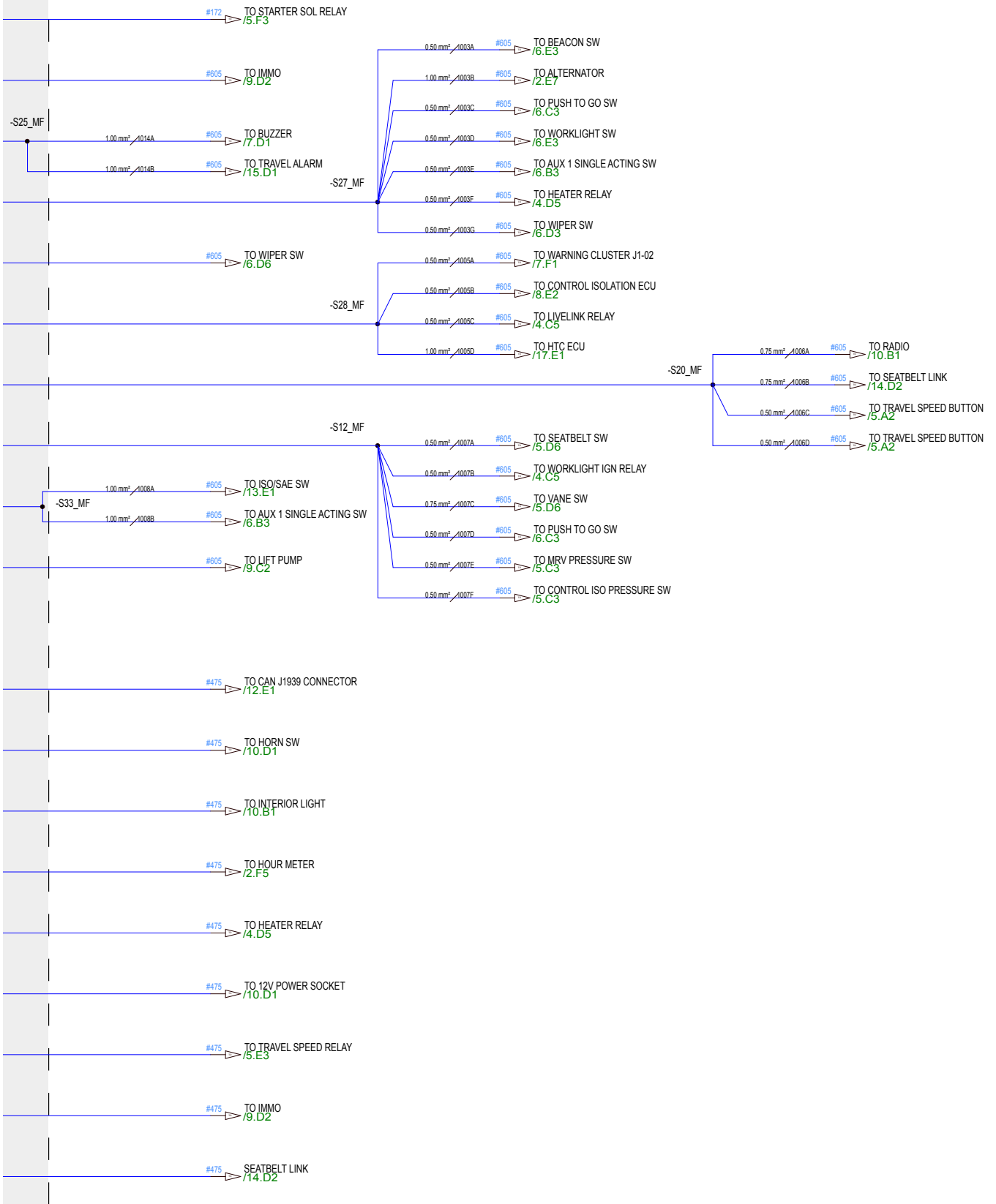
## Technical Data

### General Electrical Data

**Table 206.**

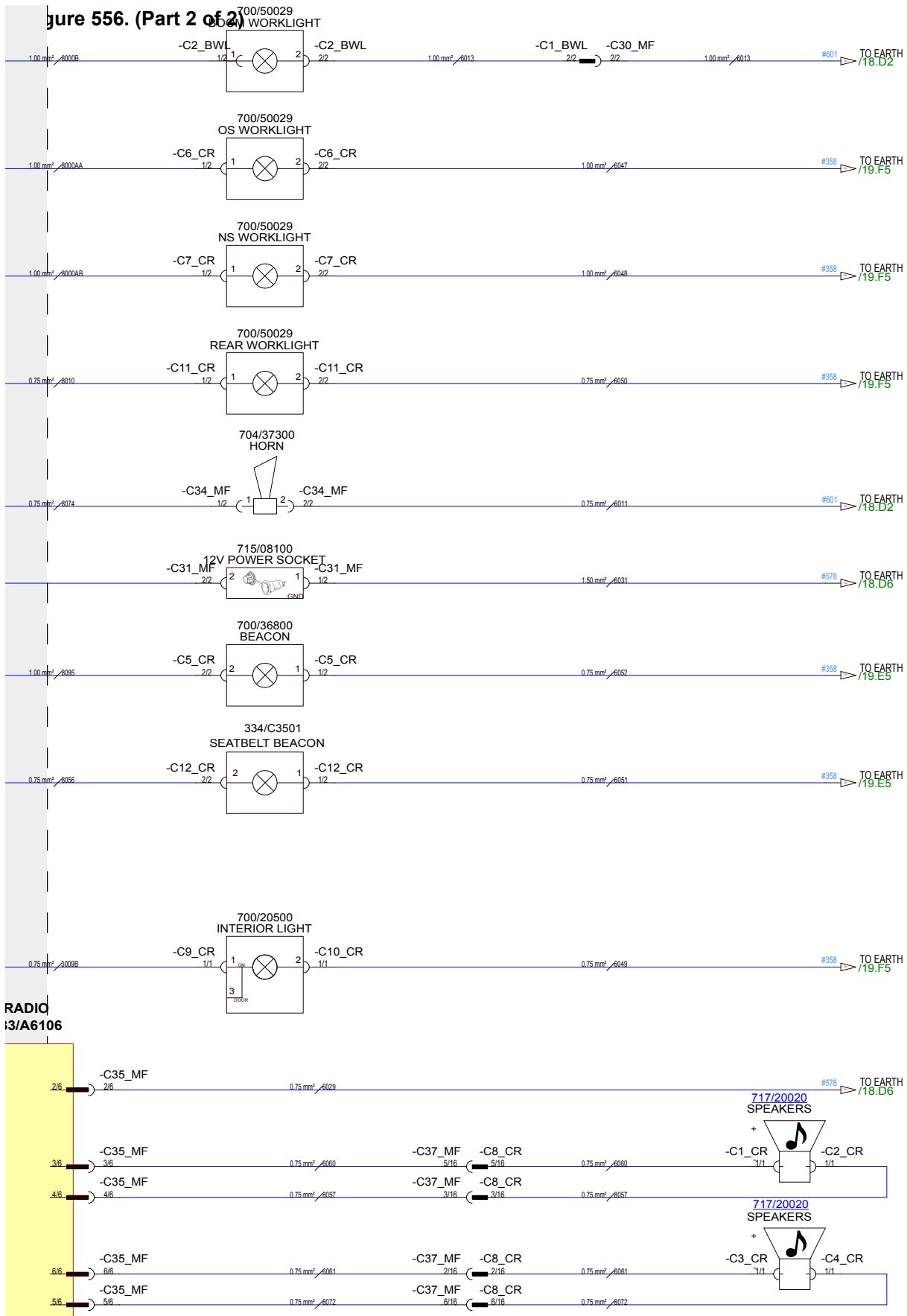
|                                  |  |
|----------------------------------|--|
| Battery                          |  |
| Type                             | 058  |
| Voltage                          | 12 V   |
| Capacity                         | 75 ampere/hour (Wet charged)<br>60 ampere/hour (Dry charged) |
| Specific gravity (fully charged) | Between 1.285 and 1.310 at 15 °C ( 59.0 °F)                  |
| Alternator                       |  |
| Type                             | A127/55A   |
| Nominal output                   | 12 Volts, 65 Amp   |
| Polarity                         | Negative earth   |

Figure 549. (Part 2 of 2)



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Figure 556. (Part 2 of 2)



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Figure 563. Handheld Tool Circuit - 400/K5936 - Issue 4 (Sheet 16 of 18)

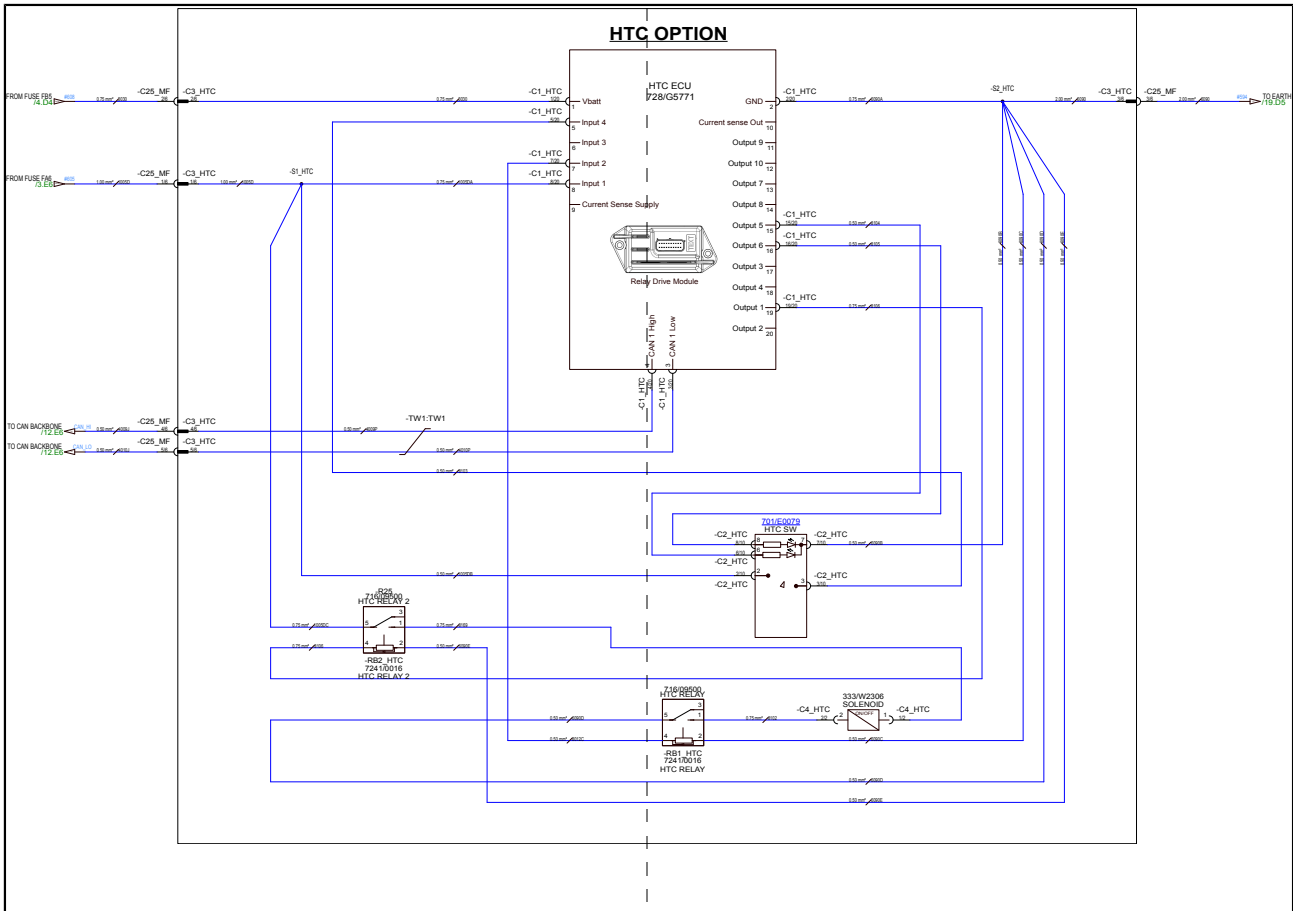
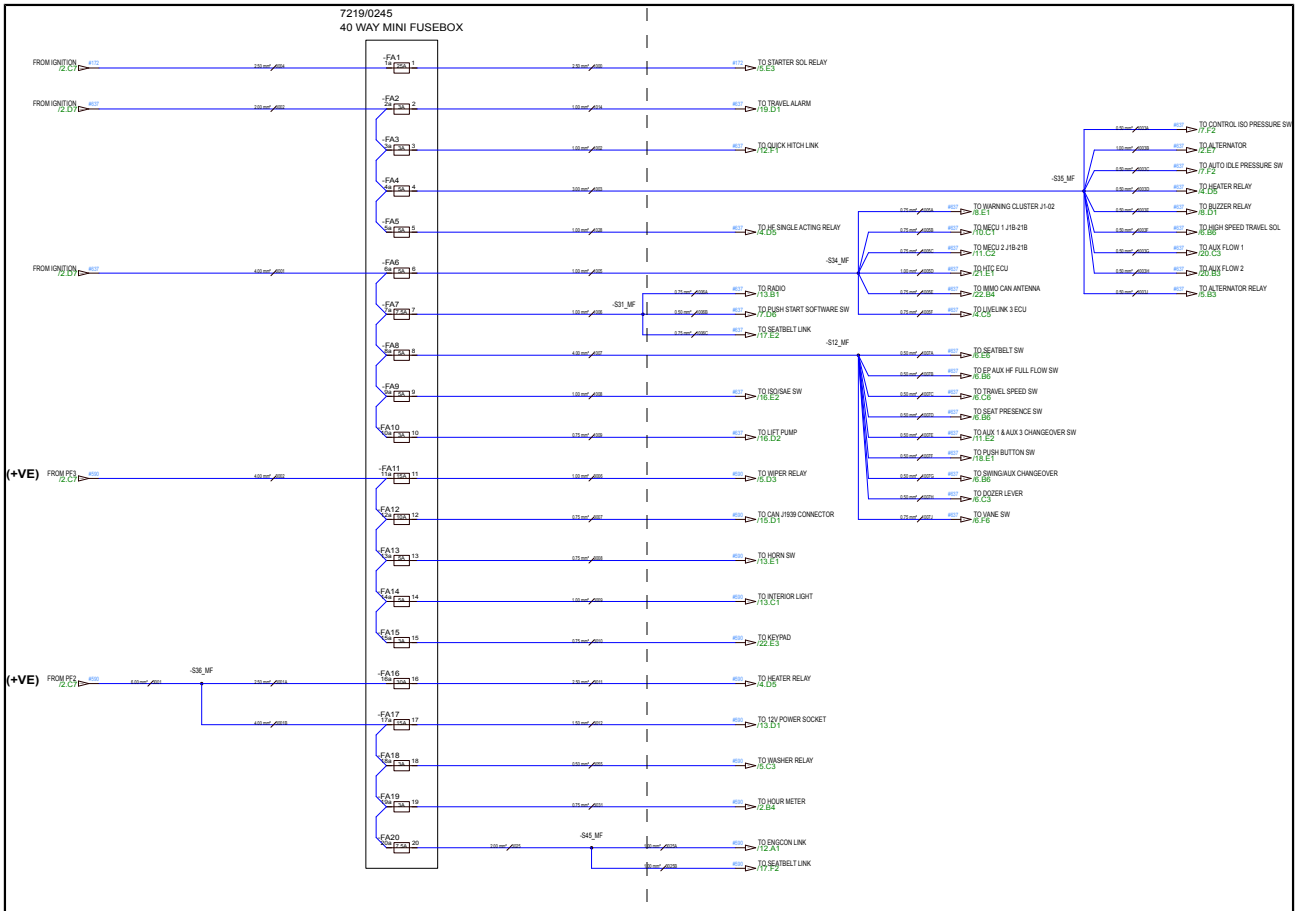


Figure 567. Secondary Fusebox - 400/K5942 - Issue 2 (Sheet 2 of 23)



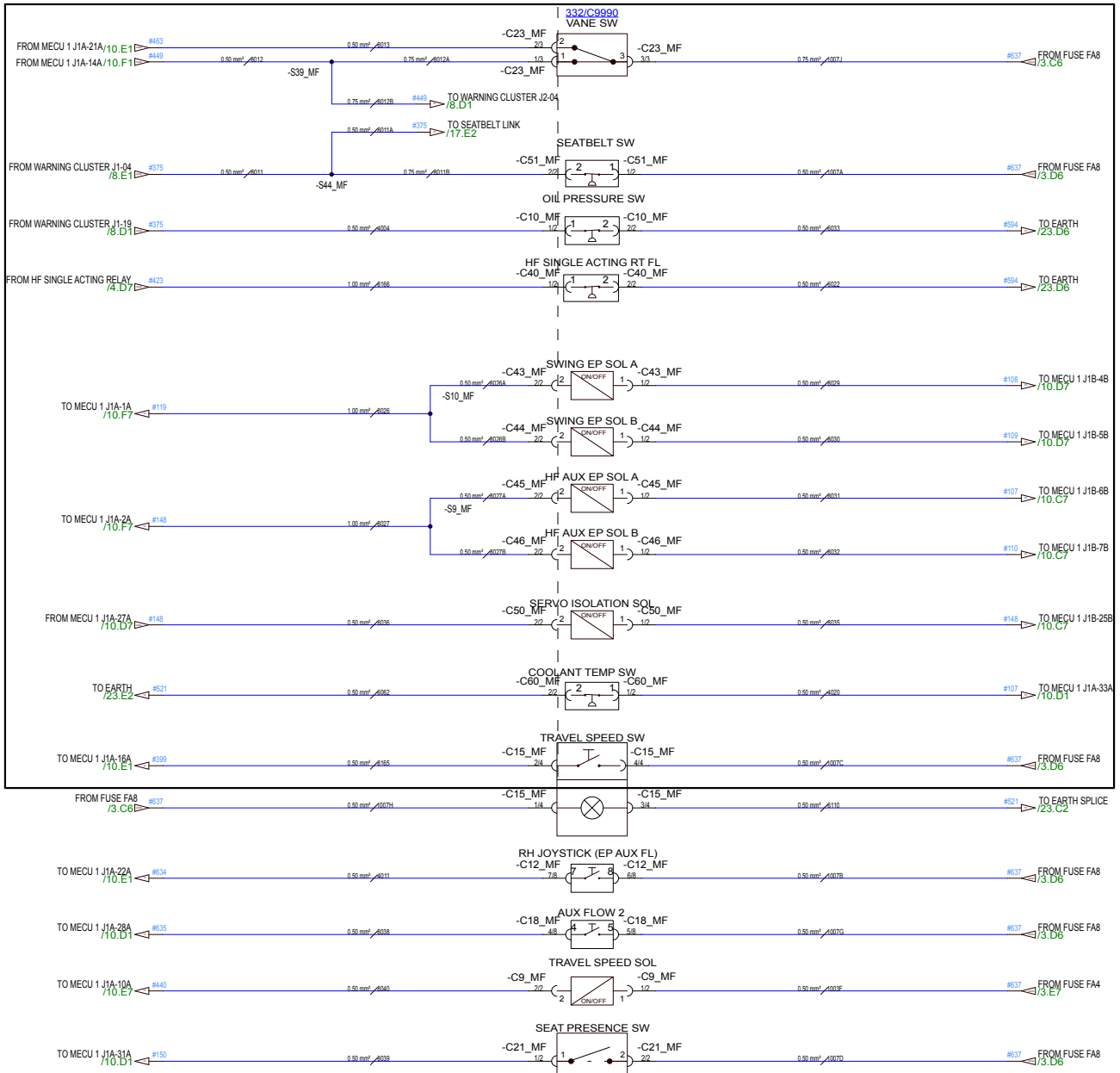
**Figure 570. Switches - 400/  
K5942 - Issue 2 (Sheet 5 of 23)**

Figure 573. NGC Low Specification Display - 400/K5942 - Issue 2 (Sheet 8 of 23)

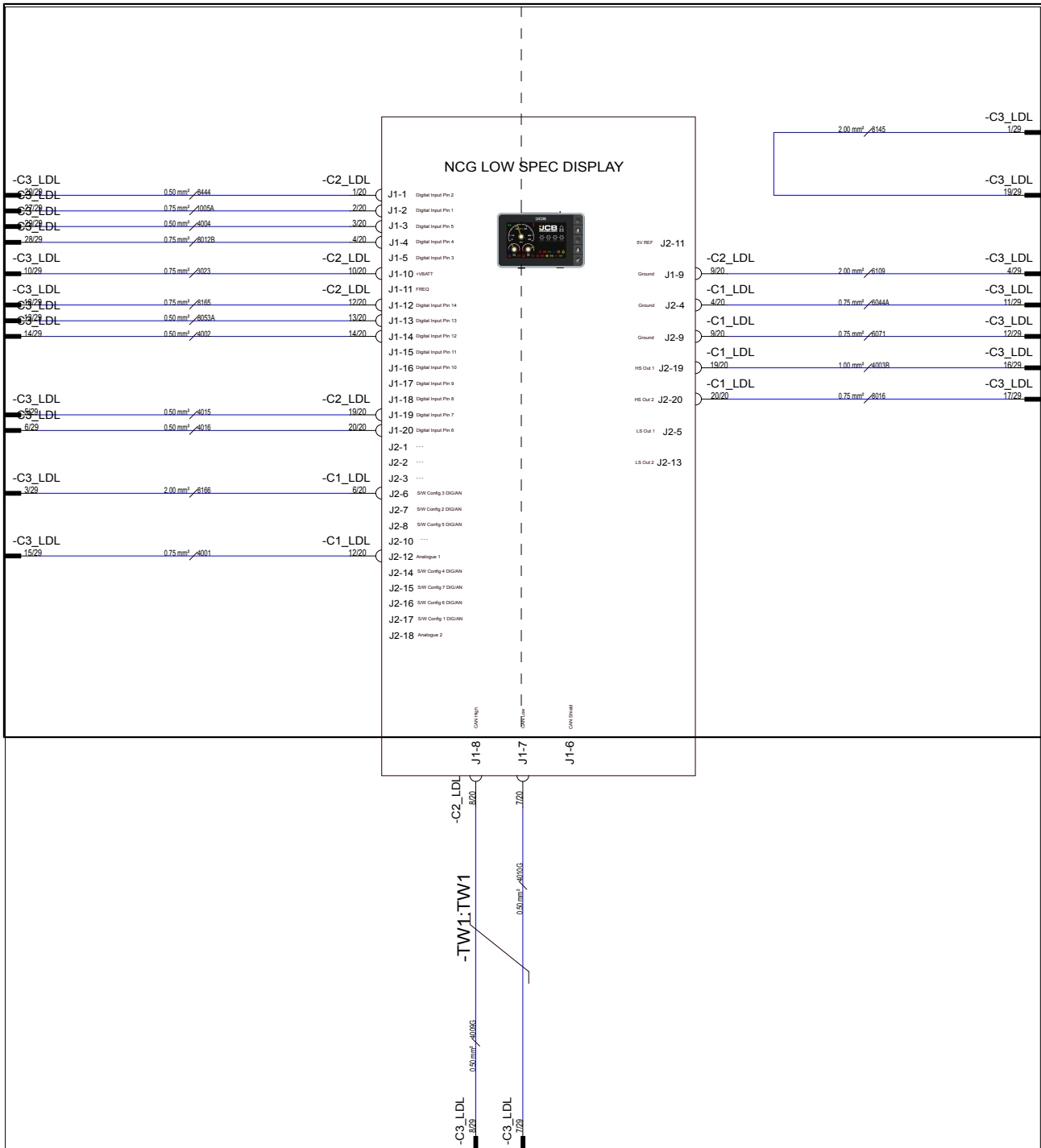


Figure 576. Quickhitch, Tilt/Grab and Engine connection - 400/ K5942 - Issue 2 (Sheet 11 of 23)

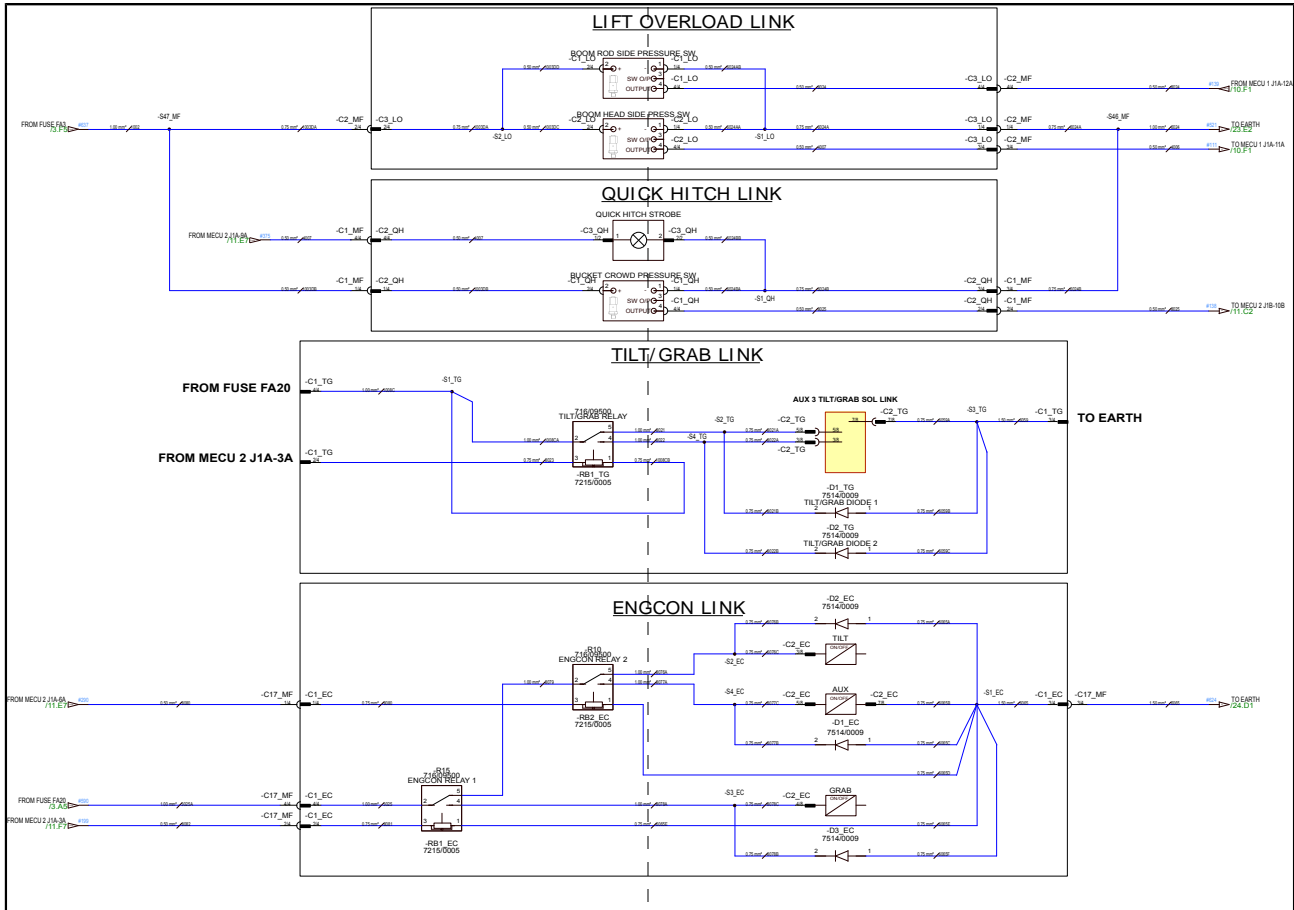


Figure 579. CANbus - 400/  
K5942 - Issue 2 (Sheet 14 of 23)

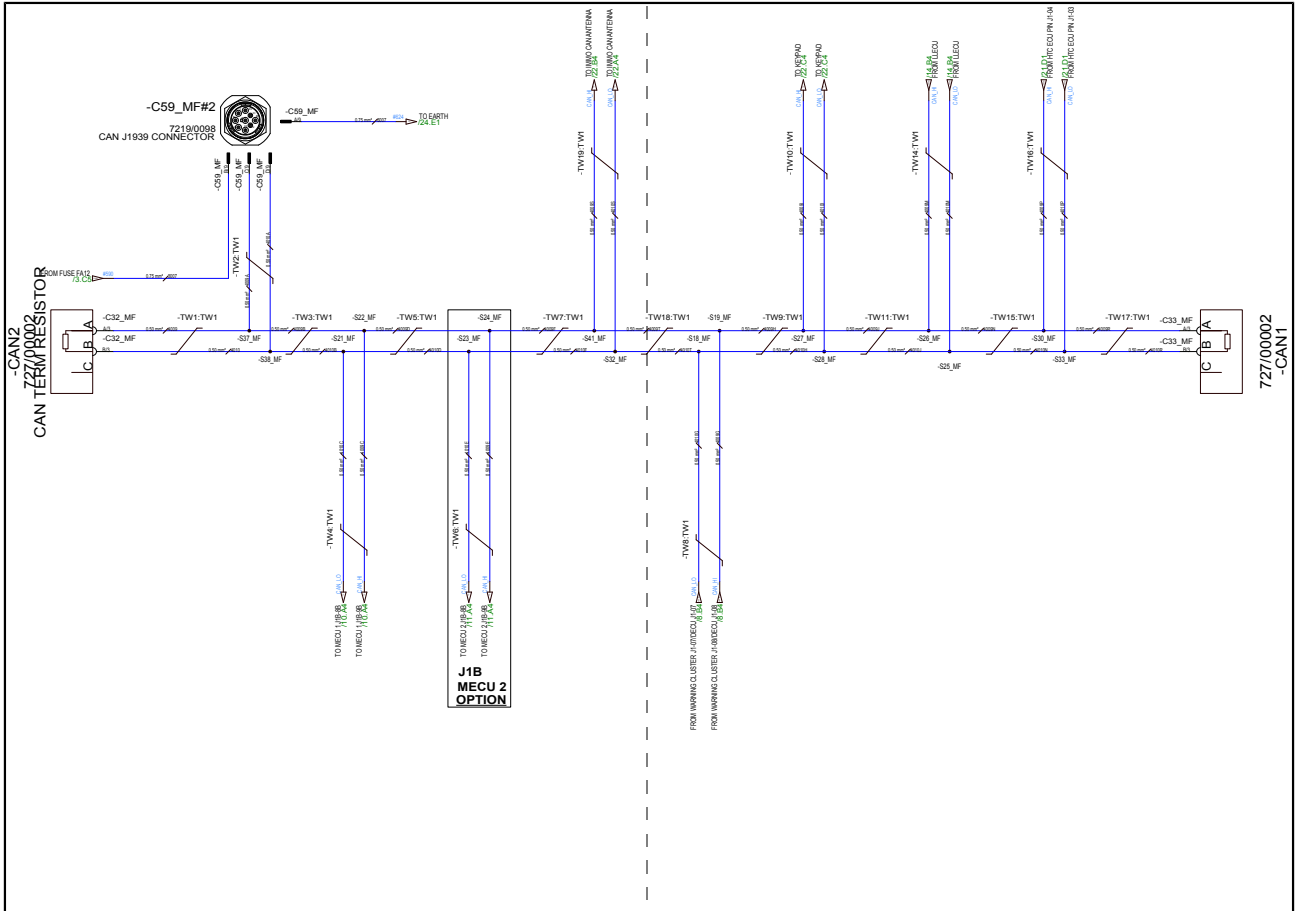


Figure 582. Push Button Start Option - 400/K5942 - Issue 2 (Sheet 17 of 23)

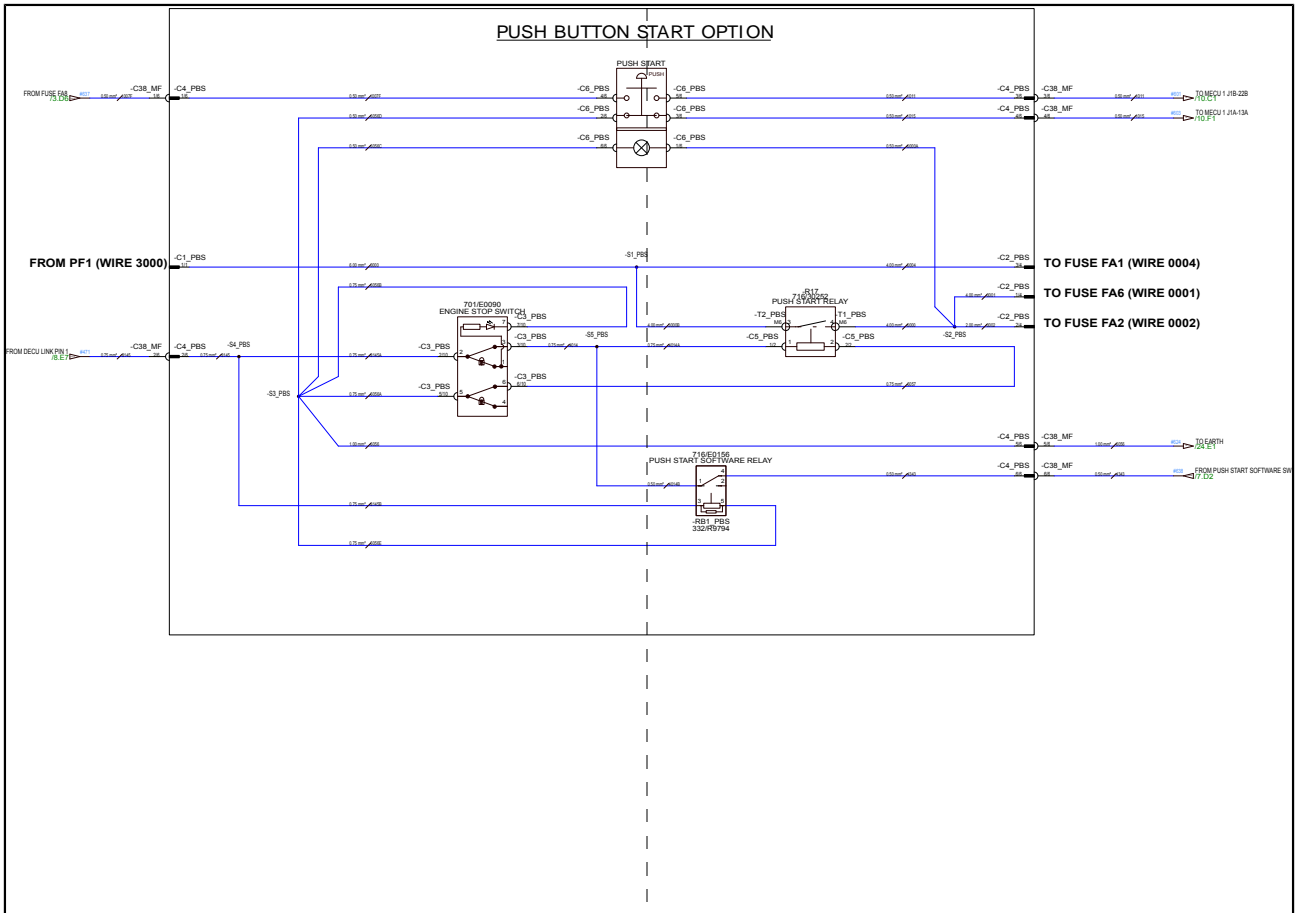
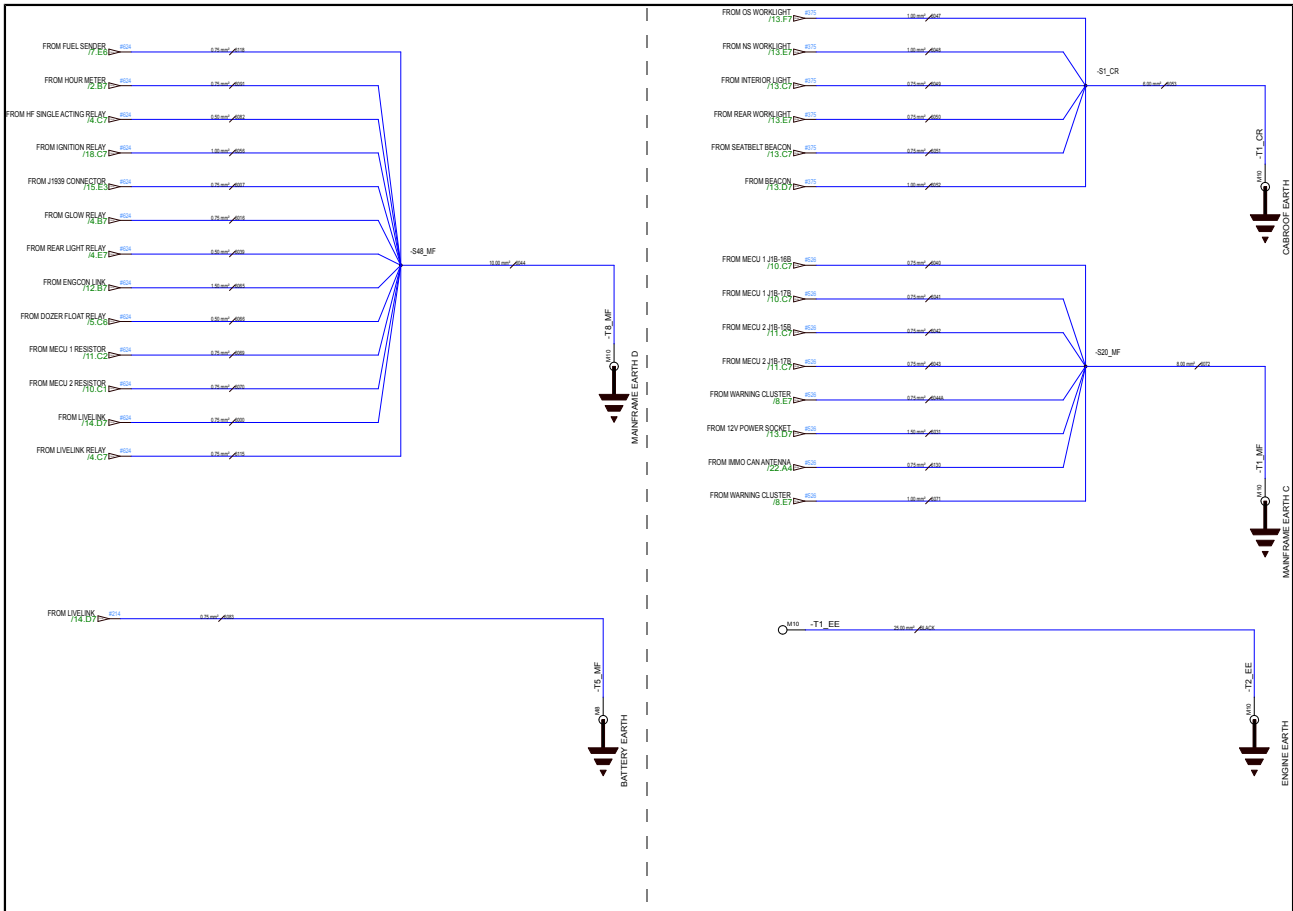
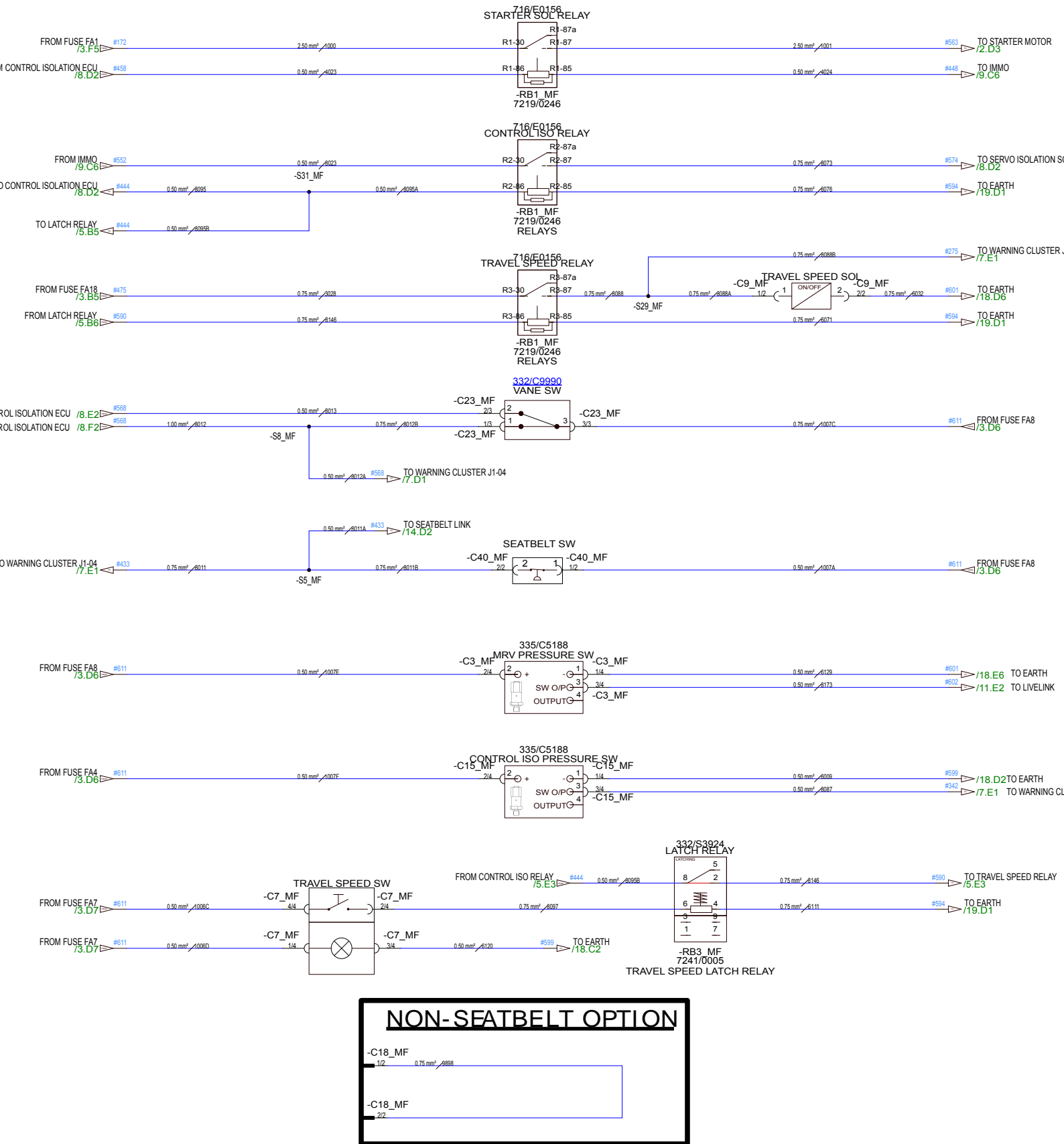




Figure 588. Earth - 400/K5942  
- Issue 2 (Sheet 23 of 23)



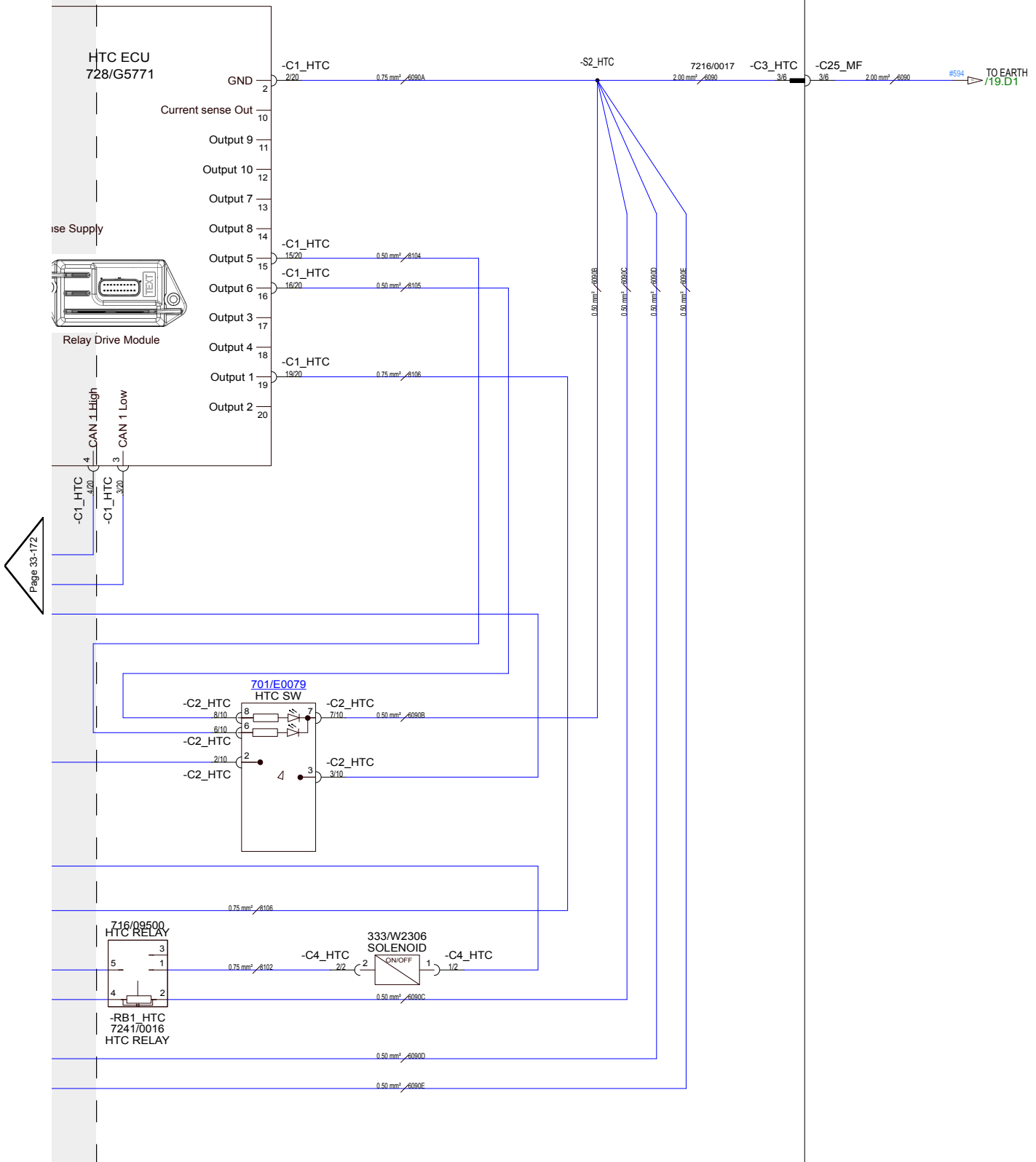
**Figure 592. Relays and Switches - 400/K5939 - Issue 4 (Sheet 4 of 18)**





#### Figure 604. (Part 2 of 2)

### TC OPTION



## Charge

### Precautions Before Charging

Follow all the precautions described below, to prevent damage to the alternator and battery.

1. Make the machine safe.  
[Refer to: PIL 01-03.](#)
2. Make sure that the battery negative terminal is connected to the earth cable.
3. Do not connect or disconnect the battery or alternator connections, or any part of the charging circuit while the engine is in operation. If you disregard this instruction, the regulator or rectifying diodes will be damaged.
4. Main output cables are always in an active state of current flow even when the engine is not in operation. If the alternator connector is removed, do not earth the moulded plug.
5. When you do arc welding on the machine, remove the moulded plug (or if the separate output cables are installed, remove the cables) to protect the alternator.
6. If it is necessary to jump start the battery, do the following steps.
  - 6.1. Connect a secondary battery in parallel without disconnecting the vehicle battery from the charging circuit.
  - 6.2. Connect the batteries using suitable jump leads. Connect the positive lead to the positive terminals of both batteries. Connect the negative lead to the negative terminals of both batteries.
  - 6.3. After the jump start, safely disconnect the jump leads and remove the secondary battery.

## Remove and Install

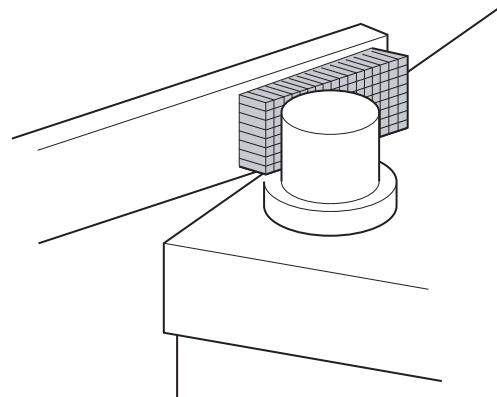
### Disconnect

1. Make the machine safe.  
[Refer to: PIL 01-03.](#)
2. Get access to the battery.
3. If the machine has a battery isolator, move the switch to the off position then remove the key.  
[Refer to: PIL 33-03-03.](#)
4. Remove the battery leads. Disconnect the earth (-) terminal first.

### Connect

1. Check the battery and do the following steps.
  - 1.1. If the terminal is dirty, clean the post.

**Figure 609.**



- 1.2. If the terminal post is corroded and generates white powder wash the terminal with hot water. If considerable corrosion is detected, clean with a wire brush or abrasive paper.
- 1.3. After you clean, apply a small coat of petroleum jelly to the terminal.
2. Connect the leads. Connect the earth (-) terminal last.
3. If the machine has a battery isolator, move the switch to the on position.  
[Refer to: PIL 33-03-03.](#)
4. Close and lock the access panels.

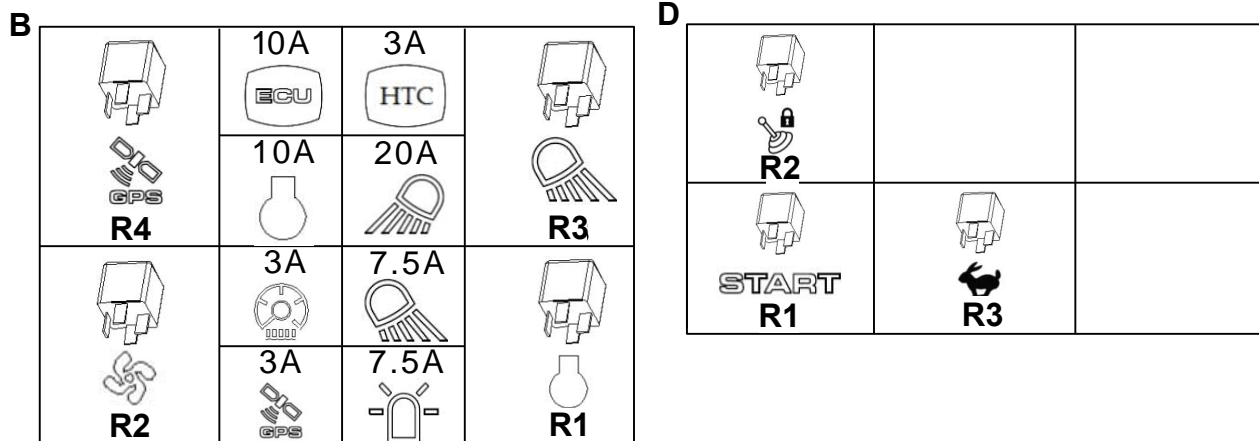
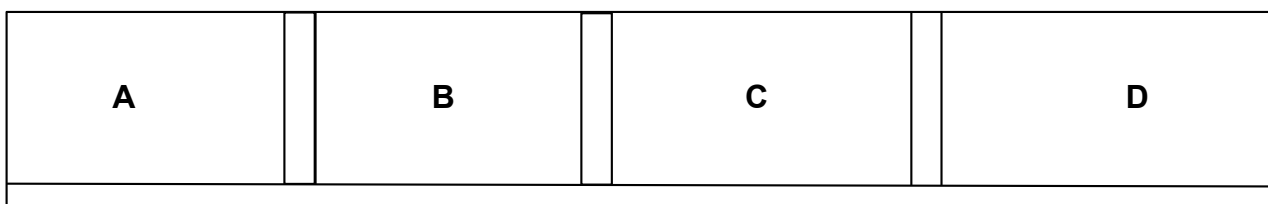
**06 - Relay**

**Technical Data**

For: 15C-1 [T3], 16C-1 [T3], 19C-1 [T3],  
 19C-1 [T4F] ..... Page 33-197  
 For: 18Z-1 [T3], 18Z-1 [T4F] .... Page 33-198  
 For: 19C-1 PC [T3] ..... Page 33-199

(For: 15C-1 [T3], 16C-1 [T3], 19C-1 [T3], 19C-1 [T4F])

**Figure 613.**



**Table 213.**

| Relay | Circuit                           |
|-------|-----------------------------------|
| B-R1  | ECM (Engine Control Module) relay |
| B-R2  | Heater relay                      |
| B-R3  | Rear worklight relay              |
| B-R4  | Livelink relay                    |
| D-R1  | Starter motor relay               |
| D-R2  | Control isolation relay           |
| D-R3  | 2- Speed relay                    |

Figure 628. 400/S7149 Issue 1 (Sheet 1 of 3)

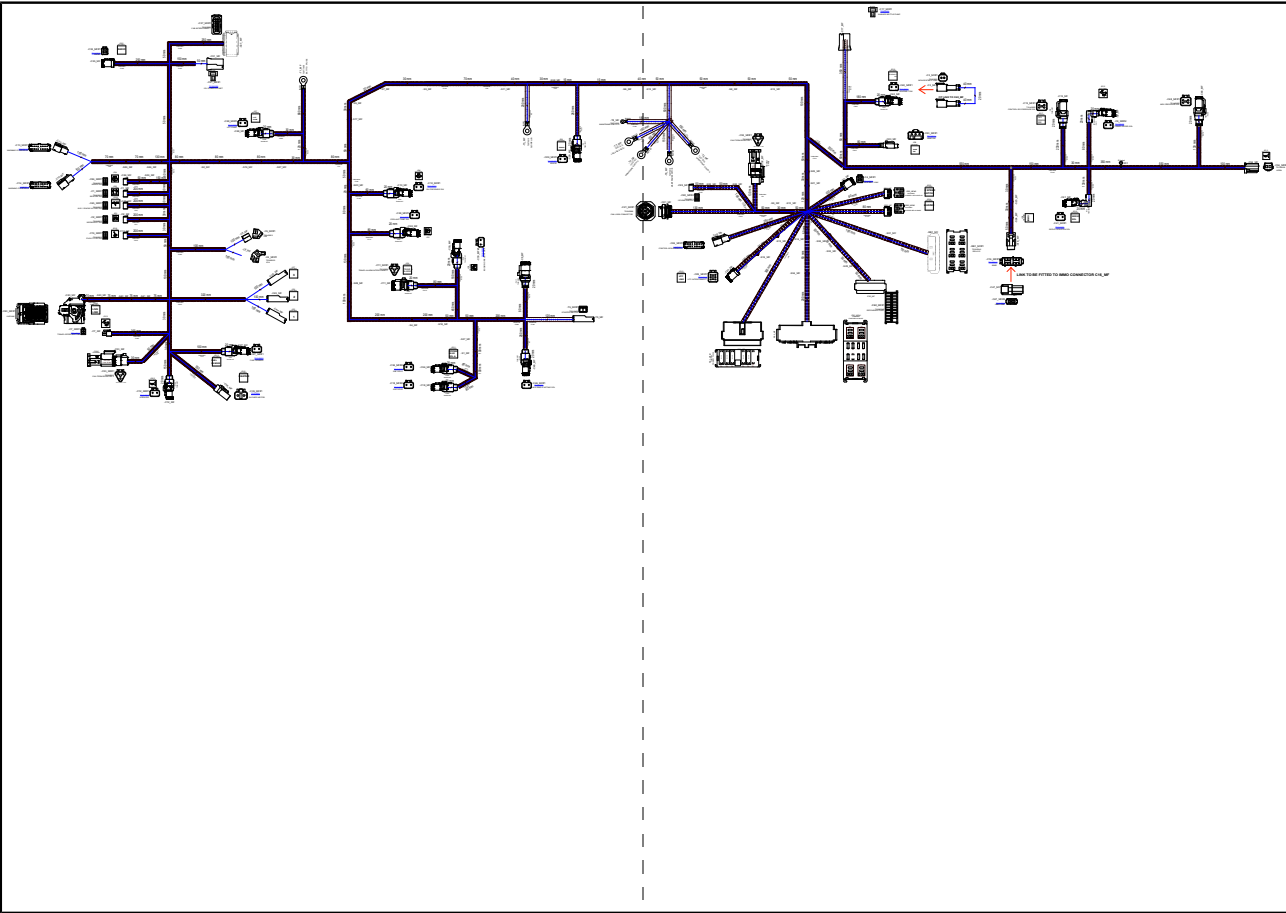


Figure 631. 400/S7155 Issue 1 (Sheet 1 of 3)

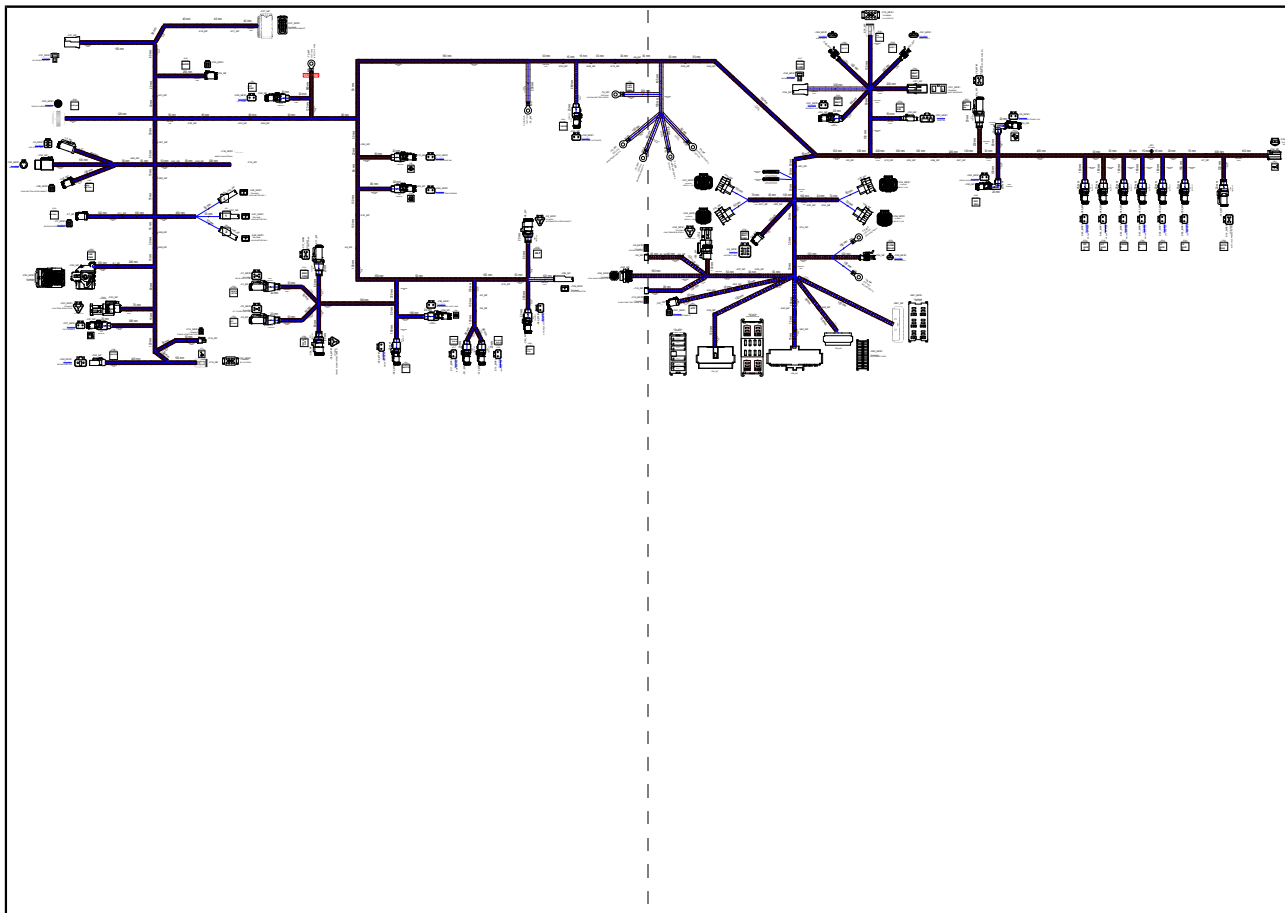
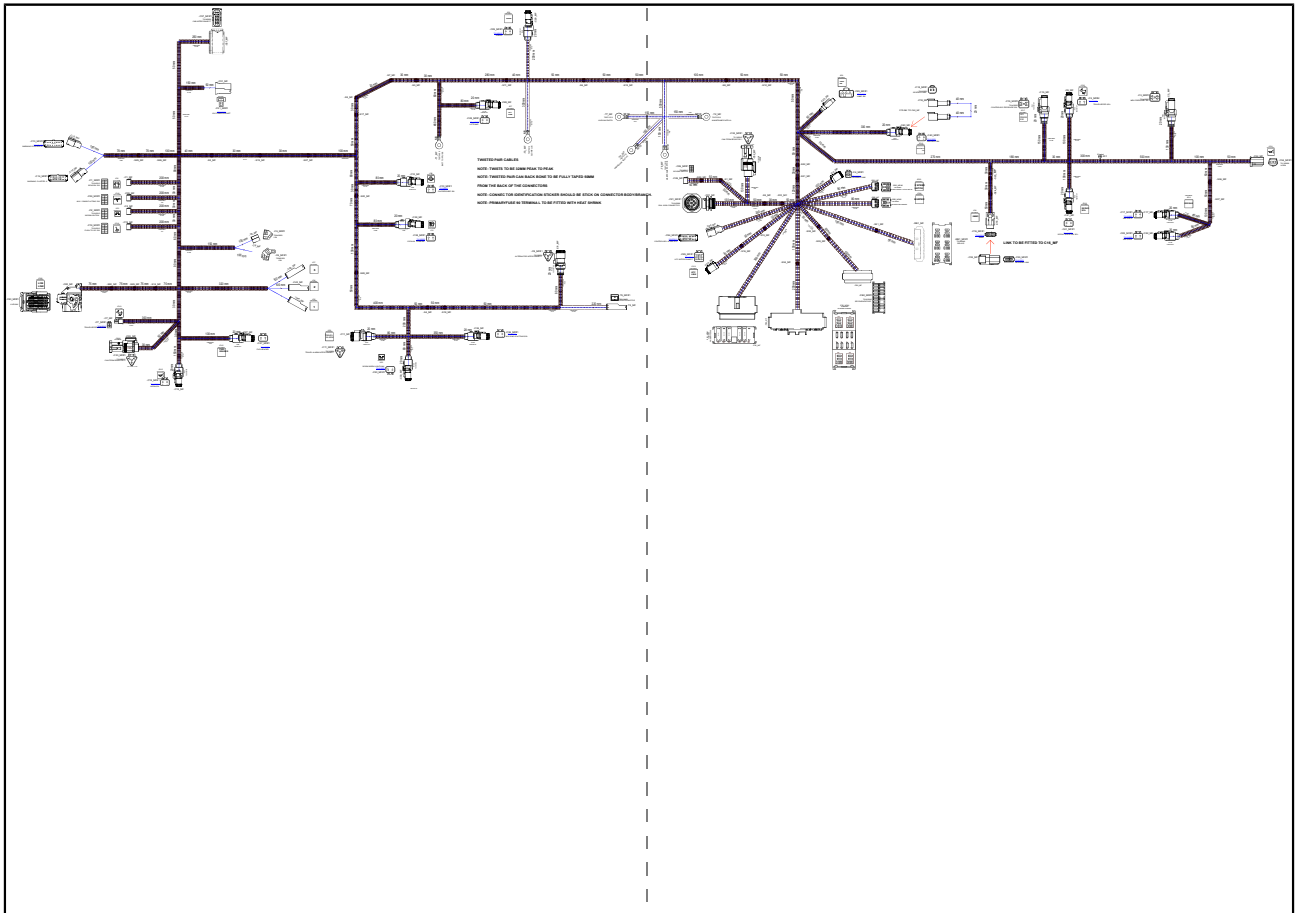
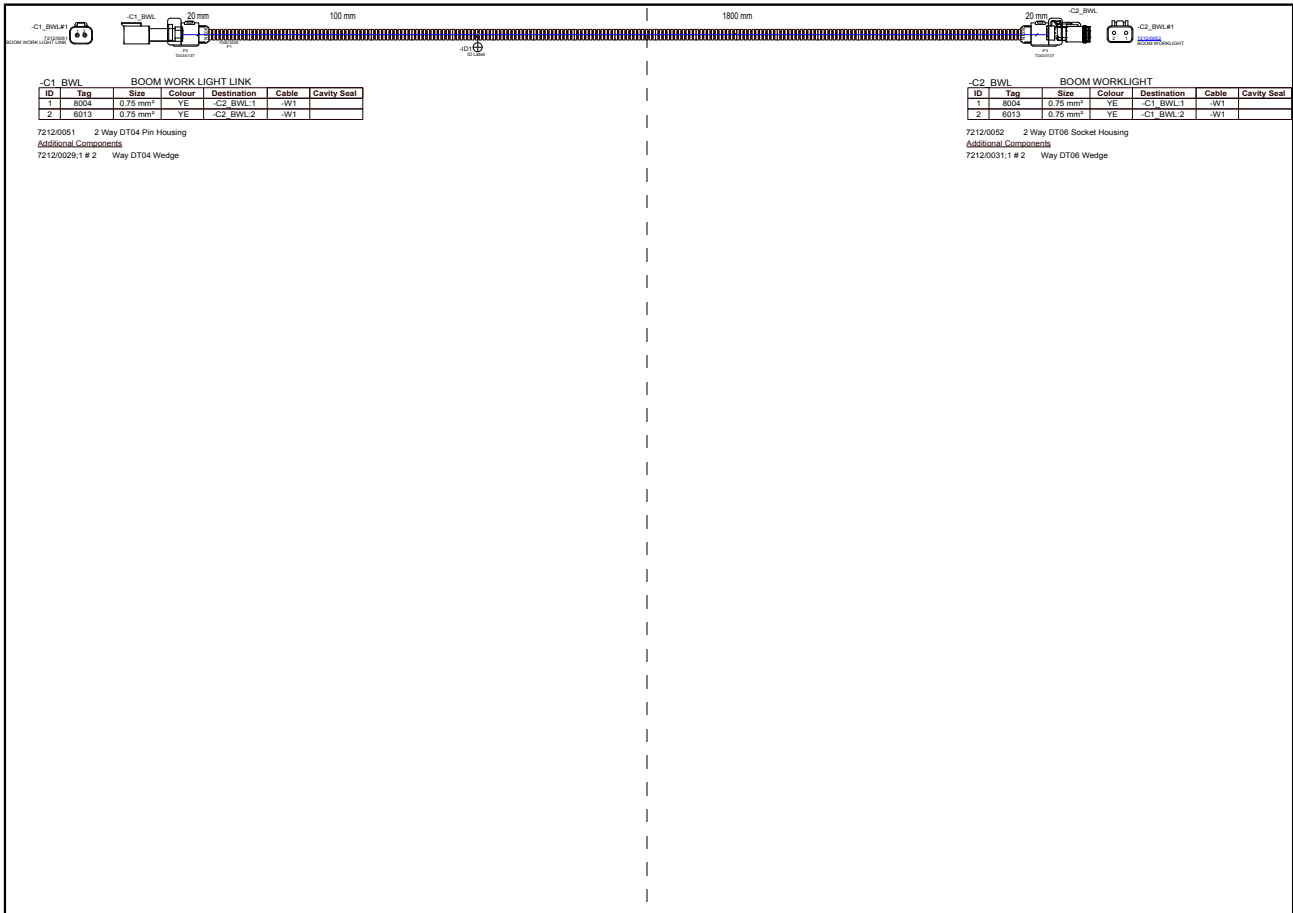


Figure 634. 400/S7152 Issue 1 (Sheet 1 of 3)







(For: 18Z-1 [T3], 18Z-1 [T4F], Fixed Canopy)

Figure 644. 400/H1969 Issue 1 (Sheet 1 of 2).....Page 33-259



## 24 - Instruments

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**00 - General**

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 Health and Safety ..... 33-282  
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**Introduction**

(For: 19C-1 PC [T3])

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

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

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

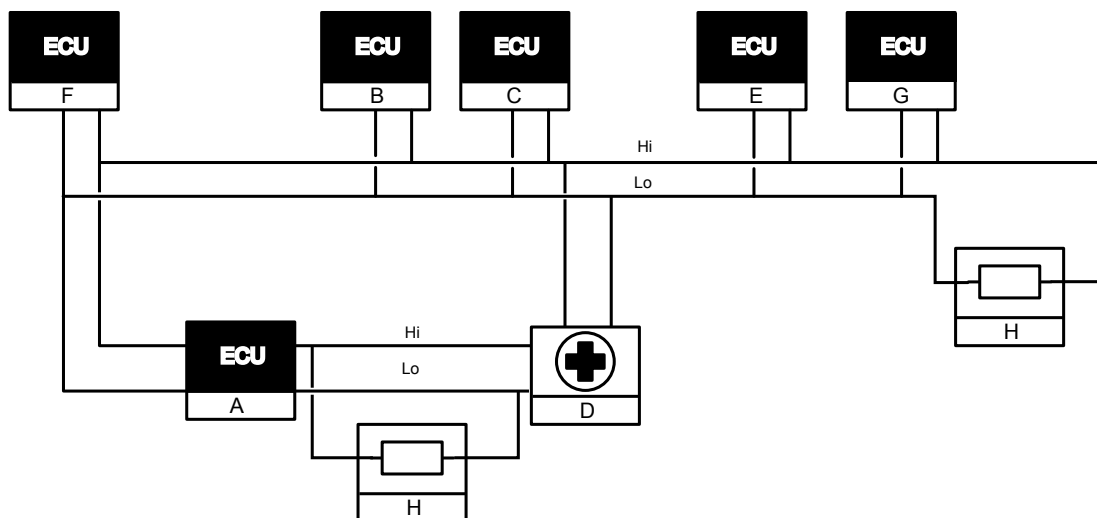
**CANbus Communications System**

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

**CANbus System Schematic**

A typical CANbus system architecture is shown for illustration purposes only below: Refer to Figure 653.

**Figure 653. Typical CANbus architecture**



The CAN architecture may differ on your machine.  
 Refer to: [PIL 33-00-50](#).

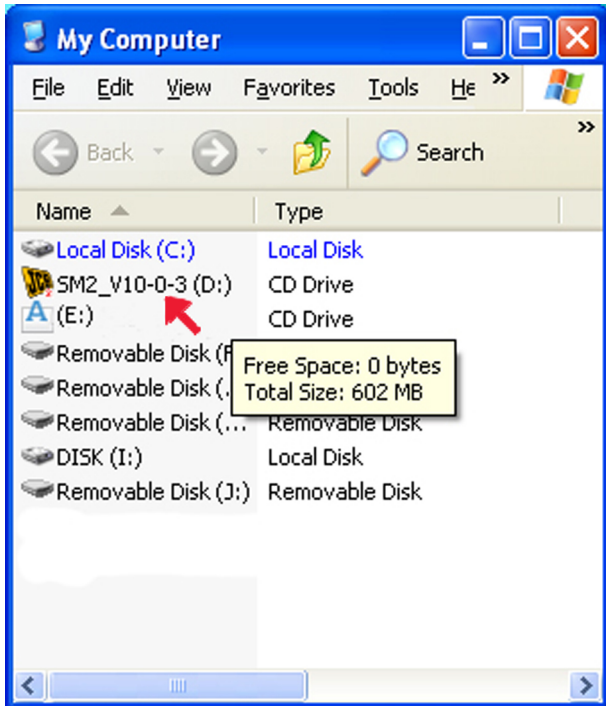


## 57 - Electronic Diagnostic

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| 33-57-03 Servicemaster ..... | 33-297   |
| 33-57-90 Fault Codes .....   | 33-314   |

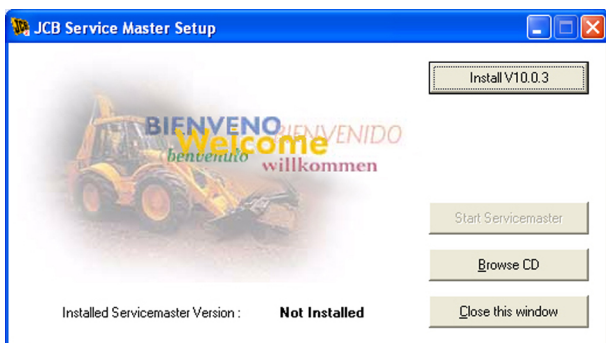
3. Select and open the "SM2\_V10-0-3 (D:)" CD drive to explore its contents. Refer to Figure 685.

**Figure 685.**



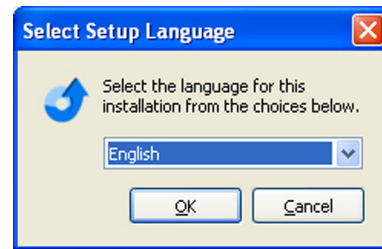
4. Select and open the "Setup.exe" application.
5. A new window "JCB Servicemaster Setup" will appear on the screen.
  - 5.1. Click the "Install V10.0.3" option to start the setup application. Refer to Figure 686.

**Figure 686.**



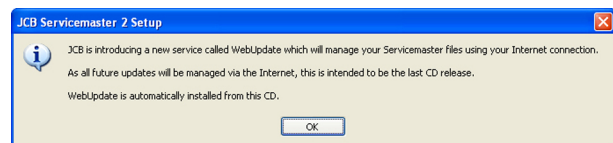
6. A new window "Select Setup Language" will appear on the screen. Refer to Figure 687.
  - 6.1. Use the drop down option to select the suitable language.
  - 6.2. Click the "OK" option to confirm selected language.

**Figure 687.**



7. A warning message window will appear on the screen. Refer to Figure 688.
  - 7.1. Click the "OK" option.

**Figure 688.**



8. A new window "JCB Servicemaster Installation Wizard" will appear on the screen. Refer to Figure 689.
  - 8.1. Click the "Next" option to proceed.

**Figure 689.**



9. Put "User Name" and "Organisation" details into the "Customer Registration" screen. Refer to Figure 690.
  - 9.1. Click the "Next" option when you inserted details.



| <b>Fault Code</b> | <b>Description</b>  | <b>Severity</b> |
|-------------------|---|-----------------|
| B268C-27          | MECU 1 - Pod Lever UP (+12) abnormal rate of change                 | Operator        |
| B268D-27          | MECU 1 - Pod Lever (+12) Down abnormal rate of change               | Operator        |
| B268E-27          | MECU 1 - Seat Belt (+12) abnormal rate of change                    | Operator        |
| B268F-27          | MECU 1 - Seat presence (+12) abnormal rate of change                | Operator        |
| B2690-27          | MECU 1 - Swing Aux Changeover (GND) abnormal rate of change         | Operator        |
| B2691-27          | MECU 1 - HF Full Flow (+12) abnormal rate of change                 | Operator        |
| B2692-27          | MECU 1 - 2 Speed Switch (+12) abnormal rate of change               | Operator        |
| B2693-27          | MECU 1 - Overload MCN (+12) abnormal rate of change                 | Operator        |
| B2694-27          | MECU 1 - Wiper Park Signal (GND) abnormal rate of change            | Operator        |
| B2695-27          | MECU 1 - Push-Start (+12) abnormal rate of change                   | Operator        |
| B2696-19          | MECU 1 - MRV (Main Relief Valve) pressure Voltage out of range high | Operator        |
| B2697-16          | MECU 1 - MRV pressure Voltage out of range low                      | Operator        |
| B2698-19          | MECU 1 - Servo pressure Voltage out of range high                   | Operator        |
| B2699-16          | MECU 1 - Servo pressure Voltage out of range low                    | Operator        |
| B269A-19          | MECU 1 - Boom Head pressure Voltage out of range high               | Operator        |
| B269B-16          | MECU 1 - Boom Head pressure Voltage out of range low                | Operator        |
| B269C-19          | MECU 1 - Boom Rod pressure Voltage out of range high                | Operator        |
| B269D-16          | MECU 1 - Boom Rod pressure Voltage out of range low                 | Operator        |
| B26B3-17          | MECU 1 - Aux 1 (High Flow) Flow Control OORH                        | Operator        |
| B26B4-16          | MECU 1 - Aux 1 (High Flow) Flow Control OORL                        | Operator        |
| B26B5-17          | MECU 2 - Aux 2 (Low Flow) Flow Control OORH                         | Operator        |
| B26B6-16          | MECU 2 - Aux 2 (Low Flow) Flow Control OORL                         | Operator        |
| B26B7-51          | MECU 1 - Rear Worklight Fitted but Option NOT set                   | Operator        |
| B26B8-51          | MECU 1 - Washer/Wiper Fitted but Option NOT set                     | Operator        |
| B26B9-51          | MECU 1 - Lift Overload Fitted but Option NOT set                    | Operator        |
| B26BA-51          | MECU 1 - Travel Alarm Fitted but Option NOT set                     | Operator        |
| B26BB-51          | MECU 1 - Aux 1 HF Fitted but Option NOT set                         | Operator        |
| B26BC-51          | MECU 2- Aux 2 LF Fitted but Option NOT set                          | Operator        |
| B26BE-51          | MECU 2 - Quick Hitch Fitted but Option NOT set                      | Operator        |
| B26C6-68          | MECU 1 - Application Software Version Mis-Match                     | Trivial         |

## Operation

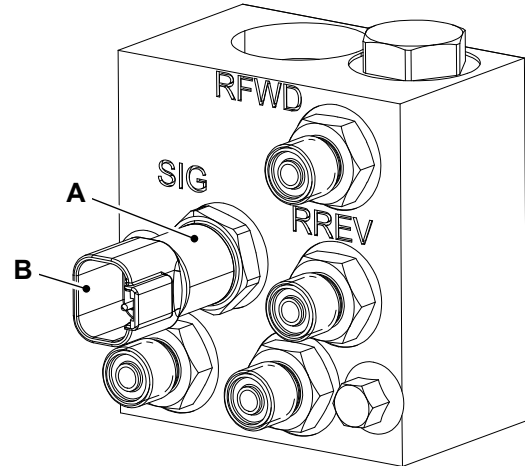
The travel alarm pressure switch is supplied with hydraulic pressure directly from the track motor service. When the tracking service is selected by the operator the hydraulic pressure operates the switch which switches on the travel alarm. When the operator deselects the tracking service and the hydraulic oil flow stops, the switch is deactivated which in turn switches off the travel alarm.

## Remove and Install

### Remove

1. Make the machine safe.  
[Refer to: PIL 01-03.](#)
2. Discharge the hydraulic pressure.  
[Refer to: PIL 30-00-00.](#)
3. Remove the floor plate.  
[Refer to: PIL 09-78-00.](#)
4. Disconnect the electrical connector.

**Figure 727.**



- A** Travel alarm pressure switch
- B** Electrical connector

5. Remove the travel alarm pressure sensor from the valve block.
  - 5.1. Plug all open ports to prevent contamination.

### Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following step.
2. Tighten the travel alarm pressure sensor to the correct torque value.

**Table 223. Torque Values**

| Item | Nm    |
|------|-------|
| A    | 30-35 |



## 06 - Bolts

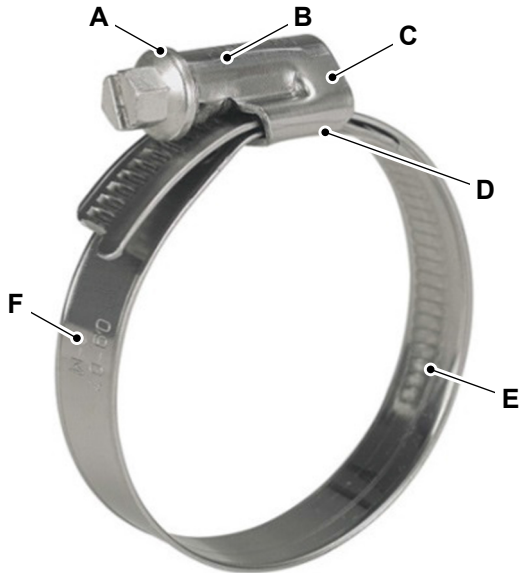
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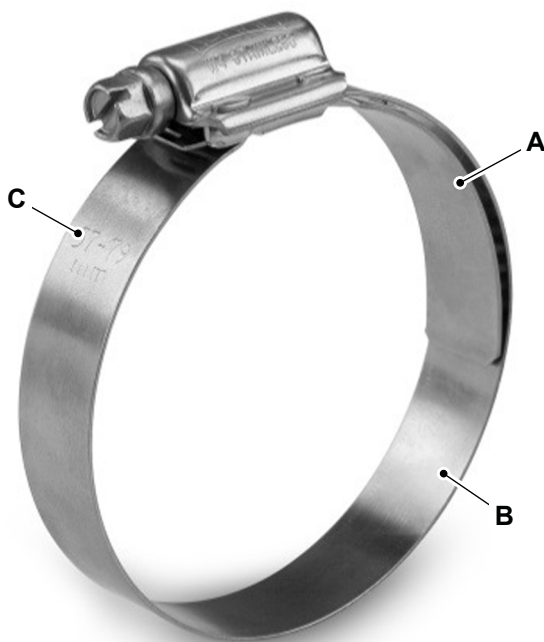
**Component Identification**

**Figure 734. Standard Worm Drive Clip**



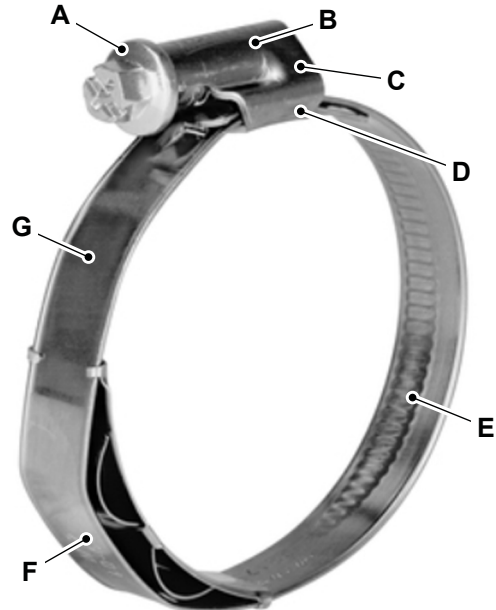
- A Screw support flange
- B Asymmetric housing
- C Asymmetric extension
- D Short housing saddle
- E Stamped inside
- F Identification of material/clamping range

**Figure 735. Heavy Duty Worm Drive Clip**



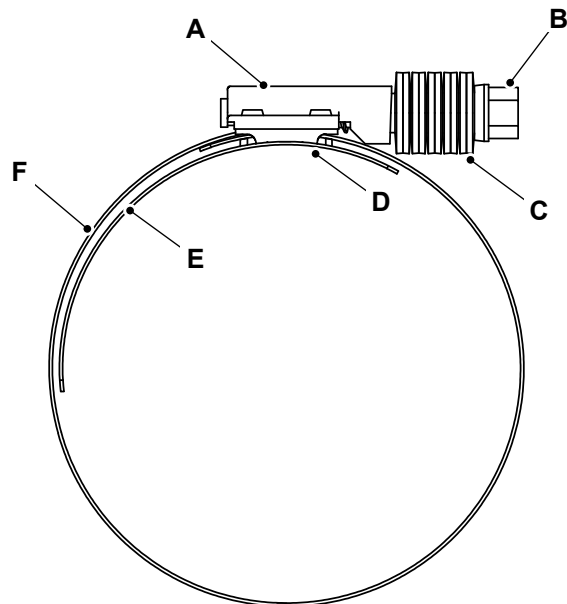
- A Extended bridge
- B Band width ( 16 mm)
- C Identification of clamping range

**Figure 736. Spring Assisted Worm Drive Clip**



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

**Figure 737. Constant Torque Worm Drive Clips**



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

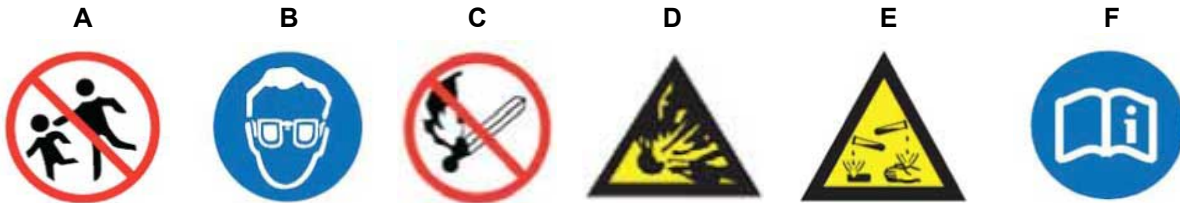
- Throw away oil-soaked shoes

## Battery

### Warning Symbols

The following warning symbols may be found on the battery.

Figure 742.



- A** Keep away from children  
**C** No smoking, no naked flames, no sparks  
**E** Battery acid

- B** Shield eyes  
**D** Explosive gas  
**F** Note operating instructions

### First Aid - Oil

#### Eyes

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

#### Swallowing

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

#### Skin

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

#### Spillage

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

#### Fires

- ▲ WARNING** Do not use water to put out an oil fire. This will only spread it because oil floats on water.  
 Extinguish oil and lubricant fires with carbon dioxide, dry chemical or foam.

### First Aid - Electrolyte

#### Eyes

In the case of eye contact, flush with water for 15 min. always get medical attention.

### Swallowing

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

#### Skin

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

### First Aid - DEF (if applicable)

Do not drink or inhale DEF (Diesel Exhaust Fluid). If large quantities of DEF have been swallowed a doctor should be called immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

Avoid prolonged or repeated skin contact. After contact with skin wash thoroughly with plenty of soap and water. If irritation develops seek medical advice.

Avoid contact with eyes, skin and clothing. Wear chemical resistant gloves, overalls and safety goggles complying with an approved standard. If in contact with eyes, rinse immediately with plenty of clean water. If irritation occurs seek medical attention. Always wash hands and arms thoroughly after handling before eating, drinking, smoking or using the lavatory.

## **00 - General**

### **Introduction**

It is most important that you read and understand this information and the publications referred to. Make sure all your colleagues who are concerned with lubricants read it too.

### **Hygiene**

JCB lubricants are not a health risk when used properly for their intended purposes.

However, excessive or prolonged skin contact can remove the natural fats from your skin, causing dryness and irritation.

Low viscosity oils are more likely to do this, so take special care when handling used oils, which might be diluted with fuel contamination.

Whenever you are handling oil products you should maintain good standards of care and personal and plant hygiene. For details of these precautions we advise you to read the relevant publications issued by your local health authority, plus the following.

### **Storage**

Always keep lubricants out of the reach of children. Never store lubricants in open or unlabelled containers.

### **Waste Disposal**

All waste products should be disposed of in accordance with all the relevant regulations.

The collection and disposal of used oil should be in accordance with any local regulations. Never pour used engine oil into sewers, drains or on the ground.



## 00 - General

Introduction ..... 75-29  
Technical Data ..... 75-30

## 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.



---

## 78 - After Sales

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