Service Manual

JS 130 Tracked Excavators

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World Class
Customer Support

Left Side, Right Side

In this manual, 'left' **A** and 'right' **B** mean your left and right when you are seated correctly in the machine.

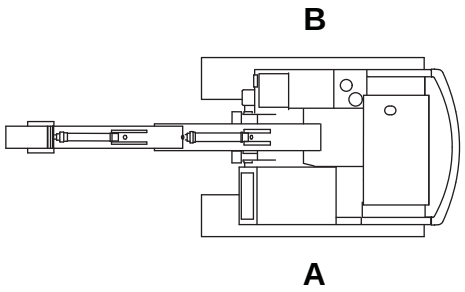

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Fig 1.

Gas Hydraulic Bladder Accumulators

Some hydraulic circuits and valve blocks are fitted with gas hydraulic bladder type accumulators.

Before removing accumulators make sure hydraulic pressure is vented. ⇨ *Venting the Hydraulic Pressure (1-15)*

Even when the hydraulic pressure is vented the accumulator still contains pressurised nitrogen gas. DO NOT attempt to discharge the gas pressure.

DO NOT transport accumulators charged with pressurised gas by air freight.

Replacement

Replacement accumulators are generally supplied in a discharged state with no nitrogen gas. A label attached to the accumulator indicates the gas charge state.

Charging

⇨ *Fig 1. (1-20)*

Important: *The following charging procedure is only applicable to accumulators supplied in a discharged state.*

To carry out the charging procedure the following is required:

- Pressurised bottle of nitrogen gas with a suitable pressure reducing valve (**3**).
- Correct gas bottle adaptor depending on territory.
- Charging kit 892/00239. Refer to ***Section 1***.

Operating charge pressures; accumulators are charged to different operating pressures depending on the application. For the correct charge pressure refer to the applicable system specifications.

Before fitting a replacement accumulator charge it with nitrogen gas as follows:

⚠ WARNING

Use only nitrogen gas to charge accumulators. The use of any other gas can cause the accumulators to explode. Remember that although nitrogen is not poisonous you can be killed by suffocation if it displaces the air in your workplace. Do not allow excessive quantities of nitrogen to be discharged into the atmosphere.

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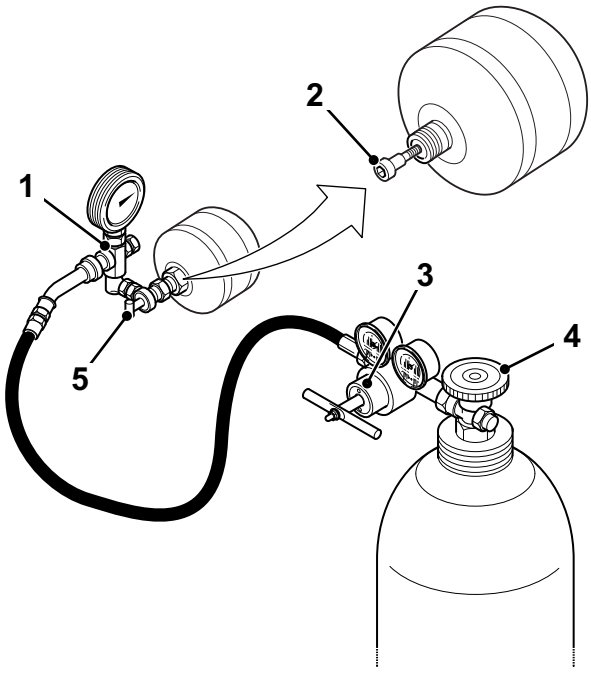

C110540-C2

Fig 1.

1 Hold the accumulator upright and remove the plastic cap from the top of the accumulator.

Note: *Some accumulators are supplied with a measured quantity of oil inside the gas chamber. Take care to prevent oil loss.*

2 Using a suitable allen key, slowly remove the filler plug **2**.

Lightly oil the sealing washer beneath. Replace the washer and plug. Loosen the plug by 1/8 of a turn.

Hose Ends and Flanged Fittings (Colour Coded)

Note: *All adapters, elbows and hoses should be tightened to JCB standard torque settings unless stated otherwise.*

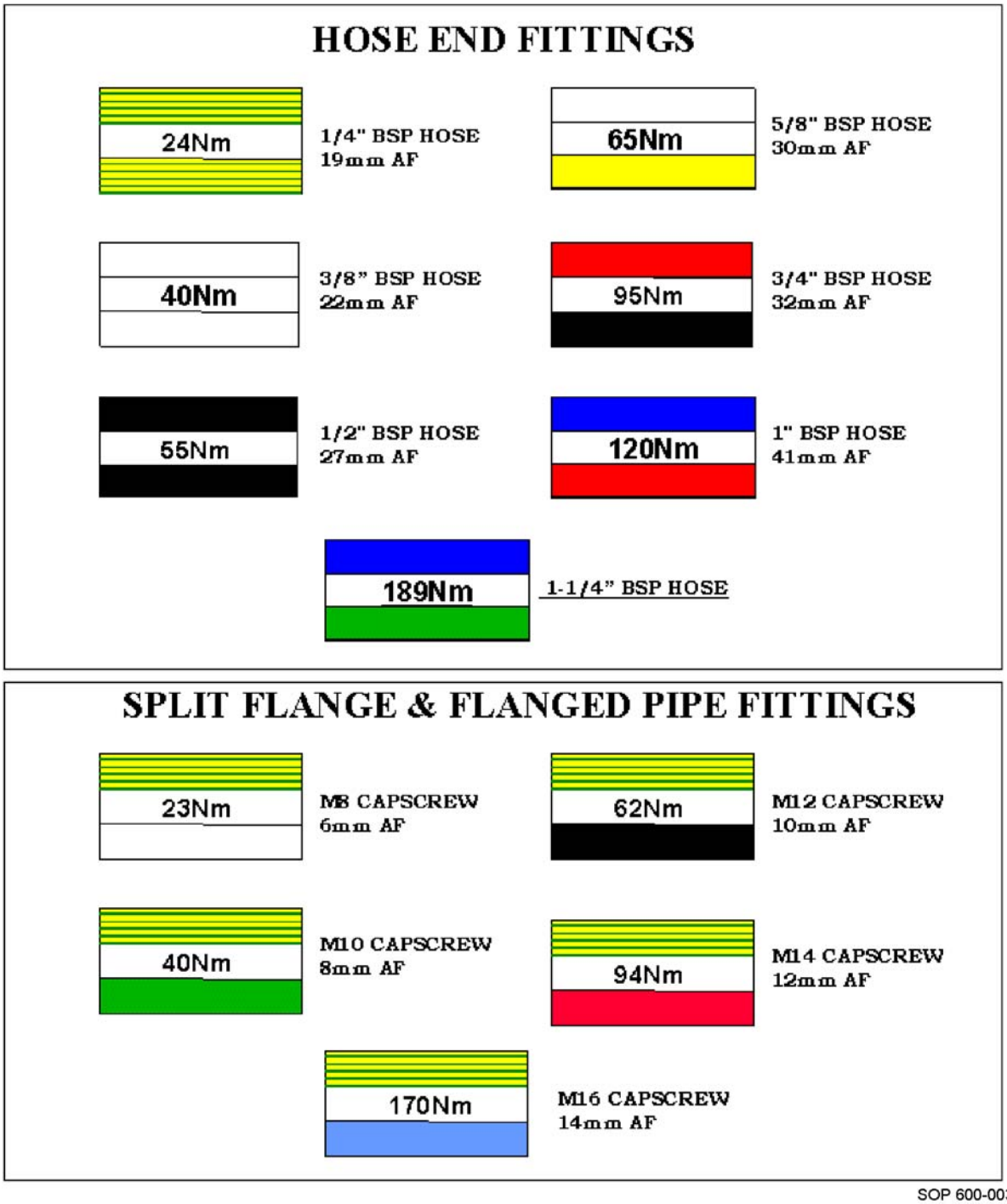

Fig 5.

T11-010

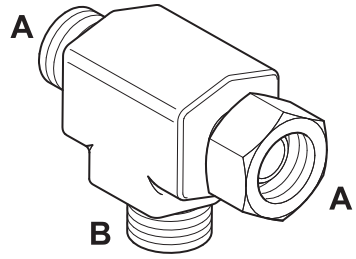

Fig 23. 'T' Adapters

892/00047	3/8 in. BSP (**A**) x 1/4 in. BSP (**B**)
892/00048	1/2 in. BSP (**A**) x 1/4 in. BSP (**B**)
892/00049	5/8 in. BSP (**A**) x 1/4 in. BSP (**B**)
816/50043	3/4 in. BSP (**A**) x 1/4 in. BSP (**B**)
892/00051	1 in. BSP (**A**) x 1/4 in. BSP (**B**)
816/50005	1/2 in. BSP (**A**) x 1/2 in. BSP (**B**)
816/60096	3/4 in. BSP (**A**) x 3/4 in. BSP (**B**)
816/00017	1 in. BSP (**A**) x 1 in. BSP (**B**)

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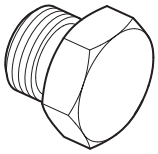

Fig 24. Female Blanking Caps

892/00055A	1/4 in. BSP
892/00056A	3/8 in. BSP
892/00057	1/2 in. BSP
892/00058A	5/8 in. BSP
892/00059A	3/4 in. BSP
892/00060	1 in. BSP

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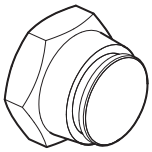

Fig 25. Male Cone Blanking Caps

816/90045	1/4 in. BSP
816/00189A	3/8 in. BSP
816/00190A	1/2 in. BSP
816/90022	5/8 in. BSP
816/90274	3/4 in. BSP
816/90205	1 in. BSP

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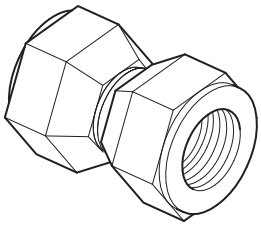

Fig 26. Female Connectors

892/00074	3/8 in. BSP x 3/8 in. BSP
892/00075	1/2 in. BSP x 1/2 in. BSP
892/00076	5/8 in. BSP x 5/8 in. BSP
892/00077	3/4 in. BSP x 3/4 in. BSP

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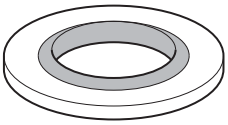


Fig 27. Bonded Washers

1406/0011	1/4 in. BSP
1406/0018	1/2 in. BSP
1406/0014	5/8 in. BSP
1406/0021	3/4 in. BSP
1406/0029	1.1/4 in. BSP

Ram Jigs

Inserting Seal Ring and Correction Jig

WDB 2052	Bucket	120mm Cylinder inner diameter
WDB 2054	Boom	125mm Cylinder inner diameter
WDB 2164	Boom	130mm Cylinder inner diameter
WDB 2056	Arm	150mm Cylinder inner diameter

Jig for Pulling Out, Press-fitting Bushing

WDB 2166	Bucket	80mm Piston Rod diameter
WDB 2167	Boom	85mm Piston Rod diameter
WDB 2170	Arm	100mm Piston Rod diameter
WDB 2168	Bucket	90mm Piston Rod diameter
WDB 2168	Boom	90mm Piston Rod diameter
WDB 2171	Arm	105mm Piston Rod diameter

Jig for Press-fitting Wiper Ring

WDB 2166-1	Bucket	80mm Piston Rod diameter
WDB 2167-1	Boom	85mm Piston Rod diameter
WDB 2170-1	Arm	100mm Piston Rod diameter
WDB 2168-1	Bucket	90mm Piston Rod diameter
WDB 2168-1	Boom	90mm Piston Rod diameter
WDB 2171-1	Arm	105mm Piston Rod diameter

Jig for Inserting Cylinder Head

WDB 2174	Bucket	80mm Piston Rod inner diameter
WDB 2175	Boom	85mm Piston Rod inner diameter
WDB 2178	Arm	100mm Piston Rod inner diameter
WDB 2176	Bucket	90mm Piston Rod inner diameter
WDB 2176	Boom	90mm Piston Rod inner diameter
WDB 2179	Arm	105mm Piston Rod inner diameter

Seal Ring and Connector Jig

WDB 2052	Seal Ring insert and connection jig set
Note: *The above Part no. is applicable to a tube diameter of 120mm*	

Table 2. Explanation of the engine identification number

Digit	Explanation
1-2	Engine type. SH = 4.4L electronic common rail fuel injection tier 4i. SD = 4.4L mechanical fuel injection tier 3. SE = 4.4L electronic common rail fuel injection tier 3. DE = 4.8L electronic common rail fuel injection tier 2
3-10	Engine part number
11	Country of manufacture. U = United Kingdom
12-16	Engine serial number
17-18	Year of manufacture

The country of manufacturer, engine serial number and year of manufacture of the engine are also stamped on the cylinder block. Refer to Figure 6.

Operator Protective Structure

Warning! *Machines with a ROPS, FOPS or TOPS are equipped with a seat belt. The ROPS, FOPS or TOPS is designed to give you protection in an accident. If you do not wear the seat belt you could be thrown off the machine and crushed. You must wear a seat belt when using the machine. Fasten the seat belt before starting the engine.*

FOPS Data Plate

⚠ **Warning!** Do not use the machine if the falling objects protection level provided by the structure is not sufficient for the application. Falling objects can cause serious injury.

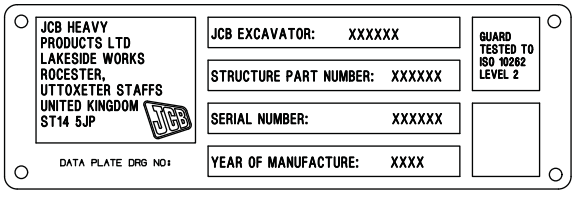
If the machine is used in any application where there is a risk of falling objects then a FOPS (Falling-Object Protective Structure) must be installed. For further information, contact your JCB dealer.

The FOPS has a data plate attached. The data plate indicates what level of protection the structure provides.

There are two levels of FOPS:

- Level I Impact Protection - impact strength for protection from small falling objects (e.g. bricks, small concrete blocks, hand tools) encountered in operations such as highway maintenance, landscaping and other construction site services.
- Level II Impact Protection - impact strength for protection from heavy falling objects (e.g. trees, rocks) for machines involved in site clearing, overhead demolition or forestry.

Figure 7.



The cab mounted FOPS available for the JS excavator range are tested to ISO 10262 level 2 and comply with EN 13627:2000.

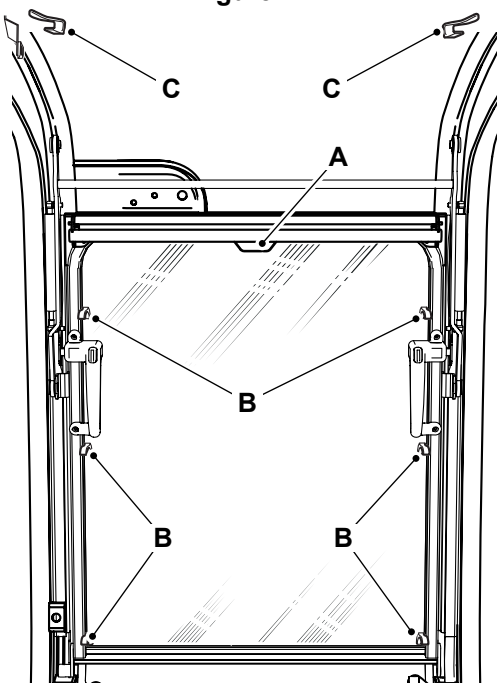
The frame mounted FOPS available for the JS excavator range are tested to ISO 3449 level 2 and comply with EN 13627:2000.

ROPS Data Plate

⚠ **Warning!** Your machine may be fitted with a Roll-Over Protective Structure (ROPS) indicating that the purchaser specified the machine for use in applications where there is risk of roll-over. ROPS is a device to protect the operator in the event of roll-over. Any damage or modification to the cab structure may invalidate the ROPS certification. If damage has occurred then an authorised JCB dealer should be consulted

3. To release the sunblind, hold the handle, release the bottom edge of the sunblind from the hooks and let the sunblind slowly rewind back into the stowed position.

Figure 22.



A Handle
B Front hooks
C Upper hooks

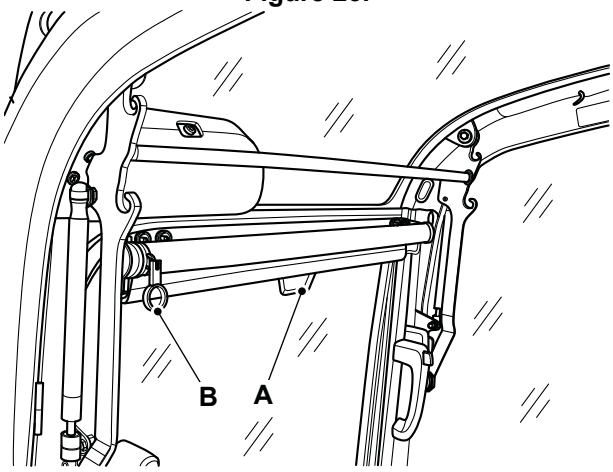
Optional Sunblind - Half Length

The sunblind is installed at the top of the cab front window and can be secured in a position to suit the operator:

1. Use the handle in the centre of the sunblind lower edge to pull the sunblind down to the required position. The sunblind will hold itself in position.

2. To release the sunblind, gently pull the hoop, while holding the handle and let the sunblind slowly rewind back into the stowed position.

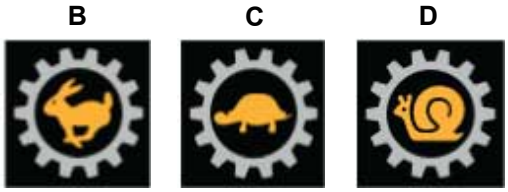
Figure 23.



A Handle
B Hoop

The travel speed selected is shown in the top left corner of the DECU (Display Electronic Control Unit):

Figure 38.



B Fast (hare)
C Slow (tortoise)
D Creep (snail)

Figure 49.

Figure 50.

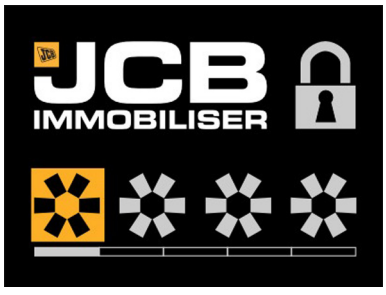
The work lights screen is displayed to warn that the work lights are left on and the ignition is off. The buzzer will sound in this state after 15s.

Figure 51.

Immobilizer Screen

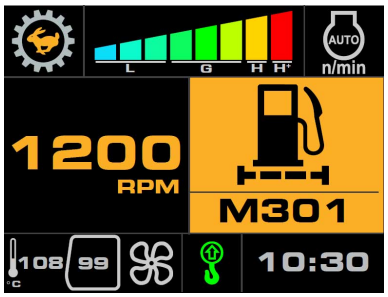
If the JCB immobilizer option is enabled the operator must enter the 4 digit immobilizer code before the engine will start. Refer to: Operation > Starting the Engine > Immobilizer (Page 94).

Figure 52.



a service fault is active. The code will remain until it is acknowledged by pressing the enter button. The fault indicator remains on if the fault is acknowledged with the enter button. If multiple service faults are active, the fault screen (icon and fault code) shall alternate through the active faults.

Figure 91.



When a critical fault is active, the left area of the main screen will show the fault icon and the right area of the main screen will show the 3 or 4 digit fault code. The fault indicator is illuminated red. The buzzer sounds when a critical fault is active. It sounds until the critical fault is no longer active. The active fault screen alternates with the standard main screen but with a colour substitution:

Figure 92.

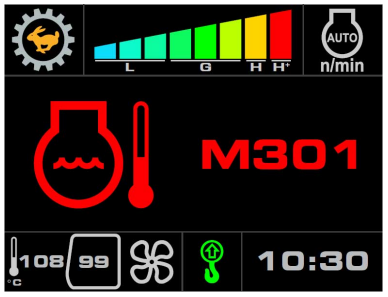
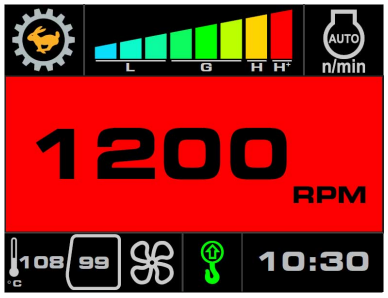


Figure 93.



If multiple critical faults are active, the fault screen (icon and fault code) shall alternate through the active critical faults). Pressing the control wheel will take the operator to the active error log screen. Press enter on this screen to acknowledge all active faults. Critical faults take precedence over service faults. If both service and critical faults are active, only critical faults shall be displayed.

The dipper will move within its limits for as long as you hold the joystick forward or backwards. It will stop automatically when you release the joystick.

To move the dipper outwards, move the joystick forwards (position 2).

To move the dipper inwards, move the joystick backwards (position 1).

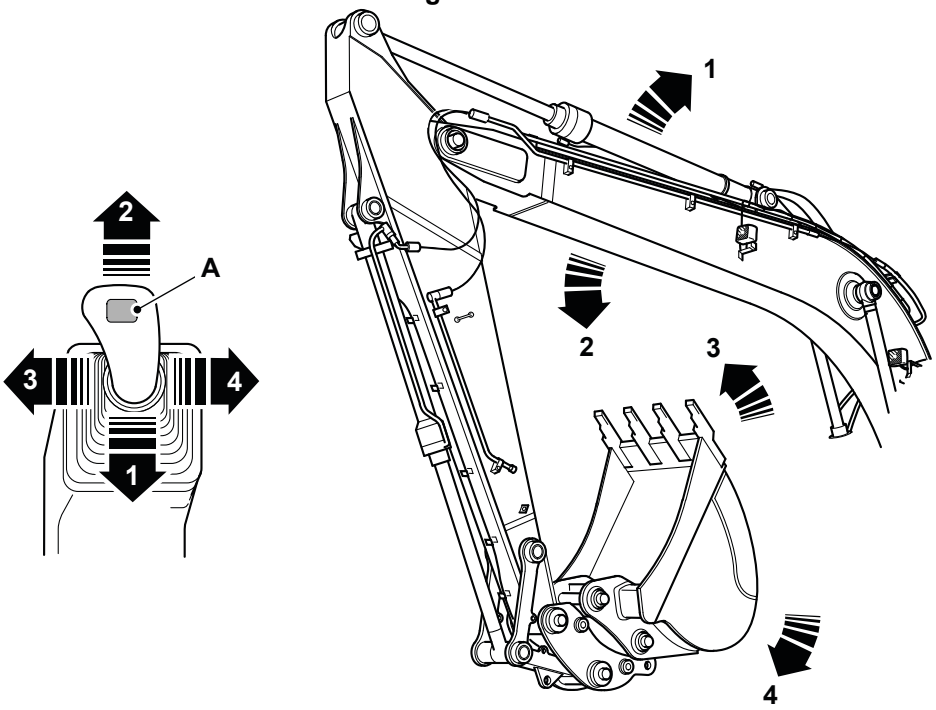
The bucket will move within its limits for as long as you hold the joystick to one side. It will stop automatically when you release the joystick.

To fill the bucket, move the joystick to the left (position 3).

To empty the bucket, move the joystick to the right (position 4).

Press the power switch for power boost.

Figure 99.



1 Backward: Raise the boom
2 Forward: Lower the boom
3 Left: Fill the bucket
4 Right: Empty the bucket
A Power Boost

Left Joystick

The left hand joystick controls the slew of the superstructure and the movements of the boom. When released, the joystick returns to the neutral position.

The superstructure will slew within its limits for as long as you hold the joystick over to one side. It will stop automatically when you release the joystick.

When the joystick is returned to neutral, the machine will still not stop moving immediately because of inertia. Remember this when you do a swing operation. The operation of the bucket attachment is reversed when it is fitted in the reverse position, be careful.

To move the dipper outwards, move the joystick to the left (position 1).

To move the dipper inwards, move the joystick to the right (position 2).

Safe Working Loads

Overloading the machine can damage it and make it unstable. Study the specifications in the Operator's Manual before using the machine.

Worksite Safety

⚠ **Warning!** You or others can be killed or seriously injured if you do unfamiliar operations without first practising them. Practise away from the worksite on a clear area. Keep other people away. Do not perform new operations until you are sure you can do them safely.

Warning! There could be dangerous materials such as asbestos, poisonous chemicals or other harmful substances buried on the site. If you uncover any containers or you see any signs of toxic waste, stop the machine and advise the site manager immediately.

Warning! Before you start using the machine, check with your local gas company if there are any buried gas pipes on the site.

If there are buried gas pipes we recommend that you ask the gas company for any specific advice regarding the way you must work on the site.

Some modern gas pipes cannot be detected by metal detectors, so it is essential that an accurate map of buried gas pipes is obtained before any excavation work commences.

Hand dig trial holes to obtain precise pipe locations. Any cast iron pipes found must be assumed to be gas pipes until contrary evidence is obtained.

Older gas pipes can be damaged by heavy vehicles driving over the ground above them.

Leaking gas is highly explosive.

If a gas leak is suspected, contact the local gas company immediately and warn all personnel on the site. Ban smoking, make sure that all naked lights are extinguished and switch off any engines which may be running.

You are strongly advised to make sure that the safety arrangements on site comply with the local laws and regulations concerning work near buried gas pipes.

Caution! Before you start using the machine, check with your local public water supplier if there are buried pipes and drains on the site. If there are, obtain a map of their locations and follow the advice given by the water supplier.

You are strongly advised to make sure that the safety arrangements on site comply with the local laws and regulations concerning work near buried pipes and drains.

Caution! If you cut through a fibre optic cable, Do not look into the end of it, your eyes could be permanently damaged.

An applicable worksite organisation is required in order to minimise hazards that are caused by restricted visibility. The worksite organisation is a collection of rules and procedures that coordinates the machines and people that work together in the same area. Examples of worksite organisation include:

- Restricted areas
- Controlled patterns of machine movement
- A system of communication.

You and/or your company could be legally liable for any damage you may cause to public utilities. It is your responsibility to make sure that you know the locations of any public utility cables or pipes on the worksite which could be damaged by your machine.

Risk Assessment

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

Immobilizer

Introduction

If your machine has an immobiliser system installed, then your JCB dealer must enable the system as part of the standard machine installation.

Coded Immobiliser System

Introduction

Before you try to disarm the immobiliser, make sure that the machine is ready to start and that you have your four digit security code available.

If you are unsure of the security code, then do not start this procedure. If the security code is incorrectly entered five times the immobiliser will lock. 15min.

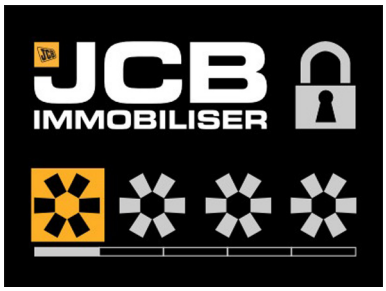
If this occurs, it is recommended that you contact the machine owner for confirmation of the security code.

The security code must be entered every time that the ignition key is in the off position for more than the time specified. 2min.

Disarm the Immobiliser

1. Put the ignition key in the ignition switch.
2. Turn the ignition key to the on position.
3. Push the rotary control.
   Refer to: About the Machine > Instruments > General (Page 41).
4. Turn the rotary control left or right to display the first digit.

Figure 115.



5. Push the rotary control, if the correct code is entered the white bar under the code will disappear
6. Repeat for digits 2 to 4.
7. Push rotary control button to finalize the security code entry.
8. If the correct security code is entered, a grey unlocked padlock is displayed momentarily and the machine can be started.

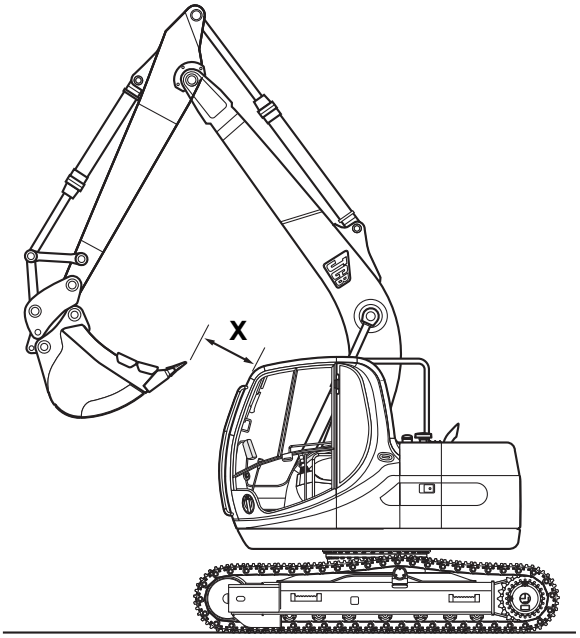
Towing Other Equipment

A light duty tow eye is attached to the undercarriage. The maximum tow capacity of the tow eye is 25% of the machine weight. Do not exceed the maximum tow capacity of the tow eye.

Use the minimum force to move the equipment slowly (not greater than 2km/h (1.2mph)) smoothly and without shocks.

Do not use the tow eye to retrieve the machine, as this will cause damage.

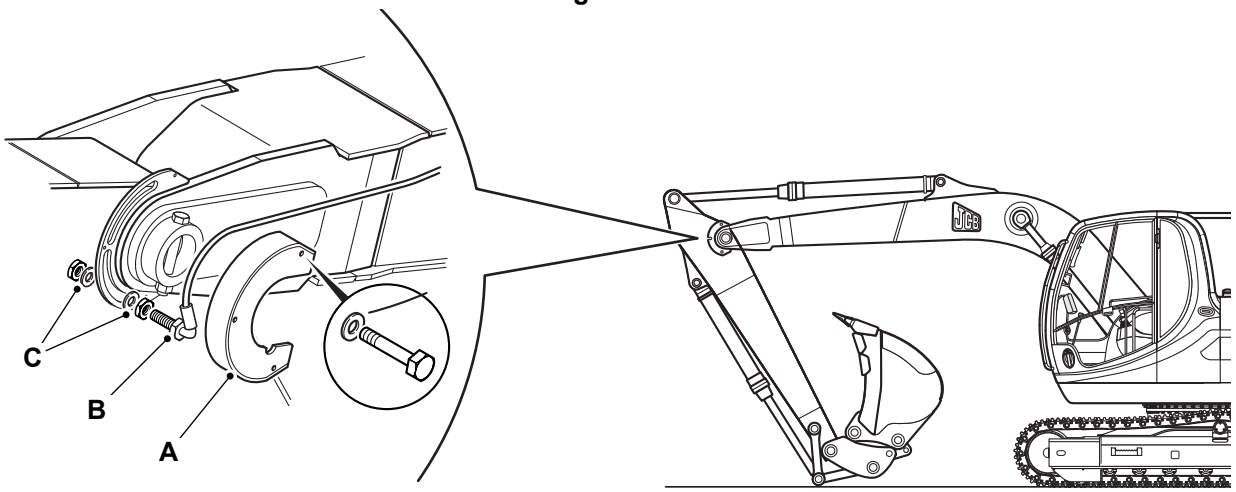
Figure 155.



X Clearance

3. Fully crowd the bucket and lower the boom until the bucket is on the ground. Do not retract or extend the dipper ram.
4. Stop the engine and remove the ignition key.
5. Remove the proximity switch cover, then loosen the proximity switch sensor fixings.

Figure 156.



A Proximity switch cover
B Proximity switch sensor
C Sensor fixings

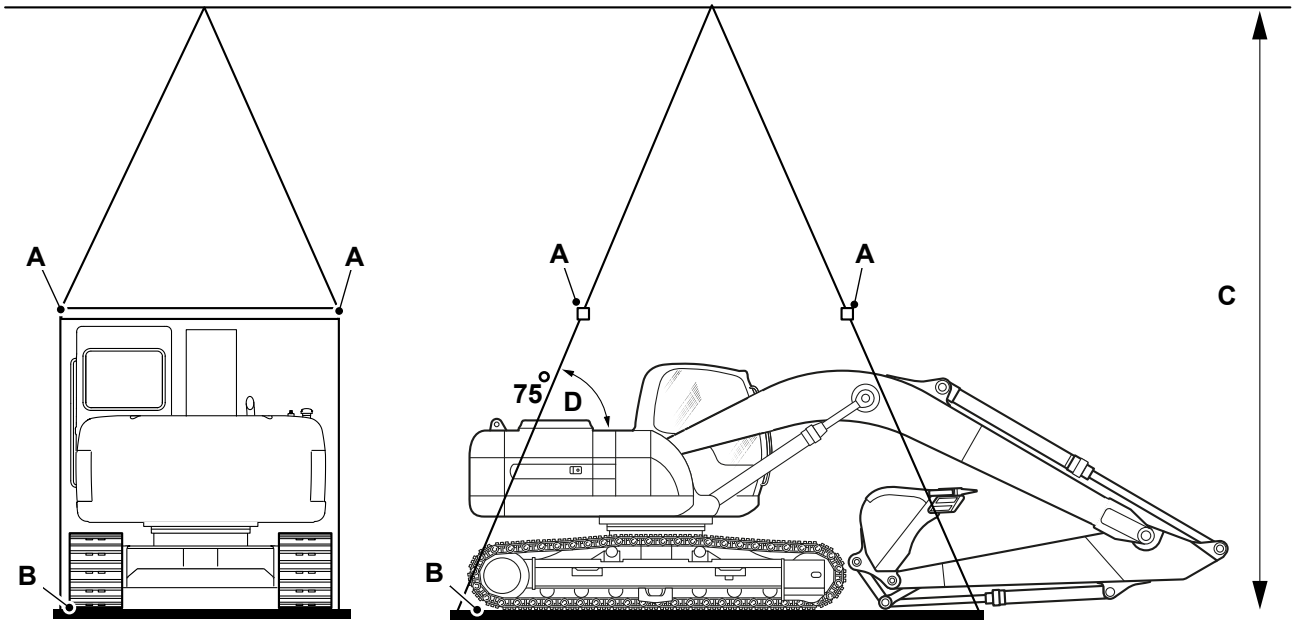
6. Put the proximity switch sensor on the slot, so that it is in line with the pick up block on the dipper.
7. Tighten the proximity switch sensor in position, then check that the distance between the sensor and the pick up block is

   Distance: 4.5 ± 0.5mm
8. Install the proximity switch cover.

Lifting the Machine

General

Figure 171.



A Spacer bars
B Lifting platform
C Lifting-hook height
D Angle = 75°

Danger! *Do not stand underneath the raised load during the lowering procedure. Stand clear and to one side until the load has been safely lowered. Make sure that the area is clear of other people before lowering the load. If you do not follow these precautions you or others could be killed or seriously injured.*

1. Park the machine on a suitable lifting platform with the attachment in the position shown. Refer to Figure 171.

   Refer to: About the Machine > Operating Levers/Pedals > General (Page 67).

2. Stop the engine.
3. Push the controls isolation switch.

   Refer to: Operation > Machine Locks > Control Lock (Page 100).

4. Turn the ignition key to the 'off' position.
5. Make sure there are no loose items in the cab or on the machine.
6. Check the unladen weight and the height of the machine.

   Refer to: Technical Data > Machine Static Dimensions > Dimensions (Page 219).

7. Make sure the lifting equipment complies with all of the local regulations, is suitable and strong enough for the task.
8. Use spacer bars are of sufficient length and strength to prevent the cables from touching the machine and causing damage.
9. Maintain the correct lifting angle between the engine cover and the sling.

   Refer to: Technical Data > Machine Static Dimensions > Dimensions (Page 219).

10. Maintain the correct height to the lifting-hook.

    Refer to: Technical Data > Machine Static Dimensions > Dimensions (Page 219).

Notice: *Some attachments may contact parts of the machine when in the fully folded position. Take extra care to avoid damage to the machine.*

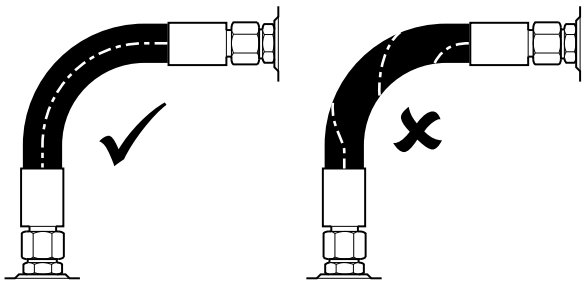
Connecting/Disconnecting Hydraulic Hoses

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

Connecting the Hydraulic Hoses

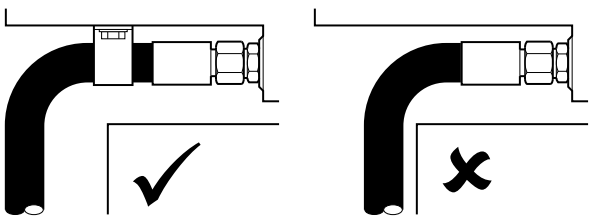
1. Make the machine safe.
   Refer to: Maintenance > Maintenance Positions (Page 174).
2. Vent the hydraulic system.
   Refer to: Maintenance > Hydraulic System > General > Discharge (Page 208).
3. Check the hoses and adaptors for damage.
   Refer to: Maintenance > Hydraulic System > General > Check (Condition) (Page 208).
4. Connect the hoses:
   4.1. Make sure that the hose is not twisted. Pressure applied to a twisted hose can cause the hose to fail or the connections to loosen.

Figure 179.



   4.2. Make sure that the hose does not touch hot parts. High ambient temperatures can cause the hose to fail.
   4.3. Make sure that the hose does not touch parts which can rub or cause abrasion.
   4.4. Use the hose clamps (where possible) to support long hose runs and keep the hoses away from moving parts, etc.

Figure 180.



   4.5. To allow for length changes when the hose is pressurised, do not clamp at the bend. The curve absorbs the change.

Notes:

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. Fire fighters must use self contained breathing apparatus.

First Aid - Electrolyte

Eyes

In the case of eye contact, flush with water for 15min. 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.

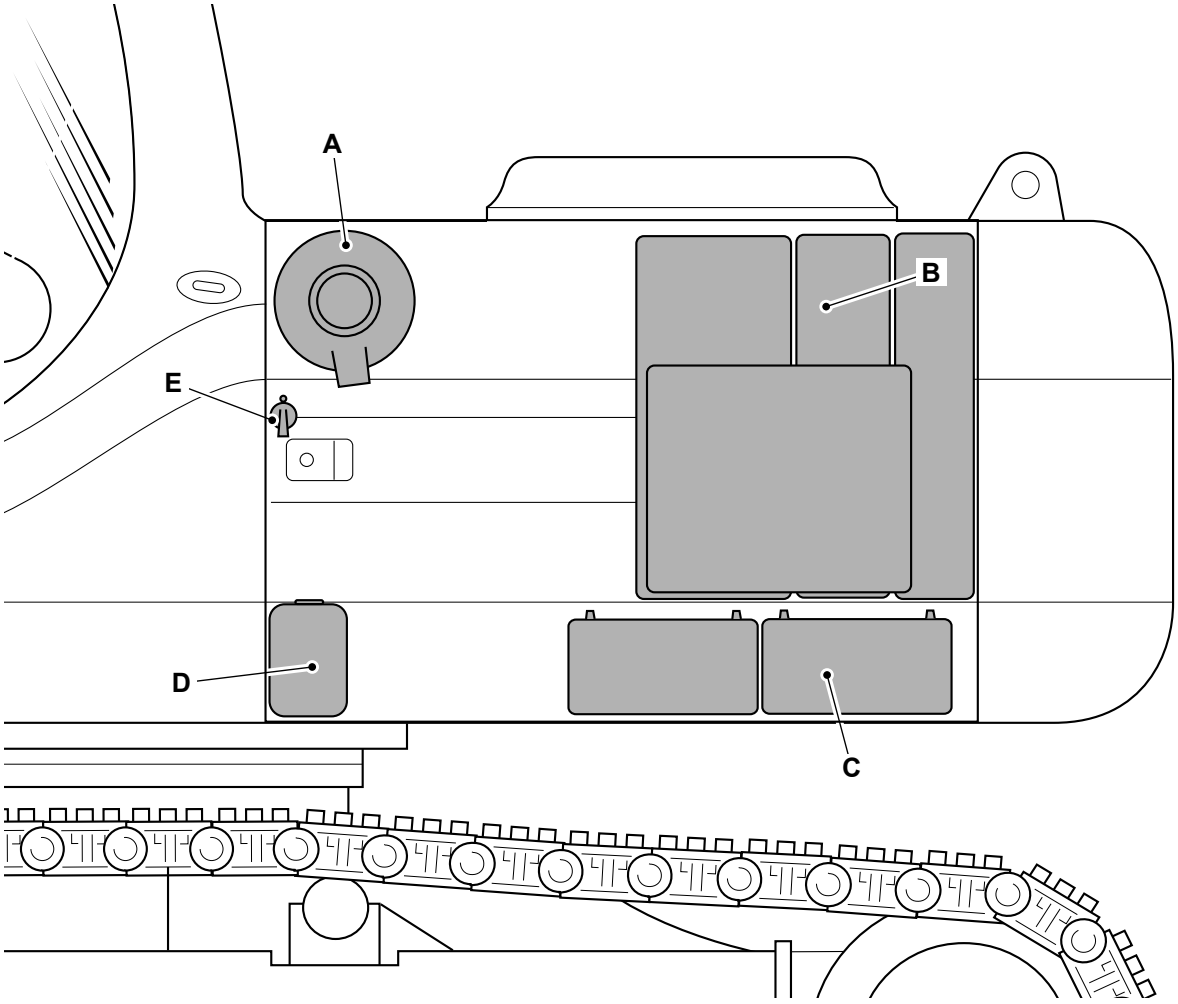
Maintenance

⚠ **Caution!** Using incorrect fluid could damage the system. See Fluids, Capacities and Lubricants for the correct fluid. The fluid can harm your skin. Wear rubber gloves. Cover cuts or grazes.

Caution! The temperature of the hydraulic oil will be high soon after stopping the engine. Wait until it cools before beginning maintenance.

Battery Compartment

Figure 199.



A Air intake
B Radiator(s)
C Batteries
D Window washer fluid bottle
E Battery isolator

Operator Station

General

Clean

⚠ **Notice:** Never use water or steam to clean inside the cab. The use of water or steam could damage the on-board computer and render the machine inoperable. Remove dirt using a brush or damp cloth.

Remove debris and loose articles from inside the cab.

Operator Protective Structure

Check (Condition)

Warning! *You could be killed or seriously injured if you operate a machine with a damaged or missing ROPS/FOPS. If the ROPS/FOPS has been in an accident, do not use the machine until the structure has been renewed. Modifications and repairs that are not approved by the manufacturer may be dangerous and will invalidate the ROPS/FOPS certification.*

All excavators are designed so that an operators protective structure can be installed. In certain applications for example demolition, the machines must have the optional FOPS (Falling-Object Protective Structure) installed. It is the operators responsibility to identify the risk of an application.

A failure to do these precautions can cause death or injury to the operator. For assistance, contact your JCB dealer.

1. Make the machine safe.

   Refer to: Maintenance > Maintenance Positions (Page 174).

2. Check the structure for damage.
3. Make sure that all of the ROPS (Roll-Over Protective Structure)/FOPS mounting bolts are undamaged and in position.
4. Make sure that the ROPS/FOPS mounting bolts are tightened to the correct torque setting.

Cooling System

General

Check (Leaks)

Before you start the machine, inspect the system for leaks:

1. Make the machine safe.
   Refer to: Maintenance > Maintenance Positions (Page 174).
2. Get access to the cooling pack.
   Refer to: Maintenance > Access Apertures (Page 181).
3. Check the cooling system for leaks.
4. If necessary, contact your JCB dealer.

Coolant

Check (Condition)

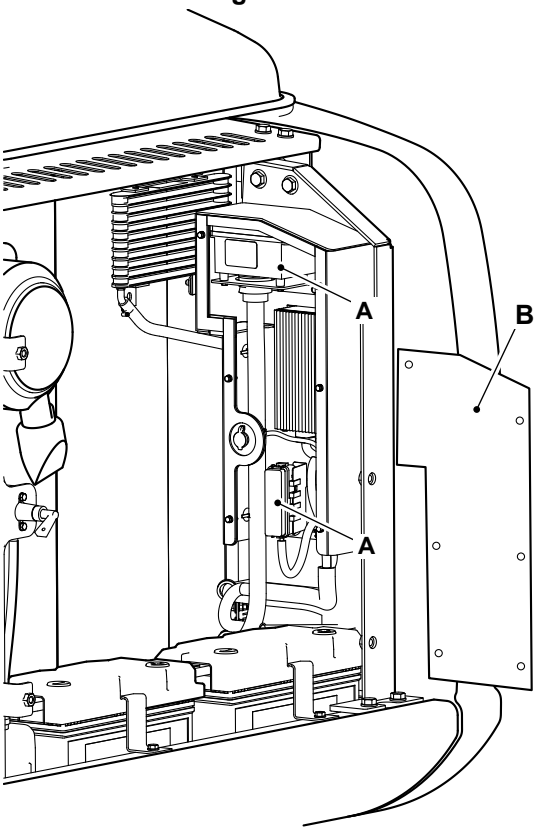
Refer to: Technical Data > Fluids, Lubricants and Capacities > Coolant (Page 230).

Check (Level)

1. Make the machine safe.
   Refer to: Maintenance > Maintenance Positions (Page 174).
2. Let the engine cool.
3. Get access to the coolant expansion bottle.
   Refer to: Maintenance > Access Apertures (Page 181).

   Caution! *The cooling system is pressurised when the coolant is hot. When you remove the cap, hot coolant can spray out and burn you. Make sure that the engine is cool before you work on the cooling system.*
4. Check the fluid level in the expansion bottle, if the fluid level is low:
   4.1. Carefully loosen the cap on the expansion bottle and let the pressure release from the system.
   Refer to: Maintenance > Service Points (Page 175).
   4.2. Remove the cap from the expansion bottle.
   4.3. Add the recommended coolant up to the maximum mark.
   Refer to: Technical Data > Fluids, Lubricants and Capacities (Page 226).
   4.4. Manipulate the top radiator hose to make sure that there are no air locks in the system.
   4.5. Replace the cap.
5. Start the engine.
6. Turn the cab heater to hot and full blower speed.
   Refer to: About the Machine > Heating, Ventilating and Air-Conditioning (HVAC) > Air-Conditioning Controls (Page 64).
7. Turn the slew lock on.
   Refer to: About the Machine > Operating Levers/Pedals (Page 67).
8. Stall the 'dipper in' service until the coolant reaches the specified temperature.
   Temperature: 90°C (193.9°F)

Figure 224.



A Box
B Cover

Relays

Replace

Introduction

For more information on the individual relays: Refer to: Technical Data > Electrical System > Relays (Page 235).

Relays - Cab

The relay are installed in the rear stowage area. Open the cover to get access to the relays.

For relay identification, a label is attached to the rear of cover.

Fluids, Lubricants and Capacities

General

JCB recommend that you use the JCB lubricants shown as they have been verified by JCB for use on JCB machines. However, you could use other lubricants that are equivalent to the JCB standards and quality or offer the same machine component protection.

Table 1. Fluids, Lubricants and Capacities

Item	Capacity	Fluid/Lubricant	JCB Part Number	Container Size [1]
Fuel Tank	253L	Diesel	-	-
Engine (Oil)[2]	20.4L	Above -10°C (14°F): JCB Engine Oil EP 15W/40	4001/1805	20L
		-20°C (-4°F) to 50°C (122°F): JCB Cold Climate Engine Oil EP 5W40	4001/2705	20L
Cooling System	19.7L	JCB Antifreeze HP/Coolant	4006/1120	20L
Track Gearbox (each)	3.5L	JCB HD90 Gear Oil	4001/0305	20L
Slew Gearbox	2.2L	JCB HD90 Gear Oil	4000/0305	20L
Track Rollers and Idler Wheels		JCB HD90 Gear Oil	4000/0305	20L
Recoil Spring Cylinder		JCB Special HP Grease	4003/2017	0.4kg
Hydraulic System	124L	JCB Hydraulic Fluid HP32-20°C (-4°F) to 15°C (59°F)	4002/1024	200L
		JCB Hydraulic Fluid HP46-10°C (14°F) to 30°C (86°F)	4002/0803	200L
		JCB Hydraulic Fluid HP680°C (32°F) to 40°C (104°F)	4002/0701	200L
Slew Ring Bearings	0.06kg	JCB Special HP Grease	4003/2017	0.4kg
Slew Ring Gear Teeth	11kg	JCB Special HP Grease	4003/2006	12.5kg
All Other Grease	As required	JCB Special HP Grease	4003/2017	0.4kg

(1) For information about the different container sizes that are available (and their part numbers), contact your local JCB dealer.
(2) Do not use ordinary engine oil.

Fuel

Acceptable and Unacceptable Fuels

⚠ **Notice:** No warranty liability whatsoever will be accepted for failure of fuel injection equipment where the failure is attributed to the quality and grade of the fuel used.

Warning! Do not use petrol in this machine. Do not mix petrol with the diesel fuel. In storage tanks the petrol will rise to the top and form flammable vapours.

Fuel Groups

The major world fuels standards are divided into four categories. Those that are fully accepted as suitable fuels, those that are acceptable from a "warranty" point of view, but may have undesirable affects on the expected life of the engine performance changes from original specification, those that will lead to reduce the expected life, and lastly those that are viewed as unacceptable for use (fuels shown on the same line as each other are considered equivalents).

The lists below are not exhaustive of all diesel fuel standards encountered in the marketplace. If comment is required on the suitability of fuel standards not on the list, requests with, if possible, specification details

Warranty Information

Machine Service Record Sheet

Table 1.

	Date		Annual Insurance (Yes)
	Hours		Signature and stamp

Figure 239. Installation Checklist

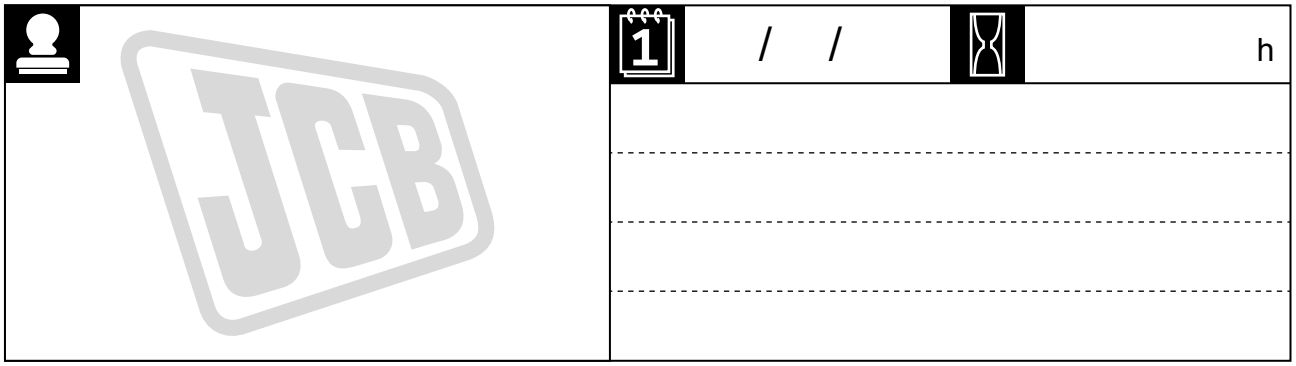


Figure 240. 500h/3 Month

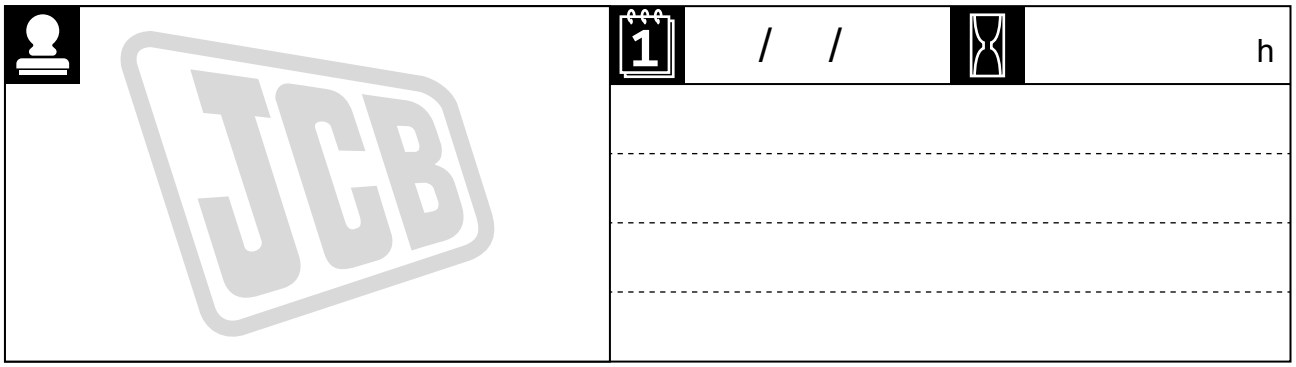
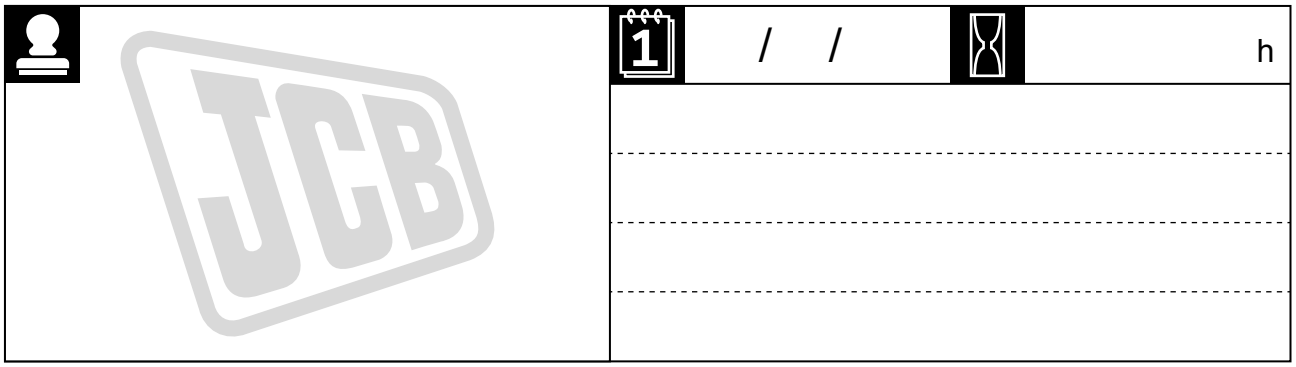


Figure 241. 1000h/6 Month



Error Codes / Error Diagnosis (Automatic Temperature Control (ATC) System)

Table 4. Error Code 1 - High Pressure Lock Out

Effect	Description	Causes	Remedy
The unit cannot cool the cab The compressor disengages.	The high pressure switch operates twice In 1 minute.	The system is overcharged.	Check the continuity of switch (usually open switch).
			Check the gas in system and recharge, refer to table.
		There is no power to the high pressure switch.	Check for 24V at the switch.
			Check the continuity between ATC control module pin 33 and switch.
		There is a bad earth on the high pressure switch.	Check the earth wire between ATC control module pin 34 and switch.
		There is a defective switch.	Replace the switch.

Note: *If, an Error code shows after one minute this can show a system Error.*

Note: *If, an Error code shows instantly this can show a wiring Error.*

Table 5. Error Code 2 - Low Pressure Lock Out

Effect	Description	Causes	Remedy
The unit cannot cool the cab The compressor disengages.	The low pressure switch opens for longer than 1 minute.	The system is undercharged.	Check the continuity of switch (usually closed switch).
			Check the gas in system and recharge, refer to table.
		There is no power to the low pressure switch.	Check for 24V at the switch.
			Check the continuity between ATC control module pin 35 and switch.
		There is a bad earth on the low pressure switch.	Check the earth wire between ATC control module pin 36 and switch.
		There is a defective switch.	Replace the switch.

Note: *If an Error code shows after one minute this can show a system error.*

Note: *If an Error code shows instantly this can show a wiring error.*

Note: *Battery reset may be required to remove the error after repair.*

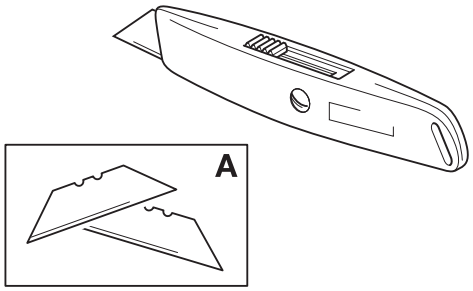


Fig 14. Craft Knife

4 Laminated glass - lift out the broken pane using glass lifters.

Toughened glass - remove the cut off sealant and all remaining particles of shattered glass.

5 If necessary, trim off the remaining old sealant to leave approximately 1 to 2 mm on the upright face of the cab frame aperture. ⇨ *Fig 15. (B-26)*

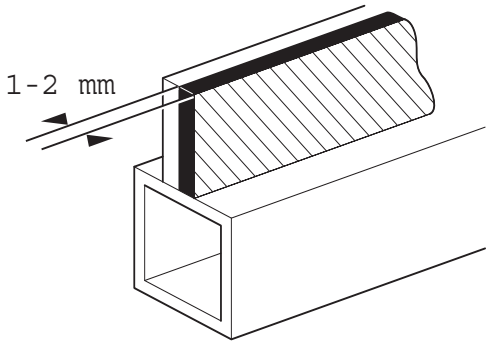


Fig 15.

6 Apply a coat of 'Black Primer 206J' to the paintwork if:

a Paintwork was damaged or scratched during the glass/sealant removal procedures.

b The old sealant was inadvertently cut back to the cab frame during the glass/sealant removal procedures.

Preparing the Cab Frame Aperture

1 If damp or wet, dry the aperture area using a hot air gun (sourced locally).

2 Use 'Active Wipe 205' to thoroughly clean and 'prime' the trimmed sealant. Use a lint free cloth to apply the 'Active Wipe 205', allow 5 minutes flash off (drying) time.

Note: *Do not use any other type of cleaning fluids, otherwise they may be absorbed into the old sealant and ultimately prevent the new glass from bonding.*

Preparing the New Glass

⚠ WARNING

Laminated glass must be handled with extra care to prevent breakage. Wherever possible, store and handle it in a vertical attitude. When placing or lifting the glass in a horizontal attitude it must be supported over its whole area, not just at the edges.

BF-1-8_1

1 Make sure that the new glass correctly fits the frame aperture **16-A**.

a Put two spacer blocks **16-B** onto the bottom part of the frame aperture.

b Install the new glass on the spacer blocks - Always use glass lifters **16-C**. Check that there is an equal sized gap all round the edge of the glass.

Note: *The spacer blocks are rectangular in section to give two common gap widths. If necessary they can be trimmed to a smaller size to give an equal sized gap around the glass.*

Important: *The glass edges must not touch the frame, otherwise movement of the frame will chip and eventually break the newly installed glass.*

Doors and Locks

Check (Condition)

Check the condition of the cab doors and locks as follows:

- Check the operation of the latches and locks. Replace worn or defective components if the latches fail to latch, release, lock or unlock correctly.
- Lubricate the locks and latches with light lubricating oil.
- Check that the machine doors and access covers open and close correctly. Make sure that the hinges and retaining devices operate correctly. replace missing, worn or defective components.
- Lubricate the door and access cover pivots with light lubricating oil.

Contents **Page No.**

Testing a Diode or a Diode Wire

A diode wire is a diode with male connector fitted on one end and a female connector fitted on the other end. The diode is sealed in heatshrink sleeving.

1 To test a Diode or a Diode Wire

a On the FLUKE 85.

i Turn the switch to position **11-D**.

ii Press the **HOLD** button and check that the H sign appears at the top right hand side of the display window.

iii Connect the black probe to the end of the diode with a band or to the male connector of the diode wire. Connect the red probe to the other end of the diode or diode wire. If the beeper does not sound the diode or diode wire is faulty.

iv Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. If the beeper sounds or the meter does not read **O.L.**, the diode or diode wire is faulty.

v Press the HOLD button and check that the **H** sign disappears from the right hand side of the display window.

b On the AV0 2003.

i Move the right hand slider to position **12-A**, and the left hand slider switch to position **12-C**.

ii Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. If the Avometer does not buzz the diode is faulty.

iii Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. If the Avometer does not read "1" the diode is faulty.

c On an analogue meter.

i Select the Ohms 1000s (1k) range.

Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. The meter should read 20-400 kΩ, if it reads more than this the diode is faulty.

ii Select the Ohms 100s range.

Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. The meter should read 300-400Ω, if it reads less than this the diode is faulty.

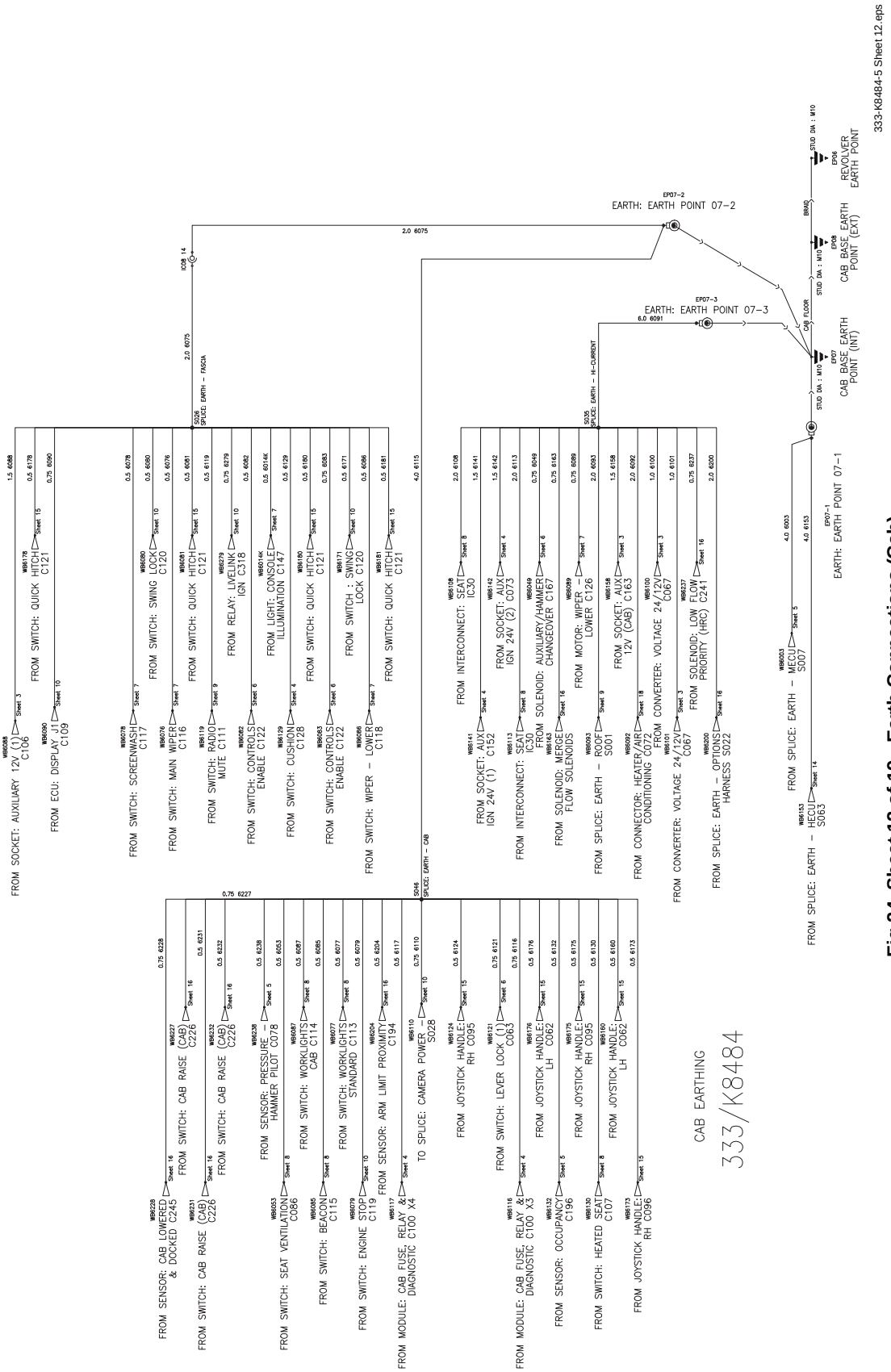


Fig 24. Sheet 12 of 19 - Earth Connections (Cab)

⇒ *Component Keys (C-30)* | ⇒ *Sheets (C-11)*

Splice Code	Function	Main Wire	Harness Location	Sheet
S009	Splice: 0V MECU - Cab	4000	Cab Harness	6
S010	Splice: 5V MECU - Cab	4005	Cab Harness	5
S011	Splice: 24V Ign - Wash/Wipe	8100	Cab Harness	7
S012	Splice: Backlighting - Fascia	1009	Fascia Harness	3
S014	Splice: Screenwash - Pump	8008	Cab Harness	7
S016	Splice: 24V Ign - Revolver	1001	Revolver Harness	3
S017	Splice: Dual Controls	8093	Options Harness	16
S019	Splice: Earth - Revolver 2	6020	Revolver Harness	11
S020	Splice: Earth - Revolver 3	6033	Revolver Harness	11
S021	Splice: Earth - JCB Engine	6054	Revolver Harness	11
S022	Splice: Earth - Options Harness	6200	Options Harness	17
S023	Splice: 12V B+ Fused	3009	Revolver Harness	2
S024	Splice: 12V Ign - Fused	1008	Fascia Harness	3
S025	Splice: 24V Ign - Engine Stop	1012	Cab Harness	10
S026	Splice: Earth - Fascia	6075	Fascia Harness	12
S027	Splice: Camera Power +	1023	Camera Harness	10
S028	Splice: Camera Power -	6110	Camera Harness	10
S029	Splice: Earth - Heater Only	6092	Heater Harness	17
S030	Splice: 24V Ign - Fascia	1006	Fascia Harness	10
S031	Splice: 12V Heater Only	1008	Heater Harness	17

Splice Code	Function	Main Wire	Harness Location	Sheet
S032	Splice: 24V Ign - Cab	1010	Cab Harness	4
S033	Splice: 24V Ign - ECU Wake Up	1006	Cab Harness	3
S034	Splice: Cab Worklights	8004	Roof Harness	9
S035	Splice: Earth - Hi-Current	6091	Cab Harness	12
S039	Splice: Backlighting Cab	1009	Cab Harness	3
S041	Splice: 24V B+ - Re-Fuelling/Ign Switch	3007	Cab Harness	3
S042	Splice: Crank	4023	Cab Harness	3
S053	Splice: Worklights Standard	8002	Fascia Harness	8
S056	Splice: Worklights Standard	8002	Cab Harness	8
S057	Splice: Lightning - Interior	8005	Cab Harness	5
S060	Splice: 24V B+ - HECU	3012	Cab Harness	14
S062	Splice: Worklights - Boom	8002 B	Boom Harness	8
S063	Splice: Earth - MECU	6153	Cab Harness	14
S070	Splice: 0V - HECU Revolver	4110	Aux Hydraulic Harness	16

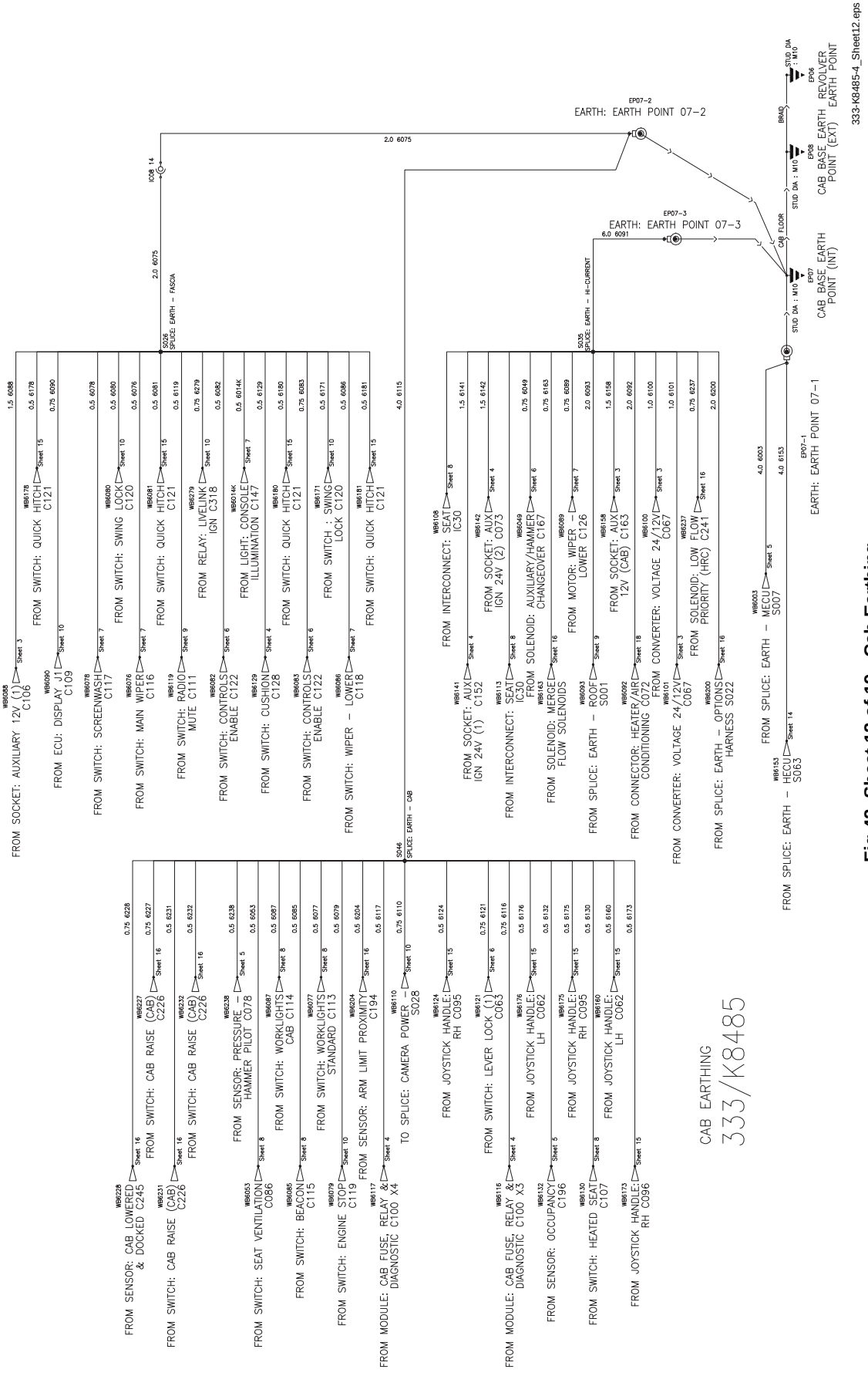


Fig 42. Sheet 12 of 19 - Cab Earthing

⇒ *Component Keys (C-54)* | ⇒ *Sheets (C-35)*

Splice Code	Function	Main Wire	Harness Location	Sheet
S012	Splice: Backlighting - Fascia	1009	Fascia Harness	3
S014	Splice: Screenwash - Pump	8008	Cab Harness	7
S016	Splice: 24V Ign - Revolver	1001	Revolver Harness	3
S017	Splice: Dual Controls	8093	Options Harness	16
S019	Splice: Earth - Revolver 2	6020	Revolver Harness	11
S020	Splice: Earth - Revolver 3	6033	Revolver Harness	11
S021	Splice: Earth - JCB Engine	6054	Revolver Harness	11
S022	Splice: Earth - Options Harness	6200	Options Harness	17
S023	Splice: 12V B+ Fused	3009	Revolver Harness	2
S024	Splice: 12V Ign - Fused	1008	Fascia Harness	3
S025	Splice: 24V Ign - Engine Stop	1012	Cab Harness	10
S026	Splice: Earth - Fascia	6075	Fascia Harness	12
S027	Splice: Camera Power +	1023	Camera Harness	10
S028	Splice: Camera Power -	6110	Camera Harness	10
S029	Splice: Earth - Heater Only	6092	Heater Harness	17
S030	Splice: 24V Ign - Fascia	1006	Fascia Harness	10
S031	Splice: 12V Heater Only	1008	Heater Harness	17
S032	Splice: 24V Ign - Cab	1010	Cab Harness	4
S033	Splice: 24V Ign - ECU Wake Up	1006	Cab Harness	3
S034	Splice: Cab Worklights	8004	Roof Harness	9
S035	Splice: Earth - Hi-Current	6091	Cab Harness	12
S039	Splice: Backlighting Cab	1009	Cab Harness	3
S041	Splice: 24V B+ - Re-Fuelling/Ign Switch	3007	Cab Harness	3
S042	Splice: Crank	4023	Cab Harness	3
S053	Splice: Worklights Standard	8002	Fascia Harness	8
S056	Splice: Worklights Standard	8002	Cab Harness	8
S057	Splice: Lightning - Interior	8005	Cab Harness	5
S060	Splice: 24V B+ - HECU	3012	Cab Harness	14
S062	Splice: Worklights - Boom	8002 B	Boom Harness	8
S063	Splice: Earth - MECU	6153	Cab Harness	14
S070	Splice: 0V - HECU Revolver	4110	Aux Hydraulic Harness	16

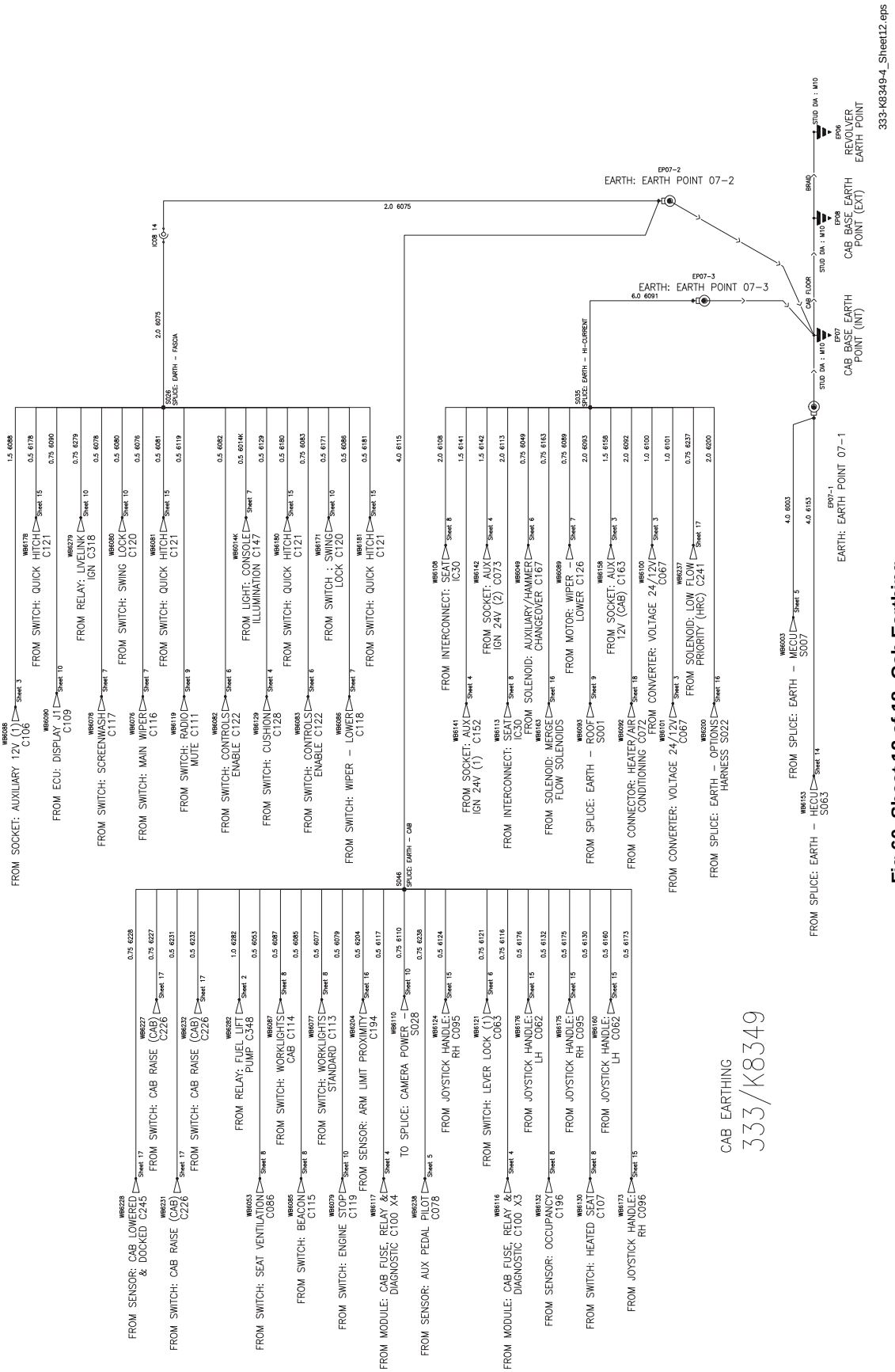


Fig 60. Sheet 12 of 18- Cab Earthing

⇒ *Component Keys (C-77)* | ⇒ *Sheets (C-59)*

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Fig 4. Engine ECU Connector Location - JS160, JS190 Machines with Dieselmax engines

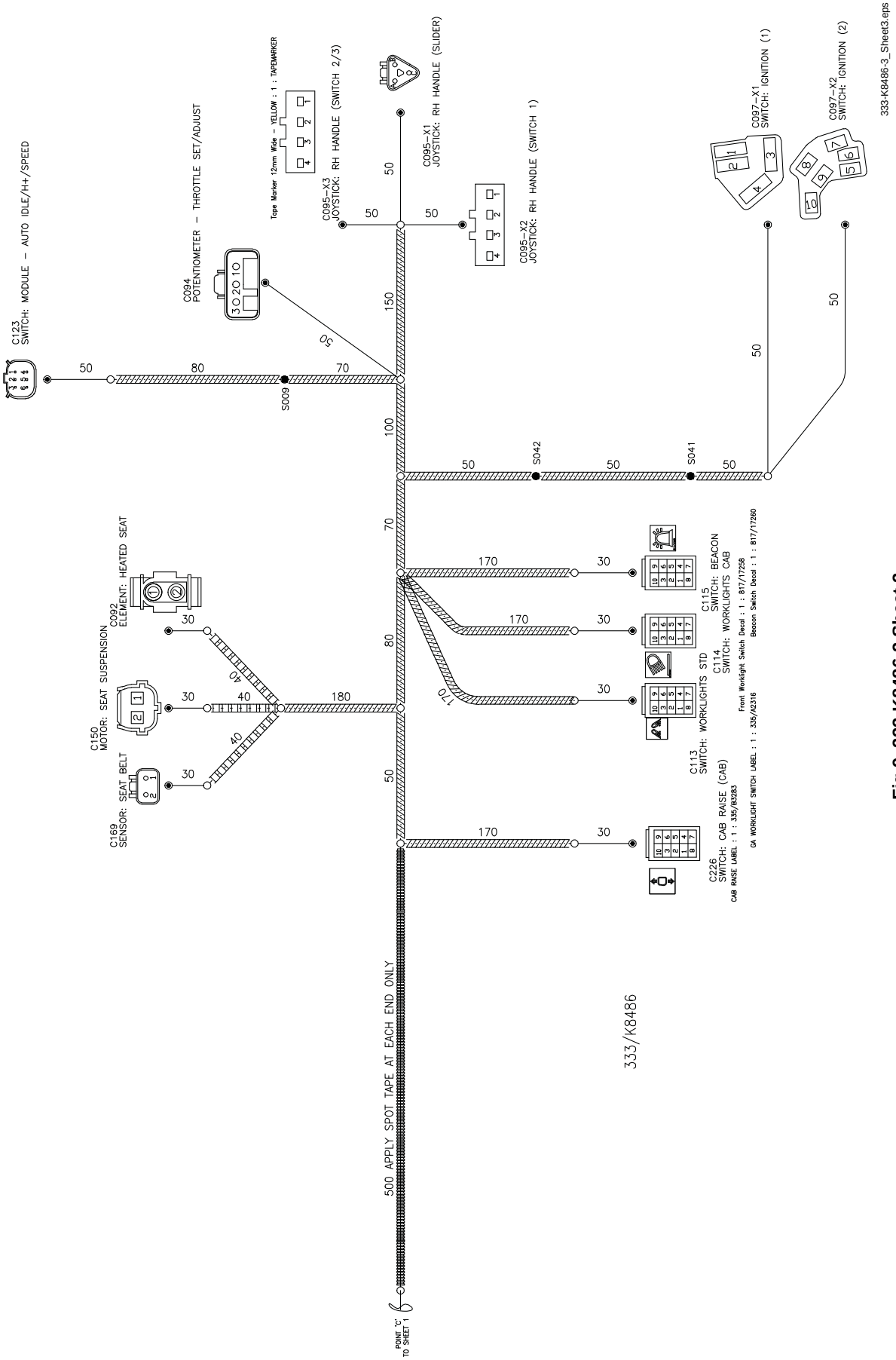


Fig 9. 333-K8486-3 Sheet 3

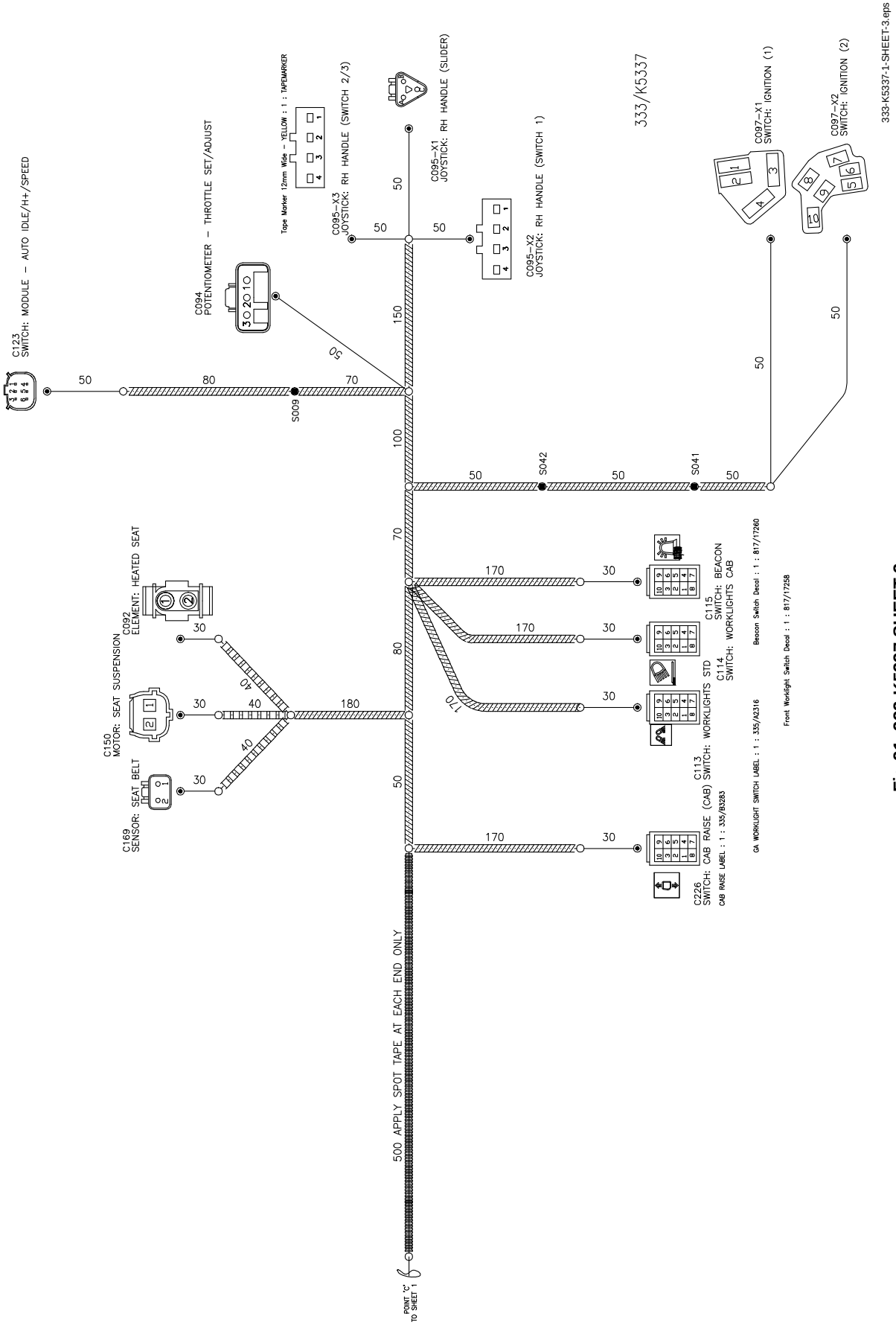


Fig 21. 333-K5337 SHEET-3

S003
MECU 0V SPLICE REVOLVER

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	4000B	0.75	C046−2	4	4000G	1.0	C038−D
2	4000C	0.75	IC01−C4	5	4000J	0.75	IC04−4
3	4000A	0.75	C021−B	6			

S004
FWD WORKLIGHT SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	8002B	1.5	IC04−1	3	8002E	2.0	IC01−F1
2	8002A	0.75	C018−1				

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

S016
FUSED IGNITION SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	1001D	0.75	C023−A	5	1001A	0.75	C024−1
3	1001	1.0	IC01−E1	6	1001L	0.75	IC01−B9
4	1001B	0.5	C033−X1−1				

S018
REVOLVER FRONT EARTH SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	6051	0.75	C049−2	8	6009	1.0	C022−2
2	6012	0.75	C023−B	9	6015	0.75	C018−2
3	6008	4.0	EP03−1−1	10	6139	0.5	C080−2
4	6013	1.0	C019−2	11	6151	0.75	IC26−2
5	6011	1.0	C025−2	12	6152	0.75	IC26−4
6	6018	0.75	C027−2	13	6179	0.5	IC26−6
7	6010	1.0	C026−2				

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

S019
REVOLVER MIDDLE EARTH SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	6020	4.0	EP03−2−1	6	6022	1.0	C125−2
2	6023	0.5	C033−X1−2	7	6028	1.0	C006−2
3	6030	0.75	C036−2	8	6027	0.75	C007−C
4	6025	0.75	C008−2	9	6177	0.75	C028−2
5	6029	0.75	C037−2				

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

S020
REVOLVER REAR EARTH SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	6033	4.0	EP03−3−1	8	6043	1.0	C139−2
2	6038	0.75	C048−2	9	6044	1.0	C138−2
3	6035	0.75	C047−1	10	6045	0.75	C156−2
4	6036	0.75	C050−2	11	6041	1.0	C040−2
5	6034	0.75	C052−2	12	6172	0.75	C041−2
6	6042	0.75	C053−2	13	6040	0.75	C155−2
7	6037	0.75	C054−2	14	6230	0.75	IC01−C8

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

S021
JCB ENGINE ECM EARTH SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	6058	2.0	C001−62	5	6056	2.0	C001−59
2	6057	2.0	C001−61	6	6055	2.0	C001−58
3	6060	1.0	IC23−F	7	6059	0.75	IC23−B
4	6054	4.0	EP04−1−1				

S023
12V FUSED B+ SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	3009−12V	4.0	C003−B	3	3009B−12V	2.0	C004−5
2	3009A−12V	2.0	C004−4				

S036
SPLICE: FUSED B+ REVOLVER

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	3007D	1.0	C020−3	3	3007C	1.0	C021−A
2	3007B	1.0	IC01−E2				

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

S055
REAR BEACON SPLICE

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	8054	1.5	IC01−F3	3	8054A	1.0	C138−1
2	8054B	1.0	C139−1				

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

S058
EARTH SPLICE T4i POD/CONVERTER

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	6067	4.0	C003−G	3	6068	2.0	C004−6
2	6066	4.0	EP04−2−1	4	6069	2.0	C004−3

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

S109
SPLICE: 12V IGN − FUSED

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	1012B−12V	0.75	C268−X1−1	3	1012A−12V	0.75	C007−A
2	1012−12V	0.75	C003−V				

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

CANHS1
CAN HI SPLICE 1

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	4102B	0.75	C002−A	3	4102A	0.75	C001−27
2	4102	0.5	IC03−B				

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

CANLS1
CANLOW SPLICE 1

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	4101B	0.75	C002−B	3	4101A	0.75	C001−23
2	4101	0.5	IC03−A				

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

ECANHS
SPLICE: ENGINE CAN H

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	4202	0.75	IC23−D	3	4202B	0.75	C017−A
2	4202A	0.75	C001−45				

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

ECANLS
SPLICE: ENGINE CAN L

CELL	TAG	CSA	DEST	CELL	TAG	CSA	DEST
1	4201A	0.75	C001−50	3	4201B	0.75	C017−B
2	4201	0.75	IC23−C				

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

EP03−1
EARTH: REVOLVER EARTH POINT 1

CELL	TAG	CSA	DEST
1	6008	4.0	S018−3

Ring Terminal M10 4.0−6.0 : 1 : 7207/1502
Adhesive Lined Heatshrink : 40.0 : 7000/3212

EP03−2
EARTH: REVOLVER EARTH POINT 2

CELL	TAG	CSA	DEST
1	6020	4.0	S019−1

Ring Terminal M10 4.0−6.0 : 1 : 7207/1502
Adhesive Lined Heatshrink : 40.0 : 7000/3212

EP03−3
EARTH: REVOLVER EARTH POINT 3

CELL	TAG	CSA	DEST
1	6033,6148	4.0,2.0	S020−1,IC04−2

Ring Terminal M10 4.0−6.0 : 1 : 7207/1502
Adhesive Lined Heatshrink : 40.0 : 7000/3212

EP04−1
EARTH: JCB ENGINE EARTH POINT 4−1

CELL	TAG	CSA	DEST
1	6054	4.0	S021−4

Ring Terminal M10 4.0−6.0 : 1 : 7207/1502
Adhesive Lined Heatshrink : 40.0 : 7000/3212

EP04−2
EARTH: JCB ENGINE EARTH POINT 4−2

CELL	TAG	CSA	DEST
1	6066	4.0	S058−2

Ring Terminal M10 4.0−6.0 : 1 : 7207/1502
Adhesive Lined Heatshrink : 40.0 : 7000/3212

333/K8488

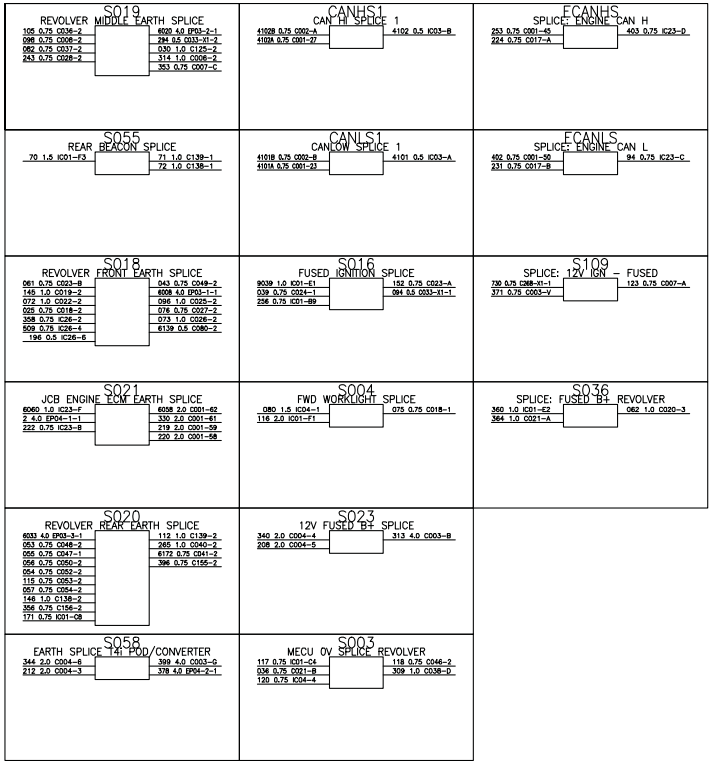


Fig 33. 333-K8488-2 Sheet 5

333-K8488-2_Sheet5.eps

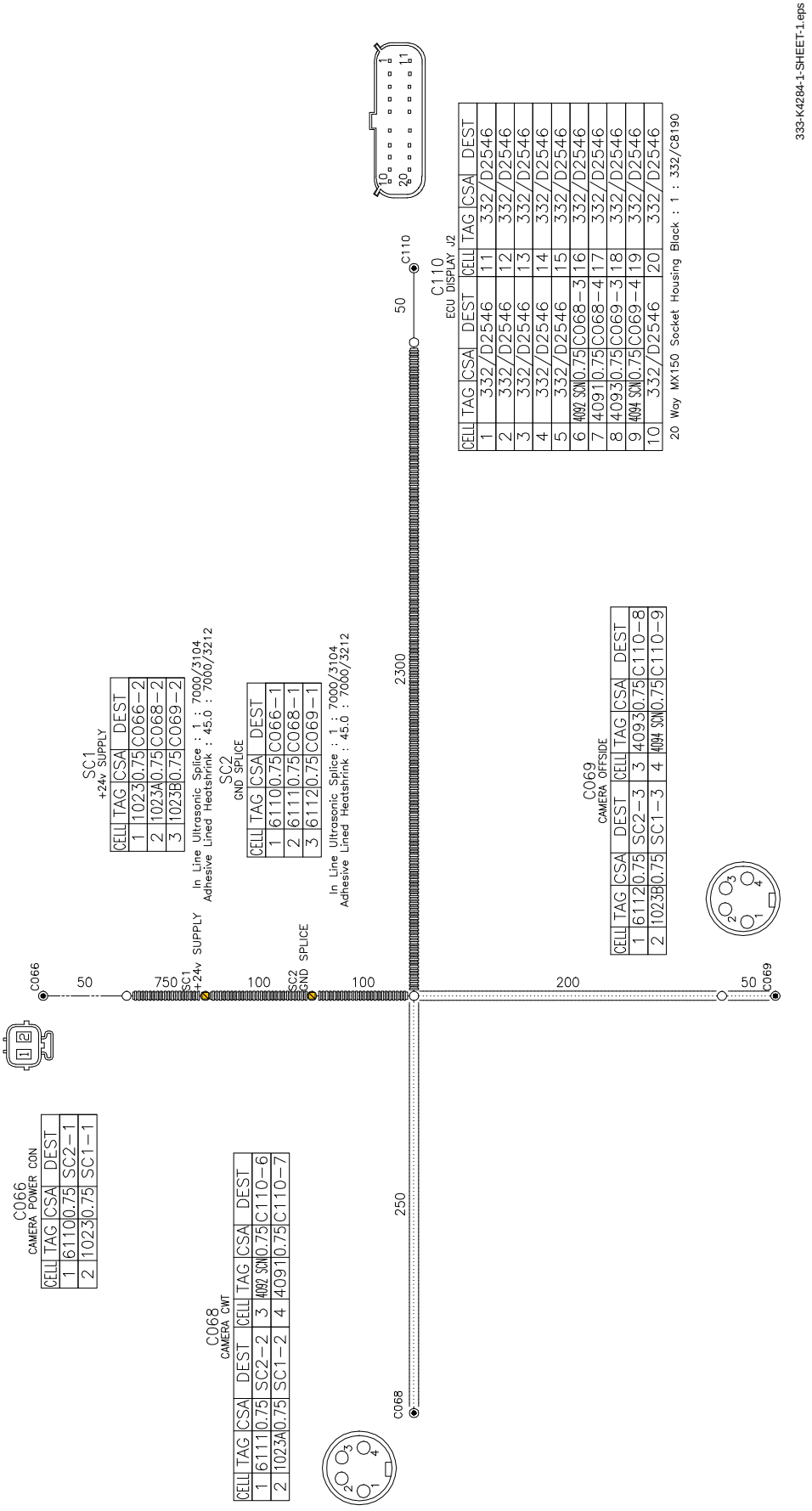


Fig 45. 333-K4284 SHEET-1

333/K4284 Issue 1

Wire Numbers and Functions

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

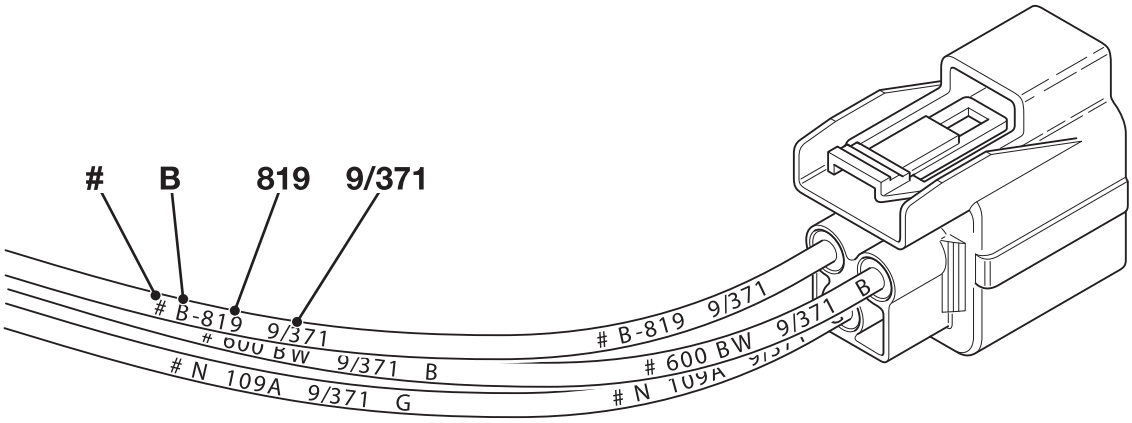


Fig 53. Typical Wire and Harness Number

⇨ *Fig 53. (C-154)*. The illustration shows a typical connector and wires. Each wire has an individual identification number permanently marked on it, at regular intervals along it's length.

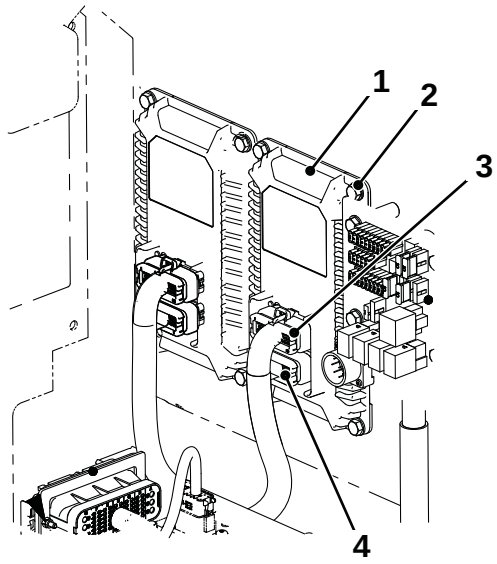
The number stamped on the wire identifies the following:

Table 11. Wire and Harness Number Identification

Ident. No.	Description
#	The # indicates the start of the identification number. It is always printed to the left of the identification number.
B	If applicable - The colour of the flying lead that the harness wire should mate with. For instance, if wire **819** from harness 719/37100 mated with a flying lead coloured black (colour code **B**) then the number printed on the wire would be **B**-819 9/371.
819	The wire's unique identification number. The wire functions and numbers allocated to them are consistent through out the JCB range of products. ⇨ *Wire Numbers and Functions (C-154)*.
9/371	If applicable - The part number of the harness that the wire originates from. If the harness part number is 719/37100, the number printed on the harness wires will be **9/371** (71 and 00 are common numbers and therefore deleted).

Removal and Replacement Guide

The MECU is a reliable and robust component. Before removing and replacing the MECU carry out all the relevant diagnostic and fault finding procedures. Most faults are usually due to damaged wires, connectors or connected devices such as sensors or solenoids.



C128250-C4

Fig 69.

Removal

The MECU is bound on the CANbus system. Do not remove or disconnect the MECU unless you have access to the applicable JCB Servicemaster software tools.

1 Park the machine and make it safe. Obey the care and safety procedures. ***Refer to Section 2, Maintenance.***

2 Use Servicemaster to view the machine Set-up. Record the details from the Set-up screen. Refer to ***Servicemaster SYSTEM***.

3 Carry out the unlock binding procedure. Refer to the ECU Set-up instructions. ⇨ ***ECU Set-up (C-162)***

4 Carry out the correct power down sequence. ⇨ ***ECU Set-up (C-162)***

5 Disconnect the black harness connector **3** (J1) and the grey harness connector **4** (J2) at the MECU. Do not touch the connector pins. Put some tape over the connectors to protect the pins.

6 Remove four screws **2** and their associated washers.

Replacement

Replace the MECU as follows:

1 Connect the harness connectors at the correct sockets on the MECU.

2 Carry out the correct power up procedure. ⇨ ***ECU Set-up (C-162)***

3 Use Servicemaster to install the ECU software. Refer to ***Servicemaster SYSTEM***.

4 Use Servicemaster to enter the applicable machine set-up options. Refer to ***Servicemaster SYSTEM***.

5 Use Servicemaster to bind the machine ECU's. ⇨ ***ECU Set-up (C-162)***

6 Use Servicemaster to update the immobiliser lock and unlock codes. ⇨ ***ECU Set-up (C-162)***

Note: *Do not replace the MECU with a unit from another machine. ECU's may look the same but have different software installations.*

34	Not Used
35	Not Used
36	Not Used
37	Not Used
38	TMAF Sensor earth
39	Engine fuse and relay box - crank request relay
40	Engine fuse and relay box - lift pump relay
41	Not Used
42	Not Used
43	Not Used
44	Engine fuse and relay box - 24V power hold relay
45	Engine CANbus High
46	Not Used
47	Not Used
48	Inlet manifold heater relay
49	Engine fuse and relay box - Fuse F1
50	Engine CANbus Low
51	Not Used
52	TMAF Sensor voltage supply
53	Engine fuse and relay box - Fuse F2
54	Not Used
55	Water in fuel sensor input
56	Not Used
57	Engine fuse and relay box - Fuse F3
58	Earth
59	Earth
60	Engine fuse and relay box - Fuse F4
61	Earth
62	Earth

Removal and Replacement Guide

For removal and replacement procedures refer to the applicable engine documentation.

Test Procedures

1 Use the applicable Servicemaster diagnostics tool to identify faults. Rectify as required.

2 Test the applicable wires and connectors for continuity, shorts to battery and shorts to earth. Rectify as required.

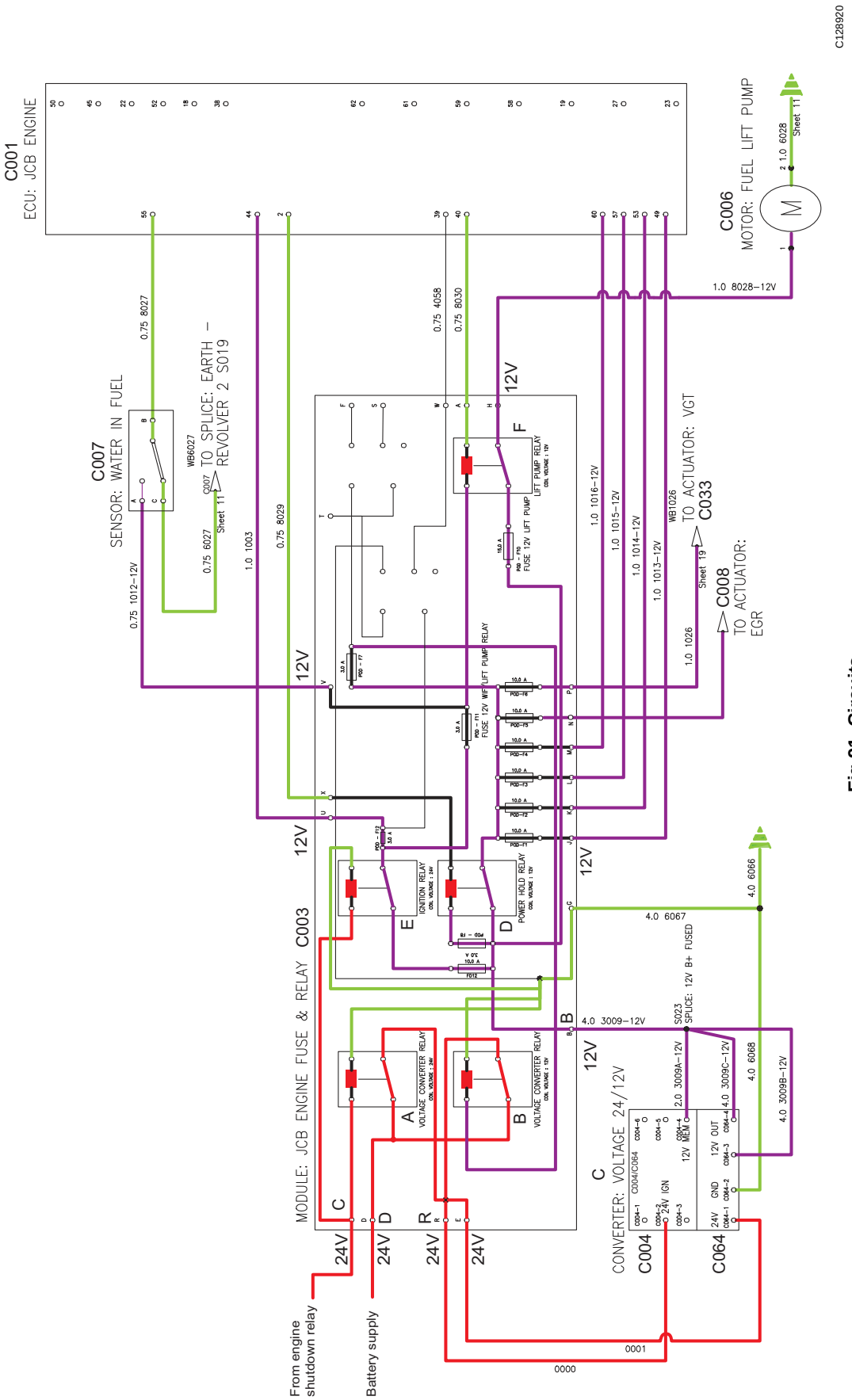


Fig 91. Circuits

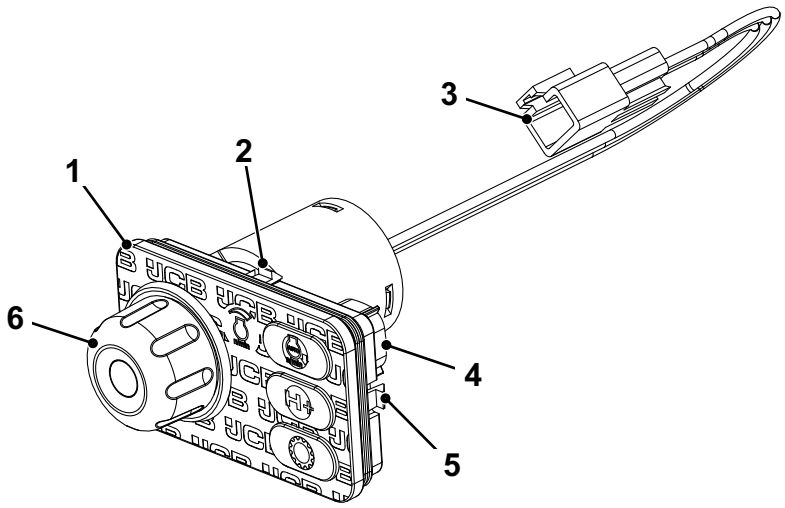
Wires and Connectors

For details of the electrical operation of the relays in the engine fuse/relay box refer to the engine start/stop topic.

⇨ *Engine Start/Stop - Ecomax Engines (C-189)*

Removal and Replacement Guide

If the engine throttle and power mode control unit **1** is faulty it must be replaced.



C128400

Fig 111.

Removal

1 Park the machine and make it safe. Obey the care and safety procedures. ***Refer to Section 2, Maintenance.***

2 Disconnect the battery. ***Refer to Section 2, Maintenance, Electrical System.***

3 Release the clips **2** and **5** from the side console and pull the control unit clear of the console.

4 Disconnect the harness connectors at the connectors **3** and **4**.

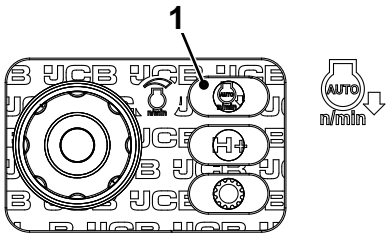
Replacement

Replacement is the opposite of the removal procedure.

Note: *The throttle potentiometer **6** does not require calibration.*

Engine Automatic Idle

The engine automatic idle function is set to ON or OFF by pressing button **1**. For a full description of how the system works refer to the applicable data in this section. ⇨ ***Engine Idle Control (C-210)***



C128380

Fig 124.

Engine Coolant Temperature Switch - Engines with Mechanical F.I.

The coolant temperature switch C134 is connected to the MECU C015 J1. The coolant temperature status is broadcast on the CANbus by the MECU.

For details of the coolant temperature switch refer to the applicable engine documentation.

Wires and Connectors

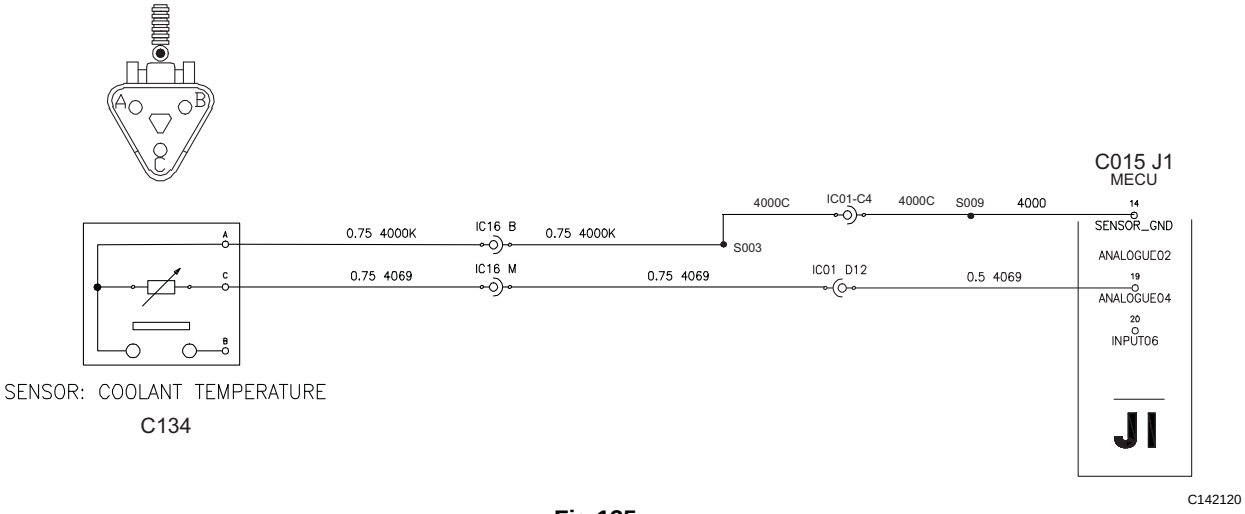
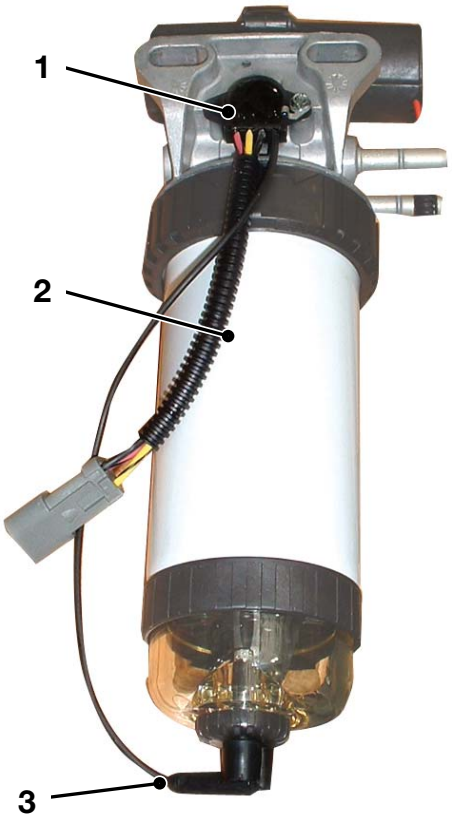


Fig 135.

Water In Fuel (WIF) Sensor - Engines with Electronic F.I.

Location

The WIF sensor is integral with the pre-filter/water separator assembly **2**. The sensor consists of an electronic module **1** mounted to pre-filter/water separator body and probe **3** at the separator bowl.



C124110

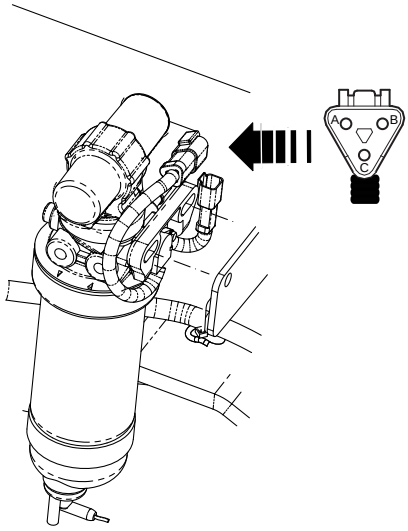
Fig 150.

Overview

The water in fuel sensor **3** detects presence of water above a pre-determined level in the pre-filter/water separator bowl. Its electrical resistance range changes when sensor probe is submerged in water. The signal from the sensor is monitored by the engine ECU. When the signal indicates water is present the engine ECU broadcasts a message on the CANbus.

Wires and Connectors

The WIF sensor power supply (12V) is controlled by the ignition relay. ***⇨ Engine Start/Stop - Ecomax Engines (C-189)***



C124830-C5

Fig 151. WIF harness connector C007

Harness connector C007	
Pins	**Details**
A	Sensor supply (+ 12V)
B	Switch signal
C	Earth

When the system pressure in the travel motor falls below 259 bar the swash plate returns to its minimum angle and the motor changes to the fast travel mode.

Wires and Connectors

⇨ *Fig 166. Circuit (C-263)*

⇨ *8 Station Solenoid Valve (C-258)*

– Boost solenoid (C052), Maximum flow solenoid (C047), Travel speed solenoid (C048).

⇨ *Pressure Switches (C-259)*

– Travel pressure switch (C037).

When the travel button **A** is pressed the signal at the MECU connector J1 pin 14 connects to earth. The MECU responds by sending a CAN message to the DECU which displays the applicable travel mode symbol.

When the operator uses the controls to select travel the travel pressure switch closes. The signal at the MECU connector J2 pin 26 connects to earth. The MECU responds by energising or de-energising the travel speed solenoid, and maximum flow solenoid to select the applicable travel mode.

The MECU also energises the boost solenoid in all travel modes. This ensures maximum hydraulic pressure is available.

The solenoid and switch states for each travel mode are given in the table.

Table 16.

Travel Mode	**Travel pressure switch** (C037)	**Travel speed solenoid** (C048)	MECU output	**Maximum flow solenoid** (C047)	MECU output	**Boost Solenoid** (C052)	MECU output
Slow	Closed	De-energised(1)	-	De-energised(2)	-	Energised	J2 pin 5
Fast	Closed	Energised(3)	J1 pin 24	De-energised(2)	-	Energised	J2 pin 5
Creep	Closed	De-energised(1)	-	Energised(4)	J2 pin 23	Energised	J2 pin 5

(1) The travel motor swash plate moves to its maximum angle (low speed high torque).
(2) Pump delivers maximum flow.
(3) The travel motor swash plate moves to its minimum angle (high speed low torque).
(4) Limits pump to 60% of its maximum flow for creep speed travel.

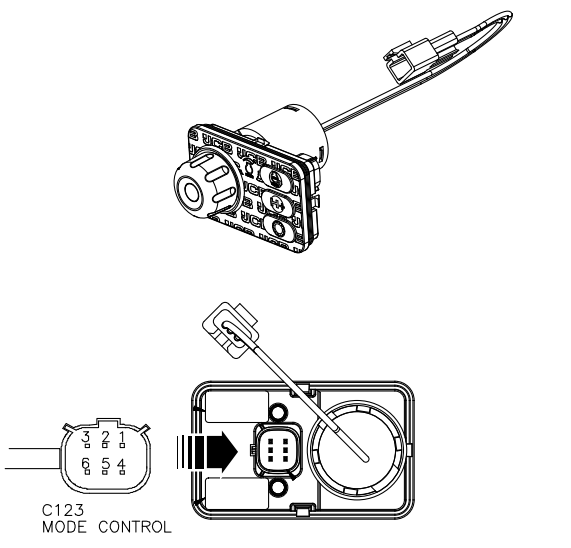


Fig 165. Harness connector C123

Table 17.

Harness Connector C123 - Mode switches	
Pins	**Details**
1	Not used
2	Switch illumination power
3	H+ power mode switch (low side output). Refer to ***Engine and Power Distribution*** in this section
4	Travel speed mode select switch (low side output)
5	Common earth (0V)
6	Auto idle switch (low side output). Refer to ***Engine and Power Distribution*** in this section

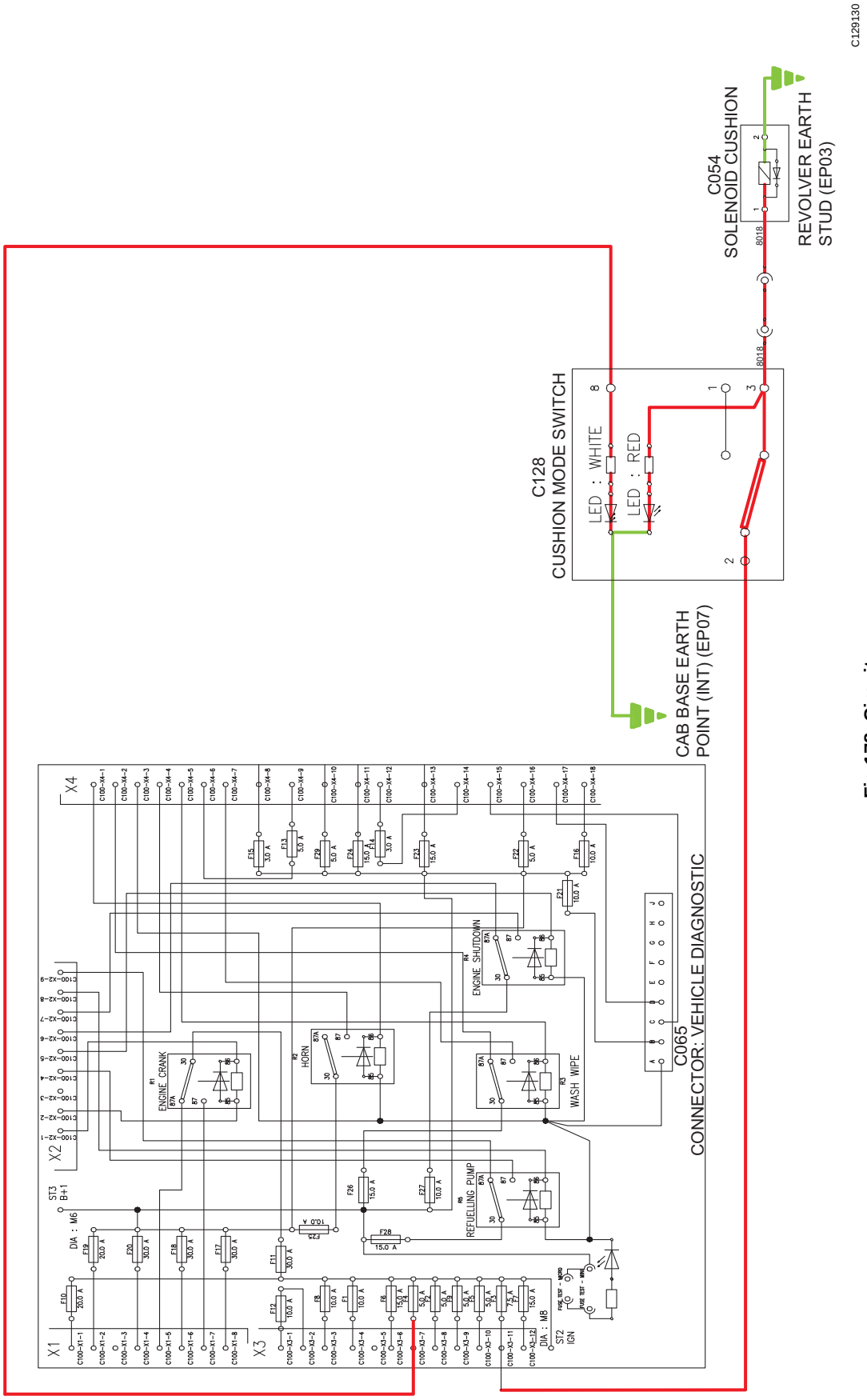


Fig 178. Circuit

Standard Work Lights

Component Location

Work lights are mounted on the boom, toolbox and counterweight to provide additional light when required.

Overview

The work lights are operated from a three position rocker switch in the right hand console.

Wires and Connectors

⇒ *Fig 197. Circuits (C-287)*

When the switch (C113) is in position 1 power supply to the work lights is isolated (work lights OFF).

24V is supplied by Fuse 24 on the main fuse module (C100 X4) to pin 2 of the switch (C113).

When the switch is in position 2 - a 24V supply exits via pin 3 where is it is distributed to the boom working lights (C124, C162), the toolbox light (C018) and the DECU (C109 J1, pin 1) The DECU activates warnings if the work lights are ON after 15 seconds if the engine is not running. Power is also connected (via splice S039) to the LED (C147) to allow back lighting and illumination of the console.

Position 3 of the switch provides power to the same circuits as position 2 plus supplies 24V to pin 5. Pin 5 is the supply to the counterweight light (C125).

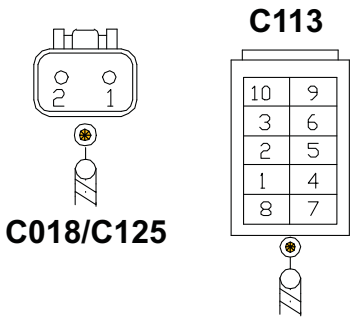


Fig 196. Harness connectors C018,C125 and C113

Cab Interior Lamp

Overview

The interior light can be operated manually or automatically to illuminate the cab.

There are three settings for the interior light:

- Off
- Automatic - light illuminates when the cab door is opened
- Manual - light is switched on manually.

Wires and Connectors

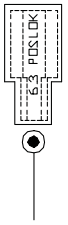
⇨ *Fig 210. (C-299)*

Automatic operation - With the ignition off, the automatic mode will operate when the cab door is opened. The door sensor (C148) detects the door movement and initiates the auto mode. 24V connects via fuse 22 on the main fuse board (C100 X4) to the light (C059) and the door sensor (C148).

When the door sensor closes 24V connects to the wake up diode (C127). 24V connects via the wake up diode to the MECU J1 (C015) pin 22 to wake up the system. 24V connects to the MECU J2 (C016) at pin 30 to signal the door has been opened. The MECU J1 pin 26 will now energise the interior light (C059) and the console illumination (C147). Once the ignition is turned on the wake up function will turn off along with the interior light.

Manual mode - With the ignition on the interior light (C059) can pressed in either direction to turn the light on via its internal switch.

C059-1, C059-2, C059-3, C148-1, C148-2



C129480-C12.eps

Fig 209. Harness connectors C059-1, C059-2, C059-3, C148-1 and C148-2

Test Run Mode

To use the test run mode, proceed as follows:

1 Start the engine and enable the hydraulic controls. If necessary operate the machine until the hydraulic oil temperature is between 50 ºC and 85 ºC.

The test run mode will not enable unless the hydraulic oil temperature is within the correct range, and the hydraulic controls are enabled.

2 Select the diagnostic mode screen and turn the select rotary control to highlight the test run mode symbol. ⇒ ***Selecting the Diagnostic Mode Screen (1-309)***

3 Press the select rotary control to start the test run mode. The engine automatically goes to the H power band.

C130400

Fig 5. Test run status screen

1 Engine rpm (actual)
2 Pump solenoid current (actual)
3 Hydraulic oil temperature (actual)(1)

(1) If the symbol is grey, the oil temperature is out of range. The test run mode is not enabled.

For information about carring out machine cycle time test procedures, refer to ***Secion E***, ***Fault Finding, Fault Finding Tests***.

To exit the test run mode press the back button or home button. Disabling the hydraulic controls or switching off the engine will also exit the test run mode.

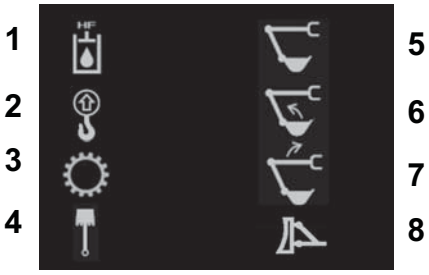
Pressure Switch Status Mode

To select the pressure switch status mode, proceed as follows:

1 Start the engine and enable the hydraulic controls.

2 Select the diagnostic mode screen and turn the select rotary control to highlight the pressure switch status mode symbol. ⇒ ***Selecting the Diagnostic Mode Screen (1-309)***

3 Press the select rotary control.



C130390

Fig 6. Pressure switch status screen

1 High flow auxiliary pressure switch(1)
2 Overload caution pressure switch(1)
3 Travel pressure switch
4 Slew pressure switch
5 Excavator pressure switch
6 Crowd pressure switch (quickhitch)(1)
7 Boom up pressure switch(1)
8 Dozer / stabiliser pressure switch(1)

(1) The symbol is only shown if the applicable option is fitted.

When a symbol on the status screen is grey, the applicable pressure switch is not active.

When a symbol on the status screen is green, the applicable pressure switch is active.

To exit the pressure switch status mode press the back button or home button. Disabling the hydraulic controls or switching off the engine will also exit the pressure switch status mode.

Fault Code	Description	Symptom
C1353	Travel Speed Disabled Due To Transmission Output Fault	Travel speed disabled
C1354	Brake Accumulator Pressure Low At Key On	Brake system charging before drive
C1355	Door Open While Cab Raised	-

Starter Motor

Check (Condition)

Inspect the starter motor installation as follows:

- Check the security of the starter motor to engine fixing bolts. Make sure that they are tightened to the correct torque.
- Check that the electrical connections at the starter motor are clean and secure.
- Repair or replace related electrical cables, wiring and connectors if they are defective.
- Check the operation of the starter motor. If it fails to operate normally or makes excessive noise repair or replace as necessary.

Proportional Pressure Reducing Valve

Table 3.

	JS115-JS190
Maximum primary pressure	39 bar (529 lb/in^2)
Maximum back pressure (allowable pressure)	10 bar (145 lb/in^2)
Secondary pressure setting range	0 - 40 bar (0 - 580 lb/in^2)
Maximum flow rate	10 l/min (2.2 UK gal/min)
Electrical specifications	
1. Rated current	700 mA
2. Coil resistance (at 20 °C)	17.5 +/-0.7 W
3. Recommended fluctuation of proportional solenoid current	80 Hz, 22 mA

Slew Motor/Gearbox

Table 4.

	JS115-JS145	JS160-190
Type	Fixed displacement piston motor	Fixed displacement piston motor
Suction capacity	87.3 cm^3/rev (5.33 in^3/rev)	87.3 cm^3/rev (5.33 in^3/rev)
Working pressure maximum	279 bar (4052 lbf/in^2)	279 bar (4052 lbf/in^2)
Work flow	137 l/min (30.13 gal/min)	137 l/min (30.13 gal/min)
Set pressure relief	279 bar (4046 lb in^2)	289 bar (4191 lb in^2)
Reduction gears	Planetary gears with 2 gear reduction	Planetary gears with 2 gear reduction
Reduction gear ratio	17.03: 1	24.73: 1
Motor max. speed	-	-
Brake torque	294 Nm	490 Nm
Brake pressure release		
Min.	30 kgf/cm^2 (426 lbf/in^2)	20 bar(290 lbf/in^2)
Max.	50 bar (725 lb/in^2)	40 bar (580 lb/in^2)
Gearbox max. output torque	4160Nm	8560Nm
Gearbox max. output speed	-	-
Dry weight	99 kg (218 lb)	220 kg (485 lb)

Item	Description	Grid Reference
20	QRC Female 1”	4F
21	QRC Female 3/4”	4F
22	Hammer Aux Valve	3F
23	Return Line Filter	2E
24	Tap	2D, 2E
25	Oil Cooler	2E
26	Filter Drain	1E
27	Breather	1E
28	Filter Plexus	2E
29	Tank Hydraulic	1D
30	Filter In Line	2E
31	Filter Strainer	1D
32	Valve - Relief	1D
33	Filter Main Return	2D
34	Manifold Tank Return	1E
36	Valve - Dual Control	2D
37	Pressure Switch	1C, 5B
38	Valve - Shuttle	1C
39	Valve - RH Joystick	3B
40	Valve - Cushion	2B
41	Valve - LH Joystick	1B
42	Pressure Switch	4C
43	Pressure Switch	4C
44	Valve - Ham/Aux and Tab Option	4C, 6C
45	Valve - Solenoid	4B
46	Valve - Remote Control	5C
47	Cab Pilot Manifold	5B
49	Valve - 8 Station	6E
50	Pilot Return Filter	7C
51	Main Pump	8C
52	Test Point	8C, 9C
53	Valve - Pilot Control	6B
54	Return Manifold	2F
55	Manifold Block	2-G2
56	Valve - Hammer Aux - Prop Q and P	2-B2
57	Pressure Sensor	2-B3, 2-D8
59	Valve - Low Flow - Prop Q and P	2-D9
60	Valve - Low Flow - Open Centre	2-G6

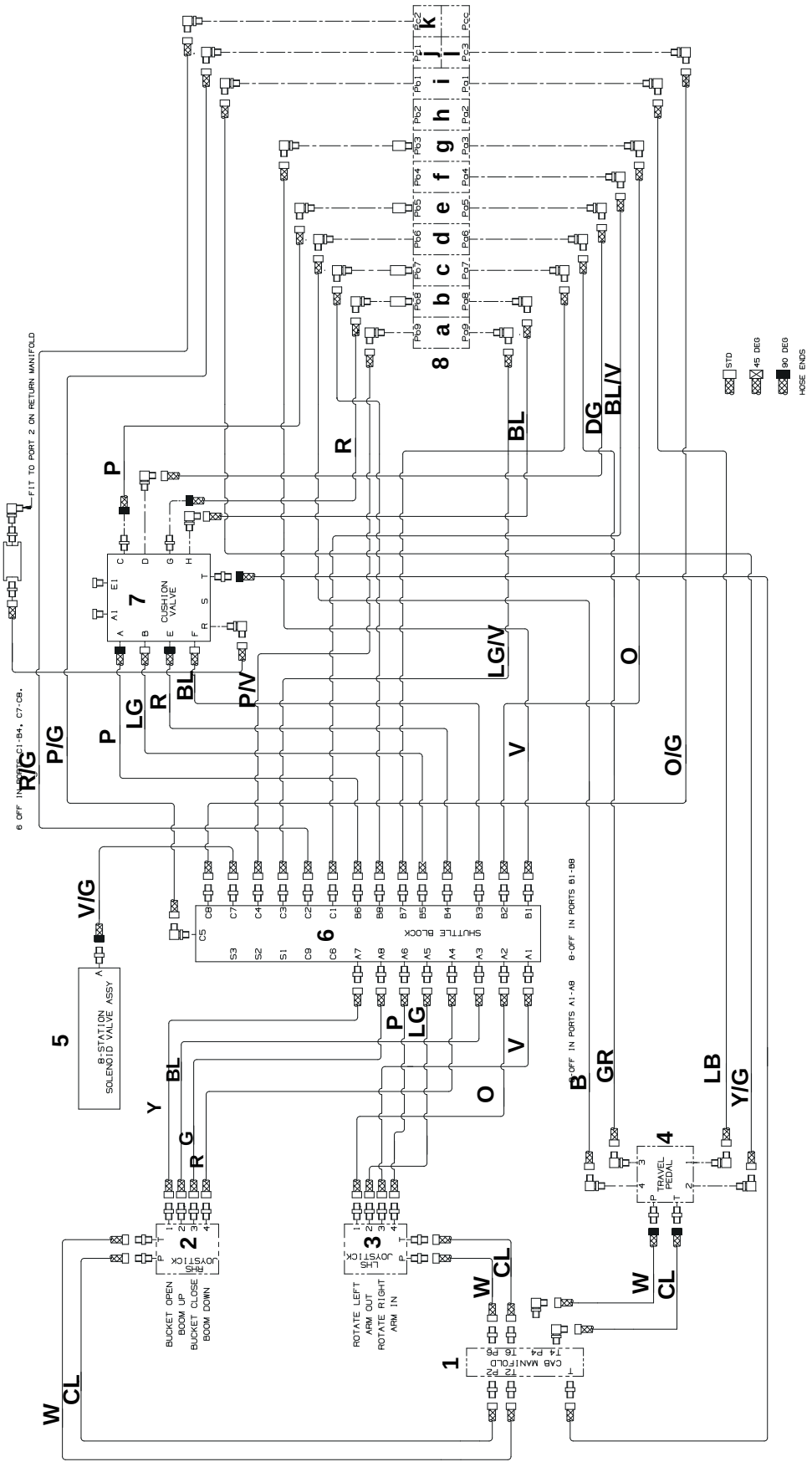


Fig 7. 333/J6103 - Issue 1

715720-C3

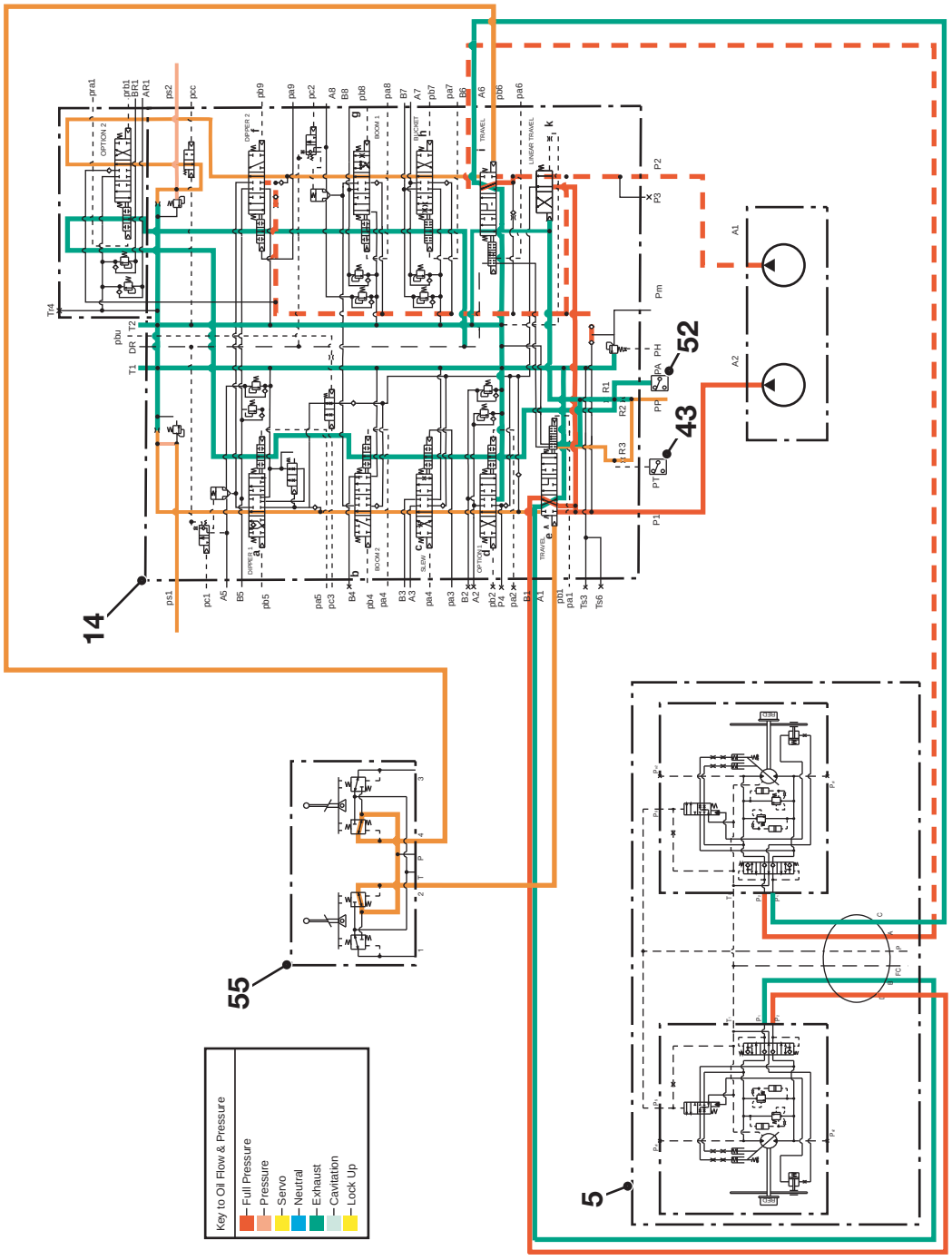


Fig 13. Travel Slow Speed Schematic

For description, ⇒ *Travel - Slow Speed (E-37)*.

Slew Circuit

For schematic, ⇒ *Fig 19. (E-51)*.

Servo pressure from the hand control **48** enters the servo shuttle valve **46** at port **A2** and is distributed to:

1 Port **C7** to port **A** on 8 spool solenoid valve **60**.

2 Port **C8** to port **Pc3** on slew over dipper priority spool **SDV** in the main control valve.

3 Port **S1** to the slew pressure switch **45**.

4 Port **B2** to the slew spool at port **Pa3** on the main control valve **14** to move spool across.

When the pressure switch **45** closes, a signal is sent from the MECU to energise **CT1** on the 8 spool solenoid valve **60**. This allows 40 bar (580 lb/in^2) to cross the solenoid then cross the shuttle **CT10** and the slew lock solenoid **CT3** to release the slew brake.

When the slew pressure switch **45** opens, the solenoid remains energised for 5 seconds to allow the swing to come to a standstill before the brake is applied. If the pressure switch fails, there is an override device fitted. Servo pressure from the hand control **48** passes through the shuttle valve **46** and exits at **C7**. This signal is sent to the 8 spool solenoid valve **60** to port **A**, crosses the shuttle **CT10** and the slew lock solenoid **CT3** and releases the slew brake.

Note: *When the override is in operation, the slew may become very harsh.*

Flow from pump **A2** is stopped in the neutral gallery by the slew spool. The flow passes through into the parallel working passage to the slew spool. The flow is then directed via port **A3** to the slew motor **1**. Exhaust oil enters the main control valve **14** at **B3** to the slew spool to the tank line.

Slew over Dipper Priority (A)

This is a non-selectable function automatically carried out within the main control valve **14** when slew and dipper are used together.

When slew is selected a signal is sent from the servo shuttle valve **46** via port **C8** to the main control valve **14** at port **Pc3**. This selects slew over dipper priority valve **B** and limits the flow to the dipper from pump **A2** only. This makes it possible to have maximum slew torque with high slew pressure when the dipper is used at the same time.

Table 10. Main control valve spools

a	Dipper (1) spool
b	Boom (2) spool
c	Slew spool
d	Option spool
e	Travel (left) spool
f	Dipper (2) spool
g	Boom (1) spool
h	Bucket spool
i	Travel (right) spool
k	Linear travel spool

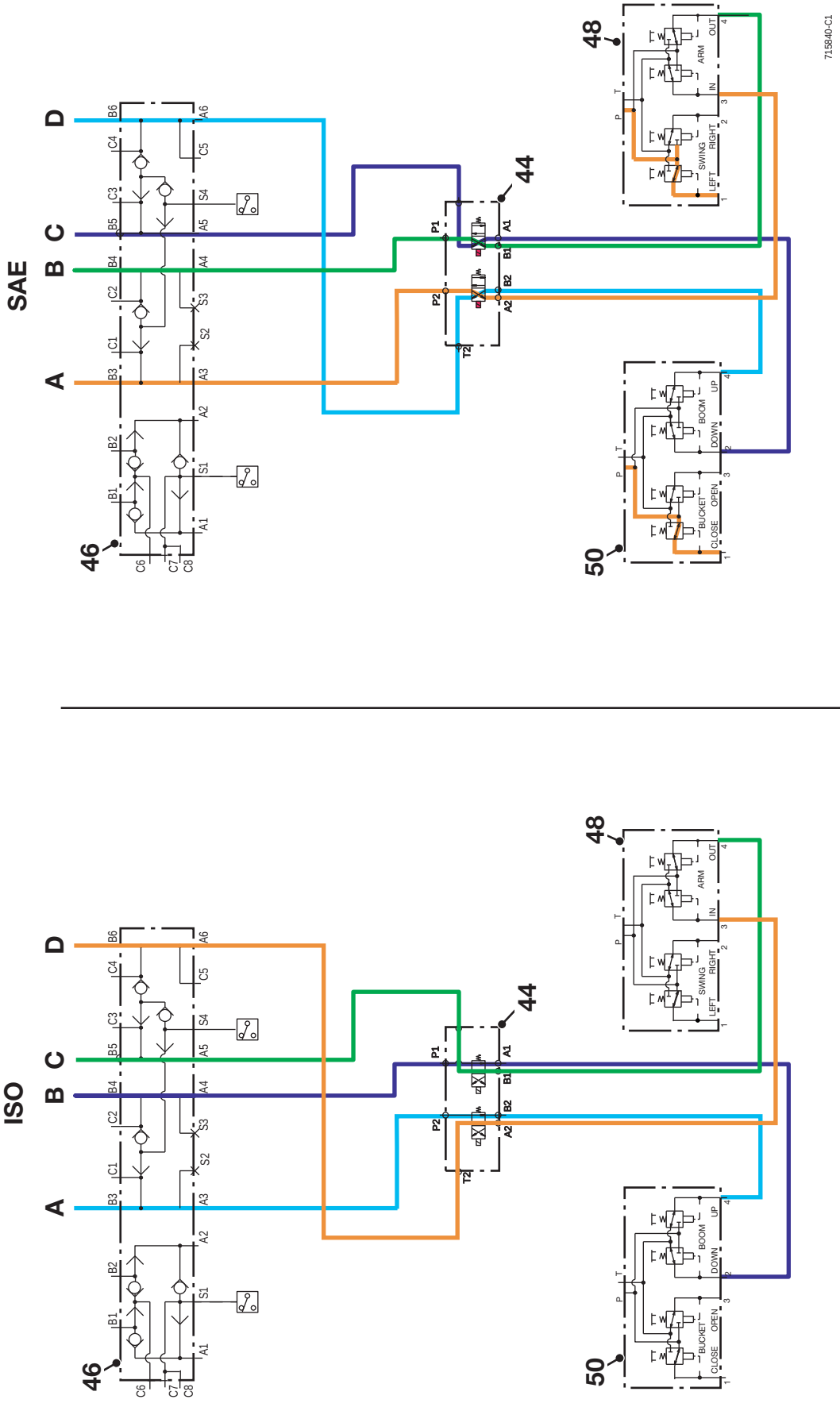


Fig 27. ISO - Solenoids Not Energised, SAE - Solenoids Energised

For description, ⇒ *ISO/SAE Controls (E-61)*.

Hydraulic Pump/Regulator

Hydraulic Pump Operation

Main Pumps (P1 and P2)

The rotary group consists of the drive shaft **7**, cylinder rod **19**, piston shoe **4**, **5**, press plate **11**, spherical bush **12**, spacer **13** and cylinder spring **14**. The drive shaft is supported on both sides by the bearings **8, 16**. The shoe is caulked on the piston and forms the spherical coupler, and because it slides slightly on the shoe plate **6**, it has a pocket to balance the oil pressure.

The subgroup, which is made up of the piston and shoe is held down on the shoe plate by the cylinder spring through the press plate and spherical bush. In the same way, the cylinder block is held down on the valve plate **15** by the cylinder spring.

The swash plate group consists of the swash plate **10**, shoe plate **6**, swash plate support **9** bush **2** pin **3** and servo piston **1**. The swash plate is supported by the swash plate support at the cylindrical part formed by the side opposite to the shoe sliding surface. The oil pressure controlled by the regulator is guided to the hydraulic cavities on both sides of the servo piston which moves the servo piston to the left and right, causing the swash plate, through the spherical portion of the pin, to press on the swash plate support and changes the angle of the swash plate.

The valve cover group comprises of the valve block **17**, valve plate **13** and valve plate pin **18**. The valve plate, which has two oval shaped ports, is on the valve block and delivers oil to and recovers oil from the cylinder block. The oil directed by the valve plate flows through the valve block and is connected to the outer piping.

When the drive shaft is driven by the engine, the cylinder block rotates simultaneously with the spline coupling. When the swash plate is leaning, the piston in the cylinder block rotates simultaneously with the cylinder block and causes reciprocal motion relative to the cylinder.

Therefore, during one rotation, the piston moves away from the valve plate for 180° (enough for oil suction) and approaches the valve plate for the remaining 180°. When the swash plate leaning angle is at the minimum 5° the piston does not stroke and does not deliver oil.

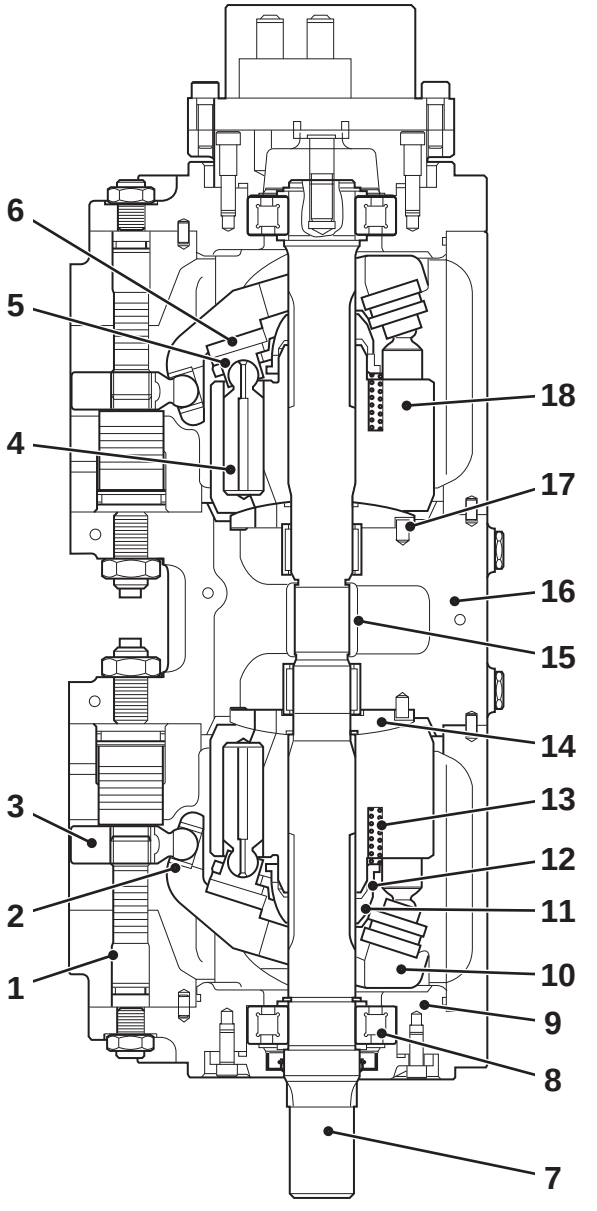


Fig 1.

Assembly

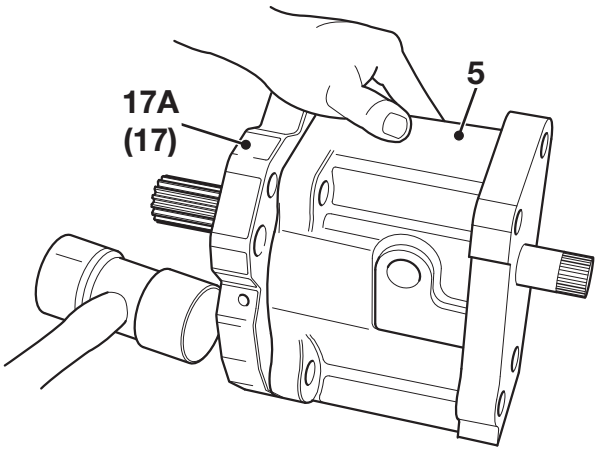
Before assembling:

a Thoroughly clean all components with clean hydraulic oil and dry with compressed air.

b Apply clean hydraulic oil to all sliding surfaces, bearings, etc.

1 If previously removed from pump casing **5**, install tilting pin **27** and servo piston **26**. Use a protector to prevent damage to the tilting pin head and feedback pin.

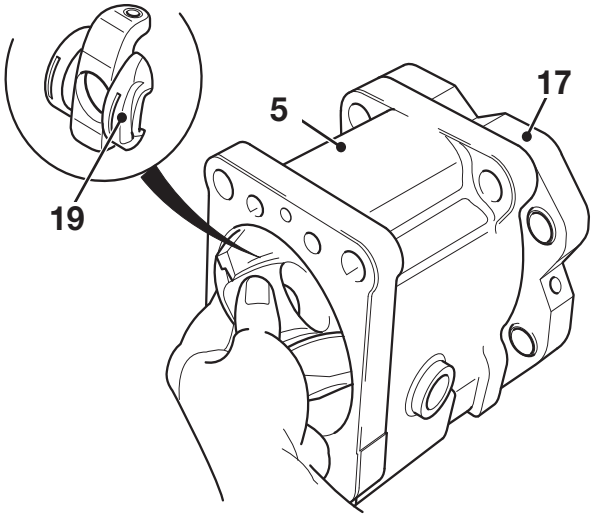
2 Take care to align the flange match marks and then fit swash plate support **17** to pump casing **5** by gently tapping it with a plastic hammer.



379610-C1

Fig 15.

3 Place the pump casing on the workbench with its regulator mounting face downwards. Attach swash plate tilting bush **31** to tilting pin **27**. Smear the sliding surfaces of swash plate support **17** and swash plate **19** with grease. Install the swash plate against the support and manually check that the swash plate slides smoothly.



379620-C1

Fig 16.

4 Pump 1

From inside pump casing **5** install shaft **22** through its support bearing **32** and secure with bearing spacer **21** and snap ring **20**.

Pump 2 (right)

From outside pump casing **5A**, install shaft **22A**, small splined end first, through its support bearing **32A** as far as it will go.

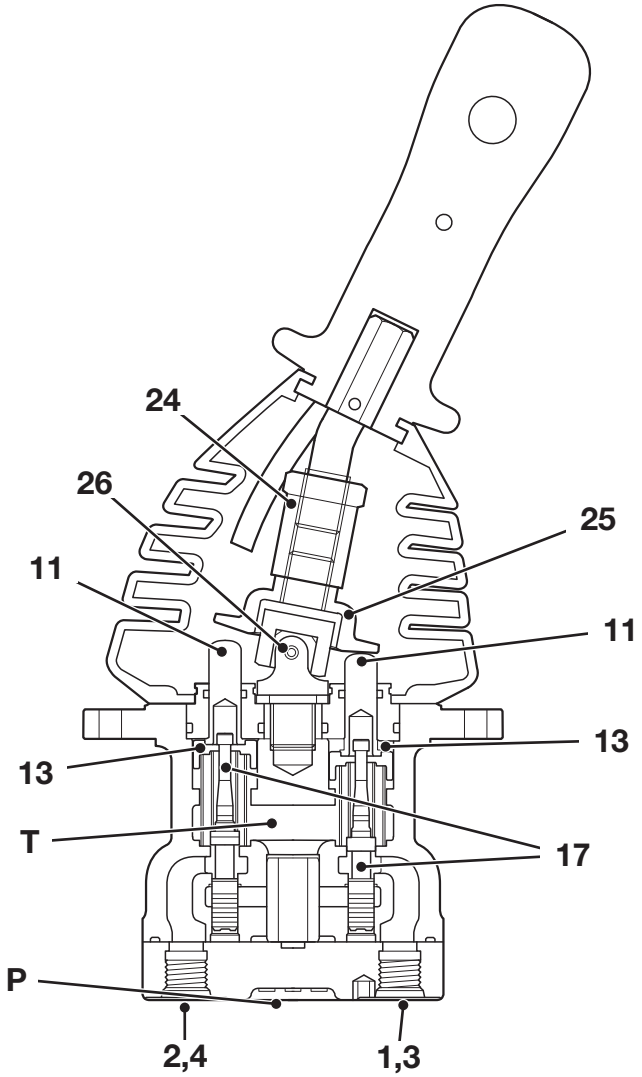


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Fig 1.

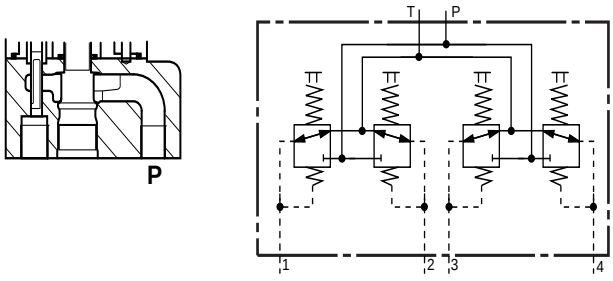

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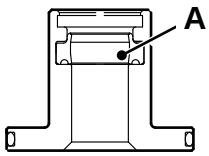
Fig 2.



A406370-2

Fig 4.

A Packing

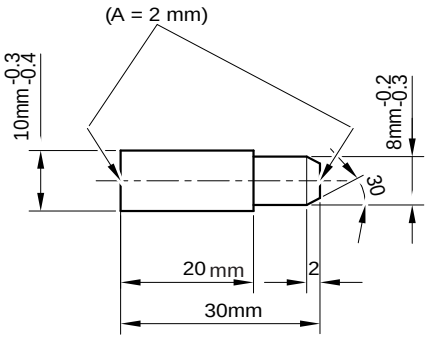
12 Fit grease cap **12** to plug **7**.

13 Fit push-rod **4** to plug **7** Apply working oil to surfaces before fitting push-rod.There is a risk of damage to the rib part of packing **13** do not use excessive force when fitting.

14 Fit the push-rod sub assembly, assembled in step 10, 11, 12 and 13, into casing **10**.

Item	Nm	Kgf m	lbf ft
125	21	2	15
312	69	7	51
301	47	5	35

15 Place cover **2** flat on a flat bench, push on bush **23** using the special Jig ⇒ ***Fig 5. (E-110)*** and insert by tapping with a hammer.



A406320-1

Fig 5.

A Central Hole (2mm maximum)

16 Fix the lower cover assembly, as assembled step 1-5, in a vice and attach upper assembly, as assembled in steps 6-14

17 Fit cover **2** to casing **10**.

18 Tighten the hexagonal socket bolt **9** to the specified torque.

19 Fit cam and steel balls **6** to cover **2**. Press down cam **6** and insert cam shaft **5** from the outside.

20 Apply JCB Threadlock or equivalent to the surfaces of hexagonal socket screws **3**.

21 Tighten hexagonal socket screw **3** to specified torque.

22 Tilt cam **6**, apply grease to the top of push-rod **4** and inject grease into grease cap **12** of plug **7**. Grease is to be applied and injected using a spatula made of soft material and care it to be taken that the surfaces of the push-rod and plug are not damaged.

23 Fit the top of bellows **1** into cam **6** and then the bottom into the groove in cover **2**.

24 Before fitting the bottom edge of the bellows into the groove in the cover, apply anti corrosion oil inside the bellows.Please note that if the bellows do not fit precisely into the groove and are loose, resistance to dust and water will deteriorate.

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Motor Brake Working Poorly

Symptom	Cause	Remedy
Low brake torque.	The friction plate is worn out.	Dismantle and renew worn parts.
	The brake piston is sticking.	Dismantle and clean.
	The brake releasing pressure is low.	Check and repair the supply circuit.
	The spline of the friction plate is broken.	Dismantle and renew the broken parts.

Motor is Driven by Exterior Torque

Symptom	Cause	Remedy
Slip volume is high.	The relief valve is not set correctly.	Set to correct value or renew.
	Relief valve plunger not seating cleanly.	Renew.
	The reversal protecting valve does not work properly.	Renew.
	Drain volume exceeds 500 cc/mm.	Dismantle and check for signs of wear. Renew suspect parts.

Oil Leakage

Symptom	Cause	Remedy
Oil leaking from around the drive shaft oil seal.	Oil seal lip damaged.	Renew the oil seal.
	The shaft is damaged or worn.	Repair or renew the shaft.
	High pressure in casing, causing the lip of the oil seal to become rolled.	Clear the drain pipes.
	The drive shaft is corroded.	Dismantle and repair.
Oil leaking from mating surfaces of main housing and valve housing.	O-ring not fitted or damaged.	Fit or renew the O-ring.
	The seal surface is damaged.	Dismantle and repair.
	The securing bolts are damaged or loose.	Renew and/or tighten to the required torque.

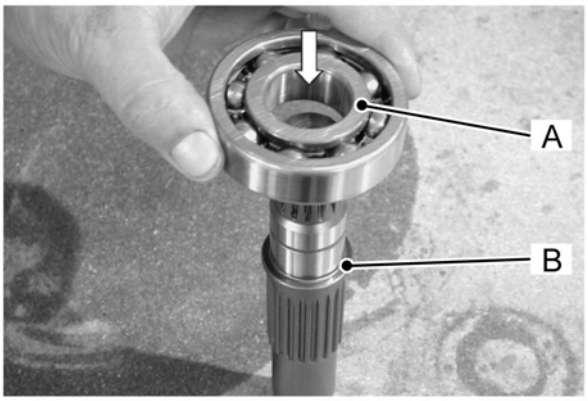

Fig 35.

3 Insert the motor shaft and bearing assembly into the motor housing. Using a soft faced hammer push the assembly against the housing shoulder ⇒ *Fig 36. (E-146)*

Note: *Before inserting the motor shaft into the motor housing, ensure the sealing ring is well lubricated.*

Fig 36.

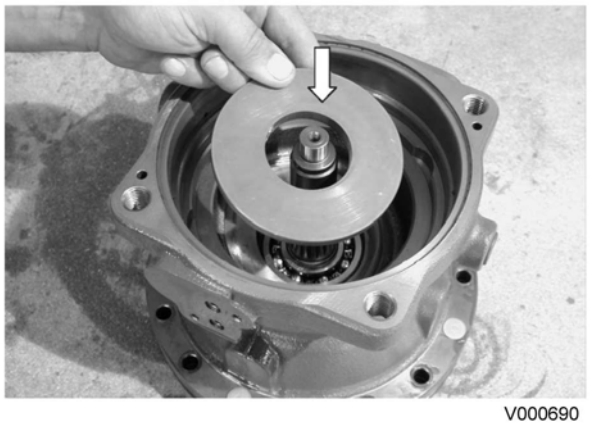

Fig 37.

4 Fit the thrust plate into the motor housing ⇒ *Fig 37. (E-146)*.

5 Assemble cylinder block.

a Grease and insert the 3 pins into the seats in the cylinder block **A**.

b Place the spherical bush **B** onto the cylinder block.

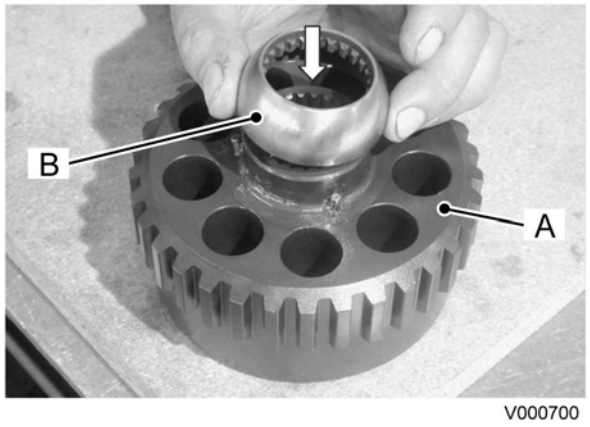

Fig 38.

Note: *Ensure the two sets of splines are aligned.*

6 Build piston assembly.

a Ensure all piston orifices are open and clean.

Removal and Replacement

TE-028

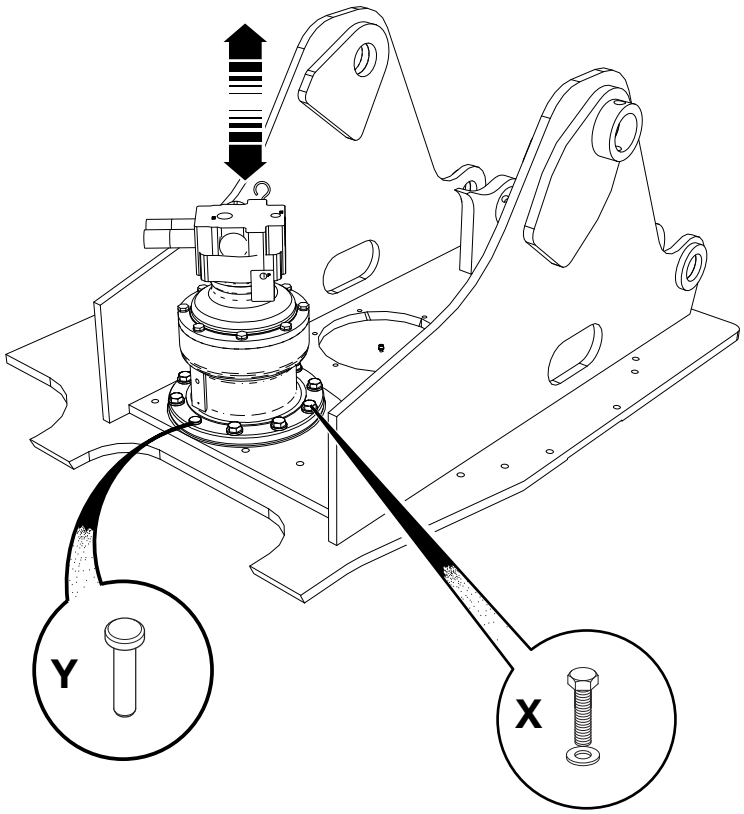

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Fig 2.

Removal

⚠ WARNING

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.

INT-3-1-11_2

1 Make the machine safe, refer to ***Section E, Service Procedures***.

2 Remove slew motor, refer to ***Section E, Slew Motor***.

3 Disconnect all hydraulic hoses from the slew gearbox and plug all orifices to prevent ingress of dirt. Label each hose before disconnection.

4 Remove bolts **X** and reference pin **Y**.

5 Using suitable lifting equipment carefully lift slew gearbox until clear of machine, refer to ***Section E, Technical Data***.

Removal and Replacement

Removal

1 Jack up the machine by pressing the boom/dipper on the ground. Install wooden blocks under the tracks. ⇒ *Fig 2. (E-170)*.

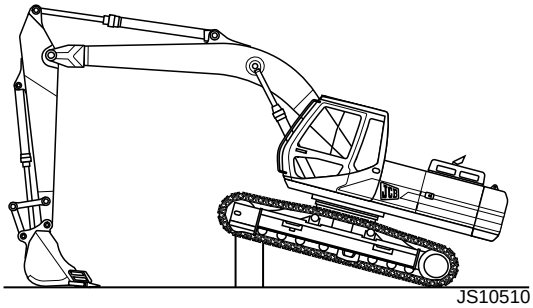

Fig 2.

2 Stop the engine and release hydraulic system pressure, refer to ***Service Procedures*** in this section.

3 Remove the belly plates.⇒ *Fig 3. (E-170)*

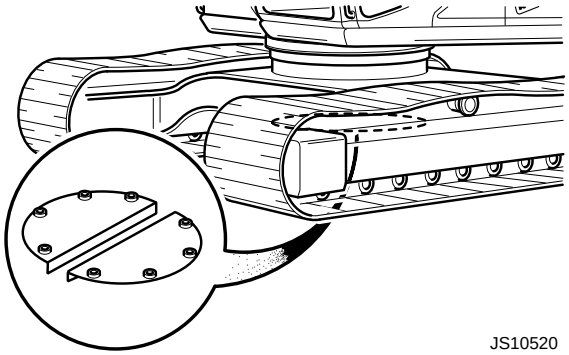

Fig 3.

WARNING

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.

INT-3-1-11_2

WARNING

Do not go underneath the machine with the engine running. Switch off the engine, apply the park brake and block both sides of all wheels before going underneath the machine.

TRANS-2-1

4 Attach identification tags to the rotary coupling hoses for reconnection purposes. Remove the hoses and install blind plugs and caps to prevent contamination.

5 Remove the three screws/washers **A** and lift off locking bar **B**.

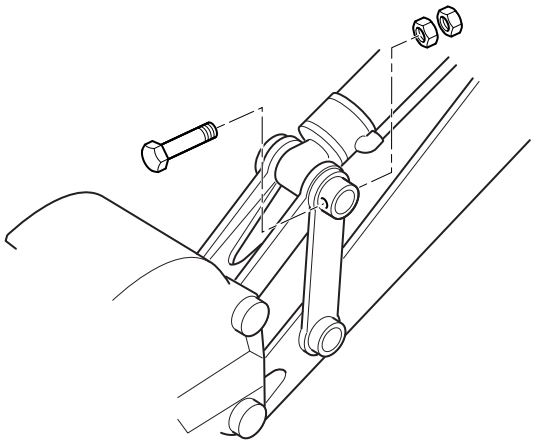

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Fig 4.

5 Push the pin out using a bar and hammer.

⚠ WARNING

Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or copper pin to remove and fit metal pins. Always wear safety glasses.

INT-3-1-3_2

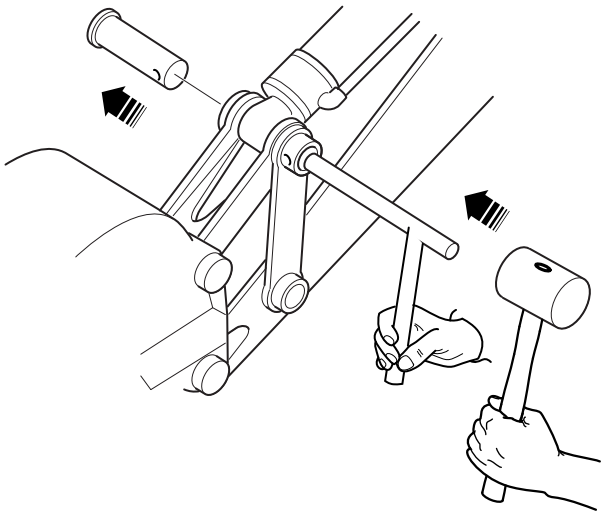

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Fig 5.

6 Restrain the eye end of the ram piston rod to the ram cylinder to prevent the piston rod from extending.

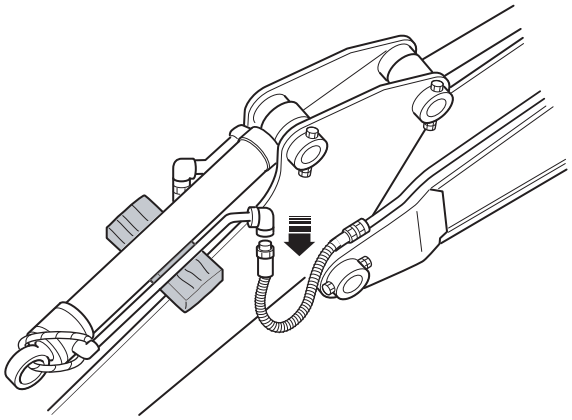

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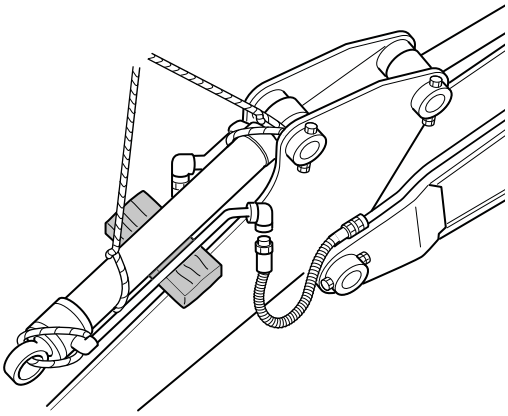
Fig 6.

7 Remove the ram hoses and install plugs or caps to prevent contamination.

8 Attach slings to support the ram.



803095-1

Fig 7.

9 Remove the nuts and bolts from the cylinder end of the ram. Push out the pin using a bar and hammer. Lift the ram clear.

⚠ WARNING

Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or copper pin to remove and fit metal pins. Always wear safety glasses.

INT-3-1-3_2

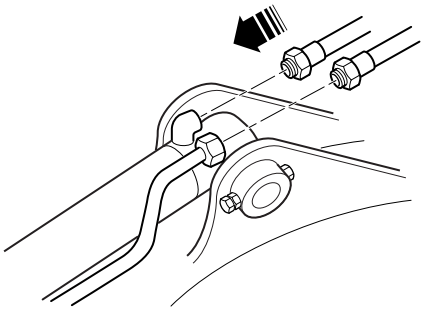


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Fig 43.

4 Hoist the ram to align the piston rod eye end with the dipper pin position.

5 Install the pin, bolt and nuts.

Note: *Stroke the ram to release entrapped air. After releasing the air, check for oil leakage.*

⚠ WARNING

Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or copper pin to remove and fit metal pins. Always wear safety glasses.

INT-3-1-3_2

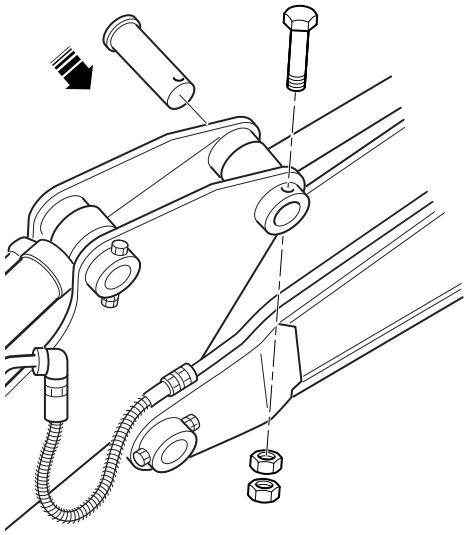

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Fig 44.

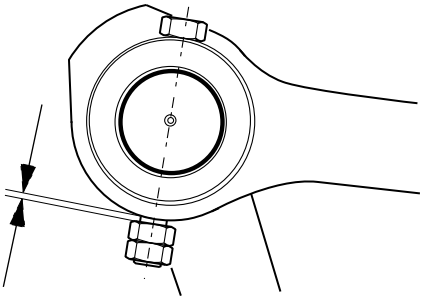

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Fig 45.

Note: *When checking or refitting JS machine pivot pins, the retaining nuts and bolts should not be fastened up tight to the pivot boss but must have approximately 3mm of play so that the pin is free from tension.*

Assembling the Cylinder Head Seals

Before Assembly

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

1 locate du-bush to cylinder and push into place using a press ⇨ ***Fig 85. (E-206)***. Fit the bush retaining ring.

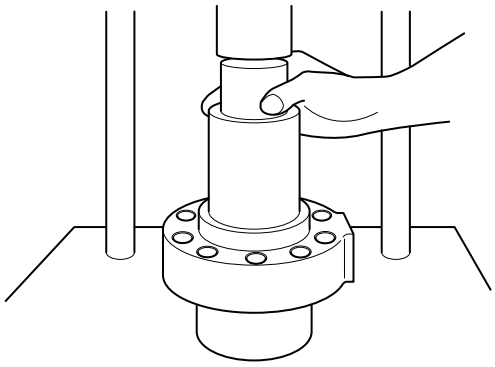

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Fig 85.

2 Fit the back up ring in its seat on the cylinder head ⇨ ***Fig 86. (E-206)***.

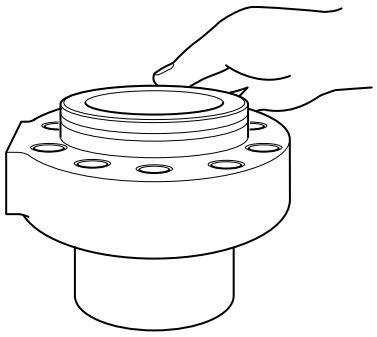

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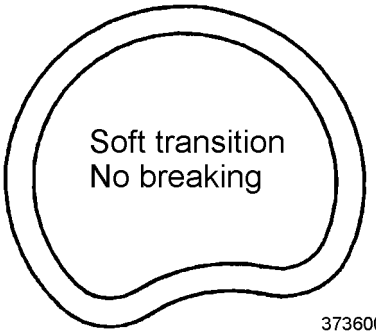
Fig 86.

3 Bend the buffer ring to a loose curve before fitting, ⇨ ***Fig 87. (E-206)***.

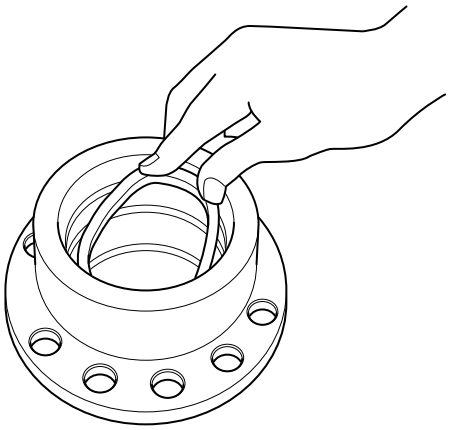


373600-V1

373600-V1

Fig 87.

4 Fit the buffer ring into its seat in the cylinder head ⇨ ***Fig 88. (E-206)***. Fit back up ring after putting the buffer ring in place ensuring correct orientation. **A** is correct **B** is incorrect.⇨ ***Fig 89. (E-207)***.



C031020

Fig 88.

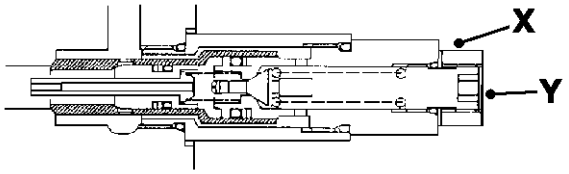
Table 2.

1	Main Relief Valve (MRV)
2	Boom Up Relief Valve
3	Boom Down Relief Valve
4	Dipper Out Relief Valve
5	Dipper In Relief Valve
6	Bucket Open Relief Valve
7	Bucket Close Relief Valve
8	Option Relief Valve
9	Option Relief Valve

4 Operate the option by pressing the foot pedal. Check the pressure on the gauge, adjust the ARV.

Note: *For accurate setting, the pressure should be adjusted up to the required level. Release lock nut* ***X****. Adjust setting screw* ***Y*** *to indicate a pressure below the required level and then bring the pressure back up for final setting. Tighten lock nut* ***X****.*

5 Restore Original MRV Pressure, refer to ***Service Procedures*** in this section.



312460-C1

Fig 24.

Item	Symptoms	Related Parts	Trouble	Treatment
1	Piston rod sliding part oil leakage	Back up ring	The protrusion of the heel of the packing is excessive.	As a rule, replace the rod packing at the same time. (It is desirable to replace parts which are attached to the buffer ring at the same time). It is possible that abnormal high pressure is the cause. Check the same as above (heel of packing protruding).
		Wiper ring	Foreign matter is biting into the lip. The lip is damaged.	Remove the foreign matter.
			There are also other abnormal damage.	Replace.
		Bushing	Wear is large and the clearance with piston rod exceeds the *maximum permissible value. (*Refer to maintenance standards for maximum permissible value.)	Replace.
			Large scratch on the sliding part.	Replace. Also inspect the piston rod.
		Cylinder head	Scratches, rust on the seal attachment parts.	Remove scratch, rust with oil stone. If it cannot be repaired, replace the cylinder head.
2	Oil leakage from cylinder head joint	O-ring	Foreign matter biting on inner and outer diameter.	Remove foreign matter Replace 'O'-ring if damaged. Inspect inside tube: if any scratches or rust, make surface smooth with oil stone Inspect cylinder head 'O'-ring groove: if any scratches or rust, make surface smooth with oil stone. Inspect back up ring: if any deformation or protrusion, replace. Confirm the above and replace 'O'-ring.
			O-ring damaged.	
		Back up ring	Deformation, protrusion	Replace with 'O'-ring.
		Cylinder head	Looseness	Disassemble cylinder head and inspect 'O'-ring and back up ring. Check tube and cylinder head thread for damage. If any damage, replace. After inspection, tighten to specified torque.
		Bolt	Looseness, stretching, broken	Replace all bolts and tighten to specified torque.
		Cylinder tube	Abnormal bulge	Replace with new parts. Oil leakage from connecting parts may be caused by abnormal pressure (including cushion pressure). Inspect the tube for bulges, deformation and check the circuit pressure.

Test 005: Checking the Operation of the Main Hydraulic Spool

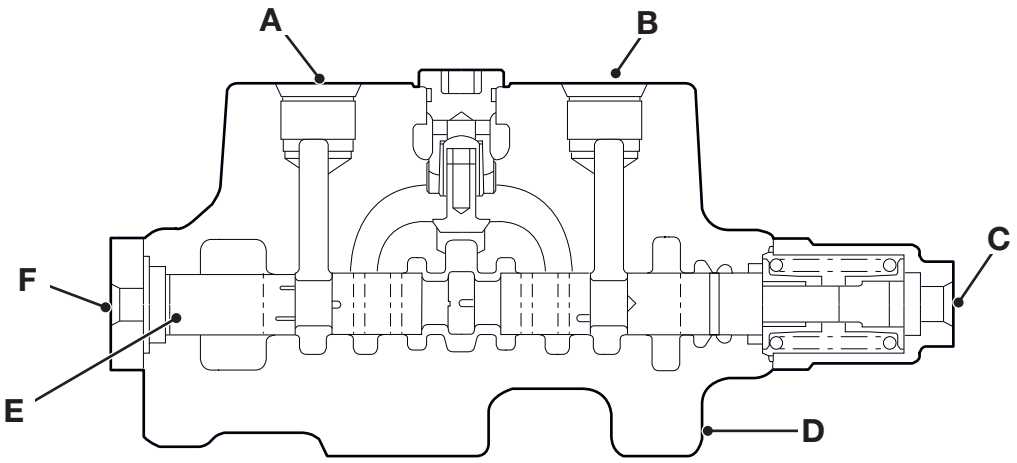


Fig 6. Sectional view of valve block showing spool and pilot ports

A Cylinder port B
B Cylinder port A
C Pilot port a
D Valve block
E Main spool
F Pilot port b

Identify which is main directional spool for service being tested, and which side of that spool is supplied pilot pressure when service is operated in desired direction

Fit pressure gauges 0 - 60 bar (0 - 1000 lb/in^2) to this port and also to port on opposite end of spool

Warm up hydraulic system to 50 °C (122 °F)

Remove the hose from the spool port that is not being selected and plug the hose.

Remove the hose from the spool end that is being selected and plug the hose. Couple a hand pump (see Service tools) with a pressure 60 bar (0 - 1000 lb/in^2) gauge attached. (Instead of using a hand pump, the pressure from the accumulator may be used by leaving the hose and Pressure gauge attached, but will not be as accurate, and should only be used if only full spool selection is being measured.)

Insert a piece of stiff clean wire (Approximately 2 mm (0.08 in) diameter)) through the adaptor in the port not being selected until the spool end is felt.

Slowly select the spool from the selected end using the portapower pack, measure the distance the spool moves and check against the graph. ⇒ ***Fig 7. (E-255)***

(If using the accumulator pressure, turn on the machines ignition, lower the lever lock and select the service.

Note: *The accumulator may require recharging by running the engine for a short period).*

Remove Spool cap from the main valve block and withdraw the spool checking for any scratches/ imperfections, or any signs of sticking. Slide the spool in and out of the valve block, rotating it at the same time checking for smoothness.

Test 015: Testing the Low Speed Tracking Setting

If experiencing low speed tracking faults, carry out following checks:

Test 008	Testing track motor speeds
Test 006	Testing pressure switches

The tracking motors change to low speed when the SLOW and CREEP travel modes are selected.

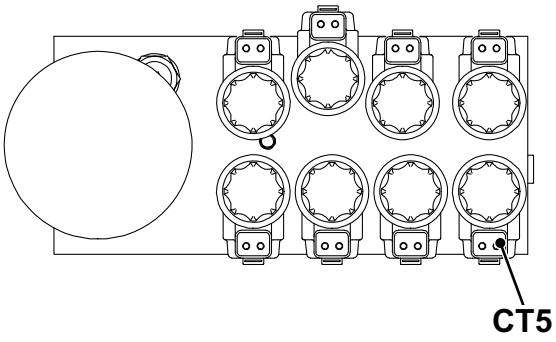
In addition to the tests do the following checks:

1 Operate the travel mode button and check that the `tortoise' symbol displays on the DECU (SLOW travel mode). If the symbol does not display check the operation of the travel mode button and its associated wiring.

2 Switch on the ignition and select the SLOW travel mode. Remove the electrical connector at the travel speed solenoid **CT5**. Check that there is no voltage supply at the connector. If there is voltage supply check the associated wires and connectors. Refer to ***Section C***.

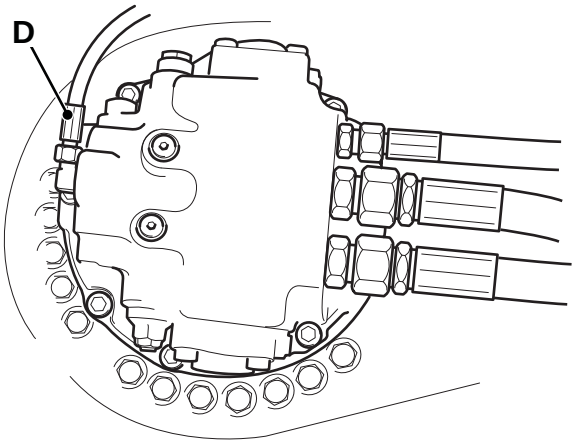
3 Fit a suitable adaptor and pressure gauge at pilot port **D** on the track motor. Start the engine and select the SLOW travel mode. check that there is no pilot pressure at pilot port. If there is pilot pressure replace the travel solenoid valve **CT5**. Refer to ***8 Station Solenoid Valve***.

4 Repeat steps 1 to 3 in CREEP travel mode (‘snail’ symbol displays on the DECU).



T023460-C2

Fig 18. 8 station solenoid valve



716370-C7

Fig 19.

Return Filter

Replace

1 Prepare the machine. Refer to ***Section 2, Maintenance, Maintenance Positions***.

2 Release Tank Pressure. Refer to ***Section 2, Maintenance, Hydraulic System***.

3 Get access to the return filter. ⇨ ***Service Points (1-274)***

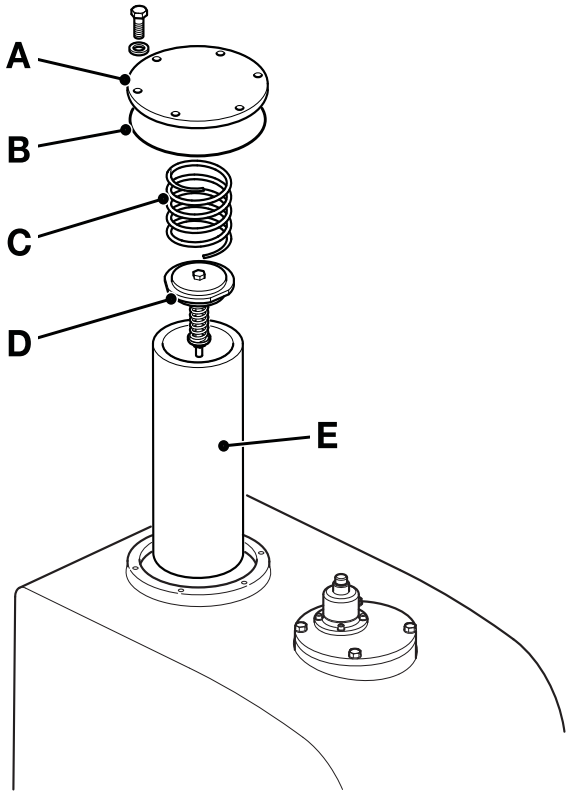


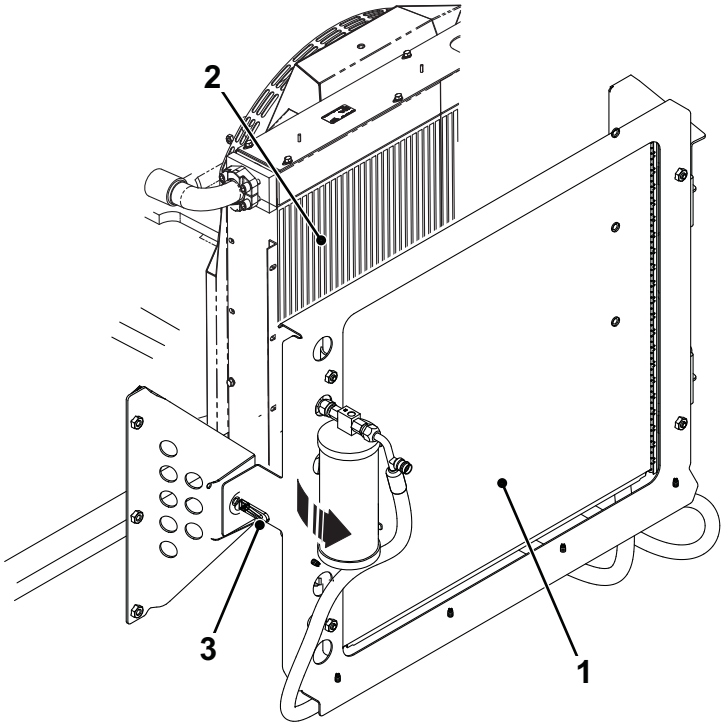
Fig 5.

4 Remove the return filter as follows:

a Remove the cover **A** and O-ring **B**.

b Remove spring **C**, valve **D** and return filter **E** from the tank.

5 Install a new return filter **E**. Re-assemble in the reverse order using a new cover O-ring **B**.



C131990

Fig 16. JS200 - 220

Parking Brake

Symptom	Possible Cause	Remedy
a Braking force is low or insufficient.	**1** Friction plates worn.	Renew discs. Completely remove foreign matter and repair damaged areas. After cleaning, reassemble.
	2 Counter places surface damaged or making poor contact.	Grind and recondition the affected area. Reassemble after cleaning. Renew plates if excessively damaged.
	3 Spring is deformed or damaged.	Renew the spring. Completely remove foreign matter and reassemble after cleaning.
b Motor speed low.	**1** Brake not releasing.	
	i Oil leaks due to broken O-ring.	Renew broken O-ring.
	ii Orifice is clogged.	Clean and reassemble.

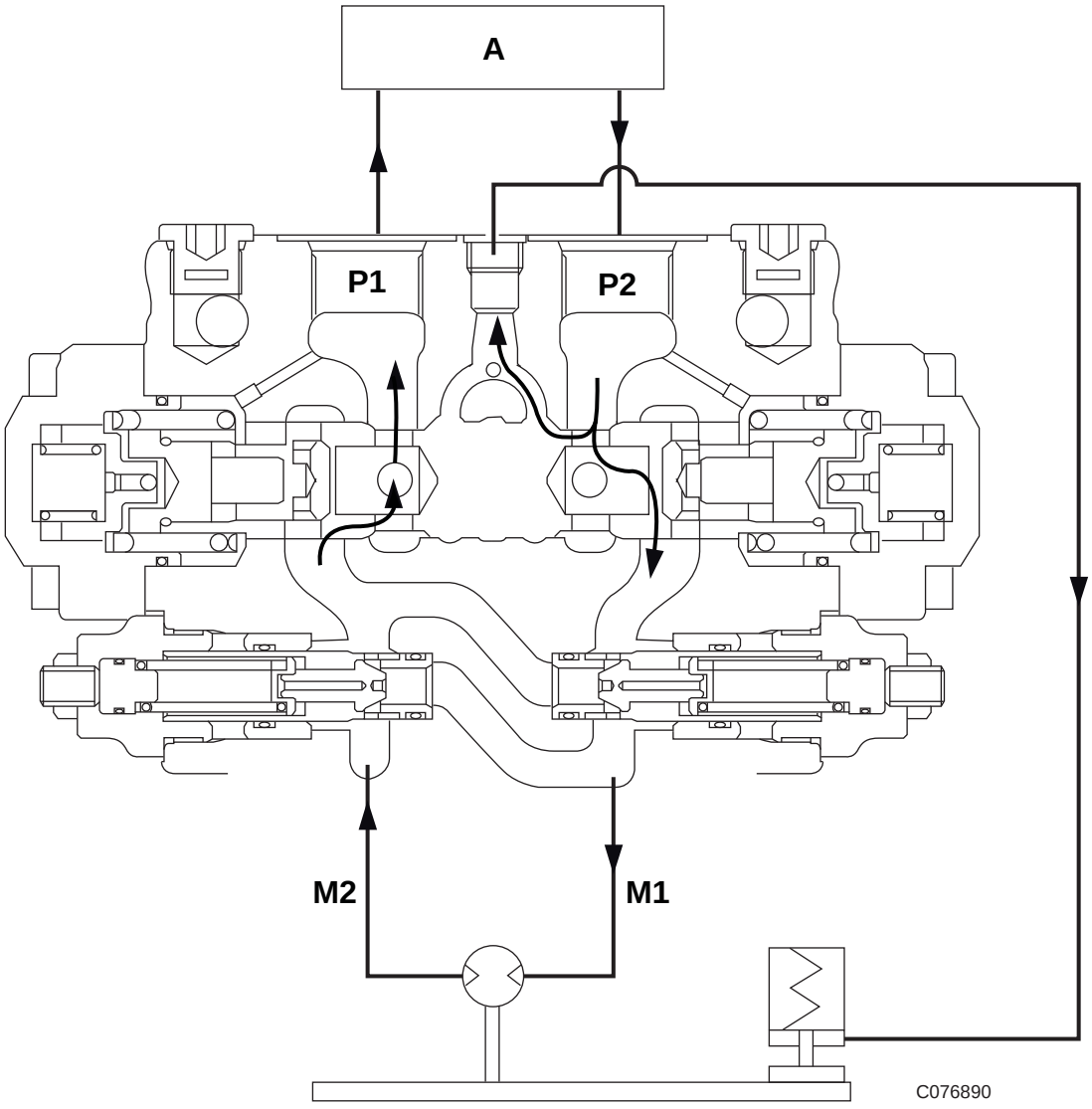


Fig 6. Motor Rotating

When hydraulic oil delivered from the hydraulic pump is guided to P1 port of the counterbalance valve through the control valve, the hydraulic oil goes through the check valve and flows into the piston motor from **M1** port and tries to rotate the motor.

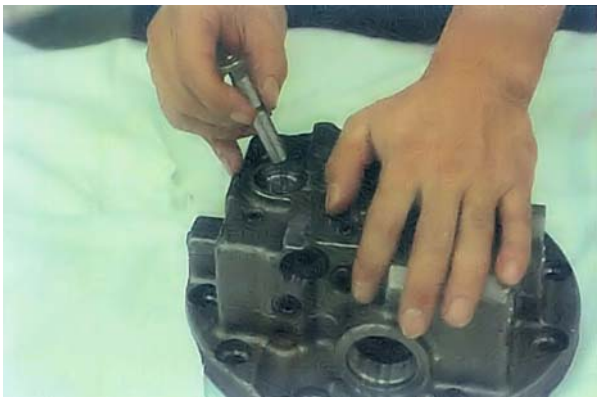
On the other hand, the return oil from the piston motor can flow from **M2** port to the counterbalance valve but is prevented by the check valve so that pump delivery pressure rises. The boosted hydraulic oil at **P1** port side goes past the orifice and works on the flange face, and resisting the spring on the opposite side with a force proportional to the pressure, it tries to move the plunger to the right side.

When a certain pressure is reached, the plunger moves towards the right and the hydraulic oil of **M2** port passes through the notch of the plunger outer perimeter and generates back pressure at **M2** port while flowing to Ps port and returns to the tank through the control valve. When the pump delivery pressure rises the plunger diaphragm opening enlarges and the **M2** port back pressure decreases. In this way, the opening of the plunger notch diaphragm automatically adjusts the return side

C079650

Fig 39.

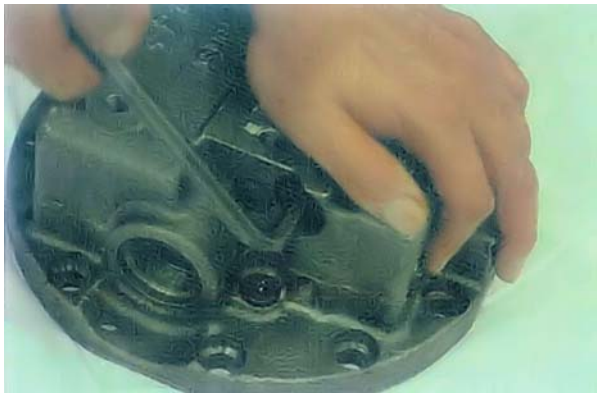
13 Remove the two speed spool and spring.



C079660

Fig 40.

14 Remove the piston plugs and remove the O-ring from the plugs. ⇨ *Fig 41. (F-28)*.



C079670

Fig 41.

15 Remove the pistons.

C079680

Fig 42.

16 Remove the ball check plugs from the rear flange. ⇨ *Fig 43. (F-29)*.

C079700

Fig 77.

18 Fit new O-rings to plugs. Fit plugs to the rear flange and temporarily tighten with Allen key.

C079690

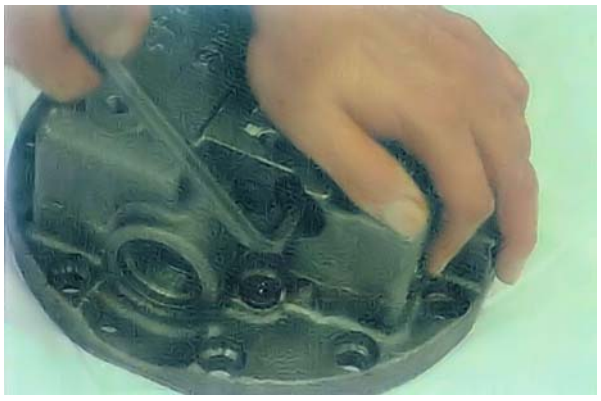
Fig 78.

19 Locate the pistons into the rear flange. ⇨ *Fig 79. (F-40)*.

C079680

Fig 79.

20 Fit new O-rings to the plugs. Fit plugs into rear flange and temporarily tighten with Allen key.



C079670

Fig 80.

21 Insert the brake spool into the flange. ⇨ *Fig 81. (F-41)*.

P017310

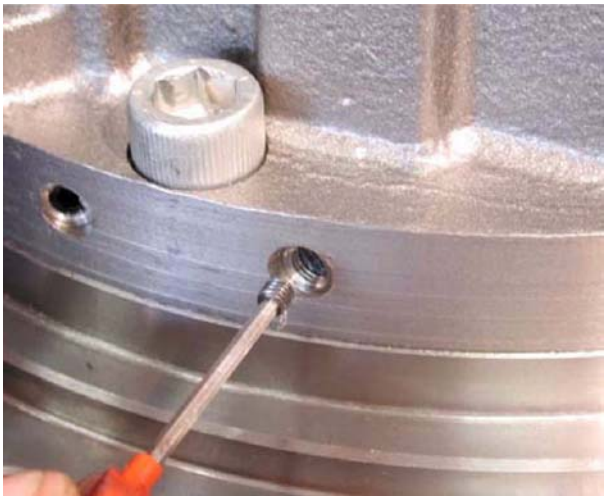
Fig 120.

25 Unscrew the conical plugs (57) from the base plate (60).

P017320

Fig 121.

26 Unscrew the orifices (58-59) from the base plate (60).



P017330

Fig 122.

27 Remove the caulking with a M5 tap before unscrewing the orifices (64).

P017340

Fig 123.

28 Unscrew the orifices (64) from the base plate (60).

P017860

Fig 166.

14 Assemble correctly the nos.9 pistons (12) in the retainer plate (13).

P017870

Fig 167.

15 Assemble the pistons-retainer plate unit (12-13) in the cylinder block (16).

P017880

Fig 168.

16 Assemble the cylinder block unit (16) into the flanged hub (1) on the motor shaft spline (7).

P017890

Fig 169.

17 Insert the brake disc (23) in the cylinder block (16).

P018320

Fig 213.

60 Insert the spring seat (48).

P018330

Fig 214.

61 By using the stopper (ATZ.06.043.0) assemble the O-ring (47) in its seat in the plug (46).

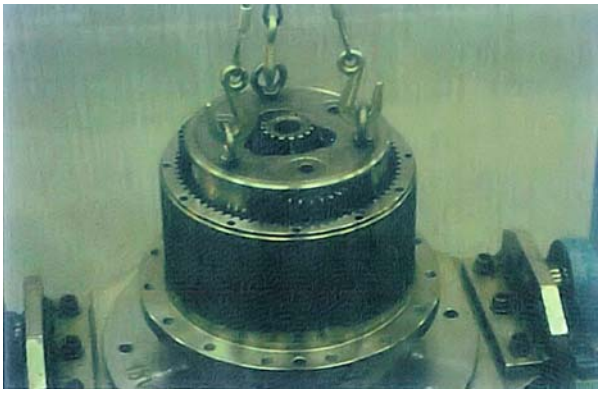
P018340

Fig 215.

62 Tighten the plug (46) by a torque wrench at 120±5 Nm torque.

P018350

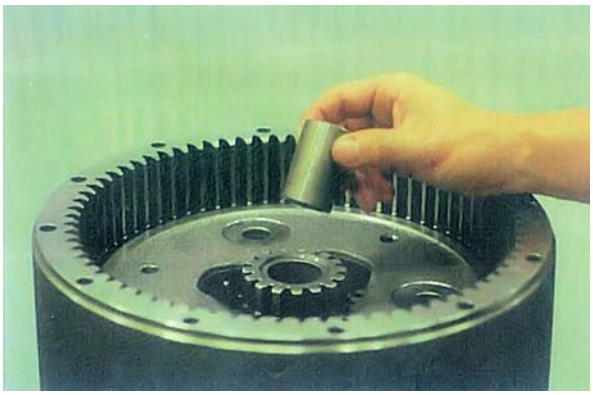
Fig 216.



C079400

Fig 20.

11 Locate the coupling.



C079390

Fig 21.

12 Using a hoist locate first reduction planet carrier into the gearbox housing. ⇨ *Fig 22. (F-88)*.

C079380

Fig 22.

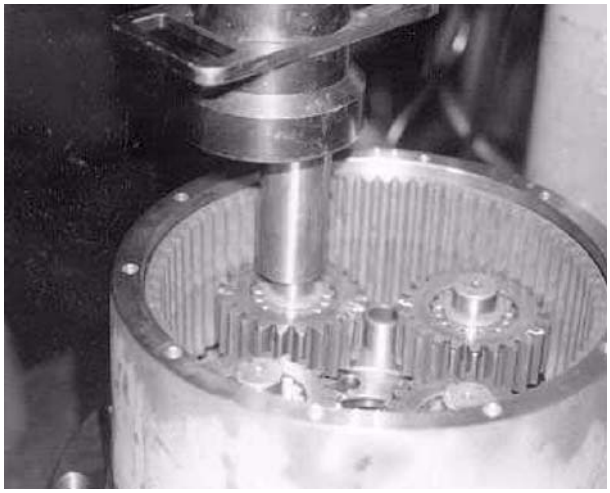
13 Locate the first reduction sun gear ensuring it engages into the splines and gears.

C079370

Fig 23.

14 Locate thrust plate into position on the carrier. ⇨ *Fig 24. (F-89)*.

11 Place the nos.4 planet assemblies of the 3rd reduction (13) into their seats in the hydraulic motor (18), and by using a press, push them against the shoulder until assembly is complete.



P018430

Fig 58.

12 Position the 3rd reduction planet carrier (13) on the hydraulic motor (18) and by using a press push it against the shoulder.

P018440

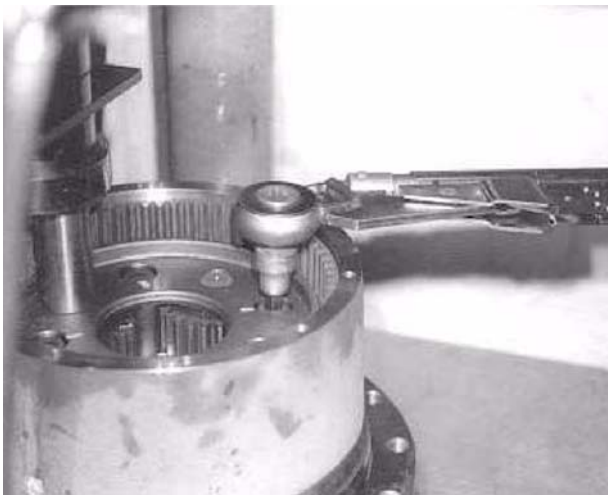
Fig 59.

13 Apply LOCTITE 243 on the nos.4 socket head screws M20x100 (12), grade 10.9, and insert them in the thread holes in the hydraulic motor (18).

P018450

Fig 60.

14 Tighten the nos.4 socket head screws M20x100 (12), grade 10.9,by a male hex head torque wrench at 585 Nm torque.



P018460

Fig 61.

15 Insert the 3rd stage sun gear (7).

Contents Page No.

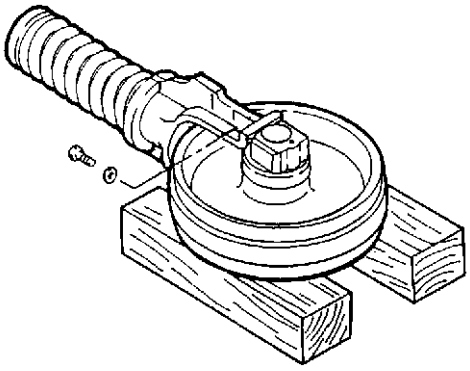


Fig 4.

⚠ WARNING

RECOIL UNITS ARE DANGEROUS. They must not be dismantled without using suitable tools to compress the spring safely. The spring pressure can cause serious injury if suddenly released. Scrap units must be made harmless by compressing the spring in a hydraulic press and cutting through the end of the shaft before slowly releasing the pressure.

TRACK-1-10

Note: *If it becomes necessary to dismantle the recoil spring assembly, the following procedure should be used.*

5 Prepare the jig for Recoil Spring Disassembly. Place the re-coil spring unit as shown.

Jack up the hydraulic jack A and compress the Recoil Spring **B**.

6 Remove the Recoil Spring. Pull out the Spring Pin **C** and remove the castellated nut **D**. Let the jack **A** down to relieve the pressure on the recoil spring **B**.

Remove the components from the jig, firstly the yoke **E**, spring **B** and finally, the grease cylinder **F**.

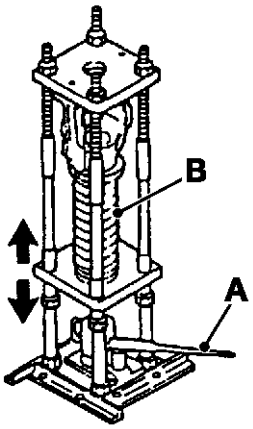


Fig 5.

Replacement

1 Re-assembly of Components.

a Set the components in the jig, firstly the grease cylinder **F**, then place the spring **B** on top, and finally, the yoke **E**.

b Extend jack **A** and compress recoil spring **B**.

c Install the castellated nut **D** on the threaded section of the grease cylinder **F** which protrudes through the yoke **E**. Tighten nut **D**, aligning the castellations with the pin hole.

d Remove the recoil spring assembly from the jig. See ***Recoil Spring Installation***.

e Renew and install spring pin **C**.

f Release jack A carefully and allow recoil spring **B** to expand. Remove assembly from the jig.

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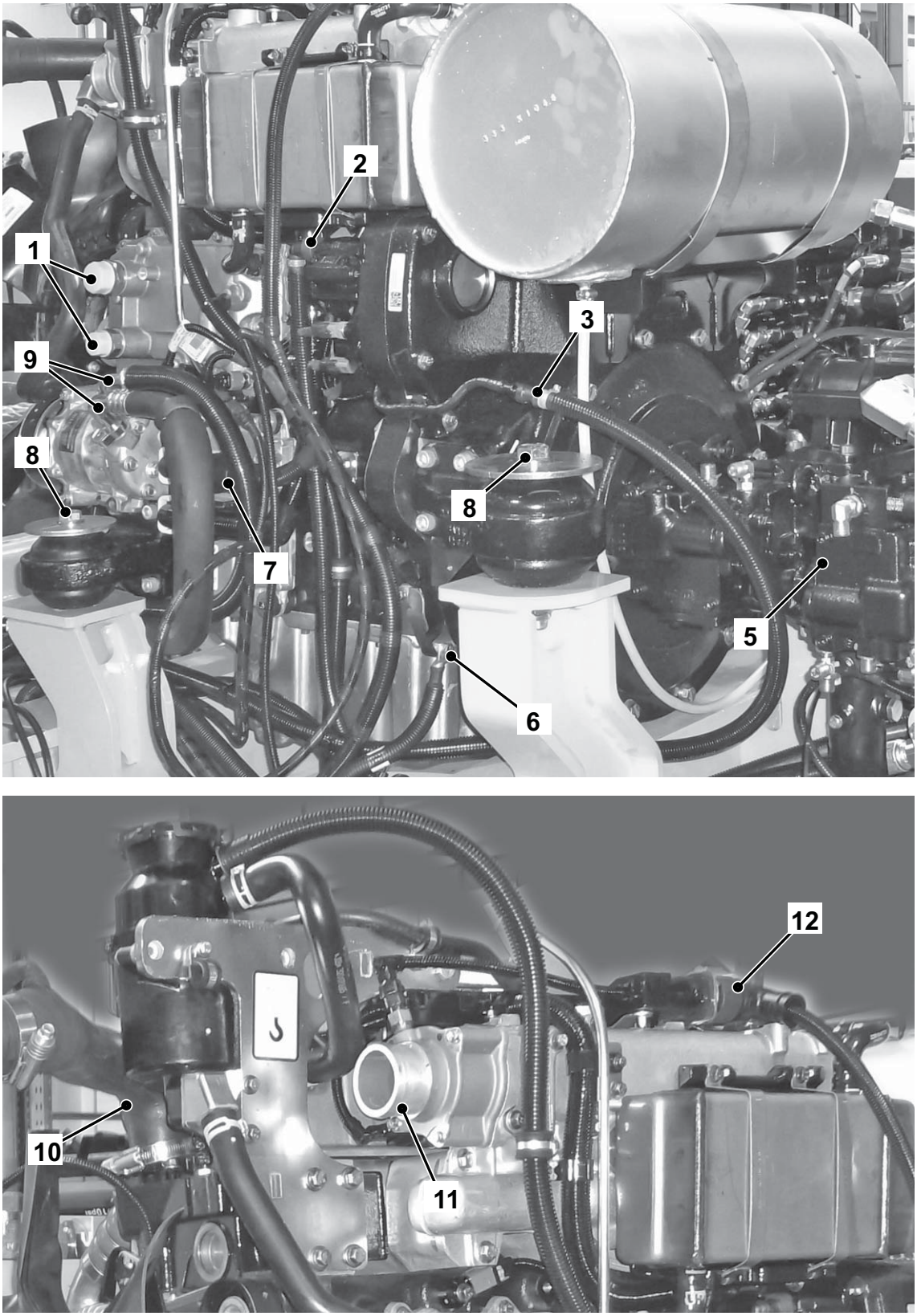
Notes:



C129710-C1

Fig 1. Items 1 to 12 (Ecomax engine shown)

Engine Mounts

Check (Condition)

Check the condition of the four engine mountings **1**. Make sure that all the fixings are secure and tightened to the correct torques. Refer the ***Section 2***, ***Technical Data***, ***Torque Values***.

Make sure that the mounting components are free from defects such as splits or cracks. Replace defective components as necessary.

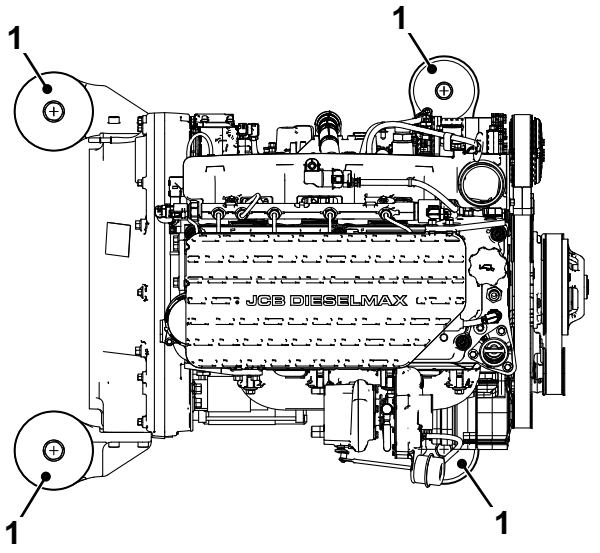


Fig 9.