Section B

Body and Framework

Service Manual - Backhoe Loader

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Service Tools

Numerical List

The tools listed in the table are special tools required for carrying out the procedures described in this section. These tools are available from JCB Service.

Some tools are supplied as kits. Cross references are given to tables showing kit contents.

Note: *Tools other than those listed will be required. It is expected that such general tools will be available in any well equipped workshop or be available locally from any good tool supplier.*

Part Number	Description	Tool Detail Reference
-	Rivet Nut Tool - see tool detail reference for content	⇨ *Fig 2. (B-2)*
892/00842	Glass Lifter	⇨ *Fig 3. (B-3)*
892/00843	Folding Stand for Holding Glass	⇨ *Fig 4. (B-3)*
892/00844	Long Knife	
892/00845	Cartridge Gun	⇨ *Fig 5. (B-3)*
892/00846	Glass Extractor (Handles)	⇨ *Fig 6. (B-3)*
892/00847	Nylon Spatula	⇨ *Fig 7. (B-3)*
892/00848	Wire Starter	⇨ *Fig 8. (B-3)*
892/00849	Braided Cutting Wire	⇨ *Fig 9. (B-4)*
926/15500	Rubber Spacer Blocks	⇨ *Fig 10. (B-4)*
992/12300	12V Mobile Oven	⇨ *Fig 11. (B-4)*
992/12400	24V Static Oven (2 Cartridge)	⇨ *Fig 12. (B-4)*
992/12600	24V Static Oven (6 Cartridge)	
992/12800	Cut-Out Knife	⇨ *Fig 13. (B-4)*
992/12801	`L' Blades	⇨ *Fig 14. (B-4)*
993/68100	Slide Hammer Kit - see tool detail reference for content	⇨ *Fig 1. (B-2)*
4104/1310	Hand Cleaner	⇨ *Fig 15. (B-5)*

Tool Detail Reference

Note: *Not all service tools are illustrated.*

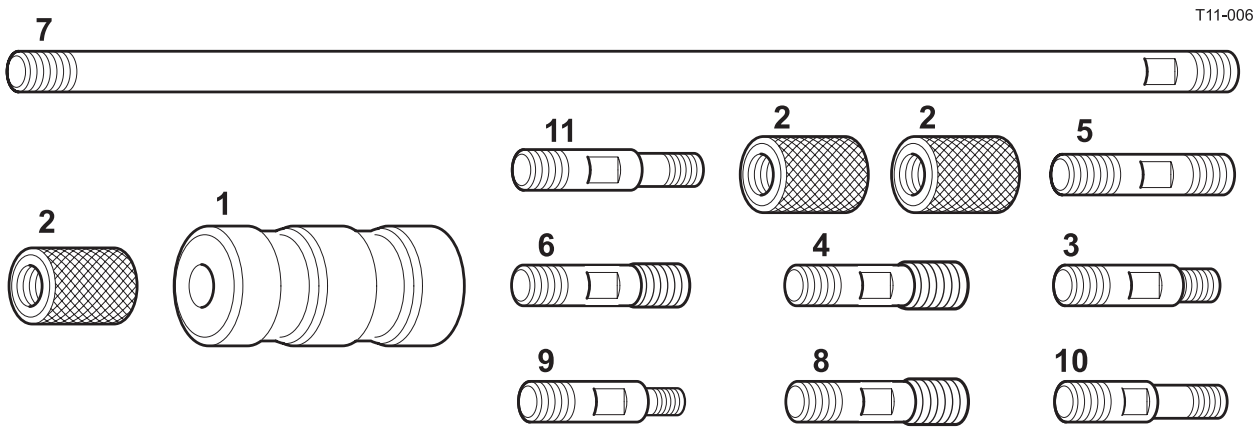

Fig 1. 993/68100 Slide Hammer Kit

1	993/68101	Slide Hammer	**7**	993/68107	Bar - M20 x M20 X 800 mm
2	993/68102	End Stops	**8**	993/68108	Adaptor - M20 x 7/8" UNF
3	993/68103	Adaptor - M20 x 5/8" UNF	**9**	993/68109	Adaptor - M20 x M12
4	993/68104	Adaptor - M20 x 1" UNF	**10**	993/68110	Adaptor - M20 x 5/8" UNF (Shoulder)
5	993/68105	Adaptor - M20 x M20	**11**	993/68111	Adaptor - M20 x 1/2" UNF
6	993/68106	Adaptor - M20 x M24			

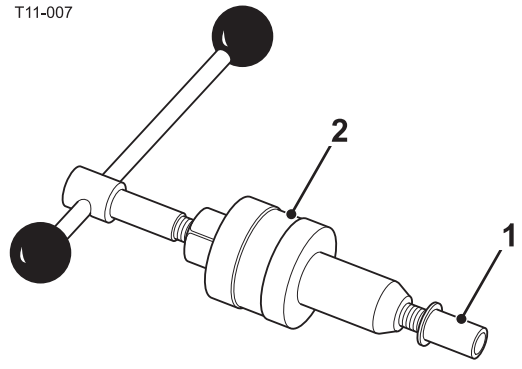

Fig 2. Rivet Nut Tool

1	826/01099	M6 x 16 mm Rivet Nut
	826/01101	M6 x 19 mm Rivet Nut
	826/01102	M8 x 18 mm Rivet Nut
	826/01103	M8 x 21 mm Rivet Nut
	826/01104	M10 x 23 mm Rivet Nut
	826/01105A	M10 x 26 mm Rivet Nut
2	-	Installation Tool available from: Bollhoff Fastenings Ltd (***www.bollhof.com***)

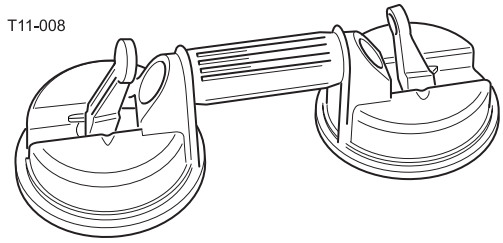

Fig 3. 892/00842 Glass Lifter

Minimum 2 off - Essential for glass installation, 2 required to handle large panes of glass. Ensure suction cups are protected from damage during storage.

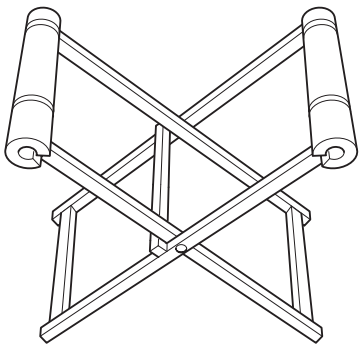

Fig 4. 892/00843 Folding Stand

Essential for preparing new glass prior to installation.

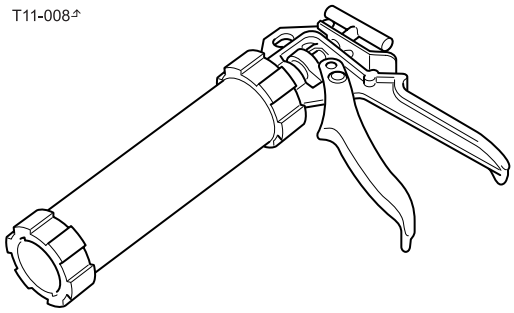

Fig 5. 892/00845 Cartridge Gun

Hand operated. Essential for the application of sealants, polyurethane materials etc.

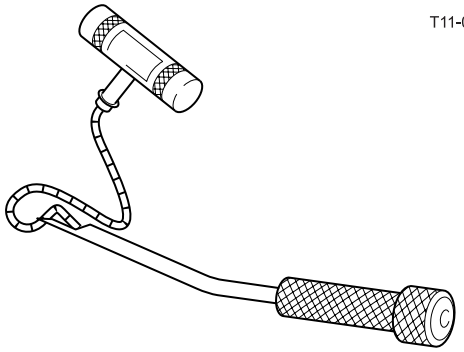

Fig 6. 892/00846 Glass Extractor (Handles)

Used with braided cutting wire to cut out broken glass. ⇨ *Fig 9. (B-4)*.

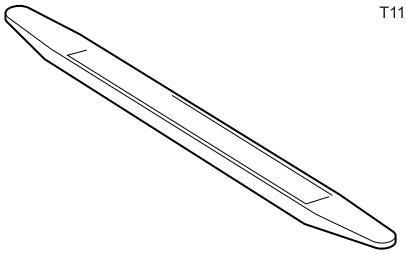

Fig 7. 892/00847 Nylon Spatula

General tool used for smoothing sealants - also used to re-install glass in rubber glazing because metal tools will chip the glass edge.

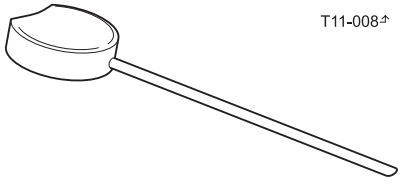

Fig 8. 892/00848 Wire Starter

Used to access braided cutting wire through original polyurethane seal. ⇨ *Fig 9. (B-4)*.

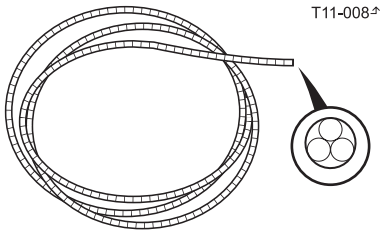

Fig 9. 892/00849 Braided Cutting Wire

Consumable heavy duty cut-out wire used with the glass extraction tool. ⇒ *Fig 6. (B-3)*. Approx 25 m length.

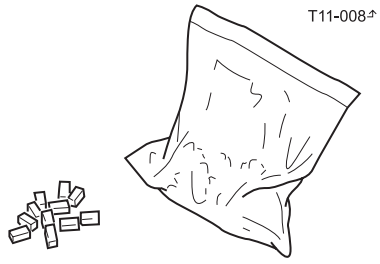

Fig 10. 926/15500 Rubber Spacer Blocks

Used to provide the correct set clearance between glass edge and cab frame. Unit quantity = 500 off.

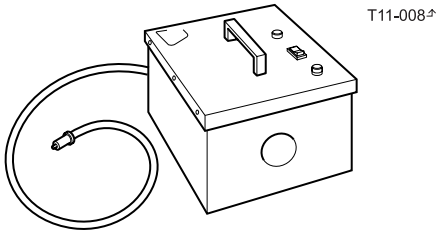

Fig 11. 992/12300 Mobile Oven 12V

1 cartridge capacity. Required to pre-heat adhesive prior to use. It is fitted with a male plug (703/23201) which fits into a female socket (715/04300).

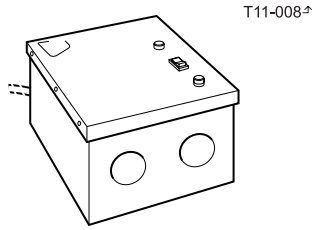

Fig 12. 992/12400 Static Oven 240V

Required to pre-heat adhesive prior to use. No plug supplied.

Note: *110V models available upon request - contact JCB Technical Service.*

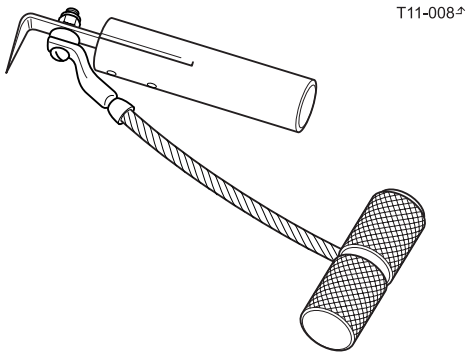

Fig 13. 992/12800 Cut-Out Knife

Used to remove broken glass.

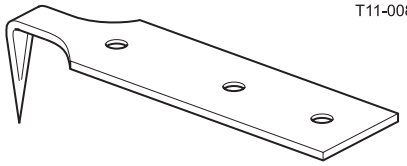

Fig 14. 992/12801 'L' Blades

25 mm (1 in.) cut. Replacement blades for cut-out knife. ⇒ *Fig 13. (B-4)*. Unit quantity = 5 off.

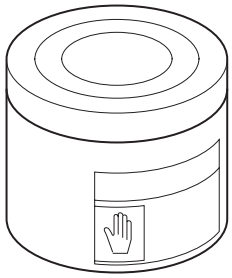

Fig 15. 4104/1310 Hand Cleaner

Special blend for the removal of polyurethane adhesives (454g; 1 lb tub).

Rivet Nuts

TB-001_2

A 'Rivet Nut' is a one piece fastener installed 'blind' from one side of the machine body/framework. The rivet nut **16-A** is compressed so that a section of its shank forms an 'upset' against the machine body/framework, leaving a durable thread **16-B**.

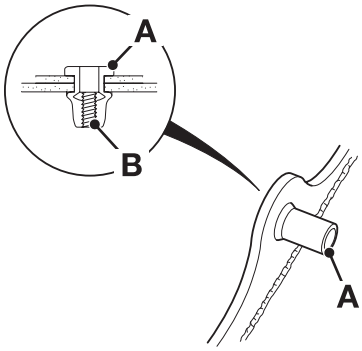

Fig 16.

Rivet nuts are fitted to various parts of the machine body and framework. They are used in a number of applications, for instance, hose clamp and hydraulic valve retention etc.

Various sized rivet nuts are available. ⇨ ***Table 1. Specifications (B-6)*** to determine the size of rivet nut to be used for particular applications.

If for any reason a new rivet nut requires fitting, then the correct installation procedure must be followed. ⇨ ***Fitting Procedure (B-7)***.

Note: *In an emergency, and if no installation tool is available, it is possible to fit a rivet nut by using a nut and bolt the same thread diameter as the rivet nut being installed. However, this is not the recommended method.*

Table 1. Specifications

Rivet Nut Thread Diameter	Rivet Nut Outside Diameter	Material Thickness	Rivet Length (Total)	Drill Hole Dia.
M5	7	0.25 - 3.00	14.00	7.10
		3.00 - 5.50	17.00	
M6	9	0.50 - 3.00	16.00	9.10
		3.00 - 5.50	19.00	
M8	11	0.50 - 3.00	18.00	11.10
		3.00 - 5.50	21.00	
M10	13	1.00 - 3.50	23.00	13.10
		3.50 - 6.00	26.00	

Note: *All dimensions in mm*

Fitting Procedure

1 Drill a hole in the machine body/framework where the rivet nut is to be fitted. De-burr hole edges.

2 Screw the rivet nut onto the mandrel of the installation tool. The bottom of the mandrel should be in line with the bottom of the rivet nut **17-A**.

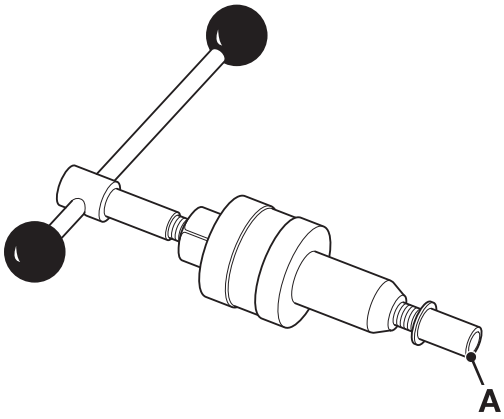

Fig 17.

3 Wind the body of the installation tool down the threaded mandrel until it touches the head of the rivet nut **18-B**.

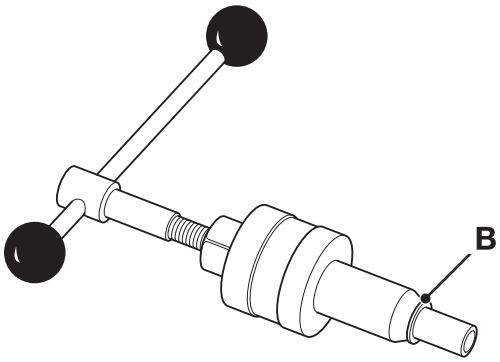

Fig 18.

4 Insert the rivet nut (assembled to the tool) into the hole drilled in step 1.

5 Hold handle **19-C** and at the same time draw the mandrel into the installation tool by turning nut **19-D**. The rivet nut will contract in length and form an 'upset' (smooth bulge) seating itself against the body/framework **19-E**.

Note: *The thread of the rivet nut must not be stripped, take care when 'upsetting' the rivet nut.*

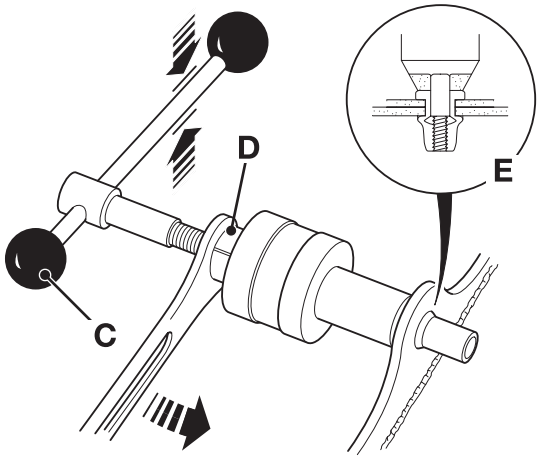

Fig 19.

6 Remove the installation tool.

Slide Hammer Kit

TB-003

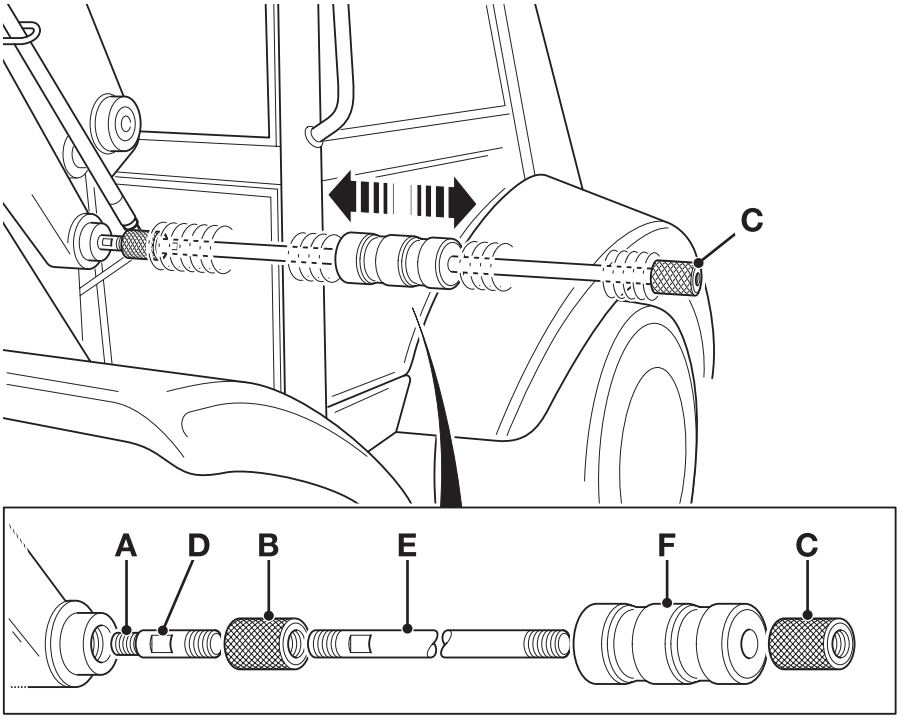

Fig 20. Typical M/c. Installation

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

The adaptors **20-A** that form part of the kit have a screwed thread at each end. One of the threads will always be M20 size, this is to accommodate the end stops, items **20-B** and **20-C**. The other end of the adaptor will have varying thread sizes to suit the different size of threads in the pivot pins.

Fitting Procedure

1 Prepare the pivot pin, for instance, if fitted, remove the pivot pin retaining bolt.

2 Determine the thread size of the pivot pin and then fit the appropriate adaptor **20-A** as shown. Use the spanner flats **20-D** to securely fit the adaptor.

3 Fit an end stop **20-B** onto the other end of the adaptor (M20 thread size), make sure that the adaptor threads are fully engaged.

4 Fit the 'slide bar' **20-E** into the end stop. Again make sure that the threads are fully engaged.

5 Fit the 'slide hammer', item **20-F**, onto the slide bar as shown.

6 Finally, fit another end stop, item **20-C**, at the end of the slide bar, as shown. The slide hammer kit is now ready to use.

7 To extract the pivot pin, slide the hammer along the bar until it contacts end stop **20-C**. Repeat this step until the pivot pin is released.

8 To remove the slide hammer kit, reverse steps 2 to 7.

Cab Air Conditioning (3CX, 4CX) SYSTEM

Related Topics

The table lists other topics in the section that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text contains cross-references to help you find the correct information.

Topic Titles:
⇨ *Air Conditioning Condenser (B-64)*
⇨ *Cab HVAC Unit (3CX, 4CX) (B-69)*
⇨ *Heater Valve (B-78)*

Specifications

Binary Pressure Switch Settings:		
Low Pressure	1.96 bar	(2.0 kgf/cm^2, 28.4 lbf/in^2)
High Pressure	27.5 bar	(28 kgf/cm^2, 400 lbf/in^2)
Thermostatic Switch Settings:		
Cut out	-0.6 °C	(33.0 °F)
Cut in	4.2 °C	(39.5 °F)
Refrigerant:		
R-134a	1.4 Kg (3.1 lb) Maximum charge	
Oil:		
Type	PolyAlkylene Glycol (PAG)	
Quantities - Recharge the system (1)		
Component Replacement:		
Condenser	1.5 fluid oz.	(42.6 ml)
Evaporator	3.0 fluid oz.	(85.2 ml)
Receiver Drier	0.3 fluid oz.	(8.5 ml)
Compressor	None - pre charged	
Hoses	If more than 4 metres of hose is replaced, then add 0.5 fluid oz. (15 ml) for every metre over 4 metres.	

(1) The quantity of oil replaced should be the same as that taken out during `Recovery' procedure.

R134a Refrigerant

TB-006

Refrigerants are the basic ingredient of all air conditioning systems and are used to transfer the heat energy around the system. Refrigerant type R134a is used in the air conditioning system. It's full chemical name is:

1, 1, 1, 2-Tetraflouroethane (CH2FCF2)

R134a is a HFC (HydrFlouroCarbon) and is non-toxic, non-flammable and non-explosive at normal atmospheric temperature and pressure. It can be flammable under certain pressure and air mixtures.

Due to environmental concerns, the use of ozone depleting chlorofluorocarbons (CFCs) in the air conditioning systems is being gradually phased out. The R-12 refrigerant used in some systems contains CFCs. Air conditioning systems using R-134a refrigerant are not compatible with systems using R-12 refrigerant. No attempt should be made to charge R-134a systems with R-12 refrigerant.

Important: *Refer to the safety procedures within this section before handling refrigerants.*

Good installation practice is required to avoid the release of refrigerant into the atmosphere. Refrigerant R134a contains no chlorine and has an Ozone Depleting Potential (ODP) of zero, and a Global Warming Potential (GWP) of 0.1.

PAG Type Refrigerant Oil

TB-007

The system requires a PAG type refrigerant oil to lubricate the compressor. The oil mixes with the refrigerant and is carried around the system.

It is important that the recommended grade of refrigerant oil is used. Mineral oil is not suitable for R134a refrigerant systems. Do not mix oil types.

The compressor is supplied with an oil charge, but additional oil will be required when the receiver drier is replaced. The oil is added to the compressor through the oil filling plug before the evacuation procedure is started.

Only use fresh, unused oil. Oil that has been exposed to the air will have absorbed water.

Operation Overview

System Operation

See component location ⇒ *Fig 1. (B-13)* and circuit diagram ⇒ *Fig 2. (B-14)*.

To maintain optimum operator comfort in warm climates or during seasons of high ambient temperature, the air conditioning system delivers cool, dehumidified air into the cab. Cooling is provided by passing the warm ambient air, together with recirculated air, over an evaporator matrix in the air conditioning unit.

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

The major components of the system are the compressor **A**, condenser matrix **B**, receiver drier **C**, expansion valve **D** and evaporator matrix **E**.

To operate the air conditioning, press switch **F** to switch the system on. Press switch **G** to operate the 3-speed heater fan. Rotate **H** to select the desired temperature. Control **J** enables the operator to select either recirculating air or fresh air from outside the machine. A combination of both is also obtainable.

Air conditioning system power is generated from the engine, via an electromagnetic clutch to the compressor. Three switches, connected in series, are included in the clutch supply line, all must be closed for the clutch and therefore the air conditioning system to operate.

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

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

The refrigerant passes through the receiver drier **C**, which contains a desiccant to remove moisture from the system.

The receiver drier serves as a reservoir for refrigerant and also includes a filter to remove foreign particles from the system.

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

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

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

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

Service connection points **X** and **Y** adjacent to the compressor are provided for connecting the pressure gauge manifold, when charging or testing the refrigerant. Connection **X** high pressure (red) and connection **Y** low pressure (blue).

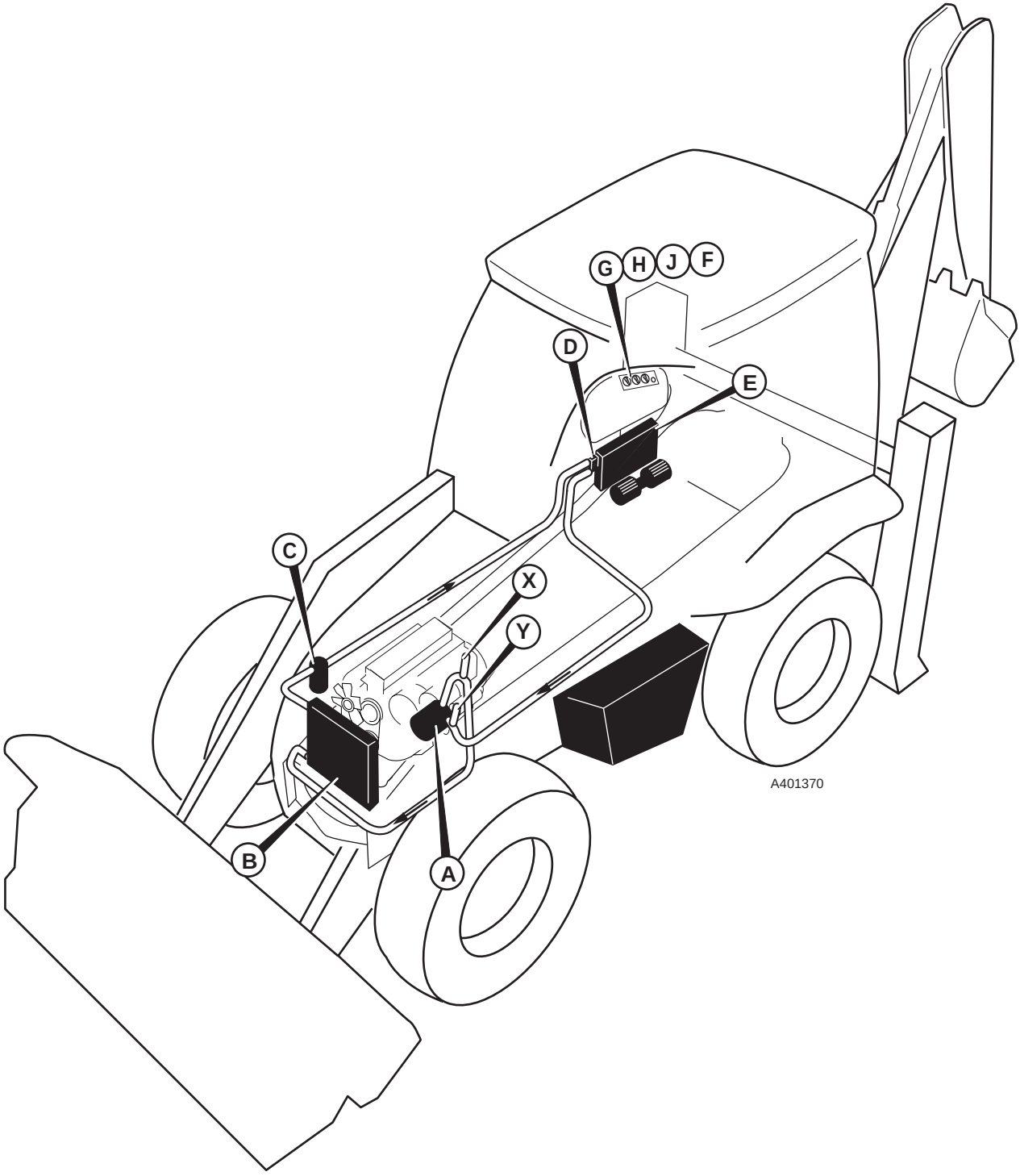

Fig 1. Component Location

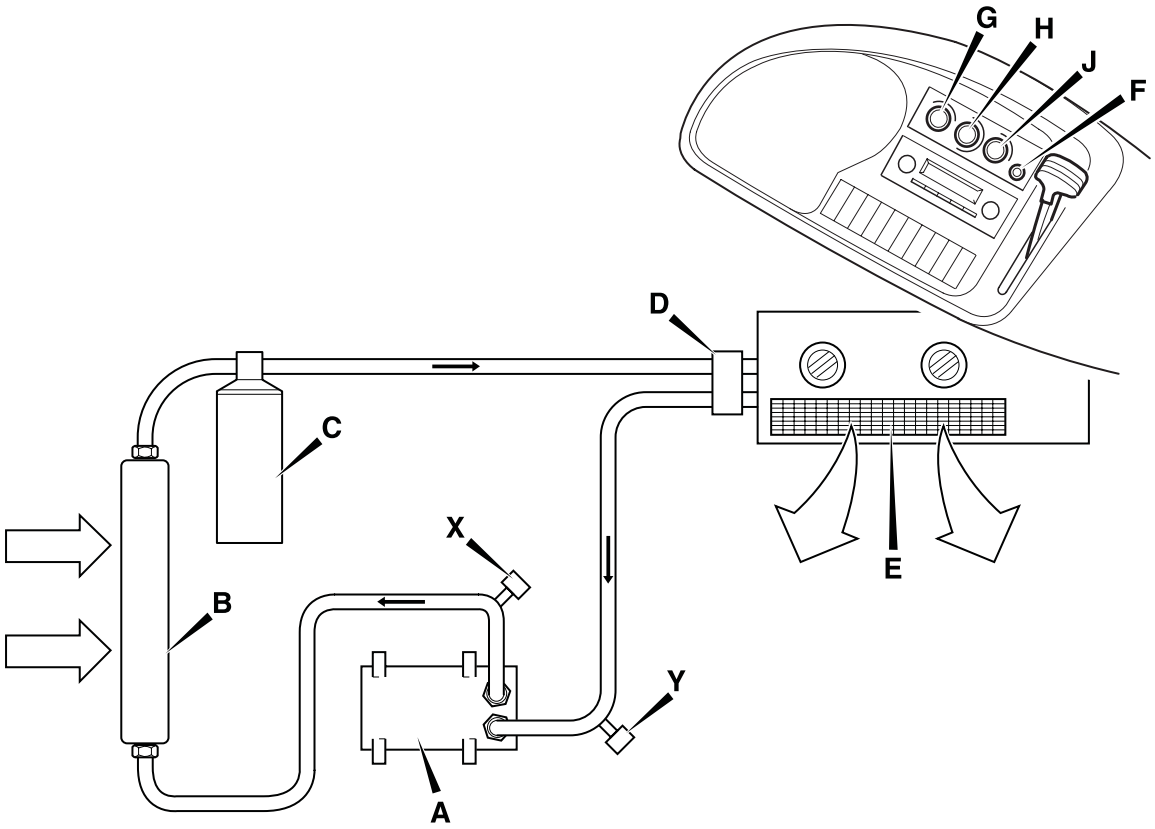

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Fig 2. Circuit Diagram

Component Key:

A	Compressor
B	Condenser matrix
C	Receiver drier
D	Expansion valve
E	Evaporator matrix
F	On, Off switch
G	Blower switch
H	Temperature control
J	Air recirculation control
X	Charging connector (High pressure)
Y	Charging connector (Low pressure)

System Control

Control of the system is achieved by the cyclic action of the compressor's electromagnetic clutch. When current is fed to the field coil of the compressor's clutch, a magnetic field develops between the field coil and the armature which pulls the field coil, complete with clutch assembly, onto the compressor's rotor. Since the clutch assembly is turned constantly by the crankshaft pulley drive belt, the compressor armature turns, starting the refrigeration cycle.

Current is fed to the field coil through three series switches whose contacts are controlled by the following:

a The manual air conditioning ON, OFF switch **F** in the control console.

b The freeze protection thermostat switch monitoring the evaporator temperature.

c The high and low level binary pressure switch.

The ON, OFF switch **F** will start the refrigeration cycle provided that the ambient temperature in the cab is greater than 0°C and the refrigerant pressure remains within the specified limits.

The thermostat has its sensor inserted in the evaporator matrix. It controls the refrigeration cycle by switching the compressor clutch on and off to prevent freezing of the condensate on the evaporator matrix.

The high and low level binary pressure switch assembly is located adjacent to the expansion valve on the HVAC unit. If the refrigerant pressure exceeds the upper pressure limit specified or falls below the lower limit, the contacts will open and the clutch will disengage, closing down the refrigeration cycle.

For details of the binary pressure switch settings ⇒ ***Specifications (B-10)***.

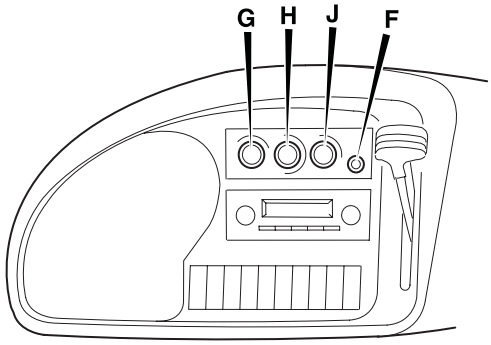

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Fig 3.

F Air conditioning ON, OFF switch.

G Blower - Turn to switch on the 3-speed heater fan. Turn further clockwise for faster speeds. It functions only with the starter switch ON.

H Temperature - Turn clockwise to increase the heat.

J Air Recirculation - Turn clockwise to recirculate air in the cab. Turn anti-clockwise for fresh air from outside. The control can be adjusted to give a combination of recirculated air and fresh air.

Electrical Operation and Schematics

Electrical Description

The schematic diagrams in this section show how the electrical circuits works when different functions are operated.

The wire numbers and colours, where appropriate, are shown as an aid to identification while fault finding. The wires coloured red show the electrical live feeds. The wires coloured green show the electrical returns to earth.

Before fault finding make sure that you understand how the electrical circuits work. Most potential faults can be traced using a multimeter to carry out continuity checks on wires, switches and solenoids.

Refrigeration Cycle Started: ⇒ *Fig 4. (B-17)*. The air conditioning electrical circuit controls the compressor's electro-magnetic clutch.

When the blower switch **E** in the side console is set to ON, the switch contacts connect a live feed to the air conditioning switch **A**. When the air conditioning switch is set to ON, the switch contacts connect the live feed through the binary pressure switch **B**, and freeze protection thermostat **C**, to energise the clutch coil **D** at the compressor. The compressor clutch engages and the refrigeration cycle starts. While the clutch coil remains energised, the compressor circulates the refrigerant around the system, which cools the air in the cab.

Refrigeration Cycle Stopped: ⇒ *Fig 5. (B-17)*. The freeze protection thermostat and binary pressure switch prevent the air temperature from becoming too cold.

If the condensate starts to freeze on the evaporator matrix in the cab, the contacts inside the freeze protection thermostat **C** will open. In the same way, if the refrigerant pressure is higher or lower than the system specified limit, the contacts inside the binary pressure switch **B** open.

The switch contacts break the electrical feed to the clutch coil **D**, which then de-energises. The compressor clutch disengages and the refrigeration cycle stops.

Blower Switch (3-speed): The circuit is shown with the blower switch **E** set to low speed. In low speed and medium speed only, the switch contacts direct the current through resistors **F**. The resistors decrease the current voltage thereby limiting the speed (rpm) of the blower motor **G**.

Component Key:

A Air conditioning switch
B Binary pressure switch
C Freeze protection thermostat
D Compressor clutch coil
E Blower switch (3-speed)
F Resistors
G Blower motor
H Switch illumination

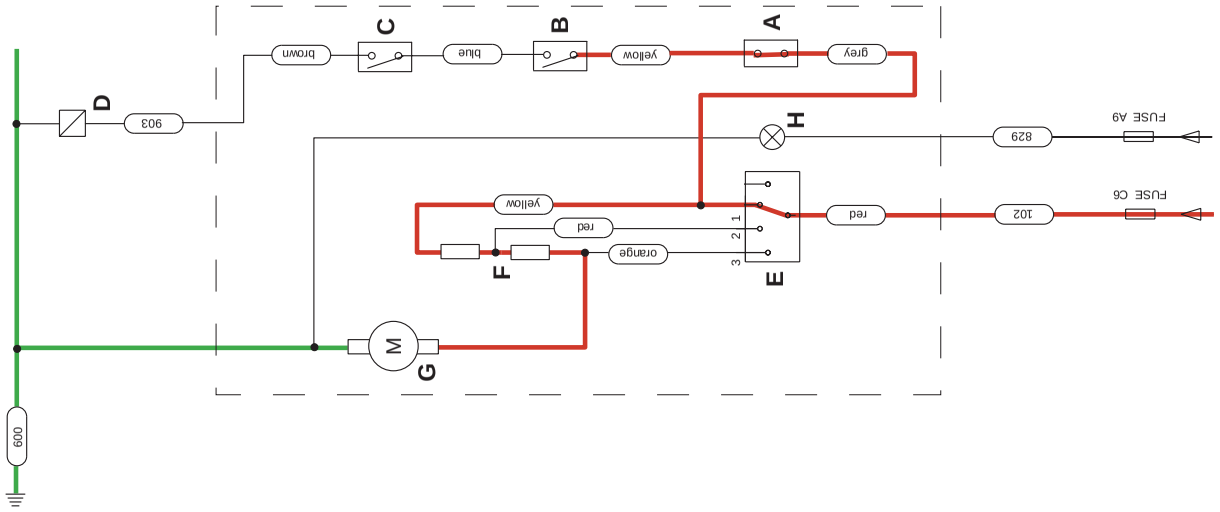


Fig 5. Refrigeration Cycle Stopped

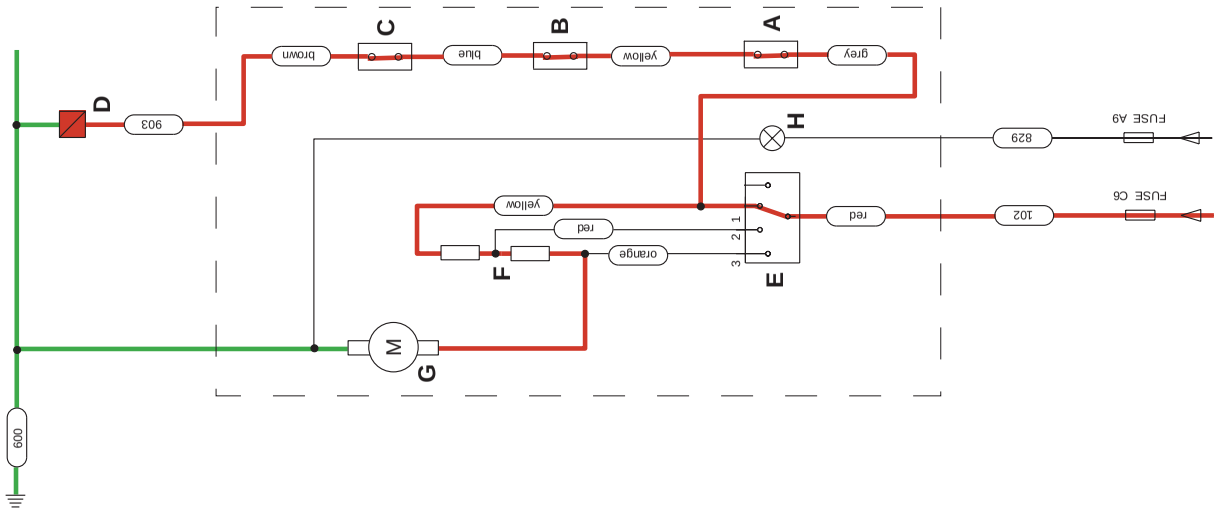


Fig 4. Refrigeration Cycle Started

Wires and Connectors

⇒ *Fig 6. (B-19)*. On the electrical diagram the electrical connectors (example, CA to NH) are shown looking on the mating face of each connector when they are disconnected.

The wire numbers and colours, where appropriate, are shown as an aid to identification whilst fault finding.

Before fault finding make sure that you understand how the electrical circuits work.

Earth Points

Faults may be caused by poor earth connections. Although earth connections are shown, it must be remembered that the cab assembly is earthed via further earth strap and cable connections. For details of these connections refer to ***Section C, Machine Earth Connections***.

Component Key:

The following key identifies the component connectors on the electrical diagram. Note that the wires coloured red show the electrical `live feed'. The wires coloured green show the electrical `return to earth'. For harness drawings refer to ***Section C, Harness Data***.

h1	Harness - Side Console/Cab
h2	Harness - Engine/Mainframe
h3	Harness - Heating, Ventilation and Air Conditioning (HVAC) Unit (Bergstrom)

Connectors (h1)

CA	h1 - h2
CCA	Fusebox A
CCC	Fusebox C
DB	Heater Control
DBA	Heater Jumper
DR2	Earth Point
DR3	Earth Point
DS	h1 - h3
DZ	A/C Compressor Relay (not used)

Connectors (h2)

NH	h2 - h1
MB1	Earth Point
MM	A/C Compressor Clutch Solenoid

Connectors (h3)

1	h3 - h1
2	A/C On/Off Switch and Panel Illumination
3	Heater Blower Switch (3-speed)
4	Binary Pressure Switch
5	Freeze Protection Thermostat
6	Blower Resistor
7	Heater Blower Motor

Splices (h1)

SC
SG
SM
TH

Splices (h2)

SA

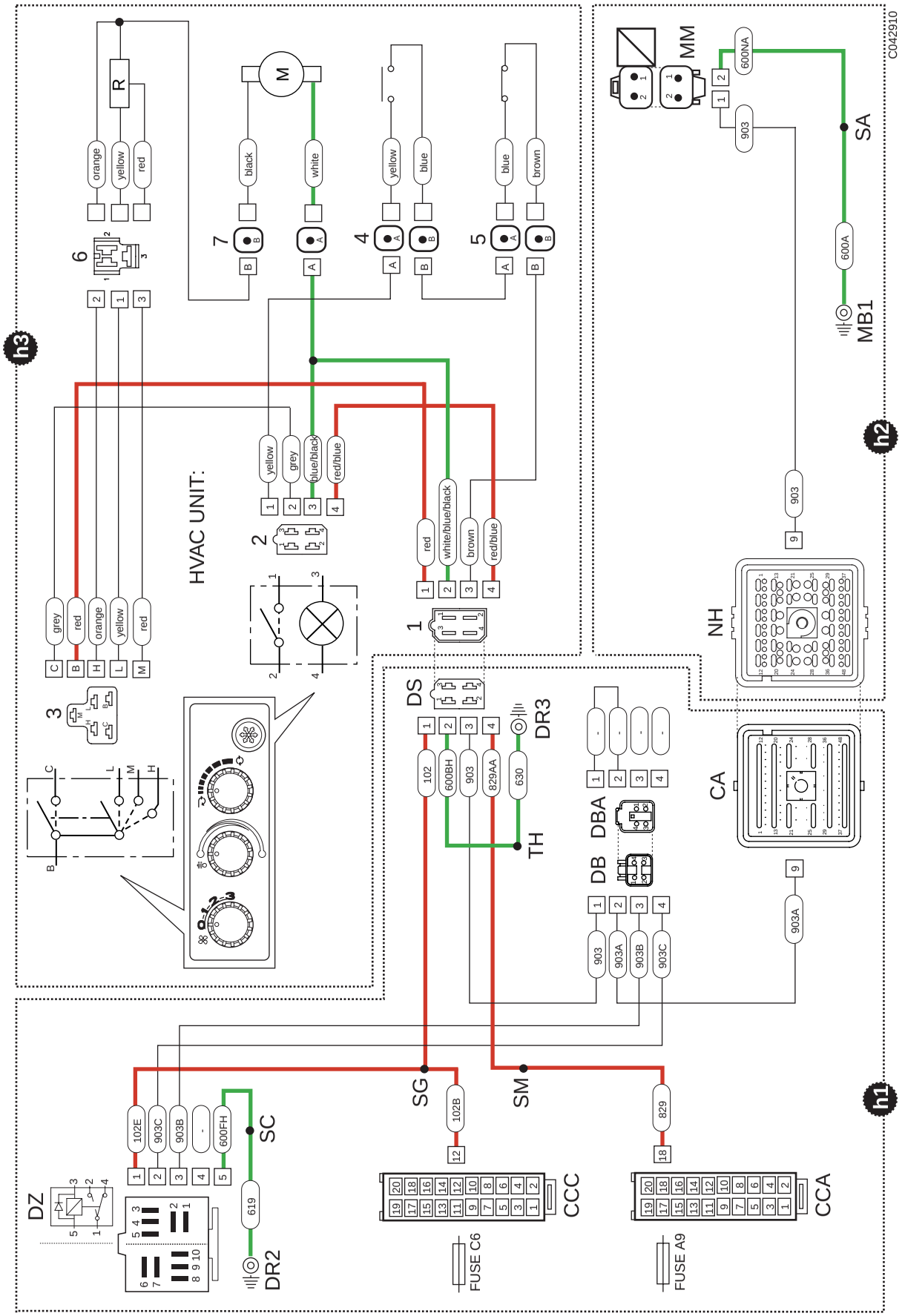


Fig 6. 3CX, 4CX Machines and Variants

Safety Procedures

The air conditioning system includes a pressurised closed circuit containing a non-CFC, environmentally friendly refrigerant, Type R-134a. Any service procedure which breaks into the closed circuit and therefore requires discharging of the system, must only be carried out by service personnel with specialist knowledge of air conditioning systems. The following guidelines should be adhered to by all personnel servicing the air conditioning system.

⚠ WARNING

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

4-3-4-1_2

⚠ CAUTION

Do not operate the air conditioning system when there is no refrigerant in the system, otherwise the compressor will be damaged.

4-3-4-4

1 It is critical that the correct refrigerant (R-134a) is used and that charging is done only by qualified personnel. It is illegal to discharge the refrigerant into the atmosphere but as a precaution in case of accidental leakage, discharging and charging of the vehicle refrigerant system must be conducted in a well-ventilated area.

2 Containers of refrigerant should be stored in a cool environment away from direct sunlight.

⚠ WARNING

Do not carry out welding operations close to the air conditioning refrigerant circuit. A poisonous gas is produced when refrigerant comes into contact with naked flames. Do not smoke or allow naked flames close to the refrigerant circuit.

BF-1-9

3 **DO NOT** perform welding operations close to refrigerant hoses (maintain a distance of at least 0.5m from hoses).

4 **DO NOT** steam clean refrigerant system components.

5 When charging or discharging the refrigerant system, no smoking or naked flames should be allowed in the immediate vicinity. The refrigerant does not give off a poisonous odour, however, when it comes into contact with a naked flame, a poisonous gas is produced.

6 When handling refrigerant, rubber gloves and goggles should be worn. Operators should ensure no refrigerant comes into contact with the skin. Particular care should be taken when connecting or disconnecting charging hoses or pressure switches. When these components are connected to the system, a short release of refrigerant occurs. This results in a high velocity, very cold gas being emitted from the connection point.

7 When checking the state of the refrigerant at the receiver drier sight glass, it is necessary to run the engine with the bonnet raised. Extreme care must be taken to avoid moving engine parts such as fans, pulleys and belts.

8 Use caution when working near exposed evaporator fins. Painful cuts can be inflicted by the edges of the fins. Also, damage to the fins will reduce the efficiency of the system.

9 Make sure pressure cylinders are not over filled, particularly when recovering refrigerant.

10 Disconnect battery before doing any work.

⚠ WARNING

PAG type oil is an irritant.It can cause skin irritation. Breathing PAG vapour can cause irritation of the eyes, nose and lungs. Prolonged inhalation can cause drowsiness.

BF-1-11

⚠ WARNING

PAG oil vapour is extremely flammable. Do not smoke or eat near PAG contaminated material. Exercise caution when working around hot and moving engine parts.

BF-1-12

Service Checks

The air conditioning system needs to be checked regularly to ensure efficient and safe operation.

Before commencing any service operations, carry out a basic service check as described below:

1 Start the engine and operate at fast idle speed (1000 RPM).

2 Switch on the air conditioning and set to maximum cooling.

Note: *The cab temperature needs to be above 20°C. At low ambient temperatures it may be necessary to operate the heating system to prevent the air conditioning system switching off.*

3 Operate the engine at operating temperature for five to ten minutes.

4 Close the cab door and windows and allow the internal temperature to stabilise.

5 Measure the temperature at the evaporator outlets. The temperature should change as the compressor clutch cycles in and out. The outlet temperature with the clutch engaged should be significantly below ambient (4°C to 10°C) rising by 6°C to 8°C when the clutch disengages.

6 Stop the engine when the tests are complete.

Off-Season Operation

During the off-season, the air conditioning system should be operated for at least five minutes every month to circulate the oil in the system to lubricate the fittings and seals.

When operating the system, ensure that:

1 Engine idle speed is greater than 1000 RPM.

2 Ambient temperature is greater than 0°C.

3 Cab temperature is greater than 20°C.

4 The engine is at normal operating temperature.

Fault Finding

Fault Indications

There are several indications that may help to determine the fault area on a system not working efficiently:

Table 1. General Fault Indications

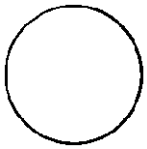
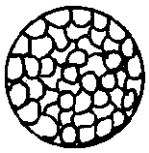
Fault	Possible Cause	Action
Poor Performance.	Low system pressure.	Evacuate and recharge system.
	Condenser matrix air flow restricted.	Remove debris from around matrix using compressed air or low pressure water.
	Air filter blocked.	Remove and replace.
	Compressor drive belt slipping.	Check condition of front end accessory drive belt (FEAD) and auto tensioner mechanism.
Warm or slightly cool air emitted from unit.	Expansion valve stuck open or closed.	Renew expansion valve.
Blower operates on fan speed 3 only.	Blower resistor failed.	Renew resistor.
	Blower motor failed.	Renew complete blower unit.
Blower does not operate.	Fuse blown.	Replace fuse and retest.
Compressor clutch continually cuts out.	Condenser matrix blockage.	Remove debris from around matrix or renew condenser.
	Overcharging of refrigerant system.	Evacuate and recharge system.
	Blocked expansion valve or condenser.	Clear blocked component.

The system will not function in very low ambient temperatures, therefore tests should be carried out in a warm environment.

It is recommended that, to locate faults on the system accurately and quickly, an electronic leak detector and a refrigerant pressure gauge should be used. However, leaks can be detected on the system by using soapy water applied to the suspected leak area and system pressure can be assessed by the state of refrigerant passing through the receiver drier sight glass. Following sections of the manual deal with the major components of the air conditioning systems and give further fault finding and maintenance information.

⇨ *Table 2. Sight Glass Indications (B-23)* and ⇨ *Table 3. No Air Conditioning (B-24)*.

Table 2. Sight Glass Indications

	Clear - No fault indicated unless the system is unable to provide cool air. The indication then is that the system is completely discharged of refrigerant.
	Foam or bubbles - Refrigerant low and in need of charging.
	Clouded - Desiccant breakdown in the receiver drier.

An approximate indication of the condition of the refrigerant can be seen through the receiver drier sight glass when the compressor is running. ⇨ ***Refrigerant Charge Level (🗋 B-35)***.

Note: *Sight glass indications cannot always give a positive identification of a problem. Further diagnosis, preferably by a refrigeration engineer using pressure gauges, is advisable before reaching a definite conclusion.*

Table 3. No Air Conditioning

Check			Action
1	Are the controls set correctly, i.e. air conditioning selected, thermostat switch set to coldest position and blower switched on?	**YES:**	Check 2.
		NO:	Reset controls and retest.
2	Is the air conditioning (evaporator) blower working?	**YES:**	Check 3.
		NO:	Check 4.
3	Is the compressor running (visual check of pulley and clutch)?	**YES:**	Check 9.
		NO:	Check 5.
4	Is the air conditioning fuse(s) blown? For details of the electrical circuit and connections ⇨ ***Electrical Operation and Schematics (B-16)***.	**YES:**	Renew fuse(s) and retest.
		NO:	Check 8.
5	Is there a 12V supply to the pressure switch harness? For details ⇨ ***Binary Pressure Switch (B-36)***.	**YES:**	Check 6.
		NO:	Check 7.
6	Does the compressor clutch engage with pressure switch assembly bypassed?	**YES:**	Replace pressure switch assembly.
		NO:	Renew the compressor clutch and retest.
7	Does the clutch engage with thermostat switch bypassed?	**YES:**	Renew thermostat switch and retest.
		NO:	Check all electrical connections.
8	Are blower switch and wiring OK?	**YES:**	Renew blower unit complete.
		NO:	Renew switch or wiring.
9	Is sight glass indication OK?	**YES:**	Check 10.
		NO:	Charge check required by refrigeration engineer or suitably trained person.
10	Is condenser air flow blocked?	**YES:**	Clean condenser and radiator.
		NO:	Check 11.
11	Is evaporator air flow blocked?	**YES:**	Clean filter and, if necessary the evaporator.
		NO:	Call in refrigeration engineer, or suitably trained person.

System Diagnosis using Test Gauges

This section gives an overview of the following system conditions:

1 ⇨ *Normally Functioning Air Conditioning System (B-25)*.

2 ⇨ *Low R-134a Charge (B-26)*.

3 ⇨ *Poor Refrigerant Circulation (B-27)*.

4 ⇨ *No Refrigerant Circulation (B-28)*.

5 ⇨ *Insufficient Cooling of Condenser or Refrigerant Overcharge (B-29)*.

6 ⇨ *Air in System (B-30)*.

7 ⇨ *Expansion Valve Improperly Mounted or Defective (Opening Too Wide) (B-31)*.

8 ⇨ *Compressor Malfunction (B-32)*.

9 ⇨ *Some Moisture in the System (B-33)*.

Normally Functioning Air Conditioning System

Gauge Readings:

Low Side Gauge - Normal.

High Side Gauge - Normal.

Other Indications:

Sight Glass - Clear.

Discharge Air - Cold.

The pressures displayed on the manifold gauges at 25 °C with the engine at 1500 RPM, the blower on maximum and the thermostat set to maximum, should be as shown at ⇨ *Fig 7. (B-25)* (i.e. typically, the high pressure is nominally 6 to 8 times greater than the low pressure).

Normal gauge readings will depend on system components and ambient conditions, make sure that the valves are closed and the readings are stable and that the system has a full charge.

Note: *The gauge hoses are normally colour coded, `Blue' for low side and `Red' for high side gauges.*

LOW SIDE (Blue)	HIGH SIDE (Red)
Normal	Normal

LOW SIDE: 2.0 bar (2.0 kgf/cm²; 29 lbf/in²)

HIGH SIDE: 14.8 bar (15.1 kgf/cm²; 215 lbf/in²)

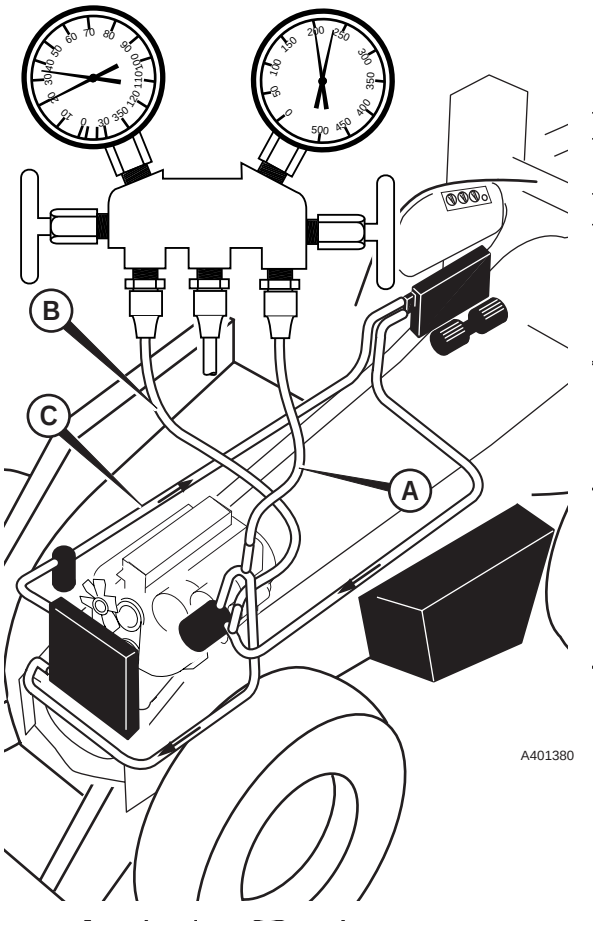


Fig 7.

Component Key:

A High pressure and high temperature gas.

B Low pressure and low temperature gas.

C High pressure liquid.

Low R-134a Charge

LOW SIDE (Blue)	HIGH SIDE (Red)
Low	Low

LOW SIDE: 0.76 bar (0.77 kgf/cm^2; 11 lbf/in^2)

HIGH SIDE: 8.3 bar (8.5 kgf/cm^2; 121 lbf/in^2)

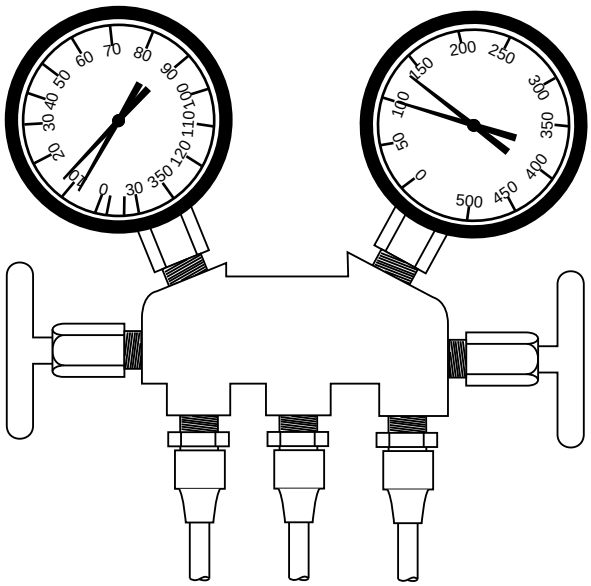


Fig 8.

Gauge Readings:

Low Side Gauge - Low.

High Side Gauge - Low.

Other symptoms:

Sight Glass - Bubbles continuously visible.

Diagnosis:

System slightly low on R-134a, due to leak or incorrect charge.

Correction:

1. Leak test system.
2. Evacuate the air conditioning system.
3. Repair system leaks.
4. Charge system with R-134a.
5. Operate system and check performance.

Poor Refrigerant Circulation

LOW SIDE (Blue)	HIGH SIDE (Red)
Zero to negative	Low

LOW SIDE: -1.0 bar (-1.1 kgf/cm^2; -15 lbf/in^2)

HIGH SIDE: 5.4 bar (5.5 kgf/cm^2; 78 lbf/in^2)

Gauge Readings:

Low Side Gauge - Zero to negative.

High Side Gauge - Low.

Other symptoms:

Receiver Drier - Frost on tubes from receiver drier to evaporator unit.

Diagnosis:

Refrigerant flow obstructed by dirt, receiver drier **clogged.**

Correction:

1. Evacuate the air conditioning system.
2. Replace receiver drier.
3. Charge system with R-134a.
4. Operate system and check performance.

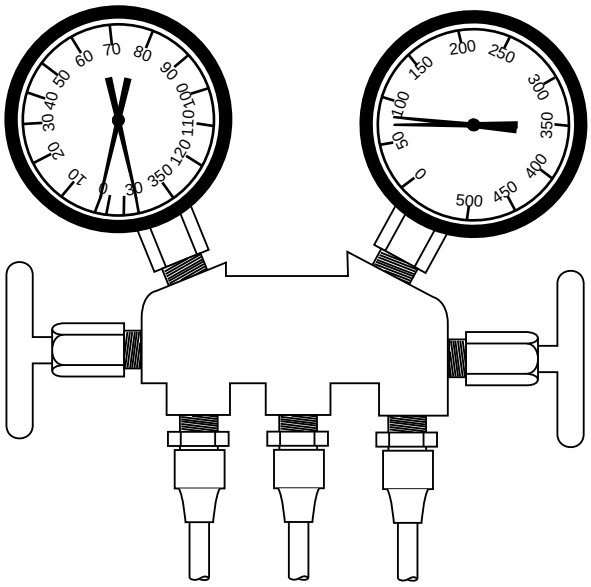


Fig 9.

No Refrigerant Circulation

LOW SIDE (Blue)	HIGH SIDE (Red)
Zero to negative	Low

LOW SIDE: -1.0 bar (-1.1 kgf/cm^2; -15 lbf/in^2)

HIGH SIDE: 5.4 bar (5.5 kgf/cm^2; 78 lbf/in^2)

Gauge Readings:

Low Side Gauge - Zero to negative.

High Side Gauge - Low.

Other symptoms:

Receiver Drier - Frost or moisture on tubes before and after receiver drier.

Diagnosis:

Refrigerant flow obstructed by dirt, moisture or gas leakage from expansion valve heat sensing tube.

Correction:

1. Evacuate the air conditioning system.
2. Check heat sensing tube at expansion valve. Replace expansion valve if necessary.
3. Remove expansion valve and attempt removal of dirt. If dirt cannot be removed, replace expansion valve.
4. Replace receiver drier.
5. Charge system with R-134a.
6. Operate system and check performance.

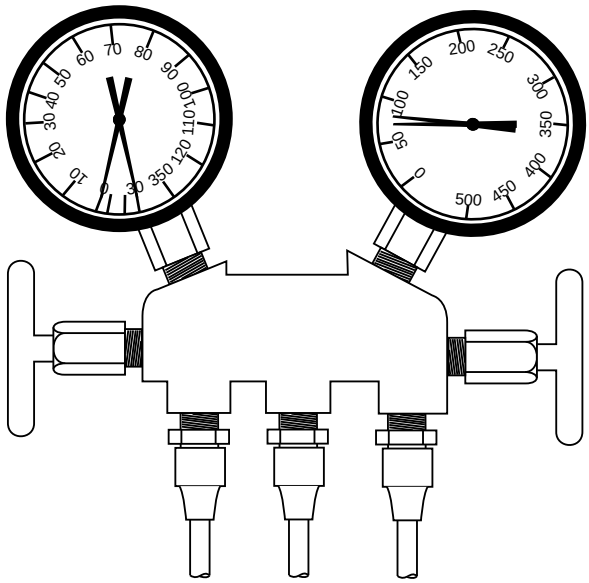


Fig 10.

Insufficient Cooling of Condenser or Refrigerant Overcharge

Gauge Readings:

Low Side Gauge - High.

High Side Gauge - High.

Other symptoms:

Sight Glass - No bubbles visible even at lower engine RPM.

Diagnosis:

Refrigerant overcharge, condenser cooling fins clogged with dirt or cooling fans malfunctioning.

Correction:

1. Clean condenser cooling fins.
2. Check cooling fan operation.
3. Evacuate the air conditioning system.
4. Charge system with R-134a.
5. Operate system and check performance.

LOW SIDE (Blue)	HIGH SIDE (Red)
High	High

LOW SIDE: 3.0 bar (3.0 kgf/cm^2; 43 lbf/in^2)

HIGH SIDE: 22.1 bar (22.5 kgf/cm^2; 320 lbf/in^2)

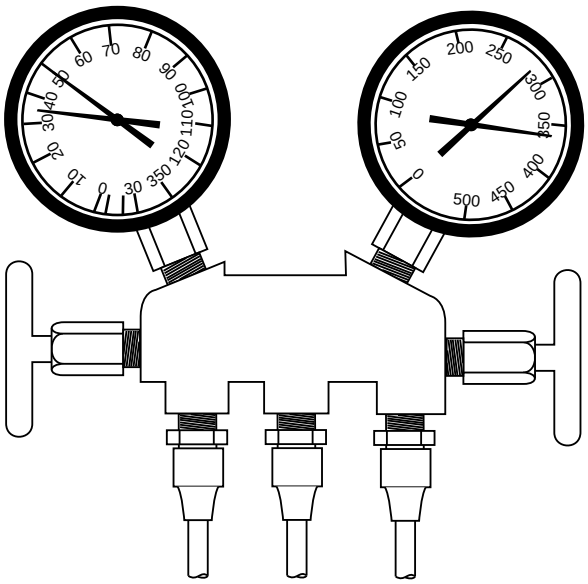


Fig 11.

Air in System

Gauge Readings:

Low Side Gauge - High.

High Side Gauge - High.

Other symptoms:

Sight Glass - Bubbles visible during system operation.

Pipes - Low pressure pipes are hot to the touch.

Diagnosis:

Air is present in the system, possibly from inadequate evacuation procedure.

Correction:

1. Evacuate the air conditioning system.
2. Check compressor oil for contamination. Check compressor for proper oil amount. Correct if necessary.
3. Charge system with R-134a.
4. Operate system and check performance.

LOW SIDE (Blue)	HIGH SIDE (Red)
High	High

LOW SIDE: 2.8 bar (2.8 kgf/cm^2; 40 lbf/in^2)

HIGH SIDE: 22.1 bar (22.5 kgf/cm^2; 320 lbf/in^2)

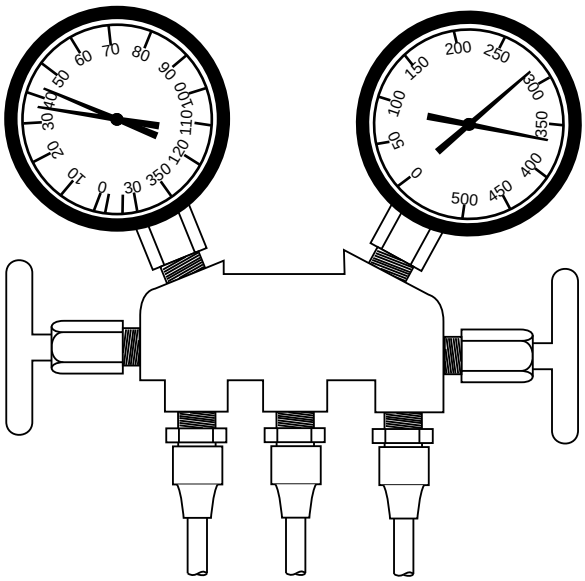


Fig 12.

Expansion Valve Improperly Mounted or Defective (Opening Too Wide)

Gauge Readings:

Low Side Gauge - High.

High Side Gauge - High.

Other symptoms:

Pipes - Large amount of frost or moisture on low side pipes.

Diagnosis:

Excessive refrigerant in low side pipes possibly from expansion valve being opened too wide.

Correction:

1. Leak test system.
2. Evacuate the air conditioning system.
3. Repair system leaks.
4. Charge system with R-134a.
5. Operate system and check performance.

LOW SIDE (Blue)	HIGH SIDE (Red)
High	High

LOW SIDE: 3.5 bar (3.5 kgf/cm^2; 50 lbf/in^2)

HIGH SIDE: 22.1 bar (22.5 kgf/cm^2; 320 lbf/in^2)

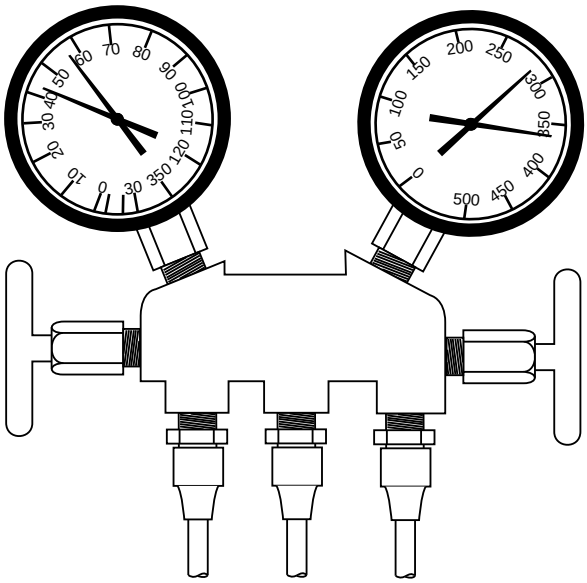


Fig 13.

Compressor Malfunction

Gauge Readings:

Low Side Gauge - High.

High Side Gauge - Low.

Diagnosis:

Internal compressor leak or compressor mechanically broken.

Correction:

1. Evacuate the air conditioning system.
2. Repair or replace compressor.
3. Charge system with R-134a.
4. Operate system and check performance.

LOW SIDE (Blue)	HIGH SIDE (Red)
High	Low

LOW SIDE: 4.9 bar (5.0 kgf/cm^2; 71 lbf/in^2)

HIGH SIDE: 8.3 bar (8.5 kgf/cm^2; 121 lbf/in^2)

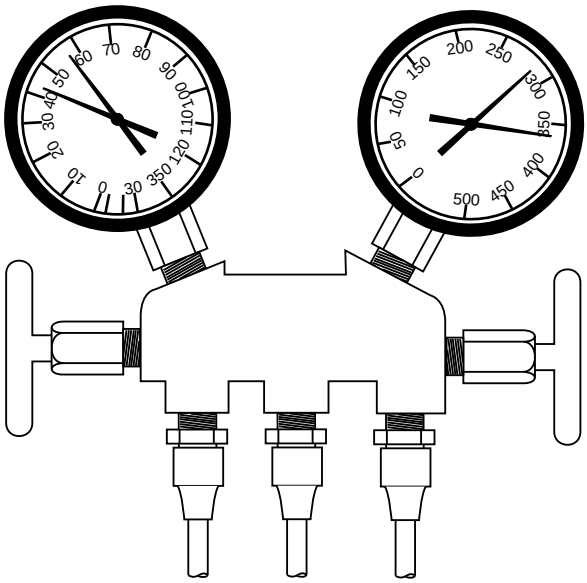


Fig 14.

Some Moisture in the System

LOW SIDE (Blue)	HIGH SIDE (Red)
Normal to low	Normal to high

LOW SIDE: -2.1 bar (-2.1 kgf/cm^2; -30 lbf/in^2)

HIGH SIDE: 14.8 bar (15 kgf/cm^2; 214 lbf/in^2)

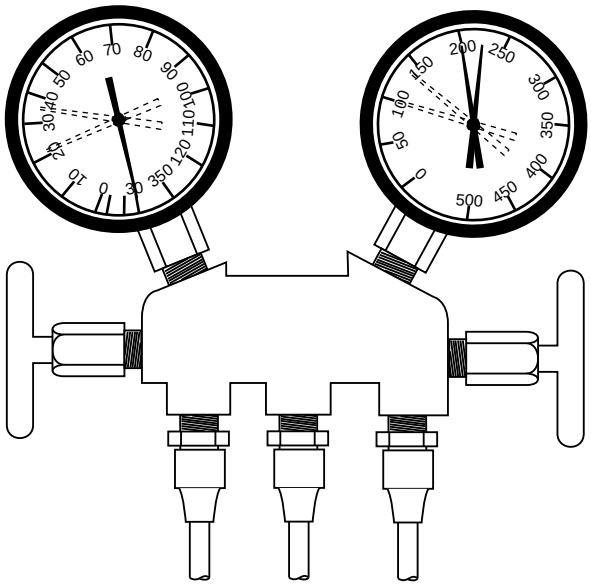


Fig 15.

Gauge Readings:

Low Side Gauge - Normal, then sometimes drops to below zero.

High Side Gauge - Normal, then sometimes goes high.

Diagnosis:

Moisture in system freezes, temporarily stopping cycle, normal system operation returns when ice melts.

Correction:

1. Evacuate the air conditioning system.
2. Replace receiver drier.
3. Remove moisture by repeatedly evacuating system.
4. Charge system with R-134a.
5. Operate system and check performance.

Test Procedures

Leak Testing

TB-004

⚠ WARNING

Leak testing in Air Conditioning systems should be carried out only in a well ventilated area.

BF-1-2

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

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

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

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

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

Tightening Leaking Hoses

⚠ WARNING

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

4-3-4-1_2

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

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

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

Refrigerant Charge Level

The pressure in the system, i.e. the refrigerant charge level can be determined by checking the state of refrigerant at the receiver drier sight glass **A**.

If the level of charge is correct the sight glass will be clear. If the charge is low bubbles will be seen. Bubbles may also be an indication of inadequate cooling, due to a restriction of air flow around the condenser coil. Recharging of the system should be carried out by an air conditioning engineer. Check refrigerant charge level as follows:

Note: *When R-134a refrigerant is used slight bubbling will be seen at the system sight glass. This is normal for this type of refrigerant. If the system is not providing adequate cooling* ***⇨ Fault Finding (B-22)***.

1 Park the machine on firm, level ground. Lower the backhoe and loader to the ground.

2 Remove the starter key.

3 Remove the front grille.

⚠ WARNING

When the engine is turning, there are parts rotating in the engine compartment.

Before starting this job make sure that you have no loose clothing (cuffs, ties etc) which could get caught in rotating parts.

When the engine is turning, keep clear of rotating parts

2-3-3-10

4 Start the engine and run at idle. Switch the air conditioning ON to circulate refrigerant.

5 Check the refrigerant charge level at the receiver drier sight glass **A**.

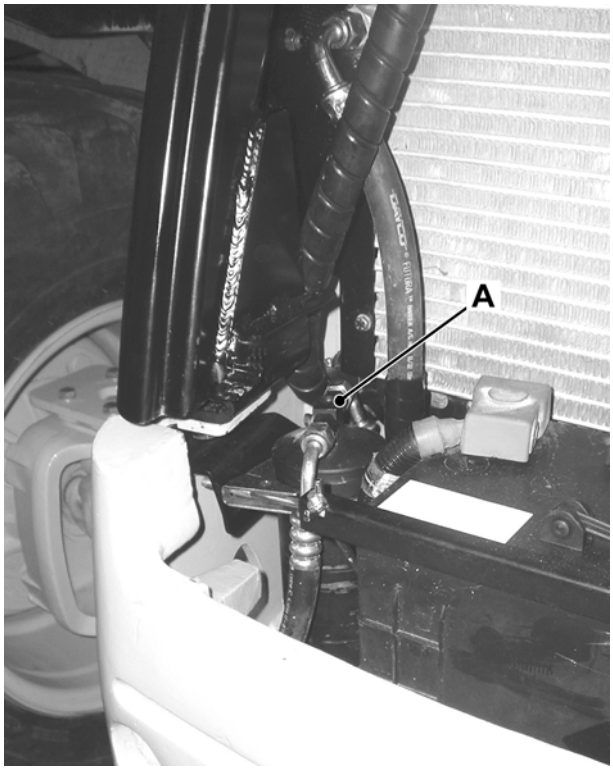


Fig 16.

Binary Pressure Switch

The binary pressure switch assembly **A** comprises of a low pressure switch and a high pressure switch.

When the refrigerant pressure is within the high and low pressure limits, both switches will be closed. Providing that the freeze protection thermostat and ON/OFF switches are also closed, a current will be supplied to the field coil of the compressor clutch.

If the fault finding table indicates that the binary pressure switch assembly is defective, the fault may be electrical or due to incorrect system pressure.

Before testing the binary pressure switch it is important to check the refrigerant charge level. ⇨ ***Refrigerant Charge Level (B-35)***. If the refrigerant charge level is satisfactory, test the switch as described below:

1 Stop the engine so that the air conditioning system cannot operate.

2 Working at the side console, undo the fixing screws from the instrument panel **X**. Carefully lift the instrument panel forward to gain access to the binary pressure switch on the side of the HVAC unit.

3 Disconnect the binary pressure switch harness **B** from the side console harness and connect an external 12V power supply between the pressure switch harness connector and chassis. If both pressure switches are working correctly, and the system is at the correct charge level, the compressor clutch will operate.

If the compressor clutch does not operate with the external power supply, one of the pressure switches in the assembly is faulty or the level of refrigerant charge is insufficient to close the low pressure switch.

4 Replace the pressure switch assembly. ⇨ ***Binary Pressure Switch (B-72)***. If the clutch still fails to operate, check the harness electrical wiring for damage and open or short circuits.

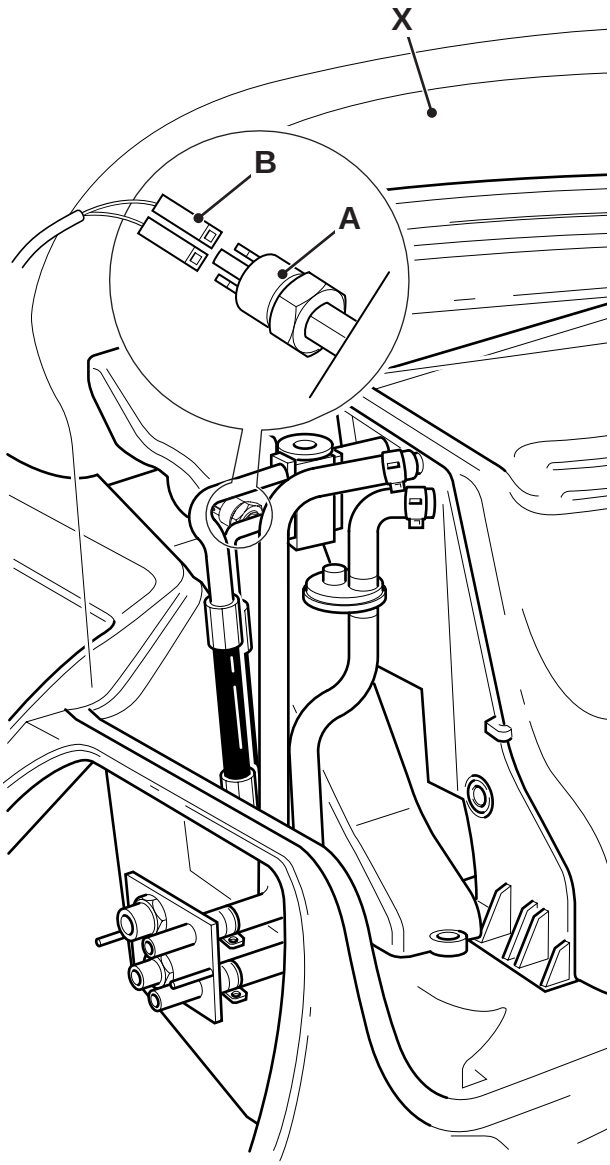


Fig 17.

Refrigerant

Refrigerant Charging and Discharging

TB-005

Note: *The procedures for refrigerant charging and discharging must only be carried out by qualified service personnel who have received specialist training on the air conditioning system.*

⚠ WARNING

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

4-3-4-1_2

Refrigerant Recovery

The recovery process clears the system refrigerant prior to servicing or for refrigerant renewal.

Note: *Do not re-use refrigerant unless you are aware of its purity.*

Note: *The JCB recommended 'Javac' unit only recovers refrigerant as a gas. Other units can recover refrigerant as a liquid and/or gas. Always check manufacturers instructions before using.*

1 Ensure that the engine is OFF and the starter key removed.

2 Connect the manifold to the system as shown, with the blue hose **18-A** connected to the system low pressure port. Do Not connect the red hose **18-B**. Make sure that both valves are closed.

3 Connect the yellow hose **18-C** to the 'Javac' unit filter **18-D**.

4 Connect the filter **18-D** to the 'Javac' unit **18-E**.

5 Connect the 'Javac' unit **18-E** to an empty receiver bottle **18-F**. Weigh the bottle before and after filling to assess system capacity.

Note: *Do not fill the receiver bottle to more than 80% by weight.*

6 Switch on 'Javac' unit **18-E** and open the low pressure manifold valve.

Note: *If the high pressure warning light on the `Javac' unit comes on, throttle back the manifold low pressure valve to provide a restriction.*

7 The 'Javac' unit **18-E** will automatically switch off when a pressure balance exists between the system and the receiver bottle. Switch off 'Javac' at main switch, but leave the system connected. Switch on after 10 minutes, the 'Javac' will restart if residual pressure remains.

8 Close valves and remove equipment.

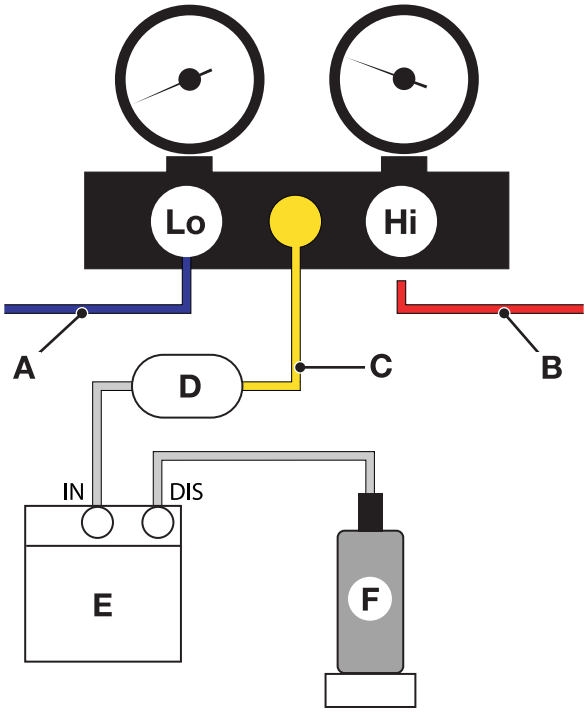


Fig 18. Refrigerant Recovery

Evacuating (Vacuuming)

This procedure follows on from the 'Recovery' process and is necessary to ensure proper refilling of the system with refrigerant.

To avoid leakage in the vacuum system itself, Do not use extensions to the yellow hose (use standard 2 metre length).

1 Recover all refrigerant from the system. ⇒ ***Refrigerant Recovery (B-37)***.

2 Close all valves and connect the manifold as shown. Connect the blue hose **19-A** to the system low pressure port and the red hose **19-B** to the high pressure port.

3 Connect the yellow hose **19-C** to the vacuum pump **19-D**.

Note: *If the Electronic Vacuum Gauge **19-E** is used connected as shown.* ⇒ ***Electronic Vacuum Gauge (B-39)****, for further information.*

4 Open manifold valves.

5 Switch on the vacuum pump **19-D** until 740mm (29 in) mercury vacuum reads on both gauges.

Note: *Achievable vacuum will vary with altitude. Maximum gauge reading will be 25mm (1 in) less for every 305 metres (1000 feet) above sea level.*

6 Maintain suction for approximately 30 minutes.

Note: *If the vacuum falls rapidly the system is leaking. Check all connections and reseal. If the point of leakage is not obvious, recharge the system and test again.*

7 Close valves and remove equipment.

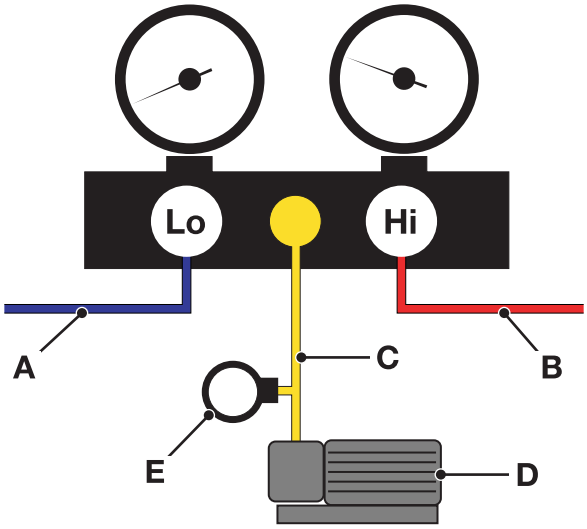


Fig 19. Evacuating

Electronic Vacuum Gauge

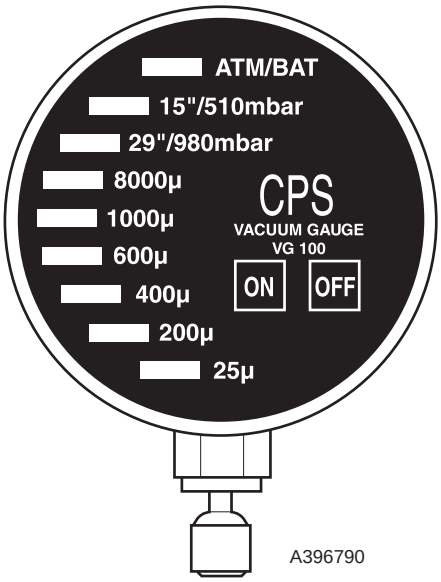


Fig 20.

The CPS VG100 vacuum gauge is an electronic type using LED's to indicate various states of vacuum. It is used in place of or to supplement the gauge on the vacuum pump.

Before connecting into the system switch on to check that the first LED lights to show that the battery is in good condition.

Note: *The indicator lights show pressure in inches of mercury (Hg) and vacuum in microns (0.001mm Hg).*

ATM/BAT	Normal atmospheric pressure reading. Battery condition.
15"/510mbar	381mm (15 in)Hg. Partial vacuum - Vacuum system is operating.
29"/980mbar	736mm (29 in)Hg. No vacuum drawn - Possible system leakage.
8000	8.0mm (0.31 in)Hg. Partial vacuum - If the reading does not progress the system may have a slow leak.
1000	1.0mm (0.039 in)Hg. Deeper vacuum.
600	0.6mm (0.023 in)Hg. Deep vacuum.
400	0.4mm (0.015 in)Hg. Deep vacuum.
200	0.2mm (0.0078 in)Hg. Deep vacuum.
25	0.025mm (0.00098 in)Hg. Pump Test. Maximum sustainable vacuum.

Relubricating

Pre-lubrication is essential after recovering system refrigerant, vacuuming and component flushing.

The system should be evacuated to a vacuum of 740mm (29 in) of mercury before re-lubricating.

1 Ensure that the engine is OFF and the starter key is removed.

2 Close all valves and connect the manifold as shown, with the blue hose **21-A** connected to the oil injector **21-E** and the red hose **21-B** to the system high pressure port.

3 Connect the yellow hose **21-C** to the vacuum pump **21-D**.

4 Connect the other end of the oil injector **21-E** to the system low pressure point **21-F**.

5 Switch on the vacuum pump **21-D** and open the high pressure side valve.

6 Unscrew the oil injector cap and add the specified quantity of refrigerant oil.

7 When 740mm (29 in) mercury shows on the vacuum gauge, open the oil injector valve to allow the oil into the system.

8 If more oil is needed repeat the above procedure. The quantity of oil should be the same as that taken out during the 'Recovery' procedure.

Note: *Use only PAG oil in R-134a systems.*

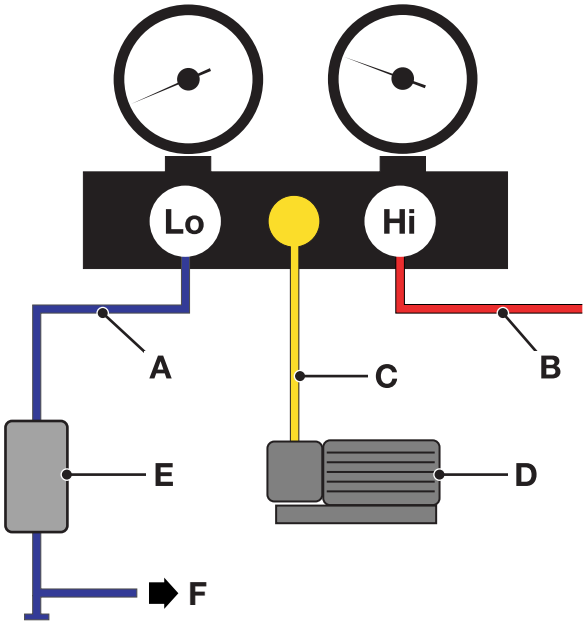


Fig 21. Relubricating

Charging

This procedure is industry recommended practice for refilling air conditioning systems with refrigerant.

Evacuate the system beforehand to 740mm (29 in) of mercury.

1 Close all valves and connect the manifold as shown. Connect the blue hose **22-A** to system low pressure and the red hose **22-B** to system high pressure. Connect the yellow hose **22-C** to the refrigerant cylinder **22-D**.

2 Invert single valve cylinder on the scales **22-E** and zero the scale reading

Note: *Some refrigerant cylinders have separate valves for gas and liquid. Be sure to connect to the liquid port when following the above procedure.*

Note: *Refrigerant can be used either in gas or liquid form. If recharging with gas follow the manufacturers instructions and recharge only via the low pressure port. Do not use liquid refrigerant at the low pressure port.*

3 Slowly open the high pressure valve and allow the vacuum to draw-in refrigerant to the specified weight for the system. Refer to ***Technical Data***.

Add refrigerant until the scales **22-E** indicate the specified weight for the system or the weight obtained when the system refrigerant was previously recovered.

Note: *To speed up the process a thermostatically controlled thermal blanket **22-F** can be used around the replenishing cylinder.*

4 Close all valves and remove the equipment.

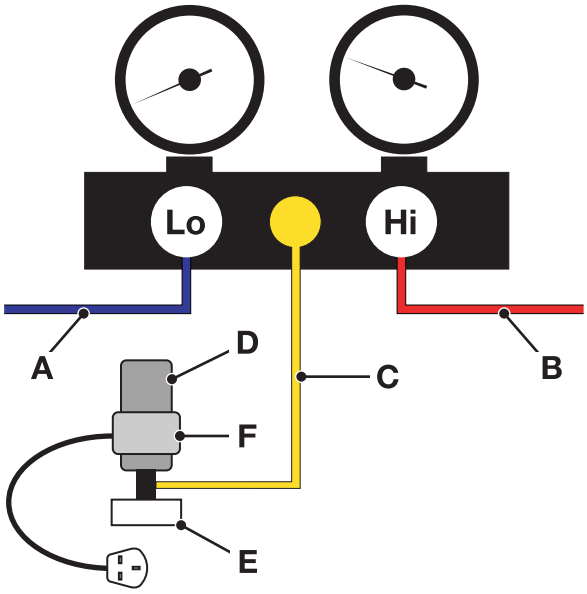


Fig 22. Charging

Cleaning the Cab Filter

The air conditioning system utilises the cab heater filter.

At the recommended service interval, clean the cab heater filter, see ***Section 3, Routine Maintenance***.

Compressor Drive Belt - Adjustment

The air conditioning compressor is driven by the front end accessory drive belt (FEAD).

The belt is automatically kept in tension so will not need to be adjusted.

At the recommended service interval, visually inspect the belt for damage, see ***Section 3, Routine Maintenance***.

Cab Air Conditioning 3C-14 (214e), 3C SYSTEM

Related Topics

The table lists other topics in the section that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text contains cross-references to help you find the correct information.

Topic Titles:
⇨ *Air Conditioning Condenser (B-64)*
⇨ *Cab HVAC Unit 3C-14 (214e), 3C (B-75)*
⇨ *Heater Valve (B-78)*

Specifications

Binary Pressure Switch Settings:		
Low Pressure	2 bar	(2.1 kgf/cm^2, 29.9 lbf/in^2)
High Pressure	26 bar	(26.5 kgf/cm^2, 375 lbf/in^2)
Thermostatic Switch Settings:		
Cut out	-0.6 °C	(33.0 °F)
Cut in	4.2 °C	(39.5 °F)
Refrigerant:		
R-134a	1.4 Kg (3.1 lb) Maximum charge	
Oil:		
Type	PolyAlkylene Glycol (PAG)	
Quantities - Recharge the system (1)		
Component Replacement:		
Condenser	1.5 fluid oz.	(42.6 ml)
Evaporator	3.0 fluid oz.	(85.2 ml)
Receiver Drier	0.3 fluid oz.	(8.5 ml)
Compressor	None - pre charged	
Hoses	If more than 4 metres of hose is replaced, then add 0.5 fluid oz. (15 ml) for every metre over 4 metres.	

(1) The quantity of oil replaced should be the same as that taken out during `Recovery' procedure.

R134a Refrigerant

TB-006

Refrigerants are the basic ingredient of all air conditioning systems and are used to transfer the heat energy around the system. Refrigerant type R134a is used in the air conditioning system. It's full chemical name is:

1, 1, 1, 2-Tetraflouroethane (CH2FCF2)

R134a is a HFC (HydrFlouroCarbon) and is non-toxic, non-flammable and non-explosive at normal atmospheric temperature and pressure. It can be flammable under certain pressure and air mixtures.

Due to environmental concerns, the use of ozone depleting chlorofluorocarbons (CFCs) in the air conditioning systems is being gradually phased out. The R-12 refrigerant used in some systems contains CFCs. Air conditioning systems using R-134a refrigerant are not compatible with systems using R-12 refrigerant. No attempt should be made to charge R-134a systems with R-12 refrigerant.

Important: *Refer to the safety procedures within this section before handling refrigerants.*

Good installation practice is required to avoid the release of refrigerant into the atmosphere. Refrigerant R134a contains no chlorine and has an Ozone Depleting Potential (ODP) of zero, and a Global Warming Potential (GWP) of 0.1.

PAG Type Refrigerant Oil

TB-007

The system requires a PAG type refrigerant oil to lubricate the compressor. The oil mixes with the refrigerant and is carried around the system.

It is important that the recommended grade of refrigerant oil is used. Mineral oil is not suitable for R134a refrigerant systems. Do not mix oil types.

The compressor is supplied with an oil charge, but additional oil will be required when the receiver drier is replaced. The oil is added to the compressor through the oil filling plug before the evacuation procedure is started.

Only use fresh, unused oil. Oil that has been exposed to the air will have absorbed water.

Operation Overview

The air conditioning system operates in the same way as 3CX machines. ⇨ ***Cab Air Conditioning (3CX, 4CX) SYSTEM (B-9)***.

Cab

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

ROPS, FOPS Structure - Checks

For the correct procedure, see ***Section 3, Routine Maintenance***.

Removal and Replacement

Direct Glazing

TB-002_4

The following procedures explain how to correctly remove and install panes of glass that are directly bonded to the cab frame apertures. When carrying out the procedures, relevant safety precautions must be taken.

1 Always wear safety glasses during both removal and replacement.

2 Use protective gloves - heavy duty leather gauntlet type gloves when cutting out the broken glass; 'non-slip' type gloves when handling/moving panes of glass; surgical type gloves when using the polyurethane adhesives.

3 Wear protective overalls.

4 Do not smoke - the activators and primers used in the procedures are highly flammable.

5 Do not attempt to handle or move panes of glass unless you are using glass lifters.

Several special tools are required to successfully complete the removal and replacement procedures. Reference is made to the tools in the text. The majority of these tools can be obtained locally and the remainder from JCB Service (see ***Service Tools***).

The work must only be carried out in a dry, frost free environment. A protective canopy may be required or the machine/frame must be moved to a sheltered area. In damp or wet conditions, hinged doors and window frames can be removed from the machine and taken to a more suitable (dry) environment.

Glass should not be replaced at temperatures below 5°C (41°F).

⚠ 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

Removing the Broken Glass and Old Sealant

⚠ WARNING

Always wear safety glasses when removing or installing screen glass. Never use a power operated knife when removing the sealant around a toughened glass screen. The action of the knife could cause particles of glass to be thrown with sufficient force to cause serious injury, even when safety glasses are being worn. Use only hand operated tools when working with toughened glass.

BF-2-3_1

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

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

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

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

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

a Pneumatic Knife. ⇒ *Fig 1. (B-51)*. This provides one of the easiest methods of removing the sealant around laminated glass. The tool, powered by compressed air, should be sourced locally.

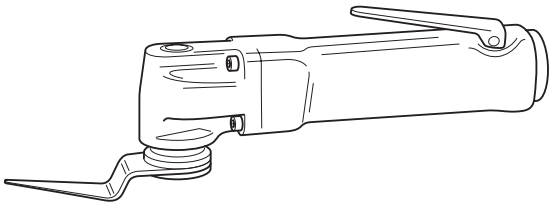


Fig 1. Pneumatic Knife

i Press the handle to start the knife blade oscillating.

Important: *This tool must not be used on toughened glass.*

ii Insert the knife blade into the sealant.

iii Slowly move the knife along the sealant with the blade positioned as close to the glass as possible. Do not allow the knife blade to overheat or the sealant will melt.

b Braided Cutting Wire and Handles. ⇨ ***Fig 2. (B-51)***. This method uses a 3-core wire, a wire starter tube and two handles.

i Insert the steel tube **2-A** into the old sealant on the inside of the glass.

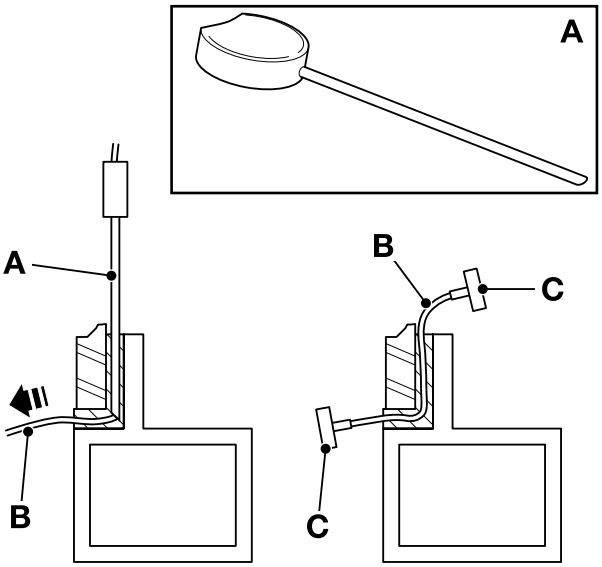


Fig 2. Braided Cutting Wire and Handles

ii Insert the braided cutting wire **2-B** down the centre of the steel tube. If necessary, from the outside, cut out local sealant at the point of the tube to gain access to the wire.

iii Using suitable pliers, pull the cutting wire through the sealant to the outer side of the glass.

iv Secure each end of the braided cutting wire in the special handles **2-C**.

v Move the cutting wire backwards and forwards in a sawing motion and at the same time gently push or pull the wire to cut through the old sealant.

c Cut-out Knife. ⇨ ***Fig 3. (B-51)***. The cut-out knife can be used as a left handed or right handed tool.

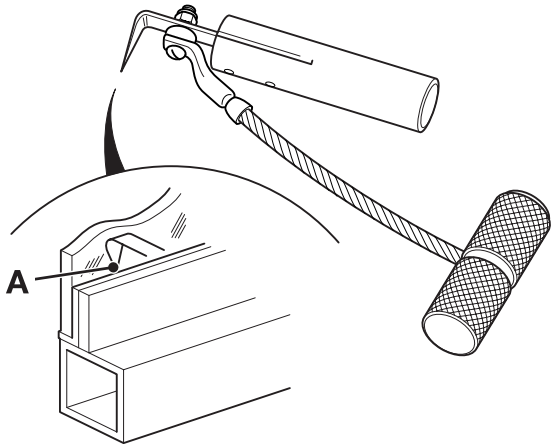


Fig 3. Cut-out Knife

i Insert the knife blade into the sealant.

ii Make sure that the blade of the knife is against the glass **3-A**.

iii Use the 'pull-handle' to pull the knife along and cut out the old sealant.

d Craft Knife. ⇨ ***Fig 4. (B-52)***. The blades **4-A** are replaceable.

i Insert the knife blade into the sealant.

ii Pull the knife along and cut out the old sealant.

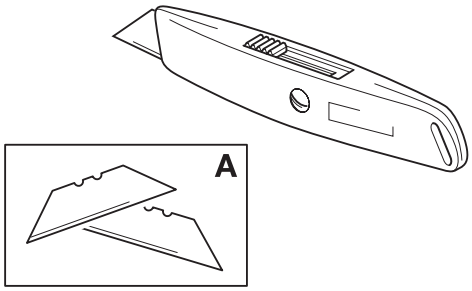


Fig 4. Craft Knife

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 5. (B-52)*

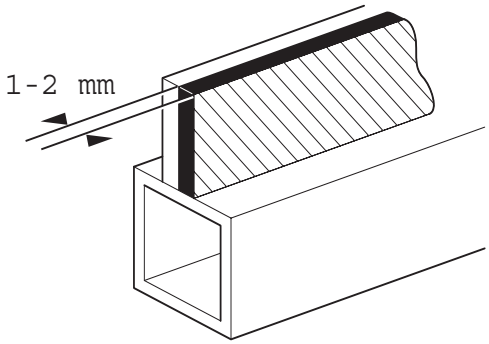


Fig 5.

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 **6-A**.

a Put two spacer blocks **6-B** onto the bottom part of the frame aperture.

b Install the new glass on the spacer blocks - Always use glass lifters **6-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.*

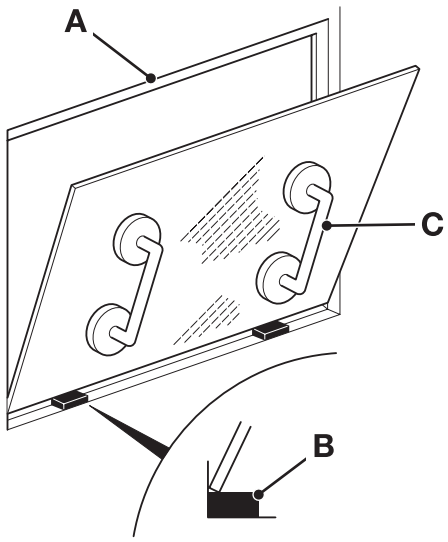


Fig 6.

2 After checking for size, remove the new glass and place it on a purpose made glass stand. ⇒ *Fig 7. (B-53)*.

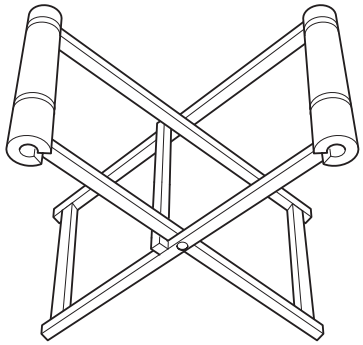


Fig 7. Glass Stand

Small panes of glass will need locating on a 600 x 700 mm x 15 to 19 mm thick plywood board **8-A**, sourced locally to fit the glass stand. It is recommended that an access hole is cut in the board to accommodate the glass lifter, making it easier and safer to handle small panes of glass. The board should be covered with felt or carpet to give an anti-scratch surface. Resting the glass on four spacer blocks will ensure clearance of the cartridge nozzle tip during application of the polyurethane sealant.

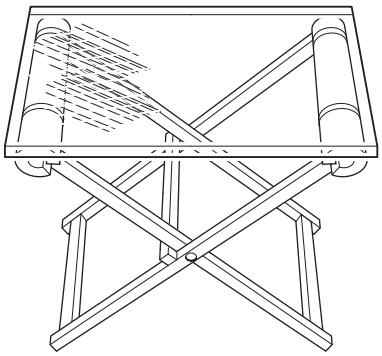


Fig 8.

3 Make sure the glass is positioned on the stand the correct way up (i.e. with the black ceramic ink band upwards) ready for application of primer etc.

4 Clean the glass

a Use 'Active Wipe 205' to thoroughly clean and 'prime' the black ceramic ink band printed on the glass (see ***Note***). Use a lint free cloth to apply the 'Active Wipe 205', allow 5 minutes flash off (drying) time.

Note: *Do not touch the glass after cleaning with the 'Active Wipe 205'.*

b If the glass does not have a black ceramic ink band, paint a band on the glass using 'Black Primer 206J'. The band should be approximately 25mm (1in) wide, and the edge should be a neat straight line. ⇒ *Fig 9. (B-53)*.

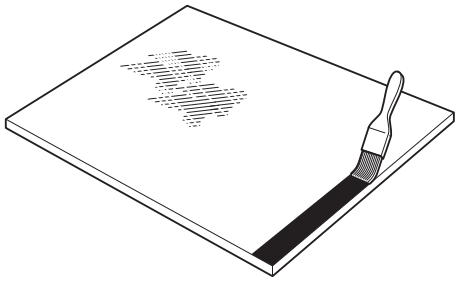


Fig 9.

5 Install the Ultra Fast Adhesive cartridge (see ***Sealing and Retaining Compounds***, Section 1 and ***Note***) into a suitable applicator gun:

a Remove the aluminium disc cover from the base of the cartridge and discard the 'dessicant capsule'.

b Make sure that the rolled edge of the cartridge is not damaged - if necessary, the edges should be pressed flat, otherwise it will be difficult to remove the cartridge from the applicator gun.

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

d Fit the pre-cut nozzle. ⇨ *Fig 10. (B-54)*.

e Install the cartridge in the applicator gun.

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

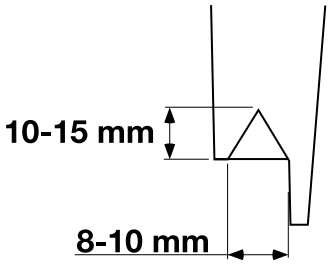


Fig 10.

6 Apply the pre-heated adhesive to the glass (do not start in a corner). Keep the nozzle guide **11-A** against the edge of the glass and make sure that the adhesive forms a continuous 'pyramid' shape. ⇨ *Fig 11. (B-54)*

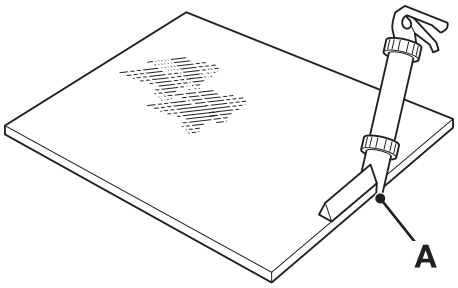


Fig 11.

Note: *Once the pre-heated adhesive has been applied to the glass, install the glass in the aperture as soon as possible. After approximately 10 minutes the sealant will form a 'skin', this will prevent the glass from bonding.*

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

Installing the New Glass

1 If the internal trim strip is damaged, renew it (cut to length as required) before fitting the new glass. Make sure the two spacer blocks are in position. ⇨ *Preparing the New Glass (B-52)* - step 1.

2 Install the glass in the frame aperture:

a Always use the special lifting tools when moving the glass. Use a lifting strap to hold large panes of glass in position. ⇨ *Fig 12. (B-54)*

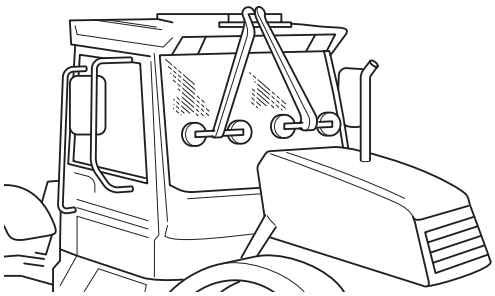


Fig 12. Typical M/c. Installation

b Sit the bottom edge of the glass on the spacer blocks. ⇨ *Fig 13. (B-55)*

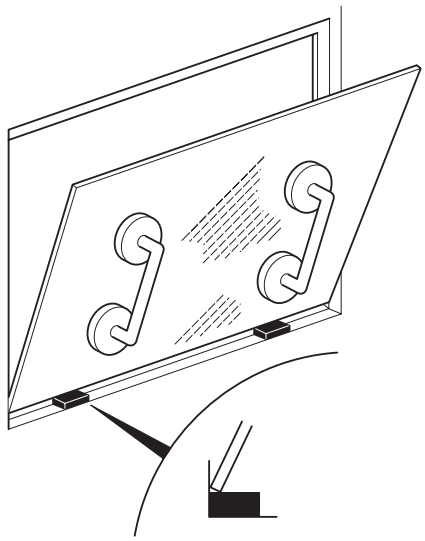


Fig 13.

c Make sure that the glass is correctly positioned, then gently press around the edges of the glass and ensure full adhesive contact is achieved. Do not press too hard or too much adhesive will squeeze out.

3 Make the inside seal smooth:

a Wearing surgical gloves, dip your finger in a soapy water solution.

b Use your finger to make the inside seal smooth.

4 All exposed edges must be sealed using Black Polyurethane Sealant (see **Sealing and Retaining Compounds**, Section 1).

Important: *Use extreme caution when wiping the inside of the new glass - pushing too hard on the inside of the glass will affect the integrity of the bonded seal.*

5 Clean the glass after installation:

a Small amounts of sealant can be cleaned from the glass using the 'Active Wipe 205'.

b Large amounts of excess sealant should be left to 'cure' and then cut off with a sharp knife.

Note: *On completion of the glass replacement procedures, the sealant 'curing' time is 30 minutes. This means that the machine can be driven and used after 30 minutes, but it must not be used during the curing period of 30 minutes.*

c Clean the glass using a purpose made glass cleaner

6 On completion of the glass installation procedures tidy the work area:

a Remove all broken glass from the cab area.

b Remove the protective covers from the cab seat and control pedestals.

c Renew all 'warning' and 'information' decals so that the new installation conforms with the original cab installation.

Cab Mountings

Removal, Front Mountings

Important: *Do not remove the front mountings* ***14A*** *and rear mountings* ***14B*** *at the same time. Remove the two front mountings OR the two rear mountings as required.*

1 Remove the covers **14C** and external trim panels **14D** to gain access to the front mountings.

2 Undo the nut **14E** and remove the lower mount **14F** from each front mounting. Withdraw the bolt **14G** from each mounting from inside the cab.

3 Place a suitable jack between the cab frame and the machine chassis. Raise the cab sufficiently to remove the upper mounts**14H**. Record the positions of the cab mounts to ensure correct replacement.

Important: *Be sure to jack the steel cab frame. DO NOT locate the jack on the composite cab floor.*

Important: *Block the cab using suitable supports. DO NOT work under the cab supported only by a jack or lifting equipment.*

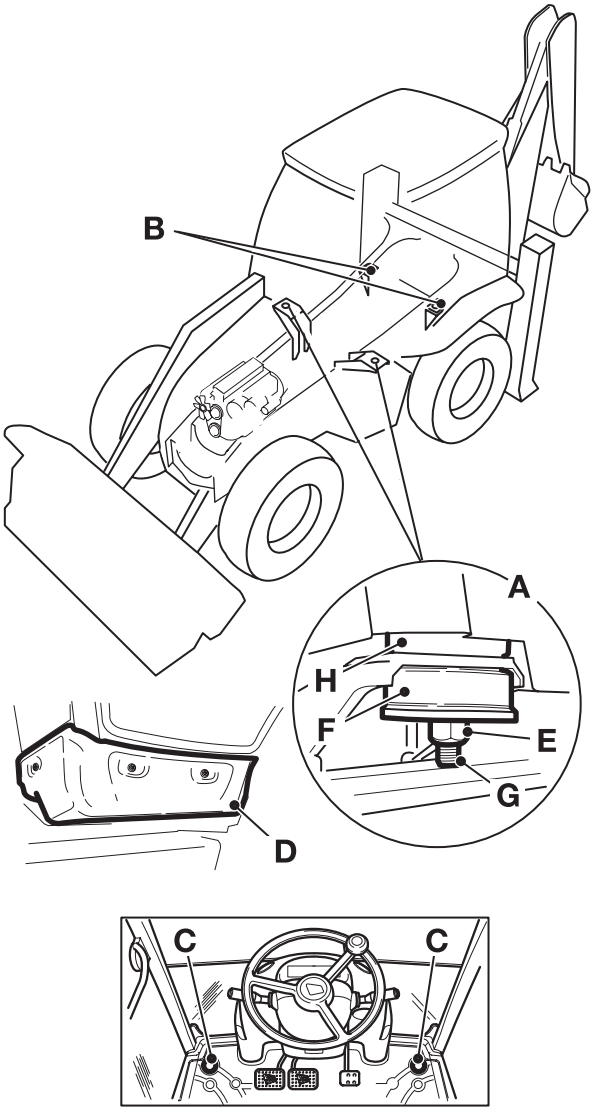


Fig 14.

Removal, Rear Mountings

Important: *Do not remove the front mountings* ***15A*** *and rear mounts* ***15B*** *at the same time. Remove the two front mountings OR the two rear mountings as required.*

1 Remove the rear wheels to gain access to the rear mountings **15B**. Block the machine using suitable supports. Do not work under a machine supported by its stabilisers under any circumstances.

⚠ WARNING

Raised Equipment

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

13-2-3-7_2

2 Undo the nut **15C** and remove the lower mount **15D** and bolt **15E** from each rear mounting.

3 Place a suitable jack between the cab frame and the machine chassis. Raise the cab sufficiently to remove the upper mounts **15F**. Record the positions of the cab mounts to ensure correct replacement.

Important: *Be sure to jack the steel cab frame. DO NOT locate the jack on the composite cab floor.*

Important: *Block the cab using suitable supports. DO NOT work under the cab supported only by a jack or lifting equipment.*

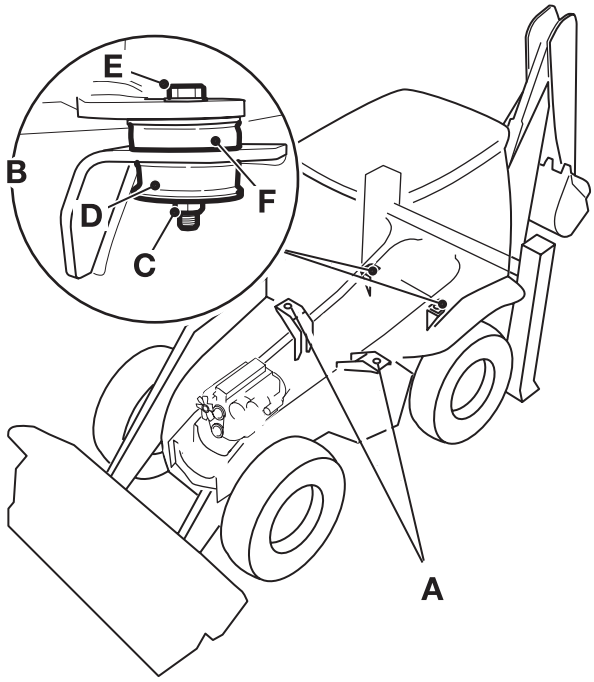


Fig 15.

Replacement

Replacement is the reversal of removing but note the following:

Although the front and rear cab mount components are similar in appearance they are not the same. Make sure that you fit them in their correct locations. If the mounts are to be renewed make sure you identify the new components correctly. Refer to the relevant parts information.

Torque tighten the fixing nuts **14E** and **15C**.

Table 1. Torque Settings

Item	Nm	kgf m	lbf ft
14E	205	21	151
15C	205	21	151

Side Console

Removal

1 Park the machine on firm level ground, engage the park brake and set the transmission to neutral. Raise the loader arms and fit the loader arm safety strut. Stop the engine and remove the starter key.

WARNING

Raised Equipment

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

13-2-3-7_2

2 Remove the front grille and disconnect the battery.

3 ⇨ *Fig 16. (B-59)*. Working in the cab, remove the fixing **A** at the top of the instrument panel and carefully lift the panel forward to reveal the connections at the back as shown.

4 Disconnect the electrical connectors and heater controls cables at the rear of the instrument panel, then remove the instrument panel assembly clear of the side console, see ***Section D, Control Cables.*** Label the connectors and controls cables before disconnecting to ensure correct replacement.

5 Remove the hand throttle lever knob **B**, remove the screws **C** from the hand throttle lever and mounting bracket assembly **D** inside the side console as shown. Withdraw the handle through the slot in the panel.

6 **Joystick control (servo) machines only:** Remove the screws from around the base of the stabiliser control levers **E**. Carefully withdraw the lever assembly from the side console and disconnect the hydraulic hoses from the underside. Label each hose before disconnecting to ensure correct replacement. Plug the open ports and cap the hoses to prevent loss of fluid and ingress of dirt.

7 Unscrew the knob and locknut from the boom lock control **F**.

8 Remove the fixings **G** (5-off) securing the side console panel at positions shown. Carefully lift up the rear corner of the side panel over the boom lock control outer sleeve, and then lift the side panel clear.

Replacement

Replacement is the reverse of the removal sequence but note the following:

Take care when removing/replacing the console panel to ensure that harnesses do not become snagged and that no other connections have been disturbed.

After re-fitting, operate the side console controls and check they all function correctly.

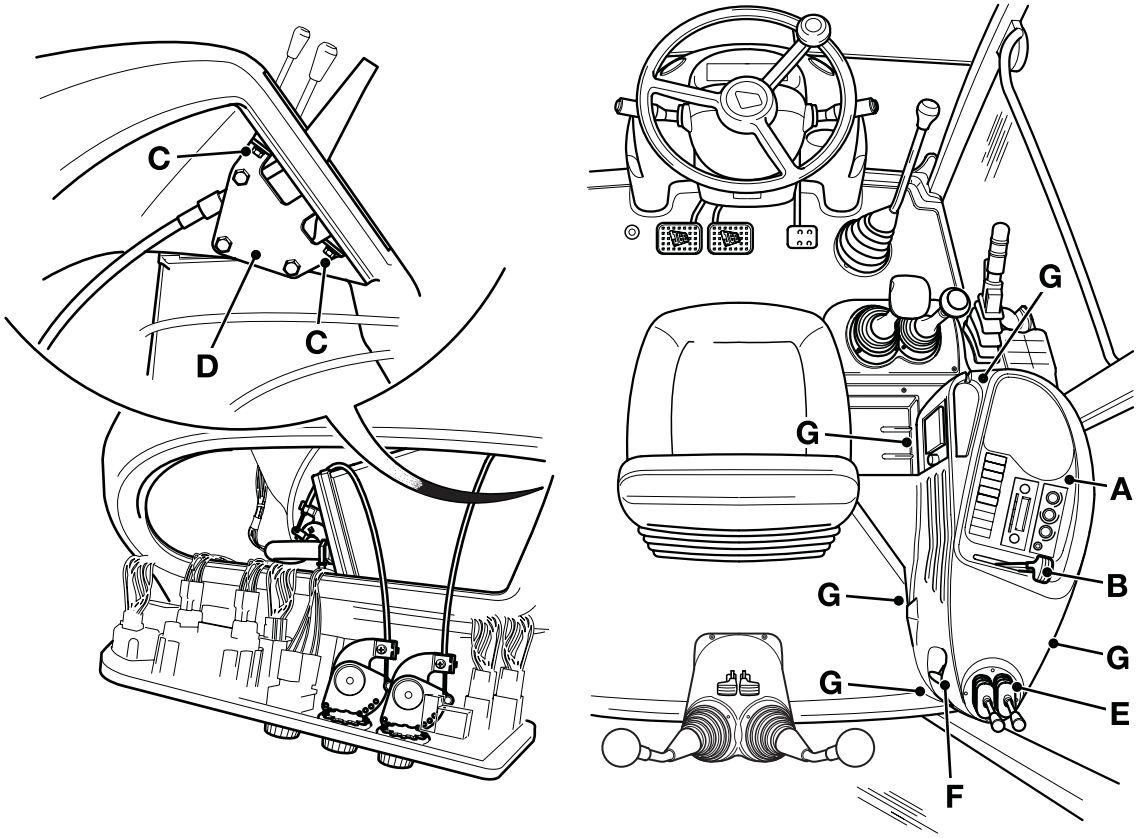


Fig 16. Side Console

Front Steering Console

Removal

1 Park the machine on firm level ground, engage the park brake and set the transmission to neutral. Raise the loader arms and fit the loader arm safety strut. Stop the engine and remove the starter key.

⚠ WARNING

Raised Equipment

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

13-2-3-7_2

2 Remove the front grille and disconnect the battery.

3 ⇒ *Fig 17. (B-60)*. Working in the cab, remove the steering wheel as shown.

4 Remove the fixings **A** (4-off) at positions shown and take off the steering column pedestal cover.

5 Remove the column switches **B**.

6 Remove the instrument panel **C**.

7 Remove the fixings **D** (4-off) securing the front console panel at positions shown and then carefully lift up the front console clear of the steering column assembly.

Replacement

Replacement is the reverse of the removal sequence but note the following:

Take care when removing/replacing the console panel to ensure that harnesses do not become snagged and that no other connections have been disturbed.

After re-fitting, operate the front/steering console controls and check they all function correctly.

Table 2. Torque Settings

Item	Nm	Kgf m	lbf ft
E	40	4.1	29.5

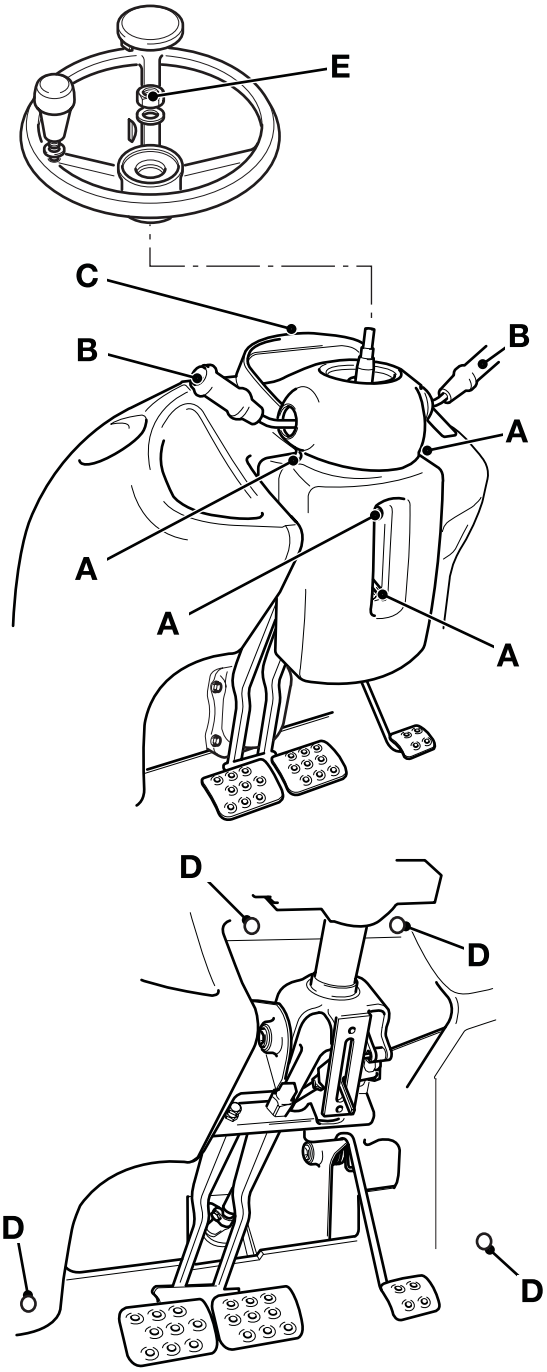


Fig 17.

B Post Covers

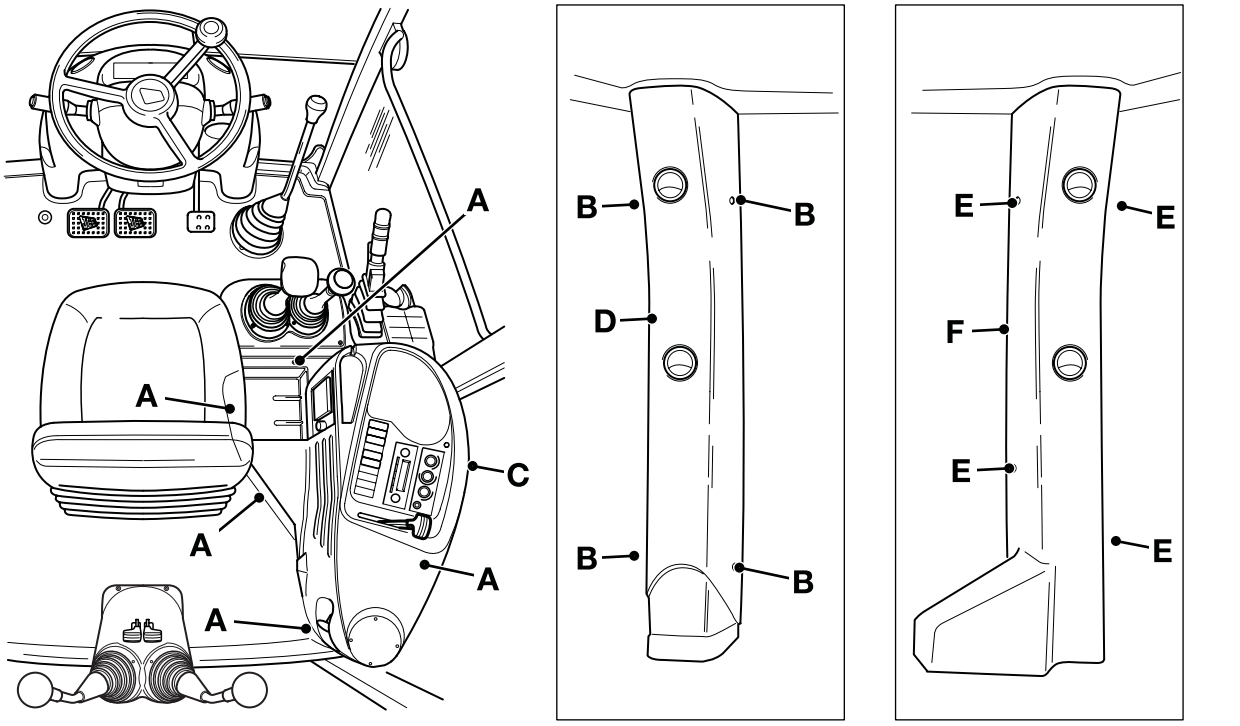


Fig 18.

Removal

1 Park the machine on firm level ground, engage the park brake and set the transmission to neutral. Lower the loader arms and excavator to the ground. Stop the engine and remove the starter key.

2 Working in the cab, undo the five side console retaining screws **A**.

3 Remove the four fixings **B**. Move the side console **C** sufficienty to allow the cover **D** to be removed. Take care no to damage the roof lining.

4 Remove the four fixings **E** and remove the cover **F**. Take care not to damage the roof lining.

Replacement

Replacement is the reversal of the removal sequence.

Roof Lining

The roof lining **A** is easily damaged or marked. When handling the roof lining take steps to protect it from dirt and grease. Do not use force when removing and replacing.

Removal

1 Park the machine on firm level ground, engage the park brake and set the transmission to neutral. Lower the loader arms and excavator to the ground. Stop the engine and remove the starter key.

2 Remove the B post covers. ⇨ ***B Post Covers (B-61)***

Important: *Before removing the roof lining make sure that the rear window is fully closed.*

3 Support the roof lining **A**.

4 Remove the three fixings **B** at the rear of the lining.

5 Remove the two fixings **C** at the front of the lining. Remove the sun blind **D**.

6 Carefully lower the lining and uncouple the electrical connectors at the radio speakers and interior light.

7 Lift the lining clear of the machine.

Replacement

Replacement is the reversal of the removal sequence.

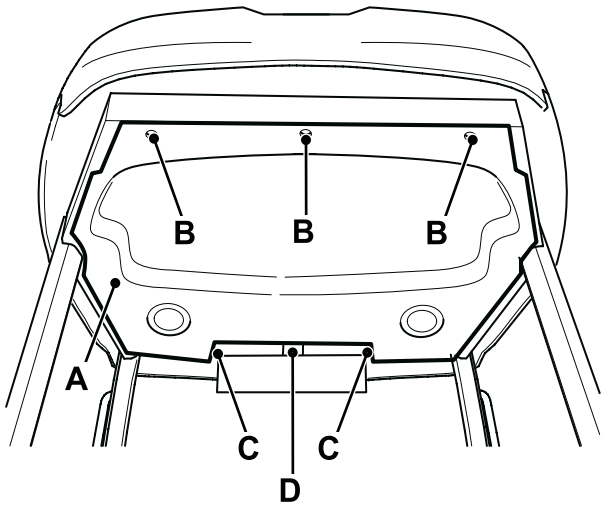


Fig 19.

Cab Roof Moulding

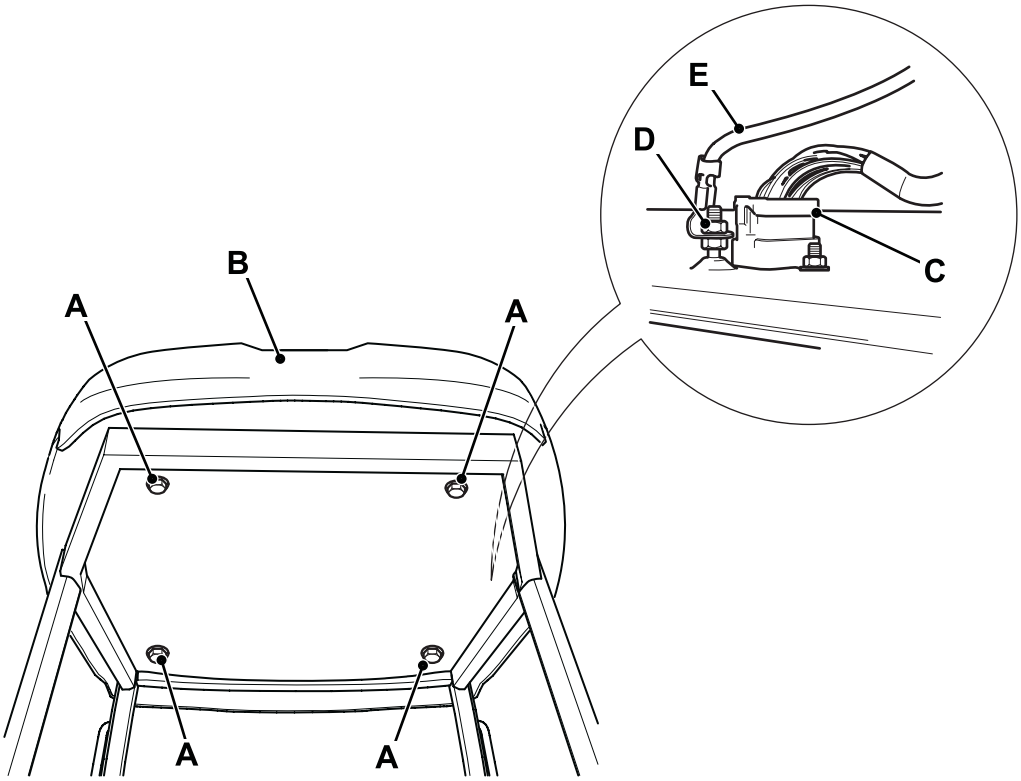


Fig 20.

Removal

1 Park the machine on firm level ground, engage the park brake and set the transmission to neutral. Lower the loader arms and excavator to the ground. Stop the engine and remove the starter key.

2 Remove the B post covers. ⇨ *B Post Covers (B-61)*

3 Remove the roof lining. ⇨ *Roof Lining (B-62)*

4 Working inside the cab remove the four fixing bolts **A**.

5 Working outside the cab carefully lift the roof moulding **B** to gain access to the electrical harness connector **C**. Uncouple the connector.

6 Undo nut **D** and remove the electrical harness earth lead **E**.

7 Lift the roof moulding **B** clear of the machine.

Replacement

Replacement is the reversal of the removal sequence but note the following:

Make sure that the electrical earth lead connection is clean and free from rust.

On completion test the roof mounted work lights.

Air Conditioning Condenser

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇒ *Cleaning (B-65)*
⇒ *Removal and Replacement (B-67)*

Cleaning

⇨ *Fig 1. (B-66)*. It is likely that over a period of time, because of the machine's working environment, the airflow around the condenser matrix **A** will become restricted due to a build up of airborne particles.

If the build up of particles is severe, heat dissipation from the refrigerant to the air will be significantly reduced, resulting in poor air conditioning performance.

In extreme cases, over-pressurisation of the system occurs, causing the high pressure cut-out switch to operate and switch off the system.

High pressure cut-out can also be caused by an internal blockage of the condenser matrix.

⚠ WARNING

Raised Equipment

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

13-2-3-7_2

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Raise the loader arms and fit the loader arm safety strut. Stop the engine and remove the starter key.

2 Raise the engine cover and remove the front grille.

⚠ WARNING

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

4-3-4-1_2

3 Remove screws **B** (2 off each side), and carefully lift the cooler matrix from the radiator. This can be done without disconnecting the air conditioning hoses i.e. with the system fully charged.

⚠ WARNING

Compressed air is dangerous. Wear suitable eye protection and gloves. Never point a compressed air jet at yourself or others.

0147_1

Important: *To avoid damaging the condenser, compressed air used for cleaning purposes must not exceed 2 bar (30 lbf/in²).*

4 With the condenser fully supported, use compressed air or low pressure water to backflow through the matrix fins.

Take care not to damage the condenser fins or tubes. Damaged fins must be straightened out to ensure a good airflow through the matrix.

5 Refit the condenser matrix by reversing the removal procedure. Refit the front grille and lower the engine cover.

6 Run the air conditioning and check cooling performance.

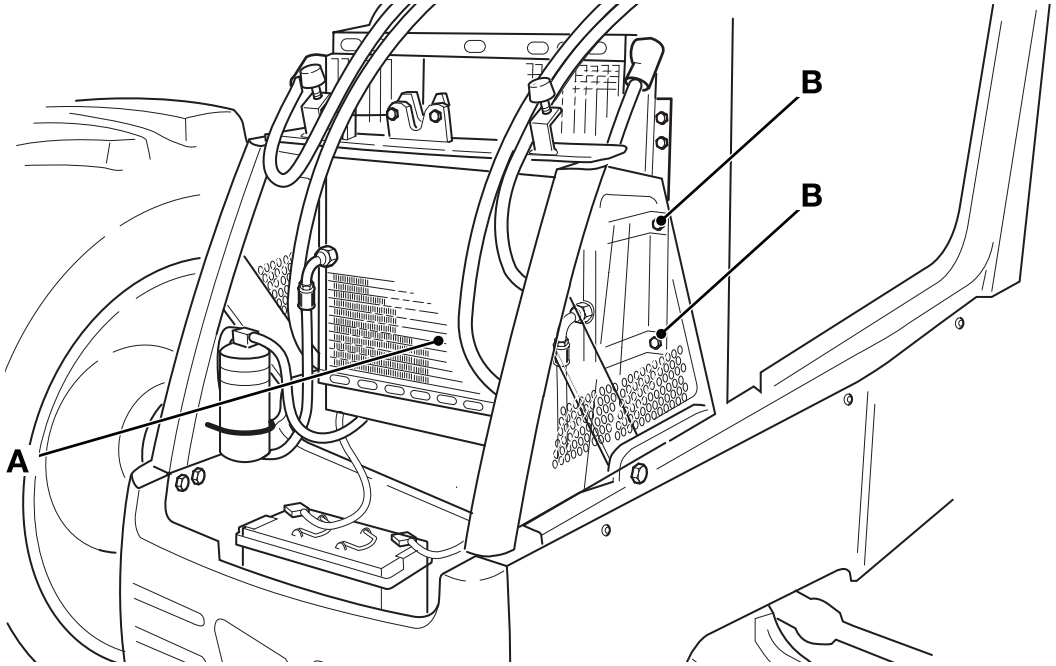


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Fig 1. Condenser Matrix Cleaning

Removal and Replacement

Note: *Before removing the condenser matrix, discharge the system.* ⇨ ***Refrigerant Charging and Discharging (B-37)***.

⇨ ***Fig 2. (B-68)***. The condenser matrix **A** is mounted onto the cooling pack in the engine compartment behind the front grille. If the condenser is being removed only to gain access to the cooling pack, this can be done without disconnecting the air conditioning hoses i.e. with the system fully charged. Having removed the screws **F** the condenser can be carefully laid to one side leaving the hoses still connected. Take care not to kink the hoses. Do not allow the condenser to hang on the hoses unsupported.

Removal of the condenser matrix will require the assistance of a refrigeration engineer or suitably trained person since the refrigerant needs to be drained from the system.

Removal

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Raise the loader arms and fit the loader arm safety strut. Stop the engine and remove the starter key.

⚠ WARNING

Raised Equipment

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

13-2-3-7_2

2 Lift the engine cover and remove the grille.

3 Remove the front grille housing. ⇨ ***Front Grille Housing (B-92)***.

4 Disconnect and remove the battery.

5 Undo the U-bolt clamp and carefully lay the receiver drier **B** to one side leaving the hoses still connected. Take care not to kink the hoses. Do not allow the receiver drier to hang on the hoses unsupported.

⚠ WARNING

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

4-3-4-1_2

6 Make sure that the air conditioning system is fully discharged. ⇨ ***Refrigerant Charging and Discharging (B-37)***. Disconnect the air conditioning hoses at the pipe stubs **E** on the side of the condenser. Label the hoses before disconnecting to ensure correct replacement. Plug the hose ends to prevent ingress of dirt and loss of fluid.

Note: *To avoid damaging the condenser when removing or installing the hoses, it is essential that the hexagon flats on the pipe stubs **E** must be held with a spanner whilst loosening or tightening the hose nuts.*

When removing components or hoses, retain any lubricant within the component/hose and replenish the system with the same amount of clean lubricant (PAG Oil).

7 Remove screws **F** (2-off each side), and carefully lift the condenser matrix from the machine.

Replacement

Replacement is the reverse of the removal procedure.

After replacement recharge the system. ⇨ ***Refrigerant Charging and Discharging (B-37)***.

Run the air conditioning and check the hose connections for leaks. In the cab, set the air conditioning to maximum cooling and check that cooled air is emitted from the vents.

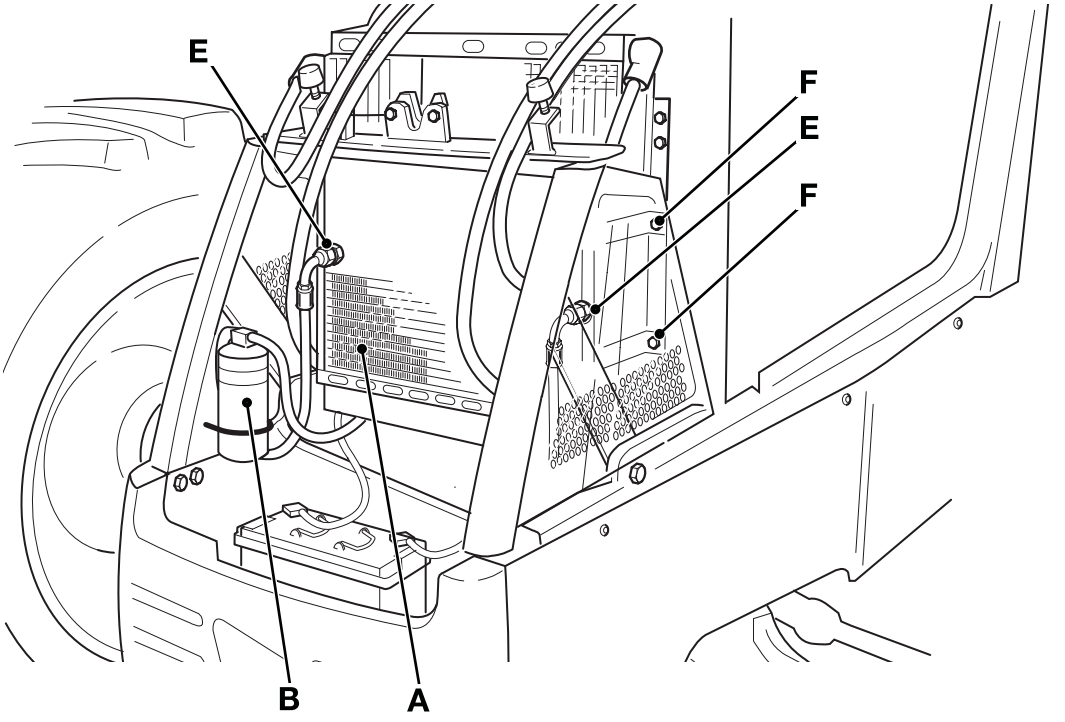

Fig 2. Condenser Matrix

Cab HVAC Unit (3CX, 4CX)

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

Removal and Replacement

Air Conditioning Unit (HVAC)

Note: *Before removing the HVAC - Air Conditioning Unit, discharge the system.* ⇨ ***Refrigerant Charging and Discharging (B-37)***.

⇨ ***Fig 3. (B-71)***. The HVAC air conditioning unit is located in the cab beneath the right hand side console. To access the unit the side console must first be removed. With the right hand side console removed as shown it is possible to gain access to the following:

- HVAC Unit Top Cover
- Binary Pressure Switch
- Water Valve

The HVAC unit top cover must also be removed to access the following components:

- Freeze Protection Thermostat
- Blower Unit
- Resistor
- Heat Exchangers (Heater and Evaporator)

Note: *When removing components or hoses, retain any lubricant within the component/hose and replenish the system with the same amount of clean lubricant (PAG Oil).*

Removal of the HVAC unit will require the assistance of a refrigeration engineer or suitably trained person since the refrigerant needs to be drained from the system.

Removal

1 Disconnect the battery.

2 Remove the side console. ⇨ ***Side Console (B-58)***.

3 Remove the spring clips (8-off) securing the HVAC unit top cover and carefully remove the HVAC top cover.

⚠ WARNING

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

4-3-4-1_2

4 Drain the refrigerant from the unit and remove all pipe work (refrigerant and air) which will prevent the unit from being withdrawn from the machine. Check around the top of unit, rear, bottom and right side.

5 Disconnect the pipe and electrical connections adjacent to the bulkhead plate **X**.

6 Remove the screws securing the HVAC unit housing to the cab and carefully withdraw the HVAC unit.

Replacement

Replacement is the reverse of the removal procedure.

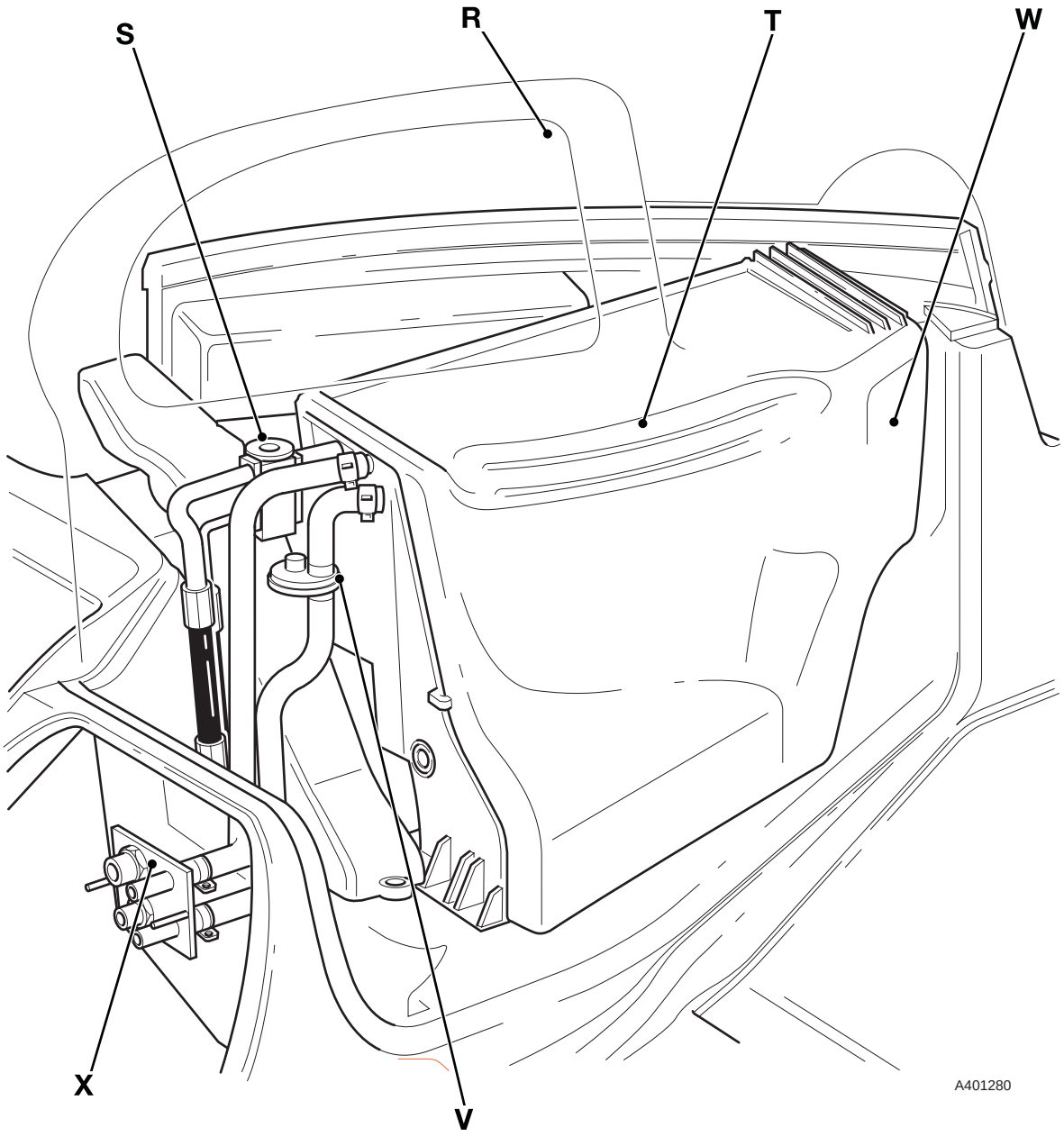

Fig 3. Heating, Ventilation and Air Conditioning Unit (HVAC)

Component Key:

R Air Conditioning Controls

S Expansion Valve

T Re-circ Air Inlet

V Water Valve

W HVAC Unit

X Bulkhead Plate

Evaporator Matrix

Note: *Before removing the Evaporator Matrix, discharge the system.* ⇨ ***Refrigerant Charging and Discharging (B-37)***.

⇨ ***Fig 4. (B-73)***. The evaporator matrix **S** is located inside the HVAC/air conditioning unit and can be removed without having to remove the HVAC unit from the machine.

Removal of the evaporator matrix will require the assistance of a refrigeration engineer or suitably trained person since the refrigerant needs to be drained from the system.

Removal

1 Disconnect the battery.

2 Gain access to the HVAC unit by removing the right hand side console, then remove the HVAC unit top cover. ⇨ ***Air Conditioning Unit (HVAC) (B-70)*** (steps 2 and 3).

3 Unclip the thermostat sensor wire from the evaporator and gently remove the wire from between the fins.

⚠ WARNING

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

4-3-4-1_2

4 Drain the refrigerant from the unit and remove all pipe work (refrigerant and air) which will prevent the unit from being withdrawn from the machine. Check around the top of unit, rear, bottom and right side.

5 Carefully lift the evaporator matrix complete with expansion valve **T** from the housing, bearing in mind that a certain amount of resistance will be met due to the stiction from the sealing putty.

Replacement

Replacement is the reverse of the removal procedure.

Binary Pressure Switch

⇨ ***Fig 4. (B-73)***. The pressure switch is located adjacent to the expansion valve **T** on the HVAC - air conditioning unit, beneath the right hand side console.

⚠ WARNING

Goggles and rubber gloves must be worn when pressure switches are removed or fitted. A small amount of refrigerant is released which can be harmful to the skin or eyes.

BF-1-10

Removal

1 Disconnect the battery.

2 Gain access to the HVAC unit by removing the right hand side console. ⇨ ***Air Conditioning Unit (HVAC) (B-70)*** (step 2).

3 Disconnect the electrical connections and unscrew the pressure switch.

Replacement

1 Screw the pressure switch into the pressure switch port and torque tighten sufficiently to form a gas-tight seal.

2 Run the air conditioning and check the pressure switches for leaks. If any leaks are found, tighten the pressure switch further until the leaking stops.

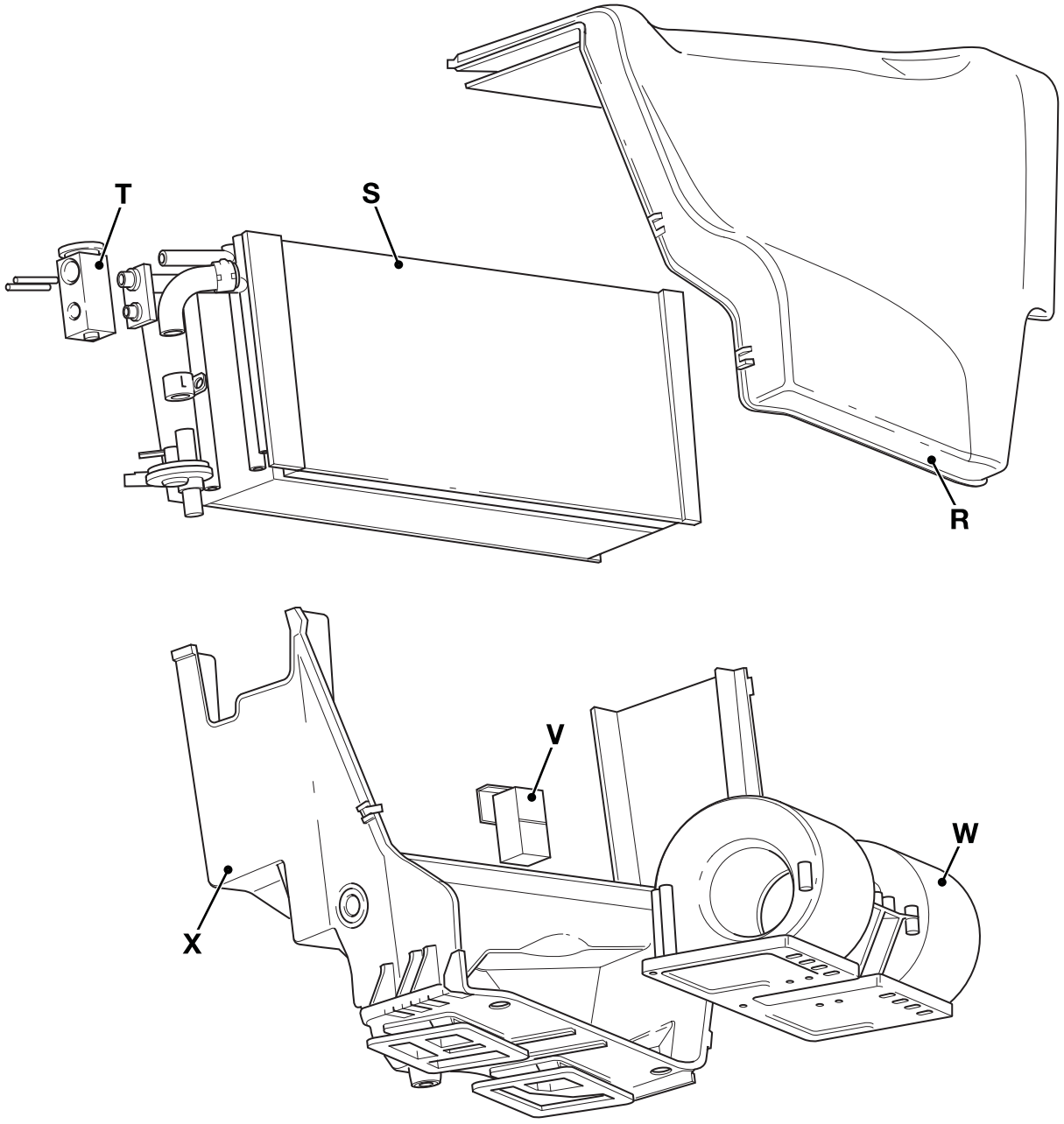

Fig 4. Heating, Ventilation and Air Conditioning Unit (HVAC)

Component Key:

R HVAC Unit Top Cover

S Heat Exchanger (Heater and Evaporator)

T Expansion Valve

V Freeze Protection Thermostat

W Blower Unit

X HVAC Unit Housing

Blower Unit

⇨ *Fig 4. (📄 B-73)*. The blower **W** is located inside the HVAC - air conditioning unit and can be removed without having to remove the HVAC unit from the machine.

The only user-serviceable part is the resistor which determines the blower motor speed. Other faults, excluding wiring faults, necessitate the replacement of the blower unit complete.

Resistor replacement requires the removal of the blower unit as follows:

Removal

1 Disconnect the battery.

2 Gain access to the HVAC unit by removing the right hand side console, then remove the HVAC unit top cover. ⇨ *Air Conditioning Unit (HVAC) (📄 B-70)* (steps 2 and 3).

3 Disconnect the electrical connections to the blower.

4 Remove the screws securing the blower unit to the HVAC unit housing.

5 Carefully withdraw the blower from the HVAC unit.

6 To remove the resistor, disconnect the electrical connections and unscrew the resistor.

Replacement

Replacement is the reverse of the removal procedure.

Freeze Protection Thermostat

⇨ *Fig 4. (📄 B-73)*. The Thermostat **V** monitors the external temperature of the evaporator and is located inside the HVAC - air conditioning unit.

Removal

1 Disconnect the battery.

2 Gain access to the HVAC unit by removing the right hand side console, then remove the HVAC unit top cover, ⇨ *Air Conditioning Unit (HVAC) (📄 B-70)* (steps 2 and 3).

3 Unclip the sensor wire from the evaporator and gently remove the wire from between the fins.

4 Disconnect the electrical connections to the thermostat.

5 Remove the screws securing the thermostat to the HVAC unit housing.

Replacement

Replacement is the reverse of the removal procedure.

Cab HVAC Unit 3C-14 (214e), 3C

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

Removal and Replacement

Blower Motor

Removal

1 ⇒ *Fig 5. (B-77)*. Remove the four screws and the front panel **1** of air conditioning unit.

2 Disconnect the electrical connections from the resistor **2**.

3 Remove the four screws securing the resistor. Remove the resistor and the blower unit **3**.

Note: *The resistor unit incorporates a bridge which retains the blower unit in position in the air conditioning unit. When the resistor is removed the blower unit is free to be removed.*

Replacement

Replacement is the reverse of the removal procedure.

Freeze Protection Thermostat

Removal

1 ⇒ *Fig 5. (B-77)*. Disconnect the electrical connections from the thermostat **4**.

2 Remove the capillary tube **5** from the evaporator coil **6**. Undo the thermostat mounting nut and bolt and remove the thermostat and capillary tube from the unit.

Note: *The capillary tube is held in position between the evaporator coil fins.*

Replacement

Replacement is the reverse of the removal procedure.

Note: *Take care when fitting not to damage the capillary tube.*

Compressor Clutch Relay

Removal

1 ⇒ *Fig 5. (B-77)*. Disconnect electrical connections from relay **7**.

2 Undo nut and bolt **8** and remove the relay.

Replacement

Replacement is the reverse of the removal procedure.

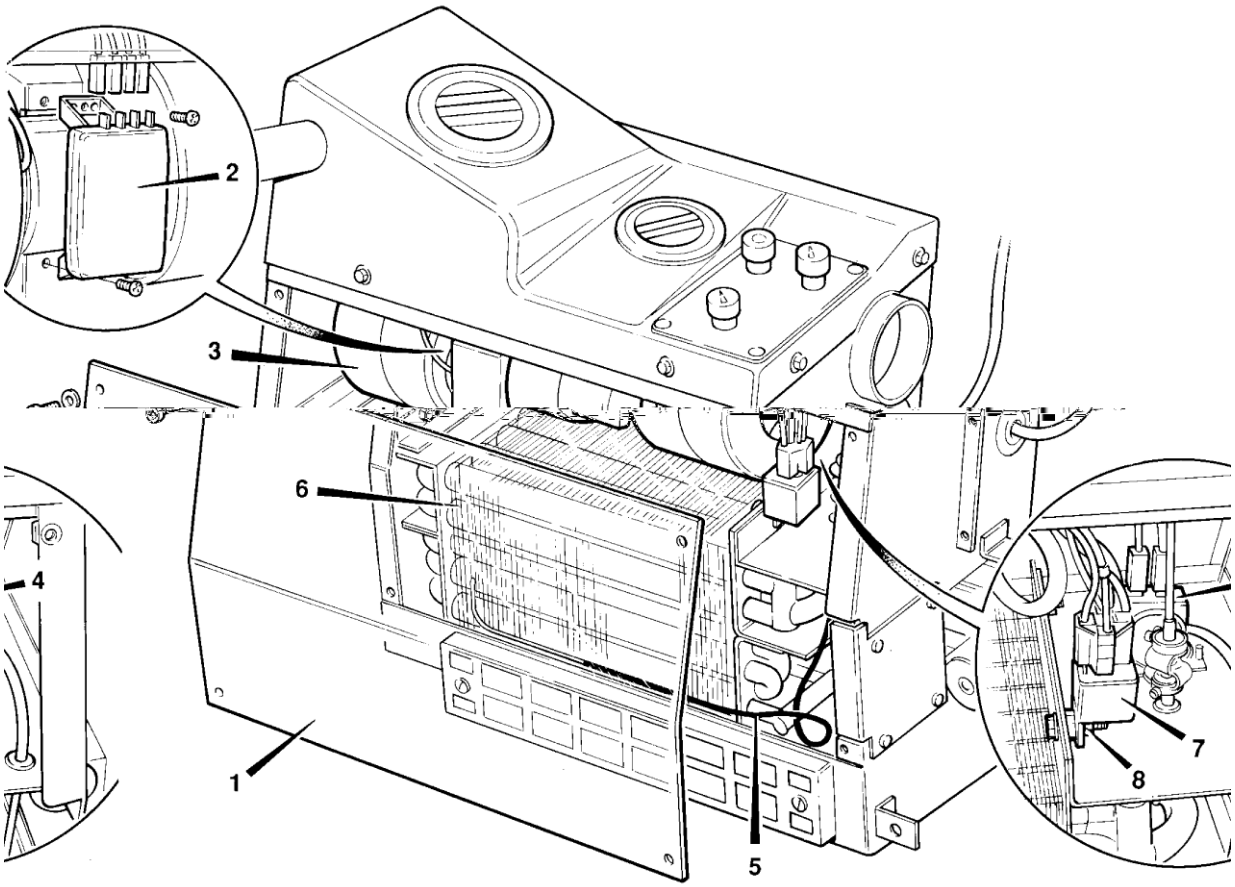

Fig 5. Heating, Ventilation and Air Conditioning Unit (HVAC)

Heater Valve

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇒ *Removal and Replacement (B-79)*

Removal and Replacement

The heater valve **A** is situated in the coolant hose to the cab heater beneath the right hand side console. To access the valve the side console must first be removed.

Removal

1 Park the machine on firm level ground, engage the park brake and set the transmission to neutral. Raise the loader arms and fit the loader arm safety strut. Stop the engine and remove the starter key.

⚠ WARNING

Raised Equipment

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

13-2-3-7_2

2 Remove the front grille and disconnect the battery.

3 Working in the cab, remove the side console. ⇨ ***Side Console (B-58)***.

4 Using suitable clamps seal off the hoses on each side of the heater valve **A**. Undo the two clips **B** and pull off the hoses.

Important: *There may be HOT coolant in the heater unit. Make sure the heater is cool before disconnecting hoses.*

Replacement

Replacement is a reversal of the removal sequence.

On completion run the engine and check for coolant leaks. Top-up the coolant level, see ***Section 3 Routine Maintenance.***

Operate the heater controls and check that the heater operates correctly.

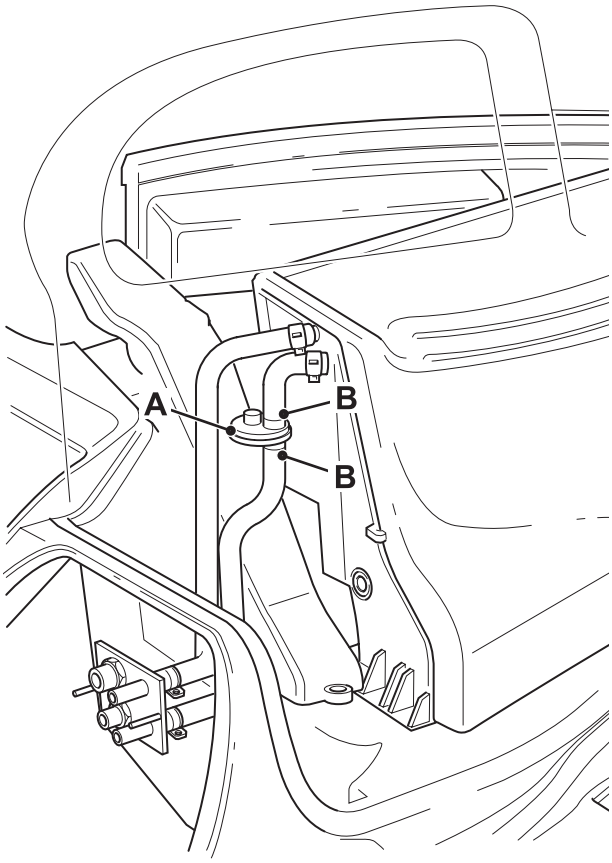

Fig 6.

Cab Seat (Not Servo)

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇒ *Removal and Replacement (B-81)*

Removal and Replacement

Removal

1 Lower the loader to the ground. Engage the park brake, stop the engine and remove the starter key.

2 Working under the seat locate uncouple the seat heater electrical connector (if fitted).

3 Locate and uncouple the seat air compressor electrical connector (if fitted)

4 Undo the four fixing bolts **A** and lift the seat assembly clear of the machine.

Important: *There are spacers fitted under the seat base. Note the positions of the spacers before removing them.*

Replacement

Replacement is the reverse of removal but note the following:

Be sure to locate spacers in their original locations.

Torque tighten bolts **A**.

Test the seat heater and air compressor (if fitted).

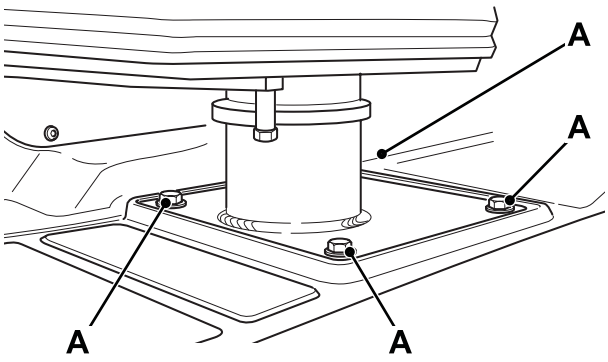

Fig 7.

Table 1. Torque Settings

Item	Nm	kgf m	lbf ft
A	47	4.8	34.7

Fuel Tank

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇨ *Removal and Replacement (B-83)*
⇨ *Fuel Level Sender (B-85)*

Removal and Replacement

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the attachments to the ground. Apply the park brake, put the transmission in neutral and stop the engine. Block both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-4-1_1

Removal

1 Disconnect the battery.

2 ⇨ ***Fig 8. (B-84)***. Working underneath the RH side of the machine, carefully remove the drain plug **A** and drain the fuel tank contents into a suitable clean container. When empty disconnect suction hose **B**.

⚠ WARNING

Diesel Fuel

Diesel fuel is flammable; keep naked flames away from the fuel system. Do not smoke while refuelling or working on the fuel system. Do not refuel with the engine running. There could be a fire and injury if you do not follow these precautions.

INT-3-2-2_1

3 Remove the plastic trim **C** below the front RH corner of the cab to gain access to the top of the fuel level sender **D**.Uncouple the electrical harness from connector **E** and disconnect the fuel return pipe from pipe stub **F**.

4 Remove bolts **G** securing the rear fender extension (if fitted).

5 Support the fuel tank with suitable lifting equipment, then unscrew mounting bolts **H** and carefully lift the tank away from the machine.

Replacement

Replacement is a reversal of the removal sequence, but note the following:

If a new fuel tank is being fitted, remove the fuel level sender **D** from the old tank and fit to the new tank. ⇨ ***Fuel Level Sender (B-85)***.

Renew the O-ring on the drain plug **A**, and apply JCB Threadlocker and Sealer to the threads before fitting. Torque tighten the plug.

Apply JCB High Strength Threadlocker to the threads of mounting bolts **H** before fitting. Torque tighten the bolts.

Refill the tank with clean fuel. Make sure all connections are tight and check for leaks.

On completion, prime the fuel system, see ***Section 3, Routine Maintenance***.

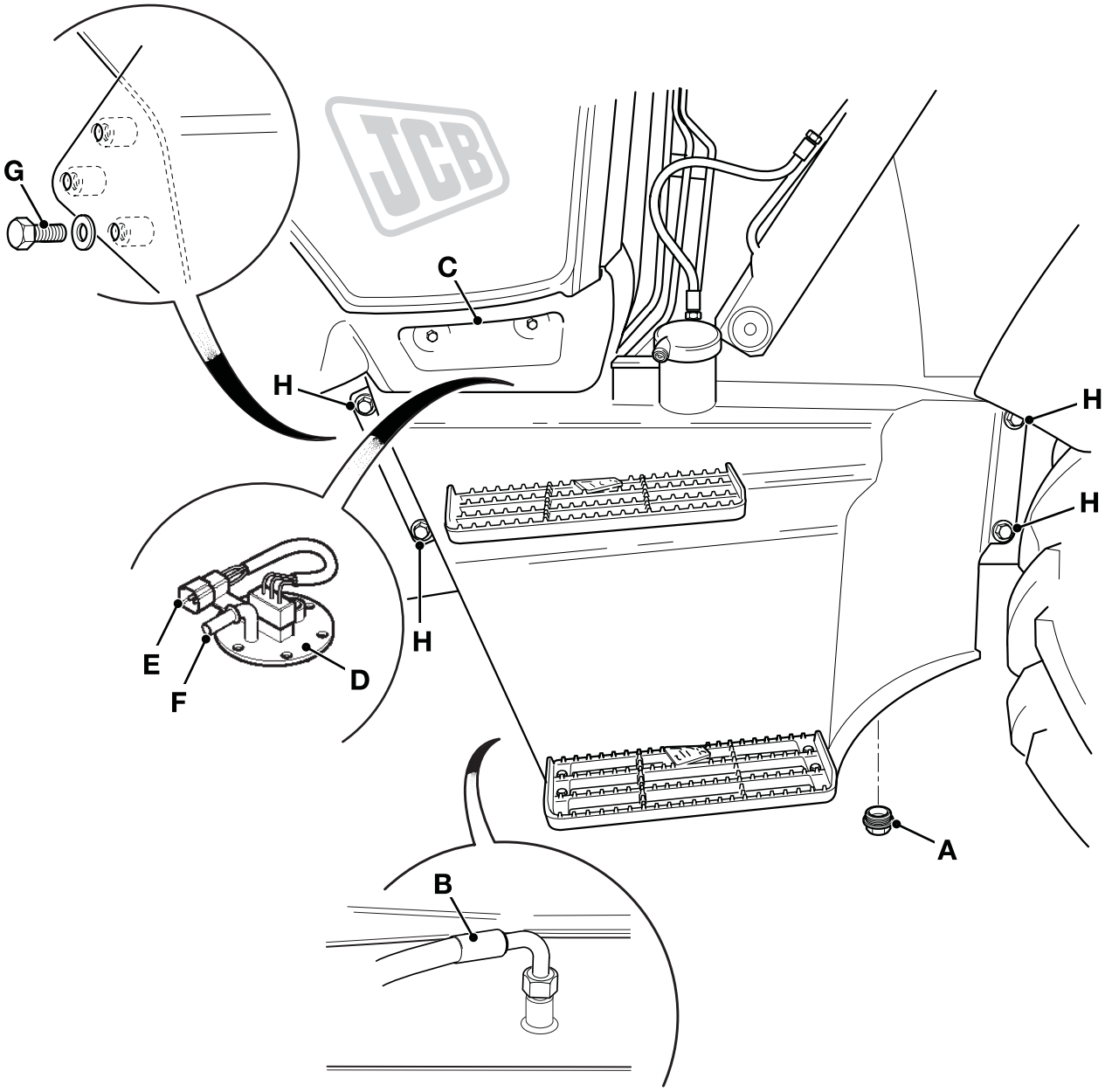

Fig 8. Fuel Tank

Table 2. Torque Settings

Item	Nm	lbf ft	kgf m
A	85 - 100	63 - 74	8.7 - 10.2
H	83	61	8.5

Fuel Level Sender

Removal

1 Note that in order to lift out the fuel level sender the tank must first be lowered from the machine, see ***Fuel Tank - Removal***.

2 Undo bolts **K** and carefully lift the fuel level sender out of the tank aperture.

Replacement

Replacement is a reversal of the removal sequence, but note the following:

Inspect the gasket **L** to make sure it is clean and in good condition. If in doubt, renew the gasket.

When refitting the fuel level sender, make sure the float arm **M** is orientated towards the front of the machine.

Apply JCB Threadlocker and Sealer to the threads of bolts **K**. Torque tighten the bolts.

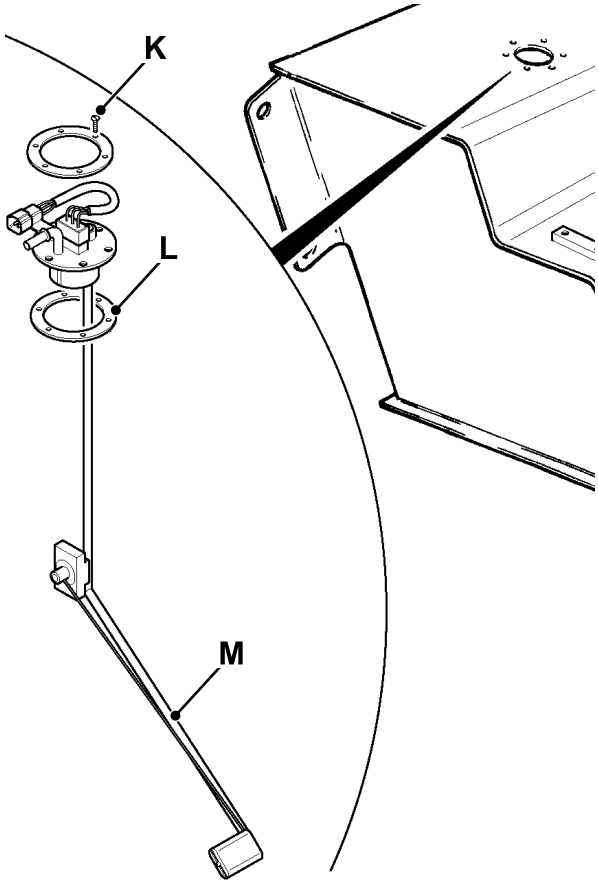

Fig 9.

Table 3. Torque Settings

Item	Nm	lbf ft	kgf m
K	7	5	0.7

Hydraulic Tank

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇨ *Removal and Replacement (B-87)*
⇨ *Fluid Level Sight Glass (B-89)*
⇨ *Filter Cover Plate (B-89)*

Removal and Replacement

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the attachments to the ground. Apply the park brake, put the transmission in neutral and stop the engine. Block both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-4-1_1

Removal

1 Operate the control levers back and forth several times to vent residual hydraulic pressure. Remove the hydraulic tank filler cap.

2 ⇨ ***Fig 10. (B-88)***. Working underneath the LH side of the machine, carefully remove the drain plug **A** and drain the hydraulic tank contents into a suitable clean container.

3 At the rear of the tank, disconnect and plug the hydraulic return hoses **B**.

Note: *Some machine variants may have different return hose configurations at the tank to those illustrated. Be sure to disconnect all hoses.*

4 Loosen the two clips **C** and pull off the suction hose **D**.

5 Remove bolts **E** securing the rear fender extension (if fitted).

6 Support the hydraulic tank with suitable lifting equipment, then unscrew mounting bolts **F** and carefully lift the tank away from the machine.

Replacement

Note: *If a new tank is being fitted, remove the tool box from the old tank and fit to the new tank (if applicable).*

Replacement is a reversal of the removal sequence, but note the following:

Inspect the fluid level sight glass **G** to make sure it is clean and in good condition. If in doubt, renew the sight glass. ⇨ ***Fluid Level Sight Glass (B-89)***.

If the filter cover plate **H** is removed for any reason, use a new gasket and sealing washers. ⇨ ***Filter Cover Plate (B-89)***.

Use a new O-ring on the drain plug **A**, and apply JCB Threadseal to the threads before fitting. Torque tighten the plug.

Apply JCB High Strength Threadlocker to the threads of mounting bolts **F** before fitting. Torque tighten the bolts.

When refitting the suction hose **D** make sure it is correctly fitted and phased on the tank spigot. There must be at least 12 mm (0.5 in) clearance between the hose and the gearbox casing. Phase the two clips **C** 180° apart.

Refill the tank with clean hydraulic fluid, see ***Section 3, Routine Maintenance***.

On completion, operate the machine to bring the hydraulic fluid up to normal working temperature (50 °C, 122 °F). Stop the engine and check for leaks.

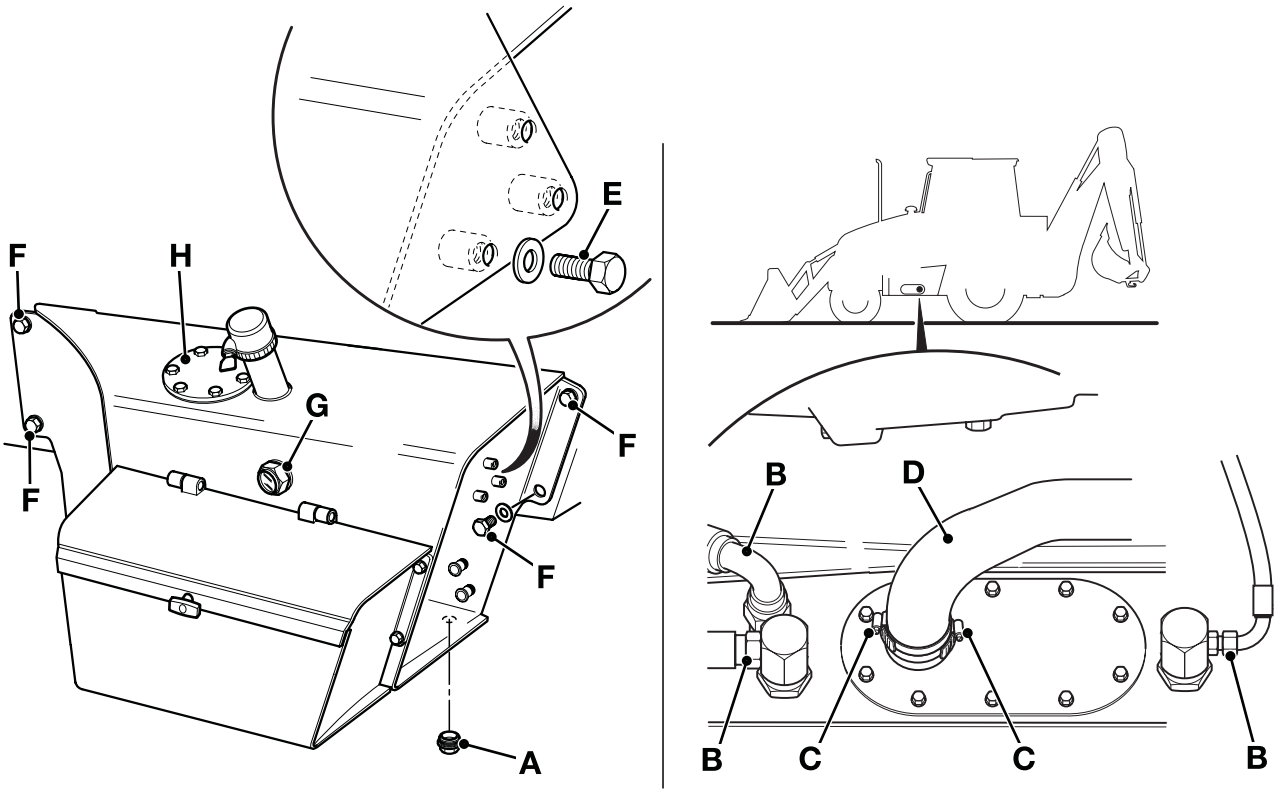

Fig 10. Hydraulic Tank

Table 4. Torque Settings

Item	Nm	lbf ft	kgf m
A	85 - 100	62 - 74	8.6 - 10.2
C	5	4	0.5
F	83	61	8.5

Fluid Level Sight Glass

Removal

1 Before removing the sight glass, the tank must first be drained until the fluid level is below the tank aperture, see ***Hydraulic Tank - Removal***.

2 Carefully unscrew the sight glass **G** from the tank aperture.

Replacement

Replacement is a reversal of the removal sequence, but note the following:

Use a new O-ring on the sight glass **G**, and apply JCB Threadseal to the threads before fitting. Torque tighten the sight glass.

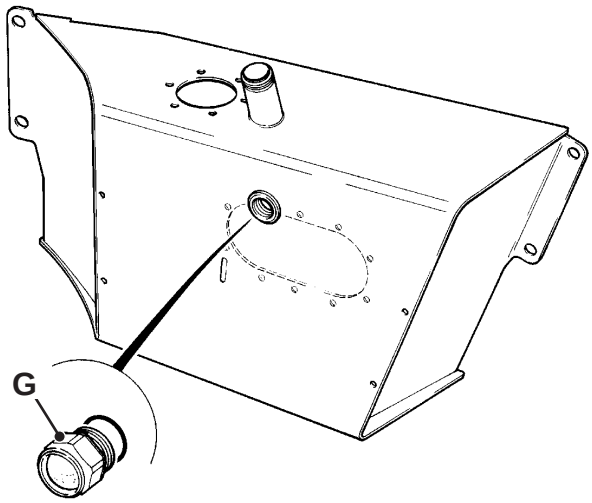

Fig 11.

Table 5. Torque Settings

Item	Nm	lbf ft	kgf m
G	50 - 55	37 - 40	5.1 - 5.6

Filter Cover Plate

Removal

1 Remove the screws **J** and filter cover plate **H**.

2 Remove the sealing washers **K** and gasket **L** and discard them.

Note: *If the screws have plain washers, these should be replaced with sealing washers **K**.*

Replacement

Replacement is a reversal of the removal sequence, but note the following:

Make sure the filter cover plate **H** and hydraulic tank surface is clean.

Use new sealing washers **K** and gasket **L**.

Apply JCB Threadseal to the threads of screws **J** before fitting. Torque tighten the screws.

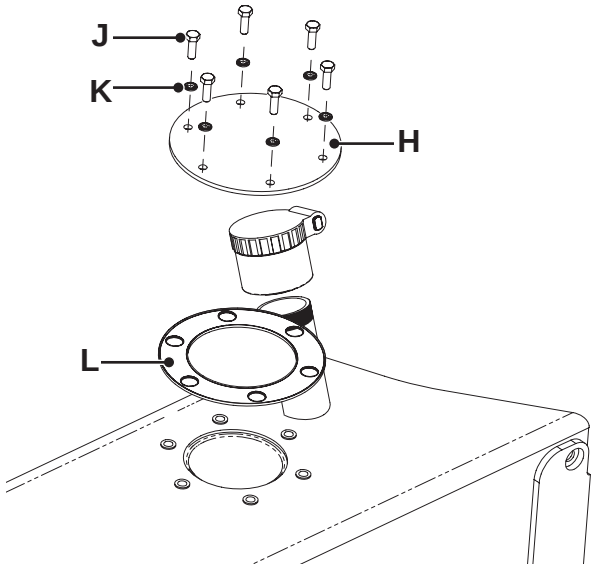

Fig 12.

Table 6. Torque Settings

Item	Nm	lbf ft	kgf m
J	21	15.4	2.1

Engine Cover

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇒ ***Removal and Replacement (B-91)***

Removal and Replacement

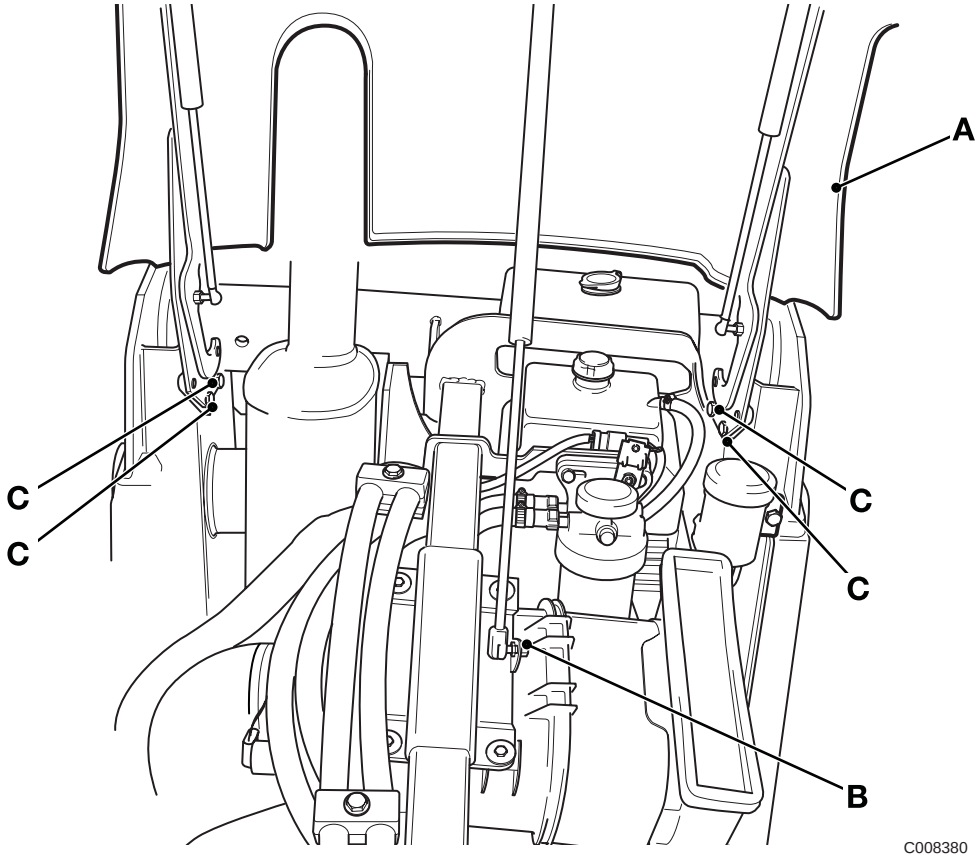

Fig 13.

Removal

1 Lower the loader to the ground. Engage the park brake, stop the engine and remove the starter key.

2 Open the engine cover **A** fully. Support the cover using suitable overhead lifting equipment.

3 Undo the centre gas strut mount **B**.

4 Undo the two hinge fixing bolts **C** at the left and right side hinges. Retrieve spacer plates (if fitted).

5 Using the lifting equipment manoeuvre the engine cover clear of the machine.

Replacement

Replacement is the reverse of removal.

Front Grille Housing

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇒ ***Removal and Replacement (B-93)***

Removal and Replacement

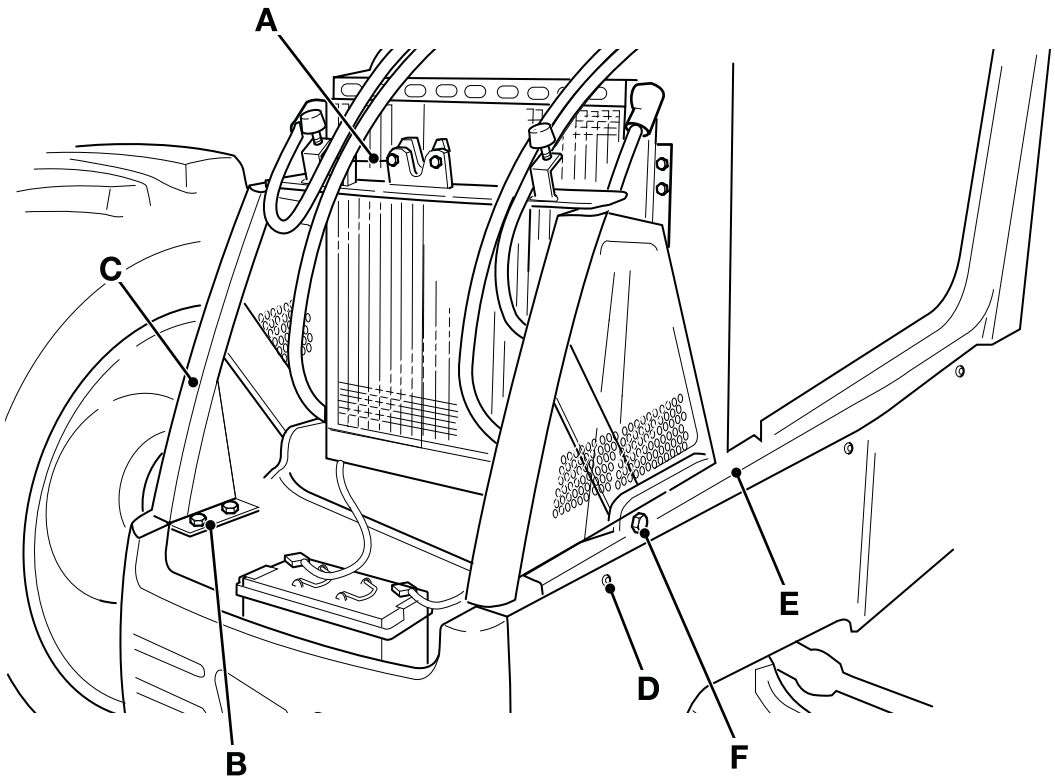

Fig 14.

Removal

1 Position the loader and make safe as applicable. Engage the park brake, stop the engine and remove the starter key.

2 Remove the front grille and raise the engine cover.

3 Disconnect the engine cover release cable (if fitted) at the catch **A**.

4 Undo the bolts **B** at each side of the grille housing **C**.

5 Undo screws **D** and remove the plastic side trim **E** (each side).

6 Undo the stay bolt **F** at the left and right hand stays.

7 Carefully lift the grille housing clear of the machine.

Replacement

Replacement is the reverse of removal.

Make sure that the engine cover release cable (if fitted) is adjusted correctly.

Loader Arms

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

⇒ ***Removal and Replacement (B-95)***

Removal and Replacement

Removal

1 Park the machine on firm level ground. Engage the parking brake and set the transmission to neutral.

2 Remove loader end attachment (such as a shovel) if fitted. If the attachment is hydraulically operated, disconnect attachment hoses and plug/cap immediately. Vent residual hydraulic pressure prior to removing hoses by operating the control levers with the engine switched off.

⚠ WARNING

Do not work under raised loader arms unless they are adequately supported by stands and/or slings.

BF-3-1

3 Remove the engine cover. ⇨ ***Engine Cover (B-90)***.

4 ⇨ ***Fig 15. (B-97)***. Raise the loader arms to give access to the lift ram pivot pins **A**.

5 Sling the loader arms as shown at **X**. Make sure that the slings are taut and therefore holding the weight of the loader arms.

6 Switch off the engine and vent residual hydraulic pressure from the loader end by operating the loader controls back and forth several times.

7 Remove the lift ram pivot pins **A**.

Note: *Care must be taken when removing the lift ram pivot pin, once the pin is removed the ram will drop. Either hold the ram using a sling or have a second person hold the ram before removing the pin.*

8 Lower the loader arms to the ground using the slings, it may be necessary to retract the lift rams to enable the loader arms to rest fully on the ground. Make sure the lift rams do not foul when retracted.

9 Make sure residual hydraulic pressure has been vented. Disconnect the shovel ram and auxiliary (if fitted) hoses, shown at **B**. Plug and cap the hoses immediately.

10 Disconnect the electrical connections (not shown) to the loader shovel reset switch (if fitted).

11 Remove pivot pin retaining bolts **D**, **E**, **F** and **G**.

12 Sling the loader arms as shown at **Y**. Make sure that the sling is wrapped around the loader arms only and not the level links.

13 Remove klipring **H** and shim **K**.

⚠ WARNING

The loader arm interlevers are potentially dangerous, when pivoting about their centre they form a 'scissor' point with the loader arm. Make sure the interlevers are securely blocked when working in the loader arm area.

BF-2-1

14 Secure the interlever linkage as shown at **Z**, otherwise with level link pivot pin **L** removed, the interlever linkage could pivot about its centre and cause injury and/or damage.

15 Remove pivot pin **L** (use slide hammer kit, see ***Service Tools***).

16 Repeat steps **13** to **15** for the opposite level link pivot pin.

17 Remove bolt **T** and retaining ring **R**.

18 Remove pivot pin **U** (use slide hammer kit, see ***Service Tools***).

19 Repeat steps **17** and **18** for the opposite loader arm pivot pin.

20 When all four pivot pins have been removed, carefully reverse the machine clear of the loader arms

Replacement

Replacement is a reversal of the removal sequence but note the following.

Fit pivot pins with the extraction hole on the outside of the machine.

Check operation of loader shovel reset switch (if fitted).

Apply grease to all mainframe bores.

Apply rust inhibiting oil to all pivot pins.

If fitting new liner bearings, assemble with a close fitting shouldered mandrel to ensure minimum ovality.

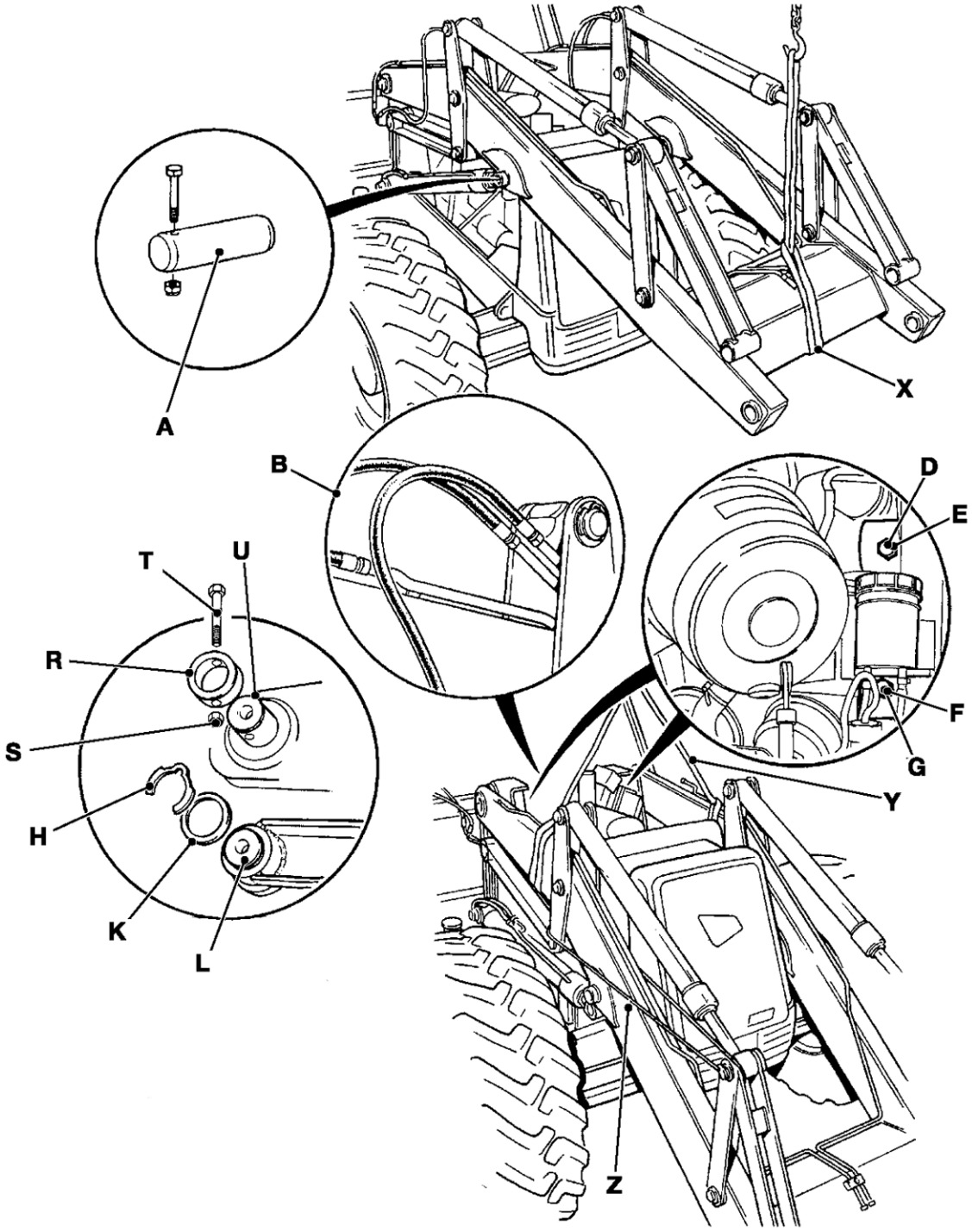

Fig 15.

Stabiliser Legs

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

Sideshift

Wear Pads

The wear pads support and guide the inner leg section. They ensure that during extension and retraction the inner leg is kept central and has a minimum amount of `float'.

Wear Pad - Adjustment

Note: *It is very important that the wear pads are adjusted at the correct service intervals, as the inner leg could contact the outer leg and scoring could occur. Scoring will dramatically reduce wear pad life.*

For the wear pad adjustment procedure, see ***Section 3, Routine Maintenance***.

Removal and Replacement

Sideshift

Removal

1 Park the machine on firm level ground. Engage the parking brake and set the transmission to neutral.

2 Lower the loader shovel to the ground.

3 Make sure that the backhoe assembly is set central to the mainframe as shown. If necessary 'sideshift' the backhoe into a central position.

4 Remove the stabiliser foot and ram, refer to ***Section E Hydraulic Rams, Removal and Replacement - Stabiliser Ram***.

5 ⇨ *Fig 16. (B-101)*. Remove the inner leg:

- **a** Locate a suitable jack underneath the inner leg.
- **b** Use the jack to lift the inner leg until the top wear pads **A** protrude from the top of the outer leg section.
- **c** Remove the wear pads and attach suitable lifting gear through the wear pad locating holes.
- **d** Use suitable lifting equipment, lift the inner leg clear.

Replacement

Replacement is a reversal of the removal sequence.

Select suitable size upper pads **A** to achieve a maximum permissible float of 1mm (0.039 in.).

Make sure that the bottom pads **C** are held in position before guiding the inner leg into position. If the lower pads are not secured then the inner leg could dislodge the pads during assembly.

When the inner leg is in position adjust the bottom pads, refer to ***Section 3, Stabiliser Legs - Wear Pad Adjustment***.

Apply a grease such as JCB slew grease (part number 4003/1601) to the threads of pad **B**.

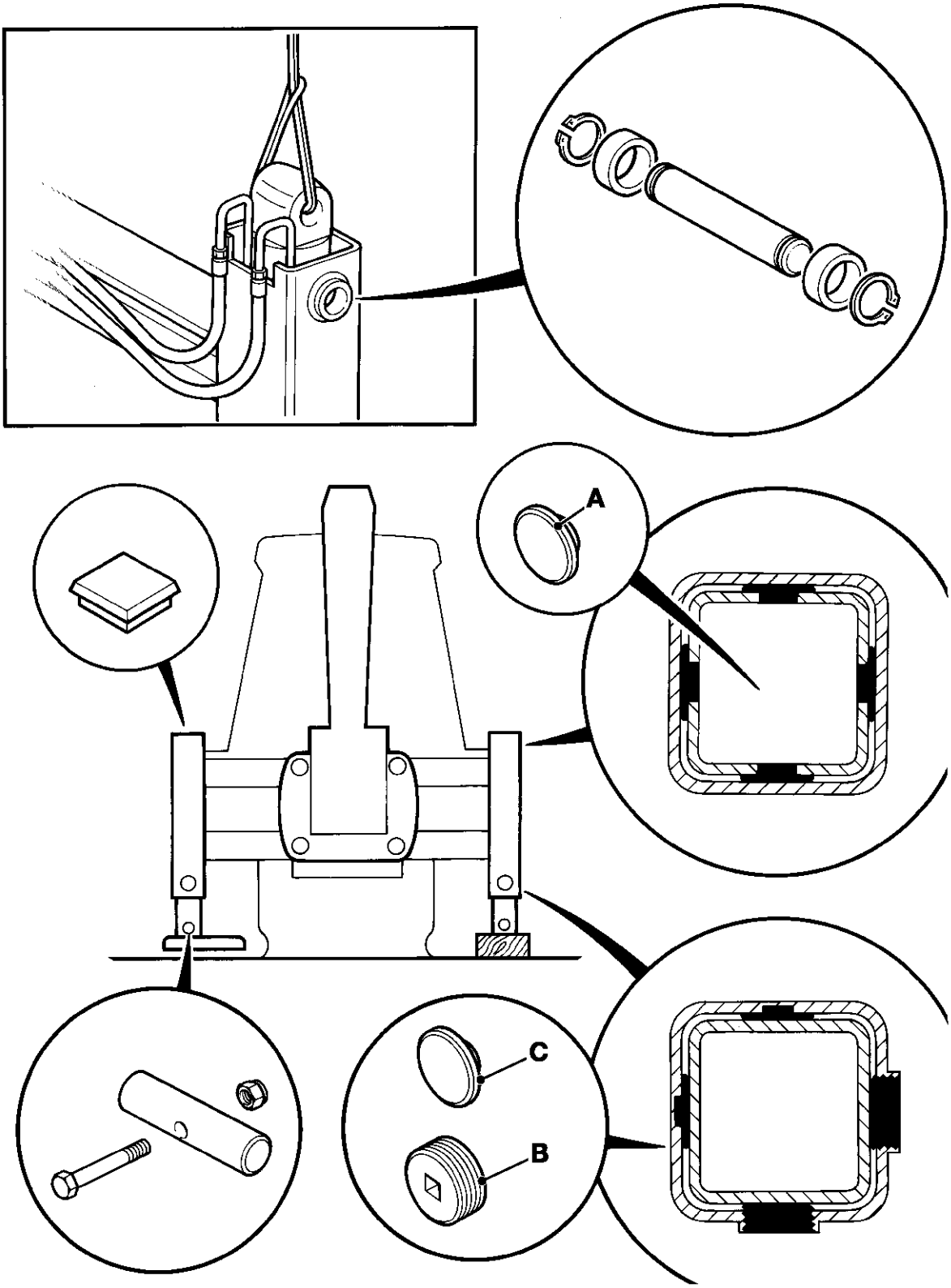

Fig 16. Sideshift

Centremount

Removal

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the backhoe and loader end to the ground and stop the engine.

2 Lower the stabiliser legs to the ground.

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

3 Make sure the engine is switched off, vent residual hydraulic pressure by moving the backhoe and stabiliser control levers back and forth.

Note: *If a check valve is fitted on the ram, the system will not vent. Extreme caution must be used when releasing hydraulic connections - release the connections one turn and allow the pressure to dissipate.*

4 ⇨ *Fig 17. (B-103)*. Remove the stabiliser ram:

a Carefully disconnect hydraulic hoses **A** and **B** from the stabiliser hydraulic ram, label the hoses before removing (as an aid to assembly). Release the connections slowly.

b If a stabiliser foot is fitted, remove nut **C** and retaining bolt **D**. Drive out the foot retaining pin **E**.

WARNING

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

BF-4-1_1

c Wrap a suitable sling around the stabiliser ram, make sure that the weight of the ram is supported by the sling.

d Remove the ram pivot pin retaining nut and bolt, drive out the ram pivot pin as shown at **F**.

e Remove the stabiliser ram.

WARNING

The stabiliser leg is heavy. It is recommended that the stabiliser leg is removed with the assistance of a sling and suitable lifting appliance.

BF-2-6

5 Remove the stabiliser leg:

a Wrap a suitable sling around the stabiliser leg, make sure that the weight of the leg is supported by the sling.

b Remove the stabiliser leg pivot pin retaining nut and bolt, drive out the stabiliser leg pivot pin, as shown at **G**.

c Remove the stabiliser leg.

Replacement

Replacement is a reversal of the removal sequence.

Use suitable lifting appliances to locate the stabiliser ram and the stabiliser leg.

After replacing or fitting the stabiliser leg, connect the hydraulic pipes, make sure that the ram and leg operate freely and do not foul.

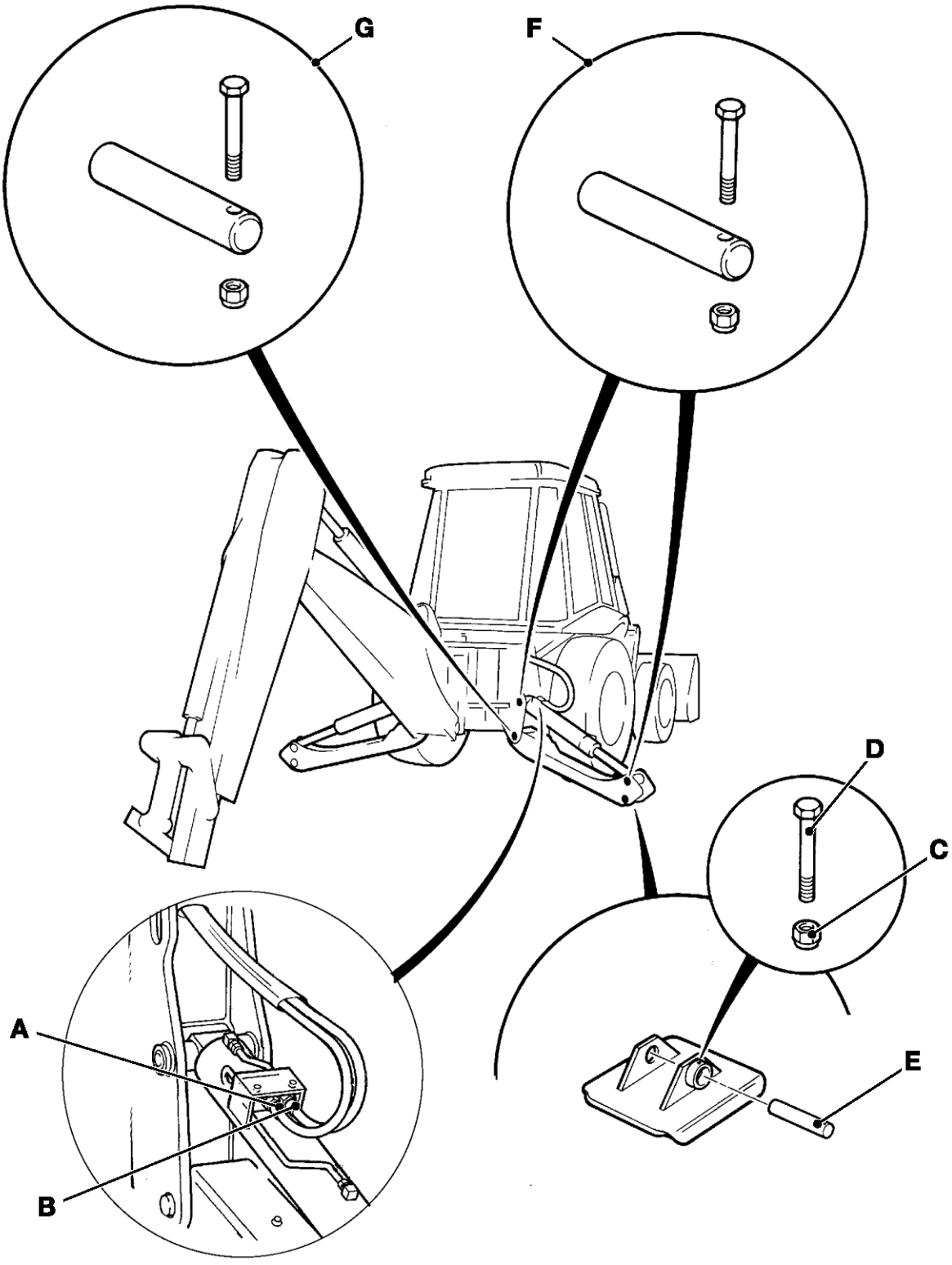

Fig 17. Centremount

Stabiliser Leg Alarm SYSTEM

Related Topics

The table lists other topics in the section that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text contains cross-references to help you find the correct information.

Topic Titles:
⇨ *Stabiliser Legs (B-98)*

Operation Overview

The stabiliser leg alarm system is installed on some machines to comply with local legislation. The stabiliser legs have sensor switches fitted that detect if the legs are extended or retracted. The switches **A** are part of an electrical circuit that is integrated with the transmission forward/neutral/reverse column lever.

If the stabiliser legs are not in the fully retracted position when either ‘forward’ or ‘reverse’ drive is selected, an indicator light on the front steering console will illuminate and a warning buzzer will sound to alert the operator to raise the stabiliser legs.

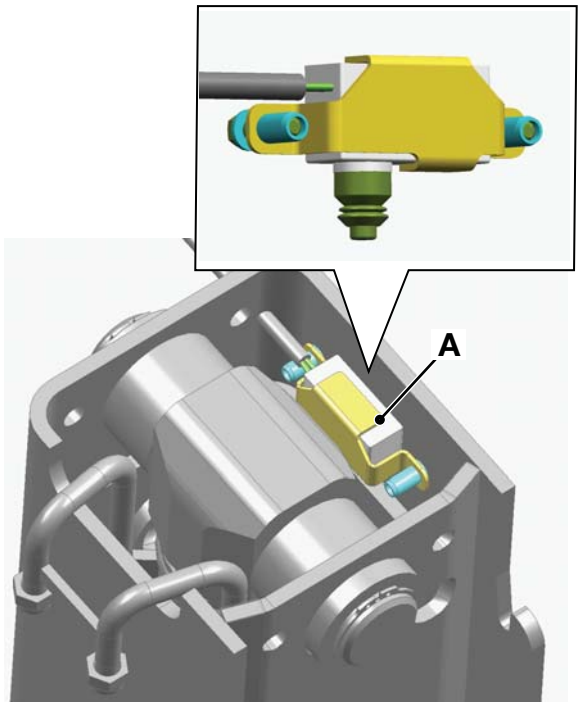

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Fig 1. Early Machines - Plunger Type Switch

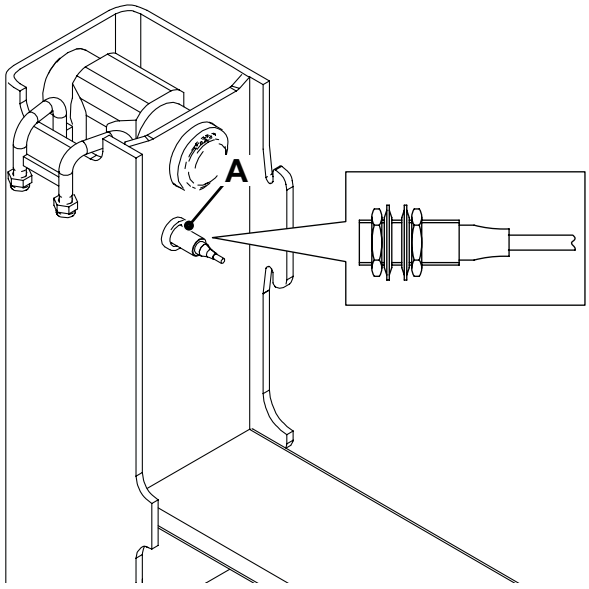

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Fig 2. Later Machines - Proximity Type Switch

Electrical Description

The schematic diagrams in this section show how the electrical circuit works when different functions are operated.

The wire numbers and colours, where appropriate, are shown as an aid to identification while fault finding. The wires coloured red show the electrical live feeds. The wires coloured green show the electrical returns to earth.

Before fault finding make sure that you understand how the electrical circuits work. Most potential faults can be traced using a multimeter to carry out continuity checks on wires, switches and solenoids.

Neutral Selected: ⇨ *Fig 3. (B-107)*. Each stabiliser leg has a sensor switch that detects if the leg is extended or fully retracted. The diagram shows the circuit with the LH stabiliser extended (sensor switch **1** contacts closed), and the RH stabiliser fully retracted (sensor switch **2** contacts open).

With the column mounted forward/reverse lever **3** set at neutral, the stabiliser leg alarm cut-out relay **4** is energised. The relay contacts break the live feed to the leg alarm relay **5**, so that it cannot energise. While the forward/reverse lever **3** remains at neutral, the warning buzzer **6** will not operate when either stabiliser leg is extended.

Forward Selected: ⇨ *Fig 4. (B-107)*. When the forward/reverse lever **3** is moved to the forward position (or the reverse position), the stabiliser leg alarm cut-out relay **4** de-energises. The relay contacts connect a live feed to the leg alarm relay **5**. The LH stabiliser switch **1** completes the return circuit for the leg alarm relay **5**, which energises. The relay contacts, in turn, complete the return circuit for the warning relay **7**, which also energises. The warning relay contacts complete the return circuit to sound the warning buzzer **6**, and illuminate the warning indicator light in the front console **8** to warn the operator that the LH stabiliser is not fully retracted.

Component Key:

1 Sensor switch - LH stabiliser leg
2 Sensor switch - RH stabiliser leg
3 Forward/Neutral/Reverse lever (column switch)
4 Stabiliser leg alarm cut-out relay
5 Stabiliser leg alarm relay
6 Warning buzzer
7 Warning relay
8 Warning lights (Front steering console)

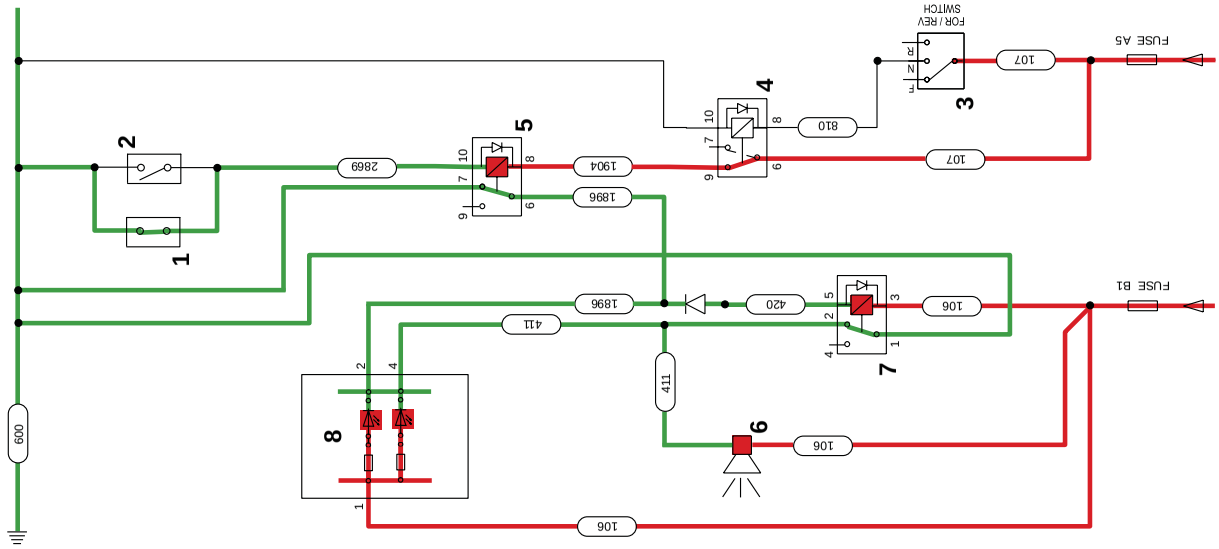

Fig 4. Forward Selected - LH Leg Extended

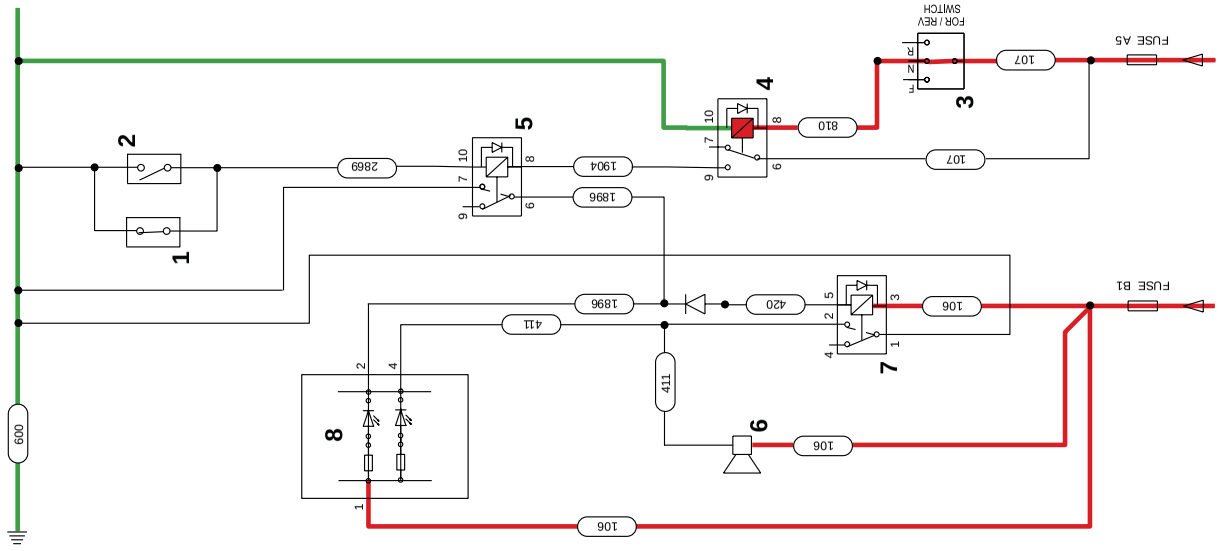

Fig 3. Neutral Selected - LH Leg Extended

Wires and Connectors

Wires and connectors ⇨ *Fig 5. (B-109)*. On the electrical diagram the electrical connectors (example, CP1) are shown looking on the mating face of each connector when they are disconnected.

Wires coloured red show the electrical live feeds. Wires coloured green show the electrical return to earth.

Earth Points

Faults may be caused by poor earth connections. Although earth connections are shown, it must be remembered that the cab assembly is earthed via further earth strap and cable connections.

Component Key

The following key identifies the component connectors.

h1	Harness - Front Console
h2	Harness - Cab/Side Console
h3	Harness - Rear Lights

Note: *For harness drawings see* ***Section C, Electrics****.*

Connectors (h1)

FA	h1 - h2
FL	LH Column switch
FR	Front warning lights
FS	Speedo

Connectors (h2)

CP1	h2 - h1
CP4	Earth point
CP5	Earth point
CP9	Diode gate
CP15	Cab bulkhead connector
CP23	Stabilser leg alarm relay
CP24	Stabilser leg alarm cut-out relay
CP26	Buzzer
CP27	Fusebox B
CP29	Warning relay
CP33	Fusebox A

Connectors (h3)

RL1	h3 - h2
RL5	Sensor switch - RH stabiliser leg
RL6	Sensor switch - LH stabiliser leg

Splices (h1)

SFC24

Splices (h2)

SCP2
SCP4
SCP6
SCP18
SCP20
SCP25
SCP32
SCP37

Splices (h3)

SRL1
SRL3

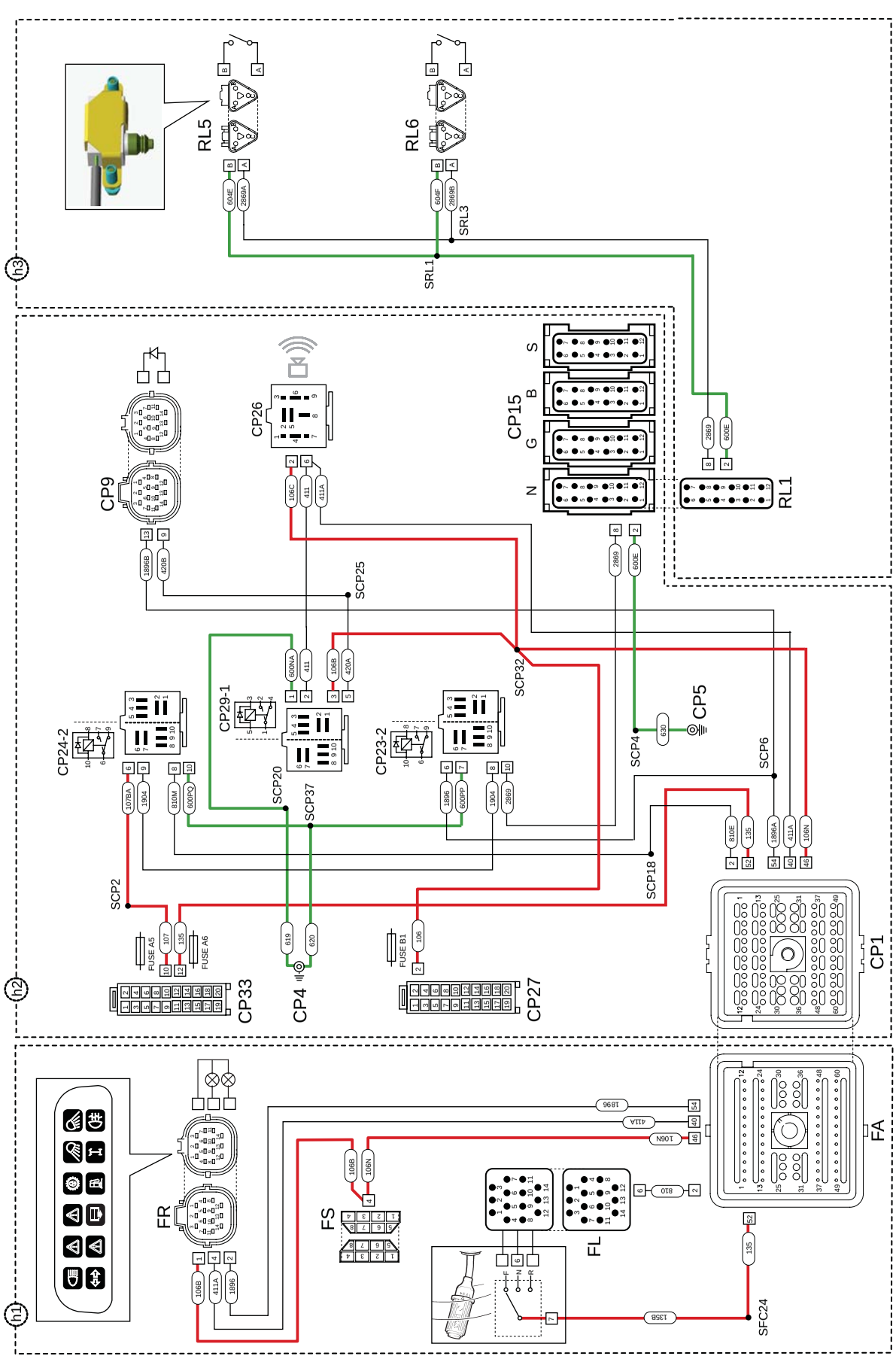

Fig 5. Wires and Connectors

Electrical Operation and Schematics - Later Machines

Electrical Description

The schematic diagrams in this section show how the electrical circuit works when different functions are operated.

The wire numbers and colours, where appropriate, are shown as an aid to identification while fault finding. The wires coloured red show the electrical live feeds. The wires coloured green show the electrical returns to earth.

Before fault finding make sure that you understand how the electrical circuits work. Most potential faults can be traced using a multimeter to carry out continuity checks on wires, switches and solenoids.

Neutral Selected: ⇨ *Fig 6. (B-111)*. Each stabiliser leg has a sensor switch that detects if the leg is extended or fully retracted. The diagram shows the circuit with the LH stabiliser extended (sensor switch **1** contacts open), and the RH stabiliser fully retracted (sensor switch **2** contacts closed).

With the column mounted forward/reverse lever **3** set at neutral, the stabiliser leg alarm relays **4** and **5** are both energised by a live feed via diodes **9**. The relay contacts break the return to earth circuit for the warning relay **7**, so that it cannot energise. While the forward/reverse lever **3** remains at neutral, the warning buzzer **6** will not operate when either stabiliser leg is extended.

Forward Selected: ⇨ *Fig 7. (B-111)*. When the forward/reverse lever **3** is moved to the forward position (or the reverse position), stabiliser leg alarm relay **5** de-energises. The relay contacts complete the return circuit for the warning relay **7**, which energises. The warning relay contacts complete the return circuit to sound the warning buzzer **6**, and illuminate the warning indicator light in the front console **8** to warn the operator that the LH stabiliser is not fully retracted.

Component Key:

1	Sensor switch - LH stabiliser leg
2	Sensor switch - RH stabiliser leg
3	Forward/Neutral/Reverse lever (column switch)
4	RH Stabiliser leg alarm relay
5	LH Stabiliser leg alarm relay
6	Warning buzzer
7	Warning relay
8	Warning lights (Front steering console)
9	Diode

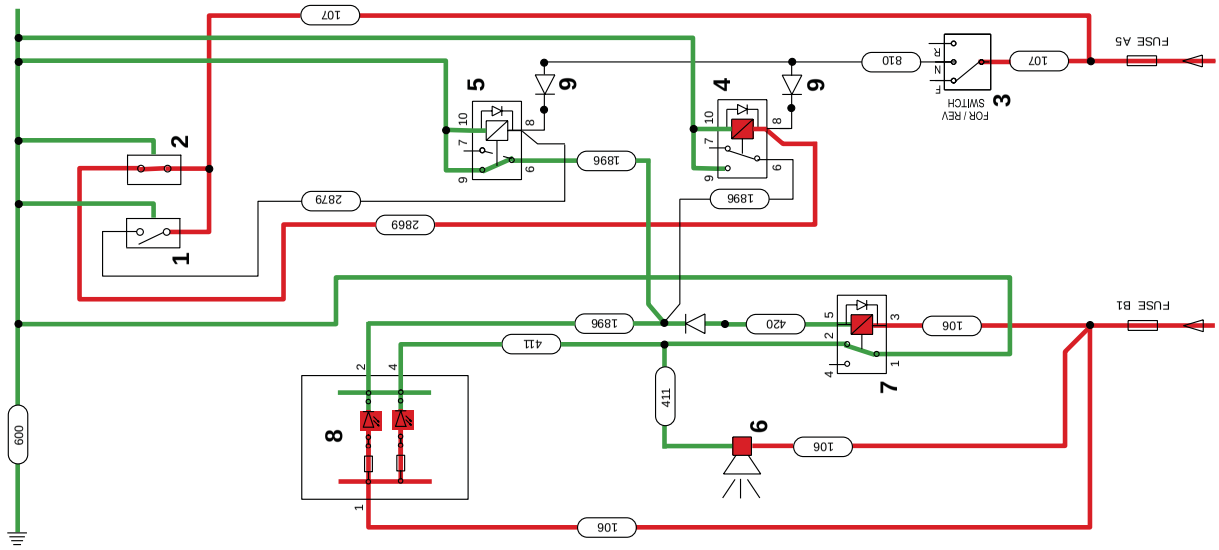

Fig 7. Forward Selected - LH Leg Extended

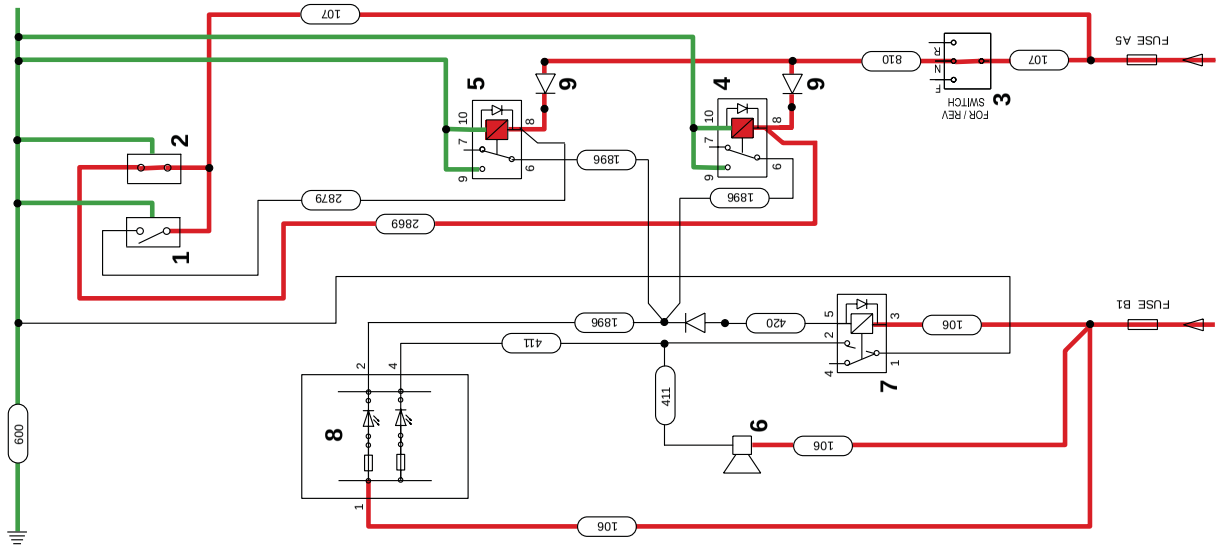

Fig 6. Neutral Selected - LH Leg Extended

Wires and Connectors

Wires and connectors ⇒ *Fig 8. (B-113)*. On the electrical diagram the electrical connectors (example, CP1) are shown looking on the mating face of each connector when they are disconnected.

Wires coloured red show the electrical live feeds. Wires coloured green show the electrical return to earth.

Earth Points

Faults may be caused by poor earth connections. Although earth connections are shown, it must be remembered that the cab assembly is earthed via further earth strap and cable connections.

Component Key

The following key identifies the component connectors.

h1	Harness - Front Console
h2	Harness - Cab/Side Console
h3	Harness - Mainframe

Note: *For harness drawings see* ***Section C, Electrics****.*

Connectors (h1)

FA	h1 - h2
FL	LH Column switch
FR	Front warning lights
FS	Speedo

Connectors (h2)

CP1	h2 - h1
CP3	Earth point
CP4	Earth point
CP6	h2 - h3
CP9D	Diode gate
CP23	Stabilser leg alarm relay
CP24	Stabilser leg alarm relay
CP27	Fusebox B
CP29	Warning relay
CP33	Fusebox A
CP57 (J1)	Instrument cluster (for warning buzzer)
CP57 (J2)	Instrument cluster (for warning buzzer)
CP110	Diode

Connectors (h3)

MF1	h3 - h2
MF22	Earth point
MF31	Sensor switch - RH stabiliser leg
MF32	Sensor switch - LH stabiliser leg

Splices (h1)

SFC24

Splices (h2)

SCP2
SCP6
SCP12
SCP18
SCP20
SCP25
SCP32
SCP37

Splices (h3)

SMF3
SMF7

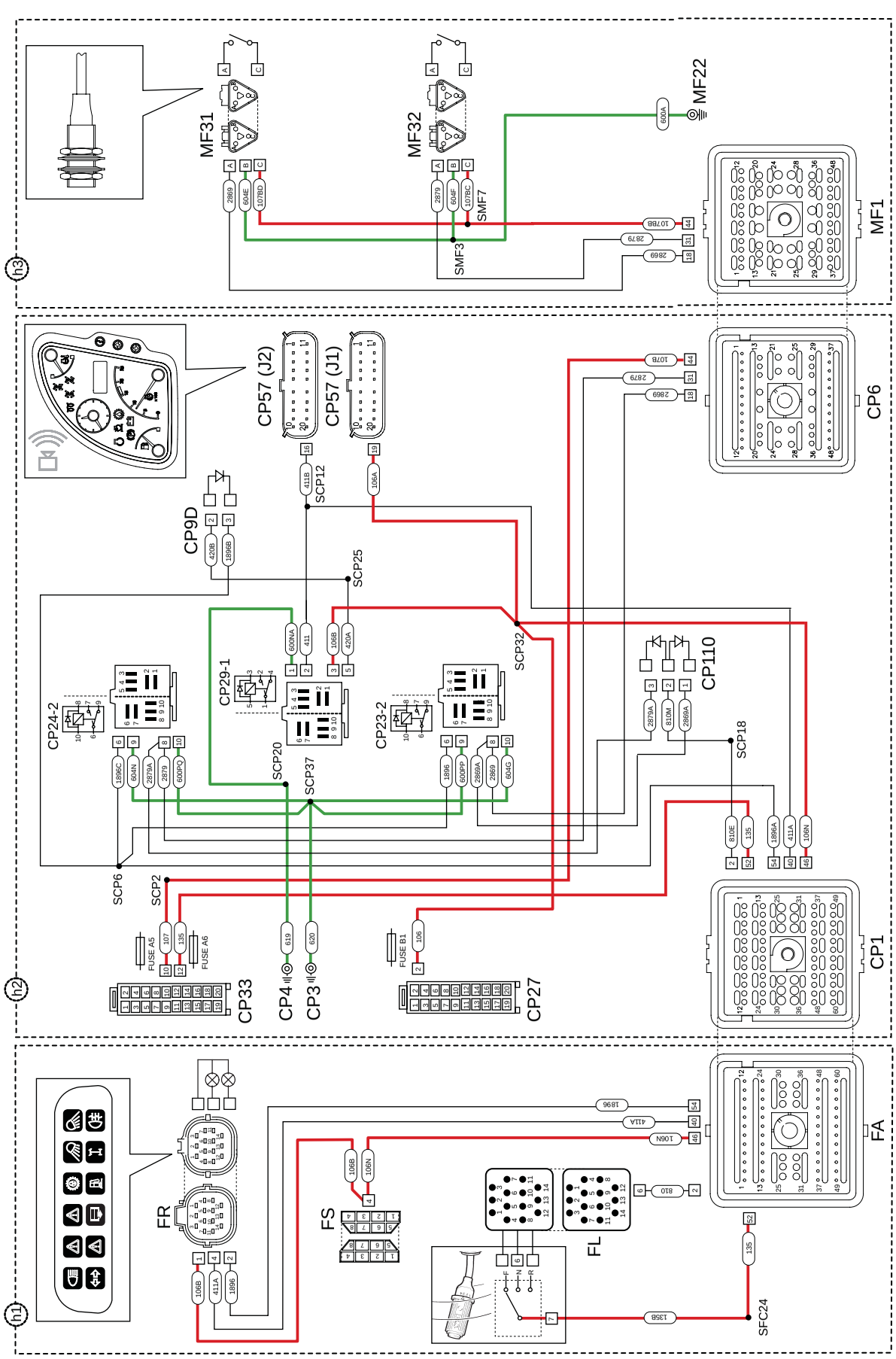

Fig 8. Wires and Connectors

Leg Alarm Switch - Adjustment (Sideshift)

Each stabiliser leg has a sensor switch that detects if the leg is extended or fully retracted. On early machines the switch **A** is a plunger type. It operates when the plunger contacts the top of the inner leg section. On later machines the switch **B** is a proximity type. It operates when the inner leg section moves in front of the switch.

1 Start the engine.

2 Make sure that the park brake is engaged, then move the Forward/Reverse column lever away from neutral.

3 Slowly extend one of the stabiliser legs and check that the low stabiliser leg indicator light (on the console) is ON, and the audible alarm sounds when the leg has extended between 10 and 20 mm (0.39 and 0.78 in).

4 Retract the stabiliser leg fully and check that the low stabiliser leg indicator light is OFF and the audible alarm stops.

5 Return the Forward/Reverse lever to neutral and stop the engine.

6 **Early Machines:** If necessary, loosen the fixing screws and adjust the position of the switch assembly so it operates at the correct distance.

Later Machines: If necessary, loosen locknuts **C** and adjust the switch.

a Screw the switch in until the front face reaches the front face of the stabiliser wear pad. Then screw the switch out by one full turn.

b Tighten the first locknut **C**, then tighten the second locknut against the first. Torque tighten each locknut to 20 Nm (2.0 kgf m, 14 lbf ft). DO NOT over-tighten because the switch may be damaged.

7 Repeat the test for the other stabiliser leg.

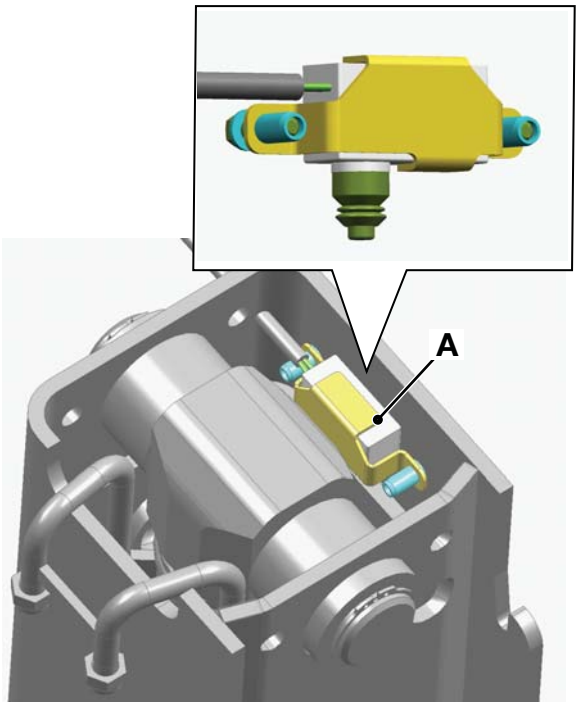

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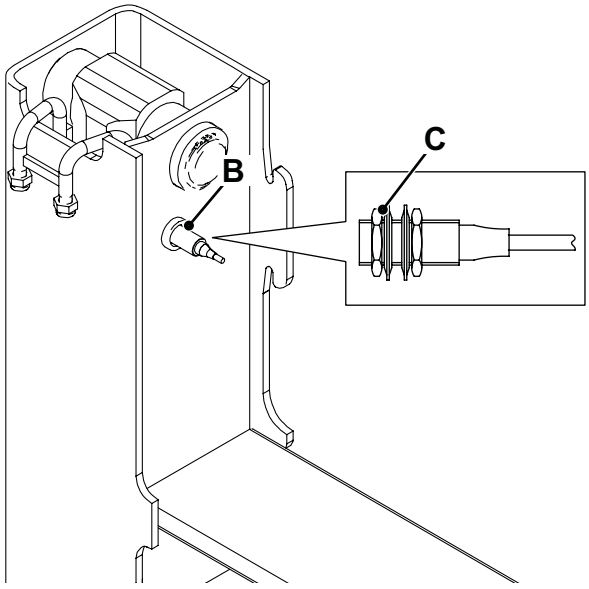
Fig 9. Early Machines

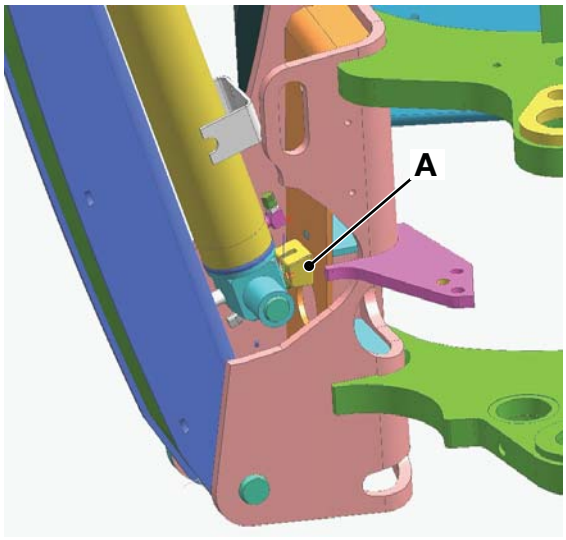


C091110-C1

Fig 10. Later Machines

Leg Alarm Switch - Adjustment (Centremount)

Each stabiliser leg has a sensor switch that detects if the leg is extended or fully retracted. The switch **A** is a vane type. It operates when the metal trigger plate moves between the switch faces.



C085990

Fig 11.

1 Start the engine.

2 Make sure that the park brake is engaged, then move the Forward/Reverse column lever away from neutral.

3 Slowly extend one of the stabiliser legs and check that the low stabiliser leg indicator light (on the console) is ON, and the audible alarm sounds when the leg has extended between 10 and 20 mm (0.39 and 0.78 in).

4 Retract the stabiliser leg fully and check that the low stabiliser leg indicator light is OFF and the audible alarm stops.

5 Return the Forward/Reverse lever to neutral and stop the engine.

6 If necessary, loosen the fixing screws and adjust the position of the metal trigger plate so the switch operates at the correct distance:

- **a** If the sensor switch contacts operate after the required distance, move the trigger plate further away from the sensor switch.
- **b** If the sensor switch contacts operate before the required distance, move the trigger plate further towards the sensor switch.
- **c** When the trigger plate is correctly set, tighten the fixing screws.

7 Repeat the test for the other stabiliser leg.

Boom and Dipper

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

Extending Dipper

Wear Pad Adjustment

For the wear pad adjustment procedure see ***Section 3, Routine Maintenance***.

Removal and Replacement

Boom

Removal

The procedures describe the removal of the boom with the boom and dipper rams still installed. If required, these items can be removed separately before removing the boom, refer to the appropriate removal and replacement procedure.

1 ⇨ *Fig 12. (B-119)*. Remove the backhoe bucket and place the backhoe in the position shown at **A**.

2 Lower the stabilisers.

3 Stop the engine and disconnect the battery (to prevent the engine being started).

4 Operate the backhoe control levers back and forth several times to release pressure trapped in the hydraulic hoses.

⚠ 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

5 Disconnect the hydraulic hoses from the bulkhead plate **B**. Always label hydraulic hoses before disconnecting them, this will ensure that they are correctly reconnected. Plug and cap all hose open ends to prevent ingress of dirt and loss of hydraulic fluid.

6 Remove the dipper. ⇨ *Dipper (B-120)*.

7 Wrap a sling around the boom as shown at **D**. Make sure the weight of the boom is held by the sling before removing pivot pins etc.

8 Place a suitable support underneath the boom ram **C**.

9 Remove two thin nuts **E**, bolt **F** and pivot pin **G**.

10 Remove heavy duty circlip **H**, spacers **J** (one fitted each side) and pivot pin **L**. Mark the spacers so that they can be replaced in the same positions.

11 Hoist the boom clear of the kingpost assembly.

⚠ WARNING

Fluid Under Pressure

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

INT-3-1-10_2

Replacement

Replacement is generally a reversal of the installation procedure.

The boom pivot pin **G** must be retained using two M12 thin nuts. Fit the first thin nut with zero torque, fit the second thin nut and torque to 98 Nm (72 lbf ft).

When fitting the boom to the kingpost assembly, make sure that spacers **J** are refitted in their original positions.

Replace all pivot pin seals as required.

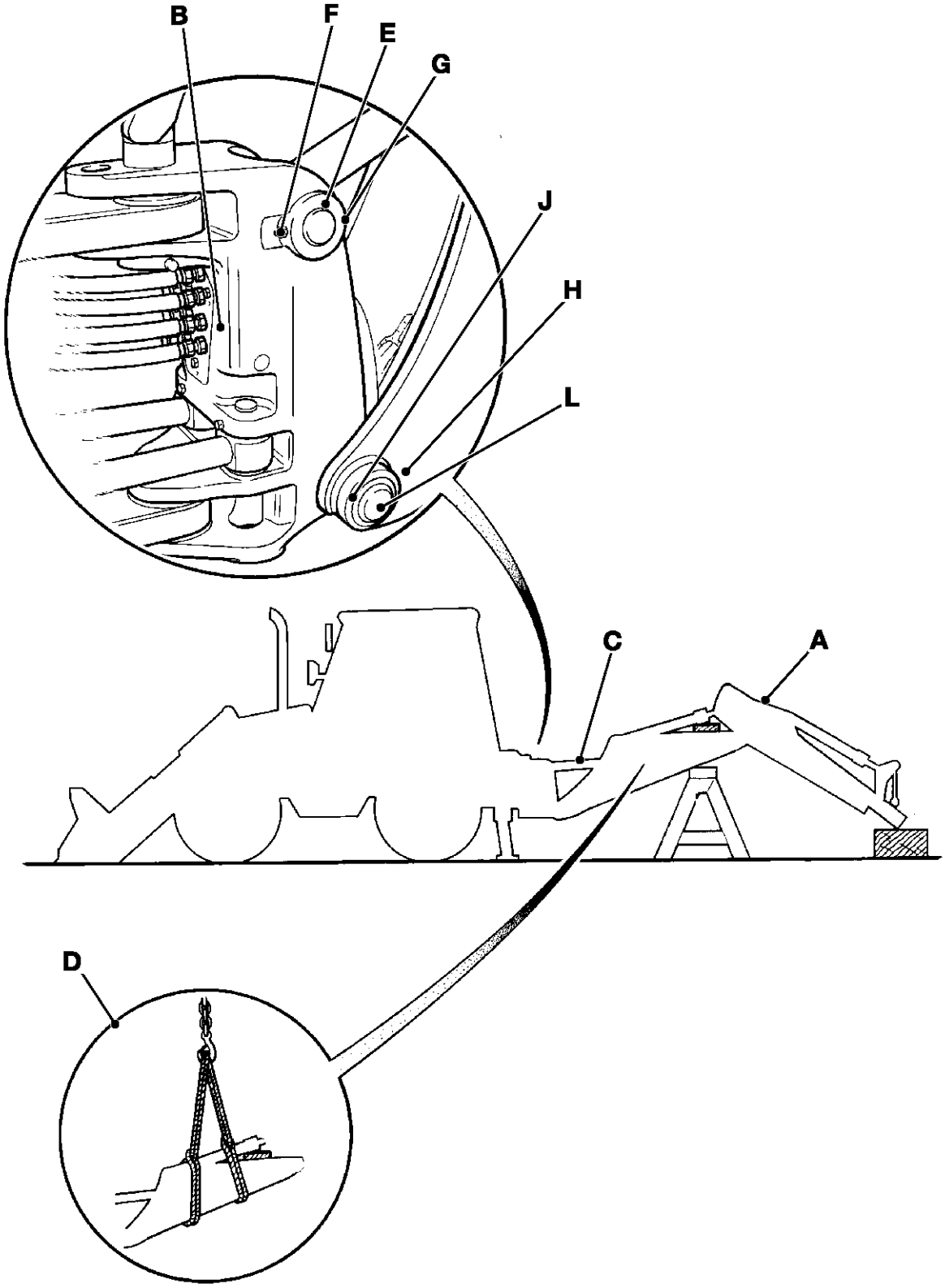


Fig 12. Boom

Dipper

Removal

The procedures describe the removal of the dipper with the extradig (if fitted) and the bucket ram still installed. If required, these items can be removed separately before removing the dipper, refer to the appropriate removal and replacement procedure.

1 ⇨ *Fig 13. (B-121)*. Remove the backhoe bucket and place the backhoe in the position shown at **A**.

2 Lower the stabilisers.

3 Stop the engine and disconnect the battery (to prevent the engine being started).

4 Operate the backhoe control levers back and forth several times to release pressure trapped in the hydraulic hoses.

⚠ 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

5 Disconnect the hydraulic hoses, as shown at **B**. Always label hydraulic hoses before disconnecting them, this will ensure that they are correctly reconnected. Plug and cap all hose open ends to prevent ingress of dirt and loss of hydraulic fluid.

6 Place a suitable support underneath the dipper ram as shown at **C**.

7 Wrap a sling around the dipper as shown at **D**. Make sure the weight of the dipper is held by the sling before removing pivot pins etc.

8 Remove nut **E**, bolt **F** and pivot pin **G**.

9 Remove two thin nuts **H**, bolt **J** and pivot pin **K**.

Note: *It is important to use two thin nuts, this arrangement allows the pivot pin retaining bolt to be secured without inducing a lateral tension.*

10 Hoist the dipper clear of the boom.

⚠ WARNING

Fluid Under Pressure

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

INT-3-1-10_2

Replacement

Replacement is generally a reversal of the installation procedure.

The boom to dipper pivot pin **K** must be retained using two M12 thin nuts. Fit the first thin nut with zero torque, fit the second thin nut and torque to 98Nm (72 lbf ft).

When fitting the dipper to the boom, make sure that shim, item **L** is installed as shown.

Replace all pivot pin seals as required.

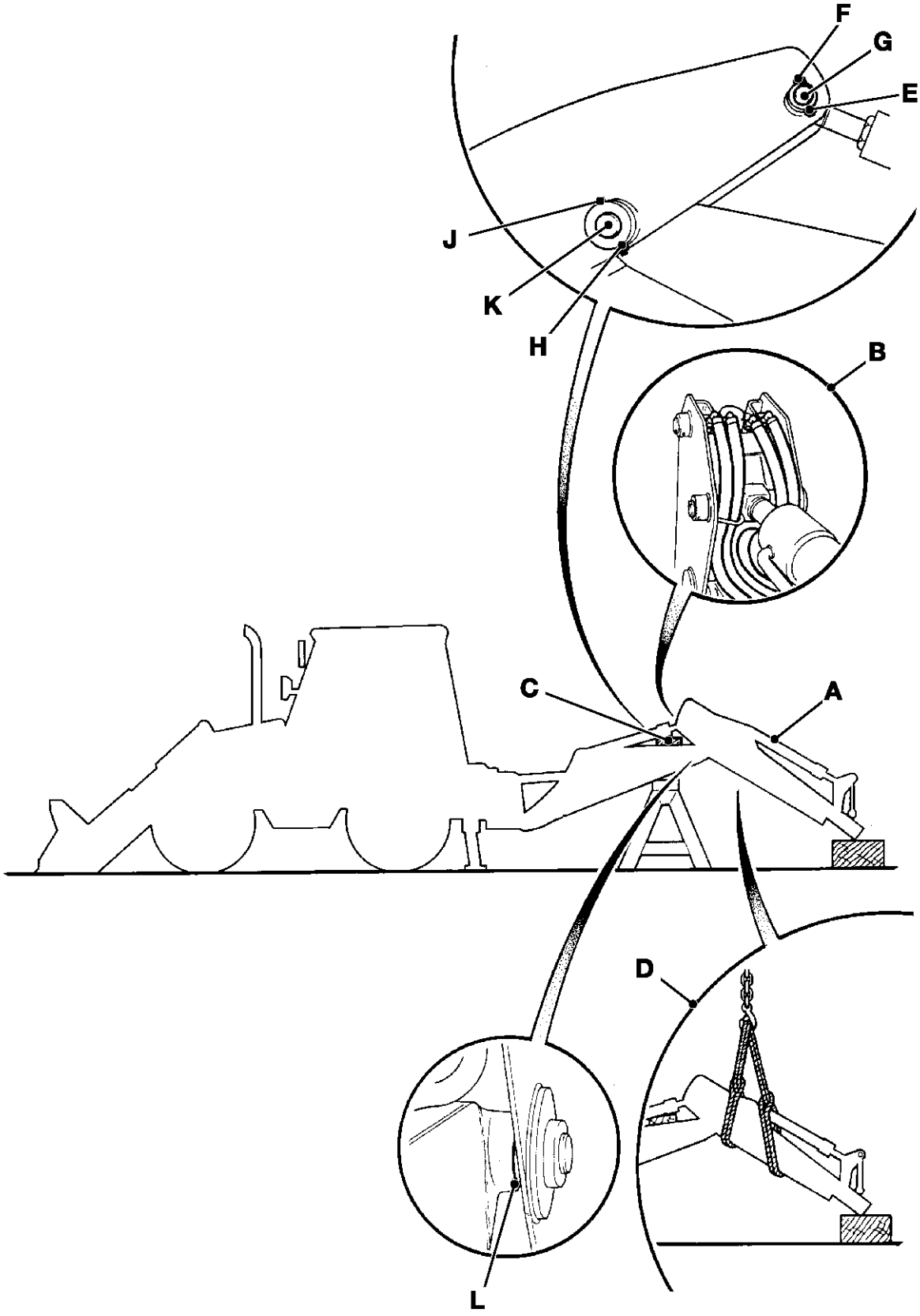


Fig 13. Dipper

Overload Warning SYSTEM

Related Topics

The table lists other topics in the section that contain information related to this topic. Refer to the applicable topics to complete your procedures. Where applicable the text contains cross-references to help you find the correct information.

Topic Titles:
⇨ *Boom and Dipper (B-116)*

Operation Overview

The overload warning system is only applicable to machines with a lifting hook or shackle **A** on the dipper when the excavator is used for lifting (object handling).

⚠ WARNING

If your machine has not been fitted with an approved lifting point such as a hook or shackle and hose burst check valves then it must not be used for object handling. Using a machine for object handling without these devices could lead to injury. Use the machine for earth-moving purposes only.

2-2-1-13

The system is installed on some machines to comply with local legislation. The boom ram has a hydraulic pressure switch fitted, which constantly monitors the hydraulic system pressure required to raise the excavator boom. The pressure switch is part of an electrical circuit that warns the operator if the excavator is operated beyond preset limits.

If the hydraulic pressure required to raise the boom is more than the setting of the pressure switch, an indicator light on the side console will illuminate and a warning buzzer will sound to alert the operator to lower the object back to the ground.

A load chart **B** in the cab shows the maximum lifting capacity of the excavator in different positions. The Safe Working Load (SWL) of the machine depends on how far the boom is extended and the angle it is raised to.

The operator must set the overload warning system switch to ON before using the excavator for object handling. For more details about lifting with the excavator and using the load chart, see the machine ***Operator Handbook***.

⚠ WARNING

You must set the overload warning switch to on before using the excavator for object handling. If you do not turn the switch on this could lead to a stability hazard.

2-2-1-14

⚠ WARNING

When the alarm activates the operator must take the necessary corrective action to reduce the lift or a stability hazard could occur. When the machine is in a safe position the buzzer will stop sounding.

2-2-1-15

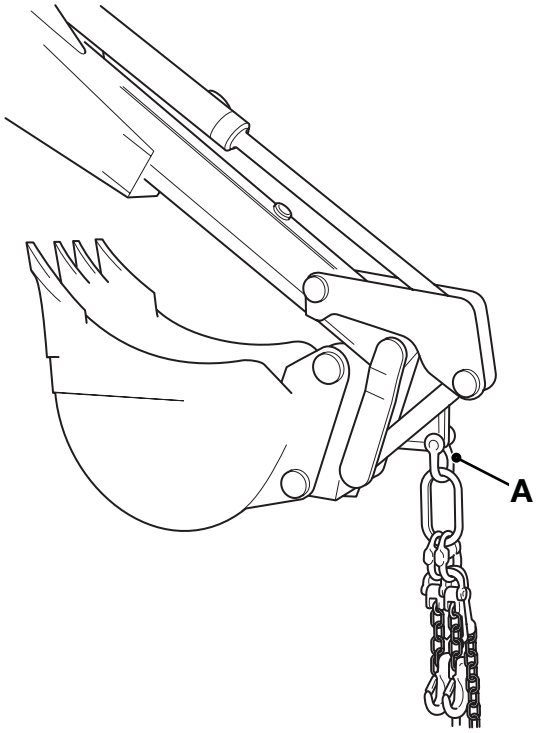


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Fig 1.

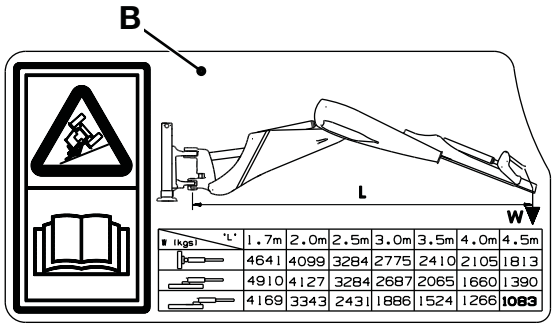

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Fig 2. Load Chart - Example

Electrical Description

The schematic diagrams in this section show how the electrical circuit works when different functions are operated.

The wire numbers and colours, where appropriate, are shown as an aid to identification while fault finding. The wires coloured red show the electrical live feeds. The wires coloured green show the electrical returns to earth.

Before fault finding make sure that you understand how the electrical circuits work. Most potential faults can be traced using a multimeter to carry out continuity checks on wires, switches and solenoids.

Excavator Stable: ⇨ *Fig 3. (B-125)*. The excavator boom ram has a hydraulic pressure switch **1** which constantly monitors the hydraulic system pressure required to raise the excavator boom. The diagram shows the circuit with the overload warning selector switch **2** set to ON.

When the excavator is operated within its lifting capacity, the hydraulic pressure required to raise the boom will always be less than the setting of the pressure switch **1**. The pressure switch contacts will remain open, and break the live feed to the overload alarm relay **3**, so that it cannot energise.

Excavator Overloaded: ⇨ *Fig 4. (B-125)*. If the excavator is operated beyond its safe lifting capacity, the hydraulic pressure required to raise the boom will be more than the setting of the pressure switch **1**. The pressure switch contacts will close, and connect a live feed to the warning indicator light on the selector switch **2**, and at the same time energise the overload alarm relay **3**. The overload alarm relay contacts, in turn, complete the return circuit for the warning relay **4**, which also energises. The warning relay contacts complete the return circuit to sound the warning buzzer **5**, and illuminate the warning indicator light in the front console **6** to warn the operator that the excavator is overloaded.

Component Key:

1 Hydraulic pressure switch - Excavator boom ram
2 Overload warning selector switch (Side console)
3 Overload alarm relay
4 Warning relay
5 Warning buzzer
6 Warning light (Front steering console)

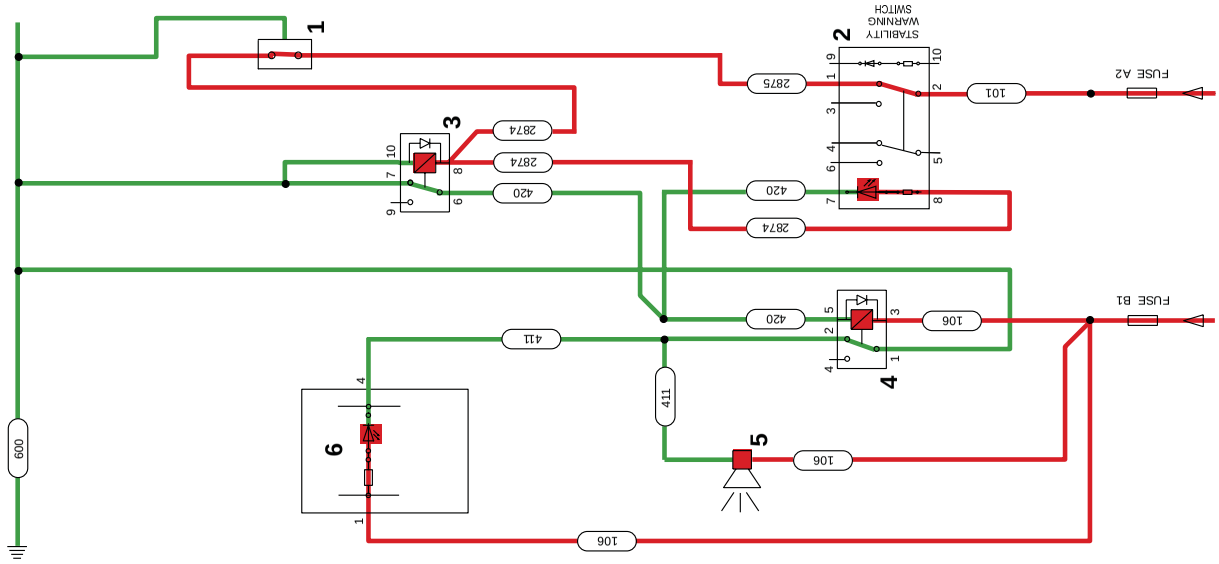

Fig 4. Excavator Overloaded

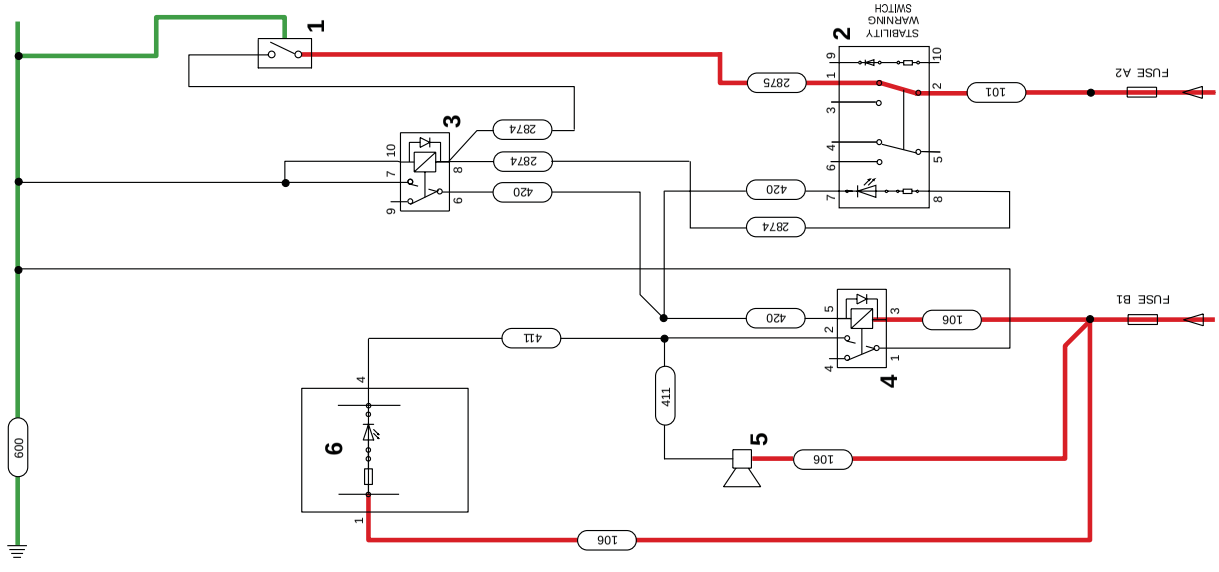

Fig 3. System ON - Excavator Stable

Wires and Connectors - Early Machines

Wires and connectors ⇨ *Fig 5. (B-127)*. On the electrical diagram the electrical connectors (example, CP1) are shown looking on the mating face of each connector when they are disconnected.

Wires coloured red show the electrical live feeds. Wires coloured green show the electrical return to earth.

Earth Points

Faults may be caused by poor earth connections. Although earth connections are shown, it must be remembered that the cab assembly is earthed via further earth strap and cable connections.

Component Key

The following key identifies the component connectors.

h1	Harness - Front Console
h2	Harness - Cab/Side Console
h3	Harness - Rear Lights
h4	Harness - Boom Overload Link

Note: *For harness drawings see* ***Section C, Electrics****.*

Connectors (h1)

FA	h1 - h2
FR	Front warning lights
FS	Speedo

Connectors (h2)

CP1	h2 - h1
CP4	Earth point
CP5	Earth point
CP15	Cab bulkhead connector
CP17	Overload alarm relay
CP26	Buzzer
CP27	Fusebox B
CP29	Warning relay
CP33	Fusebox A
CP87	Overload warning selector switch

Connectors (h3)

RL1	h3 - h2
RL7	h3 - h4

Connectors (h4)

BL1	h4 - h3
BL2	Pressure switch - Excavator boom ram

Splices (h2)

SCP4

SCP20

SCP25

SCP27

SCP32

Splices (h3)

SRL1

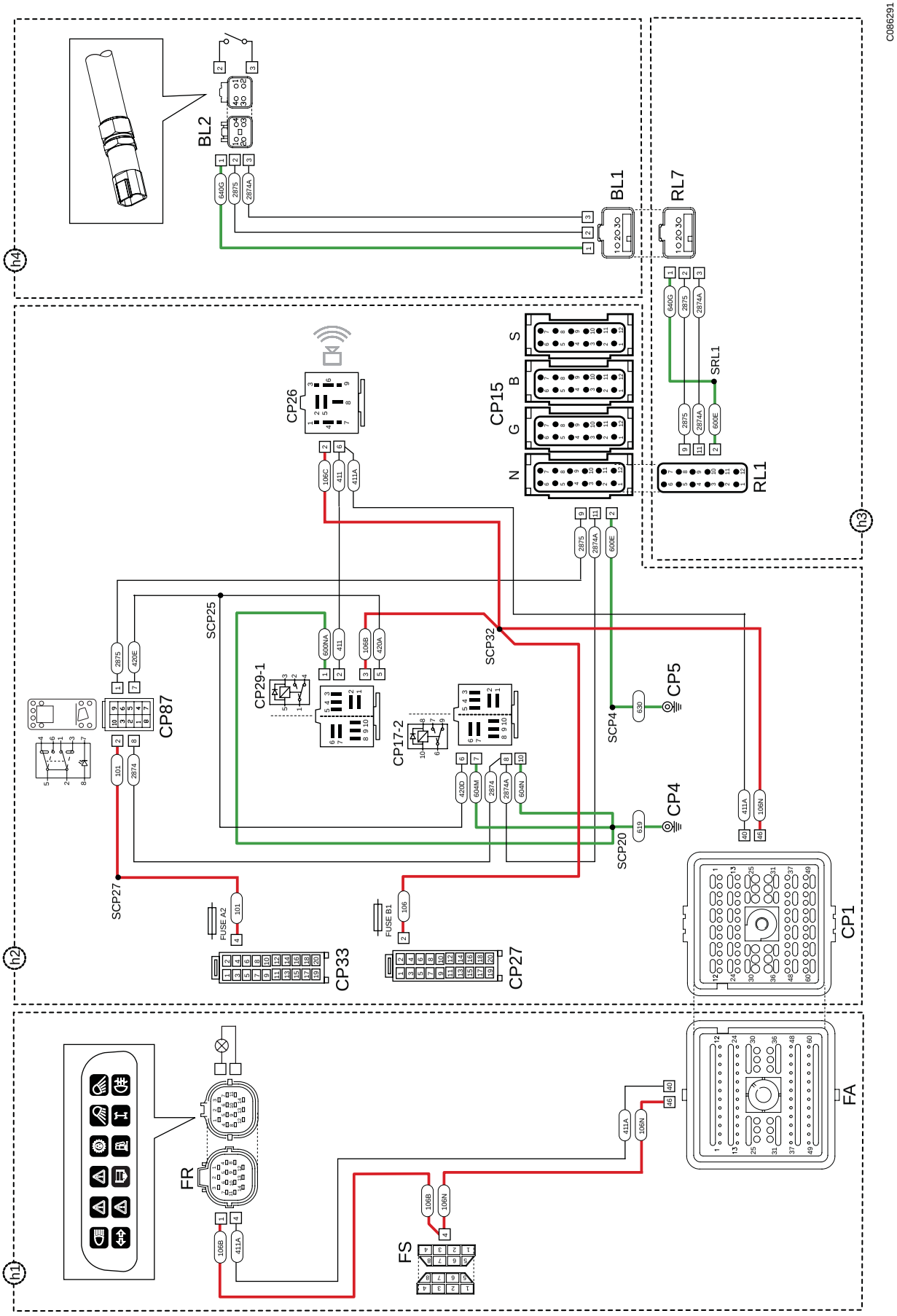

Fig 5. Wires and Connectors - Early Machines

Wires and Connectors - Later Machines

Wires and connectors ⇨ *Fig 6. (B-129)*. On the electrical diagram the electrical connectors (example, CP1) are shown looking on the mating face of each connector when they are disconnected.

Wires coloured red show the electrical live feeds. Wires coloured green show the electrical return to earth.

Earth Points

Faults may be caused by poor earth connections. Although earth connections are shown, it must be remembered that the cab assembly is earthed via further earth strap and cable connections.

Component Key

The following key identifies the component connectors.

h1	Harness - Front Console
h2	Harness - Cab/Side Console
h3	Harness - Mainframe
h4	Harness - Boom Overload Link

Note: *For harness drawings see* ***Section C, Electrics****.*

Connectors (h1)

FA	h1 - h2
FR	Front warning lights
FS	Speedo

Connectors (h2)

CP1	h2 - h1
CP4	Earth point
CP6	h2 - h3
CP17	Overload alarm relay
CP27	Fusebox B
CP29	Warning relay
CP33	Fusebox A
CP52 (J1)	Instrument cluster (for warning buzzer)
CP52 (J2)	Instrument cluster (for warning buzzer)
CP87	Overload warning selector switch

Connectors (h3)

MF1	h3 - h2
MF22	Earth point
MF29	h3 - h4

Connectors (h4)

BL1	h4 - h3
BL2	Pressure switch - Excavator boom ram

Splices (h2)

SCP12

SCP20

SCP25

SCP27

SCP32

Splices (h3)

SMF3

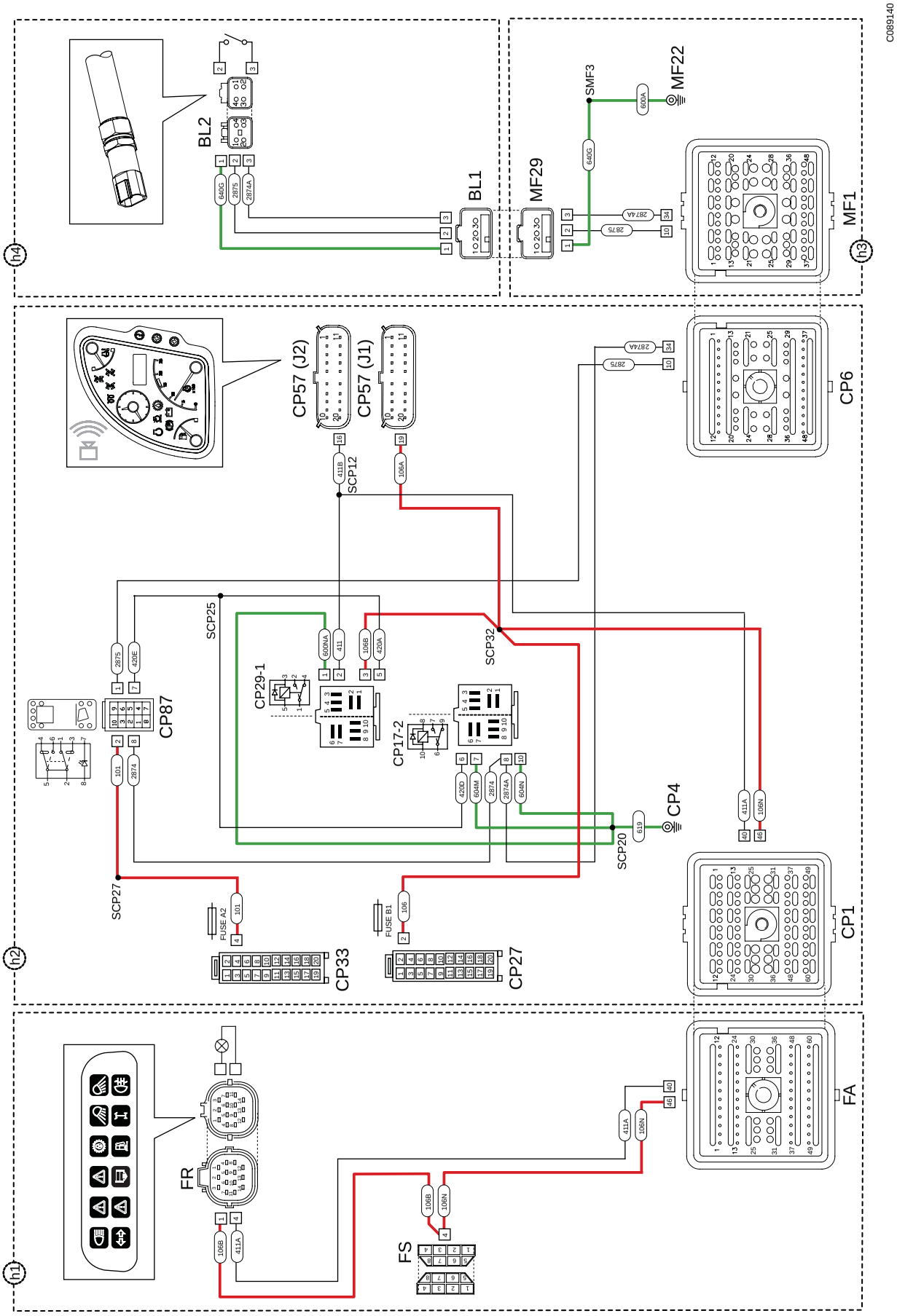

Fig 6. Wires and Connectors - Later Machines

Pressure Switch Renewal

The overload warning pressure switch **A** is located in the steel pipe at the boom ram.

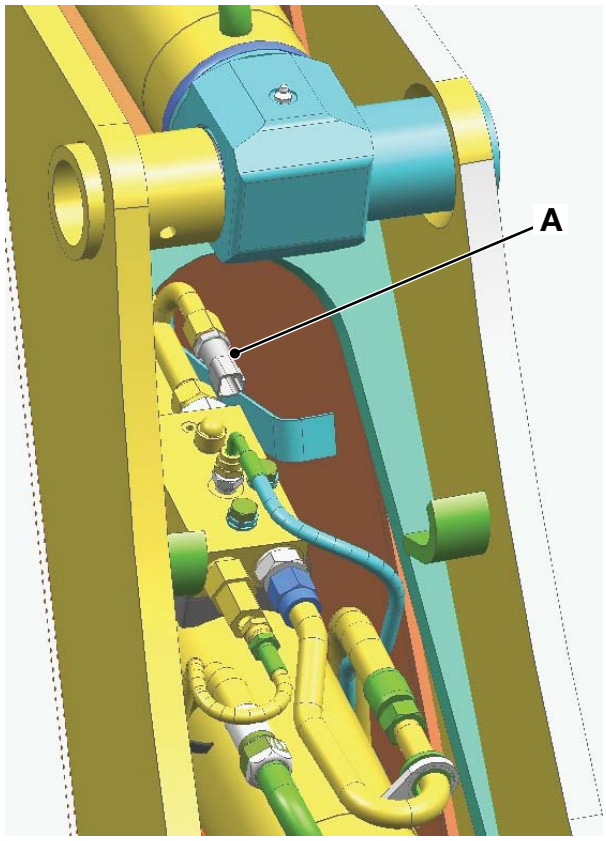

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Fig 7. Excavator with Boom Hose Burst Check Valve shown.

Removal

1 Lower the excavator to the ground. Engage the park brake, stop the engine and remove the starter key.

2 Operate the control levers back and forth several times to vent any residual hydraulic system pressure. Slowly release the hydraulic tank filler cap.

3 Clean off all debris and dirt from around the pressure switch **A**.

4 Disconnect the harness electrical connector at the pressure switch, then carefully unscrew the pressure switch from the pipe.

Plug the open port to prevent loss of fluid and ingress of dirt.

Replacement

Replacement is the opposite of the removal procedure, but note the following:

The pressure switches are non-adjustable, and are colour coded to indicate their pressure setting:

Colour Code:	Pressure Setting:
Khaki	130 bar; 132 kg cm^2; 1885 lb in^2
Mint Green	145 bar; 148 kg cm^2; 2100 lb in^2
Lilac/Purple	155 bar; 158 kg cm^2; 2250 lb in^2
Yellow	170 bar; 173 kg cm^2; 2450 lb in^2
Red	180 bar; 184 kg cm^2; 2600 lb in^2
Blue	190 bar; 194 kg cm^2; 2750 lb in^2
Silver/Grey	215 bar; 219 kg cm^2; 3100 lb in^2

Important: *DO NOT replace a pressure switch with one that has a different pressure setting. If you are unsure about the type of pressure switch contact JCB Service.*

On completion, operate the excavator and check for hydraulic leaks. Set the overload warning system switch to ON, and check that the overload warning functions correctly.

Kingpost & Carriage

Introduction

This topic contains information about a machine DEVICE. Make sure you are referring to the correct device.

This topic is intended to help you understand what the device does and how it works. Where applicable it also includes procedures such as removal and replacement and dismantle and assemble.

Sideshift

Hydraclamp Clearance Setting

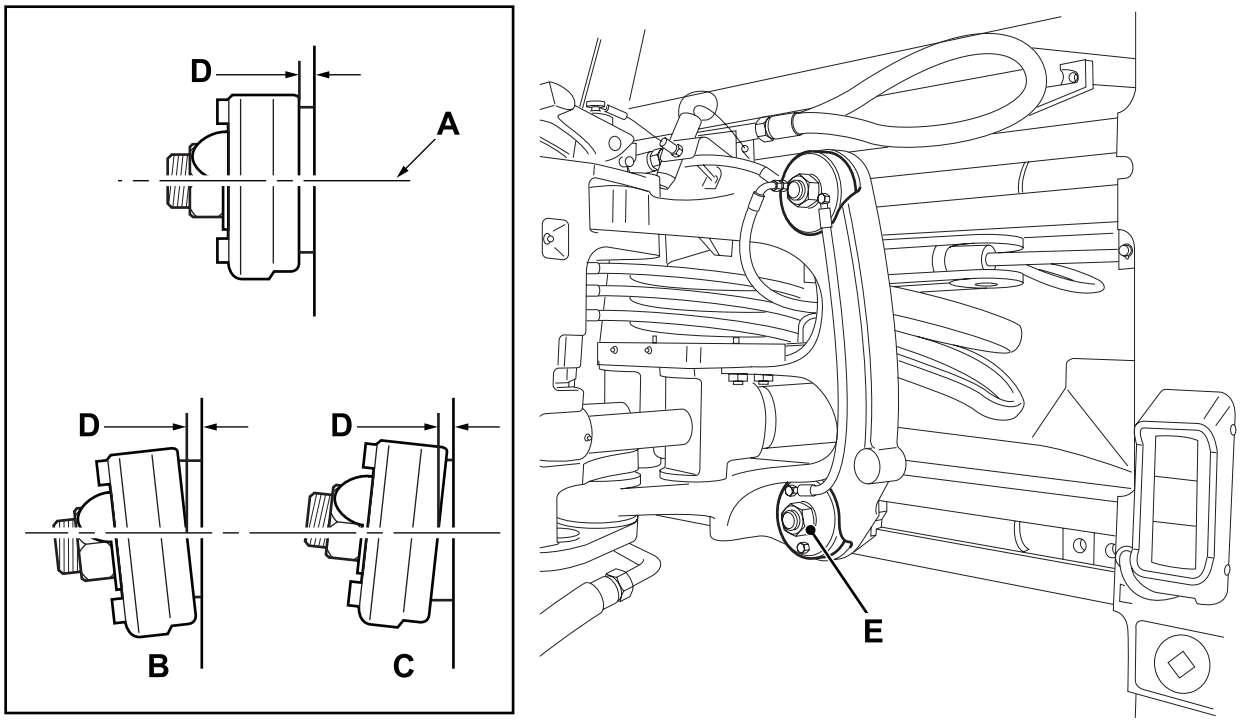

Fig 8.

If the hydraclamp clearance **D** is not set correctly, leaks may occur or the seal could become dislodged. Use the procedure below to set the clearance:

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the loader arms to the ground.

2 Select the carriage clamps to LOCK.

3 Measure the clearance on all four hydraclamps. Measurements should be taken on the centre line **A** to allow for twisting of the clamp pot as shown at **B** and **C**. The clearance **D** should be:

Manual Sideshift: 3 - 5 mm (0.11 - 0.19 in)

Powered Sideshift: 3 - 5 mm (0.11 - 0.19 in)

4 Release the clamps then tighten or loosen the clamp nut **E** as required. Recheck the measurement. When the clearance is correct, bend over the lock washer tab to secure the nut.

Powered Sideshift

Wear Pad Renewal

Inspection (1000 hours)

When the wear pads are worn to 6 mm (0.23 in) or below they should be renewed.

It is permissible to rotate the upper wear pads 180° to prolong service life, provided the contact surface is more than 6 mm (0.23 in) thick.

Note: *If rotating the wear pad the grease nipples will have to be swapped over.*

Removal

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the loader arms to the ground.

2 ⇨ *Fig 9. (B-134)*. Sideshift the carriage fully to the RH end of travel **A** (the carriage is shown in the centre position for clarity).

3 Lower the bucket to take the weight off the kingpost.

4 Switch OFF the engine and remove the starter key. Operate the control levers back and forth several times to vent any residual hydraulic pressure.

5 **RH Upper Hydraclamp:** Bend back the lock washer tab **B** and unscrew clamp nut **C**.

Remove clamp bolt **D** through the slot **E** in the rearframe rail.

Hydraclamp **F** and spacer **G** should remain in position.

Remove clamp plate **J** and wear pad **H**.

Replacement

1 **RH Upper Hydraclamp:** Fit wear pad **H**, clamp plate **J** and clamp bolt **D**.

Fit new lock washer **B** and fit clamp nut **C**.

Set the hydraclamp clearance as described in ⇨ *Hydraclamp Clearance Setting (B-132)*.

2 Repeat the procedures for the RH lower hydraclamp. Note that the only difference on the lower clamp is the wear pad **L** is on the opposite side of the rail from the upper clamp, so clamp bolt **K** need not be completely removed.

Note: *If the wear pad is trapped between the rail and carriage, lower the bucket to relieve the load on the wear pad.*

3 On completion, lift the bucket and sideshift the carriage fully to the opposite end of the travel, then repeat the procedures for LH side hydraclamps.

4 When all clamps have been assembled, check the hydraclamp clearance again on all four clamps.

5 Apply grease at each wear pad grease nipple BEFORE operating the machine.

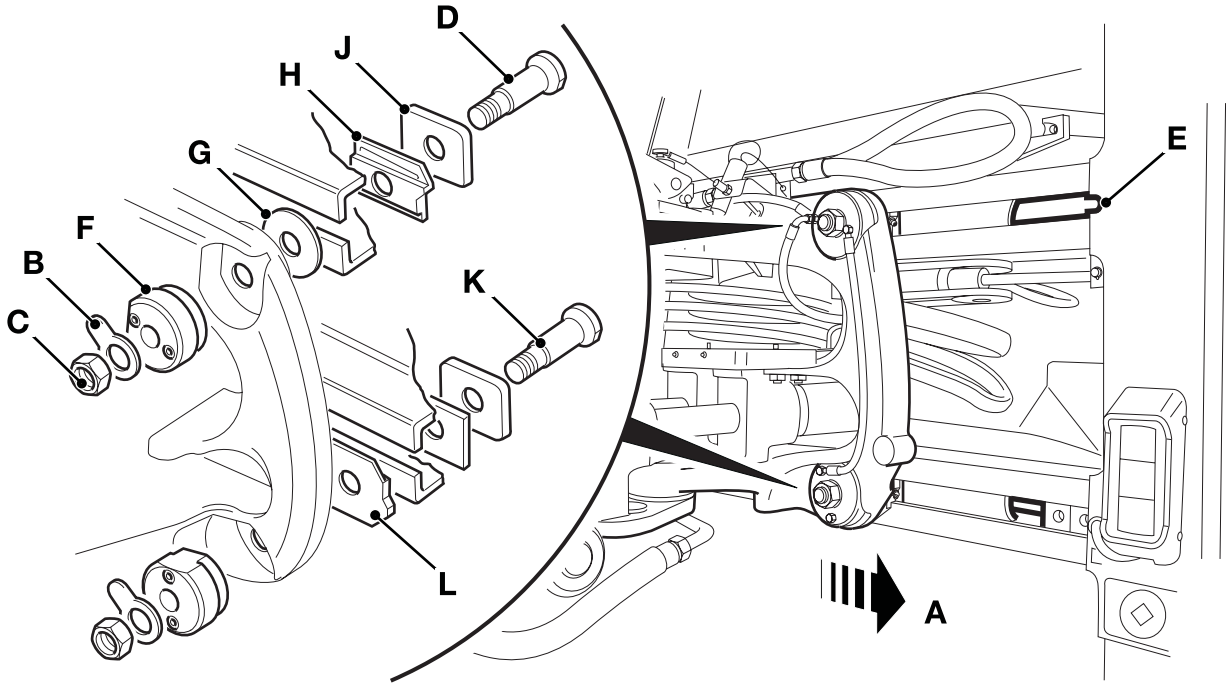

Fig 9. Wear Pad Renewal

Chain Adjustment

The chain tension should be checked at the initial 100 hours service and every 500 hours.

Check and Adjust

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the loader arms to the ground.

2 Position the carriage centrally and rest the bucket on the ground, remove the starter key.

3 ⇨ *Fig 10. (B-136)*. Check the chain tension which should be 5 to 10 mm (0.19 to 0.39 in) deflection **A** at the mid point. The tension should be equal for all chains.

4 If adjustment is required, slacken locknuts **C** and adjust on nuts **B** as required, tighten locknuts **C** on completion.

5 Repeat steps **3** and **4** for the opposite pair of chains.

Note: *When there is no thread left for adjustment fit new chains.*

6 Operate the carriage side to side several times and recheck the deflection.

Removal

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the loader arms to the ground.

2 Position the carriage centrally and rest the bucket on the ground, remove the starter key.

3 Undo and remove nuts **B**.

4 Remove split pins **D** and pin **E**.

5 Withdraw chains from the machine.

Assembly

1 Thread the chains around the pulley and secure to the carriage with pin **E**, fit new split pins **D**.

2 Connect chain adjusters, tension chains as required, see ***Check and Adjust***.

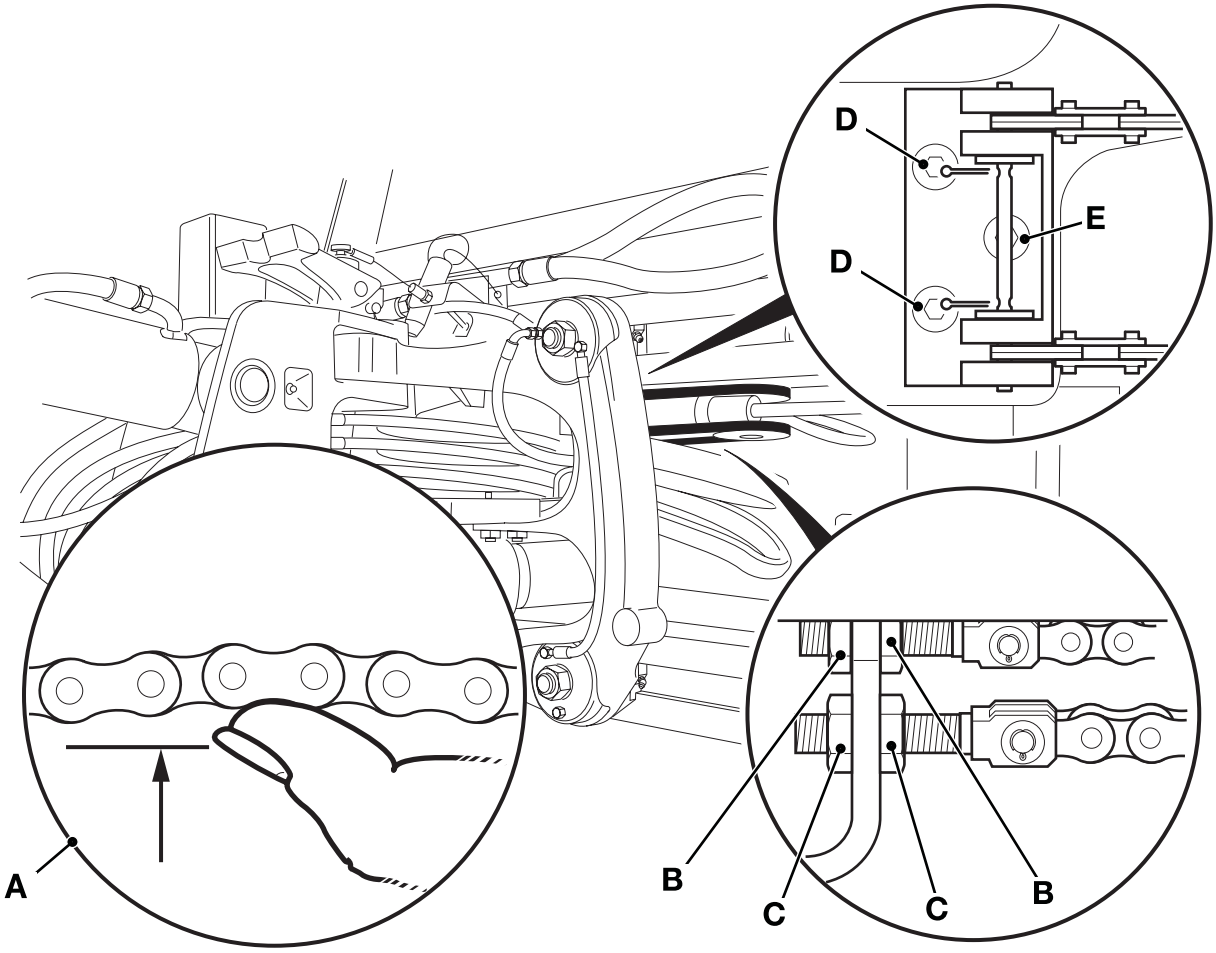

Fig 10. Chain Adjustment

Removal and Replacement

Power Sideshift Ram

Removal

1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the loader arms to the ground.

2 Position the carriage in the central protruding travel position at 150 mm (6 in) from end of the rail, rest the bucket on the ground and remove the starter key.

3 Operate control levers to vent hydraulic pressure.

4 ⇨ ***Fig 11. (B-138)***. Disconnect hydraulic hoses **A** and plug.

5 Disconnect all four chains at adjusters **B** and disengage chains from ram pulleys.

6 Remove pin **F** or pin **C** (older machines) from one end and support the ram.

Important: *Rams with clevis forks are fitted with pin type **F**. Rams with eye-ends are fitted with pin type **C**. The correct pin type must always be fitted.*

7 Remove pin **F** or pin **C** from opposite end, withdraw ram.

Replacement

Replace the power sideshift ram as follows:

1 Locate the ram at one end with pin **F**. Adjust the ram clevis fork eye so that the opposite end of the ram aligns with mounting bracket.

2 Secure the opposite end of the ram in position with pin **F**.

3 With a spanner on the rod end flats **D** adjust the rod so that the ram clevis fork engagement is equal at each end of the ram. Lock clevis forks in position with nut **E**.

Important: *Make sure that washers and new split pins are fitted at the ram pins **F** (or **C**). Type **F** pins are headed (one split pin fitted). Type **C** are plain pins (two split pins - one each end of the pin).*

4 Reconnect the hydraulic hoses.

5 Locate the chains around the applicable ram pulleys. Reconnect chains and adjust as required. ⇨ ***Chain Adjustment (B-135)***.

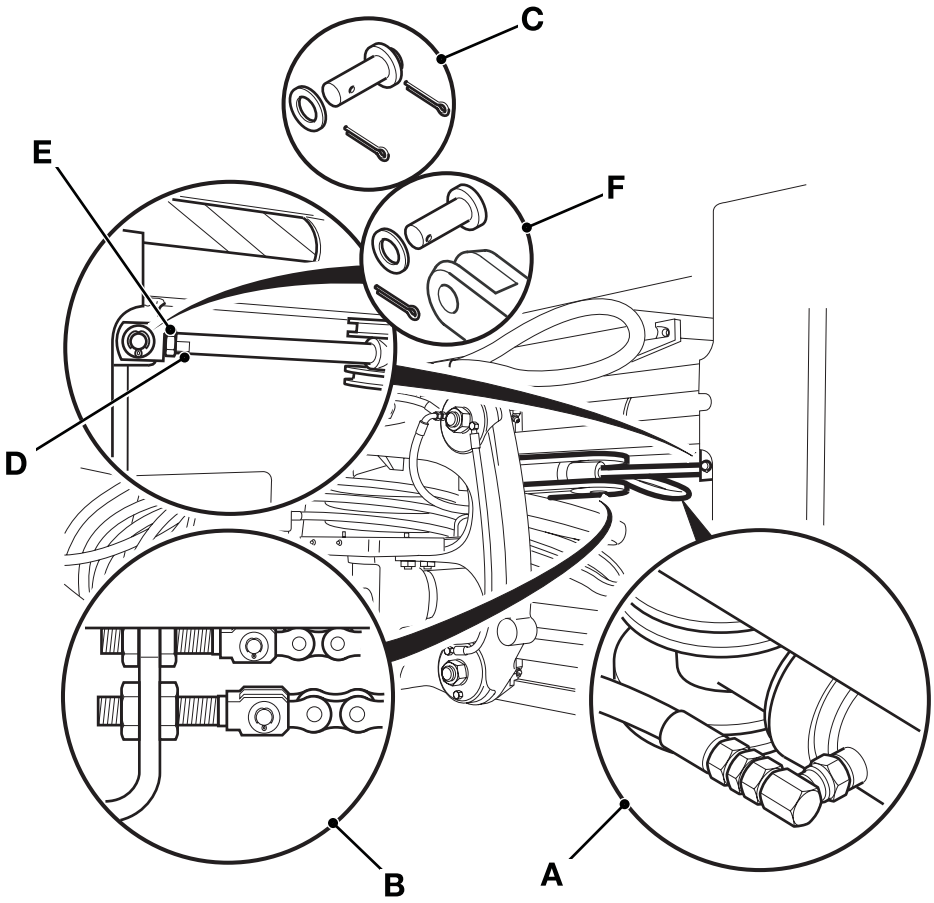

Fig 11. Power Sideshift Ram

Kingpost

Before removing the kingpost/carriage, slew the kingpost to dead centre and remove the boom and dipper. ⇨ *Boom and Dipper (B-116)*.

Removal

1 ⇨ *Fig 12. (B-141)*. Make sure that the slew lock pin **A** is in its stowage position (i.e. not fitted in the `slew lock' position.

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

2 Working from the bottom up, disconnect the backhoe hydraulic hoses from the kingpost bulkhead plate. Label the hoses before disconnecting to ensure correct replacement. Plug and cap all open hydraulic connections to prevent loss of fluid and ingress of dirt.

3 Remove thin locknuts **B** (2-off per pivot pin) and pivot pin retaining bolts **C** (2-off), then using a suitable drift knock out the slew ram (eye end) pivot pins **D** (2-off). Note that their may be shims fitted under the circlip. Take care to retrieve any shims and keep them together with their respective pivot pin.

WARNING

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

BF-4-1_1

4 Attach suitable lifting straps to the kingpost casting **E** as shown, and support its weight with a suitable hoist. The weight of the kingpost casting is approximately 130 kg (287 lbs).

5 Disconnect the boom lock cable, then remove the boom lock, see ***Section D, Boom Lock Cable - Removal and Replacement***.

6 With the kingpost securely supported on the hoist, remove thin locknuts **F** (2-off) and retaining bolt **G**, then withdraw the kingpost top pivot pin **H**.

7 Remove bolt **J**, washer **K**, and spacer **L**, then withdraw the kingpost bottom pivot pin **M**.

8 Carefully lift the kingpost away from the rearframe. Take care to retrieve the thrust washers **N**. Label the thrust washers to ensure they are returned to their original positions on assembly.

Inspection

Inspect the nickel bronze liner bearings **P**, **Q** and **R** for signs of damage, wear, scores or nicks etc. Ensure that grease holes in the bearings align with the appropriate holes in the casting.

Note: *The liner bearings need only be removed if they are damaged and are required to be renewed. Use a suitable close fitting shouldered mandrel (manufactured locally) to facilitate removal of the bearings if required. To ensure the mandrel is manufactured to the correct size, the bearing dimensions are shown on the illustration. Note that the dimensions are NOMINAL figures only and should not be used to manufacture bearings. Note also that bearing **P** could be one of two different sizes, see the illustration.*

Replacement

Replacement is generally a reversal of the removal sequence, but note the following:

To assist with the identification of 15ft 6in and 17ft centremount kingposts the number **6** is stamped on the kingpost to identify 60 mm diameter bores.

If fitting new liner bearings, assemble with a close fitting shouldered mandrel, see ***Inspection***.

If necessary, use oil or suitable lubricant to facilitate pressing-in bearings - to minimise scoring of mating face. Bearings **Q** and **R** have `lead-in' diameters (noticeable with a slight step), always install the smaller diameter first into the pivot bore. Make sure that the liner bearings **Q** are fully engaged in the boom pivot bores. There must be a recess of 5mm (3/16 inch) to allow for installation of the seals **S**.

Make sure that the liner bearings **R** are fully engaged in the kingpost pivot bores. There must be a recess of 6mm (1/4 inch) to allow for installation of the seals **T**. Seals **S** and **T**

are lip seals, on reassembly make sure that the seal lips face outward (shown in insets on the kingpost pivot).

When assembling, check for and remove any burrs and sharp edges on the pivot bores, liner bearings and pivot pins to minimise assembly damage. Make sure that all pivot bores and pivot pins are clean and smeared with grease. When fully assembled, apply grease at each grease nipple BEFORE operating the machine.

Note that thrust washers **N** come in different sizes to allow for variations of castings.

Make sure that thin locknuts, items **B** and **F** are `just' free when locked into position.

Before fitting bolt **J**, clean the threads and then apply JCB Threadlocker and Sealer. Torque tighten the bolt.

If the slew ram trunnion plate bolts **X** have been removed for any reason, make sure they are retightened to the correct torque value.

Check the operation of the boom lock. If a new kingpost casting has been fitted, the boom lock cable and boom stop will need to be adjusted, see ***Section D, Boom Lock Cable - Removal and Replacement***.

Table 1. Torque Settings

Item	Nm	lbf ft	kgf m
J	98	72	10
X	565 (1)	417	57.5
	510 (2)	376	52

(1) Un-plated Fasteners
(2) Plated Fasteners

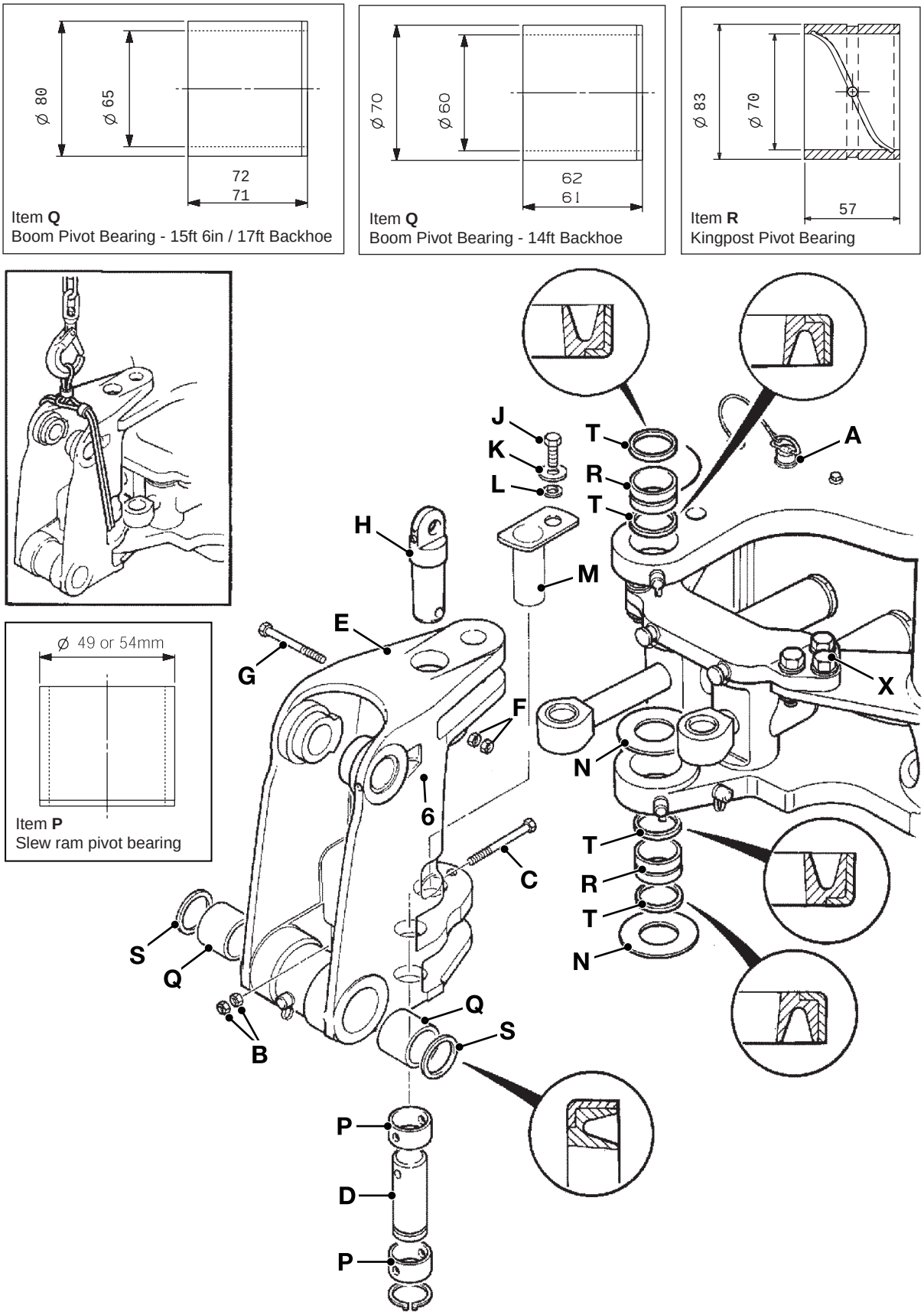

Fig 12. Kingpost

Sideshift Carriage

The following procedure assumes that the kingpost has already been removed. Note however that it is possible to remove the sideshift carriage with the kingpost still fitted, providing all the necessary hoses are first disconnected at the kingpost bulkhead plate.

Removal

1 **Powered sideshift only:** Disconnect the chains from the carriage. Tie the chains out of the way. ⇨ ***Chain Adjustment (B-135)***.

2 Remove the slew rams, see ***Section E, Hydraulic Rams - Removal and Replacement***.

Note: *If required, the sideshift carriage can be removed with the slew rams still fitted, providing the hoses to the slew rams are disconnected.*

⚠ 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

3 ⇨ ***Fig 13. (B-143)***. Disconnect and remove all the feed hoses to the hydraclamp units **A**. Plug and cap all open ports to prevent loss of fluid and ingress of dirt. Label each hose before disconnecting to ensure correct replacement.

⚠ WARNING

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

BF-4-1_1

4 Attach suitable lifting straps to the carriage casting **B** and support its weight with a suitable hoist.

5 With the carriage securely supported on the hoist, bend back the lock washer tabs **C**, unscrew clamp nuts **D** and carefully remove each hydraclamp unit in turn. Label the hydraclamp units before removing, to ensure they are refitted in their original positions on assembly.

6 Carefully manoeuvre the carriage off the clamp bolts **E** and lift the carriage away from the rearframe.

7 Remove the clamp bolts **E** and clamp plates **F** from the rearframe rail.

Powered sideshift only: These machines also have wear pads (not shown) in addition to the clamp plates.

Inspection

Inspect the nickel bronze liner bearings **X** for signs of damage, wear, scores or nicks etc. Ensure that grease holes in the bearings align with the appropriate holes in the casting.

Note: *The liner bearings need only be removed if they are damaged and are required to be renewed.*

Powered sideshift only: Inspect the wear pads to ensure they are in good condition. If in doubt, renew the wear pads. ⇨ ***Wear Pad Renewal (B-133)***.

Replacement

Replacement is a reversal of the reversal sequence, but note the following:

If fitting new liner bearings **X**, assemble with a close fitting shouldered mandrel. For more details, see ***Kingpost - Replacement***.

On completion, adjust the clamp nuts **D** to set the correct hydraclamp clearance **Y**. ⇨ ***Hydraclamp Clearance Setting (B-132)***.

Powered sideshift only: Reconnect and adjust the chains. ⇨ ***Chain Adjustment (B-135)***. Apply grease at each wear pad grease nipple BEFORE operating the machine.

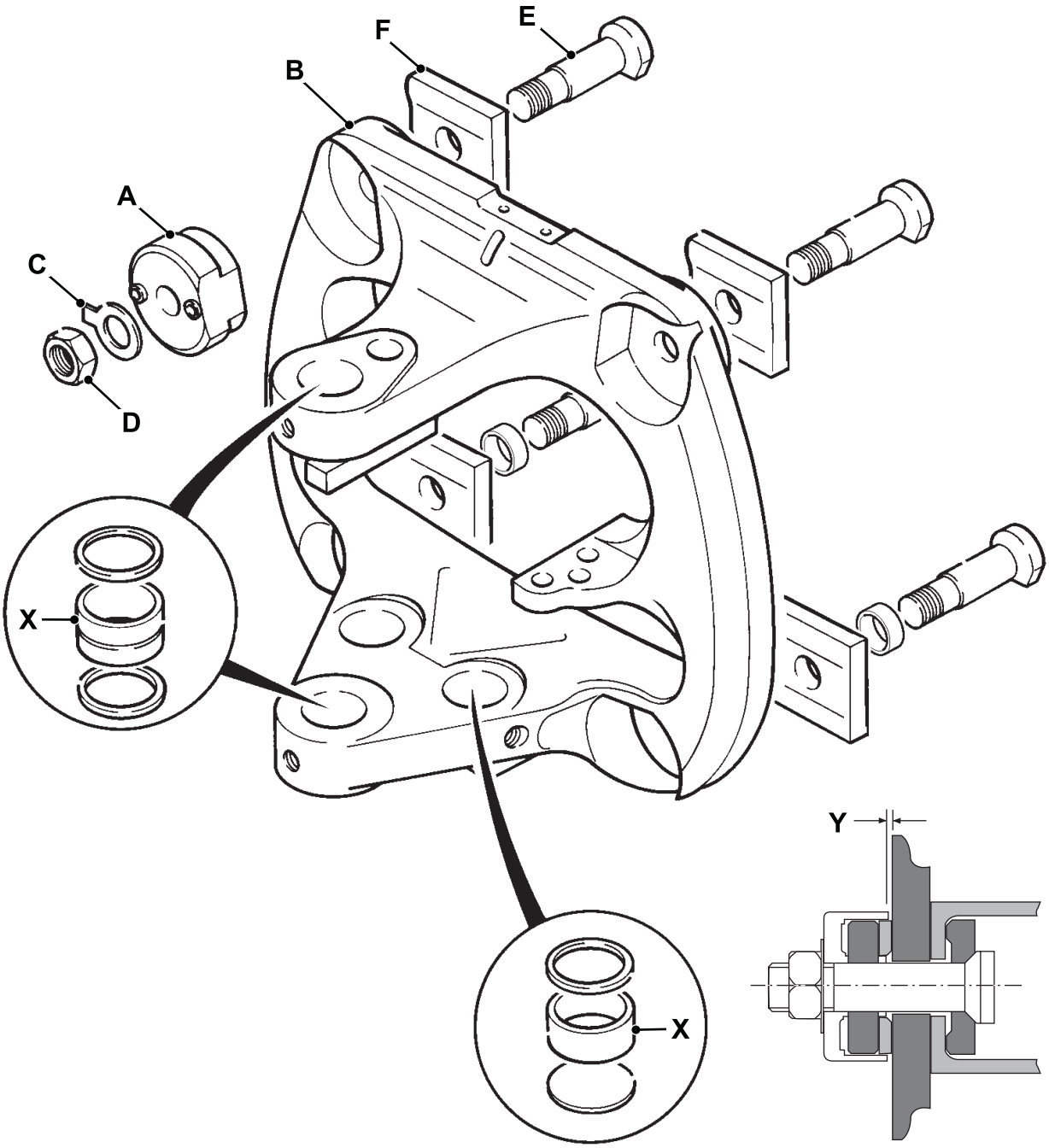

Fig 13. Sideshift Carriage (Manual sideshift shown)

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