Section 1

General Information

Service Manual - 467 Wheeled Loading Shovel

Section 1 - General Information

Section 2 - Care and Safety

Section 3 - Maintenance

Section A - Attachments

Section B - Body and Framework

Section C - Electrics

Section E - Hydraulics

Section F - Transmission

Section G - Brakes

Section H - Steering

Section K - Engine



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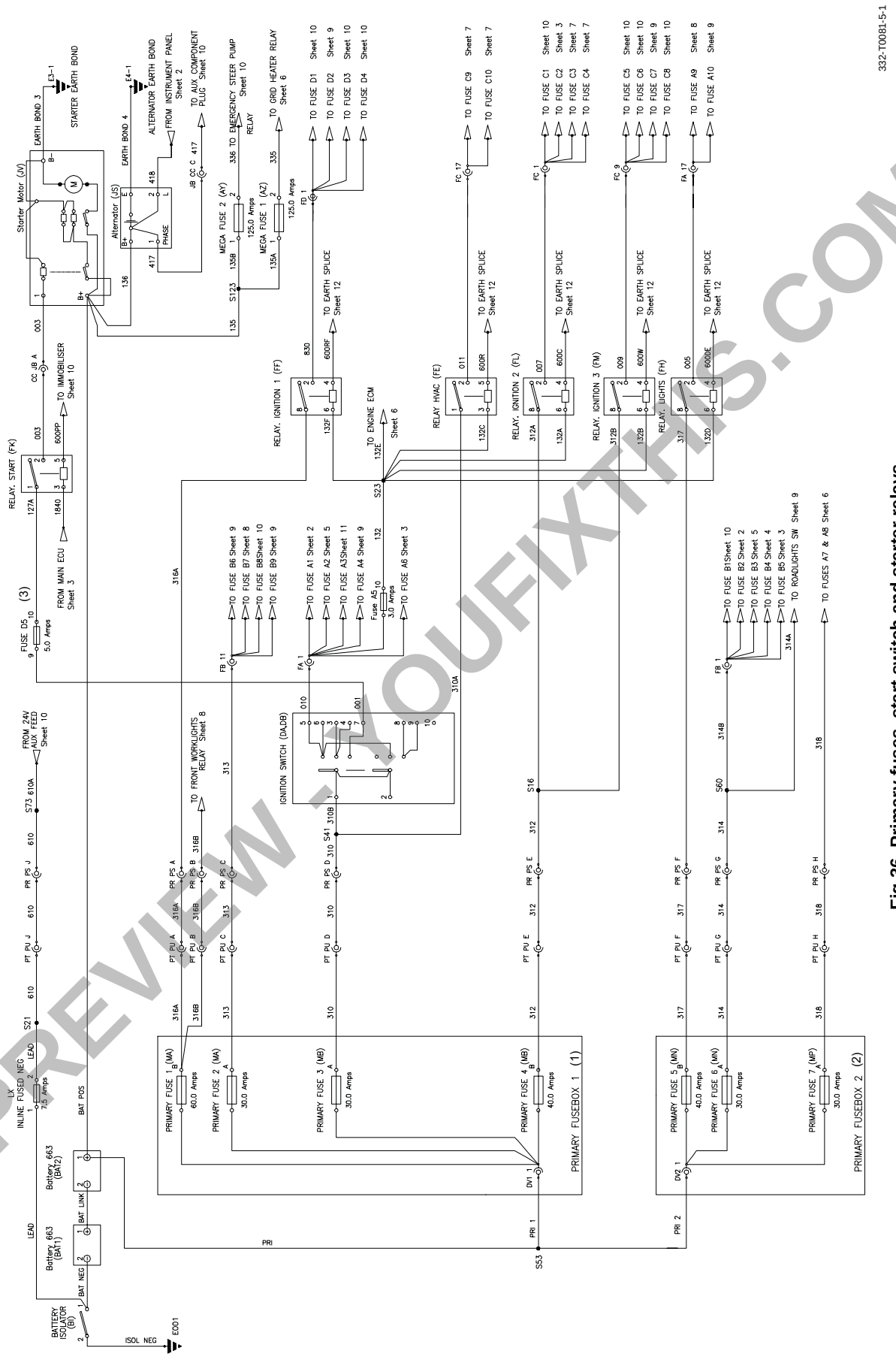
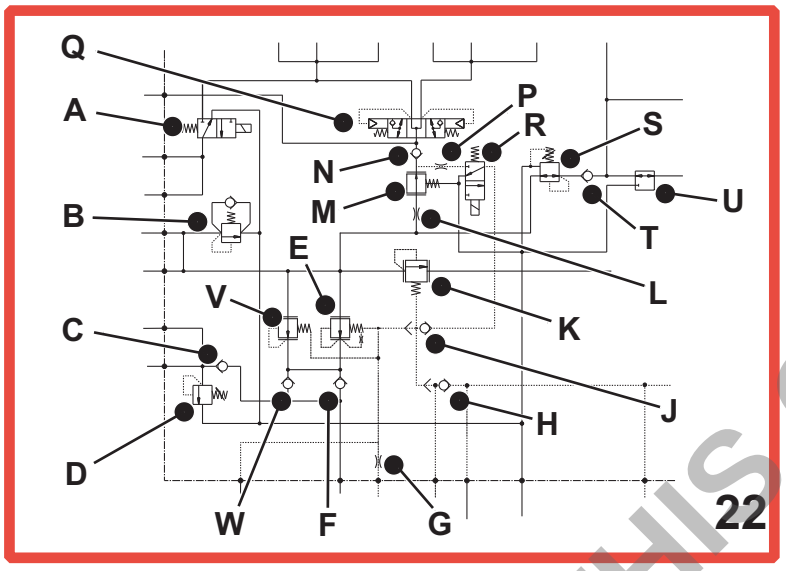
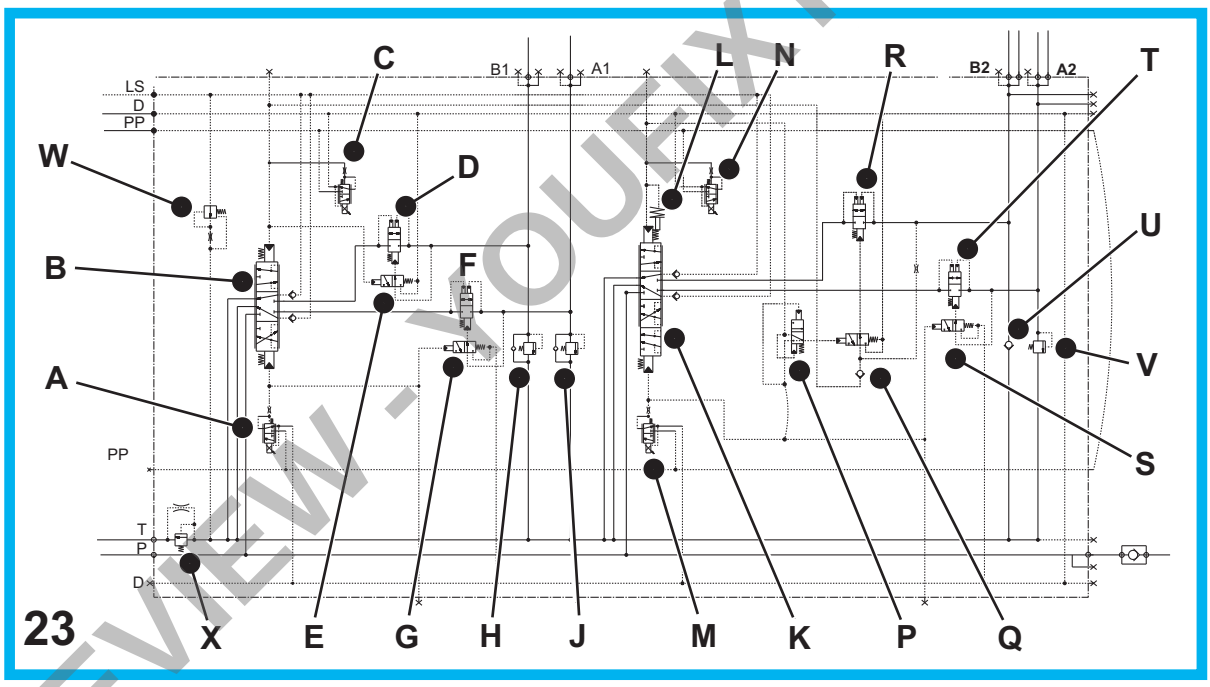


Fig 36. Primary fuses, start switch and starter relays

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333-T2430-A 466-22-23

Fig 1.

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Powershift Transmission Description

Transmission Components

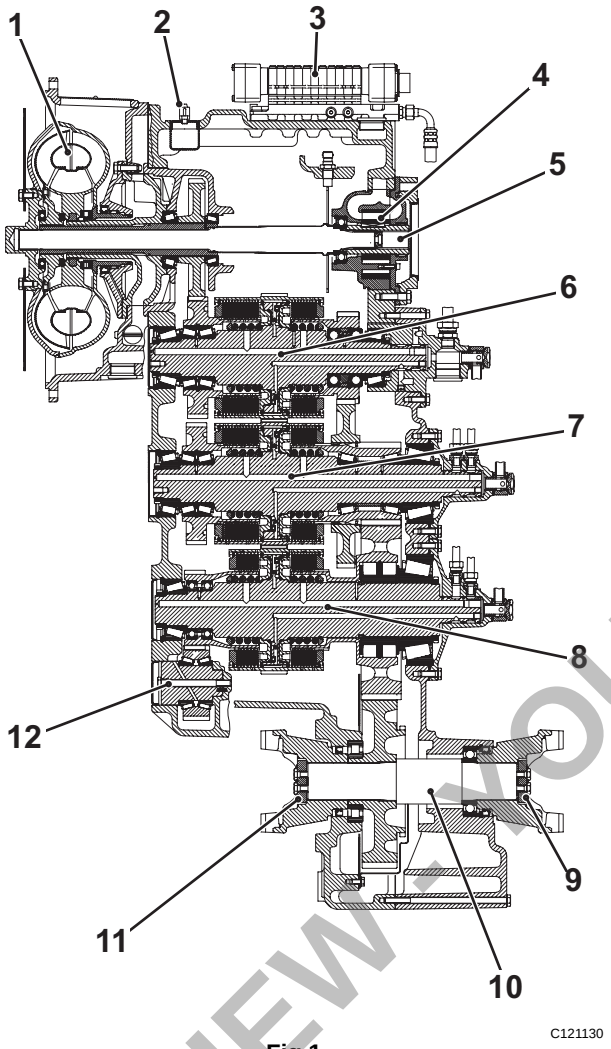


Fig 1.

Table 2. Transmission Components

Item	Description
1	Torque converter with flexi-plate drive
2	Breather
3	Electro-hydraulic control unit
4	Transmission pump
5	Power take off - Option
6	Multi-plate clutch packs **KV/K1**
7	Multi-plate clutch packs **KR/K2**
8	Multi-plate clutch packs **K4/K3**
9	Output flange - Front axle
10	Output shaft
11	Output flange - Rear axle
12	Counter shaft

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Torque Settings

Zinc Plated Fasteners and Dacromet Fasteners

T11-002

Introduction

Some external fasteners on JCB machines are manufactured using an improved type of corrosion resistant finish. This type of finish is called Dacromet and replaces the original Zinc and Yellow Plating used on earlier machines.

The two types of fasteners can be readily identified by colour and part number suffix. ⇒ ***Table 1. Fastener Types (1-15)***.

Table 1. Fastener Types

Fastener Type	Colour	Part No. Suffix
Zinc and Yellow	Golden finish	'Z' (e.g. 1315/3712Z)
Dacromet	Mottled silver finish	'D' (e.g. 1315/3712D)

Note: *As the Dacromet fasteners have a lower torque setting than the Zinc and Yellow fasteners, the torque figures used must be relevant to the type of fastener.*

Note: *A Dacromet bolt should not be used in conjunction with a Zinc or Yellow plated nut, as this could change the torque characteristics of the torque setting further. For the same reason, a Dacromet nut should not be used with a Zinc or Yellow plated bolt.*

Note: *All bolts used on JCB machines are high tensile and must not be replaced by bolts of a lesser tensile specification.*

Note: *Dacromet bolts, due to their high corrosion resistance are used in areas where rust could occur. Dacromet bolts are only used for external applications. They are not used in applications such as gearbox or engine joint seams or internal applications.*

Bolts and Screws

Use the following torque setting tables only where no torque setting is specified in the text.

Note: *Dacromet fasteners are lubricated as part of the plating process, do not lubricate.*

Torque settings are given for the following conditions:

Condition 1

- Un-lubricated fasteners
- Zinc fasteners
- Yellow plated fasteners

Condition 2

- Zinc flake (Dacromet) fasteners
- Lubricated zinc and yellow plated fasteners
- Where there is a natural lubrication. For example, cast iron components

Verbus Ripp Bolts

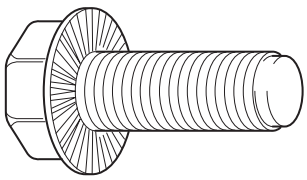


Fig 1.

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

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Error Code Mode

With the system turned on, press the PWR and AUTO keys at the same time to enter the error code mode. Any errors will be displayed on the control panel display. Repeated pressing of the PWR key will scroll through any multiple errors. After five seconds, the system will exit the error code mode and return to normal operation. The error codes are as shown in the following table.

Table 2. Error Codes

Code	Description
E0	No Faults
E1	Cab Sensor Shorted
E2	Cab Sensor Open
E3	Evap Probe Shorted
E4	Evap Probe Open
E11	Pressure Transducer Open
E12	Pressure Transducer Shorted
E13	Water Valve Actuator Error
E14	Fresh/Re circulating Air Actuator Error
E17	Electronics or Comm. Error

Advanced Diagnostics

The advanced diagnostics control panel allows the engineer to see real time system information on the control panel display, this will assist in servicing the ATC. This real time information will help the diagnosis procedure in identifying the system faults.

From the error code mode, press the PWR and AUTO keys at the same time to enter the advanced diagnosis mode. The text CAB will be displayed on the control panel. After a few seconds, the cab temperature measurement will be displayed (in degrees F or degrees C, depending on which units have previously been selected). Pressing the PWR key repeatedly will cycle through the available real time diagnostics.

The following codes are available:-

Table 3. Advanced Diagnostics Error Codes

Code	Description
CAB	Cab air temperature (0C or 0F)
EVAP	Evaporator core temperature
HEAT	Water valve position (% of valve open)
A-C	A-C clutch request (On/Off)
FAN	Blower fan speed (% of max speed)
DEF	Defrost request (On/Off)
HI-P	High side pressure (bar/lbf/in2)
FRSH	Fresh/Recirc Door position (% fresh air)
COND	Condenser fan request status (On/Off)
PRHT	Pre-heat signal status (On/Off)
VOLT	System voltage (DC Volts)

Note: *The system can be operated normally whilst in advanced diagnostics mode, including changing the temperature set point or changing the blower fan speed, in order to evaluate the response of the system to different settings.*

Firmware Version

The firmware version of the control panel and ECU can be displayed. From the advanced diagnostics mode, press the PWR and AUTO keys at the same time. The text CNTR will be displayed and after a few seconds, the control panel firmware version number will be displayed. Pressing the PWR key will toggle to the ECU firmware version.

The following firmware version information is available:-

Table 4. Firmware Codes

Code	Description
CTRL	Control panel version
ECU	ECU Version

Exiting the Diagnostics Mode

Pressing the PWR and AUTO modes at the same time will cycle through the various diagnostic modes and the normal operation mode. Continue pressing the PWR and AUTO keys until the normal set point temperature is displayed to exit the diagnostic mode.

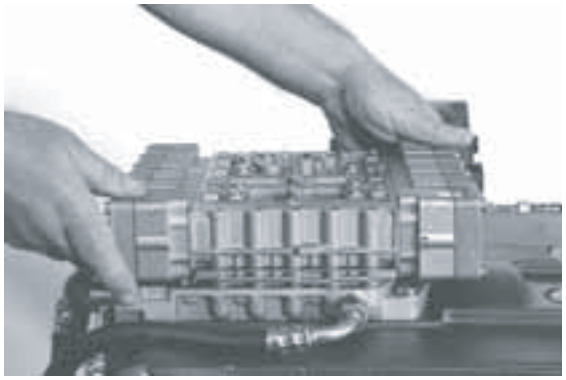
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Electro-Hydraulic Control Unit

Disassembly and Assembly

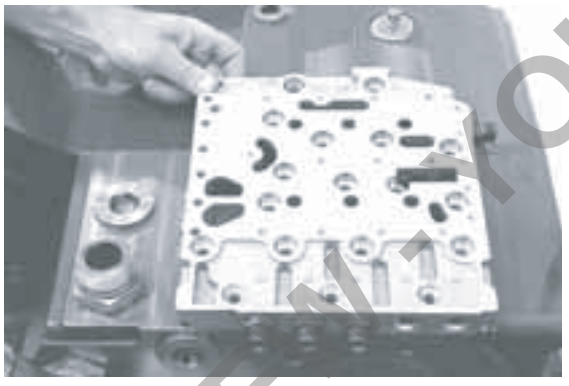
Disassembly



F003040

Fig 19.

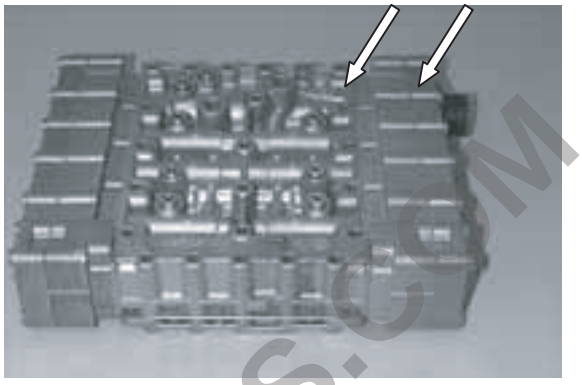
1 Remove the cap screws, then remove the gear shift valve housing.



F003050

Fig 20.

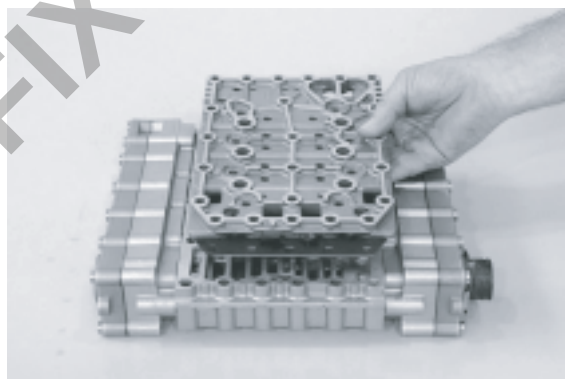
2 Separate the hose lines from the duct plate. Loosen the cap screws and the gasket from the transmission housing.



Foo3060

Fig 21.

3 Mark the installation position of the wiring harness to the valve block.



F003070

Fig 22.

4 Remove the cap screws. Separate the duct plate from the intermediate plate, from the valve block.

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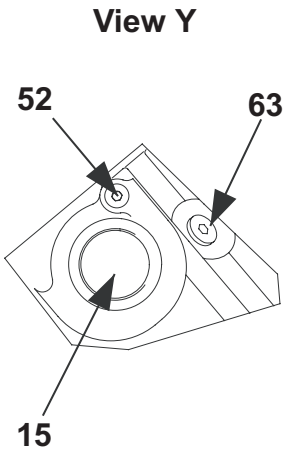


Fig 5.

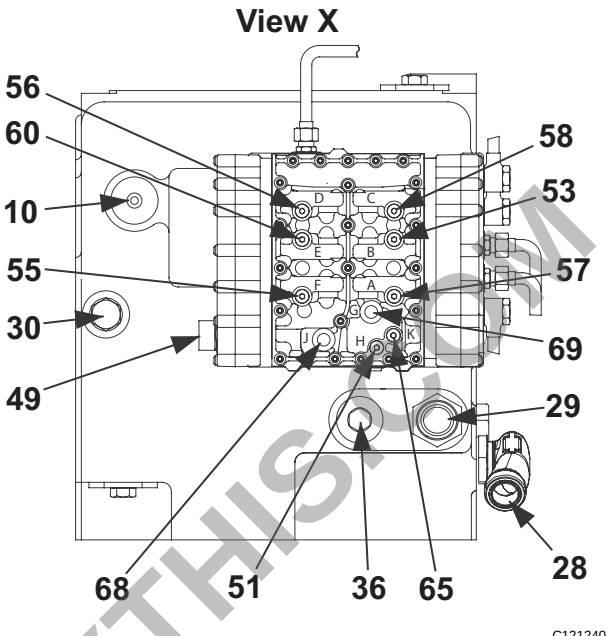


Fig 7.

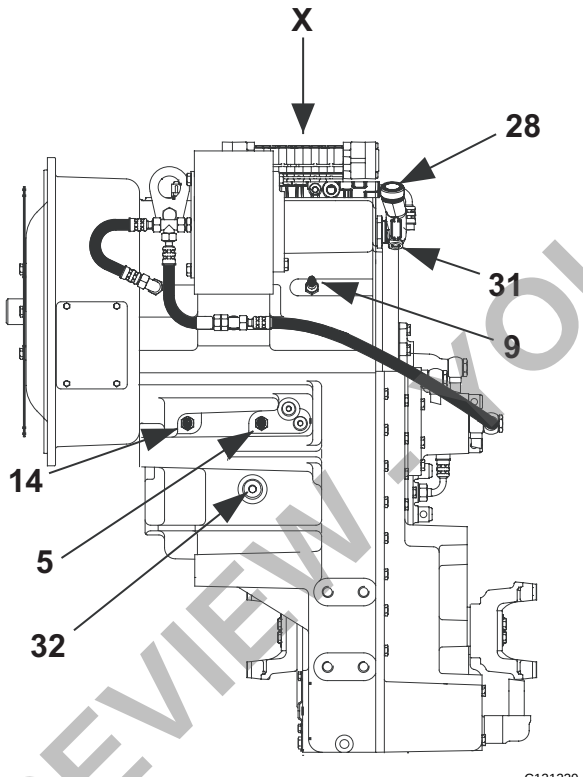


Fig 6.

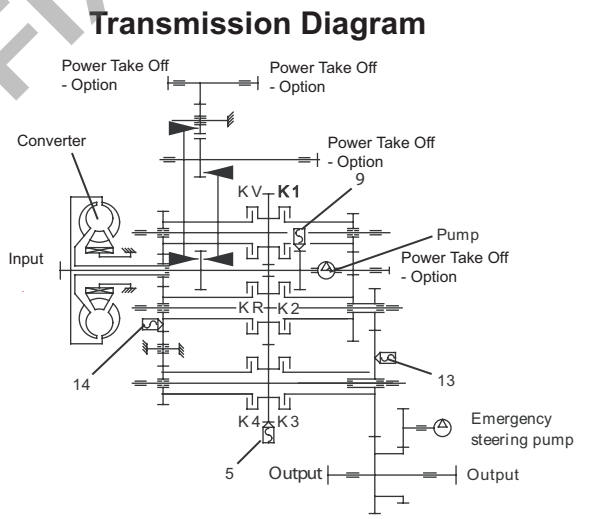


Fig 8.

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General Fault Indications

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

a)	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 too slack -	Adjust to correct tension.
b)	Warm or slightly cool air emitted from unit.	Expansion valve stuck open or closed -	Renew expansion valve.
c)	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.
d)	Compressor clutch continually cuts out.	Condenser matrix blockage -	Remove debris from around matrix/renew condenser.
		Overcharging of refrigerant system -	Evacuate and recharge system.
		Blocked expansion valve/condenser -	Clear blocked component.

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Fluids, Lubricants and Capacities

Specifications

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

Table 14.

Item	Capacity		Fluid/Lubricant	JCB Part Number	Container Size(1)
	Litres	UK Gal			
Fuel System	325	71.5	Diesel, Refer to ***Fuels***		
Engine Oil (Includes the Filter)	41	9.0	JCB Engine Oil EP 15W/40 -10 to 50° C (-4^{0}F to 122^{0}F)	4001/1805	20 litres
Engine (Coolant)	39	8.5	JCB Antifreeze HP/Coolant.	4006/1120	20 litres
Gearbox(2)	42	9.2	JCB HP Universal ATF	4000/2305	20 litres
Axles	42	9.2	JCB Gear Oil HP Plus	4000/2205	20 litres
Hydraulic System(3)(4)	170	37.4	JCB Hydraulic Fluid EP 46	4002/1605	20 litres
Grease Points(5)			JCB Special HP Grease(6)	4003/2017	400g x24
Automatic Greasing System (if fitted)(5)			JCB Special MPL-EP Grease	4003/1501	400g x24
Electrical Connection			As a corrosion and moisture inhibitor, all of the exposed connections should be coated liberally with petroleum jelly.		

(1) For information about the different container sizes that are available (and their part numbers), contact your JCB Dealer.
(2) The figure quoted is the total system capacity. Use the maximum and minimum marks on the dipstick when refilling the system.
(3) The total hydraulic system capacity depends on the equipment being used. Fill the system with all of the rams closed and watch the level indicator.
(4) For machines which operate in high ambient temperatures, JCB Hydraulic Fluid EP 68 (4002/2703) is an approved alternative.
(5) Do not use a Moly based grease.
(6) If JCB Special MPL-EP Grease is used for normal greasing, all of the 100 hour greasing operations must be done at ten hour intervals.

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Pre-Start Cold Checks, Service Points and Fluid Levels

Table 1. Engine

	Operation	10	50	100(1)	100	500	1000	2000
Oil Level and Condition	Check	☐	☐	☐	☐	☐	☐	☐
Oil and Filter	Change					☐	☐	☐
Coolant(2)	Change and Flush							
Coolant Level	Check	☐	☐	☐	☐	☐	☐	☐
Coolant Strength and Condition	Check					☐	☐	☐
Coolant Filter(3)	Change							
Coolant System for Leaks	Check			☐			☐	☐
Air Filter and Dust Valve (If Fitted)(4)	Clean			☐	☐	☐	☐	☐
Air Filter Outer Element(5)	Change						☐	☐
Air Filter Inner Element	Change							☐
Fuel System For Leaks and Contamination	Check	☐	☐	☐	☐	☐	☐	☐
Fuel Filter/Water Seperator	Drain		☐	☐	☐	☐	☐	☐
Fuel Filter/Water Seperator	Change					☐	☐	☐
Fuel Tank Breather Filter	Check					☐	☐	☐
Fuel Tank Breather Filter	Change							☐
Fan Belt Condition (6)	Check			☐		☐	☐	☐
Valve Clearances(7)	Check/Adjust							
External Oil Leaks	Check	☐	☐	☐	☐	☐	☐	☐
Air Compressor Belt Condition(6)	Check			☐		☐	☐	☐

(1) The first 100 Hours Service only, is to be completed by your JCB Dealer.
(2) Change the coolant and flush the system every 3000 hours.
(3) Change every 3000 hours.
(4) Clean more frequently when working in a dusty operating environment.
(5) Change the outer element more frequently when working in a dusty operating environment.
(6) Change if necessary.
(7) Check/adjust for the first time at 1500 hours, then every 5000 hours.

Table 2. Brakes

	Operation	10	50	100(1)	100	500	1000	2000
Park Brake Operation	Check	☐	☐	☐	☐	☐	☐	☐
Service Brake Operation	Check	☐	☐	☐	☐	☐	☐	☐
Brake Wear(2)	Check			☐				

(1) The first 100 Hours Service only, is to be completed by your JCB Dealer.
(2) Check every 1500 hours.

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Basic Operation

Moving a Disabled Machine

Introduction

P4-2025

The machine can be lifted onto a trailer for transportation. However, you **must** contact the nearest JCB Dealer before you try to tow, winch or push the machine. Towing, winching or pushing the machine without following the correct procedure can damage the transmission. If possible, repair the disabled machine where it stands.

It is not recommended to tow a disabled machine. If the machine becomes disabled, the machine must be made safe, lifted onto a transporter and moved to a location where maintenance can be carried out. If towing the machine to a safe location is unavoidable, do the procedure that follows before you try to move the machine.

Preparation for Towing

⚠ CAUTION

Towing a machine too far or too fast can damage the transmission. Do not tow the machine further than 10 Km (6 miles). Use a trailer for greater distances. When towing do not travel faster than 16 km/h (10 mph).

Use a rigid towbar. If you must use towing chains, then use two vehicles, One towing vehicle should be coupled to the front of the disabled machine. The other towing vehicle should be couple to the rear of the disabled machine, to provide braking power.

The towing vehicle(s) must have enough pulling and braking power to move and stop the machine.

4-2-5-4_2

1 Disengage the park brake.

2 Set the transmission to neutral.

3 Prepare the loader arm:

a If the engine and hydraulic systems are not damaged, lift the shovel to 900mm (3ft) above the ground, then fully 'crowd' the shovel. The machine in this position can have a straight-pull from the recovery point.

b If the engine does not work, use the applicable equipment to lift the shovel to 900mm (3ft) above the ground and crowd the shovel. Secure the shovel in position.

Note: *The procedure for preparing the loader arm will depend on the condition of the machine and its hydraulic circuits. For this reason you should contact your JCB Dealer for help and advice before you do this task.*

4 Attach the drawbar (or chain) to the front chassis side plate hole (left or right).

5 Attach the chain to the recovery hitch (if chains are used).

Front recovery hitch **A**.

Rear recovery hitch **B**. (The rear chassis lift points)

The machine is now ready for towing. Make sure you understand what the towing driver will be doing. Obey his instructions and all relevant regulations.

Important: *Do not use the tow pin **C** as a recovery hitch to move the machine.*

Note: *If the machine cannot be driven due to an engine failure, the park brake must be released manually.* ***⇨ Manually Release the Park Brake (1-7)***.

If the steering wheel has to be turned when the machine is disabled and the engine is off, push and hold the secondary steer system switch.

When the steering wheel is being turned, the pump can be heard running and the articulation of the chassis is felt. Test the secondary steer system switch once a month.

Note: *The full operation of the steering system is only achieved when the machine is moving.*

The machines recovery hitches conform to ISO:10532. Refer to this standard to get a particular machines permitted specifications.

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Safety Notices

Important Information

T1-042

The Operator Manual

⚠ WARNING

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

INT-1-4-2

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

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

Safety Warnings



This safety alert system identifies important safety messages in this manual. When you see this symbol, be alert, your safety is involved, carefully read the message that follows, and inform other operators.

In this publication and on the machine, there are safety notices. Each notice starts with a signal word. The signal word meanings are given below.

⚠ DANGER

Denotes an extreme hazard exists. If proper precautions are not taken, it is highly probable that the operator (or others) could be killed or seriously injured.

INT-1-2-1

⚠ WARNING

Denotes a hazard exists. If proper precautions are not taken, the operator (or others) could be killed or seriously injured.

INT-1-2-2

⚠ CAUTION

Denotes a reminder of safety practices. Failure to follow these safety practices could result in injury to the operator (or others) and possible damage to the machine.

INT-1-2-3

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Table 3. Transmission and Axles

	Operation	10	50	100(1)	100	500	1000	1500	2000
Transmission Oil Level	Check	☐	☐	☐	☐	☐	☐	☐	☐
Transmission Oil and Filter	Change			☐			☐		☐
Transmission Breather Filter	Check					☐	☐	☐	☐
Transmission Breather Filter	Change								☐
Differential Oil Level	Check			☐		☐	☐	☐	☐
Differential Oil	Change							☐	
Hub Oil Level	Check			☐		☐	☐	☐	☐
Hub Oil	Change							☐	
Rear Axle Pivot(2)	Grease			☐	☐	☐	☐	☐	☐
Axle Breather Filter	Check					☐	☐	☐	☐
Axle Breather Filter	Change							☐	
Tyre Pressures and Condition	Check	☐	☐	☐	☐	☐	☐	☐	☐
Wheel Nut Security	Check	☐	☐	☐	☐	☐	☐	☐	☐
Axle Mount Security	Check			☐				☐	
Driveshaft Security	Check			☐			☐		☐
Front Driveshaft Support Bearing(2)	Grease							☐	

(1) The first 100 Hours Service only, is to be completed by your JCB Dealer.
(2) Grease more frequently when operating in arduous conditions.

Table 4. Hydraulics

	Operation	10	50	100(1)	100	500	1000	2000
Oil Level	Check	☐	☐	☐	☐	☐	☐	☐
Oil Filter	Change			☐				☐
Oil	Sample					☐	☐	☐
Oil	Change							☐
Tank Breather Filter	Check					☐	☐	☐
Tank Breather Filter	Change							☐
Tank Suction Strainers (x4)	Clean							☐
Hoses, Rams and Pipe-Work for Damage or Leaks	Check			☐			☐	☐

(1) The first 100 Hours Service only, is to be completed by your JCB Dealer.

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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:

1 The manual switch in the cab located in panel **11**.

2 The thermostat switch monitoring the evaporator temperature

3 The high and low level pressure switches

Switch 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 coil. It controls the refrigeration cycle by switching the compressor clutch on and off to prevent freezing of the condensate on the evaporator coil.

The pressure level switches are housed in a common assembly located adjacent to the Receiver Drier. 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.

Pressures Switch Settings

High Pressure Switch 23 bar (341 lbf/ in^2)

Low Pressure Switch 2.06 bar (29.8 lbf/ in^2)

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. 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.

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AVO 2002
- Red lead to volts (middle) socket on meter.
- Black lead to negative on meter.
- RH slider to DC voltage.
- LH slider. ⇒ *Fig 7. (C-13)*.

AVO 2003
- Red lead to amps socket (marked A) on the meter.
- Black lead to negative on meter.
- RH slider to DC voltage
- LH slider to 200 Shunt

FLUKE 85
- Red lead to volts socket (marked V) on meter.
- Black lead to COM socket on meter.
- Set dial to mV.

7 Start the engine and run at maximum speed (see ***Technical Data***). Meter should show maximum alternator output in Amps (see ***Technical Data***).

Note: *The meter reading should be taken as soon as possible after starting the engine, as the charging current will fall rapidly.*

8 A zero reading indicates failure of the alternator and may be caused by one of the following conditions. These are listed in the order of probability.

a Defective suppression capacitor.

b Dirty slip rings or worn brushes.

c Defective regulator.

d Defective rectifier.

e Open or short - circuited field (rotor) windings.

f Open or short - circuited power (stator) windings.

9 To check for fault a, disconnect the capacitor and repeat the charging test. Renew the capacitor if necessary.

10 To check for faults b and c, remove the regulator and brush box assembly. Check the condition of the brushes and, if necessary, clean the slip rings using extra-fine glass paper. The regulator may only be checked by substitution.

11 Faults d, e, and f may be checked only by removing and dismantling the alternator for further testing.

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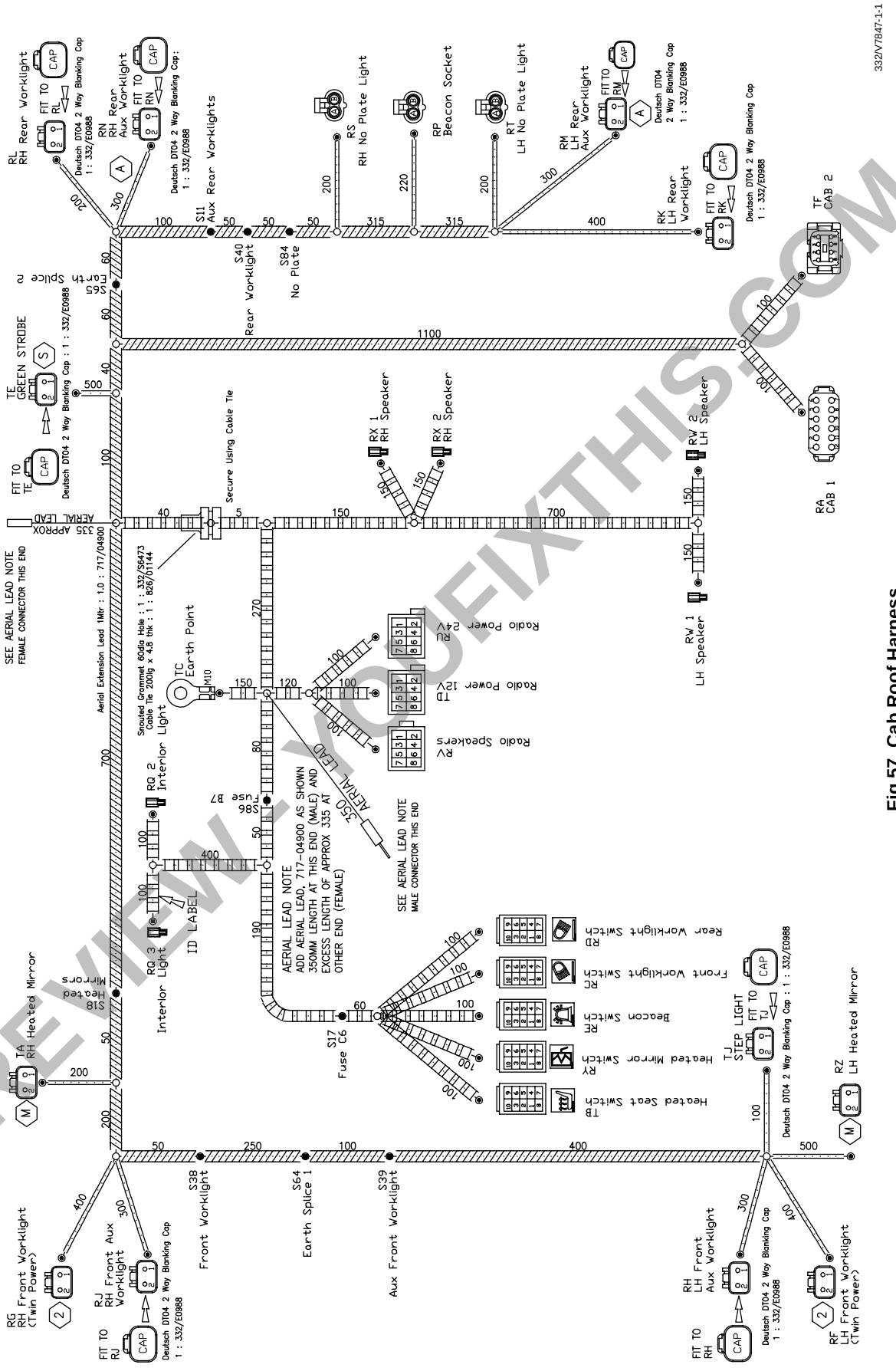


Fig 57. Cab Roof Harness

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System Operating

With the engine running, the system isolator valve **59** closed, the cab system activation switch in the ON position and the machines road speed above the speed required to activate the ACCS system, the status of the ACCS opening valve will be as follows.

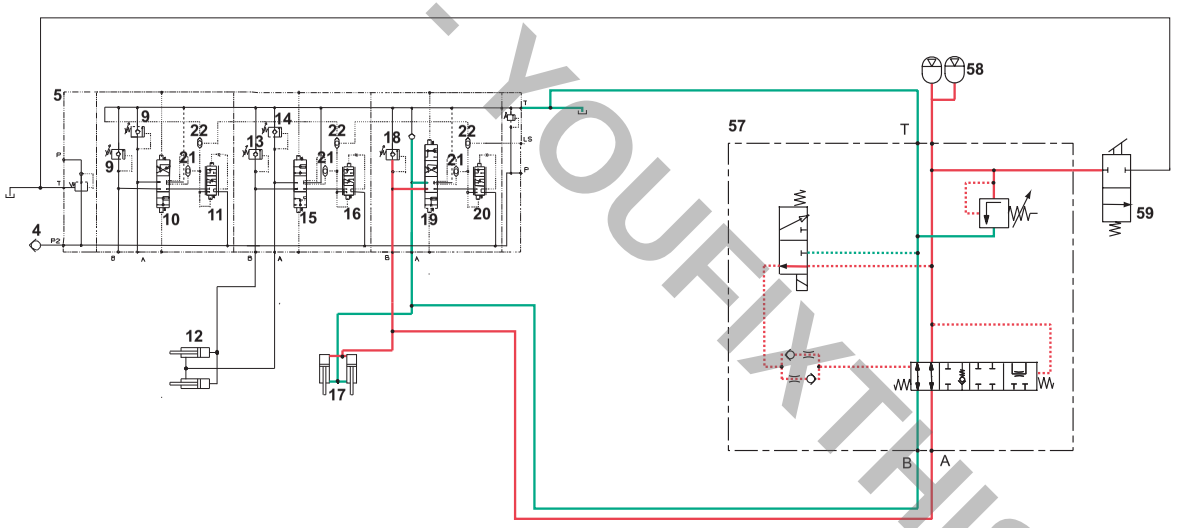
With the system activation switch turned ON and the road speed above the required activation speed, the solenoid in the ACCS valve is switched. This closes the path to the tank of the oil in the pilot line to the left of the operating spool and opens a pilot line from the accumulator charged internal pressure to the left hand side of the spool through the double check valve.

This pilot pressure in conjunction with the spring pressure is more than the combined spring and pilot pressure to the right of the operating spool which causes the spool to move to the right.

With the spool in this position, oil from the head end of the lift rams is connected to the accumulators. This allows the fluctuations in the oil pressure caused by the machine traversing uneven ground to be dampened by the action of the stored gas pressure which acts on the opposing side of the accumulator pistons.

With the loader valve lift spool **19** in the closed position, the oil from the rod end of the lift rams path to the tank has been dead ended by spool **19**.

However, a connection has been opened by the ACCS operating spool to the tank to allow the rod end of the lift rams to induce or dissipate the oil, as required.



C021000-C4

Fig 8. System Operating

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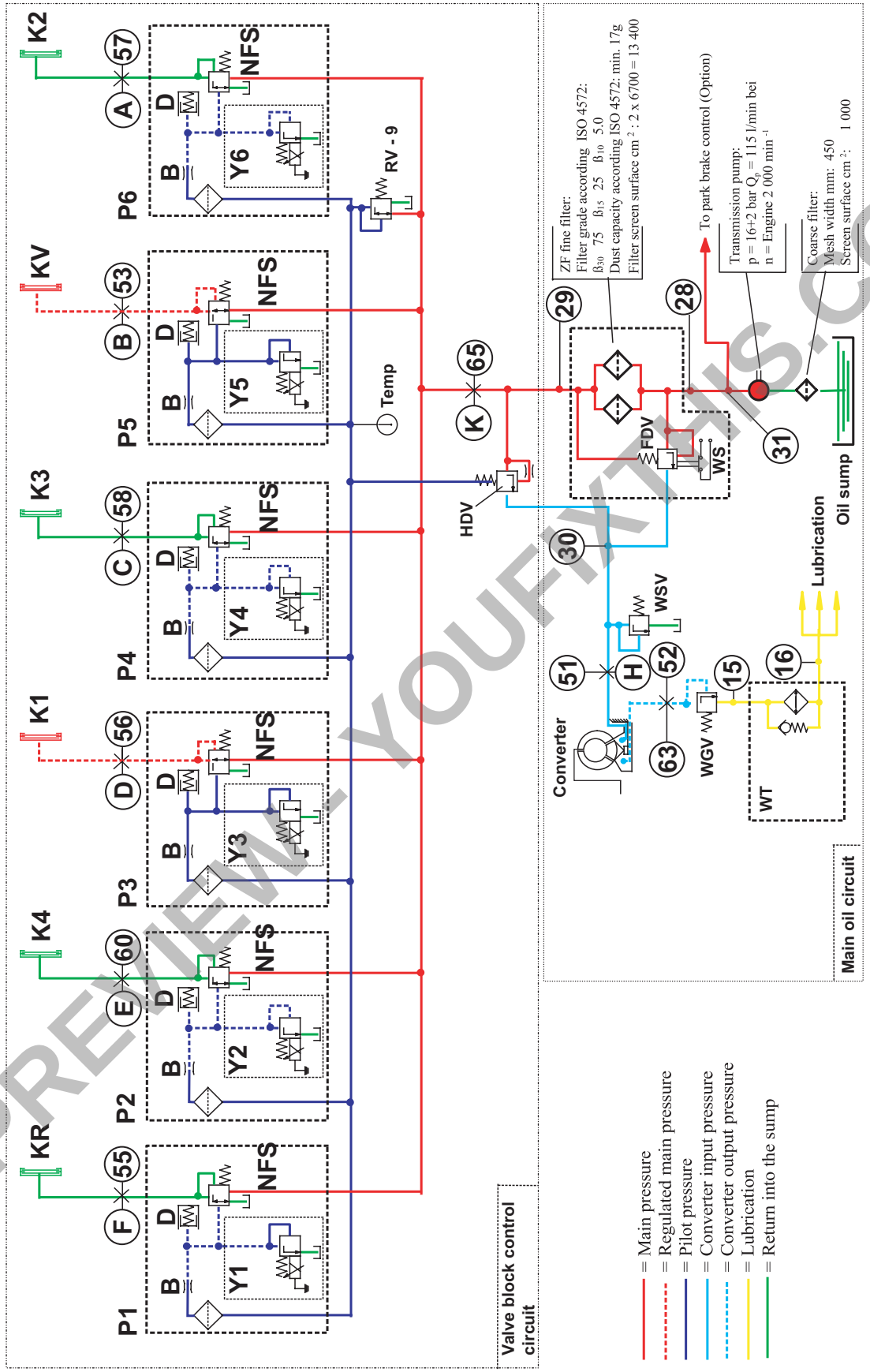


Fig 10.

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F008750

Fig 234.

4 Electrically heat the bearing **4**, then install the bearing over the shaft and into the spur gear. Wear safety gloves.



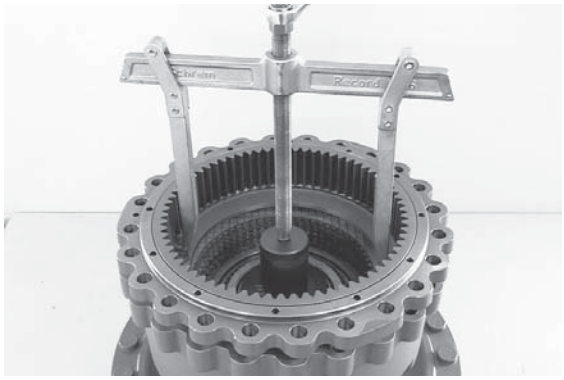
F008760

Fig 235.

5 Heat the clutch shaft taper bearing, then put it over the shaft. Make the sure bearing is seated fully home. Wear safety gloves.

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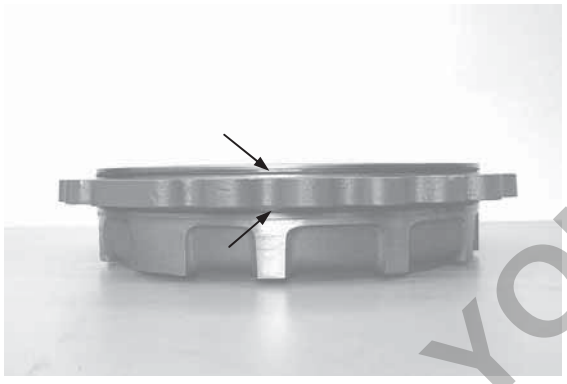
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F000410

Fig 27.

18 Separate the annulus ring from the housing. Use the two legged puller, as shown.



F000420

Fig 28.

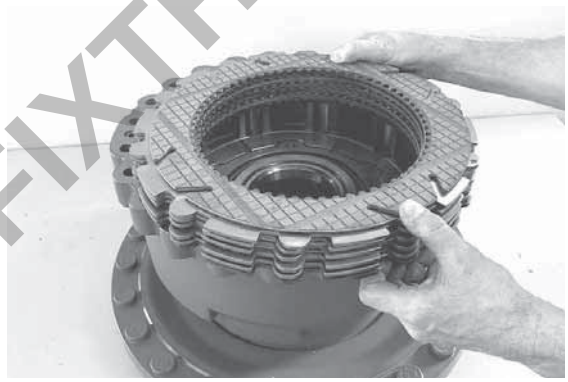
19 Remove, then discard the O-ring seals from the grooves in the annulus (arrowed).



F000430

Fig 29.

20 Remove and discard the O-ring seal (arrowed) from the brake housing.



F000440

Fig 30.

21 Remove the brake plate pack from the brake housing.

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Bleeding the Brake System

Introduction and Description

This topic contains information about a machine SYSTEM. The system has some devices that connect either mechanically, hydraulically or electrically. Make sure you are referring to the correct system. Refer to the applications table. ⇨ *Related Topics (G-8)*.

Descriptions and procedures relate to the system and not the individual devices. For information about the devices refer to the relevant topics. ⇨ *Related Topics (G-8)*

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

⇨ *Related Topics (G-8)*
⇨ *Introduction and Description (G-7)*
⇨ *Brake Circuit (467 Machines) (G-3)*
⇨ *Service Brakes (G-33)*
⇨ *Testing the Park Brake (G-40)*
⇨ *Technical Data (G-1)*

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