Service Manual

Wheeled Loading Shovel - 434S/435S

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Publication No.
9803/9420-3



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Issued by JCB Technical Publications, JCB Service, World Parts Centre, Beamhurst, Uttoxeter, Staffordshire, ST14 5PA, England. Tel +44 1889 590312 Fax +44 1889 593377

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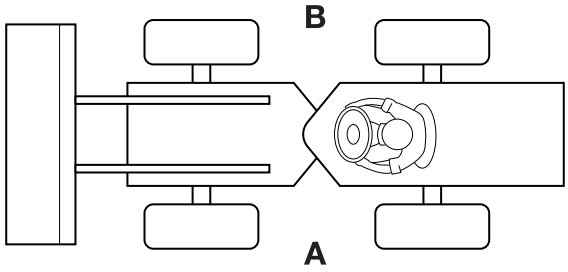
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Left Side, Right Side

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



T033800-1

Fig 1.

Cab/Canopy

T1-003_2

This manual frequently makes references to the cab. For instance, 'do not operate the machine without a manual in the cab'. It should be noted that these statements also apply to canopy build machines.

Cross References

T1-004_2

In this publication, page cross references are made by presenting the subject title printed in bold, italic and underlined. It is preceeded by the 'go to' symbol. The number of the page upon which the subject begins, is indicated within the brackets. For example: ***⇨ Cross References (1-2)***.

Component Location

Note: *The illustration(s) show a typical machine model; your machine may look different from the model shown. For example, the 435S has a diesel particulate filter.*

1	Shovel
2	Loader arms
3	Beacon
4	ROPS/FOPS cab
5	Engine cover
6	Articulation lock
7	Heater door
8	Hydraulic fluid level - sight glass
9A	Tool box (434S)
9B	Tool box (435S)
10	Battery isolator switch
11	Rear grille
12	Coolant filler cap
13	Air filter assembly
14	Hydraulic fluid filter
15	Fuel filter - suction side
16	Hydraulic fluid filler cap
17	Fuel filter - pressure side
18	Engine oil dipstick
19	Engine oil filler cap
20	Exhaust
21	Radiator
22	Diesel filler point
23	Engine oil filter
24	Transmission oil dipstick/filler point
25	Coolant header tank

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Zinc Plated Fasteners and Dacromet Fasteners

Table 2. Torque Settings - UNF Grade 'S' Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
in.	mm	in.	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
1/4	6.3	7/16	11.2	1.1	8.3	10.0	1.0	7.4
5/16	7.9	1/2	22.3	2.3	16.4	20.0	2.0	14.7
3/8	9.5	9/16	40.0	4.1	29.5	36.0	3.7	26.5
7/16	11.1	5/8	64.0	6.5	47.2	57.0	5.8	42.0
1/2	12.7	3/4	98.00	10.0	72.3	88.0	9.0	64.9
9/16	14.3	13/16	140.0	14.3	103.2	126.0	12.8	92.9
5/8	15.9	15/16	196.0	20.0	144.6	177.0	18.0	130.5
3/4	19.0	1 1/8	343.0	35.0	253.0	309.0	31.5	227.9
7/8	22.2	1 15/16	547.0	55.8	403.4	492.0	50.2	362.9
1	25.4	1 1/2	814.0	83.0	600.4	732.0	74.6	539.9
1 1/8	31.7	1 7/8	1181.0	120.4	871.1	1063.0	108.4	784.0
1 1/4	38.1	2 1/4	1646.0	167.8	1214.0	1481.0	151.0	1092.3

Table 3. Torque Settings - Metric Grade 8.8 Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
ISO Metric Thread	mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M5	5	8	5.8	0.6	4.3	5.2	0.5	3.8
M6	6	10	9.9	1.0	7.3	9.0	0.9	6.6
M8	8	13	24.0	2.4	17.7	22.0	2.2	16.2
M10	10	17	47.0	4.8	34.7	43.0	4.4	31.7
M12	12	19	83.0	8.5	61.2	74.0	7.5	54.6
M16	16	24	205.0	20.9	151.2	184.0	18.8	135.7
M20	20	30	400.0	40.8	295.0	360.0	36.7	265.5
M24	24	36	690.0	70.4	508.9	621.0	63.3	458.0
M30	30	46	1372.0	139.9	1011.9	1235.0	125.9	910.9
M36	36	55	2399.0	244.6	1769.4	2159.0	220.0	1592.4

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Tool Detail Reference

Section B - Body and Framework

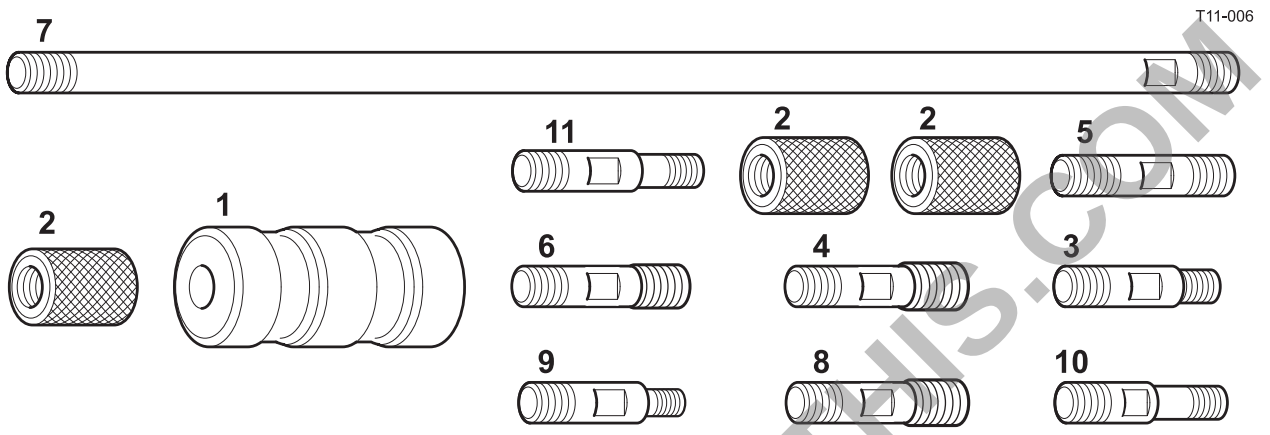


Fig 11. 993/68100 Slide Hammer Kit

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			

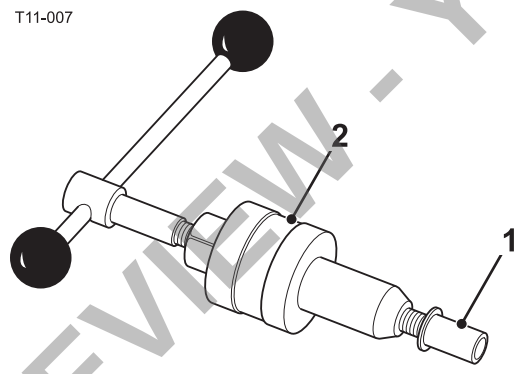


Fig 12. Rivet Nut Tool

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***)

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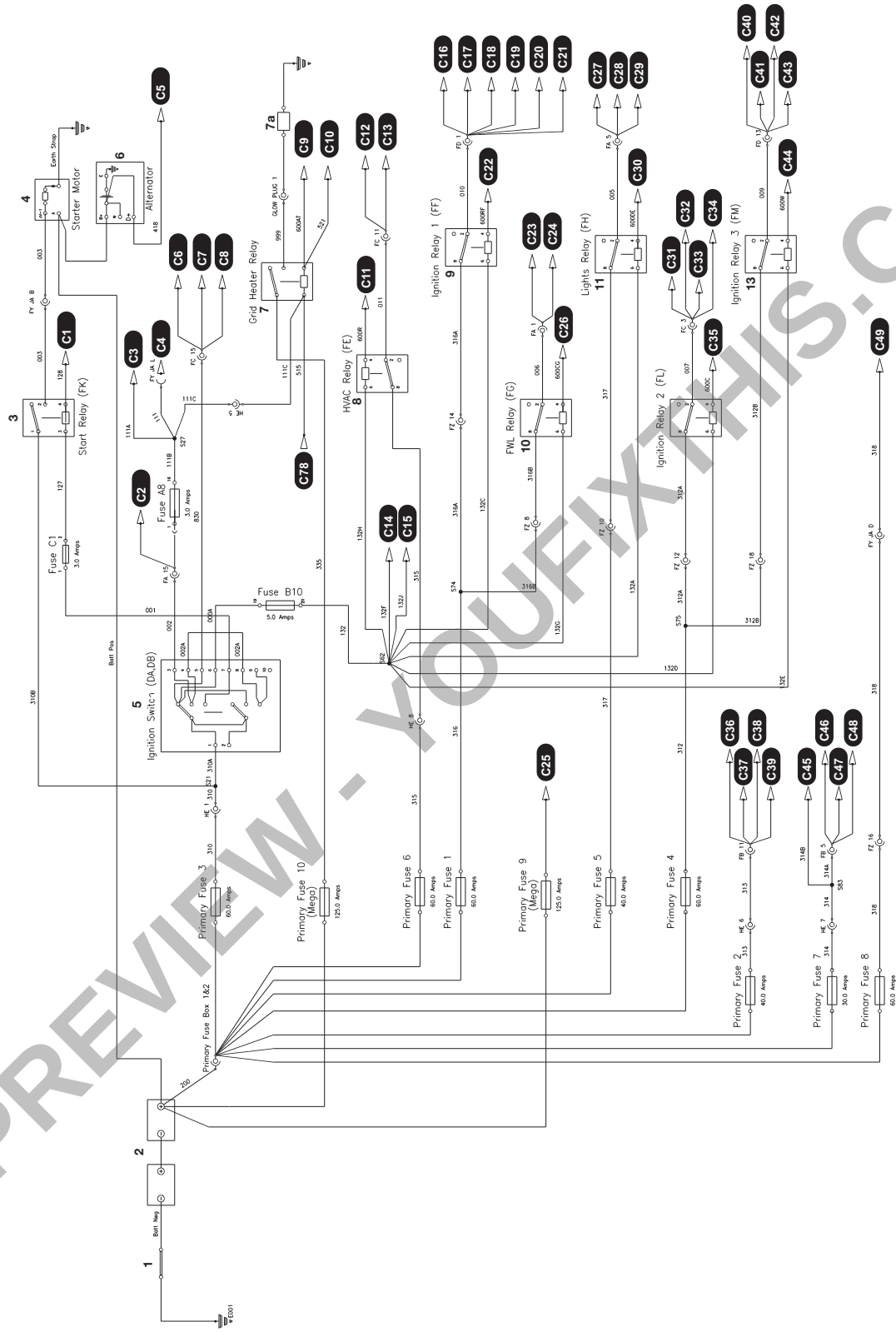


Fig 30. Primary Fuses, Ignition Switch and Relays: Sheet 1 of 13

For component key ⇒ *Table 5.* (C-25).

For key to connecting circuits ⇒ *Table 7.* (C-25)

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20 Label and disconnect the grid heater harness cable **53A** from the solenoid attached to the front bulkhead. Label and disconnect the grid heater solenoid activation cables **53B** and **53C** from the solenoid and, release the harness from its bulkhead securing fasteners.

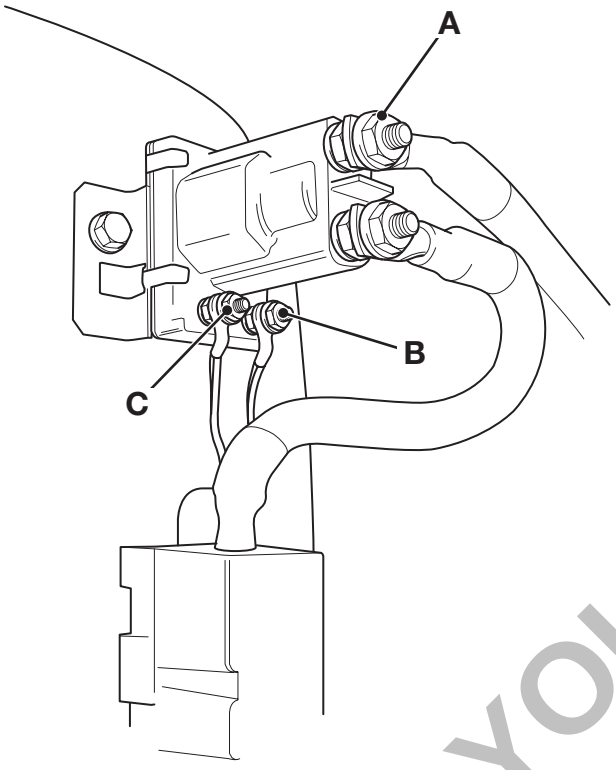


Fig 53.

21 Label and disconnect the emergency steer positive feed cable **54A** from its connection at the fusible link on the bulkhead.

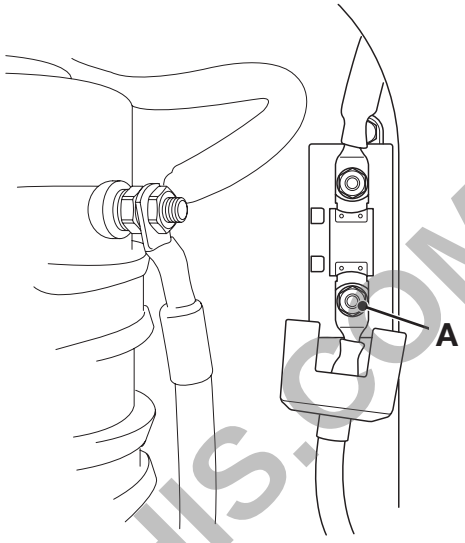


Fig 54.

22 label and disconnect the emergency steer motor feed cable **55A** at its connection at the solenoid. Also label and disconnect the solenoid operating harness cables **55B** and **C**. Release the operating harness from its bulkhead securing fasteners. The solenoid can be left attached to the bulkhead.

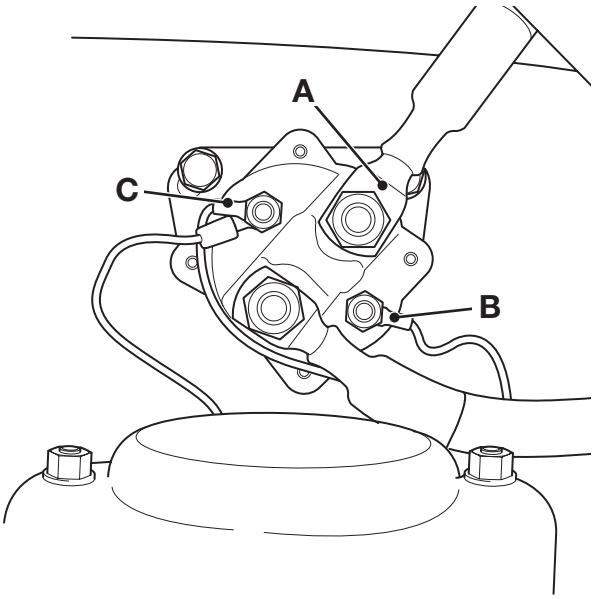


Fig 55.

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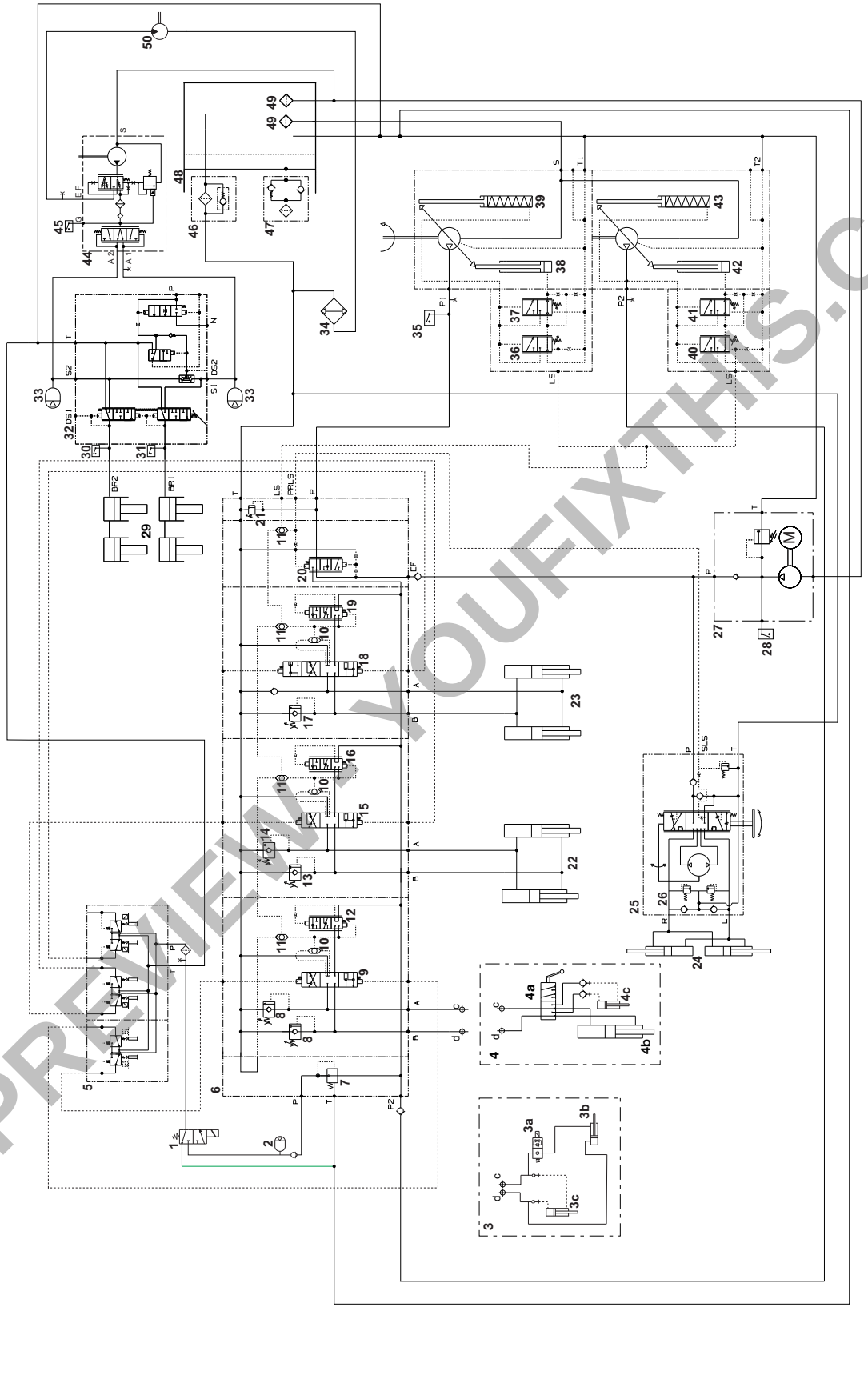


Fig 8. 3 Spool HT Circuit

⇒ Component Key (E-17)

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ZF Error Codes (4WG-160/190/210)

The Electronic Monitoring System (EMS) will display an error code in the event of a fault developing in the transmission system.

The code will be displayed on the top line of the EMS display panel in the format: **ZFCB ERROR?**

Further details of the EMS system can be found in ***Section C - Electrics.***

FC	Fault Code (Hex.)	SPN	Serial Parameter Number	FMI	Failure Mode Indicator
IC	Internal Code (Dec)	TCU	Transmission Control Unit	SC	Short Circuit
OC	Open Circuit	EMS	Electronic Monitoring System	CS	Customer Specific

Table 22. ZF Error Codes

FC	SPN	FMI	IC	Description of the Fault Code	Reaction of the TCU	Repair Procedures
11	5000	12	48	A Logical Error for the Selected Gear Range		
				The TCU senses an incorrect signal combination for the selected gear range: -A cable from the shift lever to the TCU is broken -A cable is defective, it has a SC to the battery or earth -The shift lever is defective	TCU shifts the transmission to neutral OP-Mode: transmission shutdown	Check the cables from the TCU to the shift lever Check the signal combinations at the shift lever positions for the gear range Note: A failure can not be detected in a system with a DW2/DW3 shift lever Note: The fault is reset if the TCU senses a valid signal for that shift lever position
12	5010	12	46	A Logical Error for the Selected Direction		
				The TCU senses an incorrect signal combination for the selected direction: -A cable from the shift lever to the TCU is broken -A cable is defective, it has a SC to the battery or earth -The shift lever is defective	TCU shifts the transmission to neutral OP-Mode: transmission shutdown	Check the cables from the TCU to the shift lever Check the signal combinations at the shift lever positions F-N-R Note: The fault is reset if the TCU senses a valid signal for that direction at the shift lever
13	5020	12	95	A Logical Error at the Engine Derating Device		
				The TCU does not sense a reaction from the engine when the derating device is active	After neutral is selected the TCU changes to OP-Mode: limp home	Check the engine derating device Note: The fault is reset after the power-up of the TCU

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Troubleshooting

Possible faults

Stop the engine immediately when:

- The engine RPMs suddenly increase and decrease
- A sudden and unusual noise is heard
- The colour of the exhaust fumes suddenly darkens
- The oil pressure indicator light comes on while the engine is running

Table 1.

Fault	Possible Cause
The engine does not start	No fuel
	Discharged battery
	Cable connections are uncertain or incorrect
	Tank cap vent hole is clogged
	Fuel filter is clogged
	Air or water leaks in the fuel system
	Blocked fuel line
	Defective fuel feeding pump
	Defective starting motor
	Defective glow plugs
	Burnt fuse on the pre-heating glow plugs
	Defective glow plug control relay
	Defective starting switch
	Broken or loose supplementary start-up spring
	Incorrect tuning of the injection components
	Governor linkage is incorrectly set
	Binding of the injection pump control rod
	Rings are worn or sticking
	Incorrectly sealed intake valve
	Worn cylinder

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Cab

Glazing

Direct Glazing

TB-002_6

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 park 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:

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⚠ 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 and gloves. 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_3

⚠ WARNING

Hydraulic Pressure

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

INT-3-1-11_2

⚠ WARNING

Fuel

Fuel is flammable; keep naked flames away from the fuel system. Stop the engine immediately if a fuel leak is suspected. Do not smoke while refuelling or working on the fuel system. Do not refuel with the engine running. Completely wipe off any spilt fuel which could cause a fire. There could be a fire and injury if you do not follow these precautions.

INT-3-2-2_3

⚠ WARNING

Oil

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.

INT-3-2-3

⚠ CAUTION

It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants.

Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.

INT-3-2-14

⚠ WARNING

Soft Ground

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

INT-3-2-4

⚠ WARNING

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

GEN-6-2

⚠ CAUTION

Rams

The efficiency of the rams will be affected if they are not kept free of solidified dirt. Clean dirt from around the rams regularly. When leaving or parking the machine, close all rams if possible to reduce the risk of weather corrosion.

INT-3-2-10

⚠ CAUTION

Cleaning

Cleaning metal parts with incorrect solvents can cause corrosion. Use only recommended cleaning agents and solvents.

INT-3-2-11

⚠ WARNING

When using cleaning agents, solvents or other chemicals, you must adhere to the manufacturer's instructions and safety precautions.

GEN-1-9

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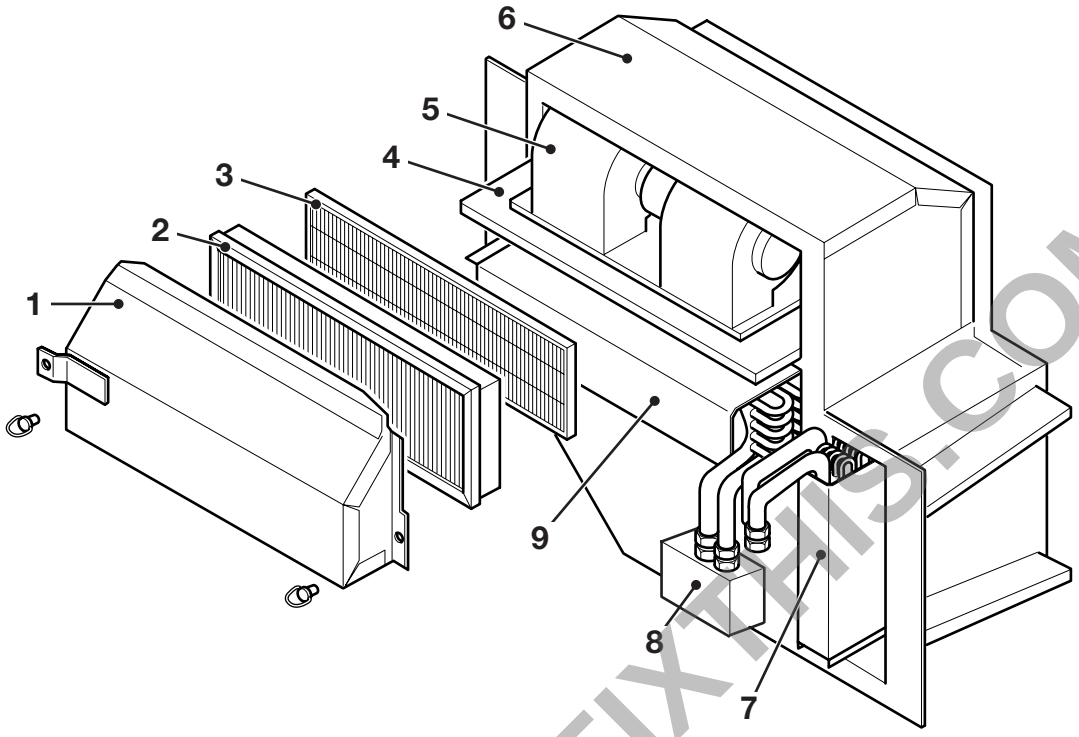


Fig 26.

Component Key:

1 Filter Cover
2 Standard Air Filter Element
3 Secondary Filter Element (HEPA/ Carbon)
4 Blower Motor Support Tray
5 Blower Motor Assembly
6 Air Conditioning Cabinet
7 Heater Matrix
8 Expansion valve
9 Evaporator

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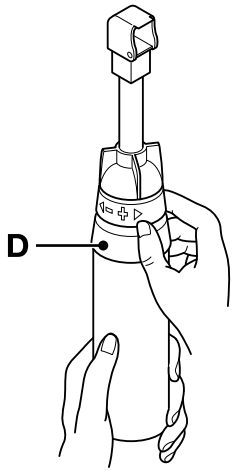


Fig 23.

f Hold the heater vertically and, using a match or cigarette lighter, light the gas as shown.

Hold the heater vertically for 1 to 2 minutes until the catalytic reaction occurs. This is indicated when the blue flame fades and the ceramic element glows red. Then turn the small ring **24-E** until the air holes at **24-F** are completely open. The tool is ready for use.

Note: *The fact that the sound of liquid cannot be heard when the cartridge is shaken does not mean it is empty. No sound will be heard even when the cartridge is full.*

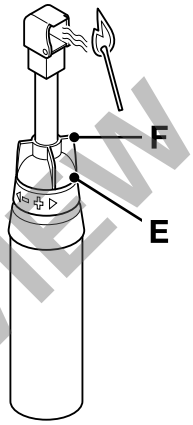


Fig 24.

g The heater can be used in two modes:

i Side wings **25-G** down, reflector head completely open. In this mode the infra-red heat waves are dominant (recommended for the light coloured plastic splices).

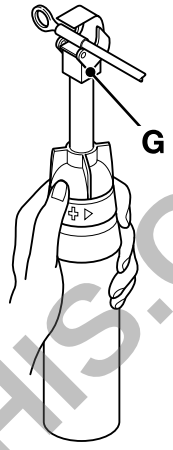


Fig 25.

ii Side wings **26-G** up, reflector head opening reduced. In this mode the heating is done only by the hot gas (use for dark coloured plastic splices).

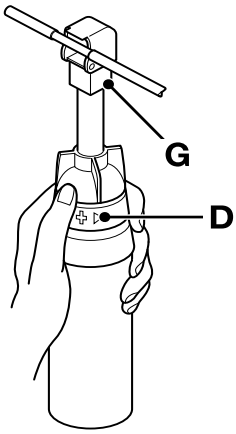


Fig 26.

h To switch off the heater, turn the red ring **26-D** to the left (in the direction of the minus sign).

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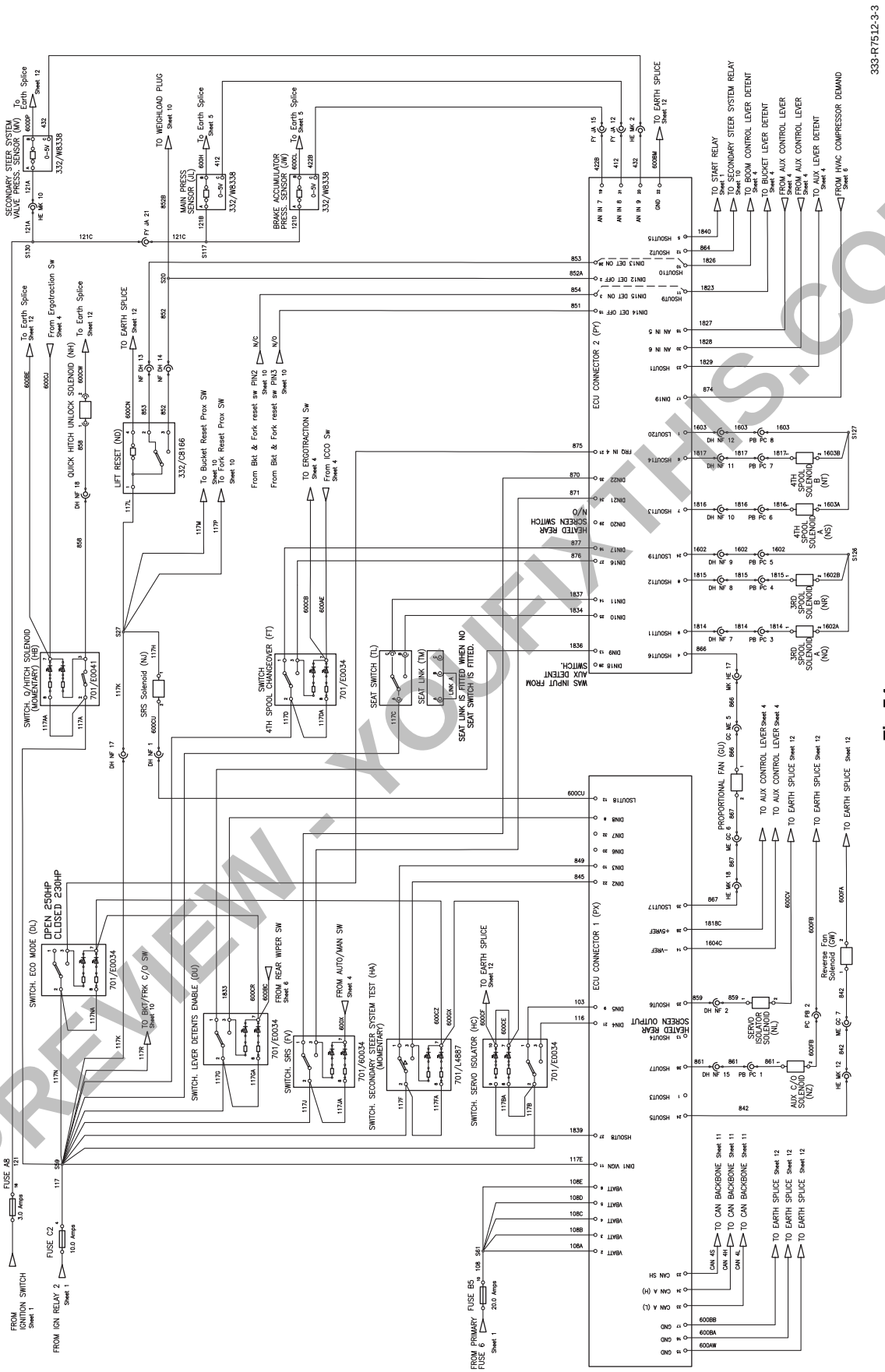


Fig 54.

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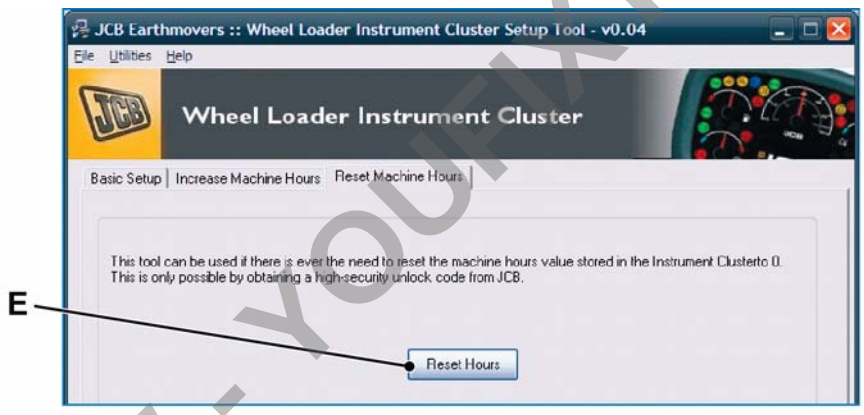
C109360-4

Fig 103.

Email the challenge value **B** to JCB Service to unlock the stored data.

Paste the 'unlock code' in box **C**.

Click 'Apply' **D**.



C109360-5

Fig 104.

With machine's ignition OFF and main beam flash ON, click the 'Reset Hours' button **E** to set current hours to 0.

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Auxiliary Services

With the B port power selected for the Auxiliary Services (Quick hitch or Clam circuits), servo pressure is applied to the loader valve section **30LV3** or **30LV4** respectively. Spool **30A** is moved from the neutral position, where both pressure and return lines are blocked, to a position where pressure oil is routed over the waisted section at **30B** to port B. From port B, oil is directed to one side of the service. Simultaneously, oil returning from the service enters the valve at port A which is connected to exhaust at **30C**.

When A port power is selected, servo pressure moves the spool so that the pressure and return line galleries are reversed. Pressure oil is then directed from port A, whilst port B is connected to exhaust.

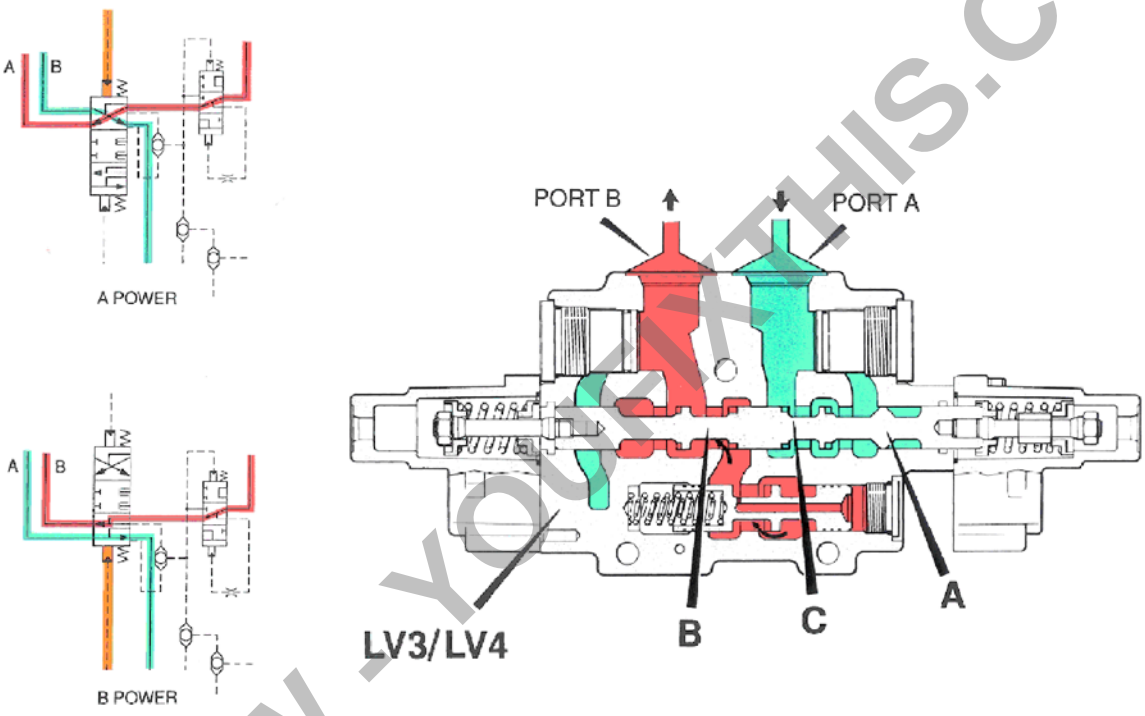


Fig 30.

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6 Fit a new shaft seal into the recess in the mounting flange with the 'garter' spring facing into the pump. Refit the circlip **17** in its groove.

Note: *In some applications there may be two shaft seals fitted back tot back. In this case the outer seal is fitted with the 'garter' spring facing outwards.*

If the seal recess is scored, Loctite hydraulic sealant must be applied to the outer diameter of the seal. Apply a light coat of high melting point grease to the seal lips.

7 Fit the shaft seal assembly sleeve **20**, supplied in the seal kit, over the driveshaft and carefully refit the mounting flange **15** ensuring it locates squarely onto the dowels in the body. Remove the assembly sleeve.

8 Holding the unit securely together, carefully turn the unit over ensuring it is supported on the mounting flange and not the driveshaft.

9 Remove the end cover **3** and fit a new body O-ring **4**, bush seals **6** and back-up seals **5**.

10 Replace the end cover and refit the securing bolts and washers. Evenly torque tighten the bolts to the correct torque. ⇨ *Table 19. Torque Settings (E-95)*.

11 Pour a small amount of clean filtered hydraulic fluid into a port and check that the driveshaft can be rotated without undue force using a suitable tool.

Table 19. Torque Settings

Item	Nm	lbf-ft
1	42 - 47	31 - 35
19	85.5	63

Component Identification

⇨ *Fig 75. (E-96)*,

1 Securing Bolt
2 Spring Washer
3 End Cover
4 Body O-ring
5 Back-up Seal
6 Seal Element
7 Thrust Block
8 Dowel Pin
9 Body
10 Driven Gear
11 Driveshaft
12 Woodruff Key (if fitted)
13 Square Key (not used)
14 Snap-ring (not used)
15 Mounting Flange
16 Shaft Seal
17 Circlip
18 Tab Washer
19 Nut
20 Sleeve (assembly tool)

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ZF Axles (With Standard or Limited Slip Differential or Auto Differential lock)

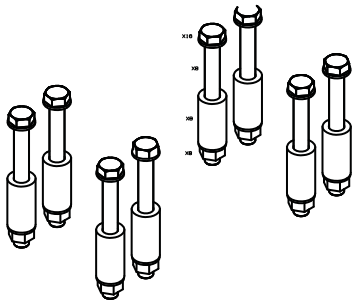
Table 1.

Front		Rear	Rear
Multi-Disk Differential Lock		Multi-Disk Differential Lock	
Axle Weight	1080 kg	Axle Weight	780 kg
Axle Ratio	20.184:1	Axle Ratio	21.53:1
Bias Ratio	0% / 30% / 100%	Bias Ratio	0% / 30% / 100%

Torque Information

Front Axle

Torque all of the bolts to 874Nm.

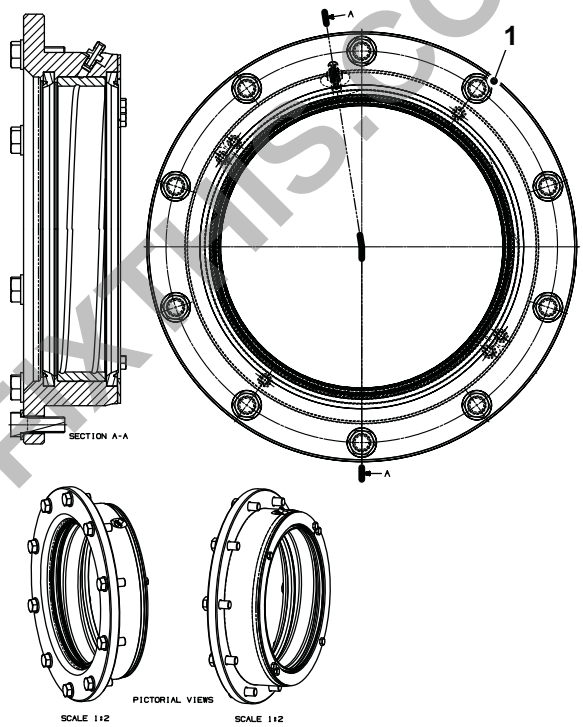


333-R7272-3-1

Fig 2.

Front Trunnion - Rear Axle

Torque all of the bolts **1** to 259Nm.

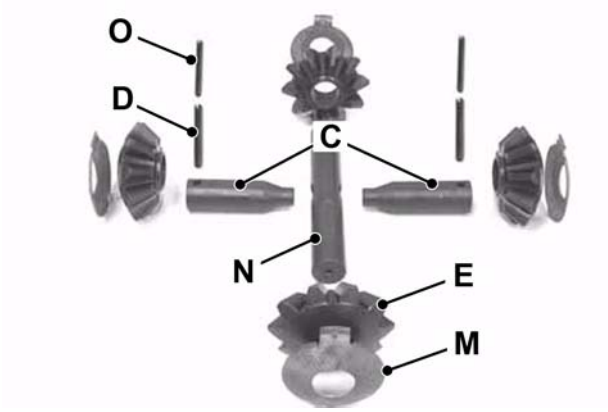


333-R3711-4-1

Fig 3.

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P028400-71

Fig 129.

Differential-spider components

N Spider-shaft: one-piece (long)

E Spider-gear (x4)

M Thrust-washer (x4)

C Spider-shaft: split model (short)

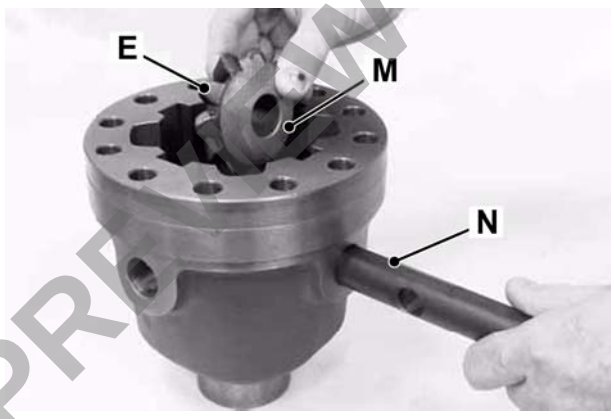
D Slotted-pin (x2)

O Slotted-pin (x2)

3 Put the spider-gears **E** and the thrust-washers **M** into the differential housing. Secure them in position with either:

Spider-shaft **N** (long) ⇨ *Fig 130. (F-56)*

Spider-shafts **C** (short) ⇨ *Fig 131. (F-56)*.

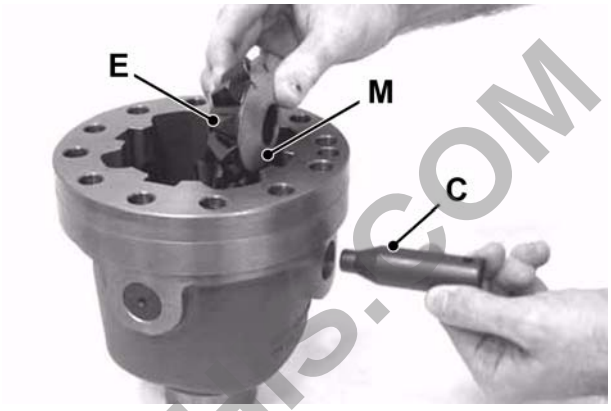


P028400-72

Fig 130.

Note: *Put the tabs of the thrust-washers **M** into the recesses in the differential housing.*

Note: *The securing-holes in the spider-shafts **C**.*



P028400-73

Fig 131.

4 Secure the spider-shafts **C** in position with the slotted-pins **D**.

Note: *Make sure that the two slotted-pins are installed flush.*

Important: *Make sure that the slotted-pins are installed with their openings 180° offset to each other.*



P028400-74

Fig 132.

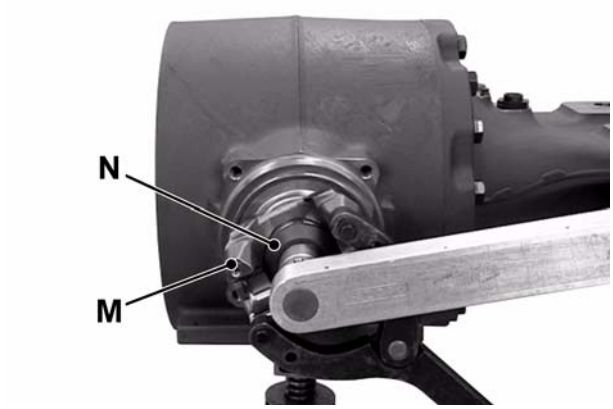
5 Install the second axle bevel-gear **F**.

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Note: *Cover the thread of the slotted-nut with Loctite.*

15 Install the input-flange **M**, then tighten with the disk and slotted-nut **N**. Torque to 1200Nm.



P028460-189

Fig 341.

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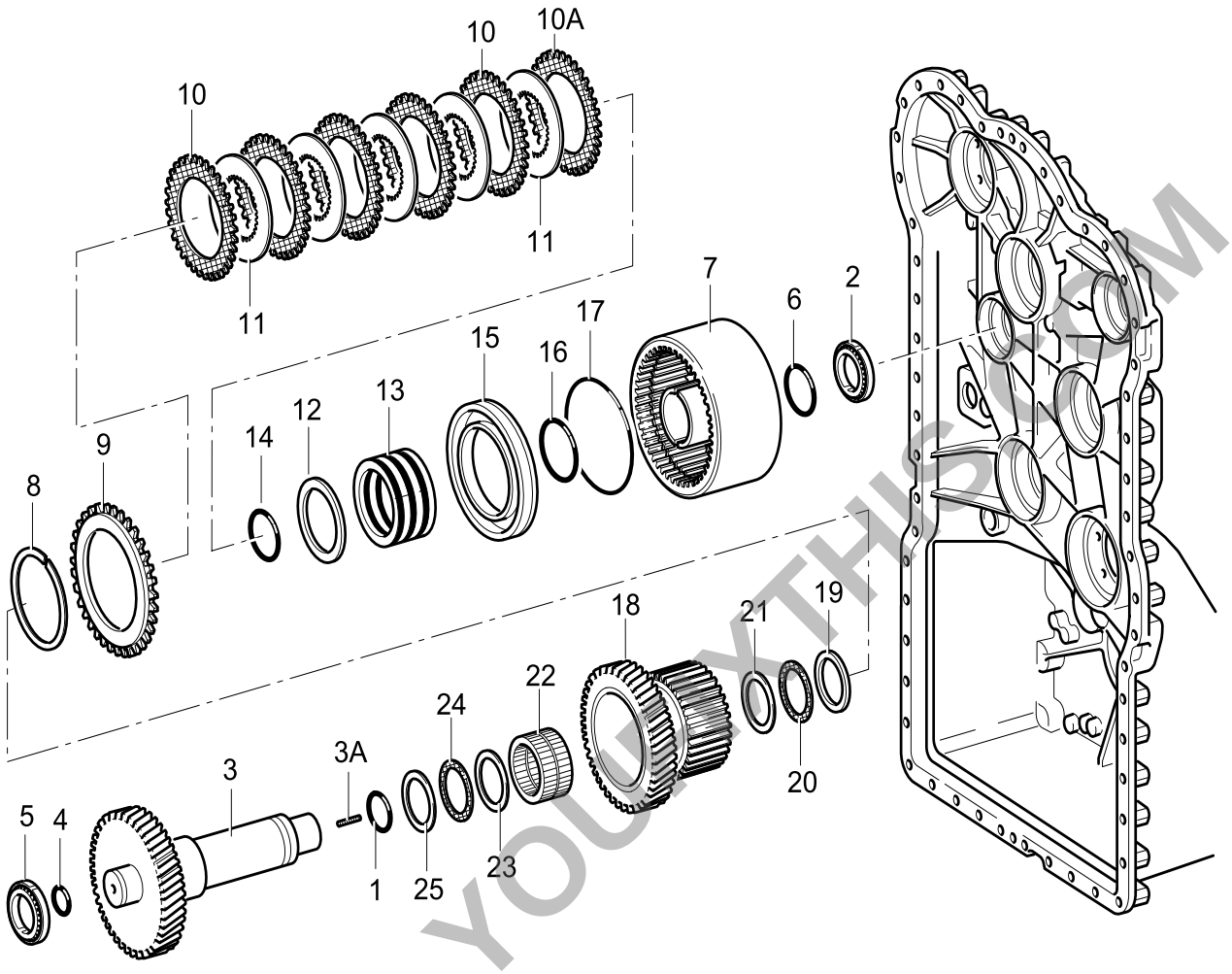


Fig 444. Clutch K4

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FC	SPN	FMI	IC	Description of the Fault Code	Reaction of the TCU	Repair Procedures
54	5260	9	103	A Gear Range Select Timeout		
				A timeout of the CAN message gear range select (ZF_3_IDENT): -Interference on the CAN bus -The CAN wire/connector is broken -The CAN wire/connector is defective, it has a SC to earth or the battery -The FWD controller is defective	Gear range set from 1st to 5th	Check the CAN bus wiring Check the FWD controller
55	5270	9	177	A DNS1 Timeout		
				A timeout of the CAN-message DNS1 from the OMRON-master: -Interference on the CAN bus -The CAN wire/connector is broken -The CAN wire/connector is defective, it has a SC to earth or the battery	TCU shifts to neutral OP-Mode: normal	Check the OMRON-master Check the CAN bus wiring Check the cable to the OMRON-master
55	5270	9	177	A SCT1 Timeout		
				A timeout of the CAN message SCT 1 from the steering computer: -Interference on the CAN bus -The CAN wire/connector is broken -The CAN wire/connector is defective, it has a SC to earth or the battery	OP-Mode: normal	Check the steering computer Check the CAN bus wiring Check the cable to the steering computer

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Adjusting the Cable Slack

1 **Parking brake lever with safety catch** (⇨ *Fig 6. (G-12)*). Turn adjuster **X** anti-clockwise to return pin **Y** to the bottom of the slot. Make sure that the lever is fully down against its stop at **Z**.

2 Loosen locknut **A** and remove pin **B** (at either end of the cable).

3 Screw in the clevis **C** only enough to remove the cable slack.

4 Refit pin **B** and tighten locknut **A** to 27 Nm (19.9 lbf ft).

5 Test the parking brake, see ⇨ *Park Brake Testing (G-15)*.

6 If the brake fails the test, repeat steps 1 to 5.

Note: *If the brake cannot be adjusted by adjusting the cable slack, replace the brake pads and/or the brake cable.*

Note: *Operating arm **D** has three machined holed to accommodate pin **B**. It is **MOST IMPORTANT** that pin **B** is fitted **ONLY** to the **CENTRE HOLE**.*

Note: *If the operating arm securing bolt **E** has to be removed it is **MOST IMPORTANT** that prior to removing the operating arm **D** its position on its splined shaft is carefully marked. The arm **MUST** be refitted in its **ORIGINAL POSITION**. Under **NO CIRCUMSTANCES** must the arms position in relation to its shaft be altered in an attempt to gain additional movement, as this could cause damage to or failure of the parking brake.*

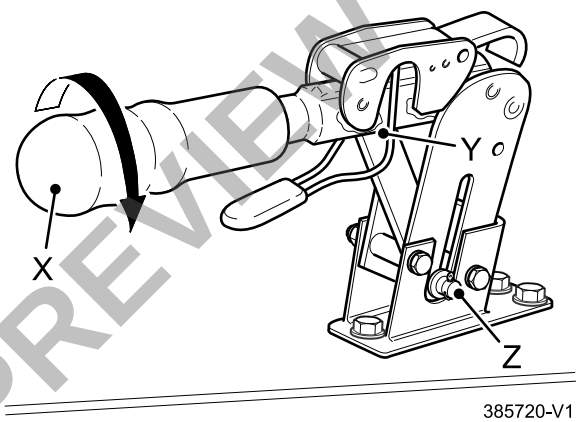


Fig 6.

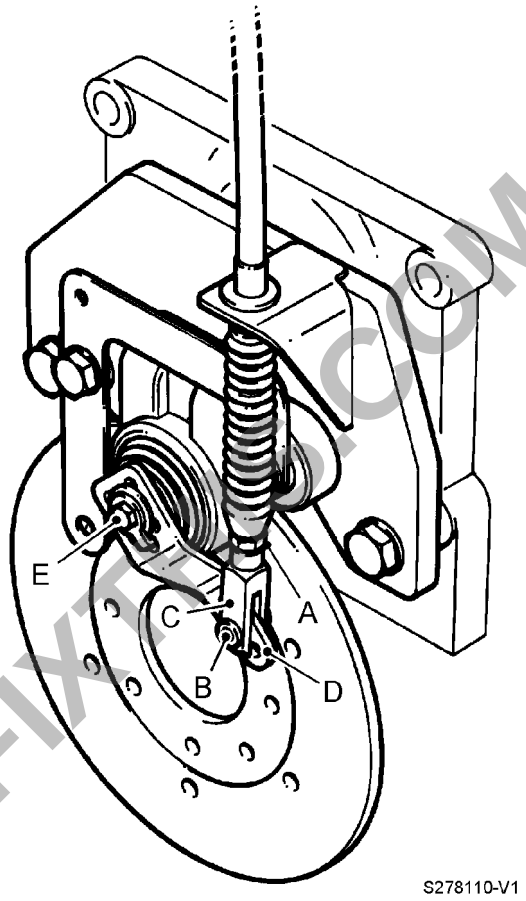


Fig 7.

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