Service Manual

Wheeled Loading Shovel - 412S, 414S, 416S

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Section 2 - Care and Safety

Section 3 - Routine Maintenance

Section A - Attachments

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Routine Maintenance

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Attachments

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Section B

Body and Framework

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Electrics

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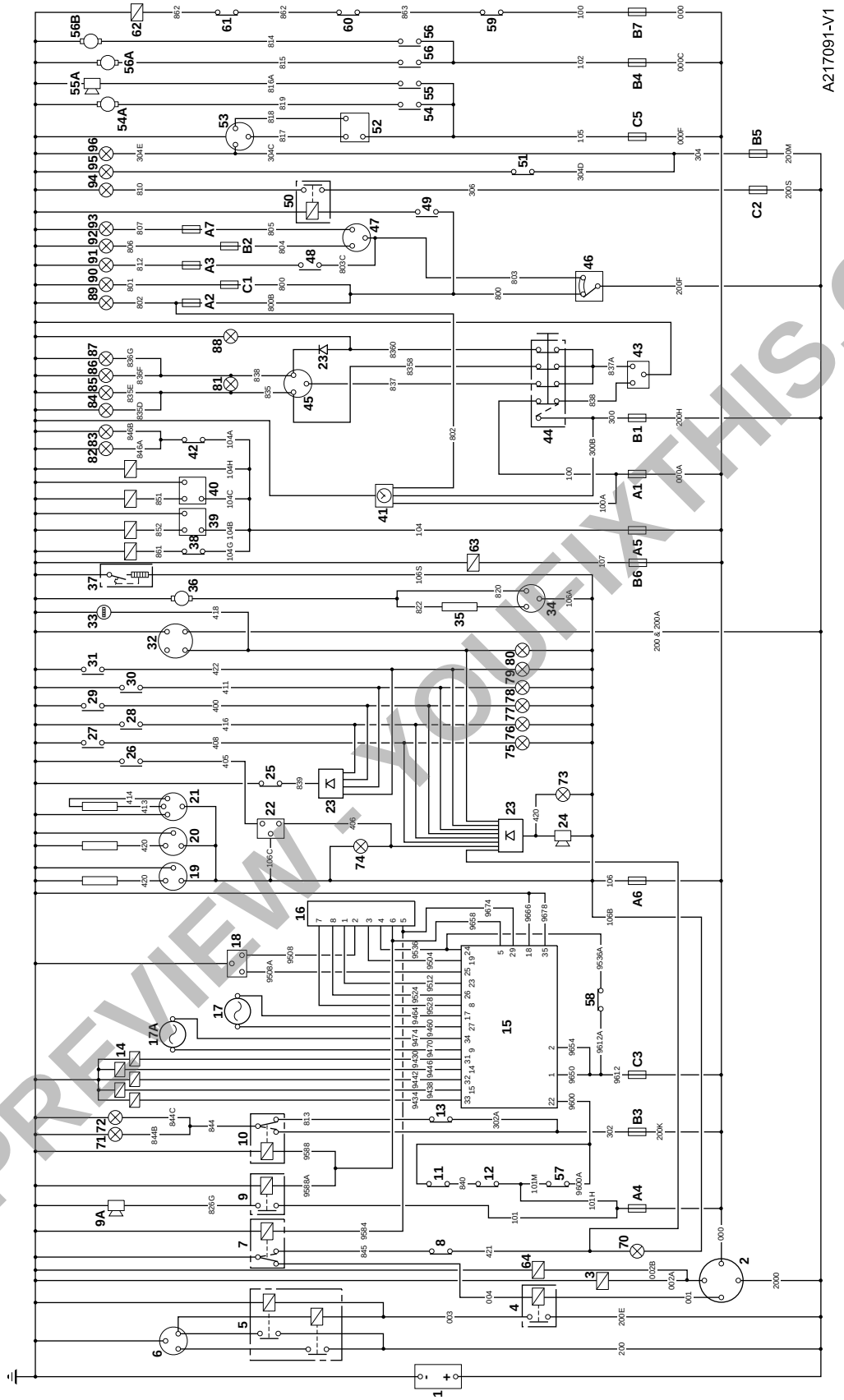


Fig 52.

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Harness Data

Wire and Harness Number Identification

TC-003_2

Introduction

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

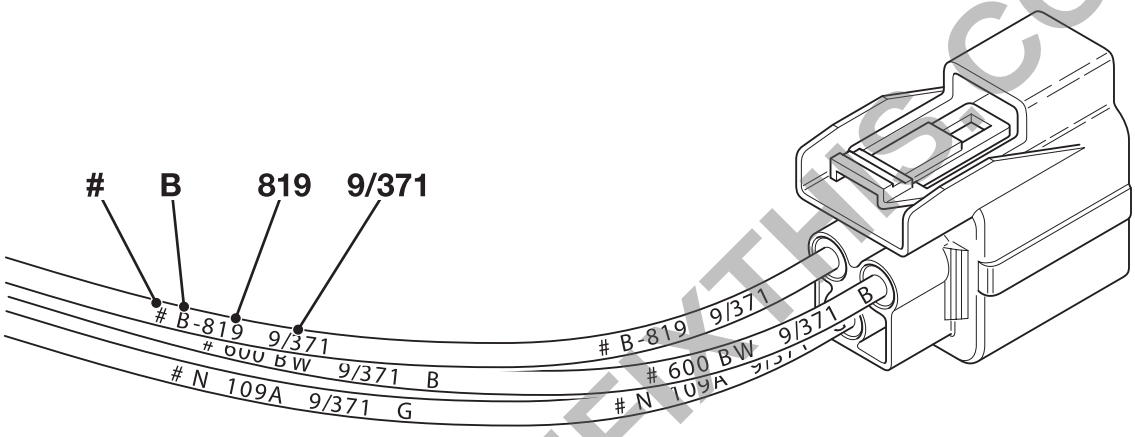


Fig 98. Typical Wire and Harness Number

⇒ *Fig 98. (C-139)*. The illustration shows a typical connector and wires. Each wire has an individual identification number permanently marked on it, at regular intervals along it's length.

The number stamped on the wire identifies the following:

Table 29. Wire and Harness Number Identification

Ident. No.	Description
#	The # indicates the start of the identification number. It is always printed to the left of the identification number.
B	If applicable - The colour of the flying lead that the harness wire should mate with. For instance, if wire **819** from harness 719/37100 mated with a flying lead coloured black (colour code **B**) then the number printed on the wire would be **B**-819 9/371.
819	The wire's unique identification number. The wire functions and numbers allocated to them are consistent through out the JCB range of products. ⇒ *Wire Numbers and Functions (C-140)*.
9/371	If applicable - The part number of the harness that the wire originates from. If the harness part number is 719/37100, the number printed on the harness wires will be **9/371** (71 and 00 are common numbers and therefore deleted).

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System Identification

General

January 2006 will see the introduction of a new advanced type of Electronic Monitoring System (EMS) to the Large Wheeled Loading Shovel machine range. This will coincide with the introduction of the new style cab, and primarily facilitates the introduction of the Tier 3 Common-Rail engines.

Unfortunately, it is not easy to differentiate between the two EMS systems as visually they are identical. However, the EMS units will have unique Hardware and Software JCB part numbers. These part numbers are the only way to guarantee correct identification.

Although the part numbers are clearly marked on the rear of the display units, viewing them would require the unit's removal. However, the units are programmed to display the software part number on the top of the display screen at start-up.

Important: *It is vital that you identify the correct software package before attempting to connect the diagnostic tools. Serious damage may result from an incorrect connection.*

The software identification part number will be displayed for approximately 1.5 seconds each time the system is powered up. If you fail to fully identify the part number at the first attempt, turn off the ignition, wait 2 - 3 seconds and then turn the ignition on again. Repeat this procedure as many times as necessary until the software has been correctly identified.

The new system (C164) will be identified by the following part numbers:

- EMS GA: 728/80077
- EMS Hardware: 728/30400
- EMS Software: 728/90269.vsf.

Important: *This EMS MUST be Set-up using Servicemaster 2.* ***⇒ C164 EMS (C-329)****.*

Note: *Only the digits of the software part numbers are displayed, ie, 728/990269. The.vsf for the C164 nor the .hex for the HC11 are not displayed on screen.*

The current EMS system (HC11) can be identified by the following part numbers:

- EMS GA: 728/80056
- EMS Hardware: 728/27700
- EMS Software: 728/90230.hex

Important: *This EMS MUST be Set-up using the current TERM 2 Software Tools.* ***⇒ HC11 EMS (C-303)****.*



Fig 208.

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Section E

Hydraulics

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Circuit Descriptions

Loader Valve

The Loader Valve **LV** is a 2-spool monoblock (Husco Series 6600) with an integral Pressure Unloader **PU**. The valve block is configured for open circuit operation and has two, three or four service valve sections **LV1** to **LV4**, a priority steer pressure section **LV5** and an inlet section **LV6** with an integral main relief valve.

When its operated, the designated valve section controls the direction of oil flow to each service through the service ports A and B. The valve spools in each service section are held in a neutral position by spring-loading. In the neutral pump the supply to the service is blocked and oil flows through the valve galleries back to the tank.

The valve section spools are:

LV1 (S1) Loader Arms. Hydraulic pilot and detent float.

LV2 (S2) Bucket. Hydraulic pilot, regenerative A to B

LV3 (S3) Auxiliary. Double acting A to B and B to A.

LV4 (S4) Auxiliary. Double acting A to B and B to A.

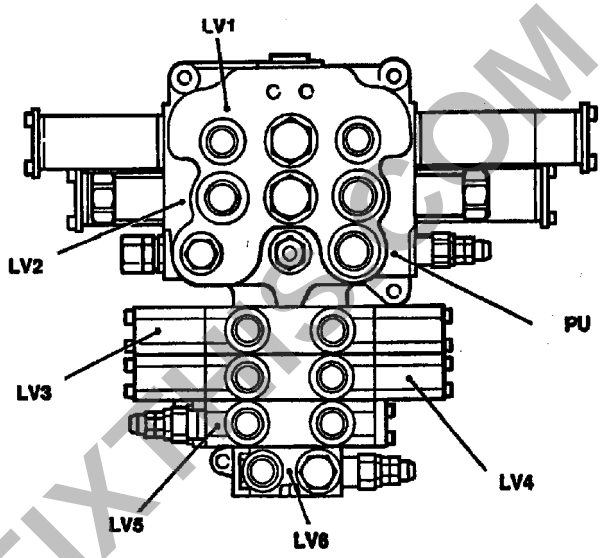


Fig 26.

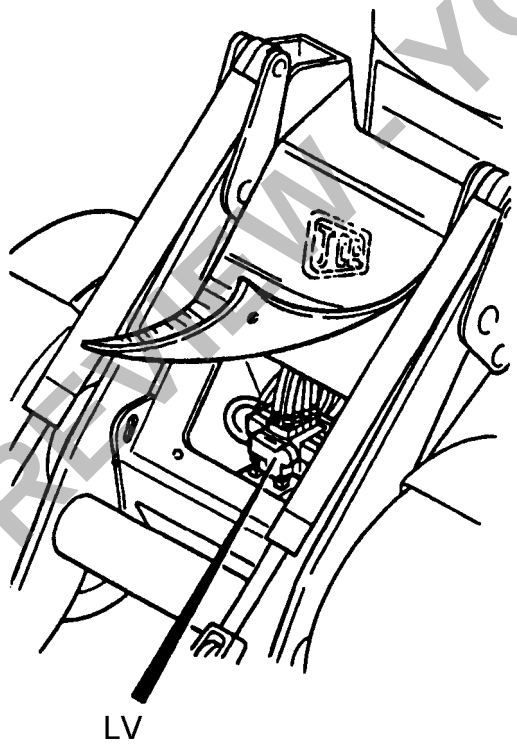


Fig 25.

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e The driveshaft-splines are worn or damaged.

f The gear cut-in area in the low pressure side of the pump body is deeper than 0.15 mm (0.006 in) or has a torn or pitted appearance.

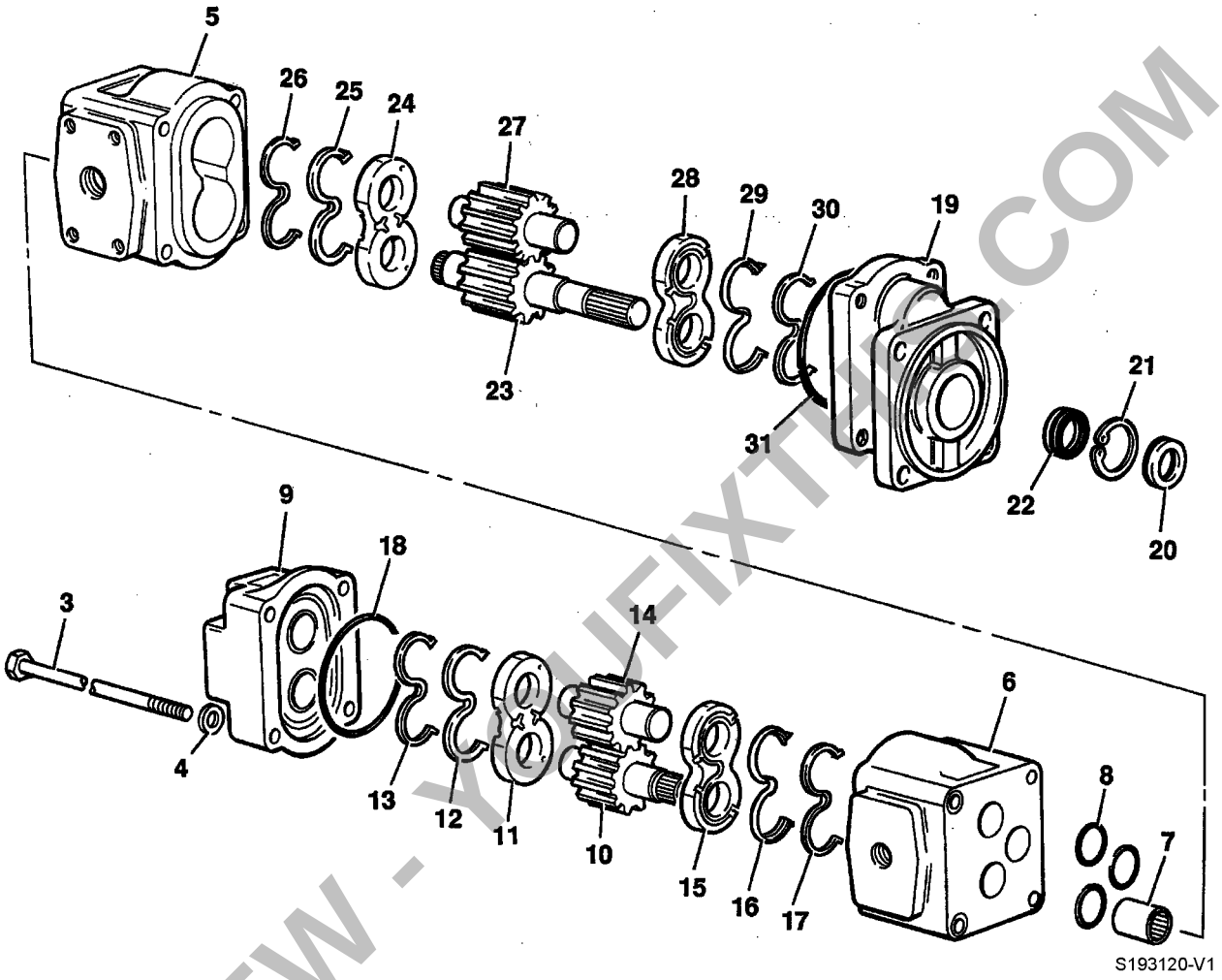


Fig 81.

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Section F

Transmission

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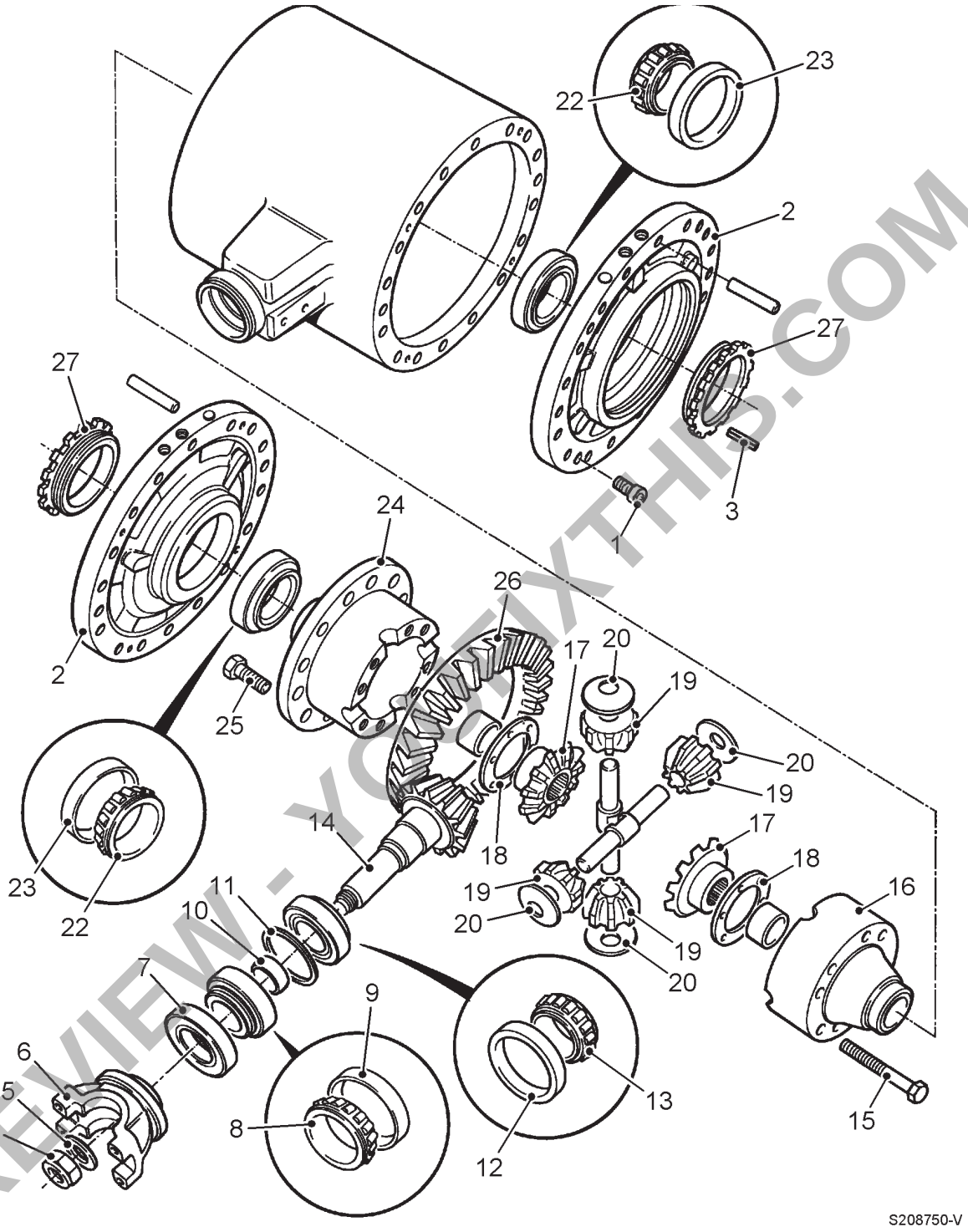


Fig 209.

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General Information

412S and 414S

Introduction

The transmission system is controlled by an on-board computer which measures transmission output speed and monitors the driver's actions.

Besides making basic decisions on gear shifting, the computer monitors driver commands via accelerator, gear and direction of travel controls and the kick-down selector. These inputs enable the computer to override and smoothly control any judgements made by the driver which could have potentially hazardous consequences for the driver or machine.

Because the computer is 'aware' of all the transmission functions it is an ideal tool for fault diagnosis on the transmission system.

The following equipment is needed for testing the transmission.

1 A computer test harness (892/00865)

2 A test indicator box PR78 A (892/00866)

3 A test interrogator box PR78 B (892/00867)

4 A Fluke 85 digital multimeter

5 A frequency meter.

The transmission computer is located near the fuse box in the cab. It is accessed as follows:

1 Turn starter switch off and remove the key.

2 Remove the coffee cup tray **A**.

3 Remove screw **B** securing the fuse box cover.

4 Remove 35-way connector **C** from computer and connect to test box. Connect 35-way female connector from test box to computer.

5 Connect PR78A (test indicator box) to 25-way female connector.

6 Connect PR78B (test indicator box) to remaining 25-way female connector.

The PR78A light indicator unit detects the various inputs and outputs to and from the machine's computer and illuminates lights which correspond to the selections the driver has made. In this way the probable fault area of a defective transmission unit can be immediately identified.

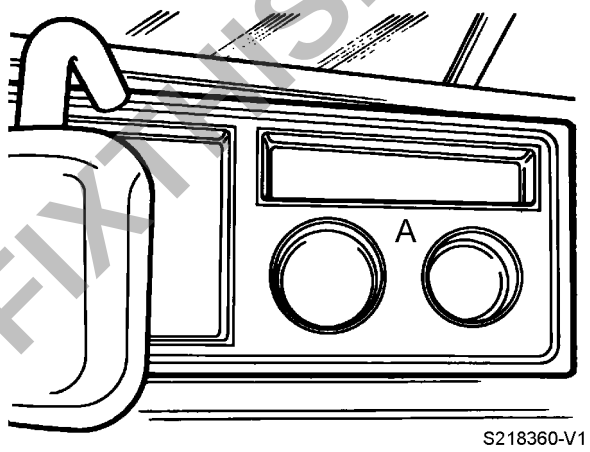


Fig 231.

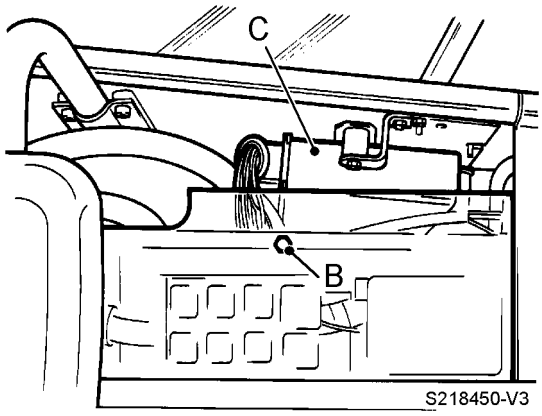


Fig 232.

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Section G

Brakes

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Section H

Hydraulic Steering

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Section K

Engine

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Changing the Oil

1 Make the machine safe with the loader arm lowere. Refer to ***Prepare the Machine for Maintenance***.

2 Clean the area around the fill/level plug **A**.

3 Remove the fill/level plug **A** and its seal.

4 Put a suitable container below the drain plug **B** (to catch the oil).

5 Remove the drain plug **B** and let the oil drain fully into the container.

⚠ CAUTION

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

2-3-4-2

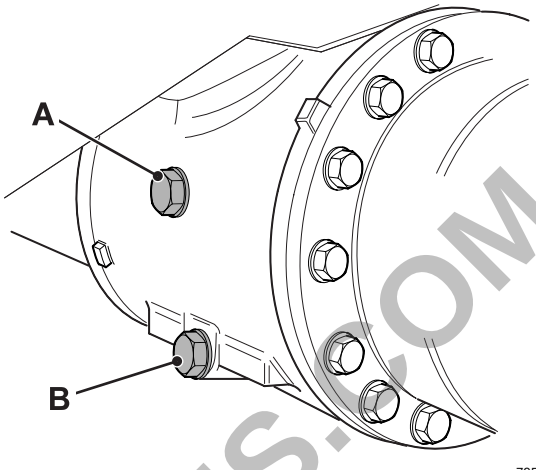
6 Clean then install the drain plug **B** and its seal. The drain plug **B** is magnetic, make sure all unwanted material is removed.

7 Tighten the drain plug **B** to 85 Nm (60 lbf ft).

8 Fill the axle with the recommended oil through fill/level plug **A**.

9 Clean then install the fill/level plug **A** and its seal.

10 Tighten the fill/level plug **A** to 85 Nm (60 lbf ft).



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Fig 67.

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readily visible. They are secured using the corresponding size and matching colour-coded jaws of the crimp tool to ensure joint security. This tool also incorporates a ratchet closing mechanism which will not release until the splice is fully closed to the correct compression size.

3 With the Butane heater assembly, seal the connection. ⇨ *Fig 44. (C-44)*.

a Remove the cap **45-A** from the end of the disposable gas cartridge **45-B**.

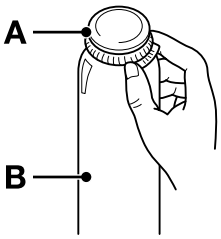


Fig 44.

b Before assembling the gas cartridge to the reflector element **46-C**, turn the red ring **46-D** to the left, (in the direction of the minus sign marked on the ring).

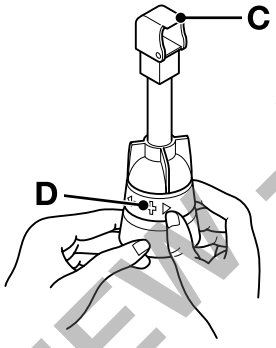


Fig 45.

c Position the tube hanging down from inside the reflector assembly into the hole at the top of the gas cartridge. Then press the gas cartridge up into the reflector assembly as far as possible until the two elements are clasped firmly together. ⇨ *Fig 46. (C-44)*. A click will be heard.

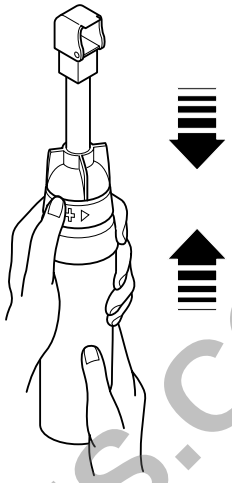


Fig 46.

d Turn the small ring **47-E** so that the air holes at **47-F** are completely closed.

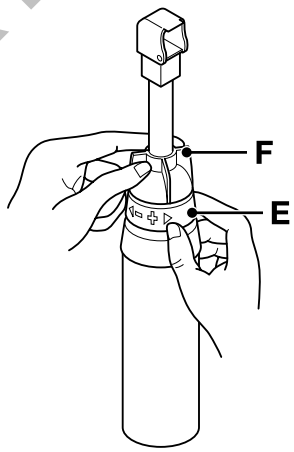


Fig 47.

e Turn the red ring **48-D** to the right (in the direction of the plus sign) in order to turn on the gas.

Important: *Before turning the heater on, make sure that the cartridge is not hotter than the reflector element. This may occur if the cartridge is held in the hand for a long time. The temperature difference between the cartridge and the reflector element may cause long yellow flames to appear on ignition.*

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Cab Roof Interior Harness - CAD 333/R4749
Issue 1

⇒ *Fig 147.* (C-201) and ⇒ *Fig 148.* (C-202).

Connect a one metre aeial lead 717/04900 in the position shown:

- A 10mm length at the female end **A**
- An excess length of approxamately 190mm at the male end **B**.

Key to Connectors:

RA	Side Console Harness 1
RB	Side Console Harness 2
RC	Front Work Light Switch
RD	Rear Work Light Switch
RE	Beacon Switch
RU	Radio Power 24v
RY	Heated Mirror Switch
TB	Heated Seat Switch
TD	Radio Power 12v
TE2	Interior Light 1
TE3	Interior Light 2
TF	Side Console Harness 3
TG	Front Roof Ext. Harness
TH	Rear Roof Harness
TJ	Roadlight Switch
TK	Dump Switch
TL	Fog Light Switch
TM	Rear Wash/Wipe Switch
TN	Auto/Manual Switch
TS	Heated Rear Screen
HB	Quickhitch Release Switch
S17	Heats Seat/Mirror Switch Feed
S25	Illumination Splice
S30	Earth Splice
S37	Earth Splice
S86	Feed Splice

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Technical Data

412S, 414S and 416S

412S Drive Axle - Front and Rear

Type	JCB Epicyclic (PD70), standard or limited slip differential
Crownwheel and pinion ratio	3.36:1
Hub ratio	5.4:1
Overall axle ratio	18.16:1

Tyre Sizes and Pressures		
Front		
15.5/80 - 24	10 ply	2.25 bar (32 lbf/in²)
17.5 LR24	-	2.5 bar (36 lbf/in²)
19.5 LR24	-	2.0 bar (29 lbf/in²)
Rear		
15.5/80 - 24	10 ply	1.75 bar (25 lbf/in²)
17.5 LR24	-	1.75 bar (25 lbf/in²)
19.5 LR24	-	1.75 bar (25 lbf/in²)

414S and 416S Drive Axle - Front and Rear

Type	JCB Epicyclic (PD90), standard or limited slip differential
Crownwheel and pinion ratio	3.909:1
Hub ratio	5.167:1
Overall axle ratio	20.197:1

Tyre Sizes and Pressures		
Front		
17.5 LR24	-	1.8 bar (26 lbf/in²)
19.5 LR24	-	1.4 bar (20 lbf/in²)
Rear		
17.5 LR24	-	1.5 bar (22 lbf/in²)
19.5 LR24	-	1.2 bar (17 lbf/in²)

Important: *Before you try to tow the machine, refer to* ⇨ *Towing Procedure (F-5)*.

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Axle Hub and Driveshaft - Assembly

PD 90

1 Lightly oil the inner wheel bearing. Assemble the inner and outer bearing cups **16** and **17**, and the inner bearing cone **18** into the bearing housing **7**.

2 Fit a new seal **20** into the bearing housing. Do not disassemble the seal or use excessive force when fitting.

Note: *Make sure that the seal enters squarely, drive the seal into the bearing housing until the locating lip is flush as shown. Use a suitable flat plate to ensure the seal is driven in squarely.*

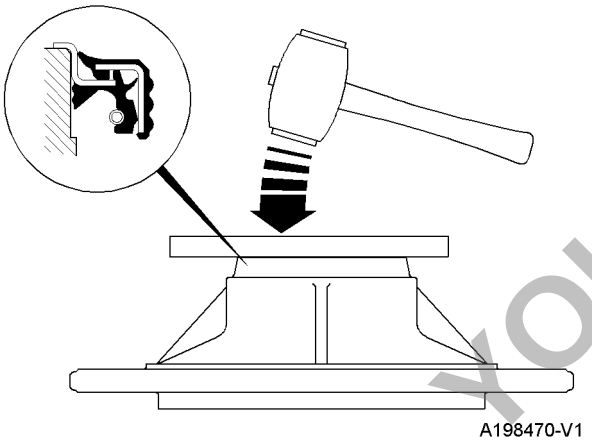


Fig 226.

3 Suitably support bearing housing **7**. Fit the bearing housing onto the hub coupling **27**.

4 Lightly oil the outer wheel bearing race **15**. Fit onto annulus carrier **14**.

5 Assemble the annulus ring **10** on the annulus carrier **14**. Secure with circlip **9**.

6 Fit annulus assembly (items **15**, **14**, **10** and **9**) onto hub coupling **27**. Secure with nut **13**.

Note: *Rotate bearing carrier backwards and forwards while carrying out torque tightening sequence.*

7 Gradually tighten nut to the lower limit of tightening torque (70 da Nm to 100 da Nm (516.3 lbf ft to 737.5 lbf ft). Fit locking plates **12**. If locking plates will not fit, further tighten nut.

DO NOT EXCEED UPPER TORQUE LIMIT

8 Fit lock plates **12** and secure with circlip **11**.

9 Fit new O ring **8**.

10 Position the three side gears **25** and inner thrust washers **26** into the side gear carrier **6**.

11 Position thrust washer **22** onto pin **21**. Smear the lower half (head end) of pin with grease and position first row of needle rollers **23**, fit spacer **24**, smear upper portion of pin with grease and position second row of needle rollers.

12 Align side gear **25** and thrust washer **26**. Fit pin as assembled in step 11. Take great care not to dislodge any of the needle rollers.

13 Repeat steps 11 and 12 for other two pins.

Note: *Make sure that the machined profile on the pin heads is aligned with the side gear carrier machining.*

14 Suitably support side gear carrier **6** and refit to bearing carrier **7**, secure with screws **5**. Torque tighten to 66 Nm to 74 Nm (48.7 lbf ft to 54.6 lbf ft).

15 Insert drive shaft.

16 Force fit driveshaft thrust pad **4** into cover plate **2**. Lubricate O ring **3** with clean oil. Fit O ring to cover plate.

17 Fit cover plate into side gear carrier.

18 Apply JCB Threadlocker and Sealer to screws **1**. Fit screws and torque tighten to 33 Nm to 37 Nm (24.3 lbf ft to 27.3 lbf ft).

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