Service Manual

JS360 Tier III Auto

Service Manual - JS360 Tier III Auto

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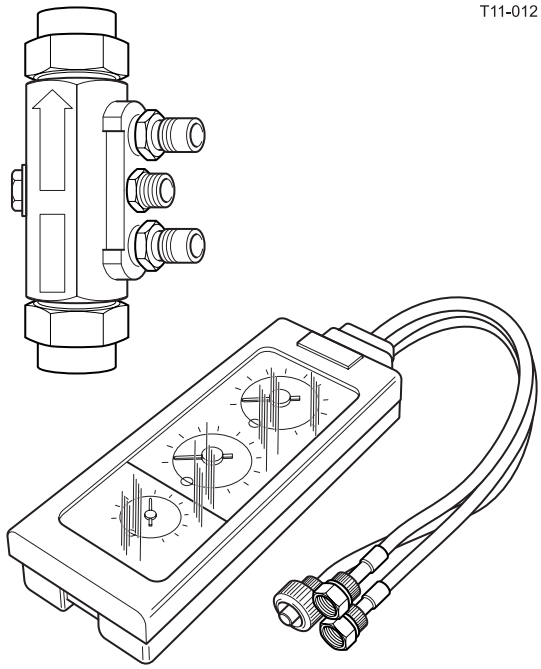
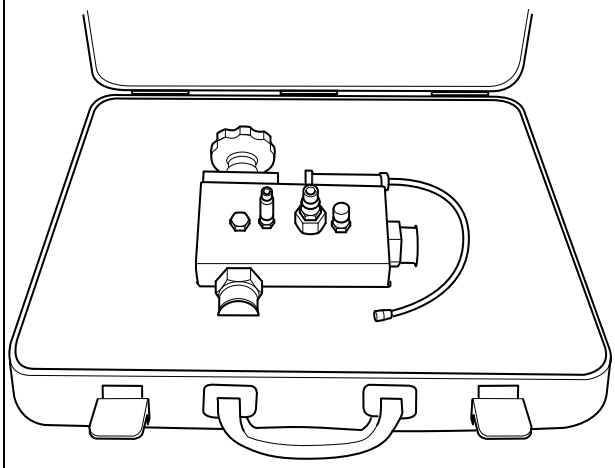
Numerical List

Part Number	Description	See Section
-	Female Blanking Caps - see ***Tool Detail Reference (Section 1)***	**E**
-	Male Cone Blanking Caps - see ***Tool Detail Reference (Section 1)***	**E**
-	Female Connectors - see ***Tool Detail Reference (Section 1)***	**E**
-	Bonded Washers - see ***Tool Detail Reference (Section 1)***	**E**
-	Ram Protection Sleeves - see ***Tool Detail Reference (Section 1)***	**E**
892/00334	Ram Seal Fitting Tool	**E**
	Hexagon Spanners - see ***Tool Detail Reference (Section 1)***	**E**
892/01027	Piston Seal Assembly Tool	**E**
-	Hydraulic Flow Test Equipment - see ***Tool Detail Reference (Section 1)***	**E**
-	Hydraulic Circuit Pressure Test Kit - see ***Tool Detail Reference (Section 1)*** for content	**E**
-	Hydraulic Hand Pump Equipment - see ***Tool Detail Reference (Section 1)***	**E**
992/10100	Spool Clamp	**E**
892/00039	Spool Clamp	**E**
992/02800	ARV Extractor	**E**
331/31069	Test Block for A.R.V.	**E**
892/00891	Valve Spool Seal Fitting Tool	**E**
892/00346	Gauge	**E**
892/00279	Gauge	**E**
892/00280	Gauge	**E**
892/00347	Connector	**E**
892/00254	Hose	**E**
-	Ram Jigs - see ***Tool Detail Reference (Section 1)***	**E**
-	Ram Piston Nut Spanners - see ***Tool Detail Reference (Section 1)***	**E**
-	Socket Box Wrench	**E**
-	Nut Adapter	**E**
-	Seal Ring Tool	**E**
-	Stopper	**E**
-	Bearing Rig	**E**
-	Inserting Seal Ring and Correction Jig - see ***Tool Detail Reference (Section 1)***	**E**
-	Jig for Pulling Out, Press-fitting Bushing - see ***Tool Detail Reference (Section 1)***	**E**
-	Jig for Press-fitting Wiper Ring - see ***Tool Detail Reference (Section 1)***	**E**
-	Jig for Inserting Cylinder Head - see ***Tool Detail Reference (Section 1)***	**E**
-	Seal Ring and Connector Jig - see ***Tool Detail Reference (Section 1)***	**E**
-	Bush Removal Jig - see ***Tool Detail Reference (Section 1)***	**E**
-	Bush Fitting Jig - see ***Tool Detail Reference (Section 1)***	**E**
-	Wiper Ring Fitting Jig - see ***Tool Detail Reference (Section 1)***	**E**
-	Wiper Ring Fitting Jig - see ***Tool Detail Reference (Section 1)***	**E**

Note: *No longer available, refer to 998/11046 JCB ServiceMaster Flow Test Kit.* ⇨ *Fig 33. (1-26).*	892/00268	Flow Monitoring Unit
 **Fig 32. Flow Test Equipment**	892/00269	Sensor Head 0 - 100 l/min (0 - 22 UK gal/min)
	892/00273	Sensor Head 0 - 380 l/min (0 - 85.5 UK gal/min)
	892/00293	Connector Pipe
	892/00270	Load Valve
	1406/0021	Bonded Washer
	1604/0006A	Adapter 3/4 in M x 3/4 in M BSP
	1612/2054	Adapter 3/4 in F x 3/4 in M BSP
	892/00271	Adapter 3/4 in F x 5/8 in M BSP
	892/00272	Adapter 5/8 in F x 3/4 in M BSP
	816/20008	Adapter 3/4 in F x 1/2 in M BSP
	892/00275	Adapter 1/2 in F x 3/4 in M BSP
	892/00276	Adapter 3/4 in F x 3/8 in M BSP
	892/00277	Adapter 3/8 in F x 3/4 in M BSP
	1606/0015	Adapter 1.1/4 in M BSP x 1 in M BSP
	892/00078	Connector 1 in F x 1 in F BSP
	1604/0008	Adapter 1 in M x 1 in M BSP
	1606/0012	Adapter 1 in M x 3/4 in M BSP
	816/20013	Adapter 3/4 in F x 1 in M BSP

 **Fig 33. 998/11046 JCB ServiceMaster Flow Test Kit**	998/11047	600 LPM Flow Turbine with Loading Valve
	998/11048	1-7/8" UNF x1 - 1/4" BSP Flow Block Adaptors x2
	998/11049	Carrying Case for Flow Test Kit
	998/11050	Temperature Sensor (125°C Max)

WDB 2166-1	Retainer
Note: *The above Part no. is applicable to a rod diameter of 80mm*	

Bush Fitting Jig

WDB 2166	Bush press fitting jig
WDB 2166-1	Retainer
Note: *The above Part no. is applicable to a rod diameter of 80mm*	

Wiper Ring Fitting Jig

WDB 2166-1	Wiper Ring fitting
Note: *The above Part no. is applicable to a rod diameter of 80mm*	

Wiper Ring Fitting Jig

WDB 2174	Cylinder Head insertion guide jig
Note: *The above Part no. is applicable to a rod diameter of 80mm*	

Contents **Page No.**

WARNING

To avoid burning, wear protective gloves when handling hot components. To protect your eyes, wear goggles when using a brush to clean components.

HYD-1-3_2

WARNING

Arc Welding

To prevent the possibility of damage to electronic components, disconnect the battery and the alternator before arc-welding on the machine or attached implements.

If the machine is equipped with sensitive electrical equipment, i.e. amplifier drivers, electronic control units (E.C.U.s), monitor displays, etc., then disconnect them before welding. Failure to disconnect the sensitive electrical equipment could result in irreparable damage to these components.

Parts of the machine are made from cast iron; welds on cast iron can weaken the structure and break. Do not weld cast iron. Do not connect the welder cable or apply any weld to any part of the engine.

Always connect the welder earth (ground) cable to the same component that is being welded, i.e. boom or dipper, to avoid damage to pivot pins, bearings and bushes. Attach the welder earth (ground) cable no more than 0.6 metres (2 feet) from the part being welded.

INT-3-1-15_2

WARNING

Counterweights

Your machine may be fitted with counterweights. They are extremely heavy. Do not attempt to remove them.

INT-3-2-5

WARNING

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

0147_1

WARNING

Accumulators

The accumulators contain hydraulic fluid and gas at high pressure. Prior to any work being carried out on systems incorporating accumulators, the system pressure must be exhausted by a JCB distributor, as the sudden release of the hydraulic fluid or gas may cause injury.

INT-3-1-17

WARNING

Petrol

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

INT-3-1-6

CAUTION

Do not disconnect the battery while the engine is running, otherwise the electrical circuits may be damaged.

INT-3-1-14

WARNING

If you try to charge a frozen battery, or jump start and run the engine, the battery could explode. Do not use a battery if its electrolyte is frozen. To prevent the battery electrolyte from freezing, keep the battery at full charge.

0125

WARNING

Battery Gases

Batteries give off explosive gases. Keep flames and sparks away from the battery. Do not smoke close to the battery. Make sure there is good ventilation in closed areas where batteries are being used or charged. Do not check the battery charge by shorting the terminals with metal; use a hydrometer or voltmeter.

INT-3-1-8

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Service Schedules

	Operation	10	50	250	500	1000	2000	4000	5000
ELECTRICS									
Battery Electrolyte Level - Low Maintenance Batteries	- Check			☐	☐	☐	☐	☐	☐
Battery Breather Caps - Low Maintenance Batteries	- Check/Clean			☐	☐	☐	☐	☐	☐
Battery Sight Glass Inspection - Maintenance Free Batteries	- Check		☐	☐	☐	☐	☐	☐	☐
Wiring for Chaffing/Routing	- Check		☐	☐	☐	☐	☐	☐	☐
Battery Terminals for Condition and Tightness	- Check			☐	☐	☐	☐	☐	☐
UNDERCARRIAGE									
Track Rollers	- Check	☐	☐	☐	☐	☐	☐	☐	☐
Idler Wheels	- Check		☐	☐	☐	☐	☐	☐	☐
Track Plate Condition and Bolt Torque	- Check			☐	☐	☐	☐	☐	☐
Track Tension	- Check	☐	☐	☐	☐	☐	☐	☐	☐
Track Wear	- Check			☐	☐	☐	☐	☐	☐
BODYWORK AND CAB									
All Pins and Bushes (except Boom Base and Boom Dipper)	- Grease		☐	☐	☐	☐	☐	☐	☐
Condition of all Pins and Bushes	- Check	☐	☐	☐	☐	☐	☐	☐	☐
Boom/Bucket/Dipper Pivot Pins (if used in very wet or severe conditions, except Boom Base and Boom Dipper)	- Check and Grease	☐							
Boom Base and Boom Dipper Pivot Pins	- Grease					☐	☐	☐	☐
Bucket Pivot Pins Grease Seals	- Check			☐	☐	☐	☐	☐	☐
Slew Ring Bearing	- Grease		☐	☐	☐	☐	☐	☐	☐
Slew Ring Teeth	- Grease				☐	☐	☐	☐	☐
Door/Window Hinges	- Lubricate			☐	☐	☐	☐	☐	☐
Cab Heater/Air Con Filter	- Clean/Change				☐	☐	☐	☐	☐
Front Window Washer Fluid Level	- Check	☐	☐	☐	☐	☐	☐	☐	☐
Condition of Paintwork	- Check			☐	☐	☐	☐	☐	☐
Machine Generally	- Check and Clean	☐	☐	☐	☐	☐	☐	☐	☐
ATTACHMENTS									
Engine Speed in Breaker Mode-Compatible with fitted Breaker.	- Check				☐	☐	☐	☐	☐
Quick Hitch	- Grease	☐	☐	☐	☐	☐	☐	☐	☐

JS290 and Variants

Table 9.

Item	Capacity	Fluid/Lubricant	JCB Part No.	Container Size(1)
ENGINE	38 litres (8.4 UK gal) (10.1 US gal)	JCB Engine Oil HP 15W40 -15°C to +40°C (5°F to 104°F)	4001/1505	20 Litres
		JCB Engine Oil HP 10W30 -30°C to +30°C (-22°F to 86°F)	4001/1705	20 Litres
COOLING SYSTEM	38 litres (8.4 UK gal) (10.0 US gal)	JCB HP Coolant ⇒ *Coolant Mixtures (3-25)*	4006/1120	20 Litres
TRACK GEARBOX	2 x 3.5 litres (2 x 0.76 UK gal) (2 x 0.92 US gal)	JCB HD90 Gear Oil	4000/0301	5 Litres
SLEW GEARBOX	16 litres (3.5 UK gal) (4.2 US gal)		4000/0305	20 Litres
TRACK ROLLERS AND IDLER WHEEL				
RECOIL SPRING CYLINDER		JCB Special HP Grease	4003/2017	400g
HYDRAULIC SYSTEM	305 litres (67.1 UK gal) (80.6 US gal)	JCB Hydraulic Fluid HP32 -20°C to +15°C (-4°F to 59°F)	4002/1024	200 Litres
		JCB Hydraulic Fluid HP46 -10°C to +30°C (14°F to 86°F)	4002/0803	
		JCB Hydraulic Fluid HP68 0°C to +40°C (32°F to 104°F)	4002/0701	
SLEW RING		JCB Special HP Grease	4003/2017	400g
- BEARING	--			
- GEAR TEETH	--		4003/2006	12.5kg
ALL OTHER GREASE POINTS	--			
FUEL TANK	650 litres (143.0 UK gal) (171.7 US gal)	⇒ *Fuel System (3-74)*		

(1) For information about the different container sizes that are available (and their part numbers), contact your JCB Dealer.

Cleaning the Machine

Introduction

T3-062_2

Clean the machine using water and or steam. Do not allow mud, debris etc. to build upon the machine.

Before carrying out any service procedures that require components to be removed:

1 Cleaning must be carried out either in the area of components to be removed or, in the case of major work, or work on the fuel system, the whole engine and surrounding machine must be cleaned.

2 When cleaning is complete move the machine away from the wash area, or alternatively, clean away the material washed from the machine.

Important: *When removing components be aware of any dirt or debris that may be exposed. Cover any open ports and clean away the deposits before proceeding.*

Detergents

Avoid using full strength detergent - always dilute detergents as per the manufacturer's recommendations, otherwise damage to the paint finish may occur.

Always adhere to local regulations regarding the disposal of debris created from machine cleaning.

Pressure Washing and Steam Cleaning

⚠ WARNING

When using a steam cleaner, wear safety glasses or a face shield as well as protective clothing. Steam can cause serious personal injury.

13-3-2-10_2

⚠ CAUTION

The engine or certain components could be damaged by high pressure washing systems; special precautions must be taken if the engine is to be washed using a high pressure system.

Ensure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system.

ENG-3-3

Important: *Do not aim the water jet directly at bearings, oil seals or electrical and electronic components such as the engine electronic control unit (ECU), alternator or fuel injectors.*

Use a low pressure water jet and brush to soak off caked mud or dirt.

Use a pressure washer to remove soft dirt and oil.

Note: *The machine must always be greased after pressure washing or steam cleaning.*

Preparing the Machine for Cleaning

P11-3004

1 Make the machine safe with the excavator lowered. Refer to ***Prepare the Machine for Maintenance***.

Important: *Stop the engine and allow it to cool for at least one hour. Do not attempt to clean any part of the engine while it is running.*

2 Make sure that all electrical connectors are correctly coupled. If connectors are open fit the correct caps or seal with water proof tape.

Battery Disconnection/Connection

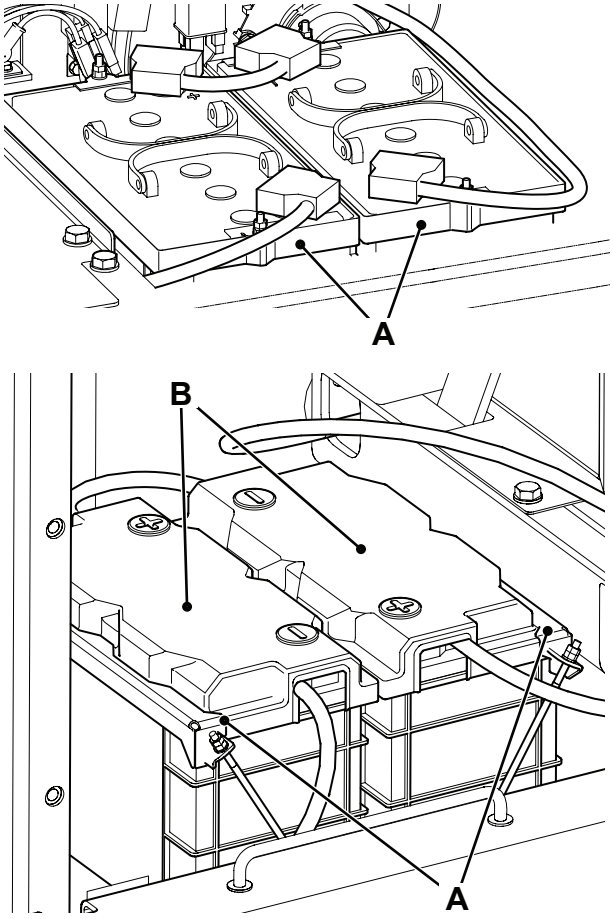
1 Prepare the machine. ⇨ *Prepare the Machine for Maintenance (3-29)*.

2 Gain access to the batteries. Remove the battery cover plate (if fitted).

3 Disconnect the battery terminals. Disconnect the earth terminal first. For connection, connect the earth terminal last.

Note: *It may be necessary to remove the battery retaining plates* ***A*** *and battery covers* ***B*** *first.*

4 If removing the batteries, remove the nuts securing the battery retaining plates **A**, remove the battery covers **B** (if fitted) and then remove the batteries.



T006771-1

Fig 15.

5 Replacement is a direct reversal of the removal procedure.

When replacing the batteries do not mix old and new batteries together, they must be replaced as a pair, otherwise the service life of the new battery will be shortened.

Table 20. JS200-260 and variants

No.	Tightening Point	Bolt Diameter	Wrench mm	Tightening Torque		Checking Torque	
				Nm	lbf ft	Nm	lbf ft
1(1)	Travel Motor	M16	24	290	213	265	195
2(1)	Drive Sprocket	M16	24	290	213	265	195
3(1)	Idler Wheel	M16	24	290	213	265	195
4(1)	Upper (Carrier) Roller	M16/M20	24/30	290/550	213/405	265/515	195/380
5(1)	Lower (Track) Roller	M16	24	290	213	265	195
6(1)	Track Guard	M16	24	290	213	265	195
7	Shoe Bolt	M20	30	840-890	620-656	756-801	558-591
8a	Counter weight upto 220	M30	46	1147	845	1050	780
8b	Counter weight above 220	M30	46	1442	1063	1335	980
9(1)	Turntable Bearing (Undercarriage)	M20	30	525	387	470	347
10(1)	Turntable Bearing (Slew Frame)	M20	30	525	387	470	347
11(1)	Slew Equipment	M20/M24	30/36	550/950	405/700	515/900	370/663
12(1)	Engine (Engine Mount)	M16	24	290	213	265	195
13(1)	Engine Bracket	M10/M12	17/19	68/118	50/87	62/107	45/79
14	Radiator	M12	19	65	48	60	44
15(1)	Hydraulic Pump	M10	17	68	50	62	45
16(1)	Hydraulic Oil Tank	M16	24	250	184	225	162
17(1)	Fuel Tank	M16	24	250	184	225	162
18(1)	Control Valve	M16	24	290	213	265	195
19	Battery	M6	10	7	5	6	4
20(1)	Rotary Coupling	M12	19	116	85	105	80
21	Cab	M16	24	132	97	125	92

(1) Use JCB Threadlocker and sealer (High Strength) and tighten to the torque listed.

10 Operate the machine until the coolant temperature reaches 90°C leaving the cab heater and fan at maximum.

Coolant temperature can be checked as follows:

a Simultaneously press the SET and MODE buttons on the EMS.

b Press the UP or DOWN arrow until 'WATER TEMP' is displayed on the EMS.

c Press the ACK button on the EMS.

The coolant temperature is displayed in °C.

11 Switch the engine OFF.

12 Remove the ignition key.

13 Let the engine cool down.

⚠ WARNING

The cooling system is pressurised when the coolant is hot. When you remove the cap, hot coolant can spray out and burn you. Make sure that the engine is cool before you work on the cooling system.

9-3-3-1_2

14 Re-check the levels in the radiator and expansion bottle. Top up if necessary.

e Fill the expansion bottle until the level in the bottle is at the FULL mark.

8 Refit the radiator cap and the expansion bottle cap. Make sure they are tight.

9 Start the engine.

10 Turn the slew lock ON.

11 Operate the machine until the coolant temperature reaches 90°C leaving the cab heater and fan at maximum.

a Simultaneously press the SET and MODE buttons on the EMS.

b Press the UP or DOWN arrow until 'WATER TEMP' is displayed on the EMS.

c Press the ACK button on the EMS.

The coolant temperature is displayed in °C.

12 Switch the engine OFF.

13 Remove the ignition key.

14 Let the engine cool down.

15 Check for leaks.

⚠ WARNING

The cooling system is pressurised when the coolant is hot. When you remove the cap, hot coolant can spray out and burn you. Make sure that the engine is cool before you work on the cooling system.

9-3-3-1_2

16 Re-check the level in the radiator and expansion bottle. Top up if necessary.

The coolant level must be to the top of the expansion bottle and radiator.

Note: *Manipulate the top radiator hose to help bleed any remaining air in the system.*

Hydraulic System

Introduction

⚠ WARNING

The temperature of the hydraulic oil will be high soon after stopping the engine. Wait until it cools (less than 40°C) before beginning maintenance.

8-3-4-10

⚠ 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

⚠ CAUTION

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

2-3-5-1_2

⚠ CAUTION

Do not allow dirt to enter the system. Before disconnecting any part of the system, thoroughly clean around the connection. When a component has been disconnected, always fit protective caps and plugs to prevent dirt ingress.

Failure to follow these instructions will lead to dirt entering the system. Dirt in the system will seriously damage the systems components and could be expensive to repair.

INT-3-3-12

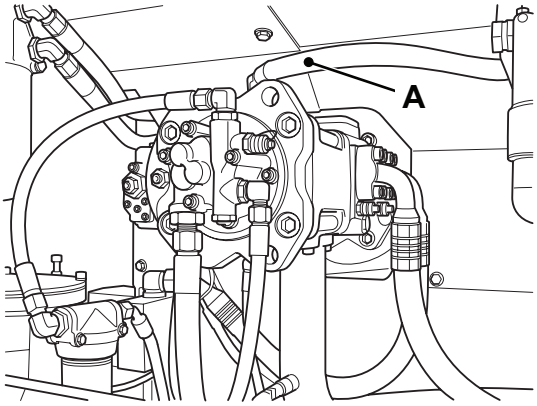


Fig 68. JS200-290

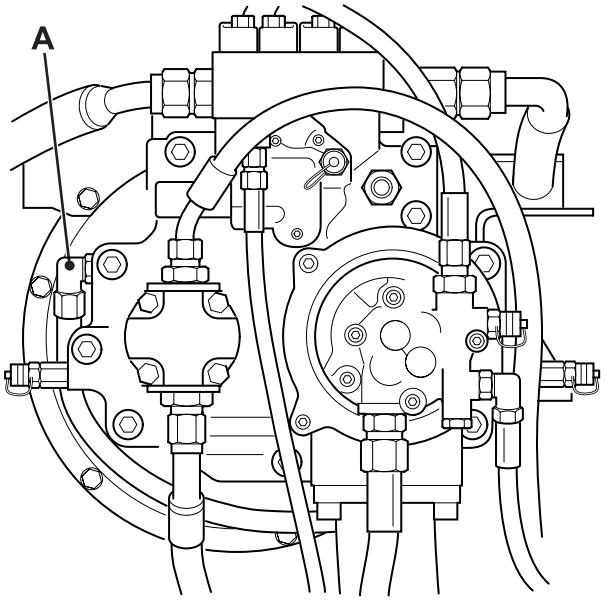


Fig 69. JS330, JS360 Similar

Air Bleeding from Rams

If air is not bled from the rams when replaced or repaired, the piston and/or seals may be damaged.

1 Prepare the machine. Idle the engine at low speed and extend and retract each ram 5 times, stopping the ram 100 mm before the end of each stroke.

2 Bleeding. Operate each ram 4 times for the full stroke to completely bleed the air.

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Heater/Air Conditioning Controls (ATC)

The heater/air conditioning can be set for automatic temperature control (ATC).

Located on the right console, the heater system is controlled by the following switches:

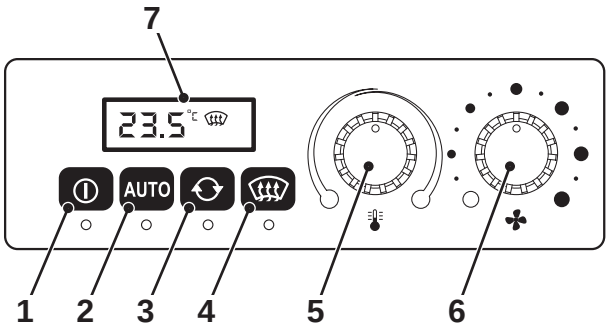


Fig 3.

1 On/Off switch.

2 Auto mode switch.

3 Re-circulation switch.

4 Defrost/Demist switch.

5 Temperature control switch.

6 Fan speed switch.

7 Display.

Heater Controls

Hot air can be directed to the front window (for demisting) and/or the cab floor by adjusting the air vents.

To activate controls press switch **1**, the switch LED and panel **7** will illuminate.

Auto Mode

The heater can be set to a selected temperature. The fan speed and temperature control will then be automatically controlled to maintain the set temperature.

1 Auto mode is activated by switch **2**, the LED will illuminate and an `**A**' will appear on the display **7**.

2 Rotate control **5** to set the desired temperature.

3 The set temperature will be displayed on panel **7**.

4 The fan speed will be automatically set to reach and then maintain the set temperature.

Note: *If control **6** is moved, Auto mode will have to be reset. Press switch **2** to reactivate.*

5 In hot weather or dusty environments, re-circulation mode should be used. Select switch **3**.

Defrost/Demist Mode

To activate press switch **4**, the LED will illuminate and switch symbol will be displayed on **7**.

1 In hot weather to produce comfortable working conditions.

- **a** Close the door and windows.
- **b** Select re-circulation switch **3**.
- **c** Rotate control **6** clockwise and direct air into the body of the cab.
- **d** Rotate control **5** fully counter-clockwise for maximum defrost. If the in cab temperature drops to low turn control clockwise.

2 In cold/damp weather, to minimise misting.

- **a** Close the door and windows.
- **b** Select re-circulation switch **3**.
- **c** Set control **6** fully clockwise and direct air onto the front window.
- **d** Set control **5** fully clockwise to heat the de-humidified conditioned air, de-mist the screen and generally de-humidify the cab air.

						From				To			
Wire No	Size mm²	Colour	Type	Ident	Length mm	Connector	Cavity	Terminal	Seal	Connector	Cavity	Terminal	Seal
1	0.75	GN/WH	W	210	1330	5 ATC CONTROLLER	21	PACKARD 12084912	N	7 CAB AIR TEMP SENSOR	1	PACKARD 12047757	N
2	0.75	GN/YW	W	211	1230	5 ATC CONTROLLER	23	PACKARD 12084912	N	8 EVAP TEMP SENSOR	1	MOLEX 5558	N
3	0.75	GN/BL	W	202	720	5 ATC CONTROLLER	3	PACKARD 12084912	N	10 WATER VALVE ACTUATOR	D	PACKARD 12048074	PACKARD 12048046
4	0.75	RD/BN	W	150	475	5 ATC CONTROLLER	4	PACKARD 12084912	N	SP4	-	-	-
5	0.75	RD/YW	W	548	1190	5 ATC CONTROLLER	5	PACKARD 12084912	N	11 PWM UNIT	3	AMP 770008-3	N
6	0.75	RD/BN	W	150A	475	5 ATC CONTROLLER	12	PACKARD 12084912	N	SP4	-	-	-
7	0.75	BL/RD	W	911	970	5 ATC CONTROLLER	15	PACKARD 12084912	N	15 Comp Clutch Relay	86	AMP 5-160558-2	-
8	0.75	RD/BN	W	150B	475	5 ATC CONTROLLER	17	PACKARD 12084912	N	SP4	-	-	-
9	0.75	BK	W	30D	520	5 ATC CONTROLLER	18	PACKARD 12084912	N	SP2	-	-	-
10	0.75	YW	W	923	970	5 ATC CONTROLLER	20	PACKARD 12084912	N	2 USER INTERFACE	D10	PACKARD 12089649	N
11	0.75	OR	W	920	970	5 ATC CONTROLLER	31	PACKARD 12084912	N	2 USER INTERFACE	D7	PACKARD 12089649	N
12	0.75	BK/OR	W	918	970	5 ATC CONTROLLER	26	PACKARD 12084912	N	2 USER INTERFACE	D5	PACKARD 12089649	N
13	0.75	BK/RD	W	30E	90	5 ATC CONTROLLER	27	PACKARD 12084912	N	18A C/F CONNECTOR	1	AMP 42460-2	-
14	0.75	YW/BL	W	912	970	5 ATC CONTROLLER	28	PACKARD 12084912	N	2 USER INTERFACE	C15	PACKARD 12089649	N
15	0.75	YW/GN	W	914	970	5 ATC CONTROLLER	29	PACKARD 12084912	N	2 USER INTERFACE	D1	PACKARD 12089649	N
16	-	-	-	-	-	-	-	-	-	-	-	-	-
17	0.75	BK	W	30L	260	15 COMP CLUTCH RELAY	85	AMP 5-160558-2	N	SP2	-	-	-
18	0.75	BK/RD	W	30K	850	18B C/F CONNECTOR	1	42281-2	N	SP2	-	-	-
19	0.75	BK	W	30J	480	4 RECIRC ACTUATOR	C	PACKARD 12048074	PACKARD 12048046	SP2	-	-	-
20	0.75	BK	W	30C	850	8 EVAP TEMP SENSOR	2	MOLEX 5558	N	SP2	-	-	-
21	0.75	BK	W	30B	950	7 CAB AIR TEMP SENSOR	2	PACKARD 12047757	N	SP2	-	-	-
22	0.75	BK	W	30A	340	10 WATER VALVE ACTUATOR	C	PACKARD 12048074	PACKARD 12048046	SP2	-	-	-
23	0.75	YW/BK	W	908	990	2 USER INTERFACE	C11	PACKARD 12089649	N	SP2	-	-	-
24	0.75	BL	W	913	990	2 USER INTERFACE	C16	PACKARD 12089649	N	SP2	-	-	-
25	0.75	BK	W	30	70	1 VEHICLE HARNESS	10	DEUTSCH 1060-16-0122	N	SP2	-	-	-
26	0.75	BL/RD	W	907	945	2 USER INTERFACE	C10	PACKARD 12089649	N	SP4	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-
28	0.75	BL	W	915	730	5 ATC CONTROLLER	35	PACKARD 12084912	N	17 LOW PRESSURE SENSOR	A	PACKARD 12103881	N
30	0.75	BL/BK	W	916	490	1 VEHICLE HARNESS	1	DEUTSCH 1060-16-0122	N	SP9	-	-	-
31	0.75	BL/OR	W	909	590	1 VEHICLE HARNESS	2	DEUTSCH 1060-16-0122	N	5 ATC CONTROLLER	33	PACKARD 12084912	N
32	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-
34	1.50	BK	W	951	930	13 BLOWER MOTOR	2	AMP 5-160558-2	N	11 PWM UNIT	4	AMP 770008-3	
35	0.75	GN	W	124	945	2 USER INTERFACE	C2	PACKARD 12089649	N	SP4	-	-	-
36	0.75	BK	W	921	990	2 USER INTERFACE	D14	PACKARD 12089649	N	SP2	-	-	-
37	1.50	BK	W	30M	810	11 PWM UNIT	5	AMP 770008-3	N	SP2	-	-	-
38	1.50	RD/BL	W	946A	725	11 PWM UNIT	1	AMP 770008-3	N	SP6	-	-	-
39	0.75	RD/BN	W	160	200	10 WATER VALVE ACTUATOR	A	PACKARD 12048074	PACKARD 12048046	SP5	-	-	-
40	1.50	RD	W	950A	450	13 BLOWER MOTOR	1	AMP 5-160558-2	N	SP6	-	-	-
41	0.75	RD/BN	W	160A	380	4 RECIRC ACTUATOR	A	PACKARD 12048074	PACKARD 12048046	SP5	-	-	-
42	0.75	GN/OR	W	201	860	4 RECIRC ACTUATOR	D	PACKARD 12048074	PACKARD 12048046	5 ATC CONTROLLER	11	PACKARD 12084912	N
43	0.75	BK	W	30H	370	6 OUTLET TEMP SENSOR	2	MOLEX 5558	N	SP2	-	-	-
44	0.75	GN/BN	W	213	750	6 OUTLET TEMP SENSOR	1	MOLEX 5558	N	5 ATC CONTROLLER	22	PACKARD 12084912	N
45				-	-	-	-	-	-	-	-	-	-
46	2.00	RD/BN	W	150F	165	1 VEHICLE HARNESS	8	DEUTSCH 1060-16-0122	N	SP6	-	-	-
47	0.75	BN/OR	W	10	215	SP6	-	-	-	15 COMP CLUTCH RELAY	30	AMP 5-160558-2	N
48	0.75	OR/WH	W	952	330	1 VEHICLE HARNESS	3	DEUTSCH 1060-16-0122	N	15 COMP CLUTCH RELAY	87	AMP 5-160558-2	N
49	0.75	RD/OR	W	953	970	2 USER INTERFACE	D8	PACKARD 12084912	N	5 ATC CONTROLLER	32	PACKARD 12084912	N
50	1.5	RD	W	950	480	11 PWM UNIT	2	AMP 770008-3	N	SP6	-	-	-
51	-	-	-	-	-	-	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	-	-	-	-	-
53	0.75	RD/BN	W	160B	2010	I VEHICLE HARNESS	11	PACKARD 12084912	N	SP5	-	-	-
54	-	-	-	-	-	-	-	-	-	-	-	-	-
55	1.50	RD/BN	W	55	235	SP6	-	-	N	SP4	-	-	-
56	-	-	-	-	-	-	-	-	-	-	-	-	-
57	0.75	WH/YW	W	955	1060	2 USER INTERFACE	C1	PACKARD 12089649	N	1 VEHICLE HARNESS	12	DEUTSCH 0462-201-16141	N
58	0.75	WH/BK	W	956	970	2 USER INTERFACE	D12	PACKARD 12089649	N	5 ATC CONTROLLER	25	PACKARD 12084912	N
59	0.75	BL/WH	W	957	970	2 USER INTERFACE	D13	PACKARD 12089649	N	5 ATC CONTROLLER	16	PACKARD 12084912	N
60	-	-	-	-	-	-	-	-	-	-	-	-	-
61	0.75	BL/GN	W	910B	350	5 ATC CONTROLLER	36	PACKARD 12084912	N	SP8	-	-	-
62	0.75	BL/BK	W	910A	380	17 LOW PRESSURE SENSOR	B	PACKARD 12103881	N	SP8	-	-	-
63	0.75	BL/BK	W	910C	250	SP8	-	-	-	SP9	-	-	-
64	0.75	BL/BK	W	910D	100	5 ATC CONTROLLER	34	PACKARD 12084912	N	SP9	-	-	-

Fig 6.

T013690-2

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 20. (B-30)*.

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.*

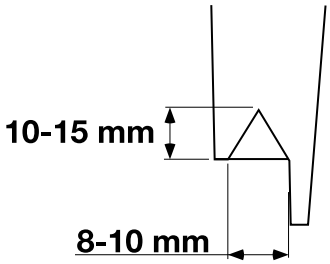


Fig 20.

6 Apply the pre-heated adhesive to the glass (do not start in a corner). Keep the nozzle guide **A** against the edge of the glass and make sure that the adhesive forms a continuous 'pyramid' shape. ⇨ *Fig 21. (B-30)*

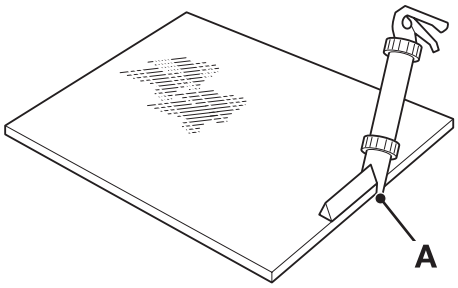


Fig 21.

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-28)* - 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 22. (B-30)*.

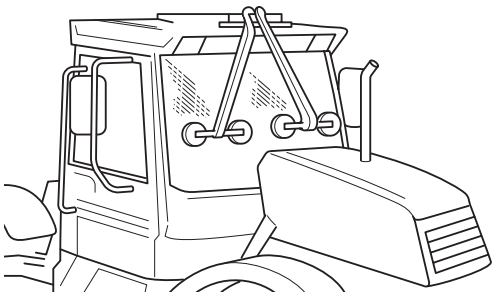


Fig 22. Typical M/c. Installation

b Sit the bottom edge of the glass on the spacer blocks. ⇨ *Fig 23. (B-31)*

Contents **Page No.**

The AMS System

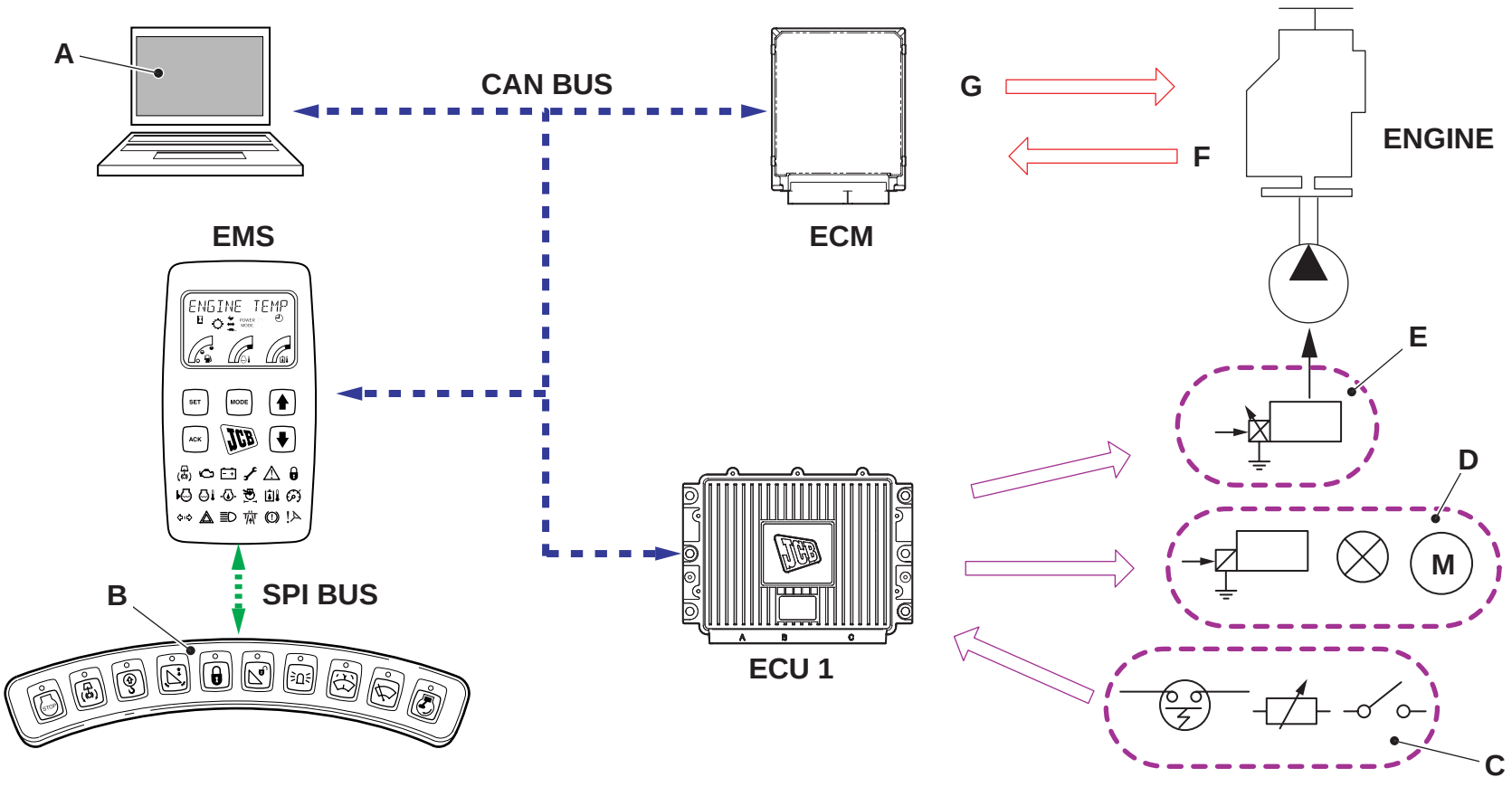


Fig 8.

key

- **A** Diagnostic port
- **B** Facia switch panel
- **C** Switches and sensors
- **D** Solenoid, lamps and motors
- **E** Pump solenoid
- **F** Inputs from switches and solenoids
- **G** Outputs to injectors and motors

Engine Throttle Control for Each Mode

Operation

The JS machine can operate in one of four different modes, depending upon the application required. The modes are selected by the "MODE" button on the EMS. The EMS displays the selected mode alongside the power mode legend. Selecting the different modes has the effect of setting the maximum possible engine speed for each working mode. Successive presses of the mode switch will cycle through the different modes in the order as shown below.

Note: *The last operating mode when the machine was stopped will be restored when the machine is restarted.*

Fig 21.

E	Economy
A	Auto
P	Precision
L	Lifting

"A" Auto Mode

In Auto mode the EMS displays "AUTO" and the letter "A" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit. The maximum rev limit is the same as the maximum permissible engine revolutions.

When in auto mode the auto idle feature is permanently active, if the throttle dial position is changed, the engine speed will not change until either the travel pressure switch (i/p 27), the upper pressure switch (i/p 26) or the auto mode pressure switch (i/p 25) are closed.

When the upper pressure switch is closed the engine speed will rise to full speed less 100 rpm (or in proportion to the throttle target input if less than 100%). When the upper pressure switch re-opens the engine speed will remain at this position for 3 seconds and then drop to 70% of the difference between auto and idle speed (plus idle speed) for the set auto idle time, after which it will drop to idle.

When the auto mode pressure switch is closed, the engine speed will rise to the full available engine speed. When the auto mode pressure switch re-opens the engine speed will drop to the full speed less 100 rpm for three seconds and then down to 70% of the difference between auto and idle speed (plus idle speed) for the set auto idle time, after which it will drop to idle.

When the travel pressure switch is closed, the engine speed will rise to the full available engine speed. When the travel pressure switch re-opens the engine speed will remain at full for three seconds, then will drop to the full speed less 100 rpm for the pre-set auto idle time, after which it will drop to idle

"E" Economy mode.

In standard mode the EMS displays "ECONOMY" and the letter "E" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit in direct proportion to the throttle input. However the maximum rev limit of 100 rpm less than the maximum permissible is imposed. Thus for a full throttle potentiometer setting the engine revolutions is 100 lower than it would be in the auto mode.

"P" Precision

In Precision mode the EMS displays "PRECISION" and the letter "P" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit in direct proportion to the throttle input. However the maximum rev limit of 200 rev/min less than the maximum permissible is imposed. Thus for a full throttle potentiometer setting the engine revolutions is 200 lower than it would be in the auto mode, the same as it is for lifting mode.

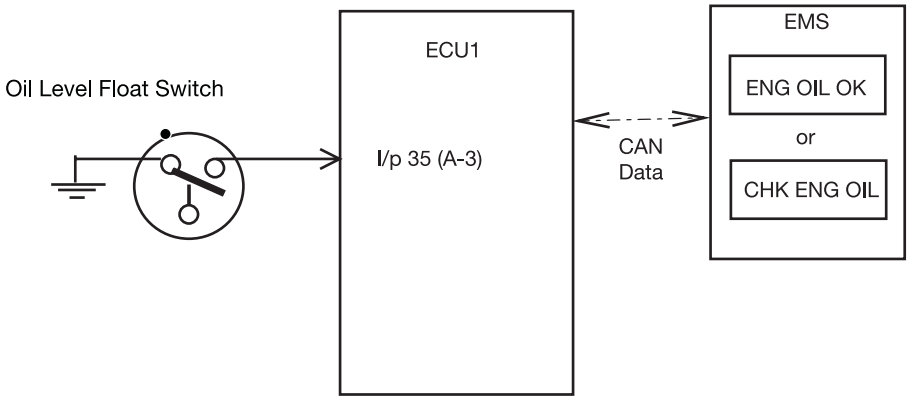
"L" Lifting mode

In Lifting mode the EMS displays "LIFTING" and the letter "L" next to the power mode icon. The engine is allowed to operate over its selected rev range as defined by its programmed rev limit in direct proportion to the throttle input. However the maximum rev limit of 200 rev/min. less than the maximum permissible is imposed. Thus for a full throttle potentiometer setting the engine revolutions is 200 lower than it would be in the auto mode, the same as it is for precision mode.

The engine speed will vary according to the following characteristic: ⇨ *Fig 22. (C-21)*

Engine Oil Level Warning

Operation



C049930-1

Fig 33.

The oil level float switch is positioned in the side of the engine.

When the engine oil level is at an acceptable level, the float switch is closed, applying an earth to the ECU1 i/p 35 (A-3)

When the engine oil level drops below the acceptable level, the float switch is opened, removing the earth from the i/p.

The i/p is only checked on machine ignition on.

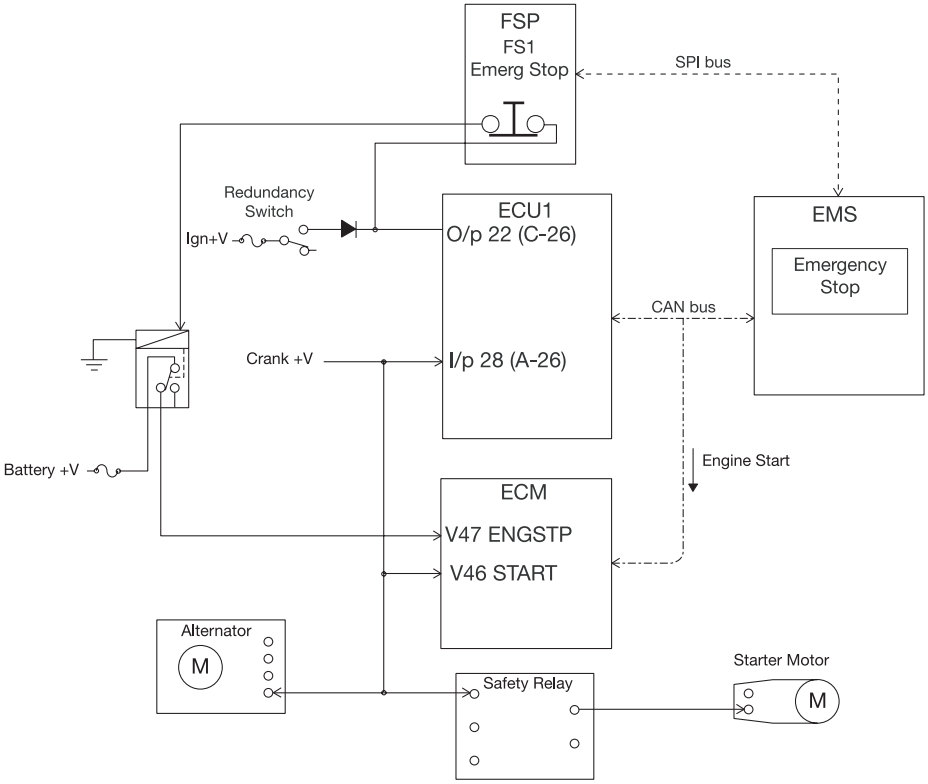
The oil level check should occur before other machine or engine faults are raised.

When the EMS receives a CAN message from the ECU1 indicating that the oil level is OK, the EMS displays the message "ENG OIL OK" for 5 seconds.

When the EMS receives a CAN message from the ECU1 indicating that the oil level is low, the EMS displays the message "CHK ENG OIL" for 5 seconds and the buzzer sounds for 1.5 seconds.

Engine Start/Stop

Operation



C031471GB-2

Fig 42.

Starting/Stopping the engine

When the ignition key is turned to the crank position, 24v is fed to:

- the ECU on i/p 28, (A-26) - Crank,
- the ECM on i/p V46 - START,
- the Safety Relay.

The ECU provides 24v from o/p 22 (C-26), through the closed contacts of the Emergency Stop button on the FSP to the coil of the emergency stop selay. The relay is energized, removing 24v from the ECM i/p V47 - ENGSTP.

The safety relay provides an output to the starter motor, and the ECM starts the engine.

When the engine is running, if the ignition key is switched off, the 24v from ECU o/p 22 (C-26) to the emergency stop relay is removed. The relay is de-energized, feeding 24v from the battery to the ECM i/p V47 - ENGSTP, and the engine is stopped.

Pressing the Emergency Stop Button

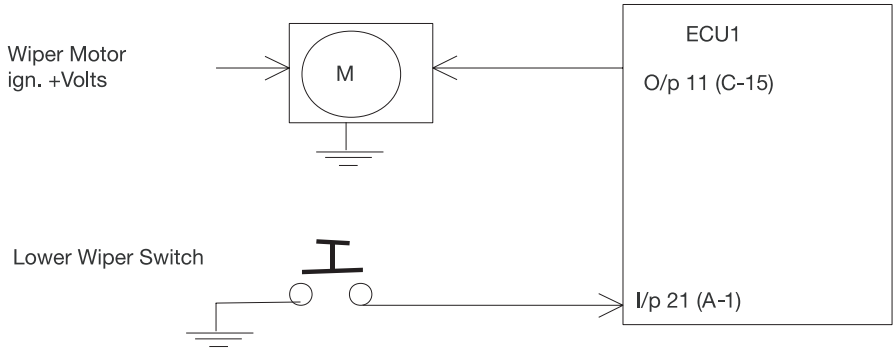
If the emergency stop button on the FSP is pressed whilst the engine is running, the 24v from ECU o/p 22, (C-26) to the Emergency Stop Relay is stopped. The relay is de-energized, feeding 24v from the battery to the ECM i/p V47 - ENGSTP, and the engine is stopped.

At the same time the EMS will display the message 'EMER STOP'. If the ignition is switched off and then back on, the system retains the emergency stop function until the emergency stop button on the FSP is pressed again.

Engine start is disabled unless the lever lock arm is raised. if the ignition is switched on and the lever lock arm is raised, the emergency stop remains off and the engine will not start. If cranking is attempted while the lever lock arm is down, the LIFT_LEVER message is displayed on the EMS and the servo isolator LED will flash on the EMS for the duration of the cranking.

Lower Wiper (option)

Operation



C027310GB-2

Fig 51.

The lower wiper is a customer selected option and is fitted to the lower glass panel at the front of the operator's cab.

The wiper has three modes of operation intermittent, continuous and off. Timing for the intermittent function is performed by ECU1. The same timer as utilised for the standard wiper is used to synchronise both wipers together.

When the lower wiper button is operated the ECU1 output number o/p 11 (C-15) is energised to start the wiper stroke. A hold on contact within the motor assembly retains power for the return stroke of the blade. A time delay equal to that set for the main wiper is activated before the output is energised again, giving intermittent operation.

A second press of the switch enables the wiper to operate continuously and the output is permanently energised.

A third press of the switch disables wiper operation.

Note: *If the upper (main) wiper is energised then the lower wiper output is energised at the same time, synchronising both wipers.*

Slew Brake (100%)

Operation

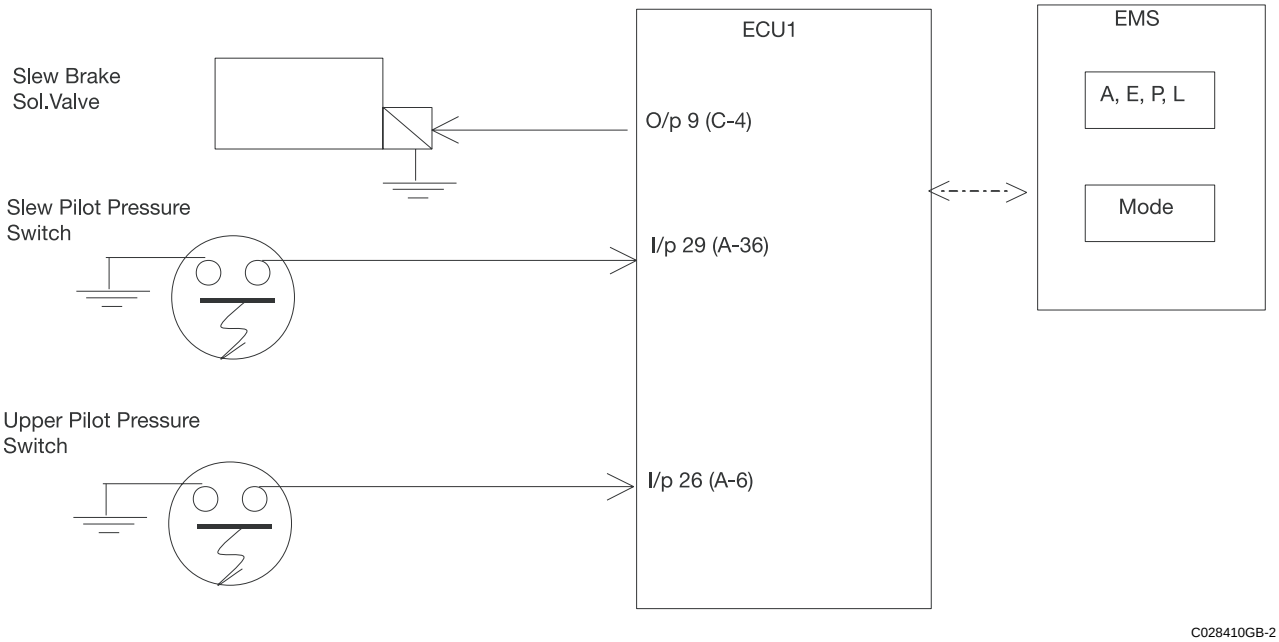


Fig 61.

The slew parking brake holds the current slew position of the machine and prevents slew drift.

This is the default operation with the engine running.

The operator signals for slew movement by moving the left hand joystick. This results in the slew pilot pressure switch being activated. This signals the ECU1 to energise the slew parking brake solenoid valve, thus enabling slew.

The slew pilot pressure switch is de-activated, by returning the joysticks to neutral, and the upper structure comes to a stop using a hydrostatic brake (cross lines relief valve). If this condition exists for 5 seconds then the slew parking brake solenoid is de-energised. Thus applying the slew brake.

To prevent any damage to the slew brake occurring when excavating the slew brake solenoid will remain energised and the slew brake remain off, if the upper pilot pressure switch is activated or re-activated within 5 seconds of the slew pressure switch closing.

If however the upper pilot pressure switch remains de-activated for 5 seconds or longer, the slew brake solenoid will de-energise (brake on). The slew brake solenoid will remain de-energised until the slew pilot pressure switch is activated.

When L mode (lifting) is selected, the upper pilot pressure switch is ignored and 100% brake applied. When the slew pilot switch is energised the slew parking brake is lifted.

By Default Slew parking brake is automatically applied at start up.

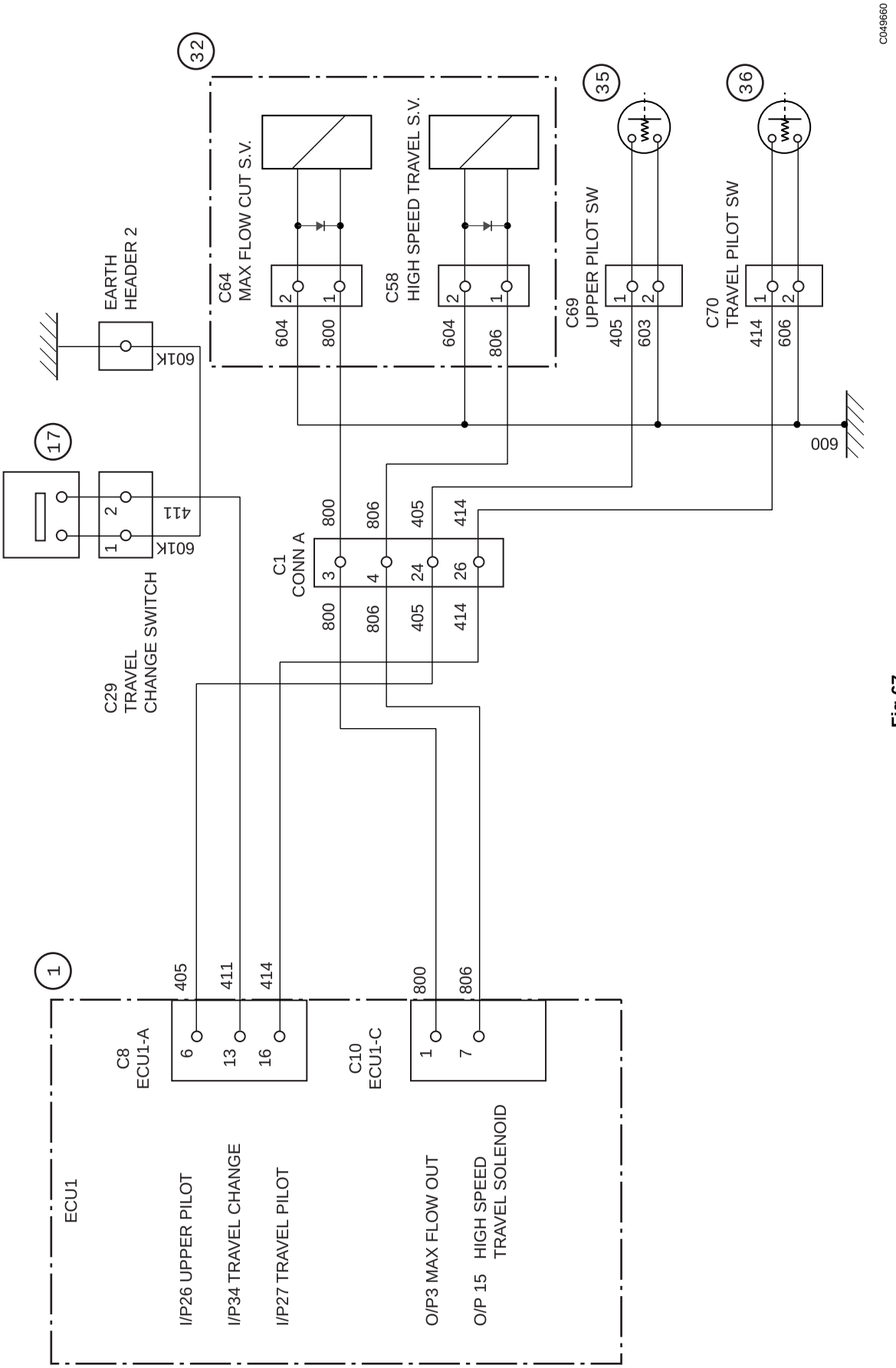

C049660
32
C64
MAX FLOW CUT S.V.
C58
HIGH SPEED TRAVEL S.V.
35
C69
UPPER PILOT SW
36
C70
TRAVEL PILOT SW
EARTH
HEADER 2
601K
17
411
601K
C29
TRAVEL
CHANGE SWITCH
C1
CONN A
009
1
ECU1
C8
ECU1-A
C10
ECU1-C
I/P26 UPPER PILOT
I/P34 TRAVEL CHANGE
I/P27 TRAVEL PILOT
O/P3 MAX FLOW OUT
O/P 15 HIGH SPEED
TRAVEL SOLENOID

Fig 67.

Table 3.

Auto Tier 3										
Bar No	**Colour**	**Temp On**	**Temp Off**	**Water Temp LED**	**Caution LED**	**Reduces to E Mode**	**Flashing Bar graph**	**Buzzer**	**WATER TEMP**	**LOW POWER**
1	Green	50	48							
2	Green	60	58							
3	Green	70	68							
4	Green	75	73							
5	Green	80	78							
6	Green	82	80							
7	Green	84	82							
8	Green	86	84							
9	Green	88	86							
10	Green	89	87							
11	Green	90	88							
12	Green	92	90							
13	Green	93	91							
14	Green	95	93							
15	Green	97	95							
16	Green	99	97							
17	Red	101	99	☐						
18	Red	103	101	☐		☐				
19	Red	105	103	☐		☐	☐	☐	☐	
20	Red	108	106	☐	☐	☐	☐	☐	☐	☐
Overheat switch		105	91+/-4	☐		☐	☐	☐	☐	
Engine Control Module - Overheat control		108		Derated performance (50%)						

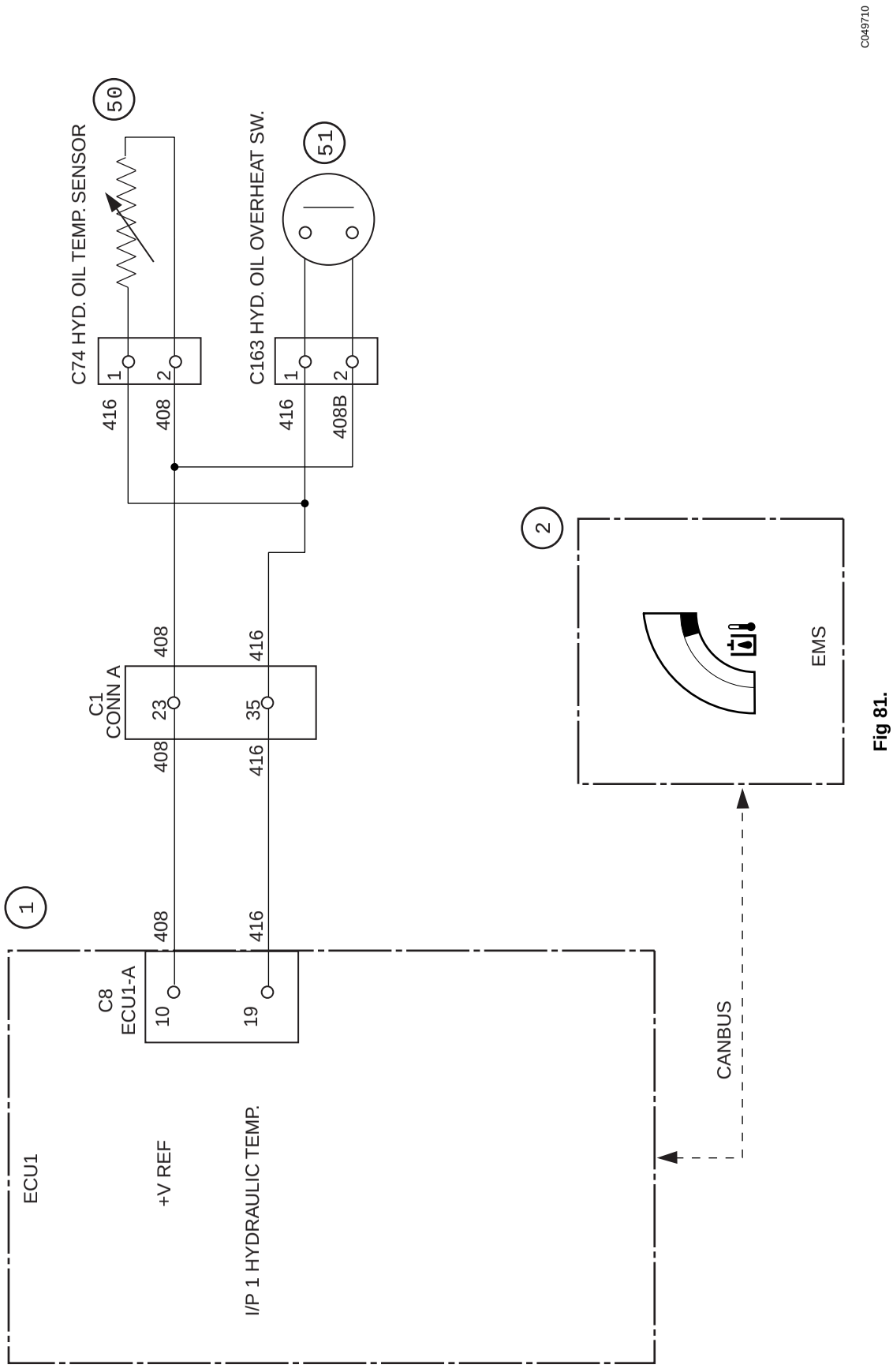

C049710
50
C74 HYD. OIL TEMP. SENSOR
1
2
416
408
51
C163 HYD. OIL OVERHEAT SW.
1
2
416
408B
C1
CONN A
408
23
416
35
408
416
2
EMS
1
C8
ECU1-A
408
10
416
19
ECU1
+V REF
I/P 1 HYDRAULIC TEMP.
CANBUS

Fig 81.

Contents **Page No.**

Introduction to Hydraulic Schematic Symbols

TE-001

General (Basic and Functional Symbols)

Complex hydraulic components and circuits can be described to the engineer by using graphical symbols. The following pages illustrate and give a brief description for some of the more common symbols used.

There are many symbols in use and it would be impossible to include them all here. However it should be noted that most are only variations or refinements on the basic principles explained here. If more detailed information is required you are recommended to obtain a copy of BS2917 or IS01219.

Once familiar with the symbols, the engineer can use hydraulic circuit diagrams as an aid to fault finding. It will be possible to see the complete hydraulic circuit and decipher the relationship between hydraulic components.

Table 2. General

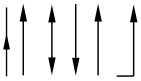
	Spring
	Flow restriction affected by viscosity
	Direction of flow
	Indication of rotation
	Indication of direction and paths of flow
	Variable control

Table 3. Rams

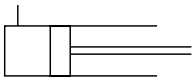
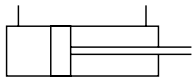
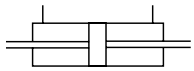
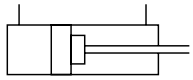
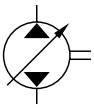
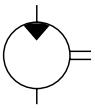
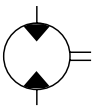
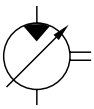
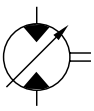
	Single acting
	Double acting
	Double ended
	Double acting with damping at rod area end

Table 4. Pumps and Motors

	Variable capacity pump two directions of flow
	Fixed capacity motor one direction of flow
	Fixed capacity motor two directions of flow
	Variable capacity motor one direction of flow
	Variable capacity motor two directions of flow

Main Servo/Pilot Line

Components

1 Cab Manifold

2 8 Station

3 Shuttle Valve

4 Travel pedal

5 Slew Lock Solenoid

6 Cushion Valve

7 Main Control Valve

- **a** Dipper 2
- **b** Boom 1
- **c** Bucket
- **d** Travel Right hand
- **e** Dipper 1
- **f** Boom 2
- **g** Slew
- **h** Option
- **i** Travel Left hand

8 Tank Return

Hose Colour

BL	Blue
BR	Brown
CI	Colourless
G	Green
GR	Grey
LB	Light Blue
O	Orange
P	Pink
R	Red
V	Violet
W	White
Y	Yellow
LG	Light Green
DG	Dark Green

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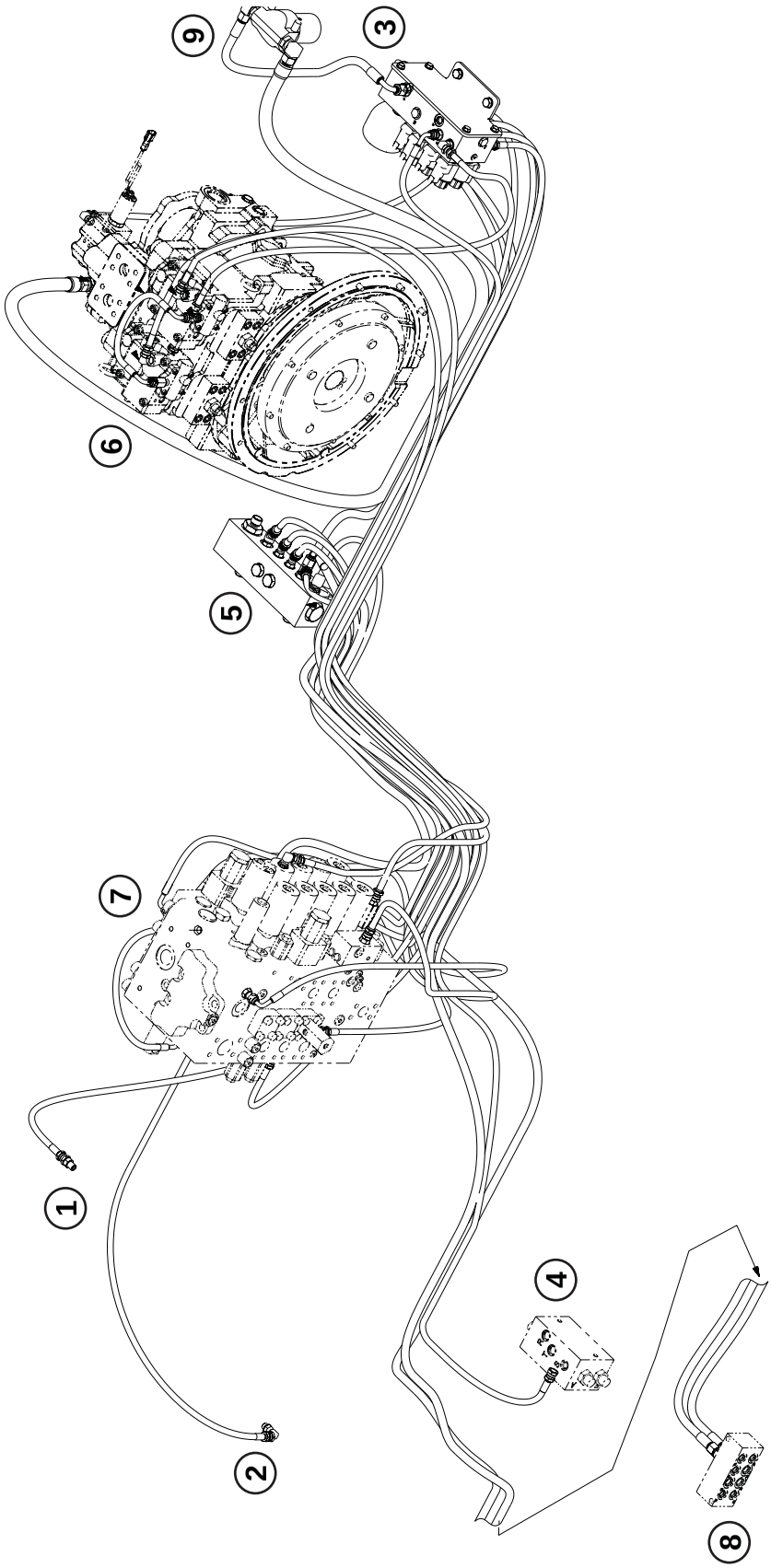

Fig 7. Servo/Pilot Pressure and Return Line

Boom Down

For schematic, ⇒ ***Fig 12. (E-39)***.

Servo pressure from the RH hand controller **51** at port 4 enters the servo shuttle valve **46** at port and is distributed to:

1 Port C9 to activate the auto mode pressure switch **43**

2 Port B4 to port E of the cushion control valve **49**. The oil flows across the unrestricted part of the spool and out of port G to the main control valve **14** at port Pb8, moving the spool to the down position, also selecting the boom holding valve and the upper pressure switch.

Note: *If HBCV's **12** are fitted a signal is also sent from port E1 of the cushion control valve **49** to the P ports of the HBCV's to move the HBCV spool over and allow oil to return from the rams.*

Flow from pump 1 enters the main control valve at port P2 and travels through the neutral gallery to the boom (1) spool. The flow is restricted allowing a reduced pressure at port Ps2 which is sensed at Pm2 of the pump to put the pump to full flow. Oil flow also passes through the parallel working gallery to the Boom (1) spool and is directed to the boom rams **16** via port B8.

Exhaust oil passes through the HBVC's **12** (if fitted) to the main control valve **14** at port A8, lifts the boom holding valve BHV off it's seat and passes through the boom (1) spool and exhausts to tank.

Exhaust oil passing through the spool can be regenerated into the feed side of the rams. A check valve in the spool allows oil to enter the pressure side of the spool, If the returning oil is at a higher pressure, due to the weight of the boom or load, Item A ⇒ ***Fig 12. (E-39)***. The restrictor creates back pressure, causing the check valve to open.

Priority Valves

For schematic, ⇒ *Fig 17. (E-49)*.

Boom over Slew Priority (A)

This is selected by the operator via switch in the right hand console.

When operated the boom priority solenoid on the 8 spool block **60** is energised sending a signal via port C6 to the main control valve **14** at port Pi1. This selects the boom over slew priority. Oil now being fed to the slew spool is restricted to give priority to the boom.

Slew over Dipper Priority (B)

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

When Slew is selected a signal is sent from the servo Shuttle valve **46** via port C8 to the main control valve **14** at port Pc3. This selects slew over dipper priority valve **B** and limits the flow to the dipper from pump P2 only. This makes it possible to have maximum slew torque with high slew pressure when the dipper is used at the same time.

Boom Priority over Bucket (C)

This a non-selectable function automatically carried out within the Main control valve **14** when Boom up is selected.

When boom up is selected a signal is sent from port C1 on the servo shuttle valve **46** to the main control valve port Pi2. This selects the boom over bucket priority valve **C**. Oil now flowing to the bucket spool is restricted and gives priority to boom up.

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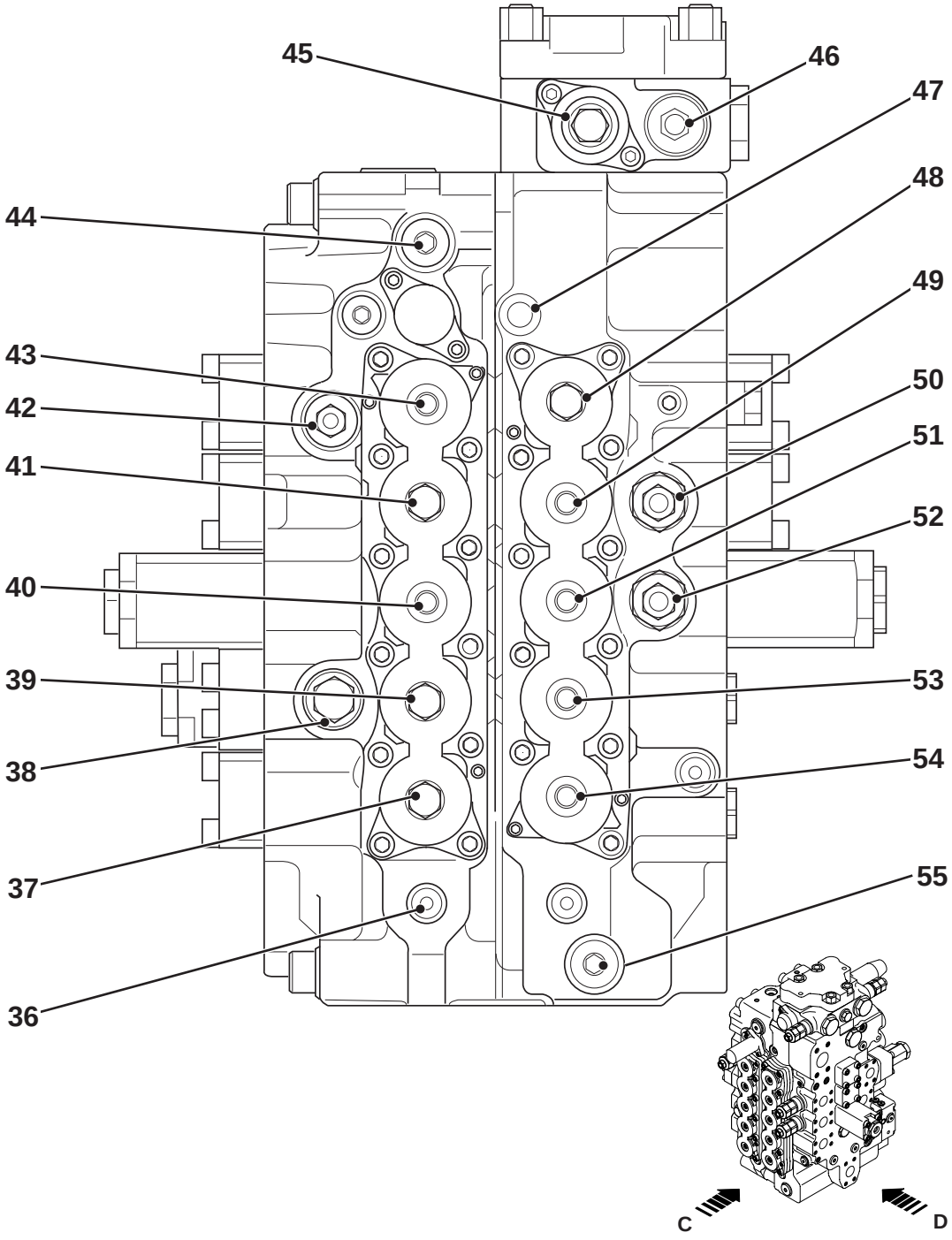

Fig 6. Main Control Valve viewed in Direction of Arrow C

⇨ *Table 4. (E-69)*

Proportional Pressure Reducing Valve

Allowable range of current pressure profile

– Primary press. 40 kgf/cm² (38.6 bar, 568.8 lb/in²)
– Flow in port A. 0 l/min Fluctuation of proportional solenoid current. 70 - 75 Hz, 400 ~ 600 mAp-p

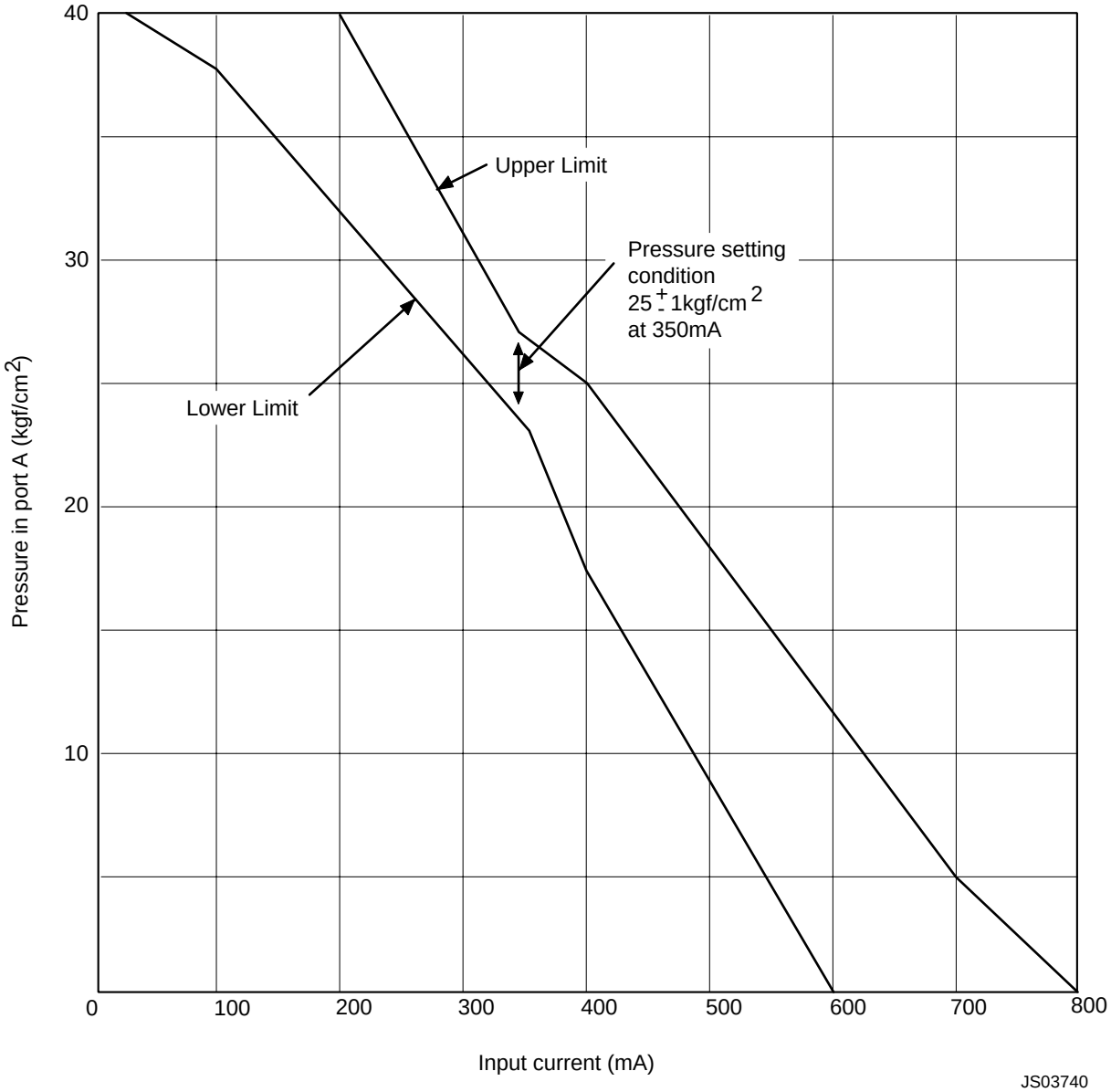

Fig 3.

plates and install on the swash plate supports **56**. Check manually that the swash plates can be moved smoothly.

Note: 2 *Make sure that the parts from the drive shaft and the driven shaft are not confused. The parts must be returned to the shafts from where they originated.*

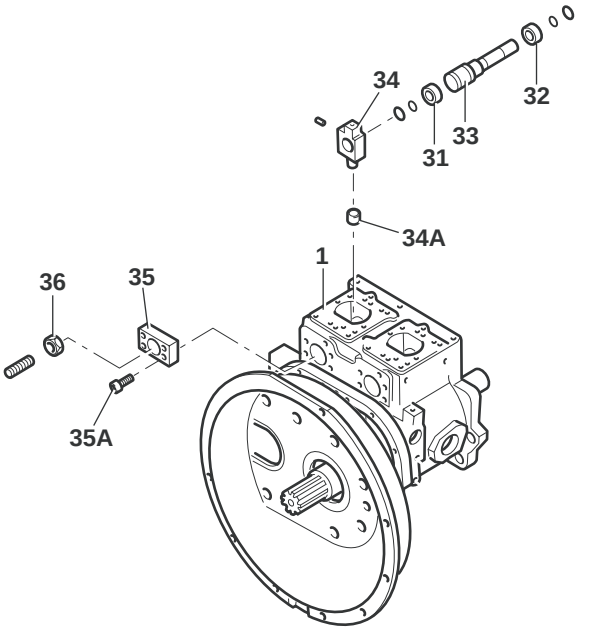

Fig 19.

12 Rebuild the two cylinder sub-assemblies comprising cylinder **24**, pistons **25**, set plate **26**, spherical bush **27** and cylinder springs **28**. Make sure that the parts from the original sub-assemblies do not get intermixed and are returned to their original locations.

13 Check that both swash plates are still in position with the tilting bushes **34A** connected to the tilting pins **34**.

Align the splines of the cylinders **24** and the spherical bushes **27** and then insert the cylinder sub assemblies over drive shaft **11** and driven shaft **12**, as appropriate.

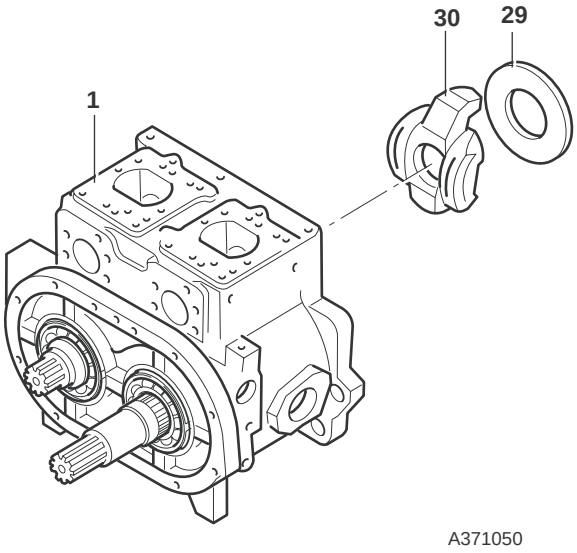

Fig 20.

14 Grease the back of valve plates **13** and **14** and fit to valve cover **10**, taking care to position correctly the suction and delivery ports.

15 After applying grease to the hole in valve cover **10**, insert check valve sub-assemblies **15**, **16**, **17**.

16 If either of the needle bearing assemblies **23** were in need of renewal (see Dismantling, step 8) fit new bearing assemblies at this stage.

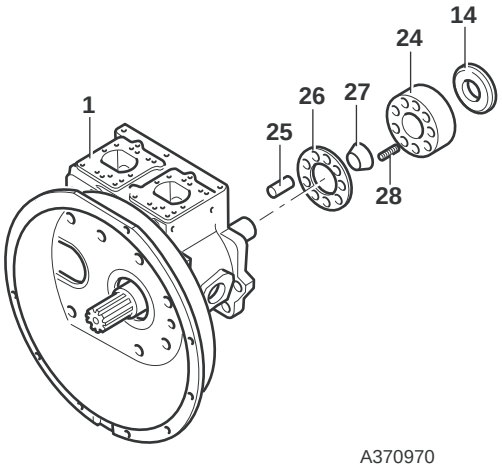

Fig 21.

Contents Page No.

Operation

Middle Speed

Note: *Second stage MRV is not selected during travel on this machine.*

Oil from the valve block enters the motor at either **P1** or **P2**. In this case the oil enters at **P1**. ⇨ ***Fig 2. (F-11)***.

Pressure entering the motor crosses the counterbalance spool **2-A** and is directed to the travel motor **2-B** and the auxiliary relief valve (ARV) ports **2-C**. At this point the motor cannot move as the brakes **2-D** are applied.

The pressure also travels to the end of the counterbalance via:

1 The restricter which restricts the flow to the spool

2 The check valve which will allow full flow to the spool end. This is the normal path for the oil to take.

The counterbalance spool is selected at 6 - 13bar (87- 188 lb in^2) which in turn diverts the flow of oil to the travel motor in 2 directions:

1 Oil can flow over the spool and direct to the motor. This is also available to the motor ARVs and the 2 speed travel spool **2-E** that is in the neutral position. Once the brake is lifted the motor will start to turn.

2 Oil is also diverted to the travel motor brake via a restrictor.

Once the pressure in the brake rises to 14bar (203lb in^2) the brake is released. This flow of oil also crosses the brake piston and is available at the end of the two speed travel spool and along with the assistance of a spring, holds the two speed spool in the low speed position. With the two speed spool in this position the swash plate angle piston head is vented to the tank port and the motor stays on maximum displacement. (Low speed).

Once the pressure rises to a 319bar (4627lb in^2) the motor's ARVs will open and allow excess pressure to be exhausted to the return side. The ARVs are of the shockless type to reduce harsh starting and stopping. When travel is deselected by the driver the **P1** port loses pressure. Pressure is also lost to the end of the counterbalance spool which is cushioned to reduce the shock when stopping. The cushioning is achieved by the check valve trapping the pressure at the spool end and only allows it to vent through the restrictor, allowing the counterbalance spool to return slowly. Returning oil from the motor is slowly blocked in its path to tank and as the back pressure rises, braking occurs.

Once the counterbalance spool is in the neutral position any additional pressure within the motor due to inertia (motor pumping function) above 319bar (4627lb in^2) is relieved through the ARV and is fed back to the opposite side to prevent cavitation. The pressure in the brake piston is also released slowly due the restrictor in the brake line restricting the flow, so the brake remains off initially to allow the motor to stop by hydraulic breaking, to protect the brakes components from damage.

Slow Speed Travel (Creep)

When slow travel speed is selected the electronic control unit (ECU1) controller sends a signal to the max flow cut solenoid CT4 on the 8-spool solenoid block. This then allows servo pressure to the ports Pm1 and Pm2 of the main hydraulic pump ⇨ ***Hydraulic Pump/ Regulator (E-73)*** and reduces the pump flow to the drive motors.

The drive motors work in exactly the same way as in middle speed travel. Only the pump flow is reduced to achieve slow-speed travel.

Removal and Replacement

Removal

1 Move the track link until the master pin is over the take-up roller in the position shown, place a wooden block under the track shoe as shown.

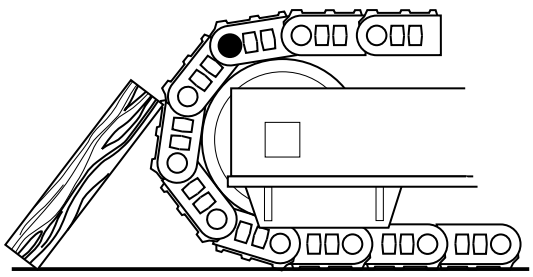

Fig 12.

2 Slacken the check valve to bleed out the grease.

⚠ WARNING

Slacken the check valve slowly and stop when grease ie released. The grease and valve are under extremely high pressure and could cause injury if suddenly released.

TRANS-6-2

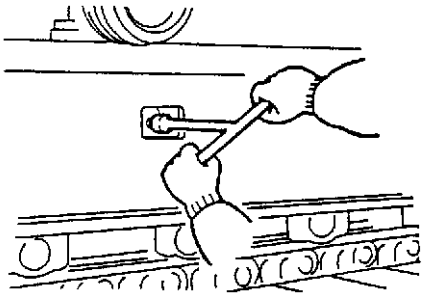

Fig 13.

3 Disconnect the track link by removing the locking pin and knocking out the master pin.

a Remove bolts and lift off the track shoes adjacent to the master pin.

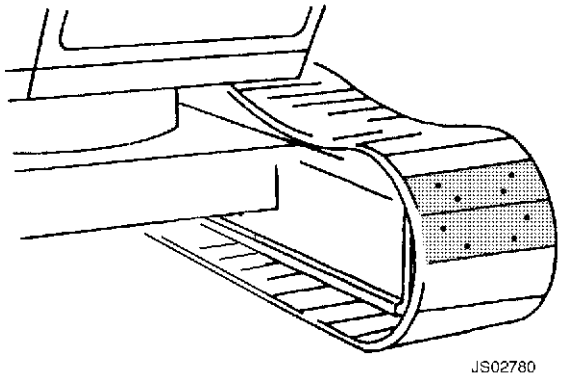

Fig 14.

b Position a suitable hydraulic press so that its ram aligns with the master pin.

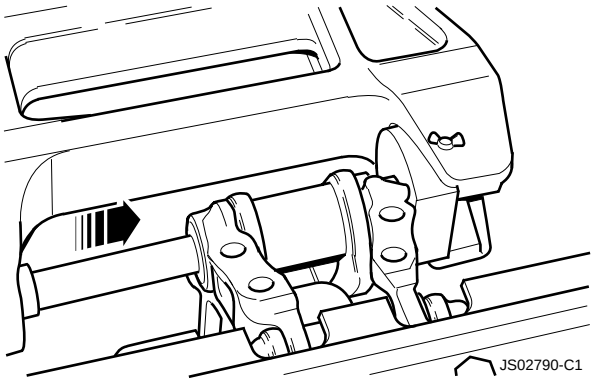

Fig 15.

c Insert the spacer bar between the master pin and the hydraulic ram.

d Slowly operate the hydraulic ram and press out the master pin.

⚠ WARNING

Stand clear and to one side of the track while you remove the master pin. When the master pin is removed the track could fall forward and injure you.

TRACK-1-1

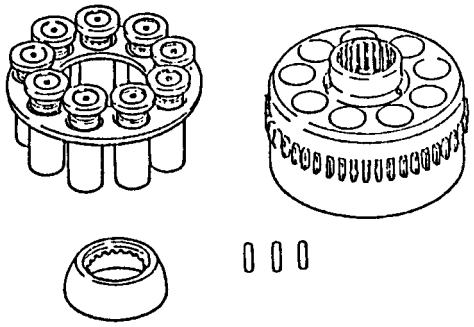

Fig 40.

13 Remove piston **6**, retainer plate **7**, retainer holder **8** and pin **19** from cylinder block **4**.

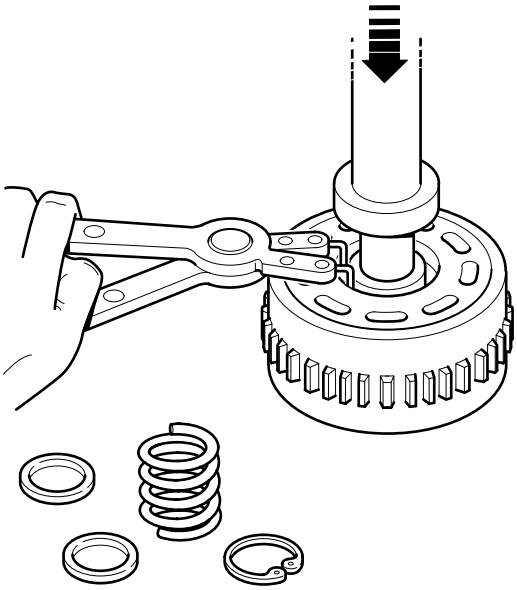

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Fig 41.

14 Remove shaft **3** from case **1** and remove swash plate **9**, piston **11**, spring **40** and steel ball **10** from case **1**.

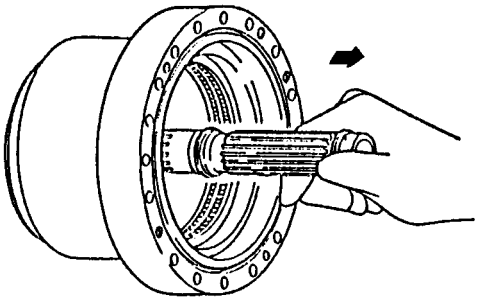

Fig 42.

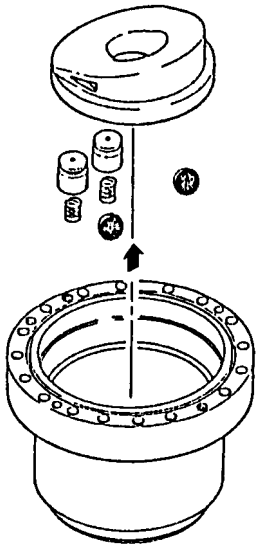

Fig 43.

15 Plunger disassembly

Push though a ø10 bar in plunger **2-2**, ø11 mm hole and fix with a vice then loosen plug **2-2-4**.

Note: *Unless absolutely necessary, do not disassemble. When fixing with a vice, use a copper plate so as not to damage the plunger sliding area.*

16 Remove spring **2-2-3** and check valve **2-2-2**.

17 Cup disassembly

Remove piston **2-6-2** and spring **2-6-3** from cap **2-6-1**.

Note: *Do not disassemble the piston unless necessary.*

Dismantling is now complete.

Item	Description	Qty
1	Case	1
2	Base Plate Assembly	1
2-1	Base Plate	1
2-2	Plunger Assembly	1
-1	Plunger	1
-2	Check Valve	2
-3	Spring	2
-4	Plug	2
-5	O-ring	2
2-3	Spring Seat	2
2-4	Spring	2
2-5	Spring Seat	2

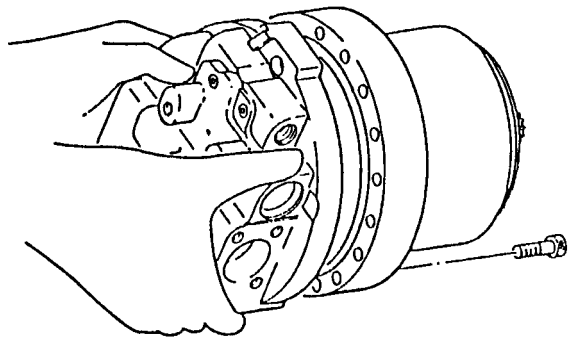

Fig 58.

16 Plunger assembly

a Attach ø10 bar to the ø11 hole of plunger **2-2-1** and fix with a vice. Assemble check valve **2-2-2** and spring **2-2-3** in order.

b Assemble plug **2-2-4** which has 'O'-ring **2-2-5** attached to it into plunger **2-2-1** and tighten to the specified tightening torque, i.e. 137 +/- 10 Nm (14 +/- 1.0 kgf m, 101.2 +/- 7.2 lbf ft)

17 Assemble plunger **2-2-1** into base plate **2-1**.

Note: *Coat the plunger sliding part with hydraulic oil and then assemble it. Slowly turn the plunger as you assemble it. Check that the plunger moves smoothly.*

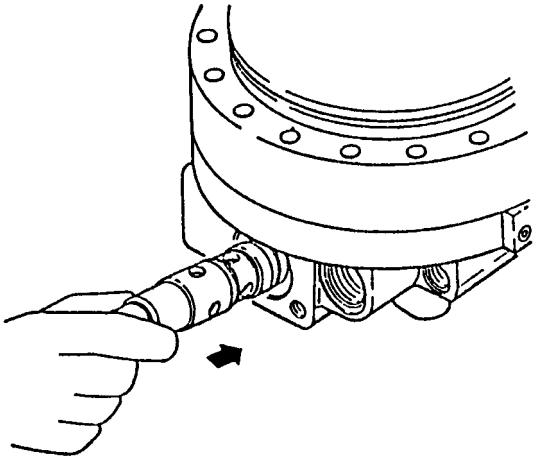

Fig 59.

18 Cap assembly

Assemble spring **2-6-3** and piston **2-6-2** in order to the cap **2-6-1**.

19 Assemble spring **2-3** and spring seat **2-5** in order.

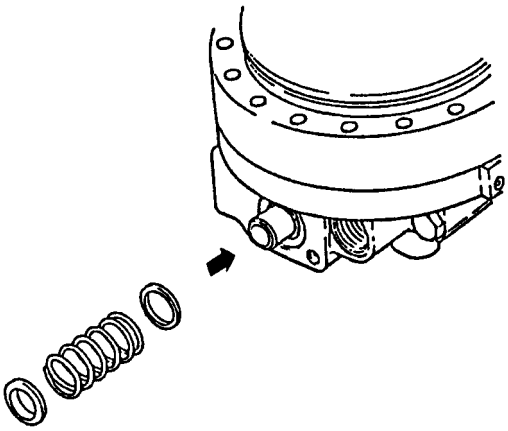

Fig 60.

20 Assemble cap **2-6-1** to base plate **2-1** and fasten with socket head bolts **2-6-5**.

Note: *Because it is pushed upwards by the spring, press down by hand and tighten the socket head bolts to the specified tightening torque, i.e. 108 +/- 20 Nm (38 +/-2 kgf m, 79.5 +/- 3.6 lb ft).*

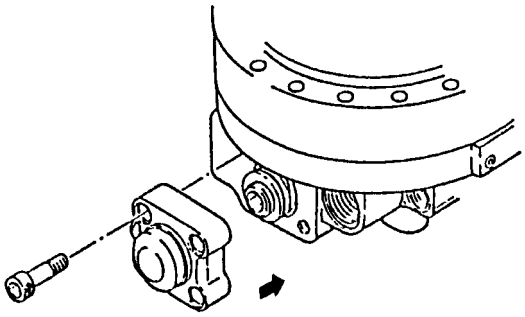

Fig 61.

21 Assemble relief valve sub-assembly **2-7** to base plate **2-1**and tighten to the specified torque, 373 +/- 20 Nm (38 +/- 2 kgf m, 274.85 +/ 14.47 lbf ft).

(1) Pitting to more than 10% of the teeth surface area
(2) Pitting to more than 10% of the teeth surface area
(3) Pitting to more than 10% of the teeth surface area
(4) Pitting to more than 10% of the teeth surface area

Assembly

Clean each part in a suitable solvent and dry using compressed air.

Inspect all parts and renew as required.

Care must be taken not to let dust or dirt adhere to parts after cleaning and that parts do not become dented, scratched or damaged.

Fit new O-rings, plugs, packing, oil seals and fastener seals.

Apply Lithium grease to all new oil seals (particularly the lip areas) and O-rings, and clean hydraulic fluid to all sliding parts before installation.

All tapped holes and gasket faces should be thoroughly degreased by washing, as liquid packing and adhesive is used on all gasket surfaces and threads.

Apply adhesive to the final few threads of a bolt or screw. Do not apply excessive amounts of adhesive. Wipe off any surplus.

Leave the unit for at least twelve hours after assembly to allow the adhesive to fully dry.

Ensure that all components are re-fitted to the positions from which they were removed, paying particular attention not to mix components from identical sets front and rear.

1 Clamp flange **10** to the bench.

Smear floating seal **11** with grease and assemble one side to the flange. Assemble the other side of floating seal **11** to housing **13**.

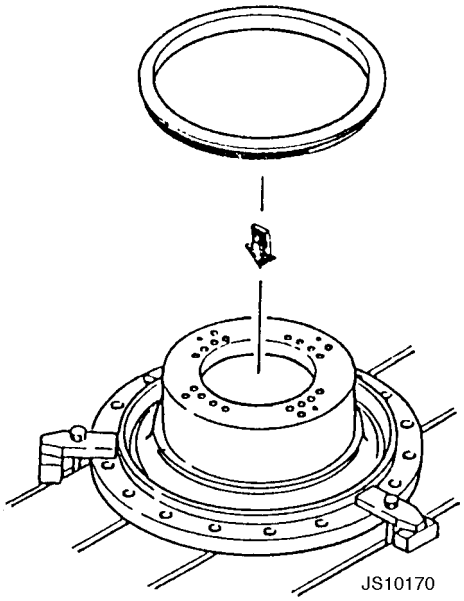

Fig 73.

2 Assemble angular bearings

a Assemble one inner ring sub-assembly of angular bearing **12** to flange **10**.

b Press fit the outer ring of angular bearing to housing **13**.

Section J

Track and Running Gear

Service Manual - JS360 Tier III Auto

Publication No.
9803/9880-3

Issued by JCB Technical Publications, JCB Aftermarket Training, Woodseat, Rocester, Staffordshire, ST14 5BW, England. Tel +44 1889 591300 Fax +44 1889 591400

World Class
Customer Support

Assembly

1 Clean all parts thoroughly in a suitable solvent. Dry shaft and bore of idler wheel using compressed air in a place free of dust and moisture.

Check components for wear as detailed. Polish out scratches and roughness using an oil stone. Then apply a coat of engine oil to all parts.

Carefully drive the new bushes **K** into the idler wheel **G**, using a suitable dolly**.**

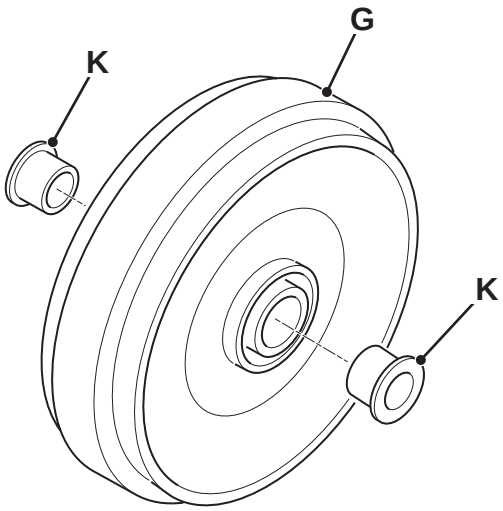

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Fig 15.

2 Apply a coating of grease and install a new floating seal **J** into each side of the idler wheel **G** and hub.

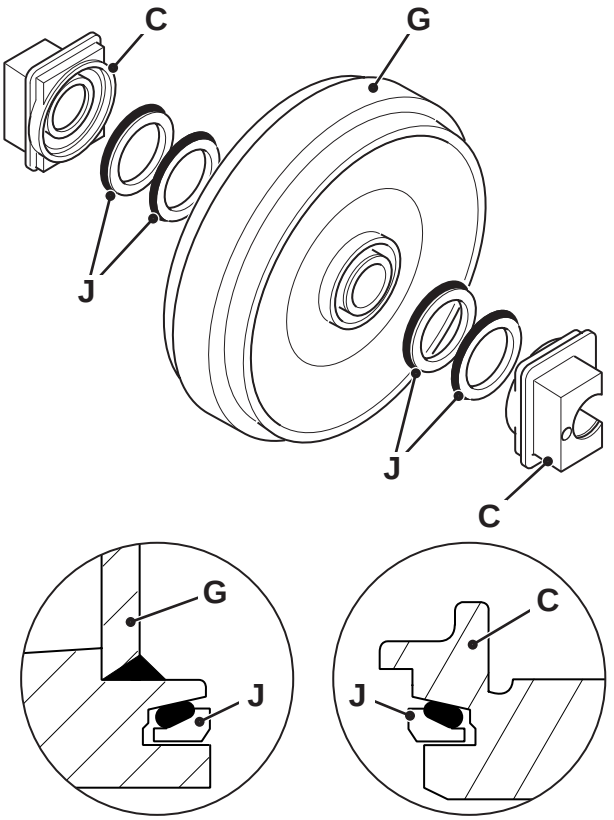

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Fig 16.

Note: *Ensure floating seals* ***J*** *are fitted correctly.* *⇒ Fig 16. (J-7)*

3 Grease a new 'O'-ring **F** and install on one end only of shaft **D**. Install shaft **D** into hub **C**. Fit new wire clip **E** or roll pin (later machines).

Top Roller

Removal

P11-J004

1 Slacken the check valve to bleed out grease.

⚠ WARNING

When opening the check valve always stand to one side and loosen a little at a time until grease starts to come out. If you over-loosen too much grease could spurt out or the valve cover fly out and cause serious injury.

8-3-4-5

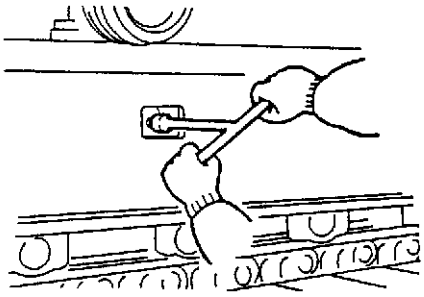

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Fig 41.

2 Jack up the track high enough to permit roller removal. Put wooden blocks between track link and side frame.

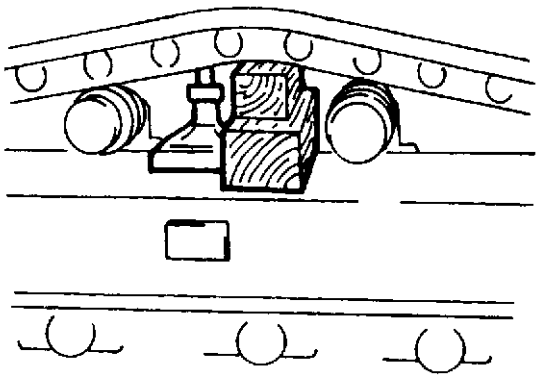

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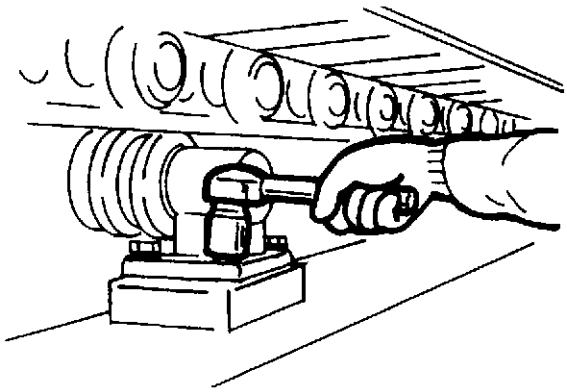
Fig 42.

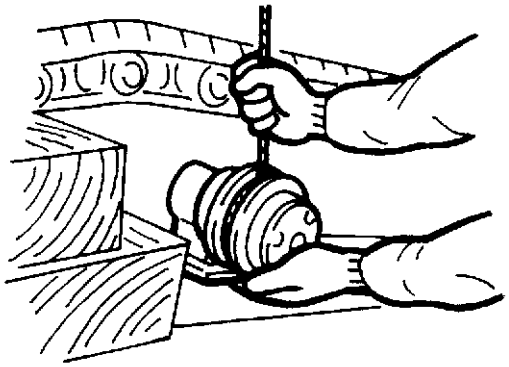
3 Loosen but do not remove the mounting bolts. Tap the upper roller with a copper mallet to separate it from the side frame.



C004760

Fig 43.

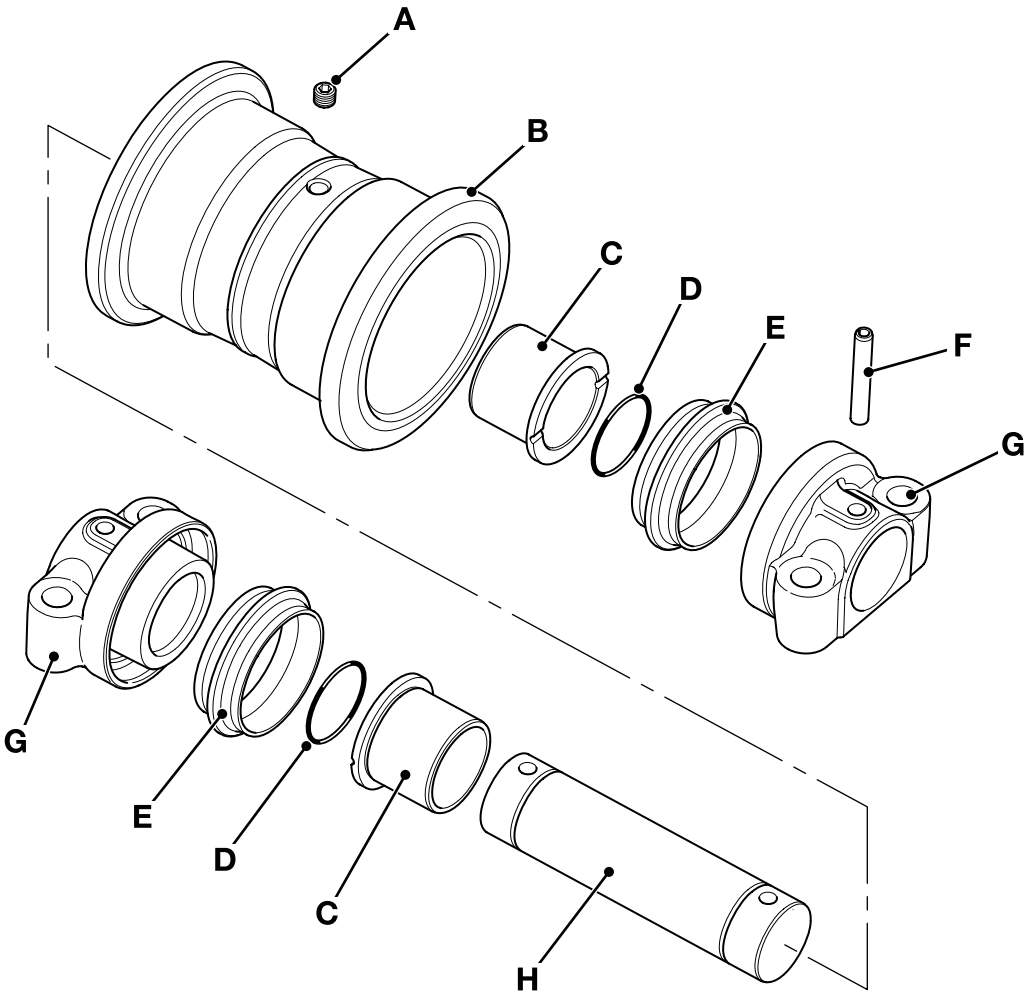
4 Fasten a sling to the upper roller. Remove the mounting bolts and lift the upper roller clear.



C004770

Fig 44.

Dismantling



802960-1

Fig 71.

Item	Part Name
A	Plug
B	Roller
C	Bush
D	`O'-ring
E	Floating seal assembly
F	Locking pin
G	Mounting bracket
H	Shaft

Engine Mounts

Table 3.

Item	Description	Torque	Remark
A	Right Front Engine Mount	-	Rubber Colour Coded Green
A1	M20 Bolt - Engine Mounting To Frame	289-337 Nm (213-249 lbf ft)	-
A2	M10 Bolt - Bracket to Engine Casing	108-127 Nm (80-94 lbf ft)	Apply Locking Fluid
B	Right Rear Engine Mount	-	Rubber Colour Coded Black
B1	M20 Bolt - Engine Mounting To Frame	289-337 Nm (213-249 lbf ft)	-
B2	M12 Bolt - Bracket to Engine Casing	108-127 Nm (80-94 lbf ft)	Apply Locking Fluid
C	Left Rear Engine Mount	-	Rubber Colour Coded Black
C1	M20 Bolt -Engine Mounting To Frame	289-337 Nm (213-249 lbf ft)	-
C2	M12 Bolt - Bracket to Engine Casing	108-127 Nm (80-94 lbf ft)	Apply Locking Fluid
D	Left Front Engine Mount	-	Rubber Colour Coded Green, ATC Option Shown
D1	M20 Bolt - Engine Mounting To Frame	289-337 Nm (213-249 lbf ft)	
D2	M10 Bolt - Bracket to Engine Casing	108-127 Nm (80-94 lbf ft)	Apply Locking Fluid

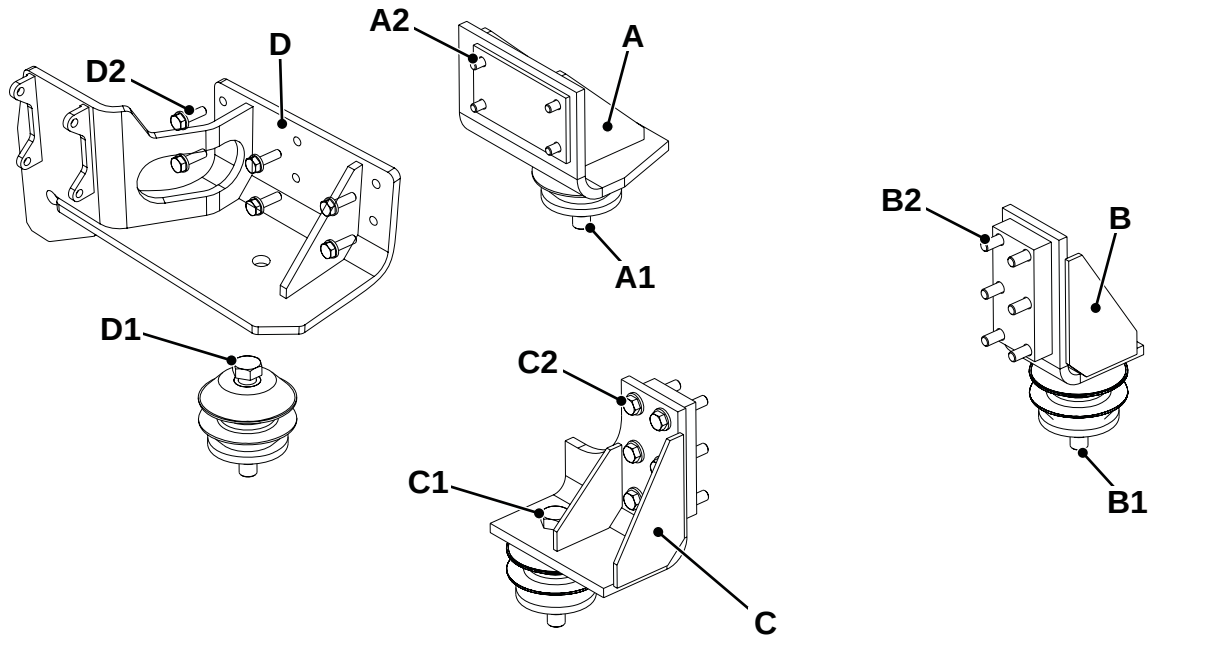
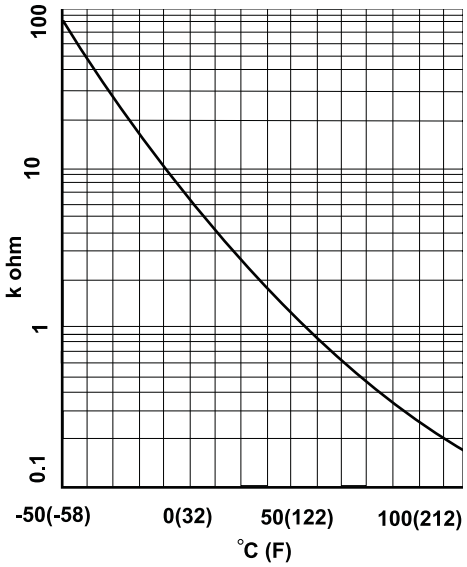


Fig 1.

Resistance



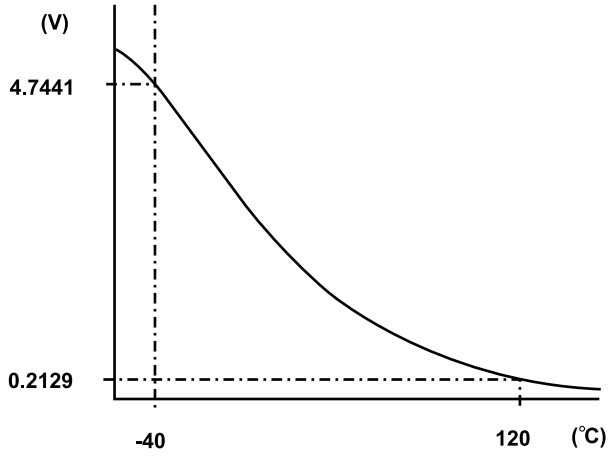
T049160

Fig 7.

Table 2.

Position	Normal	Abnormal
Pin 84 - 87	10 M Ohm or more	100 M Ohm or less
Pin 84 - Earth	10 M Ohm or more	100 M Ohm or less

Voltage



T049150

Fig 8.

Typical voltage seen 81°C = 0.5 Volts.

Camshaft Position (CMP) Sensor - 4HK/ 6HK

T049210

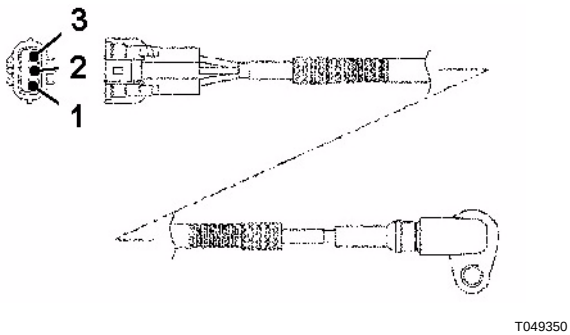
Fig 27.

The camshaft position sensor is installed onto the rear of cylinder head and produces the CMP signal when the timing gear of the cam shaft passes the sensor. The engine control module (ECM) distinguishes the cylinders by the CMP signal input from the sensor, determines the crank angle and uses it to control fuel injection and calculate the engine speed. These controls are normally performed using the CKP signal. However, the CMP sensor is used if the CKP sensor is faulty. The CMP sensor will display a no restart message if faulty.

If the CMP sensor is replaced the engine will need to be cranked over for 15 second to calibrate the sensor before restarting the engine.

4HK/6HK. Voltage between pin 98 -99 = 11 Volts.

Connector



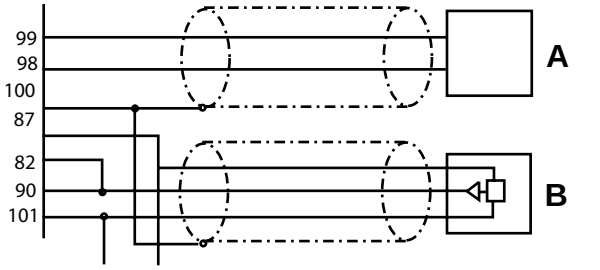
T049350

Fig 28.

Table 15.

1	Shield
2	Negative
3	Positive

Schematic



T049330-4

Fig 29.

Table 16.

A	CMP Sensor
B	Common Rail Pressure Sensor

Temperature vs Resistance

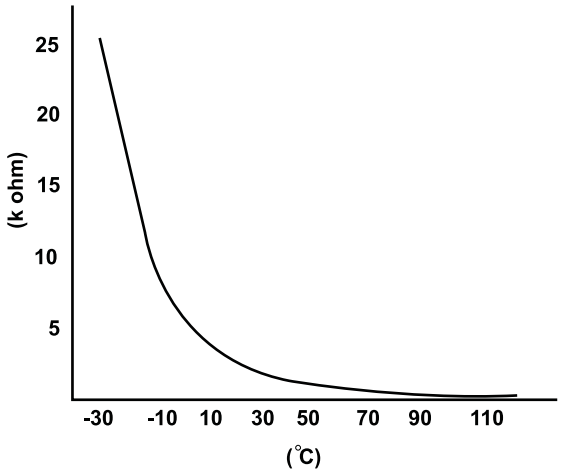


Fig 47.

Temperature vs Voltage

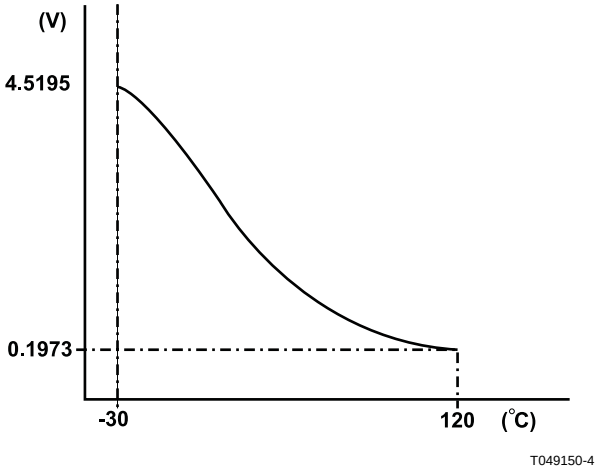


Fig 48.

Checking Circuit Resistance

Table 34.

Normal	10 M ohms or more
Abnormal	100 ohms or less

Typical Voltages

Typical voltage 52°C = 1.05 K ohms.