Service Manual

JS290 - Tier III Auto

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Section 2 - Care and Safety

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Section B - Body & Framework

Section C - Electrics

Section E - Hydraulics

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Section K - Engine



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Safety Notices

Important Information

T1-042

The Operator Manual

⚠ WARNING

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

INT-1-4-2

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

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

Safety Warnings



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

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

⚠ DANGER

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

INT-1-2-1

⚠ WARNING

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

INT-1-2-2

⚠ CAUTION

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

INT-1-2-3

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Pre Start Cold Checks, Service Points and Fluid Levels

	Operation	10	50	250	500	1000	2000	4000	5000
ENGINE									
Oil level	- Check	☐	☐	☐	☐	☐	☐	☐	☐
Oil and Filter (1)	- Sample/Change				☐	☐	☐	☐	☐
Pre Cleaner (if fitted)	- Clean			☐	☐	☐	☐	☐	☐
Air Cleaner Outer Element	- Change					☐	☐	☐	☐
Air Cleaner Inner Element	- Change						☐	☐	
Air Cleaner Dust Valve	- Check and Clean			☐	☐	☐	☐	☐	☐
Fuel Level	- Check	☐	☐	☐	☐	☐	☐	☐	☐
Fuel Tank - Water and Sediment	- Drain		☐	☐	☐	☐	☐	☐	☐
Coolant Quality/Level	- Check	☐	☐	☐	☐	☐	☐	☐	☐
Coolant	- Change							☐	
Fuel Pump Filter Element	- Change				☐	☐	☐	☐	☐
Primary Fuel Filter/Sedimenter	- Drain and Clean		☐	☐	☐	☐	☐	☐	☐
Primary Fuel Filter/Sedimenter-filter	- Change				☐	☐	☐	☐	☐
Main Fuel Filter/Sedimenter	- Drain and Clean		☐	☐	☐	☐	☐	☐	☐
Main Fuel Filter/Sedimenter-filter	- Change				☐	☐	☐	☐	☐
Fuel Filler Cap	- Check and Clean			☐	☐	☐	☐	☐	☐
Fuel Filler Cap (Dusty conditions)	- Check and Clean		☐	☐	☐	☐	☐	☐	☐
Fan Belt Tension/Condition	- Check			☐	☐	☐	☐	☐	☐
Valve Clearances	- Check and Adjust					☐	☐	☐	☐
Engine Mounting Bolts for Tightness	- Check				☐	☐	☐	☐	☐
Exhaust System Security	- Check				☐	☐	☐	☐	☐
Air Inlet System Security	- Check			☐	☐	☐	☐	☐	☐
Radiator	- Clean and Check			☐	☐	☐	☐	☐	☐

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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.

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Table 21. JS290 and variants

No.	Tightening Point	Bolt Diameter	Wrench mm	Tightening Torque		Checking Torque	
				Nm	lbf ft	Nm	lbf ft
1(1)	Travel Motor	M24	36	923	681	874	645
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	27	840-890	620-656	756-801	558-591
8	Counter weight	M27	41	1440	1062	1335	980
9(1)	Turntable Bearing (Undercarriage)	M24	36	960	708	875	645
10(1)	Turntable Bearing (Slew Frame)	M24	36	960	708	875	645
11(1)	Slew Equipment	M24	36	950	700	900	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
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.

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Changing the Oil and Filter

CAUTION

Hot oil and engine components can burn you. Make sure the engine is cool before doing this job.

2-3-3-2

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

2 Let the engine stand until it is warm. Do not check the oil straight after the engine has stopped, the oil level indicated will actually be lower than it is.

3 Drain the Oil

a Remove the belly plate

b Place an oil collecting container of suitable size beneath the engine sump drain point.

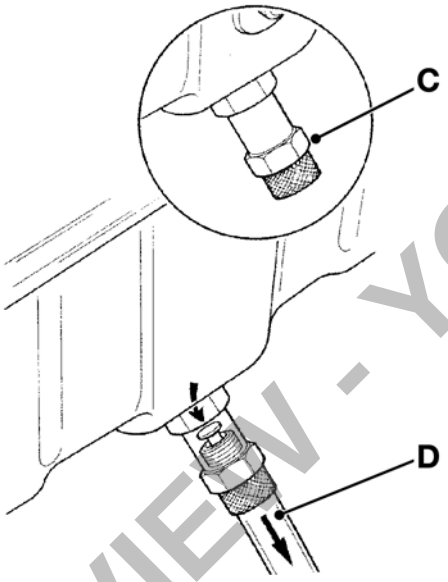


Fig 31.

c Remove the self sealing drain plug outer cover **C**.

d Fit the self sealing drain kit threaded union (with attached pipe) **D**. Drain sump oil into a suitable container.

e Remove the self seal drain kit, clean and refit the outer cover. (Do not over tighten the cover).

4 Change the Filter

a Remove the remote filter **E**.

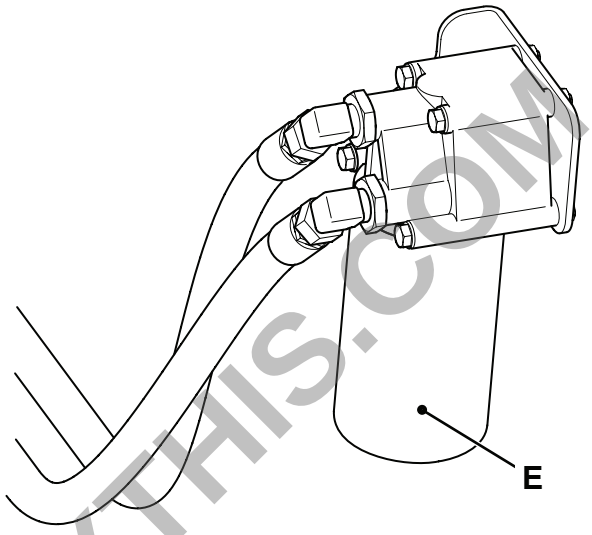


Fig 32.

b Clean the filter head.

c Smear the seal on the new filter **E** with oil.

d Fill the filter with engine oil before fitting.

e Tighten the filter until the seal bites onto the filter housing.

f Tighten the filter a minimum of one more full turn.

5 Fill the System.

a Fill the engine with new oil through filler **B** ⇒ *Fig 28. (3-56)*,⇒ *Fig 29. (3-56)*,⇒ *Fig 30. (3-56)*,⇒ *Fluids, Lubricants and Capacities (3-16)*

b Wipe off any spilt oil.

c Check for leaks.

d Make sure the filler cap is correctly refitted.

6 Check for Leaks

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Schematic Diagram

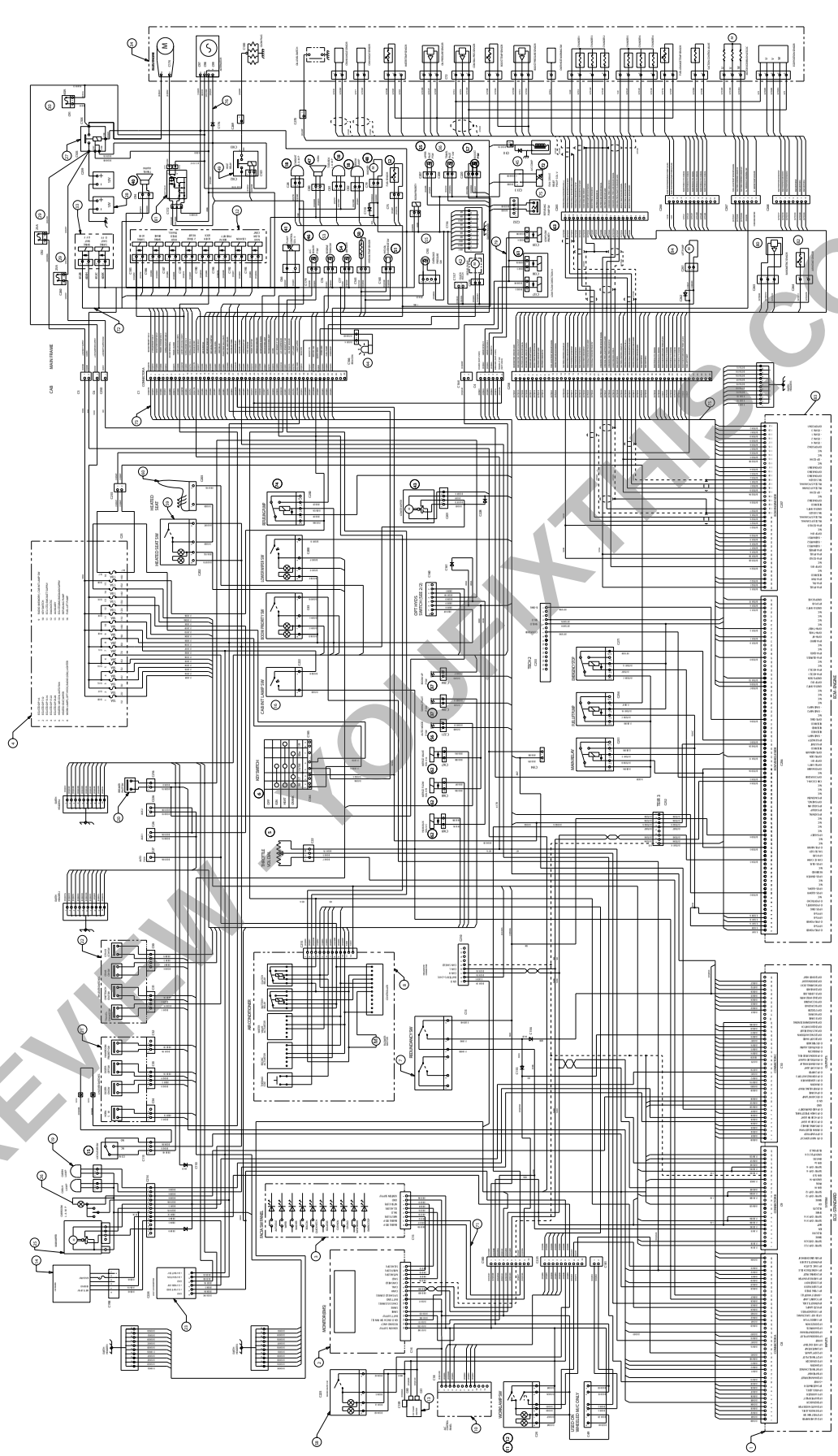


Fig 5. Electrical Schematic 332/J4979 Issue 1

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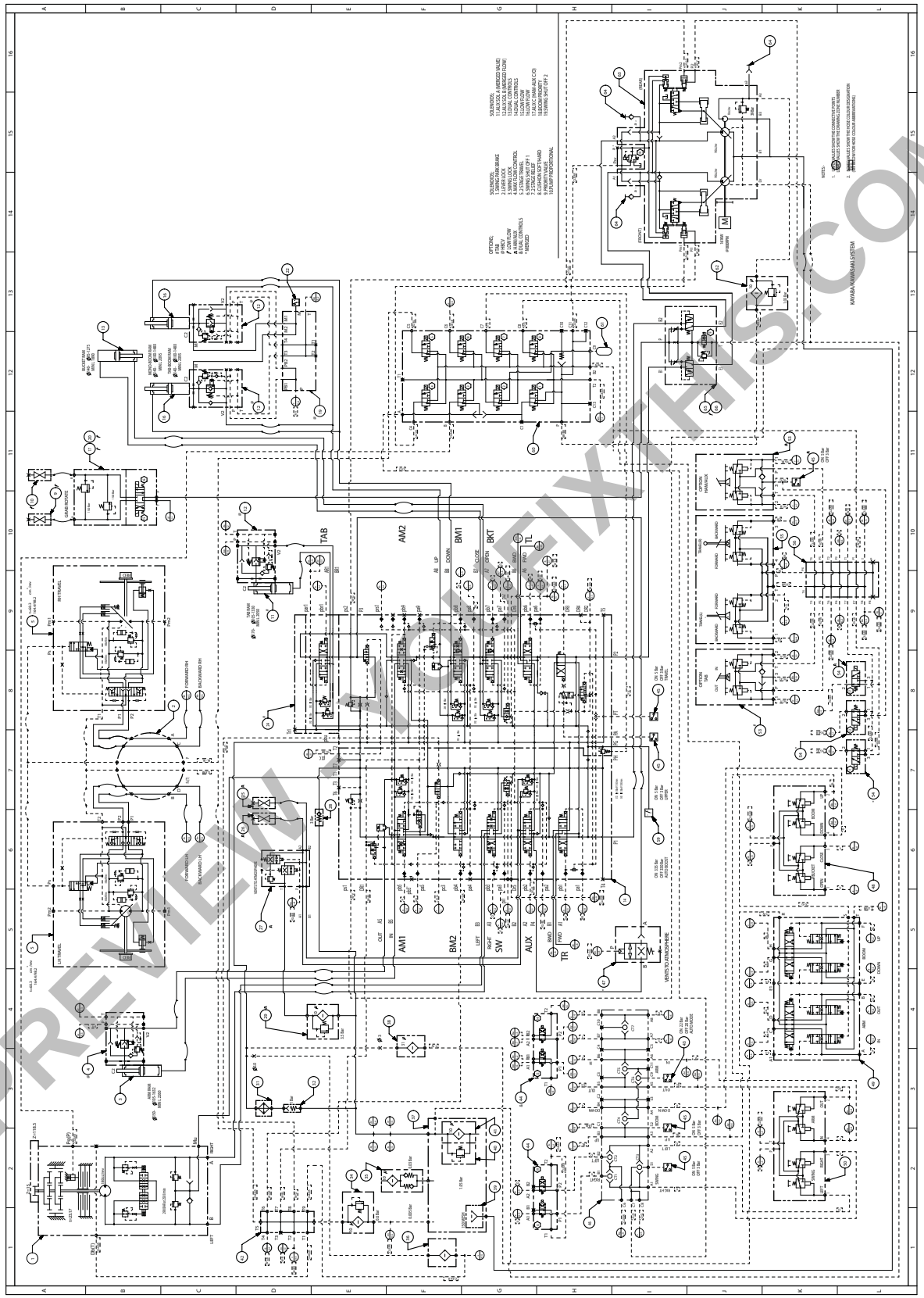


Fig 1. Hydraulic Schematic 332/J5779 Issue 2

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Hydraulic Pump/Regulator Exploded View

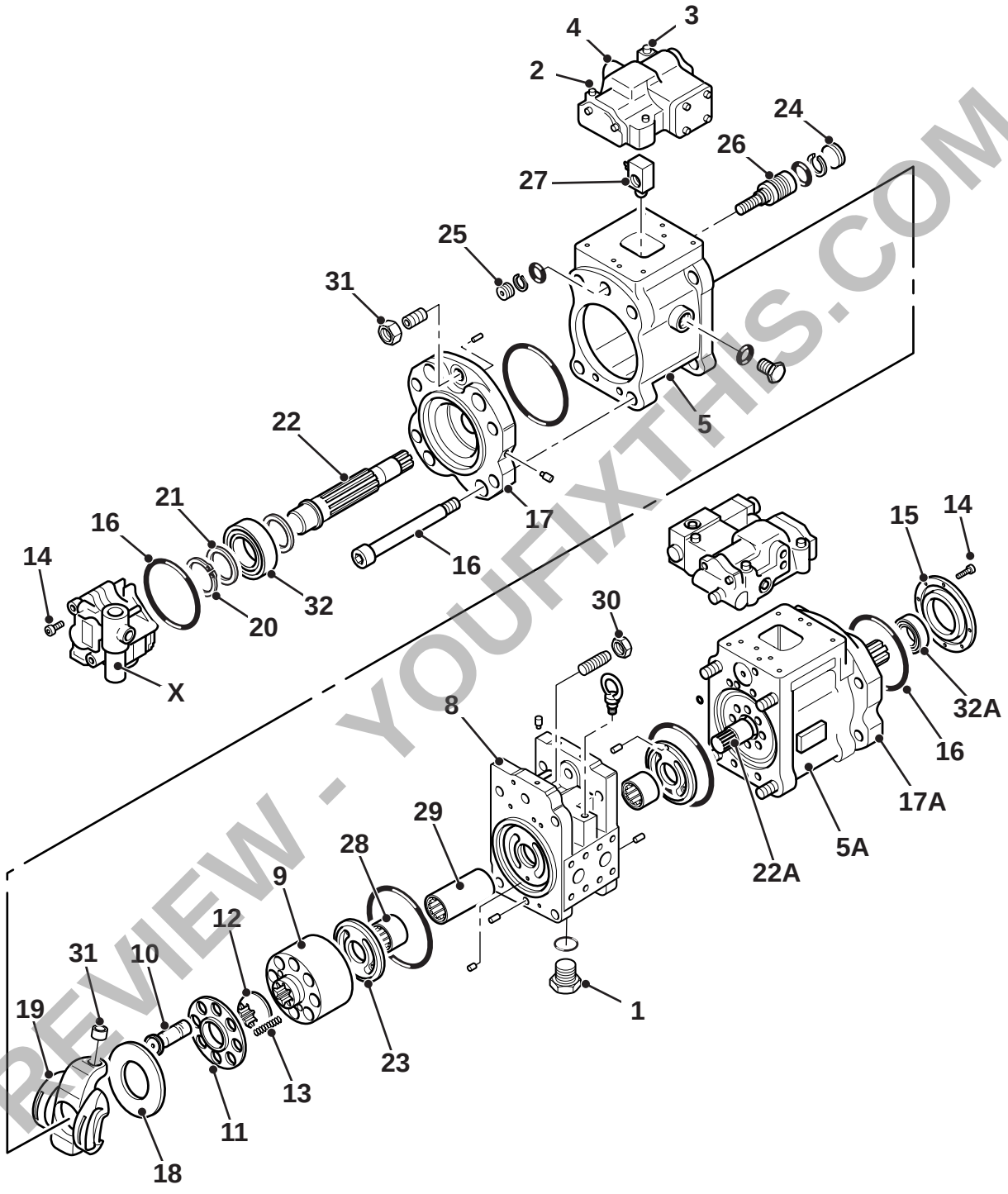


Fig 3.

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Fault Finding

Transmission

Traction Motor

Symptom	Possible Cause	Remedy
a Motor does not run.	**1** Device external to the piston motor or reduction gear malfunctioning.	Check that the specified pressurised oil is delivered to the motor input side. Inspect all associated devices and repair if necessary.
	2 Sliding area of motor is excessively worn, allowing pressurised oil to escape.	Renew the excessively worn part. Remove scratches and burrs from the surface and completely clean all parts. Reassemble.
	3 Malfunction resulting from damaged motor part(s), resulting in excessive noise.	Dismantle and renew the damaged part(s). Completely clean all parts and then reassemble.
	4 Relief valve operating due to excessive motor loading.	Check the load and only operate the machine with a suitable load.
b Motor speed low.	**1** Oil not supplied to motor at specified rate due to problems in hydraulic pump, pressure control valve etc.	Check that the specified pressurised oil is delivered to the motor input side. Inspect all associated devices and repair if necessary.
	2 Volume efficiency of motor low.	After dismantling, check for abnormal wear of the sliding area and repair or renew the worn parts.
c Motor speed varies greatly.	**1** Large amount of pressurised oil escapes and flows out of the drain port due to wear on the sliding area of the motor.	Dismantle and renew excessively worn parts. Clean all parts and reassemble.
	2 Wear in the bearings.	Renew motor bearings.
	3 Motor load is excessive and automatic 2-speed function is operating.	Check the load and only operate the machine with a suitable load.
d Oil leaks.	**1** Oil leaks due to damaged oil seals or O-rings.	Renew damaged oil seals or O-rings. When fitting an oil seal, be careful not to damage the lip. Check the system to ensure the running temperature does not exceed 80 °C. Take the necessary steps to ensure the temperature remains within the acceptable range.
	2 Refer to a2 and/or c1. ⇨ ***Traction Motor (F-3)***	Refer to a2 and/or c1. ⇨ ***Traction Motor (F-3)***
	3 Clogging due to foreign matter in drain pipe or long, narrow pipes causing the oil seal to break.	Clean the clogged drain piping. Recheck the piping system and reduce the passage resistance. Renew the oil seal taking care not to damage the lip.
e Abnormal noise, excessive speed and pressure variation due to cavitation.	**1** When the motor works as a pump, when the closed circuit is used, when the boost pressure is low (standard: 0.4 -5 kgf/cm^2) or when the double counterbalance valve operates improperly, negative pressure is generated on the suction side of the motor, resulting in cavitation.	Recheck the hydraulic circuit and by remedying or renewing the double counterbalance valve, prevent the generation of negative pressure. Dismantle the motor and renew any abnormally worn or broken parts.

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Engine Error Codes

TK-001

Engine `NO RESTART'. If this message appears the engine will continue to run to allow the machines to be moved to a position of safety where the machine can be repaired. Once the engine is stopped it will not restart until the repair as been carried out.

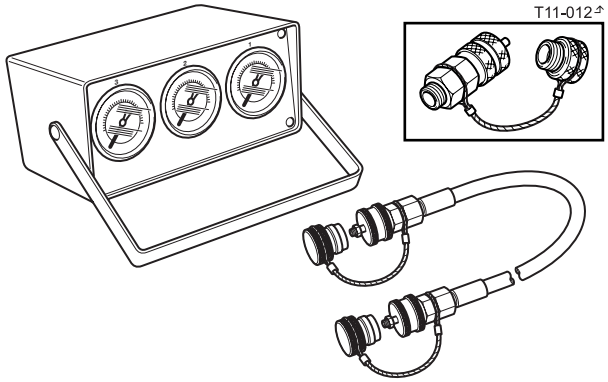
If the message `LOW POWER' displays the engine power is reduced to 60% power to protect the engine.

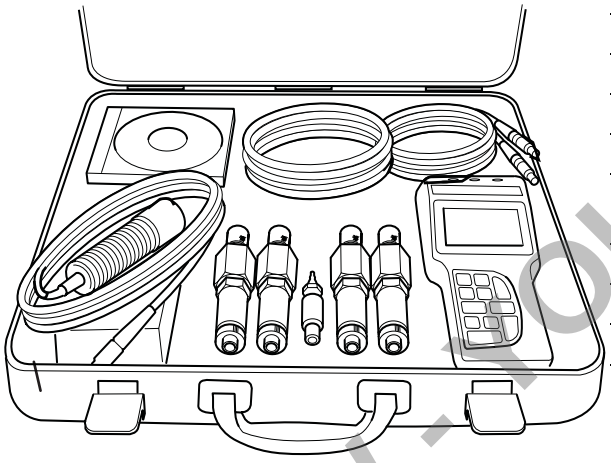
Table 3.

Use for identification the repair part			**Engine fault LED**	**Caution LED**	**Buzzer ON (1.5 sec)**	**Error Code Display (eg. ENG P0335)**	**Message Displayed**
DTC	Diagnostic Monitoring Item (Malfunction Title)	Condition for Setting DTC					
P0087	Fuel rail pressure is too low (Fuel leak)	Actual rail pressure < Minimum target rail pressure at actual rail pressure is 15MPa or more	✓		✓	✓	LOW POWER
P0088	Common rail pressure (1st stage)	Rail pressure is over 185MPa	✓		✓	✓	LOW POWER
P0088	Common rail pressure (2nd stage)	Common rail pressure failure (1st. Stage) is occurred and the rail pressure is over 190MPa.	✓		✓	✓	LOW POWER
P0089	Common rail pressure (excessive pressure for pump)	DUTY for SCV is 40% or more. Or Actual rail press -Target rail press >40MPa~ then target fuel flow is 90mm 3/st or less.	✓		✓	✓	LOW POWER
P0090	Fuel pressure regulator control circuit	SCV driving current > 2400mA or 50mA < SCV driving current, or Target current - Actual current >1000 mA	✓		✓	✓	LOW POWER
P0107	Air pressure sensor (low voltage)	The voltage of air pressure temperature sensor falls below 0.099V.	✓			✓	
P0108	Air pressure sensor (high voltage)	The voltage of air pressure temperature sensor exceeds 4.85V.	✓			✓	
P0112	Intake air temperature circuit (low voltage)	The voltage of intake temperature sensor falls below 0.099V.	✓			✓	
P0113	Intake air temperature circuit (high voltage)	The voltage of intake temperature sensor exceeds 4.85V.	✓			✓	

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Note: *No longer available, refer to 998/11051 JCB ServiceMaster Digital Hydraulic Datalogger Pressure Test Kit.* ⇨ *Fig 44. (1-27)**.*	892/00201	Replacement Gauge 0-20 bar (0-300 lbf/in²)
 **Fig 43. 892/ 00253 Hydraulic Circuit Pressure Test Kit**	892/00202	Replacement Gauge 0-40 bar (0-600 lbf/in²)
	892/00203	Replacement Gauge 0-400 bar (0-6000 lbf/in²)
	892/00254	Replacement Hose
	993/69800	Seal Kit for 892/00254 (can also be used with probe 892/00706)
	892/00706	Test Probe
	892/00347	Connector - Hose to gauge

 **Fig 44. 998/11051 JCB ServiceMaster Digital Hydraulic Datalogger Pressure Test Kit**	998/11052	Hand Held 4-Channel ServiceMaster Unit
	998/11053	SensoWin Software Kit and PC Cable
	998/11054	Equiment Case SCC-750
	998/11055	0-600 Bar Pressure Transduce x2
	998/11056	0-100 Bar pressureTransducer x2
	998/11057	RPM Tachometer (includes fixed cable, 2 meters)
	998/11058	5 Meter Connecting Cable
	998/11059	M16 Metric Adaptors for Test Points x4
	998/11060	400mm Test Hose 90˚ HSP to M16 x2
	998/11061	400mm Test Hose Straight HSP to M16 x2

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Coolant Mixtures

T3-009_3

Check the strength of the coolant mixture at least once a year, preferably at the start of the cold period.

Replace the coolant mixture according to the intervals shown in the machine's Service Schedule.

⚠ WARNING

Antifreeze can be harmful. Obey the manufacturer's instructions when handling full strength or diluted antifreeze.

7-3-4-4_1

You must dilute full strength antifreeze with clean water before use. Use clean water of no more than a moderate hardness (pH value 8.5). If this cannot be obtained, use de-ionized water. For further information advice on water hardness, contact your local water authority.

The correct concentration of antifreeze protects the engine against frost damage in winter and provides year round protection against corrosion.

The protection provided by JCB High Performance Antifreeze and Inhibitor is shown below.

50% Concentration (Standard)

Protects against damage down to -40 °C (-39 °F)

60% Concentration (Extreme Conditions Only)

Protects against damage down to -56 °C (-68 °F)

Important: *Do not exceed a 60% concentration, as the freezing protection provided reduces beyond this point.*

If you use any other brand of antifreeze:

- Ensure that the antifreeze complies with International Specification ASTM D6210.
- Always read and understand the manufacturer's instructions.
- Ensure that a corrosion inhibitor is included. Serious damage to the cooling system can occur if corrosion inhibitors are not used.
- Ensure that the antifreeze is ethylene glycol based and does not use Organic Acid Technology (OAT).

Fuel

Introduction

The quality and grade of fuel can seriously affect the service life of the fuel system. It is vitally important that the correct grade of fuel is used, a high standard of fuel storage is maintained and the use of old fuel is avoided.

The following factors should be used to ensure that the service life of the fuel system is maintained.

- ⇒ *Fuel Specifications (3-25)*
- ⇒ *Cleanliness (3-26)*
- ⇒ *Fuel Bulk Storage (3-27)*
- ⇒ *Fuel Analysis (3-27)*

Fuel Specifications

⚠ CAUTION

Consult your fuel supplier or JCB distributor about the suitability of any fuel you are unsure of.

GEN-9-2

Recommended Fuel Specification

The following fuels are recommended for use with Tier III machines.

- EN590 Diesel Fuel Types - Auto/Co/C1/C2/C3/C4.
- ASTM D975-91 Class 2, US DF1, US DF2, US DFA.
- JIS K2204 (1996) Grades 2, 3, and Special Grade 3.

Acceptable Fuel Specification

The following fuels will require some additional care and service requirements.

⚠ CAUTION

The fuel specification below is acceptable, however this fuel may reduce the life of the fuel injection equipment. The use of this fuel may also affect the engine performance.

GEN-9-3

- ASTM D975-91 Class 1-1DA.
- JP7, MIL T38219 XF63.
- NATO F63.
- French EN590 (RME5) with 5% maximum.
- RME content blended with mineral derived diesel (5% maximum)

Low Sulphur Fuels

Low sulphur fuels must have the appropriate fuel lubricity additives added to prevent premature wear of the pump

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Fan Belt

Checking the Fan Belt Tension

⚠ WARNING

Make sure the engine cannot be started. Disconnect the battery before doing this job.

2-3-3-5

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

2 Check the fan belt tension. There must be 6-8 mm (0.24-0.31 in) slack at **X**.

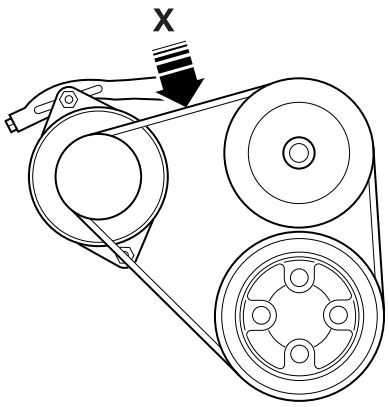


Fig 45.

3 Loosen the alternator. Slacken bolts **A** and **B**.

4 Adjust the fan belt

a Use a lever to re-position the alternator so as to adjust the fan belt tension.

Note: *If the fan belt is stretched so much that it cannot be adjusted correctly, fit a new belt.*

b While levering the alternator pinch the bolt **A** and check the tension on the belt.

c If it is not correctly tensioned complete steps 4 and 5.

d When correct tension is achieved fully tighten bolts **A** and **B**.

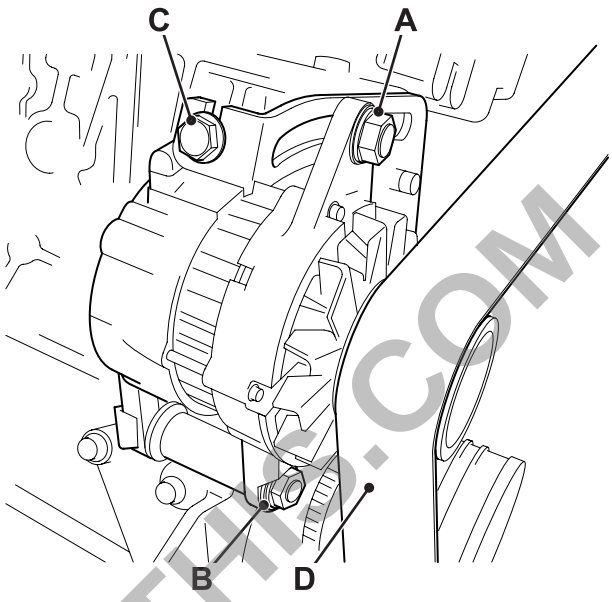


Fig 46.

Fitting a New Fan Belt

Complete steps 1 and 2.

1 Loosen the alternator. Slacken bolts **A, B** and adjust plate **C** so that the alternator is levered towards the engine, so that the fan belt **D** can be removed.

2 Fit a new fan belt. Remove the fan belt **D** and replace it with a new one, make sure the `V' profile locates in the pulleys correctly.

Note: *It may be necessary to apply leverage to the new belt to get it over the pulleys.*

3 Adjust the fan belt. Carry out step 5 of Adjusting the Fan Belt.

4 Re-check the fan belt tension. Check after running the machine for 5 minutes at low idle.

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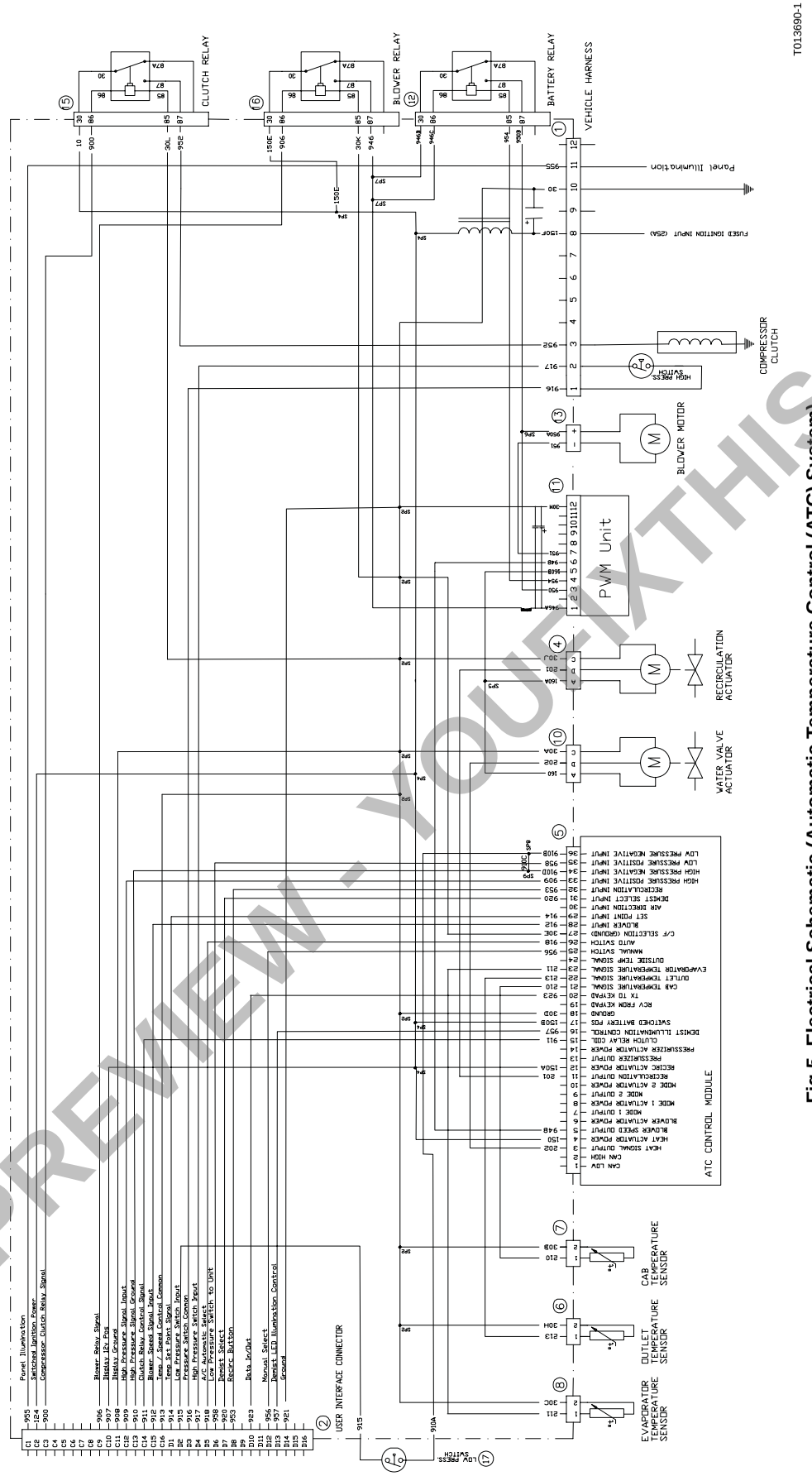


Fig 5. Electrical Schematic (Automatic Temperature Control (ATC) System)

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Auto Boost Pressure

Operation

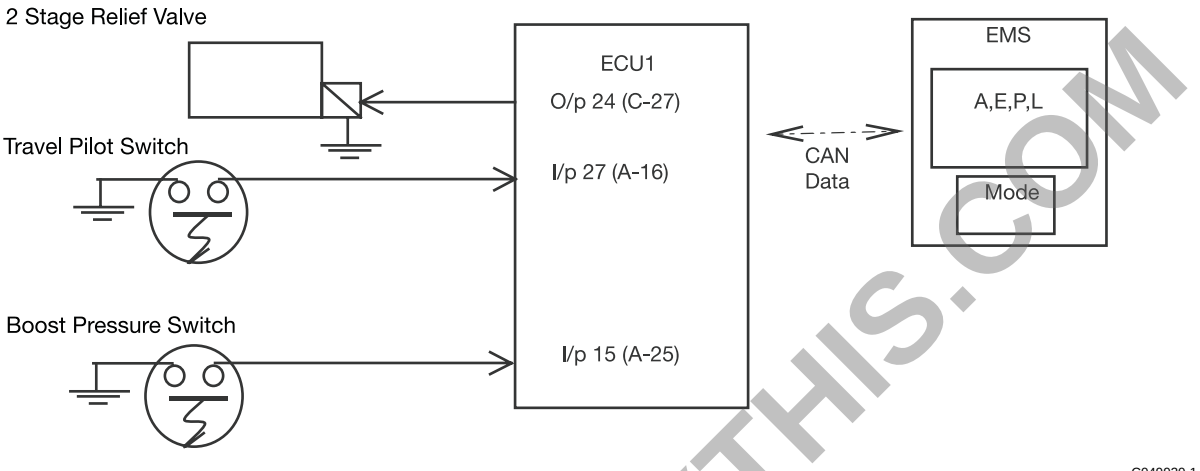


Fig 30.

The auto pressure boost function is only available when the excavator is in auto mode. By default it is not available in precision and economy mode and is permanently on (although not indicated on the EMS) in lifting mode.

In auto mode, when the boost pressure switch is closed the 2 stage relief valve, ECU1 o/p 24 (C-27) is energised (according to the logic diagram, ⇨ *Fig 31. (C-26)*). This allows a pressure increase in the excavating hydraulic circuit thus generating extra digging force.

If the boost pressure switch is seen for less than 1.5 seconds then the 2 stage relief valve is energised until the boost pressure switch is de-energised, then the logic sequence is reset and will allow the sequence to be started over again.

If the boost pressure switch is seen for more than 1.5 seconds then the 2 stage relief valve should stay open for a further 1.5 seconds. The valve cannot be re-energised for 9 seconds after the end of the last activation

However during travel operation (denoted by the travel pilot switch input) the 2 stage relief valve is energised. If the boost pressure switch is closed when the travel pressure switch is valid, the solenoid will remain energised

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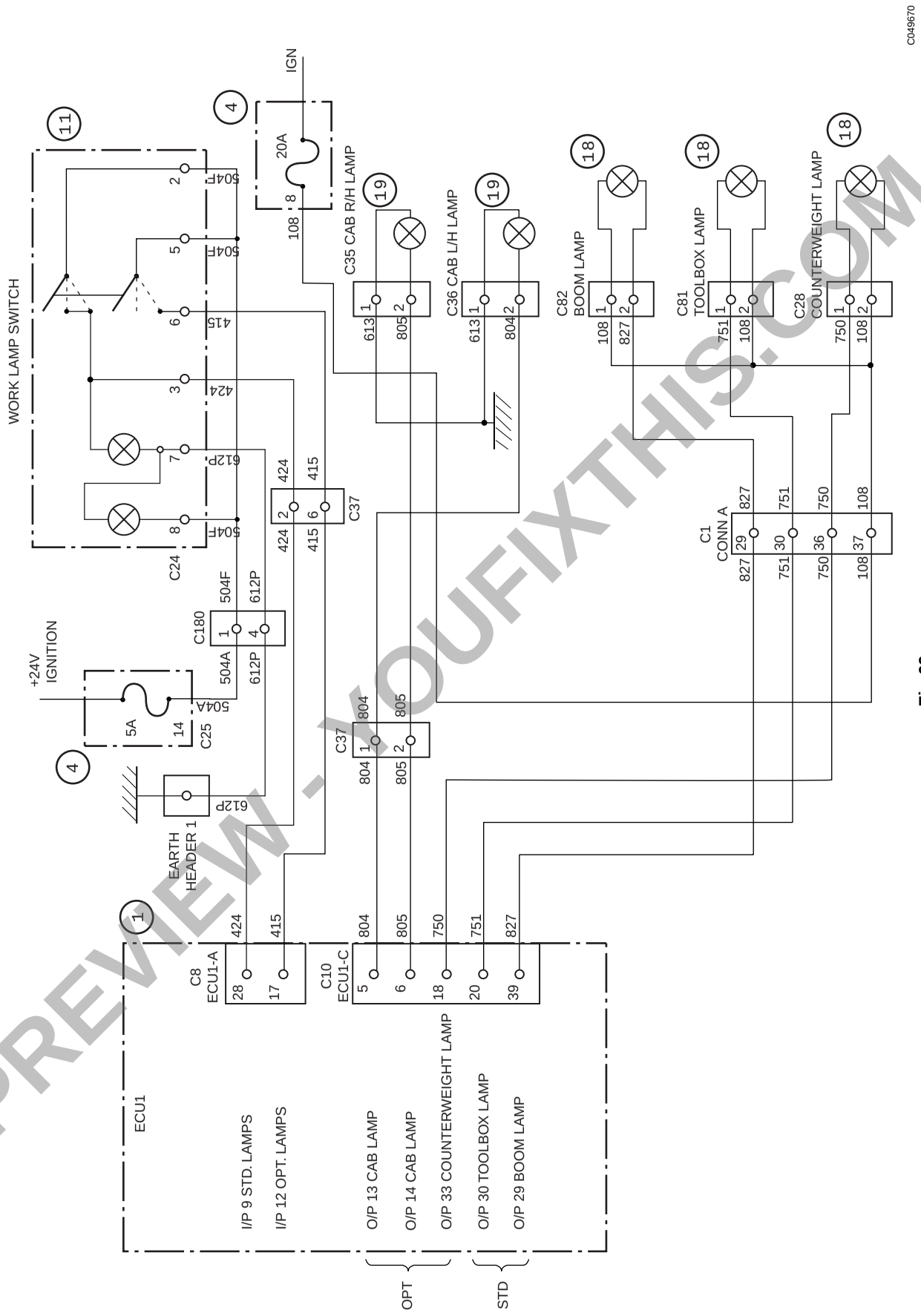


Fig 69.

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Table 3. Port Identification

Item	Port	Function
22	P1	Pump 2 Input
23	A1	Travel (L) Backwards
24	A2	Hammer/Auxiliary Option
25	P4	Merge In (if fitted)
26	A3	Swing Left
27	Pi1	Boom Priority
28	A5	Arm 1 Out
29	ps1	Negative control (Pump 2)
30	T1	Tank
31	pc3	Slew Over Dipper Priority
32	B5	Arm 1 In
33	B3	Swing Right
34	B2	Hammer/Auxiliary Option
35	B1	Travel (L) Forward

For port location, ⇒ *Fig 5. (🗋 E-60)*.

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Traction Motor / Reduction Gear

Description

The motor is of the variable swash plate, axial piston type. Pressurised oil is routed via rear flange **A** and timing plate **F** into cylinder block **D**.

The fixed timing plate directs oil to force piston **E** against swash plate **C**, until it reaches the end of its power stroke, causing the cylinder block to rotate 180°. When the piston reaches the end of its power stroke, the cylinder is disconnected from the oil supply line and instead is connected to the return line. The next 180° of cylinder block rotation causes the piston to complete its cycle by expelling the oil from the cylinder back to tank.

Altogether there are nine pistons, operating sequentially as described above to provide smooth continuous rotation of the cylinder block, which is spline coupled to drive shaft **B**.

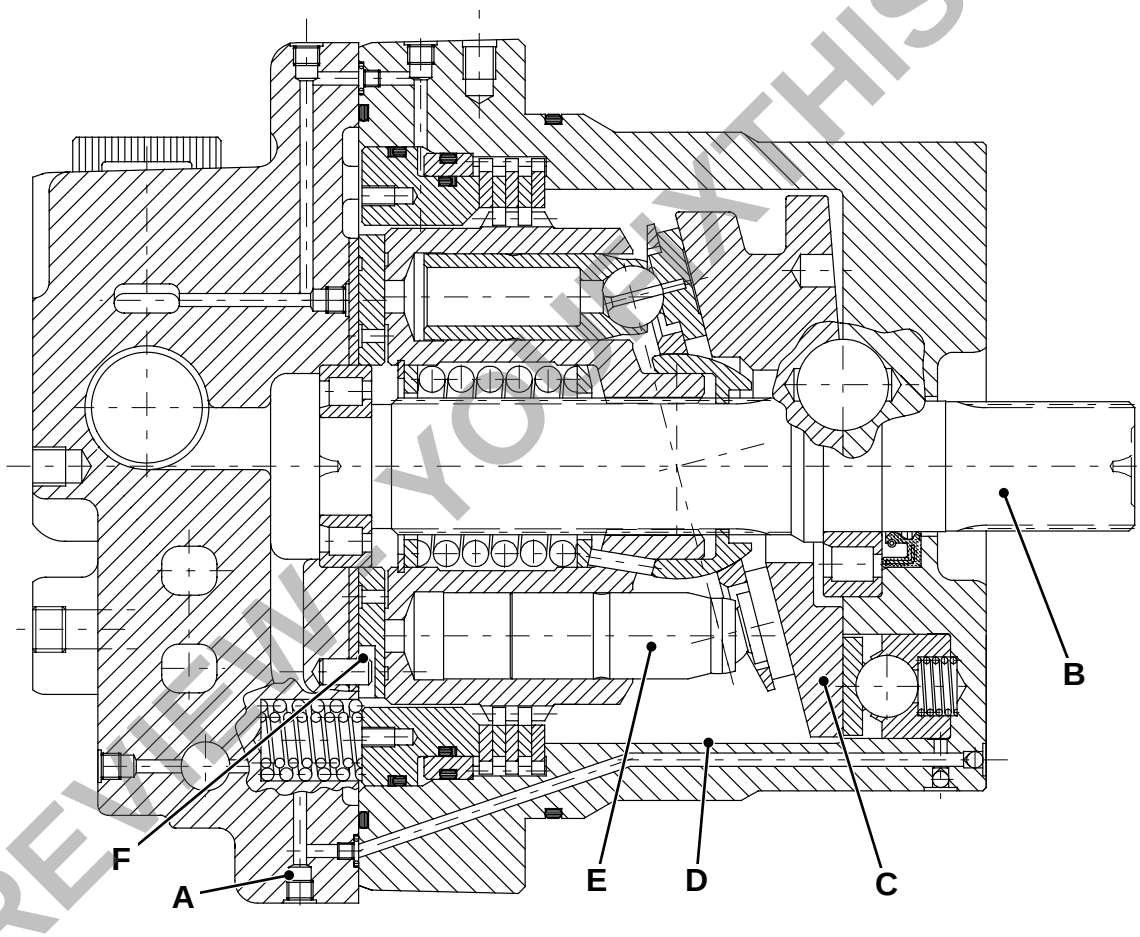
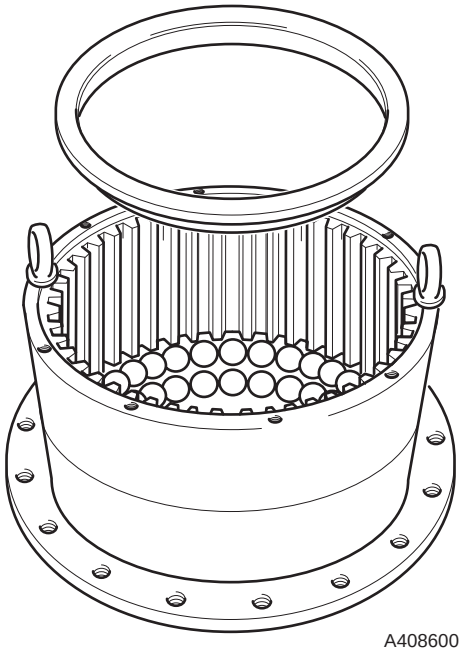


Fig 1.

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Fig 129.

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Notes:

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