Service Manual

VMT860 Tier 3

Service Manual - VMT860 Tier 3

Publication No.
9813/0750

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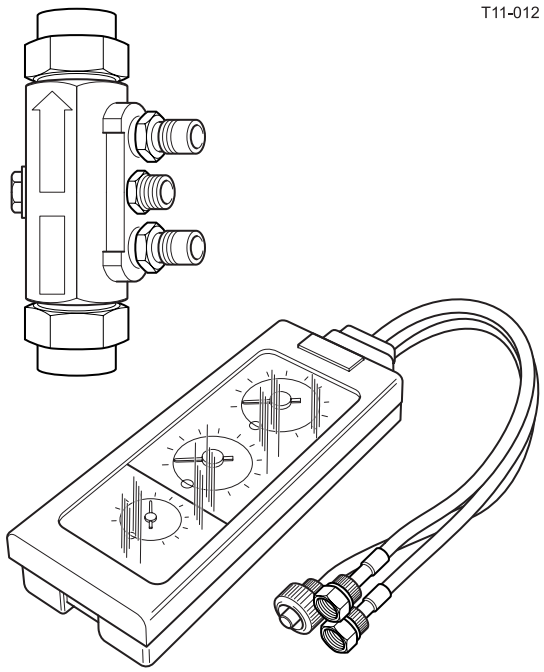
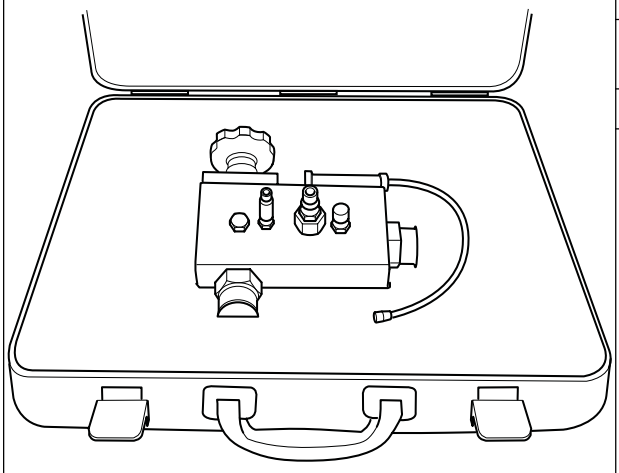
Table 4. Metric Grade 10.9 Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
ISO Metric Thread	mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M5	5	8	8.1	0.8	6.0	7.3	0.7	5.4
M6	6	10	13.9	1.4	10.2	12.5	1.3	9.2
M8	8	13	34.0	3.5	25.0	30.0	3.0	22.1
M10	10	17	67.0	6.8	49.4	60.0	6.1	44.2
M12	12	19	116.0	11.8	85.5	104.0	10.6	76.7
M16	16	24	288.0	29.4	212.4	259.0	26.4	191.0
M20	20	30	562.0	57.3	414.5	506.0	51.6	373.2
M24	24	36	971.0	99.0	716.9	874.0	89.1	644.6
M30	30	46	1930.0	196.8	1423.5	1737.0	177.1	1281.1
M36	36	55	3374.0	344.0	2488.5	3036.0	309.6	2239.2

Table 5. Metric Grade 12.9 Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
ISO Metric Thread	mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M5	5	8	9.8	1.0	7.2	8.8	0.9	6.5
M6	6	10	16.6	1.7	12.2	15.0	1.5	11.1
M8	8	13	40.0	4.1	29.5	36.0	3.7	26.5
M10	10	17	80.0	8.1	59.0	72.0	7.3	53.1
M12	12	19	139.0	14.2	102.5	125.0	12.7	92.2
M16	16	24	345.0	35.2	254.4	311.0	31.7	229.4
M20	20	30	674.0	68.7	497.1	607.0	61.9	447.7
M24	24	36	1165.0	118.8	859.2	1048.0	106.9	773.0
M30	30	46	2316.0	236.2	1708.2	2084.0	212.5	1537.1
M36	36	55	4049.0	412.9	2986.4	3644.0	371.6	2687.7

Note: *No longer available, refer to 998/11046 JCB ServiceMaster Flow Test Kit.* ⇒ *Fig 18. (17)*.	892/00268	Flow Monitoring Unit
 **Fig 17. 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 18. 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)

⚠ WARNING

Mobile Phones

Switch off your mobile phone before entering an area with a potentially explosive atmosphere. Sparks in such an area could cause an explosion or fire resulting in death or serious injury.

Switch off and do not use your mobile phone when refuelling the machine.

INT-3-3-9

⚠ WARNING

Lifting Equipment

You can be injured if you use incorrect or faulty lifting equipment. You must identify the weight of the item to be lifted then choose lifting equipment that is strong enough and suitable for the job. Make sure that lifting equipment is in good condition and complies with all local regulations.

INT-1-3-7_2

⚠ WARNING

Raised Equipment

Never walk or work under raised equipment unless it is supported by a mechanical device. Equipment which is supported only by a hydraulic device can drop and injure you if the hydraulic system fails or if the control is operated (even with the engine stopped).

Make sure that no-one goes near the machine while you install or remove the mechanical device.

13-2-3-7_3

⚠ WARNING

Raised Machine

NEVER position yourself or any part of your body under a raised machine which is not properly supported. If the machine moves unexpectedly you could become trapped and suffer serious injury or be killed.

INT-3-3-7_1

⚠ DANGER

Lightning

Lightning can kill you. Do not use the machine if there is lightning in your area.

5-1-1-2

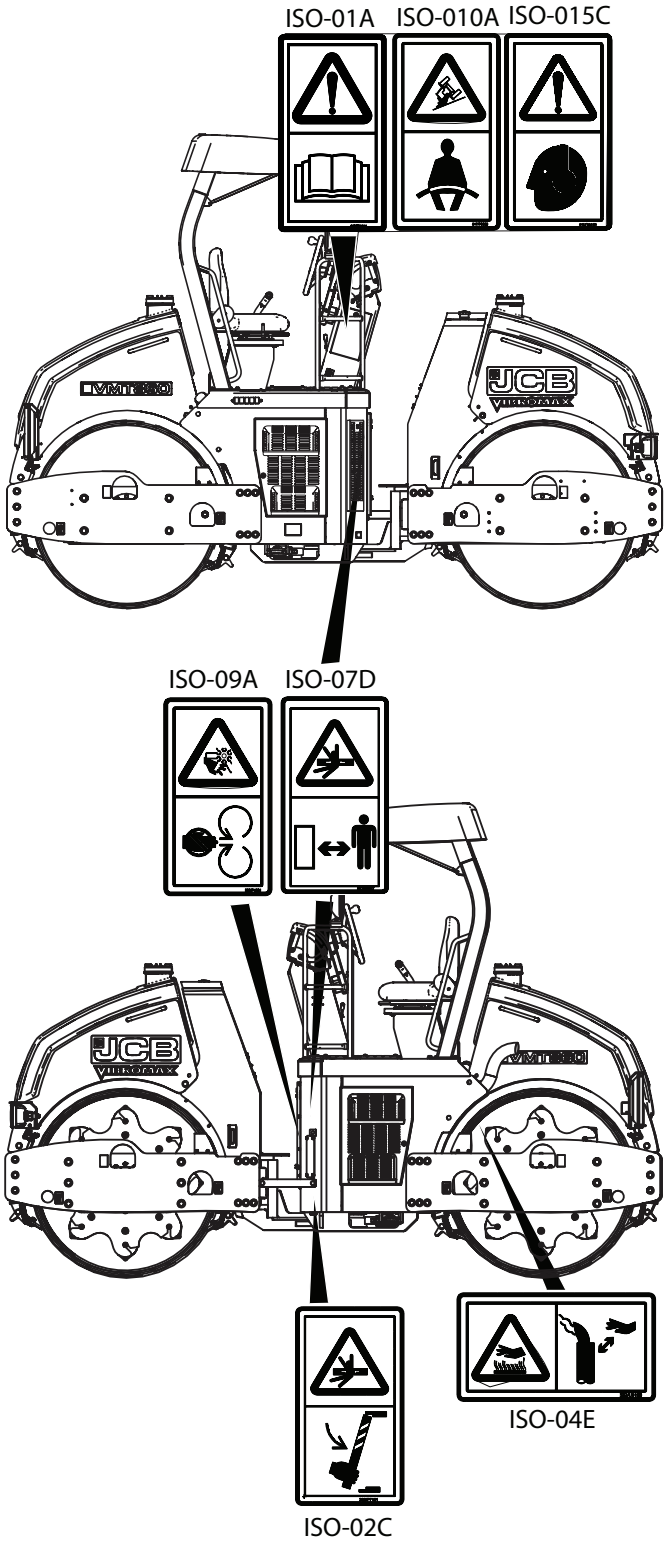
⚠ WARNING

Machine Modifications

This machine is manufactured in compliance with legislative and other requirements. It should not be altered in any way which could affect or invalidate any of these requirements. For advice consult your JCB Distributor.

INT-1-3-10_2

Safety Label Identification



T047560

Fig 1.

Warning Symbols

The following warning symbols may be found on the battery

Symbol	Meaning
 D000504	Keep away from children.
 D000505	Shield eyes.
 D000506	No smoking, no naked flames, no sparks.
 D000507	Explosive Gas.
 D000509	Battery acid.
 D000508	Note operating instructions.

Battery Maintenance Check

1 Check warning indicator located on top of the battery. For detail see ⇨ *Battery Warning Indicator (26)*

2 Clean terminals/terminal clamps with emery cloth. and wipe clean.

3 Smear vaseline on terminals/terminal clamps. Do not use grease.

4 Tighten terminal clamps.

5 Tighten battery clamp.

First Aid-Electrolyte

Do the following if electrolyte:

Gets into your eyes

Immediately flush with water for 15 minutes, always get medical help.

Is swallowed

Do not induce vomiting. Drink large quantities of water or milk. Then drink milk of magnesia, beaten egg or vegetable oil. Get medical help.

Gets onto your skin

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.

Additives

The additives listed below are advertised as being suitable for bringing the lubricity levels of kerosene/low sulphur fuels up to those of diesel fuels. They must be used as specified by your fuel supplier who will understand the concentration level necessary.

- Elf 2S 1750. Dosage 1000-1500 ppm (0.1 - 0.15%), specifically for Indian Superior Kerosene (SKO) but may be applicable to other fuels.
- Lubrizol 539N. Dosage (on Swedish low sulphur fuel) 250 ppm.
- Paradyne 7505 (from Infineum). Dosage 500 ppm (0.05%).

Note: *These products are given as examples only. The information is derived from the manufacturers data. The products are not recommended or endorsed by JCB.*

Service Requirements for use of B20 Biodiesel

- The engine oil must be a grade CH4 as minimum specification.
- Do not leave unused B20 biodiesel in the fuel tank for extended periods (top up each day).
- Make sure that 1 in 5 fuel tank fills use standard diesel to EN590 specification, this will help to prevent 'gumming'.
- Make sure regular oil sampling is completed (look for excessive unburnt fuel content, water or wear particles.
- Change the engine oil and filter more frequently (as a minimum half the recommended intervals), or as indicated by oil sampling.
- Change the fuel filters more frequently (as a minimum half the recommended intervals), or if there are engine performance related issues.
- Make sure the fuel is stored correctly, care must be taken to make sure no water enters the machine fuel tank (or the storage tank). Water will encourage mico-bacterial growth.
- Make sure that the fuel pre-filter is drained daily (not every week as currently advised).
- Only JCB engines built after Jan. 2007 are applicable (i.e. engines with 07 on the end of their serial number and factory filled with CH4 oil) - this is not approved with other manufacturers.
- Use heater kits in low ambient temperature territories.
- The biodiesel must meet the following standards: ASTM D6751, DIN 51606, ISO 14214

Note: *If necessary use a test kit to confirm the fuel specification. Testing kits are available (not from JCB currently), use the internet as a source for the kits.*

Note: *If performance related issues are to be reported to JCB Service, and the engine has been run on biodiesel, then the fuel system must be filled with standard diesel (at least 2 x tank fills) to EN590 specification and relevant stall speeds recorded prior to making the report.*

Warranty

JCB have shown a commitment to support the environment by approving the use of biodiesel blended fuels.

Using a B20 blend of biodiesel requires caution and additional servicing of the engine is required. ⇒ ***Service Requirements for use of B20 Biodiesel (16)***.

Failure to follow the additional recommended service requirements may lead to a warranty claim being declined.

Failures resulting by the incorrect use of biodiesels or other fuel additives are not defects of the JCB Dieselmax engine workmanship and therefore will not be supported by JCB Warranty.

Electrical System

Battery

Battery Disconnection/Connection

T3-019_4

WARNING

Keep metal watch straps and any metal fasteners on your clothes, clear of the positive (+) battery terminal. Such items can short between the terminal and nearby metal work. If it happens you can get burned.

5-2-2-4

Disconnection

1 Get access to the battery. See ***Access Panels***.

2 If the machine has a battery isolator, move the switch to the OFF position then remove the key.

3 Remove the leads. Disconnect the earth (-) terminal first.

Connection

1 Check the battery.

a If the terminal is dirty, clean the post.

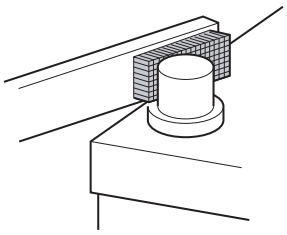


Fig 2.

b If the terminal post is corroded and generates white powder wash the terminal with hot water. If considerable corrosion is detected, clean with a wire brush or abrasive paper.

c After cleaning, apply a thin coat of petroleum jelly to the terminal.

2 Re-connect the leads. Connect the earth (-) terminal last.

3 If the machine has a battery isolator, move the switch to the ON position.

4 Close and lock the access panels.

Battery Warning Indicator

All exide battery have a indicator on the top, which shows various warning for the battery. The warnings are:

 D021870	Green color indicates that battery is OK
 D021880	White color indicates that battery needs charging
 D021890	In the event of the indicator showing red, open service plugs with the help of a coin and top up with pure distilled water or call any authorised Exide battery dealer. Do not use screw driver for opening the plugs.

Checking the Electrolyte Level

Maintenance free batteries used in normal temperate climate applications should not need topping up. However, in certain conditions (such as prolonged operation at tropical temperatures or if the alternator overcharges) the electrolyte level should be checked as described below.

1 Get access to the battery. See ***Access Panels***.

2 Disconnect and remove battery. See ***Battery Disconnection/Connection.***

WARNING

Do not top the battery up with acid. The electrolyte could boil out and burn you.

2-3-4-6

3 Remove service plugs **A**. Look at the level in each cell. The electrolyte should be 6 mm (1/4 in) above

Front End Accessory Drive (FEAD) Belt

Introduction

The front end accessory drive belt (FEAD) drives the alternator, water pump and the air conditioning compressor (if fitted).

The belt is automatically kept in tension so will not need to be adjusted.

⚠ WARNING

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

2-3-3-5

⚠ WARNING

Turning the Engine

Do not try to turn the engine by pulling the fan or fan belt. This could cause injury or premature component failure.

0094

Inspecting the Drive Belt

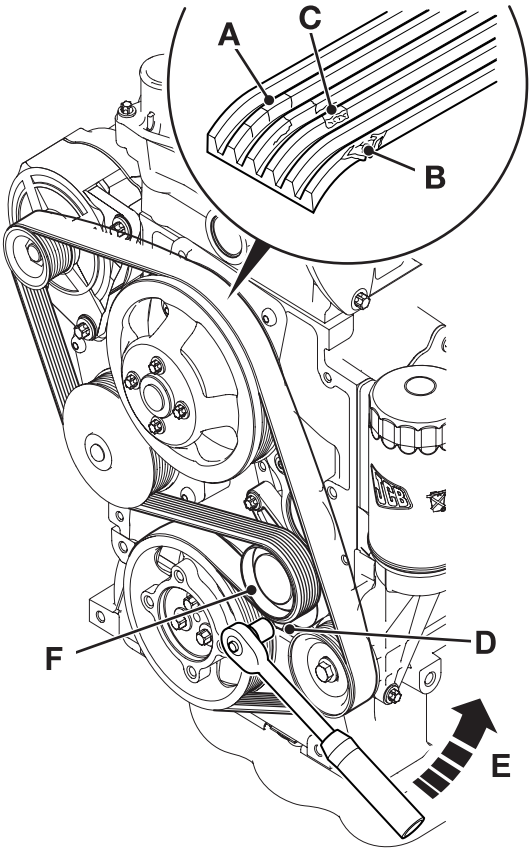
T3-029

At the recommended service interval, visually inspect the belt for damage.

1 Get access to the drive belt. Refer to ***Front End Accessory Drive Belt, Introduction***.

2 Inspect the belt for cracks **A**, fraying **B** or missing pieces **C**. ⇨ *Fig 9. (🗋 36)*.

Fit a new belt as required. Refer to ***Changing the Drive Belt***.



763440-2

Fig 9.

Changing the Engine Fuel Filter Element

Mechanical Fuel Injection System

1 Get access to the Engine Fuel Filter. Refer to ***Water Separator and Engine Fuel Filter, Introduction.***

2 Thoroughly clean the outside of the filter housing andaround the filter head.

3 Loosen the drain tap **A** and allow the fuel to drain into a suitable container.

4 Mark the pipes prior to removal to ensure they are refitted in the correct position. Press fuel coupling release button **B** and disconnect fuel lines **C** and **D**.

5 Release the filter strap retaining screw E and lift the filter clear.

6 Install new filter element **F**. Make sure that the black dot G is aligned with the locating hole **H** in the strap. Torque tighten the filter strap retaining screw E to 24 Nm (17.7 lbf ft).

7 Reconnect the fuel lines **C** and **D**.

8 Bleed the fuel system. Refer to Bleeding the System.

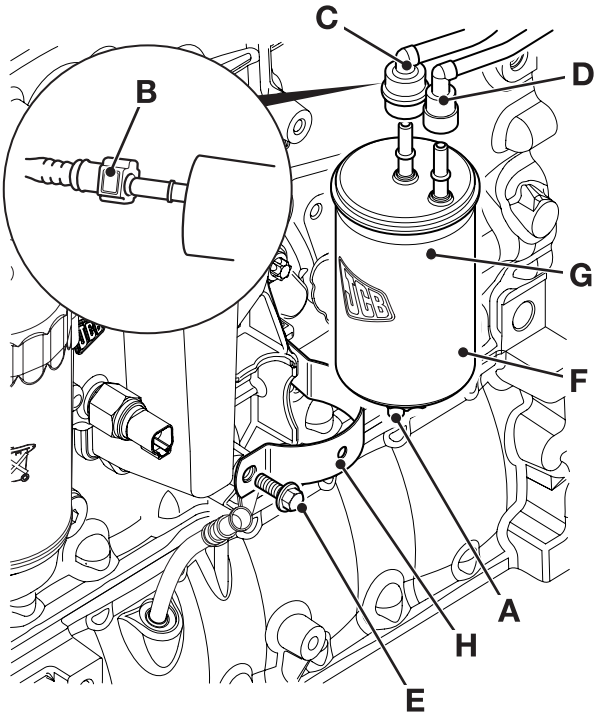


Fig 17.

Drum Drive Gearbox

Checking the Oil Level

1 Park the machine on firm level ground. ⇨ *Stopping and Parking the Machine (🗋 45)*.

Make sure that the level plug **A** is at 90 degrees to the vertical and the drain plug **B** is pointing down.

2 Switch off the engine and remove the ignition key.

3 Remove the level plug **A**. The oil must be level with the lower edge of the bore for the level plug.

4 If necessary add oil. Fill with clean oil.

5 Fit the level plug **A**.

6 Repeat the steps 1 to 5 for the other Drum also.

Changing the Oil

1 Park the machine on firm level ground. ⇨ *Stopping and Parking the Machine (🗋 45)*.

Make sure that the level plug **A** is at 90 degrees to the vertical and the drain plug **B** is pointing down.

2 Switch off the engine and remove the ignition key.

3 Place a suitable container having a capacity of approximately 5 litres below the drain plug **B**.

4 Remove the drain plug **B** and drain the warm oil. Contamination is removed more effectively when the oil is warm.

5 Fit the drain plug **B**. Remove the level plug **A**. Fill the drum drive gearbox with clean oil until it reaches the lower edge of the bore for the level plug **A**. ⇨ *Fluids, Lubricants and Capacities (🗋 13)*.

6 Fit the level plug **A**.

7 Repeat the steps 1 to 6 for the other Drum also.

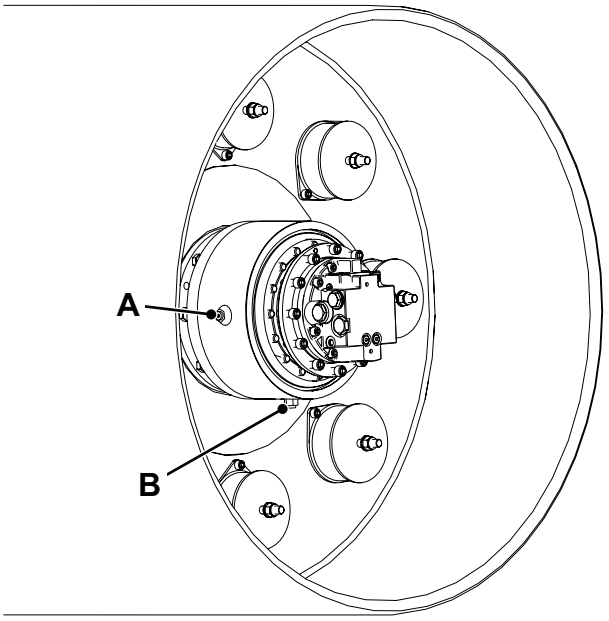


Fig 28.

Testing a Diode or a Diode Wire

A diode wire is a diode with male connector fitted on one end and a female connector fitted on the other end. The diode is sealed in heatshrink sleeving.

1 To test a Diode or a Diode Wire

a On the FLUKE 85.

i Turn the switch to position **1-D**.

ii Press the **HOLD** button and check that the H sign appears at the top right hand side of the display window.

iii Connect the black probe to the end of the diode with a band or to the male connector of the diode wire. Connect the red probe to the other end of the diode or diode wire. If the beeper does not sound the diode or diode wire is faulty.

iv Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. If the beeper sounds or the meter does not read **O.L.**, the diode or diode wire is faulty.

v Press the HOLD button and check that the **H** sign disappears from the right hand side of the display window.

b On the AV0 2003.

i Move the right hand slider to position **2-A**, and the left hand slider switch to position **2-C**.

ii Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. If the Avometer does not buzz the diode is faulty.

iii Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. If the Avometer does not read "1" the diode is faulty.

c On an analogue meter.

i Select the Ohms 1000s (1k) range.

Connect the black probe to the end of the diode marked with a band, or to the male connector of the diode wire, the red probe should be connected to the other end of the diode or diode wire. The meter should read 20-400 kΩ, if it reads more than this the diode is faulty.

ii Select the Ohms 100s range.

Connect the red probe to the end of the diode marked with a band, or to the male connector of the diode wire, the black probe should be connected to the other end of the diode or diode wire. The meter should read 300-400Ω, if it reads less than this the diode is faulty.

Starter Motor

TC-005

Starting Circuit Test

Before carrying out the voltmeter tests, check the battery condition and ensure that all connections are clean and tight.

To prevent the engine starting during the tests ensure that the engine stop fuse is removed, (refer to ***Fuse Identification*** page).

Check the readings in the following sequence using a voltmeter. Unless otherwise stated, the readings must be taken with the starter switch held in the 'start' position ('HS') and the transmission forward/reverse selector in neutral.

Note: *Do not operate the starter motor for more than 20 seconds at one time. Let the starter motor cool for at least two minutes between starts.*

1 Connect the voltmeter across the battery terminals. ⇒ *Fig 17. (14)*. Reading in 'start' position: 10.0V approximately. Minimum permissible reading in 'start' position 9.5V.

A low reading probably indicates a fault in the starter motor.

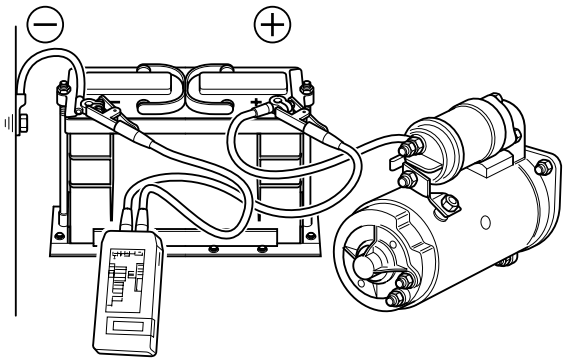


Fig 17.

2 Connect the voltmeter between the starter main terminal **18-A** and the commutator end bracket **18-B**. In the 'start' position, the reading should not be more than 0.5V below the reading obtained in Step 1. Minimum permissible reading in 'start' position 9.0V.

If the reading is within this limit, continue to Step 3. If the reading is outside the limit, proceed to Step 4 and Step 5.

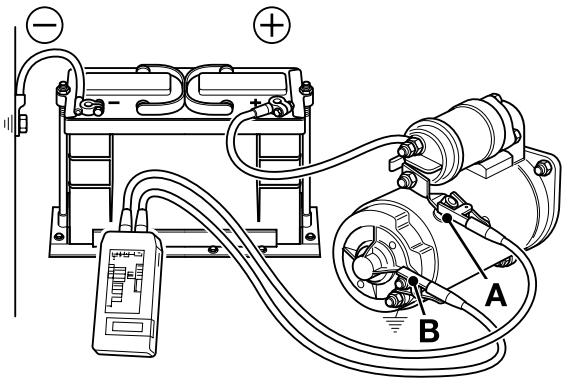


Fig 18.

3 Connect the voltmeter between the solenoid terminal **19-C** and a good earth. Minimum permissible reading in 'start' position: 8.0V.

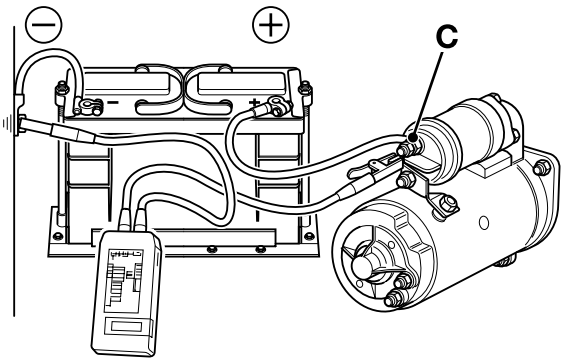


Fig 19.

a If the reading is less than specified, connect the voltmeter between the neutral start relay terminal **20-D** and earth. An increase in reading to 8.0V indicates a fault in the wiring from the start relay to the solenoid.

Front Combination Lamp

T041700

Wire ID	Ident Tag	Color	Size / Gauge	Length	From	Pin	Loc	To	Pin	Loc	Terminal 1	Seal 1	Terminal 2	Seal 2
1	600AS	Y	1.5	1250	FAE	2		SF6	1		7201/0469	–	–	–
2	855A	Y	1.5	2450	SF5	3		FAG	1		–	–	7201/0469	–
3	600AC	Y	1.5	1650	FAD	4		SF6	2		7201/0002	7210/0099	–	–
4	600AB	Y	1.5	2300	FAF	4		SF6	3		7201/0002	7210/0099	–	–
5	600AD	Y	1.0	2450	FAB	2		SF6	5		7201/0070	DT-16-E	–	–
6	600AA	Y	2.0	2350	SF6	6		IBF	1		–	–	7201/0069	DT-16-E
7	404C	Y	1.0	3200	FAB	1		IBF	3		7201/0070	DT-16-E	7201/0070	DT-16-E
8	855	Y	2.0	1950	IBF	10		SF5	1		7201/0069	DT-16-E	–	–
9	853B	Y	1.5	1650	SF5	2		FAE	1		–	–	7201/0469	–
10	600AR	Y	1.5	2050	FAG	2		SF6	7		7201/0469	–	–	–
11	870	Y	1.0	4800	IBF	6		FAC	1		7201/0070	DT-16-E	7201/0001	7210/0002
12	600AT	Y	1.0	2450	FAC	2		SF6	4		7201/0001	7210/0002	–	–
13	837	Y	1.5	3400	IBF	7		SF7	1		7201/0070	DT-16-E	–	–
14	837A	Y	1.5	600	SF7	3		FAD	2		–	–	7201/0002	7210/0099
15	837B	Y	1.5	1250	SF7	2		FAF	2		–	–	7201/0002	7210/0099
16	834B	Y	1.5	4650	FAF	3		IBF	8		7201/0002	7210/0099	7201/0070	DT-16-E
17	834A	Y	1.5	4000	FAD	3		IBF	11		7201/0002	7210/0099	7201/0070	DT-16-E
19	830E	Y	1.0	4650	IBF	9		FAF	1		7201/0070	DT-16-E	7201/0001	7210/0099
21	829E	Y	1.0	4000	IBF	12		FAD	1		7201/0070	DT-16-E	7201/0001	7210/0099
22	806E	Y	1.0	4650	IBF	5		FAF	5		7201/0070	DT-16-E	7201/0001	7210/0099
23	805E	Y	1.0	4000	IBF	4		FAD	5		7201/0070	DT-16-E	7201/0001	7210/0099
25	408	Y	1.0	3200	FAB	3		IBF	2		7201/0070	DT-16-E	7201/0070	DT-16-E

Fig 31. 332/L5204 issue 1

Section E

Hydraulics

Service Manual - VMT860 Tier 3

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Removing and Replacing Components

Renewal of oil seals, gaskets, etc. and any component showing obvious signs of wear or damage is expected as a matter of course. It is expected that components will be cleaned and lubricated where appropriate and that any open hose or pipe connections is blanked to prevent excessive loss of hydraulic fluid and the ingress of dirt.

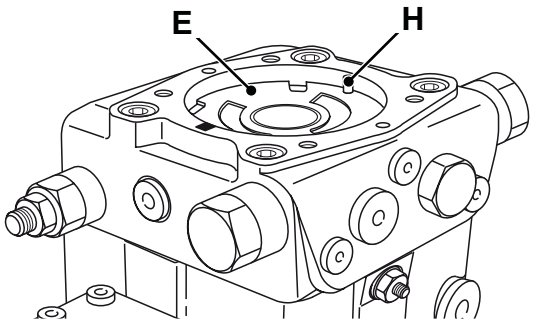
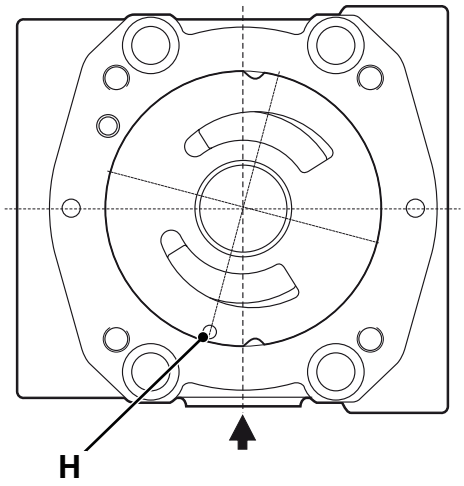


Fig 30.



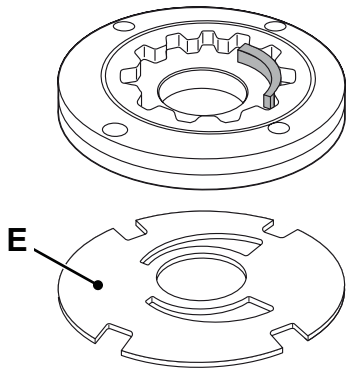
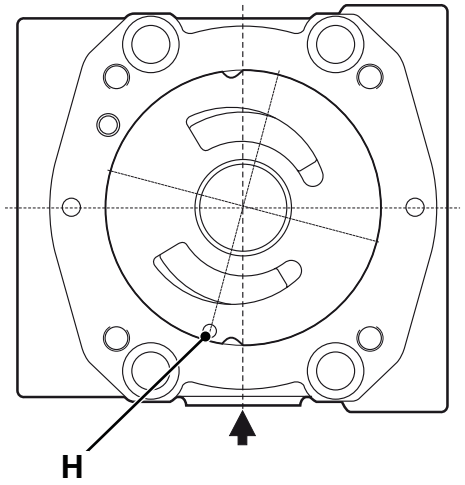


Fig 31. Clockwise



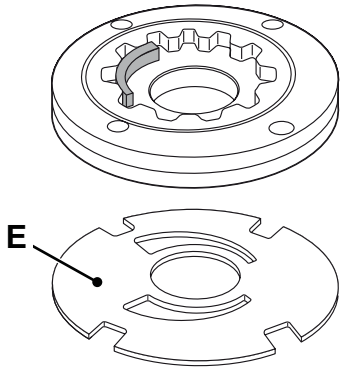


Fig 32. Counter Clockwise

9 Install the new auxiliary pump.

Use the marking made previously.

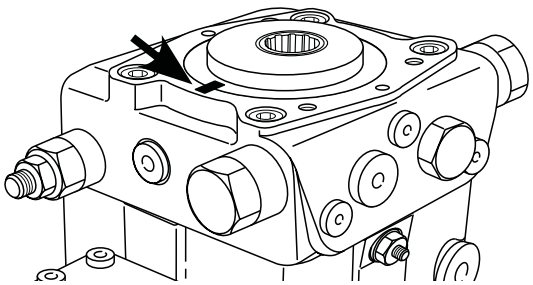


Fig 33.

Make sure that the chamfered side **I** is assembled facing the cover **A**.

Control Valves

Control valves are usually represented by one or more square boxes.

⇨ *Fig 45. (27)* shows a control valve represented by three boxes. The number of boxes indicates the number of possible valve operating positions, (3 boxes - 3 positions etc).

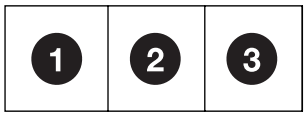


Fig 45.

⇨ *Fig 46. (27)* - In circuit diagrams the pipework is usually shown connected to the box which represents the unoperated condition. (Hydraulic circuit diagrams are usually shown in the unoperated condition).

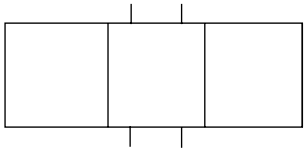


Fig 46.

⇨ *Fig 48. (27)* shows a valve described as a 3-position, 4-port control valve. Port describes the openings to and from the valve by which the hydraulic fluid enters or leaves. In the fig shown, Position **2** indicates that in an unoperated condition all 4 ports are blocked.

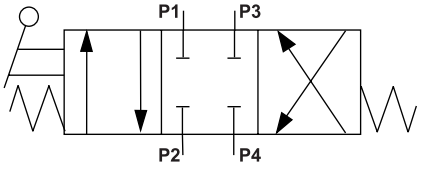


Fig 47.

If the valve spool was moved to Position **1**, movement of the spool would connect Port **P1** to Port **P2**, and Port **P3** to Port **P4**. ⇨ *Fig 48. (27)*.

If the valve spool was moved to Position **3**, movement of the spool would connect Port **P1** to Port **P4**, and Port **P3** to Port P2. ⇨ *Fig 48. (27)*.

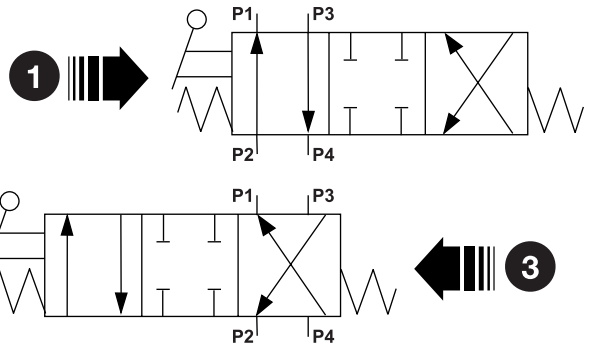


Fig 48.

It must be noted that not all spools are of the same type. Their operating designs can be seen by following the path the flow arrows take in their respective operating squares.

Three typical JCB style spools are known as 'D' spools, 'F' spools and 'N' spools.

The 'D' spools generally control rams because when in the neutral position the outlet ports are blocked, preventing ram movement. ⇨ *Fig 48. (27)* shows a 'D' type spool.

⇨ *Fig 49. (27)* - 'F' spools are often shown as four position spools with the three normal positions for neutral and service control; and the forth position, which has a detent, connects both sides of the ram together to allow the service to 'float'.

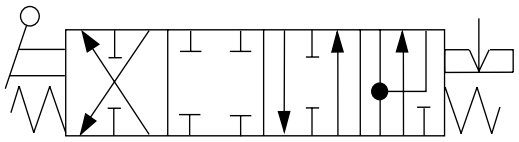


Fig 49.

⇨ *Fig 50. (27)* - 'N' spools are sometimes used to control hydraulic motors, and it can be seen from the flow arrows, that in neutral position both service ports are connected to the exhaust oil port

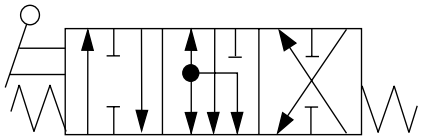


Fig 50.

Table 14.

Item	Description
K	Oil Cooler
VR2	Oil Cooler Bypass Valve
DS1	Clogging Indicator
F2	Input And Air Breather Filter
F1	Pressure Filter Charging
VB2	Control Block Gear Shifting, Park Brake
VB1	Control Block Vibration
LE	Steering Unit
M5/M6	Steering Cylinder
M4	Vibration Motor, Front
M3	Vibration Motor, Rear
M2	Driving Gear Box, Front
M1	Driving Gear Box, Rear
P1	Variable Pump Driving
P2	Variable Pump Vibration
P3	Gear Pump Steering / Charging

Steering Description

The steering lock is limited in each direction by stops. The steering angle is proportional to the rotation of the steering wheel.

Steering action is achieved by articulating the vehicle using two hydraulic cylinders **M5** and **M6**.

Hydraulic flow in the steering circuit is produced whenever the engine is running, by the charge pump **P3**.

When the engine is running, oil from the charge pump **P3** is directed into the steering control/metering valve **LE** at port **P**.

The working pressure of the steering control/metering valve is controlled at 140 bar (2058 PSI). This is done by a relief valve.

Assuming a steering correction is not applied, all of the oil exits the steering control/metering valve at port **T**. Oil from port **T** will flow into pumps **P1** and **P2**. Oil in the **L** and **R** passages of the steering control/metering valve **LE** as well as the oil in the steering cylinders **M5** and **M6** is trapped. This means it cannot flow, thus the machine maintains its steering direction.

Steering corrections are made by rotation of the steering wheel. The steering valve **LE** is connected to the steering wheel shaft.

Movement of the steering valve **LE** meters a portion of the oil from the **P** port to the **L** or **R** port (dependent on the direction the wheel is rotated).

The resultant stroking of the steering cylinders **M5** and **M6** causes the machine to turn. As oil is directed into one end of the cylinders, oil discharges from the opposite end and returns to the steering control/metering valve and discharges out of port **T** into pumps **P1** and **P2**.

Two port safety reliefs, set at 200 bar (2900 PSI), are built into cylinder ports **L** and **R** of the steering control/metering valve. These port relief valves protect the steering cylinder and work lines from being over pressurised while the oil is trapped by the steering control/metering valve.

The circuit pressures can be measured at port **MP7**.

Table 19.

Item	Description
K	Oil Cooler
VR2	Oil Cooler Bypass Valve
DS1	Clogging Indicator
F2	Input And Air Breather Filter
F1	Pressure Filter Charging
VB2	Control Block Gear Shifting, Park Brake
VB1	Control Block Vibration
LE	Steering Unit
M5/M6	Steering Cylinder
M4	Vibration Motor, Front
M3	Vibration Motor, Rear
M2	Driving Gear Box, Front
M1	Driving Gear Box, Rear
P1	Variable Pump Driving
P2	Variable Pump Vibration
P3	Gear Pump Steering / Charging

Articulation Joint

Removal and Replacement

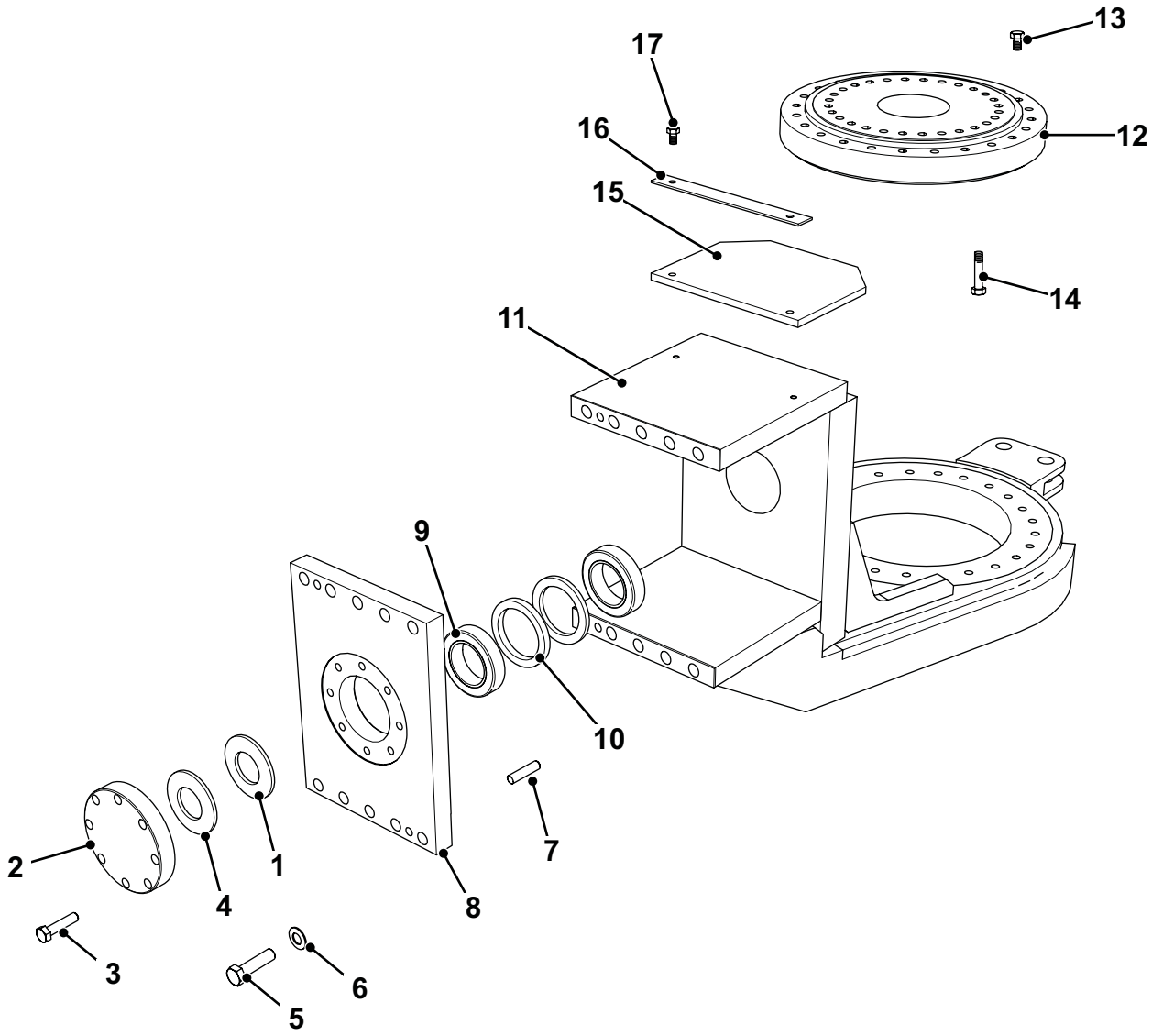


Fig 1.

Engine

Basic Engine Data

Rated speed	2200 rpm
Weight (Dry):	477 kg (1052 lb)
Number of cylinders	4
Nominal bore size	103 mm (4.055 in)
Stroke	132 mm (5.16 in)
Cylinder arrangement	In line
Combustion Cycle	4-stroke
Firing order (1 at front crankshaft pulley end)	1-3-4-2
Displacement	4.40 litres
Compression ratio	18.3 : 1
Engine Compression	see Note (1)
Direction of rotation (viewed from front {crankshaft pulley} end)	Clockwise
Valves	4 per cylinder
Valve tip clearances (measured cold):	
- Inlet	0.19 to 0.27 mm (0.007 to 0.011 in)
- Exhaust	0.56 to 0.64 mm (0.022 to 0.025in)
Lubricating oil pressure (2)	4.6 bar (67lb in^2)
Combustion system	Direct Injection
Fuel injection pump	Rotary Mechanical

(1) Compression variance between each cylinder should be no greater than 3.5 bar (50 lb in2)
(2) Engine at normal operating temperature and maximum revs.

For further details see Engine Service Manual, Publication No. 9803/3000

Section L

Vibration

Service Manual - VMT860 Tier 3

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