

Fuses

For Models: All



Do not attempt to connect or disconnect any part of the electrical circuit while the engine is running.

When installing additional electrical accessories always use individual fused circuits. Power takeoff should be made at a terminal strip powered by auxiliary accessory wire and protected by a 30 amp (maximum) fuse.

Circuit Protectors and Locations

Models	All Models	All Except 2.3, 3.0 & 3.0 L HO	2.3 L Model	3.0 & 3.0 L HO	4.3 L HO Model
SFE 20 amp main harness	(A)				
50 amp trim/tilt motor		(B)	(C)	(D)	
50 amp main harness		(B)	(C)	(D)	
Trim/tilt circuit breaker	(E)				
Ignition circuit breaker					(F)

(A) under dash - OMC P/N 304980

(B) starboard rear of intake manifold - OMC P/N 982019

(C) port rear of block - OMC P/N 982019

(D) starboard rear of block - OMC P/N 982019

(E) on trim/tilt pump

(F) on engine shift bracket



Oil and Water Sending Units

For Models: All

Special Tools Required: Ohmmeter

Inspection Procedure

Check wiring and connections between senders, lights, or gauges. Inspect indicator light bulbs. Check to see that the proper senders are being used. See chart below. Inspect orifice in oil pressure sender for blockage.

Sender Identification Chart

Oil pressure sender identification numbers are located near threaded base of sender. Water temperature identification numbers are located on one flat of hex above threads.

Type	Identification Single Station	Identification Dual Station
Oil Pressure Audible Warning*	(OMC P/N 984897)	Same
Oil Pressure Gauge	(OMC P/N 982650)	353 AM (OMC P/N 172311)
Water Temp. Audible Warning*	363 F (OMC P/N 985618)	Same
Water Temp. Gauge	362 AH or 02020 (OMC P/N 171960)	362 BB (OMC P/N 172312)

* 4.3 Litre HO Only

Test Procedure - Gauge Senders

To check oil gauge senders, start engine and run up from slow to fast. Observe gauge. If reading is unsatisfactory, replace sender with a new one. Retest. If reading is still unsatisfactory, problem may be in gauge, engine lubrication system or excessive bearing wear. Refer to appropriate Engine Section, paragraph Oil Pump Service. To check gauge, disconnect wire at sender, turn ignition switch on, and momentarily ground sender wire. Gauge needle will peg at high side of scale if gauge is operating properly.

To check water temperature senders, remove sender from engine. Connect sender to a digital ohmmeter. Immerse sender in a container of oil with a cooking thermometer. Heat oil over a flameless source. Observe meter and thermometer. Meter should indicate 448 ohms $\pm$ 10% at 100° F, 128 ohms $\pm$ 7.5% at 160°, and 46.6 ohms $\pm$ 5% at 220°.

Test Procedures - Audible Warning Senders (4.3 Litre HO Models Only)

Oil Pressure Sender

The oil pressure audible warning sender is calibrated to make or break contact at 8 ± 2.5 PSI. Use an ohmmeter to make the following continuity checks. Replace the sender if it fails either of these tests.

1. With the engine off and the sender wire disconnected, there should be a full continuity (zero) reading between the sender terminal and engine block.
2. With the engine running and sender wire disconnected, there should be no continuity (infinity) reading between the sender terminal and engine block.

Water Temperature Sender

The water temperature audible warning sender is calibrated to make or break contact at $200^\circ \pm 5^\circ$ F. Attach an ohmmeter to the sender and make the following check. Replace the sender if it fails this test.

1. Immerse sender in a container of oil. Heat oil over a flameless source and check temperature with a cooking thermometer.
2. Below the make/break temperature, the ohmmeter should show a no continuity (infinity) reading. Above the make/break temperature, the ohmmeter should show a full continuity (zero) reading.

Test Procedure - Audible Warning Device (4.3 Litre HO Models Only)

Note Under normal conditions, device will sound when ignition is turned on. Device will continue to sound until engine is started and oil pressure exceeds 8 ± 2.5 PSI.

The dash mounted audible warning device can be tested as follows. Replace the device if it fails this test.

1. Turn ignition switch to the ON position. Do not start engine.
2. Disconnect the lead at the water temperature audible warning sender, and momentarily touch lead terminal to engine block. If audible warning device does not sound, device is defective, or wiring of sender-device-ignition switch circuit has lost continuity.
3. Disconnect the lead at the oil pressure audible warning sender, and momentarily touch lead terminal to engine block. If audible warning device does not sound, device is defective, or wiring of sender-device-ignition switch circuit has lost continuity.

Cranking Circuit

All Models

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Safety Warning

Do not substitute automotive parts. OMC marine components meet U.S. Coast Guard regulations for external ignition proof operation and marine use. OMC marine components are specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive parts can result in fire and explosion.

Cranking System Operation - 3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 L Models

The starting system consists of a 12 volt starting motor, solenoid(s), ignition-starter switch, fuses and wiring to complete the circuit with the battery.

Note OMC Remote Controls have a neutral start switch which prevents operation of the starter if the control handle is not in the neutral position.

Stern drive starters employ a solenoid and lever to close the battery circuit and engage the starter pinion with the flywheel ring gear. When the key switch is turned to START position, an assist solenoid energizes the starter solenoid which closes the battery circuit and through leverage engages the starter pinion with the flywheel ring gear. When the key switch is released, the solenoids are de-energized, springs open the battery circuit, and disengage the starter pinion.

Starter and Solenoid Test Procedures

3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 L Models

Special Tools Required: Battery Hydrometer, Voltmeter, Ammeter, Tachometer, Jumper Wire

⚠ Do not substitute an automotive type starter. The OMC starter is U.S. Coast Guard Approved as external ignition proof for marine use. The OMC starter is specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive type starters can result in fire and explosion.

Inspection Procedure

No periodic lubrication of the starter motor or solenoid is required. Starter motor action is indicative, to some extent, of the cranking motor condition. A starter motor which responds readily and cranks the engine at normal speed when the control circuit is closed is usually in good condition.

Check the starter motor and solenoid switch attaching bolts to make sure these units are solidly mounted; both the starter and solenoid use their mounting for a ground path. Inspect and manually check all wiring connections in the starter motor circuit. Make sure these connections in the starter motor and control circuits are clean and tight. It is advisable to test the cranking circuit to ensure that excessive resistance does not exist. See Test Procedure below.

Test Procedure With Starter Installed

The voltage across the starting motor and switch, while cranking the engine, gives a good indication of any excessive resistance.

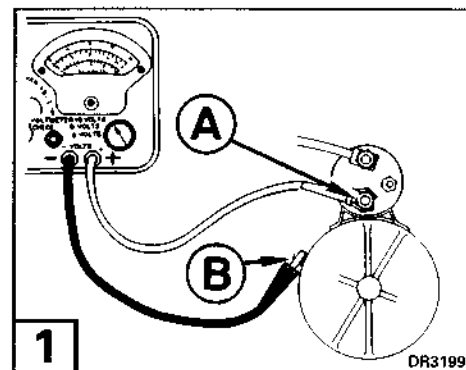
Note OMC stern drives have a neutral start switch in the remote control box which prevents operation of the starter if the shift lever is not in the neutral position. Engine must be at normal operating temperature when test is made.

1. Inspect the battery and cables to make sure that battery has ample capacity for cranking and ignition. Battery must be fully charged.

⚠ Ensure ignition switch is off when disconnecting primary wire. Failure to do so may result in sparking that can ignite fuel vapors in engine compartment or bilge and may result in fire or explosion.

2. To crank the engine without firing, turn off ignition switch and disconnect the distributor primary wire at the coil negative terminal.

1 3. Connect the voltmeter positive (+) lead to the motor terminal **A** on the solenoid switch; connect the voltmeter negative (-) lead to ground **B** on starter.



4. Turn the ignition switch on, crank engine and take voltmeter reading as quickly as possible. If starter motor turns engine at normal cranking speed with voltmeter reading nine or more volts, the motor and switch are satisfactory. If the cranking speed is below normal and the voltmeter reading is nine or lower, check for defective battery, corroded battery terminals, or corroded solenoid.

Note Do not operate starter motor for more than 10 seconds at a time without pausing to allow motor to cool for at least two minutes; otherwise, overheating and damage to the motor may result.

5. If the starter motor turns the engine at a low rate of speed and the voltmeter reads less than 9 volts, test the solenoid switch contacts as follows:

2 6. With the voltmeter switch turned to any scale above 12 volts, connect the voltmeter negative (-) lead to the motor terminal **A** of the solenoid switch and connect the positive (+) lead to the battery terminal **B** of the solenoid switch.

7. Turn the ignition switch on and crank the engine. Immediately turn voltmeter switch to low scale and take reading as quickly as possible, then turn switch back to higher scale and stop the motor.

The voltmeter will read $\frac{1}{10}$ volt or less if solenoid switch contacts are satisfactory. If voltmeter reads more than $\frac{1}{10}$ volt, solenoid switch should be repaired or replaced.

Solenoid Amperage Test

An amperage test of the solenoid switch will determine two things:

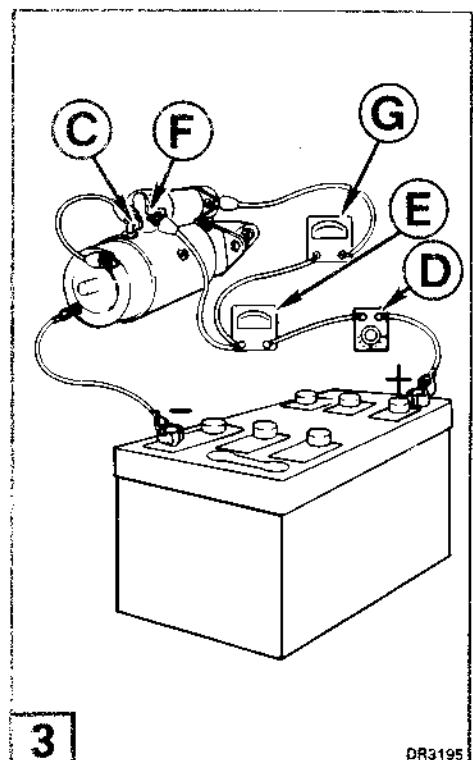
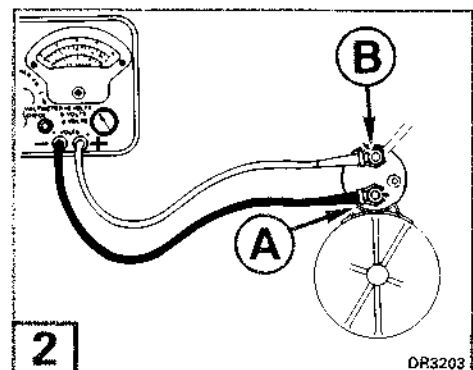
- Current draw of both windings in parallel.
- Current draw of hold-in winding alone.

3 1. Remove screw from solenoid motor terminal **C** and bend field leads slightly until clear of terminal. Ground motor terminal of solenoid with a heavy jumper wire.

3 2. Connect a 12 volt battery, a variable resistance **D** (such as a carbon pile), and an ammeter **E** of 100 amperes capacity in series with the solenoid "S" terminal **F**. Connect a heavy jumper wire from solenoid base to ground post of battery.

3 3. Connect a voltmeter **G** between the base of the solenoid and the small solenoid "S" terminal.

4. Slowly adjust resistance until voltmeter reads 10 volts and note ammeter reading. This shows current draw of both windings in parallel, and should be 47 to 55 amperes at 10 volts, with solenoid at room temperature.

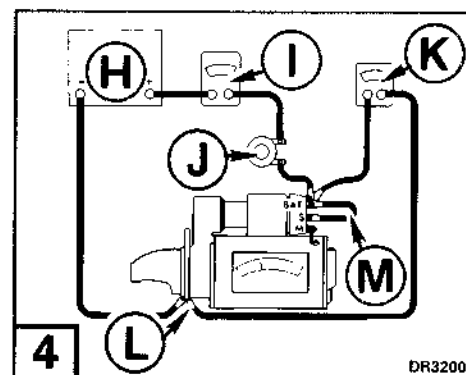


5. Remove the jumper wire from the solenoid motor terminal and readjust resistance until voltmeter reads 10 volts, then note ammeter reading. This shows current draw of hold-in winding alone and should be 15 to 20 amperes at 10 volts with solenoid at room temperature.

6. If the solenoid windings do not test within the specifications given, the solenoid switch assembly should be replaced.

Starter Bench Test

4 To obtain full performance data on a starter motor, or to determine the cause of abnormal operation, the motor should be removed from the engine and submitted to a no-load test with equipment designed for such tests. In a no-load test the starter motor is connected in series with a 12 volt battery (H) and an ammeter (I) capable of reading several hundred amperes. A variable resistor (J) is connected between the ammeter and the solenoid battery terminal. Attach a voltmeter (K) between the solenoid BAT terminal and motor ground (L). Activate the motor by attaching a jumper wire (M) between the solenoid's BAT and S (starter) terminals. A tachometer or rpm indicator is used to indicate armature rpm. Starting motor specifications will be found at the end of this section.



Compare the results of the test with the chart below. This will indicate what should be looked for when the motor is overhauled.

Test Result	Probable Cause
1. Current draw and no-load speed within specifications	Normal condition for starting motor
2. Low free speed and high current draw	Too much friction - namely tight, dirty or worn bearings, bent armature shaft, or loose pole shoe screws allowing armature to drag. Shorted armature. Check after disassembly on growler. Grounded armature or fields. Check further after disassembly.
3. Fails to operate with high current draw	Direct ground in terminal or fields. "Frozen" bearings. Should be noticed by turning armature by hand.
4. Fails to operate with no current draw	Open field circuit. Check after disassembly by inspecting internal connections and tracing circuit with a test lamp. Open armature coils. Inspect for badly burned bars after disassembly. Broken brush spring, worn brushes or high insulation between commutator bars thus preventing good brush to commutator contact.
5. Low no-load speed and low current draw	High internal resistance due to poor connections, defective leads or dirty commutator. (Also, causes listed under 4, above.)
6. High free speed and high current draw	Shorted field coils. If shorted field coils are suspected, replace with new coils and check for improved performance.

Starter Motor Replacement - 3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 L Models

Removal

⚠ Do not substitute an automotive type starter. The OMC starter is U.S. Coast Guard Approved as external ignition proof for marine use. The OMC starter is specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive type starters can result in fire and explosion.

⚠ 1. Disconnect the battery ground cable at battery and disconnect all wires at solenoid terminals to prevent sparks in engine compartment.

5 **6** 2. Cut the strap **A** holding drain hose to solenoid. Remove nut from starter support bracket. Remove ring gear guard **B** from front of flywheel housing. Take out starter mounting screws and remove the starter assembly.

Installation

1. To reinstall, position the starter assembly on the engine and start the mounting hardware.

2. Snug hardware while holding the starter squarely against its mounting surface. Tighten the screws to 28-34 ft. lbs. (38-46 N·m). Install ring gear guard and tighten screws to a torque of 5-7 ft. lbs. (7-9 N·m).

3. Connect wires to solenoid and apply *OMC Black Neoprene Dip* P/N 909570 or equivalent to terminals to prevent corrosion.

4. Connect battery ground cable at battery. Attach drain hose to solenoid with a tie strap.

Starter Motor Overhaul - 3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 L Models

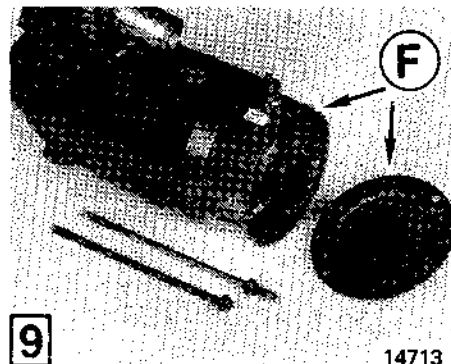
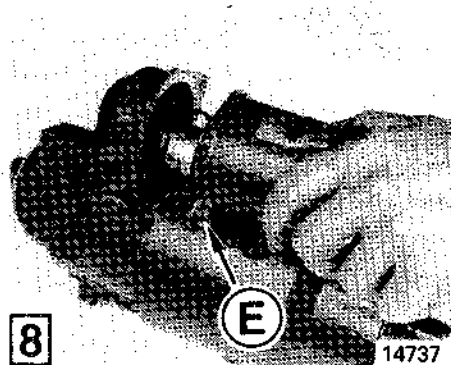
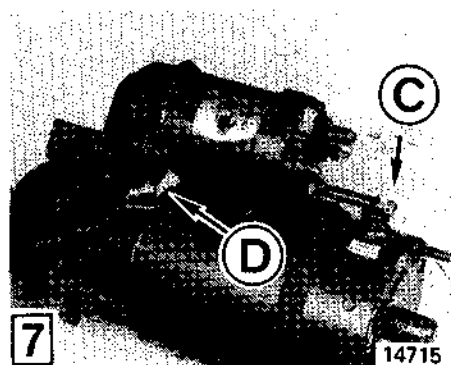
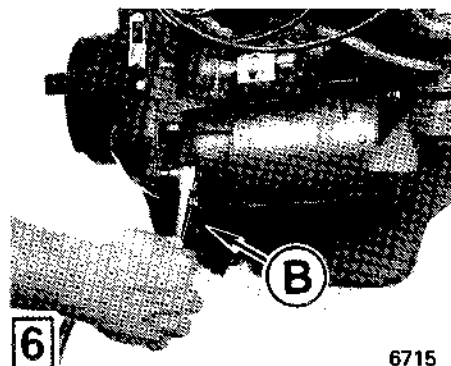
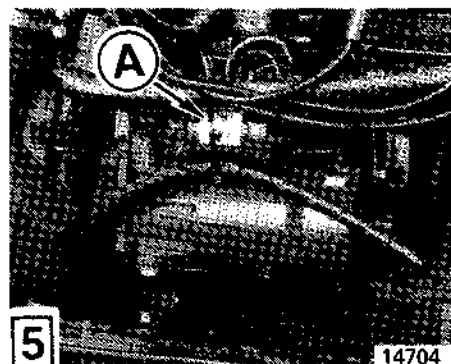
Solenoid Removal

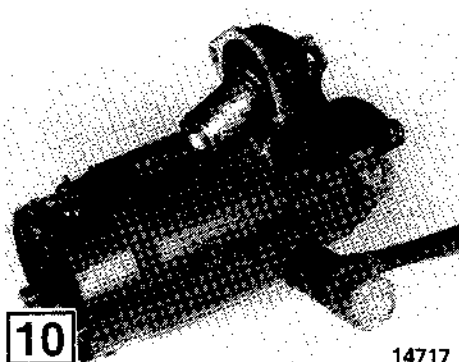
7 1. Remove field terminal screw **C**. Scrape all sealer away from solenoid/starter frame joint **D**.

8 2. Twist solenoid until engagement flange **E** clears groove, then slide solenoid and spring off plunger.

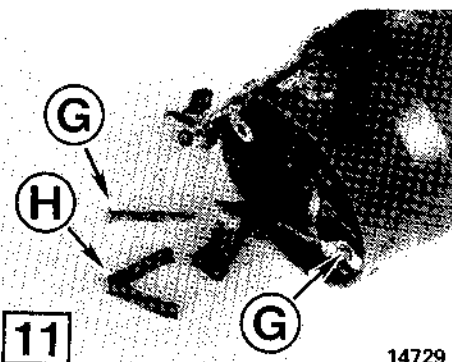
Starter Disassembly

9 3. Scribe reference marks **F** on commutator end plate and frame, next to upper thru-bolt. Remove two thru-bolts, and pull commutator end plate off frame.

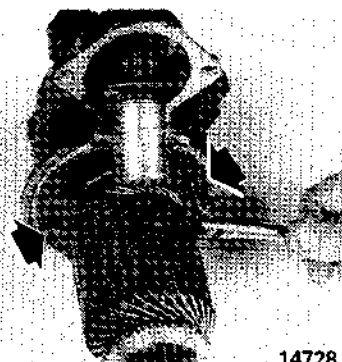




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10 4. Loosen field frame with a soft hammer. Strike frame circumference where it meets drive end housing, and pull frame off housing.

11 5. Pull out brush holder pivot pins (G). Lift brush holders and springs (H) out of frame. Remove screws holding brushes and leads to holders.

12 6. Remove two bearing plate screws and washers.

13 7. Pull the armature and drive assembly from the drive housing. Slide the thrust collar (I) from the pinion end of the shaft, then take the thrust washer (J) off the opposite end of the shaft.

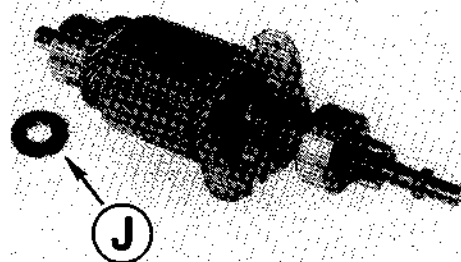
14 **15** 8. To remove the drive assembly from the armature, place a metal cylinder of proper size over the end of the shaft to rest against the pinion stop retainer. Tap the retainer to uncover the snap ring. Remove the snap ring (K) from the shaft groove, then slide off the retainer (L), drive assembly (M) fiber washer (N), and bearing plate (O).

16 9. Remove the retaining ring and pivot pin, then lift the shift lever and plunger assembly out of the drive housing.

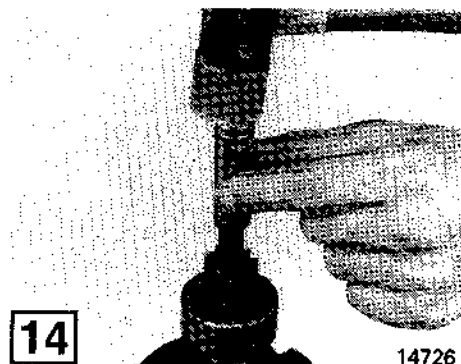
Cleaning and Inspection

1. Clean all parts by wiping with clean cloths. The armature, field coils and drive assembly must not be cleaned by any degreasing or high temperature method. This might damage the insulation and create a short or ground. It will also remove lubricant originally packed in the overrunning clutch, and would soon ruin the clutch.

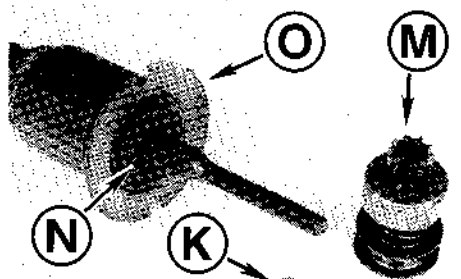
2. Carefully inspect all parts for wear or damage, and make necessary repairs or replacements. Any soldering must be done with rosin flux; never use acid flux on electrical connections.



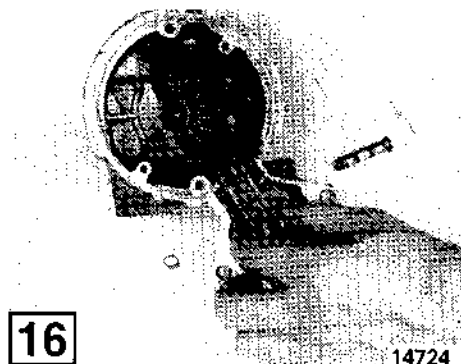
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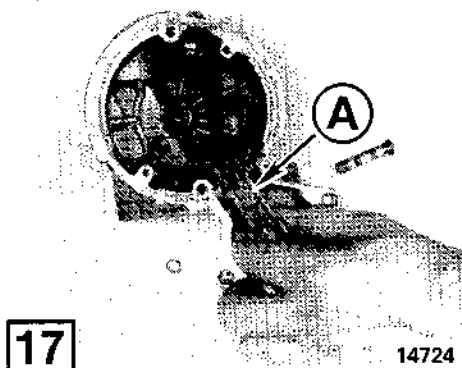
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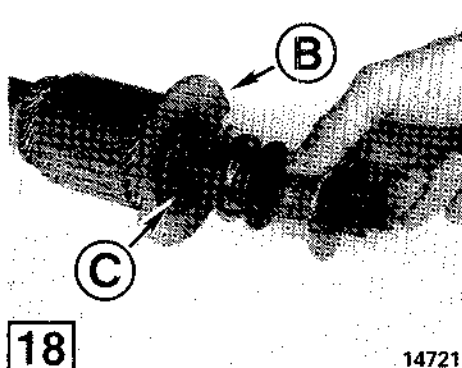


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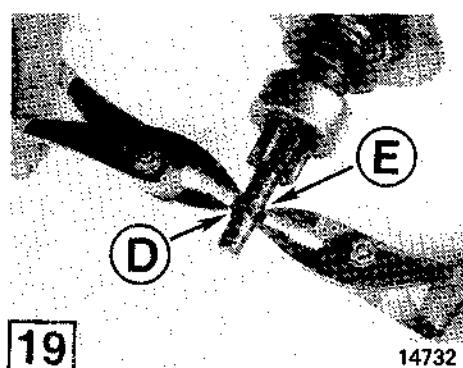
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Starter Assembly

17 1. Lubricate the shift lever linkage with silicone grease. Face open side (A) of shifter outward, then install in drive housing. Secure lever with pivot pin and retaining ring.

Note Never lubricate solenoid plunger or plunger cylinder.

18 2. Lubricate the armature shaft with silicone grease. Face raised surface of bearing plate (B) toward armature bars, then install plate and fiber washer (C). Install drive assembly with pinion outward.

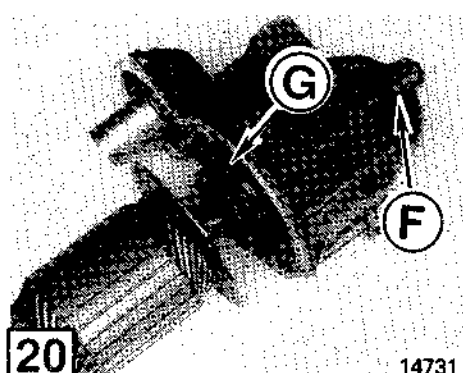
3. Face the recessed side of a new pinion stop retainer outward, then slide the retainer onto the shaft. Place a new snap ring on drive end of shaft and hold it in place with a hard wood block. Hit the wood block with a hammer to force the ring onto the shaft, then slide it down into its groove.

19 4. Place the thrust collar (D) on the shaft with the collar's shoulder against the snap ring. Slide the retainer (E) up until it contacts the opposite side of the ring. Use two pliers on opposite sides of the shaft to grip the collar and retainer as shown. Squeeze pliers simultaneously to force snap ring into retainer.

20 5. Lubricate the drive housing bushing (F) with silicone grease or *OMC Triple-Guard®* grease, and install armature and drive assembly in housing. Make sure shift lever lugs (G) engage collar of drive assembly.

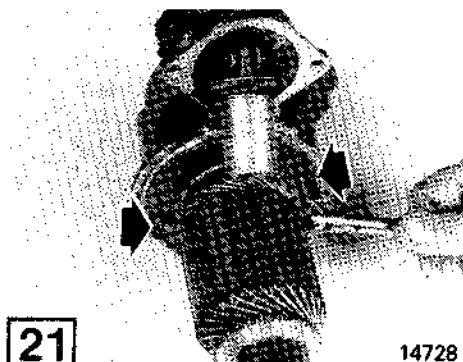
21  6. Align the center bearing plate with the drive housing attachment holes. **Install and tighten the screws securely.**

22 7. Place insulated brush holder (black) (H) inside grounded brush holder. Position V-spring around outside of both brush holders, then place assembly in frame bracket. Align holes in brush holders and bracket, then insert pin (I) to retain brushes.



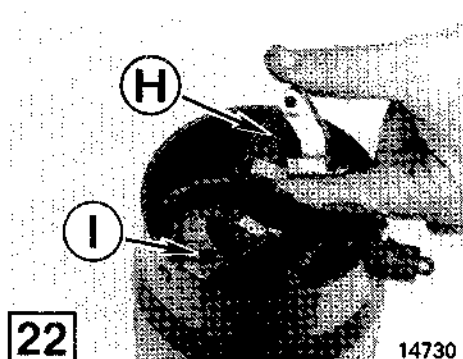
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Safety Related

8. Slide starter frame onto armature. Carefully expand brushes to clear commutator. Rotate frame until dowel engages hole and frame seats on drive housing.

23 **24** 9. Place fiber thrust washer **J** on end of armature. Lubricate end plate bushing with silicone grease, then attach end plate and align reference marks. Install thru-bolts and tighten securely. Thru-bolt with exposed thread **K** must be at top of housing.

Solenoid Assembly

25 10. Slide return spring **L** onto plunger. Hold solenoid so that engagement flange **M** projects to either side, then slide solenoid onto plunger. Seat solenoid against housing, then twist solenoid until flange completely engages slot and mounting screw holes align.

26 11. Install two mounting screws **N**, and field terminal screw **O**. Tighten them securely.

12. Cover flange engagement slot on both sides of solenoid with a waterproof silicone sealer. Coat circumference of frame/drive housing joint and frame/end plate joint with *OMC Black Neoprene Dip* P/N 909570 to seal starter against water entry.

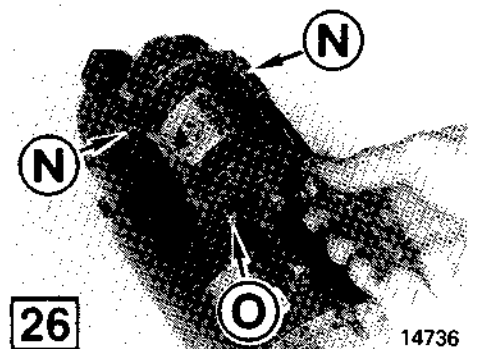
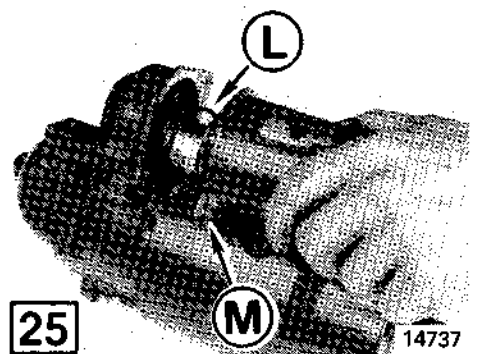
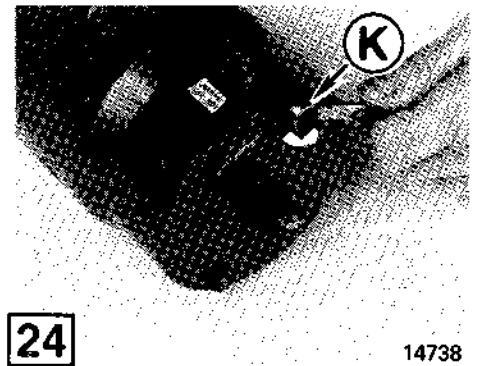
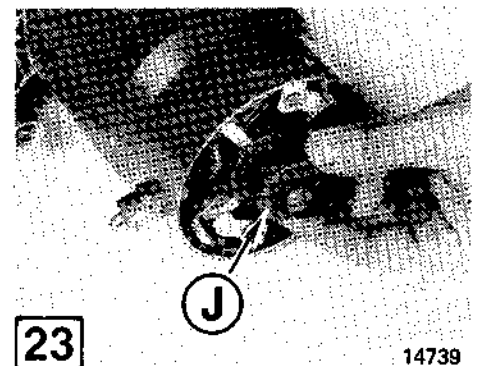
13. Test starter solenoid as described in *Amperage Test of Solenoid*. Check *Pinion Clearance* as described below. If a reliable starter tester is available, test motor as described in *Bench Test*.

Checking Pinion Clearance

Whenever the starter motor is disassembled and reassembled, the pinion clearance should be checked. This is to make sure that proper clearance exists between the pinion and the pinion stop retainer when the pinion is in the cranking position. Lack of clearance would prevent the solenoid starter switch from closing properly; too much clearance would cause improper pinion engagement in the ring gear.

1. Connect a source of approximately six volts between the solenoid "S" terminal and ground.

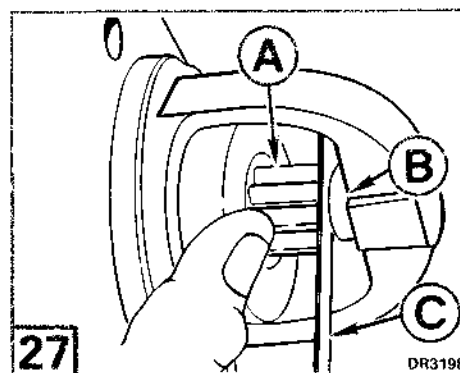
Note Do not use more than six volts or the motor will operate. As a further precaution against motoring, connect a heavy jumper wire from the solenoid motor terminal to ground.



27 2. After energizing the solenoid, push the pinion **A** away from the stop retainer **B** as far as possible and use a feeler gauge **C** to check the clearance between the pinion and retainer.

3. If the clearance is not between 0.010 in. and 0.159 in. (0,25 mm and 4,04 mm), it indicates excessive wear of the solenoid linkage, shift lever mechanism, or improper assembly of these parts.

Note Pinion clearance cannot be adjusted. If clearance is not correct, motor must be disassembled and checked for the above mentioned defects. Any defective parts must be replaced.



4. Lube shaft with *OMC Triple-Guard* grease.

Starter Motor Specifications

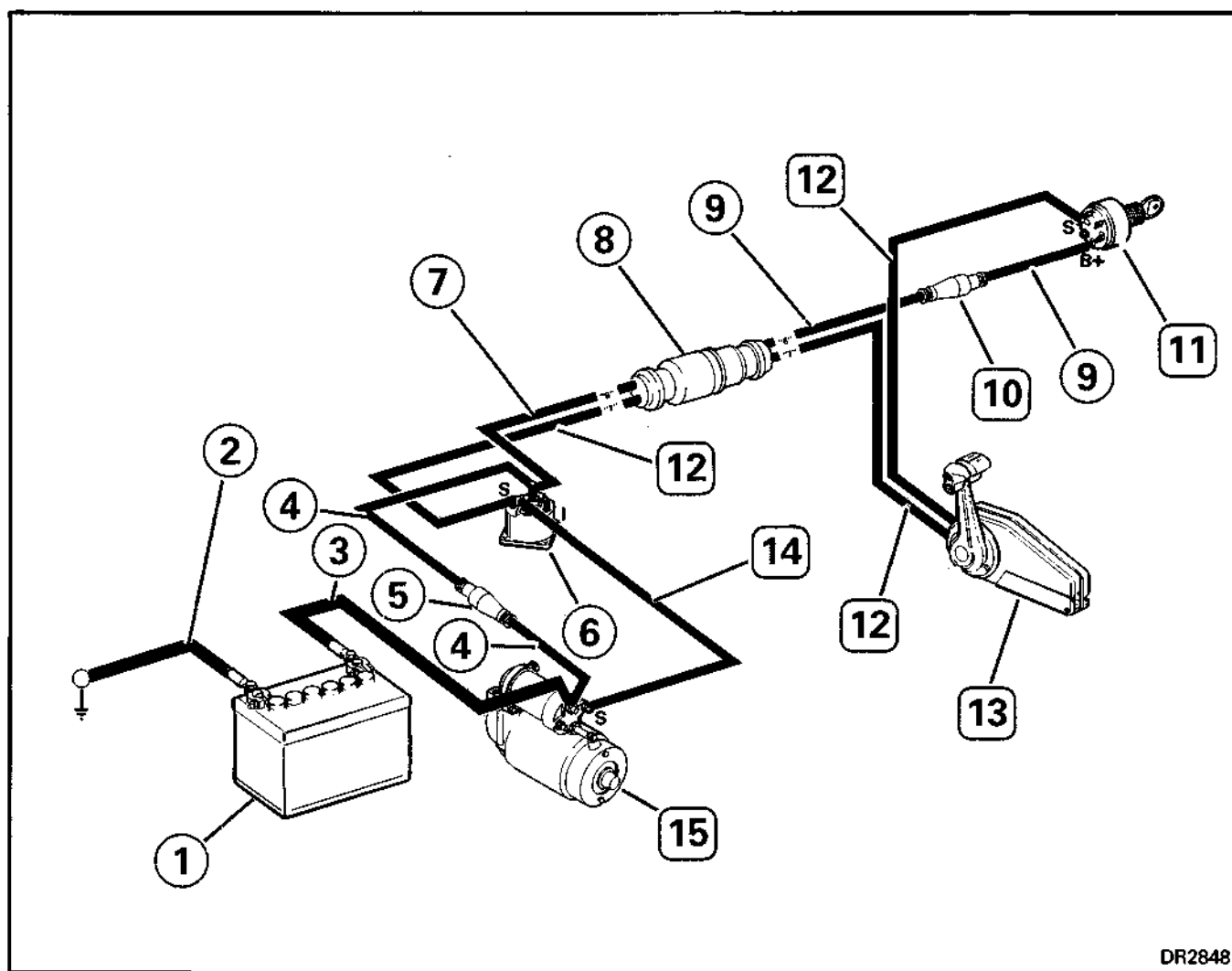
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	3.0 and 3.0 L HO Models	4.3, 4.3 HO and 5.7 L Models
Starter Motor	<i>Delco 1998317</i>	<i>Delco 1998570</i>
Shift type Shift actuation Shift operation Rotation	Mechanical Solenoid Ignition switch Clockwise	
No-load test specs		
Min. amps Max. amps	65* 95*	
Volts Min. RPM Max. RPM	9.0 6800 10,300	
Load test specs		
Volts Min. amps Max. amps	4.3 490 560	
Solenoid	<i>Delco 1114531</i>	
Current draw, solenoid		
Hold-in winding	15-20 amps at 10.0 volts	
Both windings in parallel	47-55 amps at 10.0 volts	

* Includes solenoid



Safety Related



DR2848

Cranking Circuit 3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 L Models

- ① Battery
- ② Black 4 Ga.
- ③ Red 4 Ga.
- ④ Red 10 Ga.
- ⑤ 50 Amp Fuse
- ⑥ Assist Solenoid
- ⑦ Red/Purple 10 Ga.
- ⑧ Main Cable Connector
- ⑨ Red/Purple 12 Ga.
- ⑩ 20 Amp Fuse
- ⑪ Ignition Switch
- ⑫ Yellow/Red 16 Ga.
- ⑬ Shift Control
- ⑭ Yellow/Red 12 Ga.
- ⑮ Starter Motor

Cranking System Operation - 2.3, 5.0, 5.0 HO and 5.8 L Models

The cranking system includes the starter motor with an integral positive-engagement drive, the battery, an ignition switch, the neutral safety switch, the starter solenoid, and heavy circuit wiring.

Turning of the ignition key to the START position actuates the starter solenoid through the starter control circuit. The starter solenoid then connects the battery to the starter.

OMC Cobra stern drive models have a neutral start switch in the remote control box, which prevents operation of the starter if the shift lever is not in the neutral position.

When the starter is not in use, one of the field coils is connected directly to ground through a set of contacts. When the starter is first connected to the battery, a large current flows through the grounded field coil, actuating a movable pole shoe. The pole shoe is attached to the starter drive plunger lever and thus the drive is forced into engagement with the flywheel.

When the movable pole shoe is fully seated, it opens the field coil grounding contacts and the starter is then in normal operation. A holding coil is used to maintain the movable pole shoe in the fully seated position during the time that the starter is turning the engine.

 **Do not substitute automotive parts. OMC marine components meet U.S. Coast Guard regulations for external ignition proof operation and marine use. OMC marine components are specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive parts can result in fire and explosion.**

Starter Motor Test Procedures - 2.3, 5.0, 5.0 HO and 5.8 L Models

 The starter should not be operated continuously for periods longer than ten seconds at a time. An interval of at least two minutes should be observed between such cranking periods to protect the starter from overheating.

 **Always replace plunger cover, sealer and band clamp. These parts are part of the starter motor flashproofing. Be careful of gasoline vapor buildup.**

 Do not damage the exposed switch during starter installation or removal.

Starter Circuit Resistance Test

Excessive resistance in the cranking circuit can be determined from the results of this test. To crank the engine without firing, turn off ignition switch and disconnect the distributor primary wire at the coil negative terminal.

⚠ Ensure ignition switch is off when disconnecting primary wire. Failure to do so may result in sparking that can ignite fuel vapors in engine compartment or bilge and may result in fire or explosion.

Note To avoid voltmeter damage, only connect voltmeter while cranking engine.

The voltage drop in the circuit will be indicated by a voltmeter (0 to 2 volt range). Maximum allowable voltage drop should be:

28 1. With the voltmeter negative lead connected to the starter terminal and the positive lead connected to the battery positive terminal, connection ① . . . 0.5 volt.

28 2. With the voltmeter negative lead connected to the starter terminal of the starter solenoid and the positive lead connected to the positive terminal of the battery, connection ② . . . 0.3 volt.

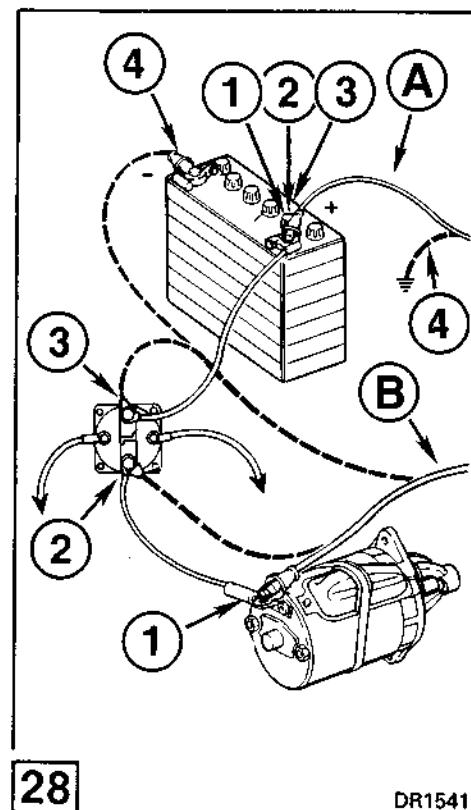
28 3. With the voltmeter negative lead connected to the starter terminal of the starter solenoid and the positive lead connected to the positive terminal of the battery, connection ③ . . . 0.1 volt.

28 4. With the voltmeter negative lead connected to the negative terminal of the battery and the positive lead connected to the engine ground, connection ④ . . . 0.1 volt.

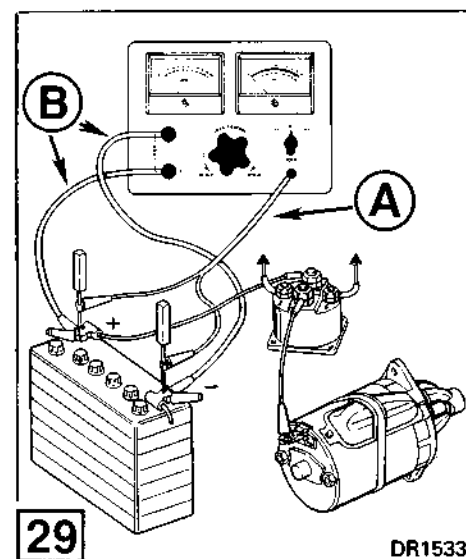
Starter Load Test

29 Connect the test equipment as shown. Be sure that no current is flowing through the ammeter and heavy-duty carbon pile rheostat portion of the circuit (rheostat at maximum counterclockwise position).

Crank the engine with the ignition OFF, and determine the exact reading on the voltmeter. In order that the engine can be cranked without firing, turn off ignition switch and disconnect the distributor primary wire at the coil negative terminal. Connect a jumper from the positive battery terminal to the S-terminal of the starter solenoid.



28
A Voltmeter Positive Lead
B Voltmeter Negative Lead



29
A Voltmeter Leads
B Ammeter Leads



Safety Related

Stop cranking the engine, and reduce the resistance of the carbon pile until the voltmeter indicates the same reading as that obtained while the starter cranked the engine. The ammeter will indicate the starter current draw under load.

Bench Tests

Starter No-Load Test

The starter no-load test will uncover such faults as open or shorted windings, rubbing armature, and bent armature shaft. The starter can be tested, at no-load, on the test bench only.

30 Make the test connections as shown. The starter will run at no-load. Be sure that no current is flowing through the ammeter (rheostat at maximum counterclockwise position). Determine the exact reading on the voltmeter.

Disconnect the starter from the battery, and reduce the resistance of the rheostat until the voltmeter indicates the same reading as that obtained while the starter was running. The ammeter will indicate the starter no-load current draw.

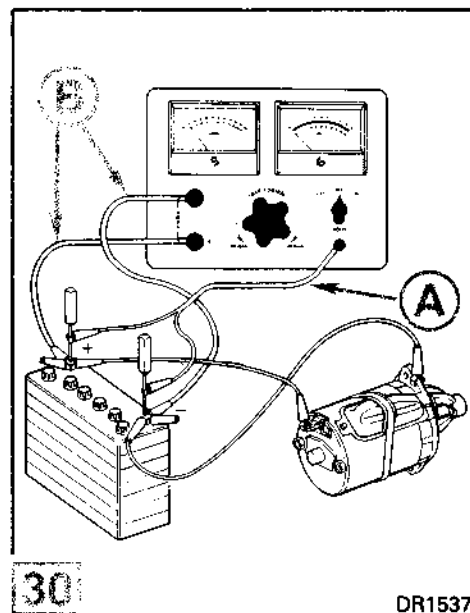
Armature Open Circuit Check

An open circuit armature may sometimes be detected by examining the commutator for evidence of burning. A spot burned on the commutator is caused by an arc formed every time the commutator segment, connected to the open circuit winding, passes under a brush.

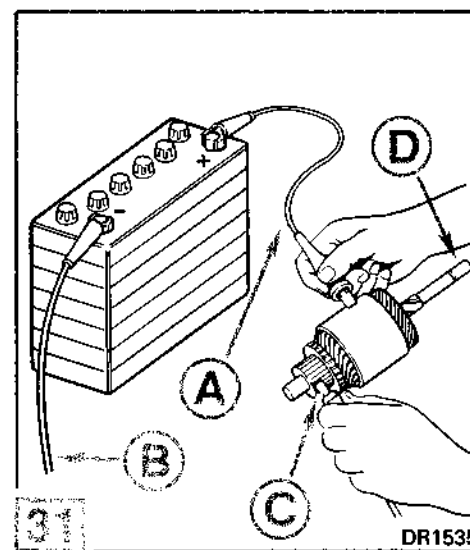
Armature and Field Grounded Circuit Test

This test will determine if the winding insulation has failed, permitting a conductor to touch the frame or armature core.

31 To determine if the armature windings are grounded, make the connections as shown. If the voltmeter indicates any voltage, the windings are grounded. Do not connect the jumper lead to the armature bearing surface.



- Ⓐ Voltmeter Leads
- Ⓑ Ammeter Leads



- Ⓐ Jumper Lead
- Ⓑ Voltmeter (-) Lead
- Ⓒ Voltmeter (+) Lead
- Ⓓ Bearing Surface

32 Grounded field windings can be detected by making the connections as shown. If the voltmeter indicates any voltage, the field windings are grounded. Keep both field brushes and holding coil ground lead away from frame. Disconnect holding coil ground lead. Insert insulator between contacts. Clip jumper lead to frame.

Starter Motor Replacement - 2.3, 5.0, 5.0 HO and 5.8 L Models

⚠ Do not substitute an automotive type starter. The OMC starter is U.S. Coast Guard Approved as external ignition proof for marine use. The OMC starter is specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive type starters can result in fire and explosion.

Removal

1. Disconnect the starter cable at the starter terminal. Cut tie strap holding drain hose to starter.
2. Unscrew the starter mounting bolts and remove the starter.

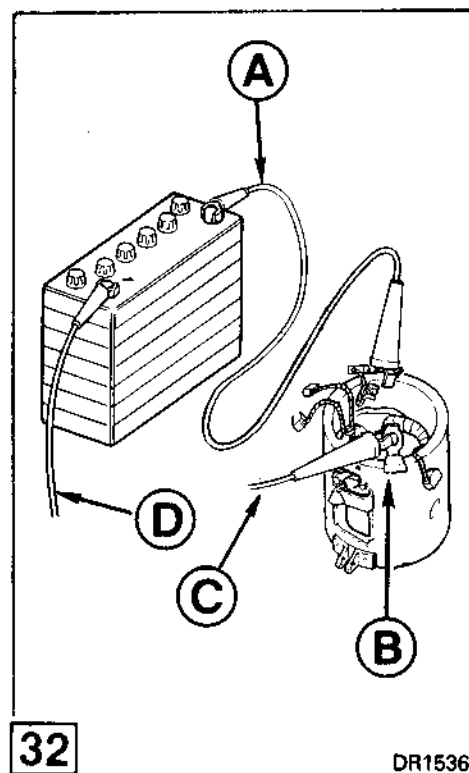
Installation

3. To reinstall, position the starter assembly to the flywheel housing and start the mounting bolts.
4. Snug all bolts while holding the starter squarely against its mounting surface and fully inserted into the pilot hole. Tighten the bolts to a torque of 20-25 ft. lbs. (27-34 N-m).
5. Connect the starter cable and tighten securely. Apply *OMC Black Neoprene Dip* P/N 909570 or equivalent to terminal to prevent corrosion. Attach drain hose to starter with new tie strap.

Starter Motor Overhaul - 2.3, 5.0, 5.0 HO and 5.8 L Models

Disassembly

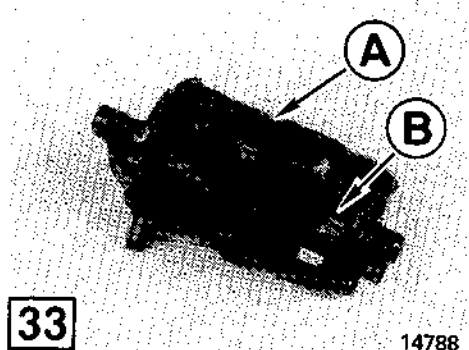
- 33** 1. Unscrew the starter cover retaining clamp **A**. Remove one screw **B** and the cover.
- 34** 2. Remove both motor thru-bolts. Use a punch and drive the roll pin **C** out of the starter plunger lever. Drive it just far enough to free the lever; do not drive pin completely out of housing.



32

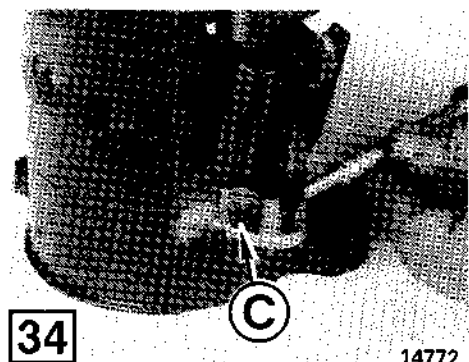
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- A** Jumper Lead
- B** Starter Terminal
- C** Voltmeter (+) Lead
- D** Voltmeter (-) Lead



33

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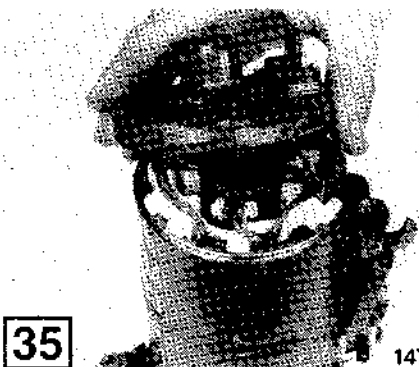


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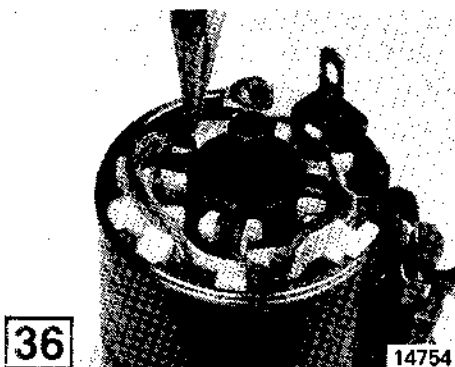
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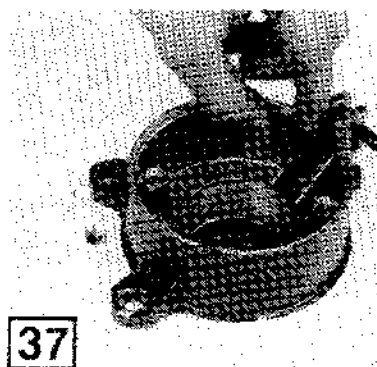
Safety Related



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37 14753

35 36 3. Lift brush end plate off starter frame. Note positions of brushes, springs and brush leads before removing them. Use needle-nose pliers and pull four brush springs up out of brush holder.

4. Lift frame and armature assembly off drive housing.

37 5. Remove plunger lever return spring from seat in housing.

38 6. Lift plunger and lever assembly off armature and out of frame, then pull out armature.

39 7. Remove thrust washer (A), retainer (B) and stop ring (C) from end of armature, then slide off starter drive assembly (D).

40 8. At a point 180° from the grommet (E), reach under the brush holder and carefully lift it out of the frame.

Note Do not remove field coils or brushes unless they need to be replaced.

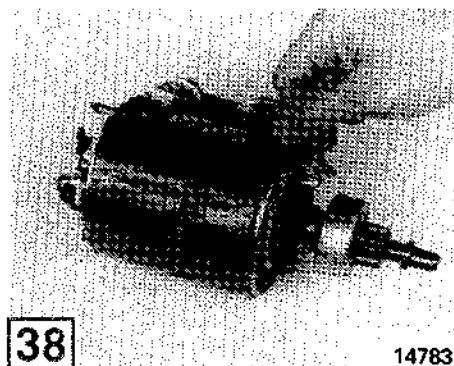
41 9. On the field coil that operates the starter drive gear actuating lever, bend up the tab (F) on the field coil retaining sleeve and remove the sleeve.

42 10. Remove the three coil retaining screws using *Owatonna Tool* part number Tool-10044-A (G) and a press. The press prevents the tool from slipping out of the screw. Unsolder the coil leads and remove the pole shoes and coils from the frame. Use a 300 watt iron.

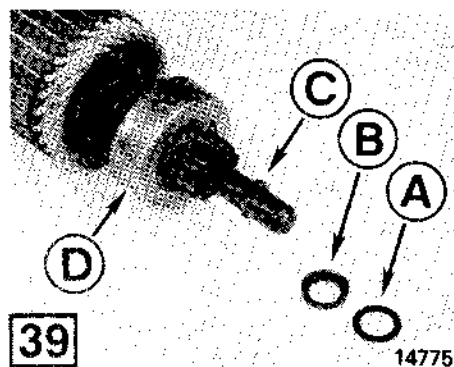
11. Cut (or unsolder) the brush leads from the field coils as close to the field connection point as possible. Cut the ground brush leads near the frame.

Cleaning and Inspection

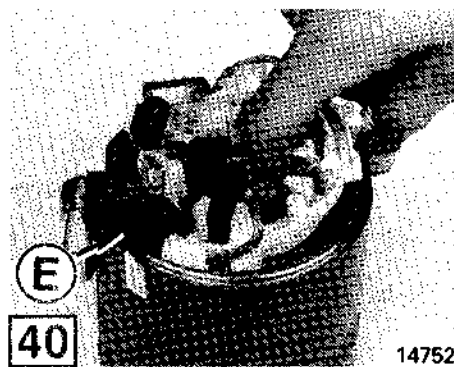
1. Use a brush or air to clean the field coils, armature, commutator, armature shaft, brush end plate, and drive end housing. Wash all other parts in solvent and dry the parts. Remove sealer material adhering to frame and plunger cover.



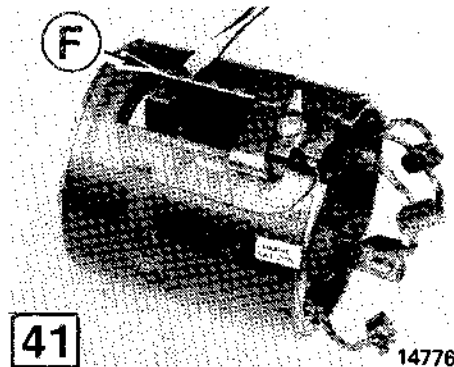
38 14783



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2. Inspect the armature windings for broken or burned insulation and unsoldered connections.

3. Check the armature for open circuits and grounds.

43 4. Check the commutator for run out. Inspect the armature shaft and two bearings for scoring and excessive wear. If the commutator is rough, or more than 0.005 in. out-of-round, turn it.

5. Check the brush holder for broken springs and cracks. Check the brush spring tension. Replace the springs if the tension is not within specified limits (40 ounces minimum). Replace the brush holder if cracked or broken.

6. Replace the brushes if worn to 1/4 in. in length.

7. Inspect the field coils for burned or broken insulation and continuity. Check the field brush connections and lead insulation. A brush kit and contact kit are available. All other assemblies are to be replaced rather than repaired.

8. Examine the wear pattern on the starter drive teeth. The pinion teeth must penetrate to a depth greater than one-half the ring gear tooth depth to eliminate premature ring gear and starter drive failure.

9. Replace starter drive and ring gears having milled, pitted or broken teeth or that show evidence of inadequate engagement.

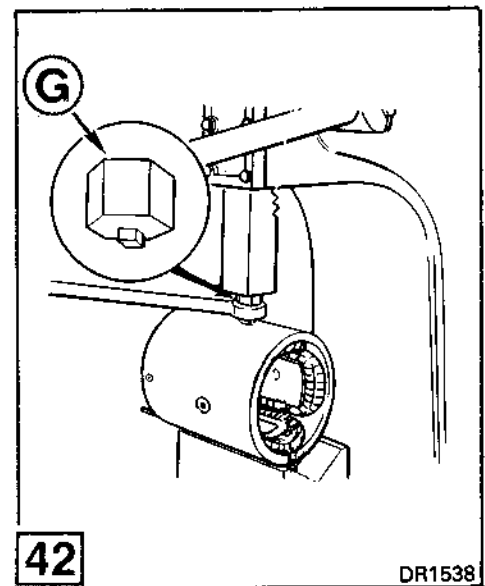
Assembly

42 1. Correctly position the coils and pole pieces, then install the retaining screws. As the pole shoe screws are tightened, strike the frame several sharp blows with a soft-faced hammer to seat and align the pole shoes, then stake the screws.

2. Install the solenoid coil and retainer, and bend the tabs to retain the coil to the frame.

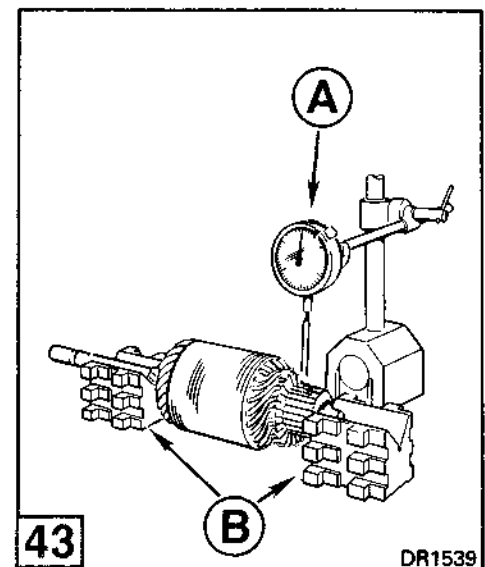
3. Solder the field coil leads together using rosin core solder. Use a 300 watt iron. Check for continuity and grounds in the assembled coils.

44 4. Position the new field coil brush leads **H** on the field coil wire. Install the clip provided with the brushes to hold the brush lead to the wire. Solder the lead, clip, and terminal together using rosin core solder.



42

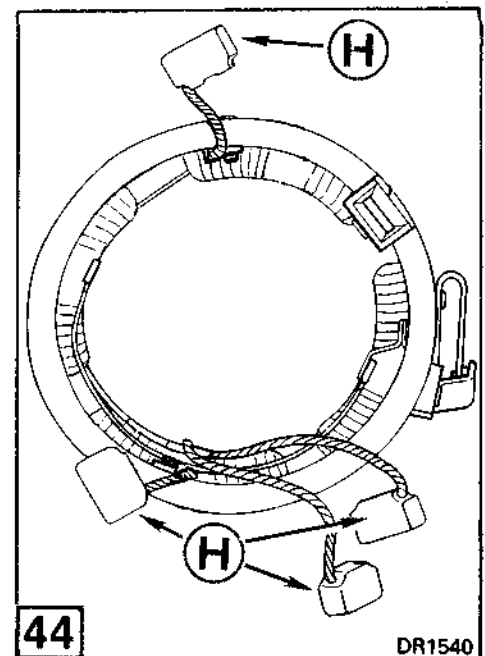
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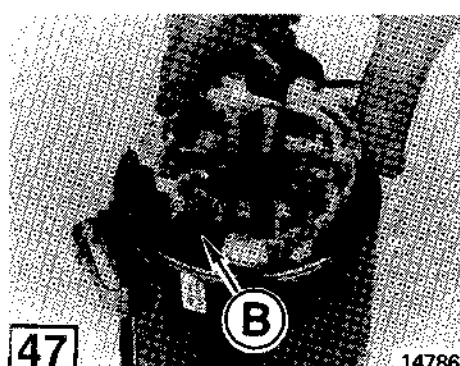
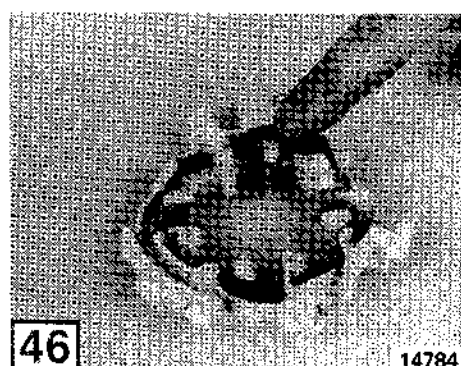
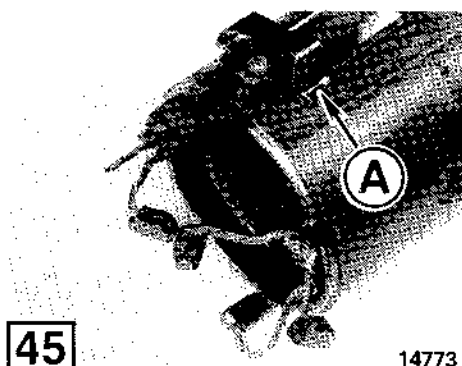
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A Dial Indicator
B V-Blocks



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45 5. Secure the solenoid coil ground wire (A) under the tab on top of the frame.

6. Solder the ground brush leads to the starter frame at the original point of attachment.

46 7. Install brush springs in holder. Flat side of spring must be down, and spring must completely seat in holder.

47 8. Insert brush holder into starter frame. Holder is correctly positioned when large lug and notch are located next to grommet (B) as shown.

Note Do not pinch brush leads between brush holder and frame.

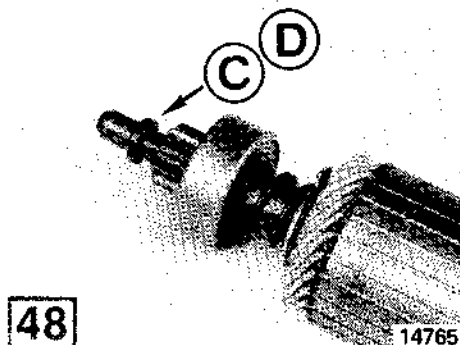
48 9. Apply a thin coat of *OMC Extreme Pressure Grease* to the armature splines. Slide starter drive onto armature. Attach a new stop ring (C) then slide a new retainer (D) over the stop ring.

49 10. Thoroughly degrease commutator, then slide armature into starter frame. Install plunger and lever assembly. Make sure lever fingers engage collar (E) behind starter drive.

50 11. Lightly lubricate the drive housing bushing (F) with *OMC Extreme Pressure Grease*. Place armature thrust washer (G) on top of bushing. Install the plunger lever return spring (H) in its seat.

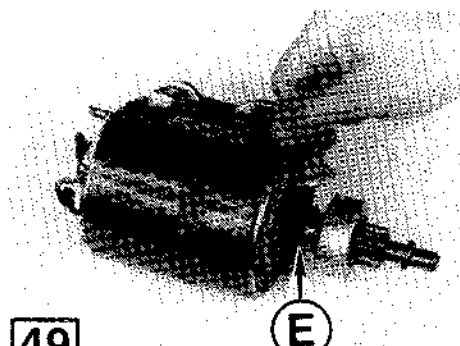
51 12. Carefully install armature and frame assembly. Projection (I) on plunger lever must engage return spring before frame seats on drive housing.

52 53 13. Use a punch to align the lever and housing holes, then drive the roll pin into place. Check starter assembly by fully depressing and releasing plunger. Plunger arm must contact copper band (J), starter drive gear must extend fully (K), and spring must return plunger and drive gear to the full disengage position without hesitation.



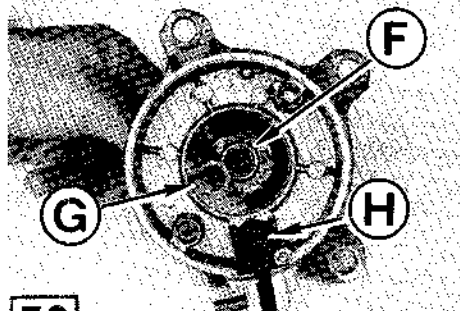
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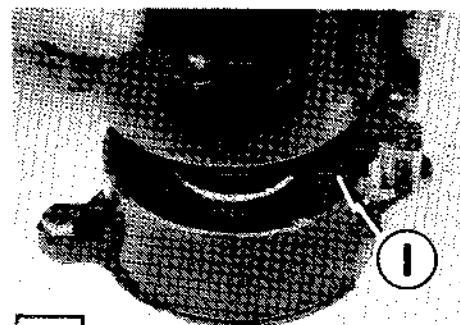
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54 14. Thoroughly degrease brushes. Hold spring back and push brush into position. Brush spring will "snap" into place when spring is properly positioned behind brush. Push down on all springs to make sure they're completely seated. Lay brush leads in proper channels as shown.

15. Install brush end plate and tighten the thru-bolts to 55-75 in. lbs. (6-8 N·m).

55  16. Apply a bead of *RTV* silicone adhesive **L** P/N 263753 or equivalent to the flange area on the starter drive cover.

56  17. Position cover over starter drive plunger. Cover must engage two projections **M** on drive housing. Install and tighten cover screw **N** securely. Place worm clamp **O** around starter and cover, and tighten clamp screw securely.

 Failure to properly secure plunger cover with screw, worm clamp and new sealer may cause ignition of fuel vapors in bilge or engine compartment.

18. Check the starter no-load current draw.

Cranking System Troubleshooting

Starter turns engine slowly. Check:

- battery water level and specific gravity
- for loose and corroded connections
- engine and drive unit for binding
- starter armature, brushes, field coils, or bearings

Starter turns intermittently. Check:

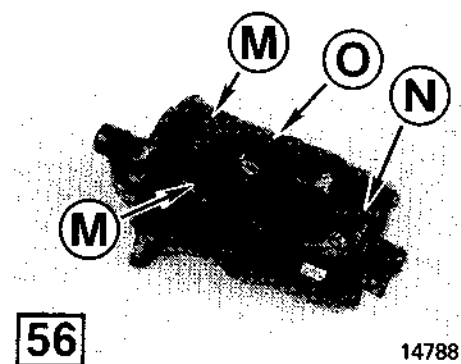
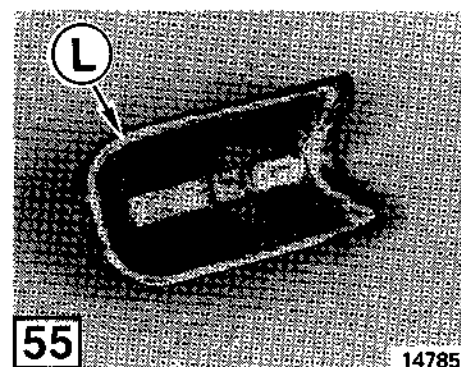
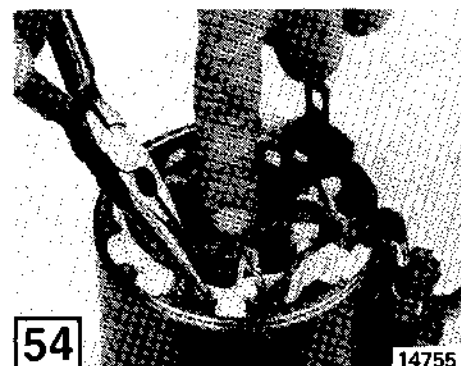
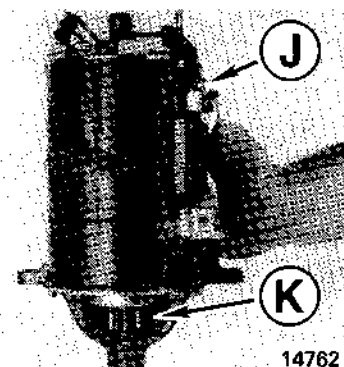
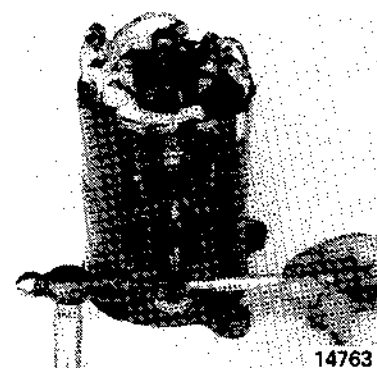
- starter motor completely
- connection at ignition switch
- starter solenoid

Starter doesn't turn - solenoid clicks. Check:

- battery and connections
- starter solenoid
- engine, transom bracket and vertical drive for seizure, or debris
- starter armature, brushes, or field coils

Solenoid doesn't click. Check:

- remote control in start position, shift in neutral
- battery and connections
- starter solenoid
- key switch and wiring circuit 20 amp fuse
- 50 amp fuse



Starter Motor Specifications

2.3, 5.0, 5.0 HO & 5.8 L Models

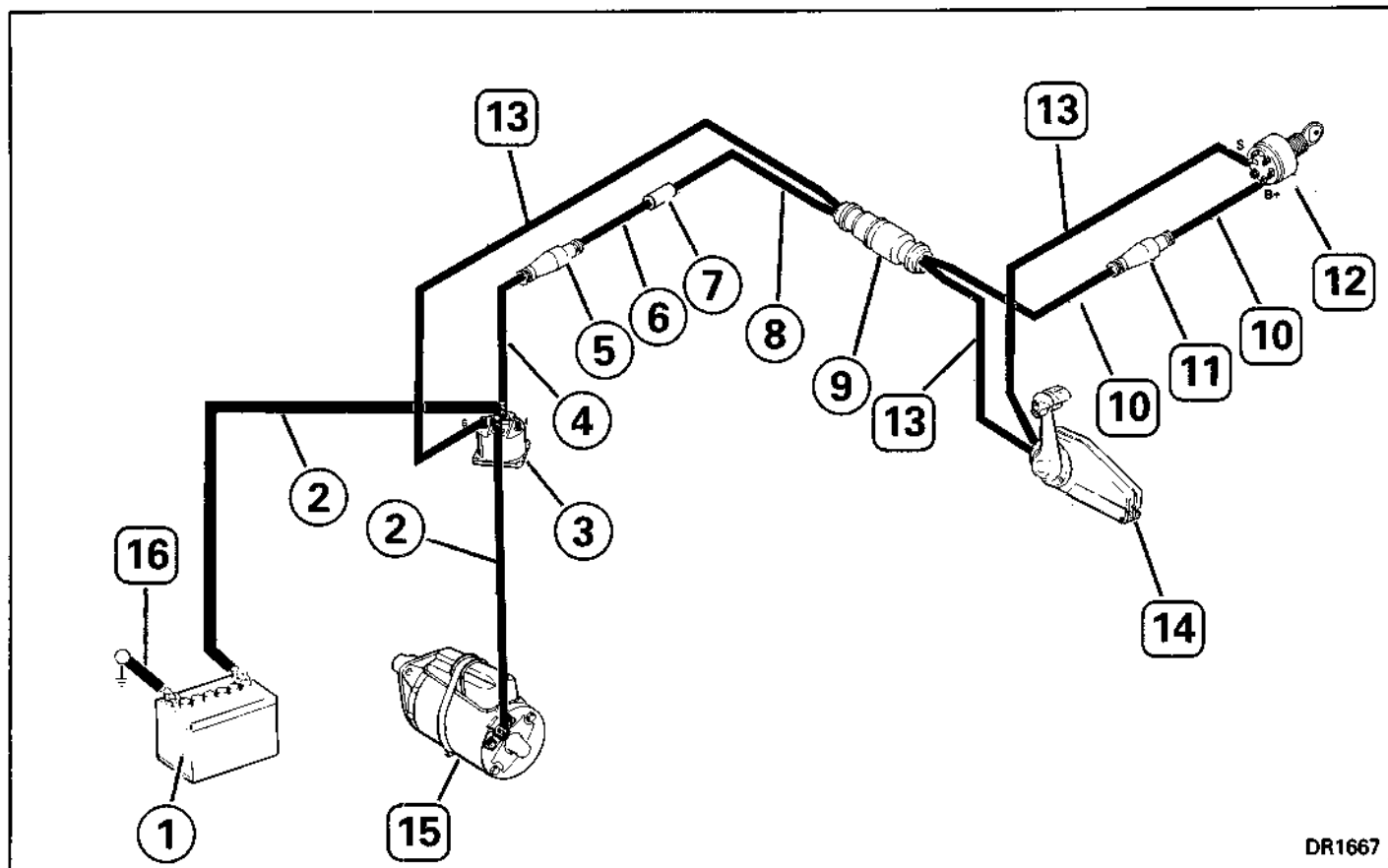
Positive Engagement Starter Motor					
Current Draw Under Normal Load (Max. Amps)	Normal Engine Cranking Speed (Min. RPM)	Cranking Volts (Min.)	Minimum Stall Torque @ 5 Volts	Max Load Amps	No Load Amps
150	180 RPM	8 Volts	9 ft. lbs. (12 N·m)	460	70

Maximum commutator runout is 0.005 inch. Maximum starting circuit voltage drop (battery positive terminal to starter terminal) at normal engine temperature is 0.5 volt.

Starter Brushes				
Mfg. Length (Inches)	Wear Limit (Inches)	Spring Tension (Ounces)	Through Bolt Torque (In. Lbs.)	Mounting Bolt Torque (Ft. Lbs.)
0.50 (12,7 mm)	0.25 (6,35 mm)	40	55-75 (6,2-8,5 N·m)	15-20 (20-27 N·m)

 Do not substitute an automotive type starter. The OMC starter meets special U.S. Coast Guard external ignition proof requirements for marine use. The OMC starter is specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive type starters that are not external ignition proof can result in fire and explosion.





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Cranking Circuit **2.3, 5.0, 5.0 HO and 5.8 L Models**

- ① Battery
- ② Red 4 Ga.
- ③ Starter Solenoid
- ④ Red 10 Ga.
- ⑤ 50 Amp Fuse
- ⑥ Orange 10 Ga.
- ⑦ Splice
- ⑧ Red/Purple 10 Ga.
- ⑨ Main Cable Connector
- ⑩ Red/Purple 12 Ga.
- ⑪ 20 Amp Fuse
- ⑫ Ignition Switch
- ⑬ Yellow/Red 16 Ga.
- ⑭ Shift Control
- ⑮ Starter Motor
- ⑯ Black 4 Ga.

Ignition Circuit

2.3, PWC 3.0, 4.3, 5.0, 5.0 HO 5.7 and 5.8 L Models

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Safety Warning

Do not substitute automotive parts. OMC marine components meet U.S. Coast Guard regulations for external ignition proof operation and marine use. OMC marine components are specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive parts can result in fire and explosion.

Ignition System Operation

To clarify operating principles as well as to simplify the process of tracing troubles, it should be understood that the ignition system contains two separate circuits (see wiring diagram at end of this section):

1. The primary circuit carries the low voltage current supplied by the battery or alternator. In addition to these sources of electrical energy, the primary circuit contains the ignition switch, resistor wire, neutral safety switch, primary winding of the ignition coil, distributor contact points, condenser and all low tension wiring.

2. The secondary circuit carries the high voltage surges produced by the ignition coil which results in high voltage spark between the electrodes of the spark plug in the engine cylinders. This circuit contains the secondary winding of the coil, coil to distributor high tension lead, distributor rotor and cap, ignition cables and spark plugs.

When the ignition switch is turned on and the distributor contact points are closed, battery current flows through the primary winding of the coil and through the contact points to ground. This flow of current through the primary winding of the coil produces a magnetic field around the coil windings.

When the contact points are opened by the revolving distributor cam, the primary circuit is broken. The condenser absorbs the current which tends to surge across the gap as the points separate and thereby produces a sharp break in the flow of current. If the flow of current were not sharply broken it would form an arc which would burn the points badly. However, with the condenser in place, the excess current builds up an electrostatic charge on the insulated plate of the condenser. Due to self induction in the primary winding, this charge immediately becomes greater in potential voltage than any other portion of the primary circuit, and for this reason will immediately discharge back through the primary coil windings in the reverse direction.

The very rapid collapse of the magnetic field when the primary circuit is sharply broken causes a high voltage to be induced in every turn of the secondary windings.

The high voltage surge produced in the secondary winding of the coil travels through the cable to the center of the distributor cap, through the rotor to the adjacent distributor cap segment from which it is conducted to the proper spark plug by the ignition cable. The high voltage surge jumps the gap between the insulated center electrode and the grounded side electrode of the spark plug, thus producing the spark required to ignite the charge in the selected combustion chamber of the engine.

The sequence of action described above is repeated as each lobe of the distributor cam moves under and past the rubbing block on the contact breaker arm to cause the contact points to close and open.

The timing of the spark with respect to the piston position in the cylinder must vary in accordance with operating conditions if best engine performance is to be obtained. The spark advance for obtaining satisfactory idling should be as low as possible. At high speed, the spark must occur earlier in the compression stroke in order to give the air-fuel mixture ample time to ignite, burn and deliver its power to the piston as it starts down on the power stroke.

Control of spark timing to satisfy these constantly changing operating requirements is obtained in two ways, as follows:

1. Initial manual setting of distributor is made so that contact points open at a specified position of piston, as indicated by the timing mark on the crankshaft pulley.

1 2. Centrifugal advance is governed by engine speed. The centrifugal advance mechanism consists of an advance cam, a pair of advance weights (A), two springs (B) and a weight base plate.

At idle speeds the springs hold the advance weights so that there is no spark advance and the spark occurs in accordance with the initial manual setting of the distributor.

As speed increases, centrifugal force causes the advance weights to throw outward and push against the advance cam. This rotates the weight base plate and integral distributor cam lobes to open and close the contact points earlier in the compression stroke, so that the spark is advanced.

Ignition Switch

For Models: All

Special Tools Required: Continuity Light or Meter

Inspection Procedure

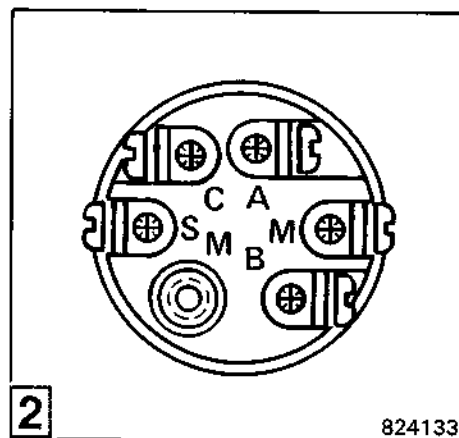
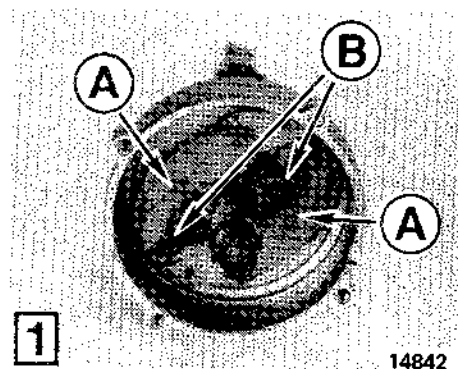
Check for loose connections, loose or corroded terminals. Check for correct wiring.

Test Procedure

2 Disconnect battery leads at battery and leads at switch. Connect continuity light or ohmmeter leads between battery (B) terminal and ignition (A) terminal. Turn switch first to ON position and then to START position. Light or meter should indicate continuity in both positions. Move test lead from ignition to starter (S) terminal and turn key to START position. Light or meter should indicate continuity. The (M) terminals and (C) terminal are not used in stern drive application.

Service and Repair Procedure

Clean terminals, correct wiring (see appropriate wiring diagram at end of this section) or replace unit. Tighten connections and coat with *OMC Black Neoprene Dip* P/N 909570 or equivalent.



Resistor Wire

For Models: All Except PWS 3.0, 3.0 HO and 4.3 L HO

Special Tools Required: Ohmmeter

Test Procedure - Resistor Wire

Disconnect 20 gauge purple/red resistor wire from ignition coil positive (+) terminal. Disconnect purple lead at back of alternator. Connect ohmmeter between purple/red wire at coil and purple wire at alternator. Meter low ohms scale should read:

All Models Except 4.3 and 5.7 L	2.0 $\pm$.1 Ohms
4.3 and 5.7 Litre	1.25 $\pm$.1 Ohms

If resistor wire fails test, do not shorten wire. Replace engine wiring harness.

Service and Repair Procedure

Clean or replace terminals as required. Tighten connections securely, and coat with *OMC Black Neoprene Dip* P/N 909570 or equivalent.

Coil

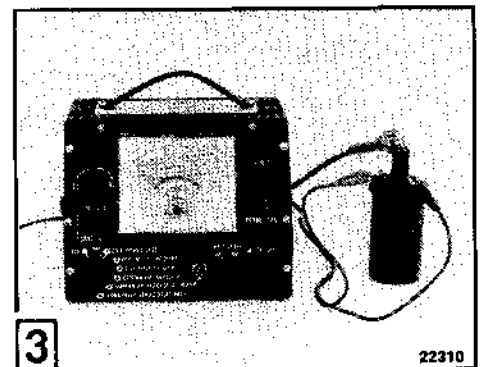
For Models: All Except PWS 3.0, 3.0 HO and 4.3 L HO

3 Special Tools Required: Ignition Tester

Most ignition coils that are replaced are classified as weak. Many coils rejected as weak actually test up to specifications and give normal performance.

A coil that actually is weak will first affect engine performance when the ignition reserve is at a minimum. This may be in starting, low speed acceleration or top speed. Eventually, the engine will fail to start.

High resistance connections in either the primary or secondary circuit wiring will react the same as a weak coil. Wide spark plug gaps, which require higher voltage than the coil can produce, will put the coil under suspicion. High compression and lean carburetion increase the voltage requirements and lead to many needless coil changes. Leakage of high tension current through moisture on an unprotected coil terminal may produce carbon tracks which weaken the coil output voltage. For this reason the nipple on the coil high tension terminal must be properly installed and in good condition.



When an ignition coil is suspected of being defective it should be tested on a reliable coil tester according to instructions supplied with instrument before being replaced.

Coil Specifications

Operating Amperage @ 75°F	1.0 Maximum
Primary Resistance, in Ohms @ 75°F	1.43 - 1.58
Secondary Resistance, in Ohms @ 75°F	7500 - 8700

Must withstand 25-30 kv for 30 seconds.

Condenser

For Models: All Except PWS 3.0, 3.0 HO and 4.3 L HO

4 Special Tools Required: Condenser Tester

Performance Diagnosis

The following four factors affect condenser performance, and each factor must be considered in making any condenser test.

1. Breakdown

A failure of the insulating material. A direct short between the metallic elements of the condenser. This prevents any condenser action.

2. Low Insulating Resistance (Leakage)

Low insulation resistance prevents the condenser from holding a charge. All condensers are subject to leakage which, up to a certain limit, is not objectionable.

3. High Series Resistance

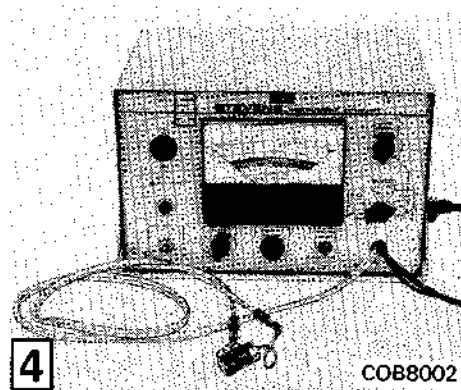
Excessive resistance in the condenser circuit due to broken strands in the condenser lead or to a defective connection. This will cause burned points and ignition failure upon initial starts and at high speeds.

4. Capacity

Capacity is determined by the area of the metallic elements, and the insulating and impregnating materials.

Condenser Specifications

For a complete check of the condenser, use a tester which will check for all of the above conditions. Follow the instructions given by the manufacturer of the test equipment. See distributor specifications for condenser capacity.



Breaker Points

For Models: All Except PWS 3.0, 3.0 HO and 4.3 L HO

Special Tools Required: Dwell Meter

Inspection

When inspection of the breaker points shows replacement to be advisable, the following procedure should be used.

Note The service replacement breaker point set has the breaker arm tension and point alignment adjusted at the factory.

Removal and Installation

1. Release distributor cap hold-down screws, remove cap and place it out of work area. Wipe out inside of cap with a clean cloth.

5 6 7 2. Remove rotor. Disconnect distributor and condenser lead wires from breaker point disconnect terminal (A).

5 6 7 3. Remove breaker point set attaching screw (B), lift set from breaker plate.

4. Clean breaker plate of oil smudge and dirt.

8 5. Check points for abnormal wear, burning or pitting. This illustration indicates a condenser problem.

Note Carefully wipe protective film from point set prior to installation.

Note Marine breaker points have corrosion resistant springs. Do not substitute automotive point sets.

6. To reinstall, place new breaker point assembly in position on breaker plate. Install attaching screw.

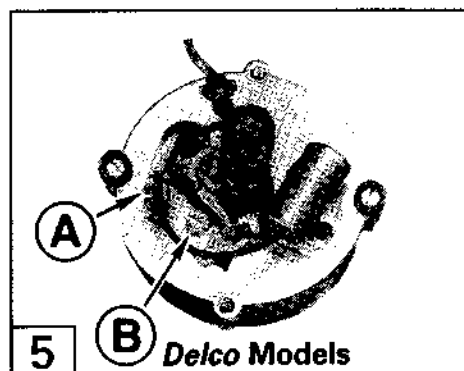
Note Pilot on breaker point set must engage matching hole in breaker plate.

7. Connect primary and condenser lead wires to quick disconnect terminal on breaker point set.

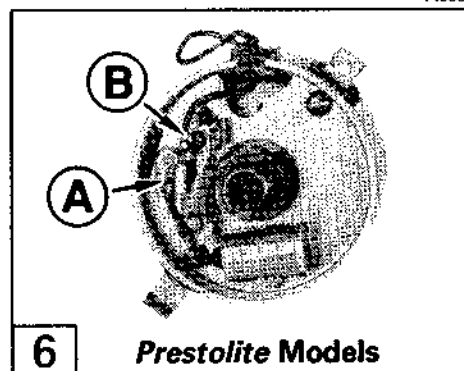
8. Rotate distributor shaft until breaker point rubbing block is positioned on tip of any cam lobe. Set point opening to proper gap.

! 9. Reinstall rotor. Position and lock distributor cap to housing.

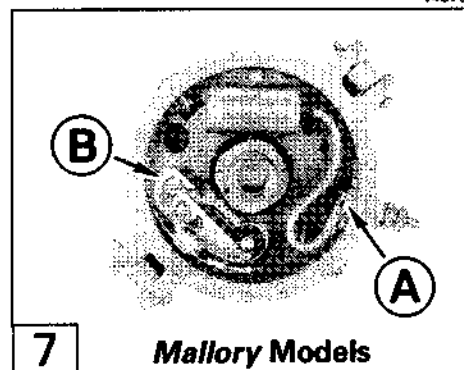
10. Always install a new felt lubricating wick when new breaker points are put in. On models without wick, apply a **light** coating of *Delco Cam and Ball Bearing Grease* or equivalent on the distributor cam.



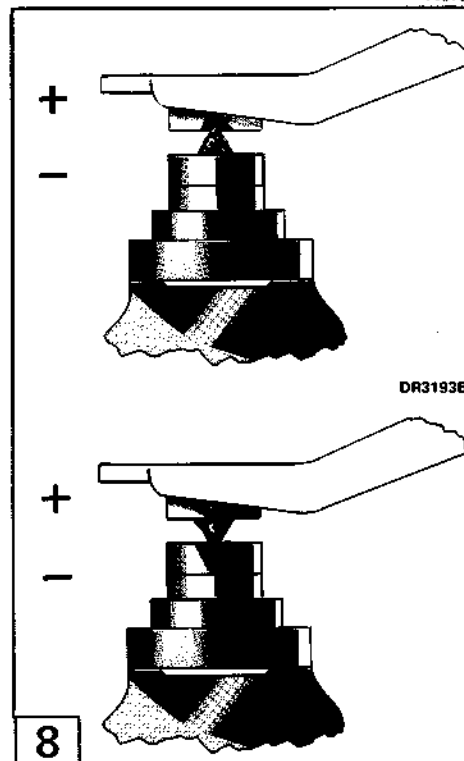
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DR3193A



Safety Related

Note When adjusting contact dwell angle, always follow the instructions which come with the dwell meter.

The point opening of new points can be checked with a feeler gauge, but the use of a feeler gauge on rough or uncleaned used points is not recommended, since accurate mechanical gauging cannot be done on such points.

- Actual opening 0.021 in. (0,53 mm) **A**
- Feeler gauge 0.016 in. (0,41 mm) **B**

Contact points must be set to the proper opening. Points set too close may tend to burn and pit rapidly. Points with excessive separation tend to cause a weak spark at high speed.

New points must be set to the larger opening as the rubbing block will wear down slightly while seating to the cam. Contact points should be cleaned before adjusting if they have been in service.

The following is the preferred method of adjusting breaker point opening.

1. If necessary, align points by bending the fixed breaker support. Do not bend the breaker lever. Do not attempt to align used points; replace them where serious misalignment is observed. Use an aligning tool if available.

2. Crank the engine or turn the distributor shaft until the breaker arm rubbing block is on the high point of the cam lobe. This will provide maximum point opening.

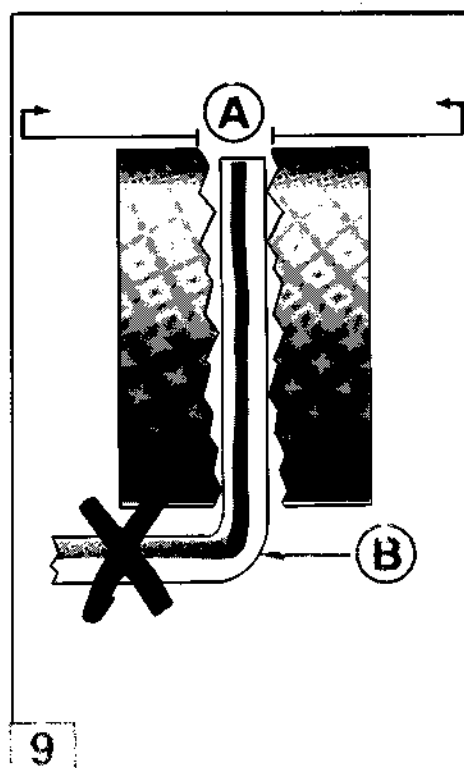
3. Loosen the breaker support lock screw.

10 11 12 4. Use a screwdriver to move the point support to obtain the proper gap. See Distributor Specifications.

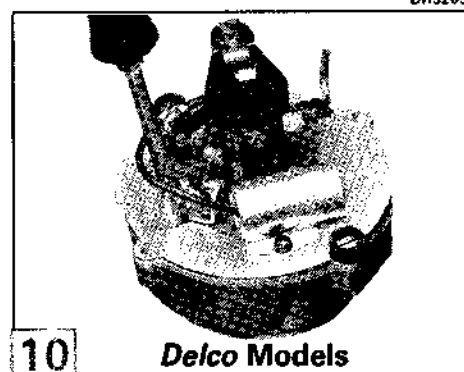
5. Tighten the contact support lock screw and recheck the point opening.

6. After checking and adjusting the breaker point opening to specifications, the cam angle or dwell should be checked with a dwell meter if such equipment is available. Dwell angle and point gap have an inverse relationship. As point gap decreases, dwell increases. As point gap increases, dwell decreases. Dwell angle is the amount of time (in terms of distributor degrees of rotation) that the breaker points are closed. If dwell cannot be adjusted to specifications, check for defective or misaligned breaker points, worn distributor cam lobes, or worn distributor bushings. The variation in dwell angle readings should not exceed 3° between idle speed and 1750 engine RPM. Excessive variation in this speed range indicates wear in the distributor.

Note Dwell angle readings taken at speeds above 1750 engine RPM may be unreliable on some dwell angle meters.



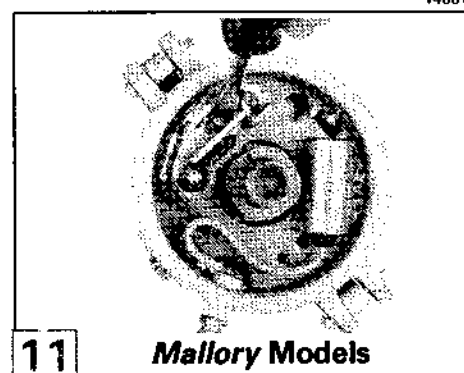
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Delco Models

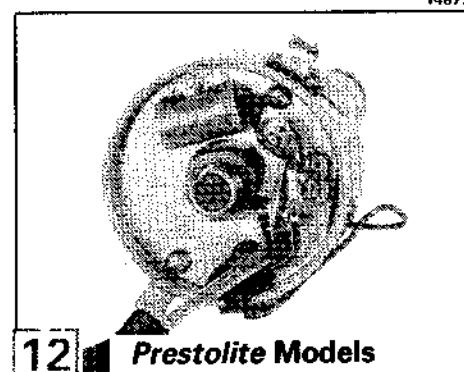
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11

Mallory Models

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12

Prestolite Models

14674

7. After adjusting dwell angle, check initial timing and adjust if necessary. See Finish Timing Procedure in **Section 2**.

- 13**  8. Ensure that distributor cap is properly installed and seated tightly to housing to maintain external ignition proof characteristics. On *Delco* models, make sure notch **C** in cap aligns with primary lead, otherwise lead will be damaged.

Distributors - All Models

 Do not substitute automotive parts. OMC marine components meet U.S. Coast Guard regulations for external ignition proof operation and marine use. OMC marine components are specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive parts can result in fire and explosion.

V-8 models may be equipped with either a *Mallory* or *Prestolite* distributor.

Special Tools Required: Distributor Tester

Removal Procedure

1. Disconnect the distributor primary wire at the ignition coil. Remove distributor cap.

2. Crank engine so number 1 cylinder is in firing position. Make a mark on distributor base and engine in line with center of rotor so that the distributor can be replaced in the exact position after it is serviced.

Note If engine is turned over while distributor is out, complete ignition timing procedure must be followed. See Initial Timing Procedure in **Section 2**.

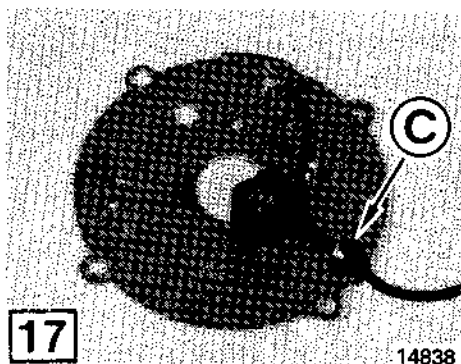
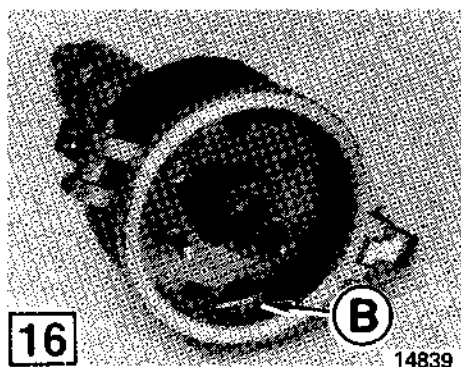
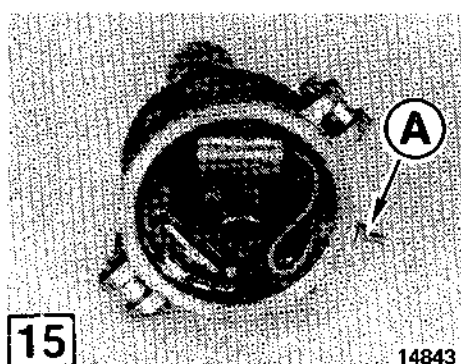
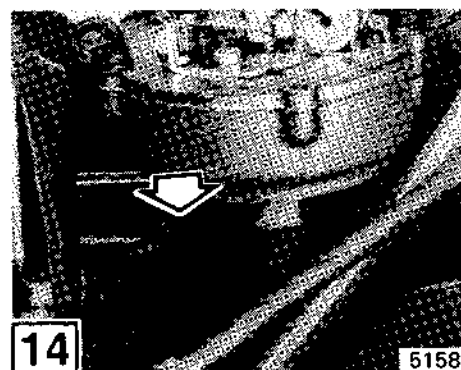
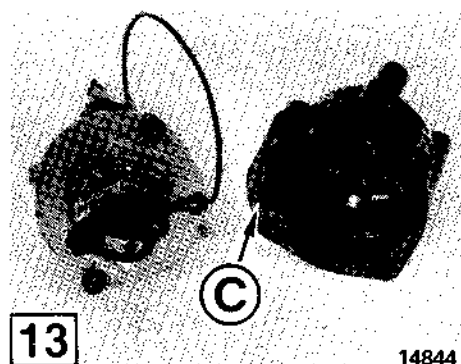
- 14** 3. Remove distributor clamp and lift distributor from engine.

Distributor Disassembly

15 1. Remove rotor, condenser and breaker point set. On *Mallory* models, point replacement requires removal of the terminal screw **A** on inside of housing.

16 **17** 2. Remove breaker plate from housing by loosening screws. Lift breaker plate from distributor housing. On *Mallory* models, note relationship of plates curved notch **B** and terminal screw hole. On *Delco* models, do not disturb grommet **C** holding primary lead in breaker plate.

3. Scribe reference marks on the housing and gear. This will prevent the gear being reinstalled 180° out of position when the distributor is assembled.



- 18** 4. Drive roll pin through gear and shaft, using a straight punch. Remove gear and spacers (if any) from shaft.

Note Be careful not to bend distributor shaft, or damage gear or collar when driving pin out.

5. Pull shaft, breaker cam and centrifugal advance assembly from the housing.

Cleaning and Inspection

Wash all parts in clean solvent. Dry parts thoroughly.

1. Cap:

Wipe out distributor cap with clean cloth and inspect it for chips, cracks and carbonized paths which would allow high tension leakage. Such defects require replacement of the cap. Clean loose corrosion from surfaces of terminal segments inside the cap. Do not use emery cloth or sandpaper. If segments are deeply grooved, cap should be replaced. Pull cables from terminal sockets and inspect sockets for corrosion. Clean sockets using a stiff wire brush to loosen corrosion. Lubricate sockets with *OMC Extreme Pressure Grease* or equivalent before reassembly of high tension leads. Check carbon contact for excessive wear.

2. Rotor:

If rotor is cracked or rotor tip is badly burned, rotor must be replaced.

3. Condenser:

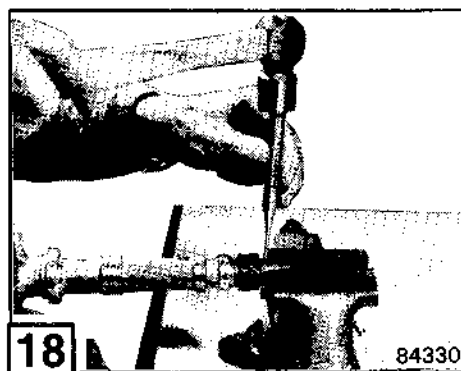
Inspect condenser and primary leads for loose or frayed terminal connections. Check condenser for leakage, capacity and resistance with a reliable condenser tester.

4. Breaker Points:

Carefully examine the mating surfaces of the breaker points, noting whether they are burned, blackened, pitted or worn excessively. Breaker points which have been in service for some time will appear dull and gray. This condition is normal and such points should not be replaced.

Breaker points which are blackened, or only slightly pitted or burned, may be cleaned with a thin contact stone or a clean fine cut file. Remove high points only; it is not necessary to remove all build-up or pitting.

Note Do not use emery cloth or sandpaper to clean breaker points because particles of these materials usually imbed in the contact surfaces and cause points to burn.



Excessively burned, pitted or worn breaker points cannot be cleaned satisfactorily; therefore, they must be replaced to ensure satisfactory ignition. Burned or pitted points may be caused by:

- a. Ignition coil resistor wire not properly connected into circuit. Connect between ignition switch and coil positive (+) terminal.
- b. Defective condenser. Check the condenser.
- c. Improper contact point opening. Adjust contact point dwell as required.
- d. Oil vapors getting into the distributor and depositing on contact surfaces or points. This causes arcing and rapid burning of breaker points. Oil vapor entering distributor usually produces a smudgy line under the points. Oil vapor enters the distributor by worn distributor bushings, damaged distributor shaft seal or high crankcase pressure.
- e. High voltage, or any other condition in the electrical system causing excessive flow through breaker points. This results in a blue scale forming on point surfaces. Check condenser for high series resistance. Check voltage regulator.

5. Centrifugal Advance:

Inspect for excessive wear between centrifugal weights and advance cam or pivot pins. Turn advance plate until weights are fully extended, then release and allow springs to return weights. Repeat several times. Springs should return weights to stop without sticking, and there should be no excess free play.

6. Cam:

Inspect cam lobes for scoring or excessive wear.

7. Distributor Shaft:

Check for excessive wear between the shaft and bushings in housing.

8. Drive Gear:

Inspect gear for scoring of teeth or excessive wear.

-  **9. Distributor housing: Spark suppression screens must be tightly in place.**

Distributor Assembly

 **Do not substitute automotive parts. OMC marine components meet U.S. Coast Guard regulations for external ignition proof operation and marine use. OMC marine components are specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive parts can result in fire and explosion.**

Assemble the distributor in the following manner:

1. Lubricate shaft and install it in distributor housing.
2. Align reference marks and install distributor gear and spacers (if any) to shaft and insert retaining roll pin. Check to see that shaft turns freely. Allowable shaft end play is 0.001 inch-0.010 inch.

19 **20** 3. Seat breaker plate in housing and install screws. *Mallory* models, position curved plate notch **A** at terminal screw hole. Make sure plate rests flush against lip inside housing when mounting screws are tightened. *Delco* models, secure plate with screws and seals. Make sure primary lead grommet **B** is seated in plate and notch in housing.

Note Lubricate top end of shaft with *Delco Cam and Ball Bearing Grease* or equivalent prior to replacing breaker points. Do not lubricate shaft if breaker point and assembly has lubricating wick.

4. Attach condenser and contact point set in proper location with appropriate attaching screws. On *Mallory* models, attach terminal screw.

Note Breaker point set pilot must engage matching hole in breaker plate. Connect primary and condenser leads.

5. Check and adjust breaker point opening.

6. If a reliable distributor tester is available, check the distributor to make sure that the centrifugal advance mechanism is operating within the proper advance curve.

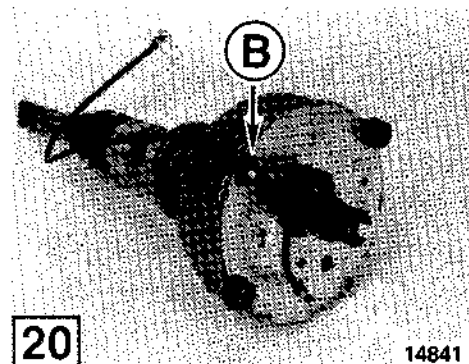
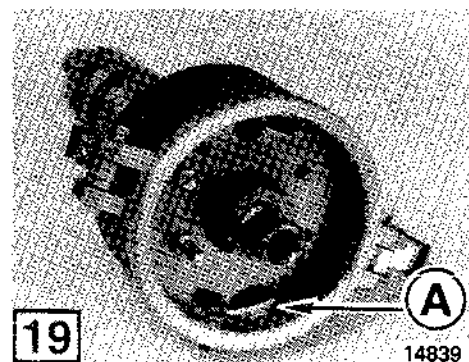
Installation - Engine Not Disturbed

Note If engine has been cranked with distributor out, install distributor following Initial Timing Procedure in **Section 2**.

1. Position rotor about one-eighth turn counterclockwise (2.3, 3.0, 3.0 L HO, 4.3 and 5.7 L models) or one-eighth turn clockwise (5.0, 5.0 HO and 5.8 L models) from the reference mark previously placed on the distributor housing to locate rotor.

2. Align reference mark on engine with mark on distributor housing, and push the distributor down into position in the block with the housing in a normal installed position.

Note It may be necessary to move rotor slightly to start gear into mesh with camshaft gear, but rotor should line up with the mark when distributor is down in place.



3. Tighten the distributor clamp bolt snugly and connect the primary wire to coil terminal and install cap. Install spark plugs and wires if removed. Lubricate sockets in the distributor cap with *OMC Extreme Pressure* grease or equivalent before installing high tension leads. Coat primary wire terminal with *OMC Black Neoprene Dip* P/N 909570 or equivalent.

21  4. Install distributor cap. Tighten screws securely to maintain external ignition proof characteristics. On *Delco* models make sure notch © in cap aligns with primary lead, otherwise lead will be damaged.

5. Time ignition as required. See Finish Timing Procedure in Section 2.

Distributor Specifications

Models	Firing Order	Rotation (Top View)	Point Gap	Dwell	Condenser Capacity*	Driven By
2.3 Litre	1-3-4-2	clockwise	0.019 in. (0,48 mm)	36° ± 2°	0,25-0,31	aux. shaft
PWC 3.0 Litre				31° - 34°	0,18-0,23	camshaft
4.3 Litre				1-6-5-4-3-2	39° ± 2°	
5.0 Litre	1-5-4-2-6-3-7-8	counter-clockwise	29° ± 2°			
5.0 Litre HO	1-3-7-2-6-5-4-8					
5.8 Litre						
5.7 Litre	1-8-4-3-6-5-7-2	clockwise				

* in microfarads

Tachometer

For Models: All

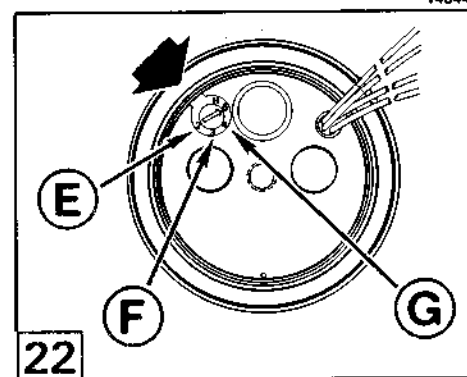
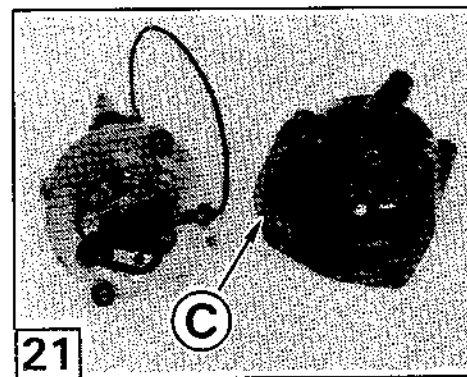
Special Tools Required: None

Inspection Procedure

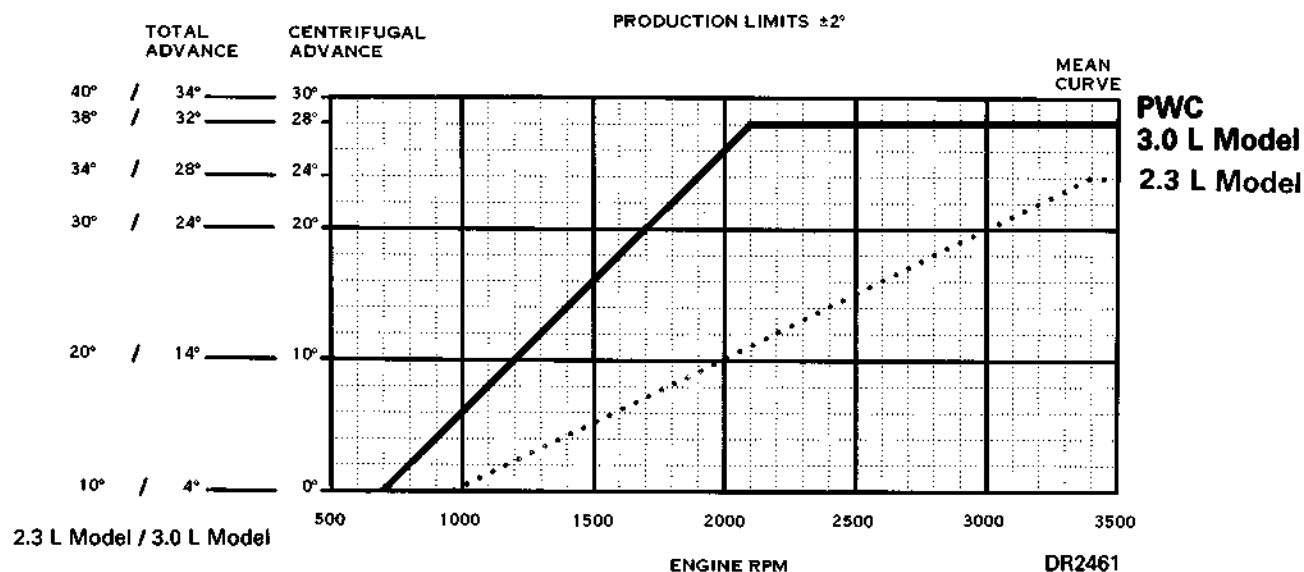
1. Check for loose or corroded terminals and connectors.

22 2. Check tachometer for proper connections, and trace leads for proper connections. Determine if tachometer is programmed correctly for each engine:

- (E) Four-cylinder engine - lead goes to Number 2
- (F) Six-cylinder engine - lead goes to Number 3
- (G) Eight-cylinder engine - lead goes to Number 4



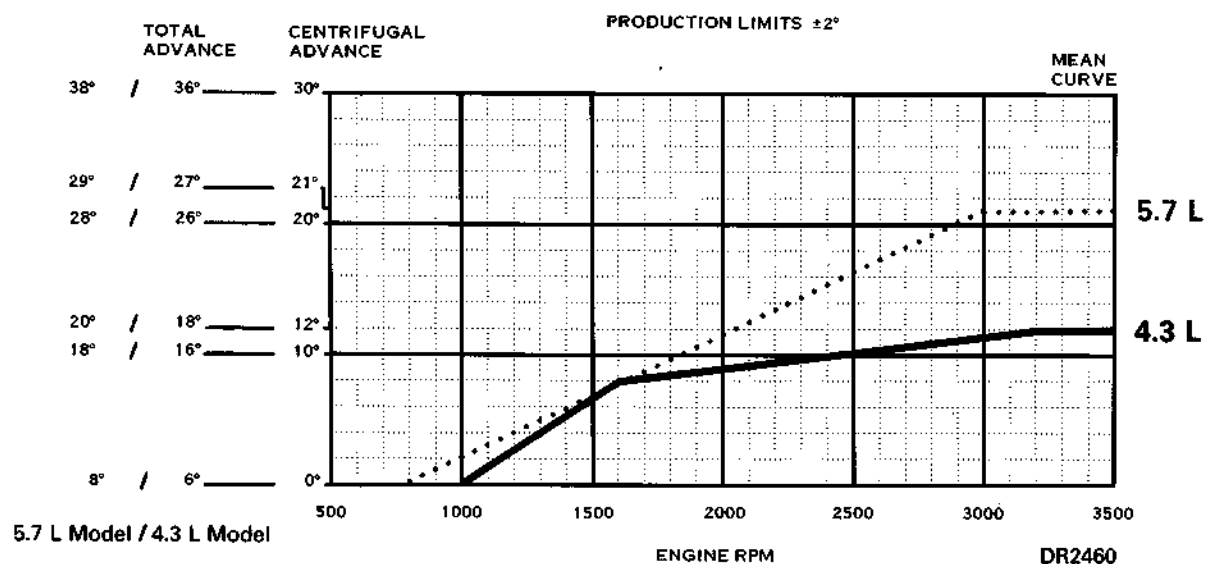
2.3 & PWC 3.0 L Model Distributor Advance Curve Charts



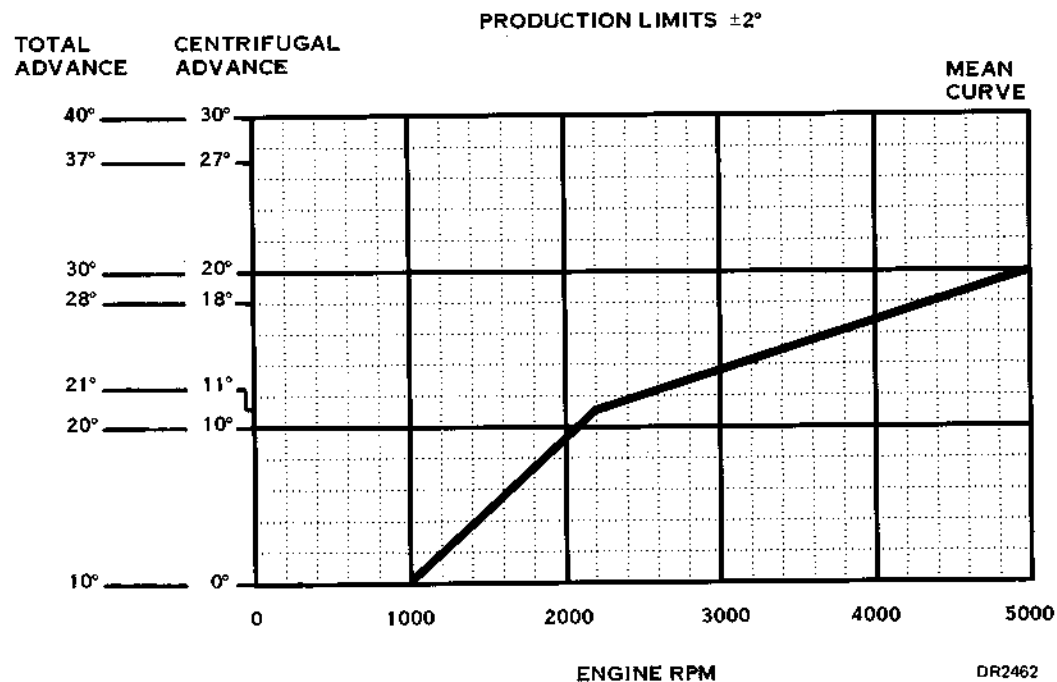
Distributor Advance

	RPM	Start Advance Centrifugal°	Total°	RPM	Full Advance Centrifugal°	Total°
2.3 L Model	1000	0°	10°	3400	24°	34°
PWC 3.0 L Model	700	0°	4°	2100	28°	32°
4.3 L Model	1000	0°	6°	3200	12°	18°
5.7 L Model	800	0°	8°	3000	21°	29°

4.3 L and 5.7 L Models Distributor Advance Curve Charts



Distributor Advance Curve Charts



5.0 L Model
5.0 L HO Model
5.8 L Model

Distributor Advance

Start Advance			Full Advance		
RPM	Centrifugal°	Total°	RPM	Centrifugal°	Total°
1000	0°	10°	4400	18°	28°
1000	0°	10°	4600	25°	35°

5.0, 5.0 HO, 5.8 L Models

Ignition Interrupter Circuit

The ignition interrupter circuit is found on all stern drive models, and is made up of the Electronic Shift Assist module; the interrupter and overstroke switches; and associated connectors and wiring.

This system reduces shifting effort and promotes smoother shifting by altering engine RPM. When the remote control handle is moved, an engine mounted shift arm senses drive train loads transmitted through the transom bracket shift cable. A switch triggers the Electronic Shift Assist module into pulsing the ignition by intermittently grounding the distributor side of the coil. The E.S.A. module will function when shifting both into and out of forward and reverse. After the gear change is completed, the triggering switch becomes inactive, and the engine resumes normal RPM operation. A second switch prevents the shift mechanism from accidentally activating the module after the engine is running in gear.

Performance Diagnosis

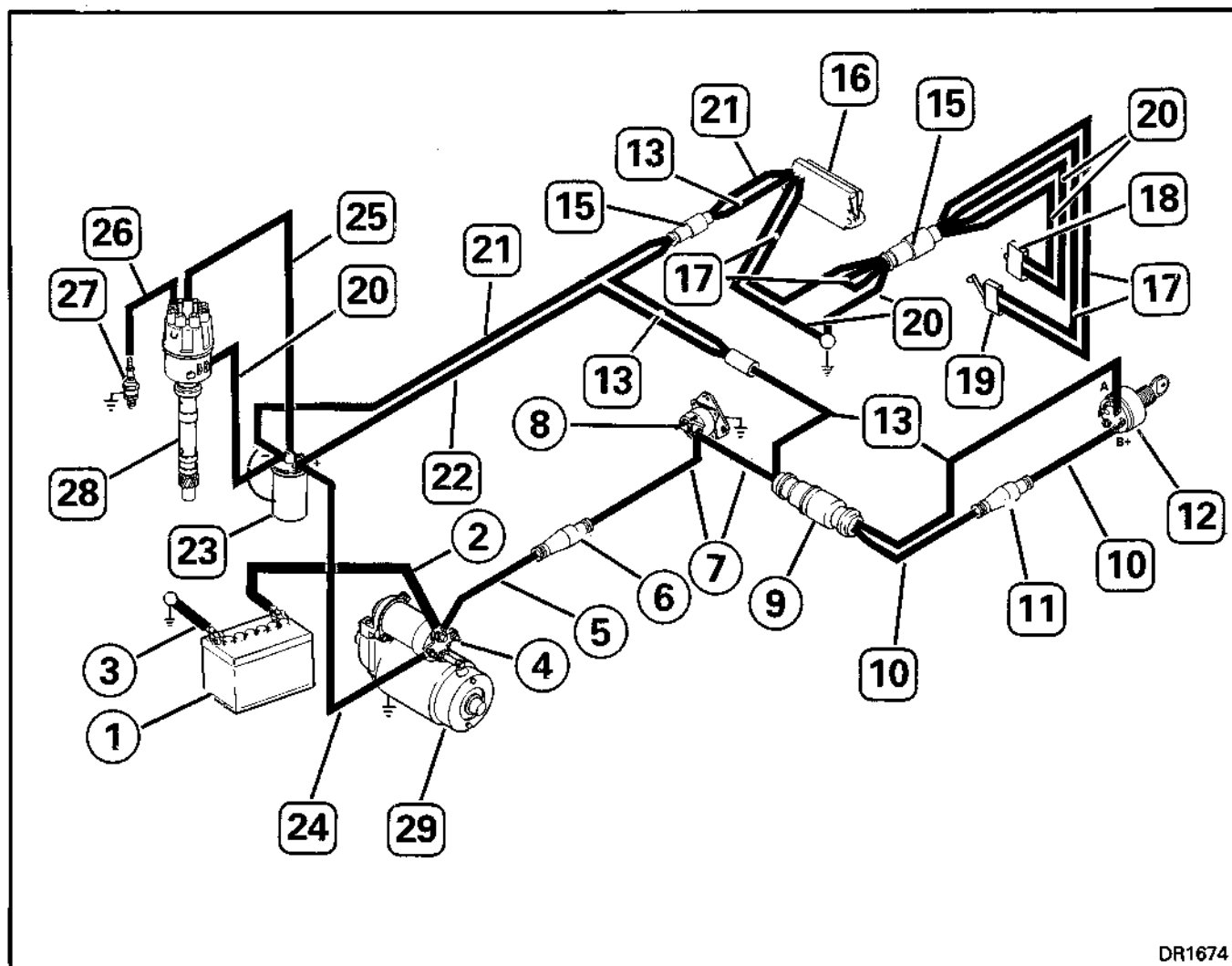
Start engine and run at 800-1000 RPM in neutral. Manually trigger the interrupter switch mounted on the shift bracket at the starboard rear of the engine. If the E.S.A. module is functioning properly, the engine will pulse and RPM will drop below 500 RPM. Engine should continue to pulse until the interrupter switch is released, at which time engine RPM will return to its original setting.

If the E.S.A. module fails to pulse RPM when the interrupter switch is actuated, make sure all lead connections are clean and tight, and that all wires are properly routed. Check the E.S.A. module for a good external ground connection, then perform continuity tests on the interrupter and overstroke switches as specified in **Section 11**. Replace the E.S.A. module if the wiring and switches check okay.

Note E.S.A. modules are stamped with identifying logo for specified engines. DO NOT interchange them as this will cause improper operation of the engine's ignition and shift systems.

Maintenance and Adjustment

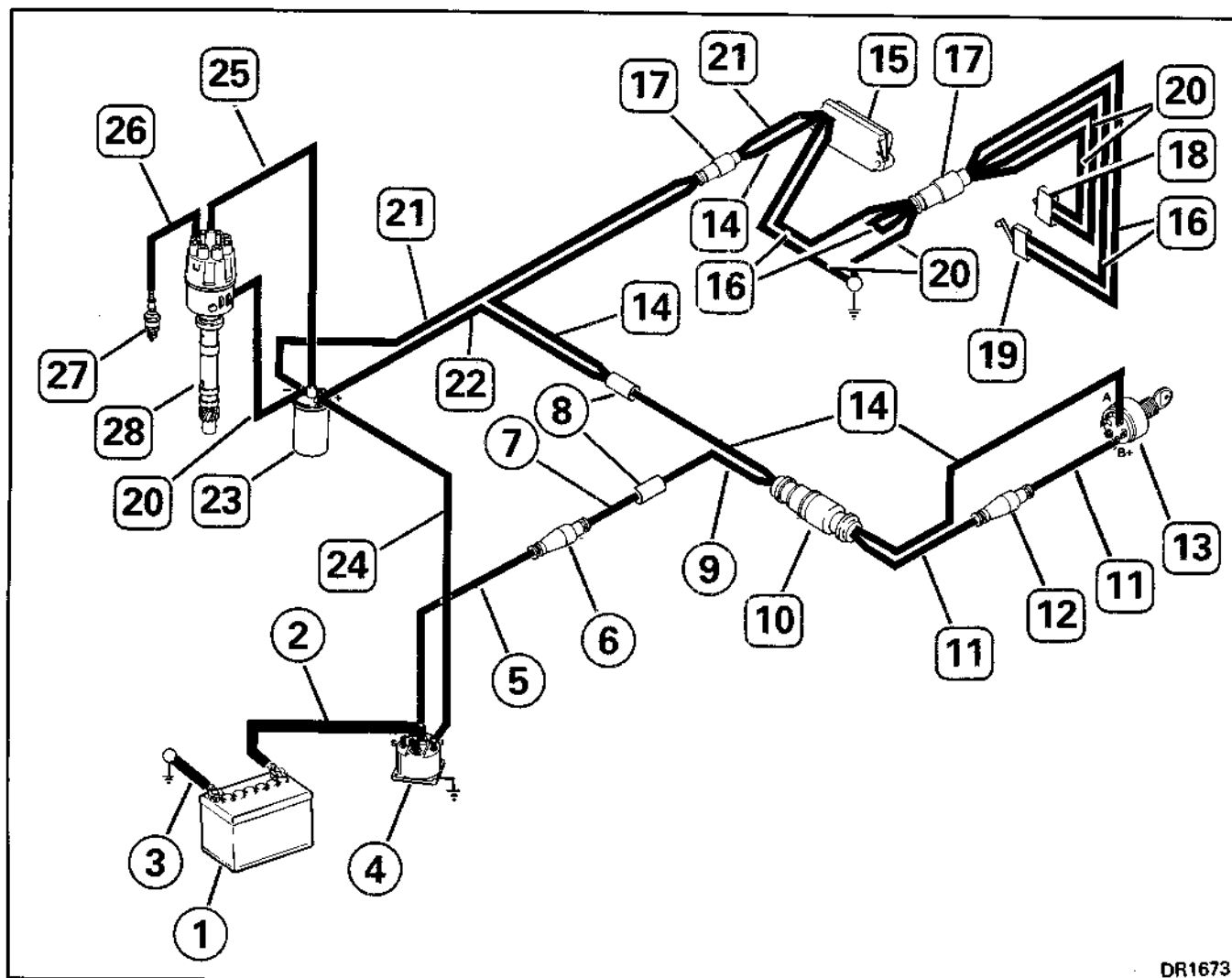
E.S.A. modules are solid state components that require no periodic maintenance or adjustment. Following the instructions in **Section 11**, adjustments can be made to accurately set the overstroke switch actuating cam.



DR1674

Ignition Circuit PWC 3.0 L and 5.7 L Models

- | | | |
|------------------------|---------------------|-----------------------------------|
| ① Battery | ⑩ Red/Purple 12 Ga. | ⑩ E.S.A. Module |
| ② Red 4 Ga. | ⑪ 20 Amp Fuse | ⑪ Blue 16 Ga. |
| ③ Black 4 Ga. | ⑫ Ignition Switch | ⑫ Overstroke Switch |
| ④ Solenoid | ⑬ Purple 16 Ga. | ⑬ Interrupter Switch |
| ⑤ Red 10 Ga. | ⑭ Splice | ⑭ Black 16 Ga. |
| ⑥ 50 Amp Fuse | ⑮ Connector | ⑮ Gray 16 Ga. |
| ⑦ Red/Purple 10 Ga. | | ⑯ Purple/Red 20 Ga. Resistor Wire |
| ⑧ Assist Solenoid | | ⑰ Coil |
| ⑨ Main Cable Connector | | ⑱ Purple/Black 16 Ga. |
| | | ⑲ High Tension Lead |
| | | ⑳ Spark Plug Lead |
| | | ㉑ Spark Plug |
| | | ㉒ Distributor |
| | | ㉓ Starter Motor |



DR1673

Ignition Circuit 2.3, 5.0, 5.0 HO and 5.8 L Models

- | | |
|------------------------|-----------------------------------|
| ① Battery | ⑮ E.S.A. Module |
| ② Red 4 Ga. | ⑯ Blue 16 Ga. |
| ③ Black 4 Ga. | ⑰ Connector |
| ④ Starter Solenoid | ⑱ Overstroke Switch |
| ⑤ Red 10 Ga. | ⑲ Interrupter Switch |
| ⑥ 50 Amp Fuse | ⑳ Black 16 Ga. |
| ⑦ Orange 10 Ga. | ㉑ Gary 16 Ga. |
| ⑧ Splice | ㉒ Red/Purple 20 Ga. Resistor Wire |
| ⑨ Red/Purple 10 Ga. | ㉓ Coil |
| ⑩ Main Cable Connector | ㉔ Purple/Black 16 Ga. |
| ⑪ Red/Purple 12 Ga. | ㉕ High Tension Lead |
| ⑫ 20 Amp Fuse | ㉖ Spark Plug Lead |
| ⑬ Ignition Switch | ㉗ Spark Plug |
| ⑭ Purple 16 Ga. | ㉘ Distributor |