

Ignition System Troubleshooting

Engine runs sluggish, overheats. Check:

- timing and automatic spark advance
- for proper fuel
- compression and for carbon buildup

Engine pings. Check:

- timing and automatic spark advance
- for proper fuel
- compression and for carbon buildup
- spark plugs for proper heat range

Engine starts hard. Check:

- for spark
- spark plugs
- breaker points and condenser
- compression
- resistor bypass circuit
- battery
- distributor cap

Engine misfires. Check:

- spark plugs and leads
- breaker points and condenser
- rotor and distributor cap
- coil
- for loose connections at resistor wire, coil and ignition switch
- engine firing order and plug wire routing
- engine timing and dwell
- ignition interrupter circuit

Engine fires when cranked, stops when key is released. Check:

- resistor wire
- wiring circuit
- ignition switch and connections

Engine cranks but doesn't start. Check:

- for spark
- breaker points and condenser
- coil and wiring
- resistor bypass to coil positive (+) terminal
- engine timing, dwell and plug wire routing
- tach and wiring
- ignition interrupter circuit

Spark Plugs, Leads and Firing Order

For Models: All

Removal and Inspection

1. To disconnect wires, twist and pull only on boot because pulling on wire may cause separation of the core of the wire. Remove spark plugs using a $\frac{5}{8}$ in. spark plug socket or a $\frac{5}{8}$ in. box wrench. Use care to avoid cracking the spark plug insulators.

2. Carefully inspect the insulators and electrodes of all spark plugs. Replace any spark plug which has a cracked or broken insulator or which has loose electrodes. If the insulator is worn away around the center electrode, or the electrodes are burned or worn, the spark plug is worn out and should be discarded. Spark plugs which are in good condition, except for carbon or oxide deposits, should be thoroughly cleaned and regapped.

3. The spark plugs wires are of a special resistance type. The core is carbon impregnated linen. This type wire is superior to copper core wire in its resistance to cross-fire; however, it is more easily damaged than copper core. For this reason care must be taken so that the spark plug wires are removed by pulling on the spark plug boots rather than on the wire insulation. If the wire is stretched, the core may be broken with no evidence of damage on the outer insulation. If the core is broken, it will cause misfiring. In the case of wire damage, it is necessary to replace the complete wire assembly since a satisfactory repair cannot be made.

4. Use an ohmmeter to test ignition leads for excessive high resistance or an open circuit. Proper resistance must not exceed 10,000 ohms per foot.

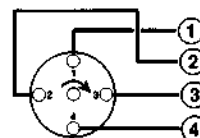
5. Wipe ignition wires with a cloth moistened in kerosene, and wipe dry. Bend wires to check for brittle, cracked or loose insulation. Defective insulation will permit misfiring or cross-firing of engine, therefore defective wires must be replaced.

6. If the wires are in good condition, clean any terminals that are corroded and replace any that are broken or distorted. Replace any wires with broken or deteriorated cable nipples or spark plug.

Spark Plug Cleaning

Spark plugs which have carbon or oxide deposits should be cleaned in a blast type spark plug cleaner. Scraping with a pointed tool will not properly remove the deposits and may damage the insulator. If spark plugs have a wet or oily deposit, dip them in a degreasing solvent and dry thoroughly with compressed air. Oily plugs will cause the cleaning compound to pack in the shell.

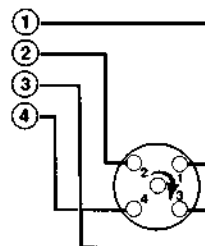
2.3 Litre
Front



23

DR2452

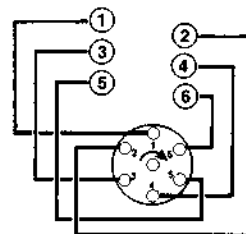
3.0 L and 3.0 L HO
Front



24

DR2451

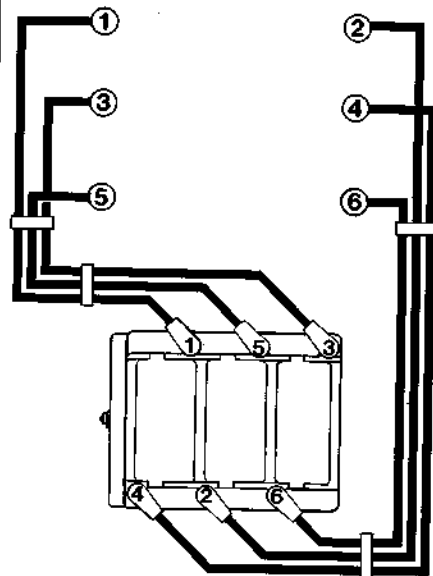
4.3 Litre
Front



25

DR2448

4.3 L HO
Front



26

DR2948

Carefully follow the instructions of the manufacturer of the cleaner being used. Clean each plug until the interior of shell and entire insulator is cleaned, however avoid excessive blasting.

1. Examine interior of plug in good light. Remove any cleaning compound with compressed air. If traces of carbon or oxide remain in plug, finish the cleaning with a light blasting operation. Clean firing surfaces of center and side electrodes with several strokes of a fine cut file.

2. When spark plugs have been thoroughly cleaned, carefully inspect them for cracks or other defects which may not have been visible before cleaning.

Adjust Spark Plug Gap

Use a round wire feeler gauge to check the gap between the spark plug electrodes. Flat feeler gauges will not give a correct measurement if the electrodes are worn. Adjust gap by bending the side electrode only. Bending the center electrode will crack the insulator. Setting the spark plug gap to any other specification in an attempt to improve idle or affect engine performance is not recommended.

23 → 29 Installation of Spark Plugs and Wires

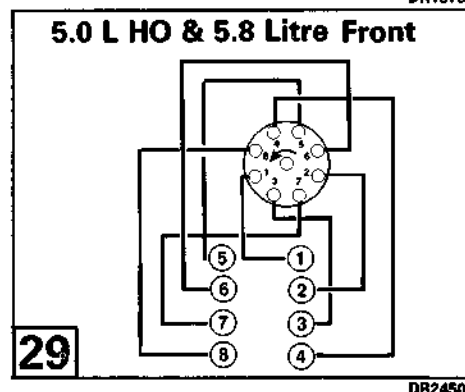
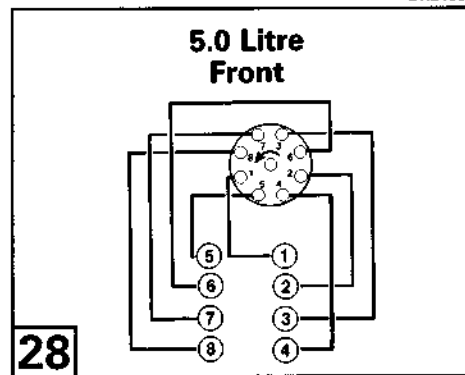
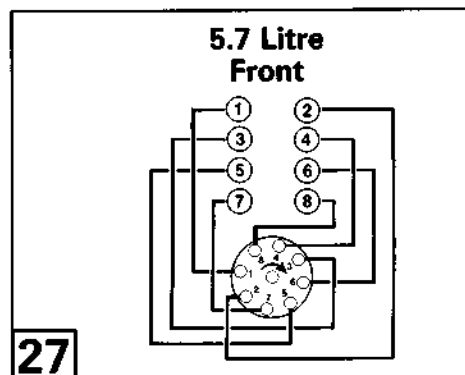
For proper engine performance it is very important that the correct spark plugs be used. When installing spark plugs, make sure that the threads in the cylinder head and all surfaces on plugs and in cylinder heads are clean. Torque spark plugs to specified foot-pounds. All engines use tapered seat plugs without gaskets.

⚠ Do not operate engine if spark plug covers or high tension leads are torn or cracked. This condition can allow external sparks which could ignite any fuel vapors in the engine compartment.

Spark plug wires must be arranged between the distributor cap and spark plugs in the order of firing sequence. If spark plug wires are not correctly installed, misfiring or cross-firing may result.

Engine Firing Order

2.3, 3.0 and 3.0 L HO Models	1-3-4-2
4.3 L Models	1-6-5-4-3-2
5.0 L HO and 5.8 L Models	1-3-7-2-6-5-4-8
5.7 L Models	1-8-4-3-6-5-7-2
5.0 L Models	1-5-4-2-6-3-7-8



Charging Circuit

All Models

Table of Contents

Alternator	
Assembly	3-57
Disassembly	3-53
Installation	3-49
Removal	3-49
Specifications	3-58
Testing, Alternator	3-51
Troubleshooting	
Alternator	3-50
Circuit Checkpoints	3-61
Voltage Regulator	3-56
Wiring Diagrams	3-59



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.

Motorola Alternator

Removal

To ensure proper operation and to protect the alternator and regulator, the following steps should be observed during installation.

⚠ 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.

⚠ 1. Disconnect the battery ground cable at battery.

1 2. Loosen both alternator bolts and remove belt from pulley.

3. Remove top bolt and pivot alternator away from engine.

2 4. Disconnect all leads at back of alternator.

5. Unscrew pivot bolt and remove alternator.

Installation

3 1. Position alternator in bracket and loosely install pivot bolt.

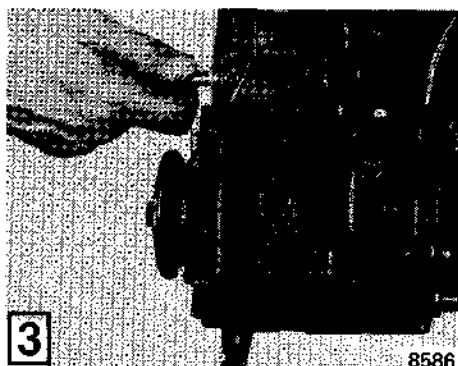
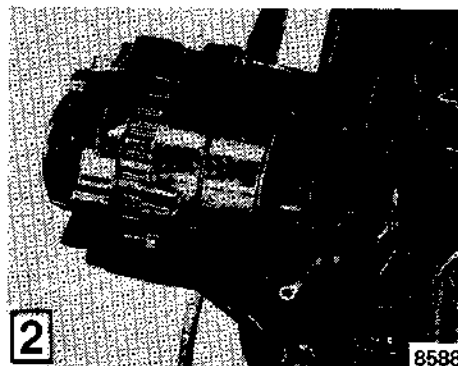
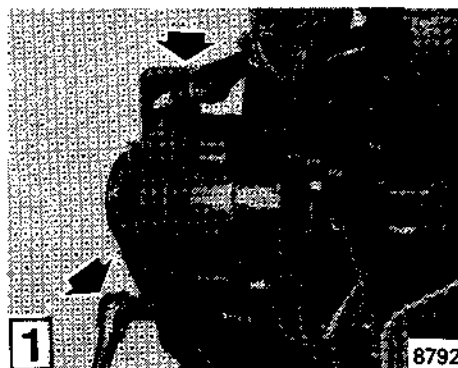
2. Connect purple lead to "S" terminal. Connect red/purple stripe lead to "EXC" blade terminal. Coat both terminals with *OMC Black Neoprene Dip* P/N 909570.

4 **⚠** 3. Connect orange lead to "POS +" stud. Connect purple/white stripe lead to "AC" stud. Tighten nuts securely. Slide rubber boots up leads and cover both terminals.

5 4. Pivot alternator toward engine and attach belt to pulley. Insert pry tool between alternator body and lower mount bracket. Correctly tension belt and tighten both mounting screws.

Note 2.3 Litre models: Do not pry against timing belt cover. Pressure may damage cover.

5. Connect battery cables.



Troubleshooting the *Motorola* Alternator

Belt Tension

6 Check the alternator belt for correct tension. Alternator belt tension is $\frac{1}{4}$ in. give (finger pressure) or 75 ± 10 pounds at point shown.

Note When adjusting alternator belt, do not overtighten. The alternator may be damaged.

Alternator Output Test

Before beginning charging system checks, test the alternator output to verify that a charging problem exists.

7 1. Disconnect orange lead **A** from "POS +" stud at back of alternator and connect an ammeter **B** in series.

7 2. Attach a voltmeter **C** to the "POS +" stud **D** and an engine ground.

3. Connect a carbon pile or *Stevens* LB-85 Load Bank across the battery.

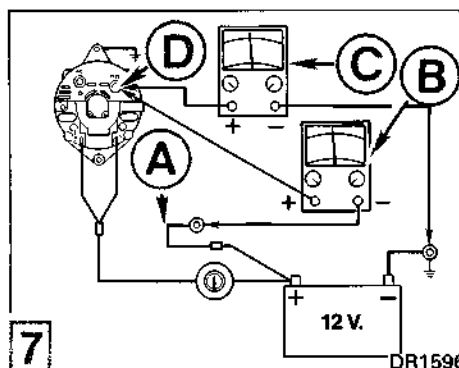
4. Start and run the engine. The amperage and voltage output readings should be as follows when the carbon pile is adjusted to obtain maximum output:

- 650 RPM - 20 amps minimum
- 3000 RPM - 45 amps minimum
- 13.9 - 14.7 volts

The output test results will fall into one of these categories; overcharging, undercharging or no charge at all.

If battery overcharge is indicated by excessive water use, ammeter or voltmeter showing consistent charge, or alternator output exceeding 14.7 volts (no load) with engine idling, voltage regulator is shorted and must be replaced.

If battery undercharge (or no charge) is indicated, perform the following tests in the order shown.



Testing *Motorola* Alternator

Wire Continuity Tests

For the battery to receive sufficient charging current, and the alternator to supply the correct amount, three wires must have proper continuity; the orange output (POS +) lead, the purple ("S") sense lead and the red/purple excite ("EXC") lead.

Testing Orange "POS +" Lead

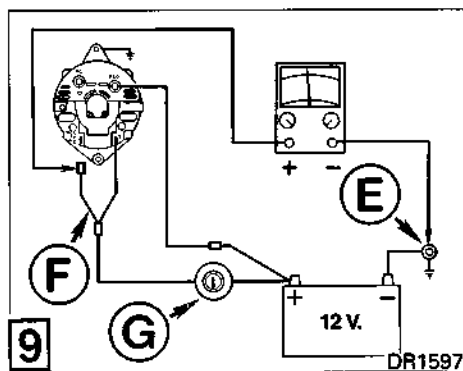
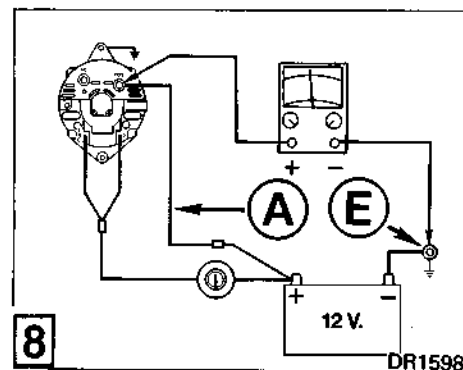
1. Slide the protective rubber boot off the "POS +" stud.
- 8 2. Connect the voltmeter positive lead to the orange wire (A), and negative lead to an engine ground (E). The voltmeter should show a reading equal to battery voltage.
3. Test results:
 - Excessive resistance - one volt or more less than battery voltage (example: 10.2 volt wire reading versus 11.8 volts)
 - Open circuit - a voltmeter reading of zero.

Check circuit between orange wire terminal and assist solenoid terminal. Correct any problems, then conduct alternator output test again. If reading is as specified, go on to following test.

Testing Red/Purple "EXC" Lead

1. Remove red/purple lead from "EXC" terminal on back of alternator.
- 9 2. Connect a voltmeter to the red/purple lead (F) and an engine ground (E).
- 9 3. With battery connected and key switch (G) on, the voltmeter reading should be within a few tenths of a voltage reading taken directly at the battery.
4. Test results:
 - Excessive resistance - one volt or more less than battery voltage (example: 10.2 volt wire reading versus 11.8 volts)
 - Open circuit - a voltmeter reading of zero
 - Grounded circuit - a reading of zero accompanied by a blown fuse each time key switch is turned on

Check circuit between red/purple wire terminal and key switch "Accy" terminal. Correct any problems, then conduct alternator output test again. If reading is as specified, go on to following test.



Testing Purple "S" Lead

- 10** Repeat steps 1 thru 4 under Testing Red/Purple "EXC" Lead with the purple lead **A** at the alternator "S" terminal. The test procedure and test results are identical.

If the wiring is okay, the battery can be the problem. The battery may be unable to accept or hold a charge. Clean both terminals thoroughly, then perform a specific gravity test to determine the condition of the battery. If necessary perform a load test. A fully charged battery, or a sulfated one, would make the alternator show normal voltage output, but be low on amperage.

If the tests show the engine wiring, battery or accessories are not at fault, make additional running tests on the alternator.

Excite/Sense Circuit Test

1. Unscrew protective cap on "light" stud. Retain cap for reuse.

- 11** 2. With ignition **B** on, but engine not running, check for 1.5-3.0 volts at the "light" stud **C**.

3. If "light" stud voltage is not as specified, replace voltage regulator. If voltage is correct, check diode-trio next.

Diode-Trio Test

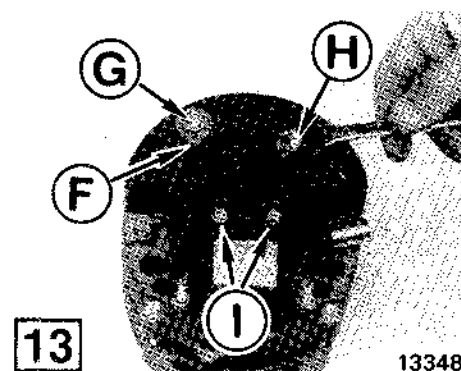
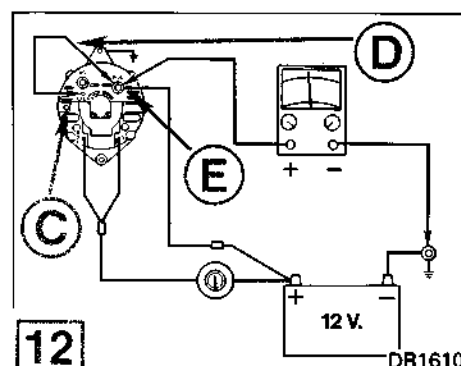
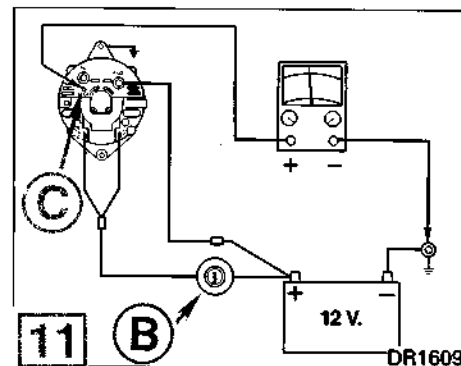
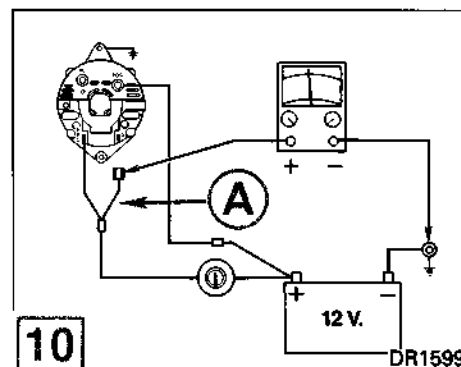
- 12** 1. Connect a jumper wire **D** between the "POS +" stud **E** and the "light" stud **C**. This will bypass the diode-trio inside the alternator.

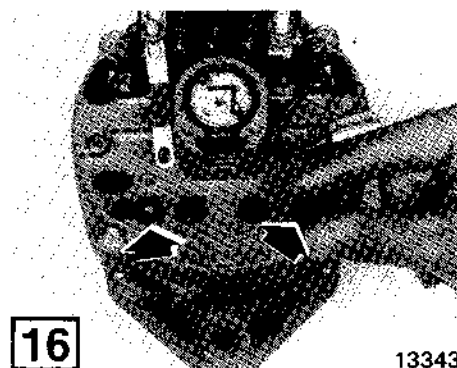
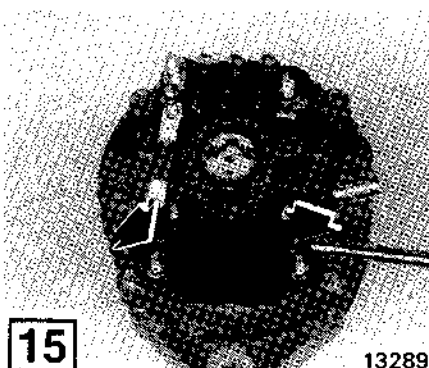
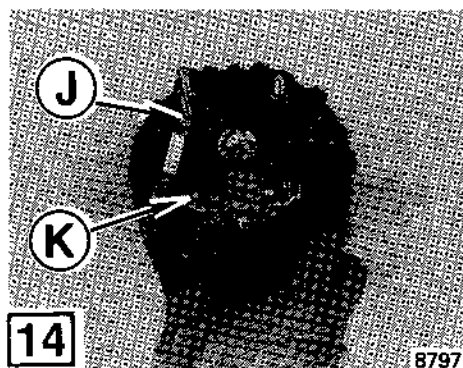
- 12** 2. Connect a voltmeter to the "POS +" stud and an engine ground.

3. Start engine and run at idle. If charging voltage is now present at "POS +" stud, diode-trio is defective and should be replaced.

- ⚠** 4. Screw protective cap onto "light" stud after completing test.

If the alternator passes both the excite/sense circuit test and the open diode trio test, replace the voltage regulator. If alternator still fails to produce the specified voltage/amperage after installation of a new regulator, the alternator will have to be disassembled in order to test internal components.

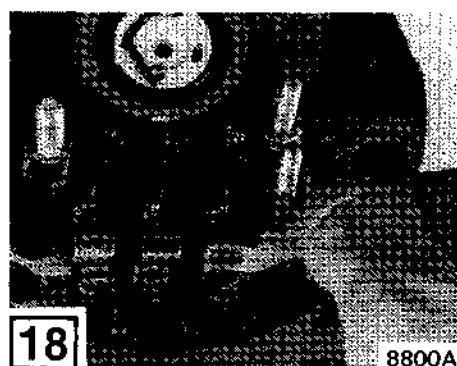
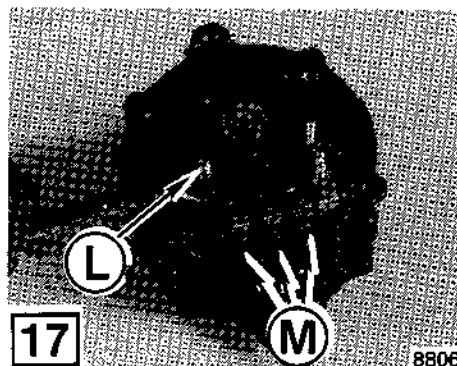




Alternator Disassembly

⚠ To prevent possible fire and explosion, do not substitute automotive parts for this alternator or its internal components. These parts and assemblies have been specifically designed not to cause ignition of fuel vapors in the bilge.

- 13 1. Unscrew protective cap **Ⓔ** from "light" stud.
- 13 2. Remove nuts, washers and insulators from "AC" stud **Ⓒ** and "POS +" stud **Ⓗ**.
- 13 3. Remove two screws **Ⓘ** and lift off rear cover.



Brush Holder Removal

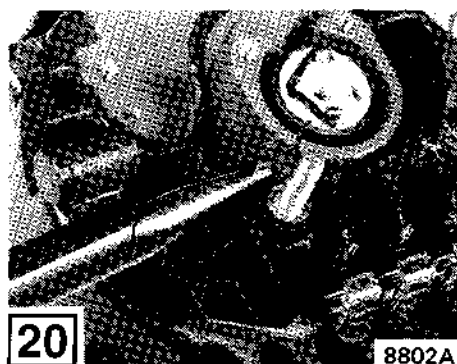
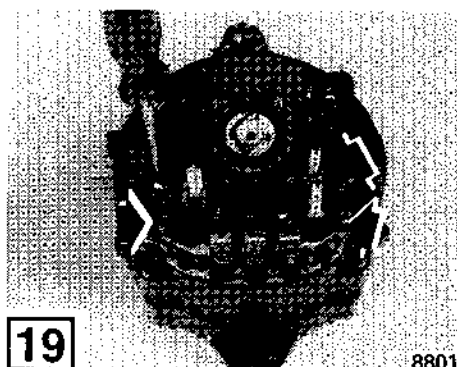
1. Unscrew two locknuts securing brush holder.
- 14 2. Back off nut **Ⓙ** holding conductive strap to "light" terminal until strap can be lifted off brush holder screw **Ⓚ**.
- 14 3. Carefully slide brush holder out of housing. Do not allow brushes to snap out of housing as they clear the slip rings.

Regulator Removal

- 15 16 Remove two screws mounting regulator and lift regulator off alternator. Remove two fibre washers under regulator.

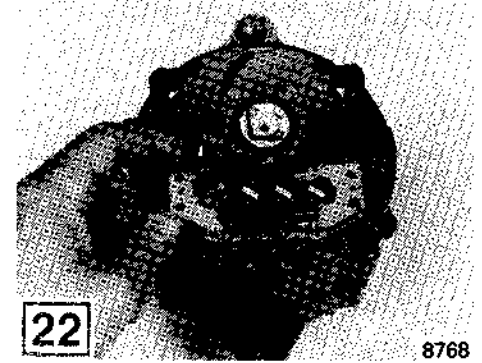
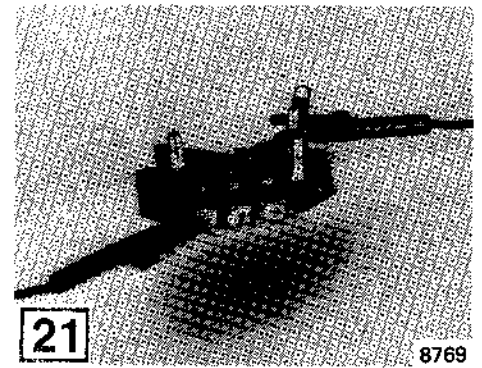
Diode Trio Removal

- 17 1. Unscrew locknut **Ⓛ** on "POS +" terminal and lift off condenser lead.
- 17 2. Remove three screws **Ⓜ** securing stator leads to trio.
- 18 3. Lift off metal tab connecting stator lead to "AC" stud.
- 19 4. Unscrew four screws holding diode trio and rectifier bridge.
- 20 5. Straighten "POS +" strap and lift diode trio off alternator.



Testing Diode Trio

- 21** 1. Attach ohmmeter leads to any stator attachment terminal and the "light" stud (has metal tab) to check one diode.
2. Take an ohmmeter reading. Reverse the leads, or the meter polarity, and take another reading. The meter must show continuity only in one direction, and a high resistance reading in the other.
3. Repeat the preceding test on each of the two remaining diode terminals. Test results must show a continuity reading in the same direction for all three diodes, and a high resistance reading in the opposite direction. If any diode fails a test, replace the diode trio assembly.



Rectifier Bridge Removal

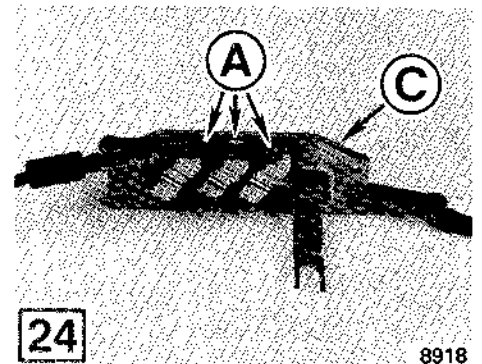
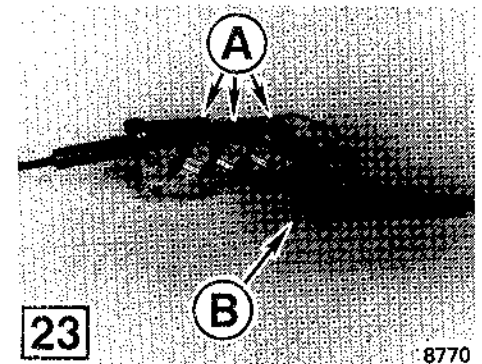
- 22** The rectifier bridge will be stuck to the back of the alternator with a heat sink compound. Carefully loosen it and lift it off.

Testing Rectifier Bridge

The rectifier bridge contains six diodes, three negative and three positive. The rectifier converts stator alternating current into direct current as it leaves the alternator. Tests must be made with an ohmmeter to check continuity of all six diodes in both directions of polarity.

Checking Positive Diodes

- 23** 1. Connect the ohmmeter leads to any stator attachment terminal **A** and the "POS +" strap **B** to check one positive diode.
2. Take an ohmmeter reading. Reverse the leads, or the meter polarity, and take another reading. The meter must show continuity only in one direction, and a high resistance reading in the other.
3. Repeat this test on each of the two remaining diode terminals. Test results must show a continuity reading in the same direction for all three diodes, and a high resistance reading in the opposite direction. If any diode fails a test, replace the rectifier bridge assembly.



Checking Negative Diodes

- 24** 1. Connect the ohmmeter leads to any stator attachment terminal **A** and the rectifier bridge body **C** to check one negative diode.
2. Take an ohmmeter reading. Reverse the leads, or the meter polarity, and take another reading. The meter must show continuity only in one direction, and a high resistance reading in the other.

3. Repeat this test on each of the two remaining diode terminals. Test results must show a continuity reading in the same direction for all three diodes, and a high resistance reading in the opposite direction. If any diode fails a test, replace the rectifier bridge assembly.

Stator Removal

25 1. Remove the four thru-bolts from the back of the alternator.

26 2. Carefully insert two screwdrivers between the stator and rear cover in two openings 180° apart. Apply equal pressure to lift cover off rotor bearing.

Note Do not insert screwdrivers deeper than $\frac{1}{16}$ in. to avoid damaging stator windings.

3. Lift the stator out of the housing.

Testing Stator

The stator consists of three separate windings terminating in a delta type connection. It produces alternating current for charging the battery and operating electrical accessories. The windings must be checked for grounds and open circuits with an ohmmeter. Any stators with discolored windings should be replaced.

Open Circuit Check

1. Resistance through the stator is very low, so set an ohmmeter on the low ohm scale.

27 2. Connect the leads to terminals **D** and **E** and check for approximately .1 ohm resistance. Repeat this check using terminals **D** and **F**, then terminals **E** and **F**. The resistance values of all three checks must be the same. If not, replace the stator.

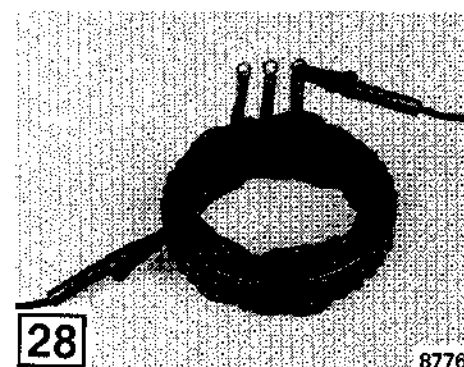
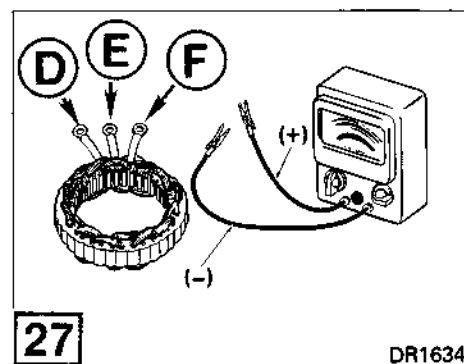
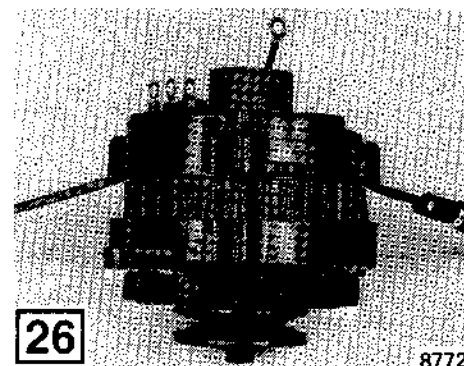
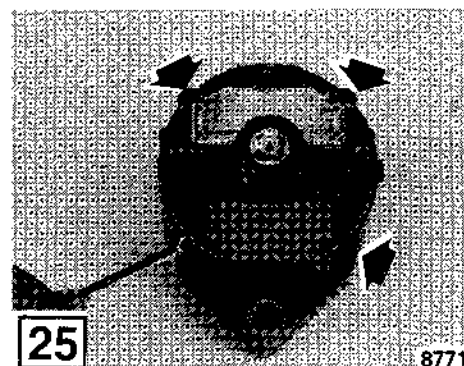
Ground Check

28 1. Set the ohmmeter on the high ohm scale. Connect the leads between one terminal and the stator frame. The meter must show no continuity (infinity).

2. Repeat this check with the remaining two terminals. If any reading shows continuity, the stator is grounded and must be replaced.

Testing Rotor Assembly

The rotor assembly requires two tests; one for shorts and open circuits, the other for grounds. Conduct both checks with an ohmmeter. An additional amperage draw check can also be made if so desired.



Open/Short Circuit Check

1. Set the ohmmeter to the low scale.

29 2. Touch one ohmmeter lead to each slip ring. The meter reading should be approximately 3.5 to 4.7 ohms at room temperature. A lower reading indicates shorted windings. A higher reading shows excessive resistance. An infinity reading means an open circuit. Replace the rotor if it doesn't have the specified resistance.

Ground Check

1. Set the ohmmeter to the high scale.

30 2. Touch one meter lead to a slip ring and the other to the rotor body. The only acceptable reading is infinity. Any continuity reading means the rotor assembly is grounded and must be replaced.

Amperage Draw Check

To confirm the resistance figures, check the amperage draw of the rotor windings. A fully charged 12 volt battery, an ammeter with a 5 amp scale, and a short jumper lead are required.

29 1. Connect an ammeter in series between the battery positive (+) terminal and either slip ring.

29 2. Connect the jumper lead to the battery negative (-) terminal, then touch the other slip ring. The ammeter should read approximately 3.0-4.0 amps at 12 volts.

If the rotor fails any of the resistance or amperage tests, replace the rotor.

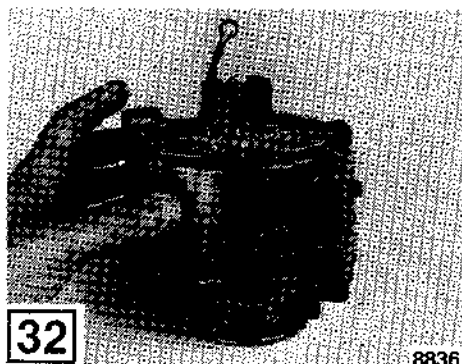
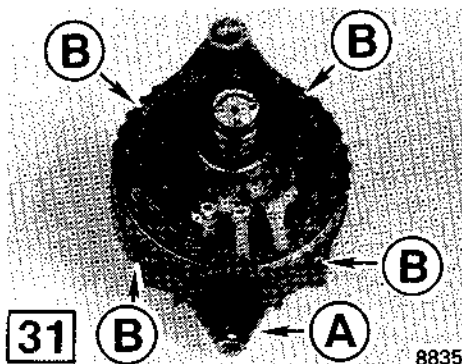
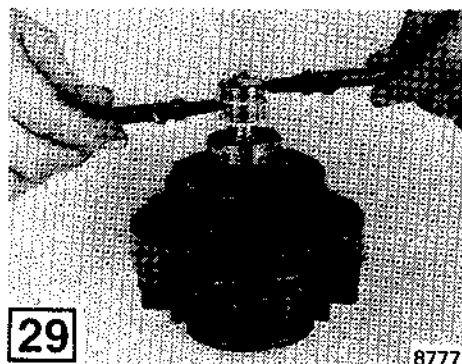
3. Clean slip ring surfaces with a fine crocus cloth and wipe off dust.

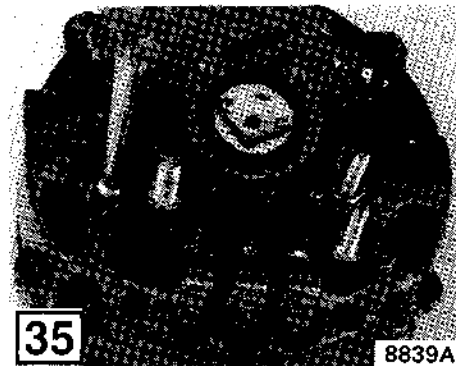
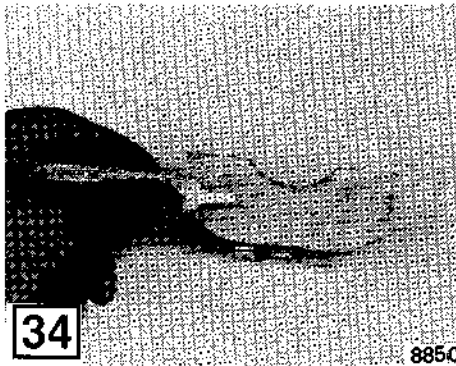
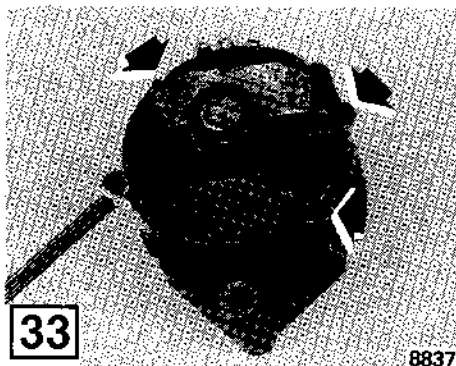
Testing Condenser

The condenser is held to the alternator rear cover by a single screw. Use an appropriate condenser tester and follow the manufacturer's instructions. The condenser capacity should be 0.5 ± 0.1 microfarad.

Voltage Regulator

There are no volt, ohm or amperage tests for the voltage regulator because it's a solid-state, transistorized component. If all other alternator components test okay, replace the regulator.





Alternator Assembly

Stator Installation

31 1. Position stator assembly so that the three leads are oriented to the upper mounting boss (A) as shown. Set stator into housing and align reliefs in stator frame with the four thru-bolt mounting holes (B).

32 2. Insert stator leads through slots in rear cover, then set cover on stator.

33 3. Align the thru-bolt holes, install thru-bolts, then tighten them to a torque of 50-60 in. lbs. (5,6-6,8 N-m). Spin pulley to ensure rotor turns freely.

Note New front housings have thru-bolt holes that are not tapped. A socket wrench will be needed to provide sufficient torque to install the thread-cutting thru-bolts.

Rectifier and Diode Trio Installation

34 1. Straighten the rectifier B+ strap. Apply a thin film of a Heat Sink Compound P/N 322170 to the back of the rectifier bridge, and to the mating area on the rear housing. Set the rectifier on the alternator.

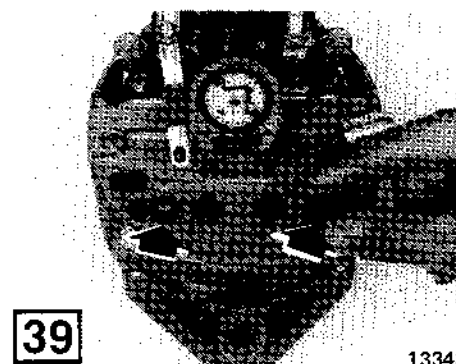
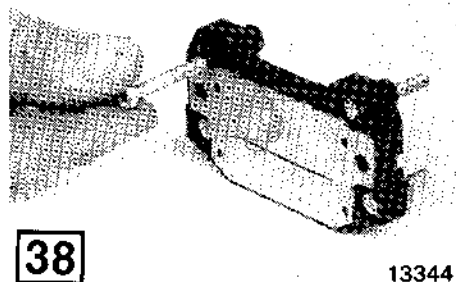
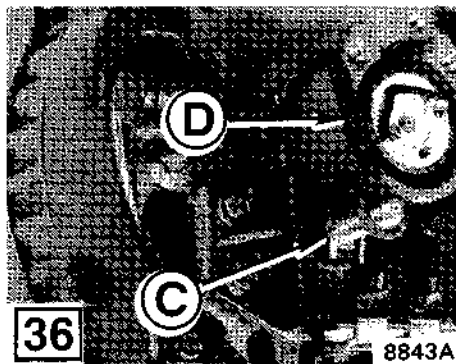
35 2. Insert the B+ strap through the slot in the diode trio body, and set the diode trio on the rectifier. Install the four mounting screws and tighten them securely.

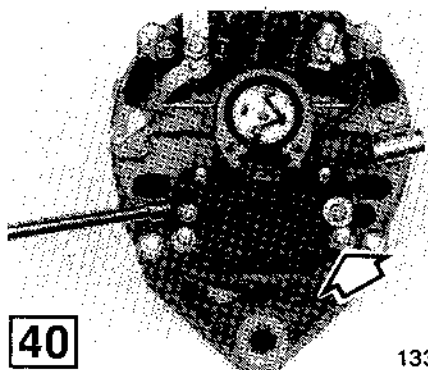
36 3. Bend over B+ strap (C) and seat it against base of diode trio output stud. Attach condenser lead (D) to output stud. Install locknut on output stud and tighten securely.

37 4. Slide connecting tab over "AC" stud and place other end between stator lead and diode-trio terminal. Secure stator leads to diode trio with three screws, and tighten them securely.

Regulator Installation

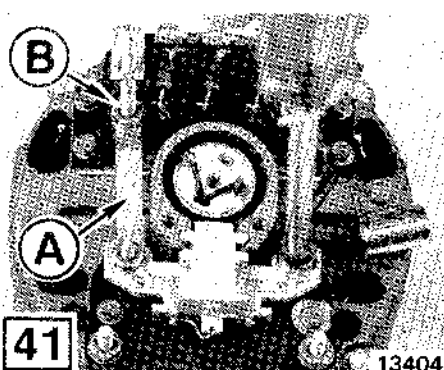
38 **39** 1. If terminal screws came out of regulator body, push them in until they seat. Place fibre washers in recesses on back of housing.





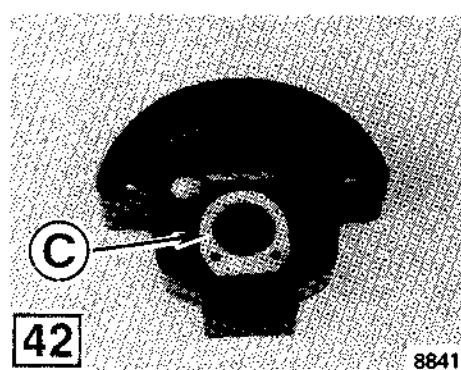
40

13346



41

13404



42

8841

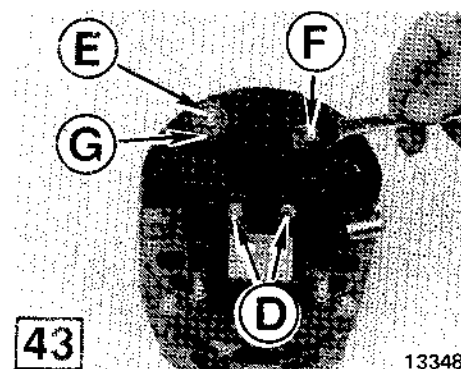
- 40 2. Place regulator on back of alternator. Install two screws and tighten them securely.

Brush Holder Installation

The original brush set may be reused if brushes are $\frac{3}{16}$ in. or longer, and are not oil soaked, cracked or grooved.

- 41 1. Position brush holder with banded surface facing away from regulator as shown. Depress brushes by hand, then slide holder into grooves at rear of housing.

- 41 2. Place conducting strap (A) over regulator/brush holder stud. Install two locknuts and tighten them securely. Tighten "light" stud nut (B) securely.



43

13348

Rear Cover Installation

- 42 ⚠ 1. Place felt gasket (C) over slip ring pocket in cover. Felt gasket must be installed. It's a sealing component that makes alternator external ignition proof.

- 43 2. Install two cover screws (D) and tighten securely.

- 43 3. Place an insulator, washer and locknut on the "AC" (E) and "POS +" (F) studs. Tighten both nuts securely.

- 43 ⚠ 4. Screw protective sleeve (G) onto "light" stud.

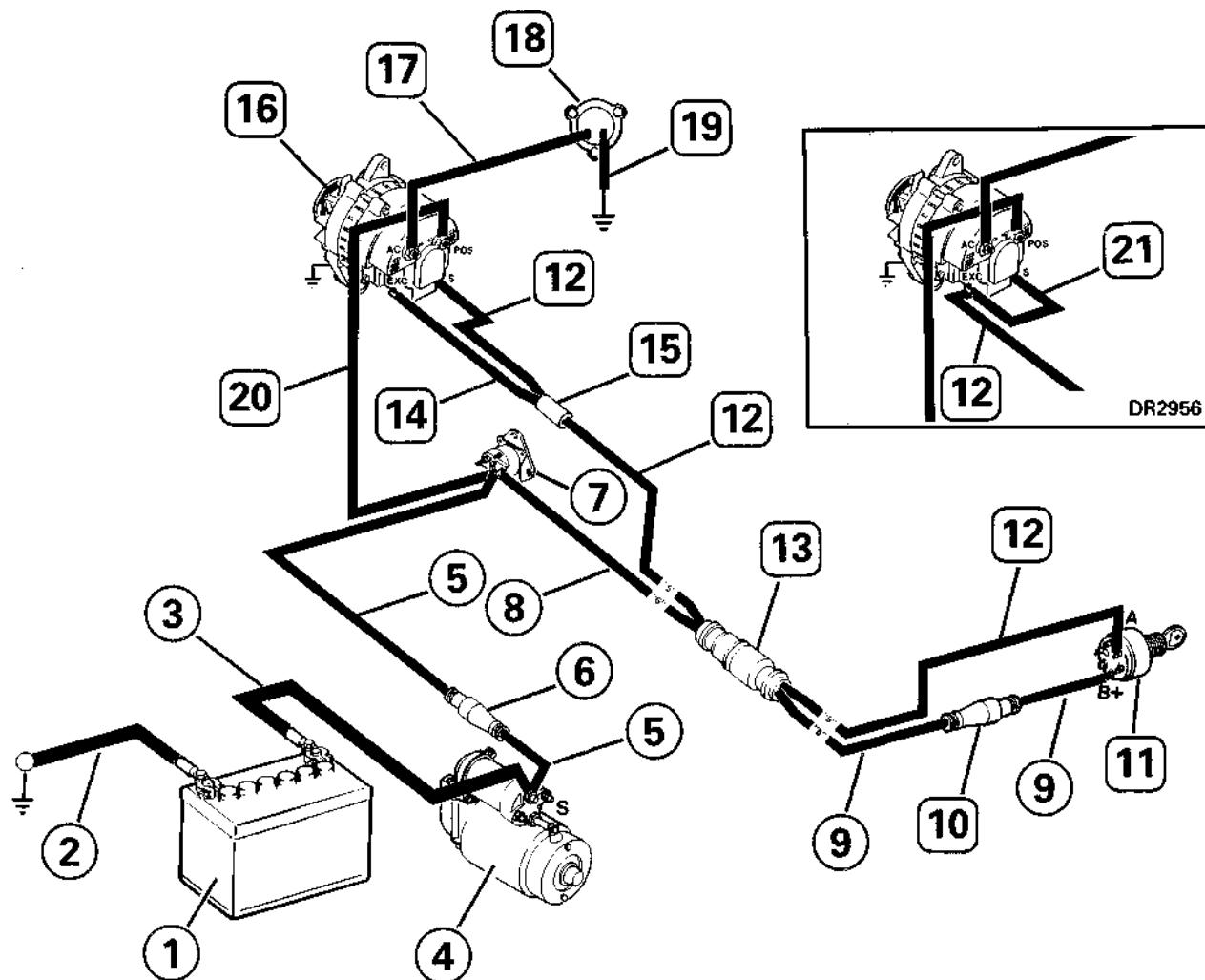
Test alternator for proper voltage and amperage output, then install on engine.

Alternator Specifications

Make and model	Marine Motorola No. 8EM2004KA
Volts	12
Amperage output	51
Regulator	Internal, solid state
Belt tension	$\frac{1}{4}$ in. give with finger pressure; 75 ± 10 lbs.
Output tests:	Load battery to obtain maximum alternator output
At 650 engine RPM	20 amps minimum
At 1500 engine RPM	13.9 - 14.7 volts
At 3000 engine RPM	45 amps minimum
"AC" stud voltage	7-8 volts
Condenser capacity	0.5 ± 0.1 microfarads



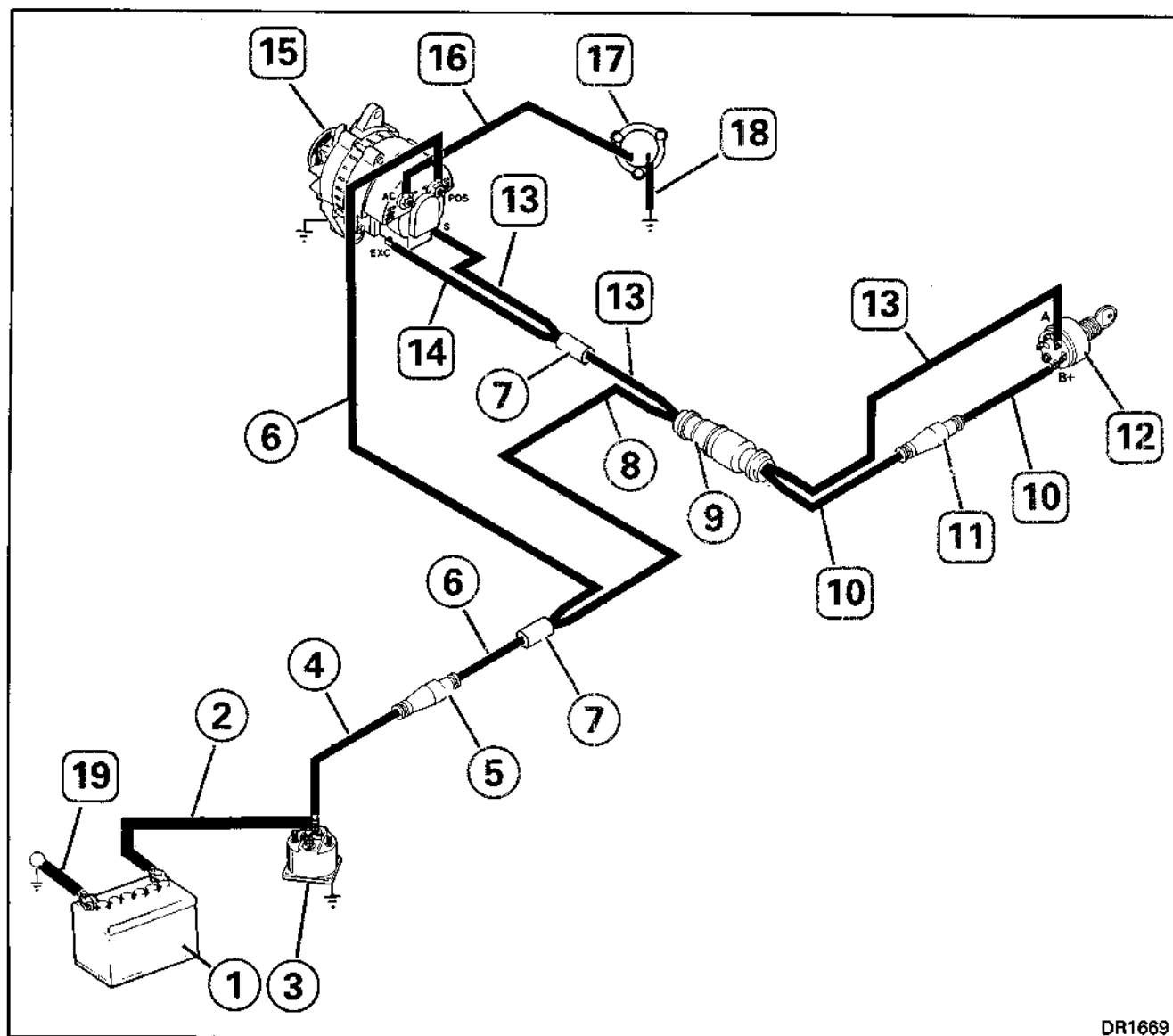
Safety Related



DR2958

Charging Circuit
3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 Litre Models

- | | |
|---------------------|--|
| ① Battery | ⑫ Purple 16 Ga. |
| ② Black 4 Ga. | ⑬ Main Cable Connector |
| ③ Red 4 Ga. | ⑭ Red/Purple 16 Ga. |
| ④ Starter | ⑮ Splice, 3.0, 3.0 HO, 4.3 and 5.7 Litre |
| ⑤ Red 10 Ga. | ⑯ Alternator |
| ⑥ 50 Amp Fuse | ⑰ Purple/White 16 Ga. |
| ⑦ Assist Solenoid | ⑱ Choke. |
| ⑧ Red/Purple 10 Ga. | ⑲ Black 16 Ga. |
| ⑨ Red/Purple 12 Ga. | ⑳ Orange 10 Ga. |
| ⑩ 20 Amp Fuse | ㉑ Red/Purple 16 Ga. Jumper, 4.3 L HO |
| ⑪ Ignition Switch | |



Charging Circuit

2.3, 5.0, 5.0 HO and 5.8 L Models

- | | |
|------------------------|-----------------------|
| ① Battery | ⑪ 20 Amp Fuse |
| ② Red 4 Ga. | ⑫ Ignition Switch |
| ③ Starter Solenoid | ⑬ Purple 16 Ga. |
| ④ Red 10 Ga. | ⑭ Red/Purple 16 Ga. |
| ⑤ 50 Amp Fuse | ⑮ Alternator |
| ⑥ Orange 10 Ga. | ⑯ Purple/White 16 Ga. |
| ⑦ Splice | ⑰ Choke |
| ⑧ Red/Purple 10 Ga. | ⑱ Black 16 Ga. |
| ⑨ Main Cable Connector | ⑲ Black 4 Ga. |
| ⑩ Red/Purple 12 Ga. | |

3-61

Power Trim/Tilt Circuit

Table of Contents

Circuit Operation	3-63
Sending Unit, Trim	3-67
Specifications, Trim/Tilt Motor	3-66
Trim/Tilt Gauge, Adjustment	3-67
Trim/Tilt Motor	3-65
Trim/Tilt Switch	3-64
Troubleshooting Checks	3-68
Wiring Diagrams	3-69

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.

Power Trim/Tilt Operation

OMC Cobra® vertical drive units are equipped with Power Trim/Tilt as standard equipment. The purpose of the Power Trim/Tilt is to enable the operator to change the angle of the vertical drive from the helm. Changing the angle of the vertical drive in relation to the boat bottom is called "trimming." Trimming provides the following benefits:

- Improved acceleration onto plane
- Maintains boat on plane at reduced throttle settings
- Increases fuel economy
- Provides smoother and/or drier ride in choppy water conditions
- Increases top speed

The trim/tilt switch is located on the remote control handle or on the boat's dashboard. The trim/tilt switch changes the direction of movement of the boat's bow. The trim/tilt gauge located on the dash shows the corresponding bow position.

Trimming

The power trim is normally used prior to accelerating onto plane, after reaching the desired RPM or boat speed, and when there is a change in water or boating condition. Locate passengers and equipment in the boat so that the weight is balanced fore and aft, and side to side. Trimming will not cancel an unbalanced load.

To operate the trim, push the switch until the desired bow position is reached. The trim may be operated at any boat speed or at rest. Avoid operating the trim system when running in reverse. Observe the trim/tilt gauge which indicates the boat's bow position achieved by the trim angle of the vertical drive unit. "Bow-Up" corresponds to the upper portion of the trim range on the gauge while "Bow-Down" corresponds to the lower portion of the trim range on the gauge.

The boat will be properly trimmed when the trim angle provides the best boat performance for your particular operating conditions. A trim position that provides a balanced steering load is desirable.

 **Safety Warning:** The boat trim should be adjusted to provide balanced steering as soon as possible each time you get underway. Some boat/motor/propeller combinations may encounter boat instability and/or high steering torque, when operated at or near the limits of the "Bow-Up" or "Bow-Down" positions. Boat stability and steering torque can also vary due to changing water conditions. If you experience boat instability and/or high steering torque, see your OMC DEALER to correct these conditions.



Tilting

The tilting feature of the vertical drive unit is also controlled by the Power Trim/Tilt switch. When the switch is held in the "Bow-Up" position, the vertical drive unit tilts up until the switch is released or the drive unit reaches the maximum tilt position. The trim/tilt gauge will indicate the "Tilt" position whenever the vertical unit is in the tilt range.

Tilting is normally used for raising the vertical drive unit to obtain clearance when beaching, launching from a trailer, or mooring. When tilting the vertical drive unit, the boat should be at rest or at idle speed only. See Shallow Water Operation.

Note Do not operate the drive unit out of water even momentarily, water pump may be damaged or engine may overheat.



- To avoid possible contact with the propeller, never use the vertical drive unit as a ladder or as a lift to board the boat. Never board at the rear of the boat when the engine is running, even if the engine is operating in neutral.
- Any malfunction of the Power Trim/Tilt system could result in a loss of shock absorber protection if an underwater obstruction is hit. Malfunction can also result in loss of reverse thrust capability. If malfunction occurs, see your OMC SERVICE DEALER.

Trim/Tilt Switch

For models: All

Special Tools Required: 12 Volt Test Light

Inspection Procedure

Check wiring connections, 50 amp fuse, circuit breaker and battery voltage.

Test Procedure

When switch is operated, current flows from input terminal (red/purple) to respective output terminals. To check switch:

1. Probe red/purple terminal with test light for voltage. If test indicates no input voltage, check 50 amp fuse, circuit breaker on trim pump, or wiring connections.
2. When pressing switch down, probe green/white terminal for voltage.
3. When pressing switch up, probe blue/white terminal for voltage.

If test light indicates failure, replace trim/tilt switch.



Trim/Tilt Motor

For Models: All

Special Tools Required: Test Ammeter, (capacity over 130 amps), Voltmeter, Torque Wrench, and Continuity Tester.

Inspection Procedure: Check wiring connections, 50 amp fuse and battery voltage.

Test Procedure

If the trim/tilt system will not operate, refer to Power Trim/Tilt System Troubleshooting Chart to isolate the problem.

Trim/Tilt Motor Bench Test

To obtain detailed performance data on the motor, it should be removed and subjected to a stall-torque test. Due to the construction of the motor, a no-load test would be inconclusive evidence of abnormal operation. Stall-torque tests (one in each direction) will, however, provide valuable information on what to look for when the motor is overhauled.

Basically, a stall-torque test is made to determine if the motor has sufficient turning power to hydraulically raise or lower the stern drive unit in minimum time.

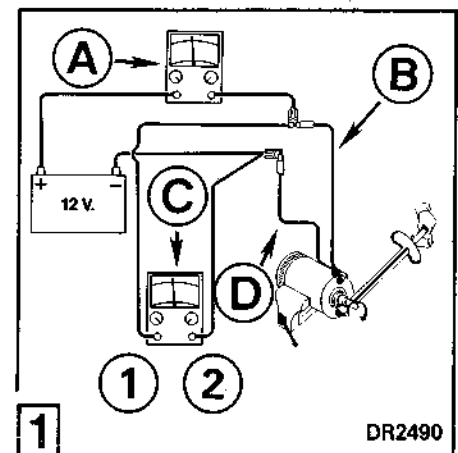
1. Remove the trim/tilt motor. Clamp the motor in a vise.

1 2. Connect an ammeter (A) capable of reading 200 amps in series with the B+ terminal of a fully charged battery and the blue motor lead (B). Connect a voltmeter (C) between the two motor leads.

1 3. Attach an inch-pounds torque wrench to a suitable adapter (D) and attach this to the end of the armature shaft.

1 4. Momentarily complete the electrical circuit by connecting the green lead (D) to battery ground, and note the reading on the torque wrench and ammeter. The voltmeter reading should be 12 volts minimum during this test. Ammeter should read 185 amps maximum. Stall-torque should not be less than 20.6 inch pounds.

5. Remove battery lead from either blue or green motor lead and connect to other lead in connector. Momentarily complete the electrical connection to perform stall-torque test in opposite rotation from step 4.

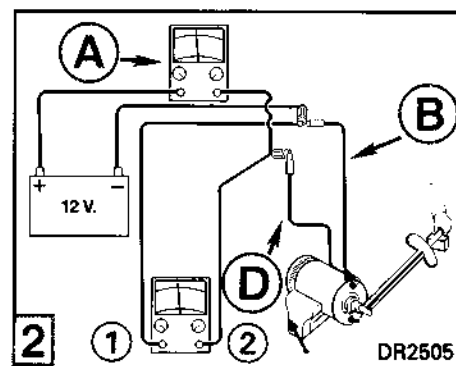


- ① Positive Lead
- ② Negative Lead

- 2 5. To perform a stall-torque test in the opposite rotation, connect the ammeter (A) in series with the battery B+ terminal and the green motor lead (D). Momentarily complete the electrical connection by touching the blue lead (B) to battery ground. The stall-torque voltage and amperage must be the same as in Step 4.

Note Do not operate the trim/tilt motor any longer than is necessary to obtain the readings. Allow the motor to cool for several minutes between tests. If stall-torque tests are performed in rapid succession, excessive heat will be generated, resulting in lower than normal torque readings and possible motor damage.

6. A low current reading with low torque would indicate high resistance in the internal connections or in the brush contacts. A high current reading with low torque would indicate faulty armature or field windings. To check for a faulty armature, complete the stall-torque test circuit and turn the torque wrench in the direction opposite of motor rotation. If the torque changes materially or if dead spots (no torque reading) are encountered, it can be assumed that the armature is at fault. However, as a final check before replacing, the armature should be tested for shorts or grounds using an appropriate armature tester.



- ① Positive Lead
② Negative Lead

Trim/Tilt Motor Specifications

Bench Stall Test @ 12 volts

Amperage 185 maximum

Torque 330 in. oz. minimum

Bench Light Load Test @ 12 volts

Amperage 45 max. @ 6500 min. RPM

Torque 40 in. oz. minimum

Circuit Breaker

Open within 20-60 seconds @ 80 amps

Outdrive Travel Time one up/down cycle @ 40 sec. max.

Trim Sending Unit

Test Procedure

Attach an ohmmeter to the two sender leads. Manually move the sender arm through a full up and down cycle. The ohmmeter should show a $0-200 \pm 10$ ohm reading. If any other ohm reading is obtained, sender is defective and should be replaced.

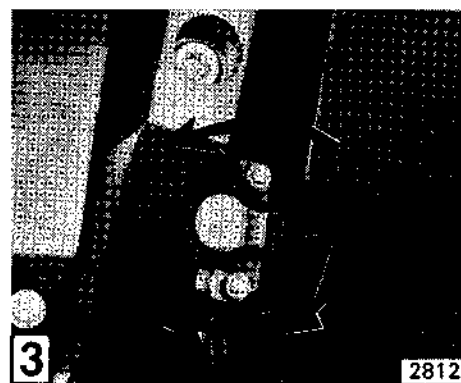
Adjustment Procedure

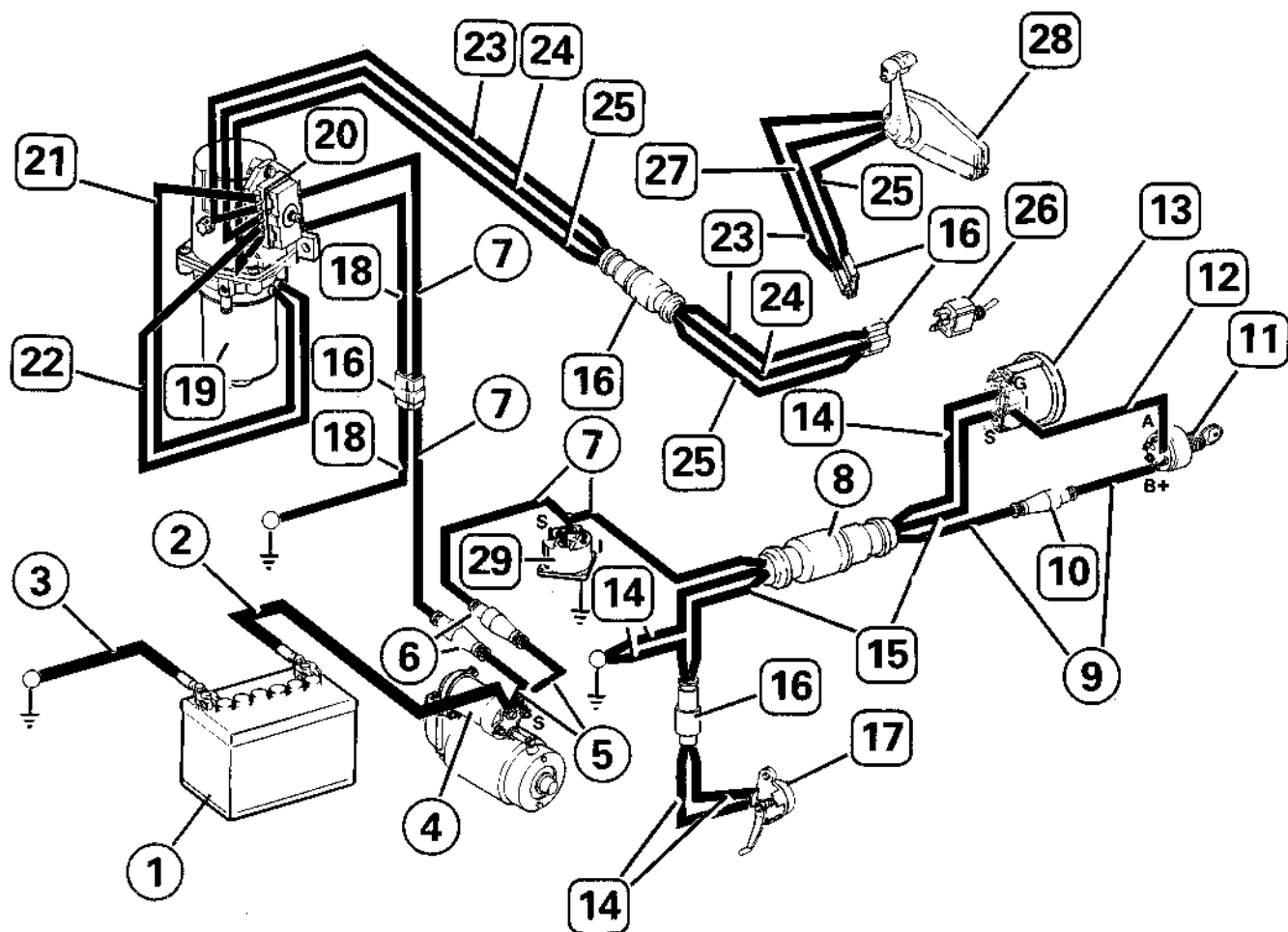
1. Sender must be mounted on starboard side of gimbal ring and vertical drive must be installed on transom bracket.

2. Run drive to full negative trim position. Loosen sending unit mounting screws.

3. Rotate sender as required to achieve a full-down reading on trim gauge.

4. Tighten sender mounting screws to a torque of 18-24 in. lbs. (2-3 N-m).

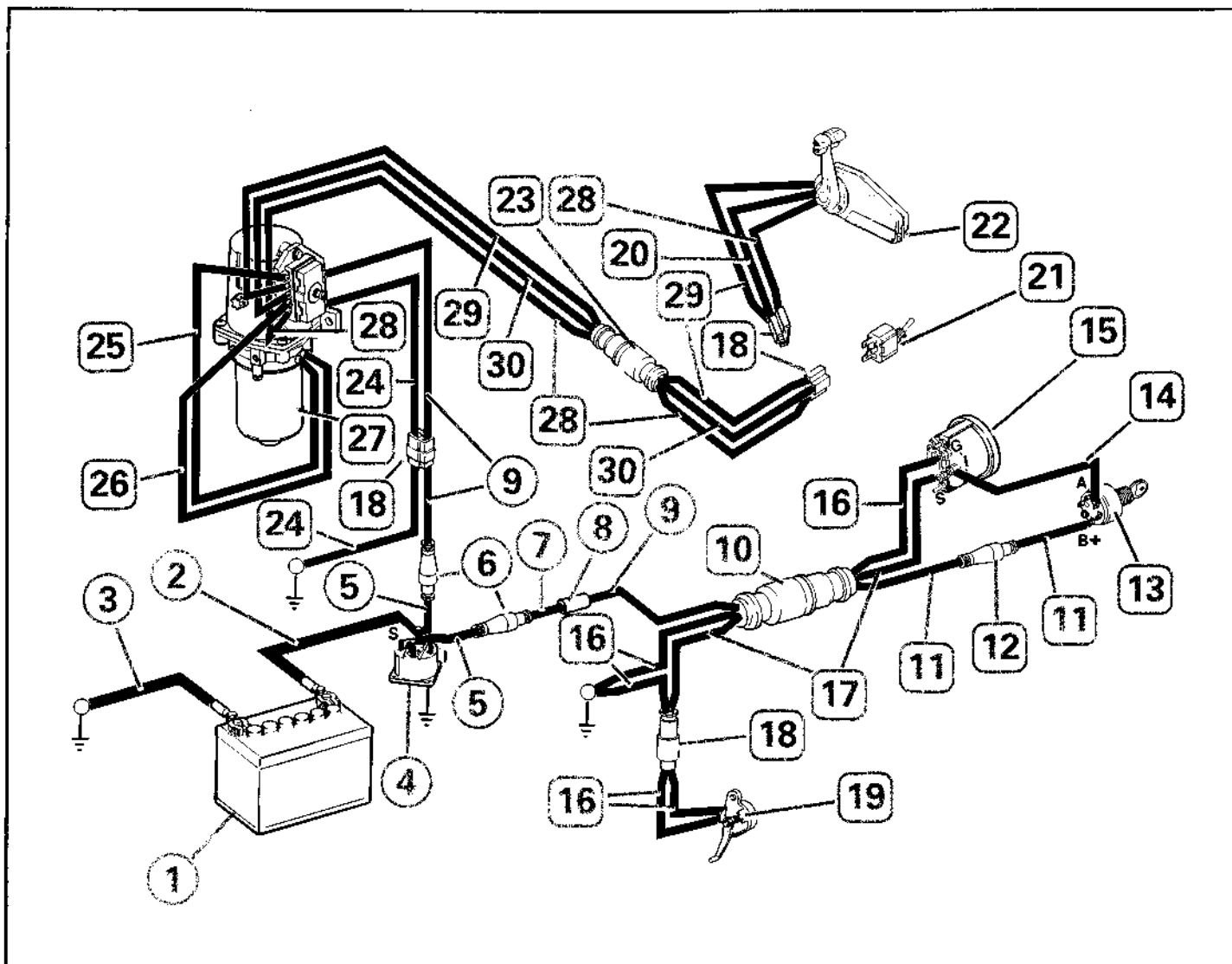




DR2894

Power Trim/Tilt Circuit 3.0, 3.0 HO, 4.3, 4.3 HO, 5.7 L Models

- | | |
|------------------------|----------------------|
| ① Battery | ⑩ 20 Amp Fuse |
| ② Red 4 Ga. | ⑪ Ignition Switch |
| ③ Black 4 Ga. | ⑫ Purple 16 Ga. |
| ④ Solenoid | ⑬ Trim Gauge |
| ⑤ Red 10 Ga. | ⑭ Black 16 Ga. |
| ⑥ 50 Amp Fuse | ⑮ Brown/White 16 Ga. |
| ⑦ Red/Purple 10 Ga. | ⑯ Connector |
| ⑧ Main Cable Connector | ⑰ Trim Sending Unit |
| ⑨ Red/Purple 12 Ga. | ⑱ Black 10 Ga. |
| ⑩ 20 Amp Fuse | ⑲ Trim/Tilt Motor |
| ⑪ Ignition Switch | ⑳ Relay |
| ⑫ Purple 16 Ga. | ㉑ Green 10 Ga. |
| ⑬ Trim Gauge | ㉒ Blue 10 Ga. |
| ⑭ Black 16 Ga. | ㉓ Green/White 16 Ga. |
| ⑮ Brown/White 16 Ga. | ㉔ Red/Purple 16 Ga. |
| | ㉕ Blue/White 16 Ga. |
| | ㉖ Trim/Tilt Switch |
| | ㉗ Red/White 16 Ga. |
| | ㉘ Shift Control |
| | ㉙ Assist Solenoid |



DR3309

Power Trim/Tilt Circuit 2.3, 5.0, 5.0 HO and 5.8 Litre Models

- | | | |
|---------------------|------------------------|-----------------------|
| ① Battery | ⑩ Main Cable Connector | ⑩ Black 16 Ga. |
| ② Red 4 Ga. | ⑪ Red/Purple 12 Ga. | ⑪ Brown/White 16 Ga. |
| ③ Black 4 Ga. | ⑫ 20 Amp Fuse | ⑫ Connector |
| ④ Starter Solenoid | ⑬ Ignition Switch | ⑬ Trim Sending Unit |
| ⑤ Red 10 Ga. | ⑭ Purple 16 Ga. | ⑭ Red/White 16 Ga. |
| ⑥ 50 Amp Fuse | ⑮ Trim Gauge | ⑮ Trim/Tilt Switch |
| ⑦ Orange 10 Ga. | | ⑯ Shift Control |
| ⑧ Splice | | ⑰ Trim/Tilt Connector |
| ⑨ Red/Purple 10 Ga. | | ⑱ Black 10 Ga. |
| | | ⑲ Green 10 Ga. |
| | | ⑳ Blue 10 Ga. |
| | | ㉑ Trim/Tilt Motor |
| | | ㉒ Blue/White 16 Ga. |
| | | ㉓ Green/White 16 Ga. |
| | | ㉔ Red/Purple 16 Ga. |

NOTES

DELCO HEI Ignition System
3.0 and 3.0L HO PWS Models

Table of Contents

Description	3-73
Distributor	
Disassembly	3-76
Installation.....	3-77
Reassembly	3-77
Removal	3-76
Ignition System Troubleshooting	3-81
Timing Procedure	
Initial Timing	3-78
Finish Timing.....	3-78
Troubleshooting	3-73
12 Volt Positive (B+) Test	3-74
Ignition Coil Test	3-74
Pickup Coil Test	3-75
Ignition Module Test	3-75
Distributor Advance.....	3-75
Wiring Diagram.....	3-80

***Delco* High Energy Ignition System**

3.0 Litre and 3.0 Litre HO Models

Description

The *Delco* HEI system consists of a distributor, cap, rotor and remote coil, with an electronic ignition module and pickup coil. It does not contain breaker points, condenser or centrifugal advance.

Troubleshooting *Delco* HEI

The following tests are used to check various components of the *Delco* High Energy Ignition System. These tests should be conducted as necessary to solve a particular problem, and should not be part of a normal tune-up procedure. The following equipment will be needed:

- Ohmmeter
- Voltmeter
- Terminal Adaptors
- Timing Light
- Timing Adaptor - OMC P/N 986662
- Tachometer
- OMC Test Propeller P/N 387388 (right-hand rotation), or P/N 398673 (left-hand rotation)

Note All running tests must be conducted with the correct test propeller to properly load engine. Do not perform tests with a flushing adaptor.

12 Volt Positive (B+) Test

Ignition Coil:

1. Disconnect the purple and gray wire connector at coil.

1 2. Connect voltmeter positive (+) lead to purple wire terminal **A** in connector and the negative (-) lead to engine ground **B**. Turn on ignition switch, meter should read a minimum of 8 volts.

Distributor:

1. Attach purple and gray wire connector to coil. Disconnect pink and brown wire connector at distributor.

2 2. Connect voltmeter positive (+) lead to pink wire terminal **C** in connector and the negative (-) lead to engine ground. Turn on ignition switch, meter should read a minimum of 8 volts.

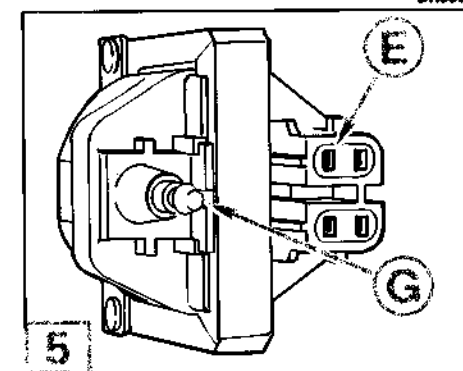
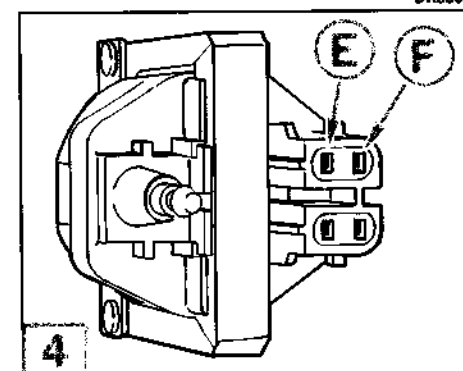
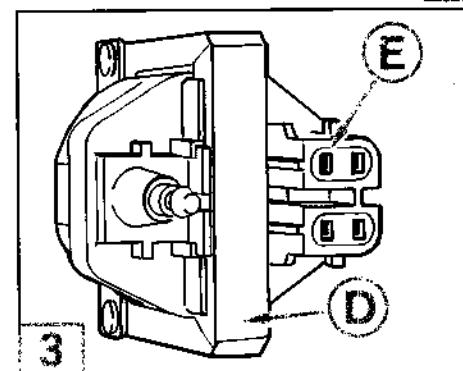
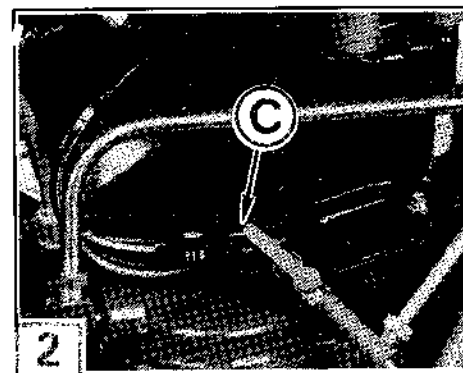
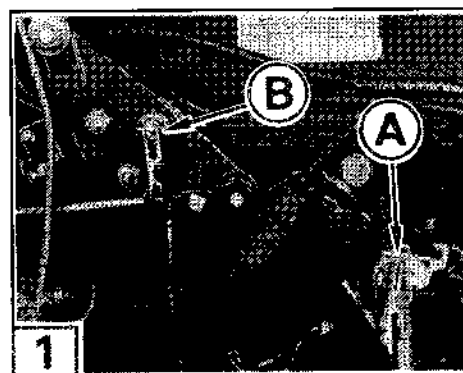
Ignition Coil Test

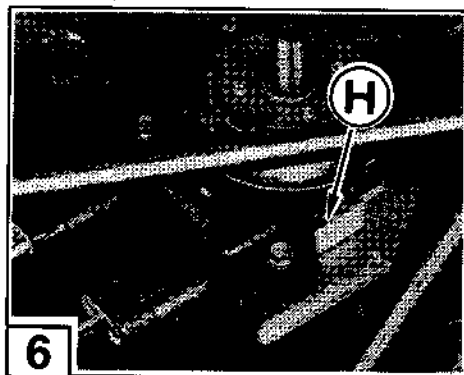
The ignition coil can be checked for open circuits and shorts with an ohmmeter. If the ignition coil fails any one of the following checks replace it. **Remove both wire connectors from coil before performing tests.**

3 1. To check for short to ground, connect ohmmeter to the frame **D** and purple wire terminal **E**. With the ohmmeter set on the high scale, reading should be infinite (∞).

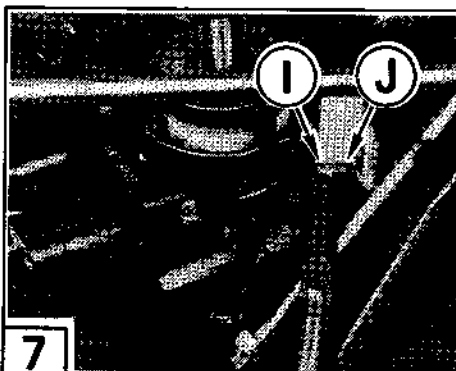
4 2. To check for an open or shorted primary circuit, connect ohmmeter to purple wire terminal **E** and gray wire terminal **F**. With the ohmmeter set on the low scale, reading should be approximately .4 ohms.

5 3. To check for an open or shorted secondary circuit, connect ohmmeter to purple wire terminal **E** and high tension terminal **G**. With the ohmmeter set on the high scale, reading should be 8300 ± 500 ohms.

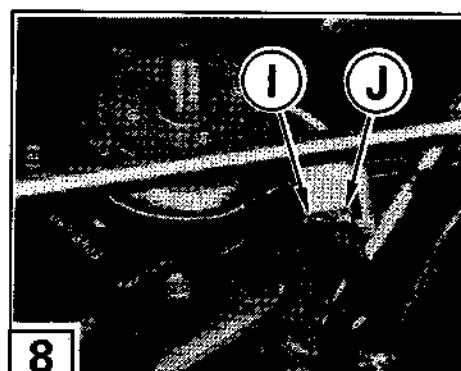




22823



22824



22825

Pickup Coil Test

The pickup coil can be checked for an open circuit and shorts with an ohmmeter. If the pickup coil fails either one of the following checks replace it.

1. Remove screws securing distributor cap. Remove cap and rotor.

6 2. Release locking tab **H** and unplug pickup coil connector.

7 3. To check for a short to ground, connect ohmmeter to the body of distributor and either terminal **I** or **J**. With the ohmmeter set on the high scale, reading should be infinite (∞).

8 4. To check for an open or shorted coil, connect ohmmeter to terminals **I** and **J**. With the ohmmeter set on the high scale, a good coil should have a constant value reading between 500 and 1500 ohms.

Ignition Module Test

The ignition module has only two failure modes, "No spark" and "No spark advance". After all other checks have been made and these conditions still exist, replace ignition module.

Total Advance

• 600 RPM	10°
• 1000 RPM	15°
• 1500 RPM	16.5°
• 2000 RPM	18.5°
• 2500 RPM	19.5°
• 3000 RPM	20.5°
• 3500 RPM	21°
• 4000 RPM	22°

To test the ignition module, Kent-Moore Module Tester, P/N J24642 or equivalent is required. If a module tester is used, follow the tester manufacturer's directions exactly.

Distributor - Delco HEI

Removal Procedure

1. Disconnect high tension leads from distributor cap.
2. Remove the two screws securing distributor cap and remove cap. Pull off rotor.

9 3. Lift locking tabs **(A)** and unplug 2 and 4 terminal connectors.

10 4. Crank engine so number 1 cylinder is in firing position. Make a mark **(B)** on distributor base and engine, so 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 this chapter.

5. Remove distributor clamp and lift distributor from engine. Discard gasket.

Distributor Disassembly

Ignition pickup coil:

11 1. Place a mark on the gear **(C)** and the drive tang **(D)** so that reassembly can be made in the same location. Drive pin from gear and remove shaft assembly.

12 2. Detach leads from module. Pry off retainer **(E)**.

12 3. Remove pickup coil **(F)**.

Ignition module:

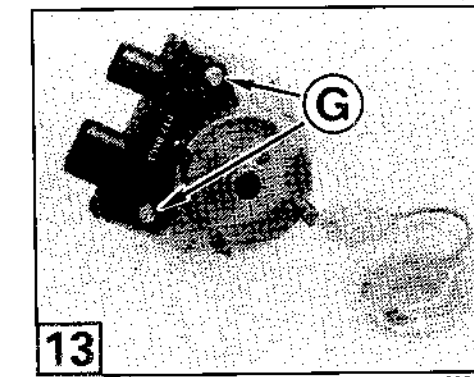
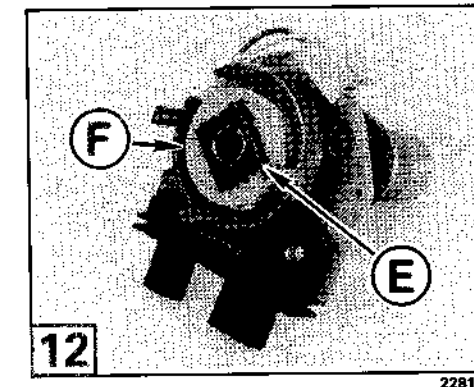
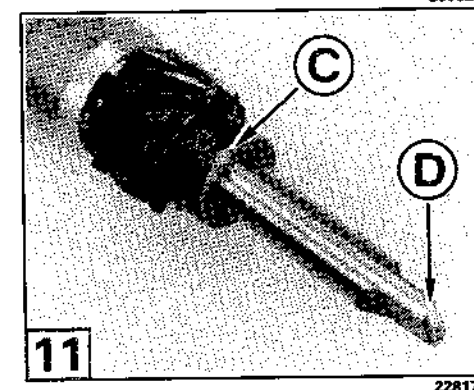
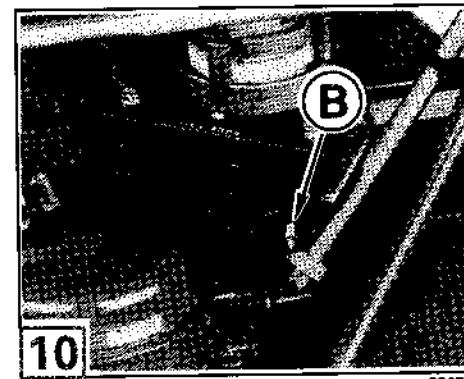
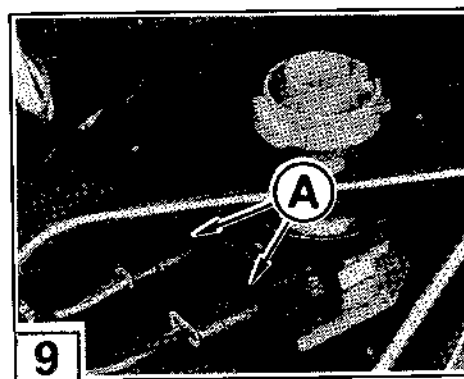
13 1. Detach leads and remove the mounting screws **(G)**.

2. Remove module. Module may be stuck to housing and require prying off.

Distributor Reassembly

Ignition module:

1. Clean old silicone grease from mounting surfaces of module and distributor.



- 14** 2. Apply Heat Sink Compound, OMC P/N 322170 or silicone grease to mounting surface of module.

Note Heat sink compound or silicone grease is necessary for proper heat dissipation.

3. Position module on mounting area of distributor and install the two mounting screws. Tighten securely.

Ignition pickup coil:

- 15** 1. Align tab **H** and attach pickup coil to pole piece as shown. Reattach pickup coil leads to module.
- 16** 2. Install retainer with locking tabs securely positioned in shaft groove **I**.

Shaft, Gear and Rotor:

- 11** 1. Install shaft into housing and assemble gear on shaft. Align gear **C** with marked tang **D** and secure with roll pin.
2. Align rotor with notch in shaft and press on securely.

Distributor Installation - Engine Not Disturbed

Note If engine has been cranked with distributor out, install distributor following Initial Timing Procedure in this section.

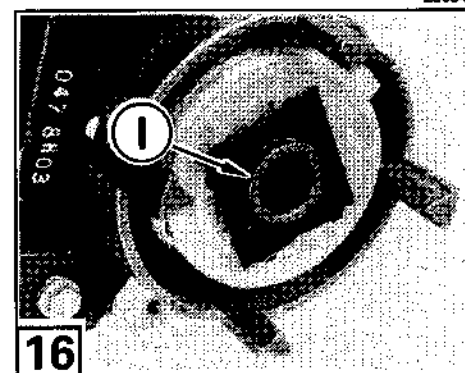
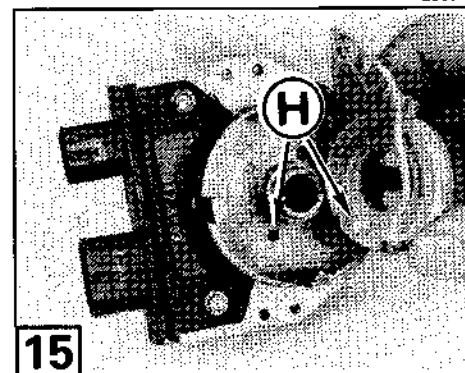
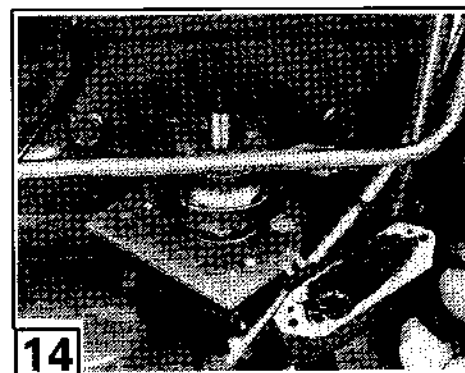
1. Position rotor about one-eighth turn counterclockwise from the reference mark previously placed on the distributor housing to locate rotor.

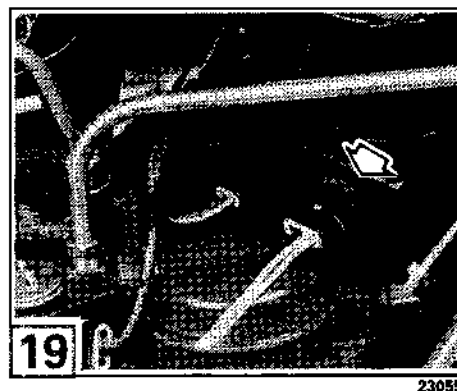
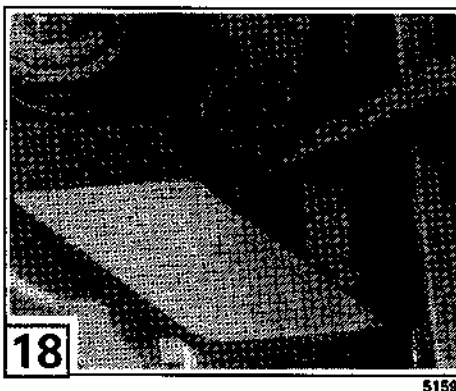
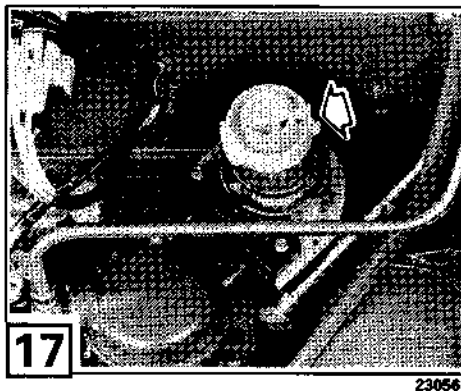
2. Place a new distributor gasket on engine block. Align reference mark on engine with mark on distributor housing, and push the distributor down into position in the block with the housing in a normal installed position.

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

3. Install distributor cap and tighten screws securely. Tighten the distributor clamp screw snugly and plug in the 2 and 4 terminal connectors. Lubricate sockets on the high tension leads with *OMC Extreme Pressure* grease or equivalent and install.

4. Time ignition as required. See Finish Timing Procedure in this section





Timing Procedure

Initial Timing

Note Use this procedure if the distributor has been removed and the crankshaft rotated, or if ignition timing is completely off. If the distributor has not been removed and the engine will run, follow the **Finish Timing Procedure**, below.

1. Locate number 1 piston in firing position by removing rocker arm cover, cranking the engine until both valves for number 1 cylinder are completely closed, and the timing mark lines up with timing grid. Number 1 cylinder is now in position to fire.

17 2. Install distributor into engine. After distributor seats, rotor must be in position to fire number 1 cylinder.

If distributor does not seat in engine block, press down lightly on distributor housing while turning rotor. After distributor engages oil pump shaft, install distributor clamp and screw. Leave screw just loose enough to permit movement of distributor with heavy hand pressure. Rotate distributor slightly until pole piece is in alignment.

3. Place distributor cap in position and check to see that rotor lines up with terminal for number 1 spark plug.

4. Install cap, check all high tension wiring, and connect spark plugs wires if they have been removed.

5. Connect 2-terminal connector and proceed to **Finish Timing Procedure**

Finish Timing

18 The timing mark is stamped on the rim of the harmonic balancer. The timing mark grid is a pointer scale attached to the timing chain cover. It shows Top Dead Center (marked "O") and degrees of advance (before) or retard (after). Each division on the scale represents 2 degrees.

The *Delco* HEI breakerless ignition requires an adaptor plug OMC P/N 986662 to shunt (turn off electronic spark advance) the system for checking timing. **Initial timing specification is 0° at idle RPM.**

19 1. Disconnect 4-terminal connector from distributor. Install adaptor plug OMC P/N 986662 into distributor and connect bare lead to 12-volt power source.

2. Connect a 12-volt timing light to number 1 spark plug using a suitable adapter, and follow the usage instructions of the timing light manufacturer.

 **Be careful not to puncture wire or boot as this would cause a high voltage leak. Make sure that spark plug wires are pushed all the way down into the distributor cap terminals and onto the spark plugs. Nipples must be firmly pushed over the terminals and boots over the spark plugs. Failure to do so can result in ignition of fuel vapors in engine compartment or bilge and may result in fire or explosion.**



- Have someone at controls.
- Keep hands, hair and clothing away from rotating parts while making adjustments when engine is running.

3. Start engine and leave engine running at 600 RPM.

4. Loosen distributor clamp.

5. Direct beam of timing light onto timing mark grid. Turn distributor slowly by hand until timing mark is aligned with zero on the timing mark grid.

6. Recheck timing mark. Reset if necessary. Tighten distributor clamp.

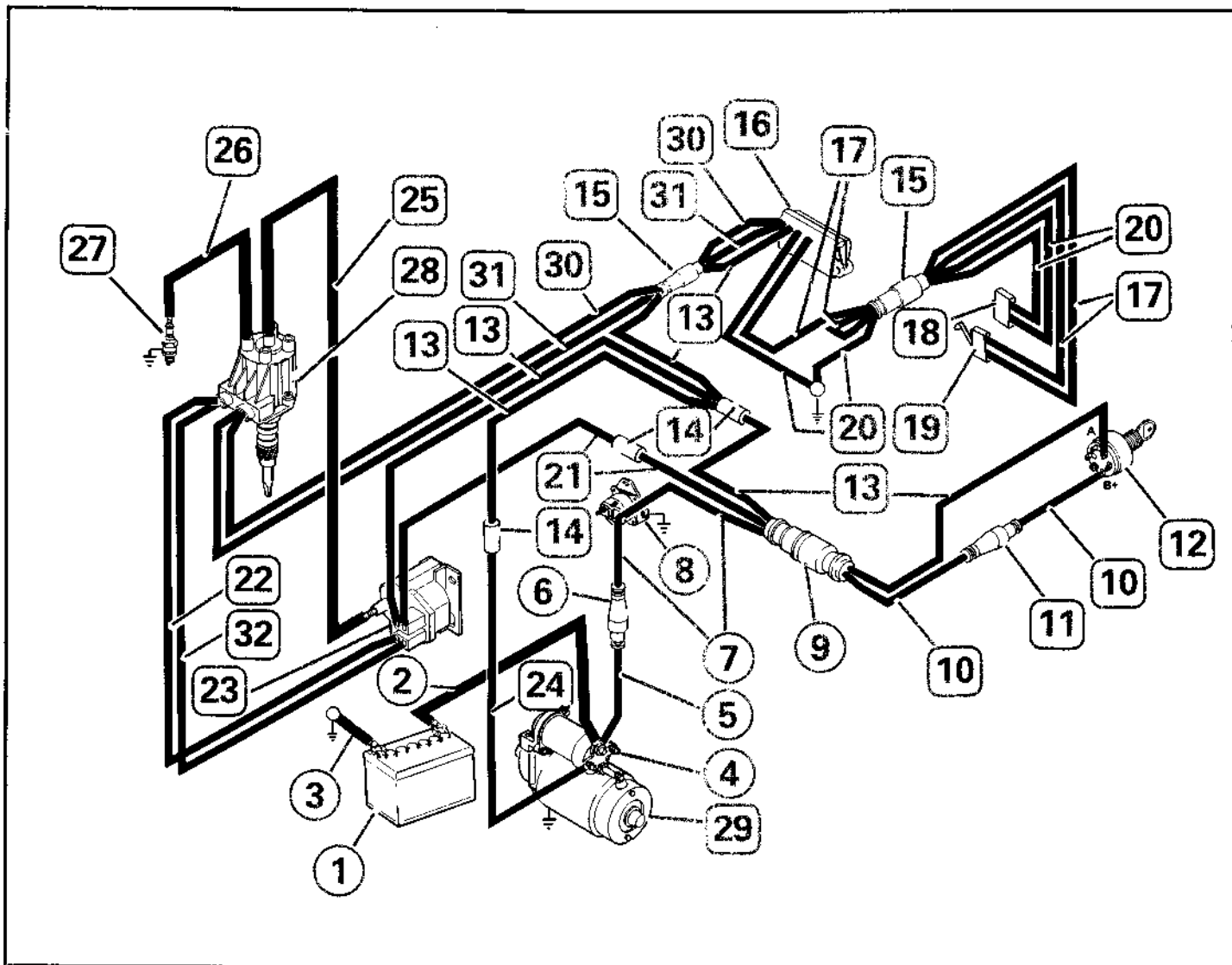
7. Stop engine and remove adaptor plug OMC P/N 986662 and reconnect 4-terminal connector.

8. Restart engine and leave engine running at 600 RPM.

9. Direct beam of timing light onto timing mark grid again. The engine is properly timed if the light flashes with the mark at 10° BTDC.

10. Remove timing light.





DR3318

Ignition Circuit 3.0 L and 3.0 L HO Models

- ① Battery
- ② Red 4 Ga.
- ③ Black 4 Ga.
- ④ Solenoid
- ⑤ Red 10 Ga.
- ⑥ 50 Amp Fuse
- ⑦ Red/Purple 10 Ga.
- ⑧ Assist Solenoid
- ⑨ Main Cable Connector
- ⑩ Red/Purple 12 Ga.
- ⑪ 20 Amp Fuse
- ⑫ Ignition Switch
- ⑬ Purple 16 Ga.
- ⑭ Splice
- ⑮ Connector
- ⑯ E.S.A. Module

- ⑰ Blue 16 Ga.
- ⑱ Overstroke Switch
- ⑲ Interrupter Switch
- ⑳ Black 16 Ga.
- ㉑ Gray 16 Ga.
- ㉒ Pink 16 Ga.
- ㉓ Coil
- ㉔ Purple/Black 16 Ga.
- ㉕ High Tension Lead
- ㉖ Spark Plug Lead
- ㉗ Spark Plug
- ㉘ Distributor
- ㉙ Starter Motor
- ㉚ Gray/Black 16 Ga.
- ㉛ Gray/White 16 Ga.
- ㉜ Brown 16 Ga.

Ignition System Troubleshooting

Engine runs sluggish, overheats. Check:

- timing
- for proper fuel
- compression and for carbon buildup

Engine pings. Check:

- timing
- for proper fuel
- compression and for carbon buildup
- spark plugs for proper heat range

Engine starts hard. Check:

- for spark
- spark plugs
- compression
- battery
- distributor cap

Engine misfires. Check:

- spark plugs and leads
- rotor and distributor cap
- coil
- engine firing order and plug wire routing
- engine timing
- ignition interrupter circuit

Engine cranks but doesn't start. Check:

- for spark
- coil and wiring
- tachometer and wiring
- ignition interrupter circuit
- coil battery positive (+) purple wire terminal
- ignition pickup coil
- ignition module

OMC Spitfire™ E.E.M. System

4.3 L HO Models

Table of Contents

Coil Pack or Ignition Module Replacement	3-102
Ignition System Operation	3-86
OMC Spitfire E.E.M. System	
Components	3-84
Description	3-83
OTC Electronic Ignition Tester Operation	3-88
Troubleshooting the OMC Spitfire E.E.M. System	3-91
Crankshaft Sensor Circuit Tests	3-93
Cruising Speed Spark Advance Test	3-102
Disabled Knock Sensor Test	3-103
Ignition System Spark Test	3-91
Knock Sensor Circuit Test	3-100
Shift Assist Circuit - Running Test	3-98
Shift Assist Circuit - Static Test	3-99
S.L.O.W.™ Circuit - Running Test	3-97
S.L.O.W. Circuit - Static Test	3-98
Tachometer Circuit Test	3-95
Wiring Diagrams	
Knock Sensor Circuit	3-105
Ignition Circuit	3-104
S.L.O.W. Circuit	3-106



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.

OMC Spitfire™ Electronic Engine Management System

Description

OMC's Spitfire™ Electronic Engine Management System is an electrical system that offers distributorless ignition, plus automatic monitoring and maintenance of various circuits. It incorporates the following features:

S.L.O.W.™ (Speed Limiting Overheat Warning) Protection

Engine sensors continually monitor oil pressure and water temperature. If low oil pressure or high water temperature occurs, the S.L.O.W. system will prevent engine damage by signaling an audible warning (if engine is equipped with a warning horn), and will gradually reduce engine speed by 200 RPM per second until it reaches 2800 RPM. If the S.L.O.W. system activates while the engine is below 2800 RPM, an audible warning will sound and maximum engine speed will be limited to 2800 RPM. If the engine is shut off, the S.L.O.W. system will reset and allow normal RPM operation until it activates again. The S.L.O.W. system continues to operate in this manner until the cause of low oil pressure/high water temperature is corrected.

Note Upon engine start-up, the audible warning device will sound due to lack of engine oil pressure. A 5 second delay is programmed into the E.E.M. circuitry to allow normal engine start-up without going into the S.L.O.W. mode.

Engine Speed Limiter

This feature prevents engine damage that can be caused by excessive RPM. If engine speed exceeds the upper limit of its programmed operating range by 200 RPM or more, the RPM limit circuit will activate and cease ignition firing. The circuit continues to operate as long as an overspeed condition exists. Once engine speed drops back into the programmed range, the RPM limit feature will de-activate and allow normal operation.

Engine Knock Sensor

A cylinder head sensor continually monitors for engine knock. Should knock occur, engine spark advance gradually retards until the knock is eliminated. The engine will maintain this retarded spark advance until engine speed is altered, up or down, by 50 RPM or more. Once a 50 RPM change occurs, the spark advance will slowly increase to the appropriate spark curve for the present mode of operation. This feature is also programmed to compensate for changes in boat load, weather and altitude.

Shift Assist Circuit

When shifting into or out of either forward or reverse, at 350 RPM or higher, the engine bracket shift lever may encounter excessive shift loads in the power delivery system. Such loads will trip the shift interrupter switch and activate a circuit that will cause erratic ignition for an electronically programmed duration. Once the interrupt duration is over, ignition firing returns to normal, even if the interrupt switch remains activated. This circuit will not function again until the shift interrupter switch is reset and tripped once more.

Tachometer Circuit

This feature provides an output voltage compatible with all marine tachometers which detect a 12V to 0V drop for their tachometer signal. The ignition circuit **will not** be disabled if the tachometer circuit is accidentally grounded.

Variable Spark Advance

The spark advance automatically adjusts for maximum performance, and is programmed for any 86 or higher AKI octane gasoline.

Cruising Spark Advance

An additional higher spark advance curve is in effect from 2200 to 3400 RPM. This feature is activated after remaining in this range for at least 4 seconds, and provides more spark advance for optimum fuel economy. This feature will not function when engine RPM is outside this range.

Distributorless Ignition System

This is a fully electronic 34 KV ignition system that fires two cylinders (360° opposite in the firing order) simultaneously. It offers quick starts since the no. 1 cylinder and its companion cylinder always fire within one crankshaft revolution. No adjustment or maintenance is required.

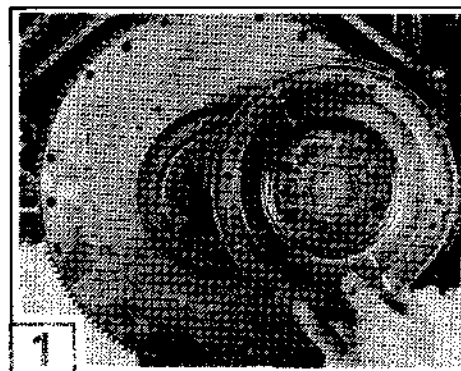
OMC Spitfire™ E.E.M. System Components

1 Timing Ring

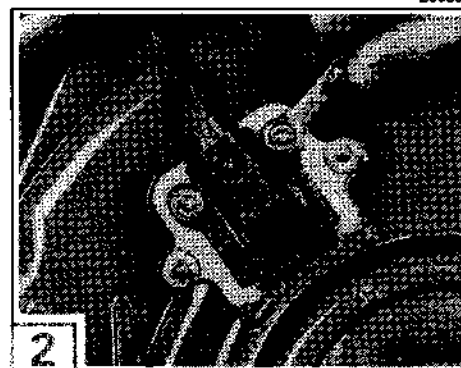
The timing ring mounts on the crankshaft behind the engine coupler. It tells the ignition module which cylinders to fire and when. Timing rings with 3 vanes are used on 6 cylinder engines, and rings with 4 vanes are used on 8 cylinder engines.

2 Timing Sensor

The timing sensor is mounted on the upper port side of the bellhousing. It's an electronic switch that receives current from the ignition module and is activated by movement of the timing ring. It transmits electrical impulses to the module to operate the ignition system.



20039



19841

Cobra/eng