

### **With the Engine Idling**

1. Remove the PCV valve from its mounting, but leave the vacuum inlet side connected to the hose. If the valve is functioning properly and not plugged, a hissing noise will be heard as air passes through the valve. A strong vacuum will be felt when a finger is placed over the valve inlet. Check for vacuum leaks in the hose line and at all connections.

2. Reinstall the PCV valve, then remove the crankcase air inlet hose at the flame arrestor connection. Loosely hold a small piece of stiff paper (such as a 3 x 5 memo card or parts tag card) over the opening at the end of the inlet hose. After a minute or so, (to allow crankcase pressure to lower) the paper should be sucked against the hose opening with a noticeable force.

### **With the Engine Stopped**

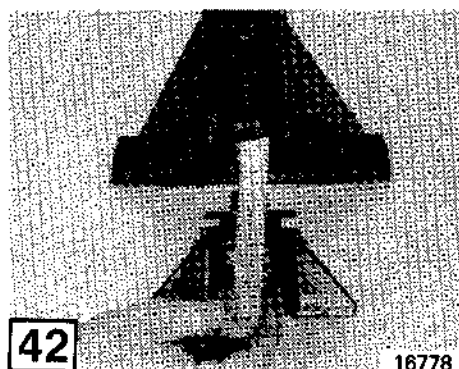
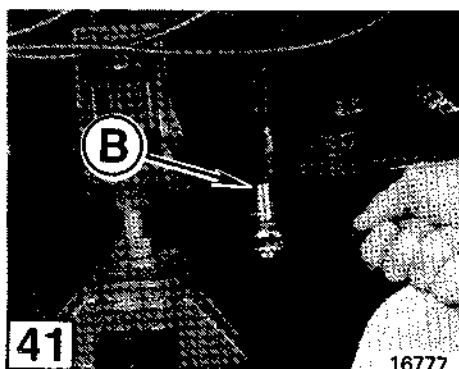
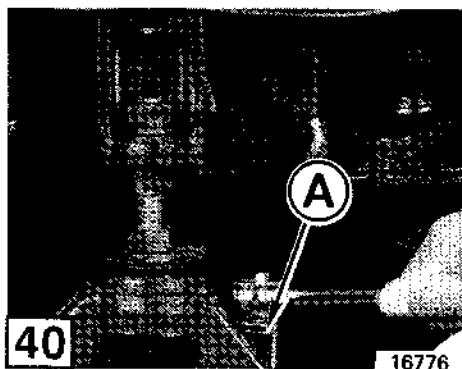
Remove the PCV valve from its mounting and shake it. A metallic clicking noise should be heard, indicating that the valve parts are free, and not sticking.

If the ventilation system passes these two tests, it can be considered functionally OK, and no further service is required. If it fails either of the tests, replace the PCV valve and repeat **Engine Idling Test**.

If the system still does not pass test, clean the ventilation system hoses and all passages to the induction system in accordance with established procedures.

### **Cleaning Regulator (PCV) Valve**

**Do not attempt to clean the crankcase ventilation regulator valve; it should be replaced.** The oil filler cap and oil separator should be cleaned at the proper maintenance interval. Remove the cap and the oil separator and wash them in a low-volatility, petroleum-base solvent. Shake the cap dry and install them. Clean the crankcase ventilation system connection(s) on the carburetor by probing with a flexible wire or bottle brush. Clean the hoses, fittings, tubes and associated hardware with a low-volatility, petroleum-base solvent and dry with compressed air.



## Front Engine Mounts

### Removal

- 40** 1. Remove two lag screws **A** and washers from mounts.
- 41**  2. Lift engine with 1000 lb. minimum capacity hoist to allow removal of front mount and bracket.
- 41** 3. Remove two mount screws and lockwashers **B**.

**42** **Note** Prior to disassembly of front mount assembly, measure distance between large washer and flat on upper mount bracket.

### Disassembly

- 43** 1. Remove three nuts **C** and engine mount bracket **D** from mount bolt while holding bolt secure with socket **E**.
- 44** 2. Remove two washers **F** and engine mount bolt **G** from mount.

### Assembly

- 45** 1. Place small washer **H** on mount bolt and insert bolt up through mount. Install large washer and secure with nut **I**. Torque to 60-75 ft. lbs. (81-102 N·m).

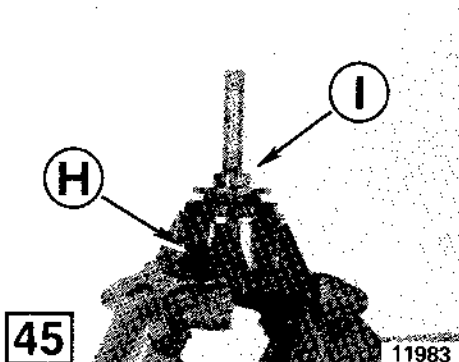
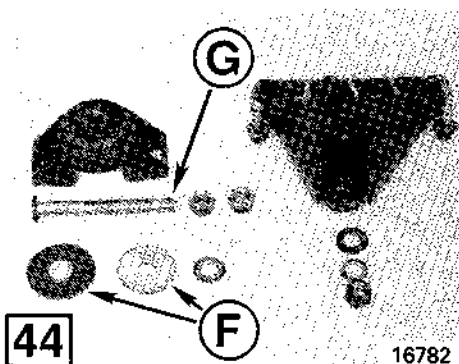
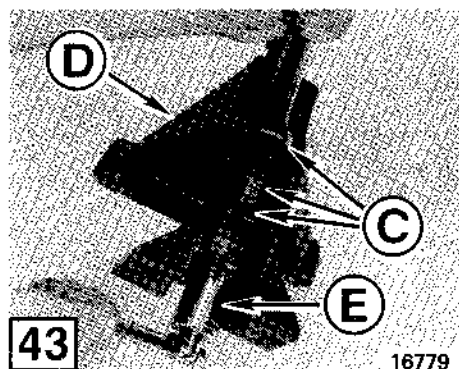
- 43** 2. Install upper inner nut and place engine mount bracket **D** on engine mount bolt.

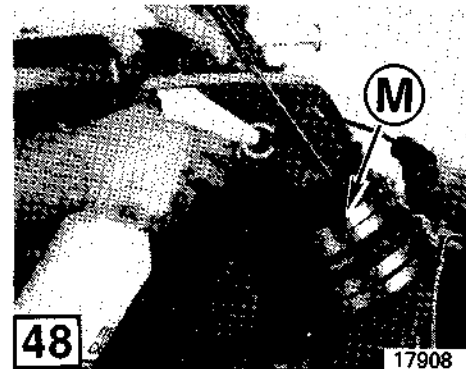
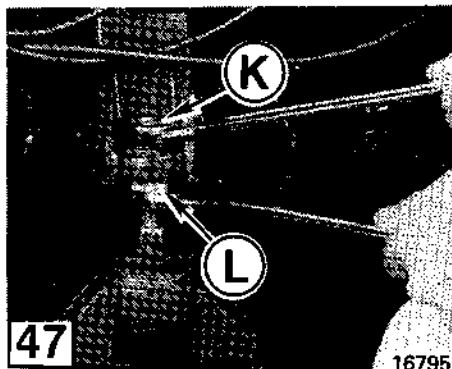
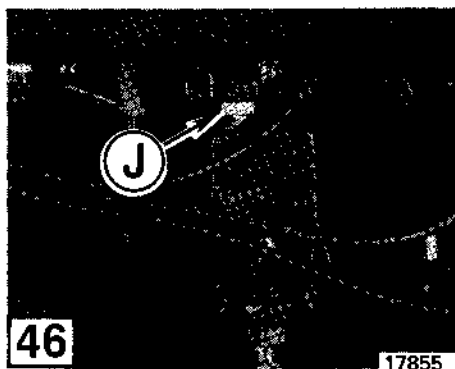
**Note** Measure distance between large washer and flat on upper mount bracket. Distance must be the same as that prior to disassembly.

3. Install lockwasher and top nut. Tighten nut to a torque of 40-50 ft. lbs. (54-68 N·m).

### Installation

- 41** 1. Attach engine mount assembly to engine with two screws and washers. Torque to 32-40 ft. lbs. (43-54 N·m).





**46** 2. Front mount rest screw (J) must make contact with flat on exhaust manifold and then be tightened 1/4 turn.

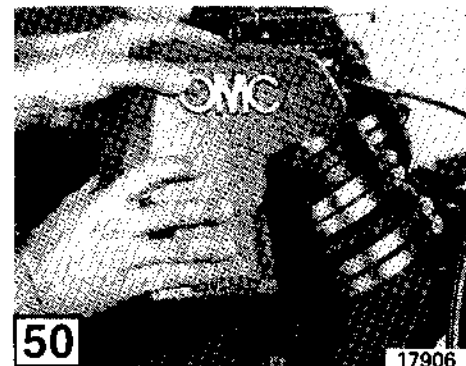
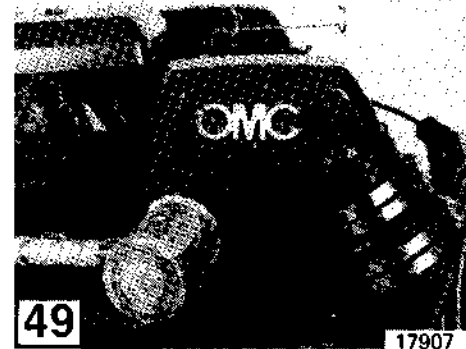
**40** 3. Install lag screws and tighten securely.

### Height Adjustment

**⚠** 1. Lift engine with 1000 lb. minimum capacity hoist. Position engine at desired height.

**47** 2. To change engine height, tighten or loosen nuts (K) and (L) as required.

**47** 3. After setting mount position, turn upper inner nut (L) up against underside of engine bracket and hold nut with a wrench. Tighten top nut (K) to a torque of 40-50 ft. lbs. (54-68 N-m).



### High-Rise Exhaust Elbow Replacement

#### Removal

**48** 1. Loosen two clamps (M) securing upper hose.

**48** 2. Lubricate inside of hose with a soapy water solution.

**49** **50** 3. Remove four screws and lockwashers mounting high-rise elbow. Use a soft hammer to free the elbow from the manifold. Use a twisting motion to pull high-rise from hose. Remove and discard the manifold gasket.

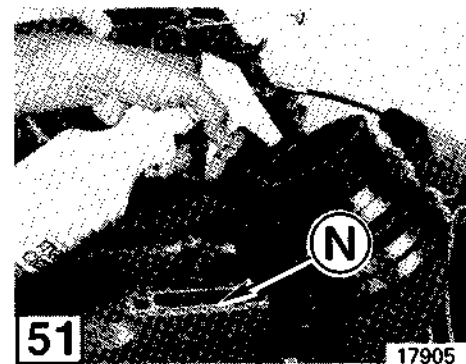
#### Installation

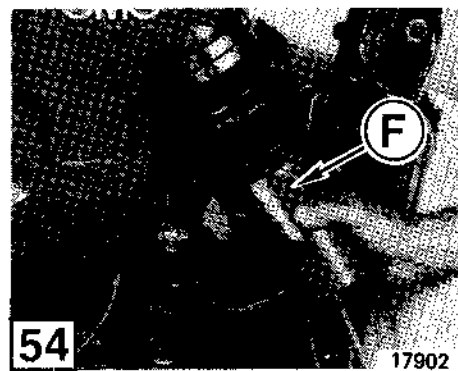
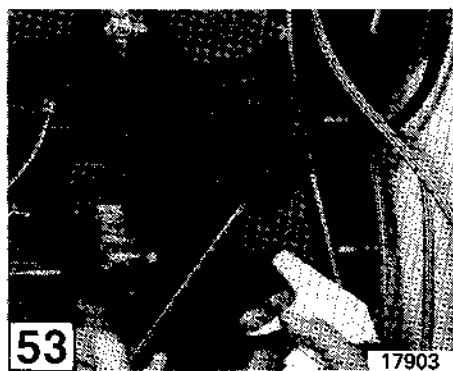
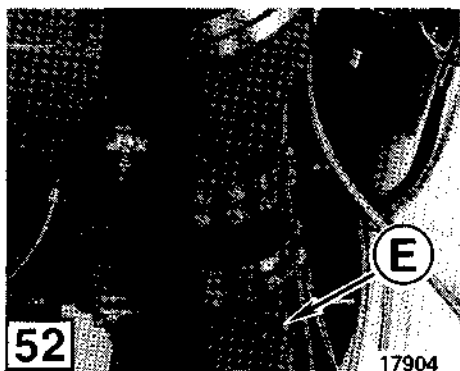
**51** 1. Thoroughly clean manifold gasket surface. Apply *OMC Gasket Sealing Compound* to both sides of a new gasket (N) and place it on the exhaust manifold.

**50** **51** 2. Lubricate the inside of the exhaust hose with a soapy water solution. Insert the high-rise into the hose with a twisting motion, and push it into hose as far as it will go.

3. Position high-rise on manifold, and install four screws and lockwashers. Tighten screws to 12-18 ft. lbs. (16-24 N-m).

4. Slide clamps up onto hose and position them in the two surface channels. Tighten clamps securely.





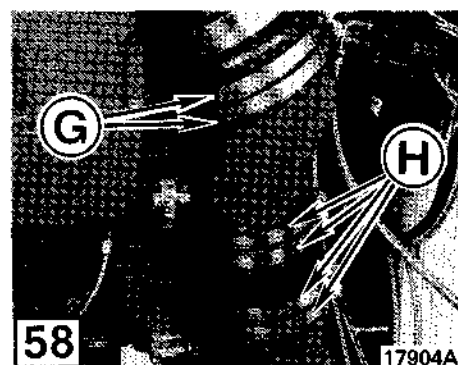
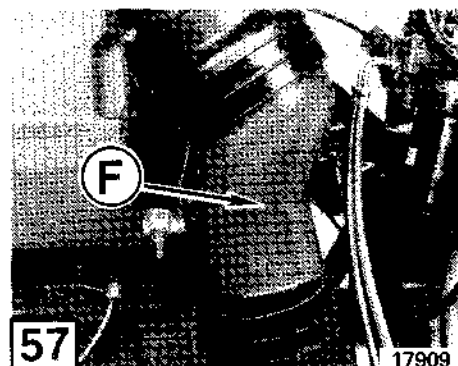
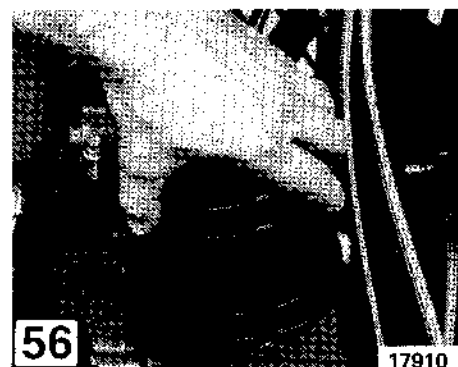
## Exhaust Hose and Intermediate Pipe Replacement

### Removal

- 52** 1. Loosen four clamps attaching lower hose, and slide clamps down onto exhaust Y-pipe **E**.
- 53** 2. Lubricate inside of hose, top and bottom, with a soapy water solution, and slide hose down onto exhaust pipe.
- 54** 3. Loosen all clamps on upper hose. Remove intermediate pipe **F** with a twisting motion.
- 55** 4. Slide upper hose off high-rise elbow.
- 56** 5. Slide lower hose off exhaust Y-pipe.

### Installation

- 56** 1. Lubricate inside diameter of lower hose with a soapy water solution. Slide it all the way onto the exhaust Y-pipe.
- 55** 2. Place two small clamps on upper hose. Push hose all the way onto high-rise elbow. Position clamps in channels at top of hose, and tighten clamps securely.
- 57** 3. Lubricate inside of upper hose. With a twisting motion, insert intermediate pipe **F** all the way into the upper hose and position it as shown. Do not attach the hose clamps at this time.
4. Slide lower hose up until it equally overlaps the intermediate and exhaust pipes.
- 58** 5. Slide two large clamps **G** up onto upper hose. Slide four remaining clamps **H** up onto lower hose. Position clamps in channels and tighten securely.



## Engine Torques

|                               |                 |             |
|-------------------------------|-----------------|-------------|
| Camshaft Sprocket             | 40-45 ft. lbs.  | 54-61 N·m   |
| Camshaft Thrust Plate         | 9-12 ft. lbs.   | 12-16 N·m   |
| Connecting Rod                |                 |             |
| 5.0, 5.0 L HO                 | 19-24 ft. lbs.  | 26-33 N·m   |
| 5.8 L                         | 40-45 ft. lbs.  | 54-61 N·m   |
| Cover Plate, Oil Pump         | 6-9 ft. lbs.    | 8-16 N·m    |
| Cylinder Front Cover          | 12-18 ft. lbs.  | 16-24 N·m   |
| Cylinder Head (5.0, 5.0 L HO) |                 |             |
| Step 1                        | 50 ft. lbs.     | 68 N·m      |
| Step 2                        | 60 ft. lbs.     | 81 N·m      |
| Step 3                        | 65-70 ft. lbs.  | 88-95 N·m   |
| Cylinder Head (5.8 L)         |                 |             |
| Step 1                        | 90 ft. lbs.     | 122 N·m     |
| Step 2                        | 100 ft. lbs.    | 136 N·m     |
| Step 3                        | 112 ft. lbs.    | 152 N·m     |
| Fuel Pump                     | 19-27 ft. lbs.  | 26-37 N·m   |
| Insert, Oil Filter            | 20-30 ft. lbs.  | 27-41 N·m   |
| Intake Manifold               | 23-25 ft. lbs.  | 31-34 N·m   |
| Main Bearing Cap              |                 |             |
| 5.0, 5.0 L HO                 | 60-70 ft. lbs.  | 81-95 N·m   |
| 5.8 L                         | 95-105 ft. lbs. | 129-142 N·m |
| Oil Inlet Tube                | 10-15 ft. lbs.  | 14-20 N·m   |
| Oil Pan                       |                 |             |
| 5/16-18                       | 8-11 ft. lbs.   | 11-15 N·m   |
| 1/4-20                        | 7-9 ft. lbs.    | 9-16 N·m    |
| Oil Pump                      | 22-32 ft. lbs.  | 30-43 N·m   |
| Pulley, Crankshaft            | 35-50 ft. lbs.  | 47-68 N·m   |
| Pulley, Water Pump            | 18-20 ft. lbs.  | 24-27 N·m   |
| Rocker Arm                    | 18-25 ft. lbs.  | 24-34 N·m   |
| Rocker Arm Cover              | 3-5 ft. lbs.    | 4-7 N·m     |
| Water Outlet Housing          | 10-15 ft. lbs.  | 14-20 N·m   |
| Water Pump                    | 12-18 ft. lbs.  | 16-24 N·m   |
| Vibration Dampener            | 70-90 ft. lbs.  | 95-122 N·m  |

# Engine Specifications

## General

### Displacement

|                 |               |
|-----------------|---------------|
| 5.0 L, 5.0 L HO | 302 cubic in. |
| 5.8 L           | 351 cubic in. |

### Bore and Stroke

|                 |                 |
|-----------------|-----------------|
| 5.0 L, 5.0 L HO | 4.00 x 3.00 in. |
| 5.8 L           | 4.00 x 3.50 in. |

## Cylinder Head

### Combustion Chamber Volume (cc)

|                 |           |
|-----------------|-----------|
| 5.0 L, 5.0 L HO | 56.7-59.7 |
| 5.8 L           | 58.9-61.9 |

### Valve Guide Bore Diameter

0.3433-0.3443 in.

### Valve Seat Width -

Intake and Exhaust..... 0.060-0.080 in.

### Valve Seat Angle - Intake and Exhaust

45°

### Valve Seat Runout - Maximum

0.0020 in.

### Surface Flatness

0.003 inch in any 6 inches

or 0.007 inch overall

### Valve Arrangement (Front to Rear)

Right..... I-E-I-E-I-E-I-E

Left..... E-I-E-I-E-I-E-I

### Rocker Arm Stud Bore Diameter -

Standard..... 0.3680-0.3695 in.

### Gasket Surface Flatness

0.003 inch

in any 6 inches

or 0.007 inch overall

### Gasket Surface Finish RMS\*

60-150

## Valve Rocker Arms, Push Rods and Lifters

### Rocker Arm Lift Ratio

1.61:1

### Valve Push Rod Runout - Maximum

0.015 in.

### Rocker Arm Stud Diameter

Standard..... 0.3714-0.3721 in.

0.006 Oversize..... 0.3774-0.3781 in.

0.010 Oversize..... 0.3814-0.3821 in.

0.015 Oversize..... 0.3864-0.3871 in.

### Hydraulic Lifter

Leakdown Rate..... 5-50 seconds maximum

measured at 1/16 in. plunger travel

### Hydraulic Lifter

Standard Diameter..... 0.8740-0.8745 in.

Clearance to Bore..... 0.0007-0.0027 in.

Wear Limit..... 0.005 in.

### Hydraulic Lifter Collapsed Gap

5.0 L, 5.0 L HO

Allowable..... 0.071-0.193 in.

Desired..... 0.096-0.165 in.

5.8 L

Allowable..... 0.098-0.198 in.

Desired..... 0.123-0.173 in.

## Valves

### Valve Stem Diameter

#### Intake

Standard..... 0.3416-0.3423 in.

0.003 Oversize..... 0.3446-0.3453 in.

0.015 Oversize..... 0.3566-0.3573 in.

0.030 Oversize..... 0.3716-0.3723 in.

#### Exhaust

Standard..... 0.3411-0.3418 in.

0.003 Oversize..... 0.3441-0.3448 in.

0.015 Oversize..... 0.3561-0.3568 in.

0.030 Oversize..... 0.3711-0.3718 in.

### Valve Face Angle..... 44°

### Valve Stem to Valve Guide Clearance -

Intake..... 0.0010-0.0027 in.

Exhaust..... 0.0015-0.0032 in.

Wear Limit..... 0.0055 in.

### Valve Head Diameter

Intake..... 1.773-1.791 in.

Exhaust..... 1.453-1.468 in.

### Valve Face Runout (Maximum)

0.0020 in.

### Valve Spring Free Length - Approximate

5.0 L, 5.0 L HO

Exhaust..... 1.87 in.

Intake..... 1.94 in.

5.8 L

Exhaust..... 1.87 in.

Intake..... 2.06 in.

### Valve Spring Out-of-Square -

Maximum..... 5/64 (0.078) in.

### Valve Spring Pressure - Lbs. at Specified Length

5.0 L, 5.0 L HO..... 76-84 @ 1.69 in.

190-210 @ 1.31 in.

5.8 L..... 71-79 @ 1.79 in.

190-210 @ 1.31 in.

### Service Limit 10% Pressure Loss @ Spec. Length

### Valve Spring Assembled Height - Pad to Retainer

5.0 L, 5.0 L HO

Intake..... 1 21/32 - 1 23/32 in.

Exhaust..... 1 19/32 - 1 5/8 in.

5.8 L

Intake..... 1 49/64 - 1 13/16 in.

Exhaust..... 1 19/32 - 1 5/8 in.

\* RMS - Root Mean Square

## Engine Specifications Cont.

### Camshaft and Bearings

#### Camshaft Journal Diameter Standard

|               |                   |
|---------------|-------------------|
| No. 1 Bearing | 2.0805-2.0815 in. |
| No. 2 Bearing | 2.0655-2.0665 in. |
| No. 3 Bearing | 2.0505-2.0515 in. |
| No. 4 Bearing | 2.0355-2.0365 in. |
| No. 5 Bearing | 2.0205-2.0215 in. |

|                                          |                                           |
|------------------------------------------|-------------------------------------------|
| Camshaft Journal to<br>Bearing Clearance | 0.001-0.003 in.<br>Wear Limit - 0.006 in. |
|------------------------------------------|-------------------------------------------|

|                   |                                           |
|-------------------|-------------------------------------------|
| Camshaft End Play | 0.001-0.007 in.<br>Wear Limit - 0.009 in. |
|-------------------|-------------------------------------------|

#### Camshaft Lobe Lift -

|          |            |
|----------|------------|
| 5.0 L    |            |
| Intake   | 0.2303 in. |
| Exhaust  | 0.238 in.  |
| 5.0 L HO |            |
| Intake   | 0.2600 in. |
| Exhaust  | 0.278 in.  |
| 5.8 L    |            |
| Intake   | 0.278 in.  |
| Exhaust  | 0.283 in.  |

Maximum Allowable Lobe Lift Loss .... 0.005 in.

#### Bearing Inside Diameter

|               |                   |
|---------------|-------------------|
| Bearing No. 1 | 2.0825-2.0835 in. |
| Bearing No. 2 | 2.0675-2.0685 in. |
| Bearing No. 3 | 2.0525-2.0535 in. |
| Bearing No. 4 | 2.0375-2.0385 in. |
| Bearing No. 5 | 2.0225-2.0235 in. |

#### Camshaft Journal

|                      |           |
|----------------------|-----------|
| Maximum Runout       | 0.005 in. |
| Maximum Out-of-Round | 0.005 in. |

#### Camshaft Bearing Location -

|               |                    |
|---------------|--------------------|
| No. 1 Bearing | 0.0050-0.0200 in.* |
|---------------|--------------------|

Timing Chain Deflection - Maximum .... 0.500 in.

\*Distance in inches that the front edge of the bearing is installed toward the rear from the front face of the cylinder block.

### Crankshaft and Flywheel

#### Main Bearing Journal Diameter

|                 |                   |
|-----------------|-------------------|
| 5.0 L, 5.0 L HO | 2.2482-2.2490 in. |
| 5.8 L           | 2.9994-3.0002 in. |

#### Main Bearing Journal Out-of-Round

|         |            |
|---------|------------|
| Maximum | 0.0006 in. |
|---------|------------|

#### Connecting Rod Journal Diameter

|                 |                   |
|-----------------|-------------------|
| 5.0 L, 5.0 L HO | 2.1228-2.1236 in. |
| 5.8 L           | 2.3103-2.3111 in. |

#### Connecting Rod Journal Out-of-Round

|         |            |
|---------|------------|
| Maximum | 0.0006 in. |
|---------|------------|

#### Main Bearing Journal Taper -

|         |                |
|---------|----------------|
| Maximum | 0.0006 per in. |
|---------|----------------|

#### Connecting Rod Journal Taper -

|         |                |
|---------|----------------|
| Maximum | 0.0006 per in. |
|---------|----------------|

Thrust Bearing Journal Length ... 1.137-1.139 in.

#### Main Bearing Journal Thrust

|             |           |
|-------------|-----------|
| Face Runout | 0.001 in. |
|-------------|-----------|

#### Crankshaft to Rear Face of Block Runout TIR\*\* -

|         |           |
|---------|-----------|
| Maximum | 0.005 in. |
|---------|-----------|

Crankshaft Free End Play ..... 0.004-0.008 in.

Wear Limit - 0.012 in.

### Main Bearings

#### Journal Clearance

|                               |                   |
|-------------------------------|-------------------|
| 5.0 L, 5.0 L HO No. 1 Bearing |                   |
| Desired                       | 0.0001-0.0015 in. |
| Allowable                     | 0.0001-0.0020 in. |

|                              |                   |
|------------------------------|-------------------|
| 5.0 L, 5.0 L HO - All others |                   |
| Desired                      | 0.0005-0.0015 in. |
| Allowable                    | 0.0005-0.0024 in. |

|           |                   |
|-----------|-------------------|
| 5.8 L     |                   |
| Desired   | 0.0008-0.0015 in. |
| Allowable | 0.0008-0.0026 in. |

#### Wall Thickness

|                               |                   |
|-------------------------------|-------------------|
| 5.0 L, 5.0 L HO No. 1 Bearing | 0.0961-0.0966 in. |
| All Others                    | 0.0957-0.0962 in. |

|                     |                   |
|---------------------|-------------------|
| 5.8 L No. 1 Bearing | 0.0957-0.0960 in. |
| All Others          | 0.0957-0.0962 in. |

\*\* Total Indicated Reading

## Engine Specifications Cont.

### Connecting Rod

|                                                     |                   |
|-----------------------------------------------------|-------------------|
| Piston Pin Bore I.D. - Standard . . .               | 0.9096-0.9112 in. |
| Bearing Bore Diameter                               |                   |
| 5.0 L, 5.0 L HO . . . . .                           | 2.2390-2.2398 in. |
| 5.8 L . . . . .                                     | 2.4265-2.4273 in. |
| Bearing Bore Out-of-Round and Taper . .             | 0.0004 in.        |
| Connecting Rod Length - Center to Center            |                   |
| 5.0 L, 5.0 L HO . . . . .                           | 5.0885-5.0915 in. |
| 5.8 L . . . . .                                     | 5.9545-5.9575 in. |
| Twist Total Difference - Maximum . . . .            | 0.024 in.*        |
| Bend Total Difference - Maximum . . . .             | 0.012 in.*        |
| Connecting Rod Assembly - Assembled to Crankshaft - |                   |
| Side Clearance . . . . .                            | 0.010-0.020 in.   |
| Wear Limit -                                        | 0.023 in.         |

\*Pin, bushing and crankshaft bearing bore must be parallel, and in the same vertical plane, within the specified total difference at ends of an 8-inch long bar measured 4 inches on each side of rod.

### Connecting Rod Bearings

|                                 |                   |
|---------------------------------|-------------------|
| Bearing to Crankshaft Clearance |                   |
| Allowable . . . . .             | 0.0008-0.0025 in. |
| Desired . . . . .               | 0.0008-0.0015 in. |
| Wall Thickness - Standard . . . | 0.0572-0.0577 in. |
| 0.002 Undersize . . . . .       | 0.0582-0.0587 in. |

### Pistons

|                                  |                   |
|----------------------------------|-------------------|
| Piston Diameter - Coded Red      |                   |
| 5.0 L, 5.0 L HO . . . . .        | 3.9984-3.9990 in. |
| 5.8 L . . . . .                  | 3.9978-3.9984 in. |
| Coded Blue                       |                   |
| 5.0 L, 5.0 L HO . . . . .        | 3.9996-4.0002 in. |
| 5.8 L . . . . .                  | 3.9990-3.9960 in. |
| 0.003 Oversize                   |                   |
| 5.0 L, 5.0 L HO . . . . .        | 4.0008-4.0014 in. |
| 5.8 L . . . . .                  | 4.0002-4.0008 in. |
| Piston to Cylinder Bore          |                   |
| Clearance . . . . .              | 0.0018-0.0026 in. |
| Piston Pin Bore Diameter         |                   |
| 5.0 L, 5.0 L HO . . . . .        | 0.9122-0.9126 in. |
| 5.8 L . . . . .                  | 0.9124-0.9127 in. |
| Ring Groove Width, Compression - |                   |
| Top . . . . .                    | 0.077-0.078 in.   |
| Bottom . . . . .                 | 0.077-0.078 in.   |
| Oil Ring . . . . .               | 0.1880-0.1890 in. |

### Piston Pin

|                                    |                   |
|------------------------------------|-------------------|
| Piston Pin Diameter - Standard . . | 0.9120-0.9123 in. |
| 0.001 Oversize . . . . .           | 0.9130-0.9133 in. |
| 0.002 Oversize . . . . .           | 0.9140-0.9143 in. |
| Piston Pin Length . . . . .        | 3.010-3.040 in.   |
| Piston Pin to Piston Clearance     |                   |
| 5.0 L, 5.0 L HO . . . . .          | 0.0002-0.0004 in. |
| 5.8 L . . . . .                    | 0.0003-0.0005 in. |
| Wear Limit -                       | 0.0008 in.        |
| Piston Pin to Connecting Rod       |                   |
| Bushing Clearance . . . . .        | Interference Fit  |

### Piston Rings

|                                                     |                 |
|-----------------------------------------------------|-----------------|
| Top Compression Ring Width . . . .                  | 0.077-0.078 in. |
| Bottom Compression Ring Width . .                   | 0.077-0.078 in. |
| Top Compression Ring                                |                 |
| Side Clearance . . . . .                            | 0.002-0.004 in. |
| Bottom Compression Ring                             |                 |
| Side Clearance . . . . .                            | 0.002-0.004 in. |
| Wear Limit - 0.002 max. increase in total clearance |                 |
| Oil Ring Side Clearance . . . . .                   | Snug            |
| Top Compression Ring -                              |                 |
| Ring Gap . . . . .                                  | 0.010-0.020 in. |
| Bottom Compression Ring -                           |                 |
| Ring Gap . . . . .                                  | 0.010-0.020 in. |
| Oil Ring (Steel Rail) -                             |                 |
| Ring Gap . . . . .                                  | 0.015-0.055 in. |

### Cylinder Block

|                                             |                   |
|---------------------------------------------|-------------------|
| Cylinder Bore Diameter                      |                   |
| 5.0 L, 5.0 L HO . . . . .                   | 4.0004-4.0052 in. |
| 5.8 L . . . . .                             | 4.0000-4.0048 in. |
| Maximum Out-of-Round . . . . .              | 0.0015 in.        |
| Wear Limit -                                | 0.005 in.         |
| Maximum Taper . . . . .                     | 0.001 in.         |
| Wear Limit -                                | 0.010 in.         |
| Crankshaft to Rear Face of Block Runout     |                   |
| TIR Maximum . . . . .                       | 0.005 in.         |
| Lifter Bore Diameter . . . . .              | 0.8752-0.8767 in. |
| Main Bearing Bore Diameter                  |                   |
| 5.0 L, 5.0 L HO . . . . .                   | 2.4412-2.4420 in. |
| 5.8 L . . . . .                             | 3.1922-3.1930 in. |
| Distributor Shaft Bearing Bore Diameter     |                   |
| 5.0 L, 5.0 L HO . . . . .                   | 0.4525-0.4541 in. |
| 5.8 L . . . . .                             | 0.5155-0.5171 in. |
| Head Gasket Surface Flatness                |                   |
| 0.003 in. in any 6 in. or 0.006 in. overall |                   |
| Head Gasket Surface Finish RMS . . . . .    | 60-150            |
| Cylinder Bore Surface Finish RMS . . . . .  | 18-38             |

### Oil Pump

|                                                       |                       |
|-------------------------------------------------------|-----------------------|
| Relief Valve Spring Tension (Lbs. @ Specified Length) |                       |
| 5.0 L, 5.0 L HO . . . . .                             | 10.6-12.2 @ 1.704 in. |
| 5.8 L . . . . .                                       | 18.2-20.2 @ 2.49 in.  |
| Drive Shaft to                                        |                       |
| Housing Bearing Clearance . . .                       | 0.0015-0.0029 in.     |
| Relief Valve Clearance . . . . .                      | 0.0015-0.0029 in.     |
| Rotor Assembly End Clearance . . .                    | 0.001-0.004 in.       |
| Outer Race to                                         |                       |
| Housing Clearance (Radial) . . . .                    | 0.001-0.013 in.       |

# Section 17

## Engine and Drive

### Removal and Installation

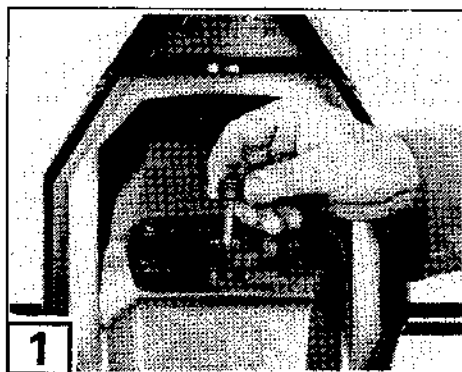
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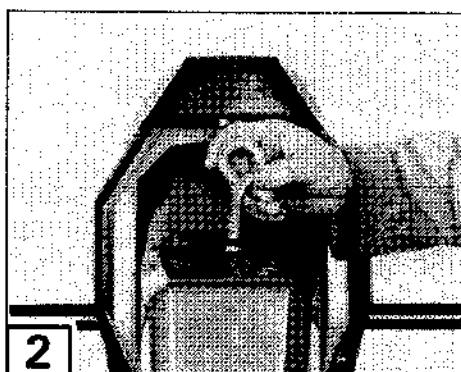


#### Safety Warning

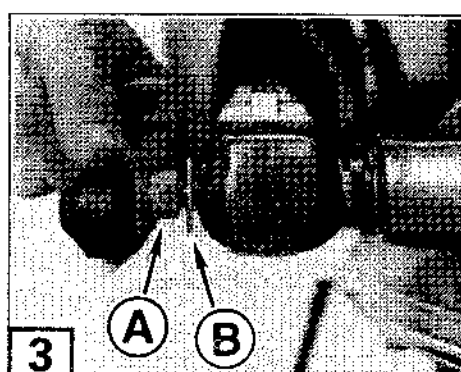
Before beginning work in this section, read Safety chapter at front of this manual. Proper installation is important for the safe, reliable operation of all mechanical products. The procedures we recommend and describe in these instructions are effective methods to be followed when installing *OMC Cobra®* stern drive products. Some of these methods require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.



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## Vertical Drive Removal

### Special Tools Required:

- Hoist
- Lifting Eye (½-13)
- Vertical Drive Holding Fixture

**Note** The boat must be out of the water on a trailer or in a cradle for removal of the vertical drive.

**1** 1. Remove oil indicator plug from upper gear housing.

**2** 2. Install lifting eye into upper gear housing until full thread engagement is achieved.

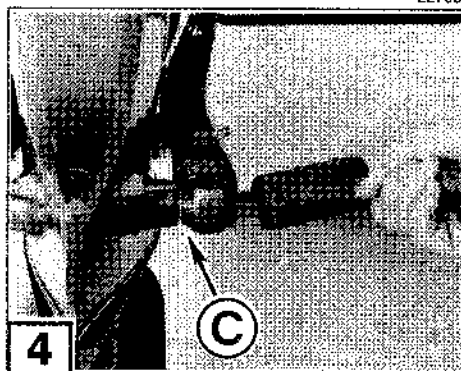
**3** 3. Remove and retain pivot pin covers, elastic locknut **A** and flat washer **B** from trim/tilt pivot rod.

**4** **5** 4. Use a soft hammer to lightly tap trim/tilt pivot rod out of trim/tilt cylinder. Remove and retain plastic spacer **C** found between each cylinder eye and housing.

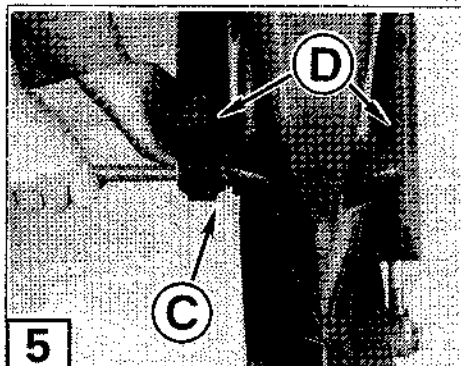
**5** **Note** 5. Support hydraulic cylinder **D** while removing pivot rod. Carefully lower each hydraulic cylinder after pivot rod is removed to prevent damage to hydraulic lines.

**6** 6. Attach a suitable hoist to lifting eye to hold vertical drive. Remove and discard six elastic locknuts **E**. Remove six flat washers from the pivot housing studs.

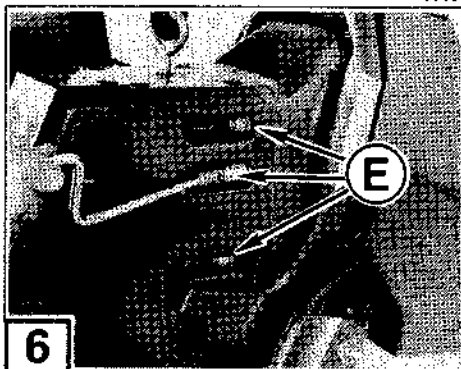
**7** 7. Pull vertical drive away from transom bracket and support driveshaft **F** and universal coupler **G**.



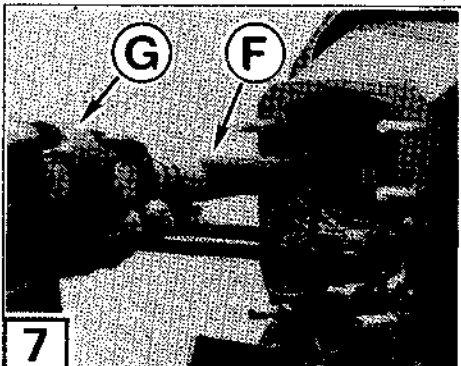
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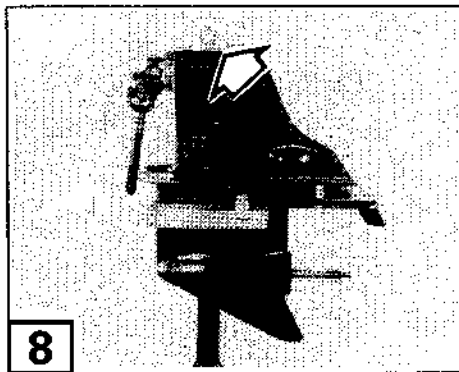


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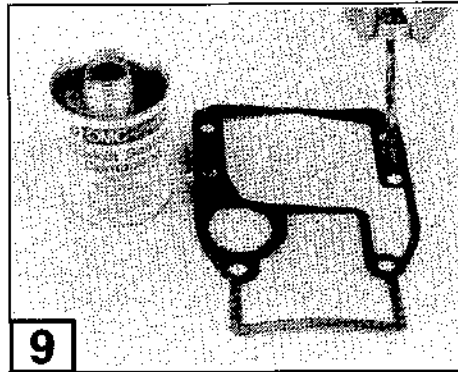


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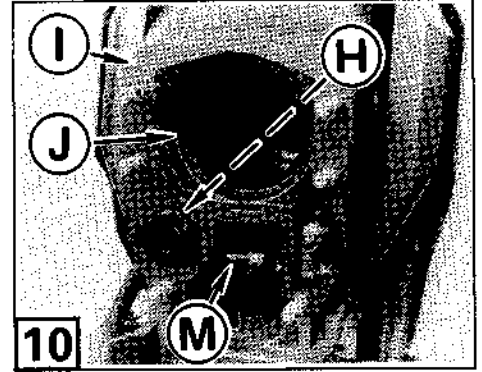
Cobra/eng



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## Vertical Drive Installation

**8** 1. Remove oil level indicator plug and install lifting eye until full thread engagement is achieved.

2. Use a suitable hoist to remove vertical drive from holding fixture.

3. Remove and clean gasket material from pivot housing and upper gear housing.

**9** 4. Apply *OMC Gasket Sealing Compound* to both sides of a new gasket.

**10** 5. Inspect molded rubber seal ring (H) for proper fit in its groove. If damaged, replace it. Install pivot housing gasket (I). Lightly lubricate large seal lip (J) with *OMC Triple-Guard*® grease.

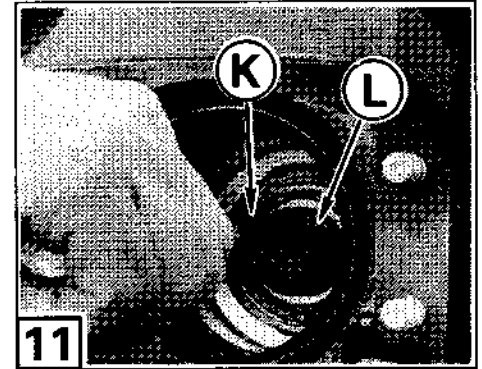
**11** 6. Slide alignment tool (K) through driveshaft gimbal bearing (L). The alignment tool must slide through the bearing and into engine coupler with ease. If the alignment tool binds going into engine coupler, the bearing and/or engine must be repositioned until alignment tool slides in and out of engine coupler with ease.

**10** 7. Shift remote control of boat into neutral position. Apply *OMC Triple-Guard* grease to shift lever pin (M).

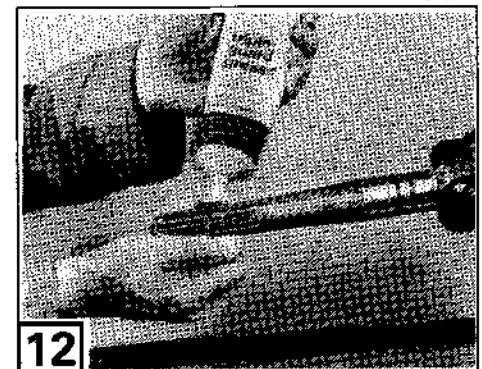
**12** 8. Lubricate driveshaft splines with *OMC Triple-Guard* grease.

**13** 9. Lightly lubricate the two O-rings (N) of driveshaft with *Evinrude*® or *Johnson*® Outboard Lubricant or *OMC Cobra*® 4-Cycle Motor Oil. Excessive grease in O-ring grooves can hydraulically lock O-rings and cause difficulty starting driveshaft into gimbal bearing.

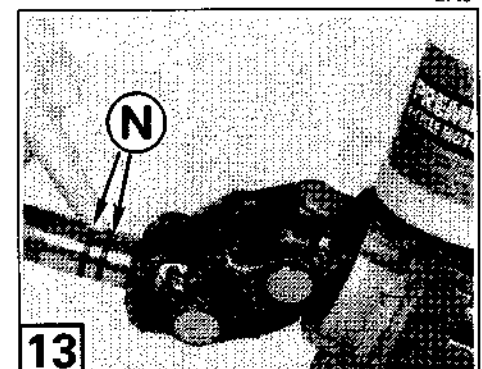
**14** 10. Grease both U-joints with *OMC Marine Wheel Bearing Grease*.



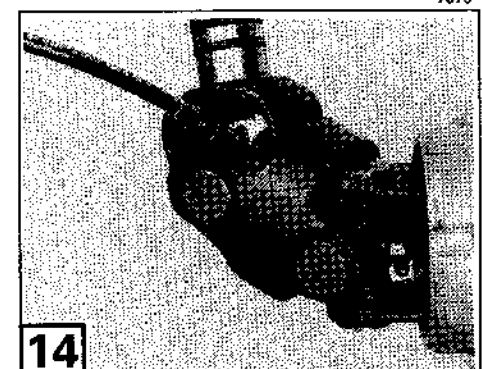
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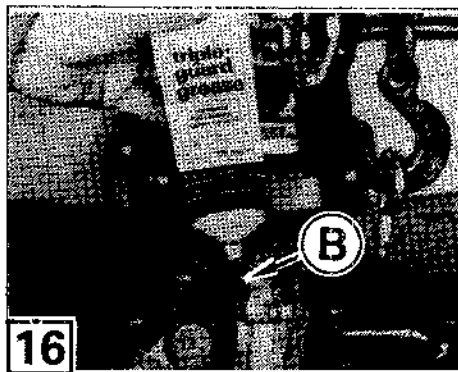
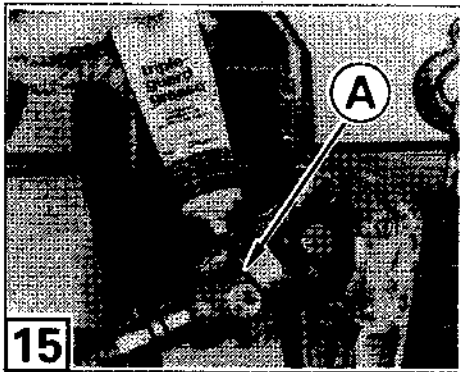
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**15** 11. Lubricate outer surface of the universal coupler (A) with *OMC Triple-Guard* grease.

**16** 12. Apply a light coat of *OMC Triple-Guard* grease to tapered end of (B) of bearing carrier.

**17** 13. Move vertical drive shift rod into neutral position. Propeller shaft should turn freely in both directions.

**18** 14. Apply *OMC Gasket Sealing Compound* to the six studs.

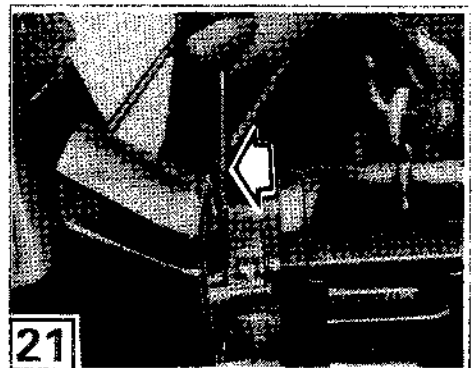
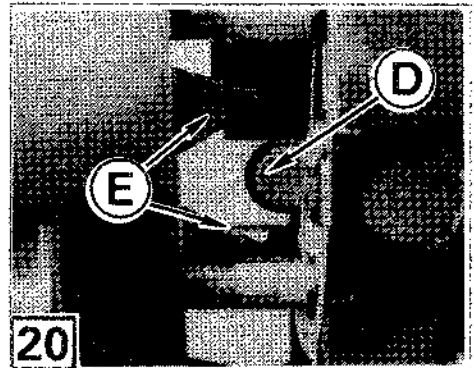
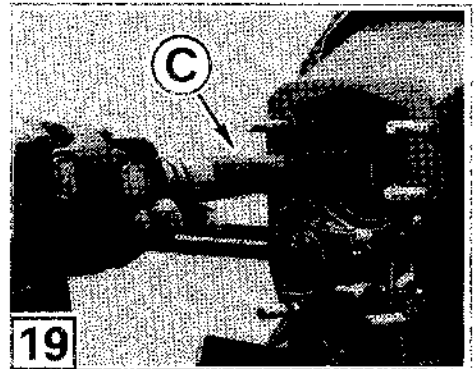
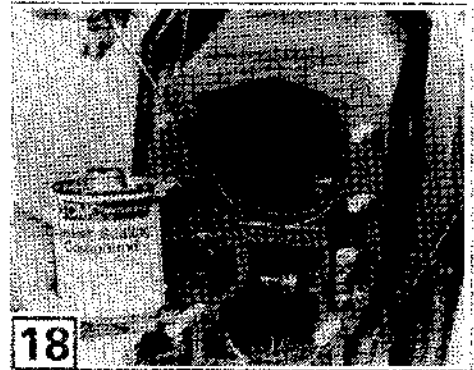
**19** 15. Slide driveshaft (C) into U-joint bellows and through gimbal bearing.

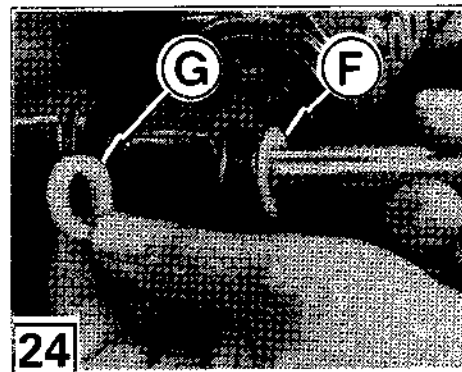
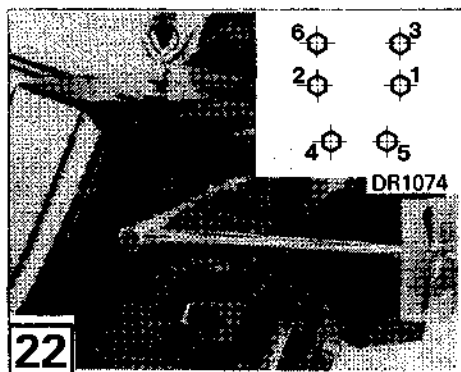
**20** 16. Check alignment of pivot housing shift lever pin (D) and fork connector (E) of vertical drive to ensure they will mesh properly.

**21** 17. To align the driveshaft splines, use a long screwdriver or a 1/4 in. diameter bar to turn universal coupler until the driveshaft splines engage the engine coupler. Slide vertical drive onto studs until completely seated against gasket of transom bracket.

18. Install six flat washers and six new elastic locknuts.

**22** 19. Use a 3/8 in. drive 5/8 in. swivel socket to tighten nuts to an initial torque of 25 ft. lbs. (34 N·m). Start with the center nut and work in a crisscross pattern, as shown.





20. Use the same crisscross pattern to tighten all six elastic locknuts to a final torque of 50 ft. lbs. (68 N·m).

21. Apply *OMC Triple-Guard* grease to the trim tilt pivot rod.

22. Align trim rod (F) with upper housing boss. Install trim/tilt pivot rod and spacer (G).

**Note** Use care when installing trim/tilt pivot rod or bushings can be damaged.

23. Align second trim rod with upper housing boss. A  $\frac{3}{8}$  in. bar can be used to turn rod end and align the bushings. Install a spacer (G) between the boss and rod end.

24. Pushing or pulling the lower gearcase will also help align the trim rods with the boss.

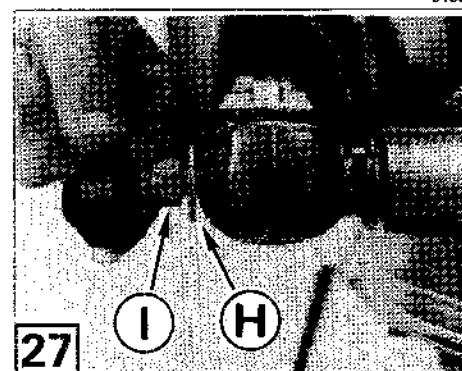
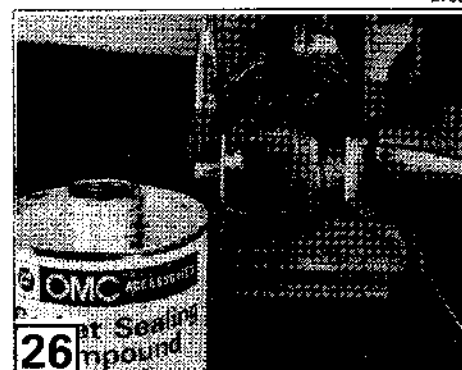
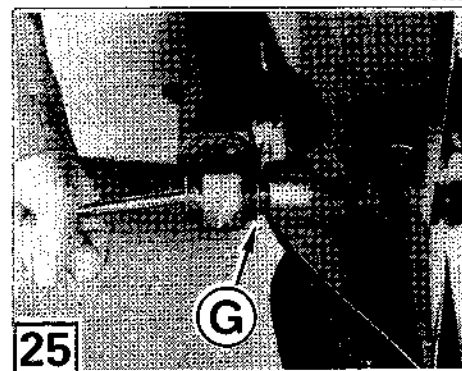
25. Use a soft hammer to lightly tap trim/tilt pivot rod until shoulder of rod is equal on both sides of the trim rods.

26. Apply *OMC Gasket Sealing Compound* to threaded ends of pivot rod.

27. Install large flat washer (H) and elastic locknut (I) onto each end of pivot rod.

28. Hold one locknut with a  $\frac{5}{8}$  in. box end wrench. Tighten both locknuts until locknuts and washers bottom out on shoulders of pivot rod. Tighten to a torque of 32-34 ft. lbs. (43-46 N·m). Install both pivot pin covers.

29. Remove lifting eye bolt from upper housing. Install oil level indicator plug using a new seal, and tighten to a torque of 48-72 in. lbs. (5-8 N·m).



## Engine Removal

Check engine clearance between front of engine and engine compartment bulkhead prior to starting work. If clearance is less than 6 in. (152,5 mm), the vertical drive must be removed to disengage U-joint shaft from engine coupler. See Vertical Drive Removal, page 17-2.

When engine clearance is more than 6 in. (152,5 mm), the engine can be pulled forward to disengage the U-joint shaft from the flywheel coupler, and be removed from the engine compartment.

**Note** Drive can remain installed only if engine removal does not require disturbing engine mount height. If mount height would need to be changed, remove engine and drive.

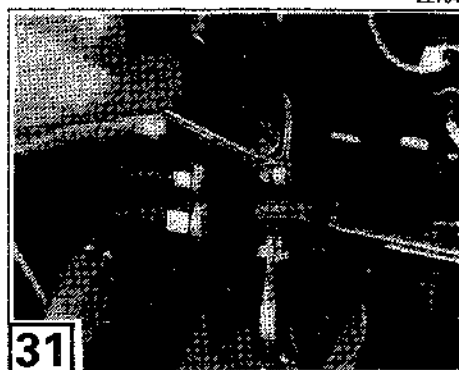
**!** To prevent possible fire and explosion caused by ignition of fuel vapors which may be present in the engine compartment, remove the positive and negative cables from the battery.



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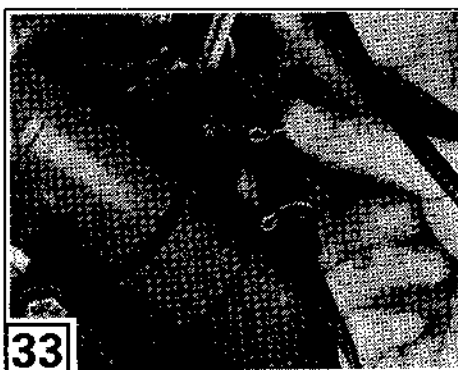


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### Power Steering Line Disconnection

- 29** 1. Disconnect both power steering lines at the hydraulic actuator.
- 30** **31** 2. To prevent fluid loss and entry of contaminants cover both the actuator openings and connect line fittings together. Tie lines higher than power steering pump onto engine to prevent damage and loss of oil during engine removal.

### Fuel Supply Disconnection

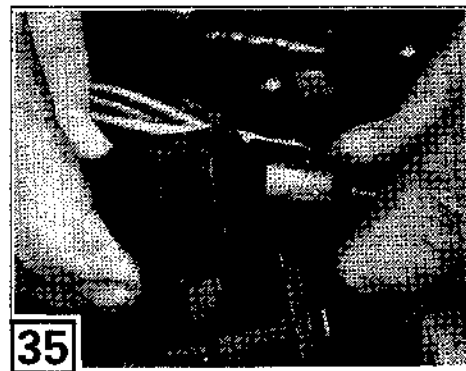
- 32**  Disconnect boat fuel line at the fuel filter canister. **Seal end of fuel line and opening to canister.**

### Electrical Cable Disconnection

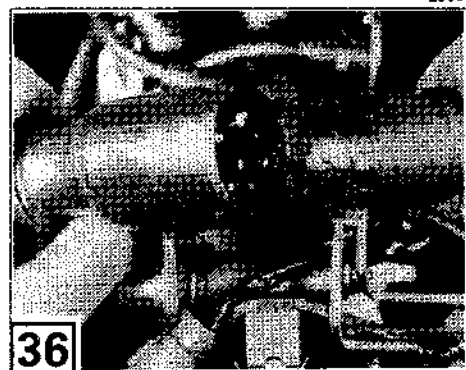
1. Disconnect the red (positive) and black (negative) cables at the battery.
- 33** 2. Unplug rubber two-wire trim/tilt sender connector.
- 34** 3. Disconnect plastic two-wire trim/tilt motor connector.
- 35** 4. Separate small rubber three-wire trim/tilt instrument cable connector.
- 36** 5. Remove large rubber instrument cable from retainer. Unscrew worm clamp and disconnect.

### Exhaust Hose Disengagement - 2.3, 3.0 and 3.0 Litre HO Models

- 37** 1. Loosen four hose clamps.
- 38** 2. For ease of moving hose, lubricate exhaust pipe.



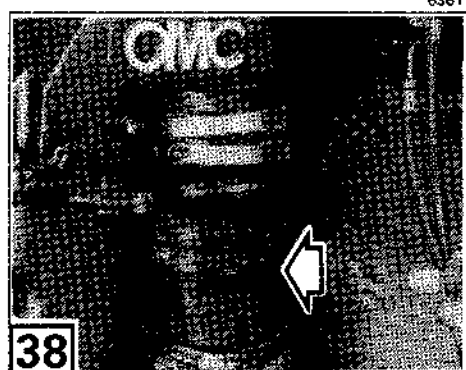
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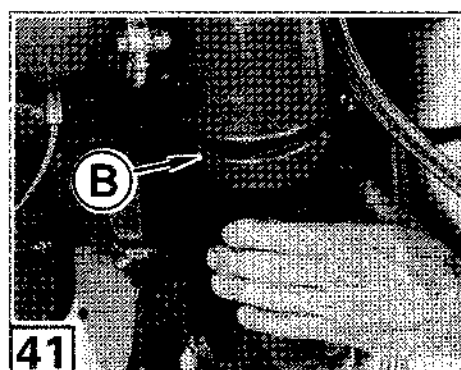
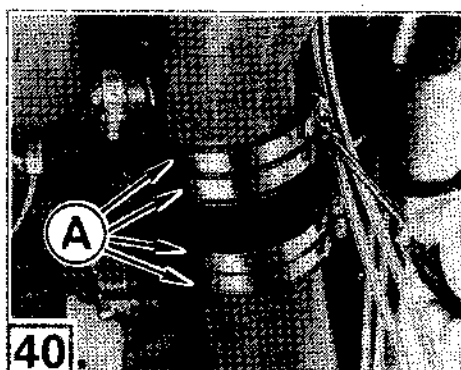


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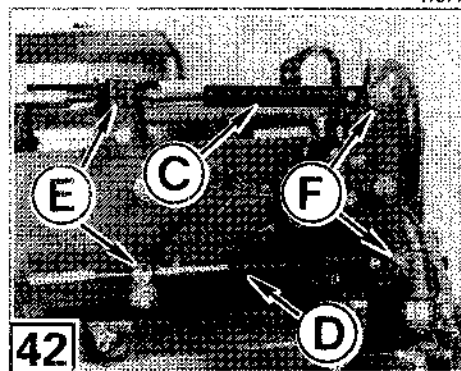


- 39** 3. To free exhaust hose from elbow, pry or twist hose. Slide hose down onto exhaust pipe.

#### Exhaust Hose Disengagement - All Models Except 2.3, 3.0 and 3.0 Litre HO

- 40** 1. Loosen four clamps **A** on lower exhaust hose. For ease of moving lower hose, lubricate exhaust pipe.

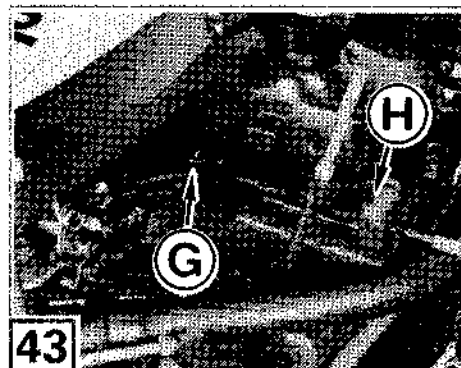
- 41** 2. To free lower hose from exhaust adaptor, pry or twist hose. Slide hose down onto exhaust pipe **B**.



#### Throttle and Shift Cable Removal

- 42** 1. Remove remote control shift cable **C** and transom bracket shift cable **D** from engine shift bracket. Remove cables from both of the anchor pockets **E** and the shift lever **F**. Tape the remote control and transom bracket cable adjustable trunnions to the cable to prevent misadjustment on reinstallation of cable.

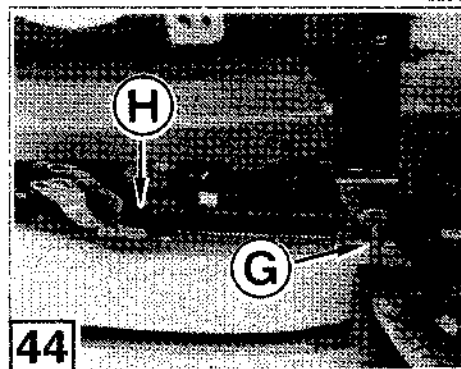
- 43** → **45** 2. Disconnect the throttle cable at the carburetor lever **G** and manifold anchor block **H**.

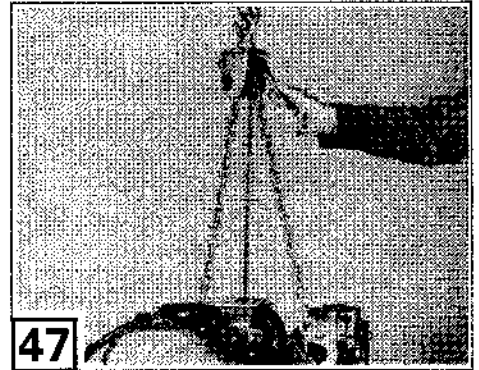
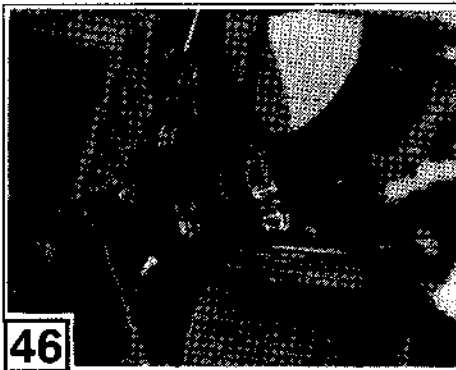
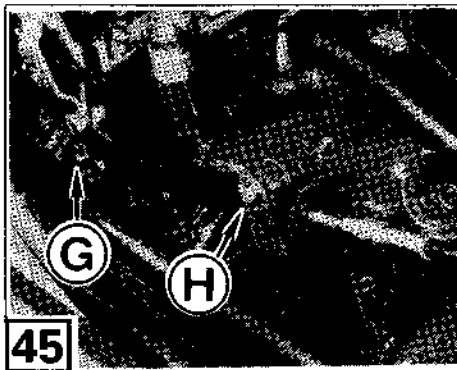


- 43** 2.3 Litre Models

- 44** 3.0 and 3.0 Litre HO Models

- 45** 4.3, 4.3 HO, 5.0, 5.0 HO, 5.7 and 5.8 Litre Models





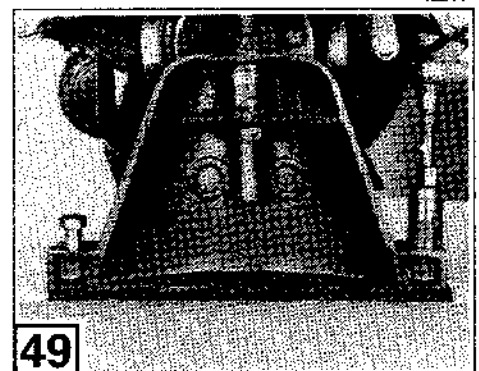
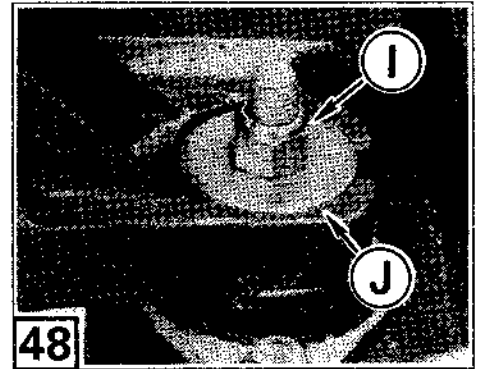
## Water Hose Removal

- 46** Loosen the clamp and pull the water supply hose off the transom bracket water tube.

## Engine Mount Separation

**!** Use hoist with a lifting capacity of at least 1500 lbs. (680 kg).

- 47** 1. Attached hoist to lifting brackets of engine.
- 48** 2. Remove and retain both elastic locknuts **I** and both flat washers **J** from rear engine mounts.
- 49** **50** 3. Remove and retain lag screws from front engine mounts.
4. If vertical drive was removed, lift engine out of engine compartment. If vertical drive was not removed, lift engine slightly and pull it forward to disengage U-joint shaft and flywheel coupler. With U-joint shaft clear of flywheel coupler, lift engine out of compartment.



3.0 Litre

All except 3.0 Litre

## Exhaust Pipe Removal

Remove engine following previous procedure.

1. Remove and retain four exhaust pipe screws.

- 51 2. Remove exhaust pipe and discard seal (A). Clean all material from transom bracket and exhaust pipe surface.

**Note** Exhaust pipe mounting holes have locking *Heli-Coil* inserts. Do not clean screw holes with a thread tapping tool, otherwise locking feature will be destroyed and *Heli-Coil* will have to be replaced.

## Exhaust Pipe Installation

- 52 1. Coat a new seal with *OMC Adhesive M™* and place in transom bracket groove (B).

- 52 2. Apply *OMC Gasket Sealing Compound* to the four exhaust pipe mounting screws (C).

- 53 3. Secure exhaust pipe (D) to transom bracket with four screws. Tighten the four screws to a torque of 20-25 ft. lbs. (27-34 N·m).

4. Install engine.

## Engine Installation

### Engine Mount Attachment

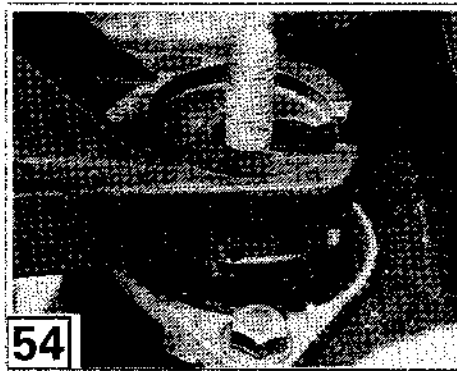
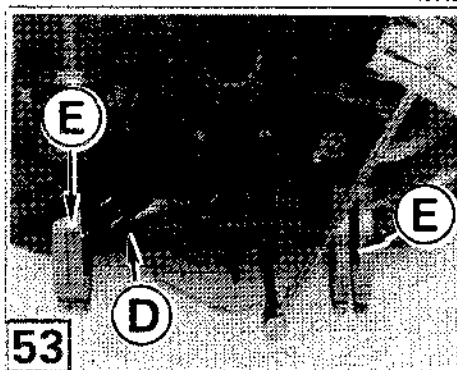
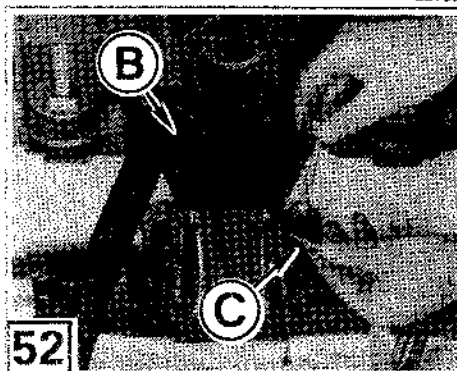
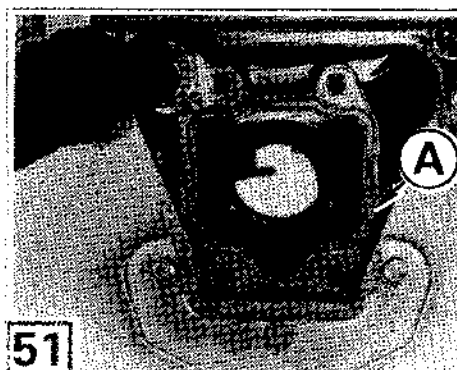
- 53 1. Slide exhaust hoses and clamps (E) onto exhaust pipes if they were removed.

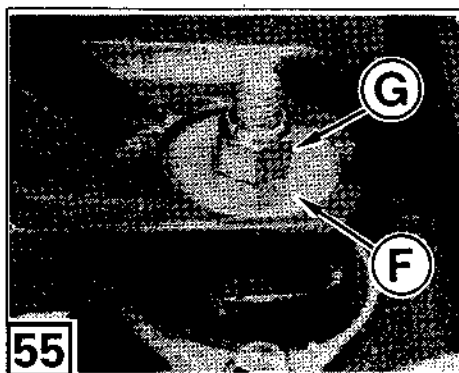
2. Lower engine into engine compartment;

- 54 • If vertical drive was not removed, turn U-joint shaft to engage the splines of flywheel coupler. Slide engine back onto rear engine mounts. If engine mount height was disturbed, engine must be realigned as described later.

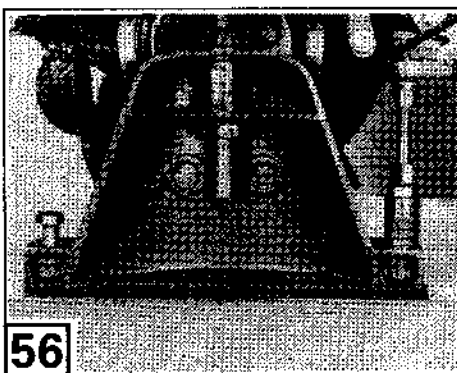
- 54 • If vertical drive has been removed, lower engine onto rear mounts.

- 55 3. Install flat washer (F) into recess of engine bracket and secure to mount with an elastic locknut (G). Tighten elastic locknut to a torque of 28-30 ft. lbs. (38-40 N·m).





12211



3.0 Litre

2888



2.3 L, V-6 and V-8

2933

- 56 57** 4. Install forward mount lag screws and tighten the lag screws securely.

If vertical drive was not removed, go on to Exhaust Hose Attachment.

If vertical drive was removed, continue with Engine Alignment section.

### Engine Alignment

Correct engine alignment is essential to long engine drivetrain life. The front engine mounts may need adjustment UP or DOWN to produce correct engine alignment. Use OMC Alignment Tool P/N 912273 with OMC Universal Handle P/N 311880 to test engine alignment.

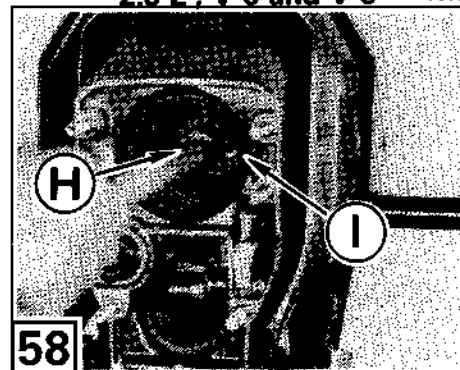
- 58** 1. Slide alignment tool **H** through gimbal bearing **I**. The alignment tool must slide through the gimbal bearing and into engine coupler with ease. If the alignment tool binds going into engine coupler, the front engine mount(s) must be adjusted either UP or DOWN, as required, until alignment tool slides in and out of engine coupler with ease.

- 59 60** 2. To change engine height, tighten or loosen nuts **J** and **K** as required. See respective engine section, Front Mount Height Adjustment.

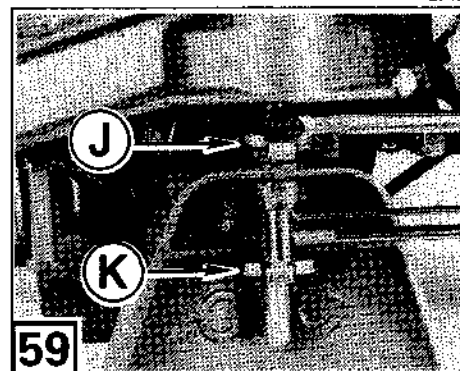
3. After correct alignment has been made, the front mount(s) must be tightened to maintain alignment.

- 59** • **3.0 and 3.0 Litre HO** - While holding one nut with an open-end wrench, tighten the second adjusting nut to a torque of 115-140 ft. lbs. (156-190 N-m).

- 60** • **2.3 L, V-6 and V-8 Models** - While holding one nut with an open-end wrench, tighten the second adjusting nut to a torque of 100-120 ft. lbs. (136-163 N-m).

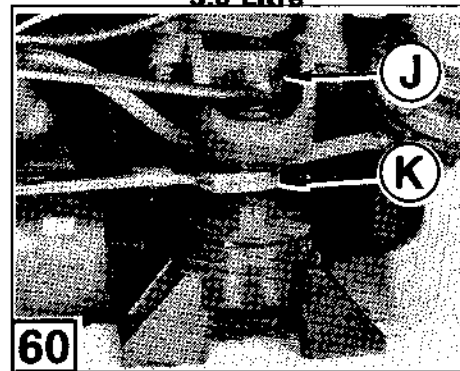


2749



3.0 Litre

2972



All Models Except 3.0 L

2953

## Exhaust Hose Attachment

**61** 2.3, 3.0 and 3.0 Litre HO Models - Slide exhaust hose (A) up onto high-rise exhaust elbow (B).

**62** V-6 and V-8 Models - Push lower hose (C) up onto adaptor (D).

**63** Position and tighten all hose clamps securely between ribs of exhaust hose(s) as shown.

**Note** DO NOT install hose clamps in expanded area (E) of hose(s). Cooling will be restricted and engine damage will occur.

## Throttle and Shift Cable Installation

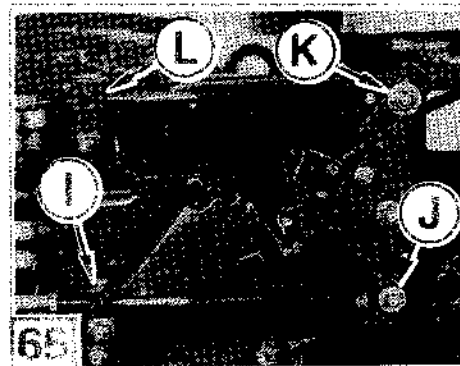
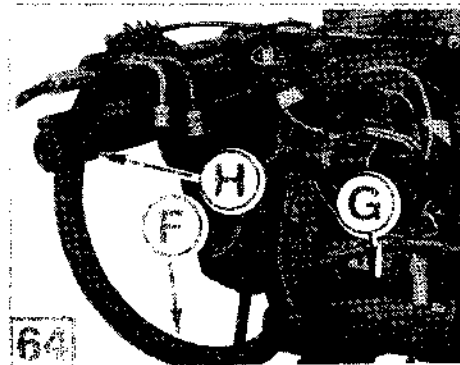
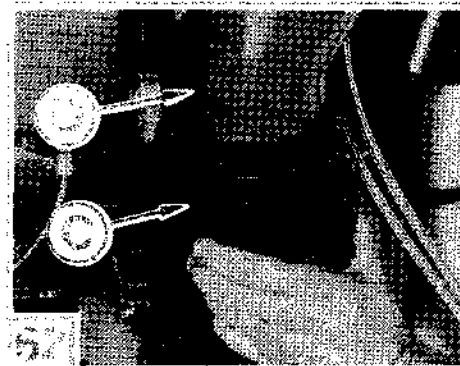
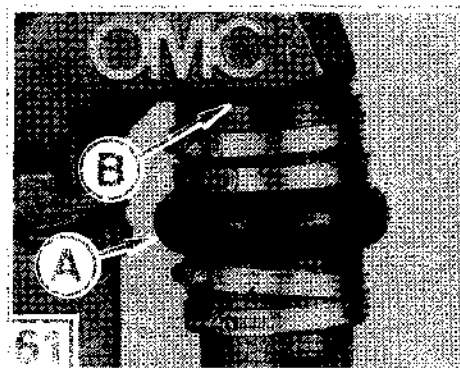
**64** 1. All Models Except 2.3 Litre - Route shift cable tube (F) between exhaust pipe and flywheel housing, below starter (G), and behind either the power or mechanical steering assembly (H). If this should result in interference, the shift cable may be routed in front of either steering assembly as long as the operation of the electronic shift assist mechanism is not adversely affected. 2.3 Litre Models - Route shift cable tube only in front of steering assembly.

**65** 2. Apply OMC Triple-Guard grease to transom bracket shift cable anchor pocket (I).

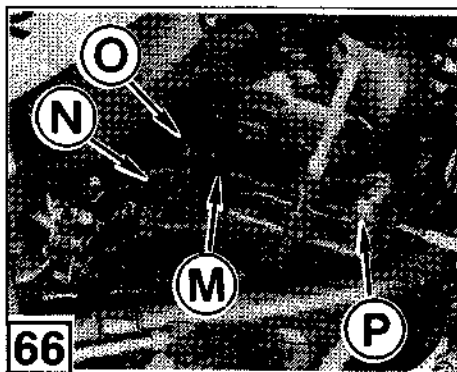
**65**  3. Attach end of transom bracket shift cable to lower pin (J) of engine shift lever. Secure with flat washer and cotter pin. Spread ends of cotter pin to prevent disengagement.

**65**  4. Remove tape preventing misadjustment of anchor. Install transom bracket shift cable anchor into anchor pocket (I) and secure with cotter pin. Spread ends of cotter pin to prevent disengagement. Make sure anchor trunnion pivots freely in pocket.

**65**  5. Attach remote control shift cable to upper shift lever pin (K). Secure with a washer and cotter pin. Spread cotter pin ends to prevent disengagement. Remove tape preventing misadjustment of trunnion and place in anchor pocket (I). Pivot retainer over trunnion and tighten locknut securely.

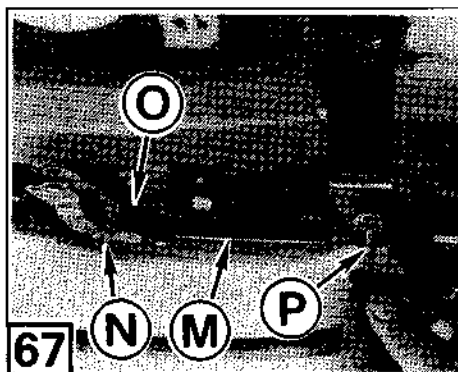


Safety Related



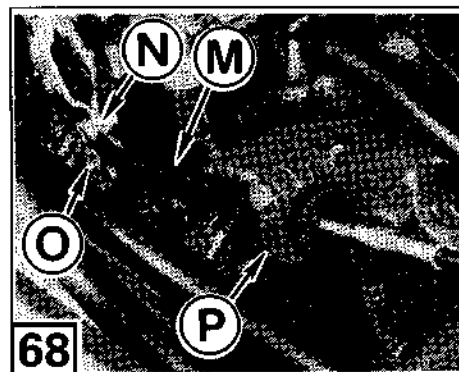
2.3 Litre

12201



3.0 Litre

22781



V-6 and V-8 Models

15383

**66 → 68** 6. Connect throttle cable (M) to carburetor arm (N). Install flat washer and cotter pin (O). **Spread cotter pin ends around carburetor arm to prevent disengagement.**

**66 → 68** 7. Place adjustable trunnion in anchor pocket (P). **Pivot retainer over trunnion and tighten locknut securely.**

**Note** For throttle and shift cable adjustment procedures, see **Section 11.**

### Water Hose Installation

**69** 1. Slide hose clamp (Q) onto water inlet hose. Lightly lubricate inside of water inlet hose and push hose onto water inlet tube (R).

**70** 2. If inlet hose is not installed properly, underside of hose may collapse. Check underside of hose for proper installation and adjust hose as required. Tighten hose clamp securely.

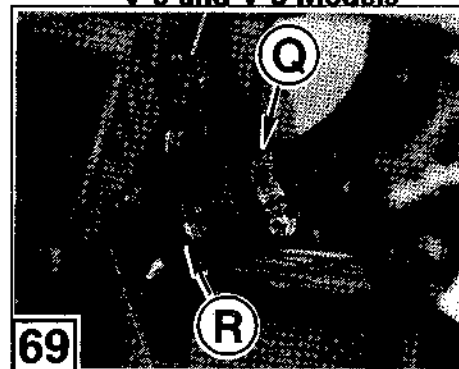
**Note** Failure to install water inlet hose correctly can result in powerhead damage from blockage of water circulation.

### Power Steering Line Installation

1. Remove tape or protective cover from large hydraulic hose fitting and large hydraulic actuator opening.

**71** 2. Install small hose fitting into hydraulic actuator and tighten securely.

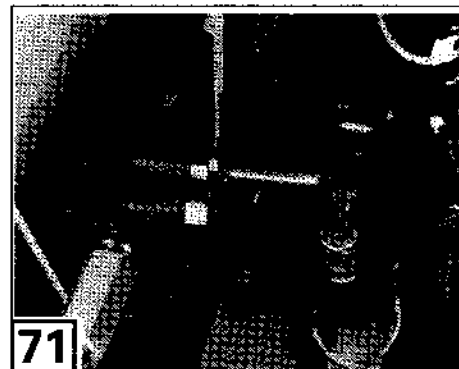
3. Remove tape or protective cover from large hydraulic hose fitting and large hydraulic actuator opening.



22698



15864



22702



- 72** 4. Install large hose fitting into hydraulic actuator and tighten securely.

#### Electrical Cable Connections

- 73** 1. Connect two-wire plug of engine harness to two-wire receptacle of trim/tilt motor. Connectors should lock together.

- 74** 2. Connect two-wire plug trim/tilt sender to two-wire receptacle of instrument harness. Connector should lock together.

3. Route the instrument cable plug to join engine cable receptacle on engine.

**!** Ensure cable is routed to prevent cutting or chafing on any sharp object which could result in an electrical short and contribute to fire and explosion in the engine compartment.

- 75** 4. Apply a light coat of *OMC Triple-Guard* grease to engine cable plug **A**. Align the OMC lettering on plug and receptacle and press together. Tighten a hose clamp **B** around plug to secure connection. Push plug assembly into wire retainer **C**.

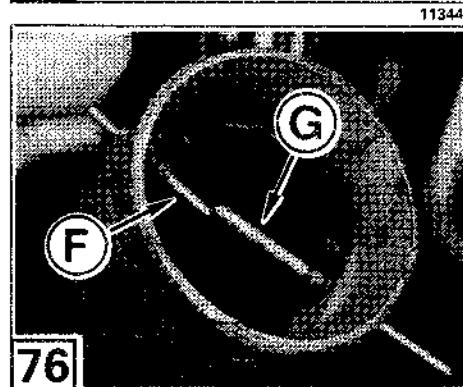
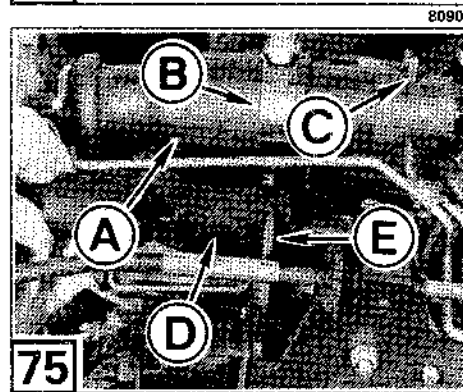
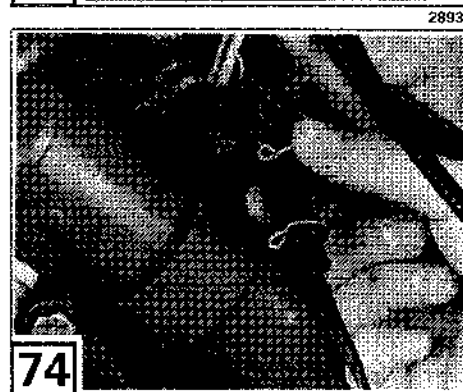
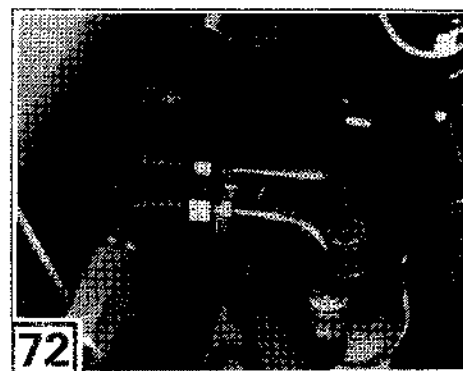
- 75** 5. Apply a light coat of *OMC Triple-Guard* grease to small trim/tilt plug **D**. Align the OMC lettering on plug and receptacle and press together. Mount small trim/tilt cable plug assembly on 50 amp fuse bracket **E**.

**!** 6. Position the red cable protector over the starter solenoid terminal.

7. Make cable connections at the battery. Be sure polarity is observed; positive (+) cable to the positive terminal, and negative (-) cable to the negative terminal.

#### Fuel Supply Connection

**!** Attach boat fuel hose to fuel filter canister. **Tighten connection securely and check for fuel leaks.**



## Exhaust Valve Replacement

### Removal

1. The exhaust valve is at the upper end of the exhaust pipe.
  - **2.3, 3.0 and 3.0 Litre HO Models** - Remove exhaust elbow and exhaust hose. See appropriate engine section for proper procedure.
  - **V-6 and V-8 Models** - Remove adaptor pipe and lower exhaust hose. See appropriate engine section for proper procedure.
- 76** 2. Using a small drift or punch (F), push the exhaust valve pin (G) out of the exhaust pipe.

- 77** **78** 3. Remove pin and valve. Push out two rubber bushings.

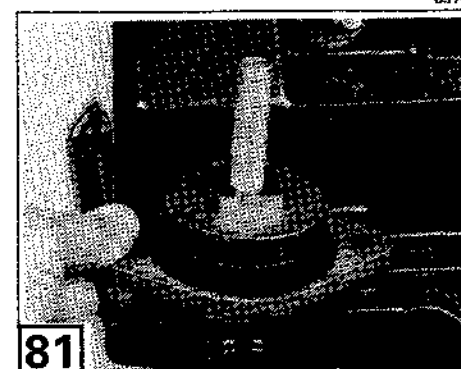
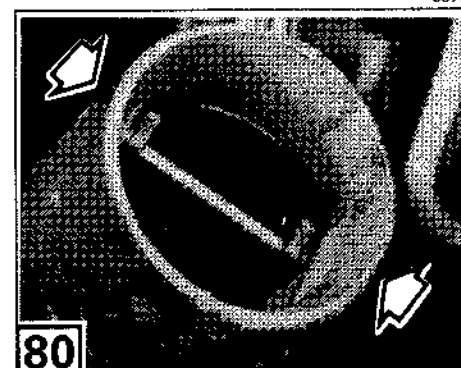
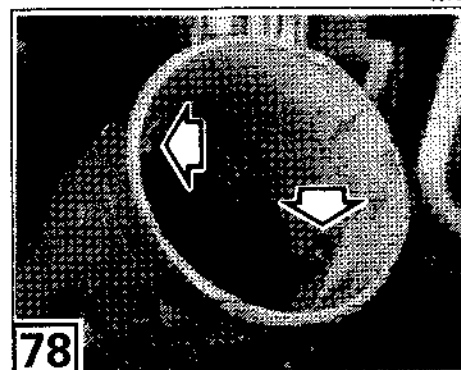
### Installation

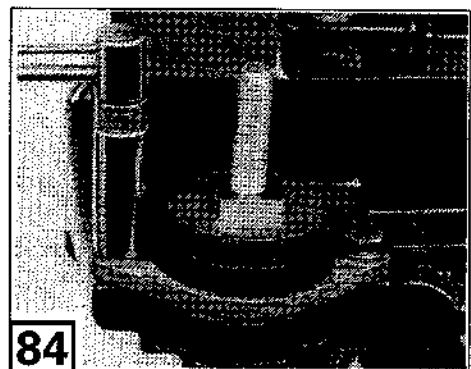
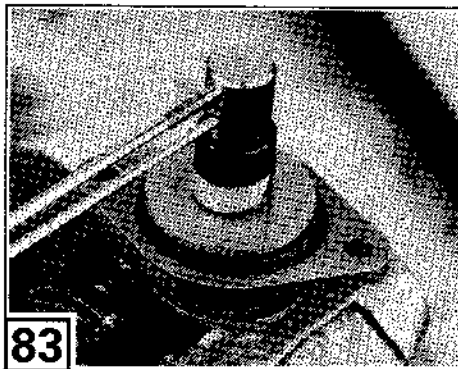
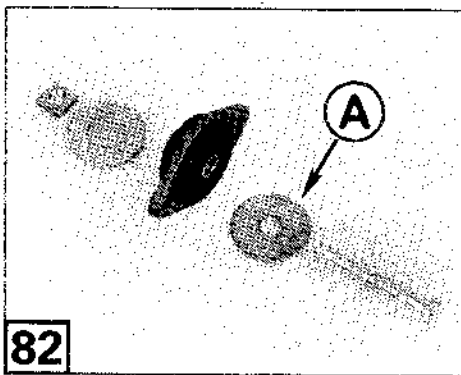
- 78** 1. Apply *OMC Scotch Grip Rubber Adhesive 1300* to two new rubber bushings and push into exhaust pipe.
- 79** **80** 2. Lightly lubricate exhaust valve pin with oil. Position valve in exhaust pipe with long side of valve down. Push pin through bushing and exhaust valve until flush with both sides of pipe.
3. Install exhaust hose, adaptor or elbow as required. See appropriate engine section for proper procedure.

## Rear Engine Mounts

### Removal

1. Remove engine as previously described in this section.
- 81** 2. Unscrew two screws and washers, then lift mount assembly off transom plate.





## Disassembly

- 82** Hold square nut and remove screw. Mount assembly will have two flat washers.

## Assembly

- 82** 1. Place thinnest washer **A** on center bolt. Insert bolt into bottom (flat) side of mount. Install remaining washer and square nut, but do not tighten nut at this time.

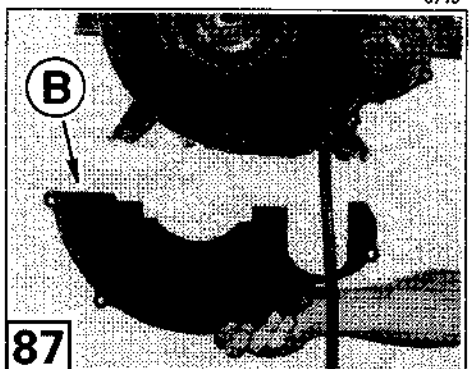
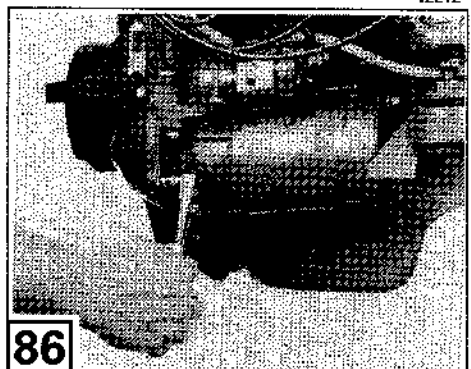
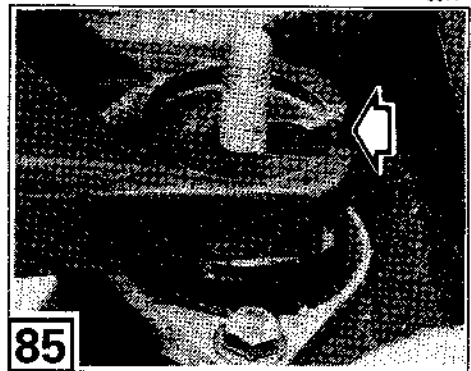
- 83** 2. Place mount assembly in vise and clamp square nut. Rotate rubber mount until mounting holes are positioned at 90° to any side of square nut. Hold mount in this position and tighten center bolt to a torque of 44-52 ft. lbs. (60-71 N·m).

**Note** If 90° relationship between nut and mounting holes is not maintained, slot of engine mount pad cannot engage rear mount during installation.

## Installation

- 84** 1. Place mount assembly on transom plate. Install two screws and washers, and tighten them to a torque of 20-25 ft. lbs. (27-34 N·m).

- 85** 2. Install engine as previously described in this section. Make sure mount pad slot engages square nut. Install flat washer and locknut, then tighten nut to a torque of 28-30 ft. lbs. (38-41 N·m).



## Engine Coupler Replacement

### Removal

1. Remove engine from boat following instructions in this section.
2. Cut tie strap holding flywheel housing drain hose to starter motor.

**86 87** 3. **3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 L** - Take out screws holding flywheel housing cover , then slide out cover.  
**2.3, 5.0, 5.0 HO and 5.8 L** - Remove starter motor.

**88** 4. Unscrew outer nut on ground stud, and take off lockwasher and electrical leads. Remove inner nut, lockwasher and washer. Remove similar ground stud and hardware on opposite side of block.

- **3.0 and 3.0 Litre HO Only** - Remove screws and washers holding ESA module/shift bracket, and move bracket aside.
- **4.3, 4.3 HO and 5.7 L Only** - Remove screws and washers mounting oil cooler (if so equipped) and move oil cooler aside. Remove ignition coil and bracket.

5. Unscrew remaining flywheel housing bolts, lockwashers and washers. Note position of clamps so they can be installed in original position.

**89** 6. Lift flywheel housing (and plate on **5.0, 5.0 HO and 5.8 L**) off engine block and set aside.

**90** 7. Unscrew six nuts and lockwashers, then pull coupler off flywheel.

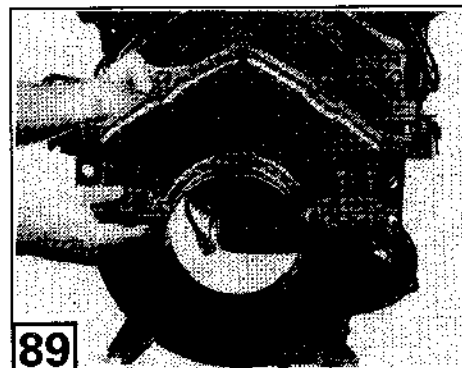
### Installation

**Note** The 2.3 Litre coupler is different than couplers on other models. Installation of the wrong coupler will adversely affect the U-joint shaft/coupler spline engagement.

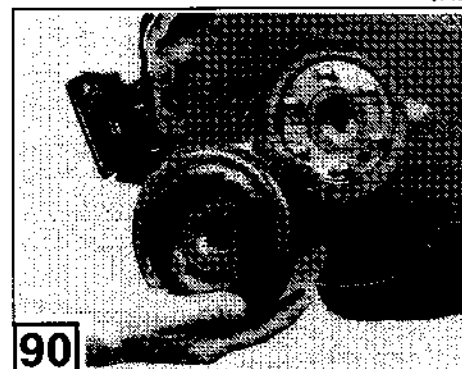
**91** 1. **All Models except 2.3 L** - Slide coupler onto crankshaft studs. Install lockwashers and nuts. Use a crowfoot wrench and tighten nuts to a torque of 40-45 ft. lbs. (54-61 N-m). **2.3 L Models Only** - Tighten coupler screws to 14-17 ft. lbs. (19-23 N-m).



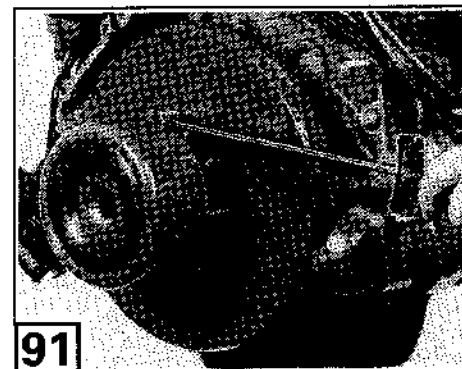
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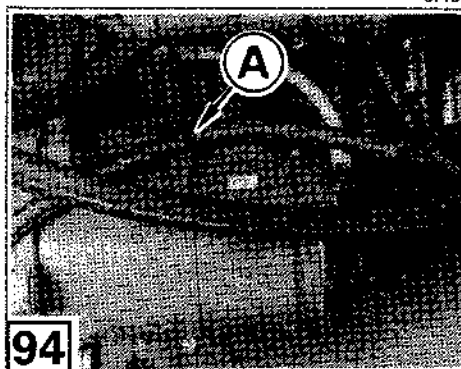
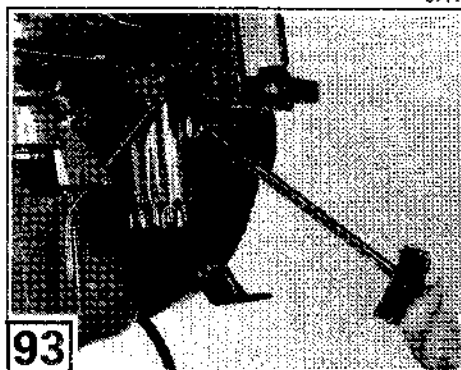
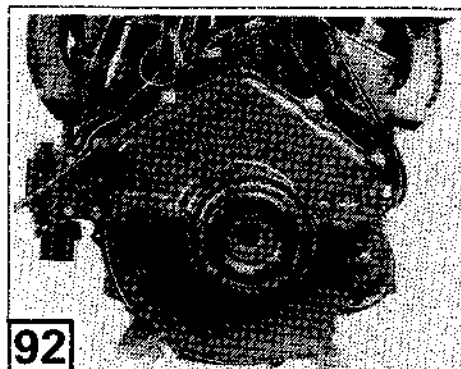
**92** 2. Install plate (5.0, 5.0 HO and 5.8 L). Install flywheel housing. Place clamps in their original positions, and attach oil cooler (if engine was so equipped), ignition coil, or shift bracket. Tighten screws to a torque of 28-36 ft. lbs. (38-49 N·m).

**!** 3. Place washer, lockwasher and nut on ground stud. Tighten inner nut to a torque of 20-25 ft. lbs. (27-34 N·m). Attach electrical leads to ground stud. **Install lockwasher and tighten outer nut securely.** Install ground stud and hardware on opposite side of block.

**93** 4. **3.0, 3.0 HO, 4.3, 4.3 HO and 5.7 L OMC Cobra Models** - Slide flywheel cover up into place. Install screws and tighten them to a torque of 5-7 ft. lbs. (7-9 N·m). **2.3, 5.0, 5.0 HO and 5.8 L OMC Cobra Models** - Install starter motor.

**94** 5. Attach flywheel housing drain hose **A** to starter motor with tie strap.

6. Install engine in boat following instructions in this section.



## NOTES

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wire harness 413-3852. Internal Engine

# NOTES

MOUSE TRAP

LEAVE BACK TRAP

