

Chapter Four

Lubrication, Maintenance and Tune-up

Almost all gasoline engines used with stern drive mechanisms are based on automotive engines. The average pleasure boat engine, however, is subjected to operating conditions which are far more severe than those encountered by the average automobile engine. This is particularly true if the engine uses raw water cooling and is used in salt or polluted water. Regular preventive maintenance and proper lubrication will pay dividends in longer engine and stern drive life, as well as safer boat operation.

This chapter provides the basis for such a program. The lubrication and maintenance intervals provided in **Table 1** are those recommended by Mercury Marine for normal operation. When the boat is used for continuous heavy duty, high speed operation or other severe operating conditions, maintenance and lubrication should be performed more frequently. If the boat is not used regularly, moisture and dust will collect in and on the engine and stern drive. This eventually leads to rust, corrosion and other damage. Active use of the boat will help to prevent such deterioration.

Tables 1-6 are at the end of the chapter.

PRE-OPERATIONAL CHECKS

Before starting the engine for the first time each day, perform the following checks.

1. Remove the engine compartment cover and check for the presence of raw gasoline fumes. If strong fumes can be smelled, determine their source and correct the problem before proceeding.

WARNING

Always have a Coast Guard-approved fire extinguisher close at hand when working around the engine.

2. Check the engine oil level with the dipstick as described in this chapter. Add oil if the level is low.
3. Check the electrolyte level in each battery cell as described in this chapter. Add distilled water, if needed.
4. Check the condition of all drive belts. If a belt is in doubtful condition, replace it. Spare belts are difficult to obtain offshore.
5. Check all water hoses for leaks, tight connections and general condition. Repair or replace as necessary.
6. Visually check the fuel filter and/or sediment bowl. Clean bowl or replace element if dirty.

7. Check oil level in the stern drive unit as described in this chapter. Add lubricant if necessary.
8. Check the fluid level in the hydraulic lift and/or trim unit reservoirs. Add fluid if necessary.
9. Check the bilge for excessive water. Drain or pump dry if present.
10. Check the propeller for nicks, dents, missing metal, etc. Repair or replace if damaged.
11. Turn on the fuel tank valve(s).
12. Connect the battery cables to the battery (if disconnected) and reinstall the engine compartment cover.

STARTING CHECK LIST

After performing the pre-operational checks, the following starting check list should be followed.

1. Operate the engine compartment blower for at least 5 minutes before starting the engine.
2. Make sure that the stern drive unit is fully down or in operating position.
3. If the engine is cold, prime it by operating the throttle one or two times. If equipped with a manual choke, set it to the closed position.
4. Make sure that the gearshift lever is in NEUTRAL.

WARNING

*Always have a fully **charged fire** extinguisher at hand before attempting to start the engine.*

5. Start the engine and let it run at idle speed for a few minutes.

CAUTION

*Prolonged operation **of** the engine with the **gearshift** lever in NEUTRAL can damage gears in the stern drive unit due to improper circulation **of** lubricant.*

6. Note the gauges and warning lights to make sure that the engine is not overheating, that proper oil pressure is present and that the battery is not discharging. If any of these conditions occur, shut the engine down at once. Determine the cause and correct the problem before proceeding.

POST-OPERATIONAL CHECKS

Perform the following maintenance after each use.

1. If the boat was used in salt or polluted water, flush the cooling system with fresh water as

described in this chapter. This will minimize corrosion and buildup of deposits in the cooling system.

2. Disconnect the battery cables from the battery. You may want to remove the battery from the boat to prevent its theft.
3. Shut off the fuel tank valve(s).
4. Top off the fuel tank(s), if possible. This will minimize the possibility of moisture condensation in the tank(s).
5. If water is present in the bilge, either drain or **pump dry**.
6. Wash the interior and exterior surfaces of the boat with fresh water.

COOLING SYSTEM FLUSHING

Flushing procedures differ depending upon the location of the water pump. Regardless of pump location, cooling water must always circulate through the stern drive whenever the engine is running to prevent damage to the pump impeller. Since V8 I-drive models are fitted with a sea water pump on the engine in addition to the sea water pump in the drive unit, *both* pumps must be supplied with cooling water.

WARNING

*When the cooling system is flushed, make sure that there is **sufficient** clear space to the side and behind the propeller and that no one is standing in the vicinity. Mercury Marine advises that you remove the propeller to prevent the possibility **of** serious personal injury.*

MerCruiser Inline Engines

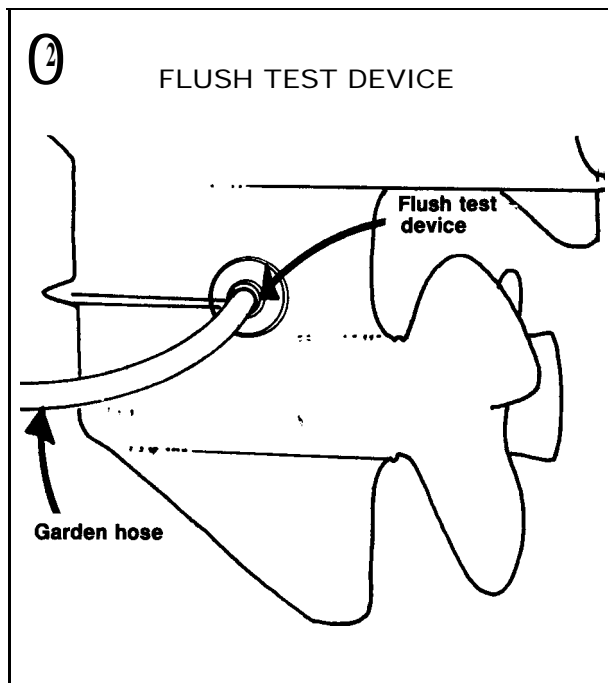
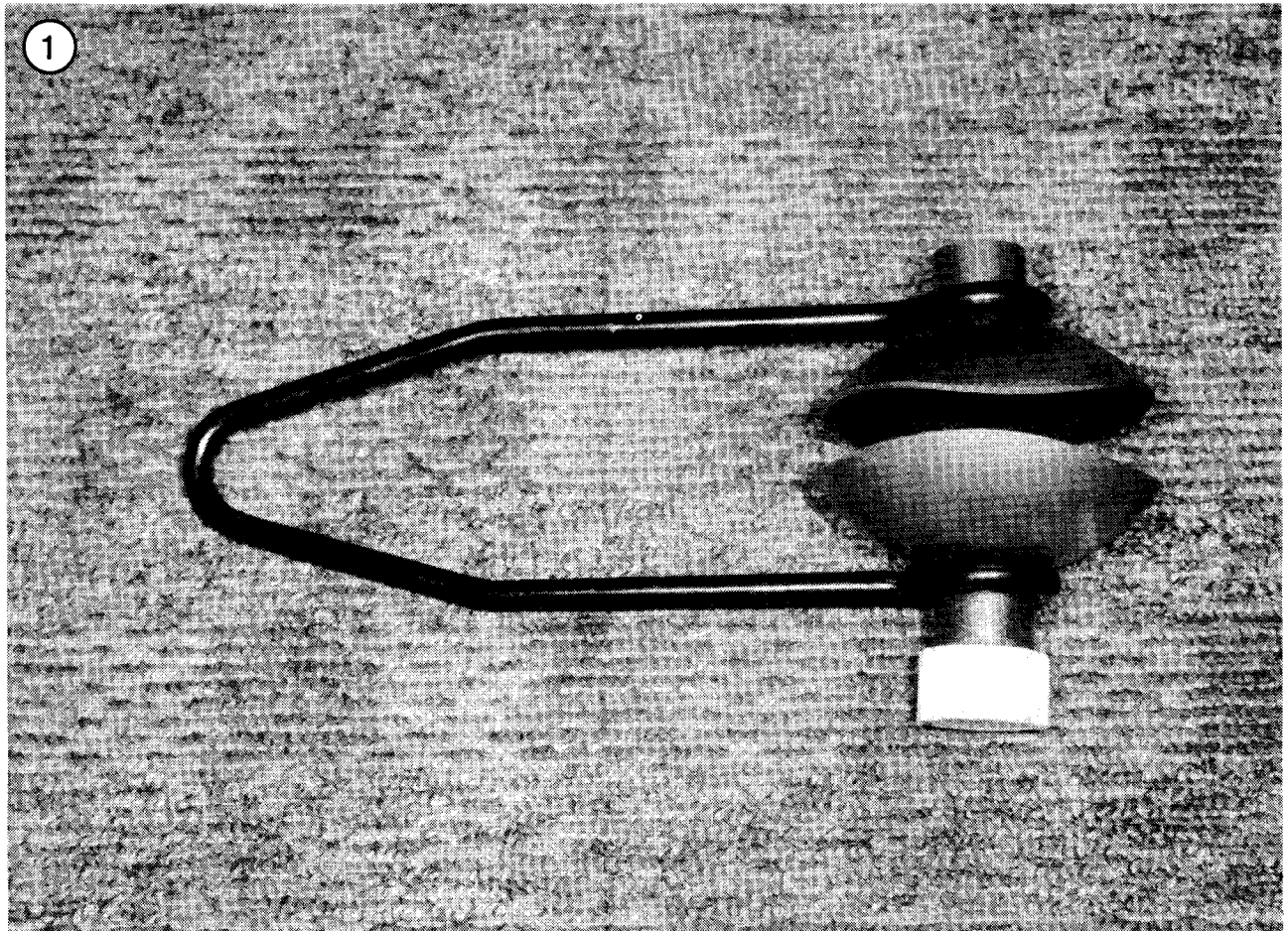
A Plush-test device (part No. C-73971A1) must be used with this procedure to provide cooling water. Suitable devices are also manufactured by several other companies. **Figure 1** shows a typical unit.

1. Attach the Plush-test device directly over the intake holes in the gear housing struts. Connect a hose between the device and the water tap. See **Figure 2**.

CAUTION

Do not use full water tap pressure in Step 2.

2. Partially open the water tap to allow a low-pressure flow of water into the device.

**CAUTION**

Do not run engine above idle speed while flushing system in Step 3.

3. Place the gearshift lever in NEUTRAL. Start engine and run at normal idle until engine reaches normal operating temperature, as shown on the temperature gauge.
4. Watch water being flushed from cooling system. When water flow is clear, shut engine off.
5. Shut the water tap off. Disconnect and remove Flush-test device from gear housing strut.

V8 I-Drive Models

If the engine is to be flushed with the boat still in the water, a sea water petcock must be installed between the water pickup and pump inlet.

1. If the boat is to remain in the water for this procedure, close the sea water petcock.

2. Loosen the water intake hose clamp and remove the hose from the water pump inlet. **Figure 3** shows a typical location.
3. Connect a length of garden hose between the water pump inlet and a water tap.

CAUTION

Do not use full water tap pressure in Step 4.

4. Partially open the water tap to allow a low-pressure flow of water into the pump inlet.

CAUTION

Make sure that water is being discharged from the exhaust outlets in Step 5. If not, shut engine off immediately and check flushing hose connections.

5. Place remote control handle in NEUTRAL. Start the engine and run at normal idle until engine reaches normal operating temperature, as shown by the temperature gauge.
6. Watch water being flushed from cooling system. When water flow is clear, shut engine off.
7. Shut the water tap off and remove the garden hose from the water pump inlet and water tap. Reconnect water intake hose to pump inlet and tighten clamp securely.
8. Open sea water petcock.

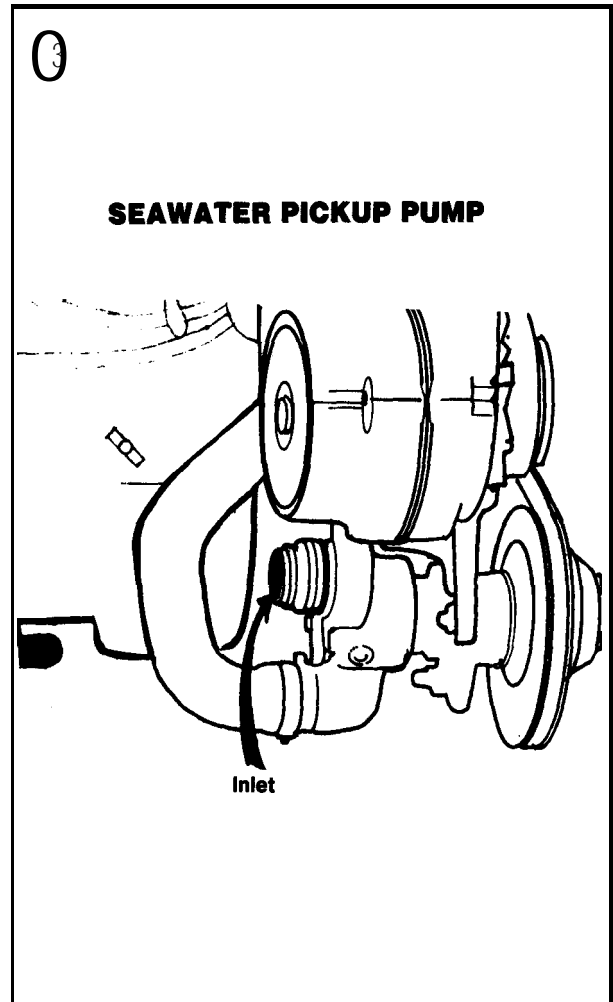
ENGINE MAINTENANCE AND LUBRICATION

The maintenance tasks discussed in this section should be performed at the intervals indicated in **Table 1**. These intervals are only guidelines, however. Consider the frequency and extent of boat use when setting actual intervals and perform the tasks more frequently if the boat is used under severe service conditions.

Engine Oil Level Check

All engines will consume a certain amount of oil as a lubricating and cooling agent. The rate of consumption is highest during a new engine's break-in period, but should stabilize after approximately 100 hours of operation. It is not unusual for a 4-cylinder engine to consume up to a quart of oil in 5-10 hours of wide-open throttle operation.

For this reason, you should check the oil level at least every 15 days. If the boat is used more



frequently, check the level each time the engine is shut down, allowing approximately 5 minutes for the oil in the upper end to drain back into the crankcase oil pan.

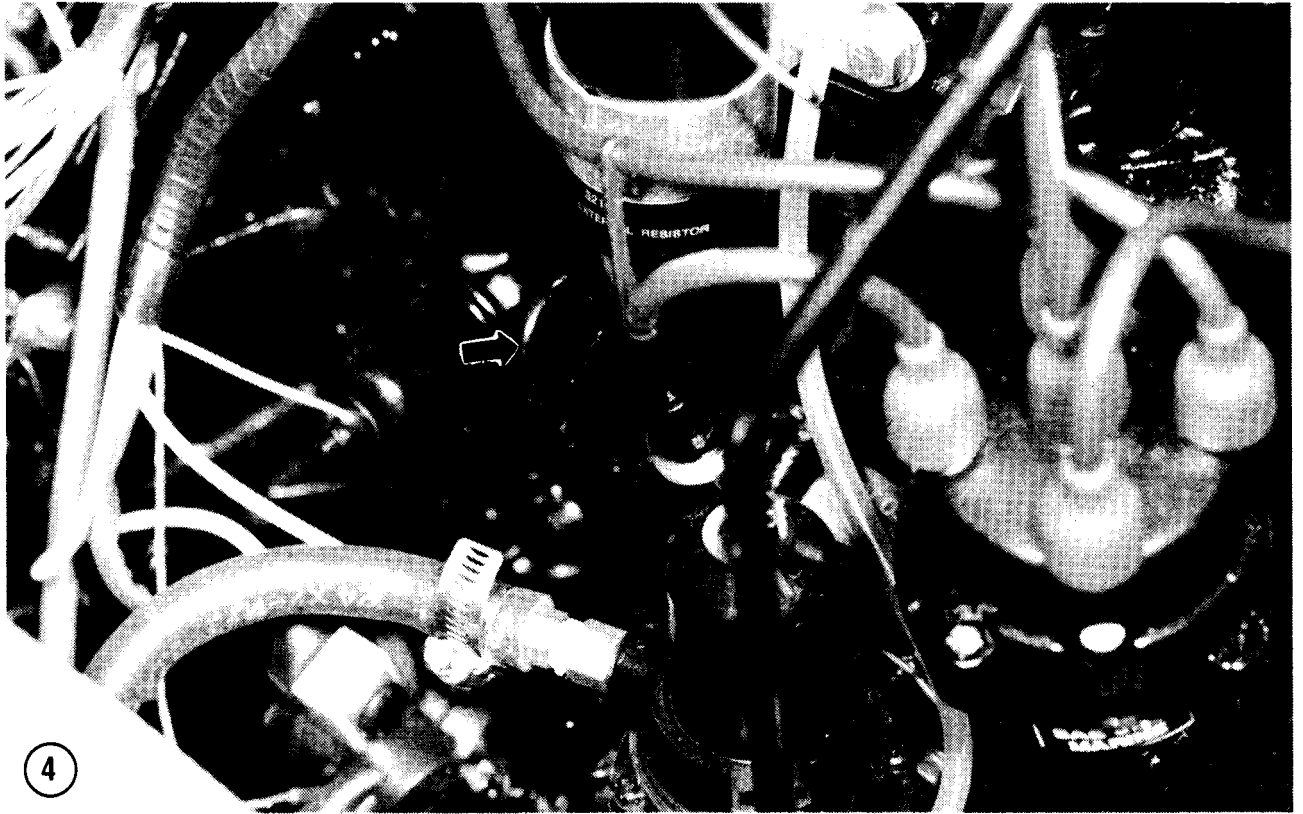
1. With the boat at rest in the water and the engine off, pull out the dipstick. See **Figure 4** (inline) or **Figure 5** (V6 and V8) for typical locations. Wipe it with a clean rag or paper towel, reinsert it and pull it out again. Note the oil level on the dipstick.

NOTE

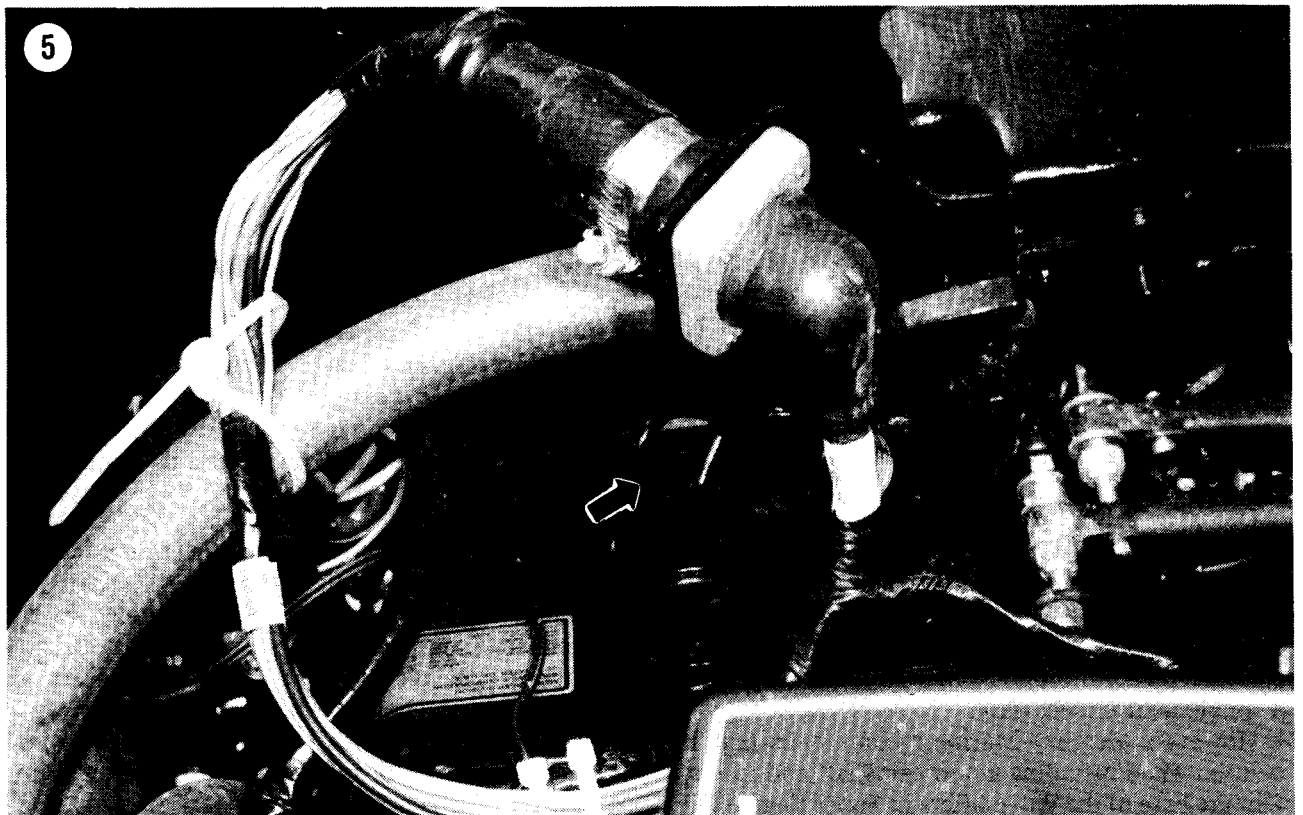
Some dipsticks have ADD and FULL lines. Others read ADD 1 QT. and OPERATING RANGE. In either case, keep the oil level above the ADD line.

2. Top up to the FULL or OPERATING RANGE mark on the dipstick if necessary, using only an SE or SF grade oil. See **Table 2** for the proper oil viscosity. Remove the oil filler cap and add oil

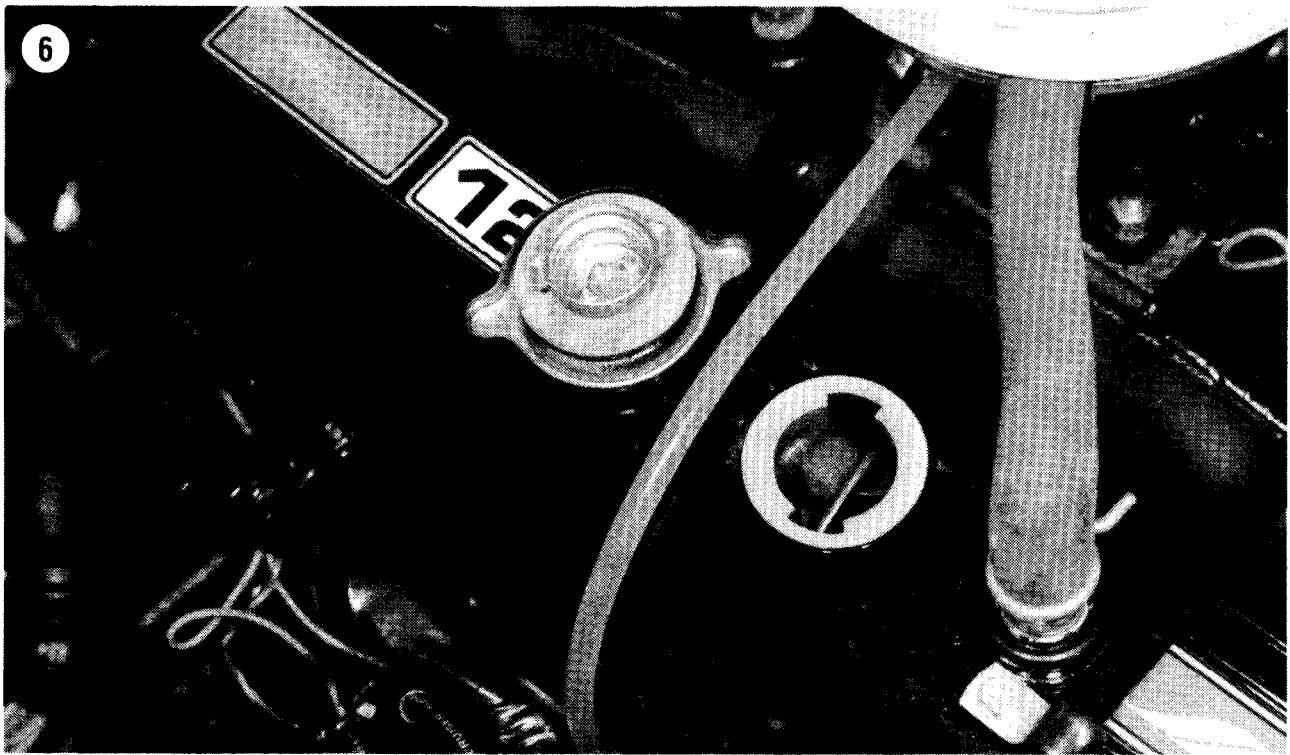
4



4



5



through the hole in the rocker arm cover. See Figure 6 (inline) or Figure 7 (V6 and V8), typical.

Supplement and pour the remaining contents of the container over the camshaft lobes through the lifter ports in the cylinder block.

Engine Oil and Filter Change

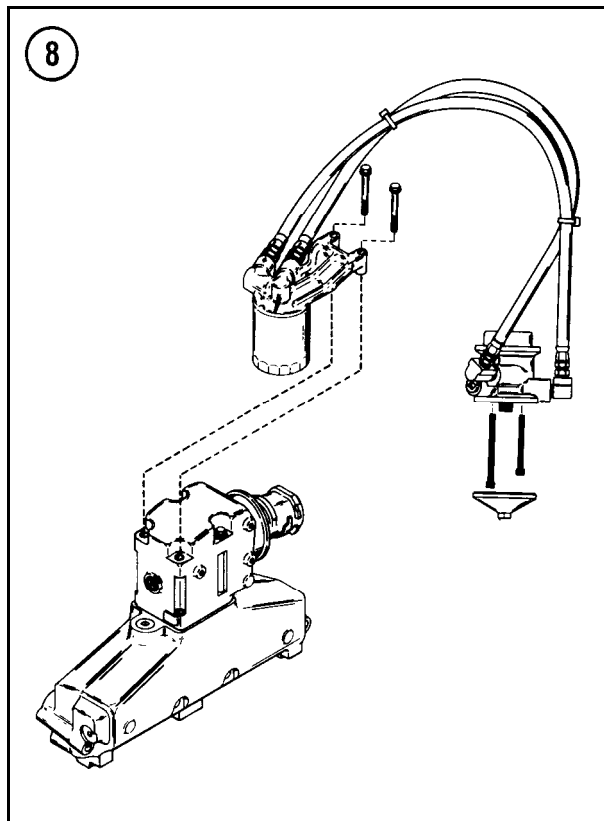
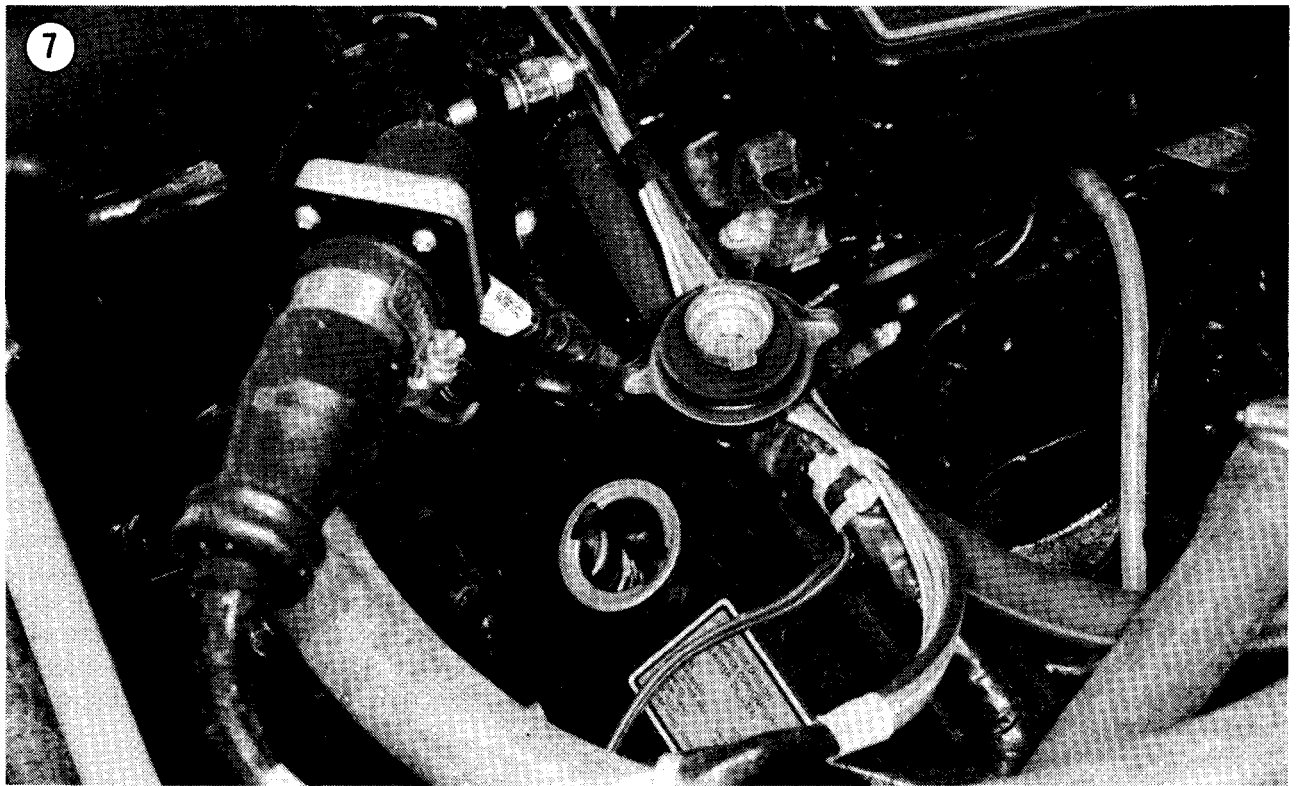
The engine oil and filter should be changed after every 100 hours of operating time or 60 days, whichever occurs first. At a minimum, the oil and filter should be changed at least once per season. Mercury Marine recommends the use of its Quicksilver 4-cycle Marine Engine Oil. If this is not available, any good grade of automotive engine oil may be used as long as it carries an API classification of SE or SF.

Quicksilver Super Engine Oil Supplement (part No. 92-78372-12) is no longer recommended for use at each oil change. Quality engine oils such as Quicksilver 25W40 4-cycle marine engine oil now contain a sufficient quantity of calcium sulfonate and zinc dialkydithiophosphate to make the use of a supplement unnecessary.

However, Mercury Marine recommends that it be used when installing a new camshaft and lifters. Dip the base of the valve lifters in Super Engine Oil

Most installations do not leave enough space to permit the use of the drain plug in the crankcase oil pan. For this reason, an oil drain pump (part No. C-91-34429 or equivalent) is the most common device used to drain the oil from the crankcase. The pump has a long flexible hose which is inserted into the oil dipstick tube and fed into the crankcase. Several makes of pumps are available from marine supply dealers. Some are hand-operated, some are motorized and others are designed to be operated by electric drill motors.

The used oil should be discharged into a sealable container and properly disposed of. There are several ways to discard the old oil safely. Plastic bleach and milk containers are excellent for this purpose. The oil can then be taken to a service station for recycling or, where permitted, thrown in your household trash. Check local regulations before disposing of oil in the trash. Never dump used oil overboard.



Oil filters are usually the disposable spin-on type. See Figure 8.

CAUTION

Mercury Marine specifically states that automotive oil filters containing a filter within a filter and offering "double filtration" should not be used on any MerCruiser installation.

Disposable spin-on type oil filters are used. Oil filters are generally located on the lower front starboard side of the engine block. However, some 1987 models are equipped with a remote oil filter assembly mounted at the top rear of the upper drive (Figure 8). A remote oil filter kit is available as an accessory for some models. The adaptor check valve on models not factory installed should be positioned with the spring pointing upward (toward the engine).

An inexpensive oil filter wrench can be obtained from any auto parts or marine supply store. This wrench is handy in removing oil filters, but should not be used to install the new filter. A firm fit is all that is required; overtightening the filter can damage it or cause an oil leak.

The installed angle of the engine affects oil level in the crankcase. To assure that the oil is drained and replaced properly, perform the following procedure with the boat at rest in the water.

1. Start the engine and warm to normal operating temperature, then shut it off.
2. Remove the dipstick, wipe it clean and place it to one side out of the way. See **Figure 4 (inline)** or **Figure 5 (V6 and V8)**, typical.
3. Insert the oil drain pump hose into the dipstick tube as far as it will go.
4. Insert the other pump hose into a sealable container large enough to hold the oil in the crankcase. Most engine crankcases hold 4-7 quarts of oil. Refer to **Table 3** to determine the capacity of your engine crankcase.
5. Operate the pump until it has removed all of the oil possible from the crankcase. Remove pump hose from dipstick tube.
6. Place a drain pan or other suitable container under the filter to catch any oil spillage when the filter is removed. See **Figure 8**, typical.
7. Unscrew the filter counterclockwise. Use the filter wrench if the filter is too tight or too hot to remove by hand.
8. Wipe the gasket surface on the engine block clean with a paper towel.
9. Coat the neoprene gasket on the new filter with a thin coat of clean engine oil.
10. Screw the new filter onto the engine *by hand* until the gasket just touches the engine block. At this point, there will be a very slight resistance when turning the filter.
11. Tighten the filter another 1/2-3/4 turn *by hand*. If the filter wrench is used, the filter will probably be overtightened. This can damage the filter or cause an oil leak.
12. Remove the oil filler cap from the rocker arm cover. See **Figure 6 (inline)** or **Figure 7 (V6 and V8)**, typical.
13. Reinstall the dipstick in the dipstick tube.
14. Refer to **Table 3** to determine the crankcase capacity of your engine. Pour the specified amount of oil into the rocker arm cover opening and install the oil filler cap. Wipe up any spills on the rocker arm cover with a clean cloth.

NOTE

Check the area under and around the oil filter for leaks while the engine is running in Step 15.

15. Start the engine and let it idle for 5 minutes, then shut the engine off.

16. Wait approximately 5 minutes, then remove the dipstick. Wipe the dipstick clean with a paper towel and reinsert it in the dipstick tube. Remove the dipstick a second time and check the oil level. Add oil, if necessary, to bring the level up to the PULL or OPERATING RANGE mark, but *do not overfill*.

Fuel System Service

This service is particularly important, especially if the boat is equipped with fiberglass fuel tanks. Some types of fiberglass tanks contain a residue of particles which will clog the filter prematurely. Others contain a wax used in their manufacture which dissolves in gasoline. This wax is trapped by the filter but, since it cannot be seen, the filter appears to be clean. The resulting lean-out condition can only be cured by installing a new filter.

NOTE

Mercury Marine does not recommend the use of special or "built-in" fuel tanks, as their fuel pickup is often unsuitable for the engine's fuel requirements.

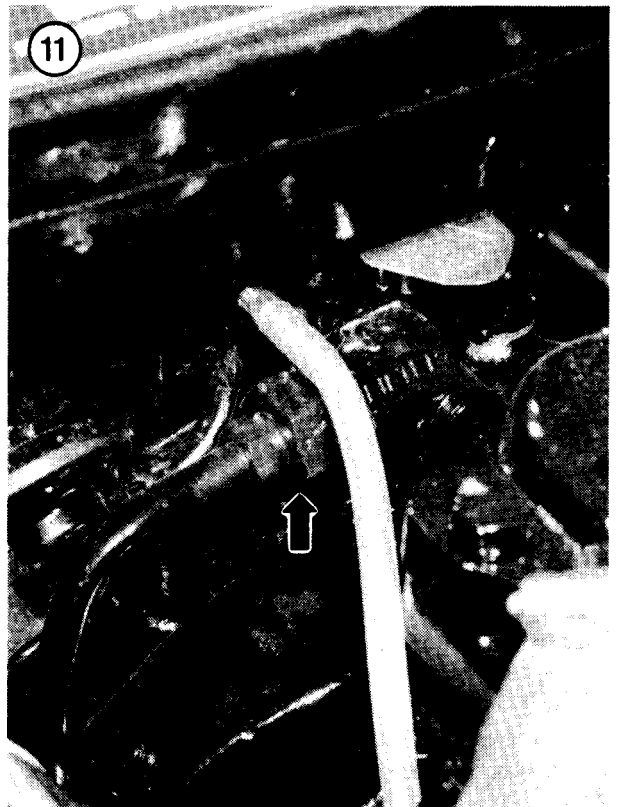
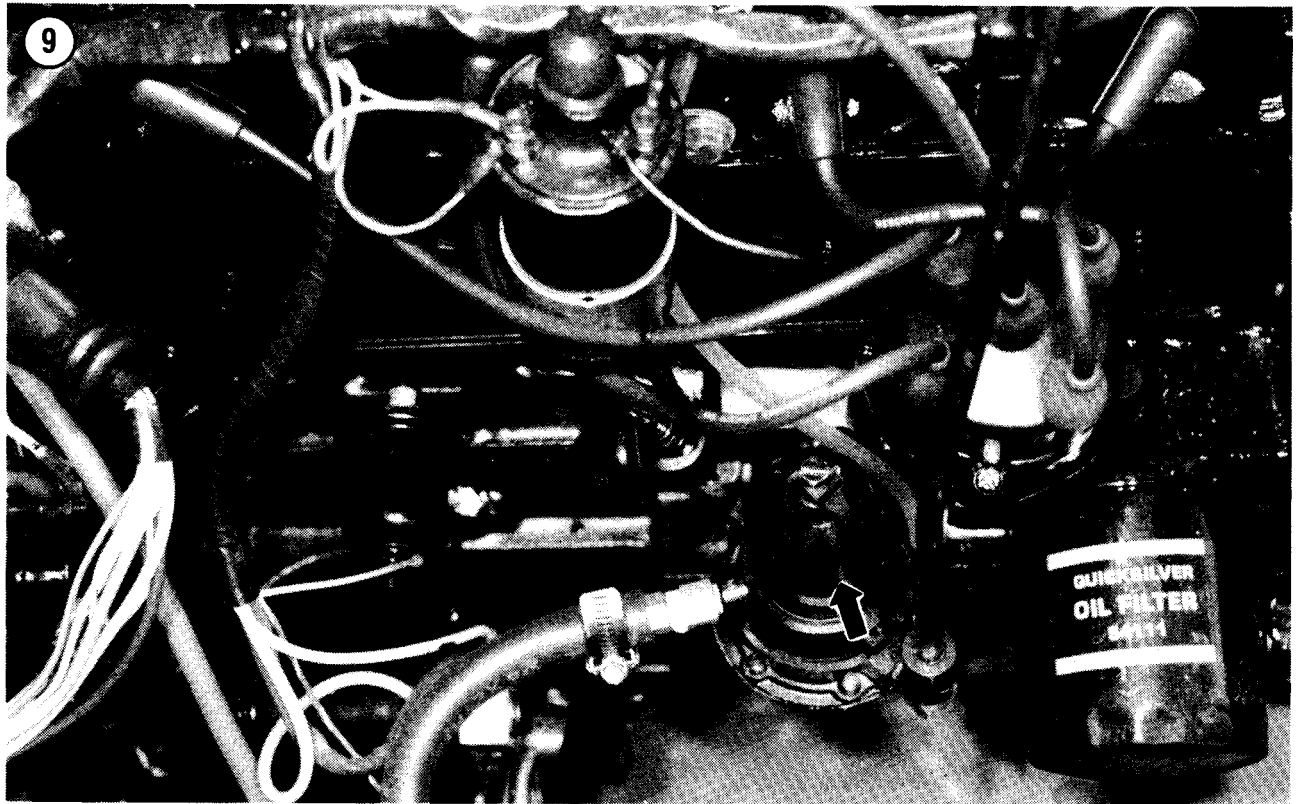
All fuel lines should be checked for deterioration or loose connections at the intervals specified in **Table 1** and replaced or tightened as required.

Remove and clean the fuel filter sediment bowl (if used) whenever moisture or contaminant can be seen. The sediment bowl is located on the fuel pump (**Figure 9**).

Replace canister-type filters (**Figure 10**) and carburetor fuel inlet filters (**Figure 11**) at least once a year, more often if operating conditions are severe.

NOTE

In areas where only poor quality fuel is available or where moisture tends to condense in fuel tanks, it is advisable to install inline fuel filters to remove moisture and other contaminants. These are sold as accessory items by marine supply dealers.





Canister-type Fuel Filter Replacement

This type of fuel filter looks like an oil filter (Figure 10) and is replaced using a procedure similar to that for oil filter replacement. Unscrew the filter canister from the filter adapter (using a filter wrench, if necessary). Wipe the neoprene gasket on the new filter with a thin film of clean engine oil and screw the filter onto the adapter until it is snug-do not overtighten. Start the engine and check for leaks.

Carburetor Fuel Inlet Filter Replacement

Refer to Figure 11 for this procedure.

1. Remove the flame arrestor or cover (Figure 12) if necessary to provide adequate working clearance.
2. Place one wrench on the carburetor inlet nut. Place a second wrench on the fuel line connector nut. Hold the fuel inlet nut from moving and loosen the connector nut.
3. Disconnect the fuel line from the inlet nut fitting.
4. Remove the filter element and spring from the carburetor fuel inlet.
5. Remove and discard the inlet nut gasket.

NOTE

The fuel inlet gasket is not included with a replacement filter. The gasket (part No. 1397-8327) must be ordered separately.

6. Installation is the reverse of removal. Make sure the end of the filter with a hole faces the inlet nut. Use a new gasket. Tighten inlet nut and connector nut snugly.
7. Install the flame arrestor or cover, if removed. Start the engine and check for leaks.

Fuel Quality

Some gasolines sold for marine use may contain alcohol, although this fact may not be advertised. Using such fuels is not recommended unless you can determine the nature of the blend. A mixture of 10 percent ethyl alcohol and 90 percent unleaded gasoline is called gasohol. While it will provide satisfactory service in engines built after 1974, Mercury Marine does not recommend its use.

Fuels with an alcohol content tend to slowly absorb moisture from the air. When the moisture

content of the fuel reaches approximately one percent, it combines with the alcohol and separates from the fuel. This separation does not normally occur when gasohol is used in an automobile, as the tank is generally emptied within a few days after filling it.

The problem does occur in marine use, however, because boats often remain idle for days or even weeks between start-ups. This length of time permits separation to take place. The water/alcohol mixture settles at the bottom of the tank where the fuel pickup carries it into the fuel line. Since an engine will not run on this mixture, it is necessary to drain the fuel tank, flush out the fuel system with clean gasoline and then remove and clean the spark plugs before the engine can be started. If it is necessary to operate an engine on gasohol, do not store such fuel in the tank(s) for more than a few days, especially in climates with high humidity.

Testing Gasoline for Alcohol Content

The problem of unlabeled gasohol has become so prevalent around the United States that Miller Tools (32615 Park Lane, Garden City, MI 48135) now offers an Alcohol Detection Kit (part No, C-4846) so that owners and mechanics can determine the quality of fuel being used. To determine the alcohol content (if any) of fuel using the kit, proceed as follows:

1. Pour a sample of the suspect fuel into the beaker.
2. Fill the graduated cylinder to the 10 ml mark with fuel from the beaker.

NOTE

The eye dropper must be calibrated in advance to determine exactly how many drops there are in 20 ml of water.

3. Add 2.0 ml water to the graduated cylinder with the eye dropper. Any alcohol in the fuel will dissolve in the water and drop to the bottom of the cylinder.

NOTE

If necessary, occasionally relieve pressure in the cylinder during Step 4 by removing the stopper. Extend the time period accordingly.

4. Fit the stopper in the graduated cylinder. Shake cylinder vigorously for one minute.
5. Let the cylinder stand for one minute on a level surface.
6. Read the boundary of the 2 liquids near the bottom of the graduated cylinder.

7. Subtract 2 from the reading and multiply the remainder by 10 to determine the **percentage** of alcohol in the fuel sample.

As an example of the calculation required in Step 7, suppose the reading in Step 6 is 3.3 ml. Subtracting 2.0 from 3.3 leaves a remainder of 1.3 X 10 or 13 percent.

The procedure above cannot differentiate between types of alcohol (ethanol, methanol, etc.) nor is it considered to be accurate enough to determine whether or not there is sufficient alcohol in the fuel to cause the user to take precautions.

Gasoline Recommendations

Due to the increasing problem of alcohol-blended gasolines and the Environmental Protection Agency (EPA) decision to eliminate lead as an anti-knock compound in gasoline, Mercury Marine has revised its fuel recommendations for MerCruiser engines as follows:

The use of any good grade regular leaded premium, low-lead or lead-free automotive gasolines with a minimum posted octane rating of 86 (Research octane number 90) are satisfactory for use in standard MerCruiser marine engines.

For high-performance models, a minimum posted octane rating of 88 (Research octane number 93) is recommended. If 88 octane is not available, a gasoline with an octane rating as low as 86 (Research octane number 90) may be used, but ignition timing should be retarded 4° to prevent harmful detonation.

With the virtual elimination of lead from gasoline on January 1, 1986, MerCruiser states that engines manufactured since 1975 should suffer little adverse effect from the use of unleaded gasoline. Such engines have hardened valves and valve seats similar to those used in automobiles. For engines manufactured prior to 1975, MerCruiser recommends the following guidelines to prevent valve seat depression in the cylinder head resulting from the use of unleaded gasoline:

1. Use a propeller that will allow the engine to reach peak rpm at wide-open throttle.
2. Do not run at wide-open throttle for extended periods of time. Engine speeds 20-25 percent below full throttle will help prevent valve and seat damage.

Gasoline known to contain methanol or ethanol should not be used except in emergencies. Such blended gasolines will not only reduce performance

and cause eventual damage to the fuel system and components, they increase the risk of fire and explosion from fuel system leaks.

Flame Arrestor

The flame arrestor (**Figure 13**, typical) serves as both an air filter and as a safety measure against backfiring. A cover is fitted over the flame arrestor on some models. See **Figure 12**.

Remove the flame arrestor every 100 hours or once per season. Wash in solvent, then dry thoroughly and reinstall.

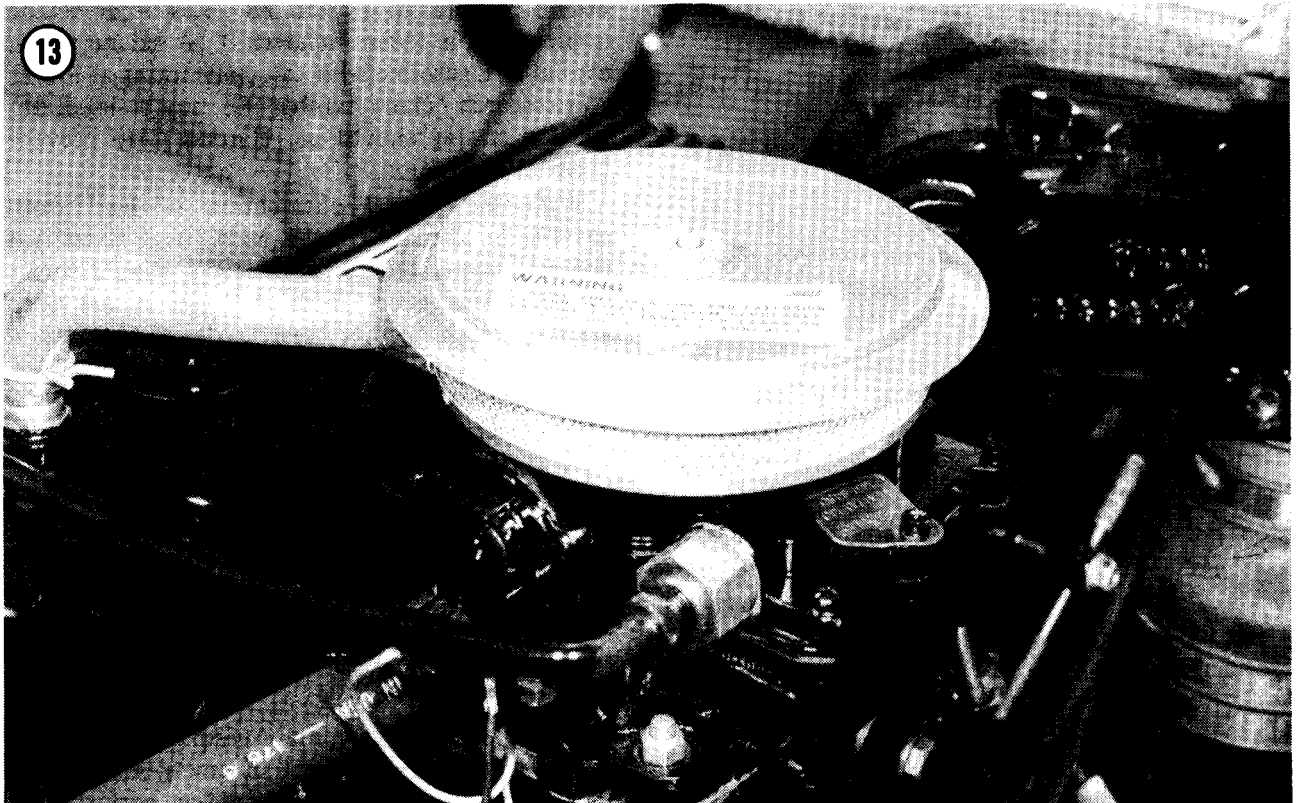
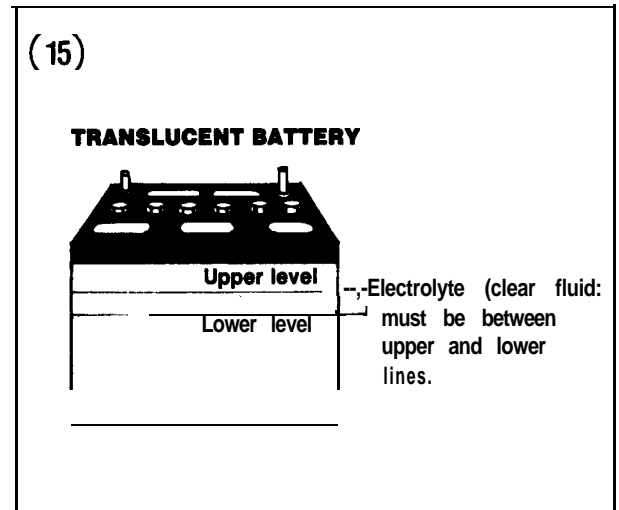
Battery

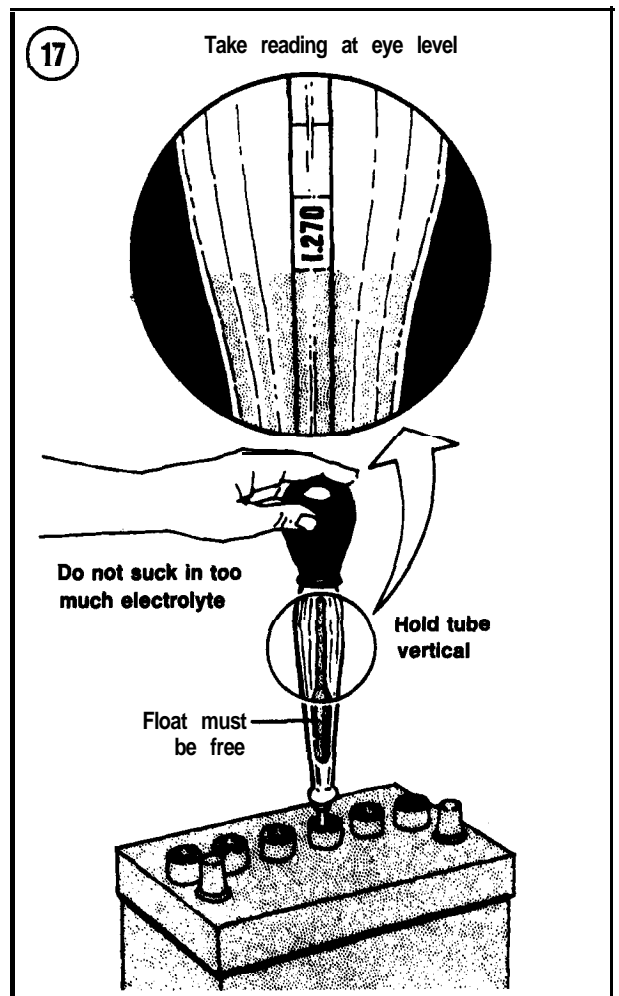
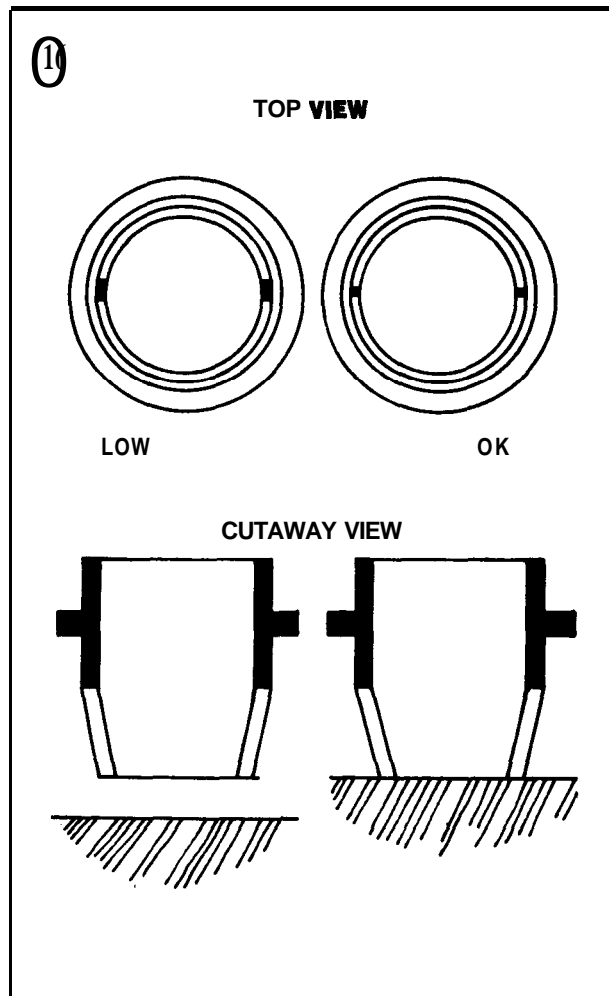
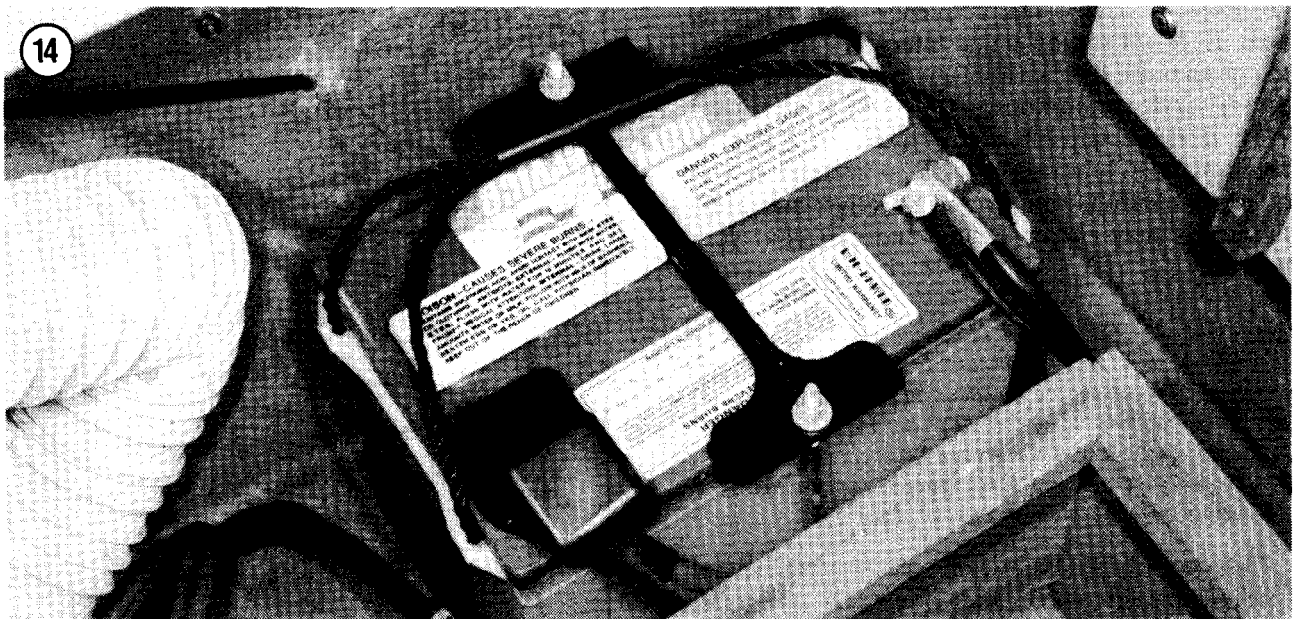
Remove the battery vent caps (**Figure 14**, typical) and check battery electrolyte level. On translucent batteries, it should be between the marks on the battery case (**Figure 15**). On 'black batteries, it should be about 3/16 in. above the plates or even with the bottom of the filler wells.

See **Figure 16**. Test battery with a hydrometer (**Figure 17**). See Chapter Thirteen.

STERN DRIVE LUBRICATION

The lubrication tasks discussed in this section should be performed at the intervals indicated in **Table 1**. These intervals are only guidelines,





however. Consider the frequency and extent of boat use when setting actual intervals and perform the tasks more frequently if the boat is used under severe service conditions.

Stem drive capacities are listed in **Table 4**; recommended lubricants are given in **Table 5**. Use of regular automotive grease or other substitute lubricants may cause damage and can void your warranty.

CAUTION

Check stern drive lubricant level when unit is cool. If more than a teaspoonful of water drains from filler hole or if the lubricant has a milky-brown color, have stern drive checked by a dealer to determine and correct the problem before running the unit again.

Dispose of old lubricant properly. Disposal methods are discussed under *Engine Oil and Filter Change* in this chapter.

MODEL 0 (60, 80 AND 90) LUBRICATION

Lubricant Level Check

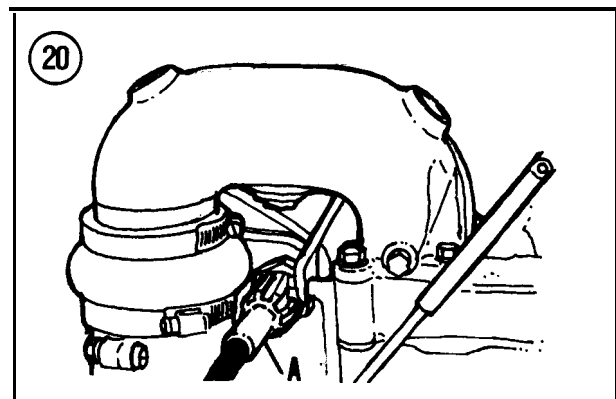
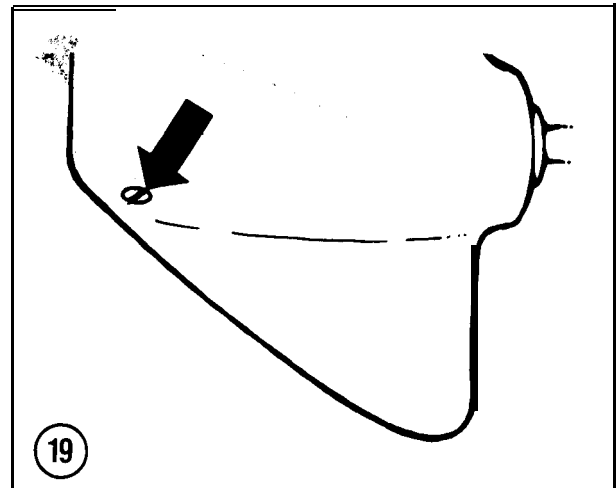
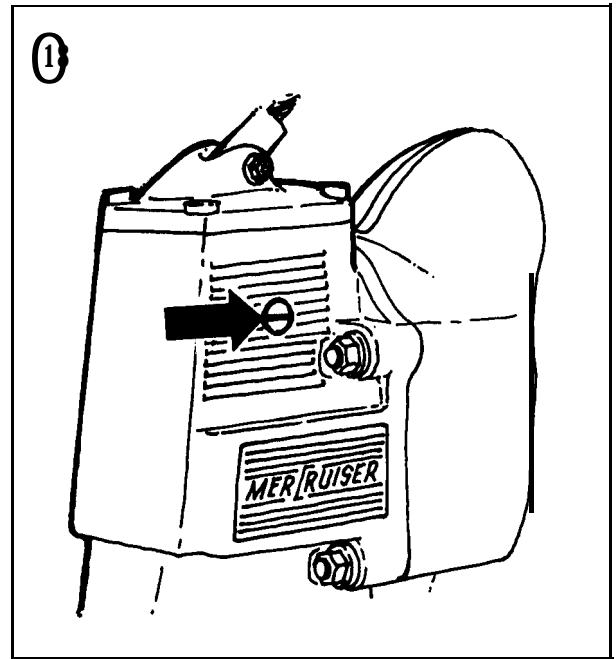
1. Remove oil vent plug and gasket located on side of drive shaft housing (**Figure 18**). Oil must be even with bottom of vent plug hole when unit is level.
2. If level is low, remove the oil filler plug on the opposite side of the drive shaft housing and add lubricant until it appears at the vent hole.
3. Reinstall oil vent and filler plugs with new gaskets.

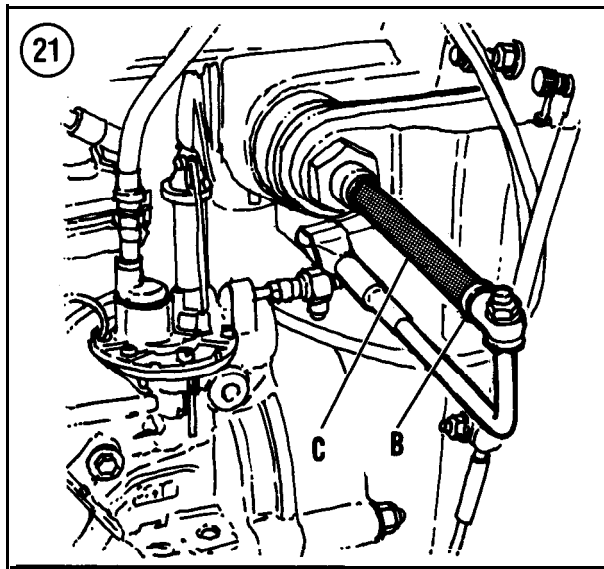
Lubricant Change

1. Remove the oil vent plug on side of drive shaft housing (**Figure 18**) and the drain plug from lower end of gear housing on left side (**Figure 19**). Tilt unit slightly to aid drainage. Allow all old lubricant to drain out.
2. Insert lubricant tube into lower drain plug hole and fill until oil runs from upper oil vent plug hole.
3. Install oil vent plug first, then quickly remove lubricant tube and install drain plug. Make certain that a new gasket is used under each plug to prevent water from leaking into the gear housing.

General Lubrication Points

Inside boat: 'apply lubricant to Ride-Guide steering cable end next to hand nut (A, **Figure 20**),





pivot socket of steering arm and exposed cable traversing through guide tube (B and C, Figure 21).

Outside boat: apply lubricant to all grease fittings and pivot points. See Figure 22, typical.

EARLY MODEL I, IA, IB AND IC LUBRICATION (INCLUDES E-Z SHIFT MODELS)

Lubricant Level Check

The upper drive shaft housing and lower unit gear chambers are separate and must be checked individually.

Upper gear chamber

1. Remove oil vent plug and gasket located on side of drive shaft housing (Figure 18). Oil must be even with bottom of vent plug hole when unit is level.
2. If level is low, remove the oil filler plug on the opposite side of the drive shaft housing and add lubricant until it appears at the vent hole.
3. Reinstall oil vent and filler plugs with new gaskets.

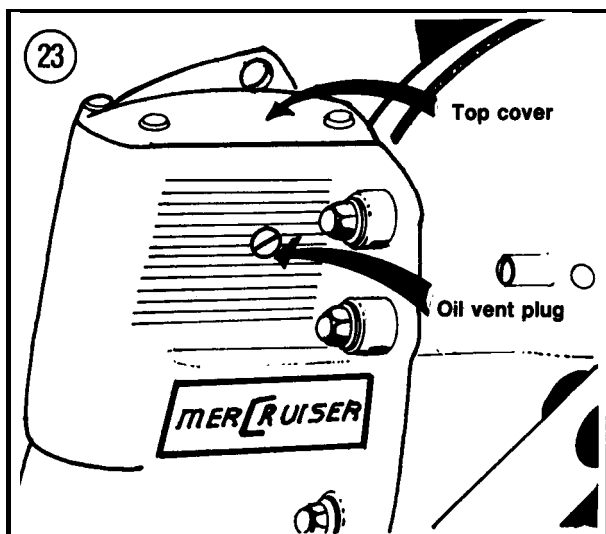
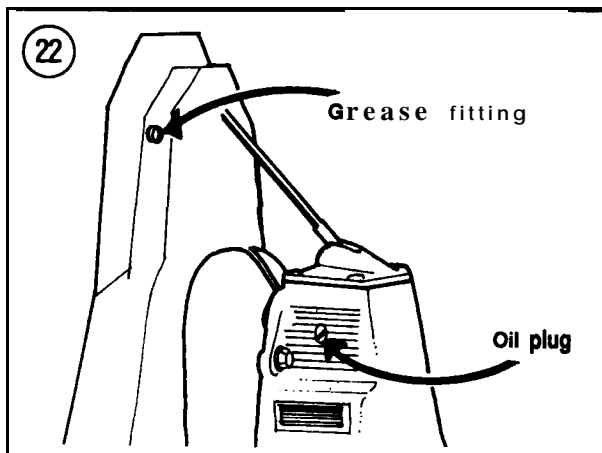
Lower gear chamber

1. Remove oil vent plug and gasket on side of gear housing just above the cavitation plate. Oil must be even with bottom of oil vent plug hole when drive unit is level in the down position.
2. If level is low, remove the oil filler plug on the opposite side of the gearhousing and add lubricant until it appears at the vent hole.
3. Reinstall oil vent and filler plugs with new gaskets.

Lubricant Change

Upper gear chamber

1. Remove top cover (Figure 23). Remove old lubricant with a pump.
2. Reinstall top cover and O-ring. Tighten screws to 20 ft.-lb.
3. Remove oil filler and vent plugs and gaskets (located on right and left side of drive shaft housing).
4. Insert lubricant tube **into** filler hole and fill until oil runs from oil vent plug hole.
5. Reinstall oil filler and vent plugs with new gaskets.



Lower gear chamber

1. Remove oil filler plug (**Figure 24**) from lower end of gear housing on left side and oil vent plug located just above the cavitation plate. Drain the unit.
2. Insert lubricant tube into filler hole and fill until oil runs from oil vent plug hole.
3. Install oil vent plug first, then quickly remove lubricant tube and install filler plug. Make certain that a new gasket is used under each plug to prevent water from leaking into the gear housing.

General Lubrication Points

Inside bout: apply lubricant to Ride-Guide steering cable end next to hand nut (A, **Figure 20**), pivot socket of steering arm and exposed cable traversing through guide tube (B and C, **Figure 21**).

Outside bout: apply lubricant to grease fittings at gimbal housing upper and lower pivot pins, tilt pins on both sides of gimbal ring and gimbal bearing. See **Figure 25**.

NOTE

The tapered end **of** the lubricant gun fits counterbore in tilt pins; no grease fitting is provided. If lubricant cannot be satisfactorily forced into tilt pins, install a grease fitting (part No. B-22-37668) in each pin. Lubricate and remove & fitting.

Lubricate universal joint bearings.

LATE MODEL I (INCLUDES MODELS I-R AND I-MR) LUBRICATION

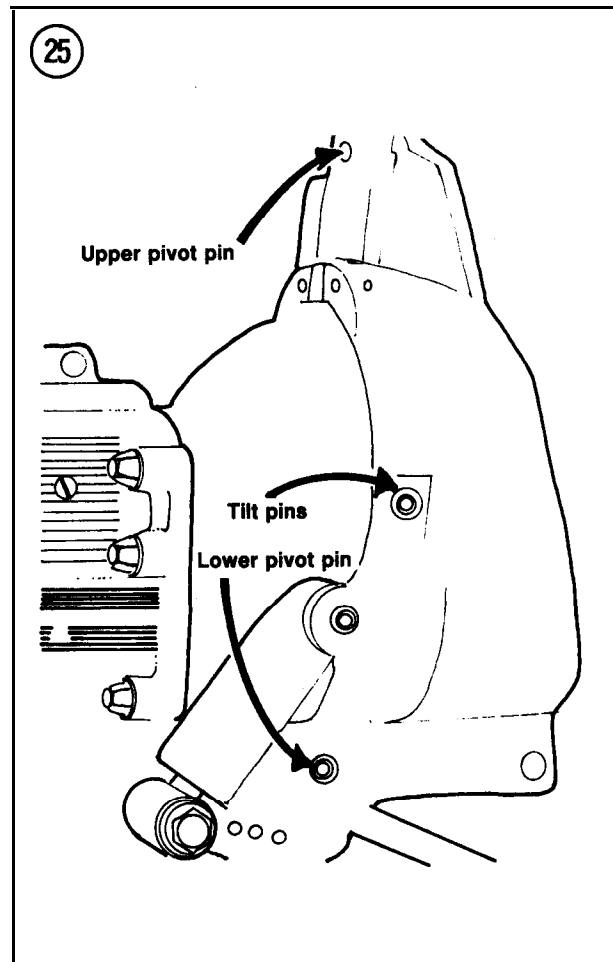
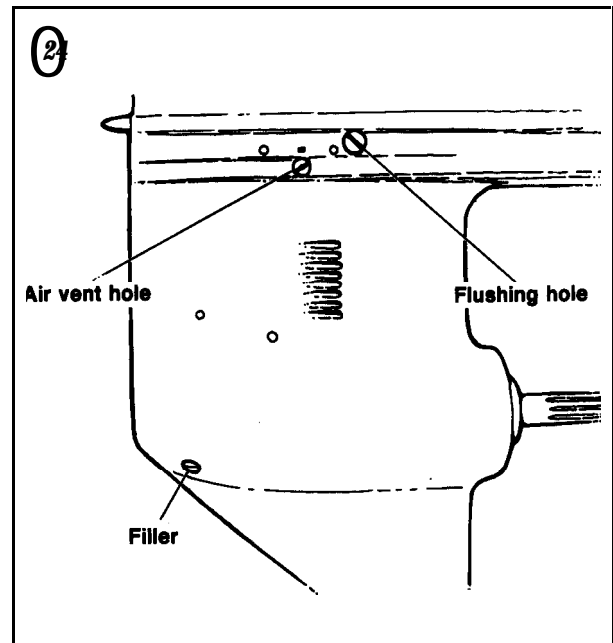
Lubricant Level Check

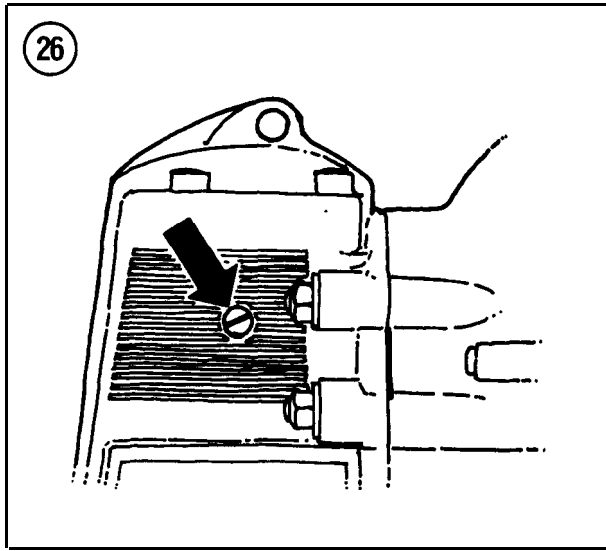
1. Remove oil vent plug and gasket on side of drive shaft housing (**Figure 26**). Oil must be even with bottom of vent plug hole when unit is level.

NOTE:

Some older units have oil filler plugs on the opposite side **of** the drive shaft housing, in addition to the filler plug specified in Step 2.

2. If level is low, remove the oil filler plug and gasket located on the lower side of gear housing (**Figure 24**). Quickly insert lubricant tube and add lubricant until it appears at vent hole.
3. Install vent plug with new gasket, then quickly remove lubricant tube and install filler plug with new gasket.





Lubricant Change

1. Remove the oil vent plug on side of drive shaft housing (Figure 18) and the drain plug from lower end of gear housing on left side (Figure 19). Tilt unit slightly to aid drainage. Allow all old lubricant to drain.
2. Insert lubricant tube into lower drain plug hole and fill until oil runs from upper oil vent plug hole.
3. Install oil vent plug first, then quickly remove lubricant tube and install drain plug. Make certain that a new gasket is used under each plug to prevent water from leaking into the gear housing.

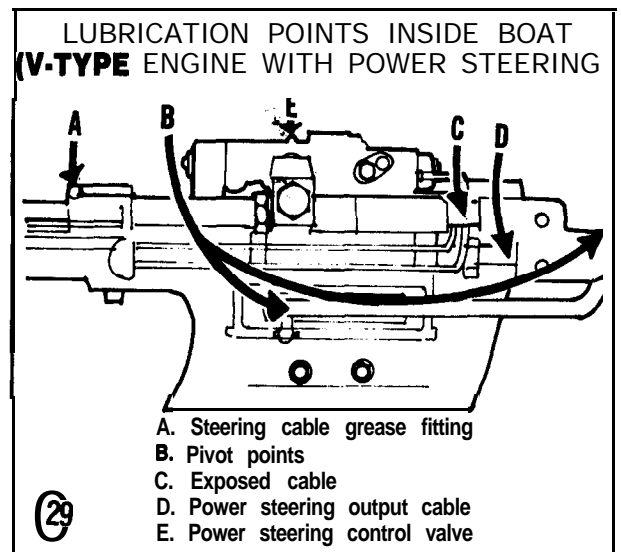
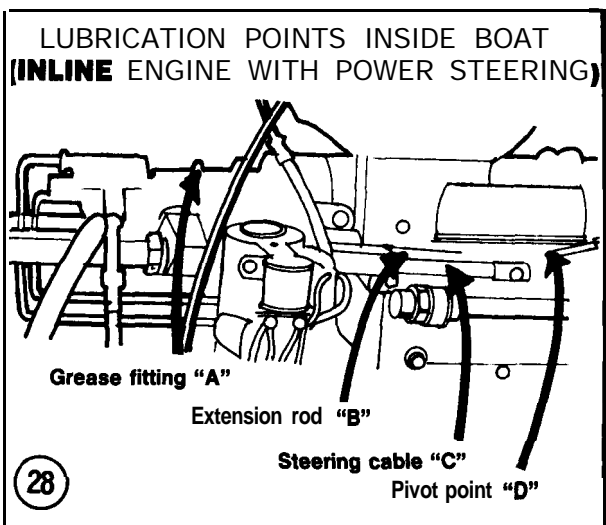
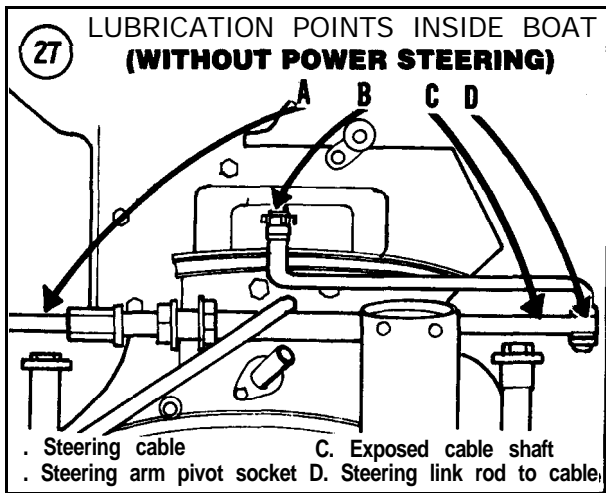
General Lubrication Points

Inside boat

Without power steering: refer to Figure 27 and apply lubricant to Ride-Guide steering cable end next to hand nut (A); pivot socket of steering arm (B); exposed cable traversing through guide tube (C) and steering link rod to steering cable (D).

With power steering (inline engines): refer to Figure 28 and lubricate control valve grease fitting (A); extension rod (B) and exposed end of cable (C); and cable end guide pivot point (D).

With power steering (V-type engines): refer to Figure 29 and lubricate Ride-Guide cable fitting (A) with cable fully retracted; pivot points (B); exposed part of steering cable (C) and output shaft (D) when both are fully extended; and control valve fitting (E). Check for loose or worn connections while lubricating these points.



Outside boat: lubricate upper and lower pivot pins, hinge pins and gimbal bearing. See **Figure 30**. Lubricate universal joint bearings.

MERCURISER II LUBRICATION

Lubricant Level Check

1. Remove filler plug and gasket (**Figure 31**). Oil should be level with bottom edge of threaded hole.
2. If level is low, a small amount can be added through the filler plug hole. If unit is empty or a great amount of oil must be added, see *Lubricant Change* below.
3. Install filler plug with a new gasket.

Lubricant Change

1. Remove the oil vent plug on side of drive shaft housing (**Figure 18**) and the drain plug from lower

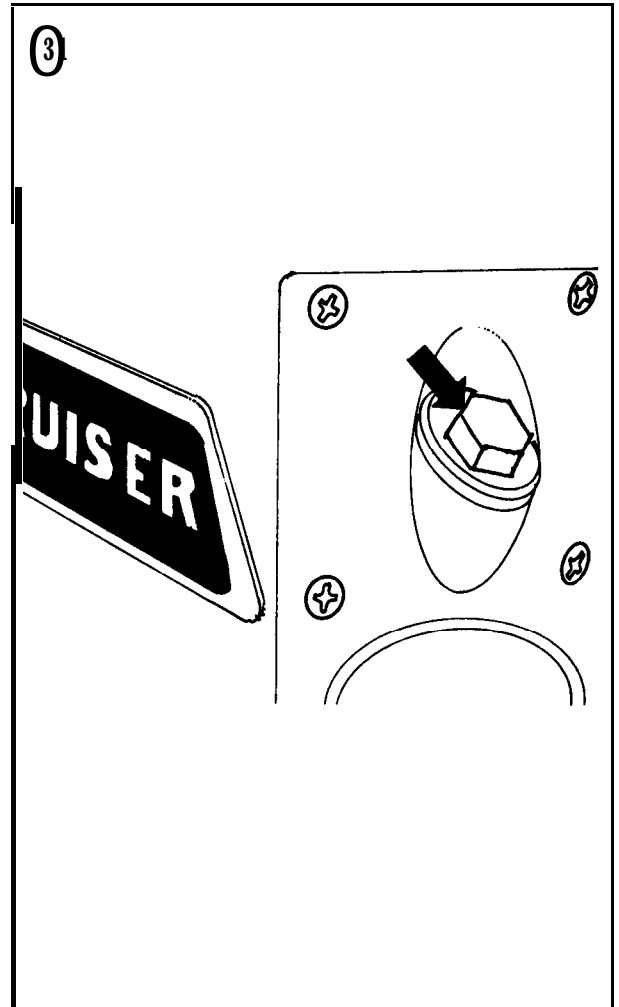
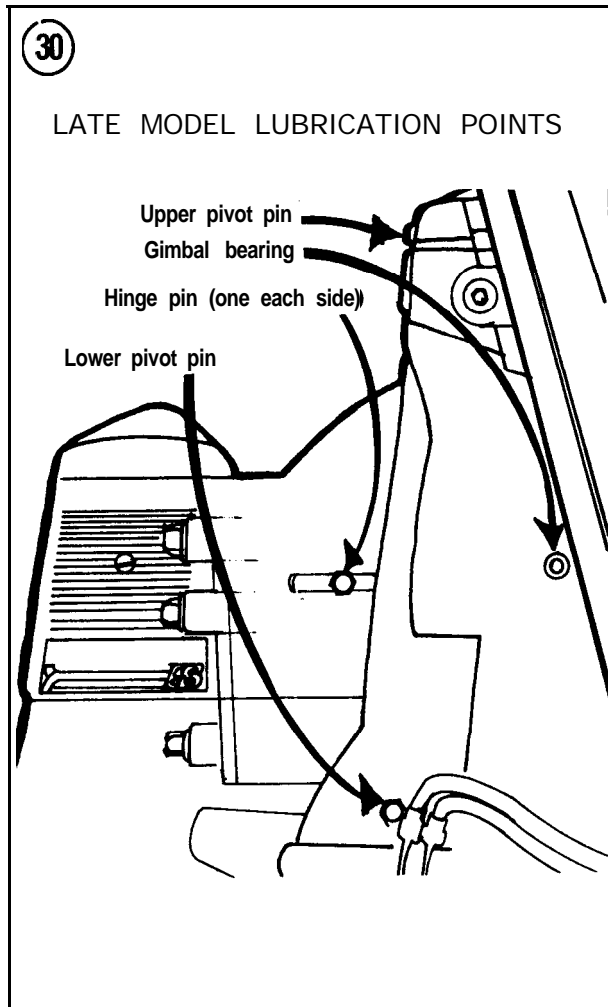
end of gear housing on left side (**Figure 19**). Tilt unit slightly to aid drainage. Allow all old lubricant to drain.

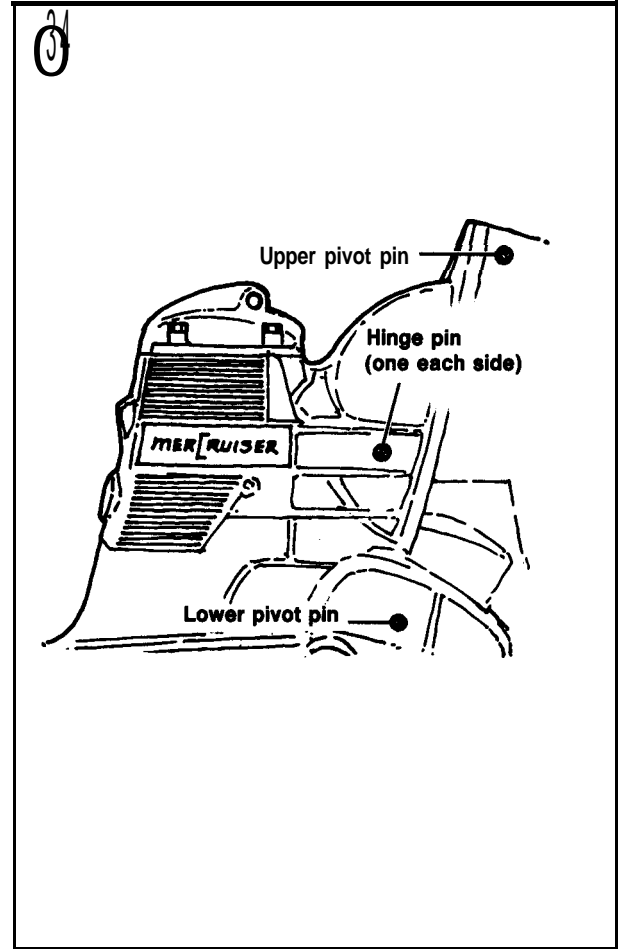
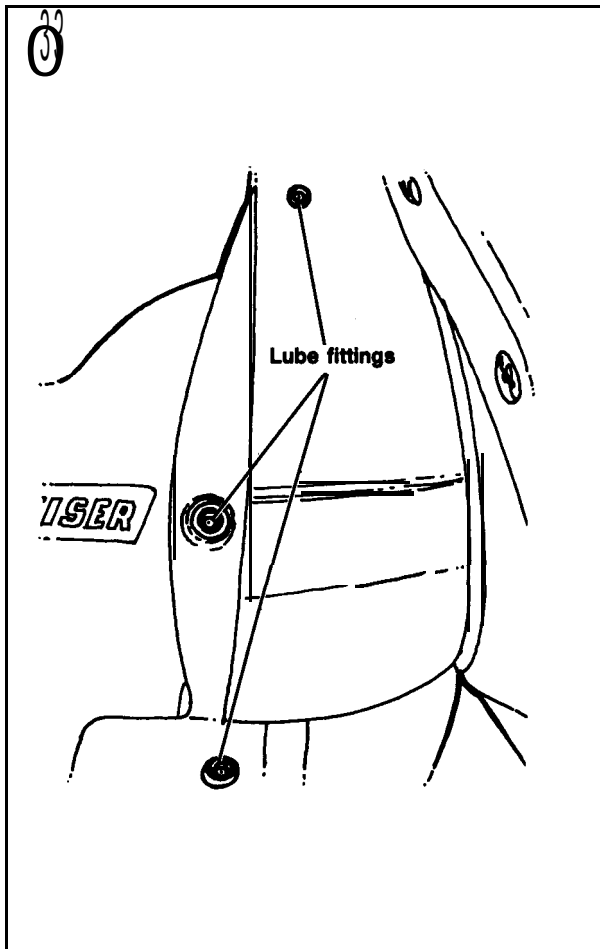
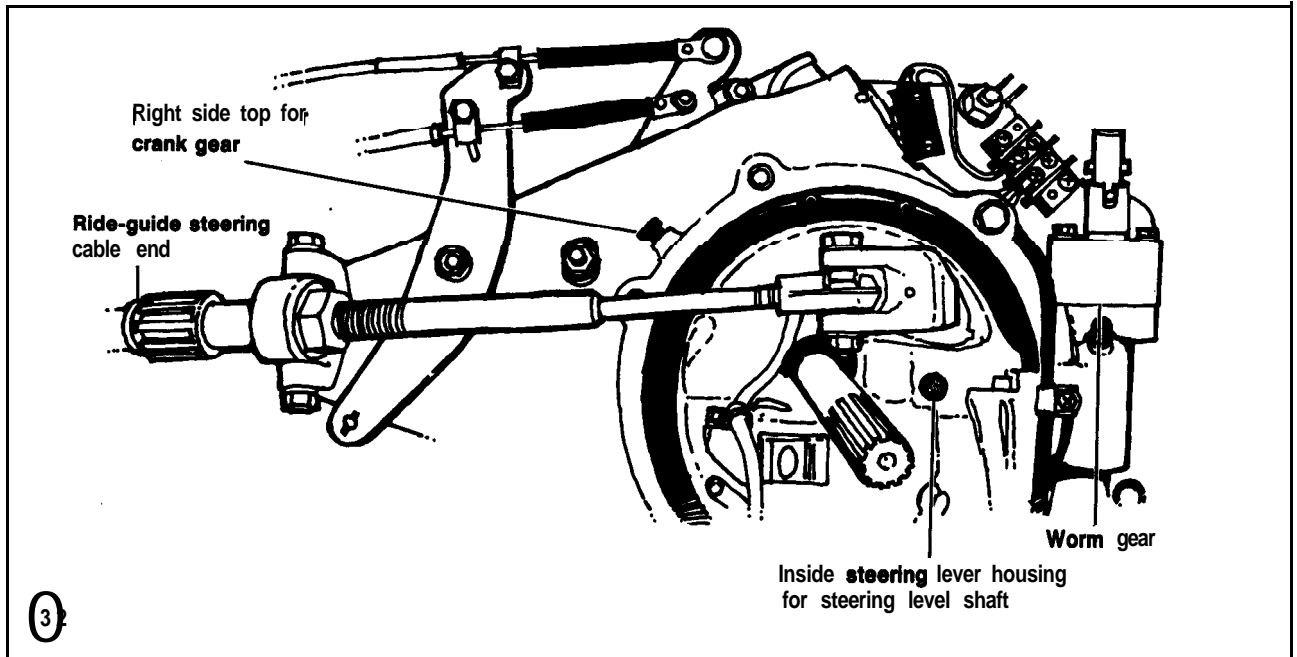
2. Insert lubricant tube into lower drain plug hole and fill until oil runs from upper oil vent plug hole.
3. Install oil vent plug first, then quickly remove lubricant tube and install drain plug. Make certain that a new gasket is used under each plug to prevent water from leaking into the gear housing.

General Lubrication Points

Inside boat: lubricate the points shown in **Figure 32**.

Outside boat: lubricate gimbal housing upper and lower pivot pins, and hinge/tilt pins on both sides of gimbal housing. See **Figure 33** (early models) or **Figure 34** (late models).





MERCUISER 215, II-TR, II-TRS, AND III LUBRICATION

Lubricant Level Check

1. Check oil level with dipstick on 215, II-TR models (**Figure 35**) or sight glass (**Figure 36**) located on inner transom plate of III models.
2. Add oil as required through dipstick tube or oil filler hole.

Lubricant Change

1. Remove oil filler plug on lower side of gear housing and vent plug on side of drive housing.
2. Make sure drive unit is installed in bell housing and let oil drain completely. Reinstall vent plug with a new gasket.
3. Use a hand-type lubricant pump and fill drive unit through filler plug hole until oil level reaches the proper line on the dipstick (**Figure 35**) for 215, II-TR and II-TRS models or the sight glass (**Figure 36**) on **MerCruiser III** models.
4. After filling, quickly remove pump and install filler plug with a new gasket. Tighten plug securely.

Lubrication (215, II-TR, II-TRS)

Lubricate drive unit upper and lower pivot pin grease fittings (**Figure 37**).

Manual steering: refer to **Figure 38** and lubricate steering cable grease fitting (A); steering lever pivot points (B); and apply a light coat of grease to the exposed steering cable (C). Do not overlubricate the cable.

Power steering: refer to **Figure 39** and lubricate steering cable grease fitting (A); steering lever pivot points (B); and apply a light coat of grease to exposed cable end and extension rod (C and D). Do not overlubricate.

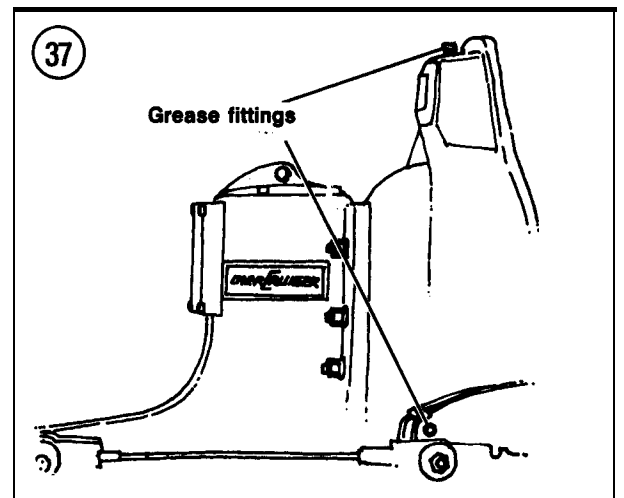
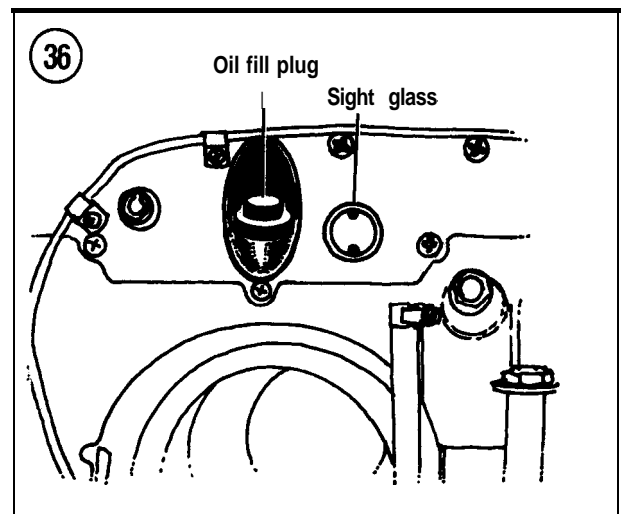
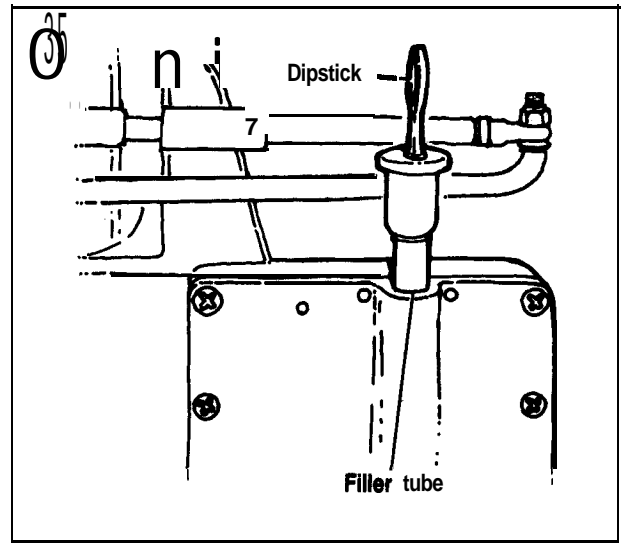
NOTE

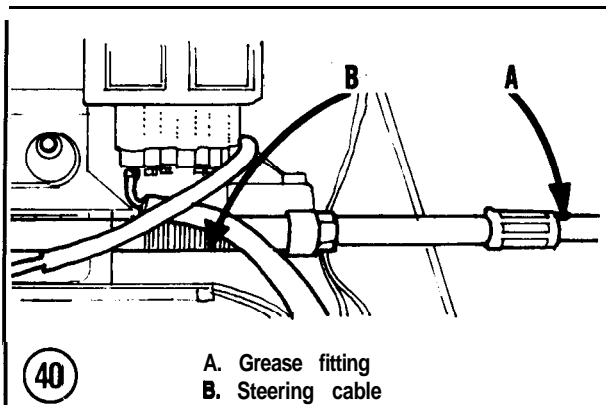
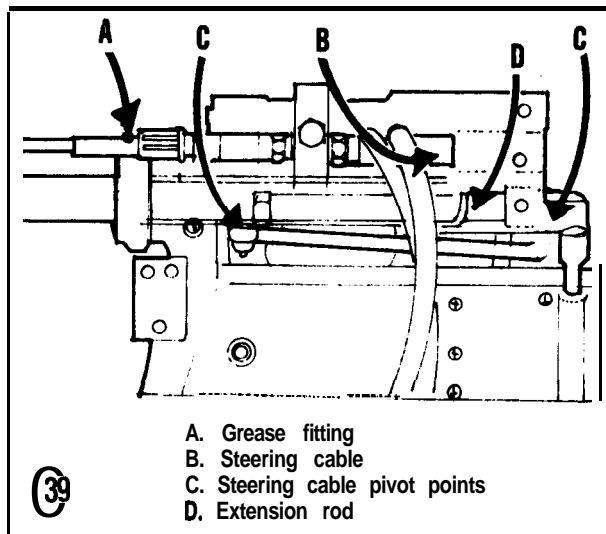
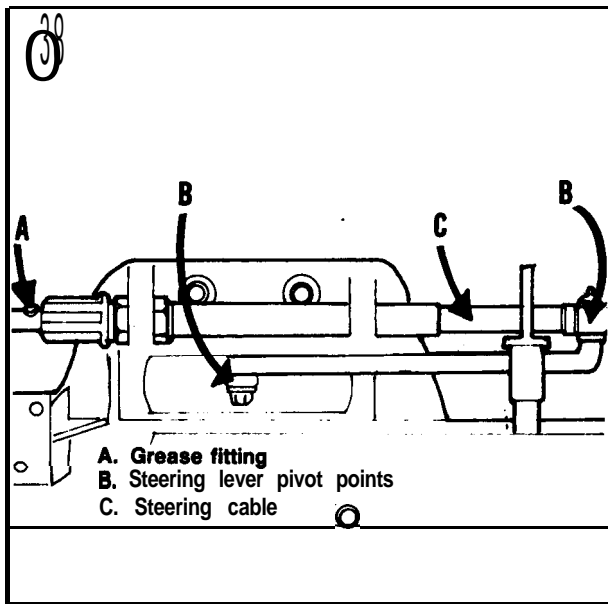
Lubricate pivot points of dual tie bar, if installed.

Lubrication (Model III)

Lubricate drive unit upper and lower pivot pin grease fittings (**Figure 37**).

Manual steering: refer to **Figure 40** and lubricate steering cable grease fitting (A). Apply coating of grease to exposed cable (B). Do not overlubricate.





Power steering: refer to **Figure 39** and lubricate steering cable grease fitting (A); steering lever pivot points (B); and apply a light coat of grease to exposed cable end and extension rod (C and D). Do not overlubricate.

NOTE

Lubricate pivot points of dual tie bar, if installed.

ENGINE TUNE-UP

A smooth running, dependable marine engine is more than a convenience. At sea, it can mean your life. To keep your engine running right, you must follow a regular program of preventive maintenance.

Part of any preventive maintenance program is a thorough engine tune-up. A tune-up is a series of accurate adjustments necessary to restore maximum power and performance. In addition, some ignition parts which deteriorate with use must be replaced.

Engine tune-ups are generally recommended at 50 hour intervals. If the engine is used infrequently, a tune-up should be performed at least once a season. Tune-up specifications are provided in **Table 6** at the end of the chapter.

A tune-up consists of the following:

- a. Compression check.
- b. Ignition system work.
- c. Carburetor inspection and adjustment.

Careful and accurate adjustment is crucial to a successful engine tune-up. Each procedure in this section must be performed exactly as described and in the order presented.

NOTE

After considerable research and extensive performance tests, Mercury Marine has concluded that increasing spark advance or recalibrating the carburetor does not improve performance for high elevation operation. To obtain maximum performance in such areas, Mercury Marine recommends you replace the propeller.

COMPRESSION TEST

Check the compression of each cylinder before attempting a tune-up. If more than a 20 pound difference exists between the highest and lowest reading cylinders, the engine cannot be tuned to develop its maximum power.

1. Warm the engine to normal operating temperature, then shut it off. Remove the flame arrestor (**Figure 41**, typical) and make sure that the choke and throttle valves are completely open.
2. Disconnect the coil high tension lead at the distributor cap tower. Ground the lead.
3. Remove the spark plugs..

NOTE

The No. 1 cylinder is the front cylinder on all inline engines. It is the front cylinder on the port side of GM V6 and V8 engines and the starboard side of Ford V8 engines.

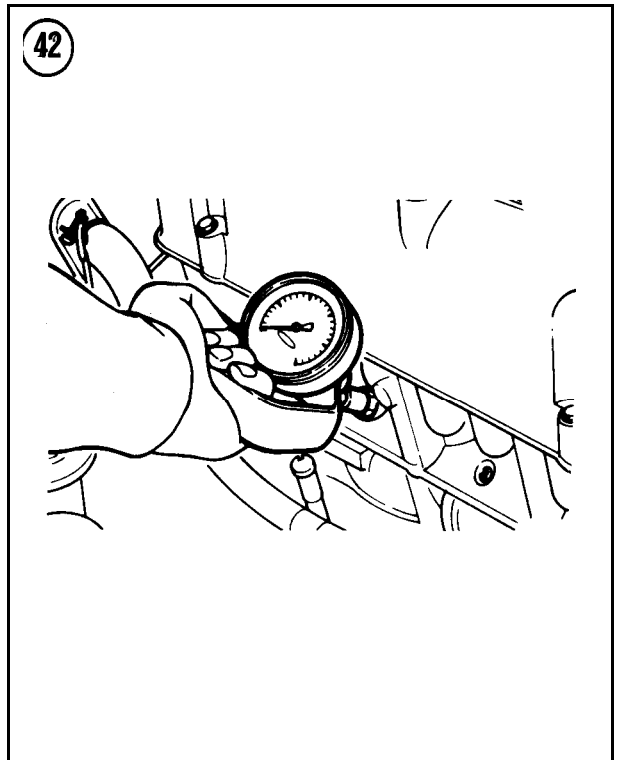
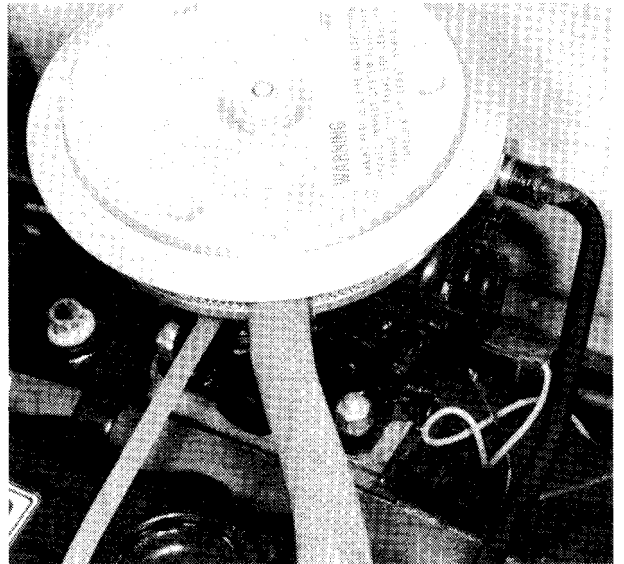
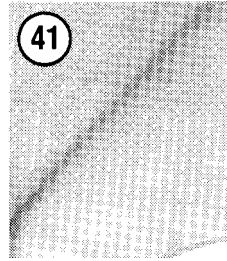
4. Connect the compression tester to the No. 1 cylinder according to manufacturer's instructions (**Figure 42**).
5. Use a remote starter button or have an assistant crank the engine over until there is no further rise in pressure.
6. Remove the compression tester and record the reading. Relieve the tester pressure valve.
7. Repeat Steps 4-6 for each cylinder.

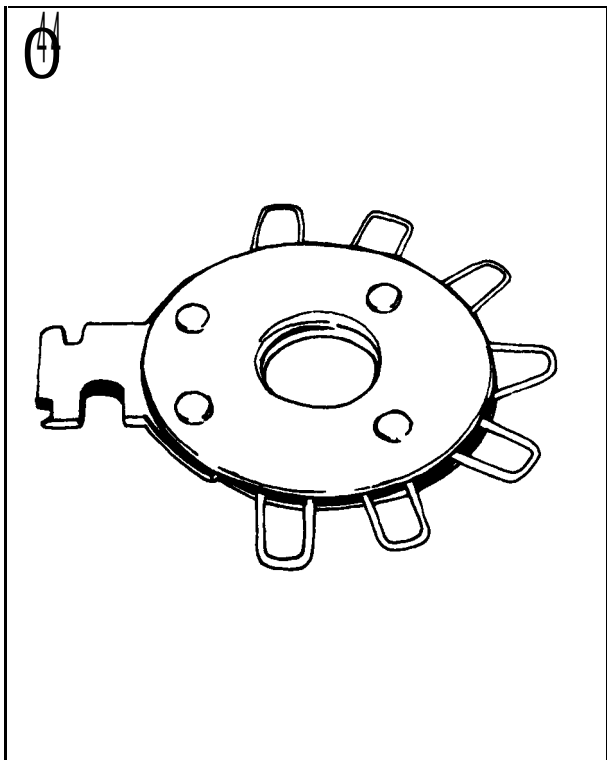
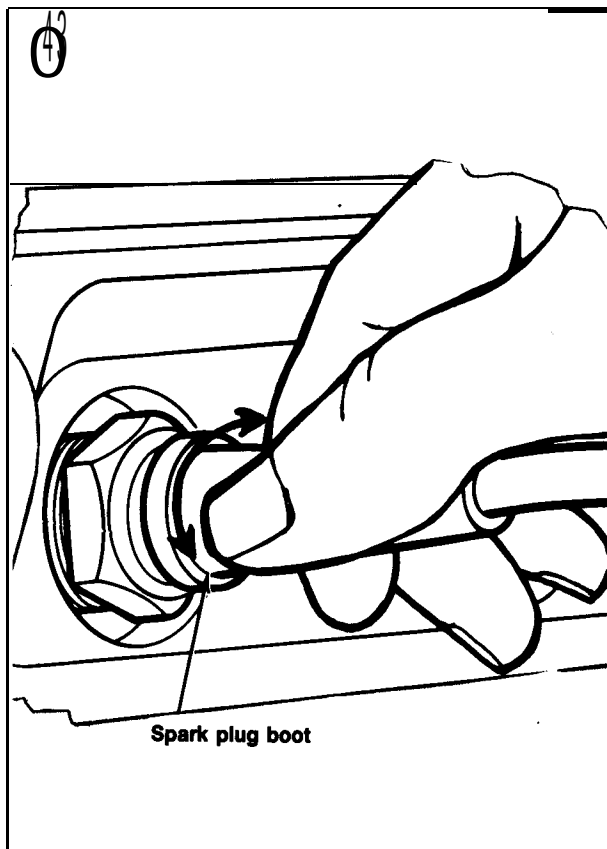
When interpreting the results, actual readings are not as important as the difference between readings. All readings should be 132-162 psi (9-11 kg/cm²). A reading below 100 psi (7 kg/cm²) indicates that an engine overhaul is due. A maximum difference of 20 psi (1.5 kg/cm²) between any 2 cylinders is acceptable. Greater differences indicate worn or broken rings, leaky or sticking valves or a combination of all. Compare with vacuum gauge readings to isolate the problem more closely.

If the compression test indicates a problem (excessive variation in readings), isolate the cause with a wet compression test. This is performed in the same way as the dry test, except that about 1 tablespoon of heavy engine oil (at least SAE 30) is poured down the spark plug hole before performing Steps 4-6. If the wet compression readings are much greater than the dry compression readings, the trouble is probably caused by worn or broken rings. If there is little difference between the wet and dry readings, the problem is probably due to leaky or sticking valves.

IGNITION SYSTEM

Two basic types of ignition systems are used on the engines covered in this manual: the mechanical contact breaker point ignition and the Thunderbolt breakerless electronic ignition.





Total ignition service is presented for mechanical contact breaker point systems. Service to Thunderbolt breakerless ignition systems is limited to replacement of spark plugs, inspection -and repair of wiring and checking and correcting ignition timing.

Suspected Thunderbolt ignition trouble should be referred to a dealer. Testing of the electronic module requires special equipment and skills. An otherwise good electronic circuit can be ruined by an incorrect test hookup.

Spark Plug Removal

CAUTION

Whenever the spark plugs are removed, dirt from around them can fall into the spark plug holes. This can cause expensive engine damage.

1. Blow out any foreign matter from around the spark plugs with compressed air. Use a compressor if you have one or a can of inert gas available at photo stores.
2. Disconnect the spark plug wires by twisting the wire boot back and forth on the plug insulator while pulling upward (**Figure 43**). Pulling on the wire instead of the boot may break it.
3. Remove the plugs with an appropriate size spark plug socket. Keep the plugs in order so you know which cylinder each came from.
4. Examine each spark plug and compare its appearance with the illustrations in Chapter Three. Electrode appearance is a good indication of performance in each cylinder and permits early recognition of trouble.
5. Discard the plugs. Although they could be cleaned, regapped and reused if in good condition, they seldom last very long. New plugs are inexpensive and far more reliable.

Spark Plug Gapping and Installation

New plugs should be carefully gapped to ensure a reliable, consistent spark. Use a special spark plug tool with a wire gauge. See **Figure 44** for one common type.

NOTE

Some older engines use polar gap plugs with a recessed center electrode. These plugs do not require gapping. If the center electrode is burned back more than 1/32 in. from end of plug, replace the plug.

1. Remove the plugs from the box. Tapered plugs do not use gaskets. Some plug brands may have small end pieces that must be screwed on before the plugs can be used.

2. Determine the correct gap setting from **Table 6**. Insert the appropriate size wire gauge between the electrodes. If the gap is correct, there will be a slight drag as the wire is pulled through. If there is no drag or if the wire will not pull through, bend the side electrode with the gapping tool (**Figure 45**) to change the gap, then remeasure with the wire gauge.

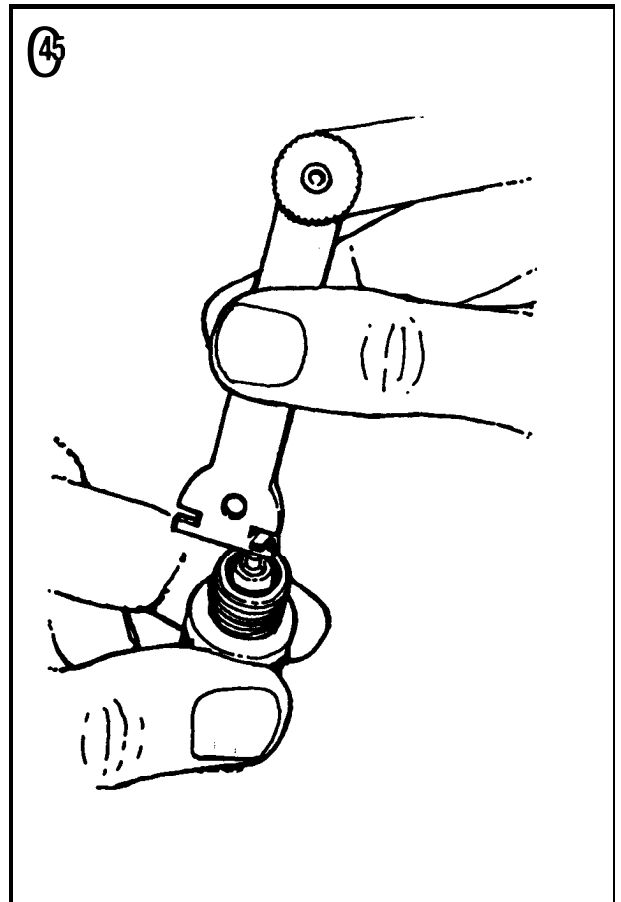
NOTE

Never try to close the electrode gap by tapping the spark plug on a solid surface. This can damage the plug internally. Always use the gapping/adjusting tool to open or close the gap.

3. Apply a drop of engine oil to the threads of each spark plug. Screw each plug in by hand until it seats. Very little effort is required. If force is necessary, the plug is cross-threaded. Unscrew it and try again.

4. Tighten the spark plugs. If you have a torque wrench, tighten to **15-20 ft.-lb. (20-30 Nm)**. If not, tighten the plugs with your fingers, then tighten an additional $1/16$ turn (tapered seat) or $1/4$ turn (gasket-type) with the plug wrench.

5. Install the wires to their correct cylinder locations.



Distributor Cap, Wires and Rotor

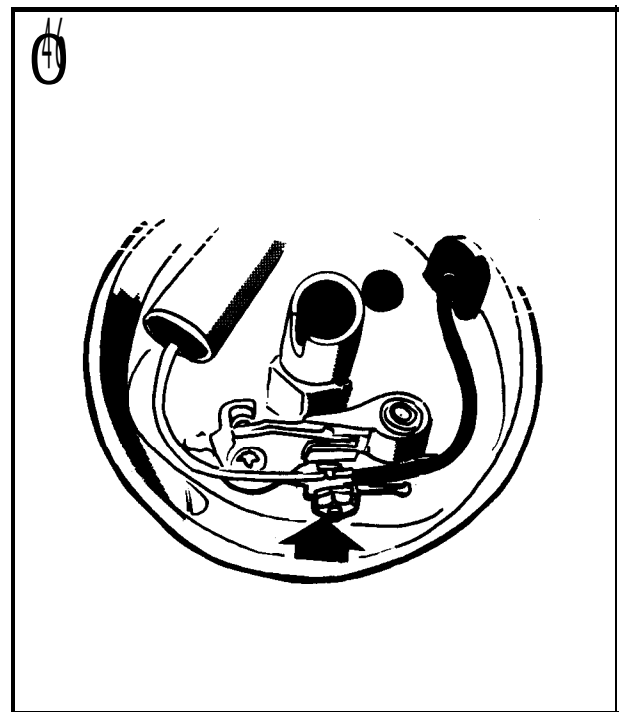
1. Inspect all spark plug wires and coil high tension lead for abrasions, cracks or deteriorated insulation. Replace wires as required.

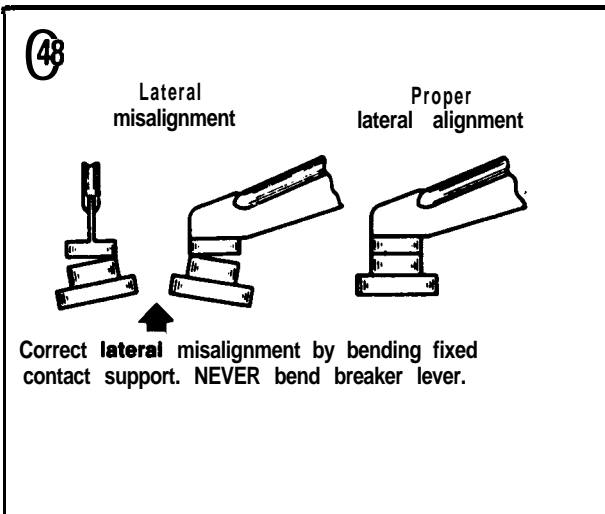
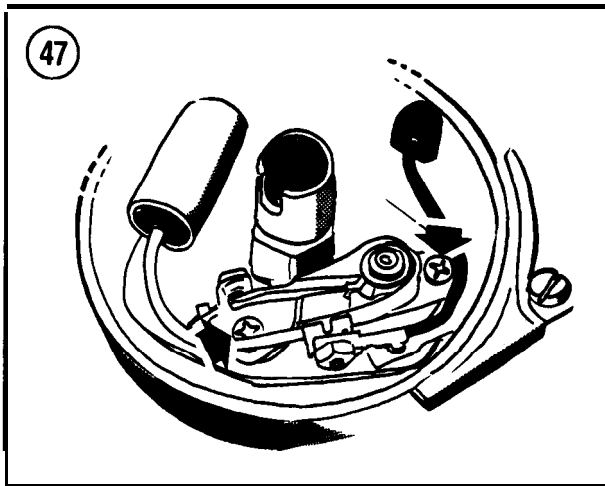
2. Unsnap, unscrew or turn the distributor cap attachment devices as required and remove the cap. Pull it straight up and off the distributor to prevent rotor blade damage.

3. Check the carbon button and electrodes inside the distributor cap for dirt, corrosion or arcing. Check the cap for cracks. Replace the cap and rotor as a set if necessary.

4. Lift the rotor straight up and off the distributor shaft. Wipe rotor with a clean, damp cloth. Check for burns, arcing, cracks and other defects. Replace the rotor and cap as a set if necessary.

5. Align tang inside rotor with slot in distributor shaft and press rotor onto shaft until it is fully seated.





6. Grasp rotor, twist it clockwise (GM motors) or counterclockwise (Ford motors) and then release it. The rotor should return quickly to its original position when released. If not, the distributor advance mechanism requires service. This should be done by a dealer.
7. Install distributor cap. Snap clips in place, tighten screws or turn cap latches as required.

Contact Breaker Point Replacement

The expendable ignition parts (breaker points and condenser) should be replaced and the breaker point dwell angle and ignition timing checked and adjusted during a tune-up. Dwell must be set to specifications (**Table 6**) before timing is checked.

NOTE

Breaker point sets used in marine distributors have corrosion-resistant springs. Do not use automotive breaker points as a replacement.

1. Remove distributor cap and rotor as described in this chapter.
2. Loosen terminal nut on contact breaker assembly (**Figure 46**, typical) and disconnect the primary lead. Unscrew the retaining screw from the condenser and the breaker assembly (**Figure 47**, typical). Note location of ground wire so it may be installed in the same place, then remove the condenser and breaker assembly from the distributor.
3. Wipe cam and breaker plate clean. Lightly coat the cam with special distributor cam grease. Never use oil or common grease; they will break down under the high temperature and frictional load and are likely to find their way onto the contacts.
4. Install the new contact breaker assembly and condenser in the distributor but do not tighten locking screw. Make sure the ground lead, condenser lead and primary lead are installed exactly as they were before. Double check the connections and screw to ensure that they are tight.
5. With the points closed, make certain the contact surfaces are properly aligned with each other (**Figure 48**). Make adjustments as required, bending the stationary arm of the points only. If reusing old points, they should not be realigned.
6. Adjust breaker point gap as described in this chapter.

Breaker Point Gap Adjustment

There are 2 ways to adjust breaker point gap:

- a. Feeler gauge.
- b. Dwell meter.

The dwell meter method is the most accurate and is required with Delco-Remy distributors.

To set the gap with a feeler gauge:

1. Ground the ignition coil high tension lead.
2. Connect a remote starter button according to manufacturer's instructions and crank the engine until the breaker point rubbing block rests on a distributor cam lobe. At this position, the points are open to their fullest.
3. Insert a flat feeler gauge between the open points and compare the gap to specifications (**Table 6**). Gap adjustment is made either with an adjusting screw or with a screwdriver inserted in the slotted hole in the point set/breaker plate. When a slight

drag is felt on the gauge blade, tighten the locking screw. Recheck gap to make sure the points did not move during tightening.

To adjust point gap with a dwell meter (except Delco-Remy):

1. Remove the distributor cap and rotor as described in this chapter.
2. Connect a dwell meter and remote starter button according to manufacturer's instructions.
3. Crank engine with remote starter button and read dwell angle on meter.
4. Adjust dwell by varying breaker point gap.
5. Tighten breaker point locking screw.
6. Repeat Step 3 to recheck dwell.
7. Install distributor rotor and cap as described in this chapter.
8. Start engine and check dwell with engine idling.

To adjust Delco-Remy distributors:

1. Connect a dwell meter according to manufacturer's instructions.
2. Start engine and run at idle.
3. Read dwell angle on meter.
4. If adjustment is necessary, raise window on, side of distributor cap. Insert appropriate size Allen wrench through the window and engage point set. Turn wrench in the direction required to bring the dwell reading on the meter into specifications.
5. Remove Allen wrench, close distributor cap window and shut engine off.

Ignition Timing

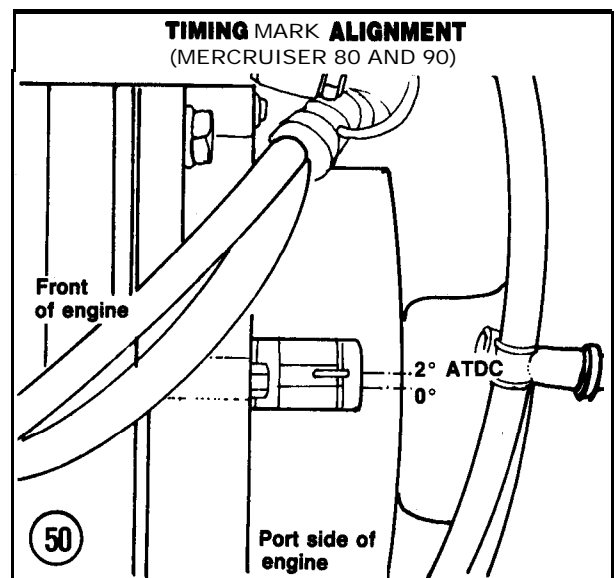
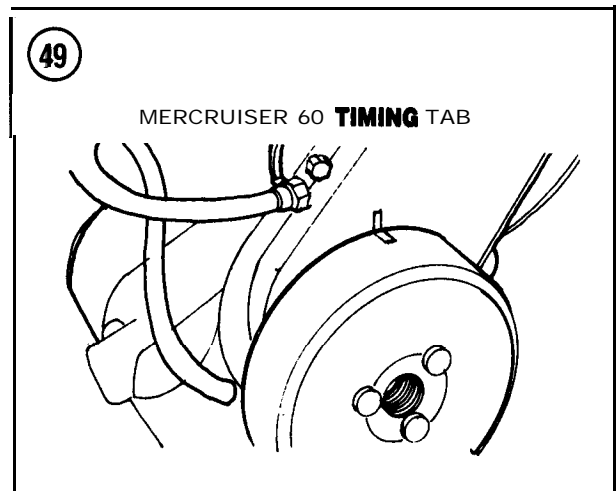
An adjustable timing light should not be used with MerCruiser engines. This type of timing light has a control knob that can be adjusted to fire the light before or after the plug fires. The meter then shows the amount of advance for which the light has compensated.

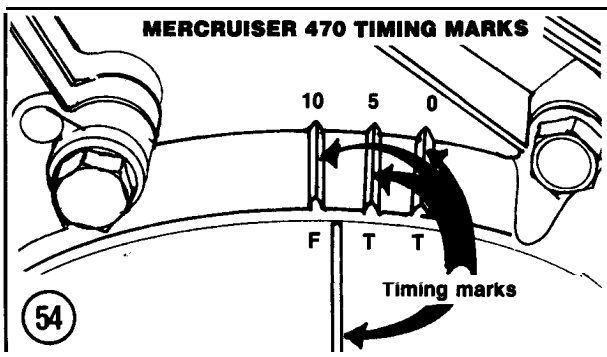
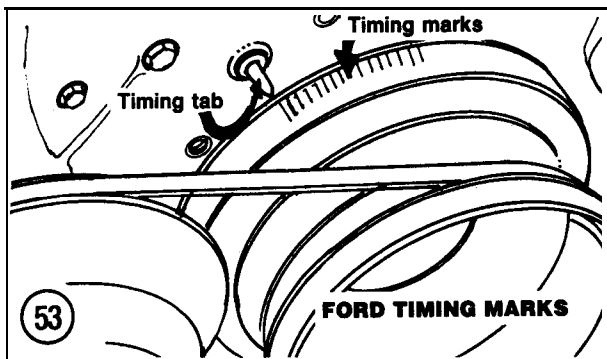
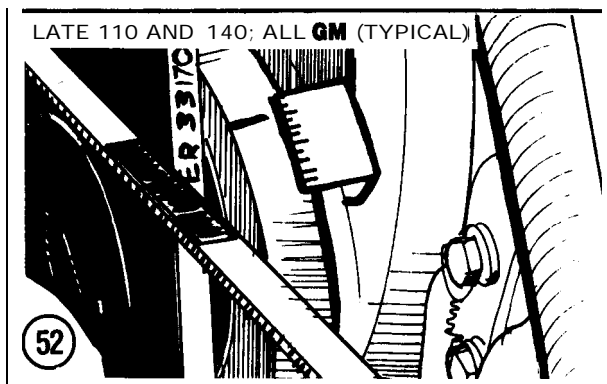
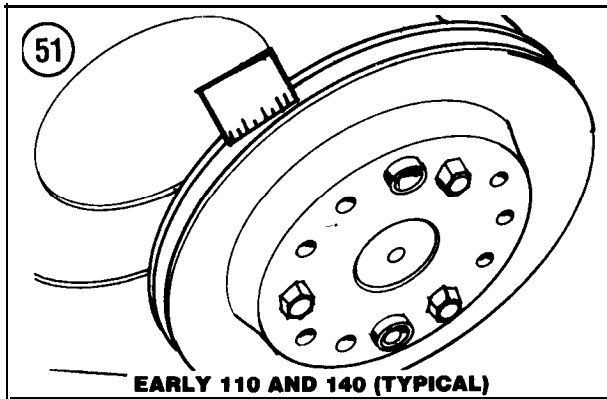
MerCruiser has found considerable inaccuracies in such lights. With breaker point ignitions, the inaccuracy may cause you to over- or under-advance the ignition timing, resulting in power loss and possible engine damage. With the Thunderbolt IV HE1 ignition, this type of timing light can cause the ignition amplifier to over-advance the timing, resulting in piston damage.

NOTE

The No. 1 cylinder is the front cylinder on all inline engines. It is the front cylinder on the port side of GM V6 and V8 engines and the starboard side of Ford V8 engines.

1. Connect a timing light to the No. 1 spark plug wire according to manufacturer's instructions.
2. Connect a tachometer according to the manufacturer's instructions.
3. Disconnect the vacuum advance line at the distributor. Plug the line with a golf tee, sheet metal screw, etc.
4. Locate the timing marks on the engine timing cover or block and crankshaft pulley or harmonic balancer. See Figures 49-54 for typical arrangements.
5. Clean timing marks. Apply a coat of white paint or chalk so they can be more easily seen.
6. Start the engine and run at slow idle. Refer to Table 6 for timing specifications and aim the





timing light at the timing marks. If the engine timing is correct, the moving mark will appear to stand still opposite the stationary mark.

7. If timing marks are not properly aligned, loosen the hold-down bolt at the base of the distributor just enough so the distributor body can be turned by hand with some resistance. Slowly rotate the distributor body clockwise or counterclockwise as required until the marks come into alignment.

8. Tighten the hold-down bolt without further moving the distributor and disturbing the setting. Recheck timing with the timing light. Repeat Step 7 if timing was disturbed while tightening the bolt.

9. After the initial timing has been set, check the operation of the centrifugal advance mechanism. With the vacuum line still disconnected and the engine operating at slow idle, note the position of the timing marks with the timing light.

10. Gradually increase the engine speed to about 1,800 rpm while observing the timing marks. The moving mark should move steadily in a direction opposite of engine rotation.

11. Decrease engine speed to slow idle while observing timing marks. The moving mark should move back smoothly as speed decreases.

NOTE

If timing mark moves with jerky motion or does not start to move within 50-100 rpm of the specified speeds, the distributor centrifugal advance is not working properly and must be cleaned or repaired.

12. Check the operation of the vacuum advance mechanism. Unplug and reconnect the vacuum line to the distributor. Operate the engine at approximately 1,500 rpm. The timing mark should move in a direction opposite of engine rotation to advance the spark timing. The timing mark should be beyond the range of the calibrated indicator.

NOTE

If the timing mark does not move as described in Step 12, check the vacuum line for breaks, leaks or obstructions. **If** vacuum is reaching the distributor, the advance mechanism is defective and must be replaced.

CARBURETOR

Idle Adjustments

Refer to specifications in Table 6 for the proper idle speed for your engine. Do not remove the flame arrester for this procedure.

1. Connect a tachometer and vacuum gauge according to manufacturer's instructions.
2. Locate the idle mixture screw(s) on your carburetor. These are usually a spring-loaded screw near the carburetor base. See Figure 55, typical.
3. Locate the idle speed screw on the carburetor throttle linkage. See Figure 55, typical.
4. Start the engine and let it run at idle until normal operating temperature is reached.
5. Shut the engine off and disconnect the throttle cable. See Figure 56, typical.
6. Start the engine and note the idle speed on the tachometer. If necessary, adjust the screw to bring the idle speed within specifications (Table 6).
7. Shut the engine off and turn the idle mixture screw(s) in (clockwise) as far as possible, allowing it (them) to bottom *lightly*. Back the screw(s) out 3 turns or until a stop is felt, whichever occurs first.
8. Restart the engine and let it idle for one minute.
9. Adjust the idle mixture screw(s) until the highest, steadiest manifold vacuum reading is obtained on the vacuum gauge.

NOTE

If a vacuum gauge is not available, turn idle mixture screw in (clockwise) until engine rpm starts to drop off, then back screw out until rpm drops again. Set screw halfway between these "drop-of points. Repeat procedure with other screw, if used. If idle rpm increases as a result, reset to specifications.

10. Shift unit into forward gear. Readjust idle speed screw to obtained specified idle rpm.
11. Shut engine off. Attach throttle cable and make sure that throttle valves are fully open with remote control in full forward position.
12. On MerCruiser 120- 165 models, make sure throttle valves are fully open and turn the wide-open throttle stop adjusting screw (Figure 57) clockwise until it just barely contacts the throttle lever. Tighten jam nut securely to prevent adjustment screw from moving. Shift to NEUTRAL and make sure that the idle stop screw rests against the stop.

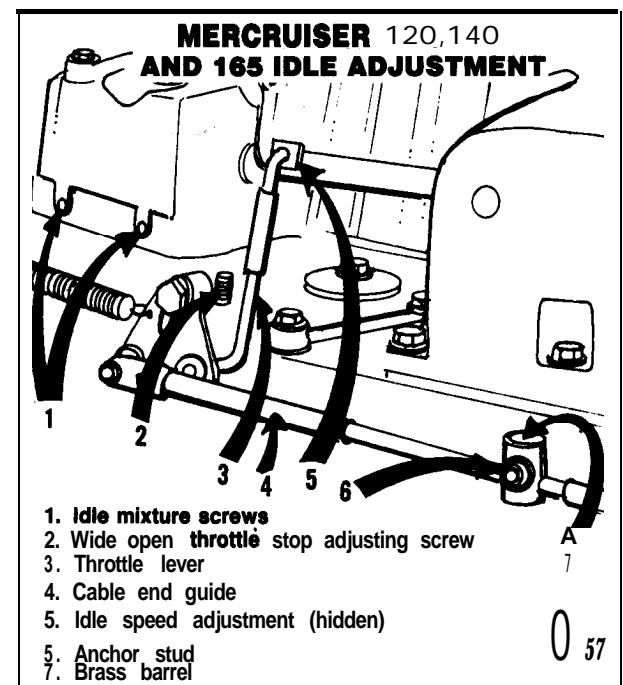
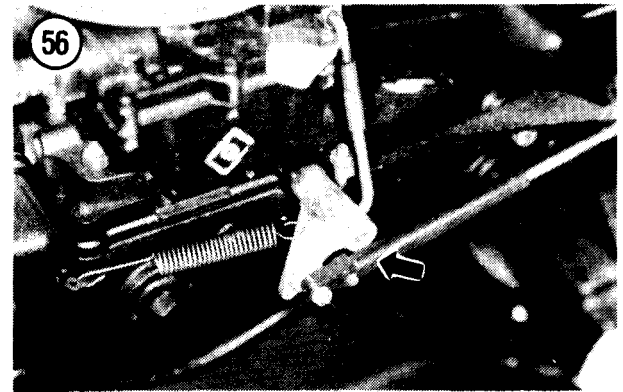
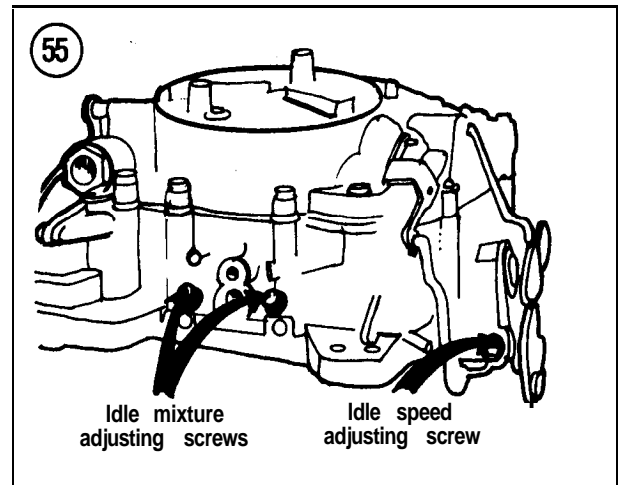


Table 1 **MERCURISER** MAINTENANCE SCHEDULE

ENGINE	
<p>After first 20 hours of operation</p>	<ul style="list-style-type: none"> . Check battery . Check cooling system condition . Check and adjust drive belt tension . inspect all electrical connections . Clean flame arrestor . Replace inline, carburetor and/or sediment bowl fuel filter element . Check fuel lines and connections . Change engine oil and filter
<p>Every 50 hours of operation</p>	<ul style="list-style-type: none"> . Check battery . Check and adjust drive belt tension . Check fuel lines and connections . Check for loose, missing or damaged components . Check power steering fluid level
<p>Every 100 hours of operation</p>	<ul style="list-style-type: none"> . Inspect breaker points¹ . Check cooling system condition . Clean crankcase vent system . Clean flame arrestor . Change engine oil and filter . Clean vent-type oil filler cap . Check and lubricate throttle and shift linkage pivot points²
<p>Every 6 months or 600 hours</p>	<ul style="list-style-type: none"> . Ford engines-check water pump bolts for tightness
<p>Once each year</p>	<ul style="list-style-type: none"> . Check alternator rear screen² . Lubricate distributor cam² . Check electrical connections . Replace inline, carburetor and/or sediment bowl fuel filter element . Check for loose, missing or damaged components . Inspect spark plug condition¹ . Check and lubricate throttle and shift linkage pivot points²
STERN DRIVE	
<p>Alter first 20 hours of operation</p>	<ul style="list-style-type: none"> . Check engine and drive alignment . Check bellows and clamps² . Check engine mount, drive, steering cable and trim cylinder fasteners for tightness • Lubricate gimbal bearing² . Lubricate hinge pins³ . Check power steering fluid level (if so equipped) . Lubricate power steering extension rod (V8 only)³ . Lubricate power steering control valve (if so equipped)³ . Check power trim pump oil level . Lubricate steering cable and levers . Check stern drive oil level . Lubricate upper and lower swivel pins* . Check transmission fluid level . Lubricate U-joint coupling splines . Check propeller for damage
<p>(continued)</p>	

4

Table 1 **MERCUISER** MAINTENANCE SCHEDULE (continued)

STERN DRIVE (cont.)	
Every 30 days	<ul style="list-style-type: none"> . Inspect trim tab and anodic plate²
Every 50 hours of operation	<ul style="list-style-type: none"> . Lubricate hinge pins³ . Check propeller for damage . Check stern drive oil level . Check transmission fluid level . Check power steering fluid level (if so equipped) . Lubricate power steering extension rod (V8 only)³ . Lubricate power steering control valve (If so equipped)³ . Lubricate exposed portion of steering cable . Lubricate steering cables . Lubricate steering linkage²
Every 6 months	<ul style="list-style-type: none"> . Check transmission oil cooler electrodes
Every 100 hours operation	<ul style="list-style-type: none"> . Clean and check exterior of drive unit² . Check engine mount, drive, steering cable and trim cylinder fasteners for tightness . Lubricate gimbal bearing . Lubricate propeller shaft splines (see notes 2 and 4) . Check power trim pump oil level . Change stern drive oil . Lubricate upper and lower swivel pins² . Lighten trim cylinder fasteners . Lubricate transmission output housing bearing . Lubricate U-joint coupling splines and cross bearings
Once each year	<ul style="list-style-type: none"> . Perform 100 hour checks . Change transmission fluid and clean transmission oil strainer screen . Check propeller for damage . Check power steering fluid level (if so equipped) . Lubricate power steering control valve (if so equipped) . Lubricate power steering extension rod (V8 only) . Lubricate shift control and linkage . Lubricate exposed portion of steering cable . Lubricate steering head . Check stern drive water pump and impeller
<ol style="list-style-type: none"> 1. Does not apply to Thunderbolt ignition. 2. Perform more frequently if operated in salt water. 3. Every 30 days in salt water; every 80 days in fresh water. 4. Lubricate during each installation. Make certain that nut is secure. 	

Table 2 ENGINE OIL VISCOSITY

Anticipated temperature range	Recommended viscosity *
Above 90° F (32° C)	SAE 40W
32° F (0° C) to 90° F (32° C)	SAE 30W
Below 32° F (0° C) or adverse operating conditions	SAE 20W

* Quicksilver **25W40 4-cycle** marine engine oil is recommended when a Mercury Marine product is used.

Table 3 APPROXIMATE ENGINE OIL CAPACITIES

Type and model	Capacity (with filter)*
INLINE 4- AND 6-CYLINDER	
60	5.3 pt.
60, 90	5 qt.
110, 120, 120R, 120MR	4 qt.
140	
4-cylinder (140R, 140MR)	4 qt.
6-cylinder	5 qt.
150,160, 165	5 qt.
200	6 qt.
470, 470R, 485, 170MR	5.5 qt.
466, 488R, 190MR	6.5 qt.
V6	
185, 185R, 185MR, 205MR	4.5 qt.
V8	
190, 200MR	5 qt.
215	7 qt.
225	
To Serial No. 2276646	5 qt.
Serial No. 2278647-on	7 qt.
225 II-TR, 230 II-TR, 260 II-TR	6 qt.
226, 228R , 226 II-TR, 230MR	5.5 qt.
233	5 qt.
250	
327 cid	7 qt.
350 cid	5 qt.
255 II-TR, 255 II-TRS	5 qt.
260, 260R , 260MR	5.5 qt.
270	
Early	7 qt.
Late	5.5 qt.
260 II-TRS, 310,696, 696R	5 qt.
325,390	6 qt.
330, 330 II-TR, 330 II-TRS	6 qt.
370 II-TRS, 400 II-TRS, 666	6 qt.

* All capacities in this table are approximate. To assure correct oil level and prevent overfilling the engine, always use the dipstick as recommended in the text.

Table 4 APPROXIMATE STERN DRIVE CAPACITIES

MerCruiser Model	Fl. oz.	Capacity*	Qt.
60	18.3		
80, 90	22		
I-Drive shaft housing	8		
I-Gear housing	18		
IA, IB, IC Drive shaft housing	8		
IA, IB, IC Gear housing	23		
120, 140, 160, 165, 888	28		
II, 200, 225			5.75
II (Heavy-duty gear housing)			7
II-TRS	81**		
III, 250, 270, 325, 390			4.5**
215H, 215E, II-TR			4**

* Capacity is approximate. When refilling a stern drive after draining all lubricant, recheck level after a **one**-minute run-in period to eliminate air pockets which may develop during filling. If necessary, top up after rechecking to bring lubricant to correct level.

. . Includes reservoir capacity.

Table 5 RECOMMENDED LUBRICANTS & APPLICATIONS

Lubricant	Application
Formula 4 Quicksilver Oil (part No. C-92-85187-24)	Steering linkage
Automatic transmission fluid Type F or DEXRON (as required)	Power steering reservoir
Quicksilver Super-Duty Gear Lubricant (part No. C-92-88817)	Stem drive
Universal Joint Lubricant (part No. C-92-74057A1)	U-joint cross bearing and coupling splines, steering head, steering cable, shift control and linkage, hinge pins, gimbal bearing, power steering control valve, drive unit swivel pin/shaft, and drive shaft splines
Perfect Seal (part No. 92-34227)	Propeller shaft splines ¹ Shift cable brass fitting (prior to installation)
Special Lubricant 101 (part No. 92-79214) extension rod	Exposed portion of steering cable; power steering
SAE 20W engine oil	All pivot points
SAE 10W-30 or SAE 10W-40 engine oil ²	Power trim pump oil

(continued)

Table 5 RECOMMENDED LUBRICANTS AND APPLICATIONS (continued)

Lubricant	Application
Quicksilver Multipurpose Lubricant (part No. C-92-63250)	Transmission output housing bearing
Quicksilver insulating Compound (part No. 92-416.69-1)	Inside of spark plug wire boot
<p>1. Mercury Marine recommends the use of Quicksilver Special Lubricant 101 in place of Perfect Seal in areas where corrosion is a problem. Quicksilver 2-4-C Multi-lube (part No. 92-66154) can also be used.</p> <p>2. SAE 30 engine oil can be used in tropical climates if multi-viscosity oil is not available.</p>	

4

Table 6 MERCURISER TUNE-UP SPECIFICATIONS

Model	Serial No.	cid	Spark Plugs		Timing (degrees BTDC)
			Type	Gap. (In.)	
80	All	87.58	AC-44F	0.025	TDC
80	All	89.70	AC-44XL	0.025	2 ATDC
90	All	95.50	AC-R42XL	0.032	2
110	All	153	AC-CR44N ²	0.035	8
120	To 3825578	153	AC-CR44N ²	0.035	8
120, 120R, 120MR	3825579-up	153	AC-MR43T	0.035	8
140 (4-cyl.)	To 3828282	181	AC-CR44N ²	0.035	6
140 (4-cyl.), 140R, 140MR	3826283-up	181	AC-MR43T	0.035	8
140 (6-cyl.)	All	194	AC-CR44N ²	0.035	10
150	All	230	AC-CR44N ²	0.035	8
180	All	250	AC-CR44N ²	0.035	8
185	To 2771483	250	AC-CR44N ²	0.035	8
185	2771484-up	250	AC-MR43T	0.035	8
185, 185R	All	229	AC-MR43T	0.035	8
185MR	All	282	AC-MR43T	0.035	8
470	to 8218038	224	AC-R42TS	0.035	8
470, 470R	6218037-up	224	AC-R42TS	0.035	8
485	All	224	AC-R42TS	0.035	8
488, 488R	All	224	AC-R42TS	0.035	8
888	To 4189598	302	AC-C83T	0.030	10
888	4169597-up	302	See note 4	0.030	10
190	All	283	AC-CR43K	0.035	See note 5
898, 898R	All	305	AC-MR44T	0.035	8
200	All	292	AC-CR44N ²	0.035	8
200MR	All	305	AC-MR43T	0.035	8
215	All	302	AC-C83T	0.030	See note 8
225	To 2278848	327	AC-C42-1	0.035	12

(continued)

Table 6 **MERCURISER TUNE-UP** SPECIFICATIONS (continued)

Model	Serial No.	cid	Spark Plugs			Timing (degrees BTDC)
			Type	Gap. (In.)		
225	2278847	to				
	3385720	.	327	AC-CR43K	0.035	See note 5
225	3385721-up		302	AC-C83T	0.030	10
228, 228R	All		305	AC-MR44T	0.035	8
230MR, 230 II-TR	All		305	AC-MR44T	0.035	8
228 II-TR	All		305	AC-MR44T	0.035	8
233	All		351	See note 4	0.030	10
250 To	4707999		327	AC-V40K	See note 8	10
250	4708000-up		350	AC-MR43T	0.035	8
255 II-TR,						
255 II-TRS To	4175499		351	AC-C83T	0.030	10
255 II-TRS	4175500-up		350	AC-MR43TS	0.035	8
260, 260R, 260MR,						
260 II-TR	All		350	AC-MR43T	0.035	8
270	All		350	AC-V40K⁹	See note 8	10
280	All		350	AC-MR43TS	0.035	6
310	All		409	AC-43N	0.035	12
325 To	2761141		427	AC-V40NK	See note 8	10
325	3043030-up		427	AC-MR41T	0.035	10
330, 330 II-TR,						
330 II-TRS	All		454	AC-MR43T	0.035	8
370 II-TR,						
400 II-TRS	All		454	AC-MR43T	0.035	10
390	All		482	AC-WR41N	0.03s	10

Model	Serial No.	cid	Distributor point gap (In.)	Dwell angle (degrees)	Idle RPM (In gear)	WOT RPM	Oil pressure (psi) ⁴
60	All	67.58	0.018	56-60	650	4,500-4,800	50-60
80	All	89.70	0.019	49-55	650	4,500-4,800	See note 3
90	All	95.50	0.016-0.019	53-57	650	4,500-4,800	See note 3
110	All	153	0.022	28-34	500-600	3,900-4,300	30-60
120 To	3825578	153	0.022	28-34	500-600	3,900-4,300	30-60
120, 120R,							
120MR	3825579-up	153	0.022	28-34	650-700	3,900-4,300	30-60
140 (4-cyl.)	To 3826282	161	0.022	28-34	500-600	4,200-4,600	30-60
140 (4-cyl.),							
140R,							
140MR	3826283-up	181	0.022	28-34	650-700	4,200-4,600	30-60
140 (6-cyl.)	All	194	0.016-0.019	28-34	500-600	3,700-4,100	35
150	All	230	0.016-0.019	28-34	500-600	3,900-4,300	35
160	All	250	0.016	28-34	500-600	3,900-4,300	30-55
165 To	2771483	250	0.016-0.019	28-34	500-600	3,900-4,300	30-60
165	2771484-up	250	0.016-0.019	28-34	650-700	3,900-4,300	30-60
185, 185R	All	229	0.020	36-42	650-700	4,400-4,800	30-55
470 to	6218036	224	0.022	28-34	650-700	3,800-4,200	30-60
470, 470R	6218037-up	2	0.022	28-34	650-700	3,800-4,200	30-60
485	All	224	0.022	28-34	650-700	4,400-4,800	30-60
488, 488R	All	224	0.022	28-34	650-700	4,400-4,800	30-60
888 To	4169596	302	0.017	26-31	550-600	3,800-4,200	40-70
888	4169597-up	302	0.016-0.019	28-31	650-700	3,800-4,200	40-70
190	All	283	0.016	28-32	550-600	3,700-4,100	35

(continued)

Table 6 **MERCURISER TUNE-UP** SPECIFICATIONS (continued)

Model	Serial No.	cid	Distributor point gap (in.)	Dwell angle (degrees)	Idle Rpm (In gear)	WOT RPM	Oil Pressure (psi) ¹
898, 898R,							
200MR	All	305	0.016-0.019	26-31	650-700	3,800-4,200	30-55
200	All	292	0.016	28-34	500-600	3,900-4,300	30-55
215	All	302	0.017	26-31	550-600	3,800-4,200	40-70
225	To 2278646	327	0.016-0.019	28-31	550-600	3,800-4,200	30-55
225	2278647 to 3385720	327	0.016-0.019	28-31	550-600	3,800-4,200	30-55
225	3385721-up	302	0.016-0.019	28-31	550-600	3,800-4,200	40-70
228, 228R	All	305	0.016-0.019	28-31	650-700	4,200-4,600	30-55
230MR,							
230	II-TR All	305	0.016-0.019	28-31	650-700	4,200-4,600	30-55
228-TR	All	305	0.016-0.019	28-31	650-700	3,800-4,200	30-55
233	All	351	0.016-0.019	28-31	See note 7	3,800-4,200	40-70
250	To 4707999	327	See note 10	See note 1	0	550-600	3,800-4,200 -55
250	4708000-up	350	0.016-0.019	28-31	650-700	4,200-4,600	30-55
255 II-TR,							
255 II-TRS	To 4175499	351	0.016-0.019	26-31	550-600	3,800-4,200	40-70
255	II-TRS 4175500-up	350	0.016-0.019	28-31	650-700	3,800-4,200	30-55
260, 260R,							
260MR,							
260	II-TR All	350	0.016-0.019	28-31	650-700	4,200-4,600	30-55
270	All	350	See note 10	See note 1	0	550-600	3,800-4,200 -55
280	II-TRS All	350	0.016-0.019	26-31	850-900	4,800-5,000	30-55
310	All	409	0.016-0.019	28-31	550-600 ^{4, 5, 0, 0}		35
325	To 2761141	427	See note 10	See note 10	550-600	3,800-4,200	30-70
325	3043030-up	427	See note 10	See note 10	550-600	3,800-4,200	30-70
330, 330 II-TR,							
330	II-TRS All	454	0.016-0.019	28-31	650-700	4,200-4,600	30-70
370 II-TRS,							
400	II-TRS All	454	0.016-0.019	26-31	800-850	4,800-5,200	30-70
390	All	482	See note 10	See note 1	0	550-600	3,800-4,200 -70

1. @ 2,000 rpm.
2. Minimum 45 psi @ 4,000 rpm.
3. Use AC-CR43N for heavy-duty, high-speed applications.
4. 5/8 in. hex, use **AC-MR43TS**, except on Model 868 with serial Nos. 4615130 through 4616217 and **4616267-up**. Use AC-R42TS on these engines. 13/16 in. hex, use **AC-C83T**.
5. Time engines with distributor Nos. 1111076 and 1111249 @ 8° BTDC; all others are timed @ 12° BTDC.
6. Time engines with distributor No. **C9FJ-12127-A** or B @ 12° BTDC; with distributor No. **D1JF-12127-JA** or KA, timing is 10° BTDC.
7. Serial No. 4173767 and below: 550-600 rpm. Serial No. 4173768 and above; **650-700** rpm.
8. Not applicable; polar gap spark plug is used.
9. If engine is equipped with service replacement head containing tapered spark plug holes, use **AC-MR41T**.
10. Thunderbolt breakerless ignition.