Chapter Three

Troubleshooting

Any engine requires an uninterrupted supply of fuel and air, proper ignition and adequate compression. If any of these are lacking, the engine will not run.

Troubleshooting is a relatively simple matter when it is done logically. The first step in any troubleshooting procedure is to define the symptoms as closely as possible and localize the problem. Subsequent steps involve testing and analyzing those areas which could cause the symptoms. **A** haphazard approach may eventually solve the problem, but it can be very costly in terms of wasted time and unnecessary parts replacement.

There are two axioms to remember about troubleshooting:

a. The source of the problem is seldom where you think it is.
b. When all else fails, go back to basics-simple solutions often solve complex-appearing problems.

The troubleshooting procedures in this chapter analyze typical symptoms and show logical methods of isolation. These are not the only methods. There may be several approaches to a problem, but all methods must have one thing in common-a logical, systematic approach.

Troubleshooting diagrams for individual systems are provided within the chapter. Master troubleshooting charts are provided in **Table 1** and **Table** 2 at the end of the chapter.

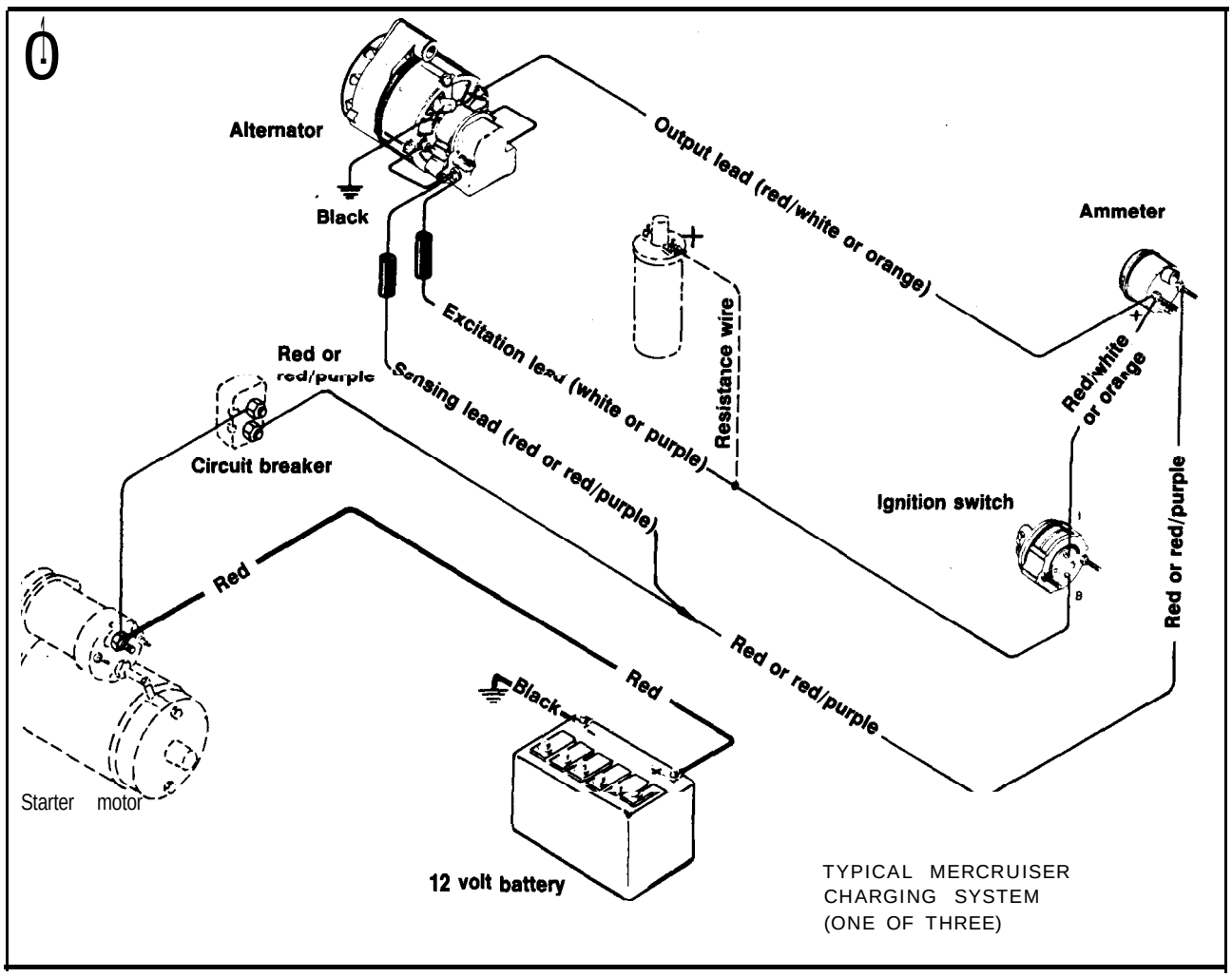
STARTING SYSTEM

The starting system consists of the starter motor and starter solenoid. The ignition key controls the starter solenoid, which mechanically engages the starter with the engine flywheel and supplies electrical current to turn the starter motor.

Starting system problems are relatively easy to find. In most cases, the trouble is a loose or dirty electrical connection. **Table 1** provides routines for finding the problem.

CHARGING SYSTEM

The charging system consists of the alternator, voltage regulator and battery. A drive belt driven by the engine crankshaft turns the alternator which produces electrical energy to charge the battery. As engine speed varies, the voltage from the alternator



TYPICAL MERCRUISER CHARGING SYSTEM (ONE OF THREE)

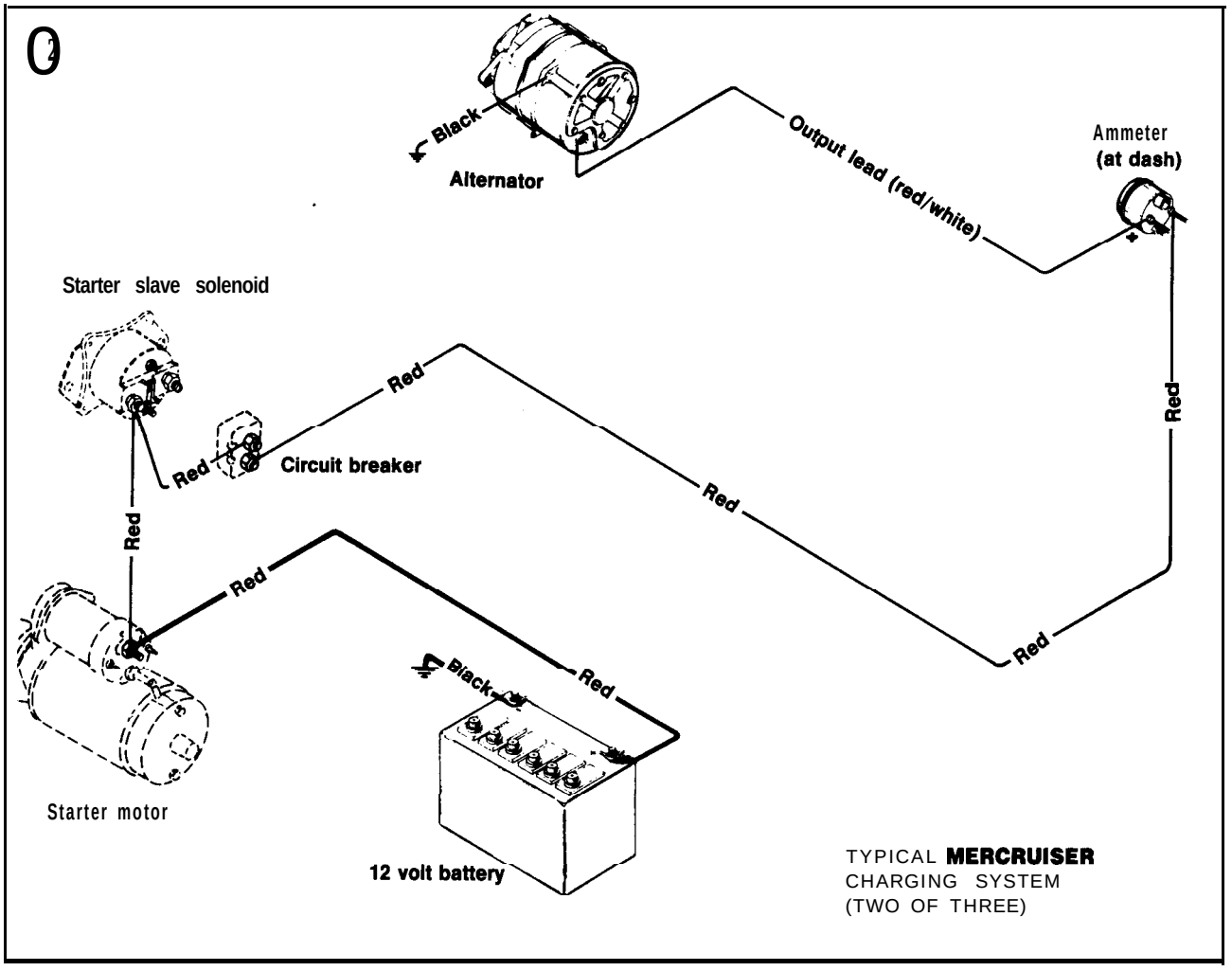
varies. A voltage regulator maintains the voltage to the electrical system at safe levels. A warning light or gauge on the instrument panel signals when charging is not taking place. **Figures l-3** show typical MerCruiser charging systems.

Complete troubleshooting of the charging system requires test equipment and skills which the average home mechanic does not possess. However, there are a few tests which can be done to pinpoint most problems.

Charging system troubles may stem from a defective alternator, voltage regulator, battery or drive belt. They may also be caused by something as simple as incorrect drive belt tension. The following are symptoms of typical problems you may encounter.

1. Battery dies frequently, even though the warning lamp indicates no discharge-This can be caused by a drive belt that is slightly too loose. With the engine off, grasp the alternator pulley with both hands and try to turn it. If the pulley can be turned without moving the belt, the drive belt is too loose. As a rule, keep the belt tight enough so that it can be deflected only about 1/2 in. under moderate thumb pressure applied between the pulleys. The battery may also be at fault; test the battery condition as described in Chapter Thirteen.

2. Charging system warning lamp does not come on when ignition switch is turned on-This may indicate a defective ignition switch, battery, voltage regulator or lamp. First try to start the engine. If it doesn't start, check the ignition switch and battery. If the engine starts, remove the warning lamp and test it for continuity with an ohmmeter or substitute a new lamp. If the lamp is good, locate the voltage regulator and make sure it is properly grounded (try tightening the mounting screws). If the problem persists, the alternator brushes may



TYPICAL **MERCRUISER** CHARGING SYSTEM (TWO OF THREE)

not be making contact. Test the alternator and voltage regulator as described in Chapter Thirteen.

3. Alternator warning lamp comes on and stays on-This usually indicates that no charging is taking place. First check drive belt tension, then the battery condition. Check all wiring connections in the charging system. If this does not locate the problem, check the alternator and voltage regulator as described in Chapter Thirteen.

4. Charging system warning lamp flashes on and off intermittently-This usually indicates that the charging system is working intermittently. Check drive belt tension first, then check all electrical connections in the charging circuit. **As** a last resort, check the alternator.

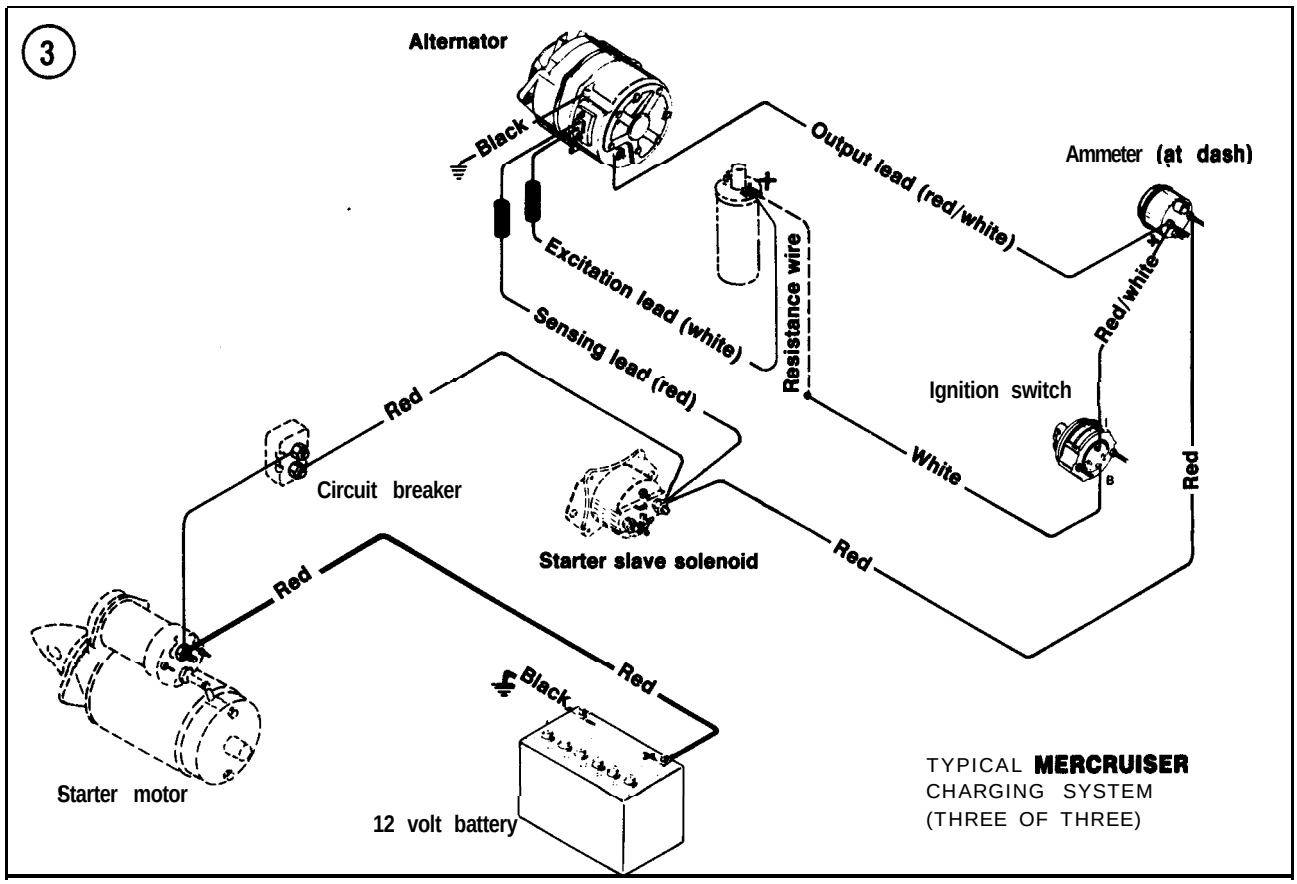
5. Battery requires frequent addition of water or lamps require frequent replacement-The alternator is probably overcharging the battery. The voltage regulator is most likely at fault.

6. Excessive noise from the alternator-Check for loose mounting brackets and bolts. The problem may also be worn bearings or (in some cases) lack of lubrication. If an alternator whines, a shorted diode may be the problem.

IGNITION SYSTEM

The ignition system may be either a mechanical contact breaker point type or a Thunderbolt breakerless ignition. Most problems involving a failure to start, poor performance or rough running stem from trouble in the ignition system, particularly in contact breaker systems. Many novice troubleshooters assume that these symptoms point to the fuel system instead of the ignition system (remember our axioms?).

Ignition system troubles may be roughly divided between those affecting only one cylinder and those affecting all cylinders. If the problem affects only



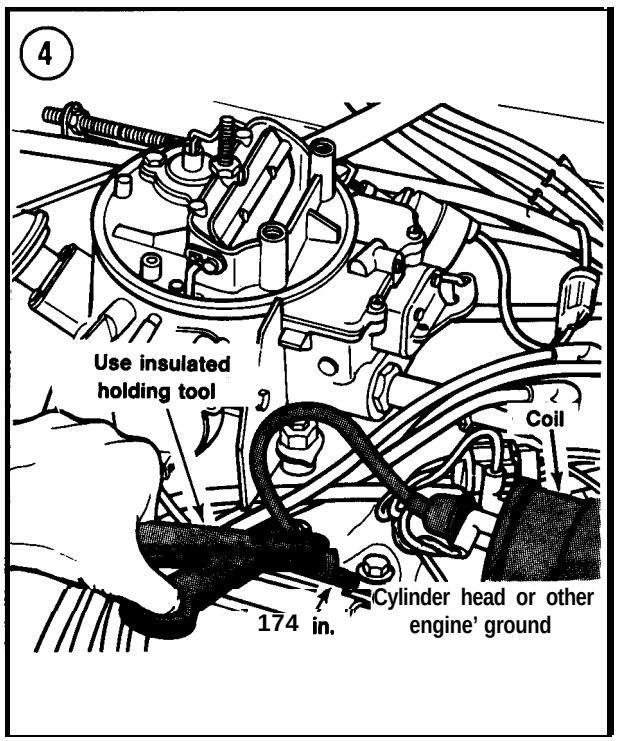
one cylinder, it can only be in the spark plug, spark plug wire or that portion of the distributor associated with that cylinder. If the problem affects all cylinders (weak spark or no spark), then the trouble is in the ignition coil, rotor, distributor or associated wiring.

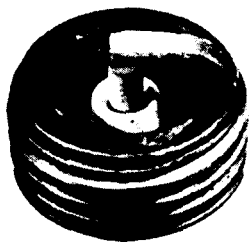
Some tests of the ignition system require running the engine with a spark plug or ignition coil wire disconnected. The safest way to do this is to disconnect the wire with the engine stopped, then hold its end next to a metal surface with insulated pliers as shown in **Figure 4.**

WARNING

Never disconnect a spark plug or ignition coil wire when the engine is running. The high voltage in an ignition system, particularly in breakerless systems, could cause serious injury or even death.

Spark plug condition is an important indicator of engine performance. Spark plugs in a properly operating engine will have slightly pitted electrodes and a light tan insulator tip. **Figure 5** shows a

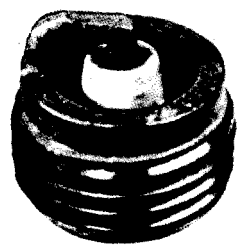




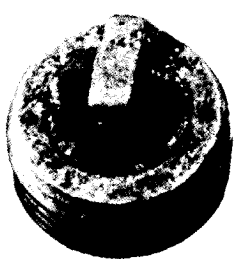
Normal plug appearance noted by the brown to grayish-tan deposits and slight electrode wear. This plug indicates the correct plug heat range and proper air fuel ratio.

Red, brown, yellow, and white coatings caused by fuel and oil additives. Such additives should not be used or damage will result.

Carbon fouling distinguished by dry, fluffy black carbon deposits which may be caused by an overich air/fuel mixture, excessive hand choking, clogged air filter, or excessive idling.

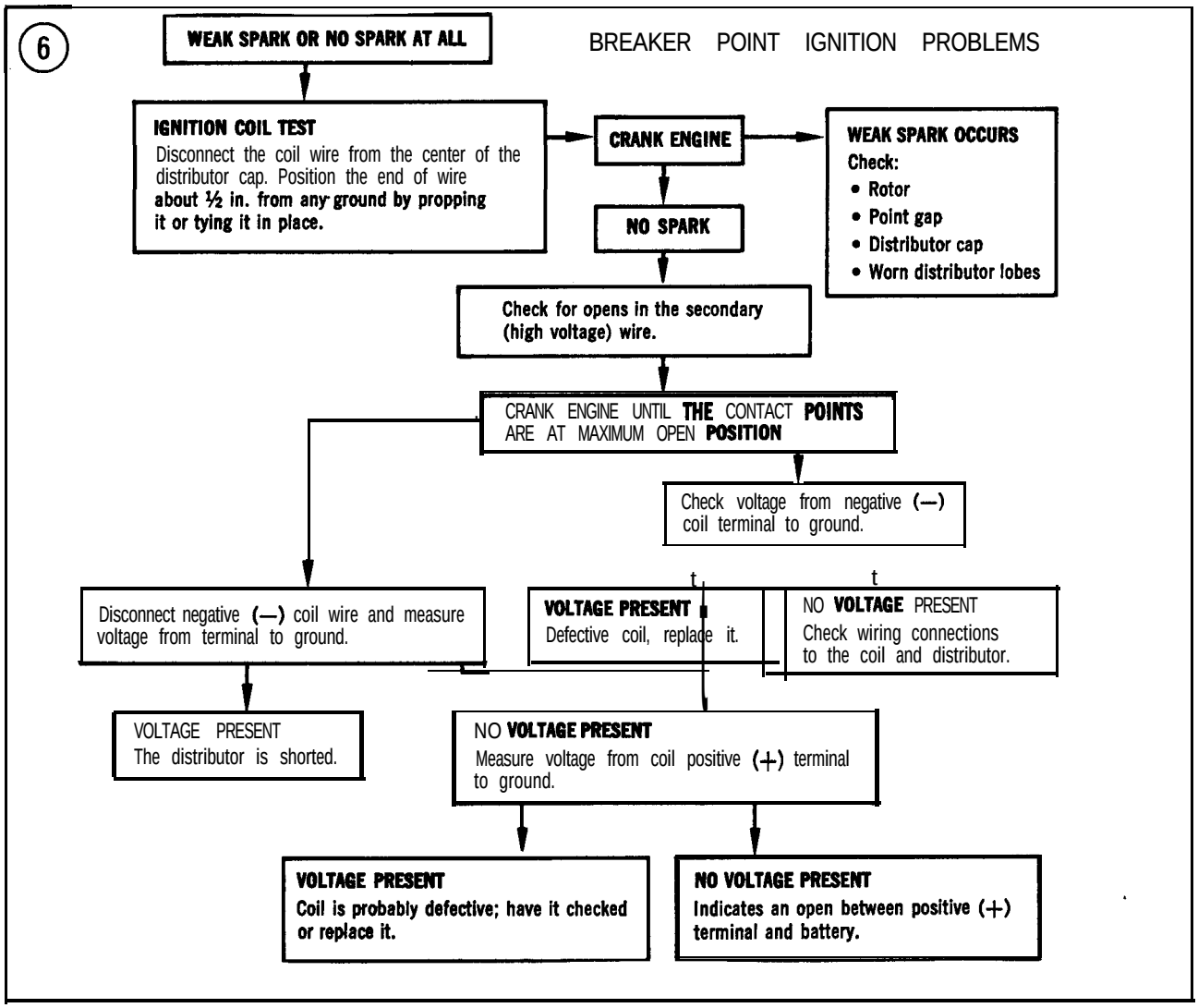


Shiny yellow glaze insulator cone is caused when the powdery deposits from fuel and oil additives melt. **Melting occurs during hard acceleration after** prolonged idling. This glaze conducts electricity and shorts out the plug. Avoid the use of additives at all times.



Oil fouling indicated by wet, oily deposits. A hotter plug temporarily reduces oil deposits but a plug that is **too hot leads to preignition and possible engine** damage.

Overheated plug indicated by burned or blistered insulator tip and badly worn electrodes. This condition **may be caused by preignition, cooling system** defects, lean air/fuel ratios, low octane fuel, or over advanced ignition timing.



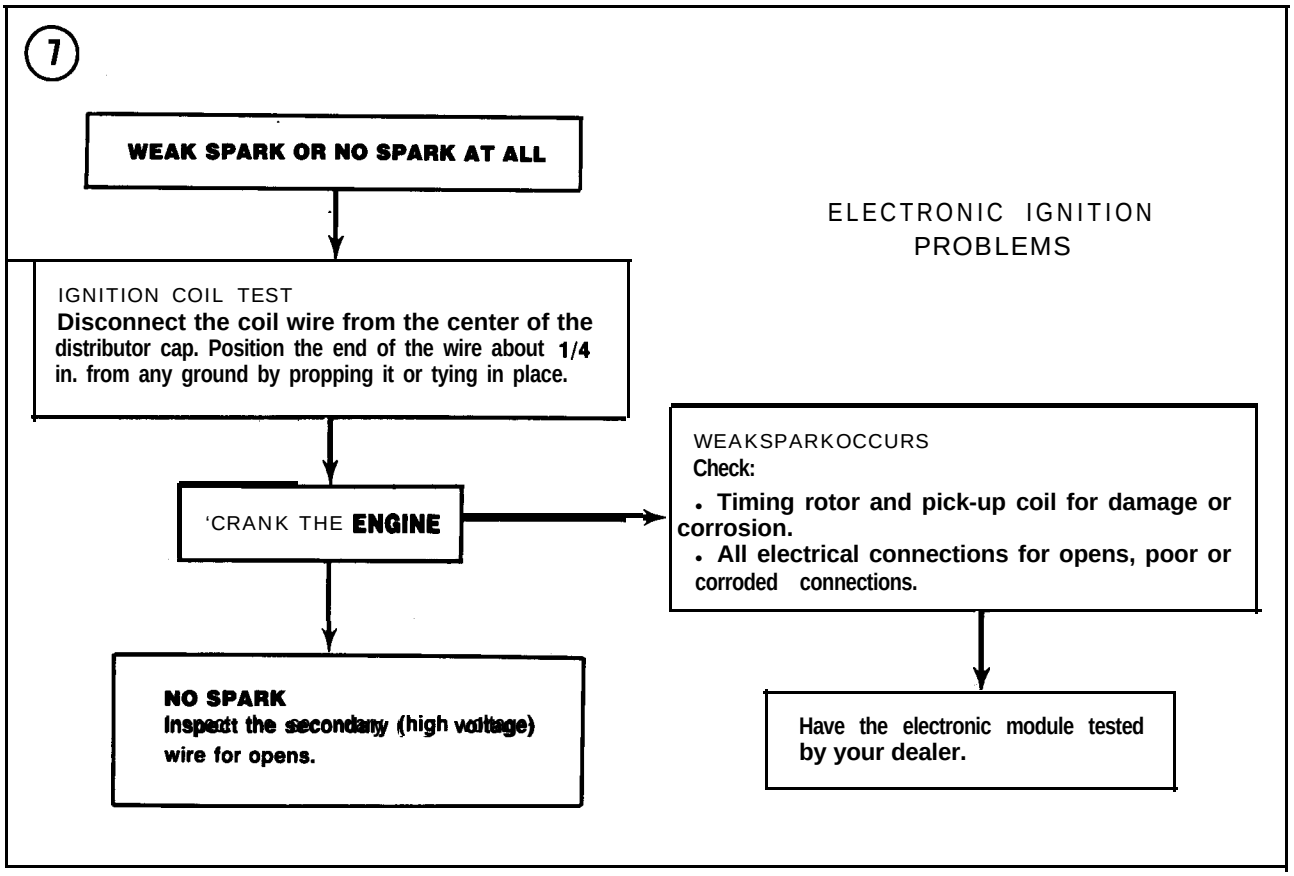
normal plug and a number of others which indicate trouble in their respective cylinders.

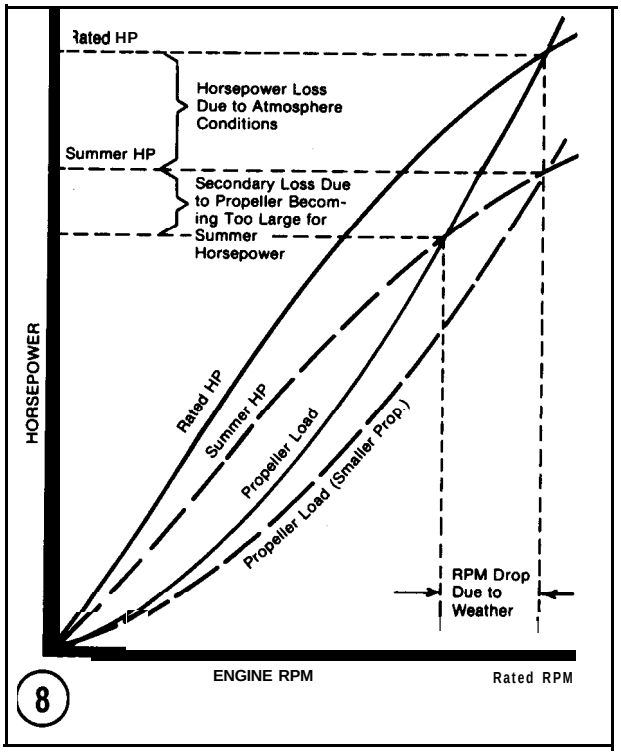
The troubleshooting procedures outlined in **Figure** 6 (breaker point ignition) or **Figure 7** (breakerless ignition) will help you isolate ignition problems quickly. These procedures assume that the battery is in good enough condition to crank the engine over at its normal rate.

ENGINE PERFORMANCE

Elevation and weather have definite effects on the wide-open throttle power of any internal combustion engine. As elevation increases, the air get thinner and the engine air-fuel mixture leans out. Installation of a lower pitch prop will regain some of the lost performance, but the basic problem remains: The diameter of the prop line is too large for the reduced power available. Your MerCruiser dealer can calculate how much diameter must be removed from a lower pitch prop to provide good performance at high elevations. You may find it helpful to make a gear ratio change to provide more reduction.

Heat and humidity affect the density of the air in a similar manner. This is particularly noticeable when your MerCruiser is propped out on a cool, dry spring day or seems to lose its pep during hot, humid August days. You may lose up to 14 percent of the available horsepower, resulting in a 2-3 mph reduction in speed and an inability to get the boat on plane. **Figure** 8 shows the relationship between horsepower and weather conditions.





A number of other factors can make the engine difficult or impossible to start or cause rough running, poor performance and so on. The majority of novice troubleshooters immediately suspect the carburetor. In the majority of cases, however, the problem lies in the ignition system.

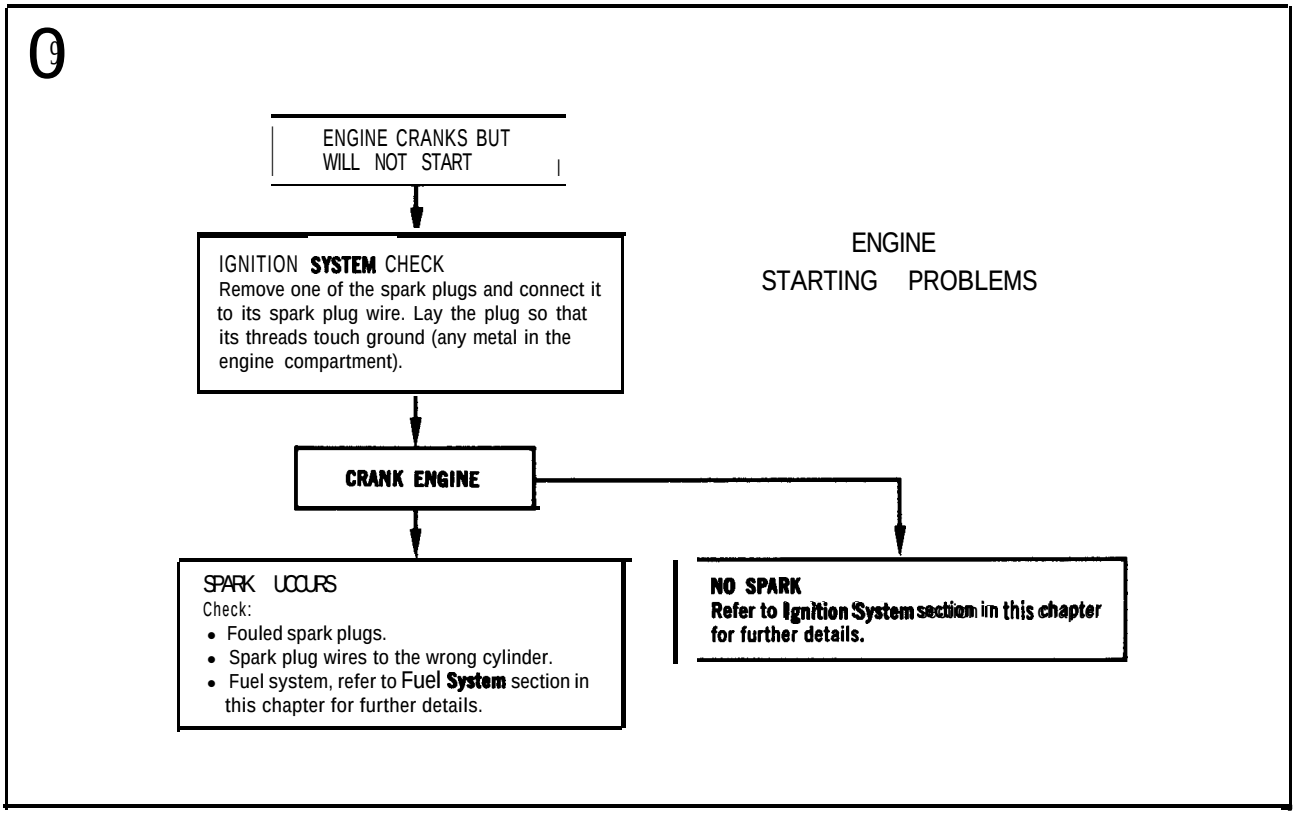
The troubleshooting procedures outlined in **Figures 9-12** and **Table 1** will help you solve most engine performance problems in a systematic manner.

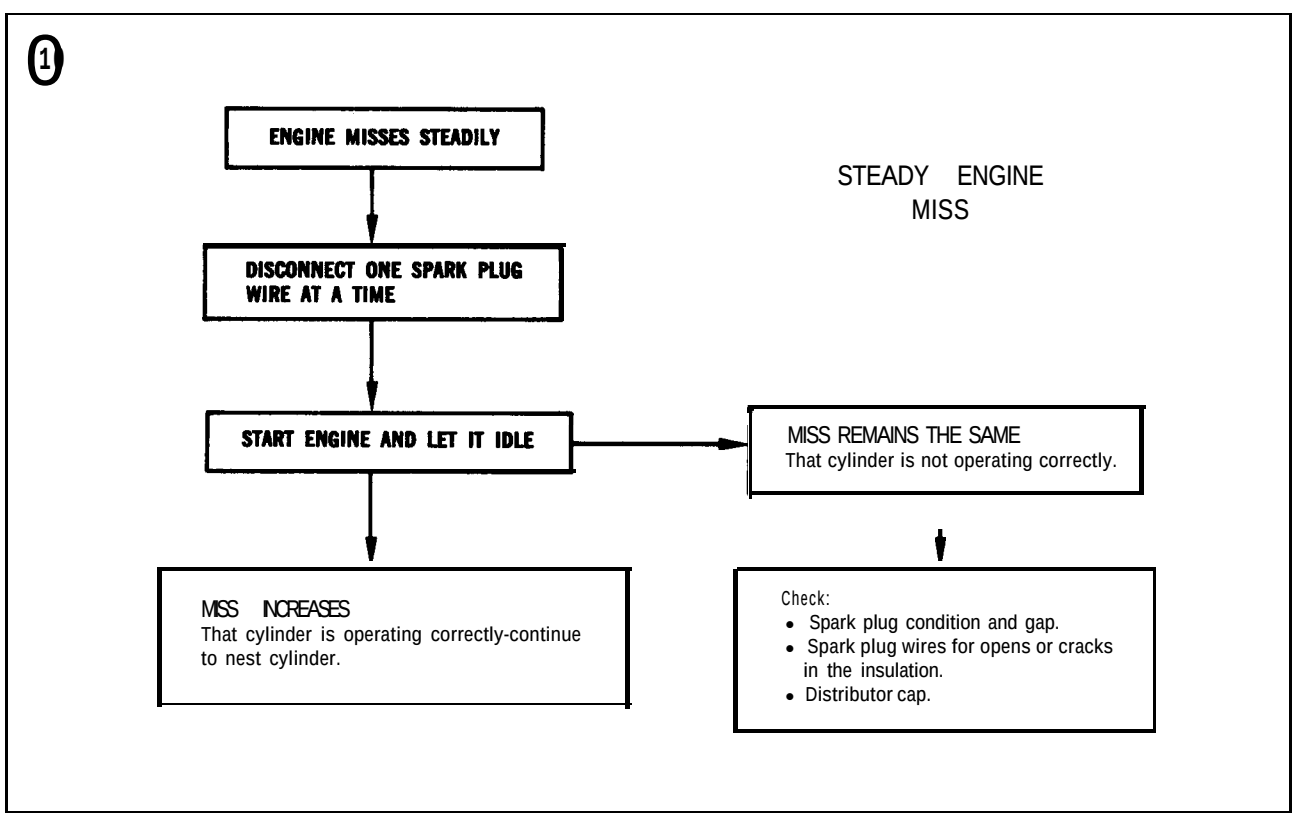
ENGINE OIL PRESSURE INDICATOR

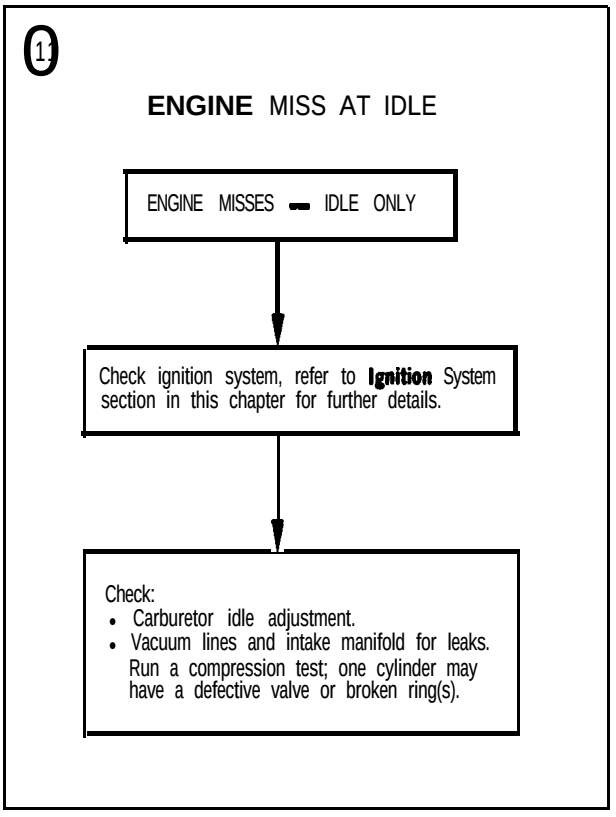
Proper oil pressure to the engine is vital. If oil pressure is insufficient, the engine can destroy itself in a comparatively short time.

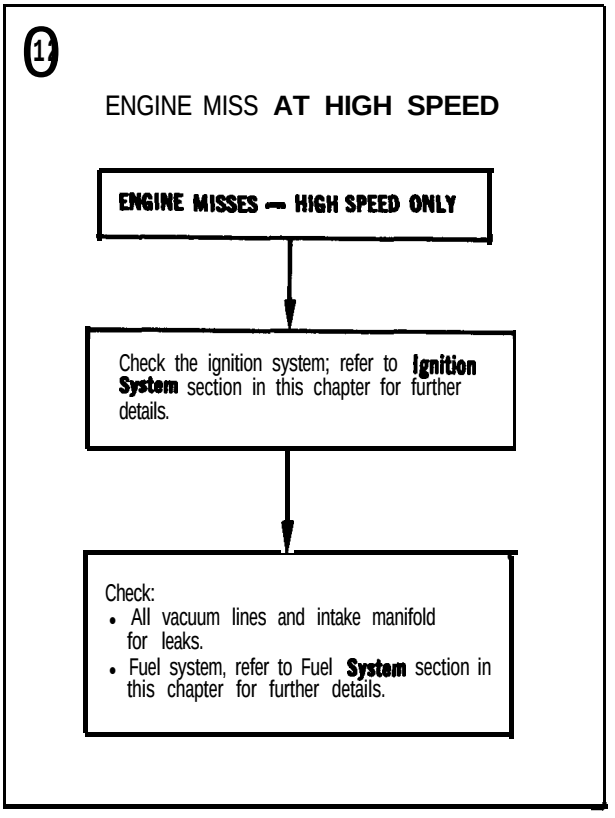
The oil pressure warning circuit monitors oil pressure constantly. If pressure drops below a predetermined level, the warning light comes on.

Obviously, it is vital that the warning circuit be in working order to signal low oil pressure. Each time you turn on the ignition, but before you start the engine, the warning light should come on. If it doesn't, there is trouble in the warning circuit, not


ENGINE CRANKS BUT WILL NOT START
IGNITION SYSTEM CHECK
Remove one of the spark plugs and connect it to its spark plug wire. Lay the plug so that its threads touch ground (any metal in the engine compartment).
CRANK ENGINE
SPARK OCCURS
Check:
• Fouled spark plugs.
• Spark plug wires to the wrong cylinder.
• Fuel system, refer to Fuel System section in this chapter for further details.
NO SPARK
Refer to Ignition System section in this chapter for further details.
ENGINE STARTING PROBLEMS


ENGINE MISSES STEADILY
DISCONNECT ONE SPARK PLUG WIRE AT A TIME
START ENGINE AND LET IT IDLE
MISS REMAINS THE SAME
That cylinder is not operating correctly.
MISS INCREASES
That cylinder is operating correctly-continue to nest cylinder.
Check:
• Spark plug condition and gap.
• Spark plug wires for opens or cracks in the insulation.
• Distributor cap.
STEADY ENGINE MISS





the oil pressure system. **See Figure 13** to troubleshoot the warning circuit.

Once the engine is running, the warning light should stay off. If the warning light comes on or acts erratically while the engine is running, there is trouble with the engine oil pressure system. *Stop the engine immediately*. Refer to **Figure 14** for possible causes of the problem.

ENGINE OIL LEAKS

Like automotive engines, Mercruiser engines are subject to oil leaks. Boat installation, however, may make it difficult to determine exactly where the leak is. Many owners of new boats who discover oil in the bilge assume that it came from the power trim system during installation. Generally, such oil leaks into the sealed flywheel housing through the rear main oil seal if the boat is shipped at too high an angle. This is not a serious problem and is self-correcting, as long as the boat is not stored at a high angle. The oil that leaks past the seal will spray out of the water pump vent on the starter motor side of the engine and can be wiped up.

More common oil leaks are found as hours are put onto the engine. A leaking rear main seal will allow oil to run down the outside of the flywheel housing when the engine is running. Replacing the seal will stop the leak.

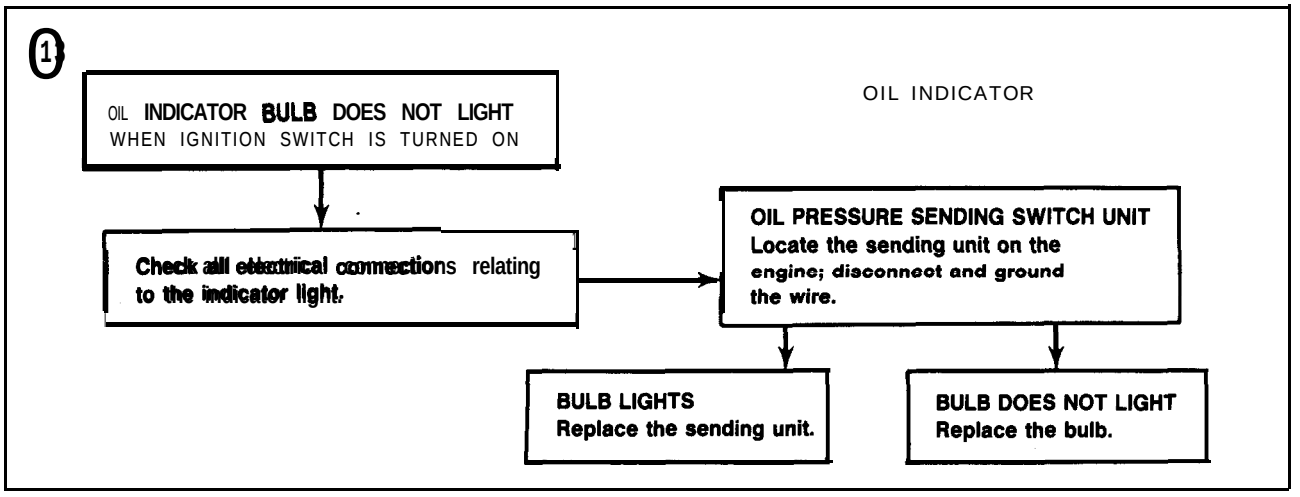
A leaking oil pan gasket will also allow oil to run down the outside of the flywheel housing when the engine is running. The leaking oil is usually found on the starter motor side of the engine. The most common cause of a leaking pan gasket is overtightening of the pan attaching screws. If a leak is traced to the oil pan, replace the gasket and check the pan gasket surface for warpage.

ENGINE NOISES

Often the first evidence of an internal engine problem is a strange noise. That knocking, clicking or tapping sound which you never heard before may be warning you of impending trouble.

While engine noises can indicate problems, they are difficult to interpret correctly; inexperienced mechanics can be seriously misled by them.

Professional mechanics often use a special stethoscope (which looks like a doctor's stethoscope) for isolating engine noises. You can do nearly as well with a "sounding stick" which can be an ordinary piece of doweling or a section of small



hose. By placing one end in contact with the area to which you want to listen and the other end near your ear, you can hear sounds emanating from that area. The first time you do this, you may be horrified at the strange sounds coming from even a normal engine. If you can, have an experienced friend or mechanic help you sort out the noises.

Clicking or Tapping Noises

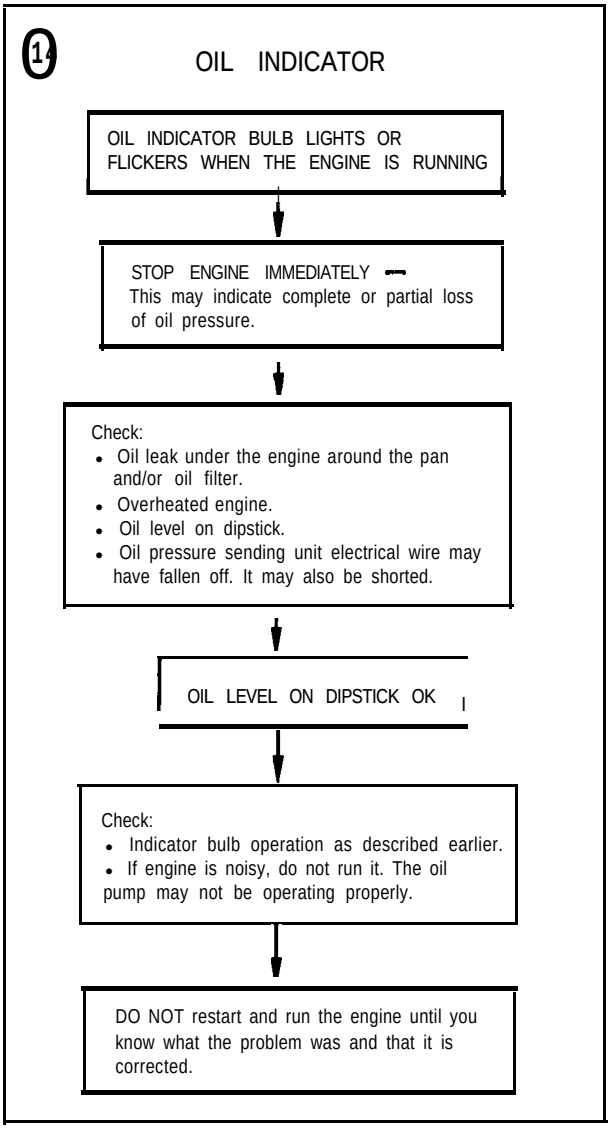
Clicking or tapping noises usually come from the valve train and indicate excessive valve clearance. A sticking valve may also sound like a valve with excessive clearance. In addition, excessive wear in valve train components can cause similar engine noises.

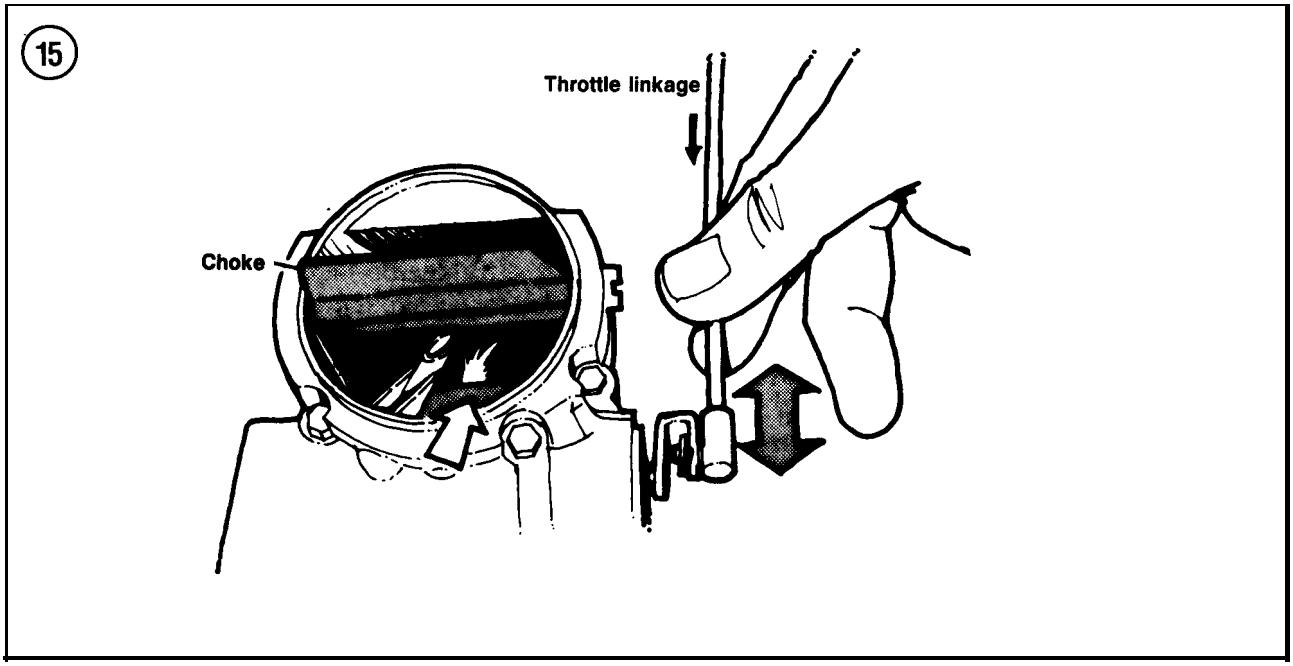
Knocking Noises

A heavy, dull knocking is usually caused by a worn main bearing. The noise is loudest when the engine is working hard, such as when accelerating at low speed. You may be able to isolate the trouble to a single bearing by disconnecting the spark plugs one at a time. When you reach the spark, plug nearest the bearing, the knock will be reduced or disappear.

Worn connecting rod bearings may also produce a knock, but the sound is usually more metallic. As with a main bearing, the noise is worse during acceleration. It may increase just as you go from acceleration to coasting. Disconnecting the spark plugs will help isolate this knock as well.

A double knock or clicking usually indicates a worn piston pin. Disconnecting spark plugs will





isolate this to a particular piston; however, the noise will *increase* when you reach the affected piston.

A loose flywheel and excessive crankshaft end play also produce knocking noises. While similar to main bearing noises, these are usually intermittent, not constant, and they do not change when spark plugs are disconnected. When caused by a loose flywheel or coupling, the noise is generally heard at idle or during rapid deceleration. It is a good idea to recheck flywheel/coupler nut torque whenever the engine is removed from the boat.

Some mechanics confuse piston pin noise with piston slap (excessive piston clearance). The double knock will distinguish piston pin noise. Piston slap will always be louder when the engine is cold.

FUEL SYSTEM

Fuel system problems must be isolated to the fuel pump, fuel lines, fuel filter or carburetor. The following procedures assume that the ignition system is working properly and is correctly adjusted.

1. *Engine will not* start-First make sure that fuel is being delivered to the carburetor. Remove the flame arrestor, look into the carburetor throat and operate the throttle linkage several times. There should be a stream of fuel from the accelerator pump discharge tube each time the throttle linkage is moved **(Figure 15).** If not, check fuel pump pressure as described in Chapter Eleven. Also check the float valve and float adjustment. If the engine will not start, check the automatic choke parts for sticking or damage. If necessary, rebuild or replace the carburetor.

2. Engine runs at fast idle-Check the choke setting. Check the idle speed and mixture adjustments.

3. Rough idle or engine miss with frequent stalling-Check idle mixture and idle speed adjustments.

4. Engine "diesels" (continues to run) when ignition is switched off—Check idle mixture (probably too rich), ignition timing and idle speed (probably too fast). Check for engine overheating.

5. Stumbling when accelerating from idle-Check the idle speed and mixture adjustments. Check the carburetor accelerator pump.

6. Engine misses at high speed or lacks power-This indicates possible fuel starvation. Check fuel pump pressure as described in Chapter Eleven. Check float needle valve(s). Check for a clogged fuel filter or dirty flame arrestor.

7. Black exhaust smoke-This indicates a badly overrich mixture. Check idle mixture and idle speed adjustments. Check choke setting. Check for excessive fuel pump pressure, leaky float(s) or worn needle valve(s).

8. Excessive fuel consumption-Check for overrich mixture. Make sure choke mechanism works

properly. Check idle mixture and idle speed adjustments. Check for excessive fuel pump pressure, leaky float(s) or worn needle valve(s).

COOLING SYSTEM

The temperature gauge usually signals cooling system problems before there is any damage. As long as you stop the engine at the first indication of trouble, serious damage is unlikely.

With standard cooling systems in which sea water is drawn into the engine, circulated and then expelled, cooling system problems are generally mechanical-a faulty pump, defective thermostat, loose or broken drive belt or passages plugged with contamination or foreign material.

Closed cooling systems are more complex in that they use a heat exchanger which transfers heat from the engine coolant to sea water without the two coming in contact. The "closed" portion of the cooling system is pressurized (like an automotive cooling system) and uses a 50/50 mixture of ethylene glycol antifreeze and pure soft water. This system should be checked periodically to make sure it can withstand 14 psi.

Heat exchangers used in closed cooling systems collect salt, silt, lime and other contaminants in their passages, leading to a gradual decrease in cooling efficiency. For this reason, they should be removed every 2 years and the sea water passages cleaned with a wire brush and compressed air.

STERN DRIVE UNIT

In normal straight-ahead operation, a stem drive makes very little noise. Changing direction to port or starboard will increase the noise level from the universal joints, but it should not be objectionable.

If U-joint noise is suspected, attach a Flush-test device (Chapter Four) and run the engine at idle. Have an assistant turn the stem drive first to port and then starboard while you listen for noise at the upper driveshaft housing. Any unusual noise during this test indicates U-joint wear or a defective gimbal bearing.

Stem drive noises can occur in either the drive shaft (upper) or gear (lower) housings. Isolate the location of the noise and refer to **Table 2** for possible causes and solutions.

Propeller damage may occur without being obvious. If the propeller has hit many underwater objects, it may slip on its hub.

If water leaks into the boat, inspect the gimbal housing seal, U-joint bellows or shift cable bellows.

A shift handle that is difficult to move may be caused by a problem in the stem drive, transom shift cable, shift box or remote control cable. To isolate the trouble, disconnect the remote control cable at the transom plate. If shifting is still difficult, the shift cable or control box are at fault. If shifting is normal, the problem is in the stem drive. Have an assistant turn the propeller by hand while you move the shift cable back and forth between the stem drive and transom plate. If the cable does not move freely, replace it.

Tilt/trim system problems may be mechanical, electrical or hydraulic. Any of these can prevent the stem drive from moving to a full up or full down position. First check to make sure that the stem drive is in forward gear. If it is in reverse, the shift interlock switch will prevent the power trim system from operating.

Mechanical problems result from frozen U-joints, lack of proper lubrication or non-use over a lengthy period. Electrical problems involve the pump motor wiring circuit and can be determined by disconnecting either the blue wire in the UP circuit or green wire in the DOWN circuit and connecting it to the positive battery terminal with a jumper lead. If the pump runs, the problem is electrical; if it does not run, check the pump, trim cylinders and hydraulic system. Many hydraulic problems are caused by low or contaminated hydraulic fluid.

Table 1 ENGINE TROUBLESHOOTING

Trouble	Probable cause	Correction
Starter will not start engine	Discharged battery	Charge or replace battery
	Corroded battery terminals	Clean terminals
	Loose connection in starting circuit	Clean and tighten all connections
	Defective starting switch	Replace switch
	Starting motor brushes dirty	Clean or replace brushes
	Jammed Bendix gear	Loosen starter motor to free gear
	Faulty starter motor	Replace motor
Starter turns but does rot crank engine	Partially discharged battery	Charge or replace battery
	Defective wiring or wiring capacity too low	Locate and replace defective wiring
	Broken Bendix drive	Remove starter motor and repair drive
Engine will not start	Empty fuel tank	Fill tank with proper fuel
	Flooded engine	Remove spark plugs and crank engine several times; replace plugs
	Water in fuel system	Clean fuel tank, lines and carburetor; refill with proper fuel
	Inoperative or sticking choke valve	Check choke, linkage and choke rod/cable for proper operation
	Improperly adjusted carburetor	Adjust carburetor
	Clogged fuel lines oi defective fuel pump	Disconnect fuel line @ carburetor. If fuel does not flow freely when engine is cranked, clean fuel line and sediment bowl (if so equipped). If fuel still does not flow freely after cleaning, repair or replace fuel pump
Engine will not start (Poor connections and other causes)	Air leak around intake manifold	Check for leak by squirting oil around intake connections; If leak is found, tighten manifold and replace gaskets, if necessary
	Loose spark plugs	Check all plugs for proper seating, gasket and tightness; replace all damaged plugs and gaskets
	Loosely seating valves	Check for broken or weak valve springs, warped stems, carbon and gum deposits and insufficient tappet clearance
	Damaged cylinder head gasket	Check for leaks around gasket when engine is cranked; if a leak is found, replace gasket
	Worn or broken plston rings	Replace worn or broken rings; check cylinders for out-of-round and taper
Engine will not start (Ignition system)	Ignition switch OFF or defective	Turn on switch or replace
	Fouled or broken spark plugs	Remove plugs and check for cracked porcelain, dirty points or improper gap
	Improperly set, worn or pitted distributor points; defective ignition coil	Remove center wire from distributor cap and hold within 3/8 in. of engine block. Crank engine. A clean, sharp spark should jump between wire and block when points open. Clean and adjust points. If spark is weak or yellow after point adjustment, replace condenser. If spark is still weak or not present, replace ignition coil.

(continued)

Table 1 ENGINE TROUBLESHOOTING (continued)

Trouble	Probable cause	Correction
Engine will not start (ignition system) (Cont.)	Wet, cracked or broken distributor cap	Dry inside surfaces of cap with clean cloth. Inspect for cracks or other defects; replace if necessary.
	Engine timing off	Set engine timing
Hard starting when cold	Choke out of adjustment	Check choke adjustment
	Stale or sour fuel	Drain fuel tank and refill with fresh fuel
	Defective fuel pump	Replace fuel pump
	Malfunction in ignition system	Check ignition system
	Improper engine timing	Check and adjust timing
Hard starting when hot	Choke out of adjustment	Check choke adjustment
	Incorrect spark plugs	Replace with plugs of the proper heat range
	Defective coil and/or condenser	Test and replace if necessary
	Water in fuel	Drain and clean fuel tank, lines and carburetor; refill with proper fuel
Excessive coolant temperatures	No water circulation	Check for clogged water lines and restricted inlets/outlets. Check for broken or stuck thermostat. Look for worn or damaged water pump or water pump drive.
	Defective thermostat	Replace thermostat
No oil pressure	Defective gauge	Replace gauge
	No oil in engine	Refill with proper grade oil
	Dirt in pressure relief valve	Clean oil pump valve
	Defective oil pump, oil line leak or broken oil pump drive	Check oil pump and oil pump drive for worn or broken parts; Tighten all oil line connections
Low oil pressure	Oil leak in pressure line	Inspect all oil lines; tighten all connections
	Weak or broken pressure relief valve spring	Replace relief valve spring
	Worn oil pump	Replace oil pump
	Worn or loose bearings	Replace bearings
Oil pressure too high	Engine oil viscosity too thick	Drain crankcase and replace with oil of proper viscosity
	Pressure relief valve stuck	Clean or replace valve
	Dirt or obstructions in lines	Drain and clean oil system; check for bent or flattened oil lines and replace where necessary
Rpm loss	Damaged propeller	Repair or replace propeller
	Bent rudder	Repair
	Misalignment	Realign engine to stern drive
	Dirty boat bottom	Clean boat bottom
Vibration	Misfiring or preignition	See “Preignition” portion of this table
	Loose mounting or mounting bolts	Tighten

(continued)

Table 1 ENGINE TROUBLESHOOTING **(continued)**

Trouble	Probable cause	Correction
Vibration (cont.)	Loose crankshaft balancer or flywheel	lighten bolts
	Loose alternator	Tighten bolts
	Propeller shaft bent or out-of-line	Repair or replace
	Propeller bent or pitch out-of-true	Repair or replace
Preignition	Defective spark plugs	Check all spark plugs for broken porcelain, burned electrodes or incorrect gap; replace all defective plugs or clean and reset gap
	Improper timing	Set timing
	Engine carbon	Remove cylinder head and clean out carbon
	Engine overheating	See "Excessive coolant temperature" portion of this table
Backfiring	Insufficient fuel reaching engine due to dirty lines, strainer or blocked fuel tank vent; water in fuel	See "Engine will not start" portion of this table
	Improper distributor adjustment	See "Engine will not start" portion of this table
Sludge in oil	Infrequent oil changes	Drain and refill with proper weight oil
	Water in oil	Drain and refill; if trouble persists, check for cracked block, cracked head or defective head gasket
	Dirty oil filter	Replace oil filter

Table 2 STERN DRIVE TROUBLESHOOTING

Trouble	Probable cause	Correction
Gear housing noise	Contaminated lubricant	Disassemble, clean, inspect and reassemble; fill with clean lubricant
	Incorrectly installed propeller	Remove propeller and reinstall correctly
	Damaged propeller	Replace propeller
	Incorrect gear alignment/shimming	Check and correct alignment/shimming as required
	Worn, loose or damaged parts	Disassemble unit and replace parts as required
Drive shaft housing noise	Low lubricant level	Add lubricant
	Worn/dirty U-joint bearings	Clean/repair as required
	Worn/dirty gimbal or transmission output bearing	Clean/repair as required
	Contaminated lubricant	Disassemble, clean, inspect and reassemble; fill with clean lubricant
	Transom too thin	Shim transom plates
	Incorrect gear alignment/shimming	Check and correct alignment/shimming as requires
	Worn, loose or damaged parts	Disassemble unit and replace parts as required
	Engine misaligned	Align with proper tools
	Worn engine coupler	Replace

(continued)

Table 2 STERN DRIVE TROUBLESHOOTING (continued)

Trouble	Probable cause	Correction
MerCruiser I-Drive will not slide into bell housing	Misaligned U-joint and engine coupling shaft splines	Rotate propeller counterclockwise to align splines
	Shift shaft coupler in bell housing not aligned	Align coupler in forward gear position
	'Misaligned engine	Align with proper tools
	Misaligned gimbal housing bearing	Align with engine alignment shaft
	Damaged shaft or coupling splines	Replace shaft or coupling
MerCruiser II-TR and II-TRS will not slide into bell housing	Misaligned drive shaft and coupling splines	Rotate propeller counterclockwise to align splines
	Misaligned engine	Align with proper tools
Hard steering (power steering)	Loose drive belt	Adjust belt tension
	Fluid level low	Fill reservoir to proper level
	Leaking hoses or air in system	Locate and correct
	Defective pump	Replace
	Restricted hoses	Locate and correct
	Defective cylinder	Replace
	Control valve	Adjust as required
	Loose mounting bracket adjusting screw'	Tighten screw and locknut
Hard steering (Ride-Guide)	Damaged cable	Replace
	Incorrect cable length	Install proper length cable
	Corroded cable	Lubricate or replace as required
	Linkage nuts too tight	Retorque nuts
	Insufficient rack or rotary head lubrication	Disassemble and lubricate rack