Cause	Special Information
1. Moisture on ignition components	1. Distributor cap or spark plug wires arcing
2. Battery, electrical connections, damaged wiring	
3. Ignition switch	
4. Shift interrupter switch (Alpha One Models Only)	
5. Shorted tachometer	5. Disconnect tachometer and try again
6. Ignition timing	
7. Spark plugs	7. Fouled, burned, cracked porcelain
8. Spark plug wires	8. Faulty insulation, broken wires
9. Cracked or dirty distributor cap	
10. Faulty ignition components	10. Check components
11. Engine synchronizer (if equipped) hooked up in series on purple ignition wire (dual engines only)	11. Synchronizers must be hooked up directly at coil terminal (parallel chute)

TROUBLESHOOTING

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Precautions

⚠WARNING

Always disconnect battery cables from battery BEFORE working on fuel system to prevent fire or explosion.

⚠WARNING

Be careful when cleaning flame arrestor and crankcase ventilation hose; gasoline is extremely flammable and highly explosive under certain conditions. Be sure that ignition key is OFF. DO NOT smoke or allow sources of spark or open flame in area when cleaning flame arrestor and crankcase ventilation hose.

⚠WARNING

Be careful when changing fuel system components; gasoline is extremely flammable and highly explosive under certain conditions. Be sure that ignition key is OFF. DO NOT smoke or allow sources of spark or flame in the area while changing fuel filter. Wipe up any spilled fuel immediately.

⚠WARNING

Avoid gasoline fire or explosion. Improper installation of brass fittings or plugs into fuel pump or fuel filter base can crack casting and/or cause a fuel leak. Follow specific procedure, given in Section 5A of this manual, for all fuel line connections.

⚠WARNING

Make sure no fuel leaks exist before closing engine hatch.

⚠CAUTION

DO NOT operate engine without cooling water being supplied to water pickup holes in gear housing, or water pump impeller will be damaged and subsequent overheating damage may result.

⚠CAUTION

DO NOT operate engine without water being supplied to seawater pickup pump on engine, or pump impeller may be damaged and subsequent overheating damage to engine may result. Engine may be operated with boat out of water, if instructions under "Running Engine with Boat Out of Water," following, are completed.

⚠WARNING

When running engine with boat out of water, be certain that area in vicinity of propeller is clear and that no person is standing nearby. As a precautionary measure, it is recommended that the propeller be removed.

⚠CAUTION

DO NOT run engine above 1500 RPM, as suction created by seawater pickup pump may collapse water supply hose and cause engine to overheat.

⚠WARNING

Be sure that engine compartment is well ventilated and that no gasoline vapors are present to prevent the possibility of a FIRE or EXPLOSION.

⚠WARNING

DO NOT leave helm unattended while performing idle speed adjustment.

Used Spark Plug Analysis

Use the following illustrations for determining serviceability of spark plug. Spark plug condition also can suggest a variety of possible engine malfunctions and, therefore, can indicate needed engine repairs. When old plugs are replaced, replace entire set. Perform plug service only on those plugs suitable for additional service, using the following procedures:

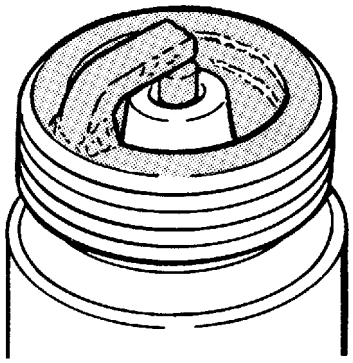
1. Remove any oil deposits with solvent and dry plugs thoroughly.
2. Open electrode gap wide enough to permit cleaning and filing.
3. Remove combustion deposits from firing end of spark plug with a plug cleaner. Blow off with compressed air to remove abrasives.
4. File electrode surfaces to restore clean, sharp edges. Again remove filings with compressed air.

5. Reset gap to specifications by bending only side electrode with proper tool.

Spark Plug Analysis

Normal Condition

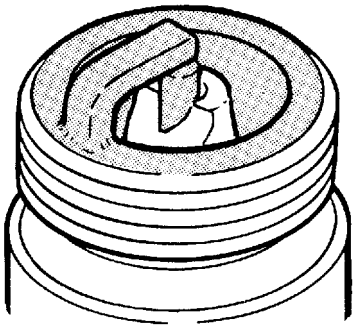
Few deposits are present and probably will be light tan or gray in color. This plug shows that plug heat range is compatible with engine, and engine is electrically and mechanically in good running condition. With proper plug servicing (clean, file and re-gap), this plug can be reinstalled with good results.



72420

Chipped Insulator

Chipped insulator usually results from careless plug re-gapping. Under certain conditions, severe detonation also can split insulator firing ends. Plug must be replaced.

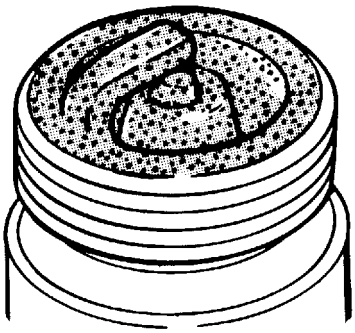


72420

Wet Fouling (Oil Deposits)

Plug becomes shorted by excessive oil entering combustion chamber, usually in engine with many hours of operation. Worn piston rings, cylinder walls, valve guides or valve stem seals are causes of oil entering combustion chamber. Only engine repairs will permanently relieve oil wet fouling.

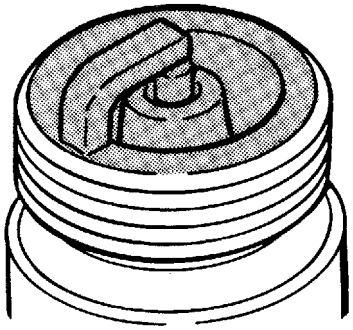
IMPORTANT: New engines or recently overhauled engines may wet foul plugs before normal oil control is achieved with proper break-in procedures. Such fouled plugs may be serviced (clean, file and re-gap) and reinstalled.



72420

Cold Fouling

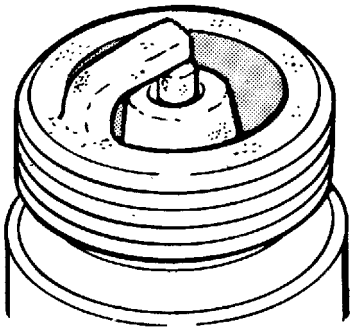
Dry, black deposits indicate rich fuel mixture or weak ignition. Clogged flame arrestor, flooding carburetor, sticky choke or weak ignition components all are probable causes. If, however, only one or two plugs in set are fouled, check for sticking valves or bad ignition leads. After correcting cause, service (clean, file and re-gap) plugs and reinstall.



72421

Overheating

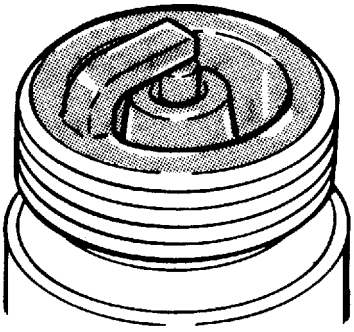
Insulator is dull white or gray and appears blistered. Electrodes are eroded and there is an absence of deposits. Check that correct plug heat range is being used. Also check for over-advanced ignition timing, cooling system malfunction, lean fuel/air mixtures, leaking intake manifold or sticking valves. Replace spark plugs.



72421

High Speed Glazing

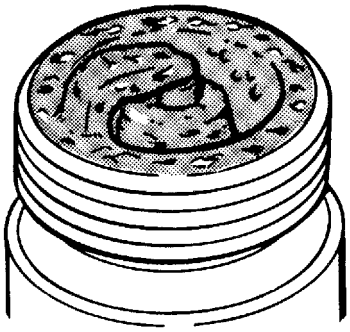
Insulator has yellowish, varnish-like color, indicating that temperatures suddenly have risen, usually during hard, fast acceleration under heavy load. Normal deposits do not get a chance to blow off. Instead, they melt and form a conductive coating. Replace plugs. If condition recurs, use colder heat range plug and service plugs more frequently.



72421

Scavenger Deposits

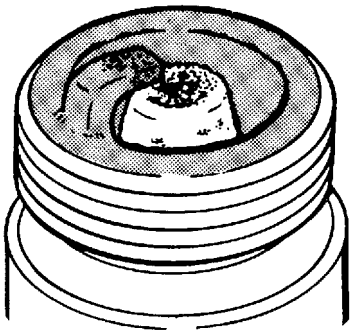
Powdery white or yellow deposits are built up on shell, insulator and electrodes. This is normal appearance with certain branded fuels. Accumulation on ground electrodes and shell areas may be unusually heavy, but may be easily chipped off. Plugs can be serviced (clean, file and re-gap) and reinstalled.



72422

Pre-Ignition Damage

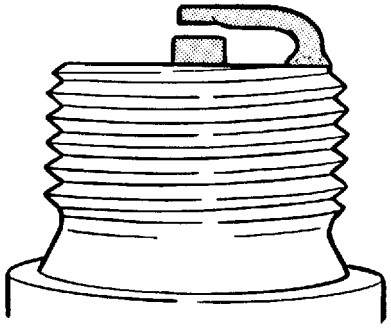
Pre-ignition damage is caused by excessive high temperatures. Center electrode melts first, followed by ground electrode. Normally, insulators are white but may be dirty if plug has been misfiring. Check for correct plug heat range, advanced ignition timing, lean fuel mixture, incorrect fuel used, malfunctioning cooling system, leaking intake manifold or lack of lubrication.



72422

Reversed Coil Polarity

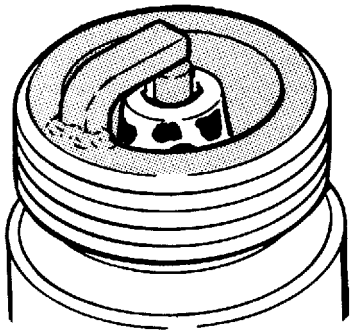
Concave erosion of ground electrode is an indication of reversed polarity. Center electrode will show only normal wear. Engine will misfire and idle rough. To correct, reverse primary coil leads. Replace spark plugs.



72422

Splashed Deposits

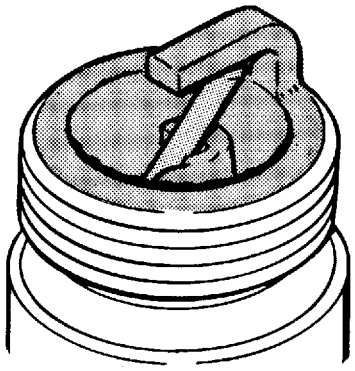
Spotted deposits, which sometimes occur after long delayed tune-up, accumulate after a long period of misfiring. When normal combustion temperatures are restored, upon installation of new plugs, deposits loosen from top of piston and head and are thrown against hot insulator. Clean and service plugs and re-install.



72423

Mechanical Damage

Mechanical damage to spark plug firing end is caused by foreign object in combustion chamber. Because of valve overlap, small objects can travel from one cylinder to another. Check all cylinders, intake manifold and exhaust material to prevent further damage.



72423

IMPORTANT: When working on engine, spark plug holes and carburetor throat should be kept covered to prevent foreign objects from entering combustion chamber.

Poor Boat Performance and/or Poor Maneuverability

Symptom	Cause
Bow too low	A. Improper drive unit trim angle
	B. Improper weight distribution
	C. Boat is underpowered
	D. Permanent or power hook in boat bottom
	E. False bottom full of water
	F. Improperly adjusted trim tabs (after planes)
	G. Dirty boat bottom (marine growth)
Bow too high	A. Improper drive unit trim angle
	B. Propeller pitch too great
	C. Dirty boat bottom (marine growth)
	D. Poor running engine
	E. Improper weight distribution
	F. Rocker in boat bottom
	G. False bottom full of water
	H. Improperly adjusted trim tabs (after planes)
Propeller ventilating	A. Drive unit installed too high on transom
	B. Dirty or rough boat bottom
	C. Damaged propeller; pitch too small; diameter too small
	D. Keel located too close to propeller or too deep in the water
	E. Water pickup or thru hull fittings located too close to propeller
	F. Hook in boat bottom
	G. Propeller plugged up with weeds

Improper Full Throttle Engine RPM

RPM Too High

Cause	Special Information
Propeller	Damaged; pitch too low; diameter too small; propeller hub slipping.
Boat	Water pickup or thru hull fittings mounted too close to propeller (ventilation); keel located too close to propeller and/or too deep in the water (ventilation). Drive installed too high on transom; wrong gear ratio.
Operation	Unit trimmed out too far.
Engine coupler slipping	

RPM Too Low

Cause	Special Information
Propeller	Damaged; pitch too great; diameter too great.
Boat	Dirty or damaged bottom; permanent or power hook in bottom; false bottom full of water. Drive installed too low on transom; wrong gear ratio.
Operation	Unit trimmed in too far.

Engine Cranks Over But Will Not Start Or Is Hard To Start

Important Information

1. First, determine which engine system is causing the problem. To make an engine run, basic components fuel, spark (ignition), and compression are required. If all three components are present, the engine should run. If any one of the three are missing, weak, or arriving at the wrong time the engine will not run.
2. Determine if there is fuel present by looking down the carburetor venturi while actuating throttle. There should be a stream of fuel coming out of the accelerator pump nozzles if the carburetor has fuel.
3. Check ignition system operation. Remove coil wire from tower on distributor cap. Hold coil wire near ground and check for spark while cranking engine over. Repeat procedure with spark plug wires. If there is spark at the spark plug wires, remove the spark plugs and make sure they are correct type and heat range, and not fouled or burned.
4. Run a compression check on engine to make sure the engine is mechanically sound.

Thunderbolt IV and V Ignition (No Spark)

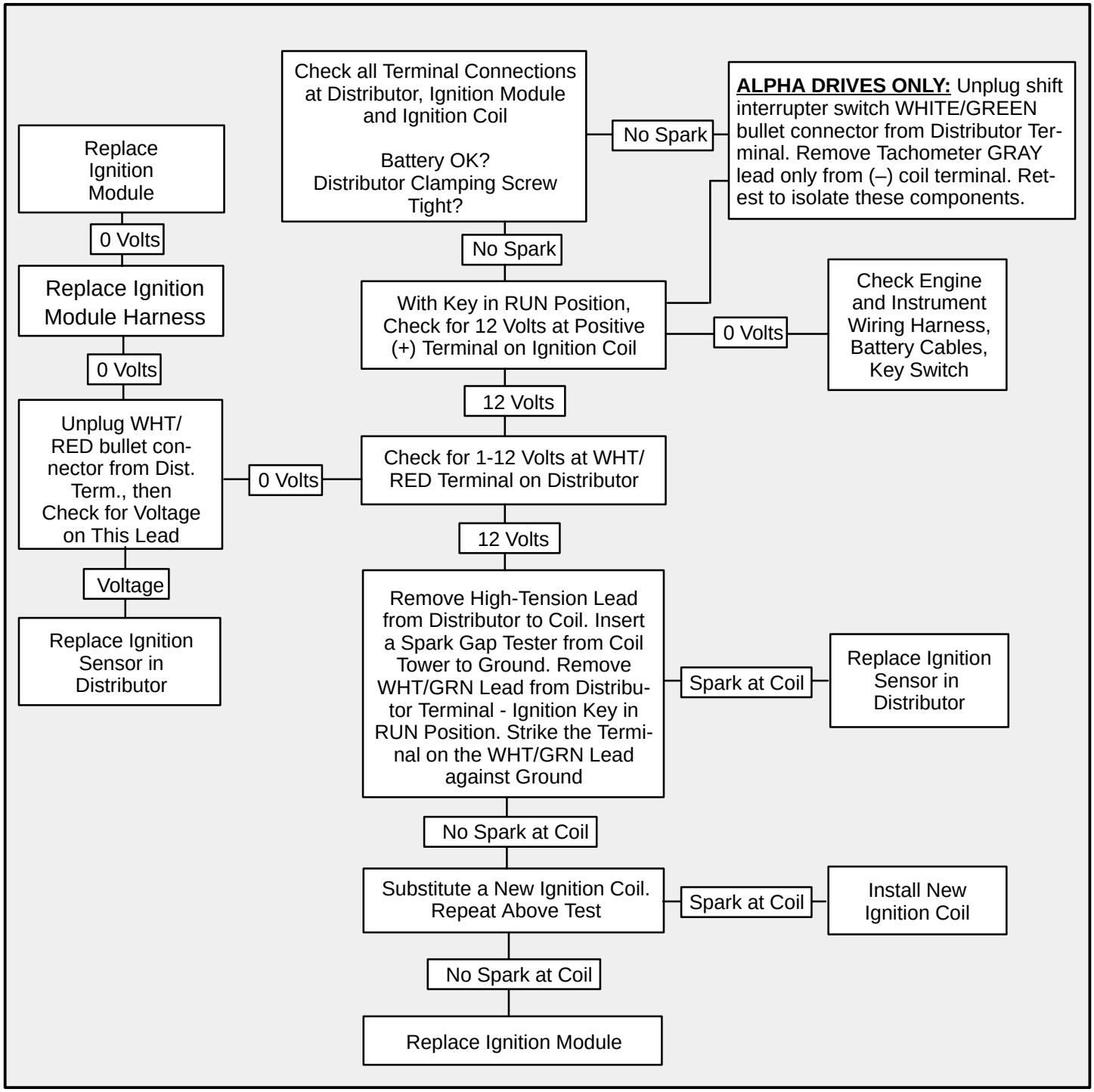
Cause	Special Information
Moisture on ignition components	Distributor cap or spark plug wires arcing
Battery, electrical connections, damaged wiring	
Ignition switch	
Shift interrupter switch (Alpha One Models Only)	
Shorted tachometer	Disconnect tachometer and try again
Ignition timing	
Spark plugs	Fouled, burned, cracked porcelain
Spark plug wires	Faulty insulation, broken wires
Cracked or dirty distributor cap	
Faulty ignition components	Check components
Engine synchronizer (if equipped) hooked up series on purple ignition wire (dual engines only)	Synchronizers must be hooked up directly coil terminal (parallel chute)

Testing Thunderbolt IV System

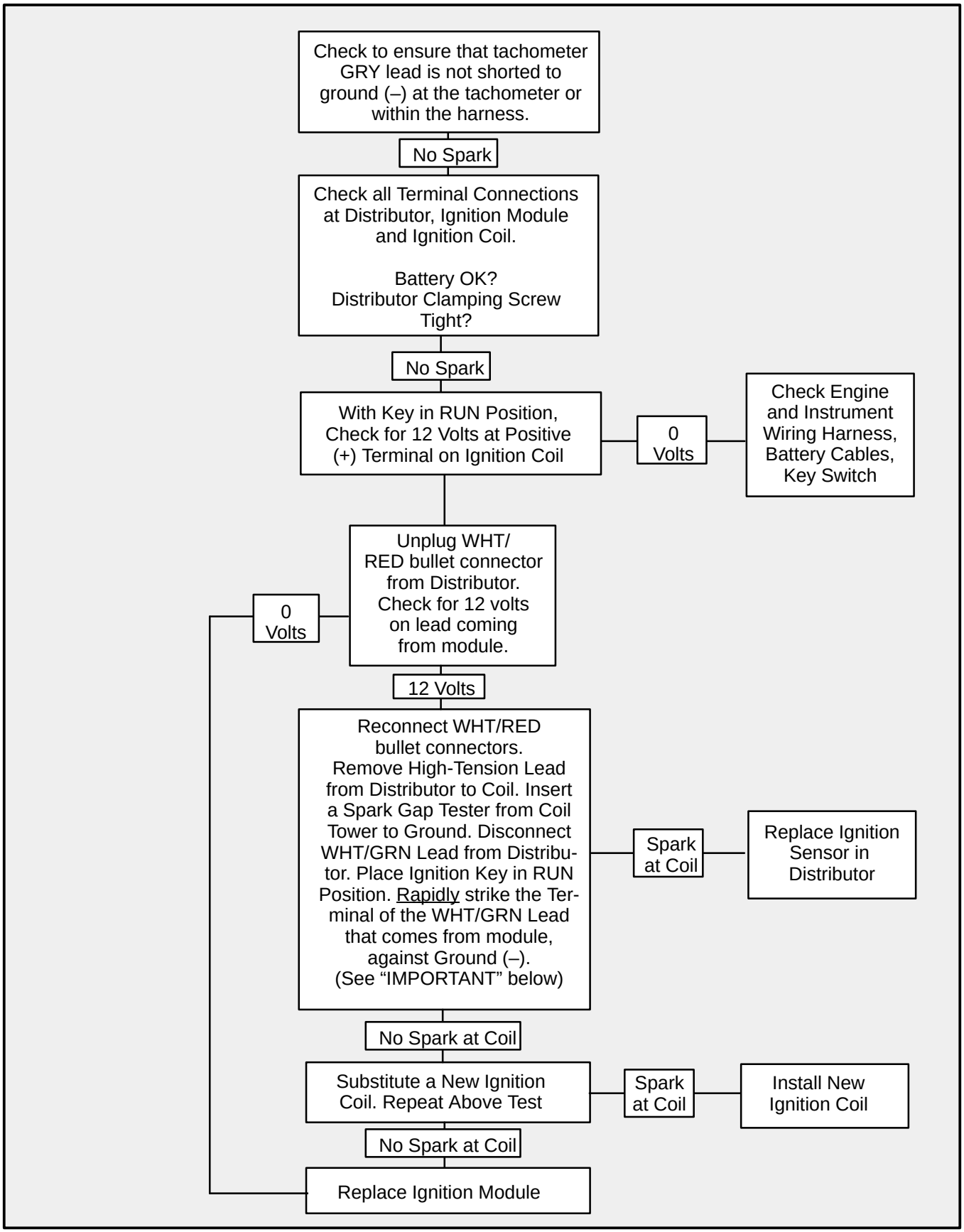
⚠WARNING

Be sure that engine compartment is well ventilated and that there are no gasoline vapors present during the following test to prevent a potential fire hazard.

IMPORTANT: Use a voltmeter when making these tests. DO NOT use a test light.



Testing Thunderbolt V Ignition System



IMPORTANT: The WHT/GRN lead must be touched against ground (–) 2-3 times per second to simulate a running engine. Repeat this test several times to ensure that spark is present.

Fuel System Rich

NOTE: *The following fuel system diagnosis refer primarily to the carbureted engines. For additional information pertaining to fuel injection refer to Section 5D of this manual.*

Cause	Special Information
Warm engine carburetor percolation	Fuel boils out of float bowl when shut off and warm. Floods intake manifold.
Clogged flame arrestor	
Automatic choke not opening	
Float adjustment	
Float leaks or is saturated with fuel	
Needle and seat leaking	
Carburetor gaskets leaking	
Excessive fuel pump pressure	
Cracked or porous carburetor body	Unseats needle and seat

Fuel System Lean

Cause	Special Information
Empty fuel tank	
Fuel shut-off valve closed (if equipped)	
Vapor lock	Engine will not start after warm engine shut down
Automatic choke	Stuck open, wrong adjustment

Miscellaneous

Cause	Special Information
1. Low grade or stale fuel	
2. Water in fuel	

Engine Will Not Crank Over/Starter Inoperative

Cause	Special Information
Remote control lever not in neutral position	
Battery charge low; damaged wiring; loose electrical connections	
Circuit breaker tripped	
Blown fuse	
Ignition switch	
Slave solenoid	
Faulty neutral start safety switch	Open circuit
Starter solenoid	
Starter motor	
Mechanical engine malfunction	

Charging System Inoperative

Cause	Special Information
Loose or broken drive belt	
Engine RPM too low on initial start	Rev engine to 1500 RPM
Loose or corroded electrical connections	
Faulty battery gauge	Best way to test is to replace gauge
Battery will not accept charge	Low electrolyte or failed battery
Faulty alternator or regulator	
Refer to Section 4C for complete “Charging System” diagnosis procedures	

Noisy Alternator

Cause	Special Information
Loose mounting bolts Drive belt Loose drive pulley Worn or dirty bearings Faulty diode trio or stator	Worn, frayed, loose

Instrumentation Malfunction

Cause	Special Information
Faulty wiring, loose or corroded terminals	
Faulty key switch	Test, as outlined in Section 4D
Faulty gauge	Test, as outlined in Section 4D
Faulty sender	Test , As outlined in Section 4D

Radio Noise

Cause	Special Information
A “popping” noise that will increase with engine RPM. Noise will stop as soon as engine is turned off.	Ignition System - wrong spark plugs; cracked distributor cap; cracked coil tower; leaking spark plug wires; moisture on ignition components
“High pitched whine” in the radio	Alternator - poor brush contact on the slip rings
A “hissing or crackling” noise when instruments are jarred with ignition on	Instrumentation - loose connections, or antennae wire routed too close to instruments
Varying unexplained noises	Accessories - bilge pump, bilge blower; fish finder, depth locator; cabin heater motor, etc. Dis connect one at a time until noise disappears.

Poor Fuel Efficiency

Cause	Special Information
Fuel leaks	
Operator habits	Prolonged idling; slow acceleration; failure to cut back on throttle once boat is on plane; boat over loaded; uneven weight distribution
Engine laboring	Bent, damaged, or wrong propeller. Water test boat for proper operating RPM at wide open throttle
Clogged flame arrestor	
Engine compartment sealed too tight	Not enough air for engine to run properly
Boat bottom	Dirty (marine growth), hook, rocker
Carburetor	Idle mixture settings, accelerator pump adjustments,linkage binding, choke adjustment, carburetor flooding over, main fuel jets
Improper fuel	
Crankcase ventilation system not working	
Engine needs tune-up	
Engine running too cold or too hot	
Plugged or restricted exhaust	
Engine	Low compression

Carburetor Malfunction

Symptoms	Cause
Flooding	A. Needle and seat
	B. Float adjustment
	C. Saturated float
	D. Gaskets leaking
	E. Cracked fuel bowl
	F. Fuel percolation
	G. Automatic choke
Rough idle	A. Idle RPM too low
	B. Idle mixture screws
	C. Idle passages dirty
	D. Throttle valves not closing
	E. Engine flooding
	F. Vacuum leak
	G. Throttle body heat passages plugged
Hesitation or acceleration flatness	A. Accelerator pump
	B. Leaking gaskets
	C. Automatic choke
	D. Power piston or power valve
	E. Throttle valves
	F. Throttle body heat passages plugged
	G. Main metering jets
	H. Float adjustment
	I. Secondary air valve wind-up

Carburetor Malfunction (continued)

Symptoms	Cause
Engine surges	A. Main metering jets
	B. Leaking gaskets
	C. Float adjustment
	D. Saturated float
	E. Power piston or valve
	F. Throttle valves
Low top speed or lack of power	A. Power piston or valve
	B. Float adjustment
	C. Main metering jets
	D. Leaking gaskets
Poor cold engine operation	A. Idle RPM too low
	B. Idle mixture screws
	C. Throttle valves
	D. Automatic choke
	E. Engine flooding
Engine stalls	A. Idle RPM too low
	B. Idle mixture screws
	C. Engine flooding
	D. Automatic choke
	E. Dirt in carburetor
	F. Accelerator pump
	G. Leaking gaskets
Hard starting	Refer to “Engine Starts Hard”

Engine Runs Poorly At Idle

Cause	Special Information
Clogged flame arrestor	
Improper idle fuel mixture adjustment	
Engine floods at idle	A. Problem in ignition system causing the engine to run rough
	B. Idle mixture screw adjusted incorrectly
	C. Bad needle and seat
	D. Incorrect float level drop
	E. If carburetor (2 bbl. only) has a solid needle, replace with a spring loaded needle
Moisture on ignition components	Cap or spark plug wires arcing
Water in fuel	
Low grade or stale fuel	
Incorrect ignition timing	
Automatic choke	
Spark plugs	Fouled, burned, cracked porcelain
Spark plug wires	Insulation breakdown, wires broken
Defective coil Cracked or dirty distributor cap	
Incorrect float level	
Dirty carburetor	
Vacuum leak	Leak at manifold or carburetor base
Incorrect fuel pump pressure	Too low - can't supply the carburetor Too high - unseats the needle and seat
Low compression	Also check for blown head gasket
Loose or worn distributor	Timing changes
Water leaking into cylinders	Head gasket, exhaust manifold, cracked head or valve seat
Loose or broken engine mounts	

Engine Acceleration Is Poor

Cause	Special Instructions
Also refer to “Poor Boat Performance”	
Idle mixture screws	
Incorrect ignition timing	
Incorrect distributor or amplifier advance curve	Refer to Section 4B
Accelerator pump	Check for stream of raw fuel from accelerator pump discharge nozzle, when opening throttle with engine shut off
Cracked or dirty distributor cap or rotor	
Vacuum leak	Intake manifold or carburetor base
Spark plugs	Fouled, burned; wrong heat range; cracked porcelain
Float adjustment	
Dirty carburetor	
Low compression	

Engine Runs Poorly At High RPM

Cause	Special Information
Also refer to “Poor Boat Performance”	
Crankcase overfilled with oil	Check oil level with boat at rest in the water.
Anti-siphon valve (if equipped)	Restricting fuel supply
Plugged fuel tank vent	
Fuel supply	Refer to “Carburetor Malfunctions” (See “Table of Contents”)
Ignition timing	
Low grade of fuel or water in the fuel	
Spark plugs	Fouled, burned, cracked porcelain, incorrect heat range
Spark plug wires	Poor insulation, broken wires
Distributor cap or rotor	Dirty or cracked
Coil	
Distributor	Excessive play in shaft
Engine overheating	Refer to “Engine Overheats”
Low compression	Worn valves, rings, cylinders, etc.
Restricted exhaust	

Troubleshooting With Vacuum Gauge

Reading	Cause
Steady reading between 15-21 inches at idle RPM	Normal
Extremely low reading, but steady at idle RPM	Vacuum leak; incorrect timing; underpowered boat; faulty boat bottom
Fluctuates between high and low at idle RPM	Blown head gasket between two adjacent cylinders
Fluctuates 4 or 5 inches very slowly at idle RPM	Carburetor needs adjustment; spark plug gap too narrow;valves are sticking
Fluctuates rapidly at idle, steadies as RPM is increased	Valve guides are worn
Continuously fluctuates between low and normal reading at regular intervals at idle RPM	Burned or leaking valve

Engine Noise

Important Information

No definite rule or test will positively determine source of engine noise; therefore, use the following information only as a general guide to engine noise diagnosis.

1. Use a timing light to determine if noise is timed with engine speed or one-half engine speed. Noises timed with engine speed are related to crankshaft, rods, pistons, piston pins, and flywheel. Noises timed to one-half engine speed are valve train related.
2. The use of a stethoscope can aid in locating a noise source; however, because noise will travel to other metal parts not involved in the problem, caution must be exercised.
3. If you believe noise is confined to one particular cylinder, ground spark plug leads, one at a time. If noise lessens noticeably or disappears, it is isolated to that particular cylinder.
4. Try to isolate the noise to location in engine: front to back, top to bottom. This can help determine which components are at fault.
5. Sometimes noises can be caused by moving parts coming in contact with other components. Examples are: flywheel or coupler; exhaust flappers rattling against exhaust pipe; crankshaft striking (pan, pan baffle, or dipstick tube); rocker arm striking valve cover; and loose flywheel cover. In many cases if this is found to be the problem, a complete engine teardown is not necessary.
6. When noise is isolated to a certain area and component, removal and inspection will be required. Refer to proper sections of service manual for information required for service.
7. If noise cannot be distinguished between engine and drive unit, remove drive from boat. Run a water supply directly to engine. Run engine without the drive to determine if noise is still there.

Valve Cover Area

Location	Possible Cause
Valve cover area, timed to one-half engine speed, noise could be confined to one cylinder or may be found in any multitude of cylinders	A. Rocker arm striking valve cover
	B. Rocker arm out of adjustment
	C. Worn rocker arm
	D. Bent push rod
	E. Collapsed filter

Cylinder Area

Location	Possible Causes
Cylinder area, may be confined to one cylinder or found in more than one cylinder, timed to engine speed	A. Sticking valve
	B. Carbon build-up
	C. Connecting rod installed wrong
	D. Bent connecting rod
	E. Piston
	F. Piston rings
	G. Piston pin
	H. Cylinder worn

Camshaft Area

Location	Possible Causes
Camshaft area, front of engine, timed to one half engine speed	A. Crankshaft timing sprocket
	B. Timing chain
	C. Fuel Pump
	D. Valve Lifter
	E. Cam Bearings
Camshaft area, center of engine, timed to one half engine speed	A. Fuel Pump
	B. Valve Lifter
	C. Cam bearing
Camshaft area, rear of engine, timed to one half engine speed	A. Distributor gear
	B. Valve lifter
	C. Cam bearings
Camshaft area, throughout engine, timed to one half engine speed	A. Loss of oil pressure
	B. Valve lifters
	C. Cam bearings

Crankshaft Area

Location	Possible Causes
Crankshaft area, front of engine, timed to engine speed	A. Crankshaft timing sprocket
	B. Timing chain
	C. Main bearing
	D. Rod bearing
Crankshaft area, center of engine, timed to engine speed	A. Crankshaft striking pan or pan baffle
	B. Main bearing
	C. Rod bearing
Crankshaft area, rear of engine, timed to engine speed	A. Loose flywheel cover
	B. Loose coupler
	C. Loose flywheel
	D. Main bearing
	E. Rod bearing
Crankshaft area, throughout engine, timed to engine speed	A. Loss of oil pressure
	B. Main bearings
	C. Rod bearings

Miscellaneous

Noise	Possible Cause
Engine spark knock	A. Advanced timing
	B. Low octane fuel
	C. Engine running hot
	D. Carbon deposits in engine
Popping through carburetor	A. Wrong ignition timing
	B. Carburetor set too lean
	C. Faulty accelerator pump
	D. Vacuum leak
	E. Valve adjustment
	F. Valve timing
	G. Burned or stuck valve
Hissing	A. Vacuum leak
	B. Leaking exhaust (manifolds or pipes)
	C. Loose cylinder heads
	D. Blown head gasket
Whistle	A. Vacuum leak
	B. Dry or tight bearing in an accessory
Sparks jumping	A. Leaking high tension lead
	B. Cracked coil tower
	C. Cracked distributor cap
Squeaks or squeals	A. Drive belt slipping
	B. Dry or tight bearing in an accessory
	C. Parts rubbing together
Rattling in exhaust pipe area	A. Exhaust shutters

Oil Pressure

Cause	Special Information
Measuring oil pressure	Use a good automotive oil pressure test gauge. Do not rely on the oil pressure gauge in the boat.
Check engine oil level with boat at rest in the water	Oil level should be between the ADD and FULL marks
Oil level in crankcase above FULL mark	May cause loss of engine RPM, oil pressure gauge fluctuation, drop in oil pressure, and hydraulic valve lifter noise at high RPM
Oil level in crankcase below ADD mark	Low oil pressure; oil pressure gauge fluctuation; internal engine noise and/or damage
Change in oil pressure	This may be a normal condition. Oil pressure may read high in the cooler times of the day, and when engine is not up to operating temperature. As the air temperature warms up and engine is running at normal opening temperature, it is normal for oil pressure to drop.
Low engine oil pressure at idle	With modern engines and engine oils, low oil pressure readings at idle do not necessarily mean there is a problem. If valve lifters do not “clatter” (at idle), there is a sufficient volume of oil to lubricate all internal moving parts properly. The reason for the drop in oil pressure is that engine heat causes an expansion of the internal tolerances in the engine and, also, the oil will thinout somewhat from heat.
Low engine oil pressure at idle after running at a high RPM	Refer to No. 5 and 6, preceding
Boats with dual engines	It is not uncommon to see different oil pressure readings between the two engines, as long as both engines fall within specifications. Differences in oil pressure can be attributed to differences in engine tolerances, gauges, wiring, senders, etc.
Boats with dual stations	Refer to No. 8. preceding

Low Oil Pressure

Cause	Special Information
Low oil level in crankcase	
Defective oil pressure gauge and/or sender	Verify with an automotive test gauge. Refer to Section 4D for instrument testing.
Thin or diluted oil	Oil broken down; contains water or gas; wrong viscosity; engine running too hot or too cold; excessive idling in cold water (condensation)
Oil pump	Relief valve stuck open; pickup tube restricted; worn parts in oil pump; air leak on suction side of oil pump or pickup oil tube
Oil leak can be internal or external	Oil passage plugs leaking, cracked or porous cylinder block
Excessive bearing clearance	Cam bearings, main bearings, rod bearings

High Oil Pressure

Oil too thick	Wrong viscosity, oil full of sludge or tar
Defective oil pressure gauge and/or sender	Verify with an automotive test gauge
Clogged or restricted oil passage	
Oil pump relief valve stuck closed	

Excessive Oil Consumption

Cause	Special Information
Normal consumption.	One quart of oil consumed in 5-15 hours of operation at wide-open-throttle (especially in a new or rebuilt engine) is normal
Oil leaks	Clean bilge, run engine with clean white paper on bilge floor, locate oil leak(s)
Oil too thin	Oil diluted or wrong viscosity
Oil level too high	
Drain holes in cylinder head plugged	Oil will flood valve guides
Defective valve seals	
Intake manifold gasket leaking	
Worn valve stems or valve guides	
Defective oil cooler (if so equipped)	Crack in cooler tubes
Defective piston rings	Glazed, scuffed, worn, stuck, improperly installed; ring grooves worn; improper break-in; wrong end gap
Defective cylinders	Out of round, scored, tapered, glazed; excessive piston to cylinder clearance; cracked piston
Excessive bearing clearance	

Water in Engine

Important Information

IMPORTANT: First determine location of water in engine. This information can be of great help when trying to determine where the water came from and how it got into the engine. The three most common problems are "water on top of pistons, water in crankcase oil, water in crankcase oil and on top of pistons."

The first step, after locating water, is to remove all the water from the engine by removing all spark plugs and pumping cylinders out by cranking engine over. Next change oil and filter. Now, start engine and see if problem can be duplicated. If problem can be duplicated, there more than likely is a mechanical problem. If the problem cannot be duplicated, the problem is either an operator error or a problem that exists only under certain environmental conditions.

If water is contained to cylinder(s) only, it is usually entering through the intake system, exhaust system, or head gasket.

If the water is contained to crankcase only, it is usually caused by a cracked or porous block, a flooded bilge, or condensation.

If the water is located in both the cylinder(s) and the crankcase, it is usually caused by water in the cylinders getting past the rings and valves, or complete submersion.

Checking for rust in the intake manifold or exhaust manifolds is a good idea. Rust in these areas will give clues if the water entered these areas.

Water In Crankcase

Cause	Special Information
Water in boat bilge	Boat has been submerged or bilge water was high enough to run in through dipstick tube
Water seeping past piston rings or valves	Refer to "Water in Engine" ("On Top of Pistons")
Engine running cold	Defective thermostat, missing thermostat; prolonged idling in cold water
Intake manifold leaking near a water passage	
Cracked or porous casting	Check cylinder head, cylinder block, and intake manifold

Water On Top Pistons

Cause	Special Information
Operator shut engine off at high RPM	
Engine “diesels” or tries to run backwards	Engine out of tune, poor fuel, high idle RPM, timing set too high
Rain water running into flame arrestor	Hatch cover
Spark plug misfiring	Improper combustion causes moisture in the air to accumulate in the cylinder
Backwash through the exhaust system	
Improper engine or exhaust hose installation	
Cracked exhaust manifold	
Improper manifold to elbow gasket installation	
Loose cylinder head bolts	
Blown cylinder head gasket	Check for warped cylinder head or cylinder block
Cracked valve seat	
Porous or cracked casting	Check cylinder heads, cylinder block, and intake manifold

Engine Overheats (Mechanical)

Cause	Special Information
Engine RPM below specifications at wide-open-throttle (engine laboring)	Damaged or wrong propeller; growth on boat bottom;false bottom full of water
Wrong ignition timing	Timing too far advanced or retarded
Sticking distributor advance weights	
Spark plug wires crossed (wrong firing order)	
Lean fuel mixture	Refer to “Carburetor Malfunctions” in this section
Wrong heat range spark plugs	
Exhaust restriction	
Valve timing off	Jumped timing chain, or improperly installed
	A blown head gasket(s) normally cannot be detected by a compression check. Normally the engine will run at normal temperature at low RPM, but will overheat at speeds above 3000 RPM.
Blown head gasket(s)	**Engines that are seawater cooled**: Using a clear plastic hose, look for air bubbles between seawater pump and engine. If there are no bubbles present, install clear plastic hose between thermostat housing and manifold(s).If air bubbles are present at a higher RPM, it is a good indication there is a blown head gasket.
Insufficient lubrication to moving parts of engine	Defective oil pump, plugged oil passage, low oil level

Engine Overheats (Cooling System)

Cause	Special Information
IMPORTANT: The first step is to verify if the engine is actually overheating or the temperature gauge or sender is faulty Loose or broken drive belt	**IMPORTANT: Best way to test gauge or sender is to replace them.**
Seawater shutoff valve partially or fully closed (if equipped)	
Clogged or improperly installed sea strainer	
Loose hose connections between seawater pickup and seawater pump inlet (models with belt driven seawater pump only)	Pump will suck air. Pump may fail to prime or will force air bubbles into cooling system.
Seawater inlet hose kinked or collapsed	
Seawater pickup clogged	
Obstruction on boat bottom causing water turbulence	Obstruction will be in front of seawater pickup, causing air bubbles to be forced into cooling system
Defective thermostat	
Exhaust elbow water outlet holes plugged	
Insufficient seawater pump operation	Worn pump impeller
Obstruction in cooling system such as casting flash, sand, rust, salt, etc.	Refer to water flow diagram for engine type being serviced
Engine circulating pump defective	
Also refer to “Engine Overheats (Mechanical)”	
IMPORTANT: In addition to previous checks, make the following checks if engine is equipped with closed cooling.	
Low coolant level	
Antifreeze not mixed properly	Antifreeze should be mixed 50/50 or maximum 60/40 (60% antifreeze, 40% water)
Heat exchanger cores plugged	
Water hoses reversed at the water distribution block	Refer to water flow diagram in Section 6

Insufficient Water Flow From Belt Driven Seawater Pump

Cause	Special Information
Drive belt	Loose, worn or broken
Seawater shutoff valve partially or fully closed	
Clogged or improperly installed sea strainer	
Loose hose connections between seawater pickup and seawater pump inlet	Pump will suck air, pump may fail to prime or will force air bubbles into cooling system
Seawater inlet hose kinked or plugged	
Seawater pickup plugged	
Obstruction on boat bottom causing water turbulence.	Obstruction will be in front of seawater pickup, causing air bubbles to be forced into cooling system
Faulty seawater pump	

Power Steering

Poor, Erratic, or No Assist

Cause	Special Information
Drive belt	Worn, broken or out of adjustment
Low fluid level	
Air in system	Air leak in lines, pump, or air from installation. Refer to Section 9A for bleeding procedure.
Leaking hoses	Refer to Section 10A for bleeding procedure.
Steering cables and/or steering helm	Cable or helm partially frozen from rust or corrosion; cable over-lubricated; improper cable installation.
Binding in stern drive unit	Refer to appropriate Stern Drive Service Manual
Restriction in hydraulic hoses	Causes a loss of pressure
Control valve not positioned properly, not balanced properly, or the mounting nut is loose	
Mounting bracket adjusting screw loose or mounting tube is loose	
Faulty pump	Flow control valve may be sticking
Worn piston ring or scored housing bore in cylinder.	Causes loss of pressure
Leaking valve body or loose fitting spool	

Noisy Pump

Cause	Special Information
Drive belt	Check belt tension
Low fluid level	
Air in fluid	Air leak in lines, pump, or air form installation
Faulty pump	Use stethoscope to listen for noise in pump
Restricted fluid passages	Kinks or debris in hoses or debris in passages
Stop nut adjusted improperly	Refer to appropriate Stern Drive Service Manual
Steering cables installed that do not meet BIA standards	Refer to appropriate Stern Drive Service Manual

Fluid Leaks

Cause	Special Information
Loose hose connections	Refer to Section 10A for bleeding instructions
Damaged hose	
Oil leaking from top of pump	System overfilled; fluid contains water; fluid contains air
Cylinder piston rod seal	
Faulty seals in valve	
Faulty seals in o-rings in pump	
Cracked or porous metal parts	