1
C

IMPORTANT INFORMATION

Section 1C - General Information

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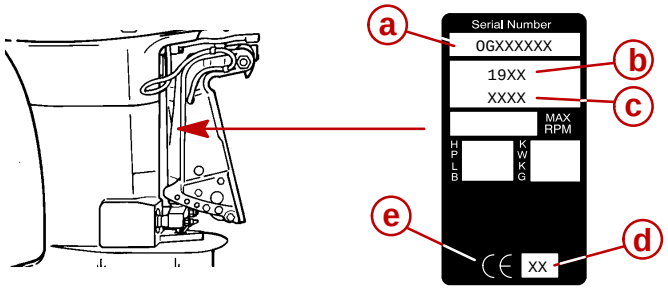
Serial Number Location

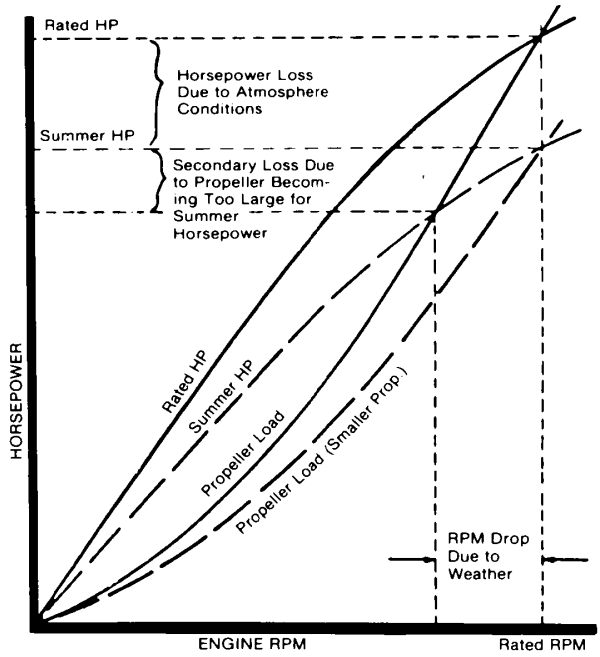
The engine serial number is located on the top of the engine block. A serial number is also located on the starboard side of the swivel bracket.



a - Serial Number
b - Model Year
c - Model Description
d - Year Manufactured
e - Certified Europe Insignia

Conditions Affecting Performance

Weather



Weather conditions exert a profound effect on power output of internal combustion engines. Established horsepower ratings refer to the power that the engine will produce at its rated RPM under a specific combination of weather conditions.

Corporations internationally have settled on adoption of I.S.O. (International Standards Organization) engine test standards, as set forth in I.S.O. 3046 standardizing the computation of horsepower from data obtained on the dynamometer, correcting all values to the power that the engine will produce at sea level, at 30% relative humidity at 77° F (25°C) temperature and a barometric pressure of 29.61 inches of mercury.

Summer conditions of high temperature, low barometric pressure and high humidity all combine to reduce engine power. This is reflected in decreased boat speeds – as much as 2 or 3 mph. Nothing will regain this speed for the boater but the coming of cool, dry weather.

In pointing out the consequences of weather effects, an engine – running on a hot, humid summer day – may loose as much as 14% of the horsepower it would produce on a dry, brisk spring or fall day. The horsepower that any internal combustion engine produces depends upon the density of the air that it consumes and this density is dependent upon the temperature of the air, its barometric pressure and water vapor (or humidity) content.

Accompanying this weather-inspired loss of power is a second but more subtle loss. At rigging time in early spring, the engine was equipped with a propeller that allowed the engine to run within its recommended RPM range at full throttle. With the coming of the summer weather and the consequent drop in available horsepower, this propeller will, in effect, become too large. Consequently, the engine operates at less than its recommended RPM.

Due to the horsepower/RPM characteristics of an engine, this will result in further loss of horsepower at the propeller with another decrease in boat speed. This secondary loss can be regained by switching to a smaller pitch propeller that allows the engine to run again at recommended RPM.

To obtain optimum engine performance under changing weather conditions, the engine MUST be propped to allow it to operate at or near the top end of the recommended maximum RPM range at wide-open-throttle with a normal boat load.

This will allow the engine to develop full power while operating in an RPM range that discourages damaging detonation.

Boat

WEIGHT DISTRIBUTION

1. Proper positioning of the weight inside the boat (persons and gear) has a significant effect on the boat's performance, for example:
   a. Shifting weight to the rear (stern)
      (1.) Generally increases top speed.
      (2.) If in excess, can cause the boat to porpoise.
      (3.) Can make the bow bounce excessively in choppy water.
      (4.) Will increase the danger of the following wave splashing into the boat when coming off plane.
   b. Shifting weight to the front (bow)
      (1.) Improves ease of planing off.
      (2.) Generally improves rough water ride.
      (3.) If excessive, can make the boat veer back-and-forth (bow steer).

BOTTOM

1. **Boat Bottom:** For maximum speed, a boat bottom should be nearly a flat plane where it contacts the water and particularly straight and smooth in fore-and-aft direction.
   a. **Hook:** Exists when bottom is concave in fore-and -aft direction when viewed from the side. When boat is planing, "hook" causes more lift on bottom near transom and allows bow to drop, thus greatly increasing wetted surface and reducing boat speed. "Hook" frequently is caused by supporting boat too far ahead of transom while hauling on a trailer or during storage.
   b. **Rocker:** The reverse of hook and much less common. "Rocker" exists if bottom is convex in fore-and-aft direction when viewed from the side, and boat has strong tendency to porpoise.
   c. **Surface Roughness:** Moss, barnacles, etc., on boat or corrosion of motor's gear housing increase skin friction and cause speed loss. Clean surfaces when necessary.
   d. **Gear Housing:** If unit is left in the water, marine vegetation may accumulate over a period of time. This growth MUST be removed from unit before operation, as it may clog the water inlet holes in the gear housing and cause the engine to overheat.

Trim

TRIMMING OUTBOARD “OUT” (“UP”)

⚠ WARNING

Excessive trim “out” also may reduce the stability of some high speed hulls. To correct instability at high speed, reduce the power GRADUALLY and trim the outboard “in” slightly before resuming high speed operation. (Rapid reduction in power will cause a sudden change of steering torque and may cause additional momentary boat instability.)

1. Will lift bow of boat, generally increasing top speed.
2. Transfers steering torque harder to left on single outboard installations below 23 in. (584mm) transom height.
3. Increases clearance over submerged objects.
4. In excess, can cause porpoising and/or ventilation.
5. If trimmed out beyond the water pickup, reduced water supply can cause overheating resulting in engine damage.

TRIMMING OUTBOARD “IN” (“DOWN”) CHARACTERISTICS

⚠ WARNING

Excessive speed at minimum trim “in” may cause undesirable and/or unsafe steering conditions. Each boat should be tested for handling characteristics after any adjustment is made to the angle (trim adjustment bolt relocation.)

1. Will help planing off, particularly with a heavy load.
2. Usually improves ride in choppy water.
3. In excess, can cause boat to veer to the left or right (bow steer).
4. Transfers steering torque harder to right (or less to the left) on single outboard installations.
5. Improves planing speed acceleration (by moving trim adjustment bolt one hole closer to transom).

WATER ABSORPTION

It is imperative that all through hull fasteners be coated with a quality marine sealer at time of installation. Water intrusion into the transom core and/or inner hull will result in additional boat weight (reduced boat performance), hull decay and eventual structural failure.

CAVITATION

Cavitation is caused by water vapor bubbles forming either from a sharp edge or angle on the gear case or from an irregularity in the propeller blade itself. These vapor bubbles flow back and collapse when striking the surface of the propeller blade resulting in the erosion of the propeller blade surface. If allowed to continue, eventual blade failure (breakage) will occur.

VENTILATION

Ventilation occurs when air is drawn from the water’s surface (excessive trim out angle) or from the engine exhaust flow (wrong propeller/propeller hardware installed or gear case labyrinth seal worn) into the propeller blades. These air bubbles strike the propeller blade surface and cause erosion of the blade surface. If allowed to continue, eventual blade failure (breakage) will occur.

Engine

DETONATION

Detonation in a 2-cycle engine resembles the “pinging” heard in an automobile engine. It can be otherwise described as a tin-like “rattling” or “plinking” sound.

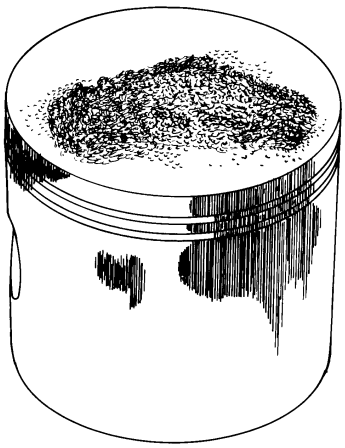
Detonation is an explosion of an unburned portion of the fuel/air charge after the spark plug has fired. Detonation creates severe shock waves in the engine, and these shock waves often find or create a weakness: The dome of a piston, cylinder head/gasket, piston rings or piston ring lands, piston pin and roller bearings.

A few of the most common causes of detonation in a marine 2-cycle application are as follows:

- Over-advanced ignition timing.
- Use of low octane gasoline.
- Propeller pitch too high (engine RPM below recommended maximum range).
- Lean fuel mixture at or near wide-open-throttle.
- Spark plugs (heat range too hot – incorrect reach – cross-firing).
- Inadequate engine cooling (deteriorated cooling system).

Detonation usually can be prevented if:

1. The engine is correctly set up.
2. Diligent maintenance is applied to combat the detonation causes.



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Engine Compression

Engine compression should be checked with engine block warm, throttle shutter wide open, all spark plugs removed and using a fully charged battery. Normal compression for all cylinders should be 110 to 130 psi (758.5 to 896.4 kPa). Cylinders should not vary more than 15 psi (103.4 kPa) between one another. A variance of more than 15 psi would indicate the need for a power head inspection/disassembly.

Following Complete Submersion

Salt Water Submersion

Due to the corrosive effect of salt water on internal engine components, complete disassembly is necessary before any attempt is made to start the engine.

Submerged While Running

When an engine is submerged while running, the possibility of internal engine damage is greatly increased. If, after engine is recovered and with spark plugs removed, engine fails to turn over freely when turning flywheel, the possibility of internal damage (bent connecting rod and/or bent crankshaft) exists. If this is the case, the powerhead must be disassembled.

SUBMERGED ENGINE (FRESH WATER)

IMPORTANT: Engine should be run within 2 hours after recovery, or serious internal damage may occur. If unable to start engine in this period, disassemble engine and clean all parts. Apply oil as soon as possible.

NOTE: *If sand has entered the air intake on the engine, do not attempt to the start the engine. Sand will cause internal engine damage. disassembly is required to clean all internal engine components of sand.*

1. Recover engine from water as quickly as possible.
2. Remove cowling.
3. Clean the exterior of the outboard with fresh water.
4. Dry all wiring and electrical components using compressed air.
5. Drain water from fuel system as follows:
   a. Disconnect remote fuel hose from engine.
   b. EFI Models – Remove drain plug from vapor separator and drain fuel/water. Reinstall plug after draining.
   c. EFI Models – Remove the water separating fuel filter and empty contents.
6. Remove spark plugs and get as much water as possible out of powerhead. Most water can be eliminated by placing engine in a horizontal position (with spark plug holes down) and rotating flywheel.
7. Pour alcohol into carburetor throats (alcohol will absorbed water). Again rotate flywheel.
8. Turn engine over (place spark plug openings down) and pour engine oil into throat of carburetors while rotating flywheel to distribute oil throughout crankcase.
9. Again turn engine over and pour approximately one teaspoon of engine oil into each spark plug opening. Again rotate flywheel to distribute oil in cylinders.
10. Remove and clean carburetors and fuel pump assembly.
11. Dry all wiring and electrical components using compressed air.
12. Disassemble the engine starter motor and dry the brush contacts, armature and other corrodible parts.
13. Reinstall spark plugs, carburetors and fuel pump.
14. Drain water from the oil injection system as follows:

a. Remove remote oil hose (black without blue stripe) from pulse fitting on starboard side of engine.

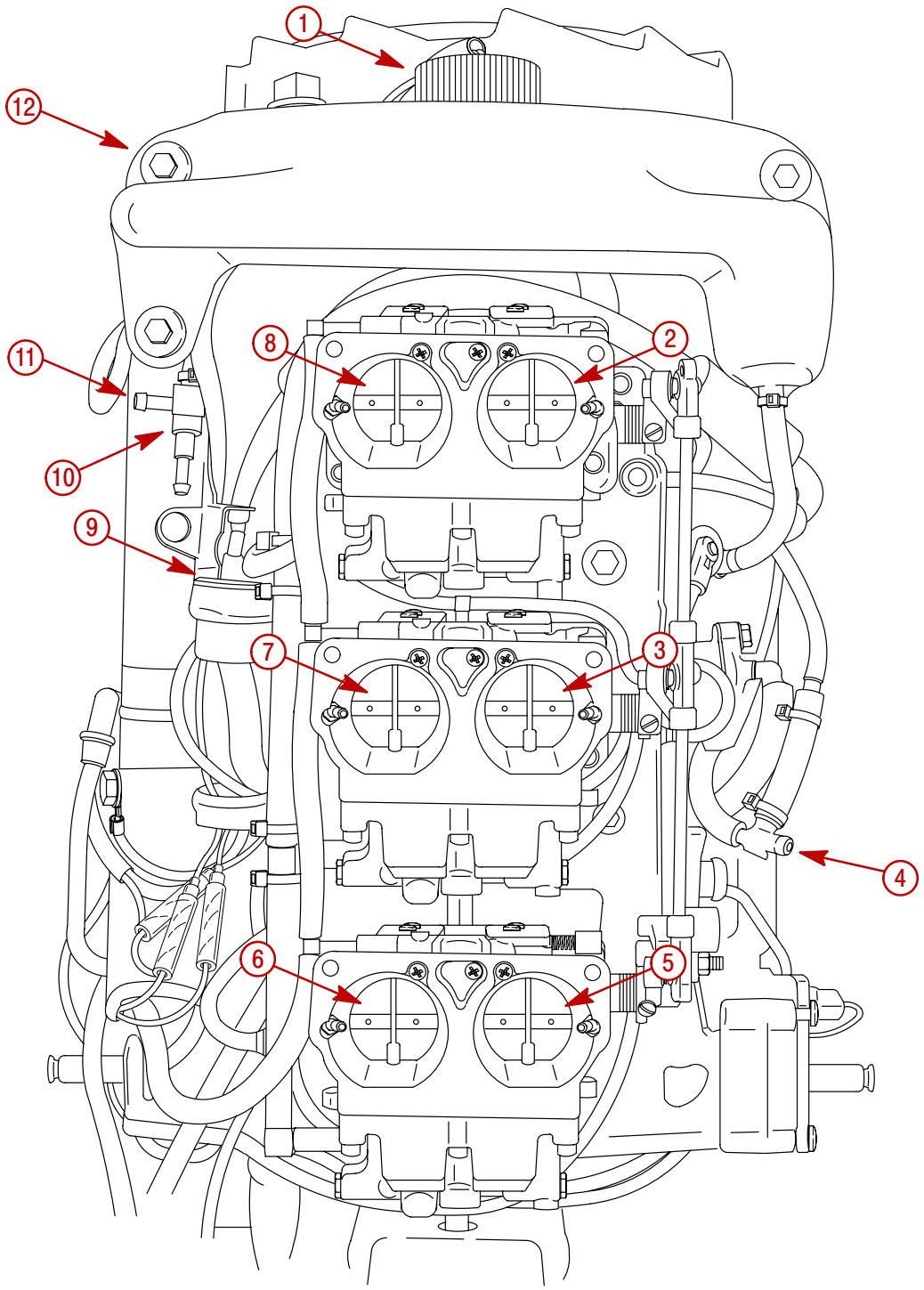
b. Drain any water from hose and reconnect.

c. If water was present in hose, check for water in the remote oil tank. Drain tank if water is present.

15. Attempt to start engine, using a fresh fuel source. If engine starts, it should be run for at least one hour to eliminate any water in engine.

16. If engine fails to start, determine cause (fuel, electrical or mechanical). Engine should be run within 2 hours after recovery of outboard from water, or serious internal damage may occur. If unable to start engine in this period, disassemble engine and clean all parts. Apply oil as soon as possible.

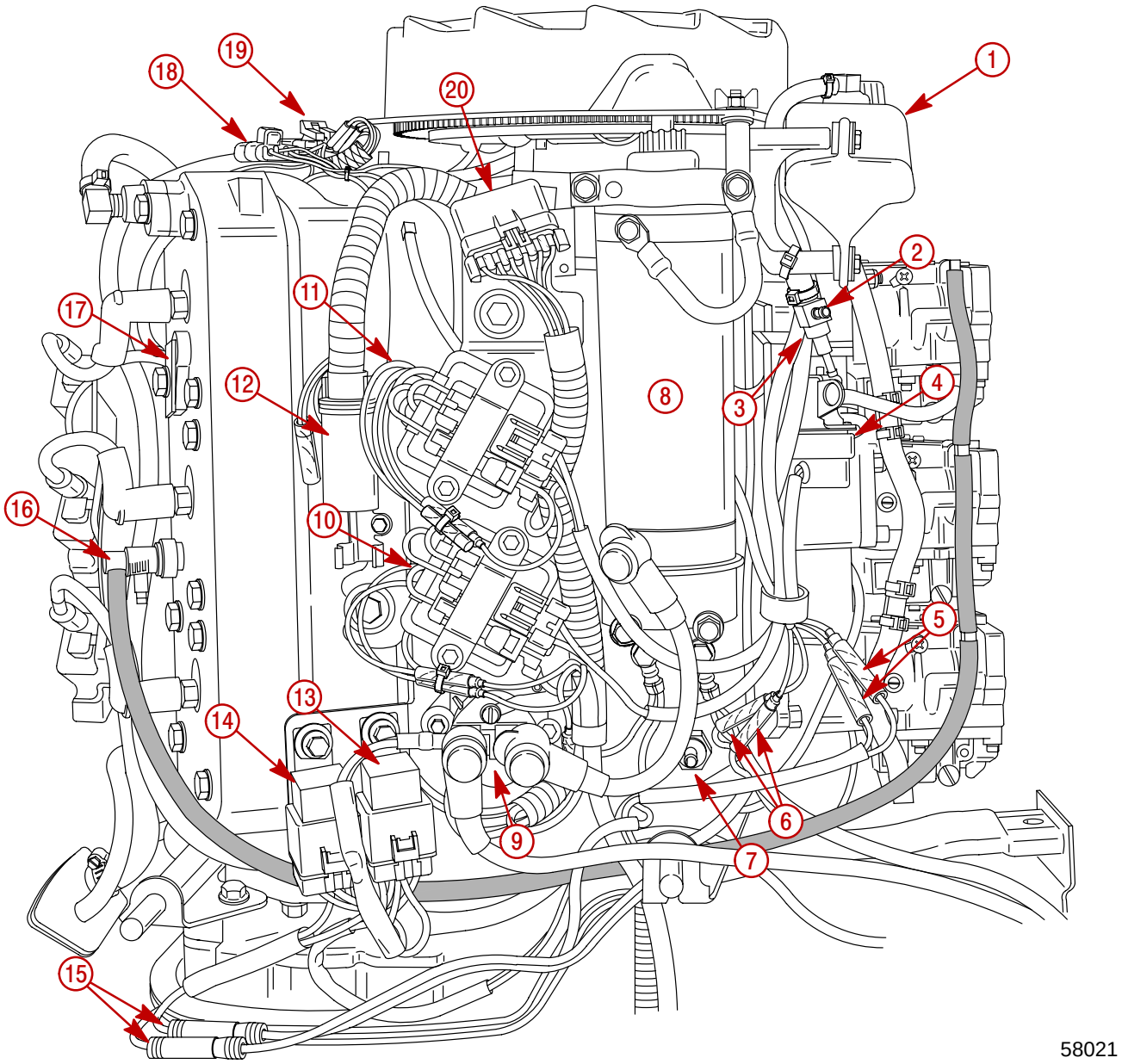
Model 135/150/200 Powerhead Front View



58022

1 - Oil Fill Cap/Low Oil Sensor
2 - #1 Cylinder Carb Throat
3 - #3 Cylinder Carb Throat
4 - Remote Fuel Tank Hose Fitting
5 - #5 Cylinder Carb Throat
6 - #6 Cylinder Carb Throat
7 - #4 Cylinder Carb Throat
8 - #2 Cylinder Carb Throat
9 - Fuel Enrichment Solenoid
10 - Vent 2 psi Check Valve
11 - Remote Oil Tank Hose Fitting
12 - Oil Reservoir [0.94 qt. (0.89 Liter)]

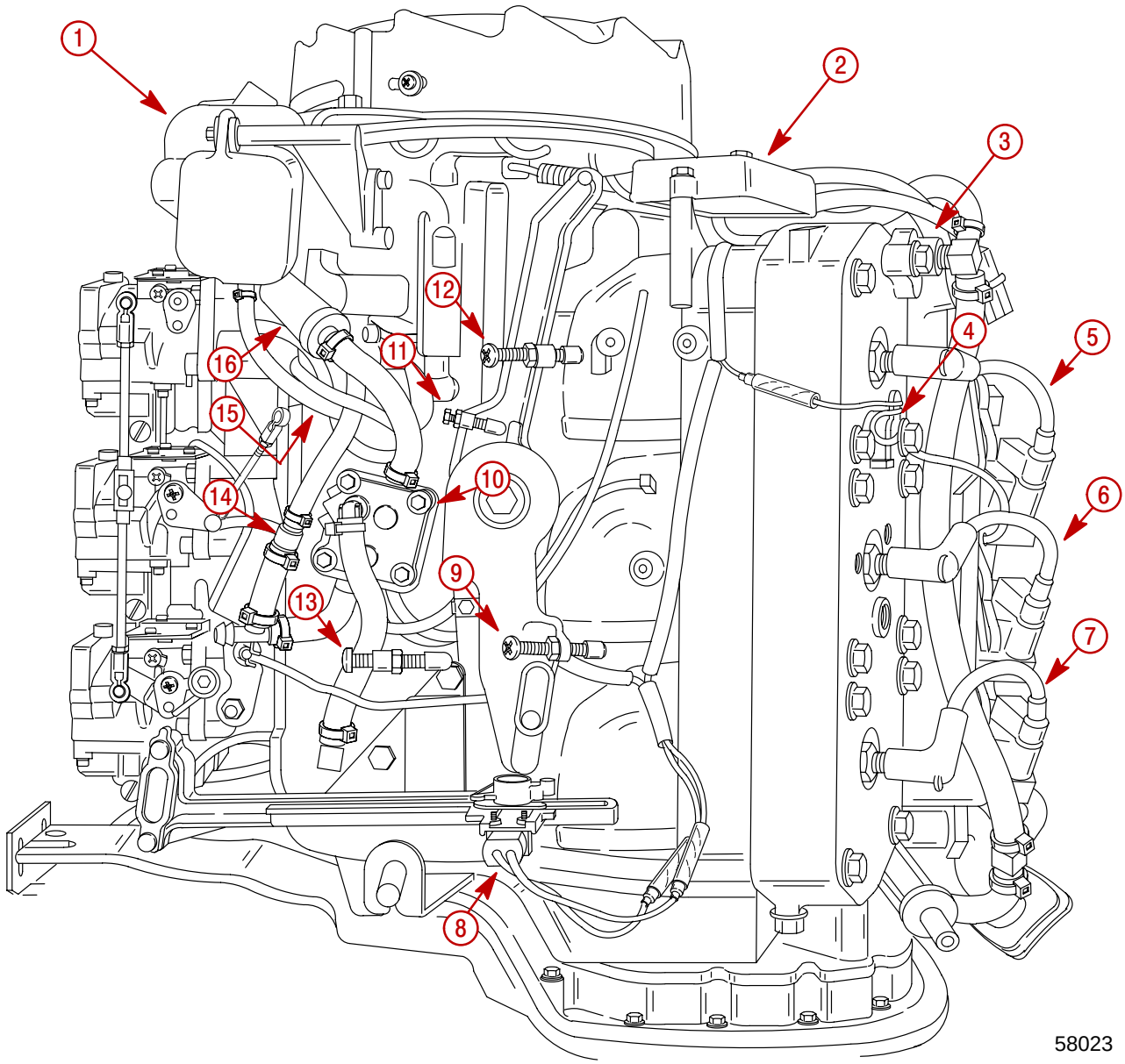
Model 135/150/200 Powerhead Starboard View



58021

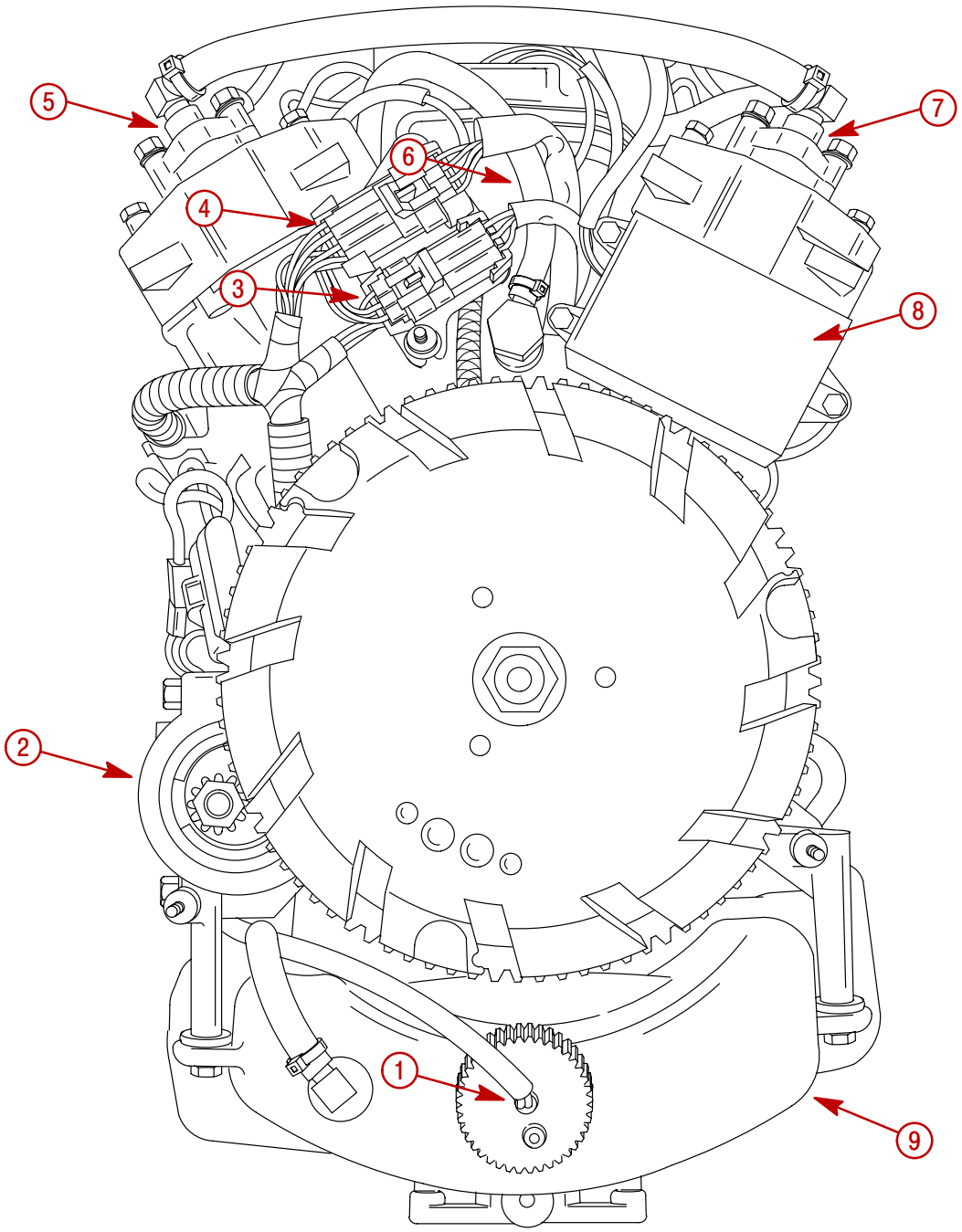
1 - Oil Reservoir
2 - Remote Oil Tank Hose Fitting
3 - Vent 2 psi Check Valve
4 - Fuel Enrichment Valve
5 - Low Oil Sensor Connectors
6 - Fuel Enrichment Valve Connectors
7 - Remote Oil Tank Pressure Check Valve
8 - Starter Motor
9 - Starter Solenoid
10 - Voltage Regulator
11 - Voltage Regulator
12 - Engine Harness Connector
13 - Trim UP Relay
14 - Trim DOWN Relay
15 - Power Trim Pump Connectors
16 - Thermal Air Valve
17 - Block Temperature Sensor
18 - Control Module Connector
19 - Trigger Connector
20 - 20 Ampere Fuses (3)

Model 135/150/200 Powerhead Port View



1 - Oil Reservoir
2 - Control Module
3 - Thermostat 143° F (61.7° C)
4 - Temperature Sensor
5 - #2 CDM
6 - #4 CDM
7 - #6 CDM
8 - Shift Interrupt Switch
9 - Idle Stop Screw
10 - Pulse Fuel Pump
11 - Primary Pick-up Screw
12 - Maximum Timing Screw
13 - Wide Open Throttle Stop Screw
14 - 2 psi Check Valve
15 - Oil Pump
16 - Fuel Filter

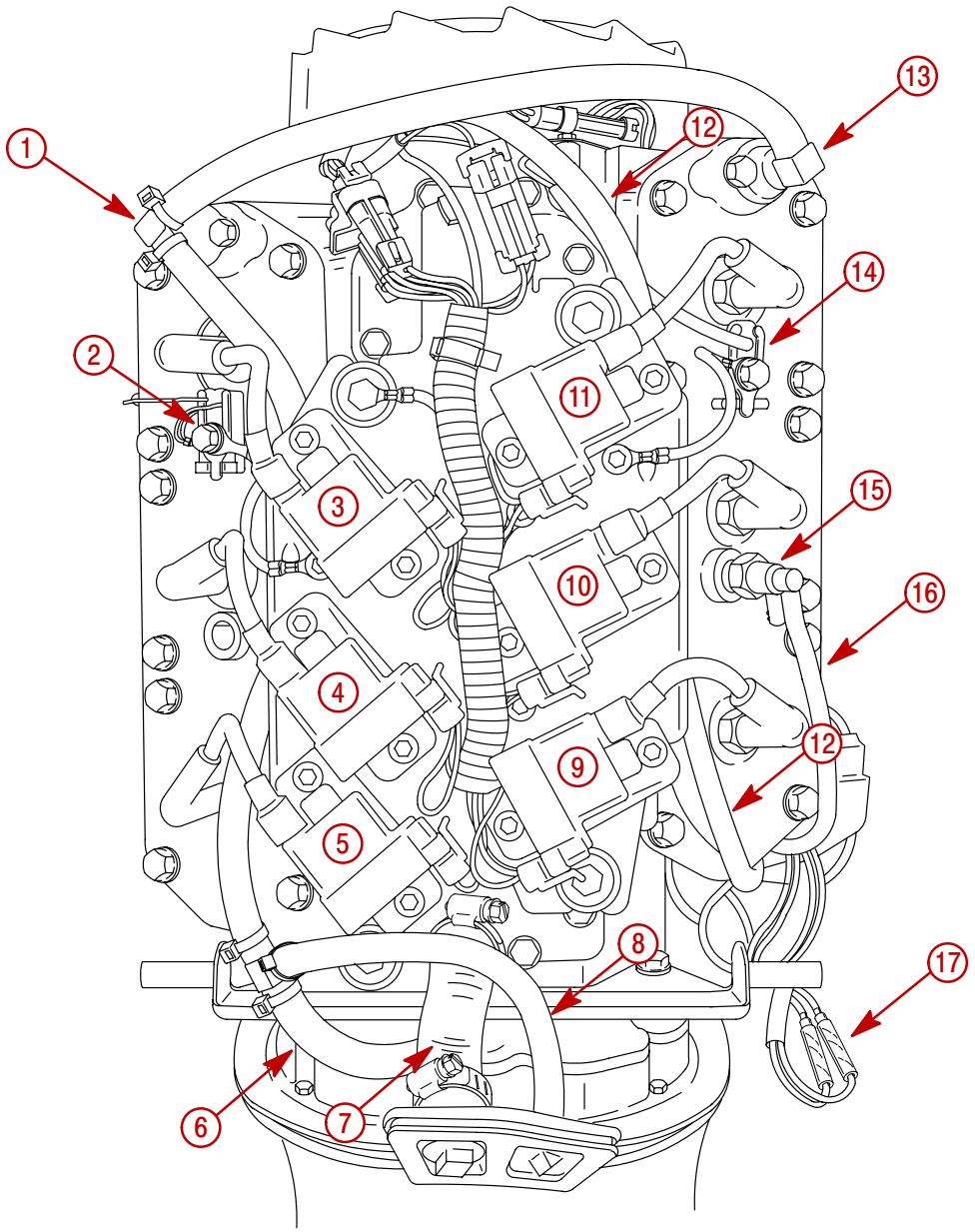
Model 135/150/200 Powerhead Top View



58020

1 - Low Oil Sensor
2 - Starter Motor
3 - Trigger Harness Connector
4 - Control Module Harness Connector
5 - Starboard Thermostat (143°F (61.7°C)
6 - Water By-Pass Hose
7 - Port Thermostat (143°F (61.7°C)
8 - Control Module (RPM Limiter, Bias Control,Shift Stabilizer, Idle Stabilizer, and Low Oil Warning
9 - Oil Reservoir [0.94 qt. (0.89 Liter)]

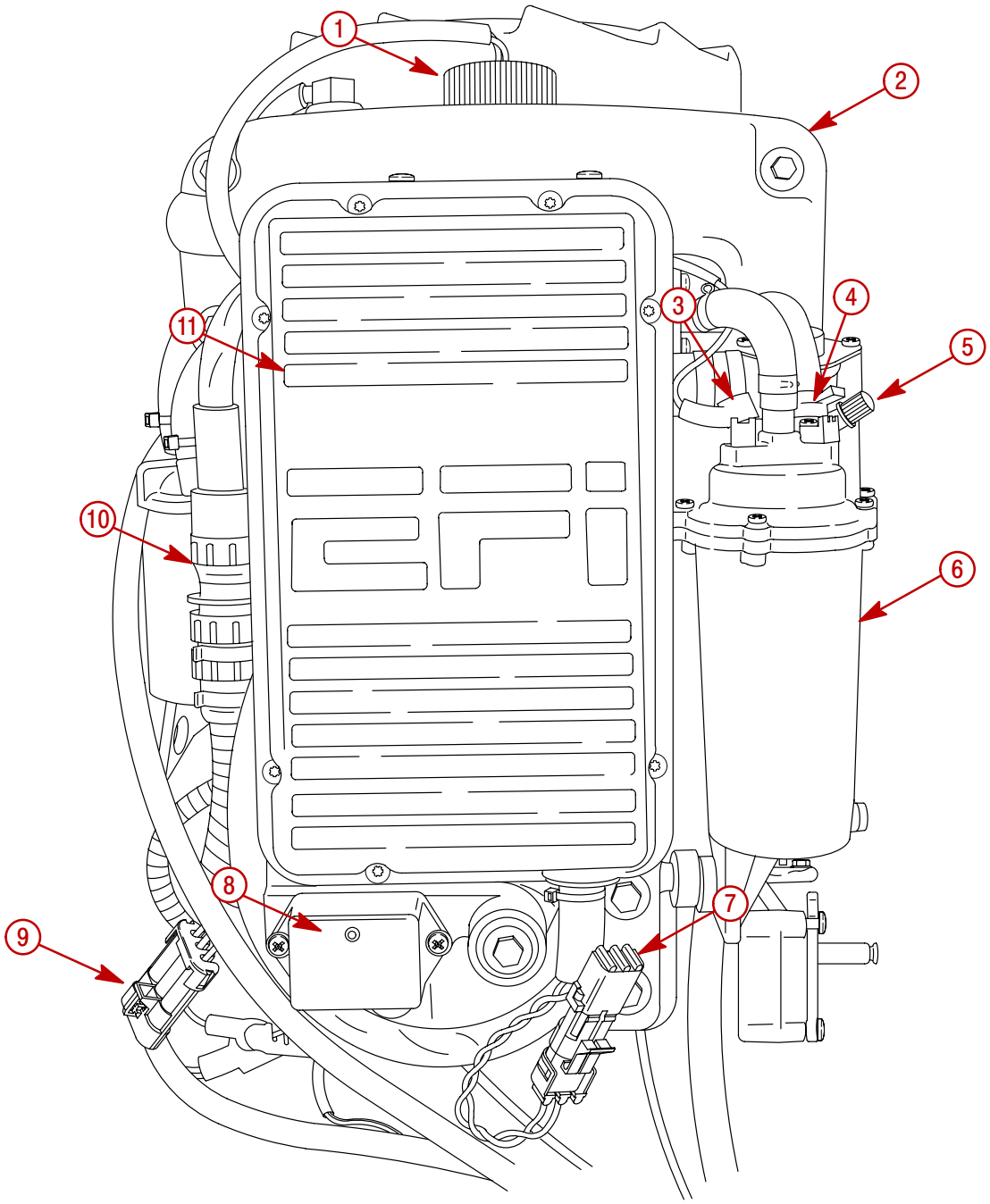
Model 135/150/200 Powerhead Aft View



58024

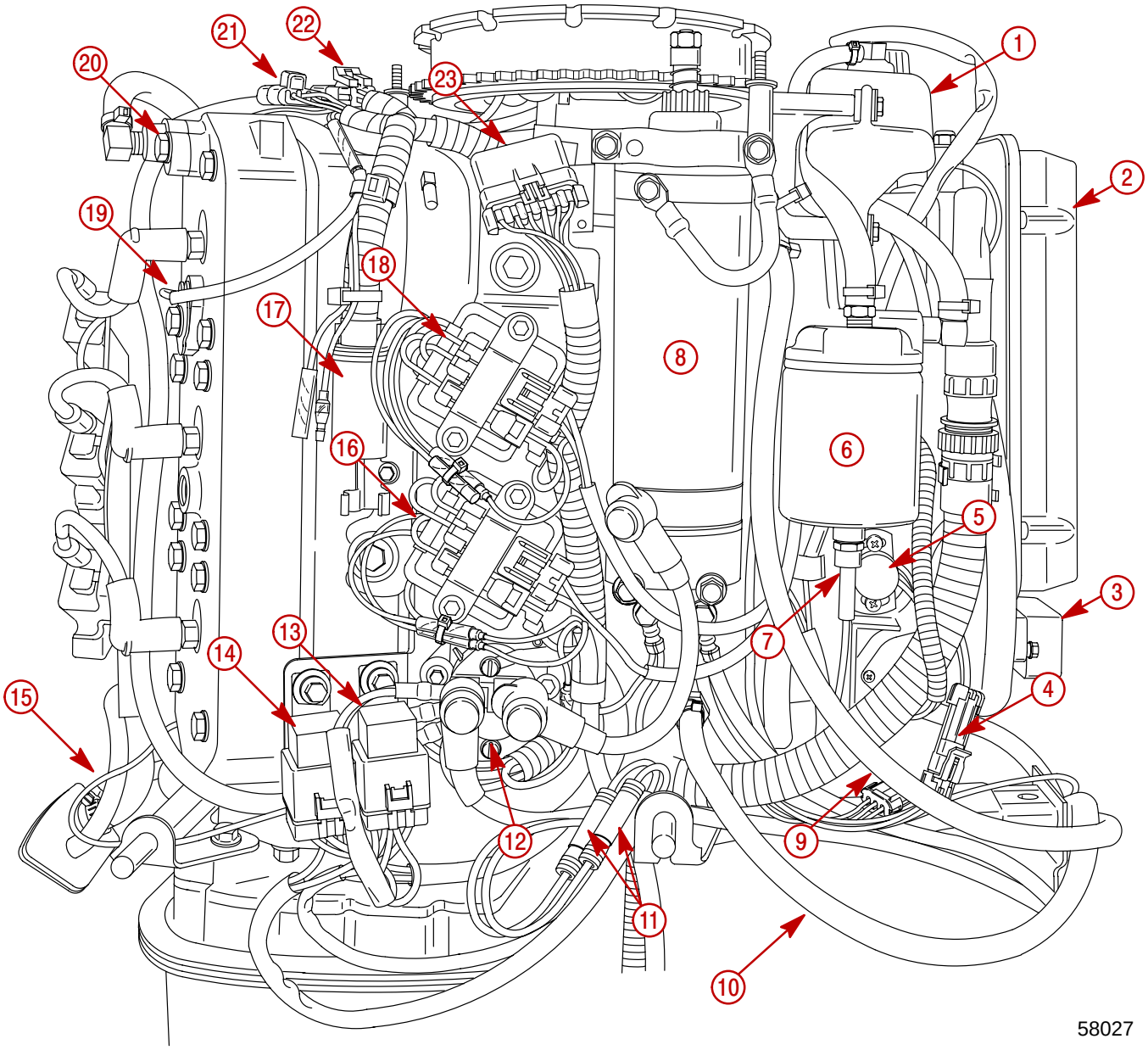
1 - Port Thermostat [143°F (61.7°C)]
2 - Temperature Sensor (Temperature Gauge)
3 - #2 CDM
4 - #4 CDM
5 - #6 CDM
6 - Thermostat Outlet Hose to Adaptor Plate
7 - Cylinder Block Flush Hose
8 - Tell–Tale Hose
9 - #5 CDM
10 - #3 CDM
11 - #1 CDM
12 - Water By-Pass Hose to Poppet Valve Cover
13 - Starboard Thermostat [143°F (61.7°C)]
14 - Temperature Sensor (Engine Overheat)
15 - Thermal Air Valve
16 - Thermal Air Hose to Carburetors
17 - Trim Motor Bullet Connectors

Model 150 XRI/175 XRI/200 XRI Powerhead Front View



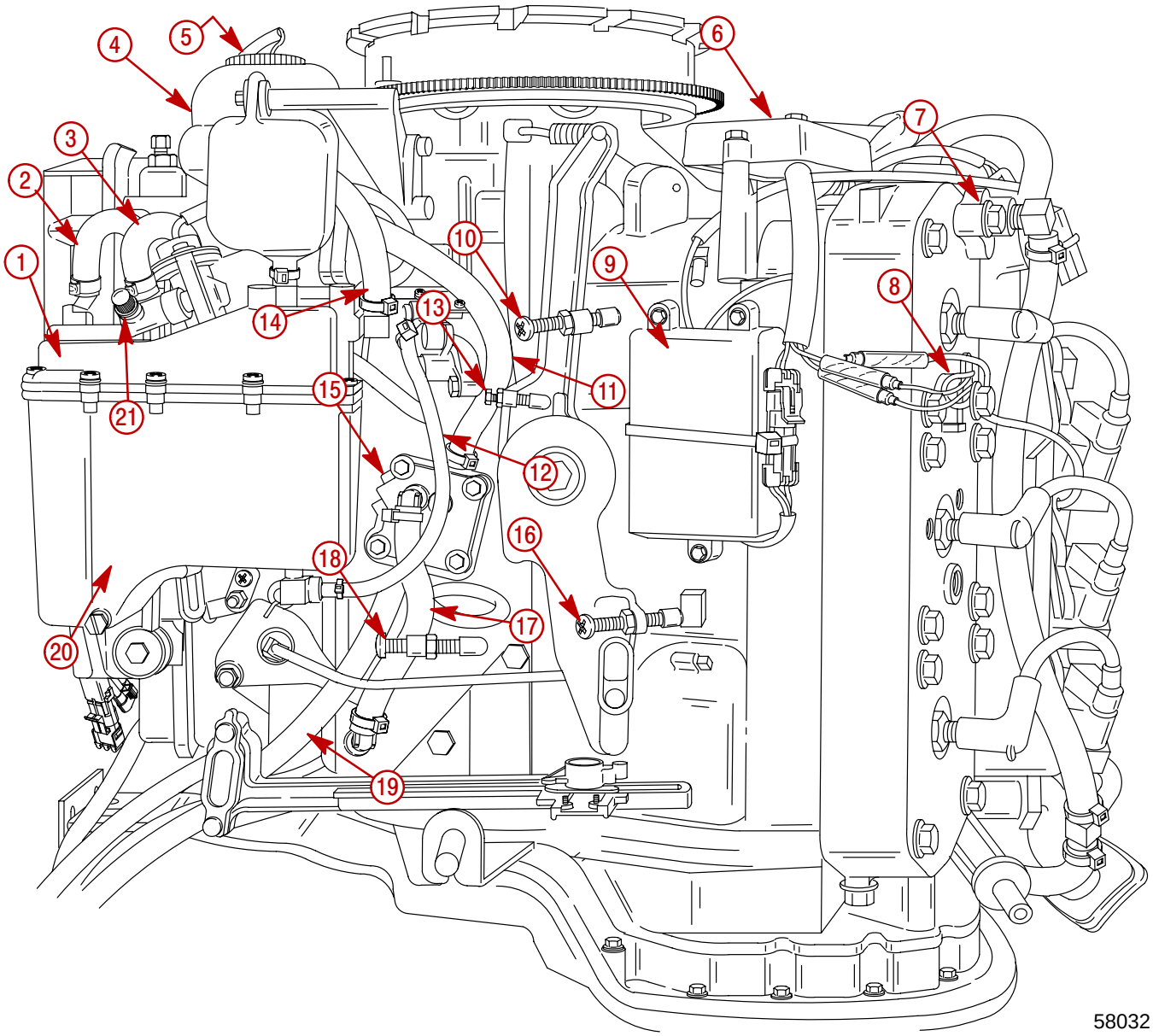
1 - Oil Fill Cap/Low Oil Sensor
2 - Oil Reservoir [0.94 qt. (0.89 Liter)]
3 - Positive (+) Terminal
4 - Negative (–) Terminal
5 - Shrader Valve
6 - Vapor Separator Tank (VST)
7 - Digital Diagnostic Terminal (DDT) Connector
8 - Water Sensor Module
9 - Throttle Position Indicator (TPI) Connector
10 - Electronic Control Module (ECM) Connector
11 - Electronic Control Module

Model 150 XRI/175 XRI/200 XRI Powerhead Starboard View



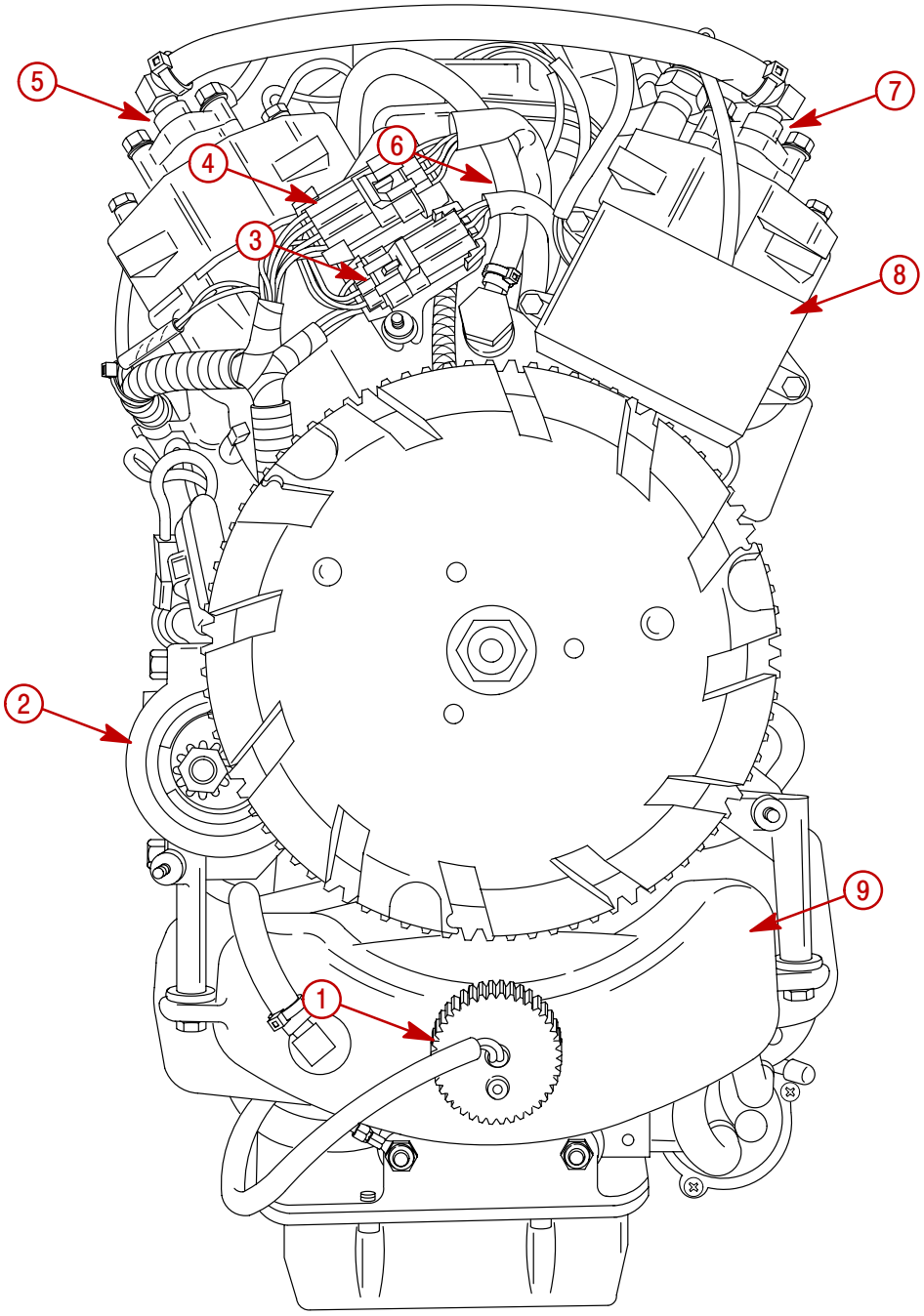
1 - Oil Reservoir [0.94 qt. (0.89 Liter)]
2 - Electronic Control Module
3 - Water Sensor Module
4 - Throttle Position Indicator (TPI) Connector
5 - Throttle Position Indicator (TPI)
6 - Fuel/Water Separator Filter
7 - Water Sensor Probe
8 - Starter Motor
9 - Oil Supply Hose to Oil Reservoir
10 - Remote Oil Tank Pressure Hose
11 - Trim Motor Bullet Connectors
12 - Starter Solenoid
13 - Trim UP Relay
14 - Trim DOWN Relay
15 - Water Pressure Gauge Hose
16 - Voltage Regulator
17 - Engine Harness Connector
18 - Voltage Regulator
19 - Temperature Sensor (Engine Overheat)
20 - Starboard Thermostat [143°F (61.7°C)]
21 - Control Module Harness Connector
22 - Trigger Harness Connector
23 - 20 Ampere Fuses (3)

Model 150 XRI/175 XRI/200 XRI Powerhead Port View



1 - Electric Fuel Pump (inside Vapor Separator)
2 - Fuel Out to Fuel Rail
3 - Fuel Return from Fuel Rail
4 - Oil Reservoir [0.94 qt. (0.89 Liter)]
5 - Low Oil Sensor
6 - Control Module (RPM Limiter, Bias Control,Shift Stabilizer, Idle Stabilizer, Injector Timing Signal and Low Oil Warning
7 - Port Thermostat [143°F (61.7°C)]
8 - Temperature Sensor (Temperature Gauge)
9 - Detonation Sensor
10 - Maximum Spark Advance Screw
11 - Fuel Outlet to Fuel /Water Separator
12 - Oil Output Hose to Vapor Separator (VST)
13 - Primary Pickup Screw
14 - Fuel Inlet from Fuel/Water Separator to VST
15 - Pulse Fuel Pump
16 - Idle Stop Screw
17 - Pulse Pump Vacuum Hose
18 - Wide Open Throttle Stop Screw
19 - Fuel Inlet Hose to Pulse Pump
20 - Vapor Separator Tank (VST)
21 - Schrader Valve

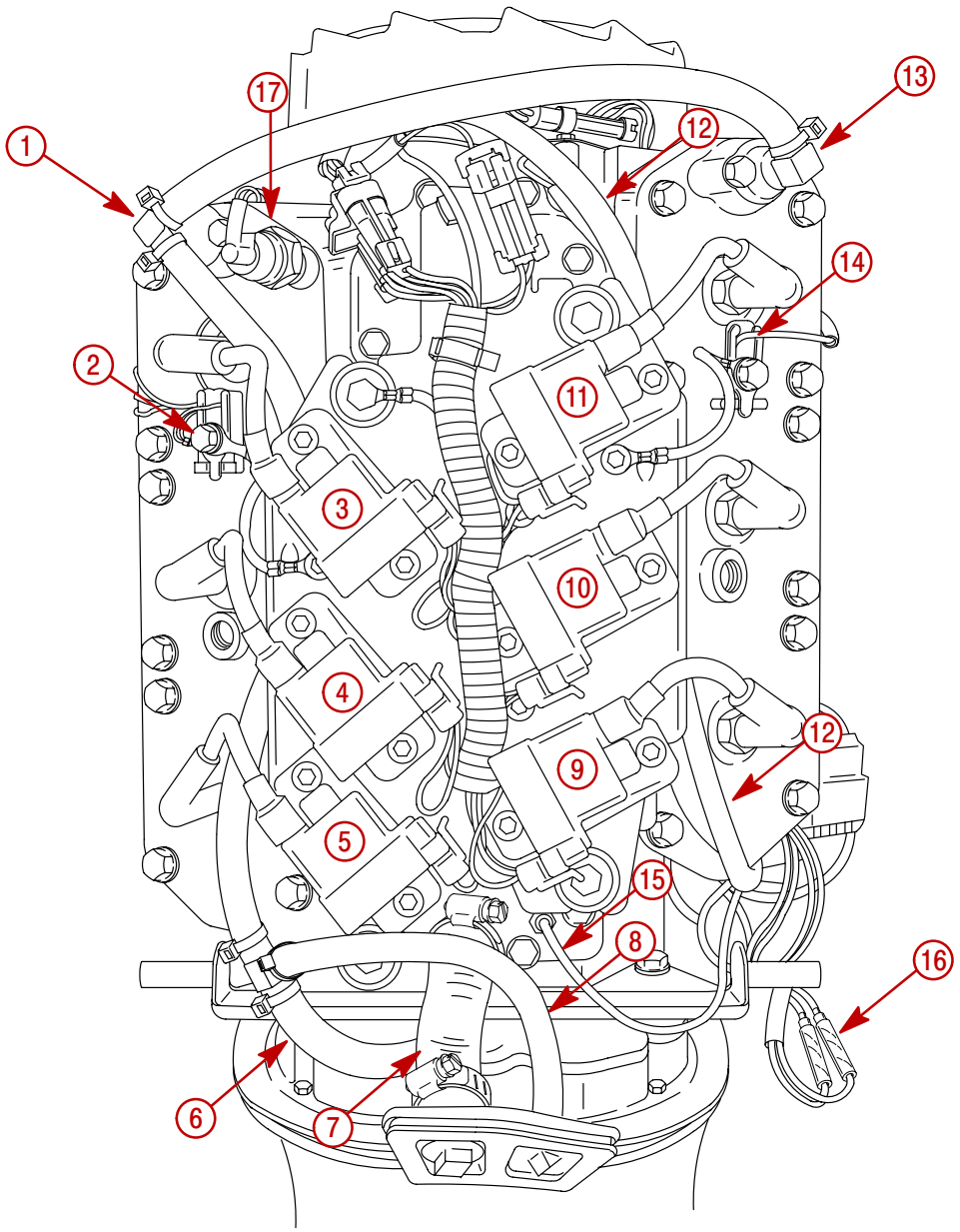
Model 150 XRI/175 XRI/200 XRI Powerhead Top View



58029

1 - Oil Cap/Low Oil Sensor
2 - Starter Motor
3 - Trigger Harness Connector
4 - Control Module Harness Connector
5 - Starboard Thermostat (143°F (61.7°C)
6 - Water By-Pass Hose
7 - Port Thermostat (143°F (61.7°C)
8 - Control Module (RPM Limiter, Bias Control,Shift Stabilizer, Idle Stabilizer, Injector Timing Signal and Low Oil Warning
9 - Oil Reservoir [0.94 qt. (0.89 Liter)]

Model 150 XRI/175 XRI/200 XRI Powerhead Aft View



58030

1 - Port Thermostat [143°F (61.7°C)]
2 - Temperature Sensor (Temperature Gauge)
3 - #2 CDM
4 - #4 CDM
5 - #6 CDM
6 - Thermostat Outlet Hose to Adaptor Plate
7 - Cylinder Block Flush Hose
8 - Tell–Tale Hose
9 - #5 CDM
10 - #3 CDM
11 - #1 CDM
12 - Water By-Pass Hose to Poppet Valve Cover
13 - Starboard Thermostat [143°F (61.7°C)]
14 - Temperature Sensor (Engine Overheat)
15 - Water Pressure Gauge Hose
16 - Trim Motor Bullet Connectors
17 - Detonation Sensor

Painting Procedures

Cleaning & Painting Aluminum Propellers & Gear Housings

⚠ WARNING

Avoid serious injury from flying debris. Avoid serious injury from airborne particles. Use eye and breathing protection with proper ventilation.

PROPELLERS

1. Sand the entire area to be painted with 3M 120 Regalite Polycut or coarse Scotch-Brite, disc or belts.
2. Feather edges of all broken paint edges. Try not to sand through the primer.
3. Clean the surface to be painted using PPG Industries DX330 Wax and Grease Remover or equivalent (Xylene or M.E.K.).
4. If bare metal has been exposed, use Quicksilver's Light Gray Primer.
5. Allow a minimum of 1 hour dry time and no more than 1 week before applying the finish coat.
6. Apply the finish coat using Quicksilver's EDP Propeller Black.

GEAR HOUSINGS

The following procedures should be used in refinishing gear housings. This procedure will provide the most durable paint system available in the field. The materials recommended are of high quality and approximate marine requirements. The following procedure will provide a repaint job that compares with a properly applied factory paint finish. It is recommended that the listed materials be purchased from a local Ditzler Automotive Finish Supply Outlet. The minimum package quantity of each material shown following is sufficient to refinish several gear housings.

Procedure:

1. Wash gear housing with a muriatic acid base cleaner to remove any type of marine growth, and rinse with water, if necessary.
2. Wash gear housing with soap and water, then rinse.
3. Sand blistered area with 3M 180 grit sandpaper or P180 Gold Film Disc to remove paint blisters only. Feather edge all broken paint edges.
4. Clean gear housing thoroughly with (DX-330) wax and grease remover.
5. Spot repair surfaces where bare metal is exposed with (DX-503) alodine treatment.

IMPORTANT: Do not use any type of aerosol spray paints as the paint will not properly adhere to the surface nor will the coating be sufficiently thick to resist future paint blistering.

6. Mix epoxy chromate primer (DP-40) with equal part catalyst (DP-401) per manufacturers instructions, allowing proper induction period for permeation of the epoxy primer and catalyst.
7. Allow a minimum of one hour drying time and no more than one week before top coating assemblies.
8. Use Ditzler Urethane DU9000 for Mercury Black, DU34334 for Mariner Grey, and DU35466 for Force Charcoal, and DU33414M for Sea Ray White. Catalyze all four colors with Ditzler DU5 catalyst mixed 1:1 ratio. Reduce with solvents per Ditzler label.

⚠ CAUTION

Be sure to comply with instructions on the label for ventilation and respirators. Using a spray gun, apply one half to one mil even film thickness. Let dry, flash off for five minutes and apply another even coat of one half to one mil film thickness. This urethane paint will dry to the touch in a matter of hours, but will remain sensitive to scratches and abrasions for a few days.

9. The type of spray gun used will determine the proper reduction ratio of the paint.

IMPORTANT: Do not paint sacrificial zinc trim tab or zinc anode.

10. Cut out a cardboard “plug” for trim tab pocket to keep paint off of mating surface to maintain good continuity circuitry between trim tab and gear housing.

Decal Application

Decal Removal

1. Mark decal location before removal to assure proper alignment of new decal.
2. Carefully soften decal and decal adhesive with a heat gun or heat blower while removing old decal.
3. Clean decal contact area with a 1:1 mixture of isopropyl alcohol and water.
4. Thoroughly dry decal contact area and check for a completely cleaned surface.

Instructions for “Wet” Application

NOTE: *The following decal installation instructions are provided for a “Wet” installation.* ***All*** *decals should be applied wet.*

TOOLS REQUIRED

1. Plastic Squeegee*
2. Stick Pin
3. Dish Washing **Liquid/Detergent without ammonia**** “Joy” and “Drift” are known to be compatible for this process.

* Automotive Body Filler Squeegee

** Do not use a soap that contains petroleum based solvents.

SERVICE TIP: Placement of decals using the “Wet” application will allow time to position decal. Read entire installation instructions on this technique before proceeding.

TEMPERATURE

IMPORTANT: Installation of vinyl decals should not be attempted while in direct sunlight. Air and surface temperature should be between 60°F (15°C) and 100°F (38°C) for best application.

SURFACE PREPARATION

IMPORTANT: Do not use a soap or any petroleum based solvents to clean application surface.

Clean entire application surface with mild dish washing liquid and water. Rinse surface thoroughly with clean water.

DECAL APPLICATION

1. Mix $^{1}/_{2}$ ounce (16 ml) of dish washing liquid in one gallon (4 l) of cool water to use as wetting solution.

NOTE: *Leave protective masking, if present, on the face of decal until final steps of decal installation. This will ensure that the vinyl decal keeps it's shape during installation.*

2. Place the decal face down on a clean work surface and remove the paper backing from "adhesive side" of decal.
3. Using a spray bottle, flood the entire "adhesive side" of the decal with the pre-mixed wetting solution.
4. Flood area where the decal will be positioned with wetting solution.
5. Position pre-wetted decal on wetted surface and slide into position.
6. Starting at the center of the decal, "**lightly**" squeegee out the air bubbles and wetting solution with overlapping strokes to the outer edge of the decal. Continue going over the decal surface until all wrinkles are gone and adhesive bonds to the cowl surface.
7. Wipe decal surface with soft paper towel or cloth.
8. **Wait 10 - 15 minutes.**
9. Starting at one corner, "carefully and slowly" pull the masking off the decal surface at a 180° angle.

NOTE: *To remove any remaining bubbles, pierce the decal at one end of the bubble with stick pin and press out the entrapped air or wetting solution with your thumb (moving toward the puncture).*