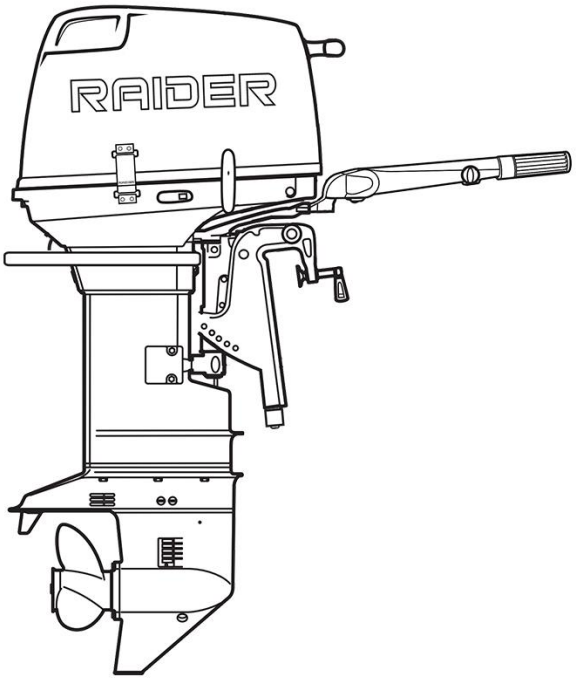
2022

OWNER'S MANUAL

RAIDER MODEL 55 2-STROKE
SUBMERSIBLE / GASOLINE OUTBOARD ENGINE
PART NO. R50-ES-003
NSN 2805-01-697-7842



RAIDER OWNER'S MANUAL NO. R50-ES-003
INSTRUCTIONS FOR OPERATION OF THE MODEL 55 OUTBOARD ENGINE
"SHOP MANUAL"

RAIDER Outboards Inc.
1885 ARMSTRONG DRIVE
TITUSVILLE, FL 32780

RAIDER 55

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DUAL ENGINE SYSTEM

The Raider series of outboard engines are dedicated to the Marine Raiders established by the United States Marine Corps during WWII and are said by many to be the first United States special operations force. Handpicked from the elite, these men were given specialized training and the best equipment. They distinguished themselves during the conduct of clandestine amphibious landings, utilizing small inflatable boats, operating behind enemy lines in direct support of combat operations in the Central Pacific and Solomon Islands. Even though the Raiders were disbanded at the close of WWII the need for specially trained warfighters and the requirements for specialized equipment did not. Today's Special Operations Forces (SOF) under the United States Special Operation Command (USSOCOM) are expected to conduct similar and far more demanding missions, to that end and with those warfighters in mind the Raider (OBM) is specifically developed for SOF that routinely operate within the often unforgiving, highly demanding, dynamic maritime environment.

WHO WE ARE

- Raider Outboards, Inc. is a-US owned and operated company based in Central Florida near Kennedy Space Center, located in the Space Port Commerce Park. We design and produce multi-fuel, submersible, lightweight outboard engines, and associated parts. Our markets include Department of Defense (DOD), Other Government Agencies (OGA), National and Local Law Enforcements and First Responder Services, Search & Rescue, and commercial/retail.

- Raider also provides a series of transom plates that are attached to the transom of the Inflatable Combat Raiding Craft (I-CRC) and Inflatable Combat Assault Craft (I-CAC). The transom plates have single and dual engine configurations. The transom plates provide centerline alignment and safety if the engine clamps loosen under vibration. Specialty items like extended handles, extended fuel hose connections, outboard engine carts and transportation cages are also available.

WHAT WE ARE ABOUT

Raider Outboards develops, manufactures, and provides technical support services for highly reliable outboard engines for today's warfighter. Our designs are field proven and add capacity and capability to perform the most difficult and demanding maritime missions. Features include.

- Simple and Robust.
- System Redundancy.
- Minimized Electronics.
- Air droppable.
- Bagless submersion.
- Superior dewatering.
- Leader in horsepower to weight ratio.
- 25% better fuel efficiency than any other engine in its class.
- Easy to maintain and troubleshoot.

OUR MISSION

Raider Outboards will provide and deliver the most reliable premium products, hands on training, and highest quality to the customer and serve as the premier outboard engine company to the U.S. Military; while honoring those who protect, defend, and support our communities and our country.

Chris Woodruff
Director of Engineering
Raider Outboards Inc.
Chris@raideroutboards.com
321-567-2309

YOUR RAIDER OUTBOARD ENGINE

a. The Raider R50ES-003 2805-01-697-7842 outboard engine is designed specifically for and specially manufactured for the Department of Defense for use as the main propulsion system on Inflatable Combat Raiding Craft (I-CRC) and Inflatable Combat Assault Craft (I-CAC). The Raider brings additional capability far superior to any other engine in its class. This engine can be submerged, without bagging, for extended periods and quickly restarted.

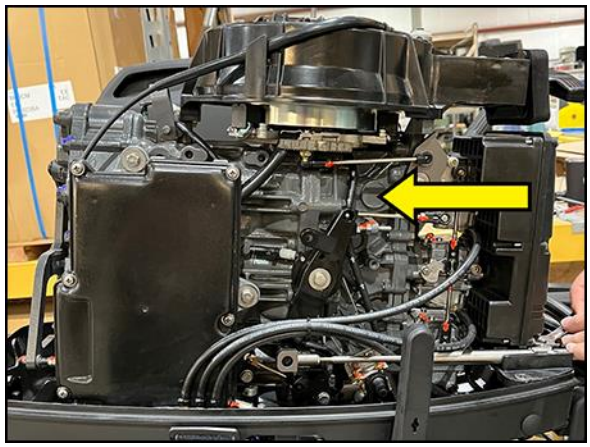
b. We would like to emphasize that optimum engine operational performance can only be assured on the condition that this manual is read through in its entirety and the maintenance routines described later are followed carefully. Should difficulty arise with the engine, please follow the troubleshooting procedures listed throughout the specified sections within this manual. For any other issues, questions, or concerns please call 321-383-9585 ext. 210 or contact TechSupport@raideroutboards.com where our trained staff of subject matter experts will provide you with any assistance required.

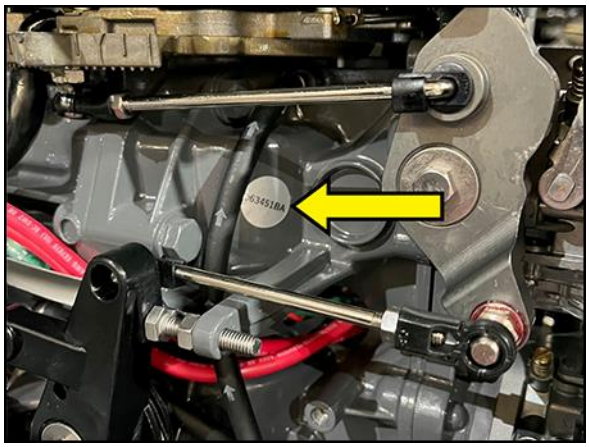
OWNER REGISTRATION AND IDENTIFICATION

a. This Raider outboard has been purchased by the Department of Defense. Each outboard contains individual Serial Numbers and Raider Outboards has a record of every engine delivered.

b. Serial Number: In the space provided below, please record the outboard engine's serial number which is indicated on the starboard side of the cylinder block. The serial number will be needed in ordering spare parts.

c. Serial Number: _____





LIMITED WARRANTY

a. Raider Outboards Engines are fully guaranteed against defective materials and workmanship for the period from the date of delivery for one year. The limited warranty will not apply to the normal wear and tear of parts, adjustments, tune-ups, or to any damage caused by:

    1. Use or operation **NOT** conforming to the instructions described in this owner's manual.

    2. Damaged caused as a result of parachute failure or improper parachute rigging.

    3. Damage, Deterioration, or Corrosion resulting in engine failure due to improper conduct of Pre and Post Operations Checks. The Raider 55HP Outboard must be flushed with fresh water and washed down after use.

    4. Improper dewatering. Damage caused by failure to adhere to the dewatering procedures.

    5. Damage from accidents, collisions, contact with foreign materials, or submersion without cleaning.

    6. Growth of marine organisms on engine surfaces that exceeds recommended submergibility times or left in the water between operational periods.

    7. Any other careless use or operation issues.

    8. Normal deterioration.

b. The limited warranty does not cover maintenance items. The following items are some examples not covered by the limited warranty.

c. Spark plugs, anodes, trim-tab, propeller, fuel filter, Starter rope, split-pin, bolt/nut washer, wire cable. Rubber goods: pump impeller. Oil seal, "O"-ring, fuel line, primer bulb, etc., vinyl tube.

d. The limited warranty will cover only your Raider Outboards 55HP and will not cover the craft the engine is mounted on, the trailer, equipment, or accessories associated with the product.

THIS MANUAL

a. This owner's manual provides information that is needed for inspection, procedures to prepare the engine for an operational cycle, preventative maintenance and troubleshooting of the Raider 55 Outboard Engine. Additional information about specific systems and parts are described within the service and parts manuals. These manuals including this one may be found on the Raider Outboards web site raideroutboards.com and may be downloaded for convenience. Should additional information be required please call or email customer service department at 321-383-9585 ext 210 or TechSupport@raideroutboards.com.

b. For our users we have built the best outboard engine for long term, it is essential for the maintainer to prepare the outboard prior to the operational period. To ensure this, the maintenance and service must be done properly by a service technician with fundamental knowledge and skills. This manual is utilized so that our operators can always use their outboard engine with full satisfaction.

c. Raider 55HP Outboard Engine Service manual: https://www.raideroutboards.com/ or contact Raider Outboards customer service at 321-383-9585 ext 210, TechSupport@raideroutboards.com

Contents

General Information

SAFETY INFORMATION

As the operator or coxswain of your craft, first and foremost, you are personally responsible for the safety of the crew, embarked personnel, and any person in the water or in the vicinity of the craft. Safety is paramount in all operations. Therefore, you should possess thorough knowledge of correct operation of your craft, its accessories, and the RAIDER Model 55 Outboard Engine. This manual details the proper procedures, correct operation, and maintenance of the engine. Additional hands-on training courses for both the operators and technicians are available through Raider.

Hearing Protection

Ensure all personnel in the vicinity and operating the Outboard Engine wear hearing protection when engine is being operated to prevent against potential noise hazards. Failure to follow this warning may cause damage or loss of hearing.

Low Pressure (LP) Air

Compressed air used for cleaning purposes must not exceed 30 psi (207 kPa). Wear gloves and eye protection. Do not direct compressed air at yourself or other people. Failure to comply may cause injury to personnel.

HAZARDOUS MATERIALS WARNING

Degreasing Solvent

Cleaning Solvent is flammable and can cause irritation to the eyes, skin or respiratory tract. Read and carefully follow manufacturer's instructions prior to use. Only use in well-ventilated areas and keep away from heat, open flame and/or other ignition sources. Ensure containers are securely closed when not in use. Keep fire extinguishers nearby. Wear protective eyewear and clothing. Do not breathe vapors. Use a respirator as needed. If exposed, immediately flush eyes with water and/or wash skin with soap and water, seek medical attention.

Refer to local procedures and plans for preventing and responding to spills or leaks. Immediately clean up any spills. Keep cloths / rags away from open flame and / or ignition sources. Comply with local procedures and environmental regulations when disposing of solvent, cleanup materials, and leaked or spilled fluid.

Failure to comply may result in injury to personnel, damage to equipment and/or damage to the environment.

Adhesive And Sealing Compounds

Adhesive and sealing compounds can be toxic and/or flammable. Only use in well-ventilated areas and keep away from heat, open flame and/or other ignition sources. Ensure containers are securely closed when not in use. Keep fire extinguishers nearby. Do not breathe vapors. Continued exposure can cause dizziness and irritation to eyes, skin or respiratory tract. Sealing compounds and adhesives bond on contact with eyes, skin, or clothing. Do not allow compounds to contact skin or eyes. Wear protective eyewear and clothing. If exposed, immediately flush eyes with water and/or wash skin with soap and water, seek medical attention. Immediately clean up any spilled compound. Comply with local procedures and environmental regulations when disposing of any adhesives/sealants or cleanup materials.

Failure to comply may result in injury to personnel and/or damage to the environment.

Fluid Spill

Fluid spills may be slippery and cause falls. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Immediately clean up spilled fluid. Use a drain pan or suitable container to capture any draining, leaking or spilled fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Immediately clean up spilled fluid. Comply with local procedures and environmental regulations when disposing of cleanup materials, and drained, leaked or spilled fluids. Failure to comply may result in injury to personnel and/or damage to the environment.

Fuel

Fuel is flammable and harmful to health. Keep fuel away from heat or ignition sources. DO NOT smoke within 50 feet (15 m) of a fuel source. Do not work on fuel system when engine is hot. Shut down engine before refueling. Ensure fuel nozzle is grounded to filler neck. Do not overfill fuel tank. Keep fire extinguisher nearby. Wear gloves and eye protection and ensure adequate ventilation during refueling. Refer to local procedures and plans for preventing and responding to fuel spills or leaks. Use a drain pan or suitable container to capture any draining, leaking or spilled fuel. Refer to local procedures and plans for preventing and responding to fuel spills or leaks. Immediately clean up spilled fuel. Keep cloths / rags away from open flame and / or ignition sources. Comply with local procedures and environmental regulations when disposing of unused fuel, soiled/cleanup materials (such as filters and rags), and drained, leaked or spilled fuel.

Failure to comply may result in injury to personnel and/or damage to the environment.

Lubricating Oil

Lubricating Oil may be flammable. Keep away from heat, open flame and/or other ignition sources. Prolonged contact with lubricating oil may cause a skin rash. Wear protective eyewear, gloves and clothing. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. If exposed, flush skin and/or eyes with water and seek medical attention.

Use a drain pan or suitable container to capture any draining, leaking or spilled fluid. Refer to local procedures and plans for preventing and responding to fluid spills or leaks. Immediately clean up spilled oil. Keep cloths / rags away from open flame and / or ignition sources. Comply with local procedures and environmental regulations when disposing of lubricating oil, soiled/cleanup materials (such as filters and rags), and drained, leaked or spilled fluids.

Failure to comply may result in injury to personnel and/or damage to the environment.

Grease

Grease contains ingredients that can cause mild skin contact hazard. Treat random or occasional skin contact with mild soap and water. Gloves and eye protection is required with heavy, constant exposure. Do not ingest. Immediately clean up any spilled compound. Comply with local procedures and environmental regulations when disposing of grease or cleanup materials.

Failure to comply may result in injury to personnel and/or damage to the environment.

NOTICE: WARNING/CAUTION/NOTE

Before installing, operating, or otherwise handling your RAIDER Model 55 Outboard Engine, be sure to thoroughly read and understand this operations section of this manual and carefully follow all the instructions. Of particular importance is information preceded by the words "WARNING," "CAUTION," and "NOTE." Always pay special attention to such information to ensure safe operation of the outboard engine at all times.

The following safety statements are found throughout this manual and indicate information which, if ignored, could result in fatal safety hazards or property damage.

Failure to observe could result in severe personal injury or death, or property damage.

Failure to observe could result in property damage.

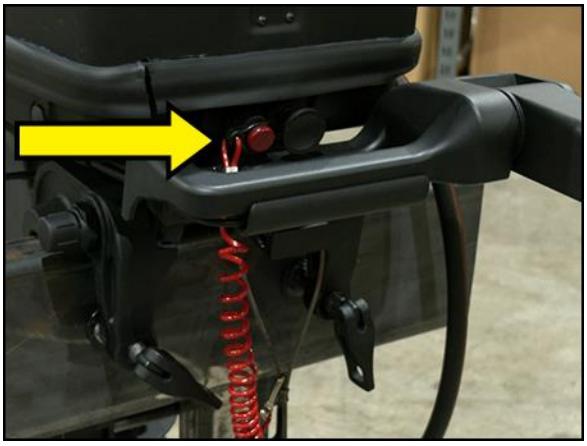
This instruction provides special information to facilitate the use or maintenance of the Outboard Engine or to clarify important points.

EMERGENCY STOP SWITCH

WARNING

Accidental activation of the Emergency Stop Switch could cause passengers to lose their balance and even fall overboard, or it could result in loss of power in heavy seas, strong currents, or high winds. Loss of control while mooring is another potential hazard.

The Emergency Stop Switch will stall the outboard engine when the stop switch lanyard is pulled off. This stop switch lanyard can be attached to the operator of the outboard engine to minimize or prevent injuries from the propeller in case the operator falls overboard. We highly recommend use of the Emergency Stop Switch lanyard.



RAIDER EMERGENCY TOOL KIT

Included with each RAIDER Model 55 Outboard Engine is a Raider Emergency Field Kit (EFK). This includes tools for underway troubleshooting and emergency repairs and spare parts. The tools and parts provided are contained inside a small waterproof case designed for easy stowage and is intended to be carried onboard the craft as part of the operational load out. This kit is not inclusive and additional items may be required based on organizational Standard Operating Procedures (SOP).

The EFK includes the following items:

Emergency Field Kit with Case R-EFK50-002

CAGE Code	Part No.	Description	Qty
595K1	**R-NGK4919**	Sparkplugs	3
595K1	**R-841150**	M10 Deep Socket 3/8 Dr	1
595K1	**R-841156**	M16 Deep Socket 3/8 Dr	1
595K1	**R-841153**	M13 Deep Socket 3/8 Dr Modified	1
595K1	**R-2292340**	6 Way Screwdriver	1
595K1	**R-67149**	Crescent Wrench	1
595K1	**R-63818**	Pliers	1
595K1	**R-52735A45**	3/8 Hex Drill Socket	1
595K1	**R-106988**	3/8 Ratchet	1
595K1	**R-5009238**	Pelican Case 1150	1
595K1	**R-203561746**	#5.5 Starter Cord (7ft)	1
595K1	**R-25002**	2 Oz Marine Grease	1

RAIDER Model 55 Outboard Engine System Overview

CAPABILITIES/FEATURES

2-Stroke, Gasoline, Submersible, Air Droppable Outboard Engine

Part No. (R50-ES-003)

A propulsion system for boats, consisting of a self-contained unit that includes engine, gearbox, and propeller, designed to be affixed to the outside of the transom. Lightweight and easily removed for service, storage, or repairs.

- Gasoline only, with a certified NMMA TC-W3 2-Cycle Synthetic Marine Oil, Part No. (TC-W III) at 50:1 Fuel to oil mixture.
- Fully submersible, in salt water, without bagging to depths greater than 50ft for 24 hours.
- Upon surface recovery fully operational within 10 minutes.
- Air Deployable from fixed wing and rotary aircraft

Submersible

Allows for full submersion, in salt water, without bagging to a depth greater than 50ft for 24 hours.

Dewatering

Upon recovery to the surface fully operational within 10 minutes. Easy instructions for dewatering are provided affixed to each engine cowling of every outboard engine. Most operators, with practice and adherence to the provided instructions, restore the engine to operations within two minutes of surfacing. Skilled operators are able to achieve lite off in as few as 30 seconds.

Air Deployable

When required is capable of being dropped from both fixed wing and rotary aircraft.

Lightweight

Maneuverable through the hatch of a Submarine or mounting when underway. The engine is easily maneuvered by two personnel through the hatches of ships or submarines by using the

installed reinforced no slip grab handles and rails. The special rail design allows the engine to be stowed in an upright position of the deck or pallet instead of laying on its side.

Dual Linkage/Transom Plate applies to Inflatable Combat Assault Craft, I-CAC (15 Person Craft) only

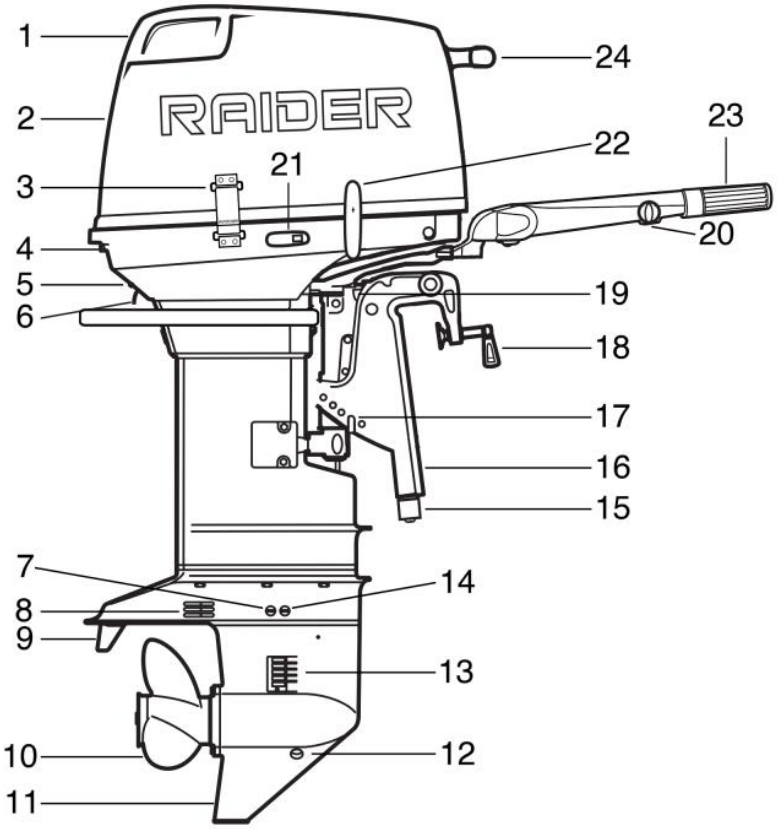
Dual Engine Transom Plate

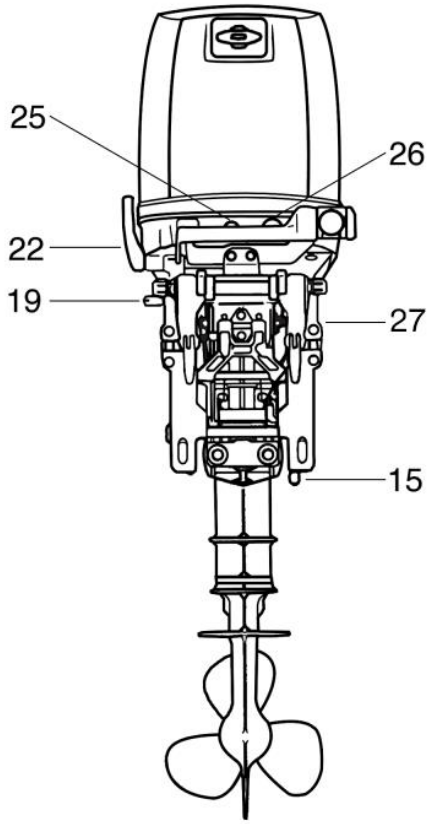
Provides a means for repetitive, expeditious, safe, and secure dual mounting of the engine on any marine craft transom. These plates provide a guide for the stern bracket of the engine that will automatically center the Raider 55 to the keel (center line) of the craft. Then simply tighten the stern bracket screws.

SPECIFICATIONS

ITEM	RAIDER Model 55 Outboard Engine
Horsepower	55 HP
Overall length	45.1 inches (1145 mm)
Overall width	13 inches (330.2 mm)
Overall height	55.6 inches (1413 mm) (Long Shaft)
Weight	163.5 lbs. (74.2 kg)
Transom length	21.7 inches (550 mm)
Engine type	2-Stroke
Piston Displacement	42.5 in^3 (697cc)
Bore and Stroke	2.68 Inches x 2.52 Inches (68 mm x 64 mm)
Number of cylinders	3
W.O.T.	5000 – 5800 rpm
Exhaust System	Through Hub
Cooling System	Water cooling (Rotary rubber impeller)
Ignition System	Flywheel Magneto C.D. Ignition
Starting System	Pull Start
Intake System	Reed Valve
Lubrication System	Fuels pre-mixed with additives
Cooling System	Forced Water-cooling
Water temperature control	Thermostat (with pressure relief valve)
Gear Reduction Gear Ratio	12:23 1.92
Firing Order	1-2-3
Spark Plug	R-NGK4919 GAP ".035"
Alternator	12V 280W (Max.) (13.6V regulated)
Trim Angle	4-24 degrees
Trim Angle settings	6 degrees
Maximum tilt-up angle	75 degrees
Transom board thickness	1.22 - 2.76 inches (31-70 mm)
Maximum steering angle	80 degrees
Gear shift	Dog clutch (F-N-R) – front location
Throttle Control	Tiller Handle
Fuel Bladder/Tank	Organizational Dependent
Gasoline	50:1 mix
Engine Oil	TC-W3 2-Cycle Synthetic Marine Oil
Gear Oil	Synthetic Blend API GL5, SAE#80 to #90 16.89 fl. Oz. (500 ml)

COMPONENTS AND CONTROLS





1. Tilt Handle
2. Cowling
3. Cowling Strap
4. Cowling Latch
5. Tell-tale
6. Discharge Drain Tube
7. Water Plug
8. Exhaust Port
9. Trim Tab
10. Propeller
11. Skeg
12. Oil Plug (Lower)
13. Water Strainer
14. Oil Plug (Upper)
15. Stern Bracket Anode
16. Stern Bracket Clamp
17. Thrust Rod
18. Clamp Screw
19. Reverse Lock Lever
20. Throttle Tension Adjust
21. Dewatering Lever
22. Shift Lever
23. Throttle Grip
24. Pull Start Handle
25. Stop Switch
26. Primer
27. Tension Adjustment Bolt

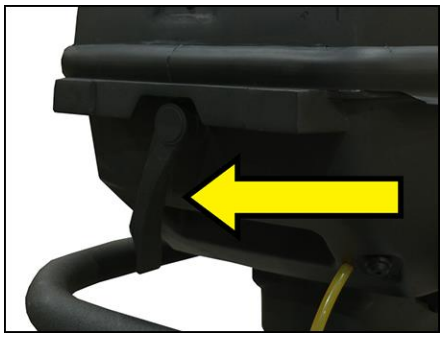
RAIDER 55 Components

Cowling

A removable cover of the outboard engine that provides protection for the powerhead and components during operation and storage.

Cowling Latch

A mechanism located on the rear portion of the lower engine cover that provides a means to secure the cowling in place.

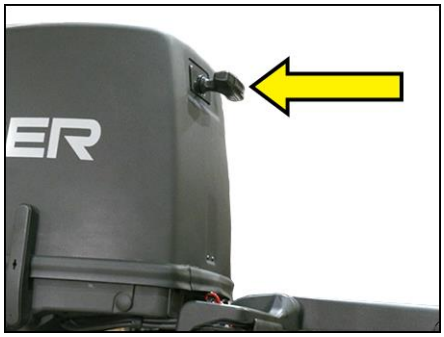


Cowling Retention Strap

Velcro Straps fixed to the cowling and lower engine cover that prevent the cowling from dislodging during air drop, engine submersion, or craft capsize.

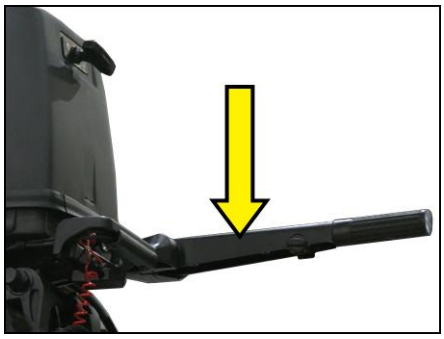
Pull Handle and Cord

T-Handle grip fixed to the leading end of the pull cord of the recoil starter. Routed through the starter cord opening of the cowling for operator access. This is the primary method used to start the engine.



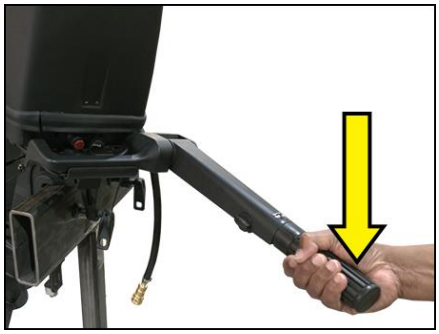
Tiller Arm

Mechanical lever the attaches to the swivel bracket that allow the operator to steer the craft to port or starboard. Also provided the mounting structure for the Throttle Control and Throttle Tension Adjustment.



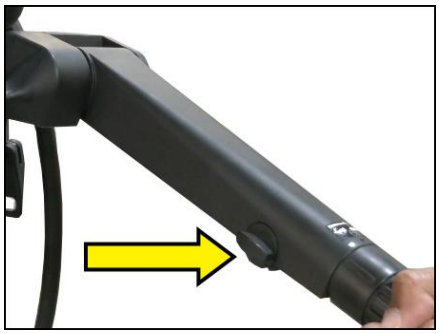
Throttle Control

Affixed to the end of the Till Arm. Allow the operator to control the acceleration and deceleration of the engine. It provides a raised indicator that aligned for ideal throttle position during engine start.



Throttle Tension Adjustment

A control located on the inboard side of the Tiller Arm. Provides adjustable resistance to movement of the throttle grip and can be set to operator preference.

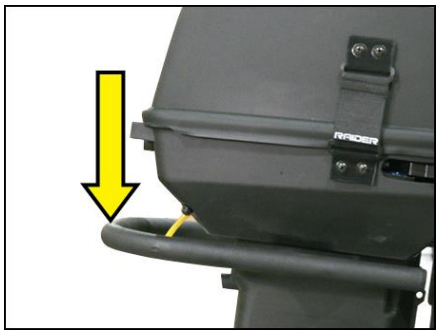


Forward Carry/Grab Handle

Located on the forward part of the engine. Provides the operator with a secure means to lift the engine for movement or mounting.

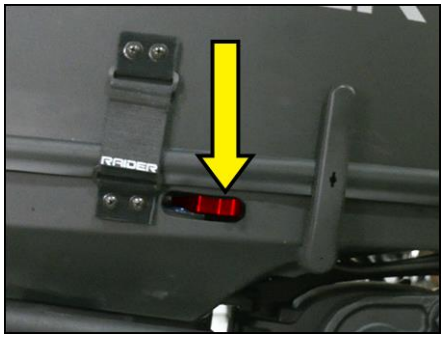
Carry/Grab Rail

Located around the left, right, and rear of the engine. Provides a means for the operator to lift the engine for movement or mounting. Also provides a means for the engine to be laid down in the upright position. Coated with a non-slip surface.



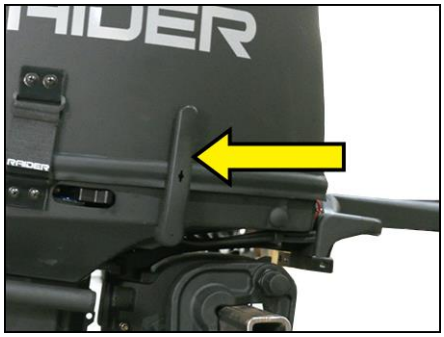
Dewatering Lever

Mechanical lever located on the right side of the engine. When actuated it opens the Dewatering Valve to expel bad fuel overboard and by means of a rod and fingers it opens Decompression Valves on the cylinder head, so that water may be expelled from the cylinders. Features a detent position, to allow for hands free operation while dewatering.



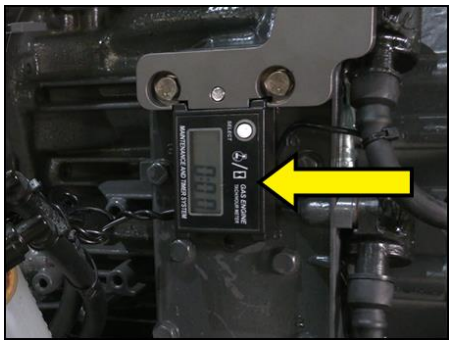
Gear Shifter

Located on the forward section of the lower engine cover. Three position lever that allows for selection of forward, neutral, and reverse. Ensure that the throttle is at idle before placing the engine into gear.



Tachometer/Hour Meter

Displays the total number of hours the RAIDER Model 55 Outboard Engine has been operational. Tachometer mode may be selected by the operator to monitor engine RPM.

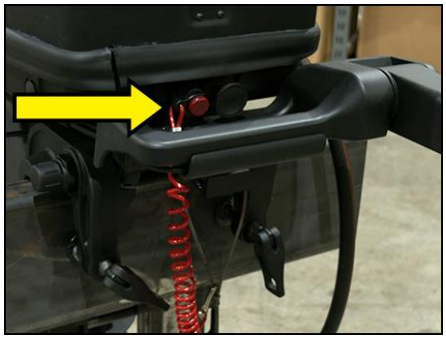


Engine Stop Push Button/Kill Switch

Located on the front of the lower engine cover. Push button switch that when pressed will shut the engine down.

Lock Plate and Lanyard

The lock plate must be attached to the engine stop switch for the engine to start and remain running. The lock plate lanyard should be attached to a secure place on the operators clothing. When the lock plate is removed the engine will stop.

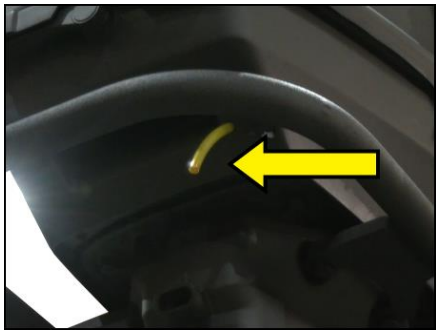


Primer

Located on the front of the lower engine cover. Pull forwards then depress repeatedly to “prime” engine before starting. Utilized for cold starts and dewatering. Allows engine to begin combustion immediately on start, after which carburetor begins to deliver fuel/air.

Fuel Overboard Discharge Drain Tube

The throughput for the fuel system that provides passage for bad fuel from the fuel system when the Dewatering Valve is opened.

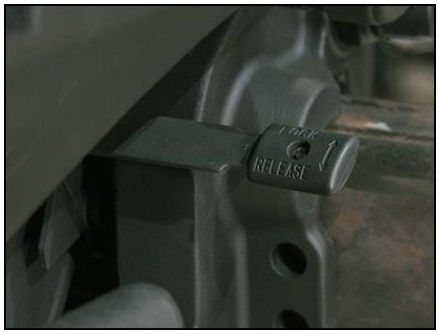


Stern Brackets

Used to mount the engine to the transom plate. C-shaped clamps that slide over the transom for the purpose of securing the engine for operations.

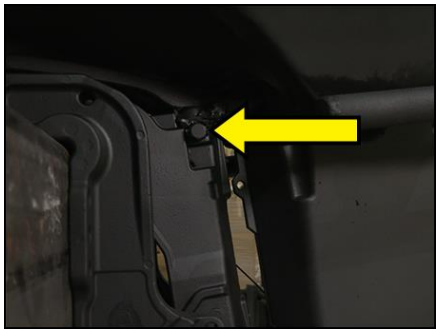
Reverse Lock Lever

A two-position lever, located on the right side of the Swivel Bracket. When in the fully down position will release the engine to be place into the Shallow Running Position or full tilt. When in the up position locks the engine in the down position.



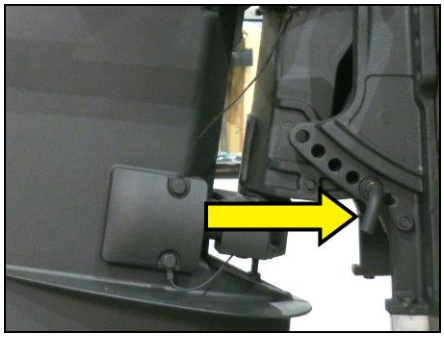
Tension Adjustment Bolt

Used to adjust the tension of the engine moving left or right.



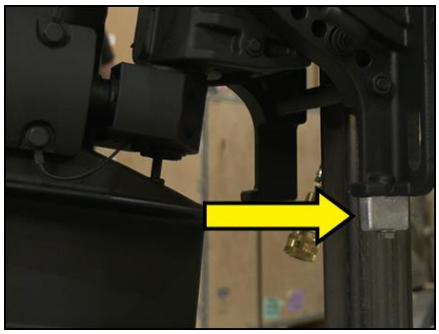
Thrust Rod (Trim Adjust)

A removable rod that is inserted through holes in the Stern Brackets that are used to adjust the trim angle of the craft.



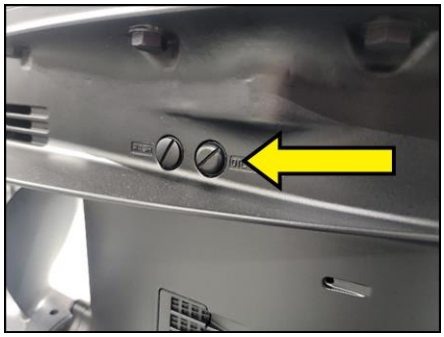
Stern Bracket Anode

Made of zinc a highly active metal that attracts electrolytes that would normally corrode and weaken the less active metal.



Oil Level Plug

Located just beneath the AV-Plate on the forward portion of the Gearcase. When open it release vacuum in the Gearcase to allow oil to drain freely from the Lower Fill/Drain hole. When filling provided indication that Gearcase is full when oil seeps out the hole.



Oil Drain Plug

A magnetic screw, located on the forward bottom of the Gearcase. Removed to drain the oil and provides connecting point for oil fill.

Exhaust Outlet

The exhaust relief is located above the AV-plate, allowing the prop to run in clean, exhaust-free water.

Water Strainer (Set)

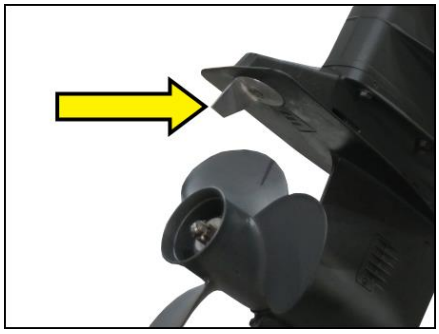
Located on both sides of the Gearcase. A fabricated beveled opening covered by a plastic screen that allows for the intake of water by the impeller for cooling. This is simply a small plastic basket that is tapered and has perforation holes which acts as a filter for larger debris.

Propeller

Three blade aluminum construction, which is able to absorb impact energy to protect drive component.

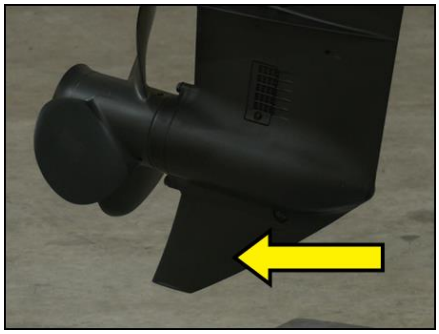
Anode Trim Tab

A fin shaped object attached behind the propeller that serves two functions. Functions as a zinc anode and counter acts the torque pressure generated by the propeller spin that makes steering more difficult.



Skeg

The lowest point on an outboard engine, improves directional stability. Protects the prop from impact. The angle of the skeg deflects the Gearcase from rocks and logs.

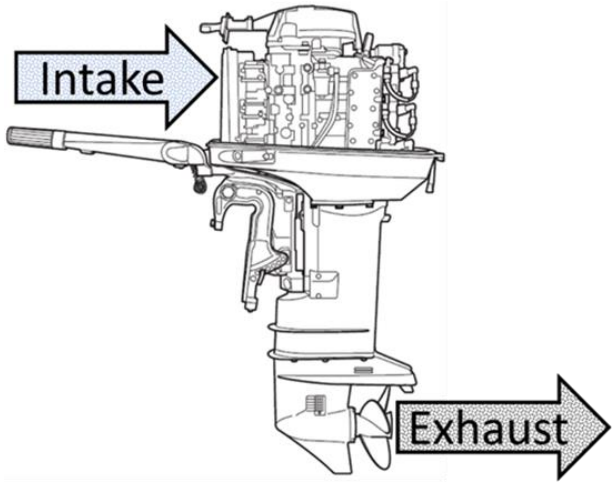


Systems Details

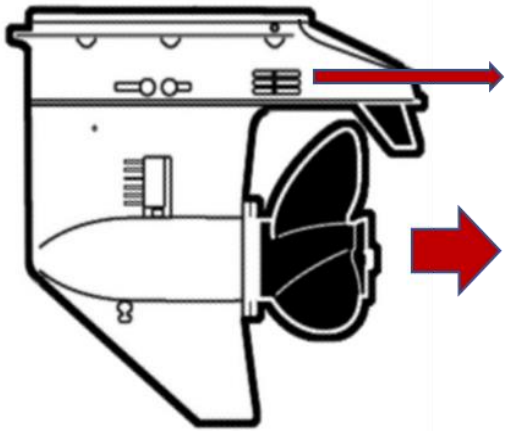
INTAKE AND EXHAUST SYSTEM

The Intake and Exhaust System of the RAIDER Model 55 Outboard Engine is comprised of two sets of components, the intake and the exhaust.

The intake side of the system is designed to allow air to be drawn into the engine so that the oxygen in the air may react with fuel when compressed and ignited to explosively combust. This combustion provides the power to actuate the pistons and, in turn, rotate the drivetrain and propeller in order to propel the vessel. A secondary function of the intake is to keep water from entering the combustion chamber while the engine is running, as this could result in catastrophic failure if even a moderate amount of water were to be compressed in the cylinder.



The exhaust side of the system is designed to contain hot exhaust gasses as they exit the combustion chamber and direct them out of the engine through either the upper exhaust port or through the propeller hub.

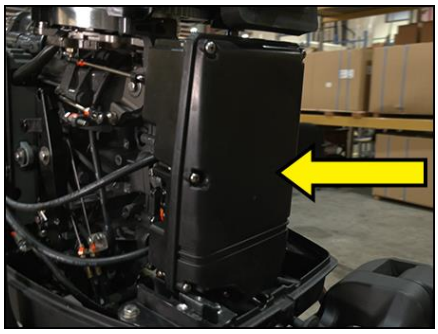


Intake and Exhaust System Components

Cowling

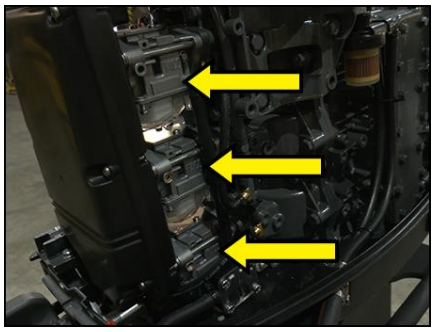
A series of circular baffles are integrated into the upper-rear portion of the cowling. These baffles are designed to allow fresh air to pass into the cowling while preventing most water from entering. Does not prevent water from entering during submersion.

Air Intake Silencer



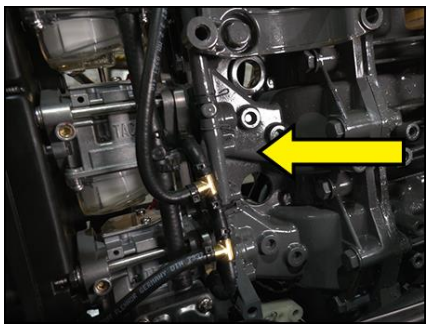
Also known as an 'air box'. Attached to the carburetor stack at the front of the engine. Opening in the bottom of box allows air to enter. Provides further protection against water-ingress during operation.

Carburetors



Attached to intake manifold. Responsible for introducing fuel to incoming air. Regulate fuel-air mixture by means of throttle.

Intake Manifold

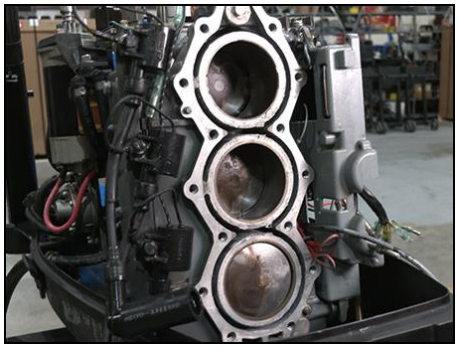


Metal housing attaching carburetor to engine block. Houses reed valves.

Reed Valves

Set of flexible metal flaps which act as one-way valves. The flaps are free to bend forwards into the intake, allowing air-fuel mixture to enter cylinder. As the compression stroke occurs, the pressure from inside the cylinder forces the reed valves back the other way, closing them and preventing exhaust gasses from traveling backwards through system.

Combustion Chamber



Air-fuel mixture is drawn into the combustion chamber on the downstroke of the piston, then compressed on the upstroke. The compressed air-fuel mixture is then ignited by the spark plug. The resulting combustion creates a rapidly-expanding pressure wave which forces the piston down again. As the piston moves downwards, the remaining gasses are expelled from the cylinder into the exhaust manifold.

Engine Basement

Attached to the bottom of the crankcase. Directs exhaust gasses to the exhaust pipe, which is bolted directly to the engine basement. Also contains passages for cooling water.

Exhaust Port

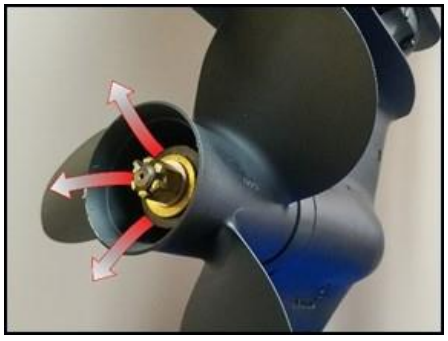
Three slots located on either side of the gearcase, directly above the cavitation plate. These openings allow exhaust gasses to escape the engine.

Exhaust Pipe

Directs exhaust gas from the combustion chamber to the gearcase, where it exits the engine through either the exhaust ports or the propeller hub.

Through-Hub Exhaust

Allows exhaust to exit the engine through the propeller hub, allowing the propeller spin more easily at lower speeds. This benefits acceleration, and helps to quiet the engine.



FUEL SYSTEM

The Fuel System of the RAIDER Model 55 Outboard Engine is designed to store fuel and to deliver that fuel to the engine's combustion chamber where it is combined with air, compressed, and ignited in order to power the engine.

The Fuel System is also responsible for providing lubrication to the moving parts of the engine in the form of oil, which is pre-mixed with fuel.

Fuel System Components

Fuel Bladder/Fuel Tank

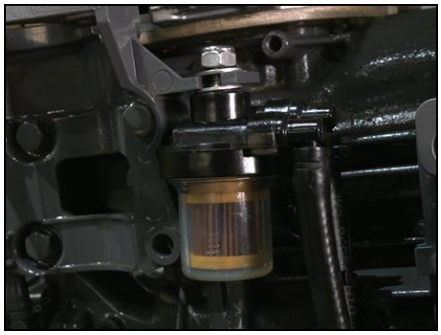
Portable fuel-storage system. Pre-mixed fuel is drawn from the fuel bladder/tank into the fuel hose.

Primer Bulb

Hand pump used to pressurize the fuel line prior to starting the engine. In the event of a fuel pump failure, the engine may be kept running by pumping the primer bulb to maintain pressure in the line.

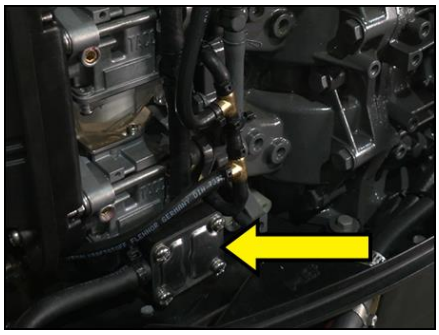
Fuel Filter

Screens out particulate matter, such as dirt or rust, from fuel. The fuel filter cup is made of a semi-transparent material to allow for visual inspection to determine whether fuel is present in the line. The cup may be unscrewed from the fuel filter assembly to allow for disposal of collected contaminants.



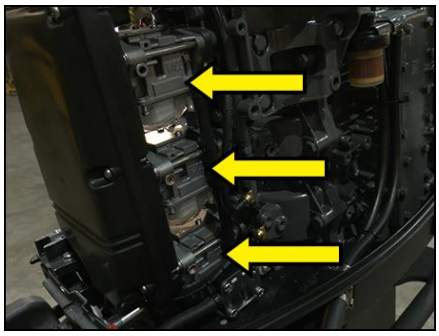
Fuel Pump

Force fuel through the fuel system. The pumps contain internal diaphragms that move in response to crankcase pressure. This changing pressure causes fuel to be drawn in and pumped out through a series of one-way valves, ensuring fuel is moved in the correct direction.



Carburetors

Responsible for introducing the fuel to incoming air. Fuel flow is metered in response to throttle position. Clear bowls allow for visual inspection to determine whether fuel is present. Drain lines in bowls connect to the dewatering valve to allow contaminated fuel and water to be drained from the carburetors after submersion.

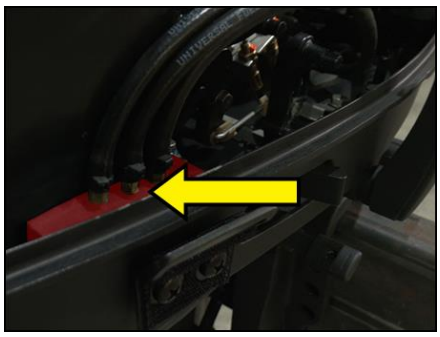


Engine Primer

Hand pump located on the front of the engine pan. Pumps fuel from the carburetor bowl, allowing for immediate ignition when starting.

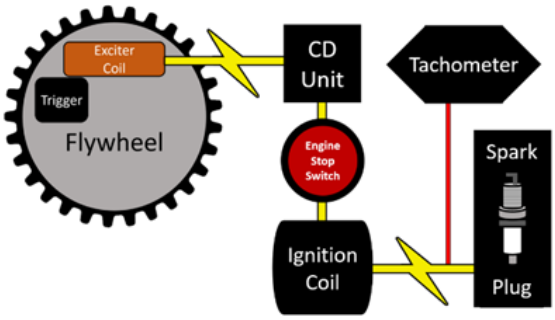
Dewatering Valve

Connects the carburetor bowl to the overboard drain tube, allowing contaminated fuel and water to be discharged overboard after submersion.



ELECTRICAL SYSTEM

The RAIDER Model 55 Outboard Engine's electrical system is comprised of the Ignition System. The Ignition System is responsible for providing the electrical spark which ignites the compressed air-fuel mixture in the combustion chamber.



Electrical System Components

Flywheel/Magneto

The flywheel is a magnetized gear which sits at the top of the engine and spins with the rotation of the crankshaft. Electrical power is generated by the movement of the magnetic field surrounding the flywheel in the presence of the windings of copper in the alternator and exciter coils.

Coil Plate/Stator

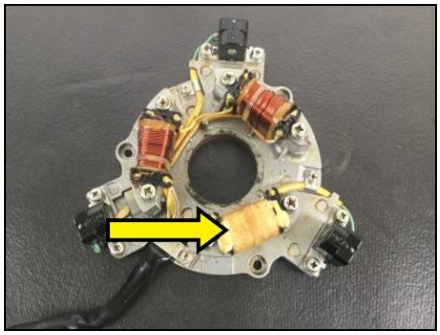
Stationary plate that sits under the flywheel. Provides a mounting point for the alternator, exciter coil, and pulser coil. Part of both the ignition and charging systems.

Alternator Coil

Set of copper windings located on the coil plate, and part of the charging system. AC voltage is generated in the copper coil by the movement of the flywheel's magnetic field and sent to the rectifier.

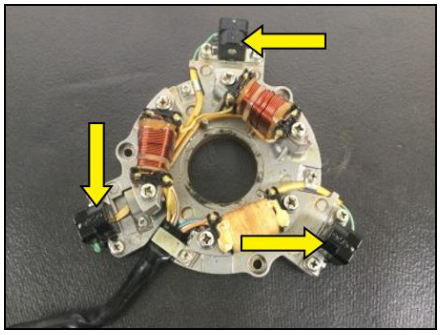
Exciter Coil

Works similarly to the alternator coil, but part of the ignition system. Provides power to the CD unit.



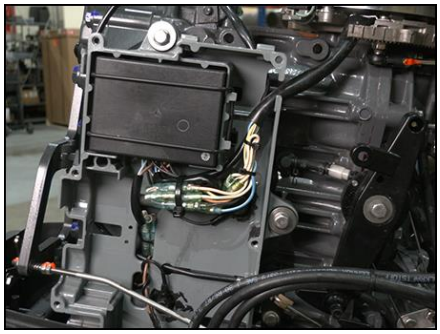
Trigger (Pulser Coil)

Part of the ignition system, the trigger detects the position of the crankshaft and relays the information to the CD unit. This enables the CD unit to fire at the correct point in the cycle.



CD Unit

Part of the ignition system, the CD unit converts the AC voltage from the exciter coil into DC voltage which is then sent to the ignition coil.

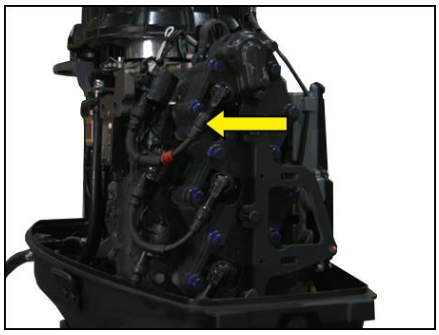


Ignition Coil

Transforms the output of the CD unit into the voltage required to fire the spark plugs.

Ignition Cable

Responsible for conducting the voltage from the ignition coil to the spark plug with as little resistance as possible.

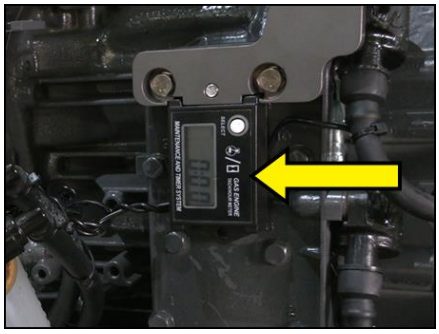


Spark Plug

Part of the ignition system, one spark plug per cylinder is threaded into the head of the engine. The stainless-steel spark plugs are responsible for igniting the air-fuel mixture using electricity supplied by the ignition system.

Tachometer/Hour Meter

Part of the ignition system, the tachometer allows the operator to monitor engine RPM. The integrated hour meter displays the total number of hours the engine has been operational.



DRIVE SYSTEM

The RAIDER Model 55 Outboard Engine Drive System is comprised of the set of components responsible for capturing the energy produced in the combustion chamber, and transferring that energy to the propeller to generate thrust. The Drive System can be divided into three main subsystems, the Crankcase, the Gearcase, and the Gear Shifter.

Drive System Subsystems

Crankcase

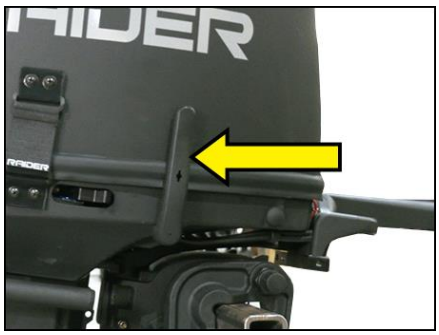
Houses the combustion chamber, pistons, and crankshaft. The crankcase is where the all of the engine's systems come together to produce the energy required to power the engine. The crankcase houses or provides mounting for most of the engine's components. May also be referred to as the Powerhead.

Gear Case

Also commonly known as the Lower Unit, the gearcase is responsible for transferring the power created in the crankcase to the propeller to generate thrust.

Gear Shifter

Allows the forwards or reverse gears to be engaged, transferring the power generated by the engine to the propeller in the appropriate manner when desired.



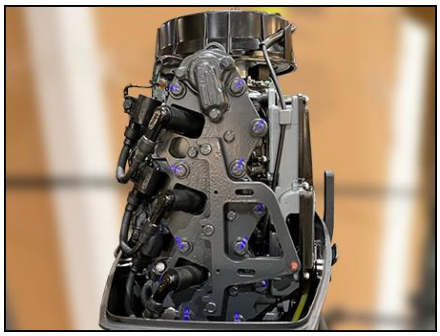
Drive System Components

Engine Block/Crankcase Cover

Houses the combustion chamber, pistons, and crankshaft. The crankshaft assembly is held in place by the crankcase cover.

Cylinder Head/Cylinder Head Cover

Two-part cylinder head houses the spark plugs, thermostat, and decompression valves. Acts as the 'top' of the combustion chamber, containing the air-fuel mixture as it is compressed and ignited, and directing the energy of the resulting combustion towards the piston.



Piston/Piston Rod

The piston travels back and forth in the cylinder, first compressing the air-fuel mixture, and then being driven rapidly in the opposite direction by the resulting combustion. The piston rod connects the piston to the crankshaft, allowing the linear motion of the piston to be converted into rotational motion.

Crankshaft

Converts the linear motion of the pistons into the rotational motion required to drive the propeller. The piston rods are connected to the crank throws which are offset from the central axis of the crankshaft to create a rotation about that axis when the pistons are actuated.

Flywheel

Connected to the crankshaft at the top of the engine, the flywheel stores some of the rotational energy from the crankshaft as inertia. This inertia allows the crankshaft to continue rotating as the piston reaches the bottom of the power stroke. Without the flywheel's momentum, the piston would stop at bottom dead center instead of continuing on with the compression stroke.

Driveshaft

Runs through the midsection of the engine. Connects the crankshaft to the gearcase, transferring the rotational energy to the prop shaft through a beveled pinion gear on the end of the shaft.

Pinion Gear

Attached to the end of the driveshaft, the pinion gear is a beveled gear which engages either the forwards or reverse gear depending on gear selector position.

Gear Case

Mounts to the bottom of the midsection. Houses the water pump, driveshaft, gears, clutch dog, propeller shaft, and the propeller.

Prop Shaft Housing

Mounted inside the gearcase, secures the prop shaft in place and houses the prop shaft roller bearing and the forwards gear ball bearing.

Forwards/Reverse Gears

Opposite-facing gears mounted concentrically along the prop shaft. Selected by actuation of the shift handle.

Clutch Dog

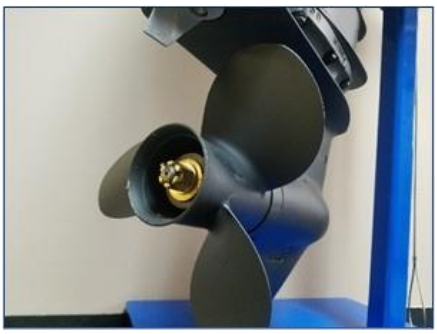
Slides between the forwards and reverse gears engaging one or the other depending on the position of the shift handle.

Propeller Shaft

Driven by the drive shaft pinion gear through the forwards and reverse gears.

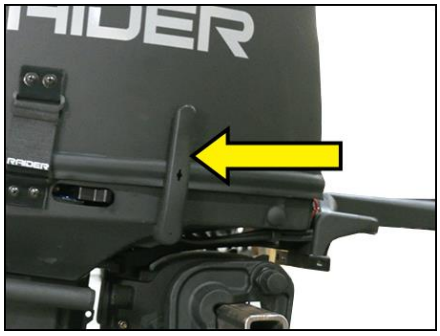
Propeller

Three-blade, aluminum construction. Able to absorb impact energy to protect drive components.



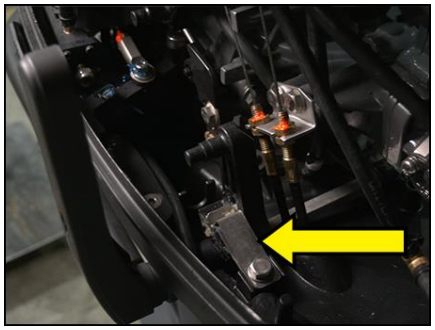
Shift Handle

Mounted on the side of the engine pan, allows the operator to select between forwards, neutral, and reverse.



Shift Linkage

Series of rods and levers, including the shift rod and cam rod, which actuate the clutch dog.



Spring Pin

Single-use pin connecting the shift rod to the cam rod. Must be removed in order to detach lower unit for service or repairs. Must be replaced after removal.

Clutch Cam

Stepped cam attached to the end of the cam rod. Actuates the clutch dog.

COOLING SYSTEM

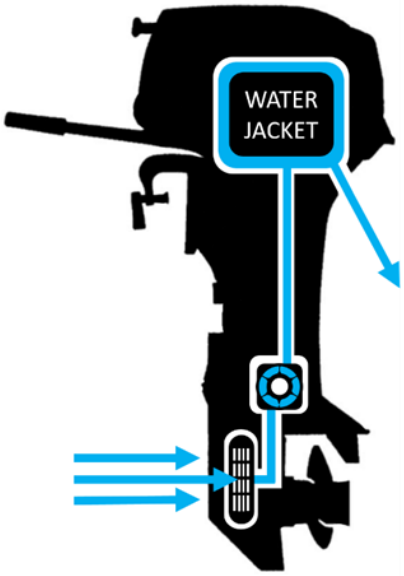
Exhaust Manifold Blockage

A fault with engine exhaust manifold can be catastrophic, especially if the pipework corrodes and exhaust cooling water gets in to the manifold. This can find its way back to the cylinders potentially resulting in a total engine failure when the water (which can't be compressed) causes the pistons and cylinders to warp.

From an overheating perspective, an exhaust manifold doesn't necessarily need to be corroded or faulty to cause problems; a blockage in the cooling water supply can cause overheating issues.

Flushing through the cooling system by connecting a hose to the water inlet on the bottom of the engine unit is usually enough to flush out any debris, but it's important to try and avoid taking on said debris in the first place by avoiding using your boat in shallow water, or other places where silt and sand could accidentally be sucked in by the cooling water intake.

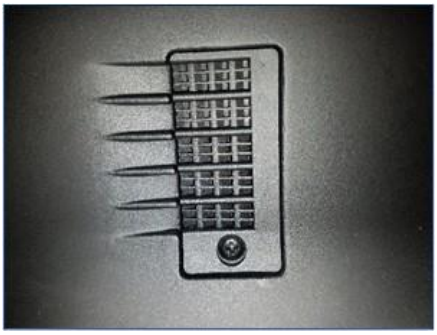
The Cooling System of the RAIDER Model 55 Outboard Engine is designed to provide cooling to the engine block by pumping cool, raw water through the engine. This ensures that the engine operates at a specific temperature, allowing the air-fuel mixture to burn as completely as possible. Maximizing the combustion of the air-fuel mixture increases both power and fuel economy, while preventing the buildup of carbon inside the engine.



Cooling System Components

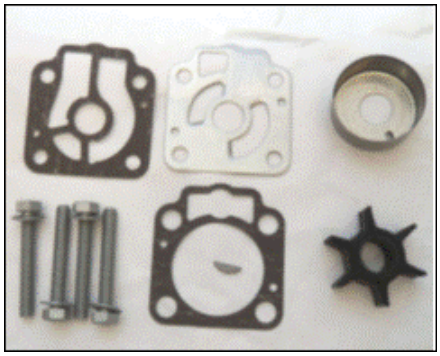
Water Intake

The opening through which the water pump draws water into the gearcase. A screen across the opening prevents foreign matter such as grass, sticks, and small rocks from entering the system, as this could plug the cooling passages and destroy the engine through overheating.



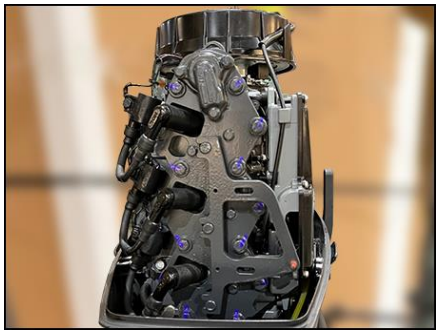
Water Pump

The water pump consists of a rubber impeller keyed to the engine's drive shaft, which sits in a stainless steel-lined, off-centric plastic housing. The blades of the impeller are compressed as they pass the short side of the housing, and expand as they return to the long side. This compression and expansion action is what allows the pump to pressurize the water enough to force it through the engine's cooling passages.



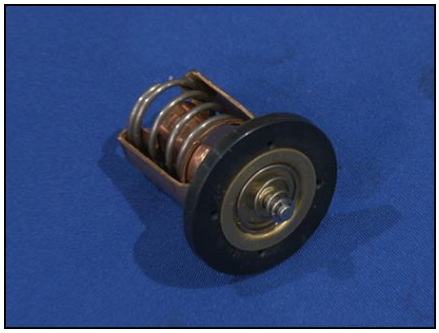
Cylinder Head

Houses the thermostat and contains water passages for cooling of the head.



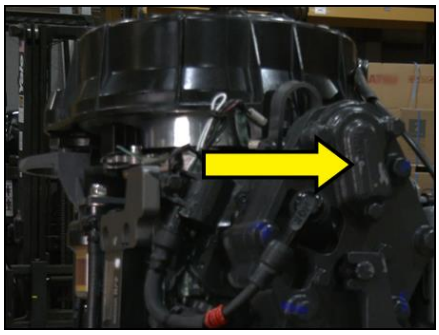
Thermostat

Responsible for regulating engine temperature. At a specific temperature, the thermostat opens, allowing water to flow through the cooling jackets in the engine block and cylinder head. The thermostat closes again once the temperature has dropped below the desired level.



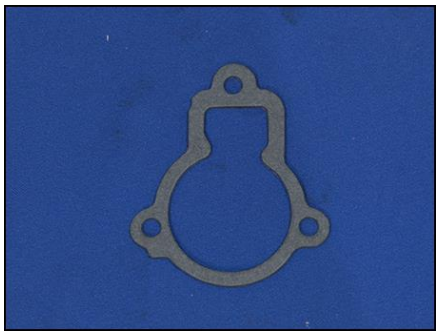
Thermostat Cap

Removable cover which allows access to the thermostat for servicing. Bolts must be re-torqued after removal to prevent water from leaking.



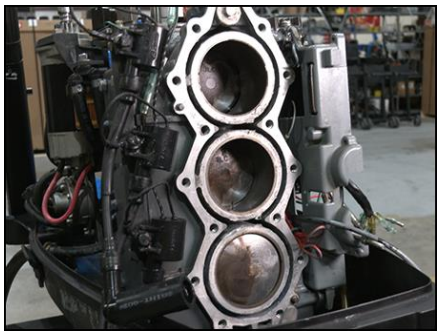
Thermostat Cap Gasket

Ensures proper seal of thermostat cap. Must be replaced if thermostat cap is removed.



Water Jacket

Passageways inside the engine block and cylinder head through which cooling water flows. Proper post-operations procedures must be followed to ensure that these passages do not become blocked with corrosion or debris, as this can cause overheating and catastrophic engine failure.

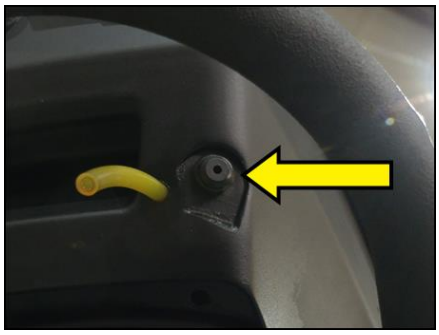


Water Discharge Port

Pair of openings located on the rear of the midsection, directly under the engine pan. After passing through the water jackets, water exits the system through these ports.

Tell-tale

Small opening which emits a stream of water, indicating that the water pump is functioning correctly. If little or no water is being discharged from the check port, check whether the intake screen is clogged. This is not the primary exit for cooling water, as most of the water leaves the engine through the exhaust ports.



Prior To Operation

FUEL REQUIREMENTS

Fuel is flammable and harmful to health. Keep fuel away from heat or ignition sources. DO NOT smoke within 50 feet (15 m) of a fuel source. Do not work on fuel system when engine is hot. Shut down engine before refueling. Ensure fuel nozzle is grounded to filler neck. Do not overfill fuel tank. Keep fire extinguisher nearby. Wear gloves and eye protection and ensure adequate ventilation during refueling. Failure to comply may result in injury to personnel and/or damage to the environment.

Use of engine oils that do not meet certified NMMA TC-W3 2-Cycle Synthetic Marine Oil requirements will result in reduced engine life, and other engine problems.
Be advised that fuel poses a significant danger of ignition or explosion.

Do not mix different brands of oil. Mixing different brands of oil, or different types of oil even if the brand is the same, may cause gelling, resulting in possible filter screen blockage. This could result in serious engine damage because of impaired lubrication performance.

Use of gasoline containing alcohol can cause engine starting and/or operating difficulties, wear of and damages to engine parts, and deterioration of chemical parts, which may lead to shortening of your outboard engine's life.

Use of low-quality gasoline results in a short engine life as well as starting difficulties and other engine problems. We recommend use for Fuel stabilizer.

Use of engine oils that do not meet certified NMMA TC-W3 2-Cycle Synthetic Marine Oil requirements will result in reduced engine life, and other engine problems.

Use gasoline only when operating the RAIDER Model 55 Outboard Engine. Use a major brand of Marine Fuel Stabilizer with ethanol treatment. STA-BIL 360® MARINE™ is recommended for added internal engine cleanliness and conditioning the fuel system to ward off corrosion. Leaded gasoline is acceptable in areas where unleaded gasoline is not available.

Regardless of what fuel is utilized, the fuel must be mixed with a certified NMMA TC-W3 2-Cycle Synthetic Marine Oil. Raider Outboards provides a specially formulated TC-W3 developed by VP Racing. The Raider Outboards TC-W3 2-Cycle Outboard Synthetic Marine Oil is specifically designed to meet the lubrication requirements of a submersible engine.

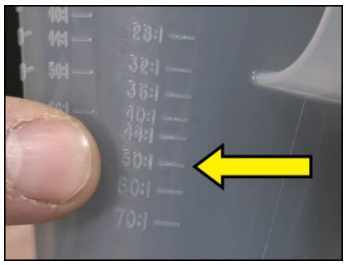
Mix Ratios: Gasoline requires a 50:1 Fuel to oil mixture. 16oz per six (6) gallons or about 2.5oz per one (1) gallon. Fuel Stabilizer should be added per the manufacturer's recommendations.

When mixing fuel, pour the oil mixture into the bladder or tank first. Shake the tank to mix marine oil and gasoline well and even. Annotate the date of the mixture. Fuel older than 90 days should be disposed of via required hazardous materials disposal instruction for your organization.

The only lubrication provided for the RAIDER Model 55 Outboard Engine is through the oil added to the gasoline, therefor running with too little oil will cause engine damage. Oil burns differently than gasoline however and running too much oil will make the engine run poorly, smoke excessively, foul spark plugs, and will even plug up the exhaust with oil residue. So, it is vital to both engine life and engine performance that you run the right mixture.

The following will instruct you on how to properly mix fuel for the RAIDER Model 55 Outboard Engine:

1. Gasoline requires a 50:1 Fuel to oil mixture. 16oz of oil per six (6) gallons of fuel or about 2.5oz per one (1) gallon.



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2. Fill the measuring device up to the 50:1 mark with oil. Then pour the oil mixture into the bladder or tank first.

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3. Repeat this step, filling the measuring device with oil 50:1 for each gallon of gasoline required.

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4. **NOTE:** If the bladder or tank only requires 6 gallons of fuel to oil mixture you will repeat this step 6 times.

---

5. Fill bladder with correct amount of gasoline.

6. Shake the bladder or tank to mix the marine oil and gasoline well and even.

7. Annotate the date of the mixture. Fuel older than 90 days should be disposed of via required hazardous materials disposal instruction for your organization.

BREAK-IN

Ensure all personnel in the vicinity and operating the Outboard Engine wear hearing protection when engine is being operated to prevent against potential noise hazards. Failure to follow this warning may cause damage or loss of hearing.

Operating the Outboard Engine without break-in can shorten service life of the product. If any abnormality is experienced during the break-in: Discontinue the operation immediately. Contact Raider Outboards Technical Support for action(s) if necessary.

Proper break-in allows Outboard Engine to deliver full performance for longer service life.

Your new outboard engine and lower unit require break-in for the moving components according to the conditions described in the following timetable.

Fuel mix ratio for break-in: 25:1 Mix Ratios: 32oz of TC-W3 2-Cycle Outboard Synthetic Marine Oil per six (6) gallons of gasoline or about 5oz per every one (1) gallon.

Break-In Timetable

	1-10min	10min-2hrs	2-3hrs	3-10hrs	After 10hrs
Throttle Position	Idle	Less than 1/2 throttle	Less than 3/4 throttle	3/4 throttle	Full throttle available
Speed		Approx. 3000 rpm max	Full throttle run allowed for 1 min every 10 min	Approx. 4000 rpm. Full throttle run allowed for 2 min every 10 min	

ENGINE MOUNTING

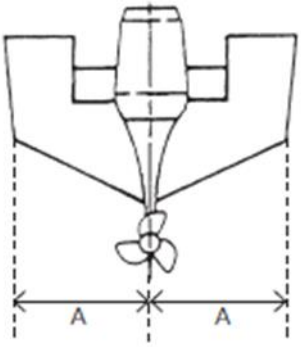
WARNING

The outboard engine weighs approximately 163.5 lbs. (74.2 kg). A minimum of 5 personnel and proper lifting techniques are recommended to lift, move, or carry engine. Failure to comply to this warning could result in injury to personnel.

CAUTION

Do not operate the Outboard Engine until it has been securely mounted on the boat in accordance with the instructions below.

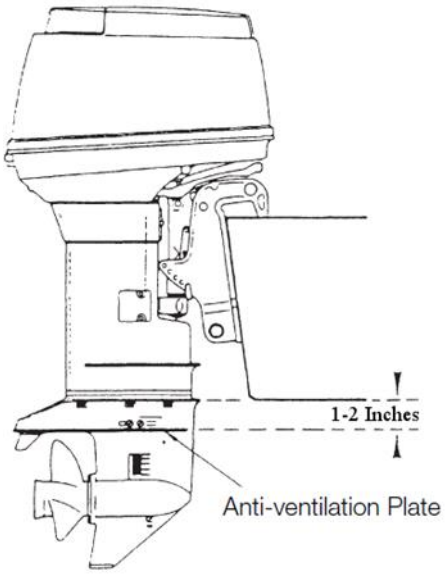
Position the outboard engine at the exact center of the transom. Use the hand-tightened screw thread clamps. These clamp the transom of the craft between the engine stern bracket and the screw thread plates.



Attach safety cable (lanyard) to secure the engine to the craft and prevent the engine from dropping from the stern if the clamps get loose or fail during operation.

CAUTION

Overheating may occur if the Anti-ventilation Plate is at a level higher than the bottom of the boat, as a result of a lack of cooling water.



When installed the Anti-ventilation Plate should be just below the bottom of the boat approximately 1-2 inches. Be sure that the anti-ventilation plate of the outboard is below the water surface when running with wide open throttle. If the water is being pushed into the craft; raise the engine on the transom by adding a shim on top of transom to achieve proper engine height.

Attaching the Stern Bracket. Both Zodiac and Wing inflatables should come with a transom plate attached. These plates provide a guide for the stern bracket of the engine that will automatically center the Raider 55 to the center line of the craft. Then simply tighten the stern bracket screws.

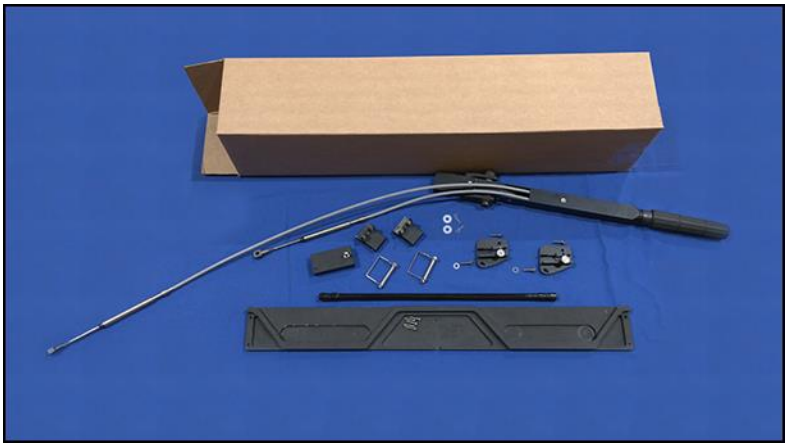
After 10-15 minutes of operation recheck the stern clamp screws for tightness.

DUAL ENGINE

NOTE

Dual Linkage/Transom Plate applies to Inflatable Combat Assault Craft, I-CAC (15 Person Craft) only

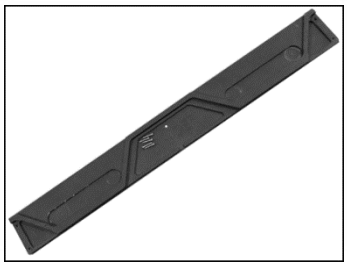
The Dual Engine Transom Plate is only used during the operation of two (2) RAIDER 55HP Engines. Do not try to center a single engine using the Dual Transom Plate.



The Dual Linkage Kit and Dual Engine Transom Plate are both required to operate the I-CAC using dual RAIDER 55HP Engines. The Dual Linkage kit allows for steering and throttle control of two (2) RAIDER 55HP Engines from a single tiller arm. The system uses a tie bar with two steering arm extensions and hardware which allow both engines to be steered at the same time. A single push-pull cable is used to engage both engine throttles simultaneously. The Dual Engine Transom Plate facilitates accurate positioning and installation when mounting dual engines to the I-CAC.

The following steps will instruct you on installation of the Dual Engine Transom Plate.

1. The Dual Engine Transom Plate kit for the I-CAC contains a transom plate and five (5) screws.



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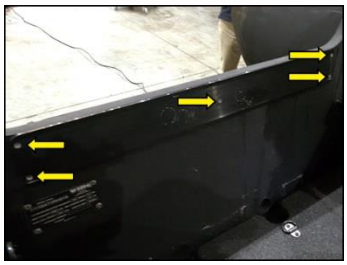
2. Remove existing transom by removing the five (5) screws using a Phillips head screw driver. Retain both the transom and screws for operation of a single engine.



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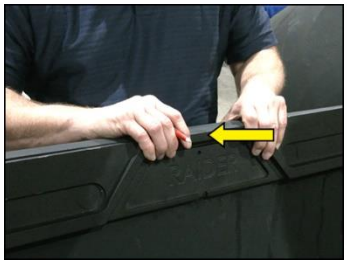
3. Using center hole as a guide, carefully center the new Dual Engine Transom Plate.



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4. With the help of additional personnel, hold the Dual Engine Transom in place.

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5. With the provided five (5) screws alternate screwing in the Dual Engine Transom in place.

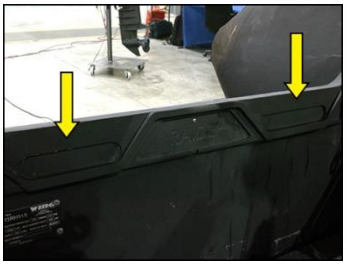
6. With the transom correctly installed you are ready to mount the two engines. See Dual Engine System Installation Guide for additional instructions

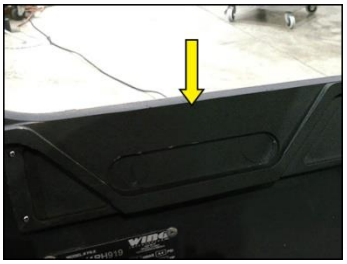
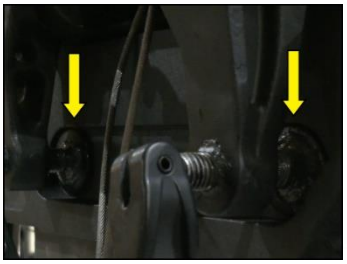
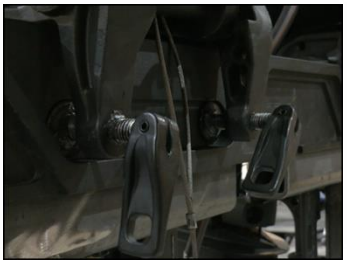
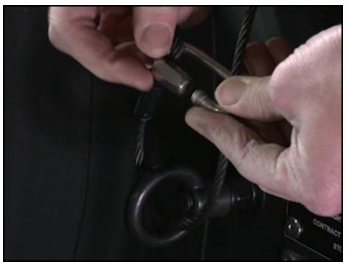
DUAL ENGINE MOUNTING

The following steps will instruct you on mounting engines with the Dual Engine Transom Plate.

1. Install the Dual Engine Transom Plate. The Transom Plate facilitates accurate positioning and installation when mounting dual engines.

2. Position one engine onto one of the two premade slots.



3.	Centering the engine over position both stern bracket clamps into premade groove.	 
4.	Hand-tightened the two (2) stern bracket clamps.	
5.	Attach safety cable (lanyard) to secure the engine to the craft and prevent the engine from dropping from the stern if the clamps get loose or fail during operation.	
6.	Repeat with second engine.	

DUAL LINKAGE KIT INSTALLATION

NOTE

Dual Linkage/Transom Plate applies to Inflatable Combat Assault Craft, I-CAC (15 Person Craft) only

The Dual Engine Transom Plate is only used during the operation of two (2) RAIDER 55HP Engines. Do not try to center a single engine using the Dual Transom Plate.

The following steps will instruct you on how to install the Dual Linkage Kit:

1. With both engines mounted on the Dual Transom Plate.

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2. Remove the two (2) engine cowlings.

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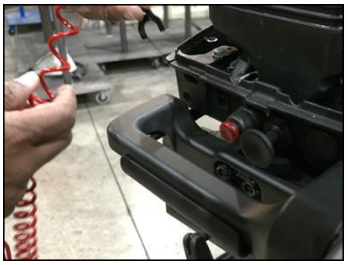
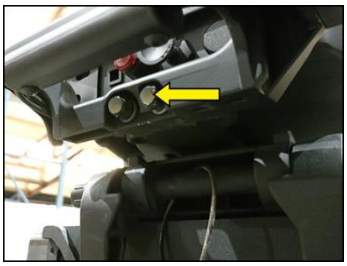
3. Remove lock plate & safety lanyard from the kill switch of each engine.



4. Remove the two (2) 14 mm bolts from underside of front grab handle and retain for installation.

NOTE: Grab handle will become loose.



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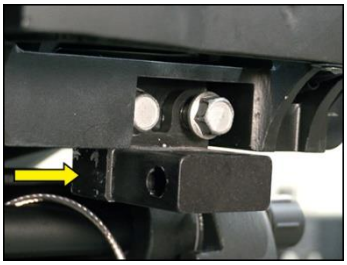
5. Insert the two (2) 14 mm bolts into the steering arm extension. Apply blue threadlocker to each bolt. Reattach front grab handle and steering arm extension and screw until tight.

Repeat for second engine.



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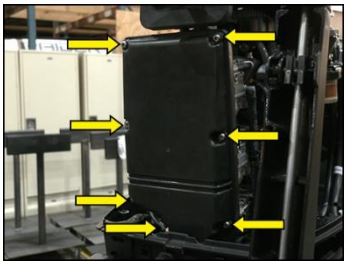
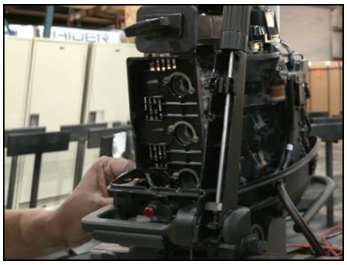
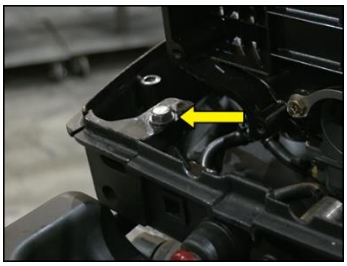
6. Remove the seven (7) phillips head screws securing the air box cover. Remove air box cover and retain for installation.

Repeat for second engine.





7. Remove the 10mm bolt and the front cover plate.



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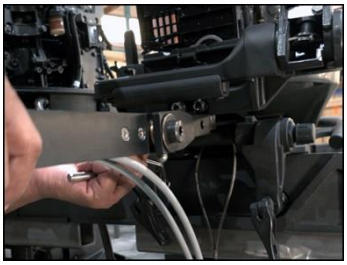
8. Insert the Dual Linkage tiller arm into the right most steering arm extension.



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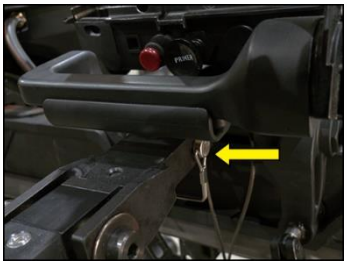
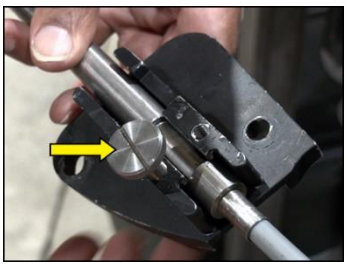
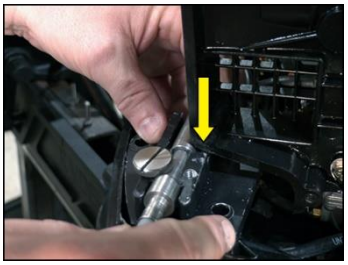
9. Insert the round wire lock pin and fasten



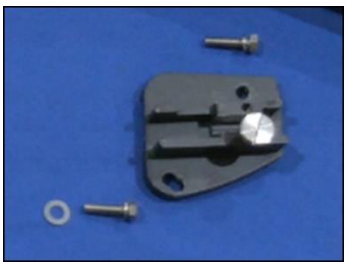
10. Insert the short push pull cable into cable control mount and tighten.

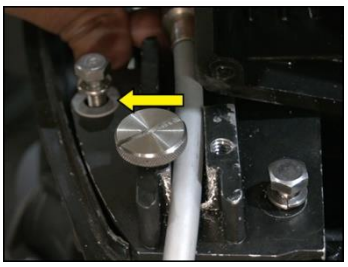


11. Insert the cable control mount into the engine. The two (2) bolt holes will line up and the mount will rest against the air intake frame.



12. Secure the cable control mount using the provided bolts and washers. A larger washer is provided for the rear most bolt.





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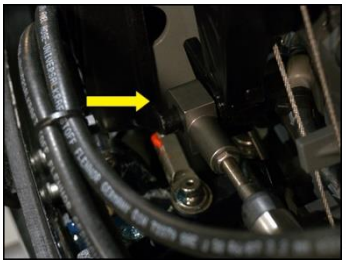
13. Adjust throttle control as needed, connect the throttle cable end to the throttle advancer arm.



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14. Tighten the two (2) 10 mm bolts on the cable control mount.

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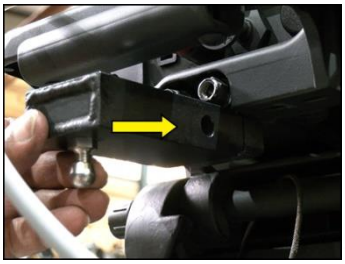
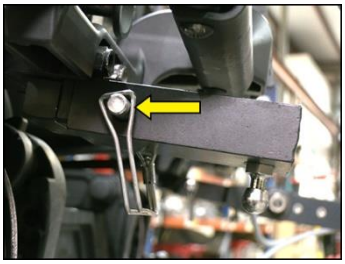
15. Secure the throttle cable end to the throttle advancer arm with the white plastic washer and pin provided.

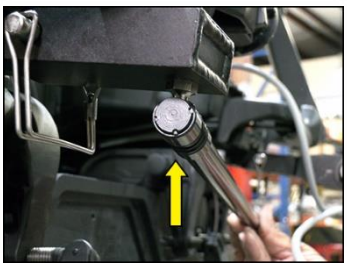
16. Using the long push pull cable repeat steps 10 through 15 with second engine.

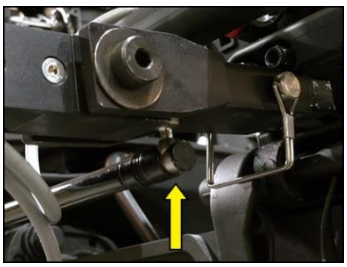
17. Attach the steering rod mount to left engine steering arm extension and secure with retaining pin.





18. Attach steering rod to both ball connectors on the underside of the steering rod mount and tiller arm.





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19. Reinstall air box covers on both engines.

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20. Reinstall both engine cowlings and reinsert both safety lanyards.

PROPELLER SELECTION

NOTE

The RAIDER Model 55 Outboard Engine is shipped with the propeller item listed in the parts list. This propeller is designed for an average load.

A propeller must be selected so that the engine rpm measured at wide open throttle while cruising is within the max. operating range; 5,150 to 5,850 rpm.

	Mark	Propeller Size (Diameter Pitch)	
		Inch	mm
Heavier Load	7*	11.4x7.1	290x180
	9	12.1x7.1	307x229
	11	11.6X11.0	295X279
	12	11.4X12.0	290X305
	13	11.1X13.0	282X330
	14	11.1X14.0	282X356
Lighter Load	15	11.0X15.0	279X381

*Indicates a four (4) blade propeller.

The pitch of a propeller is defined as "the distance a propeller would move in one revolution if it were moving through a soft solid, like a screw through wood." For example, a 15-pitch propeller would move forward 15 inches in one revolution.

The lower the prop pitch, the better your hole-shot. However, this comes at a price: top speed. The lower pitch makes the engine reach maximum rpm at slower speeds. Conversely, a higher pitch will deliver greater top speeds, but slower acceleration.

If you are changing pitch, remember that each inch of pitch is worth about 200 rpm. Lowering the pitch will increase rpm and vice versa. For example, going from a 11-pitch to a 13-pitch propeller will increase engine rpm by about 400 revolutions.

The trick is to choose a propeller that delivers acceptable acceleration and top speed. Perhaps what is most important is your performance goals, either deliver low-end torque or faster top speeds, you can't have both. If you load your boat with tons of gear, you might need a low pitch. If you need more speed, a higher pitch is the way to go.

Standard Operating Procedure

STARTING THE RAIDER MODEL 55 OUTBOARD ENGINE

The primary means to start the engine is by using the recoil starter. The recoil starter is mounted to the top of the powerhead with the T-Handle pull cord grip fed through the opening in the forward part of the engine cowling. A mechanical safety mechanism prevents the engine form starting unless the gear select lever is in the neutral position.

The secondary means to start the engine is used only when the primary failed. The engine cowling is removed to gain access to the Recoil Starter. Using tools provided in the Emergency Tool Kit, the recoil starter is removed. Using the cord provided in the Emergency Tool kit, wrap it around the starter pully. When the cord is fully wrapped around the starter pully, simply pull the end to start. When using this method, the engine will start in gear.

Ensure all personnel in the vicinity and operating the Outboard Engine wear hearing protection when engine is being operated to prevent against potential noise hazards. Failure to follow this warning may cause damage or loss of hearing.

- **Do not operate the engine with gear case out of water. Severe personal injury, or engine damage will result.**
- **Be careful that your clothes or other items do not get caught in the rotating engine parts.**
- **To prevent accident and injury, do not reattach the recoil starter after the engine has been started using the emergency starter rope. Be sure to put the top cowl back on.**
- **Do not operate the outboard engine with top cowl removed from the power unit or contacting turning flywheel which can lead to serious personal injury.**

- **Be sure to warm up engine well before starting cruise. Operating cold engine can give damage to it.**
- **Be sure to stop engine immediately if cooling water check port is not discharging water, and check if cooling water intake is blocked. Operating engine could lead to overheating potentially leading to engine damage. Consult an authorized dealer if the cause cannot be found.**
- **Do not shift to "F" or "R" until engine is at proper idle speed.**

The following steps will instruct you on how to start the RAIDER Model 55 Outboard Engine:

1. Connect the fuel connector to the engine

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2. Feed fuel to the carburetor by squeezing the primer bulb until firm.

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3. Install the safety lock in the stop switch (lanyard).

4. Set the shift lever to Neutral

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5. Turn the throttle grip so that the indicator line meets the "START" mark.

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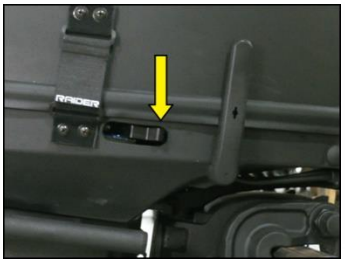
6. Ensure dewatering lever is fully forward and locked into position.



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7. Pull the starter rope slowly until resistance is met. Give it a sharp tug to start the engine.

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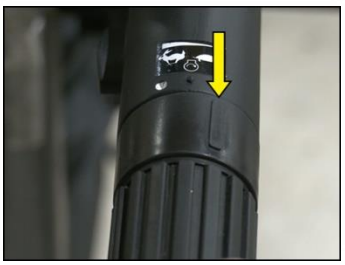
8. Turn the handle grip to its original position gradually once the engine has started. Confirm that cooling water is being discharged from the check port and idle port.

9. Carefully turn the throttle grip to "SLOW".



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10. Let the engine run at idle for approximately three minutes for warm prior to placing under load. This will ensure all moving surface are at optimal operating temperature and properly lubricated. Immediately placing under load after start will significantly shorten engine life.

MANEUVERING

- **Never stop the engine immediately after a full throttle run. Keep it running for two or three minutes at idling speed (Shift Lever set to Neutral) to allow it to cool down.**
- **Before moving the Shift Lever to Reverse, make sure the Reverse Lock is engaged (in up position).**
- **Do not increase the engine speed unnecessarily while reversing.**
- **The Shift Lever cannot be turned from Neutral to Reverse unless the throttle grip has been turned fully toward "SLOW"**

Idle. Proper idle speed after warm-up operation. Clutch in (In gear) 750 RPM, Clutch off (Out of gear) 900 RPM.

Accelerating. Twist the throttle grip on the end of the steering tiller inboard to accelerate. Do not exceed the full-throttle engine speed. Wide-open throttle (WOT) RPM range 5,150 - 5,850 RPM.

Shifting. Prior to shifting between forward and reverse, ensure that the engine is brought to idle, then place the engine into gear.

Turning. The tiller is always moved in the direction opposite of which the bow of the boat is to move. If the tiller is moved to port side (left), the bow will turn to starboard (right). If the tiller is moved to starboard (right), the bow will turn port (left).

Stopping. Bring the engine to idle speed and place the gear shift lever in the neutral position. Secure craft to pier if required. Press the engine stop switch.

Reversing. Turn the throttle grip toward "SLOW" and move the Shift Lever quickly to Reverse when the engine speed has reached the lowest RPM. Ensure the Tilt Lever is in the locked position (fully up). If not, when engaged the propeller will climb out of the water.

Ensure that the Emergency Stop Switch lanyard is attached to some point on your body, in the event of falling overboard. The engine will shut down when the switch lock becomes disconnected from the engine.

TRIM ADJUSTMENTS

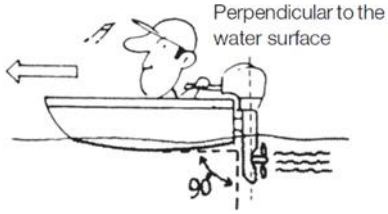
WARNING

Excessive trim up or down may lead to unstable boat operation, potentially causing the steering difficulty that leads to accident during cruising. When testing a trim position, run boat slow initially to see if it can be controlled safely.

- **Do not put hand or finger in between outboard engine body and clamp bracket when adjusting trim angle to prevent injury in case the outboard engine body falls.**
- **Unsuitable trim position can cause loss of control of boat.**
- **Do not cruise at high speed if improper trim position is suspected. Stop the boat and readjust trim angle before continuing cruise.**

By changing the outboard engine's drive angle, the vessel's bow can be made to rise or fall. The performance and stability of a vessel depends a great deal on correctly trimming the engine. The correct trim angle depends on the vessel's handling characteristics, the sea and loading conditions. Care must therefore be taken to ensure the outboard is trimmed correctly under different sea and loading conditions.

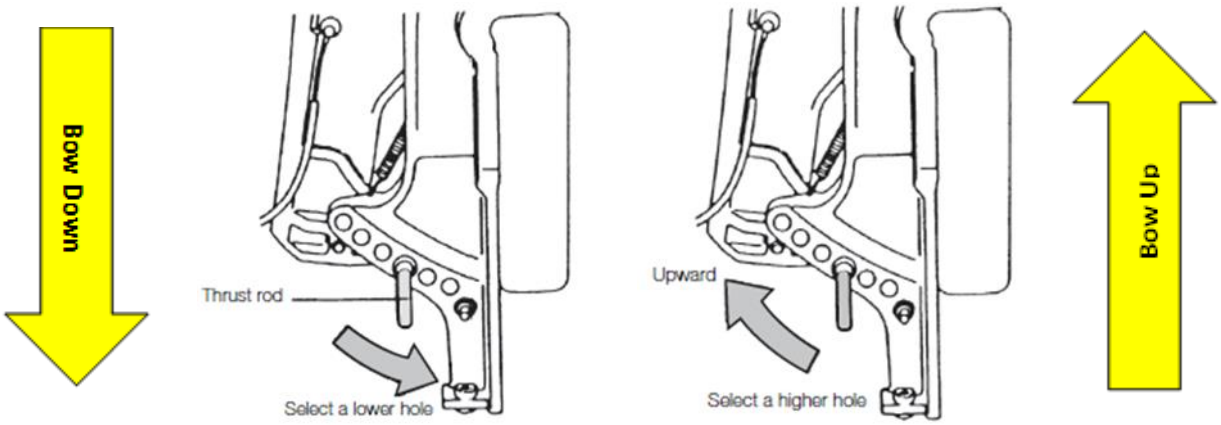
Proper Trim Angle. The trim angle is optimum when the craft is parallel to the water surface while running. Physically lift the engine, remove the thrust rod from series of holes in the stern bracket and re-adjust it higher or lower. Either alters the angle thrust delivered from the propeller relative to the water surface and the craft, and the attitude (or trim,) of the craft to the water accordingly.



Trimming Out Excessively (bow rises too high) If the trim angle is set to far out, the bow will rise out of the water and the speed will decrease. Furthermore, the bow may sway, or the bottom may slam the water while cruising. In this case decrease the trim angle by setting the thrust rod in a lower hole.

Trimming In Excessively (bow sinks or broaches) If the trim angle is set too far in, the bow will sink or plunge into the water decreasing speed and swamping your craft. Moreover, as the bow buries into a wave, the resistance created when hitting the wave causes the bow to dig into the water and the craft to veer sharply off course. Craft control is lost, passengers are thrown around, and this can even result in capsizing. In this case increase the trim angle by setting the thrust rod in a higher hole.

In general, the Raider 55 HP trim should be set to the second hole from the bottom. However, this does not preclude the Operator from assessing load and prevailing sea conditions and adjusting the Trim setting accordingly.



SHALLOW WATER RUNNING/BEACHING

WARNING

During shallow water operation, be careful not to place your hand between the swivel bracket and the stern bracket. Be sure to tilt the outboard down slowly.

- **Run at lowest possible speed during cruising using shallow water drive.**
- **Tilt lock is disabled when in shallow water drive position.**
- **When driving shallow water, be careful not to strike outboard engine against sea bottom, or propeller may be pushed out of water, resulting in loss of control.**

CAUTION

While in shallow water drive position, do not operate the outboard in reverse. Operate the outboard at slow speed and keep the cooling water intake submerged.

Place the engine in a modified-up position, nearly at 45 degrees to allow for operations through shallow waters or beaching, where the lower unit may inadvertently contact the bottom.

Set the Reverse Lock Lever on the starboard side of the engine swivel mount to "Release" by placing it in the fully downward position.

Tilt the engine up approximately to 45 degrees and lower it on the tilt stop.

Ensure the water intakes are below the waterline, failure to do so will cause the engine to overheat and fail.

When operating reverse propulsion, do not accelerate rapidly. Rapid acceleration will cause the propeller to climb out of the water and may dislodge from the transom or injure personnel.

DEWATERING

The RAIDER Model 55 Outboard Engine upon recovery to the surface may be fully operational within 10 minutes. Easy instructions for dewatering are provided affixed to the cowling of every outboard engine. Most Operators, with practice and adherence to the provided instructions, restore the engine to operations within two (2) minutes of surfacing. Skilled operators are able to achieve lite off in as few as 30 seconds.

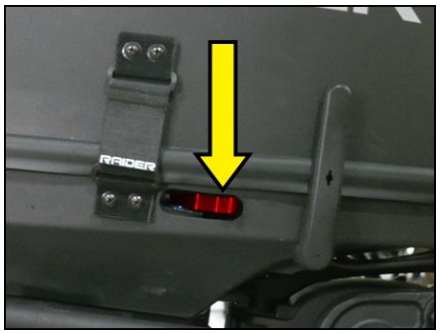
The ability to submerse, without bagging, and quickly start is achieved by actuating a lever that opens valves in the cylinder head and fuel system that allows water to quickly be dispelled from the engine. Using the recoil starter, the Operator slowly pulls the engine over several times forcing water from the head by movement of the pistons while simultaneously using the fuel line primer bulb to expel bad fuel from the fuel system through the Dewatering Valve.

The Raider Outboards Dewatering System is a proprietary system, exclusive to the Raider line of Outboard Engines. After submersion, the Dewatering System's unique design allows the engine to be cleared of water and started in as little as 30 seconds. This is accomplished primarily by two sets of valves, both actuated by a lever located on the side of the engine. These valves allow contaminated fuel and water to be removed from the fuel system as well as allowing water to be ejected from the combustion chambers.

Dewatering Components

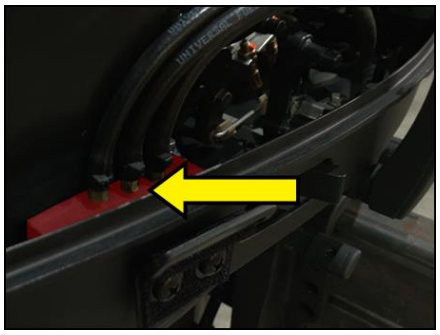
Dewatering Lever

A two-position lever located on the right side of the lower engine cover. When locked in the rear position, the Dewatering Lever opens the fuel system Dewatering Valve and the Decompression Valves on the cylinder head.



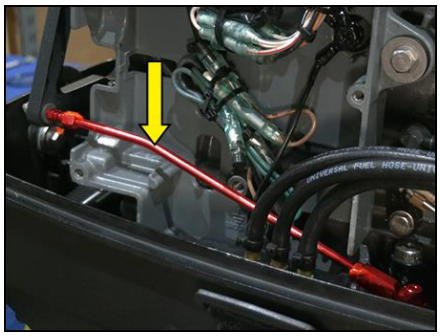
Dewatering Valve

Push button valve located inside the right side of the lower engine cover. When actuated, the Dewatering Valve opens the drain line from the bowl of the carburetor, providing a discharge path for bad fuel to be expelled overboard from the system.



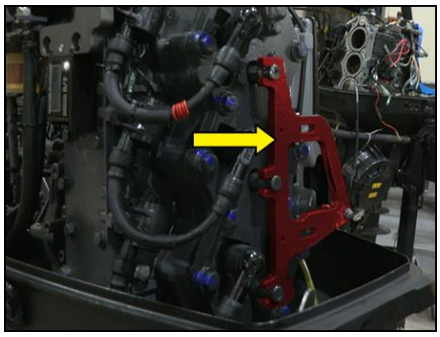
McQuaig Rod

Machined metal rod connecting the Dewatering Lever and the Stinson Fingers. It provides the mechanical linkage required to move the Stinson Fingers to actuate the Decompression Valves.



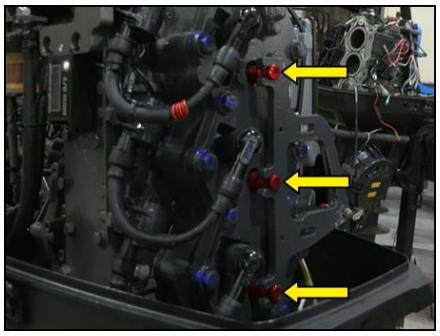
Stinson Fingers

Mounted on the outside of the cylinder head. Provides the mechanical linkage from the McQuaig Rod to the Decompression Valves. Opens all valves simultaneously.



Decompression Valves

One valve per cylinder, mounted in the cylinder head, for a total of two valves. Opened by the Stinson Fingers. When opened provide a path for water to exit the cylinder.



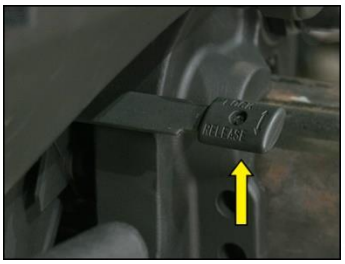
Pre-Submersion

- To prevent water intrusion on electronics during submersion. Make sure the inside of all electrical connectors are coated with dielectric grease and firmly connected.
- Ensure the Dewatering Lever is locked forward (shut).
- Ensure fuel bladder if fully filled with 50:1 oil mix and cap tightened.

- Connect fuel line and pump primer bulb until firm resistance is felt to fill fuel system.

The following steps will instruct you on how to perform the Dewatering procedure:

1. Secure the engine in the run position.



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2. Remove safety lanyard and place shift lever in NEUTRAL position.

---

3. Open the Dewatering Valve (slide Dewatering Lever towards the back of engine).

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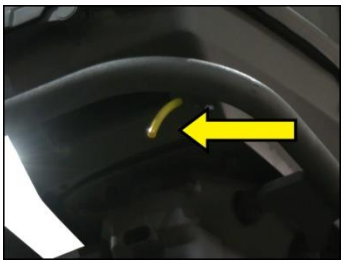
4. Slowly pull the Recoil Starter ten (10) times (until water is cleared form the cylinders).

5. Make sure the fuel line is connected and squeeze the Primer Bulb 5 – 10 times until water clears from fuel line overboard.



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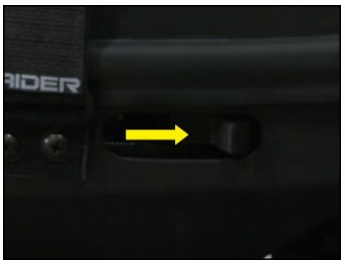
6. Push the Dewatering Valve back to the closed position.



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7. Squeeze the primer bulb until firm.

8. Pump the engine primer five (5) times.

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9. Turn the throttle 1/2-inch past normal start position.

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10. Reinsert the emergency stop switch lanyard.

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11. Start engine.

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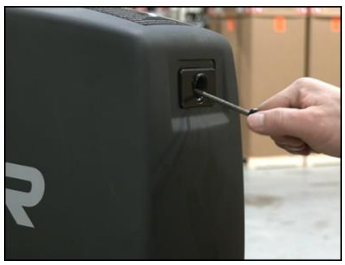
12. If engine fails to start pump primer three (3) more times

13. Start engine. If engine does not start, repeat procedure.



Post Submersion

- Whenever possible after submersion in sea water, upon completion of operational period, wash entire engine and powerhead with fresh water to remove salt deposits, especially under the Recoil Starter and Flywheel where the accumulation of deposits will build up. Raider recommends that your organization use Salt-Away when conducting post submersion maintenance. Corrosion removing compound is a water-based, non-hazardous, biodegradable solution and contains properties that dissolve, release, and remove salt crystals from any surface. Works to protect against salt corrosion and reduces costly unforeseen maintenance actions caused by salt. Salt-Away breaks apart and removes salt accumulation with repeated use.
- After submersion and operation, if the Raider cannot be immediately serviced, keep it submersed or re-submerge the engine until time is sufficient that it may be serviced. Avoid prolonged exposure to the atmosphere. If possible, submerge in fresh water but even prolonged saltwater submersion is preferable over exposure of an unserviced engine to the atmosphere. When operations are concluded, simply recover the engine, and dewater following the Dewatering Procedures and proceed with service.
- After submersion period it is critical that the engine must be run at operating temperature for no less than 30-minutes to ensure all water is removed from the head. Raider recommends that your organization use STA-BIL 360 Marine treated fuel during this run period. STA-BIL 360 Marine provides enhanced water removal properties to prevent fuel system corrosion. Engineered specially for the harsh coastal climates, prevents corrosion, cleans the fuel system, and prevents the buildup of unwanted gum and varnish, mitigating the adverse effects of submerging your RAIDER Model 55 Outboard Engine.
- After the 30-minute run period, disconnect the fuel supply with the engine running and let the engine run itself dry.

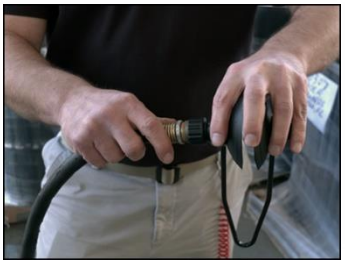
Compressed air used for cleaning purposes must not exceed 30 psi (207 kPa). Wear gloves and eye protection. Do not direct compressed air at yourself or other people. Failure to comply may cause injury to personnel.

- Using Low Pressure (LP) air, if available remove excess water from the surfaces of the powerhead. Force air under the recoil starter and flywheel. If LP air is not available, use shop towels or rags to remove excess water.
- Spray the entire power head with a liberal coat of Corrosion Preventative penetrate/lubricant or equivalent. Raider recommends that your organization use Corrosion Preventative, a special corrosion preventative compound that prevents deterioration and contamination of all surfaces of electronic equipment and mechanical close-tolerance components. This corrosion inhibitor contains extremely long-lasting, specially formulated, and proprietary anti-corrosive inhibitors that provide a superior lubrication coefficient. Corrosion Zero film remains flexible and will not crack when the treated material is subject to vibration and/or thermal expansion or contraction. It is the flexibility of the film that makes Corrosion Zero extremely effective against fretting corrosion. Also, because the film is not rigid, the film tends to be "self-healing" and will fill scratches that are caused by the mating and/or unmating of close tolerance parts.
- Leave the upper cover off, when possible, to allow the power head and other components to air dry.

FLUSHING

The following steps will instruct you on how properly Flush the RAIDER Model 55 Outboard Engine:

1. Attach flush kit “ears or flush connector” to a hose connected to a water source.



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2. Connect the flushing kit to the two (2) water intakes located on the lower unit.

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3. Connect the fuel line and pump the fuel bulb until firm

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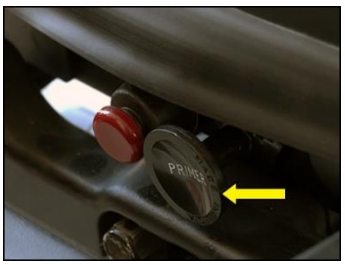
4. Turn on the water. Water may leak from flushing kit.

5. Prime the engine 3 – 5 times. Three (3) if engine was used earlier that day, five (5) if you haven't used it.



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6. Attach the safety lanyard

---

7. Start the engine. Operate the for approximately five (5) minutes at full operating temperature.

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8. A steady stream of water will discharge from the tell-tale. If no water, ensure the flush kit covers both intakes.

---

9. After a submersion period the engine must be run at operating temperature for no less than thirty (30) minutes to ensure all water is removed from the head.

10. Disconnect the fuel supply and let the engine run itself dry.

---

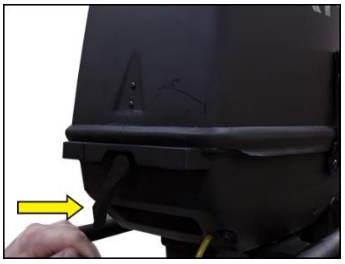
11. Turn off water and remove flush kit.

LONG-TERM STORAGE (LAYUP)

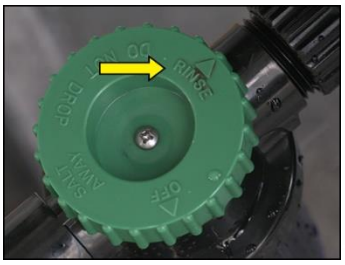
For extended periods of nonuse or long-term storage, typically 90 days or more, placing the engine into a Layup condition is highly recommended. This process adds the needed layer of oil residue onto all the interior parts preventing corrosion and removes residue from the breakdown of fuel that clogs fuel system components. Upon completion of the Layup Procedures the engine should be stored inside the dive locker/boat shop, garage, or storage container. Prior to the layup procedure, conduct a complete set of engine Before Operations checks. Use corrosion removing compound flushing kit to prevent corrosion and decrease metal deterioration by eliminating build-up of rust in water passageways.

The following steps will instruct you on how to perform the Layup Procedure:

1. Remove cowling.



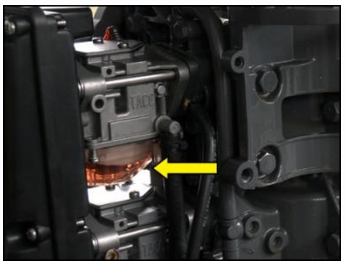
2. Remove the seven (7) Phillips head screws and remove the air box cover.

3.	Attach Mixing Unit to a hose connected to a water source.	
4.	Attach the Flush Unit to mixing unit. Thread until tight	
5.	Fill mixing unit with corrosion preventive according to manufacturing instructions.	
6.	Attach flush unit to the water intake screens on the lower unit.	
7.	Set mixing unit selector to “RINSE" position.	

8. Attach fuel line and pump bulb until firm allowing fuel to enter into the carburetor bowls.

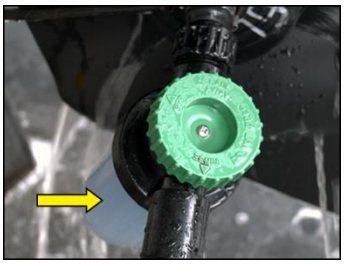
9. Turn on water.

10. Run the engine at a fast idle to circulate treated fuel throughout the filter and carburetor(s).



11. Once engine has reached operating temperature, set the mixing unit mixing selector to the “Salt-Away" position.

12. Run until the mixing unit is clear.

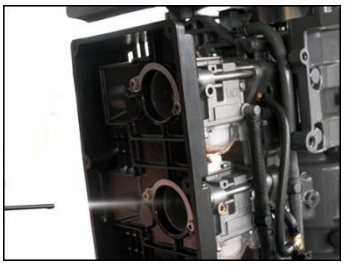


13. With engine idling, disconnect fuel supply. Engine will run on just the treated fuel in the carburetor float bowl(s).

14. As engine starts to die, rpm will climb. At this precise moment, begin squirting fogging oil down the carburetor throat for 3-5 seconds.

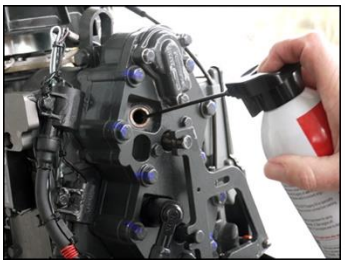
Repeat for each carburetor.

15. Continue to flood with a mist of fogging oil until engine stops running.



16. Turn the mixing unit to the “Off” position.

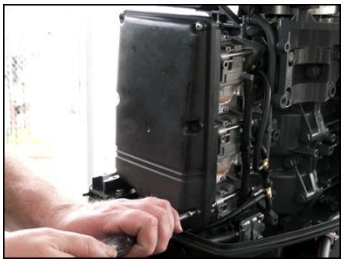
17. Remove spark plug with a 3/8 socket and spray fogging oil into cylinder for 3-5 seconds. Reinsert spark plug.



18. Apply dielectric grease to plug boot and reattach to respective spark plug.

Repeat for each spark plug (3).

19. Reinstall the air box cover



20. Spray Powerhead with Corrosion Preventative protecting all external metal parts.

21. Install cowling.

22. Turn off water and remove mixing unit and flush kit

23. Stow engine inside a dive locker/boat shop, garage, or storage container.

Troubleshooting

Troubleshooting Guidelines

When troubleshooting any malfunction, the root cause of the issue should be investigated prior to performing any repair actions. Unless the fundamental source of the problem is identified and corrected, similar malfunctions will continue to occur. Before disassembling or replacing any components or making any adjustments to the engine, be sure to note the following:

1. Were any abnormalities observed before the problem arose?

2. How was the engine being used when the problem occurred?

3. Have any recent repairs been performed?

4. Are there any other problems with the engine?

Thorough inspection and diagnosis prior to disassembly leads to quick repairs and reduction of wasteful work. Attempting to repair the engine without identifying the root cause of the issue often results in difficulty replicating the original malfunction, obscuring its cause and ultimately leading to repeated failures and repairs.

B. Troubleshooting Matrix

The Troubleshooting Matrix is a table containing the most common performance issues encountered when working with outboard engines. The table contains a grid indicating the potential conditions affecting the engine, which are listed along the right side of the table. The Troubleshooting Matrix can be found in the appendix of this manual.

C. Troubleshooting Procedure

1. Using the Troubleshooting Matrix, locate the issue you are experiencing along the top row of the matrix.

2. The dots in the column beneath the issue indicate which of the potential conditions on the right side of the matrix may be causing the problem.

3. Beginning with the simplest or easiest condition to evaluate, check the engine for each of the conditions indicated.

4. If a condition is found to be affecting the engine, follow the suggested remedy to correct the problem.

5. Test the engine to see if the problem persists. If you still experience the problem, go on to the next simplest solution in the Troubleshooting Matrix. Continue this procedure until the problem no longer occurs.

6. If the problem persists after exhausting all solutions provided in the Troubleshooting Matrix, seek the next level of technical support within your organization, or contact Raider Outboards Technical Support.

D. Common Performance Issues

1. Engine Fails to Start

a. Is the fuel tank/bladder empty?

Fill with clean, fresh fuel.

b. Is the fuel contaminated or stale?

Fill tank/bladder with clean, fresh fuel.

c. Is there water in the fuel?

Inspect fuel filter and lines for signs of water. Initiate dewatering procedure.

d. Is there a loose connector or vacuum leak in the fuel line assembly?

Inspect fuel line assembly, connectors, line, and primer bulb.

e. Is the anti-siphon valve faulty or improper?

Change valve or fuel line assembly.

f. Is the fuel filter clogged?

Clean or replace filter.

g. Is the fuel tank/bladder vent open?

Open vent screw.

h. Has the fuel pump malfunctioned?

Remove cowling, visually inspect fuel lines for fuel flow.

i. Are spark plugs fouled or incorrect type?

Inspect spark plugs. Clean or replace with recommended type.

j. Are the spark plug boots fitted incorrectly?

Check and refit boots.

k. Is ignition wiring damaged or poorly connected?

Check wires for wear or breaks. Tighten all loose connections. Replace worn or broken wires.

l. Is engine emergency stop switch lanyard not attached?

Attach lanyard.

m. Is the carburetor obstructed?

Remove cowling and inspect carburetor.

2. Engine Idles Irregularly or Stalls

a. Are spark plugs gapped improperly, fouled or incorrect type?

Inspect spark plugs, test for spark and gap correctly. Clean or replace with recommended type.

b. Is the fuel system obstructed?

Check for pinched or kinked fuel line or obstructions in the fuel system.

c. Is the fuel contaminated or stale?

Fill tank/bladder with fresh, clean fuel.

d. Is the fuel oil mixture too rich or too lean?

If blue smoke is coming out of the exhaust or if oil is dripping from the exhaust, the fuel ratio is too rich. Loss of power while throttling, a hot smell like metal rubbing against metal, and excessive heat are signs the mix is too lean.

e. Is the thermostat faulty or clogged?

Remove and inspect thermostat.

3. Engine Overheats

a. Is the water intake screen clear?

Inspect and clear screens of foreign or bio matter.

b. Is the water pump operating?

Check the “tell-tale” water stream for full flow.

c. Is the thermostat faulty or clogged?

Remove and inspect thermostat.

4. Engine Vibrates Excessively

a. Is the propeller damaged?

Have propeller repaired or replaced.

b. Is the propeller shaft damaged?

Remove engine from service.

c. Are weeds or other foreign matter tangled on propeller?

Remove and clean propeller.

d. Are the stern bracket clamp screws loose?

Inspect and tighten screws.

5. Engine Power Loss

a. Is the propeller damaged?

Have propeller repaired or replaced.

b. Is the trim angle incorrect?

Adjust trim angle to achieve most efficient operation.

c. Is engine mounted at an incorrect height on transom?

Have engine adjusted to proper transom height.

d. Are weeds or foreign matter tangled in the gearcase?

Remove foreign matter and clean lower unit.

e. Is the fuel system obstructed?

Check for kinked fuel line or other obstructions in fuel system.

f. Is fuel filter clogged?

Clean or replace filter.

g. Is fuel contaminated or stale?

Fill tank/bladder with fresh, clean fuel.

6. Electrical Fault

a. Is the starting system wiring cracked, corroded, or disconnected?

Inspect the starting system component and associated wiring.

If you encounter a problem with the engine, check the list below. Locate the problem you are experiencing, then follow the suggested remedies. Do not hesitate to contact Raider Technical Support, as professional advice and assistance is the best way to keep the engine in optimum condition.

Difficult to start engine	Engine starts, but stops soon	Poor Idling	Unstable engine running speed or engine speed	Abnorm-ally high engine speed	Abnorm-ally low engine speeds	Cannot obtain high engine speeds	Over-heating of engine	
●	●		●					Empty fuel tank
●	●	●	●		●	●	●	Incorrect connection of fuel system
●	●	●	●		●	●	●	Air enters fuel line
●	●	●	●		●	●	●	Deformed or damaged fuel pipe
●	●	●	●		●	●	●	Closed air vent on fuel tank cap
●	●	●	●		●	●	●	Clogged fuel filter, fuel pump or carburetor
		●	●		●	●	●	Use of improper engine Oil
●	●	●	●			●	●	Use of improper Gasoline
●	●							Excessive supply of gasoline
●	●	●	●		●	●	●	Poor carburetor Adjustment
●	●	●	●			●	●	Recirculation pipe Broken
●	●	●	●		●	●	●	Use of non-specified spark plugs
●	●	●	●		●	●		Dirt or carbon deposits on spark plugs
●	●	●	●		●	●		No sparks or weak Sparks
			●		●	●	●	Insufficient cooling water flow
		●	●			●	●	Faulty thermostat

Difficult to start engine	Engine starts, but stops soon	Poor Idling	Unstable engine running speed or engine speed	Abnorm-ally high engine speed	Abnorm-ally low engine speeds	Cannot obtain high engine speeds	Over-heating of engine	
				●		●	●	Propeller cavitation
				●	●	●	●	Incorrect propeller selection
		●		●	●	●	●	Damaged or bent propeller
				●	●	●	●	Unbalanced load in boat
				●		●	●	Transom too high
					●	●	●	Transom too low
●	●	●			●	●	●	Incorrect adjustment of throttle link
●	●	●			●	●	●	Incorrect adjustment of ignition timing
●								Safety switch lock plate not fitted

Preventive Maintenance Checks and Services (PMCS)

Before, During, and After Operations Checks

As the Operator or Field Service Technician (FST) you must be intimately familiar with the Before and After Operations Checks for the RAIDER Model 55 Outboard Engine. Preparing the engine for an operational period is the most critical part of mission execution. These actions directly contribute to mission success and when ignored will lead to reduced reliability, engine casualties, or mission failure.

Before Operations Checks are developed and implemented for the express purpose of assessing the reliability of the engine prior to use, prepare the engine for use, and reduce failures of the engine during an operational cycle or mission.

After Operations Checks are developed and implemented for the purpose of establishing a maintenance procedure to be conducted after each operational cycle or mission that mitigates operational stressors placed on the engine while in use, extends service life of the engine, and improves reliability of the engine.

Formal documentation provided by Raider Outboards that details the recommended procedures for placing the engine into and out of an operational cycle or mission.

The Before, During and After Operations Sheets allow Maintainers and Operators a written means to document prescribed preventative maintenance checks, document operational hours and accurately capture discrepancies.

For every operational cycle, a record or log should be maintained under engine serial number that provide Maintainers, Operators, and Service Technicians with a history of the engine.

BEFORE OPERATIONS CHECKS

- **Grease contains ingredients that can cause mild skin contact hazard. Treat random or occasional skin contact with mild soap and water. Gloves and eye protection is required with heavy, constant exposure. Do not ingest.**
- **Immediately clean up any spilled compound. Comply with local procedures and environmental regulations when disposing of grease or cleanup materials.**
- **Failure to comply may result in injury to personnel and/or damage to the environment.**

Item	Interval	Procedure	Equipment Not Available If:
Exterior	BEFORE	Inspect Cowling, Engine Pan (lower cowling), Midsection, and Lower Unit for cracks, defects, or damage.	Upper Cowling: any condition that would prevent the cowling from being properly secured to the engine pan with cowling straps or hook. Structural damage in the form of holes, cracking, gouging, impacts, abrasions that compromise the integrity of the cowl and allow for abnormally high flexing. Engine Pan (lower cowling): any condition that would prevent the Upper Cowling from being properly secured to the Engine Pan with cowling straps or hook lever. Structural damage in the form of holes, cracking, gouging, impacts, abrasions that compromise the operation of the mounting or function of the engine controls. Midsection: Structural damage in the form of holes, cracking, gouging, impacts, abrasions that compromise engine mounting to the craft transom, steering functionality, and the transfer

			of power from the engine to the propeller shaft. Lower Unit: Any indication or the presence of gear oil leaking form the oil fill, oil drain, and bearing cap. Structural damage in the form of holes, cracking, gouging, impacts, abrasions that result in gear oil leakage. Structural damage in the form of holes, cracking, gouging, impacts, abrasions that compromise steering functionality.
Zinc Anodes	BEFORE	Stern Bracket Anode. Replace if damaged or reduced in size by more than 40%. Trim Tab Anode. Replace if damaged or reduced in size by more than 40%.	Stern Bracket Anode: When anode is reduced size typically below 40%, the corrosion protection properties afforded by the anode will be significantly reduced. This reduction in protection will lead to increased susceptibility for engine corrosion reducing service life of components and engine. Trim Tab: When anode is reduced size typically below 40%, the corrosion protection properties afforded by the anode will be significantly reduced. This reduction in protection will lead to increased susceptibility for engine corrosion reducing service life of components and engine. The counter forces generated by the tab against the spin of the propeller will also be reduced. The operator will be required to apply more force to the tiller arm in keeping the craft on desired course.
Control Panel	BEFORE	Inspect Stop control. Verify the Lock Plate and Emergency Stop Switch lanyard are installed. Inspect for damage due to	Engine Stop/Kill Switch: If the switch does not function as intended, when pressed or when lock plate is removed the engine will stop.

		corrosion, lack of maintenance, or abuse.	Should the wire shielding present damage that exposes bare wire.
Cable Lanyard	BEFORE	Verify the Cable Lanyard is securely attached to the engine and may be securely attached to craft Transom.	Cable Lanyard missing.
Shift Lever Mechanism and Shift Lever Stopper	BEFORE	Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps.	The Shift Lever should smoothly shift between forward, neutral, and reverse and remain in selected position. Should the Shift Lever and or linkages present damage that prevent smooth gear selection, or the Shift Lever will not remain in selected position.
Throttle Linkage	BEFORE	Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps. Lubricate with low temperature lithium grease.	Should the Throttle linkages present damage that prevent the application of throttle while the engine is operating.
Tilt Stopper, Bracket Bolt, Bracket Shaft, Clamp Screw, and Reverse Lock	BEFORE	Inspect for damage due to corrosion, lack of maintenance, or abuse. Lubricate with Friction Surface Marine Grease.	Should the engine be unable to freely move through its full range of motions from left to right, half tilt, and full tilt positions as a result of abuse or damage.
Hook Lever Mechanism (cowling latch)	BEFORE	Inspect for damage due to corrosion, lack of maintenance, or abuse. Lubricate with Friction Surface Marine Grease.	Any condition that would prevent the cowling from being properly secured to the engine pan with cowling straps or hook.

Recoil Starter	BEFORE	Inspect for damage due to corrosion, lack of maintenance, or abuse.	Any condition that would prevent the mechanical mechanism from operating. Starter handle is missing or damaged. Starter rope is torn, broken or frayed.
Starter Lock	BEFORE	Inspect for damage due to corrosion, lack of maintenance, or abuse.	Cable Lanyard missing.
Electrical Wiring	BEFORE	Inspect wires for cracks, chaffing and insulation damage. Check for loose connections.	Should the wire shielding/insulation present damage that exposes bare wire.
Ignition Coil Plug Wire Boots	BEFORE	Prior to submersion, remove plug boots and fill with dielectric grease.	Should the wire shielding/insulation present damage that exposes bare wire. Should the 2” boot extension present damage that would allow for the intrusion of water when submerged.
Gearcase	BEFORE	Inspect water intake screens. Inspect the skeg for damage.	Any indication or the presence of gear oil leaking from the oil fill, oil drain, and bearing cap. Structural damage in the form of holes, cracking, gouging, impacts, abrasions that result in gear oil leakage. Structural damage in the form of holes, cracking, gouging, impacts, abrasions that compromise steering functionality.
Propeller	BEFORE	Inspect and verify propeller is true and free of nicks, chips, and other damage that could affect performance.	Blade deformities, nicks and chips produce noticeable vibration/cavitation when the engine is in gear.

		Propeller Shaft. Inspect for damage due to corrosion, lack of maintenance, or abuse. Inspect the shaft threads and splines for wear and damage.	High RPMS produce little or zero boat acceleration, loss of power. Indicative of a spun hub or damaged shaft spline. Bent shaft
Gasoline Fuel Mix Ratio	BEFORE	Requires a 50:1 oil to fuel mixture. 16oz per six (6) gallons or about 2.5oz per every one (1) gallon. Use only NMMA TC-W3 2-Cycle Synthetic Marine Oil. Record date of mix, dispose of fuel mixtures older than 90 days. Lubricate with Friction Surface Marine Grease.	Gasoline fuel mix contains too little or too much oil.
Full Tank/Bladder	BEFORE	Inspect for leaks: Ensure that the bladder is not leaking from any seam, fill cap, vent, or rip in membrane. Inspect securing straps: Ensure the bladder can be adequately secured to the deck. Inspect fuel line connector: Check for damage and ensure that the fuel line fitting properly mates. Inspect vent: Ensure the vent opens and shuts.	Equipment not available if fuel leak of any type is present. This item is organization dependent, as Raider Outboards does not supply tank or bladder systems.

Fuel Line Assembly	BEFORE	Inspect end connectors: Check ensuring proper fit and seal to bladder and engine. Inspect fuel line: Check for dry rot and leaks. Inspect bulb: Check for proper installation, dry rot, and function. Stow extra Fuel Line Assembly in sponson bag or Emergency Kit.	Equipment not available if fuel leak of any type is present.
Fuel Filter	BEFORE	Inspect component for leaks, damage, or excessive wear. Inspect Clamps: Ensuring proper fit, note leaks, damage, or excessive wear. Inspect Lines: Check for dry rot and chaffing.	Equipment not available if fuel leak of any type is present.
Fuel Pumps	BEFORE	Inspect component for leaks, damage, or excessive wear. Inspect Clamps: Ensuring proper fit, note leaks, damage, or excessive wear. Inspect Lines: Check for dry rot and chaffing.	Equipment not available if fuel leak of any type is present.
Carburetors	BEFORE	Inspect component for leaks, damage, or excessive wear. Inspect Clamps: Ensuring proper fit, note leaks, damage,	Equipment not available if fuel leak of any type is present.

		or excessive wear. Inspect Lines: Check for dry rot and chaffing.	
Primer	BEFORE	Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps. Lubricate with Friction Surface Marine Grease.	Equipment not available if fuel leak of any type is present.

DURING OPERATIONS CHECKS

Item	Interval	Procedure	Equipment Not Available If:
Pull Start	DURING	Start the engine using the Recoil Starter.	Starter handle is missing or damaged. Starter rope is torn, broken or frayed.
Neutral Safety	DURING	Verify that the engine will not start in gear both forward and reverse.	Throttle or Tiller arm is significantly damaged or missing parts that prevent proper operation. Shift Lever and or linkages present damage that prevent smooth gear selection, or the Shift Lever will not remain in selected position.
Water discharge from check ports	DURING	When the engine is running verify that water is being discharged from all check ports.	There is an unsteady stream of water or no stream at all.
Tiller Steering	DURING	When moving the Tiller Arm, verify that the engine moves	Tiller arm is significantly damaged or missing parts that prevent proper operation.

		freely to port and starboard.	
Neutral	DURING	Verify the propeller does not engage when the gear selector is in the neutral position.	The Shift Lever should smoothly shift between forward, neutral, and reverse and remain in selected position. Should the Shift Lever and or linkages present damage that prevent smooth gear selection, or the Shift Lever will not remain in selected position.
Forward	DURING	With the engine at idle, verify the Gear Selector moves freely into the forward position and the propeller engages.	The Shift Lever should smoothly shift between forward, neutral, and reverse and remain in selected position. Should the Shift Lever and or linkages present damage that prevent smooth gear selection, or the Shift Lever will not remain in selected position.
Reverse	DURING	With the engine at idle, verify the Gear Selector moves freely into the reverse position and the propeller engages.	The Shift Lever should smoothly shift between forward, neutral, and reverse and remain in selected position. Should the Shift Lever and or linkages present damage that prevent smooth gear selection, or the Shift Lever will not remain in selected position.
Throttle Control	DURING	With the engine in neutral, slowly increase the throttle RPM's to approximately.	Should the Throttle linkages present damage that prevent the application of throttle while the engine is operating.
Emergency Stop Switch	DURING	While the engine is running, remove the lock plate, the engine should stop.	Cable Lanyard missing.
Shallow Water Running	DURING	Move the engine Reverse Lock Lever to the release position,	Engine can not be tilted. Tilt support lock does not engage or disengage.

		lift the lower unit past a 45° angle until the tilt stopper assembly locks.	
Full Tilt Position	DURING	Move the engine Reverse Lock Lever to the release position, lift the Lower Unit past a 90° angle until the tilt stopper assembly locks.	Engine can not be tilted. Tilt support lock does not engage or disengage.

AFTER OPERATIONS CHECKS

Item	Interval	Procedure	Equipment Not Available If:
Fresh water wash-down.	AFTER	Wash the exterior of the engine with fresh water. Remove the engine cowling and fresh water wash the powerhead. After submersion period ensure fresh water is forced under the flywheel and Recoil Starter. After submersion full extend the Recoil Starter Line/Rope and wash with fresh water.	Any area of the engine has significant cracks or Class II leaks. Fasteners are loose, missing or damaged. Screens are clogged or damaged. Anodes are damage or severe corrosion. Anode has eroded twothirds past its original size. Trim tab is bent, broken or missing. Propeller blades are bent or damaged.
Fresh water engine flush	AFTER	Attach “ears or flush connector” to lower unit. Operate the engine for approximately five (5) minutes at full operating temperature. After a	There is an unsteady stream of water or no stream at all.

		submersion period the engine must be run at operating temperature for no less than 30 minutes to ensure all water is removed from the head. Disconnect the fuel supply and let the engine run itself dry.	
Wipe Down	AFTER	Use Low Pressure (LP) air or dry cloth to remove excess water from exterior and interior surfaces of the engine. After submersion use LP air to remove water and moisture under the Flywheel and Recoil Starter.	Any area of the engine has significant cracks or Class II leaks. Fasteners are loose, missing or damaged. Screens are clogged or damaged. Anodes are damage or severe corrosion. Anode has eroded twothirds past its original size. Trim tab is bent, broken or missing. Propeller blades are bent or damaged.
Corrosion Prevention	AFTER	Spray the Powerhead with a liberal coat of Anti-Corrosion Spray penetrant/lubricant or equivalent. Spray Corrosion Preventative Lubricant or equivalent under the flywheel.	Powerhead/flywheel shows signs of damage or severe corrosion.
Air Dry	AFTER	Leave the upper cover off, when possible, to allow the powerhead and other components to air dry.	Covers are missing or damaged. De-watering valves or hoses are missing or damaged.

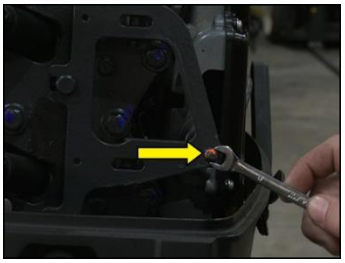
			Latch handle and shaft assembly missing or damaged. Wires are damaged, chaffed or corroded. Connections are loose, dirty or corroded.

Operator Maintenance and Repair Procedures

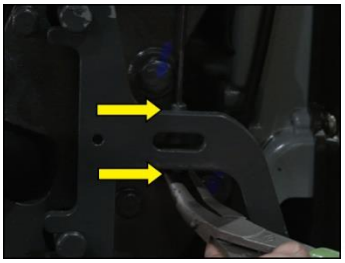
The following section is intended to provide operators of the RAIDER Model 55 Outboard Engine with step-by-step instructions on how to maintain and repair each relevant item included on the “Recommended Parts List Per Engine”. For a complete “Recommended Parts List Per Engine”, please reference the “Appendices” section of this manual.

DECOMPRESSION VALVE

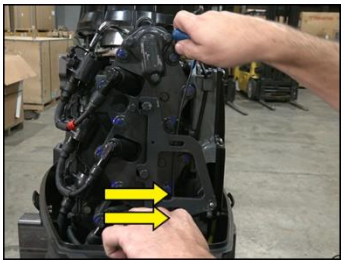
1. Remove 8mm nut from McQuaig Rod and retain for later installation.



2. Using a 2mm Allen key and needle nose pliers remove the upper shoulder bolt and nut.



3. Repeat with lower shoulder bolt and nut.



4. Loosen electrical box cover.

5. Remove Stinson Fingers

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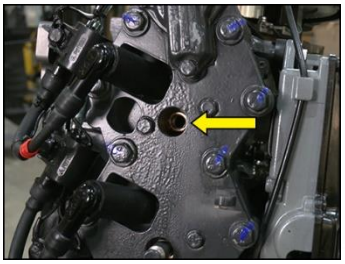
6. Using a modified 13 mm socket, located in the emergency toolkit, remove decompression valve.



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7. Apply copper anti-seize onto threads of new decompression valve.

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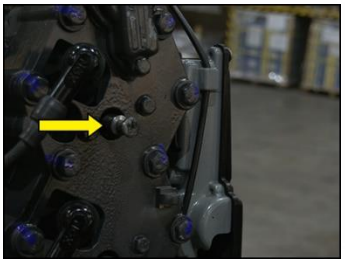
8. Insert valve and tighten to a torque of 15ft/lbs.



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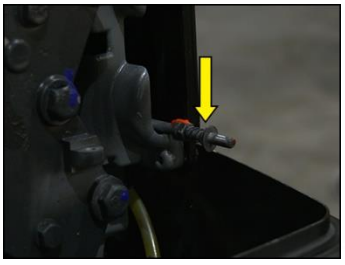
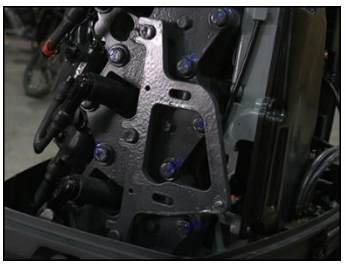
9. Ensure washer and spring remain on McQuaig Rod before installing Stinson Fingers.



10. Reinstall Stinson Fingers.



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11. Reinstall lower shoulder bolt and nut.

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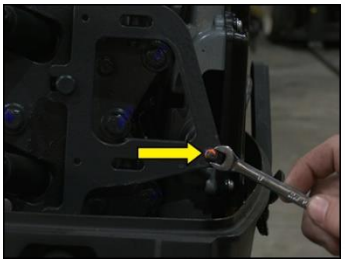
12. Ensuring dewatering lever is closed (forward) reinstall McQuaig Rod 8mm nut.



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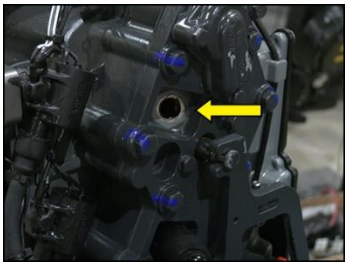
13. Tighten electrical box cover.

SPARK PLUGS

1. Remove plug caps and then using a 3/8 socket remove spark plugs.



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2. Obtain new spark plug gapped at 0.035in and apply copper anti-seize to threads.

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3. Install spark plug, torqued to 20ft/lbs.

   NOTE: If a torque-wrench is not available when you are fitting a spark plug, a good estimate of the correct torque is 1/4 to 1/2 a turn past finger-tight. Have the spark plug adjusted to the correct torque as soon as possible with a torque-wrench.

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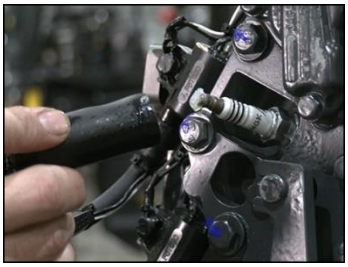
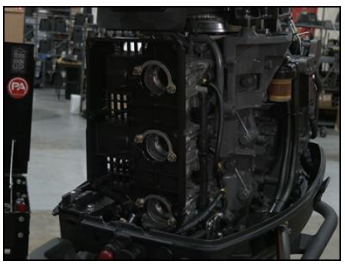
4. Apply electrical grease to spark plug connector tip and reinstall plug cap.



FLOAT CHAMBER GASKET

1. Drain fuel from engine.

2. Remove air intake silencer box cover.



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3. Using a flat head screw driver, bend down all six (6) tabs holding the locking plate bolts.

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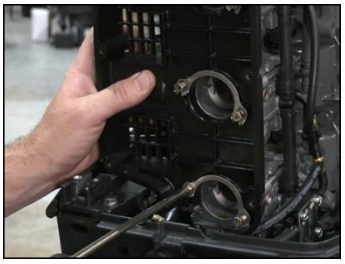
4. With an 8mm wrench or Phillip's head screwdriver loosen the six (6) bolts holding the locking plates in place.



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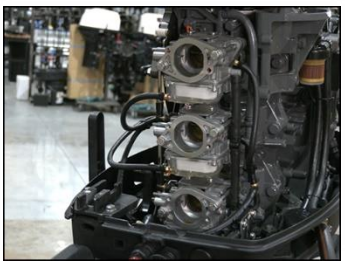
5. Remove air intake silencer box.



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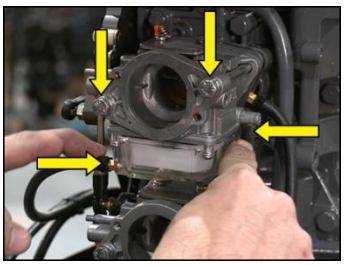
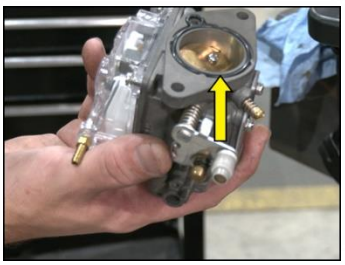
6. Remove the two (2) fuel lines and using a 10mm socket remove the two (2) bolts holding the carburetor.



7. Remove carburetor ensuring O-ring attached.



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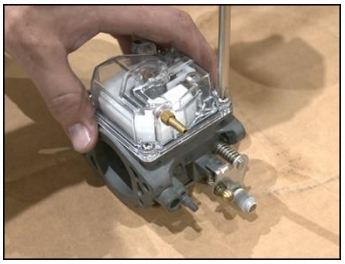
8. Remove the four (4) Phillip's head screws holding the float chamber.



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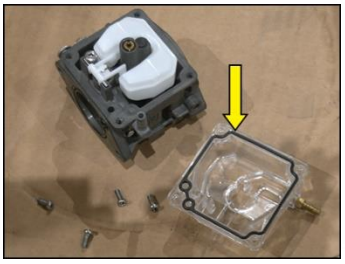
9. Replace Float Chamber Gasket, gasket only sits one way.



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10. Reinstall Float Chamber

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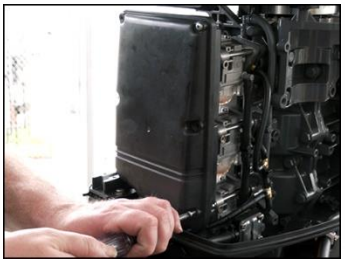
11. Reinstall carburetor, air intake, and air intake cover



PRIMER

1. Obtain new Primer.

Drain fuel in engine.

2. Dispose of contaminated drained fluids IAW the Standard Operating Procedures (SOP) of your unit.

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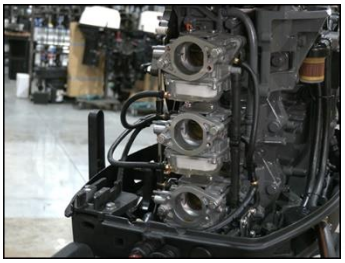
3. Remove air intake silencer.



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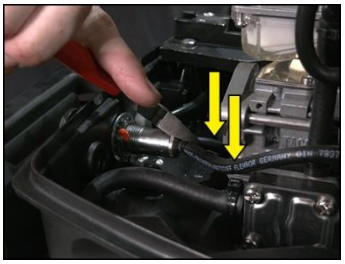
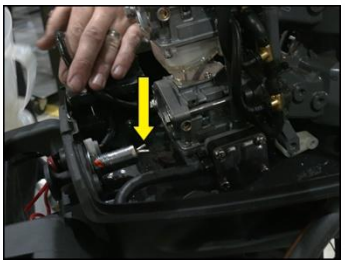
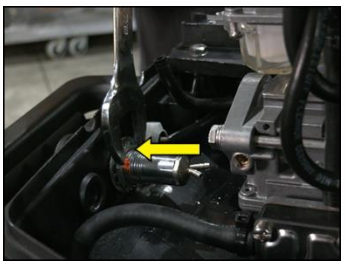
4. Cut the two (2) zip ties and disconnect the two (2) fuel lines connected to the Primer.





5. Remove the 7/8 nut and washer from the Primer.



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6. Remove old Primer

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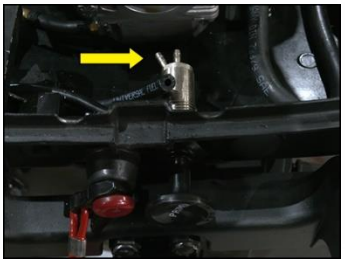
7. Unthread washer and nut from new Primer. Insert new Primer with angled fuel line connector facing left. Reinstall washer and nut.



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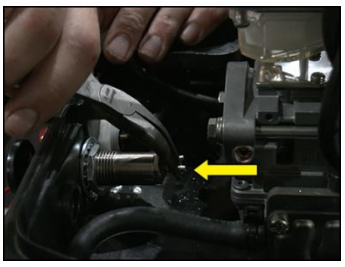
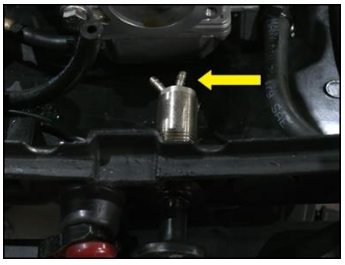
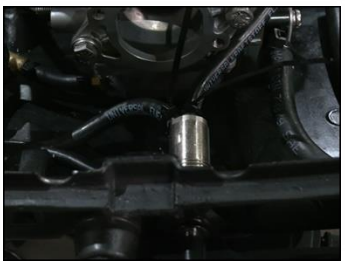
8. With needle nose pliers gentle bend right side fuel line connector. This will make it easier to reattach fuel line zip ties.





9. Reinstall the two (2) fuel lines and fasten with zip ties. Remove any excess zip tie.



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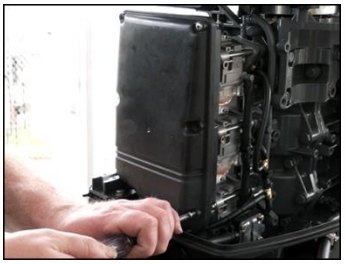
10. Reinstall air intake and air intake cover.



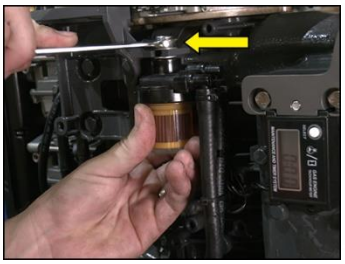
FUEL FILTER ELEMENT W/O-RING

If water is in the cup. Remove the cup and drain the water.

1. Obtain replacement Fuel Filter and O-Ring.

---

2. Using a 13 mm wrench loosen the nut holding the Fuel Filter to the engine.



3. Place container under fuel filter.

---

4. Twist off fuel filter cup, pouring any excess fuel into container.

Dispose of contaminated drained fluids IAW the Standard Operating Procedures (SOP) of your unit.

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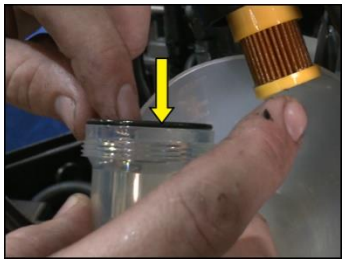
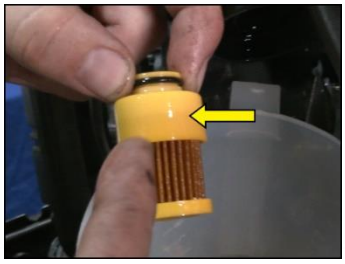
5. Remove old O-Ring and fuel filter. Retain fuel filter cup.





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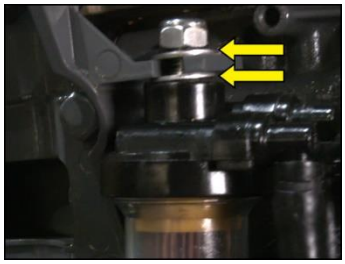
6. Insert new O-Ring and fuel filter into fuel filter cap.

7. Tightly screw in fuel filter cup.

---

8. Reconnect fuel filter to engine. Ensure the two washers connect with engine.



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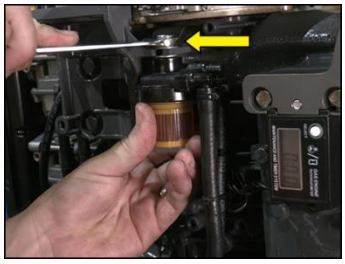
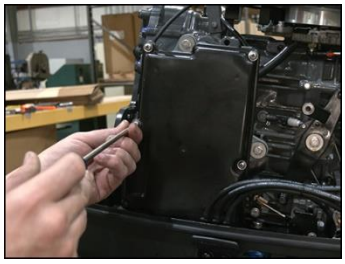
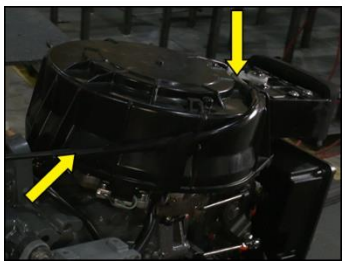
9. Tighten nut.

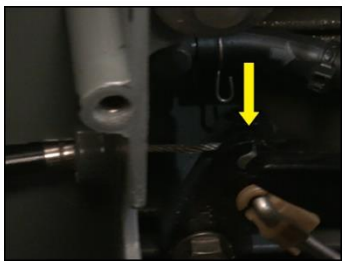


STARTER LOCK

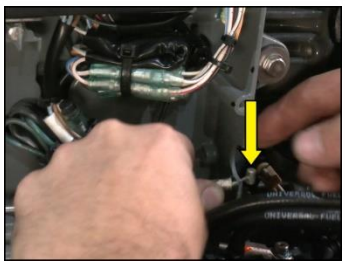
1. Remove electrical box.

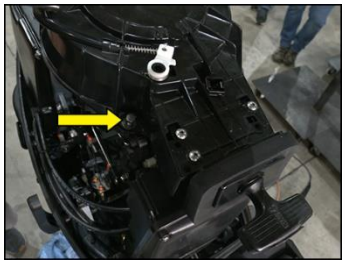




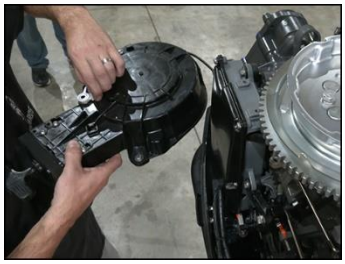


2. Trace Starter Lock wire to CD Unit and disconnect from starter lock arm using needle nose pliers.



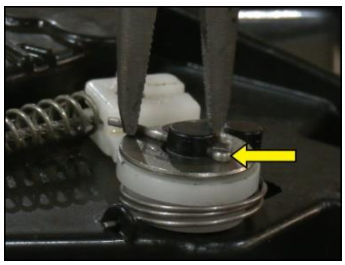


3. Remove and collect the three (3) bolts and washers holding the flywheel cover.



4. Release starter lock wire from CD Unit and remove fly wheel cover.

5. With needle nose pliers remove split pin from Starter Lock.



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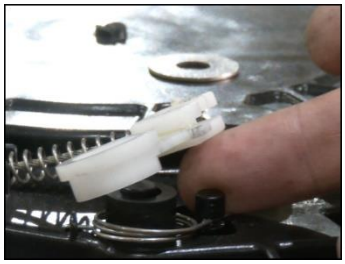
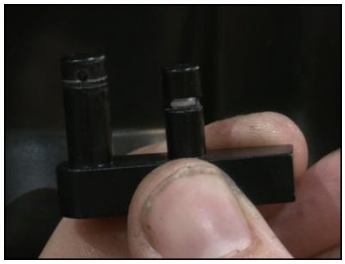
6. Remove washer and Starter Lock. Release Starter Lock Cam from spring.





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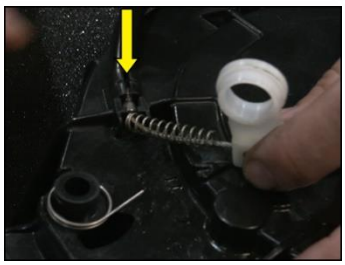
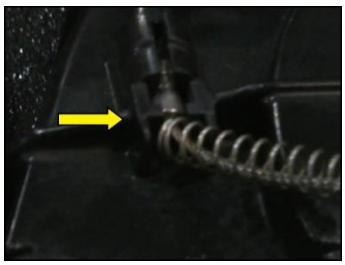
7. Replace all nonfunctioning part(s).

8. Install Starter Lock wire into flywheel cover. Ensure wire clamp and spring are properly set in tab.





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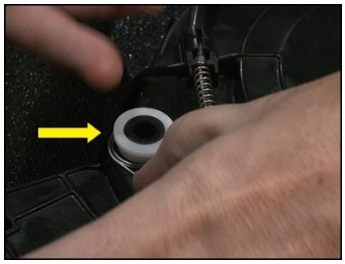
9. Install Starter Lock spring and Starter Lock.



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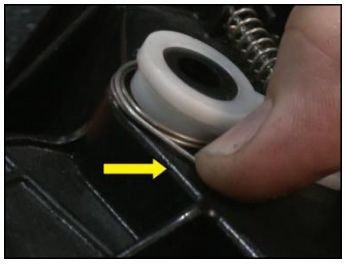
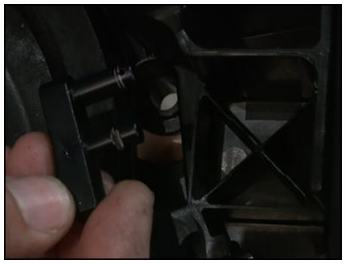
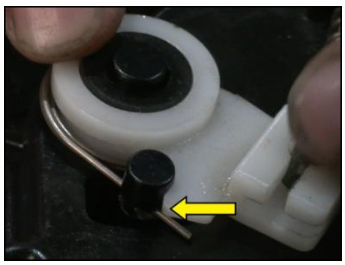
10. Holding Starter Lock spring. Insert Starter Lock Cam from underneath flywheel cover.





11. Release Starter Lock spring into Cam groove, holding in place.



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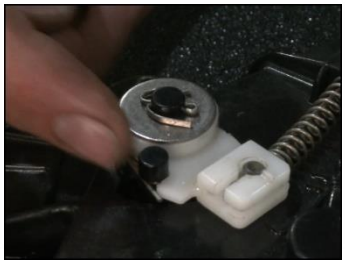
12. Install washer and pin. Using needle nose pliers bend ends in place.



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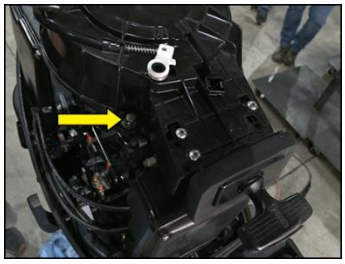
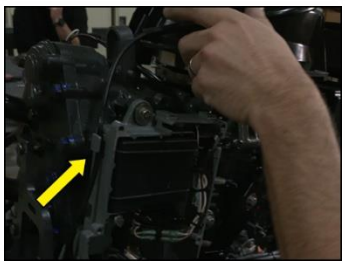
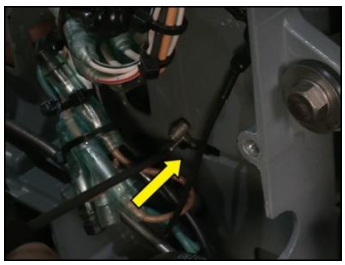
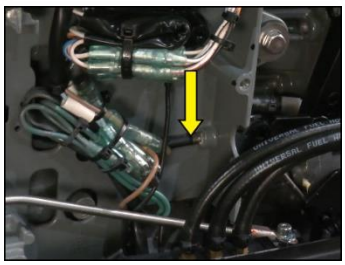
13. Reinstall flywheel. Apply blue thread locker and install the three (3) bolts and washers.







14. Reinstall the Starter Lock wire.



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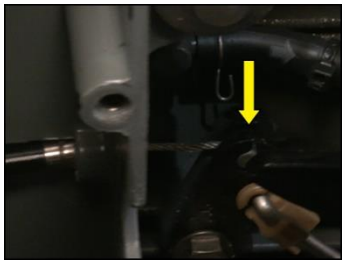
15. Reinstall Starter Lock wire clamp into starter lock arm using needle nose pliers.



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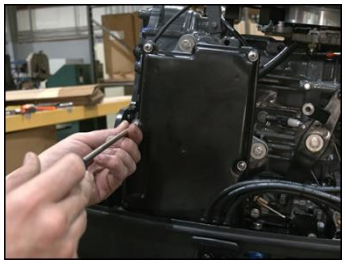
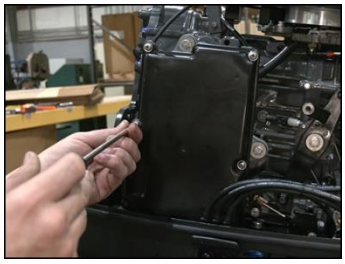
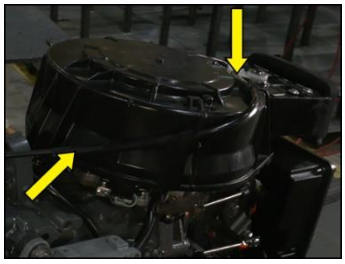
16. Reinstall electrical box.



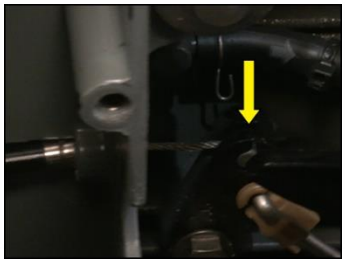
STARTER ROPE

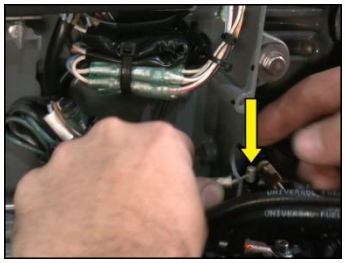
1. To remove the fly wheel cover, first remove electrical box cover. Retain parts for later installation.





2. Trace Starter Lock wire to CD Unit and disconnect from starter lock arm using needle nose pliers.





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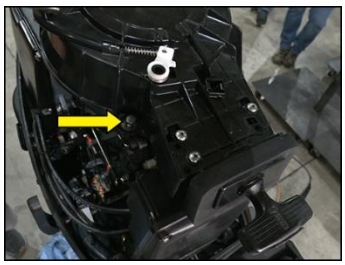
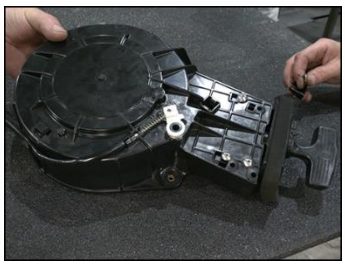
3. Remove and collect the three (3) bolts and washers holding the flywheel cover.



4. Remove fly wheel cover.



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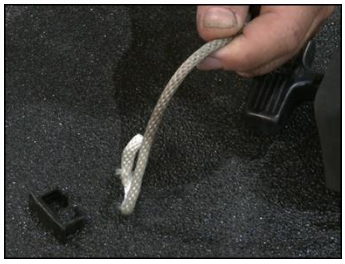
5. With a flat head screwdriver remove the plug from the pull handle.

---

6. Untie pull rope knot and remove handle.



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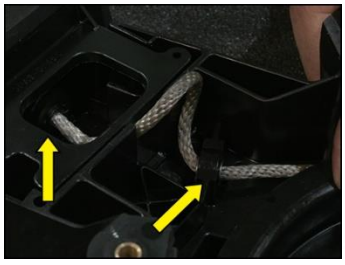
7. Remove rope to fly wheel.



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8. Locate fly wheel notch. Holding rope in notch rotate fly wheel clockwise until spring tension released (approximately three (3) times).

9. Using a Phillip's head screw driver remove the metal clamp and screw. Retain for later installation.

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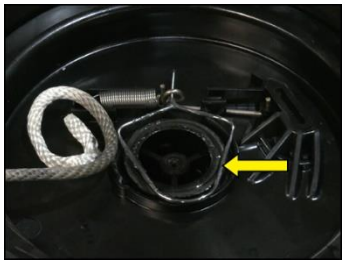
10. Remove and retain wire retainer ring.



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11. Carefully lift and remove fly wheel.

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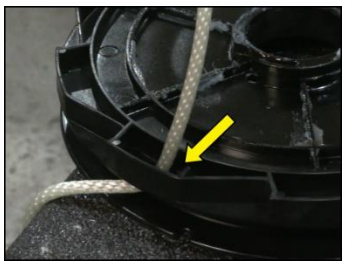
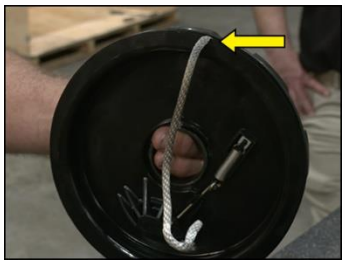
12. Unwind rope clockwise and remove.

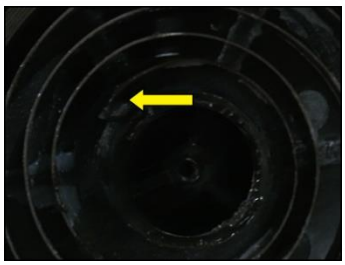
13. With replacement rope tie a knot in one end. Feed other end through fly wheel leaving knotted end in notch.



14. Wrap rope counter clockwise leaving the end notched.



15. With spring side up insert fly wheel and turn counter clockwise until notch in fly wheel sets with notch in spring. Fly wheel will be flush with cover.



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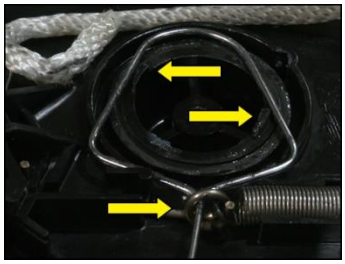
16. Sit wire retainer ring outside of tabs with end inserted into spring loop.



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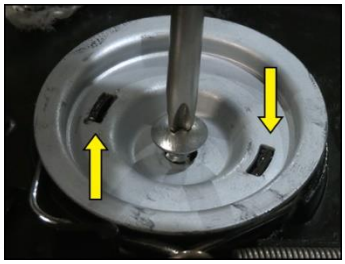
17. Align metal clamp with tabs and install Phillip's head screw until tight.



18. Wind fly wheel counter clock wise until tension causes fly wheel to cock back. Then continue to turn counter clockwise another three (3) turns.

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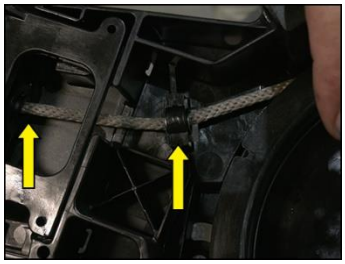
19. Holding fly wheel in place, feed rope through the loops.



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20. With rope installed test fly wheel tension by pulling and releasing starter rope.

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21. Feed rope through pull handle.

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22. Tie a knot in rope end and insert into pull handle plug.

23. Reinstall plug into pull handle.

OIL FILL/DRAIN GASKET

1. Position oil drain pan under the lower unit.

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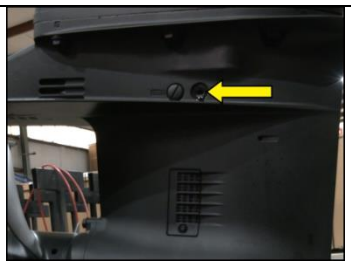
2. With a flat head screwdriver remove oil fill plug and washer (drain gasket).

   Retain plug for reassembly and discard washer.



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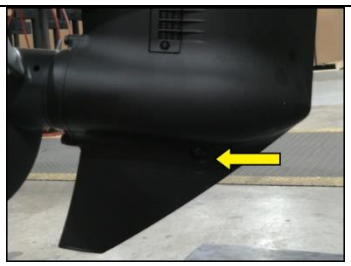
3. Remove oil level plug to release vacuum, allowing oil to drain freely.



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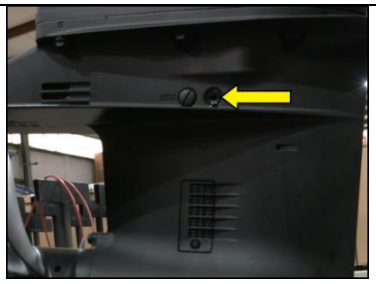
4. Drain gear oil completely.

5. To fill oil, attach lower unit pump via connector at fill port.

6. Pump until gear oil flows from oil level port.



7. Replace oil level plug and washer.

Washers should be replaced every oil change.

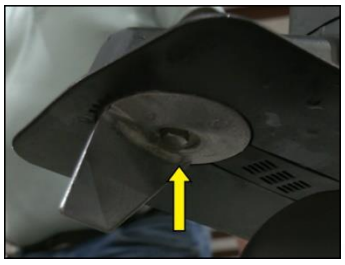
8. Remove lower unit pump from oil fill port.

Replace the oil fill plug and washer.

Clean excess oil that might have collected on lower unit.

ANODE, TRIM TAB

1. With a 10mm socket loosen bolt that retains trim tab sacrificial anode.



2. Anodes must be replaced when they have been reduced to 2/3 of their original size.
Engine corrosion will increase if eroded anodes are not replaced.
Do not paint or coat anodes or their mounting surfaces.

---

3. Lightly coat external anode bolt threads with anti-seize. Internal anode bolt should be lightly coated in marine grease.

Align trim tab with mounting hole, insert bolt and washer and hand tighten.

---

4. Torque to 9ft/lbs.

PROPELLER ASSY (11PCV)

WARNING

- **Before removing or installing propeller, be sure to remove stop switch lock plate.**
- **When removing or installing propeller, do not handle propeller with bare hands.**
- **Put a piece of wooden block between anti-cavitation plate and propeller to prevent rotation of propeller when removing or installing propeller.**

1. Use the needle nose plyers to remove the split pin. The split pin can be reused if serviceable.

---

2. Use a 22mm socket to remove nut, washer and thrust washer.

   Retain for reassembly.

---

3. Remove propeller.

   If propeller will not come off you may use a rubber mallet to gently tap propeller free.

   If unsuccessful, use propeller puller.

---

4. Use flat-head screwdriver to pry up and lift off thrust washer.

Retain for reassembly.

---

5. Carefully scrutinize propeller blades for damage.

Dings and missing chunks are easy to spot, but a slightly bent blade may not be readily apparent.

You can often feel it when underway because it usually creates vibration

Looking at prop from side makes it easier to spot a bent blade

---

6. Before reinstalling propeller, inspect prop hardware and replace any worn components such as cotter pin.

Apply generous coat of marine grease to entire shaft.

---

7. Install thrust washer over propeller shaft.

---

8. Install propeller over propeller shaft.

---

9. Use 22mm socket and to tighten propeller nut.

Do not over-tighten nut.

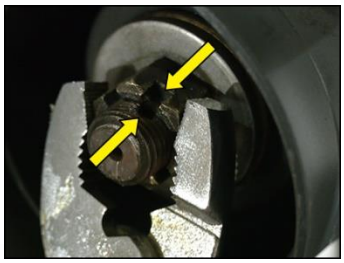
---

10. Install washer.

---

11. Using a 22mm socket install propeller nut. Do not over-tighten.

Ensure alignment of nut and pin bolt hole.



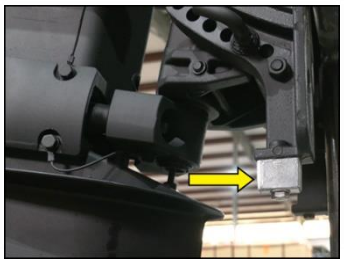
12. Insert split pin through propeller nut and use needle nose plyers to bend ends into place

ANODE, STERN BRACKET

Anode protects outboard engine from galvanic corrosion. Do not paint or apply grease or oil to anode. Doing so disables the anode.

1. With a 10mm socket, loosen bolt that retains sacrificial anode on bottom of stern bracket.

   Retain bolt and washer for reassembly.



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2. Anodes must be replaced when they have been reduced to 2/3 of their original size.
   Engine corrosion will increase if eroded anodes are not replaced.

   Do not paint or coat anodes or their mounting surfaces.

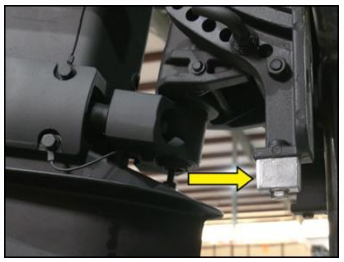
---

3. Lightly coat external anode bolt threads with anti-seize. Internal anode bolt should be lightly coated in marine grease.

---

4. Align sacrificial anode with mounting hole on underside of mounting bracket, insert bolt and washer and hand tighten.

   Torque to 9ft/lbs.

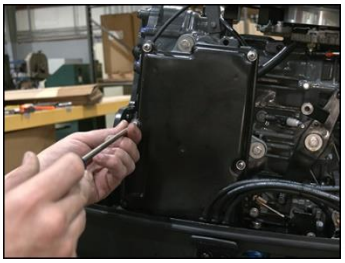


STOP SWITCH LANYARD ASSY

1. Obtain replacement Stop Switch Lanyard Assembly.

---

2. Remove the six (6) Phillip's head screws from the electrical box cover. Retain screws and box cover for later installation.



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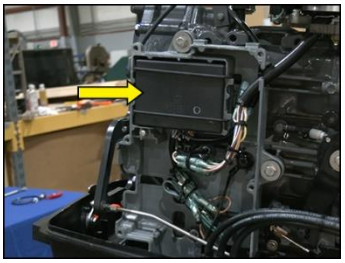
3. Trace the Stop Switch wire to its connection with the CD Unit.



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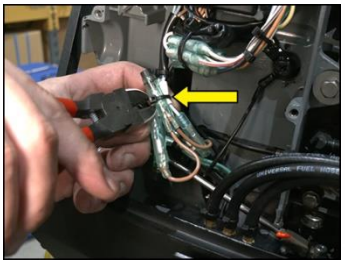
4. Clip and remove the two (2) zip ties holding the Stop Switch and CD Unit wire connectors.



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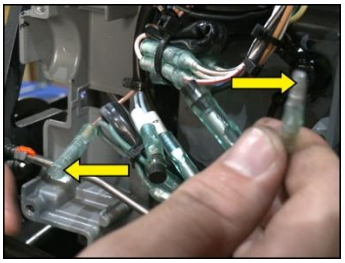
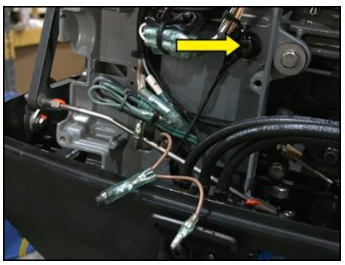
5. Unplug the Stop Switch wire connector from the CD Unit connector.



6. Unscrew and release the Stop Switch ground wire.



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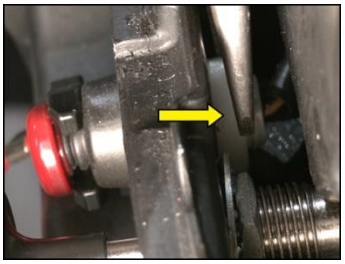
7. Using needle nose pliers remove the 7/8 nut from the Starter Switch Assembly located near the front grab handle.



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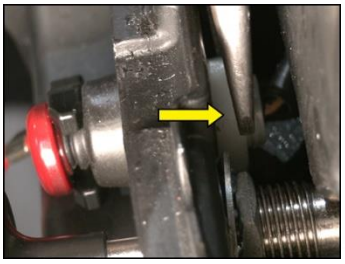
8. Replace Starter Switch Assembly, then using needle nose pliers install the 7/8 nut to hold the assembly in place.



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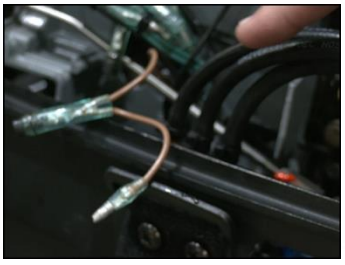
9. Feed the new Start Switch wire end connector along engine to CD Unit end connection.



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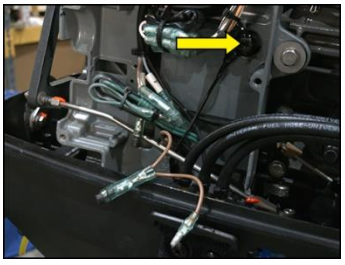
10. Reconnect ground wire.

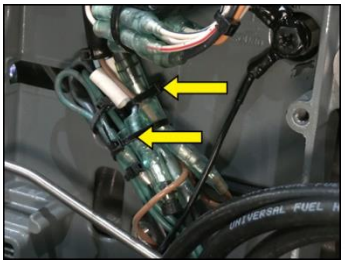


11. Regrease CD Unit wire end connector.

---

12. Reconnect Start Switch wire end connector to CD Unit connector.

    Zip tie connections to hold in place and remove any excess tie.



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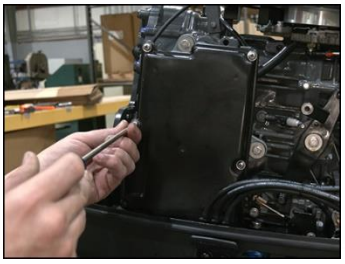
13. Reinstall electrical box cover using the six (6) Phillip's head screws.



FUEL LINE REPLACEMENT KIT

1. Fuel Line Replacement Kits contains precut lines, ties, clamps and a parts list.

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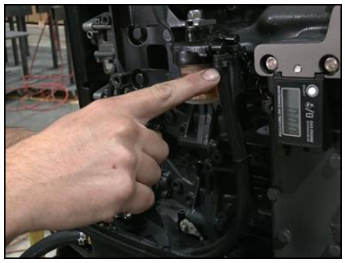
2. Locate the fuel line to be replaced



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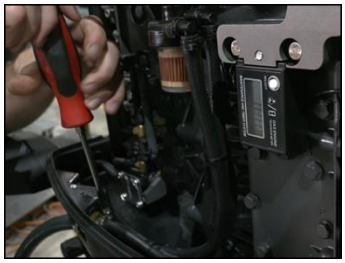
3. Follow the line to both end points and cut any ties and/or remove retention bands or hose clamps.

   Remove broken fuel line.



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4. Identify the replacement piece from the item description and the length of hose removed.

Replace with the new hose.

5. Replace any ties, retention bands and clamps. Securing any loose ends.

STERN BRACKET CLAMP SCREW KIT

1. To remove, remove retainer bolt.

---

2. Remove back plate.

---

3. Unscrew and remove clamp screw.

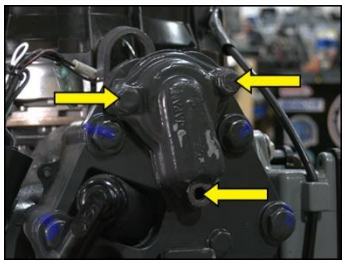
---

4. Reverse steps for installation.

THERMOSTAT AND THERMOSTAT CAP GASKET

1. To remove, loosen and remove 3x 10mm thermostat cap bolts with 10mm socket.

   Retain for reassembly.



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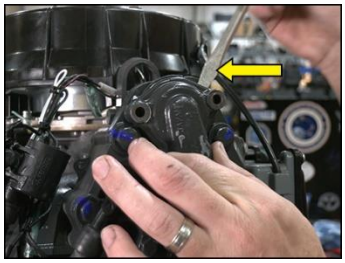
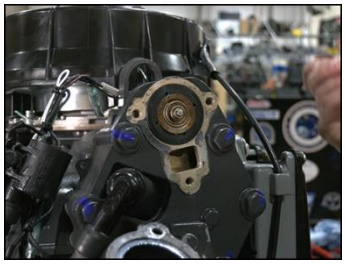
2. Remove thermostat cap and gasket

   Discard gasket and retain cover for reassembly.





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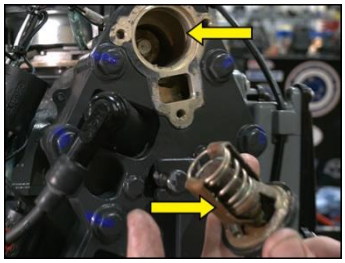
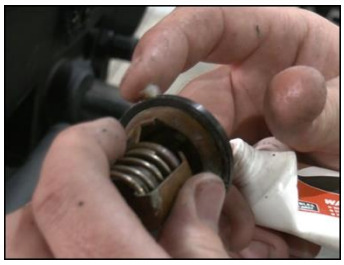
3. Remove and discard thermostat.



4. With a razor blade remove old gasket from thermostat cap and cylinder head.

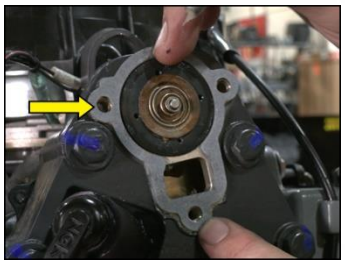
Obtain new thermostat and gasket.

5. Lightly coat thermostat sealing surface with marine grease to aid in placement inside cylinder head.



Insert thermostat into cylinder head.

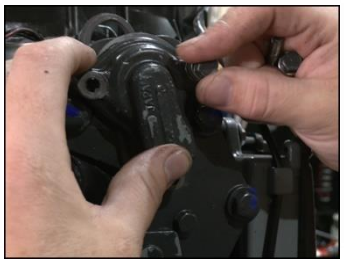
6. Align gasket with bolt holes.



Align the thermostat cap with the bolt holes.

Coat the three (3) 10mm bolts in marine grease and
7. thread in by hand.

Torque to 8ft/lbs.

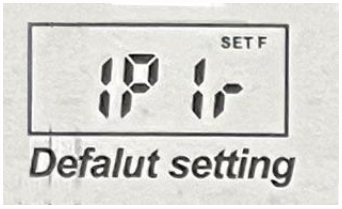


TACHOMETER

When the engine is started, the display will indicate the RPM of the engine. When the engine is shut down, the display will show hours and minutes.

Operating

1. Push “SELECT” button several times until display shows “1P1r”. DO NOT RELEASE BUTTON until “SET” appears in the upper right corner of display. Once “SET” appears release and press “SELECT button to toggle through all degree settings.
2. Stop at correct degree setting for your engine. (i.e., 1P1r, 3P1r, 4P1r, etc.). See figure 1
3. Wait for 30 seconds and the display will return to “TOT” Total Hours.
4. TACH/HOUR METER is now ready to use.



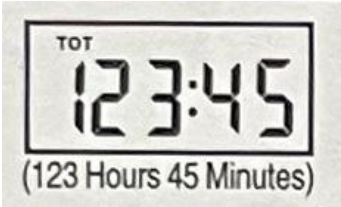
TIP: Most single cylinder air cooled engines idle around 1400 RPM, if the RPM displayed is too low set the value to 1P2r, if the RPM is too high set the value to lower Degree number 2P1r or lower.

Figure 1

To decrease RMP Reading

8P1r=8 SPARK PER REVOLUTION
6P1r=6 SPARK PER REVOLUTION
4P1r=4 SPARK PER REVOLUTION
3P1r=3 SPARK PER REVOLUTION
2P1r=28 SPARK PER REVOLUTION
1P1r=1 SPARK PER REVOLUTION
1P2r=1 SPARK PER 2 REVOLUTION

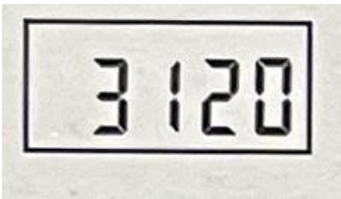
TOTAL TIME



TOT = Total Hours of operation

This is always displayed when the engine is off.

RPM & MAX RPM



1. Typical RPM display when engine is running.
2. When engine is shut down, the display will show MAX RPM for 8 seconds
3. Push “SELECT” button three times, the display will show MAX RPM for 8 seconds.

SVC & SVC2

1. Push “SELECT” button four times, the display will show “SVC”, do not release button until “SET” appears “5:00” is flash. Then can to set. The “SVC” degree is 5 to 50 hours.
2. Push “SELECT” button five times, the display will show “SVC2”, do not release button until “SET” appears “10:00” is flash. Then can to set. The “SVC” degree is 10 to 250 hours.

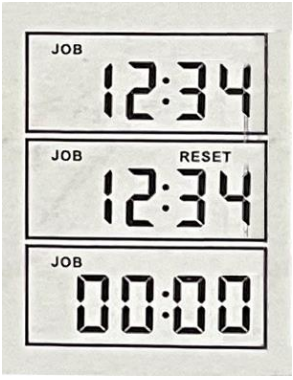
JOB TIMER – A RESET FUNCTION used for interval tracking.

JOB = Hours of operation since the timer was reset.

To view “JOB” time push the “SELECT” button once.

To reset “JOB” time: Push and Hold “SELECT” button display shows “RESET” and show hours that accumulated on the current job.

When you RELEASE THE “SELECT” button the “JOB” display will reset to: “00:00”. You will begin to record the next job interval.



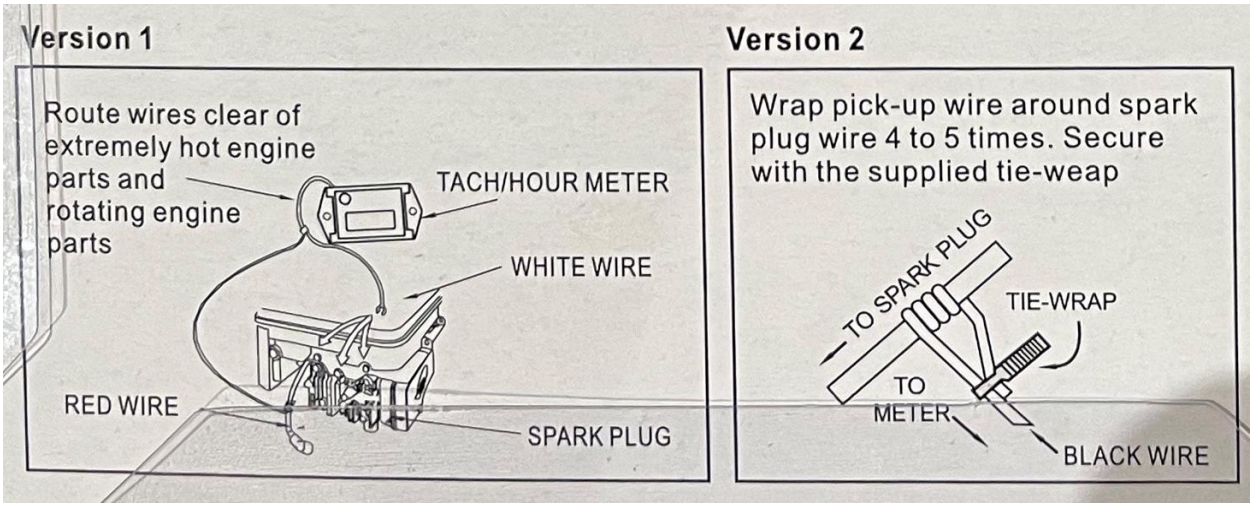
Installation

Wire damage (cuts or burns) will cause the wire to short and the TACH/HOUR METER will stop working. Wire damage is not covered under warranty.

The red/black wire should be slipped over an insulated section of the spark plug wire using about 5* turns.

*If the signal is not strong enough, you can add one wrap at a time until your signal is clear. The signal strength is controlled by the number of wraps (too many wraps will pick up electronic noise and give a faulty reading).

This product has two versions about wire (installation). Function is the same.



APPENDICES

BEFORE OPERATIONS CHECKLIST

Engine Serial Number:		**Engine Hours:**		**Date of Operation:**	

Before placing the RAIDER Model 55 Outboard Engine into service and or starting the engine, complete the checks listed in the Before Operations Checklist. The Before Operations Checklist is designed to ensure that the engine and all systems are in proper working order to support engine operation, and to ensure safe and efficient boat operation.

The Before Operations Checklist may be modified to meet operational commitments.

Not all steps may be required every time prior to start.

This list of before operations checks is not inclusive.

Before Operations Checks			**Completed (initial)**	
a.	Exterior	• Inspect Cowling, Engine Pan, Midsection, and Lower Unit for cracks, defects, or damage.	*a.*	
b.	Zinc Anodes	• Stern Brackett Anode. Replace if damaged or reduced in size by more than 40%. • Trim Tab Anode. Replace if damaged or reduced in size by more than 40%.	*b.*	
c.	Control Panel	• Inspect the Start and Stop controls. • Verify the Lock Plate and Lanyard are installed. • Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps.	*c.*	
d.	Wire Cable Lanyard	• Verify the Wire Cable Lanyard is securely attached to the engine and maybe securely attached to craft Transom.	*d.*	

e.	Shift Lever Mechanism and Shift Lever Stopper	• Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps.	*e.*	
f.	Throttle Linkage	• Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps. • Lubricate with low temperature lithium grease.	*f.*	
g.	Throttle Cable, Throttle Mechanism, Handle, and Grip.	• Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps. • Lubricate with Friction Surface Marine Grease.	*g.*	
h.	Tilt Stopper, Bracket Bolt, Bracket Shaft, Clamp Screw, and Reverse Lock.	• Inspect for damage due to corrosion, lack of maintenance, or abuse. • Lubricate with Friction Surface Marine Grease.	*h.*	
i.	Hook Lever Mechanism (cowling)	• Inspect for damage due to corrosion, lack of maintenance, or abuse. • Lubricate with Friction Surface Marine Grease.	*i.*	
j.	Recoil Starter	• Inspect for damage due to corrosion, lack of maintenance, or abuse. • Lubricate with Friction Surface Marine Grease.	j.	
k.	Starter Lock	• Inspect for damage due to corrosion, lack of maintenance, or abuse. • Lubricate with Friction Surface Marine Grease.	k.	
l.	Electrical Wiring	• Inspect wires for cracks, chaffing and insulation damage. • Check for loose connections.	*l.*	
m.	Ignition Coil Plug Wire Boots	• Prior to submersion, remove plug boots and fill with dielectric grease.	*m.*	
n.	Gearcase	• Inspect water intake screens • Inspect Skeg for damage	*n.*	
o.	Propeller	• Inspect and verify propeller is true and free of nicks, chips, and other damage that could affect performance.	*o.*	
p.	Propeller Shaft	• Inspect for damage due to corrosion, lack of maintenance, or abuse. Inspect the shaft threads and splines for wear and damage. • Lubricate with Friction Surface Marine Grease.	*p.*	

Fuel System Checks			Completed (initial)	
a.	Gasoline Fuel Mix Ratio	• Requires a 50:1 fuel to oil mixture. 16oz per six (6) gallons or about 2.5oz per every one (1) gallon. • Use only NMMA TC-W3 2-Cycle Synthetic Marine Oil. • Use STA-BIL 360® MARINE™ with ethanol treatment. 1oz per every 10 gallons of fuel. • Record date of mix, dispose of fuel mixtures older than 90 days.	*a.*	
b.	Fuel Bladder/Tank	• Inspect for leaks: Ensure that the bladder is not leaking from any seam, fill cap, vent, or rip in membrane. • Inspect securing straps: Ensure the bladder can be adequately secured to the deck. • Inspect fuel line connector: Check for damage and ensure that the fuel line fitting properly mates. • Inspect vent: Ensure the vent opens and shuts.	*b.*	
c.	Fuel Line Assembly	• Inspect end connectors: Check ensuring proper fit and seal to bladder and Raider. • Inspect fuel line: Check for dry rot and leaks. • Inspect bulb: Check for proper installation, dry rot, and function. • Stow extra Fuel Line Assembly in sponson bag or Emergency Kit.	*c.*	
d.	Fuel Filter	• Inspect component for leaks, damage, or excessive wear. • Inspect Clamps: Ensuring proper fit, note leaks, damage, or excessive wear. • Inspect Lines: Check for dry rot and chaffing.	*d.*	
e.	Fuel Pumps	• Inspect component for leaks, damage, or excessive wear. • Inspect Clamps: Ensuring proper fit, note leaks, damage, or excessive wear. • Inspect Lines: Check for dry rot and chaffing.	*e.*	
f.	Carburetors	• Inspect component for leaks, damage, or excessive wear. • Inspect Clamps: Ensuring proper fit, note leaks, damage, or excessive wear. • Inspect Lines: Check for dry rot and chaffing.	*f.*	
g.	Primer	• Inspect for damage due to corrosion, lack of maintenance, or abuse. Loose ball joints, locknuts, bent link rods, loose rod snaps. • Lubricate with Friction Surface Marine Grease.	*g.*	

DURING OPERATIONS CHECKS

During Operations Checks			Completed (initial)	
a.	Pull Start	• Start the engine using the recoil starter.	*a.*	
b.	Neutral Safety	• Verify that the engine will not start in gear both forward and reverse.	*b.*	
c.	Water discharge from check ports	• When the engine is running verify that water is being discharged from all check ports.	*c.*	
d.	Tiller Steering	• When moving the Tiller Arm, verify that the engine moves freely to port and starboard.	*d.*	
e.	Neutral	• Verify the propeller does not engage when the gear selector is in the neutral position.	*e.*	
f.	Forward	• With the engine at idle, verify the Gear Selector moves freely into the forward position and the propeller engages.	*f.*	
g.	Reverse	• With the engine at idle, verify the Gear Selector moves freely into the reverse position and the propeller engages.	*g.*	
h.	Throttle Control	• With the engine in neutral, slowly increase the throttle RPM's to approximately.	*h.*	
i.	Emergency Stop Switch	• While the engine is running, remove the lock plate, the engine should stop.	*i.*	
j.	Engine Stop Switch	• While the engine is running, press the Engine Stop Switch, the engine should stop.	*j.*	
k.	Shallow Water Running	• Move the engine Reverse Lock Lever to the release position, lift the lower unit past a 45° angle until the tilt stopper assembly locks.	*k.*	
l.	Full Tilt Position	• Move the engine Reverse Lock Lever to the release position, lift the Lower Unit past a 90° angle until the tilt stopper assembly locks.	*l.*	

Notes and Discrepancies

AFTER OPERATIONS CHECKLIST

Engine Serial Number:		Engine Hours:		Date of Operation:	

Complete the checks listed in the post-operational checklist. The post-operational checklist is designed to ensure all systems are secured properly and the boat is prepared for future missions.

After Operations Checks			Completed (initial)	
a.	Fresh water wash-down	• Wash the exterior of the engine with fresh water. • Remove the engine cowling and fresh water wash the powerhead. • After submersion period ensure fresh water is forced under the flywheel and Recoil Starter. • After submersion fully extend the Recoil Starter Line/Rope and wash with fresh water.	*a.*	
b.	Fresh water engine flush	• Attach “ears or flush connector” to lower unit. Operate the engine for approximately five (5) minutes at full operating temperature. • After submersion period the engine must be run at operating temperature for no less than 30 minutes to ensure all water is removed from the head. • Disconnect the fuel supply and let the engine run itself dry.	*b.*	
c.	Wipe down	• Use LP air or dry cloth to remove excess water from exterior and interior surfaces of the engine. • After submersion use LP air to remove water and moisture under the Flywheel and Recoil Starter.	*c.*	
d.	Corrosion Prevention	• Spray the Powerhead with a liberal coat of Anti-Corrosion Spray penetrant/lubricant or equivalent. • Spray Penetrating Lubricant or equivalent under the flywheel.	*d.*	
e.	Air Dry	• Leave the upper cover off, when possible, to allow the powerhead and other components to air dry.	*e.*	

Notes and Discrepancies

RECOMMENDED PARTS LIST PER ENGINE

CAGE	Part No.	Description	Qty
595K1	R400921	Decompression Valve	3
595K1	R500151	Spark Plug	3
595K1	R500418	Float Chamber Gasket	3
595K1	R500521	Primer	1
595K1	R500541	Fuel Filter Element W/O-Ring	1
595K1	R500711	Starter Rope	1
595K1	R500715	Starter Lock	1
595K1	R501406	Oil Fill/Drain Gasket	10
595K1	R501407	Anode, Trim Tab	1
595K1	R501521	Propeller Assy (11PCV)	1
595K1	R501522	Propeller Hardware Kit	1
595K1	R501527	Split Pin	10
595K1	R501804	Anode, Stern Bracket	1
595K1	R501033	Stop Switch Lanyard Assy	1
595K1	R50ES003FHK	Fuel Line Replacement Kit	1
595K1	RSB4050CSK	Stern Bracket Clamp Screw Kit	2
595K1	R508804	Dual Engine Kit w/Transom Plate	1
595K1	R660150	Flush Kit	1
595K1	RR100	Fuel/Oil Measuring Device	1
595K1	R500115	Thermostat	1
595K1	R500117	Thermostat Cap Gasket	1

CONSUMABLE MATERIAL REQUIREMENTS

CAGE	Part No.	U/I	Item
5972	77164	CN	Anti-Seize Lubricant
1UVT5	777185	BX	Carb/Throttle Cleaner
0VJ14	90104	BX	Corrosion Preventative
71984	DC4-2OZ	TU	Dielectric Grease
48CF5	AT412	BT	Flange Sealant
1UVT5	777186	CN	Fogging Oil
1UVT5	766210	CO	Fuel Stabilizer
0U583	J2360	QT	Gear Oil, API Grade GL-5, SAE 80W-90W
05972	38050	OZ	Instant Adhesive
52152	70-2022-7219-4	QT	Isopropyl Alcohol Cleaning Solvent
0B629	LET14Z03	EA	Liquid Electrical Tape
1UVT5	508298	TU	Marine Grease NLGI#2 GC/LB
1UVT5	775776	TU	Multipurpose Lubricant
05972	59330	TU	RTV Silicone Gasket – Maker & Sealant
1V8N4	SA32	CO	Corrosion removing compound
10136	03030	BX	Silicone Spray
54926	TC-W III	PT	TC-W3 2-Cycle Synthetic Marine Oil
05972	24241	BT	Thread locker, Blue (Medium)
05972	27240	BT	Thread locker, Red (High)
09137	30024	CO	White Lithium Grease
1V8N4	SA32M	KT	Corrosion compound/Mixing Unit