90-68647

Mercury Outboard 1966 thru 1974

To get the information on the spine of the book please cut on the dotted line and attach it to the spine or write on the spine with a marker.

90-68647

Mercury Outboard 1966 thru 1974

MERCURY OUTBOARD SERVICE MANUAL OUTLINE

SECTION NO. and HEADING	PART and PART HEADING
1. General Information	Part A - General Information B - Tuneup C - Lubrication
2. Installation	Part A - Installation B - Propeller Selection
3. Electrical Systems	Part A - Manual Starting System B - Electrical Starting System C - Electrical Troubleshooting and Component Testing D - Ignition System E - Timing, Adjusting, Testing F - Instrumentations G - Wiring Diagrams
4. Fuel Systems	Part A - Fuel Pumps B - Carburetors C - Fuel Tanks
5. Powerhead	
6. Lower Unit	Part A - Merc 39-40-60-75-110-200 B - Merc 350-400 (2-Cyl.) and 500 C - Merc 650 and 800 (4-Cyl.) and 6-Cylinders
7. Accessories	Part A - Steering Systems B - Remote Control Systems C - Power Trim D - General Accessories
8. Specifications	
9. Tools	

OUTBOARD
SECTION 1

GENERAL INFORMATION

TABLE of CONTENTS

SECTION 1 - GENERAL INFORMATION

MERCURY
OUTBOARDS

PART A - GENERAL INFORMATION

INDEX

GENERAL INFORMATION

HOW TO USE THIS MANUAL

This comprehensive overhaul and repair manual is designed for mechanics to use as a reference guide.

The manual is divided into SECTIONS which represent major components and systems. Following are the SECTIONS which compose this manual:

Section	Section Heading
1	General Information
2	Installation
3	Electrical Systems
4	Fuel Systems
5	Powerhead
6	Lower Unit
7	Accessories
8	Specifications
9	Tools
10	Labor Rate Manual/Service Bulletins (Dealers Only)

SECTIONS are separated by dividers (heavier colored paper) which enable the user to quickly locate any desired SECTION. A table of contents, which lists major subjects and page numbers, is printed on the reverse side of each SECTION divider.

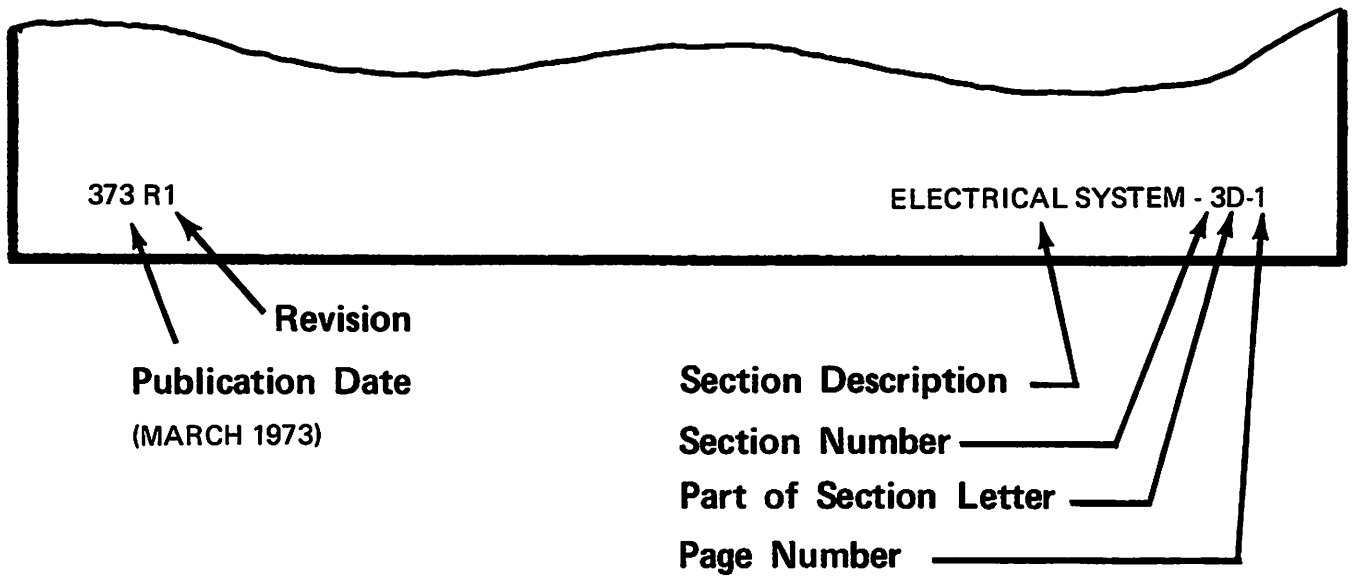
The SECTIONS are further divided into PARTS. Each PART has a colored title page which is the same color as the SECTION divider. An index for the particular PART is printed on the title page.

EXAMPLE: To find "Phelon Magneto", turn to "Electrical Systems" divider. The table of contents on the back side of the divider indicates that "Phelon Magneto" is located in PART D, "Ignition System", Page 3D-1.

PAGE NUMBERING

Two number groups appear at the bottom of each page. The example, below, is self explanatory.

Example:



DIRECTIONAL REFERENCES

Front of boat is bow; rear is stern. Starboard side is right side; port side is left side. In this maintenance manual, all directional references are given as they appear when viewing boat from stern, looking toward bow. (Figure 1)

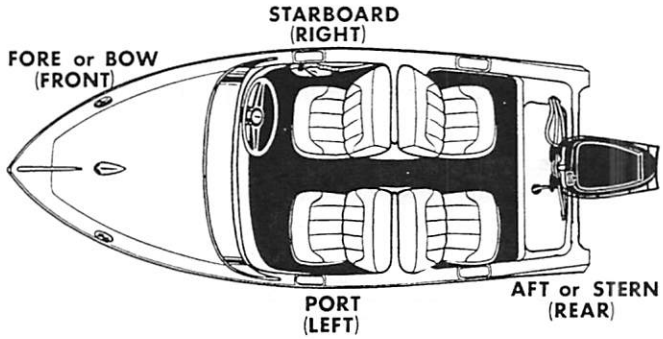


Figure 1. Directional Reference

SERIAL NUMBER

The serial number is stamped into the instruction plate on the swivel bracket. This number is the manufacturer's key to numerous engineering details which apply to the motor. When ordering parts, accessories and tools, or when corresponding with the manufacturer in regard to service matters, always specify model and serial number. Serial number is also stamped on powerhead.

FLUSHING

1. Remove flushing plug (marked "Flush") and washer from flushing hole.
2. Connect flushing device (chart following) and attach garden hose coupling with hose.
3. Turn on water but DO NOT OPERATE the outboard while flushing. Water flow is strong enough that flushing can be done with water pressure provided from the water tap. DO NOT USE full water pressure.

Model	Kit Part No.
Merc 200 (2432536 & Above) and All 1969 and Newer 4 and 6-Cylinder	C-48755A1
All 2-3-4-6-Cylinder Engines, except Those Listed Above and prior to 1966	C-24789A1

CAUTION: If outboard must be operated while flushing, in order to prevent damage to the water pump impeller, it will be necessary to use a Flush-Test Device (Part No. C-55585) which attaches directly over the intake holes in the gear housing strut and provides cooling water at this point. DO NOT OPERATE outboard above idle speed while flushing with Flush-Test Device, or RPM cannot be controlled.

WARNING: When flushing, be certain that area in vicinity of propeller is clear and that no person is standing nearby (to avoid possible injury). It is advisable to remove propeller as a precautionary measure.

4. While and after flushing, keep motor in upright position (resting on skeg) until all water has drained from drive shaft housing to prevent water from entering the powerhead via drive shaft housing and exhaust parts.

WINTER STORAGE and SHIPMENT

In preparing the motor for storage or shipment, two precautions must be taken into consideration: 1) The unit must be protected against physical damage, and 2) the unit must be protected from rust, corrosion and dirt. Original shipping carton is ideal for storage or shipment but, if it is no longer available and a new container must be made, it should be so constructed that weight of the unit is supported by the clamp bracket. Also, suitable blocking and bracing should be provided to hold the motor securely in place regardless of the position in which the container might be set. The opening should be sealed against entry of dirt, but an air vent should be provided to prevent moisture accumulation due to condensation. Before placing the motor in the container, the following preventive measures should be applied to protect external and internal parts from rust and corrosion.

1. Operate outboard on boat or in test tank. Disconnect fuel line from outboard and allow engine to run slowly. Induce approximately 4 ounces of Quicksilver Storage Seal (Part No. C-92-54778) into each carburetor and allow engine to stall out, indicating that carburetors have run dry.
2. Drain fuel tank and fuel lines.
3. Remove cowling.
4. Service fuel filters as follows.

FUEL TANK FILTER

a. Detach the fuel line from fuel tank and remove fuel pickup tube by removing screws in top connector housing.
b. The filter, a fine wire mesh, can be cleaned by rinsing in clean benzol (benzine).

MOTOR FUEL FILTER

a. Remove cowlings.
b. Remove front bracket by taking off cap screws which secure it to front of bottom cowl and top plate, if applicable.
c. Remove screw from top of filter covers on the carburetors.
d. Remove fuel filter covers.
e. Inspect filters, fuel lines and fittings for signs of wear or leakage.
f. Drain and clean filters.
g. Replace filter covers, tighten screws.
h. Replace front bracket and cowlings.

Fuel filter is more than adequate to take care of all requirements under normal use. If, after all other checks, it is determined that the fuel filter is the cause of the trouble, the filter element should be replaced.

5. Lubricate lower drive unit as instructed in "Lubrication" Section 1, Part C.
6. Lubricate control linkage as instructed in "Lubrication" Section 1, Part C.
7. Lubricate distributor adaptor as instructed in "Lubrication" Section 1, Part C.
8. Clean the motor thoroughly, including all accessible powerhead parts, and spray with Corrosion and Rust Preventive (C-92-29152). Install the cowling and apply a thin film of clean, fresh engine oil to all painted surfaces.
9. Remove the propeller, apply Perfect Seal No. 4 (C-92-34227-1) or a waterproof-type lubricant to the propeller shaft and re-install propeller.
10. Lubricate swivel bracket as instructed in Section 1, "Lubrication" Part C.
11. Battery storage and care. Refer to "Electrical Systems" Section 3.

IMPORTANT: When storing outboard motors for the winter, be sure that all water drain holes in the gear housing are open and free and that the flushing plug is removed so that all water will drain out. Trapped water may freeze and expand, thus cracking the gear housing and/or water pump housing. Check and refill lower unit with SUPER-DUTY Quicksilver Gear Lubricant (C-92-52650) before storage to protect against possible water leakage into gear housing which is caused by loose air vent plug or loose grease filler plug. Be sure to replace gaskets under screws and flush plug, renewing any damaged gaskets.

COMPLETE SUBMERSION

Motor, which has been submerged, must be completely disassembled for cleaning and inspection. This should be accomplished as soon as possible after recovery. Delayed action will encourage rust and corrosion of internal parts. Emergency treatment may be completed by following instructions under "Tune-Up", this section. This will temporarily retard rust and corrosion. Basically, the points to remember are these:

1. Recover motor as quickly as possible.
2. Wash entire motor with fresh, clean water to remove mud, weeds, etc.
3. Get as much water as possible out of powerhead. Most of the water can be eliminated by removing spark plugs and operating manual starter with spark plug holes facing downward.

CAUTION: If motor does not turn over freely when starter is operated, do not force. This may be an indication of internal damage such as a bent connecting rod or a broken piston.

4. Pour alcohol in cylinders first, as alcohol will dissolve water (or use Quicksilver Engine Cleaner [C-92-26845]) then lubricate all internal parts which can be reached with engine oil. This is best accomplished by injecting oil into spark plug holes, installing spark plugs and operating manual starter to distribute oil. If alcohol and oil are not available, insert a rod into fuel check unit to open check valve and actuate primer bulb, thus directing fuel flow into cylinders.
5. Disassemble and clean engine as soon as possible.

TRIM TAB

REMOVAL and REPLACEMENT

1. Before removing trim tab, mark trailing edge location on cavitation plate and remove plug which is located directly above trim tab. (Figure 2)
2. Loosen cap screw, which holds trim tab, thru hole in drive housing.
3. Clean recess area to assure metal-to-metal contact between drive and trim tab.
4. Place trim tab in position and secure by reversing removal steps.
5. Readjust trim tab, following, if necessary.

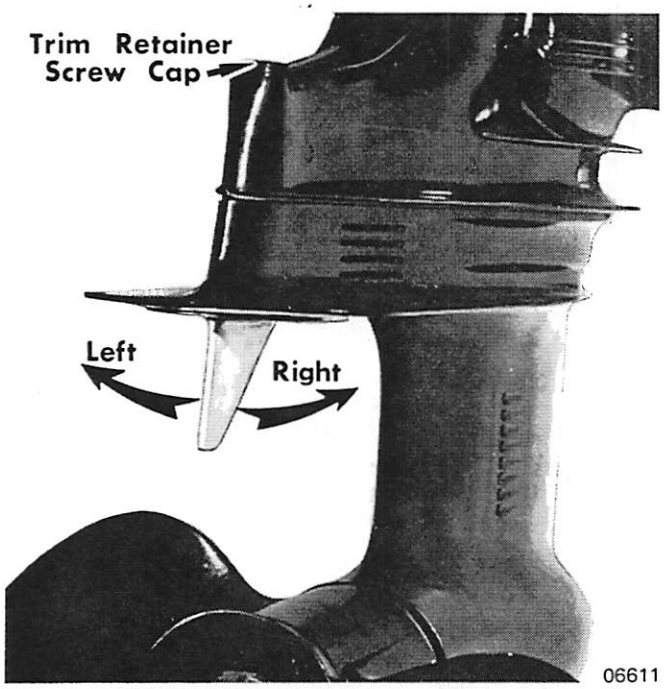


Figure 2. Trim Tab Location

TRIM TAB ADJUSTMENT

The trim tab also is an anodic tab and is self-sacrificing to help combat galvanic corrosion on Merc 200 and larger models. The trim tab should be periodically inspected for corrosion. If trim tab is being eaten-away, it should be replaced.

NOTE: DO NOT paint or place protective coating on the trim tab, or its inhibiting value is lost.

NOTE: When trimming-in or trimming-out, steering torque may increase even though trim tab has been adjusted properly. Trim tab will be the most effective at the boat speed and trim setting for which tab was adjusted.

Mercury Outboards are equipped with an adjustable trim tab to balance "steering torque" so that the steering wheel will turn with equal ease in each direction.

1. Operate boat at best throttle setting. Adjust tilt pin setting or trim boat with "Power Trim". Turn steering wheel to left and right, noting in which direction wheel turns more easily. With boat at rest, remove plug from drive shaft housing and loosen cap screw.
2. If steering wheel turns more easily to left, position trailing edge of trim tab to left. (Figure 1)
3. If steering wheel turns more easily to right, position trailing edge of trim tab to right. (Figure 1)
4. Tighten cap screw securely and replace plug.
5. Operate boat to check setting. Readjust trim tab if necessary.

TILT PIN ADJUSTMENT

The tilt angle should be set so that anti-cavitation plate is about parallel to and even with bottom of boat. Speed of boats, having center of gravity located forward, may sometimes be improved by tilting engine out one pin hole. (Figure 3) This will tend to raise bow and reduce wetted surface. If engine is tilted in, the boat will ride with the bow down, wetting more of the bottom and reducing speed. This generally will improve operation in rough water.

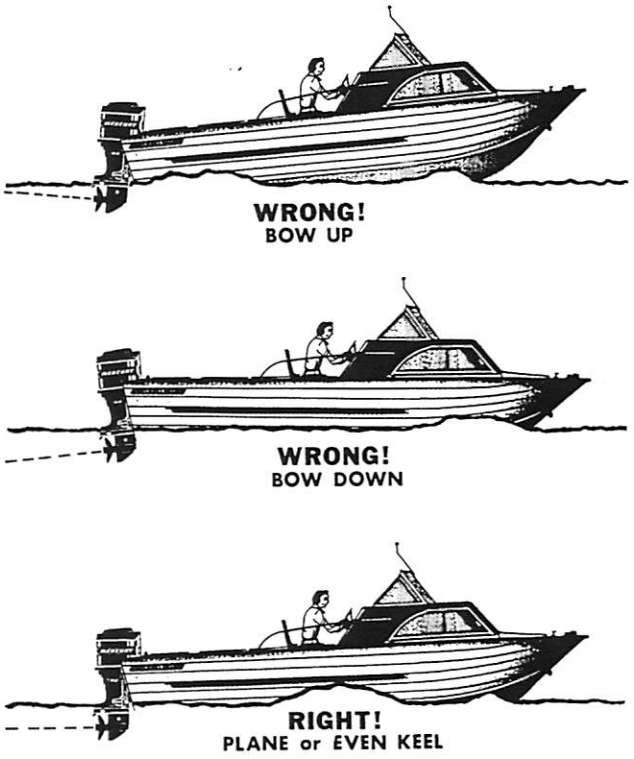


Figure 3. How to Plane a Boat

BOAT PERFORMANCE

BOAT SPEED

Consult Boat House Bulletins for similar boat size and loading. These boats and motors are run with the best-suited propellers and with the optimum setup (transom height and tilt angle, usually with aft position of center of gravity).

EFFECT of CENTER of GRAVITY LOCATION

For maximum speed, move weight aft until boat porpoises or is about to porpoise. This reduces wetted surface to a minumum, only the rear half of the boat bottom being wet.

EFFECT of TRANSOM HEIGHT

A greater transom height will increase boat speed but makes cavitation more likely. The effect of the transom height on speed is slight at low speeds (15-20 MPH) but important at higher speeds (30-35 MPH and above).

EFFECT of BOAT BOTTOM CONDITION

For maximum speed, a boat bottom should be nearly a flat plane where it contacts the water. It should be especially straight and smooth in the fore and aft direction. *Hook:* The bottom is said to have a "hook" if it is concave in the fore and aft direction when viewed from below. (Figure 4) When the boat is planing, this causes more lift on the bottom near the transom and allows the bow to drop. This greatly increases the wetted surface and reduces boat speed. A hook is frequently caused by supporting the boat too far forward to the transom while hauling on a trailer or during storage. *Rocker:* A "rocker" is the reverse of a "hook" and much less common. (Figure 4) The boat has a rocker if the bottom is convex in the fore and aft direction when viewed from below. A boat with a rocker has a strong tendency to porpoise. *Suface Roughness:* Moss, barnacles or other surface irregularities that increase skin friction of the boat bottom will cause considerable loss of boat speed.

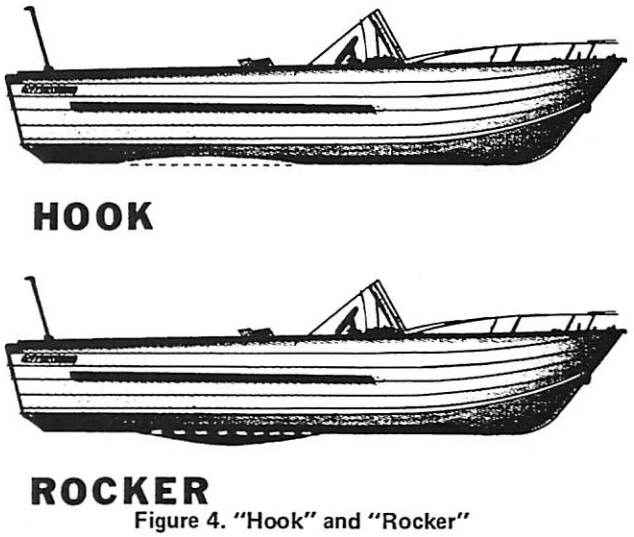


Figure 4. "Hook" and "Rocker"

EFFECT of GEAR CASE EXTERIOR

Surface roughness of the gear case, caused by barnacles or corrosion, can easily cause a speed loss of 1 or 2 MPH on boats in the 30 to 35 MPH and higher class.

PRE-IGNITION and DETONATION

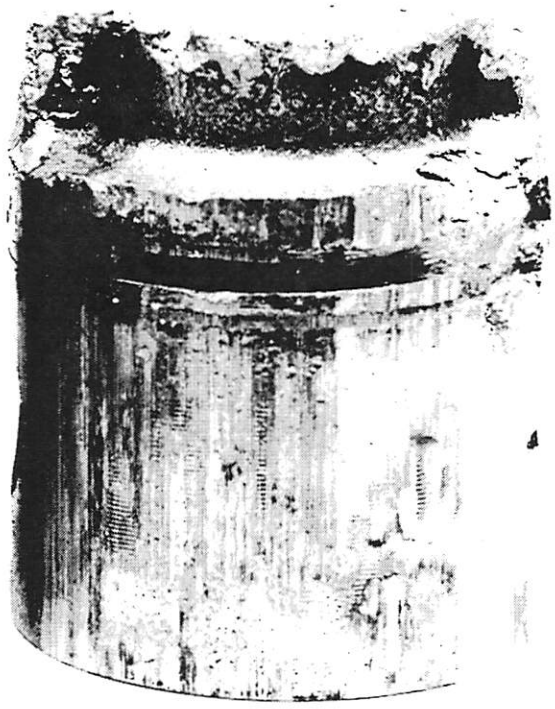
PRE-IGNITION

Pre-ignition is abnormal fuel ignition, caused by combustion chamber hot spots. Control of the start of ignition is lost, as combustion pressure rises too early, causing power loss and rough running. The upward motion of the piston is opposed by the pressure rise. This can result in extensive damage to the internal parts from the high increase in combustion chamber temperature. (Figure 5)

PRE-IGNITION CAUSES

1. Hot spots in the combustion chamber from glowing deposits (due in turn to the use of improper oils and/or fuels).
2. Overheated spark plug electrodes (improper heat range or defective plug).
3. Any other protuberance in the combustion chamber, or any other inadequately cooled section of material can serve as a source.

Figure 5. Pre-Ignition Damage



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DETONATION

Detonation, commonly called "fuel knock", "spark knock" or "carbon knock", is abnormal combustion of the fuel which causes the fuel to explode violently. The explosion, in turn, causes overheating or damage to the spark plugs, pistons, and, in severe cases, results in pre-ignition. (Figure 6)

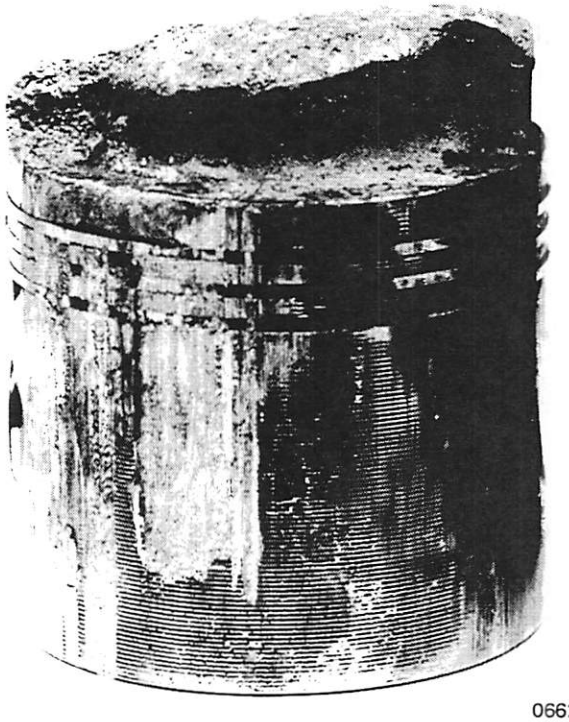
Use of low octane gasoline is one of the most common causes of detonation. Even with high octane gasoline, detonation could occur if engine maintenance is neglected.

OTHER CAUSES of DETONATION

1. Over-advanced ignition timing.
2. Lean fuel mixture at or near full throttle.
3. Cross-firing spark plugs.
4. Excess accumulation of deposits on piston and/or combustion chamber (results in higher compression ratio).
5. Inadequate cooling of engine by deterioration of cooling system.

Engine failures, which result from the foregoing conditions, are beyond the control of Kiekhaefer Mercury, therefore, no warranty will apply to failures which occur under these conditions.

Figure 6. Detonation Damage



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FUEL and FUEL MIXING PROCEDURE

It is recommended that regular leaded and low-lead automotive gasolines be used in Mercury Outboards which are equipped with Thunderbolt Ignition Systems and Perma-Gap Spark Plugs. (Figure 7)

Some marine white gasolines have been known to give trouble because of their very low octane number, thereby causing detonation, or to their "dirty" components which cause ring sticking and port plugging.

Regular and low-lead gasolines are of a more closely controlled, uniform quality and are readily available at any service station or marina.

Figure 7. Perma-Gap Spark Plug

Figure 8. Conventional Spark Plug

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Mercury Outboards with conventional ignition systems and spark plugs (Figure 8) operate with higher plug temperatures than those with Thunderbolt Ignition. Outboard motors should be operated with particular gasolines as described in "CAUTION" box, below.

RECOMMENDED FUEL MIXTURE

CAUTION: DO NOT OPERATE Mercury Outboards on white gasolines intended for use in stoves or lanterns. Regular leaded, low-lead and lead-free automotive fuels are satisfactory in all Mercury Outboards manufactured since 1964. Avoid use of premium gasolines other than Amoco lead-free premium, as piston failure may occur from the use of phosphorus additives. Some oil companies manufacture high-grade fuels, leaded or lead-free, which are specifically designed for use in 2-cycle engines, either directly or as pre-mixes. Such fuels, if known to be of good quality, may continue to be used.
Mercury Marine reserves the right to refuse warranty on parts which are damaged when using improper fuels or lubricants.

Use automotive regular leaded or low-lead gasolines and mix with oil in the following ratios:

1. When using FORMULA 50 Quicksilver 2-Cycle Outboard Motor Oil, thoroughly mix one 12-ounce can with each 5 gallons of gasoline (8 ounces with each 3 gallons) in your remote fuel tank.
2. When using FORMULA 50-D Quicksilver 2-Cycle Outboard Motor Oil, thoroughly mix one 8-ounce can with each 3 gallons of gasoline in your remote fuel tank.
3. In emergency, when FORMULA 50 or 50-D Quicksilver Oil are not available, substitute a high quality 2-cycle oil that is intended for outboard use and meets BIA rating TC-W, shown on oil container. BIA rating TC-W is the Boating Industry Association's designation for approved 2-cycle, water cooled outboard oils. Use oil manufacturer's recommended gasoline-oil mixture.

CAUTION: The use of other than FORMULA 50 or 50-D Oil in the 50:1 ratio may cause piston scoring, bearing failure or both.
Do not, under any circumstances, use multi-grade or other highly detergent automobile oils or oils which contain metallic additives. This type of oil is harmful to 2-cycle motors and may result in piston burning, scoring or both.

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OPERATION IN CANADA: Use 15 ounces of FORMULA 50 or 50-D Quicksilver 2-Cycle Outboard Motor Oil to each 5 Imperial gallons of gasoline in the remote fuel tank.

Figure 9. FORMULA 50 Motor Oil

CORRECT FUEL MIXING PROCEDURE

Observe fire prevention rules, particularly in the matter of smoking. Mix fuel outdoors or at least in a well-ventilated location. Mix fuel directly in the remote tank.

Measure accurately the required amounts of oil and gasoline. Pour a small amount of gasoline into remote tank and add a small amount of oil (about the same amount as gas). Mix thoroughly by shaking or stirring vigorously; then add balance of oil and gasoline and mix again. Cleanliness is of prime importance in mixing fuel, as even a very small particle of dirt can cause carburetion trouble.

Always use fresh gasoline. Gasoline contains certain gum and varnish deposits and, when kept in a tank for a length of time, may give carburetor trouble and cause spark plug fouling.

BREAK-IN PROCEDURE for FUEL-OIL MIXTURE

CAUTION

1. **FORMULA 50 Quicksilver 2-Cycle Outboard Motor Oil.**

   For the first two tanks-full, thoroughly mix two 12-ounce cans to each 6-gallon tank of fuel. After break-in, refer to "Recommended Fuel Mixture", preceding.

2. **FORMULA 50-D Quicksilver 2-Cycle Outboard Motor Oil**

   For the first two tanks-full, thoroughly mix two 8-ounce cans to each 3 gallons of fuel. After break-in, refer to "Recommended Fuel Mixture", preceding.

3. **Operate a new motor at ½-throttle (2500-3500 RPM) for 2 hours. After 2 hours, the motor may run at any speed, although sustained operation at full throttle should be avoided for an additional 8 hours.**

NOTE: If using metric or Imperial measure, one U.S. ounce is .03 liter; one U.S. gallon is .83 Imperial gallon or 3.8 liters.

IMPORTANCE of CONSISTENT FUEL MIXTURES

Carburetor idle adjustment is sensitive to fuel mixture variations which result from use of different gasolines and oils or due to inaccurate measuring or mixing. This may necessitate frequent readjustment of the carburetor idle needle. Be consistent. Prepare each batch of fuel exactly the same as previous ones.

Using less than the recommended proportion of oil may result in very serious motor damage due to lack of sufficient lubrication. Using more than the recommended proportion of oil will cause spark plug fouling, erratic carburetion, excessive smoking and faster-than-normal carbon accumulation.

CRUISING FUEL ECONOMY

A special feature of 3-4 and 6-cylinder and Merc 350 and 400 models provides far greater fuel economy than ever before provided on any outboard motor. This is obtained by a specially designed linkage between the carburetor and ignition system. It is automatically brought into operation by pulling control lever back to give cruising speed 70 to 90 percent of maximum speed. The special feature increases cruising range (or miles per gallon) and reduces fuel consumption (gallons per hour).

WARNING to MERCURY OUTBOARD DEALERS and OWNERS

WARNING: The use of any other oil than Mercury Quicksilver FORMULA 50 or 50-D Oil in the 50:1 ratio may cause piston scoring, bearing failure or both. The motor warranty may be void if failure should occur with the use of other oils in the 50:1 fuel-oil mixture.

Examination of outboard motors with scored pistons, which have been returned to our Service Department, show that the use of certain types of so-called "outboard motor oils" have caused piston scoring.

Do not – under any circumstances – use multi-grade or highly detergent automobile oils or oils which contain metallic additives in any fuel mixture. This type of oil may result in piston burning, scoring or both.

SECTION 1 - GENERAL INFORMATION

MERCURY
OUTBOARDS

PART B - TUNEUP

INDEX

OUTBOARD TUNEUP

DESCRIPTION

An engine tuneup is a service to put the maximum capability of economy, power and performance back into the engine and, at the same time, assure the operator of a complete check and more lasting results in efficiency and trouble-free operation.

Each year tuneup of the modern outboard engine has become increasingly important with improved power and performance. Today, this increase in power and performance has meant higher compression ratios and new and improved electrical systems among other advances in design.

It is advisable that the service technician follow a definite and thorough procedure of analysis and correction of all items which affect power, performance and economy to assure lasting results.

The extent of engine tuneup usually is determined by the amount of time since the last servicing of the engine; however, specific servicing of items on the engine should be performed at regular intervals, depending upon conditions under which the engine operates.

TUNEUP SEQUENCE

1. Changes to sequence of service outlined should be minimized whenever possible.
2. Tuneup is performed in 2 parts:
   a. Maintenance and adjustments
   b. Additional checks and adjustments
      (1) Includes added instrument checkouts performed with any of the modern compact units of service equipment available for this purpose.
      (2) Many checks and adjustments are included to isolate and correct trouble located during tuneup.
      (3) Always follow instructions for use of equipment as provided by manufacturer.
3. When major corrective action is required, refer to appropriate sections of this manual for detailed service information.

COMPRESSION

1. Remove spark plugs.
2. Install compression gauge in spark plug hole.
3. Crank engine thru at least 4 compression strokes to obtain highest possible reading.
4. Check and record compression of each cylinder. Variation of more than 15 lbs. per sq. in. between cylinders indicates that lower compression cylinders are in some way defective, such as worn or sticking piston rings and/or scored pistons and cylinders.
5. Compression check is important because an engine with low or uneven compression cannot be tuned successfully to give peak performance. It is essential, therefore, that improper compression be corrected before proceeding with an engine tuneup.
6. Cylinder scoring: If powerhead shows any indication of overheating, such as discolored or scorched paint, inspect cylinders visually thru transfer ports for possible scoring. It is possible for a cylinder to be scored slightly and still have comparatively good compression.

QUICKSILVER ENGINE CLEANER

a. After determining that all cylinders are in good condition, remove engine components for checking and servicing.
b. Place engine in horizontal position and soak combustion chambers for not more than 6-8 hours with Quicksilver Engine Cleaner (C-92-26845) to remove carbon deposits.
c. Considerable time will be saved by servicing engine components while powerhead is being soaked.

SPARK PLUGS

CONVENTIONAL SPARK PLUGS

1. Inspect each plug individually for badly worn electrodes, glazed, broken, blistered or lead fouled porcelains and replace plugs where necessary. (Figure 1)

   NOTE: Refer to spark plug diagnosis information in "Ignition System" Section 3 for an analysis of plug conditions.

2. Inspect each spark plug for make and heat range. All plugs must be of the same make and number or heat range.
3. Adjust spark plug gaps to "Specifications" Section 8 with a round feeler gauge.

CAUTION: Never bend center electrode to adjust gap. Always adjust by bending ground or side electrode.

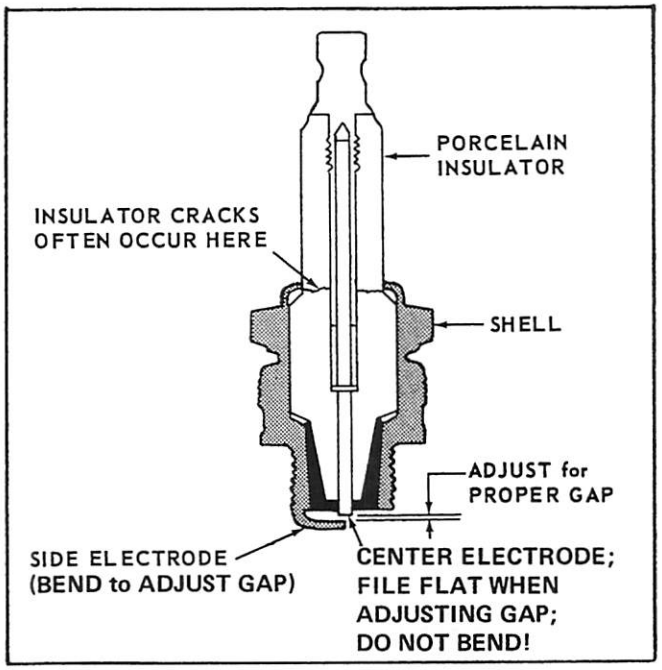
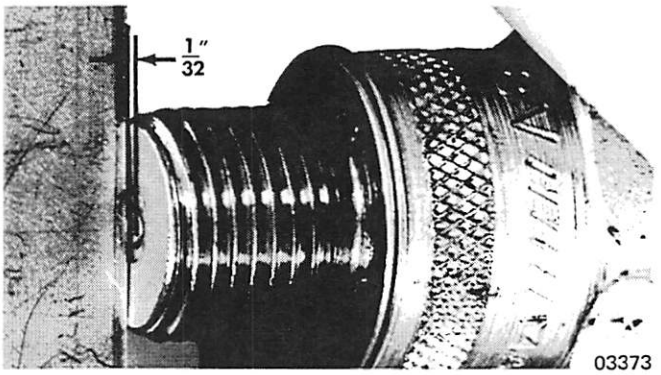


Figure 1. Spark Plugs - Conventional (Top) and Surface Gap (Below)



SURFACE GAP SPARK PLUGS

1. If spark plug center electrode is not burned back 1/32" (.8mm) below insulator, it will function properly. (Figure 1, bottom) Do not replace for other than this reason.
2. Be sure plugs being replaced are definitely misfiring; deposit accumulation can be deceiving.

SPARK PLUG INSTALLATION

1. Inspect spark plug hole threads and clean before installing plugs.

CAUTION: Crank engine several times to blow out any material which might become dislodged during cleaning operation.

2. Install spark plugs in engine with new gaskets and tighten to 20 ft. lbs. torque. Improper installation is one of the greatest single causes of unsatisfactory spark plug performance. Improper installation is the result of one or more of the following practices:

Cause	Result
Insufficient torque (to fully seat gasket)	Compression loss. Early plug failure.
Excessive torque	Reduced operation life. Complete destruction from inability to dissipate heat rapidly.
Dirty gasket seal	High temperatures. Early plug failure. Compression loss.
Corroded spark plug hole threads	Excessive high temperatures. Early failure from overheating.

3. Always use a new gasket and wipe seats in head clean. Gasket must be fully compressed on clean seats to complete heat transfer and provide a gas-tight seal in the cylinder. For this reason, as well as the necessity of maintaining correct plug gap, the use of correct torque is extremely important during installation.

RADIO INTERFERENCE SUPPRESSION

1. Radio and ship-to-shore telephone interference can be partially eliminated on 6-cylinder models (without Thunderbolt Ignition) by using resistor type spark plugs. DO NOT use resistor type spark plugs on 2 and 4-cylinder models with magneto ignition.
2. It should be noted that the quality of the receiver, antenna location and radio frequency used determines the effectiveness of any suppression equipment.
3. Suppressor type spark plug (A-33-60818) will substantially reduce ignition interference affecting depth finders, fish locators and radio equipment on all Mercury Outboards equipped with Thunderbolt Ignition, however, when used on 1970-71 Merc 200-110-75-40 models, the green coil (C-336-4409A1) is recommended to provide additional interference reduction. When installing these spark plugs, the carburetor idle adjustment screw and ignition idle stop may require readjustment.

CARBURETORS

FLOAT LEVEL and DROP ADJUSTMENTS

1. Remove cowl.
2. Remove filter cover(s) and fuel filter(s).
3. Remove float bowl cover(s) and float(s).

   NOTE: On electric models, it may be necessary to remove starter motor.

4. Inspect carburetor bowl(s) for sediment, gum or varnish deposits. If dirt, gum or varnish is present, it will be necessary to remove carburetor(s) and clean, as outlined in Section 4 of this manual.

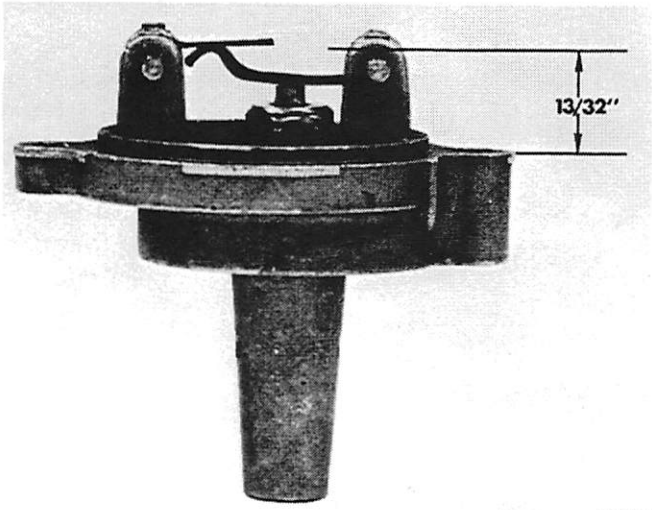


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Figure 2. Gauging Primary Lever

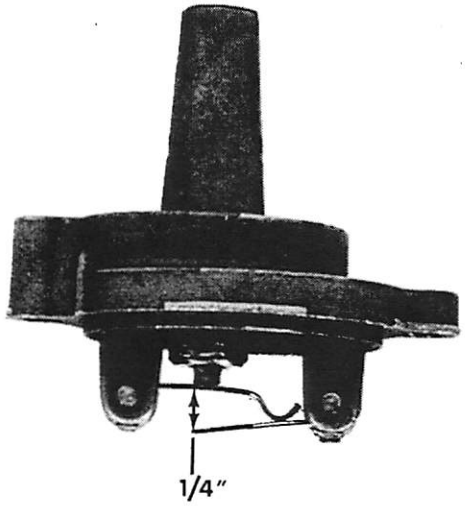

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Figure 3. Clearance between Levers

5. Invert float bowl cover. Distance from face of shoulder to primary lever is 13/32", plus or minus 1/64". (Figure 2) Bend secondary lever as required.

   NOTE: In metric scale 1" = 25.4mm.

6. Be sure needle does not stick in seat. Tip unit upright, and needle should move freely on actuating primary lever.
7. Hold float bowl cover upright. (Figure 3) Distance between levers is ¼". Bend tab on secondary lever as required.
8. Check float(s) for deterioration and/or saturation.
9. Check that float spring measures approximately 3/32" from top of float (not insert) to end of exposed spring. (Figure 4)

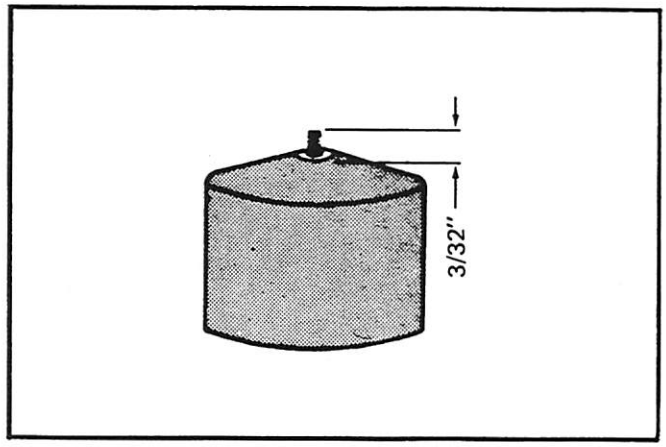

Figure 4.
Carburetor Float Assembly

10. Place float in bowl on float needle.
11. Float should spin freely in bowl. If anything restricts float movement, correction should be made, or flooding will occur.
12. Install new gasket(s) and replace float bowl cover(s).

HARD STARTING

1. Clearance between choke shutter and carburetor must not exceed .015" (.38mm) when choke is closed, or engine will start hard.
2. Hard starting is often traced to improper choke shutter operation. Adjust choke linkage and choke return spring for fast, positive action of the choke shutters.
3. It may be necessary to readjust the carburetor idle mixture screw up to 1/4-turn with each change in brand of gasoline to compensate for varying volatility and differences in refining process.

FLOAT LEVEL and DROP ADJUSTMENTS

(Merc 200-110-75[1973])

1. Adjust float level to ¼"±1/64" from float bottom to casting. (Figure 5)

   NOTE: Hold carburetor upside down for ease of measurement.

2. Adjust float drop to get 1/64" to 1/32" between bottom of float and fixed jet. (Figure 6) Adjust by bending tang on float.
3. Install new float bowl gasket. Secure float bowl with 2 fiber washers and screw.

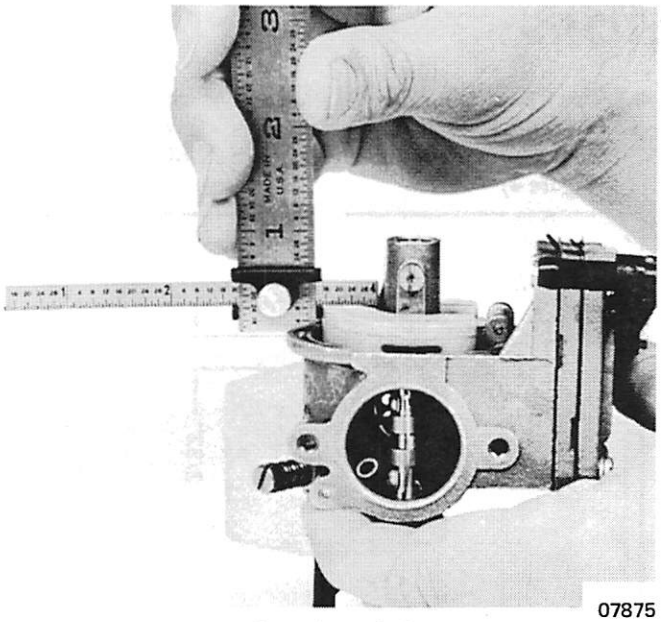

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Figure 5. Float Level Adjustment

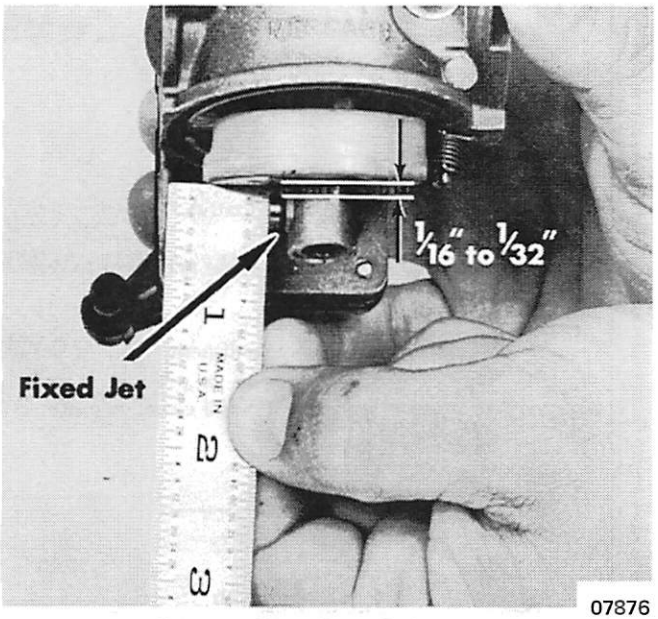

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Figure 6. Float Drop Adjustment

FUEL PUMPS - VACUUM TYPES

MERC 200-110-75-60-39 (Up to 1972 MODELS) (Figure 7)

1. Wash all parts carefully and inspect for wear or damage.
2. Replace diaphragm and gaskets.

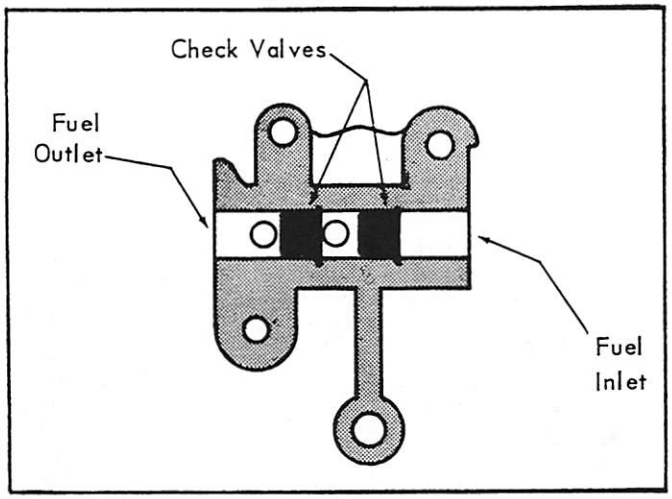

Figure 7. Merc 200-110-75-60-39 Fuel Pump (Up to 1972 Models)

3. Test check valves by blowing thru outlet hole. Air should be drawn thru valve but should close immediately when attempting to blow thru it.
4. Test inlet valve by reverse procedure. If leakage is encountered, replace check valves. See "Fuel Systems" Section 4 of this manual.
5. Reassemble, using new gaskets.

ALL OTHER MODELS (Figure 8)

1. Wash all parts thoroughly and use compressed air to dry.
2. Inspect each part carefully for wear or damage.
3. Replace pulsator diaphragm with new.
4. Be sure that valve seats provide flat contact area for valve disc.
5. Tighten elbows and check valve connections firmly when replacing.
6. Do not use Permatex on valve retainer gasket.
7. Check valves after reassembling fuel pump cover by blowing thru outlet hole. Air should be drawn thru valve but should close immediately when attempting to blow thru it.
8. Check inlet valve by reverse procedure. If leakage is encountered, check for free operation and accurate setting of valves.
9. Worn or slightly warped valve will cause leakage. Replace with new valves for more accurate setting.
10. When installing fuel line fittings, we recommend aviation Permatex for sealing. Apply sparingly to avoid clogging of fuel lines.

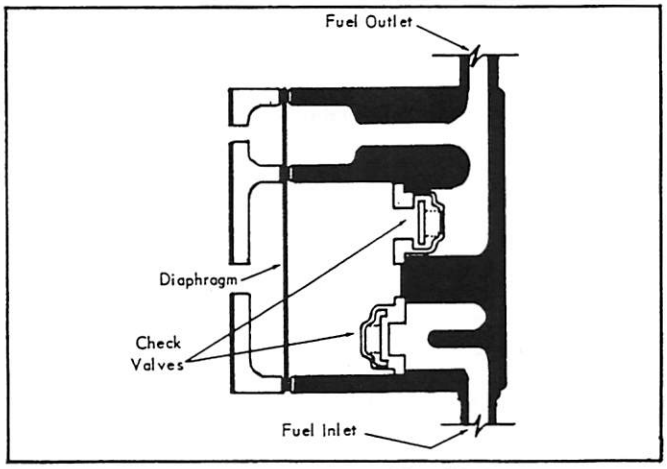

Figure 8. Fuel Pump for Most Models

CAUTION: Do not use Liquid Neoprene on fuel line fittings. Neoprene is recommended only for exposed electrical connections. Permatex is available thru all local hardware stores.

11. Reassemble fuel pump(s), using new gasket(s).

FUEL PUMPS - Merc 200-110-75 (1973)

(Refer to "Carburetors" Section 4B).

NOTE: Fuel pump is an integral part of the carburetor.

FUEL PUMP DIAPHRAGM

A defective fuel pump diaphragm is often mistakingly diagnosed as ignition trouble. A tiny pin-hole in diaphragm will permit gas to enter crankcase causing that particular cylinder to wet foul the spark plug at idle speed. At higher speeds, quantity of gas is limited and spark plug will fire normally.

FUEL LINES and FILTERS

1. Inspect fuel lines for kinks, leaks and restrictions and correct any defects found. If necessary, remove fuel lines and blow out with compressed air to remove any foreign material. When reinstalling lines, be sure that they are not twisted or kinked, thereby causing restrictions.
2. Clean or replace fuel line filter element(s) as follows:
   a. Remove filter cover(s) and element(s).
   b. Wash parts in solvent and dry with compressed air.
3. Reinstall element(s).

   NOTE: If a complaint of poor high speed performance exists, fuel pump pressure test, described under "Additional Checks and Adjustments" in this section, should be performed.

4. Brass fuel line fittings are available for replacing damaged fittings or for shortening ½" diameter type fuel lines. No special tools are required.

IGNITION SYSTEM

1. Use equipment as directed by manufacturer. All ignition components must be checked.
   a. Coil(s)
      (1) Maximum operating amperage test
      (2) High speed test
      (3) Secondary continuity test
      (4) Surface insulation test
      (5) Ground test
   b. Spark plug wires, rotor, distributor cap
      (1) High voltage leakage test
      (2) Continuity and/or resistance test
   c. Condenser
      (1) Capacity test
      (2) Leakage and short test
2. Breaker points
   Examine breaker points and clean or replace if necessary. Contact points, with an overall gray color and only slight roughness or pitting, need not be replaced. Replace points which are burned, badly pitted or have high resistance.
3. Maker points
   High primary voltage in the Thunderbolt Ignition System will darken and roughen the maker points within a short period of time. DO NOT BE ALARMED. While points in this condition would not operate satisfactorily in the conventional magneto, they will continue to perform in the Thunderbolt System.
   DO NOT replace Thunderbolt Ignition points unless an obvious malfunction exists, or the contacts are loose or burned away. Rough or discolored contact surfaces are not evidence for replacment in the Thunderbolt Ignition System. In general, the cam follower will have worn away by the time the points become unserviceable.
4. Finding cause of trouble
   When burned or badly pitted points are encountered, ignition system and engine should be checked to determine cause of trouble so that it can be eliminated. Unless condition which causes point burning or pitting is corrected, new points will provide no better service than the old points.
5. Adjust breaker points in the following manner:
   a. Merc 40 - Adjust breaker point gap at .020" (0.508mm).
   b. 2-Cylinder models (1969 and Earlier)
      (1) With flywheel removed and components tested, place Synchronizing (Degree) Plate (C-91-36454A1) on rim of stator plate. (Figure 1)

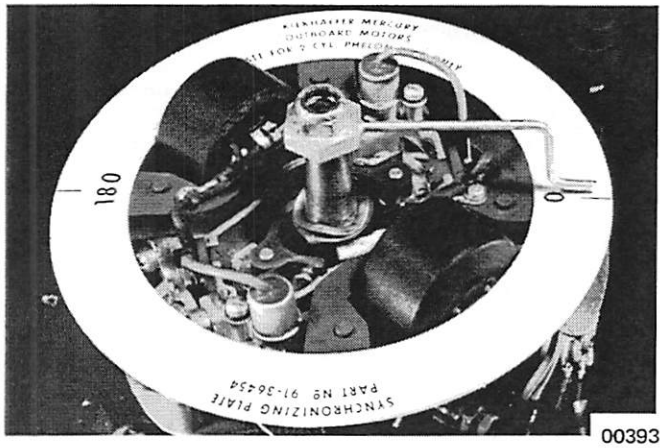

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Figure 1. Degree Plate C-91-36454A1 on Stator

   (2) Move stator to position where magneto cam just touches carburetor pickup lever. Leave stator positioned at this point during point adjustments.
   (3) Thread indicator arm on crankshaft and lock in position with flywheel nut.
   (4) Turn crankshaft - not indicator arm - to prevent bending indicator arm.
   (5) Turn crankshaft until breaker arm rubbing block is positioned on high point of cam and adjust breaker point gap to .020" (0.508mm). High point of cam is not at the keyway, but located as shown in Figure 2.

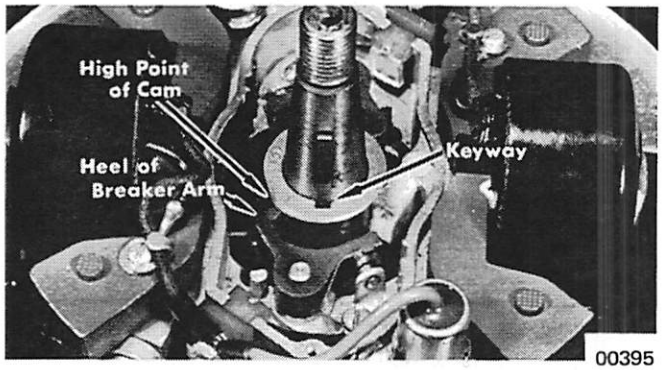

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Figure 2. Locating High Point of Cam

   (6) Set Magneto Analyzer (C-91-25213) selector switch on No. 2 ("Resistance") or, employing Continuity Meter (C-91-22966), attach one small test lead to stator plate (ground) and second small test lead to spring arm of breaker point.
   (7) Rotate indicator arm clockwise to allow breaker to close. Continue to rotate crankshaft and indicator arm (turn crankshaft, not indicator arm, to prevent bending indicator arm) clockwise until meter hand moves (breaker points open). This will be indicated by sudden movement of meter pointer hand.
   (8) Move Degree Plate in either direction required to place 0° mark directly under indicator arm.
   (9) Move small test lead from first breaker point spring to second point spring and attach.
   (10) Rotate indicator arm clockwise toward second breaker assembly until indicator arm is directly over 180° mark. Second breaker must open exactly at this time. If not, readjust breaker points until they just begin to open, as indicated by the meter pointer hand movement.

NOTE: Check breaker cam for looseness. Install with arrow in direction of rotation. It must be tight on crankshaft. If loose, it may cause rough idling. (Some models have cam cut on crankshaft.)

   (11) Recheck settings on No. 1 and No. 2 breaker points to assure that settings have not changed, due to possible movement of Degree Plate.

NOTE: If Degree Plate is not available, turn crankshaft until breaker arm rubbing block is positioned on high point of cam and adjust breaker point gap to .020" (0.508mm). Adjust second set of breaker points in the same manner.

(12) Timing and adjustments are covered in "Adjustments before Testing".

c. 1970-71-72-73 Merc 110-75-40 and 1970-71-72 Merc 200

(1) Place contact housing in full throttle position.

(2) Gap both sets of points to .020" on high side of cam. Lock points.

(3) Install Phasing Tool C-91-59096A1 onto crankshaft. Install flywheel nut to lock Phasing Tool in position.

(4) Remove white lead and brown lead from coils.

(5) Connect Magneto Analyzer (C-91-25213) from white lead to ground. Place Analyzer on scale No. 3.

(6) Turn crankshaft in clockwise direction until No. 1 set of points just closes.

(7) Place masking tape under pointer of Phasing Tool and mark pointer location on tape. (Figure 3)

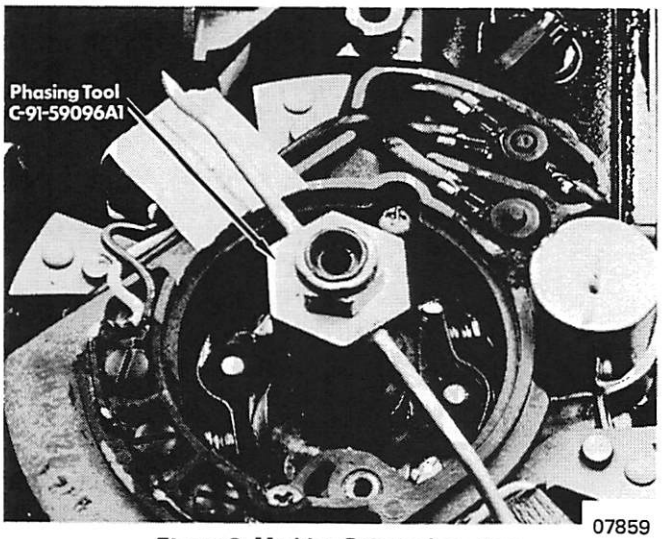

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Figure 3. Marking Pointer Location

(8) Move Magneto Analyzer connection from white lead to brown lead.

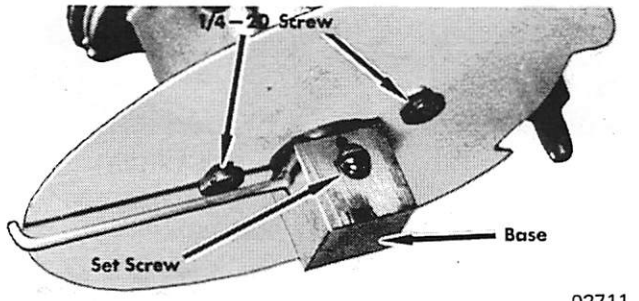
(9) Turn crankshaft until opposite end of Phasing Tool pointer lines-up with mark on tape. No. 2 set of points should just close within 1/16" on either side of mark. If points do not close or close too soon, readjust No. 2 set of points. Lock points.

d. 4-Cylinder models

(1) Installing dwell plate (C-91-31484A2) (Figure 4)

(a) With magneto dwell plate face up, set magneto housing drive end collar into center opening of dwell plate with air intake nozzle extended into slot on side of dwell plate.

(b) Install the 2 flat-headed ¼-20 screws from underneath thru slots of dwell plate into magneto mounting screw holes. DO NOT tighten, as travel must be allowed for the mounting slots in degree plate.



02711

Figure 4. Four-Cylinder Dwell Plate Installation

NOTE: Set screw in base of indicator arm MUST BE ALIGNED with blank spline of drive coupling.

(c) Install base of indicator arm on large splined drive coupling of magneto.

(d) Tighten set screw in base of indicator arm.

(e) Clamp large square end of indicator arm in vise (with vise jaw protectors) to allow use of both hands for adjusting. DO NOT over-tighten.

(2) Dwell adjustment (Figure 5)

(a) Set breaker point gap to .008" (0.203mm) for an approximate setting of 48° dwell.

(b) With Magneto Analyzer (C-91-25213) selector switch on scale No. 2 (Resistance) or employing a continuity meter, attach one small lead to housing of magneto (ground) and second small lead to primary ground screw.

(c) With breaker points open, rotate magneto slowly in a clockwise direction until meter hand moves, indicating points closed.

(d) Holding magneto housing in this position, rotate dwell plate in either direction so that "Points Close" mark is in line with indicator arm.

(e) While holding dwell plate and magneto housing together, rotate assembly in clockwise direction. Observe meter hand movement indicating "Points Close" which must fall on 0° and remain closed until pointer indicates 48° "Points Open" position.

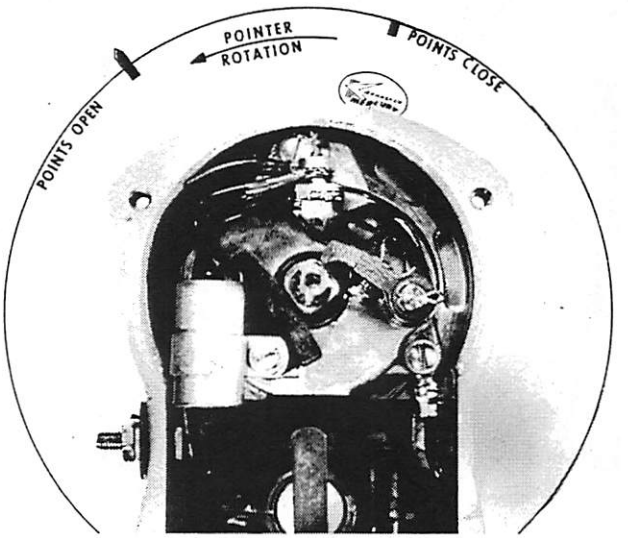


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Figure 5. Four-Cylinder Dwell Adjustment

(f) If rotation is less than 48°, breaker points open too soon, and point gap must be closed slightly. If rotation is more than 48°, breaker points open too late, and gap must be increased slightly.

(g) After each point gap adjustment, repeat Paragraphs (c), (d) and (e).

NOTE: If a dwell plate is not available, set breaker point gap at .008" +.000" -.002" (0.203mm +.000 -0.051mm) when cam follower fibre arm is on highest part of cam lobe.

e. 6-Cylinder model

(1) Install dwell plate (C-91-45510A1)

(a) Place rubbing block of No. 1 set of points (white lead; brown lead for Thunderbolt Ignition models) on high lobe of distributor cam and set points at .007" (.178mm). This is a primary setting required to obtain the appropriate dwell.

(b) Set indicator arm over rotor shaft. Note that indicator arm groove is off center; therefore, it will be set over rotor shaft cross pin only one way.

(c) With Magneto Analyzer (C-91-25213) selector switch on No. 3 (Continuity) or employing a continuity meter, attach small red test lead to white primary lead wire (brown lead on Thunderbolt) of distributor and small black test lead to frame of distributor.

(d) With breaker points open, rotate indicator arm counterclockwise until hand moves (breaker points close). This will be indicated by sudden movement of Magneto Analyzer or Continuity Meter pointer hand.

(e) Move degree plate in (either) direction which is required to place "Points Close" mark directly under indicator arm. (Figure 6)

(f) Rotate indicator arm counterclockwise until breaker points open (indicated by sudden movement in opposite direction of meter pointer hand. Indicator hand must be exactly on centerline marked "Points Open". (Figure 7)

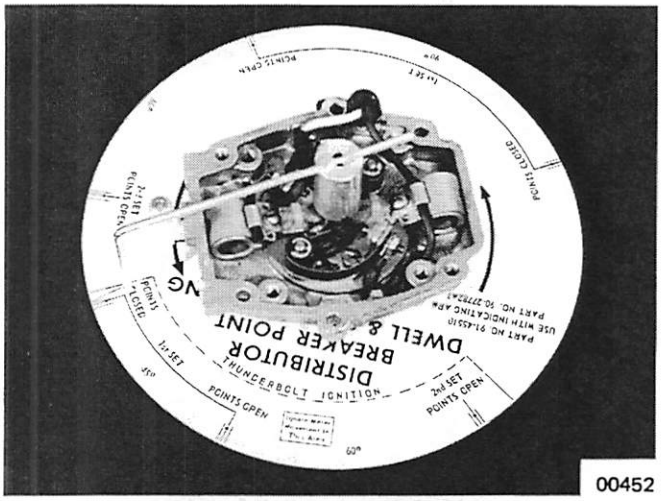

Figure 6. Six-Cylinder Dwell Plate (C-91-45510A1)

[1] If breakers open too soon (before mark), move indicator hand counterclockwise half way to mark. At this time, readjust breaker points until they just begin to close and reopen, as indicated on meter.

[2] If points open too late (after mark), move indicator hand back half way (clockwise) to mark. At this time, readjust points until they just begin to open. Above divides distance between starting point and breaker to get correct setting.

(g) After making adjustment "[1]" or "[2]", preceding, return to instruction "(c)" and proceed as before, as adjustment of breaker

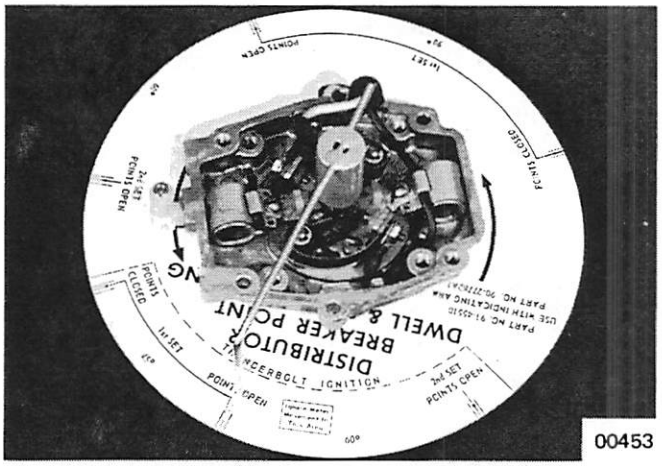

Figure 7. Dwell Plate (C-91-45510A1)

under "[1]" or "[2]" changes starting point, and degree plate must be readjusted.

(h) After obtaining 90° dwell (45° on Thunderbolt Ignition), tighten Degree Plate with two ¼-20 screws and recheck that dwell was not changed while tightening screws.

(i) This completes No. 1 breaker assembly settings. No further adjustment of breaker points is required, but do not remove degree plate under any circumstances.

(j) Brown lead, No. 2 breaker point setting (white lead on Thunderbolt ignition).

[1] Move test lead from No. 1 lead and attach to No. 2 lead terminal.

[2] Move indicator arm to align "Points Open" and adjust brown (white on Thunderbolt Ignition) lead breaker points until meter pointer hand indicates points just begin to open. (Figure 8) If points open too soon, point gap must be closed slightly.

[3] Always recheck after tightening breaker assembly to plate so that point setting does not change. This completes breaker point settings.

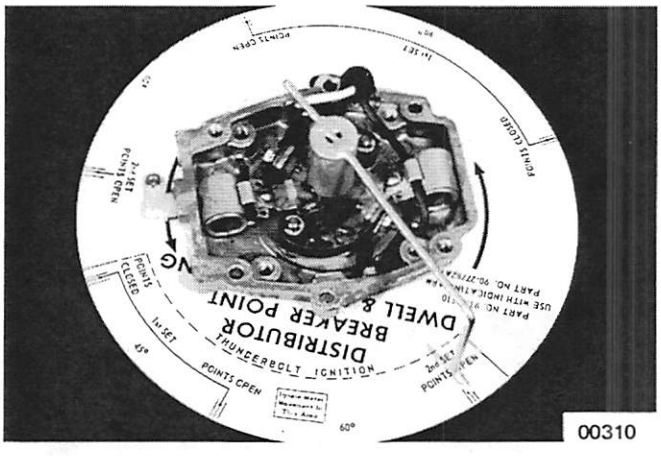

Figure 8. Dwell Plate C-91-45510A1

NOTICE: Observe "Ignore Meter Movement in This Area" on C-91-45510A1 Dwell Plate.

(2) Installation - Secure with 4 hex head cap screws and attach ground straps from crankcase to distributor frame.

STARTER MOTOR and SOLENOID

STARTER MOTOR

TESTING STARTER MOTOR

1. Be sure that battery is fully charged and at least 70 ampere hour capacity before testing starter motor. Many starter motors are needlessly disassembled when battery actually is at fault.
2. With a fully charged battery, connect a negative jumper cable to upper ground terminal on side of starter motor and a positive jumper cable to positive terminal of starter motor. If starter still does not operate, remove for overhaul or replacement.

CLEANING and INSPECTION of STARTER MOTOR

1. Remove starter motor and disassemble.
2. With starter motor completely disassembled, except for removal of field coils, component parts should be cleaned and inspected. DO NOT use grease dissolving solvent for cleaning armature or field coils, as insulation will be damaged.
3. Test pinion gear and screw shaft. Pinion gear must move freely on screw. Check pinion gear to see that it is not chipped or worn excessively.
4. Check that brush holders are not deformed or bent and will properly hold brushes against commutator.
5. Check brush springs. If tension is insufficient, the brushes will arc and wear very rapidly.
6. Check condition of brushes. If pitted or worn to one half their original length, they should be replaced.
7. Check fit of armature shaft in bushing of drive end plate. Shaft should fit snugly in bushing. If bushing is worn, it should be replaced. Apply No. 10 oil to this bushing before reassembly. *Avoid excessive lubrication.*
8. Check fit of bushing in commutator end plate. If this bushing is damaged or worn excessively, end plate assembly should be replaced. Apply No. 10 oil to this bushing before reassembly. Avoid excessive lubrication. Lubricant forced onto commutator will gum and cause poor commutation, with resulting decrease in starter motor performance.
9. Inspect armature commutator. If commutator is rough or out-of-round, it should be turned down and under-cut. Inspect points, where armature conductors join commutator bars, to make sure that it is a good firm connection. Burned commutator bar usually is evidence of a poor connection.
10. To remedy any of preceding conditions, refer to Section 3B.
11. Reassemble starter motor and lubricate pinion gear and screw shaft with No. 10 oil.
12. Check return spring for normal tension. Pinion must return from engaged position smoothly and rapidly.

TESTING SOLENOID

1. Turn selector switch of Magneto Analyzer (C-91-25213) to Position No. 2 (Distributor Resistance) and clip small red and black leads together.
2. Turn meter adjustment knob for Scale No. 2 until meter pointer lines up with set position on left side of "OK" block on Scale No. 2.
3. Unclip small red and black leads.
4. Connect small red test lead to one large terminal of solenoid and connect small black test lead to other large terminal, as shown in Figure 1.

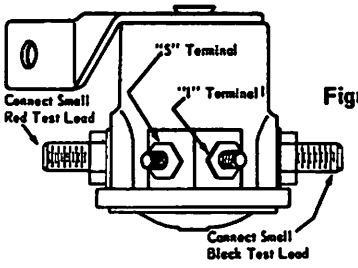

Figure 1. Terminals on Solenoid

5. Using 12-volt battery and jumper leads, connect positive lead to small "S" terminal of solenoid.
6. Connect negative battery lead to "I" terminal of solenoid.
7. Meter pointer hand must move into the "OK" block, or solenoid is defective and must be replaced.

CAUTION: DO NOT connect battery leads to large terminals of solenoid, or meter will be damaged.

ALTERNATOR and RECTIFIER

TESTING ALTERNATOR

1. Alternator may be tested without removing flywheel.
2. Disconnect 2 yellow alternator leads from rectifier.
3. Turn selector switch of Magneto Analyzer (C-91-25213) to position No. 2.
4. DO NOT clip small red and black leads together.
5. Turn No. 2 scale meter adjustment knob to adjust meter needle with red line on right side of scale No. 2.
6. Connect small red and black test leads to terminals of yellow alternator leads.
7. Read figures on scale No. 2. Refer to "Specifications" Section 8 for model being tested. If alternator does not meet specifications, it should be replaced.

RECTIFIER CHECK on THUNDERBOLT IGNITION MODELS

The rectifier will protect the switch box from damage if the harness plug becomes loose during engine operation, however, it will damage the rectifier.

Disconnecting the battery leads during engine operation or reversing the battery leads also will damage the rectifier. Leaving the battery leads connected to the wrong terminals will damage the switch box.

NOTE: The engine can be operated without the rectifier if the alternator leads are disconnected and properly insulated.

Mercury Marine will not honor warranty on rectifiers and switch boxes which are damaged under conditions described here. To check a rectifier, proceed as follows:

1. Remove rectifier from engine . (Figure 2)
2. Set Magneto Analyzer (C-91-25213) scale on No. 3, (Continuity).
3. Connect red (positive) lead to rectifier case.
4. Connect black (negative) lead alternately to terminals 1 and 3. On each terminal, the meter pointer should move to right of scale 3. If the pointer does not move when connected to either terminal, the rectifier must be replaced.
5. Connect black lead to rectifier case.
6. Connect red lead alternately to terminals 1 and 3. On each terminal, the meter pointer should remain stationary on the left side of scale 3. If pointer moves when connected to either terminal, the rectifier must be replaced. DO NOT use an early type rectifier as a replacement.
7. Connect black lead to terminal 2.
8. Connect red lead alternately to terminals 1 and 3. On each terminal, the meter pointer should move to right of Scale 3. If the pointer does not move when connected to either terminal, the rectifier must be replaced.
9. Connect red lead to terminal 2.
10. Connect black lead alternately to terminals 1 and 3. On each terminal, the meter pointer should remain stationary on the left side of scale 3. If pointer moves when connected to either terminal, the rectifier must be replaced. DO NOT use an early type rectifier as a replacement.

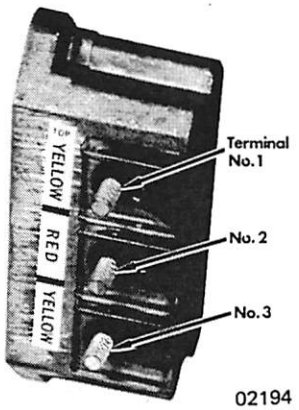

Figure 2. Rectifier Terminals

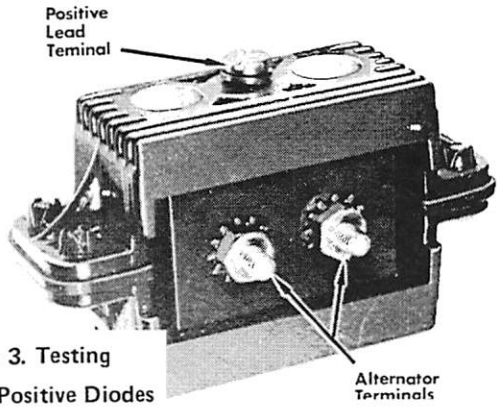

Figure 3. Testing Positive Diodes

TESTING DIODE RECTIFER

1. Turn Magneto Analyzer selector switch to position No. 3 (Coil Continuity) and connect small red and black test leads together.
2. Turn meter adjustment knob for scale No. 3 until meter pointer lines up on right side (set position).
3. Testing positive diodes:

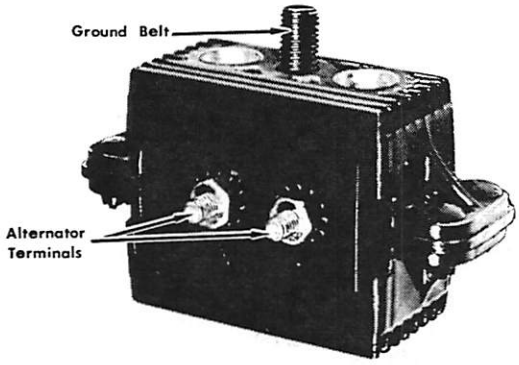

Figure 4. Testing Negative Diodes

   a. Connect small red test lead to either alternator terminal and connect black lead to positive terminal of rectifier. (Figure 3) Meter pointer should move to right of Scale 3.
   b. Reverse test leads on rectifier. Meter pointer should remain stationary at left side of scale No. 3.
   c. Repeat Steps "a" and "b" on the opposite alternator terminal. This will determine condition of positive diodes.
4. Testing negative diodes.
   a. Connect small red test lead to either alternator terminal and connect black test lead to rectifier ground stud. (Figure 4) Meter pointer should remain stationary at left side of scale No. 3.
   b. Reverse test leads on rectifer. Meter pointer should move to right side of scale No. 3.
   c. Repeat Steps "a" and "b" on the opposite alternator terminal. This will determine condition of negative diodes.

NOTE: If any of the diodes do not check good, rectifier is defective and must be replaced.

CAUTION: Do not attempt to check polarity of battery leads by "sparking" lead terminals against terminals. This action may result in a burned-out rectifier.

FINDING CAUSE OF TROUBLE: Burned-out rectifiers are greatly discolored and/or have a "baked" appearance. Unless condition which caused failure is corrected, new rectifier will provide no better service than old rectifier.

TESTING PLATE TYPE RECTIFIER (Figure 5)

(By Measuring Direct Current Resistance on Magneto Analyzer)

1. Set selector switch on position No. 3 (Continuity).
2. Clip small red and black test leads together and turn meter adjustment knob for scale No. 3 until meter pointer hand lines up on set position on scale No. 3. right side.

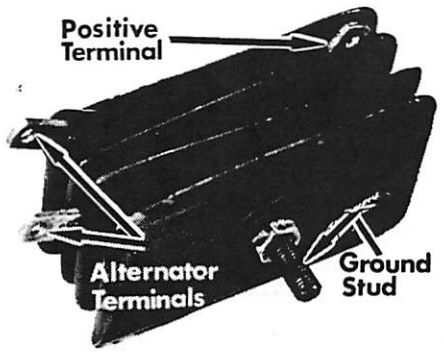

Figure 5. Testing Plate Type Rectifier

3. Connect small red and black test leads from analyzer to:
   a. Black wire and red wire on positive ground type rectifiers, or
   b. Red wire and ground bolt on negative type rectifier.
4. Note reading of figures on lower hand, scale No. 3.
5. Reverse test leads on rectifier and note readings again.
6. Ratio of two readings should be 10:1 or greater.
7. Remove analyzer test leads and connect to the two alternator leads or lead terminals on rectifier. Note reading of figures on lower hand scale No. 3.
8. Reverse test leads on rectifier and note readings again.
9. The ratio of the two readings should be no more than 2:1.
10. This is only a preliminary test to determine condition of rectifier. If questionable, as a final test, rectifier should be installed on engine and checked with ammeter while engine is running.

TESTING MERC 402 and 650 (3-Cyl.) TYPE RECTIFIERS

1. Turn Magneto Analyzer (C-91-25213) selector switch to position No. 3 (Coil Continuity) and connect small red and black test leads together (or use VOA Tester [C-91-52751]).
2. Turn meter adjustment knob until meter pointer is on zero ohms or "Set Position".
3. Connect small red test lead to either alternator terminal and connect black lead to positive terminal of rectifier. (Figure 6 and 7) Meter pointer should move to right. If meter does not move, rectifier is bad.
4. Reverse test leads on rectifier. Meter pointer should remain stationary at left side of meter. If pointer moves to right, rectifier is bad.
5. Repeat Steps 3 and 4 on opposite alternator terminal.

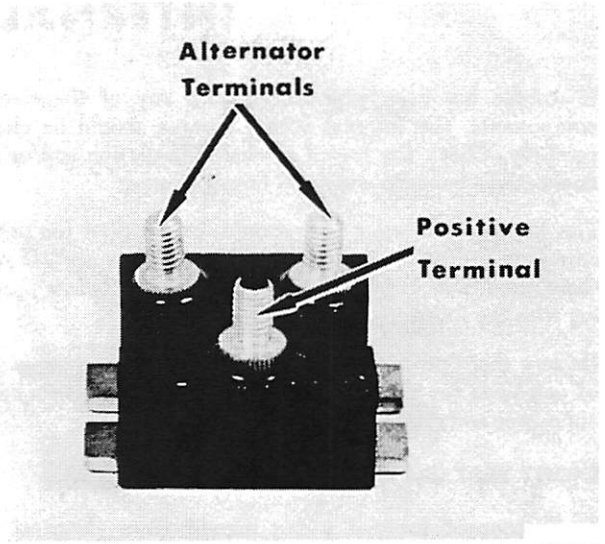

Figure 6. Merc 402 Type

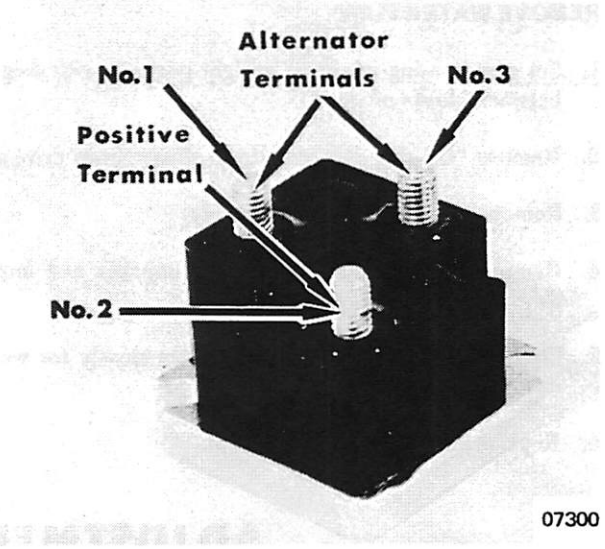

Figure 7. Merc 650 (3-Cyl.) Type

INTERNAL WIRING HARNESS

If trouble has been experienced with any of the electrical components, the internal wiring harness should be checked carefully. Check for frayed or chafed insulation and/or loose connections between wires and terminal ends.

The harness connector also should be checked for possible corrosion and/or bent or broken electrical "prongs". If any of these conditions exist, they must be corrected before proceeding with the following tests.

Be sure that "prongs" of harness connector are clean and free of corrosion for a good electrical connection between harness connector and remote control harness.

SHORT TEST (See Wiring Diagrams in Section 3G)

1. Disconnect internal wiring harness from electrical components.
2. Using Magneto Analyzer, scale No. 3, check for continuity between any of the wires in the harness. If continuity exists, harness will have to be repaired or replaced.

RESISTANCE TEST (See Wiring Diagrams in Section 3G)

1. Turn selector switch of Magneto Analyzer to position No. 2 (Distributor Resistance) and clip small red and black leads together.
2. Turn meter adjustment knob for scale No. 2 until meter pointer lines up with set position on left side of "OK" block on scale No. 2.
3. Unclip small red and black leads.
4. Using wiring diagram as a guide, check each wire for resistance between harness connection and terminal ends.
5. If resistance exists, harness will have to be repaired or replaced.

WATER PUMP IMPELLER

REMOVE WATER PUMP

1. Set gear housing in vise in upright position with skeg held between blocks of wood.
2. Remove "O" ring and centrifugal slinger from drive shaft.
3. Remove water pump body assembly.
4. Remove water pump and remove impeller and impeller drive pin and face plate.
5. Check impeller and water pump insert closely for wear or damage.
6. Replace impeller if wear is evident.

INSTALLATION of WATER PUMP IMPELLER

1. Place drive pin on drive shaft, holding in position with dab of New Multipurpose Lubricant (C-92-49588).
2. Set impeller in place over drive shaft.
3. Insert stainless water pump cartridge in water pump body and place water pump body-to-face-plate gasket on water pump body.
4. Slide water pump body assembly over drive shaft and impeller.
5. Turn drive shaft clockwise, at same time seating impeller. Be sure that impeller drive pin is in position in drive pin groove of impeller.
6. Replace lockwashers and tighten nuts and cap screw.
7. Place plastic water tube guide in water pump body recess.
8. Replace drive shaft slinger and drive shaft "O" ring.

ADJUSTMENTS BEFORE TESTING

Refer to "Timing, Testing and Adjusting" Section 3E, for particular models. Importance of correct timing and synchronization cannot be over-emphasized, as a motor, even in excellent mechanical condition, will not perform satisfactorily unless timing and synchronization are correct.

BOAT TEST

1. Mount motor on boat.
2. Install remote control cables and check for proper adjustment.
3. Electric models:
   a. Inspect battery and cables and perform necessary service on these components.
   b. Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level.
   c. Fill cells to proper level with distilled water or water passed thru a "demineralizer".
   d. Top of battery should be clean and battery fastened securely in position. Particular care should be taken so that tops of 12-volt batteries are kept clean of acid film and dirt because of high voltage between battery terminals.
   e. For best results, when cleaning batteries, wash first with a dilute ammonia or soda solution to neutralize any acid present, then flush off with clean water.
   f. Keep vent plugs tight so that neutralizing solution does not enter cell.
   g. Hold-down device should be kept tight enough to prevent battery from shaking around in its holder, but

it should not be tightened to point where battery case will be placed under a severe strain.

h. To insure good contact, battery cables should be tight on battery posts. If battery posts or cable terminals are corroded, cables should be cleaned separately with a soda solution and wire brush. After cleaning and before installing clamps, apply a thin coating of Multipurpose Lubricant (C-92-49588) to posts and cable clamps to help retard corrosion.

i. If battery has remained under-charged, check for high resistance in charging circuit.

j. If battery has been using too much water, it may be defective or undersize.

4. Check fuel tank(s) for dirt, water and/or "stale" fuel.

NOTE: If any doubt exists, clean fuel tanks and refill with fresh fuel before continuing test.
If other than Mercury Marine fuel tanks are used, see "Additional Checks and Adjustments", following.

5. If possible, boat should be tested with average gross load.
6. Check motor tilt pin adjustment. Boat should ride on even keel.
7. If motor is equipped with adjustable trim tab, tab should be adjusted so that boat steers with equal ease in either direction.
8. Check engine RPM at full throttle. RPM should be within specified range. If RPM is not within specified range, check propeller pitch.
   Higher pitch propeller will decrease RPM, lower pitch propeller will increase RPM.
   For optimum low speed motor performance, we recommend that idle mixture and idle speed be readjusted under actual operating conditions.

"HOOK" and "ROCKER"

Check boat bottom carefully before testing. Any marine growth, or a "hook" or a "rocker" in boat bottom, can greatly reduce performance.

ADDITIONAL CHECKS and ADJUSTMENTS

Following tests are described herein for use as required where either an abnormal condition, requiring further checking, has been detected during tuneup, or a specific customer complaint exists.

Water Pressure (Use Water Pressure Gauge A-33371A2)
Fuel Pressure (Use Fuel Pressure Gauge C-91-30692)

WATER PRESSURE TEST (C-33371A2)

1. Water pressure at the cylinder block should be checked whenever an overheating condition is detected or suspected.
2. A large keel or other accessories, located on the boat bottom forward of the motor, can cause what is mistakenly diagnosed as water pump failure.
3. A motor mounted unusually high on the transom also can cause overheating. A solid, unrestricted water flow must be delivered to the gear housing for maximum cooling and engine efficiency.
4. Install necessary fitting and water pressure hose on the cylinder block and place water pressure gauge in convenient position for viewing while operating boat. Water pressure at full throttle under any running conditions, i.e. turning, maneuvering, etc, must be 5 psi (lbs. per sq. in.) (9.352kg/cm^2) or more.

FUEL PRESSURE (C-91-30692)

1. Fuel pressure at the top carburetor should be checked whenever insufficient fuel is suspected, or if other than Mercury Marine fuel tank is used.
   Check "foreign" fuel tanks for the following:
   a. Adequate air vent in fuel cap.
   b. Fuel line large enough (5/16-to3/8") (7.937mm-to-9.525mm).
   c. Filter on end of pickup too small or clogged, or fuel pickup tube too small. Use A-32-33909A4 Fuel Pickup Assembly as a comparison.
2. Insufficient fuel supply will cause engine to run lean, lose RPM or cause piston scoring.
3. The fuel pressure gauge should be installed at the end of the fuel line that leads to the upper carburetor. Fuel pressure must be 2 psi (lbs. per sq. in.) (0.141 kg/cm^2) or more at full throttle.

LOW SPEED PERFORMANCE

For optimum low speed motor performance, we recommend that idle mixture and idle speed be readjusted under actual operating conditions.

OPERATION at RECOMMENDED RPM

The correct propeller should be installed on the engine so that it will run at recommend RPM. See "Installation" Section 2.

The lower RPM is recommended for large, heavy, slow boats or for commercial applications. The higher RPM is recommended for light, fast boats. The wide RPM range will result in greater satisfaction derived from maximum performance and maximum fuel economy.

If the engine speed is too high, try a higher pitch or the same pitch cupped. Likewise, if engine speed is low, try a lower pitch prop. There normally is a 300-500 RPM change between propeller pitches.

For dual installation, the next higher pitch propeller may be best. For water skiing, it may be desirable to use the next lower pitch; however, be cautious - do not operate at full throttle when using ski propeller but not pulling skiers. If, in this connection, a propeller has too little pitch for the application, dangerous overspeed of the engine may result. If the propeller has too much pitch for the application, acceleration will be slow. Light, fast boats require higher pitch propellers, while heavier boats require lower pitch propellers.

PREVENTIVE MAINTENANCE

LOWER DRIVE UNIT LUBRICATION

Periodically lubricate the lower drive unit with Quicksilver outboard gear lubricant.

Refer to "Specification" Section 8 for "Capacity of Lubricant in Gear Housing".

NOTE: Use only Quicksilver Super-Duty Gear Lubricant (C-92-52650) in the lower unit. In an emergency, when these lubricants are not immediately available, use extreme pressure marine gear lubricant. DO NOT use regular automotive grease in the lower drive unit.

1. Remove lubricant filler plug, located on right side of gear housing just above skeg, then remove air vent screw above anti-cavitation plate (Figure 5), being careful not to lose the accompanying washers.

   IMPORTANT: Never apply lubricant to the lower unit without first removing the air vent screw, as the injected lubricant displaces air which must be allowed to escape, otherwise the gear housing cannot be completely filled as required.

2. Insert lubricant tube into filler plug hole and inject lubricant until excess fluid starts to flow out of air vent screw hole, indicating that the housing is filled. (Figure 3)
3. Replace air vent screw first, then filler plug, taking special care that the washer is in place under the head of each so that water will not leak past the threads into the gear housing.

   IMPORTANT: Do not use regular automotive grease in the lower drive unit. Use only Quicksilver Gear Lubricant.

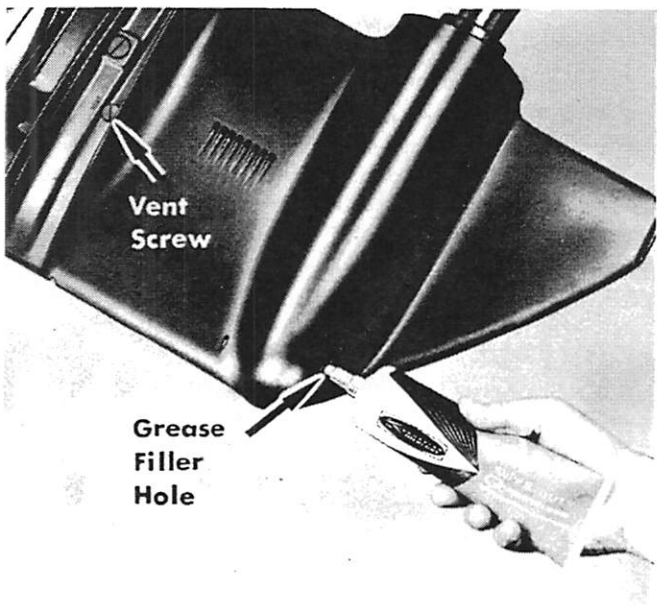

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Figure 5. Lower Drive Unit Lube

25-HOUR CHECKUP

1. Remove cowling.
2. Clean entire unit thoroughly, including all accessible powerhead parts.
3. Lubricate lower drive unit as instructed in paragraph preceding.
4. Lubricate other points as shown in following illustrations and lubrication chart.
5. Remove propeller and inspect. Trim nicks and burrs with a file, being careful not to remove more metal than absolutely necessary. Inspect for cracks, damage or bent condition. Before reinstalling propeller, lubricate propeller shaft with graphite grease or Perfect Seal (C-92-34227-1).
6. Service spark plugs as instructed in Ignition Section 3D.
7. Inspect spark plug leads and electrical leads for damage or deterioration, particularly where insulation comes in contact with metal parts. Be sure to reconnect each lead to its respective post.
8. Inspect fuel lines for damage or deterioration.
9. Inspect surfaces for damage or corrosion. Thoroughly clean damaged or corroded areas and apply matching paint.

04103

Figure 6. Swivel Pin Lubrication

10. Check entire unit for loose, damaged or missing parts. Tighten or replace as required.
11. Service fuel filter on remote tank after every 100 hours of operation or whenever performance indicates that this attention is needed, at least once a season.
12. Check controls. Be sure all connections and fittings are in good condition, properly secured and correctly adjusted. If equipped with steering handle, adjust co-pilot if necessary.
13. On other than Thunderbolt Ignition models, ignition breaker points should not be disturbed as long as engine is operating satisfactorily. If the points are cleaned and adjusted at the time of the interseason checkover, they will normally require no further attention for at least 100 hours of operation.

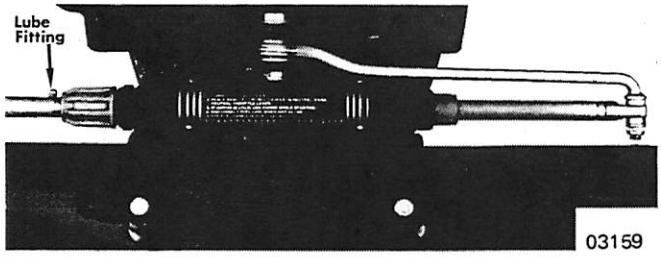


Figure 7. Ride-Guide Tube

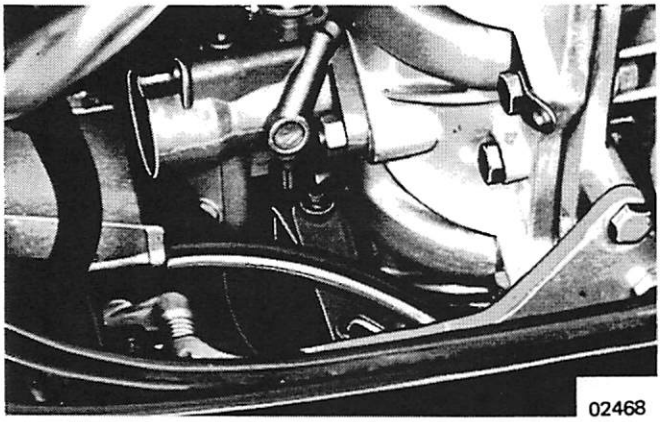


Figure 8. Throttle-Shift Linkage and Upper Shift Shaft

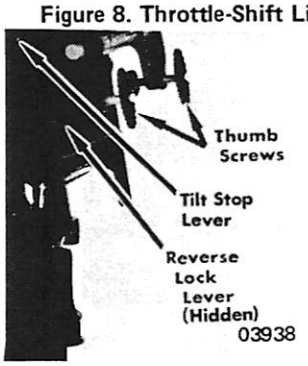


Figure 9. Reverse Lock Lever Lubrication

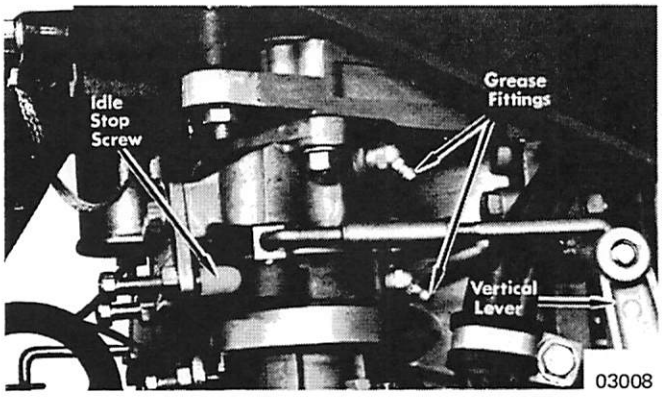


Figure 10. Distributor Adaptor Fittings

14. Check condition of starter cable.
15. Replace cowling.
16. Battery maintenance and storage – See "Electrical Systems" Section 3.

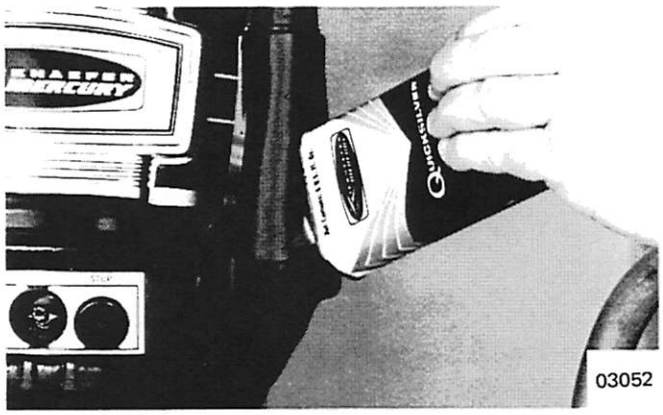


Figure 11. Control Handle Lubrication

LUBRICATION CHART

	Location	Fig. No.	Lubricant	Frequency			
				Every 30 Days	Every 60 Days	Once in Season	Twice in Season
All	Lower Drive Unit	5	Super-Duty Gear Lubricant (C-92-52650)	●			
All	Propeller Shaft Splines	–	Perfect Seal (C-92-34227-1)	●			
All	Swivel Pin§	6	Anti-Corrosion Grease (C-92-45134)	*	●		
4 and 6-Cylinder	Magneto/Distributor Adaptor	10	Multipurpose Lubricant (C-92-49588)			●	*
If Equipped	Ride-Guide Tube and Cable	7		*	●		
All	Reverse Lock Cam	--			●		
If Equipped	Ride-Guide Pivot/Ball Joint	7	Anti-Corrosion Oil (C-92-39928)	*	●		
All	Throttle/Shift Linkage	8		*	●		
All	Upper Shift Shaft	--		*	●		
All	Thumb Screws	9		*	●		
All	Reverse Lock Lever	9		*	●		
All	Tilt Stop Lever	9		*	●		
200-110-75-40	Stator Plate Clamps	--				●	*
200-110-75-40	Tiller Handle Pivot/Gears	11		*	●		
Electric Start	Starter Motor Pinion Gear	--	No. 10 Oil		*	●	
If Equipped	Power Trim Pump Oil Level	--	Formula 4 Oil (C-92-33157)		●		

*Model 1973 Merc 200-110-75-40 do not have a swivel pin grease fitting (a different type bushing is used). The hole, however, is in the swivel bracket and is plugged with a screw.** In an extremely corrosive environment, the screw can be replaced with a grease fitting. Exercise CAUTION when greasing swivel pin. DO NOT use high pressure type grease dispensers. Use hand-type dispenser only and avoid excessive pressure so that bushings will not be forced out of position.*

***Some early production 1973 Merc 110 and 75 did not have the hole drilled and tapped.*

** Units Operated in Salt Water*

SECTION I - GENERAL INFORMATION

MERCURY
OUTBOARDS

PART C - LUBRICATION

INDEX

OUTBOARD LUBRICANT and MAINTENANCE CHART

Locations ▲	Every 30 Days	Every 60 Days	Once in Season	Twice in Season
Check Lubricant Level in Lower Drive Unit	A			
Lubricate Propeller Shaft Splines	K-Each Prop Installation			
Lubricate Swivel Pin	§	C		
Lubricate Magneto/Distributor Adaptor ★			D	§
Lubricate Ride-Guide Steering Tube	§	D		
Lubricate Ride-Guide Steering Cable	§	D		
Lubricate Ride-Guide Steering Pivot/Ball Joint	§	E		
Lubricate Throttle/Shift Linkage	§	E		
Lubricate Thumb Screws	§	E		
Lubricate Upper Shift Shaft	§	E		
Lubricate Reverse Lock Lever ★	§	E		
Lubricate Reverse Locking Cams	§	C		
Lubricate Tilt Stop Lever	§	E		
Lubricate Starter Motor Pinion Gear		§	J	
Lubricate Tiller Handle Knuckle Pivot/Gears ★	§	E		
Lubricate Stator Plate Clamps			E	§
Check Lubricant Level in Power Trim Pump		*I*		
Check Condition of Battery/Terminals				●
Inspect Spark Plug Leads/All Electrical Connections			●	
Clean Fuel Filter(s)			●	
Clean Fuel Tank Filter			●	
Inspect All Fuel Lines/Connections				●
Check Entire Unit/Loose, Damaged or Missing Parts			●	
Check Condition of Spark Plugs			●	
Inspect Breaker Points			●	
Inspect Propeller for Possible Damage				●
Inspect and Clean Entire Unit/Touch-Up Paint			L-M	§

▲ - *Complete List of Maintenance Is Not Applicable to All Models.*
§ - *Units Operated in Salt Water*
★ - *Includes All Pivot Points and Sliding Surfaces, unless Stated Elsewhere*
A - Super-Duty Quicksilver Gear Lubricant (C-92-52650)
C - Anti-Corrosion Grease (C-92-45134A1)
D - Multipurpose Quicksilver Lubricant (C-92-49588)
E - Anti-Corrosion Oil (C-92-39928A1)
L - Quicksilver Marine Cleaner (C-92-32172)
M - Quicksilver Spray Paint
I - Quicksilver Formula 4 Oil (C-92-55573-24) or SAE 20-20W Specification MS
J - S.A.E. 10 Oil
K - Perfect Seal (C-92-34227-1)

QUICKSILVER ENGINE CLEANER

Quicksilver Engine Cleaner (C-92-47949-12) is a laboratory and field-tested blend of chemicals designed to purge power-robbing deposits that accumulate in gasoline engines. It eliminates costly dismantling of the engine to remove carbon deposits caused by certain types of gasolines.

Heavy carbon deposits in combustion chambers result in spark plug burning, pre-ignition and reduction of RPM.

Quicksilver Engine Cleaner is effective in removing gum, varnish and carbon from the following: Outboards, chainsaws, inboards, power lawn mowers, snowmobiles, garden tractors and other 2 and 4-cycle engines.

04947

Figure 1. Quicksilver Engine Cleaner (C-92-47949)

HOW TO USE

Run engine to normal operating temperature. Quicksilver Engine Cleaner is most effective when engine is warm. While operating engine at lowest RPM above stalling, spray a sufficient quantity of Engine Cleaner into throat of one carburetor. Allow engine to run until it is again firing on all cylinders and repeat process for other sets of carburetors. Next, flood entire engine thru carburetor(s) and allow to stand for ½-hour.

SEVERELY CARBONED ENGINES

Tilt engine in horizontal position and close as many intake and exhaust ports as possible by turning flywheel so that pistons cover ports. Spray Engine Cleaner thru spark plug holes. Allow engine to set for not more than a 6-to-8 hour period. After setting, place vertically and pull starter over several times to remove excess accumulation. Ready engine to run and repeat the regular cleaning process, as explained under "How to Use", preceding.

ADDITIONAL CLEANING BENEFITS

Mix one can of Quicksilver Engine Cleaner to one (1) gallon of fuel mixture. Run this special mixture until depleted, then follow normal application as outlined under "How to Use", preceding.

OTHER SUGGESTED USES

PENETRATING OIL

Quicksilver Engine Cleaner has a tremendous penetrating and soaking action. Frees engines which are tight from rust and corrosion caused by submersion.

PROTECTION for SUBMERGED ENGINES

Emulsifies with water and gives protective coat to parts. Remove water from engine and spray Engine Cleaner thru spark plug holes. Turn engine over several times, allowing it to drain into crankcase.

EXTERNAL CLEANER

Cleans and removes external marine growth, grease, oil and dirt deposits from engines. Spray on and allow to set for ½-hour.

QUICKSILVER STORAGE SEAL

WINTERIZING

It is good policy to clean the combustion chamber of engines with Quicksilver Engine Cleaner at time of winterizing, tuneup or (if engine has been in dealer storage) before delivery in spring. Apply Quicksilver Storage Seal (C-92-54778) for winterizing (after cleaning combustion chamber).

Figure 2. Quicksilver Storage Seal (C-92-54778)

06491

ANTI-CORROSION LUBRICANTS

ANTI-CORROSION OIL and GREASE

Quicksilver Anti-Corrosion Oil (C-92-39928A1) and Grease (C-92-45134A1) are specially processed to provide a good lubricating coat for all external moving surfaces, such as linkages, hinge pins, yokes, swivels, etc, on outboard motors, stern drive units, 4-cycle marine engines and for other 2, 3 and 4-cylinder engine applications.

DO NOT USE on ball, roller or needle bearings or steering linkage. Observe the chart, below.

Both lubricants are non-conductors on electrical connections and are suitable for high temperature and high pressure applications. The lubricant does not deteriorate, dry out or harden under adverse conditions, and it is easy to apply.

Where To Use Anti-Corrosion Oil
Throttle, Choke and Shift Linkage and Swivels
Throttle Control Shaft Sq.
Reverse Lock Cam Surfaces
Thumb Screw Threads
Reverse Lock Pivot Shaft
Exterior Nut, Ball & Screw Threads
Reverse Lock Mechanism

Where To Use Anti-Corrosion Grease
Water Pump Cartridge Between Insert & Housing
Shift Shaft Splines
Shift Shaft Coupler Splines
Tilt Tube to Swivel Bracket
Swivel Pins

LUBRICANT GUNS

Where Quicksilver Multipurpose Lubricant (C-92-49588) is to be dispensed, the Pistoluber Grease Gun (C-91-37299) and Lube Gun (C-91-30500) speed the job.

Squeeze-grip design of Pistoluber Gun permits one-hand operation. High pressure 12" (30cm) flexible hose attaches easily to grease fittings on outboards and stern drives. Multipurpose tube screws directly on lighweight gun to prevent possible contamination of lubricant.

Lube Gun facilitates application on all linkage and exterior moving surfaces on outboards, stern drives, power mowers, chain saw parts and industrial units, where all-purpose lube is specified by the manufacturer, and on boat trailer wheel bearings. Also for application on Ride-Guide cables, shafts and other moving parts of marine accessories which require external lubrication.

MARINE CLEANER

Removes dirt, grease and scum from all boat and motor surfaces, as well as from power mowers, automobile engines, and grease-marked walls, floors and shop equipment.

Quicksilver Marine Cleaner (C-92-32172) is non-flammable and leaves no ordor nor insoluble residue.

CORROSION and RUST PREVENTIVE

Protects exterior metal surfaces from corrosion and rust during use and in storage. Quicksilver Corrosion and Rust Preventive (C-92-29152) also is handy to have around home workshops.

LOWER DRIVE UNIT LUBRICATION

Lubricate the lower drive unit with Super-Duty Quicksilver Outboard Gear Lubricant (C-92-52650) as follows:

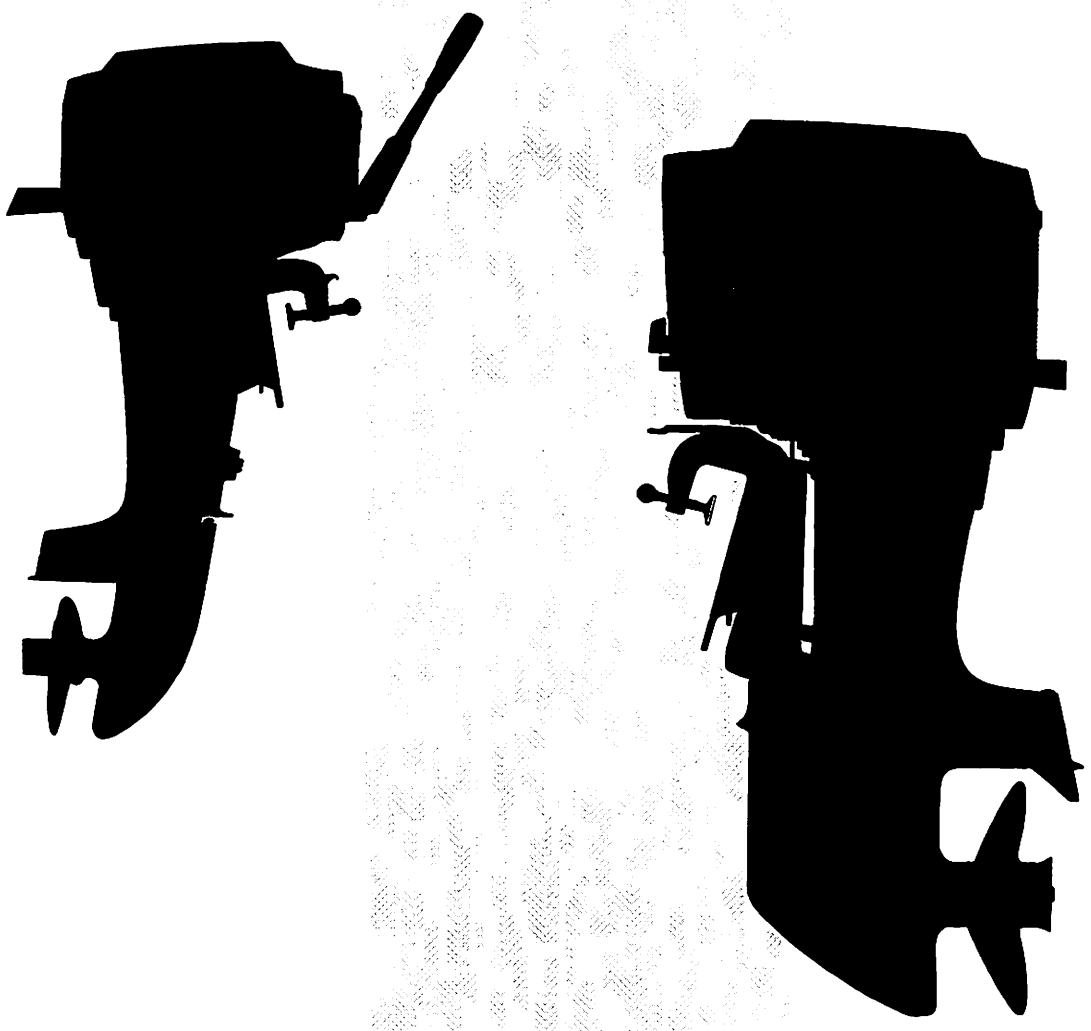
IMPORTANT: DO NOT use regular automotive grease in the lower drive unit. Use only SUPER-DUTY Quicksilver Gear Lubricant.

1. Remove lubricant filler plug and washer, located on left side of gear housing.
2. Insert lubricant tube into filler hole, then remove air vent screw and washer.

   IMPORTANT: Never apply lubricant to the lower unit without first removing air vent screw, as the injected lubricant displaces air which must be allowed to escape so that the gear housing can be completely filled.
3. Fill gear housing with lubricant until excess starts to flow out of air vent screw hole.
4. Replace air vent screw and washer.
5. Remove lubricant tube from filler hole and install filler plug and washer.

CAUTION: Only QUICKSILVER SUPER-DUTY GEAR LUBRICANT is recommended for Mercury Outboards. DO NOT USE ANY OTHER lower unit lubricant. Lower units, which are damaged from the use of a lubricant other than QUICKSILVER SUPER-DUTY GEAR LUBRICANT, will not be covered by warranty.

OUTBOARD
SECTION 2



INSTALLATION

TABLE of CONTENTS

SECTION 2 - INSTALLATION

MERCURY
OUTBOARDS

PART A - INSTALLATION

INDEX

MOTOR INSTALLATION

Installation of the motor on the transom should be given very careful attention. The clamp bracket not only must support the weight of the motor, but it is subject to thrust, impact, inertia and steering stresses. These forces are applied directly to the transom through the clamp bracket assembly.

The motor is designed for a recommended transom height. To avoid damage to transom and to prevent motor from working loose during operation, it is important that clamp (thumb) screws are tightened securely and equally. Thumb screw grips should be in (or near) a horizontal plane to allow full tilt up and turn of motor. Failure to observe this thumb screw position could result in damage to steering parts.

NOTE: Refer to "Transom Mounting Specifications", following.

CAUTION: Before operating, 4 and 6-cylinder motors must be secured to boat with 2 bolts placed through transom into slots provided at bottom of clamp bracket. Refer to instructions on red "Caution" tag attached to new motor. Upper mounting bolts must be installed if transom has an extremely hard, smooth surface – or for severe service. During operation, clamp screws should be checked occasionally for tightness on the transom. Failure to bolt motor to transom may result in damage to boat and/or loss of motor and possible injury to occupants of boat.

TILT PIN ADJUSTMENT

Holes are provided in the clamp bracket to permit changing location of tilt lock pin for proper adjustment of tilt angle. Tilt angle of motor on transom should be set so that anti-cavitation plate is about parallel with bottom of boat. Speed of boats, which have center of gravity located forward, may sometimes be improved by tilting motor out one tilt pin hole. This will tend to raise bow and reduce wetted surface. If motor is tilted in, boat will ride bow down, wetting more of the bottom and reducing speed. The preceding generally will improve operation in rough water. Under ideal conditions, efficiency is best with lower unit operating in level position, because entire thrust then is applied parallel to plane of motion. With some boats, however, and under certain unfavorable conditions of loading, there will be a tendency to ride stern high or bow high. This condition can be corrected considerably by adjusting tilt angle so that boat rides level.

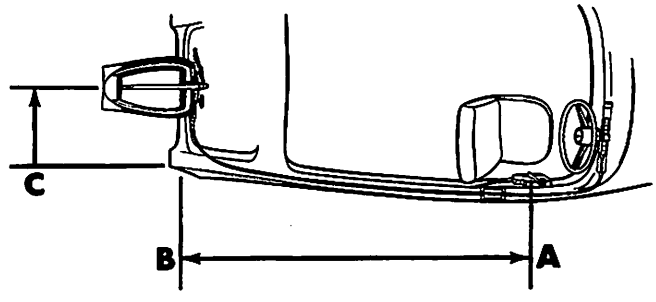
It must be considered that operation with excessive tilt will reduce performance noticeably and may induce cavitation. It is, therefore, preferable to level boat by proper loading rather than by extreme adjustment of tilt angle. Except on very rough water, if tilt angle is correctly adjusted and boat is favorably loaded, a properly designed boat will ride level and will plane without "spanking" or "bucking."

NOTE: DO NOT operate motor with tilt lock pin removed. Refer to "General Information" Section 1 for tilt pin adjustment.

REMOTE CONTROL CABLE INSTALLATION

Determine total length of cable required for remote control installation by measuring the boat from the centerline of the control box ("A" in figure, right) to the back of the boat transom ("B"), over to the center of the boat transom ("C") and add the following:

1½ ft. (45.7cm) for all full gear shift models with right side mounting, as shown in figure, right.

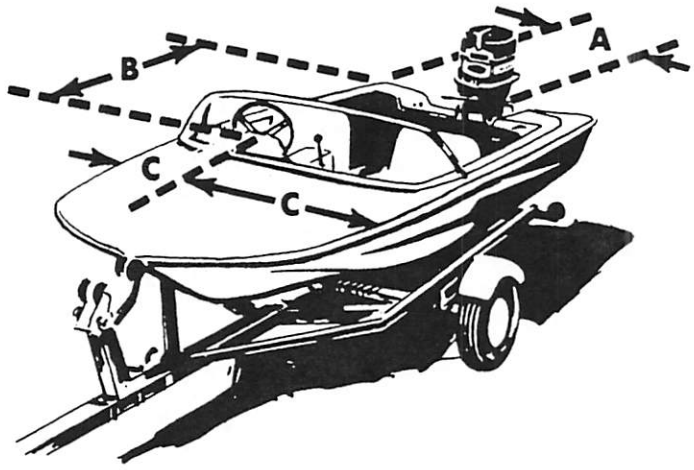


STANDARD and UNIVERSAL

RIDE-GUIDE INSTALLATION DIMENSIONS

SINGLE ENGINE INSTALLATION

1. Add boat measurements A-B-C.
   - *A = distance from Ride-Guide attachment on engine to side (inside) of boat*
   - *B = distance from inside rear of boat to dashboard*
   - *C = distance from centerline of steering wheel hub to side (inside) of boat (right hand or left hand installation)*
2. Subtract 30" for Standard Ride Guide
   39" for Universal Ride Guide.
   (This allows for 12" radii at each cable bend.)
3. Divide by 12.
4. Answer is cable assembly suffix number.



DUAL ENGINE INSTALLATION

1. Add boat measurements A-B-C.
2. Subtract 21" for Standard Ride-Guide.
   Universal Ride-Guide measurement depends upon location of mounting bracket, 1) between clamp brackets of first engine or 2) to one side of transom on which cable is attched.
   (This allows for 12" radii at each cable bend.)
3. Divide by 12.
4. Answer is cable assembly suffix number.

Ride-Guide Cables Available in Lengths 7 Ft. (2.134m) thru 40Ft. (12.192m). (Longer Cables Available on Request)

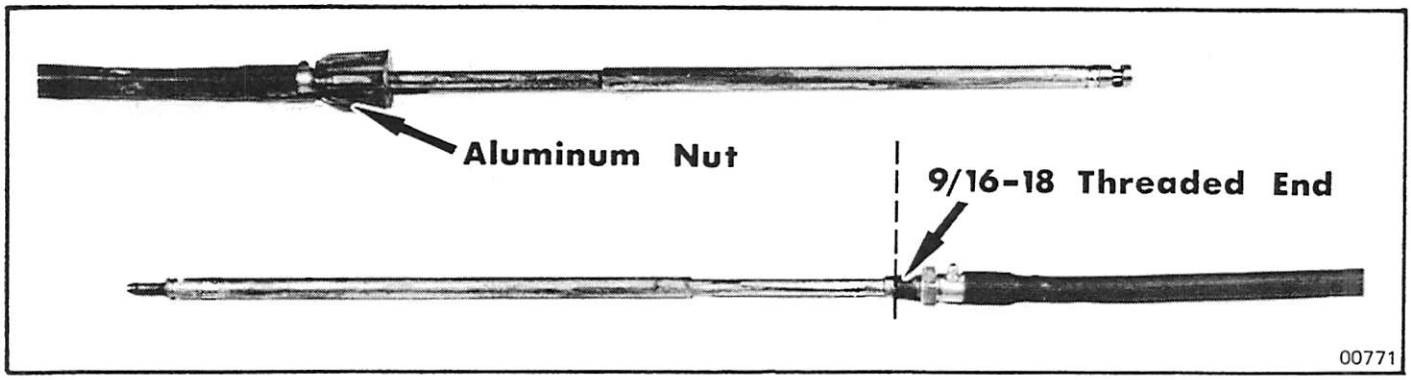
Example: A = 29"
B = 106"
C = 39"

Total 174"
Minus 30" Single Engine
Divided by 12/144"
(12)

Order A-37305A_(12)Cable

RIDE-GUIDE CABLE MEASUREMENTS

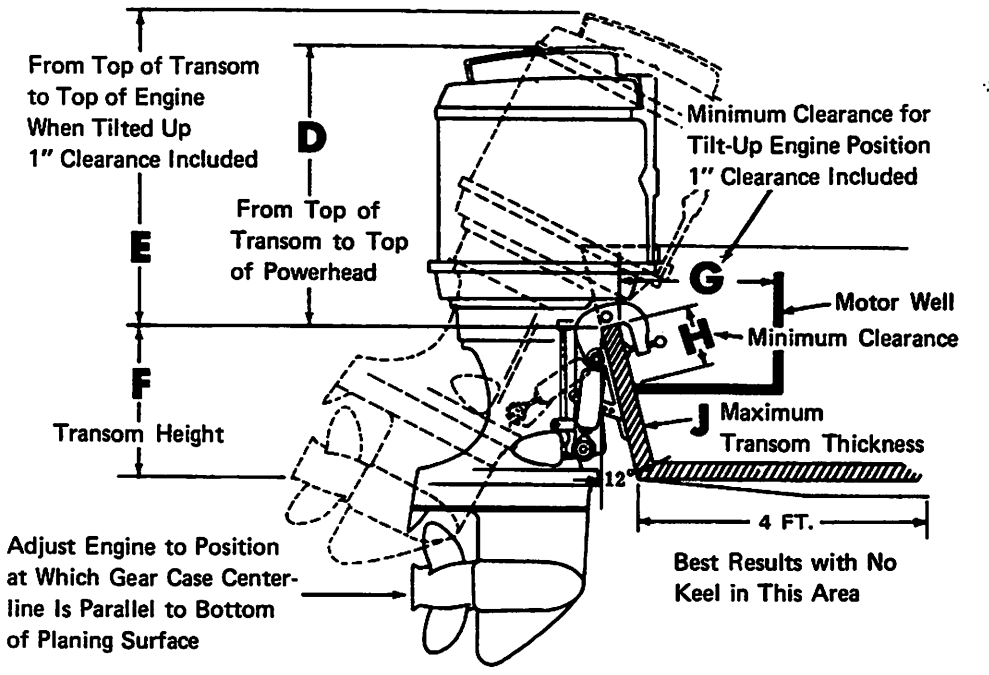
In order to clarify measurement of Ride-Guide cable, cable is measured from large aluminum nut to 9/16-18 threaded end, as shown in figure below.

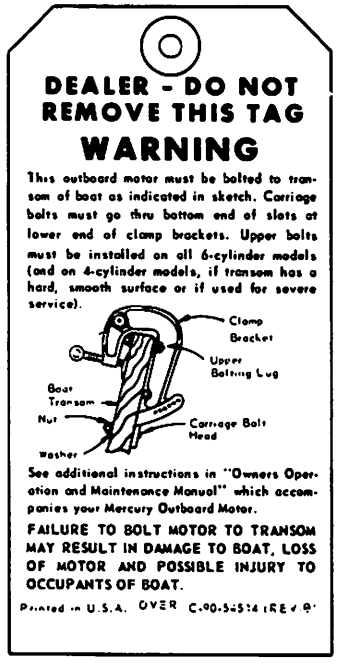


NOTE: On boats with considerable freeboard drop or unusual routing of cables, it may be necessary to add extra length to cables. Ride-Guide Cable is measured from large aluminum nut to 9/16-18 threaded end.

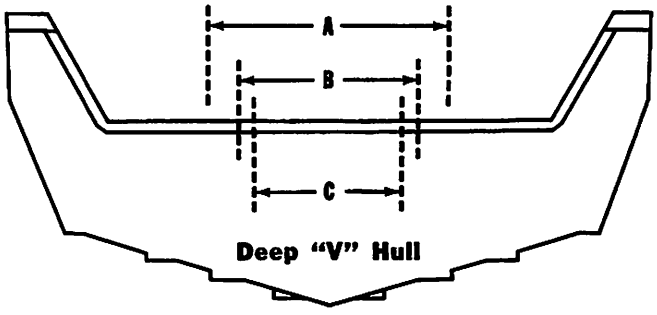
TRANSOM MOUNTING SPECIFICATIONS

(Continued on Following Page)

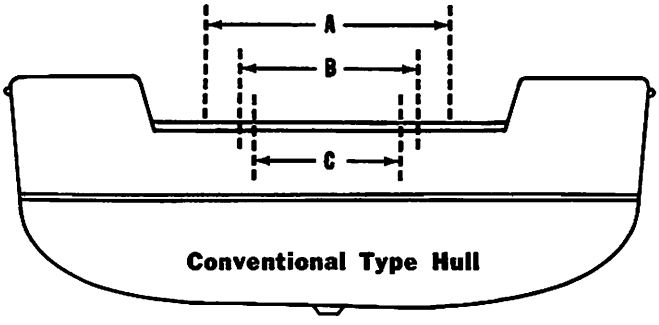




NOTE: Clamp screws should be in horizontal position after tightening.



A - Transom Opening for Dual Installation
B - Single Engine Opening
C - Engine Centerline for Dual Engine Installation



TRANSOM MOUNTING SPECIFICATIONS

Model	Min. A§	Min. B§	Min. C**	Min. D	Min. E	F* Short Shaft	F* Long Shaft	G	H***	J	Control On Boat Mount £
Merc 1500-1400-1350-1250-1150-1100-1000-(68-69)-950	33"	17"	16"	27¾	32"	15½"	20"	30"	4-3/8"	2-3/8"	R. Side
Merc 1000-900	34	17	16	27¾	32	15½	20	30	4-3/8	2-3/8	R. Side
Merc 850 (1973)-800-650(4-Cyl.) (1969 thru 72)	33	17	16	22¼	28½	15½	20	24	4-3/8	2-3/8	R. Side
Merc 650 (3-Cyl.) (1972-73)	33	17	18	18	26½	15½	20	19½	4-3/8	2-3/8	R. Side
Merc 500 (1966 thru 73)	31½	16	15½	20	25½	16½ §§	20	20½	4-3/8	2-3/8▲	R. Side
Merc 350 (2-Cyl.)-400 (1970-71)-402 (1972-73)	34	16	18	16	24	16½ §§	20●	17¾	4-3/8	2¼	R. Side
Merc 200 (1966 thru 73)	39¼	21	18¼	16¾	23-3/8	15½■	20½	19-5/8÷	4-3/8	1-7/8▲	R. Side
Merc 75 & 110-60 (1966-thru-73)	35¼	21¾	13½	14-3/8	20-1/8	15½■	20½	19-5/8÷	2-7/8	1-7/8▲	R. Side
Merc 40 & 39 (1966-thru-73)	35¼	21¾	13½	12¾	18¼	15½■	20½	18¾ ÷	2-7/8	1-7/8▲	R. Side

NOTE: Dimensions are 1/16" tolerance.

* *Best transom height for 4-or-6-cylinder engines is to locate engine's anti-cavitation plate at the boat bottom. Boats with heavy keels will require lower settings to avoid propeller cavitation. Very fast boats may benefit from higher settings.*

£ *Recommended location for mounting remote throttle-shift & steering controls on boat to balance engine torque caused by direction of propeller rotation.*

§ *Includes clearance for Power Trim where applicable.*

÷ *End of throttle-shift-steering handle.*

● *21½" for 1966 and earlier models.*

** *Variable on deep "V" hulls.*

*** *This allows sufficient clearance for Ride-Guide Steering. For rope steering, add to this figure according to type of bracket used.*

§§ *15½" for 1970-71-72-73 Merc 400 and 500 & 402*

▲ *2¼" for 1972-73*

■ *15" for 1972-73*

WARNING: Before operating, 4 and 6-cylinder motors must be secured to boat with 2 bolts placed thru transom into slots provided at bottom of clamp bracket. Refer to figure on preceding page and instructions on red "Caution" tag attached to new motor and shown on preceding page. Upper mounting bolts must be installed on all 4 and 6-cylinder models if transom has an extremely hard, smooth surface - or for severe service. During operation, clamp screws should be checked occasionally for tightness on the transom. Failure to bolt motor to transom may result in damage to boat and/or loss of motor and possible injury to occupants of boat.

SECTION 2 - INSTALLATION

MERCURY
OUTBOARDS

PART B - PROPELLER SELECTION

INDEX

PROPELLER RECOMMENDATION CHART

FIRST, select a trial propeller from chart, using approximate boat length and load if known. This usually will be the correct choice. Refer to transom height recommendation. Establish exact transom height and tilt pin setting by test. TO CHECK, make a trial run, using an accurate tachometer. It is important that the engine speed (RPM) falls within the recommended limits. The trial run should be made with a light load (one person). Under these conditions, it is desirable to have the engine speed near the top of the recommended limit so that under a heavy load, engine speed will not fall below recommendations.

If the engine speed is too high, try a higher pitch or the same pitch cupped. Likewise, if engine speed is low, try a lower pitch prop. There normally is a 300-500 RPM change between propeller pitches.

RIGHT HAND ROTATION - MARK MODELS

NOTE: For information concerning left hand rotation props, refer to "Left Hand Rotation Only", this section.

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range RPM
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Mark 15	A-48-25551A1	9½"	9"	3	Bronze	750-1200	14-16'	16"		15-25
Mark 25-20	A-48-25663A1	9¾"	11.6"	2	Bronze	400-500	11-12½'			31-34
Recommended	A-48-25419A2	9¾"	11.7"	2	Alum.	400-500	11-12½	All		31-34
Operating	A-48-25662A1	9¾"	11"	2	Bronze	450-800	12-15			25-30
RPM:	A-48-23647A1	9¾"	11"	2	Alum.	450-800	12-15	16"		25-30
5500-5800	A-48-25551A1	9½"	9"	3	Bronze	750-1200	14-16			15-25
Mark 30	A-48-25518A1	9¾"	13"	2	Bronze	Up to 650	12-14'			32-36
	A-48-25419A2	9¾"	11.7"	2	Alum.	600-850	14-16	All		27-32
Recommended	A-48-25663A1	9¾"	11.6"	2	Bronze	600-850	14-16			27-32
Operating	A-48-23647A1	9¾"	11"	2	Alum.	850-1400	15-16½			25-29
RPM:	A-48-25662A1	9¾"	11"	2	Bronze	850-1400	15-16½	16½"		25-29
5700-5900	A-48-25551A1	9½"	9"	3	Bronze	1300-1850	17-20			17-22
Mark 55*	A-48-28765A2	10¾"	15"	2	Bronze	Up to 850	12-14'		21½"	40-47
50	A-48-27028A2	10¾"	14"	2	Bronze	Up to 950	13-15		21½"	35-43
35A	A-48-23587A*	10¾"	13"	2	Bronze	Up to 800	12-14'		21½"	35-40
	A 48-29986A2	10¾"	13"	2	Alum.	Up to 800	12-14	All	21½"	35-40
	A-48-22636A*	10¾"	12"	2	Bronze	700-1100	14-16		21½"	30-35
	A-48-22914A*	10¾"	12"	2	Alum.	700-1100	14-16		21½"	30-35
	A-48-23586A*	10¾"	11"	2	Bronze	800-1300	15½-16½		21½"	28-32
	A-48-29296A2	10¾"	11"	2	Alum.	800-1300	15½-16½		21½"	28-32
	A-48-26666A*	10¾"	10"	2	Bronze	900-1800	16½-18		21½"	23-28
	A-48-29985A2	10¾"	10"	2	Alum.	900-1800	16½-18	16½"	21½"	23-28
Full Throttle	A-48-22105A*	10¾"	10"	3	Bronze	950-1800	16½-18		21½"	23-28
RPM Range:	A-48-25773A2	10¾"	9"	2	Bronze	1000-1900	18-20		21"	18-25
5200-5600	A-48-22814A*	10¾"	8"	3	Bronze	1900-3000	19-21		21"	14-21

* *Suffix for Mark 55 11-spline propeller hub is "A2"; for 14-spline, "A1" All Mark 50 are "A1"; all Mark 35A are "A2".*

\# *Gross Loads are approximate; include weight of boat, engine, fuel, passengers and gear.*

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Mark 58	A-48-28765A2	10¾"	15"	2	Bronze	Up to 750	12-14'		21½"	40-45
58A	A-48-27028A2	10¾"	14"	2	Bronze	Up to 850	12-14		21½"	36-43
55A	A-48-23587A2	10¾"	13"	2	Bronze	750-1200	13-15		21½"	31-35
	A-48-29986A2	10¾"	13"	2	Alum.	750-1200	13-15		21½"	31-35
	A-48-22636A2	10¾"	12"	2	Bronze	1000-1500	14½-16	All	21½"	27-32
	A-48-22914A2	10¾"	12"	2	Alum.	1000-1500	14½-16		21½"	27-32
	A-48-23586A2	10¾"	11"	2	Bronze	1200-1700	16-17		21½"	25-30
	A-48-29296A2	10¾"	11"	2	Alum.	1200-1700	16-17		21½"	25-30
	A-48-22105A2	10¾"	10"	3	Bronze	1500-2200	17-18		21½"	23-27
	A-48-26666A2	10¾"	10"	2	Bronze	1500-2200	17-18½	16½"	21½"	22-26
Full Throttle	A-48-29985A2	10¾"	10"	2	Alum.	1500-2200	17-18½		21½"	22-26
RPM Range:	A-48-25773A2	10¾"	9"	2	Bronze	1900-2700	18-20		21"	18-22
5200-5600	A-48-22814A2	10¾"	8	3	Bronze	2300-4000	20-23		21"	12-19
Mark 75	A-48-29016A1	12-3/8"	19"	2	Bronze	700-850	13-15½*			42-47
Direct Rev.	A-48-29017A1	13"	17"	2	Bronze	700-1000	14-16	All	All	36-43
	A-48-29018A1	13"	15"	2	Bronze	800-1600	15-17			30-36
RPM Range:	A-48-29019A1	13½"	13"	2	Bronze	1200-2100	17-19	16½"	20½"	24-30
5100-5500	A-48-29021A1	13½"	9½"	3	Bronze	2300-4000	20-24			15-22
Mark 78-78A	A-48-29014A1□	12¼"	23"	2	Bronze	650 or Less	12-13½			51-58
75A	A-48-29015A1□	12¼"	21"	2	Bronze	650 or Less	12-13½			45-52
Direct Rev.	A-48-29016A1	12-3/8"	19"	2	Bronze	650-1200	13-15½'			38-45
	A-48-29017A1	13"	17"	2	Bronze	800-1600	15½-17	All	All	33-40
	A-48-29018A1	13"	15"	2	Bronze	1100-2200	17-19			27-34
	A-48-29019A1	13½"	13"	2	Bronze	1400-2600	20-22			23-29
RPM Range:	A-48-29020A1	13½"	11"	3	Bronze	2000-3600	21-23	16½"	20½"	19-24
5100-5500	A-48-29021A1	13½"	9½"	3	Bronze	2700-5500	23-26			9-20

** *Left Hand Rotation is standard. See "Left Hand Rotation" propellers, following.*

□ *Not for Mark 75A*

\# *Gross Loads are approximate; include weight of boat, fuel, passengers and gear.*

RIGHT HAND ROTATION - MERC MODELS

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 39 RPM Range: 5000-5400	A-48-31214A1	8¼"	6"	2	Alum.	All Purpose	All Purpose	15½"	20½"	All Purp.
Merc 40 Merc 39 (1968) RPM Range: 5000-5500	A-48-47940A1	8¼"	6"	2	Alum.	All Purpose	All Purpose	15½"	20½"	All Purp.
Merc 60 Full Throttle RPM Range: 5000-5400	A-48-34398A1 A-48-31105A1 A-48-45890A1	8" 7-7/8" 8-7/8"	8" 8" 5"	2 2 3	Bronze Alum. Alum.	Up to 500 Up to 500 All Purpose	8-13 8-13 All Purpose	All 15½"	All 20½"	8-18 8-18 3-12
Merc 60 (1968) Full Throttle RPM Range: 5000-5400	A-48-47920A1 A-48-47938A1 A-48-47944A1	8" 7-7/8" 8-7/8"	8" 8" 5"	2 2 3	Bronze Alum. Alum.	Up to 500 Up to 500 All Purpose	8-13' 8-13 All Purpose	All 15½"	All 20½"	8-18 8-18 3-12
Merc 75 RPM Range: 4500-5500	A-48-47922A1 A-48-47670A1	9" 9"	9" 7"	2 3	Alum. Alum.	Up to 450 All Purpose	8-13' All Purpose	15½"	20½"	16-20 3-16
Merc 100 Full Throttle RPM Range: 5000-5400	A-48-26608A1 A-48-27787A1	9½" 9"	9½" 7½"	2 3	Alum. Alum.	400-750 600-1200	12-14' 14-16	15½" 15½"	16½" 16½"	17-26 12-19
Merc 110 (Early) Full Throttle RPM Range: 5000-5400	A-48-34400A1 A-48-31504A1 A-48-32364A1 A-48-37318A1	9" 9" 9" 9"	10" 10" 9" 7"	2 2 2 3	Bronze Alum. Alum. Alum.	Up to 750 Up to 750 600-Plus Aux. Power or Work Boat	11-14' 11-14 14-16	All 15½"	All 20½"	15-26 15-26 10-18 1-11
Merc 110 (1968-69-70-71) Full Throttle RPM Range: 4500-5500	A-48-47924A1 A-48-47926A1 A-48-47922A1 A-48-47670A1	9" 9" 9" 9"	10" 10" 9" 7"	2 2 2 3	Bronze Alum. Alum. Alum.	Up to 750 Up to 750 600-Plus Aux. Power or Work Boat	11-14' 11-14 14-16	All 15½"	All 20½"	15-26 15-26 10-18 1-10
Merc 200 FGS Full Throttle RPM Range: 4800-5500	A-48-34402A1 A-48-33480A1 A-48-33482A1 A-48-37316A1	9-7/8" 9-7/8" 9-7/8" 9-7/8"	11" 11" 9" 7"	2 2 3 3	Bronze Alum. Alum. Alum.	Up to 1000 Up to 1000 850-1600 Aux. Power or Work Boat	12-15' 12-15 15'-Plus	All 15½"	All 20½"	22-33 22-33 13-24 1-14

 # Gross Loads are approximate; include weight of boat, engine, fuel, passengers and gear.

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
	A-48-32180A1	11"	13"	2	Bronze	Up to 800	12-14'			30-37
Merc 350	A-48-32182A1	11"	13"	2	Alum.	Up to 800	12-14			30-37
	C-48-38090A1	10¾"	13"	3	Alum.	Up to 800	12-14	All	All	30-37
2-Cylinder	A-48-32184A1	11"	12"	2	Bronze	700-1200	13-15			24-31
	A-48-32186A1	11"	12"	2	Alum.	700-1200	13-15			24-31
	C-48-38094A1	10¾"	12"	3	Alum.	700-1200	13-15			24-31
	A-48-32188A1	11"	11"	2	Bronze	1000-1600	15-17			19-25
	A-48-32190A1	11"	11"	2	Alum.	1000-1600	15-17			19-25
	C-48-38098A1	10¾"	11"	3	Alum.	1000-1600	15-17			19-25
	A-48-33772A1	10¾"	10"	3	Bronze	1000-1800	17-19			16-23
	C-48-33774A1	10¾"	10"	3	Alum.	1000-1800	17-19			16-23
Full Throttle	A-48-32192A1	10¾"	9"	3	Bronze	1600-2000	18-22	16½"	21½"	11-19
RPM Range:	C-48-32194A1	10¾"	9"	3	Alum.	1600-2000	18-22			11-19
4800-5300	C-48-37314A1	11"	8"	3	Alum.	Aux. Power or Work Boat				1-12
Merc 400	A-48-56250A1	10¾"	17"	2	Bronze	Up to 750	11-13'			36-44
2-Cylinder	A-48-56230A1	10¾"	17"	2	Alum.	Up to 750	11-13'			36-44
	A-48-56252A1	10¾"	15"	2	Bronze	Up to 800	12-14			32-40
	A-48-56232A1	10¾"	15"	3	Alum.	Up to 800	12-14	All	All	32-40
	A-48-56254A1	11"	13"	2	Bronze	700-1200	13-15			29-36
	A-48-56234A1	11"	13"	2	Alum.	700-1200	13-15			29-36
	A-48-56236A1	10¾"	13"	3	Alum.	700-1200	13-15			29-36
	A-48-56256A1	11"	12"	2	Bronze	1000-1600	15-17			26-32
	A-48-56238A1	11"	12"	2	Alum.	1000-1600	15-17			26-32
	A-48-56240A1	10¾"	12"	3	Alum.	1000-1600	15-17			26-32
	A-48-56258A1	11"	11"	2	Bronze	1000-1800	15-19			22-28
	A-48-56242A1	11"	11"	2	Alum.	1000-1800	15-19			22-28
	A-48-56244A1	10¾"	11"	3	Alum.	1000-1800	15-19			22-28
Full Throttle	A-48-56260A1	10¾"	10"	3	Bronze	1600-2000	18-22	16½"	20"	15-22
RPM Range:	A-48-56246A1	10¾"	10"	3	Alum.	1600-2000	18-22			15-22
4800-5300	A-48-56262A1	10¾"	9"	3	Bronze	Aux. Power or Work Boat				To 16
	A-48-56248A1	10¾"	9"	3	Alum.	Aux. Power or Work Boat				To 16
Merc 350	A-48-28765A2	10¾"	15"	2	Bronze	Up to 850	12-14'		21½"	40-47
Merc 300	A-48-27028A2	10¾"	14"	2	Bronze	Up to 950	13-15		21½"	35-43
	A-48-23587A2	10¾"	13	2	Bronze	Up to 800	12-14		21½"	35-40
4-Cylinder	A-48-29986A2	10¾"	13"	2	Alum.	Up to 800	12-14	All	21½"	35-40
	A-48-22636A2	10¾"	12"	2	Bronze	700-1100	14-16		21½"	30-35
	A-48-22914A2	10¾"	12"	2	Alum.	700-1100	14-16		21½"	30-35
	A-48-23586A2	10¾"	11"	2	Bronze	800-1300	15½-16½		21½"	28-32
	A-48-29296A2	10¾"	11"	2	Alum.	800-1300	15½-16½		21½"	28-32
	A-48-26666A2	10¾"	10"	2	Bronze	900-1800	16½-18		21½"	23-28
	A-48-29985A2	10¾"	10"	2	Alum.	900-1800	16½-18	16½"	21½"	23-28
Full Throttle	A-48-22105A2	10¾"	10"	3	Bronze	950-1800	16½-18		21½"	23-28
RPM Range:	A-48-25773A2	10¾"	9"	2	Bronze	1000-1900	18-20		21"	18-25
5200-5600	A-48-22814A2	10¾"	8"	3	Bronze	1900-3000	19-21		21"	14-21

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load*	Approx. Boat Length	Transom Height		Speed Range RPM
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
	A-48-28765A2	10¾"	15"	2	Bronze	Up to 750	12-14'		21½"	40-45
Merc 400	A-48-27028A2	10¾"	14"	2	Bronze	Up to 850	12-14		21½"	36-43
4-Cylinder	A-48-23587A2	10¾"	13"	2	Bronze	750-1200	13-15		21½"	31-35
	A-48-29986A2	10¾"	13"	2	Alum.	750-1200	13-15	All	21½"	31-35
	A-48-22636A2	10¾"	12"	2	Bronze	1000-1500	14½-16		21½"	27-32
	A-48-22914A2	10¾"	12"	2	Alum.	1000-1500	14½-16		21½"	27-32
	A-48-23586A2	10¾"	11"	2	Bronze	1200-1700	16-17		21½"	25-30
	A-48-29296A2	10¾"	11"	2	Alum.	1200-1700	16-17		21½"	25-30
	A-48-22105A2	10¾"	10"	3	Bronze	1500-2200	17-18	16½"	21½"	23-27
	A-48-26666A2	10¾"	10"	2	Bronze	1500-2200	17-18½		21½"	22-26
Full Throttle	A-48-29985A2	10¾"	10"	2	Alum.	1500-2200	17-18½		21½"	22-26
RPM Range:	A-48-25773A2	10¾"	9"	2	Bronze	1900-2700	18-20		21"	18-22
5200-5600	A-48-22814A2	10¾"	8"	3	Bronze	2300-4000	20-23		21"	12-19
	A-48-28765A2	10¾"	15"	2	Bronze	Up to 850	12-14'		21½"	40-47
Merc 500	A-48-27028A2	10¾"	14"	2	Bronze	Up to 950	13-15		21½"	35-43
	A-48-23587A2	10¾"	13"	2	Bronze	900-1300	14-16		21½"	31-39
	A-48-29986A2	10¾"	13"	2	Alum.	900-1300	14-16	All	21½"	31-39
	A-48-22636A2	10¾"	12	2	Bronze	1100-1500	15-17		21½"	28-35
	A-48-22914A2	10¾"	12	2	Alum.	1100-1500	15-17		21½"	28-35
	A-48-23586A2	10¾"	11"	2	Bronze	1300-1800	16½-19		21½"	24-30
	A-48-29296A2	10¾"	11"	2	Alum.	1300-1800	16½-19		21½"	24-30
	A-48-22105A2	10¾"	10"	3	Bronze	1600-2200	18-20		21½"	22-28
Full Throttle	A-48-26666A2	10¾"	10"	2	Bronze	1700-2400	19-21	16½"	21½"	19-26
RPM Range:	A-48-29985A2	10¾"	10"	2	Alum.	1700-2400	19-21		21½"	19-26
5200-5600	A-48-25773A2	10¾"	9"	2	Bronze	2000-2700	20'-Plus		21"	13-21
	A-48-22814A2	10¾"	8"	3	Bronze	2500-4000	Work Boat		21"	5-13
Merc 500	A-48-56228A1	10¾"	19"	3	Alum.	Up to 850	12-14'			38-45
(1970-71)	A-48-56250A1	10¾"	17"	2	Bronze	Up to 950	12-15			33-40
	A-48-56230A1	10¾"	17"	3	Alum.	Up to 950	12-15			33-40
	A-48-56252A1	10¾"	15"	2	Bronze	700-1200	14-16			28-35
	A-48-56232A1	10¾"	15"	3	Alum.	700-1200	14-16			28-35
	A-48-56254A1	11"	13"	2	Bronze	800-1300	13-15			26-30
	A-48-56234A1	11"	13"	2	Alum.	800-1300	13-15	All	All	26-30
	A-48-56236A1	10¾"	13"	3	Alum.	800-1300	13-15			26-30
	A-48-56256A1	11"	12"	2	Bronze	1000-1700	13-17			23-28
	A-48-56238A1	11"	12"	2	Alum.	1000-1700	13-17			23-28
	A-48-56240A1	10¾"	12"	3	Alum.	1000-1700	13-17			23-28
	A-48-56258A1	11"	11"	2	Bronze	1100-2000	14-18	15½"	20"	20-25
	A-48-56242A1	11"	11"	2	Alum.	1100-2000	14-18			20-25
	A-48-56244A1	10¾"	11"	3	Alum.	1100-2000	14-18			20-25
	A-48-56260A1	10¾"	10"	3	Bronze	1600-2200	16-20			18-23
	A-48-56246A1	10¾"	10"	3	Alum.	1600-2200	16-20			18-23
	A-48-56262A1	10¾"	9"	3	Bronze	Aux. Power or Work Boat				0-18
	A-48-56248A1	10¾"	9"	3	Alum.	Aux. Power or Work Boat				0-18

** Gross Loads are approximate; include weight of boat, fuel, passengers and gear.*

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range RPM
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 500SS	A-48-32176A1	10¾"	17"	2	Bronze	Up to 850	12-14'			45-52
500	C-48-38086A1	10¾"	15"	3	Alum.	Up to 950	12-15			40-44
450	A-48-32178A1	10¾"	15"	2	Bronze	Up to 950	12-15			40-44
	C-48-38090A1	10¾"	13"	3	Alum.	700-1300	14-16	All	All	34-38
Jet Prop	A-48-32180A1	11"	13"	2	Bronze	700-1300	14-16			34-38
	A-48-32182A1	11"	13"	2	Alum.	700-1300	14-16			34-38
	C-48-38094A1	10¾"	12"	3	Alum.	950-1500	15-17			30-35
	A-48-32184A1	11"	12"	2	Bronze	950-1500	15-17			30-35
	A-48-32186A1	11"	12"	2	Alum.	950-1500	15-17			30-35
	C-48-38098A1	10¾"	11"	3	Alum.	1000-1800	16½-19			26-30
	A-48-32188A1	11"	11"	2	Bronze	1000-1800	16½-19			26-30
	A-48-32190A1	11"	11"	2	Alum.	1000-1800	16½-19			26-30
	A-48-33772A1	10¾"	10"	3	Bronze	1600-2200	18-22			18-28
	C-48-33774A1	10¾"	10"	3	Alum.	1600-2200	18-22	16½"	21½"	18-28
Full Throttle	A-48-32192A1	10¾"	9"	3	Bronze	2000-Plus	22'-Plus			8-20
RPM Range:	C-48-32194A1	10¾"	9"	3	Alum.	2000-Plus	22'-Plus			8-20
5200-5600	C-48-37314A1	11"	8"	3	Alum.	Aux. Power or Work Boat				1-10
Merc 600	A-48-29016A1	12-3/8"	19"	2	Bronze	650-1200	13-15½'			38-45
Direct Rev.	A-48-29017A1	13"	17"	2	Bronze	800-1600	15½-17	All	All	33-40
	A-48-29018A1	13"	15"	2	Bronze	1100-2200	17-19			27-34
	A-48-29019A1	13½"	13"	2	Bronze	1400-2600	20-22	16½"	20½"	23-29
RPM Range:	A-48-29020A1	13½"	11"	3	Bronze	2000-3600	21-23			19-24
5100-5500	A-48-29021A1	13½"	9½"	3	Bronze	2700-5500	23-26			9-20
Merc 700	A-48-29652A2	12¼"	23"	2	Bronze	650 or Less	12-13½'			51-58
Direct	A-48-29654A2	12¼"	21"	2	Bronze	650 or Less	12-13½			45-52
Reversing**	A-48-29656A2	12½"	19"	2	Bronze	650-1200	13-15½	All	All	38-45
	A-48-29658A2	13"	17"	2	Bronze	800-1600	15½-17			33-40
Full Throttle	A-48-29660A2	13"	15"	2	Bronze	1100-2200	17-19			27-34
RPM Range:	A-48-29662A2	13½"	13"	2	Bronze	1400-2600	20-22	16½"	20½"	23-29
5100-5500	C-48-30398A3	14"	9½"	3	Bronze	2700-5500	23-26			9-20
	C-48-31450A3	13¾"	23"	2	Bronze	Up to 1000	Up to 16'			48-56
Merc 650SS	A-48-29654A2	12¼"	21"	2	Bronze	Up to 1000	Up to 16			43-51
650	A-48-29656A2	12½"	19"	2	Bronze	900-1300	Up to 17			38-46
700	A-48-29658A2	13"	17"	2	Bronze	1000-1800	15-17	All	All	33-40
Gear Shift	A-48-31072A2	13"	17"	2	Alum.	1000-1800	15-17			33-40
	A-48-37902A2	12"	17"	3	Alum.	1000-1800	15-17			33-40
	A-48-29660A2	13"	15"	2	Bronze	1200-2000	15-18			27-34
	A-48-31074A2	13"	15"	2	Alum.	1200-2000	15-18			27-34
	A-48-37900A2	12½"	15"	3	Alum.	1200-2000	15-18			27-34
	A-48-29662A2	13½"	13"	2	Bronze	1800-2600	18-22			23-29
	A-48-31076A2	13½"	13"	2	Alum.	1800-2600	18-22			23-29
Full Throttle	A-48-37898A2	13"	13"	3	Alum.	1800-2600	18-22			23-29
RPM Range:	C-48-30396A3	14"	11"	3	Bronze	2200-3500	21-24			19-26
Merc 650:	C-48-35936A3	14"	11"	3	Alum.	2200-3500	21-24	15½"	20"	19-26
4800-5300	C-48-30398A3	14"	9½"	3	Bronze	3300-Plus	Houseboat			9-20
Merc 700:	C-48-33242A3	14"	9½"	3	Alum.	3300-Plus	Houseboat			9-20
5100-5500	C-48-30400A3	14"	8½"	3	Bronze	7000-Plus	Work Boat			1-10

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

*** Left Hand Rotation is standard. See "Left Hand Rotation" propellers, following. Transom height for Merc 700 Direct Reversing model is higher than for gear shift models.*

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 650	A-48-49614A4●	13"	24"	2	Bronze	Up to 1000	Up to 15'			43-50
(1970-71)	C-48-31450A3	13¾"	23"	2	Bronze	Up to 1000	Up to 16			39-45
	C-48-32386A3	13¾"	23"	2	Alum.	Up to 1000	Up to 16			39-45
	A-48-49612A4●	13"	22"	2	Bronze	Up to 1000	Up to 17			40-46
	C-48-49630A3	13¾"	21"	2	Bronze	900-1300	15-17			35-41
	C-48-49632A3	13¾"	21"	2	Alum.	900-1300	15-17			35-41
	C-48-32744A3	13"	21"	3	Bronze	900-1300	15-17			35-41
	C-48-32746A3	13"	21"	3	Alum.	900-1300	15-17			35-41
	A-48-49610A4●	13"	20"	2	Bronze	900-1300	15-17	All	All	36-42
	C-48-32748A3	13"	19"	3	Bronze	1000-1800	16-19			31-37
	C-48-32750A3	13"	19"	3	Alum.	1000-1800	16-19			31-37
	C-48-31458A3	13"	17"	3	Bronze	1200-2000	18-21	15½"	20"	26-33
	C-48-32264A4	13"	17"	3	Alum.	1200-2000	18-21			26-33
	C-48-31460A3	14"	15"	3	Bronze	1800-2600	19-22			21-28
	C-48-32390A3	14"	15"	3	Alum.	1800-2600	19-22			21-28
	C-48-30394A3	13½"	13"	3	Bronze	2000-3000	20-23			16-23
	C-48-32392A3	13½"	13"	3	Alum.	2000-3000	20-23			16-23
	C-48-30396A3	14"	11"	3	Bronze	2200-3500	21-24			11-18
Full Throttle	C-48-35936A3	14"	11"	3	Alum.	2200-3500	21-24			11-18
RPM Range:	C-48-30398A3	14"	9½"	3	Bronze	3300-Plus	Houseboat			2-13
4800-5300	C-48-33242A3	14"	9½"	3	Alum.	3300-Plus	Houseboat			2-13
Merc 800	C-48-31448A3	13½"	25"	2	Bronze	950	Up to 15'			55-60
	C-48-31450A3	13¾"	23"	2	Bronze	950	Up to 15			48-55
	A-48-30386A1	13½"	21"	2	Bronze	1000	Up to 16	All	All	43-50
Direct	A-48-30388A1	13¼"	19"	2	Bronze	800-1400	15½-17			38-45
Reversing**	A-48-30392A1	13½"	15"	2	Bronze	1500-2400	17-19			28-35
	C-48-30394A3	13½"	13"	3	Bronze	1800-2800	19-21			24-30
Full Throttle	C-48-30396A3	14"	11"	3	Bronze	2000-3600	21-23			19-24
RPM Range:	C-48-30398A3§	14"	9½"	3	Bronze	2400-6000	23-26	16½"	20½"	14-20
4800-5200	C-48-30400A3§	14"	8½"	3	Bronze	6000-Plus	Houseboat			1-16
Merc 800	A-48-52010A3	13"	25"	3	Bronze	950	Up to 15'			42-49
(1970)	A-48-52012A3	13"	25"	3	Alum.	950	Up to 15			42-49
	C-48-31448A3	13½"	25"	2	Bronze	950	Up to 15			42-49
	A-48-52006A3	13"	23"	3	Bronze	1000	Up to 16			36-44
	A-48-52008A3	13"	23"	3	Alum.	1000	Up to 16			36-44
	C-48-31450A3	13¾"	23"	2	Bronze	1000	Up to 16			36-44
	C-48-32386A3	13¾"	23"	2	Alum.	1000	Up to 16			36-44
	C-48-31452A3	13¾"	21"	2	Bronze	800-1400	15-17			33-38
Gear Shift	C-48-31454A3	13¾"	21"	2	Alum.	800-1400	15-17			33-38
	A-48-53894A3	13¾"	21"	3	Bronze	800-1400	15-17			33-38
	A-48-53892A3	13¾"	21"	3	Alum.	800-1400	15-17	All	All	33-38
	C-48-31456A3	13¾"	19"	2	Bronze	1000-1800	16-18			30-35
	C-48-32388A3	13¾"	19"	2	Alum.	1000-1800	16-18			30-35
	A-48-53898A3	13¾"	19"	3	Bronze	1000-1800	16-18			30-35
	A-48-53896A3	13¾"	19"	3	Alum.	1000-1800	16-18	15½"	20"	30-35
	A-48-53902A3	14"	17"	3	Bronze	1500-2400	17-19			27-32
	A-48-53900A3	14"	17"	3	Alum.	1500-2400	17-19			27-32

** *Left Hand Rotation is standard. See "Left Hand Rotation" propellers, following. Transom height for Merc 800 Direct Reversing model is higher than for gear shift models.*

\# *Gross Loads are approximate; include weight of boat, fuel, passengers and gear.*

● *Hi-Performance Quicksilver Propeller* § *For special applications only*

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range RPM
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
	C-48-31460A3	14"	15"	3	Bronze	1800-2800	19-21			22-29
	C-48-32390A3	14"	15"	3	Alum.	1800-2800	19-21	All	All	22-29
	C-48-30394A3	13½"	13"	3	Bronze	2000-3600	21-23			18-24
	C-48-32392A3	13½"	13"	3	Alum.	2000-3600	21-23			18-24
Full Throttle	C-48-30396A3	14"	11"	3	Bronze	2400-6000	Houseboat			13-20
RPM Range:	C-48-35936A3	14"	11"	3	Alum.	2400-6000	Houseboat			13-20
4800-5300	C-48-30398A3	14"	9½"	2	Bronze	6000-Plus	Work Boat	15½"	20"	1-15
	C-48-33242A3	14"	9½"	3	Alum.	6000-Plus	Work Boat			1-15
Merc 800	C-48-59138A4	14"	26"	2	Bronze	Up to 1000	Up to 16			48-55
(1971)	A-48-49616A4	13"	26"	2	Bronze	Up to 1000	Up to 16			48-55
	A-48-52010A3	13"	25"	3	Bronze	Up to 950	Up to 15			42-49
	A-48-52012A3	13"	25"	3	Alum.	Up to 950	Up to 15			42-49
	A-48-55458A4	14"	24"	2	Bronze	Up to 1200	Up to 17			44-51
	A-48-49614A4	13"	24"	2	Bronze	Up to 950	Up to 15			44-51
	C-48-31450A3	13¾"	23"	2	Bronze	Up to 1000	Up to 16			36-44
	C-48-32386A3	13¾"	23"	2	Alum.	Up to 1000	Up to 16			36-44
	A-48-52006A3	13"	23"	3	Bronze	Up to 1000	Up to 16			36-44
	A-48-52008A3	13"	23"	3	Alum.	Up to 1000	Up to 16			36-44
Gear Shift	A-48-55456A4	14"	22"	2	Bronze	Up to 1400	Up to 18			38-46
	A-48-49612A4	13"	22"	2	Bronze	Up to 1000	Up to 16	All	All	38-46
	C-48-49630A3	13¾"	21"	2	Bronze	1000-1800	15-17			34-42
	C-48-49632A3	13¾"	21"	2	Alum.	1000-1800	15-17			34-42
	C-48-32744A3	13"	21"	3	Bronze	1000-1800	15-17			34-42
	C-48-32746A3	13"	21"	3	Alum.	1000-1800	15-17			34-42
	C-48-59136A4	14"	20"	2	Bronze	1200-2000	16-19			47-54
	A-48-49610A4	13"	20"	2	Bronze	1000-1800	15-17			35-40
	C-48-31456A3	13¾"	19"	2	Bronze	1600-2200	16-18			32-36
	C-48-32388A3	13¾"	19"	2	Alum.	1600-2200	16-18	15½"	20"	32-36
	C-48-32750A3	13"	19"	3	Alum.	1600-2200	16-18			32-36
	C-48-31458A3	13"	17"	3	Bronze	1900-2600	17-19			28-34
	C-48-32264A3	13"	17"	3	Alum.	1900-2600	17-19			28-34
	C-48-31460A3	14"	15"	3	Bronze	2000-2800	19-21			24-29
	C-48-32390A3	14"	15"	3	Alum.	2000-2800	19-21			24-29
	C-48-30394A3	13½"	13"	3	Bronze	2000-3600	21-23			18-24
	C-48-58826A3	14"	13"	3	Alum.	2000-3600	21-23			18-24
Full Throttle	C-48-30396A3	14"	11"	3	Bronze	2400-6000	Houseboat			13-20
RPM Range:	C-48-35936A3	14"	11"	3	Alum.	2400-6000	Houseboat			13-20
4800-5300	C-48-30398A3	14"	9½"	3	Bronze	6000-Plus	Work Boat			1-15
	C-48-33242A3	14"	9½"	3	Alum.	6000-Plus	Work Boat			1-15
Merc 850	A-48-31448A3	13½"	25"	2	Bronze	950	Up to 15'			55-60
76 Cu. In.	C-48-31450A3	13¾"	23"	2	Bronze	950	Up to 15			48-55
(1246cc)	A-48-30386A1	13½"	21"	2	Bronze	1000	Up to 16	All	All	43-50
and Merc 800	A-48-30388A1	13¼"	19"	2	Bronze	800-1400	15½-17			38-45
	A-48-31080A1	13¼"	19"	2	Alum.	800-1400	15½-17			38-45
	C-48-32264A3	13"	17"	3	Alum.	1000-1800	16-18			34-40
	A-48-30392A1	13½"	15"	2	Bronze	1500-2400	17-19	15½"	20"	28-35
Gear Shift	C-48-30394A3	13½"	13"	3	Bronze	1800-2800	19-21			24-30
	C-48-32392A3	13½"	13"	3	Alum.	1800-2800	19-21			24-30

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range RPM
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
	C-48-30396A3	14"	11"	3	Bronze	2000-3600	21-23			19-24
	C-48-35936A3	14"	11"	3	Alum.	2000-3600	21-23	All	All	19-24
Full Throttle	C-48-30398A3§	14"	9½"	3	Bronze	2400-6000	23-26			14-20
RPM Range:	C-48-33242A3§	14"	9½"	3	Alum.	2400-6000	23-26	15½"	20"	14-20
4800-5200	C-48-30400A3§	14"	8½"	3	Bronze	6000-Plus	Houseboat			1-16
Merc 950SS-950	C-48-31450A3	13¾"	23"	2	Bronze	1000	Up to 16'			45-56
900-850	C-48-32386A3	13¾"	23"	2	Alum.	1000	Up to 16			45-56
(90 Cu. In.)	C-48-32744A3	13"	21"	3	Bronze	900-1500	Up to 17			40-47
(1,475cc)	A-48-31452A3	13¾"	21"	2	Bronze	900-1500	Up to 17			40-47
	C-48-32746A3	13"	21"	3	Alum.	900-1500	Up to 17			40-47
	A-48-31454A3	13¾"	21"	2	Alum.	900-1500	Up to 17	All	All	40-47
	C-48-32748A3	13"	19"	3	Bronze	1100-1800	16-18			35-42
	A-48-31456A3	13¾"	19"	2	Bronze	1100-1800	16-18			35-42
	C-48-32750A3	13"	19"	3	Alum.	1100-1800	16-18			35-42
	A-48-32388A3	13¾"	19"	2	Alum.	1100-1800	16-18			35-42
Gear Shift	C-48-31458A3	13"	17"	3	Bronze	1400-2200	17-20			30-37
	C-48-32264A3	13"	17"	3	Alum.	1400-2200	17-20			30-37
	C-48-31460A3	14"	15"	3	Bronze	1800-2600	19-22			25-32
	C-48-32390A3	14"	15"	3	Alum.	1800-2600	19-22			25-32
	C-48-30394A3	13½"	13"	3	Bronze	2200-3500	21-24			17-27
	C-48-32392A3	13½"	13"	3	Alum.	2200-3500	21-24	15½"	20"	17-27
	C-48-30396A3	14"	11"	3	Bronze	3500-Plus	Houseboat			12-18
	C-48-35936A3	14"	11"	3	Alum.	3500-Plus	Houseboat			12-18
Full Throttle	C-48-30398A3§	14"	9½"	3	Bronze	6000-Plus	Work Boat			1-13
RPM Range:	C-48-33242A3§	14"	9½"	3	Alum.	6000-Plus	Work Boat			1-13
4800-5200	C-48-30400A3	14"	8½"	3	Bronze	12000-Plus	Work Boat			1-8
Merc 1000SS	A-48-49614A4	13"	24"	2	Bronze	1000	Up to 16'			49-62
(1968-69)	C-48-31450A3	13¾"	23"	2	Bronze	1000	Up to 16			43-50
	C-48-32386A3	13¾"	23"	2	Alum.	1000	Up to 16			43-50
	A-48-49612A4	13"	21"	2	Bronze	1000	Up to 16			45-52
	C-48-32744A3	13"	21"	3	Bronze	900-1500	Up to 17	All	All	40-47
	A-48-31452A3	13¾"	21"	2	Bronze	900-1500	Up to 17			40-47
	C-48-32746A3	13"	21"	3	Alum.	900-1500	Up to 17			40-47
	A-48-31454A3	13¾"	21"	2	Alum.	900-1500	Up to 17			40-47
	C-48-49630A3	13¾"	21"	2	Bronze	900-1500	Up to 17			40-47
	A-48-49632A3	13¾"	21"	2	Alum.	900-1500	Up to 17			40-47
	A-48-49610A4	13"	20"	2	Bronze	900-1500	Up to 17			42-49
	C-48-32748A3	13"	19"	3	Bronze	1100-1800	16-18			35-42
	A-48-31456A3	13¾"	19"	2	Bronze	1100-1800	16-18			35-42
	C-48-32750A3	13"	19"	3	Alum.	1100-1800	16-18			35-42
	C-48-32388A3	13¾"	19"	2	Alum.	1100-1800	16-18			35-42
Gear Shift	C-48-31458A3	13"	17"	3	Bronze	1400-2200	17-20			30-37
	C-48-32264A3	13"	17"	3	Alum.	1400-2200	17-20	15½"	20"	30-37
	C-48-31460A3	14"	15"	3	Bronze	1800-2600	19-22			25-32
	C-48-32390A3	14"	15"	3	Alum.	1800-2600	19-22			25-32
	C-48-30394A3	13½"	13"	3	Bronze	2200-3500	21-24			17-27
	C-48-32392A3	13½"	13"	3	Alum.	2200-3500	21-24			17-27

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

§ For special applications only

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
	C-48-30396A3	14"	11"	3	Bronze	3500-Plus	Houseboat	All	All	12-18
Full Throttle	C-48-35936A3	14"	11"	3	Alum.	3500-Plus	Houseboat			12-18
RPM Range:	C-48-30398A3§	14"	9½"	3	Bronze	6000-Plus	Work Boat			4-13
4800-5300	C-48-33242A3§	14"	9½"	3	Alum.	6000-Plus	Work Boat	15½"	20"	4-13
Merc 1100SS-	C-48-31448A3	13½"	25"	2	Bronze	1000	Up to 16'			47-60
1100	C-48-31450A3	13¾"	23"	2	Bronze	1200	Up to 17			43-50
(93.5 Cu. In.)	C-48-32386A3	13¾"	23"	2	Alum.	1200	Up to 17			43-50
(1532cc)	A-48-31452A3	13¾"	21"	2	Bronze	1100-1800	16-18			38-45
	A-48-31454A3	13¾"	21"	2	Alum.	1100-1800	16-18			38-45
Merc 1000	C-48-32744A3	13"	21"	3	Bronze	1100-1800	16-18	All	All	38-45
(90 Cu. In.)	C-48-32746A3	13"	21"	3	Alum.	1100-1800	16-18			38-45
(1475cc)	A-48-31456A3	13¾"	19"	2	Bronze	1400-2300	17-20			33-40
	A-48-32388A3	13¾"	19"	2	Alum.	1400-2300	17-20			33-40
	C-48-32748A3	13"	19"	3	Bronze	1400-2300	17-20			33-40
	C-48-32750A3	13"	19"	3	Alum.	1400-2300	17-20			33-40
	C-48-31458A3	13"	17"	3	Bronze	1800-2600	19-22	15½"	20"	28-35
	C-48-32264A3	13"	17"	3	Alum.	1800-2600	19-22			28-35
Gear Shift	C-48-31460A3	14"	15"	3	Bronze	2200-3000	21-24			23-30
	C-48-32390A3	14"	15"	3	Alum.	2200-3000	21-24			23-30
	C-48-30394A3	13½"	13"	3	Bronze	2800-4200	23-27			16-25
	C-48-32392A3	13½"	13"	3	Alum.	2800-4200	23-27			16-25
	C-48-30394A3	14"	11"	3	Bronze	4000-Plus	Houseboat			11-17
Full Throttle	C-48-35936A3	14"	11"	3	Alum.	4000-Plus	Houseboat			11-17
RPM Range:	C-48-30398A3§	14"	9½"	3	Bronze	12000-Plus	Work Boat			1-12
4800-5200	C-48-33242A3§	14"	9½"	3	Alum.	12000-Plus	Work Boat			1-12
	C-48-30400A3	14"	8½"	3	Bronze	12000-Plus	Work Boat			1-8
Merc 1150	□C-48-59138A4	14"	26"	2	Bronze	1000	Up to 16			60-68
(1970)	□C-48-49616A4	13"	26"	2	Bronze	1000	Up to 16			60-68
	□C-48-52010A3	13"	25"	3	Bronze	1200	Up to 17			53-63
	□C-48-55458A4	14"	24"	2	Bronze	1200	Up to 17	All	All	55-63
	A-48-49614A4●	13"	24"	2	Bronze	Up to 1100	Up to 16'			51-63
	C-48-31450A3	13¾"	23"	2	Bronze	Up to 1100	Up to 17			49-57
* 1970 Only	C-48-32386A3	13¾"	23"	2	Alum.	Up to 1100	Up to 17			49-57
□ 1971 Only	□C-48-52006A3	13"	23"	3	Bronze	1400	Up to 18			50-58
	□C-48-55456A4	14"	22"	2	Bronze	1400	Up to 18			52-60
	A-48-49612A4●	13"	22"	2	Bronze	Up to 1100	Up to 17			52-60
	C-48-49630A3	13¾"	21"	2	Bronze	1100-1700	Up to 18			44-51
	C-48-49632A3	13¾"	21"	2	Alum.	1100-1700	Up to 18			44-51
	C-48-32744A3	13"	21"	3	Bronze	1100-1700	Up to 18			44-51
Gear Shift	C-48-32746A3	13"	21"	3	Alum.	1100-1700	Up to 18			44-51
	A-48-49610A4●	13"	20"	2	Bronze	1100-1700	Up to 18			47-54
	□C-48-59136A4	14"	20"	2	Bronze	1200-2000	17-19			47-54
	C-48-31456A3	13¾"	19"	2	Bronze	1400-2100	17-19			39-46
	C-48-32388A3	13¾"	19"	2	Alum.	1400-2100	16-19			39-46
	C-48-32748A3	13"	19"	3	Bronze	1400-2100	17-19	15½"	20"	39-46
	C-48-32750A3	13"	19"	3	Alum.	1400-2100	17-19			39-46
	C-48-31458A3	13"	17"	3	Bronze	1700-2500	18-21			33-41
	C-48-32264A3	13"	17"	3	Alum.	1700-2500	18-21			33-41

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

● Hi-Performance Quicksilver Propeller *§ For special applications only*

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
	C-48-31460A3	14"	15"	3	Bronze	2100-2900	20-23			27-35
	C-48-32390A3	14"	15"	3	Alum.	2100-2900	20-23			27-35
	C-48-30394A3	13½"	13"	3	Bronze	2500-4000	22-25	All	All	20-29
	□C-48-58826A3	14"	13"	3	Alum.	3000-4500	23-28			20-29
	*C-48-32392A3	13½"	13"	3	Alum.	2500-4000	22-25			20-29
	C-48-30396A3	14"	11"	3	Bronze	3700-Plus	Houseboat			12-22
Full Throttle	C-48-35936A3	14"	11"	3	Alum.	3700-Plus	Houseboat	15½"	20"	12-22
RPM Range:	C-48-30398A3	14"	9½"	3	Bronze	9000-Plus	Work Boat			1-14
4800-5300	C-48-33242A3	14"	9½"	3	Alum.	9000-Plus	Work Boat			1-14
Merc 1250SS	A-48-49614A4	13"	25"	3	Bronze	Up to 1200	Up to 17			49-62
(1968-69)	C-48-52010A3	13"	25"	3	Bronze	1200	Up to 17'			47-60
	C-48-52012A3	13"	25"	3	Alum.	1200	Up to 17			47-60
	C-48-31448A3	13½"	25"	2	Bronze	1200	Up to 17			47-60
	C-48-52006A3	13"	23"	3	Bronze	1400	Up to 18			43-50
	C-48-52008A3	13"	23"	3	Alum.	1400	Up to 18			43-50
	C-48-31450A3	13¾"	23"	2	Bronze	1400	Up to 18			43-50
	C-48-32386A3	13¾"	23"	2	Alum.	1400	Up to 18			43-50
	A-48-49612A4	13"	22"	2	Bronze	Up to 1400	Up to 18			45-52
	A-48-49630A3	13¾"	21"	2	Bronze	1200-2000	16-19			38-45
	C-48-49632A3	13¾"	21"	2	Alum.	1200-2000	16-19			38-45
	A-48-53894A3	13¾"	21"	3	Bronze	1200-2000	16-19			38-45
	A-48-53892A3	13¾"	21"	3	Alum.	1200-2000	16-19			38-45
	A-48-31452A3	13¾"	21"	2	Bronze	1200-2000	16-19			38-45
	A-48-31454A3	13¾"	21"	2	Alum.	1200-2000	16-19	All	All	38-45
	C-48-32744A3	13"	21"	3	Bronze	1200-2000	16-19			38-45
	C-48-32746A3	13"	21"	3	Alum.	1200-2000	16-19			38-45
	A-48-49610A4	13"	20"	2	Bronze	1200-2000	16-19			40-47
Gear Shift	A-48-31456A3	13¾"	19"	2	Bronze	1600-2400	17-21			33-40
	A-48-32388A3	13¾"	19"	2	Alum.	1600-2400	17-21	15½"	20"	33-40
	A-48-53898A3	13¾"	19"	3	Bronze	1600-2400	17-21			33-40
	A-48-53896A3	13¾"	19"	3	Alum.	1600-2400	17-21			33-40
	C-48-32748A3	13"	19"	3	Bronze	1600-2400	17-21			33-40
	C-48-32750A3	13"	19"	3	Alum.	1600-2400	17-21			33-40
	A-48-53902A3	14"	17"	3	Bronze	2000-2800	19-21			28-35
	A-48-53900A3	14"	17"	3	Alum.	2000-2800	19-21			28-35
	C-48-31458A3	13"	17"	3	Bronze	2000-2800	19-21			28-35
	C-48-32264A3	13"	17"	3	Alum.	2000-2800	19-21			28-35
	C-48-31460A3	14"	15"	3	Bronze	2400-3200	21-25			23-30
	C-48-32390A3	14"	15"	3	Alum.	2400-3200	21-25			23-30
	C-48-30394A3	13½"	13"	3	Bronze	3000-4500	23-28			16-25
	C-48-32392A3	13½"	13"	3	Alum.	3000-4500	23-28			16-25
	C-48-30396A3	14"	11"	3	Bronze	4000-Plus	Houseboat			11-17
Full Throttle	C-48-35936A3	14"	11"	3	Alum.	4000-Plus	Houseboat			11-17
RPM Range	C-48-30398A3§	14"	9½"	3	Bronze	12000-Plus	Work Boat			1-12
4800-5300	C-48-33242A3§	14"	9½"	3	Alum.	12000-Plus	Work Boat			1-12
	C-48-30400A3§	14"	8½"	3	Bronze	12000-Plus	Work Boat			1-8

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

§ For special applications only

Right Hand Rotation Only (Continued)

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 1350	□C-48-59138A4	14"	26"	2	Bronze	Up to 1000	Up to 16'			60-68
(1970-71)	□A-48-49616A4	13"	26"	2	Bronze	Up to 1000	Up to 16			60-68
	□A-48-52010A3	13"	25"	3	Bronze	Up to 1200	Up to 17			53-63
* 1970 Only	□A-48-55458A4	14"	24"	2	Bronze	Up to 1200	Up to 17			55-63
□ 1971 Only	A-48-49614A4●	13"	24"	2	Bronze	Up to 1200	Up to 17			51-63
	C-48-31450A3	13¾"	23"	2	Bronze	Up to 1200	Up to 18			49-57
	C-48-32386A3	13¾"	23"	2	Alum.	Up to 1400	Up to 18			49-57
	□A-48-52006A3	13"	23"	3	Bronze	Up to 1400	Up to 18			50-58
	A-48-49612A4●	13"	22"	2	Bronze	Up to 1400	Up to 18			52-60
	□A-48-55456A4	14"	22"	2	Bronze	Up to 1400	Up to 18			52-60
	C-48-49630A3	13¾"	21"	2	Bronze	1200-2000	16-19			44-51
	C-48-49632A3	13¾"	21"	2	Alum.	1200-2000	16-19			44-51
	C-48-32744A3	13"	21"	3	Bronze	1200-2000	16-19	All	All	44-51
	C-48-32746A3	13"	21"	3	Alum.	1200-2000	16-19			44-51
	A-48-49610A4●	13"	20"	2	Bronze	1200-2000	16-19			47-54
	□C-48-59136A4	14"	20"	2	Bronze	1200-2000	16-19			47-54
	C-48-31456A3	13¾"	19"	2	Bronze	1600-2400	17-21			39-46
	C-48-32388A3	13¾"	19"	2	Alum.	1600-2400	17-21			39-46
	*C-48-32748A3	13"	19"	3	Bronze	1600-2400	17-21	15½"	20"	39-46
Gear Shift	C-48-32750A3	13"	19"	3	Alum.	1600-2400	17-21			39-46
	C-48-31458A3	13"	17"	3	Bronze	2000-2800	19-23			33-41
	C-48-32264A3	13"	17"	3	Alum.	2000-2800	19-23			33-41
	C-48-31460A3	14"	15"	3	Bronze	2400-3200	21-25			27-35
	C-48-32390A3	14"	15"	3	Alum.	2400-3200	21-25			27-35
	C-48-30394A3	13½"	13	3	Bronze	3000-4500	23-28			20-29
	□ C-48-58826A3	14"	13"	3	Alum.	3000-4500	23-28			20-29
	*C-48-32392A3	13½"	13"	3	Alum.	3000-4500	23-28			20-29
	C-48-30396A3	14"	11"	3	Bronze	4000-Plus	Houseboat			12-22
Full Throttle	C-48-35936A3	14"	11"	3	Alum.	4000-Plus	Houseboat			12-22
RPM Range:	C-48-30398A3	14"	9½"	3	Bronze	12000-Plus	Work Boat			1-14
4800-5300	C-48-33242A3	14"	9½"	3	Alum.	12000-Plus	Work Boat			1-14

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

● *Hi-Performance Quicksilver Propeller*

LEFT HAND ROTATION - MARK MODELS

Motor Model	Counterclockwise LH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Mark 6-6A	A-48-25774	7¼"	7"	2	Alum.	All Purpose	All Purpose	15½"		To 16
Mark 15A	A-48-28880A1	9-7/8"	8½"	2	Alum.	400-1200	12-16'	16"		13-28
	A-48-27787A1	9"	7½"	3	Alum.	1200-1600	15-17	16		5-14
Mark 28-28A	A-48-28038A1	9-7/8"	12"	2	Alum.	400-650	12-13½'	16"		27-33
Full Throttle	A-48-28036A1	9-7/8"	11"	2	Alum.	500-950	13½-16	16		22-30
RPM Range:	A-48-28037A1	9½"	9"	3	Alum.	850-1600	16-18	16		13-23
5000-5400										
Mark 75	A-48-28268A1	13"	17"	2	Bronze	700-850	13-15'			42-47
	A-48-29294A1	13"	17"	2	Alum.	650-1200	13-15½			38-45
Direct	A-48-28268A1	13"	17"	2	Bronze	700-1000	14-16	All	All	36-43
Reversing	A-48-29295A1	13"	15"	2	Alum.	800-1600	15½-17			33-40
	A-48-26505A1	12"	15"	2	Bronze	800-1600	15-17			30-36
Full Throttle	A-48-26506A1	12½"	13"	2	Bronze	1200-2100	17-19	16½"	20½"	24-30
RPM Range:	A-48-28272A1	13½"	9½"	3	Bronze	1500-2500	17-20			20-25
5100-5000	A-48-27148A1	14"	7½"	3	Bronze	3500-8000	24-40			10-15
Mark 78-78A	A-48-28655A1*	12¼"	23"	2	Bronze	650 or Less	12-13½'	All	All	51-58
75A	A-48-28266A1*	12¼"	21"	2	Bronze	650 or Less	12-13½	16½"	20½"	45-52
	A-48-28267A1	12-3/8"	19"	2	Bronze	650-1200	13-15½'			38-45
	A-48-28268A1	13"	17"	2	Bronze	800-1600	15½-17			33-40
	A-48-29294A1	13"	17"	2	Alum.	800-1600	15½-17			33-40
	A-48-28269A1	13"	15"	2	Bronze	1100-2200	17-19	All	All	27-34
Direct	A-48-29295A1	13"	15"	2	Alum.	1100-2200	17-19			27-34
Reversing	A-48-28270A1	13½"	13"	2	Bronze	1400-2600	20-22			23-29
	A-48-28271A1	13½"	11"	3	Bronze	2000-3600	21-23			19-24
Full Throttle	A-48-28272A1	13½"	9½"	3	Bronze	2700-5500	23-26	16½"	20½"	9-20
RPM Range:	A-48-28484A1	14"	8½"	3	Bronze	3500-6000	22-26			10-16
5100-5000	A-48-27148A1	14"	7½"	3	Bronze	8000-Above	Work Boat			1-9

* *For Mark 78-78A models only*

\# *Gross Loads are approximate; include weight of boat, engine, fuel, passengers and gear.*

LEFT HAND ROTATION - MERC MODELS

Motor Model	Counterclockwise LH Rotation	Propeller				Approx. Gross Load#	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 150	A-48-28880A1	9-7/8"	8½"	2	Alum.	400-1200	12-16'	16"		13-28
	A-48-27787A1	9"	7½"	3	Alum.	1200-1600	15-17	16		5-14
Merc 250-200										
Auto. Trans.	A-48-28038A1	9-7/8"	12"	2	Alum.	400-650	12-13½'	16"		27-33
Full Throttle	A-48-28036A1	9-7/8"	11"	2	Alum.	500-950	13½-16	16		22-30
RPM Range:	A-48-28037A1	9½"	9"	3	Alum.	850-1600	16-18	16		13-23
5000-5400										
Merc 600	A-48-28267A1	12-3/8"	19"	2	Bronze	650-1200	13-15½'			38-45
	A-48-28268A1	13"	17"	2	Bronze	800-1600	15½-17			33-40
	A-48-29294A1	13"	17"	2	Alum.	800-1600	15½-17	All	All	33-40
	A-48-28269A1	13"	15"	2	Bronze	1100-2200	17-19			27-34
Direct	A-48-29295A1	13"	15"	2	Alum.	1100-2200	17-19			27-34
Reversing	A-48-28270A1	13½"	13"	2	Bronze	1400-2600	20-22			23-29
	A-48-28271A1	13½"	11"	3	Bronze	2000-3600	21-23	16½"	20½"	19-24
Full Throttle	A-48-28272A1	13½"	9½"	3	Bronze	2700-5500	23-26			9-20
RPM Range:	A-48-28484A1	14"	8½"	3	Bronze	3500-6000	22-26			10-16
5100-5000	A-48-27148A1	14"	7½"	3	Bronze	8000-Above	Work Boat			1-9
Merc 700	A-48-29651A1	12¼"	23"	2	Bronze	650 or Less	12-13½'			51-58
	A-48-29653A1	12¼"	21"	2	Bronze	650 or Less	12-13½			45-52
	A-48-29655A1	12½"	19"	2	Bronze	650-1200	13-15½	All	All	38-45
Direct	A-48-29657A1	13"	17"	2	Bronze	800-1600	15½-17			33-40
Reversing	A-48-29659A1	13"	15"	2	Bronze	1100-2200	17-19			27-34
	A-48-29661A1	13½"	13"	2	Bronze	1400-2600	20-22	16½"	20½"	23-29
Full Throttle	A-48-29663A1	13½"	11"	3	Bronze	2000-3600	21-23			19-24
RPM Range:	A-48-29665A1	13½"	9½"	3	Bronze	2700-5500	23-26			9-20
5100-5500	A-48-29667A1	14"	8½"	3	Bronze	3500-6000	22-26			10-16
Merc 800	A-48-30869A1	13"	25"	2	Bronze	950	Up to 15'			55-60
	A-48-30383A1	12¾"	23"	2	Bronze	950	Up to 15'			48-55
	A-48-30385A1	12¾"	21"	2	Bronze	1000	Up to 16			43-50
Direct	A-48-30387A1	13¼"	19"	2	Bronze	800-1400	15½-17	All	All	38-45
Reversing	A-48-30389A1	13¾"	17"	2	Bronze	1000-1800	16-18			34-40
	A-48-30391A1	13¾"	15"	2	Bronze	1500-2400	17-19			28-35
	A-48-30393A1	13½"	13"	3	Bronze	1800-2800	19-21	16½"	20½"	24-30
Full Throttle	A-48-30395A1	14"	11"	3	Bronze	2000-3600	21-23			19-24
RPM Range:	A-48-30397A1	14"	9½"	3	Bronze	2400-6000	23-26			14-20
4800-5200	A-48-30399A1	14"	8½"	3	Bronze	6000-Plus	Houseboat			1-16

 # Gross Loads are approximate; include weight of boat, fuel, passengers and gear.

QUICKSILVER RACING PROPELLERS

Model	Description	Number	Class
Mark 55H	2 Blade Stain. Steel	A-48-24588	"D" Utility
Mark 55H	2 Blade Stain. Steel	A-48-29468	"D" Hydro
Mark 40H	2 Blade Stain. Steel	A-48-29468*	"D" Hydro
Mark 30H	2 Blade Stain. Steel	A-48-25845*	"C" Utility
Mark 30H	2 Blade Stain. Steel	A-48-25844*	"C" Hydro
Mark 20H	2 Blade Stain. Steel	A-48-29926§	"B" U. & H.
Mark 20H	2 Blade Stain. Steel	A-48-23636	"B" Utility
Mark 20H	2 Blade Stain. Steel	A-48-26011*	"B" Hydro
Mark 20H	2 Blade Bronze	A-48-21055	"B" Hydro

* *Use with long-skeg lower unit* § *Use with 16:21 gear ratio lower unit*

SPEEDMASTER PROPELLERS

Motor Model	Part No.	Dia.	Pitch	No. Bl.	Material
Super Speedmaster Left Hand Rotation	A-48-39961	9½"	15"	2	S. Steel
	A-48-38693	9½"	17"	2	S. Steel
	A-48-38695	9½"	19"	2	S. Steel
	A-48-38697	9¾"	21"	2	S. Steel
	A-48-38699	9¾	23	2	S. Steel
Speedmaster Left Hand Rotation (1/4" hole)	A-48-30071	9"	15"	2	S. Steel
	A-48-30073	8¼"	16"	2	S. Steel
	A-48-30737	8¼"	17"	2	S. Steel
Speedmaster Left Hand Rotation (5/16" hole)	A-48-30071A1	9"	15"	2	S. Steel
	A-48-30073A1	8¼"	16"	2	S. Steel
	A-48-30737A1	8¼"	17"	2	S. Steel
Sportmaster Left Hand Rotation	A-48-30735A1	11¾"	16"	2	Bronze
	A-48-30733A1	11¾"	18"	2	Bronze
	A-48-30731A1	11¾"	20"	2	Bronze

Motor Model	Part No.	Dia.	Pitch	No. Bl.	Material
Super Speedmaster Right Hand Rotation	A-48-39960	9½"	15"	2	S. Steel
	A-48-38692	9½"	17"	2	S. Steel
	A-48-38694	9½"	19"	2	S. Steel
	A-48-38696	9¾"	21"	2	S. Steel
	A-48-38698	9¾"	23"	2	S. Steel
Speedmaster Right Hand Rotation (1/4" hole)	A-48-30072	9"	15"	2	S. Steel
	A-48-30074	8¼"	16"	2	S. Steel
	A-48-30738	8¼"	17"	2	S. Steel
Speedmaster Right Hand Rotation (5/16" hole)	A-48-30072A1	9"	15"	2	S. Steel
	A-48-30074A1	8¼"	16"	2	S. Steel
	A-48-30738A1	8¼"	17"	2	S. Steel
Sportmaster Right Hand Rotation	A-48-30736A1	11¾"	16"	2	Bronze
	A-48-30734A1	11¾"	18"	2	Bronze
	A-48-30732A1	11¾"	20"	2	Bronze

NOTES:

1. *Metric Conversion: 1' (foot) is equal to 0.305m (meters); 1" (inch) is equal to 25.4mm (millimeters) or 2.54cm (centimeters); 1 lb. (pound) is equal to 0.45kg (kilograms); 1 MPH (mile-per-hour) is equal to 1.609km-per-hr. (kilometers-per-hour).*
2. *For dual installation, follow same procedure and select the next higher pitch propellers on the chart.*
3. *For water skiing, use next lower pitch propeller on chart.*
4. *CAUTION: When using a low pitch propeller on a light boat for water skiing, DO NOT operate at full throttle when not pulling skis, for this will result in over-speed of engine and subsequent possible damage to engine.*
5. *Use next lower pitch propeller for each additional 2,500 ft. (762.5m) of elevation.*
6. *For commercial application, use lower RPM listed.*

1972-73 MERC MODELS

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load Lbs.	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 40 RPM Range 4500-5500	A-48-63494A1	8¼"	6	2	Alum.	All Purpose	All Purpose	15"	20"	All Purpose
Merc 75 RPM Range 4500-5500	A-48-47922A1	9"	9	2	Alum.	Up to 450	8-13'	15"	20"	15-20
	A-48-47670A1	8¾"	7	3	Alum.	All Purpose	All Purpose	15"	20"	3-16
Merc 110 RPM Range 4500-5500	A-48-47924A1	9"	10"	2	Bronze	Up to 700	11-14'	15"	20"	15-26
	A-48-47926A1	9"	10"	2	Alum.	Up to 700	11-14'	15"	20"	15-26
	A-48-47922A1	9"	9"	2	Alum.	400-700	12-15'	15"	20"	15-20
	A-48-47670A1	8¾"	7"	3	Alum.	Aux. Power or Work Boat		15"	20"	1-15
Merc 200 RPM Range 4800-5500	A-48-49446A4	9-7/8"	11"	2	Bronze	Up to 750	Up to 13'	15"	20"	24-35
	A-48-34402A1	9-7/8"	11"	2	Bronze	Up to 1000	12-15'	15"	20"	22-33
	A-48-33480A1	9-7/8"	11"	2	Alum.	Up to 1000	12-15'	15"	20"	22-33
	A-48-33482A1	9-7/8"	9"	3	Alum.	850-1600	15' Plus	15"	20"	13-24
	A-48-37316A1	9-7/8"	7"	3	Alum.	Aux. Power or Work Boat		15"	20"	1-14
Merc 402 RPM Range 4800-5300	A-48-63452A1	10¾"	17"	2	Bronze	Up to 900	12-14'	15½"	20"	32-38
	A-48-56230A1	10¾"	17"	3	Alum.	Up to 900	12-14'	15½"	20"	32-38
	A-48-63454A1	10¾"	15"	2	Bronze	700-1100	12-15'	15½"	20"	28-34
	A-48-56232A1	10¾"	15"	3	Alum.	700-1100	12-15'	15½"	20"	28-34
	A-48-63456A1	11"	13"	2	Bronze	800-1200	14-16'	15½"	20"	24-30
	A-48-56236A1	10¾"	13"	3	Alum.	800-1200	14-16'	15½"	20"	24-30
	A-48-63458A1	11"	12"	2	Bronze	1200-1700	15-17'	15½"	20"	22-28
	A-48-56240A1	10¾"	12"	3	Alum.	1200-1700	15-17'	15½"	20"	22-28
	A-48-63460A1	11"	11"	2	Bronze	1500-1800	16-19'	15½"	20"	19-26
	A-48-56244A1	10¾"	11"	3	Alum.	1500-1800	16-19'	15½"	20"	19-26
	A-48-56246A1	10¾"	10"	3	Alum.	1600-2000	18-22'	15½"	20"	15-23
	A-48-63464A1	10¾"	9"	3	Bronze	Aux. Power or Work Boat		15½"	20"	1-16
	A-48-56248A1	10¾"	9"	3	Alum.	Aux. Power or Work Boat		15½"	20"	1-16
Merc 500 RPM Range 4800-5500	A-48-56228A1	10¾"	19"	3	Alum.	Up to 1000	Up to 15'	15½"	20"	37-44
	A-48-63452A1	10¾"	17"	2	Bronze	900-1200	14-16'	15½"	20"	32-39
	A-48-56230A1	10¾"	17"	3	Alum.	900-1200	14-16'	15½"	20"	32-39
	A-48-63454A1	10¾"	15"	2	Bronze	1000-1700	14-16	15½"	20"	28-35
	A-48-56232A1	10¾"	15"	3	Alum	1000-1700	14-16'	15½"	20"	28-35
	A-48-63456A1	11"	13"	2	Bronze	1200-2000	15-17'	15½"	20"	24-32
	A-48-56236A1	10¾"	13"	3	Alum.	1200-2000	15-17'	15½"	20"	24-32
	A-48-63458A1	11"	12"	2	Bronze	1400-2100	15-17'	15½"	20"	22-31
	A-48-56240A1	10¾"	12"	3	Alum.	1400-2100	15-17'	15½"	20"	22-31
	A-48-63460A1	11"	11"	2	Bronze	1600-2200	16-18'	15½"	20"	19-30
	A-48-56244A1	10¾"	11"	3	Alum.	1600-2200	16-18'	15½"	20"	19-30
	A-48-56246A1	10¾"	10"	3	Alum.	1800-2500	17-20'	15½"	20"	15-26
	A-48-63464A1	10¾"	9"	3	Bronze	2400-Plus	20' Plus	15½"	20"	1-16
	A-48-56248A1	10¾"	9"	3	Alum.	2400-Plus	20' Plus	15½"	20"	1-16
Merc 650 RPM Range 4800-5300	A-48-64724A1	10¾"	17"	3	Alum.	Up to 750	Up to 14'	15½"	20"	43-50
	A-48-64726A1	10¾"	17"	3	Bronze	Up to 750	Up to 14'	15½"	20"	43-50
	A-48-61824A1	10¾"	16"	3	Alum.	Up to 850	12-14'	15½"	20"	41-46
	A-48-63538A1	10¾"	16"	3	Bronze	Up to 850	12-14'	15½"	20"	41-46
	A-48-61822A1	11"	15"	3	Alum.	Up to 950	13-15'	15½"	20"	38-43
	A-48-63540A1	11"	15"	3	Bronze	Up to 950	13-15'	15½"	20"	38-43
	A-48-61820A1	11¼"	14"	3	Alum.	700-1300	14-16'	15½"	20"	35-40

1972-73 MERC MODELS

Motor Model	Clockwise RH Rotation	Propeller				Approx. Gross Load Lbs.	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 650 (Continued)	A-48-63542A1	11¼"	14"	3	Bronze	700-1300	14-16'	15½"	20"	35-40
	A-48-61818A1	11½"	13"	3	Alum.	950-1500	15-17'	15½"	20"	32-37
	A-48-63544A1	11½"	13"	3	Bronze	950-1500	15-17'	15½"	20"	32-37
	A-48-61816A1	11¾"	12"	3	Alum.	1100-1700	16-18'	15½"	20"	27-34
	A-48-63546A1	11¾"	12"	3	Bronze	1100-1700	16-18'	15½"	20"	27-34
	A-48-61814A1	12"	11"	3	Alum.	1300-2000	18-20'	15½"	20"	23-30
	A-48-63548A1	12"	11"	3	Bronze	1300-2000	18-20'	15½"	20"	23-30
RPM	A-48-61812A1	12¼"	10"	3	Alum.	1500-2500	20-23'	15½"	20"	19-27
Range	A-48-62274A1	12¼"	9"	3	Alum.	1700-3000	21-25'	15½"	20"	1-20
4800-5300	A-48-63552A1	12¼"	9"	3	Bronze	1700-3000	21-25'	15½"	20"	1-20
Merc 800	A-48-59138A4	14"	26"	2	Bronze	Up to 950	Up to 15'	18½"	23"	48-55
	A-48-49616A4	13"	26"	2	Bronze	Up to 950	Up to 15'	15½"	20"	48-55
	A-48-55458A4	14"	24"	2	Bronze	Up to 950	Up to 15'	18½"	23"	44-51
	A-48-49614A4	13"	24"	2	Bronze	Up to 950	Up to 15'	15½"	20"	44-51
	A-48-52008A3	13"	23"	3	Alum.	1000-1700	Up to 16'	15½"	20"	40-47
	A-48-55456A4	14"	22"	2	Bronze	Up to 1200	Up to 18'	18½"	23"	38-46
	A-48-49612A4	13"	22"	2	Bronze	Up to 1200	Up to 16'	15½"	20"	38-46
	A-48-59136A4	14"	20"	2	Bronze	1200-2000	16-19'	18½"	23"	47-54
	A-48-32390A3	14"	15"	3	Alum.	2000-2900	19-21'	15½"	20"	24-31
RPM	A-48-58826A3	14"	13"	3	Alum.	2000-3600	21-23'	15½"	20"	18-24
Range	A-48-35936A3	14"	11"	3	Alum.	2400-6000	Houseboat	15½"	20"	13-22
4800-5300	A-48-33242A3	14"	9½"	3	Alum.	6000-Plus	Work Boat	15½"	20"	1-15
Mer 850	A-48-52010A3	13"	25"	3	Bronze	Up to 1200	Up to 16'	15½"	20"	45-52
	C-48-52012A3	13"	25"	3	Alum.	Up to 1200	Up to 16'	15½"	20"	45-52
	A-48-52006A3	13"	23"	3	Bronze	1000-1800	Up to 17'	15½"	20"	41-48
	C-48-52008A3	13"	23"	3	Alum.	1000-1800	Up to 17'	15½"	20"	41-48
	C-48-32744A3	13"	21"	3	Bronze	1200-2200	15-18'	15½"	20"	38-44
	C-48-32746A3	13"	21"	3	Alum.	1200-2200	15-18'	15½"	20"	38-44
	C-48-32750A3	13"	19"	3	Alum.	1400-2300	16-19'	15½"	20"	34-41
	C-48-31458A3	13"	17"	3	Bronze	1800-2600	17-20'	15½"	20"	29-36
	C-48-32264A3	13"	17"	3	Alum.	1800-2600	17-20'	15½"	20"	29-36
	C-48-31460A3	14"	15"	3	Bronze	2200-3200	19-24'	15½"	20"	25-32
	C-48-32390A3	14"	15"	3	Alum.	2200-3200	19-24'	15½"	20"	25-32
	C-48-58826A3	14"	13"	3	Alum.	2400-4000	20-26'	15½"	20"	21-28
RPM Range	C-48-35936A3	14"	11"	3	Alum.	3000-6000	Houseboat	15½"	20"	15-23
4800-5500	C-48-33242A3	14"	9½"	3	Alum.	6000-Plus	Work Boat	15½"	20"	1-18
Merc 1150	A-48-52010A3	13"	25"	3	Bronze	Up to 1300	Up to 16'	15½"	20"	51-56
	C-48-52012A3	13"	25"	3	Alum.	Up to 1300	Up to 16'	15½"	20"	51-56
	A-48-52006A3	13"	23"	3	Bronze	1000-1800	Up to 17'	15½"	20"	44-52
	C-48-52008A3	13"	23"	3	Alum.	1000-1800	Up to 17'	15½"	20"	44-52
	C-48-32744A3	13"	21"	3	Bronze	1200-2100	16-19'	15½"	20"	40-47
	C-48-32746A3	13"	21"	3	Alum.	1200-2100	16-19'	15½"	20"	40-47
	C-48-32750A3	13"	19"	3	Alum.	1500-2500	17-20'	15½"	20"	35-43
	C-48-31458A3	13"	17"	3	Bronze	2000-2800	18-21'	15½"	20"	31-39
	C-48-32264A3	13"	17"	3	Alum.	2000-2800	18-21'	15½"	20"	31-39
	C-48-31460A3	14"	15"	3	Bronze	2300-3600	19-24'	15½"	20"	27-36
	C-48-32390A3	14"	15"	3	Alum.	2300-3600	19-24'	15½"	20"	27-36
	C-48-58826A3	14"	13"	3	Alum.	3000-5000	20-27'	15½"	20"	18-31
	C-48-35936A3	14"	11"	3	Alum.	4000-Plus	Houseboat	15½"	20"	1-22
RPM Range 4800-5300							Work Boat			

1972-73 MERC MODELS

Motor Model	Clockwise RH Rotation	Propellers				Approx. Gross Load Lbs.	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 1400	A-48-49616A4	13"	26"	2	Bronze	Up to 1000	Up to 16'		20"	50-65
	A-48-52010A3	13"	25"	3	Bronze	Up to 1200	Up to 17'		20"	48-60
	C-48-52012A3	13"	25"	3	Alum.	Up to 1200	Up to 17'		20"	48-60
	A-48-49614A4	13"	24"	2	Bronze	Up to 1200	Up to 17'		20"	48-60
	A-48-52006A3	13"	23"	3	Bronze	Up to 1400	Up to 18'		20"	44-52
	C-48-52008A3	13"	23"	3	Alum.	Up to 1400	Up to 18'		20"	44-52
	A-48-49612A4	13"	22"	2	Bronze	Up to 1400	Up to 18'		20"	44-52
	C-48-32744A3	13"	21"	3	Bronze	1300-2100	16-19'		20"	39-46
	C-48-32746A3	13"	21"	3	Alum.	1300-2100	16-19'		20"	39-46
	A-48-49610A4	13"	20"	2	Bronze	1300-2100	16-19'		20"	39-46
	C-48-32750A3	13"	19"	3	Alum.	1600-2400	16-20'		20"	37-41
	C-48-31458A3	13"	17"	3	Bronze	1700-3000	17-21'		20"	26-38
	C-48-32264A3	13"	17"	3	Alum.	1700-3000	17-21'		20"	26-38
	C-48-31460A3	14"	15"	3	Bronze	6000-Plus	20-25'		20"	15-28
RPM Range	C-48-32390A3	14"	15"	3	Alum.	6000-Plus	20-25'		20"	15-28
4800-5800	C-48-58826A3	14"	13"	3	Alum.	12000-Plus	Houseboat Work Boat		20"	1-15
Merc 1500	HIGH SPEED BOATS – 48 MPH and HIGHER TOP SPEED (5800 RPM MAXIMUM)									
	A-48-52010A3	13"	25"	3	Bronze	Up to 1300	Up to 17'	15½"	20"	51-60
	C-48-52012A3	13"	25"	3	Alum.	Up to 1300	Up to 17'	15½"	20"	51-60
	A-48-52006A3	13"	23"	3	Bronze	1000-1800	Up to 18'	15½"	20"	48-56
	C-48-52008A3	13"	23"	3	Alum.	1000-1800	Up to 18'	15½"	20"	48-56
	GENERAL PURPOSE BOATS - 26 to 50 MPH TOP SPEED (5800 RPM MAXIMUM)									
	C-48-32744A3	13"	21"	3	Bronze	1500-2300	16-19'	15½"	20"	45-50
	C-48-32746A3	13"	21"	3	Alum.	1500-2300	16-19'	15½"	20"	45-50
	A-48-65024A1	13¾"	19"	3	Alum.	1800-2600	17-20'	15½"	20"	37-45
	A-48-53902A3	14"	17"	3	Bronze	2100-3500	18-21'	15½"	20"	26-42
	C-48-53900A3	14"	17"	3	Alum.	2100-3500	18-21'	15½"	20"	26-42
	LARGER, HEAVIER BOATS - UP to 29 MPH TOP SPEED (5300 RPM MAXIMUM)									
	C-48-31460A3	14"	15"	3	Bronze	3000-Plus	20-25'		20"	15-29
	C-48-32390A3	14"	15"	3	Alum.	3000-Plus	20-25'		20"	15-29
	C-48-58826A3	14"	13"	3	Alum.	12000-Plus	Houseboat Work Boat		20"	1-15
RPM Range 4800-5800										

1974 MERC MODELS

Motor Model	Part No. Clockwise RH Rotation	Propeller				Approx. Lbs. Gross Load	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 40	A-48-63494A1	8¼"	6"	2	Aluminum	All Purpose	All Purpose	15" (38.1cm)	20" (50.8cm)	------
Max. RPM 4500-5500	A-48-65010A1	8¼"	6"	2	Plastic	All Purpose	All Purpose			------
Merc 75	A-48-47926A1	9"	10"	2	Aluminum	Up to 450 (Up to 205kg)	8-12' (2.4-3.7m)	All	All	17-24 (27-39km/hr)
	A-48-47922A1	9"	9"	2	Aluminum	Up to 450 (Up to 205kg)	10-13' (3.1-4.0m)	15"	20"	14-19 (23-31km/hr)
	A-48-47670A1	8¾"	7"	3	Aluminum	All Purpose	All Purpose	(38.1cm)	(50.8cm)	1-16 (1-26km/hr)
Maximum RPM 4500-5500	A-48-65012A1	8¾"	7"	3	Plastic	All Purpose	All Purpose			1-16 (1-26km/hr)
Merc 110	A-48-47924A1	9"	10"	2	Bronze	Up to 700 (Up to 320kg)	11-14' (3.4-4.3m)			15-24 (24-39km/hr)
	A-48-47926A1	9"	10"	2	Aluminum	Up to 700 (Up to 320kg)	11-14' (3.4-4.3m)	All	All	15-24 (24-39km/hr)
	A-48-47922A1	9"	9"	2	Aluminum	400-700 (180-320kg)	12-15' (3.7-4.6m)	15"	20"	15-20 (24-32km/hr)
	A-48-47670A1	8¾"	7"	3	Aluminum	Aux. Power/Work Boat		(38.1cm)	(50.8cm)	1-15 (1-24km/hr)
Maximum RPM 4500-5500	A-48-65012A1	8¾"	7"	3	Plastic	Aux. Power/Work Boat				1-15 (1-24km/hr)
Merc 200	*A-48-34402A1	9-7/8"	11"	2	Bronze	Up to 1000 (Up to 455kg)	12-15' (3.7-4.6m)			22-33 (35-53km/hr)
	A-48-33480A1	9-7/8"	11"	2	Aluminum	Up to 1000 (Up to 455kg)	12-15' (3.7-4.6m)	All	All	22-33 (35-53km/hr)
	A-48-65002A1	9-7/8"	11"	2	Plastic	Up to 1000 (Up to 455kg)	12-15' (3.7-4.6m)	15"	15"	22-33 (35-53km/hr)
	A-48-33482A1	9-7/8"	9"	2	Aluminum	850-1600 (385-725kg)	15'-Plus (4.6m-Plus)	(38.1cm)	(50.8cm)	13-24 (21-39km/hr)
Maximum RPM 4800-5500	A-48-37316A1	9-7/8"	7"	3	Aluminum	Aux. Power/Work Boat				1-14 (1-23km/hr)
Merc 402	A-48-64724A1	10¾"	17"	3	Aluminum	Up to 800 (Up to 365kg)	Up to 14' (Up to 4.3m)			34-38 (55-61km/hr)
	A-48-64726A1	10¾"	17"	3	Bronze	Up to 800 (Up to 365kg)	Up to 14' (Up to 4.3m)	All	All	34-38 (55-61km/hr)
	A-48-61824A1	10¾"	16"	3	Aluminum	Up to 900 (Up to 410kg)	12-14' (3.7-4.3m)	15½"	20"	31-36 (50-58km/hr)
	A-48-63538A1	10¾"	16"	3	Bronze	Up to 900 (Up to 410kg)	12-14' (3.7-4.3m)	(39.4cm)	(50.8cm)	31-36 (50-58km/hr)
Maximum RPM 4800-5300	A-48-61822A1	11"	15"	3	Aluminum	600-1000 (270-455kg)	13-15' (4.0-4.6m)			28-33 (45-53km/hr)
	A-48-63540A1	11"	15'	3	Bronze	600-1000 (270-455kg)	13-15' (4.0-4.6m)			28-33 (45-53km/hr)
(Continued on Next Page)	A-48-61820A1	11¼"	14"	3	Aluminum	700-1100 (320-500kg)	13-15' (4.0-4.6m)			26-30 (42-48km/hr)

*NOTE: All Merc 402 Quicksilver Propellers and Merc 200 A-48-34402A1 Prop (Identified by *) Are Available in Cupped Form by Substituting "A4" Suffix in the Part No. for the "A1".*

1974 MERC MODELS

Motor Model	Part No. Clockwise RH Rotation	Propeller				Approx. Lbs. Gross Load	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 402	A-48-63542A1	11¼"	14"	3	Bronze	700-1100 (320-500kg)	13-15' (4.0-4.6m)			26-30 (42-48km/hr)
(Continued)	A-48-61818A1	11½"	13"	3	Aluminum	800-1200 (365-545kg)	14-16' (4.3-4.9m)			23-27 (37-43km/hr)
	A-48-63544A1	11½"	13"	3	Bronze	800-1200 (365-545kg)	14-16' (4.3-4.9m)	All	All	23-27 (37-43km/hr)
	A-48-61816A1	11¾"	12"	3	Aluminum	1100-1600 (500-725kg)	15-17' (4.6-5.2m)			20-24 (32-39km/hr)
	A-48-63546A1	11¾"	12"	3	Bronze	1100-1600 (500-725kg)	15-17' (4.6-5.2m)	15½" (39.4cm)	20" (50.8cm)	20-24 (32-39km/hr)
	A-48-61814A1	12"	11"	3	Aluminum	1400-1700 (635-770kg)	16-19' (4.9-5.8m)			16-21 (26-34km/hr)
	A-48-63548A1	12"	11"	3	Bronze	1400-1700 (635-770kg)	16-19' (4.9-5.8m)			16-21 (26-34km/hr)
	A-48-62274A1	12¼"	9"	3	Aluminum	Aux. Power/ Work Boat	----			1-17 (1-27km/hr)
Maximum RPM 4800-5300	A-48-63552A1	12¼"	9"	3	Bronze	Aux. Power/ Work Boat	----			1-17 (1-27km/hr)
Merc 500	A-48-64724A1	10¾"	17"	3	Aluminum	Up to 1100 (Up to 500kg)	Up to 15' (Up to 4.6m)			34-40 (55-64km/hr)
	A-48-64726A1	10¾"	17"	3	Bronze	Up to 1100 (Up to 500kg)	Up to 15' (Up to 4.6m)			34-40 (55-64km/hr)
	A-48-61824A1	10¾"	16"	3	Aluminum	900-1200 (410-545kg)	14-16' (4.3-4.9m)			31-37 (50-60km/hr)
	A-48-63538A1	10¾"	16"	3	Bronze	900-1200 (410-545kg)	14-16' (4.3-4.9m)			31-37 (50-60km/hr)
	A-48-61822A1	11"	15"	3	Aluminum	1000-1600 (450-725kg)	14-16' (4.3-4.9m)			28-35 (45-56km/hr)
	A-48-63540A1	11"	15"	3	Bronze	1000-1600 (450-725kg)	14-16' (4.3-4.9m)	All	All	28-35 (45-56km/hr)
	A-48-61820A1	11¼"	14"	3	Aluminum	1100-1700 (500-770kg)	14-17' (4.3-5.2m)	15½" (39.4cm)	20" (50.8cm)	26-32 (42-52km/hr)
	A-48-63542A1	11¼"	14"	3	Bronze	1100-1700 (500-770kg)	14-17' (4.3-5.2m)			26-32 (42-52km/hr)
	A-48-61818A1	11½"	13"	3	Aluminum	1200-1800 (545-810kg)	15-17' (4.6-5.2m)			23-29 (37-47km/hr)
	A-48-63544A1	11½"	13"	3	Bronze	1200-1800 (545-810kg)	15-17' (4.6-5.2m)			23-29 (37-47km/hr)
	A-48-61816A1	11¾"	12"	3	Aluminum	1400-2100 (635-950kg)	16-18' (4.9-5.5m)			20-26 (32-42km/hr)
	A-48-63546A1	11¾"	12"	3	Bronze	1400-2100 (635-950kg)	16-18' (4.9-5.5m)			20-26 (32-42km/hr)
	A-48-61814A1	12"	11"	3	Aluminum	1600-2200 (725-1000kg)	16-19' (4.9-5.8m)			16-23 (26-37km/hr)
	A-48-63548A1	12"	11"	3	Bronze	1600-2200 (725-1000kg)	16-19' (4.9-5.8m)			16-23 (26-37km/hr)
	A-48-62274A1	12¼"	9"	3	Aluminum	2400-Plus (1090kg-Plus)	19'-Plus (5.8m-Plus)			1-17 (1-27km/hr)
Maximum RPM 4800-5500	A-48-63552A1	12¼"	9"	3	Bronze	2400-Plus (1090kg-Plus)	19'-Plus (5.8m-Plus)			1-17 (1-27km/hr)

NOTE: All Above Quicksilver Propellers Are Available in Cupped Form by Substituting "A4" Suffix in the Part No. for the "A1".

1974 MERC MODELS

Motor Model	Part No. Clockwise RH Rotation	Propeller				Approx. Lbs. Gross Load	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 650	A-48-64724A1	10¾"	17"	3	Aluminum	Up to 750 (Up to 320kg)	Up to 14' (Up to 4.3m)			43-50 (69-80km/hr)
	A-48-64726A1	10¾"	17"	3	Bronze	Up to 750 (Up to 320kg)	Up to 14' (Up to 4.3m)			43-50 (69-80km/hr)
	A-48-61824A1	10¾"	16"	3	Aluminum	Up to 850 (Up to 385kg)	12-14' (3.7-4.3m)			41-46 (66-74km/hr)
	A-48-63538A1	10¾"	16"	3	Bronze	Up to 850 (Up to 385kg)	12-14' (3.7-4.3m)			41-46 (66-74km/hr)
	A-48-61822A1	11"	15"	3	Aluminum	Up to 950 (Up to 430kg)	13-15' (4.0-4.6m)			38-43 (61-69km/hr)
	A-48-63540A1	11"	15"	3	Bronze	Up to 950 (Up to 430kg)	13-15' (4.0-4.6m)	All	All	38-43 (61-69km/hr)
	A-48-61820A1	11¼"	14"	3	Aluminum	700-1300 (320-585kg)	14-16' (4.3-4.9m)	15½"	20"	35-40 (56-64km/hr)
	A-48-63542A1	11¼"	14"	3	Bronze	700-1300 (320-585kg)	14-16' (4.3-4.9m)	(39.4cm)	(50.8cm)	35-40 (56-64km/hr)
	A-48-61818A1	11½"	13"	3	Aluminum	950-1500 (430-675kg)	15-17' (4.6-5.2m)			32-37 (52-60km/hr)
	A-48-63544A1	11½"	13"	3	Bronze	950-1500 (430-675kg)	15-17' (4.6-5.2m)			32-37 (52-60km/hr)
	A-48-61816A1	11¾"	12"	3	Aluminum	1100-1700 (500-770kg)	16-18' (4.9-5.5m)			27-34 (43-55km/hr)
	A-48-63546A1	11¾"	12"	3	Bronze	1100-1700 (500-770kg)	16-18' (4.9-5.5m)			27-34 (43-55km/hr)
	A-48-61814A1	12"	11"	3	Aluminum	1300-2000 (585-905kg)	18-20' (5.5-6.1m)			20-30 (32-48km/hr)
	A-48-63548A1	12"	11"	3	Bronze	1300-2000 (585-905kg)	18-20' (5.5-6.1m)			20-30 (32-48km/hr)
Maximum RPM 4800-5300	A-48-62274A1	12¼"	9"	3	Aluminum	1700-3000 (770-1360kg)	21-25' (6.4-7.6m)			1-22 (1-35km/hr)
	A-48-63552A1	12¼"	9"	3	Bronze	1700-3000 (770-1360kg)	21-25' (6.4-7.6m)			1-22 (1-35km/hr)
Merc 850	A-48-52010A3	13"	25"	3	Bronze	Up to 1200 (Up to 545kg)	Up to 16' (Up to 4.9m)			43-52 (69-84km/hr)
	C-48-52012A3	13"	25"	3	Aluminum	Up to 1200 (Up to 545kg)	Up to 16' (Up to 4.9m)			43-52 (69-84km/hr)
	A-48-52006A3	13"	23"	3	Bronze	1000-1800 (450-810kg)	Up to 17' (Up to 5.2m)	All	All	39-47 (63-76km/hr)
	C-48-65736A1	13"	23"	3	Aluminum	1000-1800 (450-810kg)	Up to 17' (Up to 5.2m)	15½"	20"	39-47 (63-76km/hr)
	C-48-32744A3	13"	21"	3	Bronze	1200-2200 (545-1000kg)	15-18' (4.6-5.5m)	(39.4cm)	(50.8cm)	35-43 (56-69km/hr)
Maximum RPM 4800-5500	C-48-67280A1	13"	21"	3	Aluminum	1200-2200 (545-1000kg)	15-18' (4.6-5.5m)			35-43 (56-69km/hr)
	A-48-53898A3	13¾"	19"	3	Bronze	1400-2300 (635-1035kg)	16-19' (4.9-5.8m)			31-39 (50-63km/hr)
	A-48-65024A1	13¾"	19"	3	Aluminum	1400-2300 (635-1035kg)	16-19' (4.9-5.8m)			31-39 (50-63km/hr)
(Continued on Next Page)	A-48-53902A3	14"	17"	3	Bronze	1800-2600 (810-1170kg)	17-20' (5.2-6.1m)			27-35 (43-56km/hr)

NOTE: All Above Quicksilver Propellers Are Available in Cupped Form by Substituting "A4" Suffix in the Part No. for the "A1" and "A3".

1974 MERC MODELS

Motor Model	Part No. Clockwise RH Rotation	Propeller				Approx. Lbs. Gross Load	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
Merc 850	C-48-65022A1	14"	17"	3	Aluminum	1800-2600 (810-1170kg)	17-20' (5.2-6.1m)			27-35 (43-56km/hr)
(Continued)	C-48-31460A3	14"	15"	3	Bronze	2200-3200 (1000-1450kg)	19-24' (5.8-7.3m)	All	All	23-31 (37-50km/hr)
	C-48-32390A3	14"	15"	3	Aluminum	2200-3200 (1000-1450kg)	19-24' (5.8-7.3m)	15½" (39.4cm)	20" (50.8cm)	23-31 (37-50km/hr)
	C-48-58826A3	14"	13"	3	Aluminum	2400-4000 (1090-1815kg)	20-26' (6.1-7.9m)			18-27 (29-43km/hr)
	C-48-35936A3	14"	11"	3	Aluminum	3000-6000 (1360-2720kg)	Houseboat/ Work Boat			13-23 (21-37km/hr)
Maximum RPM 4800-5500	C-48-33242A3	14"	9½"	3	Aluminum	6000-Plus (2720kg-Plus)	Houseboat/ Work Boat			1-18 (1-29km/hr)
Merc 1150	A-48-52010A3	13"	25"	3	Bronze	Up to 1300 (Up to 585kg)	Up to 16' (Up to 4.9m)			50-56 (80-90km/hr)
	C-48-52012A3	13"	25"	3	Aluminum	Up to 1300 (Up to 585kg)	Up to 16' (Up to 4.9m)			50-56 (80-90km/hr)
	A-48-52006A3	13"	23"	3	Bronze	1000-1800 (450-810kg)	Up to 17' (Up to 5.2m)			44-52 (71-84km/hr)
	C-48-65736A1	13"	23"	3	Aluminum	1000-1800 (450-810kg)	Up to 17' (Up to 5.2m)			44-52 (71-84km/hr)
	C-48-32744A3	13"	21"	3	Bronze	1200-2100 (545-950kg)	15-18' (4.6-5.5m)	All	All	40-47 (64-76km/hr)
	C-48-67280A1	13"	21"	3	Aluminum	1200-2100 (545-950kg)	15-18' (4.6-5.5m)	15½" (39.4cm)	20" (50.8cm)	40-47 (64-76km/hr)
	A-48-53898A3	13¾"	19"	3	Bronze	1500-2500 (675-1135kg)	16-19' (4.9-5.8m)			35-42 (56-68km/hr)
	A-48-65024A1	13¾"	19"	3	Aluminum	1500-2500 (675-1135kg)	16-19' (4.9-5.8m)			35-42 (56-68km/hr)
	A-48-53902A3	14"	17"	3	Bronze	2000-2800 (905-1270kg)	17-20' (5.2-6.1m)			30-38 (48-61km/hr)
	C-48-65022A1	14"	17"	3	Aluminum	2000-2800 (905-1270kg)	17-20' (5.2-6.1m)			30-38 (48-61km/hr)
	C-48-31460A3	14"	15"	3	Bronze	2300-3600 (1035-1635kg)	19-24' (5.8-7.3m)			25-33 (40-53km/hr)
	C-48-32390A3	14"	15"	3	Aluminum	2300-3600 (1035-1635kg)	19-24' (5.8-7.3m)			25-33 (40-53km/hr)
	C-48-58826A3	14"	13"	3	Aluminum	3000-5000 (1360-2270kg)	20 26' (6.1-7.9m)			18-28 (29-45km/hr)
Maximum RPM 4800-5300	C-48-35936A3	14"	11"	3	Aluminum	4000-Plus (1815kg-Plus)	Houseboat/ Work Boat			1-22 (1-35km/hr)
	HIGH SPEED BOATS - 44 MPH and HIGHER (5800 RPM MAXIMUM)									
Merc 1500	A-48-52010A3	13"	25"	3	Bronze	Up to 1300 (Up to 585kg)	Up to 17' (Up to 5.2m)	All	All	50-60 (80-96km/hr)
4800 to 5800 RPM	C-48-52012A3	13"	25"	3	Aluminum	Up to 1300 (Up to 585kg)	Up to 17' (Up to 5.2m)	15½" (39.4cm)	20" (50.8cm)	50-60 (80-96km/hr)
(Continued on Next Page)	A-48-52006A3	13"	23"	3	Bronze	1000-1800 (450-810kg)	Up to 18' (Up to 5.5m)			44-56 (71-90km/hr)
	C-48-65736A1	13"	23"	3	Aluminum	1000-1800 (450-810kg)	Up to 18' (Up to 5.5m)			44-56 (71-90km/hr)

NOTE: All Above Quicksilver Propellers Are Available in Cupped Form by Substituting "A4" Suffix in the Part No. for the "A1" and "A3".

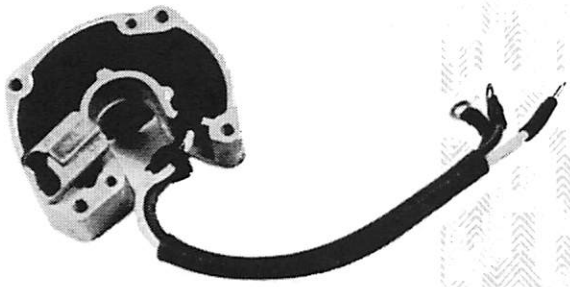
1974 MERC MODELS

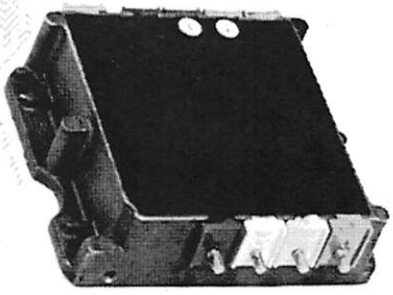
Motor Model	Part No. Clockwise RH Rotation	Propeller				Approx. Lbs. Gross Load	Approx. Boat Length	Transom Height		Speed Range MPH
		Dia.	Pitch	No. Bl.	Material			Std. Length	Long Shaft	
	GENERAL PURPOSE BOATS - 26 to 50 MPH TOP SPEED (5800 RPM MAXIMUM)									
Merc 1500	C-48-32744A3	13"	21"	3	Bronze	1500-2300 (675-1035kg)	16-19' (4.9-5.8m)			40-50 (64-80km/hr)
(Continued)	C-48-67280A1	13"	21"	3	Aluminum	1500-2300 (675-1035kg)	16-19' (4.9-5.8m)	All	All	40-50 (64-80km/hr)
	A-48-53898A3	13¾"	19"	3	Bronze	1800-2600 (810-1170kg)	17-20' (5.2-6.1m)	15½"	20"	35-45 (56-72km/hr)
	A-48-65024A1	13¾"	19"	3	Aluminum	1800-2600 (810-1170kg)	17-20' (5.2-6.1m)	(39.4cm)	(50.8cm)	35-45 (56-72km/hr)
	A-48-53902A3	14"	17"	3	Bronze	2100-3500 (950-1590kg)	18-21' (5.5-6.4m)			26-42 (42-68km/hr)
	C-48-65022A1	14"	17"	3	Aluminum	2100-3500 (950-1590kg)	18-21' (5.5-6.4m)			26-42 (42-68km/hr)
	LARGER, HEAVIER BOATS - UP to 30 MPH TOP SPEED (5300 RPM MAXIMUM)									
	C-48-31460A3	14"	15"	3	Bronze	3000-Plus (1360kg-Plus)	20-25' (6.1-7.6m)	All	All	16-30 (26-48km/hr)
	C-48-32390A3	14"	15"	3	Aluminum	3000-Plus (1360kg-Plus)	20-25' (6.1-7.6m)	15½"	20"	16-30 (26-48km/hr)
4800 to 5800 RPM	C-48-58826A3	14"	13"	3	Aluminum	12000-Plus (5445kg-Plus)	Houseboat/ Work Boat	(39.4cm)	(50.8cm)	1-20 (1-32km/hr)

NOTE: All Above Quicksilver Propellers Are Available in Cupped Form by Substituting "A4" Suffix in the Part No. for the "A1" and "A3".

OUTBOARD

SECTION 3





ELECTRICAL SYSTEM

TABLE of CONTENTS

SECTION 3 - ELECTRICAL SYSTEMS

MERCURY
OUTBOARDS

PART A - MANUAL STARTING

INDEX

AUTOMATIC REWIND STARTERS

REMOVAL and DISASSEMBLY

1. After starter assembly has been removed from motor proper, entire unit can be disassembled further if in need of repair.
2. Pull starter handle out from starter housing, tie cable in knot and pry end cap out of rubber handle. (Figure 1)

Figure 1. Tieing Starter Rope

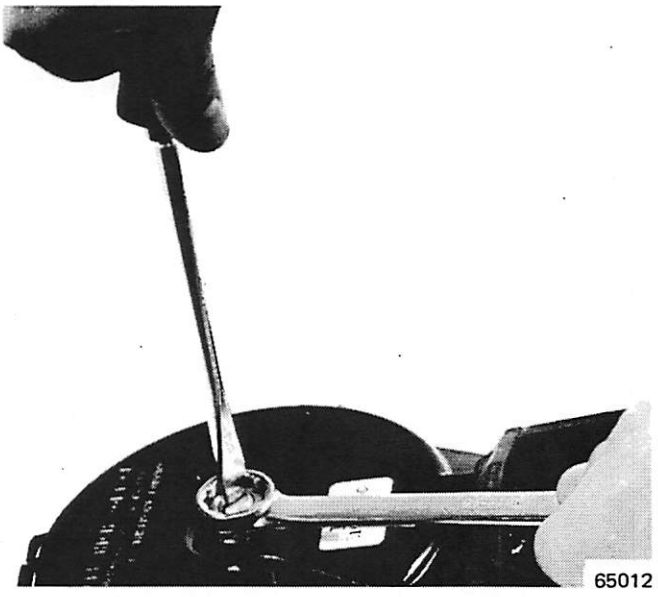
3. Remove cable from rubber handle and release cable so that spring unwinds.
4. Bend locktabs down from nut. Place screwdriver in sheave shaft slot to hold shaft while removing nut (left hand thread). (Figure 2)
5. Remove nut which holds internal parts to inside top of housing with aid of sheave shaft. Component parts are removable.

Figure 2. Removing Sheave Nut

CAUTION: When removing the following parts (Paragraph 6), be careful that rewind spring does not fly out of sheave and cause injury. Place cloth in hand and grasp spring firmly. Pull out, allowing spring to uncoil slowly in hand.

6. Remove retainer plate, shaft, starter pawls, wave washers, bushings, spring guide, retainer spring, sheave shaft spacer, wave washer and wave washer retainer.
7. Remove cable from sheave by unwinding and twisting end near anchor 1/2-turn.

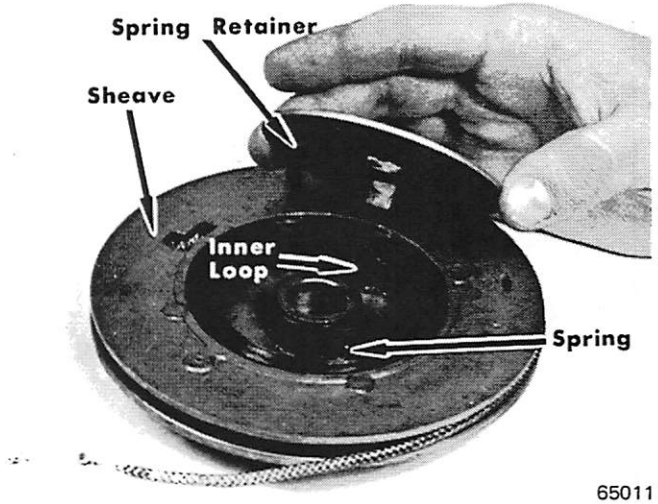
NOTE: On some motors, the starter lockout and trigger coil assembly must be removed from the starter housing before the rewind starter can be removed.



REASSEMBLY and INSTALLATION

1. Replace starter cable in starter sheave by attaching anchor end of cable in slot. Slide in sideways and twist 1/2-turn after anchor is in hole in sheave to lock.
2. Wind cable on sheave in clockwise (right hand) direction, working from bottom of sheave and leaving enough free end to insert later through starter housing opening.
3. Place sheave in vise and engage outer loop of spring into slot of spring recess in sheave. Wind counterclockwise (to left) until spring is in place.
4. Place spring guide bushing on hub of sheave, chamfered end toward sheave.
5. Set spring retainer on top of spring, engaging inner loop in anchor pin of spring retainer plate. (Figure 3)

Figure 3. Installing Spring Retainer Plate



1 - Nut
2 - Tab Washer
3 - Starter Housing
4 - Rope Guide
5 - Seal
6 - Pulley
7 - Spacer
8 - Washer
9 - Screw
10 - Screw
11 - Retainer
12 - Spring
13 - Bushing
14 - Pin
15 - Sheave
16 - Wave Washer
17 - Pawl
18 - Nylon Bushing
19 - Spacer
20 - Retainer
21 - Washer
22 - Wave Washer
23 - Retainer Plate
24 - Sheave Shaft
25 - Cable
26 - Handle
27 - Retainer

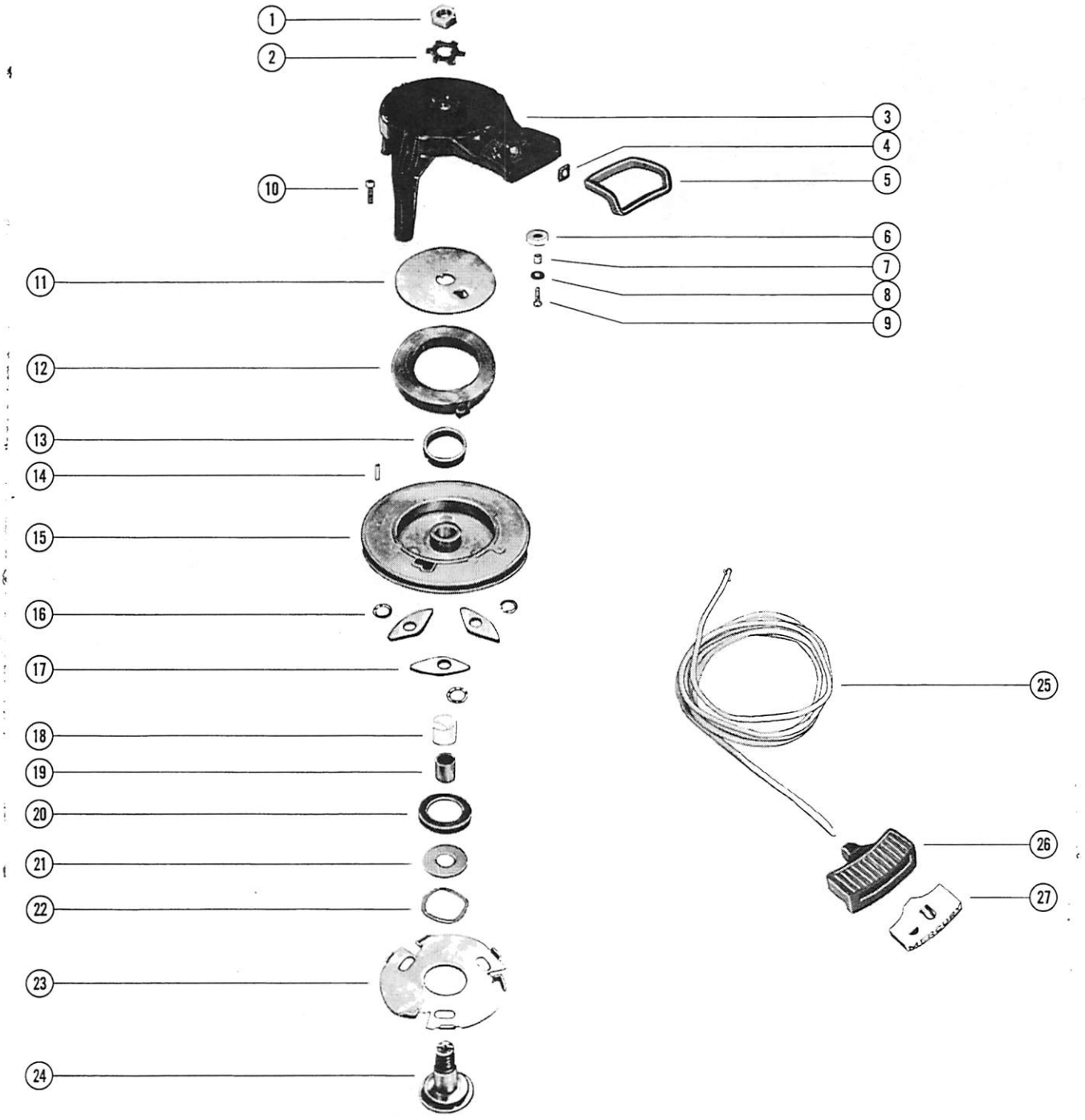


Figure 4. Automatic Rewind Starter

6. Lubricate spring and spring guide bushing with Multipurpose Lubricant (C-92-49588).
7. Assemble starter pawl to sheave with identification mark side away from sheave and end (on which mark appears) toward rim of sheaves.
8. Mount the 3 starter pawl wave washers on anchor pins on bottom of sheave and follow with starter pawls on top of pins. Lubricate all parts with New Multipurpose Lubricant as they are being installed.

   NOTE: Be careful (when replacing these pawls) that they are all set the same way. Radii of pawls are to follow radius of pawl retainer plate (flat angle end to inside) which follows to hold pawls in place. (Figure 5)

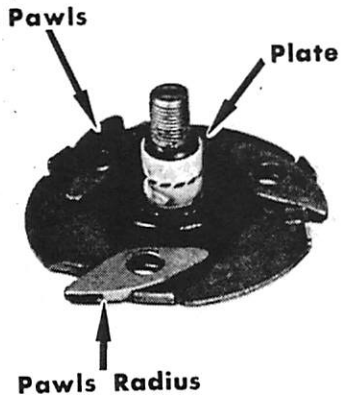


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Figure 5. Pawl Radius

9. Set sheave shaft spacer in place in sheave hub.
10. Set wave washer retainer on with cup end up. Place washer equalizer ring into cup and set wave washer and pawl retainer plate in position. Refer to Figure 4.

    NOTE: Be sure that pawls extend through slots in sides and insert sheave shaft so that keyway guides thru spring retainer notch.

11. Insert sheave shaft through pawl retainer plate assembly and sheave.
12. Insert free end of starter cable into cable outlet in starter cover and tie temporary knot about one foot from end of cable to hold.
13. Place sheave assembly (with sheave shaft up) into starter housing for tightening.
14. Place lockwasher for sheave shaft with notch set in keyway and screw nut (left hand thread) on sheave shaft.
15. Untie temporary knot and insert thru starter cable handle and end cap.
16. Install cable into starter handle as shown in Figure 6.
17. Pull cable and end cap into starter handle to complete assembly.

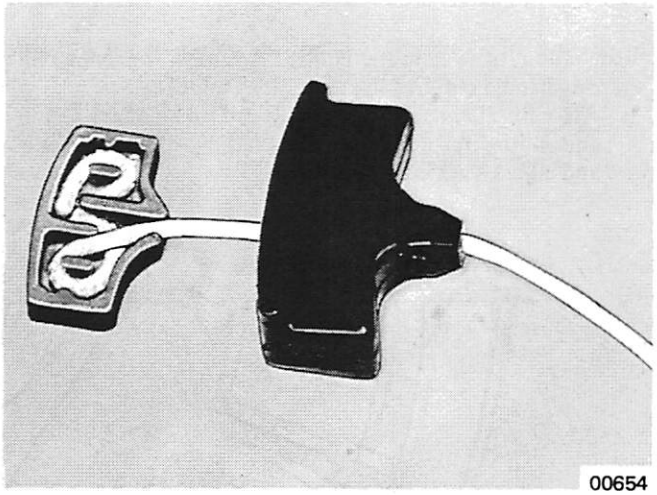

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Figure 6. Installing Cable in Starter Handle

18. Turn sheave shaft counterclockwise with screwdriver until handle is against guide bushing, then turn in additional 1¼-turns counterclockwise to wind spring to correct returning tension. (Figure 2)
19. With a ¾" open end wrench, turn down on sheave shaft nut until tight, while keeping screwdriver in slot in shaft to prevent spring from unwinding.
20. Bend one tab of washer down into hole of cover and one tab up to flat side of nut.
21. Replace auxiliary cover and secure with small screw.
22. Pull starter cord several times to see that pawls actuate correctly and that there is sufficient tension on starter spring.

    NOTE: Cord should be pulled out to full length to be sure that it does not stick when pulled out.

23. Replace entire starter housing assembly on top of unit and tighten.
24. Check that starter pawls engage auxiliary starter plate for proper operation.

SHIFT INTER-LOCK ADJUSTMENT

Merc 400M (Serial No. 297375 4 and Up)

Merc 402M-500M (Serial No. 2858814 and Up)

Installation of a remote control assembly or an auxiliary steering handle requires shift inter-lock adjustment.

1. After installing shift cable (shift rod on auxiliary handle) – and before throttle cable installation – remove top cowl and adjust shift inter-lock.
2. Shift engine into neutral.
3. Move sliding cam by moving cable until toggle pin is centered on cam rise. (Figure 1)
4. Tighten screw.

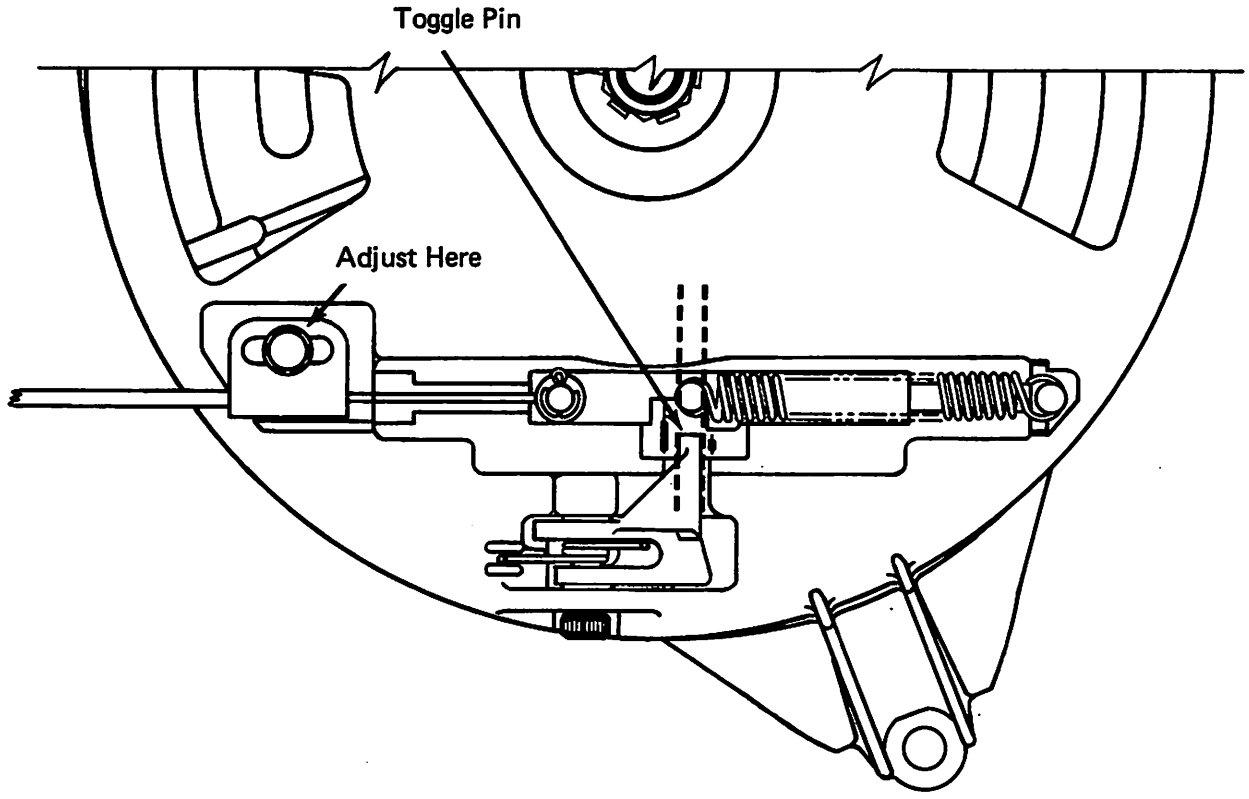

Figure 1. Cable Adjustment

SECTION 3 - ELECTRICAL SYSTEM

MERCURY
OUTBOARDS

PART B - ELECTRIC STARTING SYSTEM

INDEX

ELECTRIC STARTING

STARTER MOTORS

DESCRIPTION

Motors equipped with MercElectric starting are distinguished by the letter "E" following the model number; e.g. Merc 400E, Merc 800E, Merc 1350E.

The electric starter system is a 12-volt type especially designed for outboard use. It is as simple and dependable as the starting system on your automobile. There are no adjustments to make.

PRECAUTIONS

The cranking motor is designed to operate under great overload and produce a high horsepower for its size. It can do this only for a short time, since considerable heat accumulates and can cause serious damage. For this reason, the cranking motor never must be used for more than 15 seconds at any one time. Cranking should not be repeated without a pause of at least 2 minutes to permit the heat to escape.

PERIODIC INSPECTION

Cranking motor and solenoid are completely enclosed in the motor cowling to prevent entrance of moisture and dirt. However, as an aid to preventive maintenance, periodic inspection is required as follows:

1. Inspect terminals for corrosion and loose connections.
2. Inspect wiring for frayed and worn insulation.
3. Check mounting bolts for tightness.

TROUBLESHOOTING CHART

Trouble	Cause	Remedy
Starter motor has low no-load speed and high-current draw.	Armature may be dragging on pole shoes from bent shaft, worn bearings or loose pole shoes. Tight or dirty bearings.	Replace shaft or bearings and/or tighten pole shoes. Loosen or clean bearings.
Low no-load speed and high-current draw.	Armature may be dragging on pole shoes. Tight or dirty bearings.	Remove armature and test on growler for short. Loosen or clean bearings.
High-current draw with no armature rotation.	A direct ground at switch, at terminal or at brushes or field connections. Frozen shaft bearings which prevent armature from rotating.	Replace defective parts. Loosen, clean or replace bearings.
Starter motor has grounded armature or field winding.	Field and/or armature is burned or lead is thrown out of commutator because of excessive leakage.	Raise grounded brushes from commutator & insulate them with cardboard. Use Magneto Analyzer (C-91-25213) (Selector No. 3) & test points to check between insulated terminal of starter motor & starter motor frame. (Remove ground connection of shunt coils on motors with this feature.) If analyzer shows resistance (meter hand moves to right), there is a ground. Raise other brushes from armature & check armature and fields separately to locate ground.
Starter motor has grounded armature or field winding.	Current passes thru armature first, then to ground field windings.	Disconnect grounded leads, then locate any abnormal grounds in starter motor.
Starter motor fails to operate & draws no current and/or high resistance.	Open circuit in fields or armature, at connections or brushes or between brushes and commutator.	Repair or adjust broken or weak brush springs, worn brushes, high insulation between commutator bars or a dirty, gummy or oily commutator.
High resistance in starter motor.	Low no-load speed & a low-current draw and low developed torque.	Close "open" field winding on unit which has 2 or 3 circuits in starter motor (unit in which current divides as it enters, taking 2 or 3 parallel paths).
High free speed and high current draw.	Shorted fields in starter motor.	Install new fields and check for improved performance. (Fields normally have very low resistance, thus it is difficult to detect shorted fields, since difference in current draw between normal starter motor field windings would not be very great.)
Excess, voltage drop.	Cables not adequate size.	Because of high current draw, install larger diameter cables.
High circuit resistance.	Dirty connections.	Clean connections.
Starter does not operate.	Run down battery . . . . . . Poor contact at terminals . . . . . . Wiring or key switch . . . . . . Starter solenoid . . . . . . Starter motor	(1) Check battery with hydrometer. If reading is below 1.230, recharge or replace battery. (2) Remove terminals, scrape clean and tighten bolts securely. Coat with sealer to protect against further corrosion. Check for resistance between: a) Positive (+) terminal of battery and large input terminal of starter solenoid, b) large wire at top of starter motor and negative (-) terminal of battery, and c) small terminal of starter solenoid and positive battery terminal (key switch must be in "Start" position). Repair all defective parts. (3) With a fully charged battery, connect a negative (-) jumper wire to upper terminal on side of starter motor and a positive jumper to large lower terminal of starter motor. If motor still does not operate, remove for overhaul or replacement.

Trouble	Cause	Remedy
Starter turns over too slowly.	Low battery	Complete (1) preceding.
	Poor contact at battery terminal . . .	Complete (2) preceding.
	Poor contact at starter solenoid or starter motor.	(4) Check all terminals for looseness and tighten all nuts securely.
	Starter mechanism	Disconnect positive (+) battery terminal. Rotate pinion gear in disengaged position. Pinion gear and motor should run freely by hand. If motor does not turn over easily, clean starter and replace all defective parts.
	Starter motor	Complete (3) preceding.
Starter spins freely but does not engage engine.	Low battery	Complete (1) preceding.
	Poor contact at battery terminal . . .	Complete (2) preceding.
	Poor contact at starter solenoid or starter motor.	Complete (4) above.
	Dirty or corroded drive pinion . . .	Clean thoroughly and lubricate the spline underneath pinion with New Multipurpose Lubricant (C-92-49588).
Starter does not engage properly.	Pinion or flywheel gear	Inspect mating gears for excessive wear. Replace all defective parts.
	Small anti-drift spring	If drive pinion interferes with flywheel gear after engine has started, inspect anti-drift spring located under pinion gear. Replace all defective parts. *(NOTE: If drive pinion tends to stay engaged in flywheel gear when starter motor is in idle position, start motor at ¼-throttle to allow starter pinion gear to release flywheel ring gear instantly.)*
Starter keeps spinning after key is turned to "On" position.	Key not fully returned	Check that key has returned to normal "On" position from "Start" position. Replace switch if key constantly stays in "Start" position.
	Starter solenoid	Inspect starter solenoid to see if contacts have become stuck in closed position. If starter does not stop running with small yellow lead disconnected from starter solenoid, starter solenoid should be replaced.
	Wiring or key switch	Inspect all wires for defects. Open remote control box and inspect wiring at switches. Repair or replace all defective parts.
Wires are over-heating.	Battery terminals improperly connected.	Check that negative marking on harness matches that of battery. If battery is connected improperly, red wire to rectifier will overheat.
	Short circuit in wiring system . . .	Inspect all connections and wires for looseness or defects. Open remote control box and inspect wiring at switches. Repair or replace all defective parts. Check for high resistance.
	Short circuit in choke solenoid . . .	If blue choke wire heats rapidly when using choke, choke solenoid may have internal short. Replace if defective.
	Short circuit in starter solenoid . .	If yellow starter solenoid lead overheats, there may be internal short (resistance) in starter solenoid. Replace a defective solenoid.
Battery voltage.	Battery voltage	Battery voltage is checked with Ampere-Volt Tester (C-91-27883) only when battery is under starting load. Battery must be recharged if it registers under 9½ volts. If battery is below specified hydrometer reading (1.230), it will not turn engine fast enough to start.

STARTER REMOVAL and INSTALLATION

NOTE: The Delco-Remy Starter Motor replaces the American Bosch Starter Motor on later MerElectric models and is completely interchangeable as a unit.

CAUTION: Make sure that battery is disconnected before working on electrical system.

1. Remove electrical connections from starter motor.
2. Remove starter motor and mechanism from engine by removing mounting bolts from mounting flange. (Figure 1)
3. Replace starter motor by reversing the above precedure.

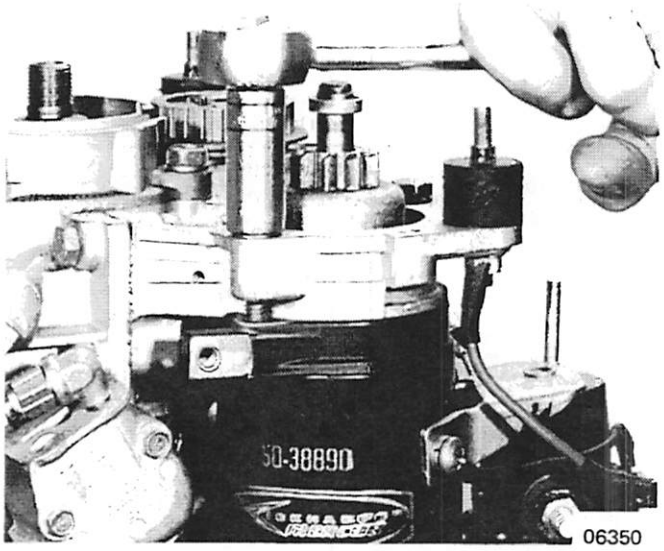

Figure 1. Removing and Installing Starter Motor

CLEANING and INSPECTION

With starting motor completely disassembled (refer to specific starter motor for disassembly), except for removal of field coils, component parts should be cleaned and inspected as follows:

1. Clean all starting motor parts but do not use grease-dissolving solvents for cleaning armature and field coils. Such a solvent would damage armature and field coil insulation.
2. Check that pinion teeth have not been chipped, cracked or excessively worn. Check spring for normal tension and collar for wear. If necessary, replace spring or collar.
3. Check that brush holders are not damaged or bent and will hold brushes against commutator.
4. Check condition of brushes. Replace if pitted or worn to one-half their original length.
5. Check fit of armature shaft in bushing of top cap. Shaft should fit snugly in bushing. Replace bushing if worn. Apply SAE No. 10 oil to this bushing before reassembly. Avoid excessive lubrication.
6. Check fit of bushing in commutator end plate. If bushing is damaged or worn excessively, replace end plate assembly. Apply SAE No. 10 oil to this bushing before reassembly. Avoid excessive lubrication. Lubricant forced onto commutator would gum and cause poor commutation and drop in cranking motor performance.
7. Inspect armature commutator. If commutator is rough or out-of-round, it should be turned down and undercut. Inspect points (where armature conductors join commutator bars) to make sure that it is a good, firm connection. Burned commutator bar usually is evidence of poor connection. See "Turning the Commutator", following.
8. Open circuited armatures often can be saved where the open circuit is obvious and repairable. The most likely place for an open circuit to occur is at the commutator bars as a result of excessively long cranking periods. Long cranking periods overheat the starter motor so that the solder in the connections melts and is thrown out. The consequent poor connections then cause arcing and burning of the commutator bars as the starter motor is used. If the bars are not too badly burned, repair often can be affected by resoldering the leads in the bars (using the rosin flux) and turning down the commutator in a lathe to remove the burned material. The mica then should be undercut.
9. Short circuits in the armature are located by use of a growler. When the armature is revolved in the growler with a steel strip, such as a hack-saw blade held above it, the blade will vibrate above the area of the armature core in which the short circuit is located. Copper or brush dust in the slots between the commutator bars sometimes produces shorts between the bars which can be eliminated by cleaning out the slots.
10. Grounds in the armature can be detected by the use of the Magneto Analyzer (C-91-25213), No. 3 continuity test. If the needle moves across the meter when one test point is placed on the commutator with the other point on the core or shaft, the armature is grounded. Grounds often occur as a result of insulation failure which is often brought about by overheating of the starter motor produced by excessively long cranking periods.

BRUSH REPLACEMENT
2 and 4-CYLINDER MODELS

NOTE: Replacement brush sets are available and contain insulated brushes and ground brushes, along with the necessary screws, washers and nuts for attaching to the frame. (Figure 2)

1. Cut off old brush leads at the point where they are attached to the field coils.
2. Clean ends of coils by filing or grinding the old brush lead connections. Varnish should be removed only as far back as necessary to make solder connections.
3. Using rosin flux, solder leads to the field coils, making sure that they are in the right position to reach the brush holders. (Figure 3)

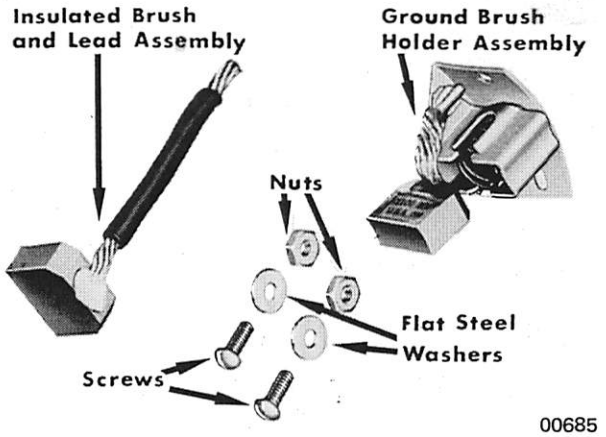

Figure 2. Brush Replacement Kit

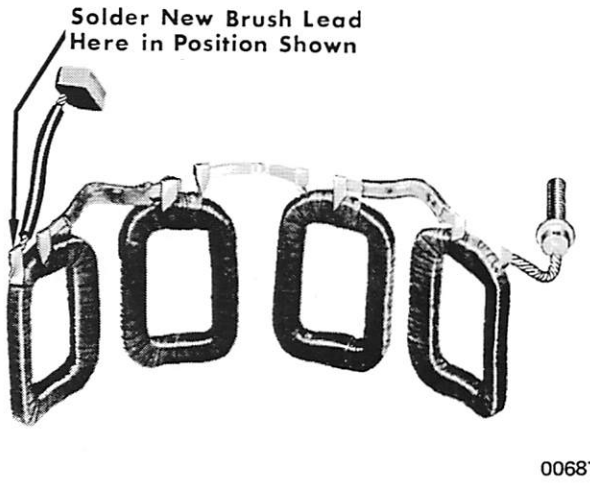

Figure 3. Field Coil and Brush Assembly, Showing Proper Position of Brush Lead

NOTE: It is recommended that the leads be soldered to the back sides of the coils so that excessive solder will not rub the armature. DO NOT overheat leads, as the solder will run on the lead, and it will no longer be flexible.

4. If applicable, remove the old ground brush holders and attach the new assemblies to the frame with screws, washers and nuts. Peen screws with hammer so that nuts cannot vibrate loose during operation.

NOTE: Make sure that none of the soldered connections is touching the frame and grounding the fields.

6-CYLINDER MODELS

1. Partial disassembly of cranking motor is necessary to replace brushes.
2. First, loosen and pull out the thru bolts.
3. Remove commutator end frame.
4. Remove armature and drive assembly from frame and field assembly.

REMOVAL of GROUND BRUSH ASSEMBLIES

1. Remove ground brush assemblies by cutting, drilling or grinding out rivets which fasten holders to field frame.
2. If drill is used, care should be taken not to enlarge hole in frame.

REMOVAL of INSULATED BRUSHES

1. Bend clip inward to facilitate brush lead removal.
2. Open clip, which supports insulated brush leads, with pair of sidecutters or similar tool.
3. Break weld which holds brush lead to clip.
4. Note which brush has longer lead and replace with same length brush lead provided in package.
5. Discard all old parts.

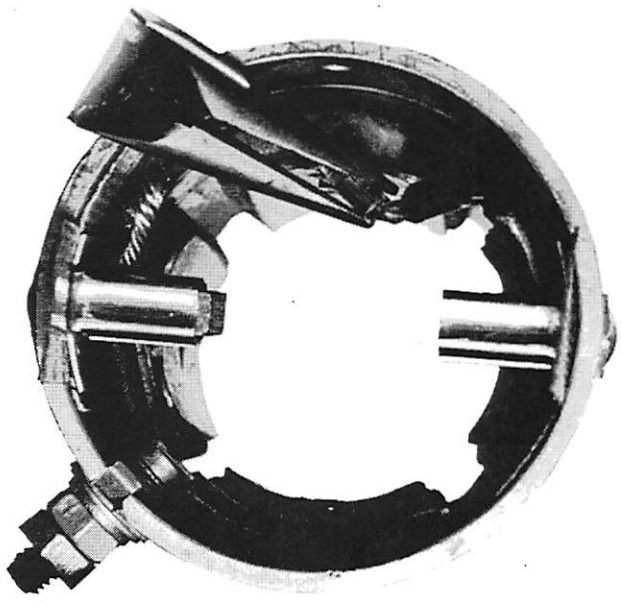

Figure 4. Crimping Clip

NEW BRUSH INSTALLATION

1. Install new insulated brushes by placing proper brush lead into open clips on field coils.
2. Tin approx. ¼" (6.35mm) of both field coil assembly clip and brush lead with large (heavy duty) soldering iron before placing into field.
3. Place brush lead into clip and crimp clip with lead inside it to form good mechanical connection. (Figure 4)
4. Solder connection with large solder iron to heat quickly so that field coil and brush lead are not overheated. Use only rosin core solder.

CAUTION: DO NOT allow solder to run up lead, since this will make lead rigid.

COMPONENT CHECKS

ARMATURE

ARMATURE TEST for SHORTS

Check armature for short circuits by placing on growler and holding hack saw blade over armature core while armature is rotated. (Figure 5) If saw blade vibrates, armature is shorted. Recheck after cleaning between commutator bars. If saw blade still vibrates, replace armature.

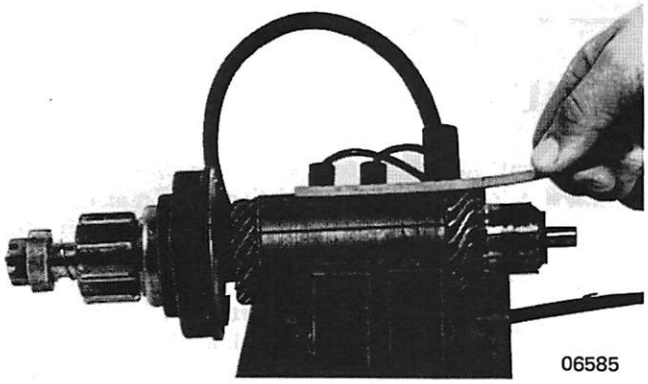

Figure 5. Armature Tests for Shorts

ARMATURE TEST for GROUND

1. With Magneto Analyzer selector switch set on scale No. 3 (Continuity) (or using, VOA Tester [C-91-52751] on Rx1 scale), place one lead on armature core or shaft and other lead on commutator.

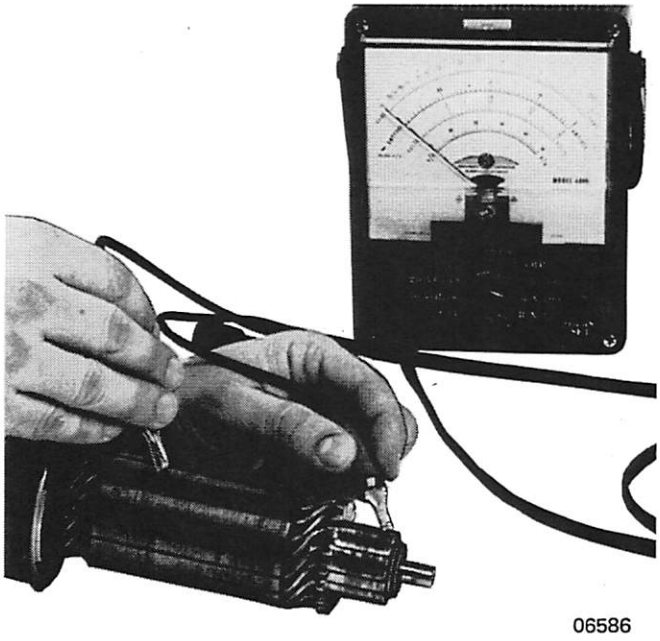

Figure 6. Armature Test for Ground Field Coil

2. If meter hand on Analyzer (or VOA Tester) moves to right, armature is grounded and must be replaced. (Figure 6)

FIELD COIL

FIELD COIL TEST for OPEN CIRCUIT

1. With Magneto Analyzer selector switch set on scale No. 3 (Continuity) (or using VOA Tester on Rx1 scale), place one lead on each end of field.
2. If meter hand on Analyzer (or VOA Tester) does not move to right, field coils are open and must be replaced. (Figure 7)

Figure 7. Field Coil Test for Open Circuit

FIELD COIL TEST FOR GROUND (All Except Kiekhaefer Type Starter)

1. With Magneto Analyzer selector switch set on scale No. 3 (Continuity) (or using VOA Tester on Rx1 scale), place one lead on field coil connector and other lead on field frame.
2. If meter hand moves to right, field coils are grounded and must be replaced. (Figure 8)

Figure 8. Field Coil Test for Ground

SUMMARY of STARTER CHECKS

Component	Connection	Reading	Result
Armature	1. Armature on growler. Hack saw blade over armature core.	Saw vibrates	Shorted
	2. Analyzer from armature core to commutator.	Low	Grounded

Component	Connection	Reading	Result
Field Coil	1. Analyzer to each end of field coils.	Low	Open
	2. Analyzer from field coil to field frame.	Low	Grounded

LOOSE ELECTRICAL CONNECTIONS

If open soldered connection of armature to commutator leads is found during inspection, resolder with rosin flux.

CAUTION: Never use acid flux on electrical connections.

TURNING the COMMUTATOR

When inspection shows commutator roughness, clean as follows:

1. Turn down commutator in a lathe until thoroughly cleaned.

CAUTION: Do not cut beyond section previously turned.

2. Undercut insulation between commutator bars 1/32" (.8mm) to full width of insulation and flat at bottom. A triangular groove is not satisfactory. After undercutting, clean out slots carefully to remove dirt and copper dust.
3. Sand commutator lightly with No. 00 sandpaper to remove any slight burrs left from undercutting.
4. Recheck armature on growler for short circuits.

DELCO-REMY STARTER MOTOR

DISASSEMBLY

STARTER MECHANISM

1. Remove cotter pin from armature shaft and remove nut. (Figure 1)
2. Pull entire starter mechanism off in the following sequence: Pinion stop, anti-drift spring, pinion washer, anti-drift spring sleeve, pinion gear, screw shaft, thrust washer, cushion cup, cushion, cushion spacer and thrust washer. (Figure 2)

STARTER MOTOR

1. Remove 2 thru bolts and lockwashers at bottom end of starter motor.
2. Remove drive end mounting bracket by pulling off armature shaft.
3. Remove armature by grasping splined shaft end and pulling out. Be careful not to lose shims at either end of armature shaft.
4. Remove lower end cap by pulling off.

FRAME and FIELD

NOTE: DO NOT remove unless necessary to replace.

1. Remove pole shoe screws with impact screwdriver.
2. Remove terminal nut and insulating washers. Remove field coil set.

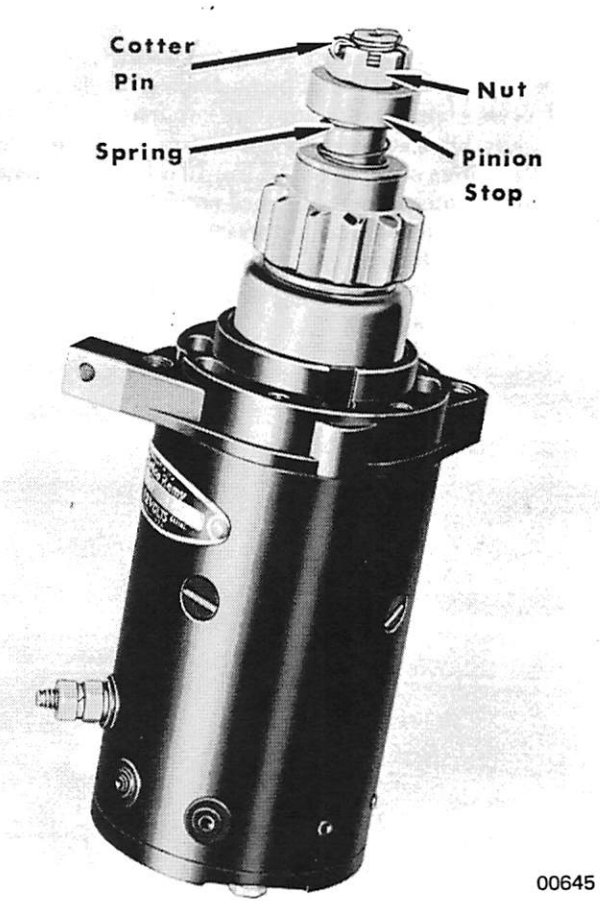

Figure 1. Delco-Remy Starter Motor

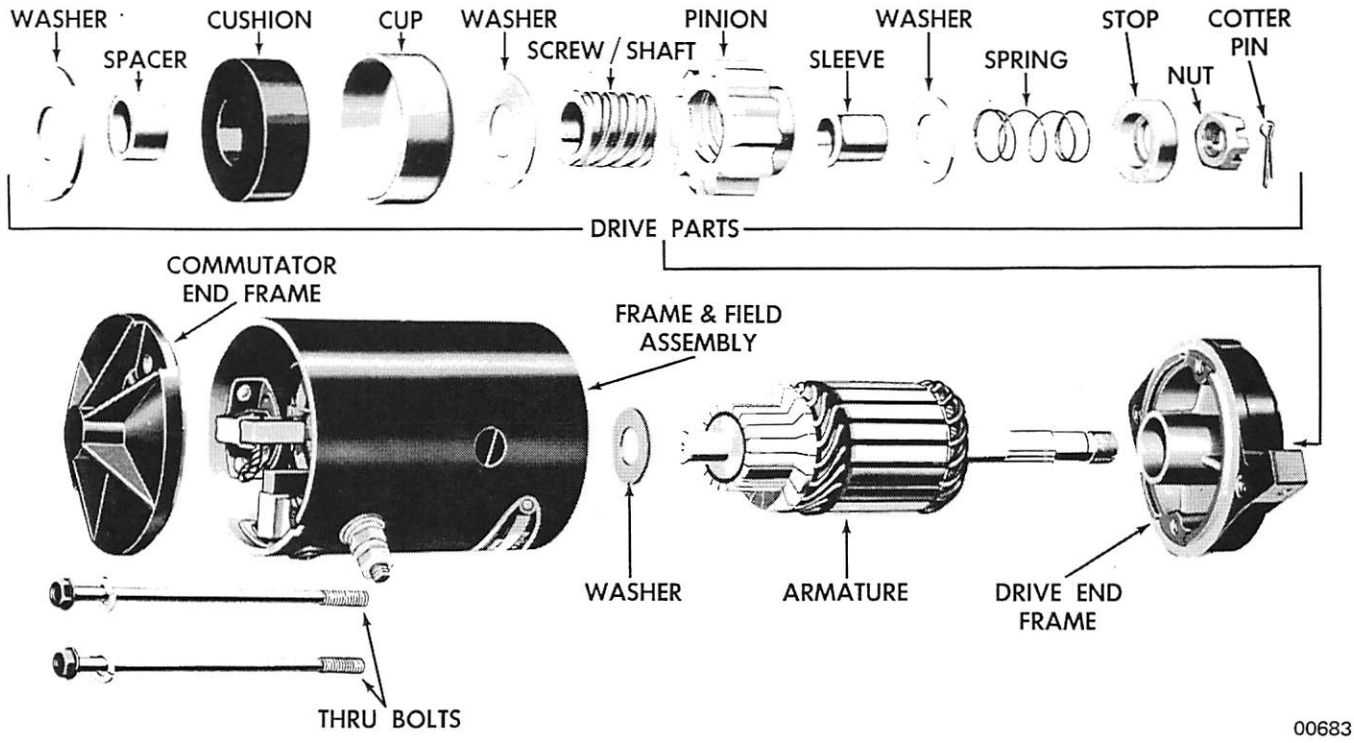

Figure 2. Exploded View of Starter Motor and Mechanism, Delco-Remy

REASSEMBLY

1. Install field coil set, pole shoes and pole shoe screws. Pole shoes must be installed parallel to each other, or they will rub on armature.
2. Set armature into field and frame assembly, commutator end toward brush end of frame. Depress brushes into brush holders while inserting armature into frame.
3. Lightly lubricate commutator end cap and thrust washer on armature shaft with SAE No. 10 oil. Assemble end cap, aligning notch in cap with small notch in frame.
4. Insert 2 thru bolts and lockwashers in commutator end cap and secure to drive end cap. Place drive end cap on frame over armature shaft and align with dowel pin. Torque to 60-65 in. lbs.

NOTE: In metric scale, 1 in. lb. = .1775 kg/cm.

5. Brush Liquid Neoprene (C-92-25711) around all screws, seams and terminals to seal starter motor against water leaks and moisture.
6. Reassemble starter mechanism in the following order: Thrust washer, cushion spacer, cushion, cushion cup (open end over cushion), cup thrust washer, screw shaft (splined end up) lubricate underside with SAE No. 10 oil) pinion gear (screw end down), anti-drift spring sleeve (shoulder down) anti-drift spring washer, anti-drift spring and pinion gear stop (recessed end down) and secure with castellated fastening nut to torque of 200 in. lbs. Space so that cotter pin can be passed through nut and hole in shaft.

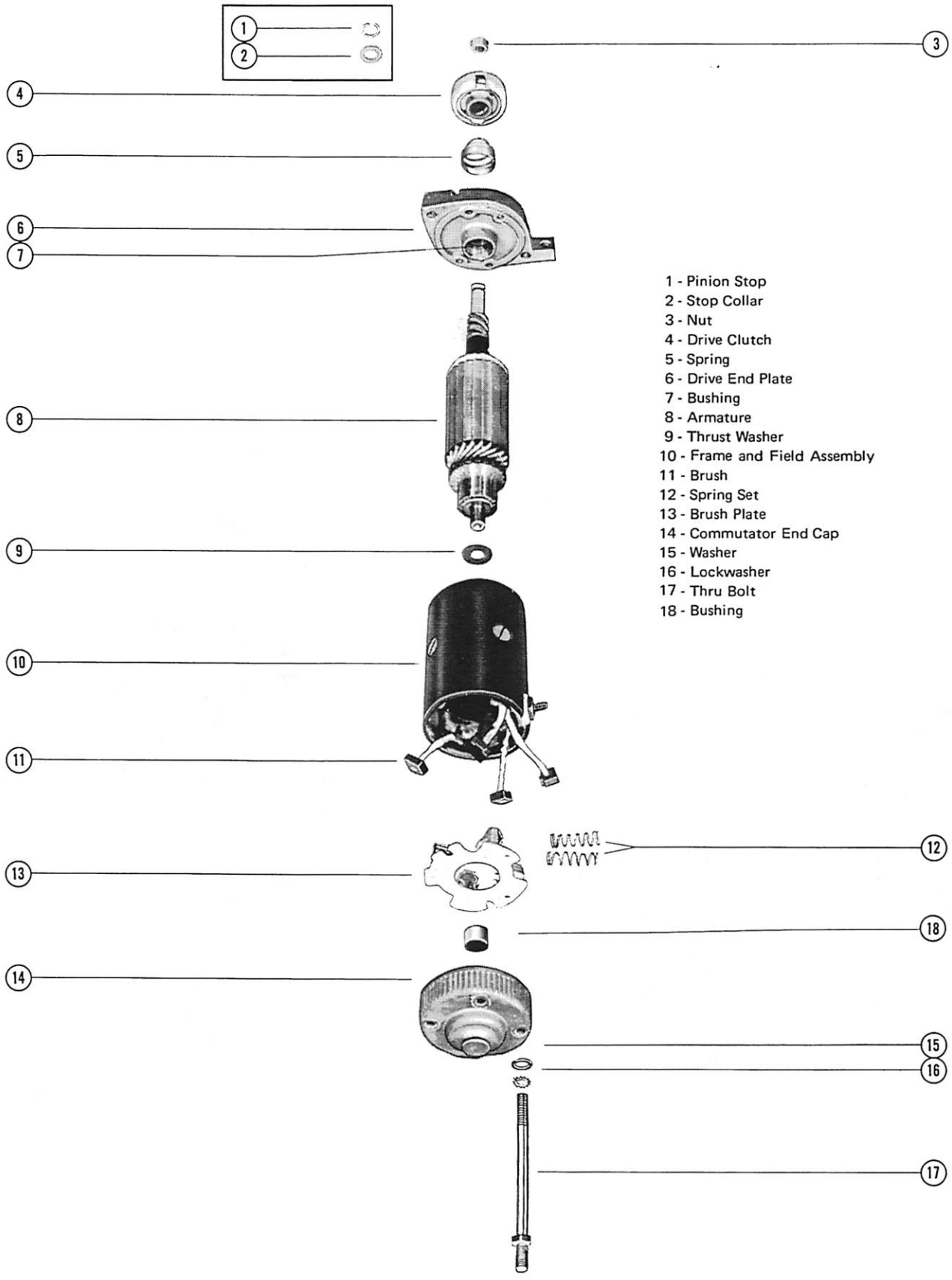

Figure 1. Exploded View, Kiekhaefer Starter

KIEKHAEFER STARTER MOTOR (For 6-Cyl. Models)

DISASSEMBLY

1. Remove 2 thru bolts, lockwashers and flat washers from bottom of starter.
2. Pull armature and upper end caps from body and field.
3. Remove lower end cap and release brushes from brush holder. DO NOT lose thrust washers from end cap or armature shaft.
4. Two brushes and terminal can be removed by pushing terminal block toward bottom of field housing.
5. Field brushes are removed by loosening solder connections with a soldering gun.
6. Field winding is an integral part of body and must be replaced as a unit if found defective.
7. The drive assembly is an inertia drive. Refer to "Inertia Drive", following in this part, for disassembly.

REASSEMBLY

1. Place shims and upper end cap on armature shaft, install armature into body and field and line up detents.
2. Install thrust washers on lower end of armature shaft.
3. Install brushes into brush holder and depress brushes and brush springs while sliding over commutator bars. (Figure 2)
4. Align lower end cap with brush holder and install end cap. Two marks on cap line up with terminal block. (Figure 3)
5. Install 2 thru bolts and tighten.

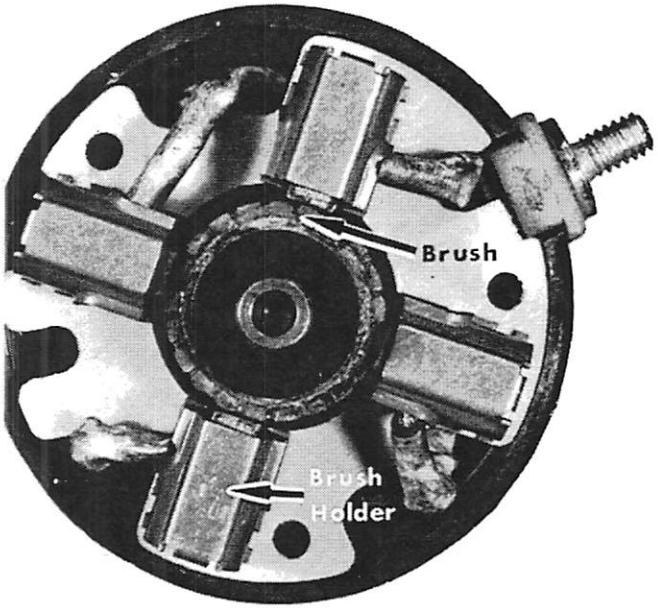

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Figure 2. Brush and Brush Holder Aligned

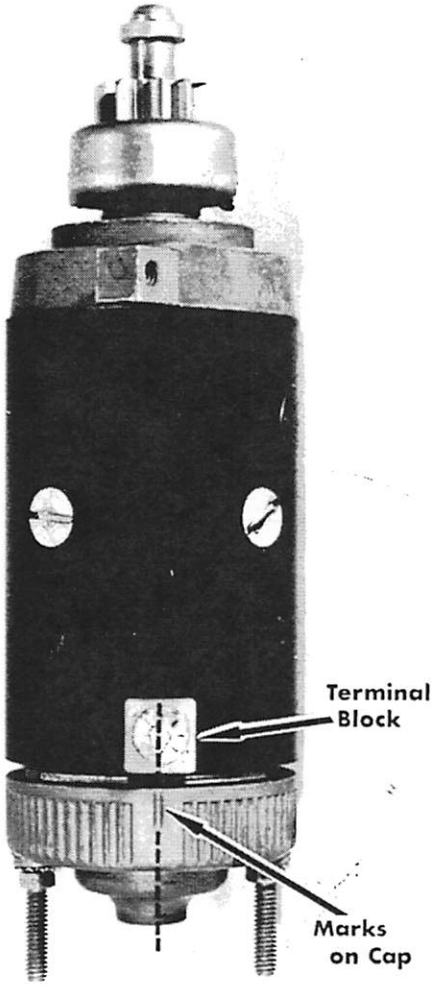

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Figure 3. Aligning End Cap with Brush Holder

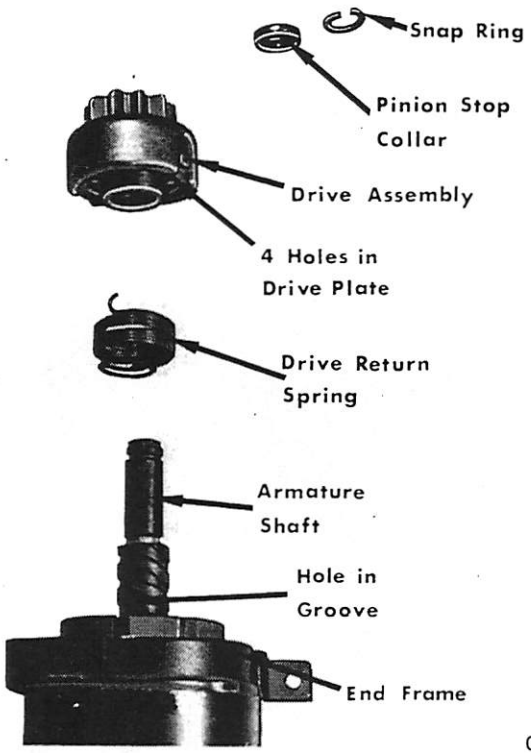
INERTIA DRIVE

DESCRIPTION

The inertia type drive assembly is mounted on the armature shaft which has external spiral splines that match the internal splines in the drive assembly.

DISASSEMBLY

1. To disassemble drive from armature, slide a standard ½" pipe coupling or other metal cylinder onto shaft so that end of coupling or cylinder butts against edge of pinion stop collar.
2. Tap end of coupling to drive the stop collar toward armature and off snap ring.



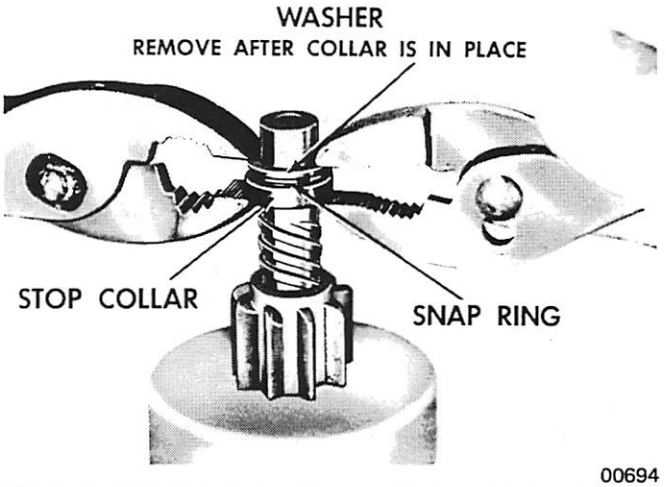


Figure 5. Installing Pinion Stop on Motor with Inertia Type Drive

3. Remove snap ring from groove in shaft.
4. Remove drive and spring in order shown in Figure 4.
5. Remove drive end frame from armature to complete disassembly.
6. Frame and field assembly may be disassembled for servicing, if required.

Figure 4. Inertia Type Drive Assembly

REASSEMBLY

1. Lubricate splined portion of armature shaft with SAE 10 or 10W30 oil.
2. Place drive return spring on armature shaft with small diameter of spring toward end frame.
3. Install first turn of small end of spring in groove of shaft next to end frame. Hook tip of end of spring in hole at bottom of groove. DO NOT distort spring.
4. With spring in free position, hold spring out of way while drive is assembled on shaft in full disengaged position.
5. Wind up free end of spring 3/4-turn and hook it into nearest of 4 holes in drive plate. Be sure that spring is securely hooked into drive plate.
6. Slide pinion stop collar onto shaft with cupped surface facing away from drive.
7. Install snap ring in groove at end of shaft. Squeeze snap ring (with pliers) so that it fits well into groove.
8. Position pinion stop collar next to snap ring and assemble a washer (standard automotive cranking motor thrust washer, if available) next to other side of snap ring. (Figure 5) Use 2 pairs of pliers at the same time (one pair on either side of shaft) to grip stop collar and washer. Stop collar will rotate freely when properly assembled.
9. Rotate drive against pinion stop and relieve any turns which may be overlapping other turns. When spring is properly assembled, drive should return snappily from engaged position.

RECTIFIERS

REMOVAL

Rectifier can be detached by removing the following:
1. Two yellow leads to alternator.
2. Red lead to electrical harness.
3. The ½" hex head nut and lockwasher from rectifier bracket or 2 phillips head screws from rectifier or 2 cap screws from rectifier.

INSTALLATION

Install rectifier on rectifier mounting bracket with ½" hex head nut and lockwasher, then attach the 3 leads removed previously.

IMPORTANT: Failure of rectifier to discharge a direct current (DC) indicates that it (or the alternator) is faulty.

Rectifiers usually are rendered useless ("baked" or discolored appearance) when battery leads of electrical harness are connected to wrong battery terminals. Function of rectifier is to convert alternating current (AC), supplied by alternator flywheel and alternator stator, to direct current (DC) for recharge of battery.

TESTING

Three types of rectifiers are employed in outboards: Plate type, diode type and diode type used on Thunderbolt Ignition. If a rectifier fails, it may be one of the following:
1. Reversed battery wires.
2. Stopping engine with ignition switch with engine running above idle RPM.
3. Open circuit, such as broken wire, loose connection, bad switch or loose harness connector at engine.

CHECK for OPEN CIRCUIT

1. Connect remote control to engine.
2. Disconnect battery terminals from battery.
3. Use Magneto Analyzer (C-91-25213) set to scale No. 3. (Figure 1)
4. Connect 2 small test leads together and adjust meter for "Zero".
5. Connect one test lead to red (center) wire of rectifier.
6. Connect other test lead to red battery cable.
7. Turn ignition switch of remote control to "On" position. Meter should move to right to "Zero". If wiring is good, meter hand always will remain at right hand "Zero", while ignition switch is in "On" position, when following tests are being made. If it does not, fault must be found and corrected, or new rectifier also will be burned out.
8. Turn ignition switch "On" and "Off" several times and make sure that pointer moves to "Zero" each time that switch is turned "On". If it does not, high resistance will be present and must be found, or a new rectifier also will fail.
9. With ignition switch "On", move external wiring harness back-and-forth, up-and-down, to check for breaks in wiring. Meter should remain at "Zero" if harness is good.
10. Move red wire on rectifier back-and-forth, up-and-down. Meter should remain at "Zero" if lead is not broken.
11. Remove test lead from red battery cable and connect to black battery cable.
12. Remove other test lead from red (center) wire of rectifier and connect center ground stud of rectifier.
13. Move internal harness back-and-forth, up-and-down, to check for breaks in wiring. Meter should remain at "Zero" if harness is good.
14. Move external harness back-and-forth, up-and-down, to check for breaks in wiring. Meter should remain at "Zero" if harness is good.
15. Disconnect meter from engine and harness, reconnect battery terminals and engine is ready for use.

TESTING PLATE TYPE RECTIFIER

Test by Measuring Direct Current Resistance on Magneto Analyzer (C-91-25213). (Figure 1)

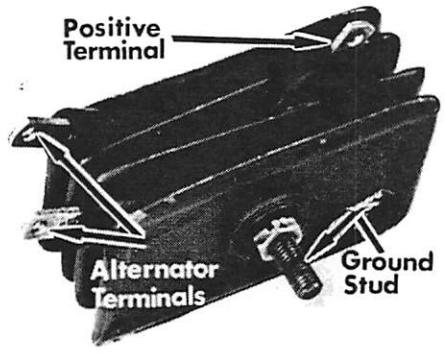


Figure 1. Testing Plate Type Rectifier

1. Set selector switch on position No. 3 (Continuity).
2. Clip small red and black test leads together and turn meter adjustment knob for scale No. 3 until meter pointer hand lines up on net position on scale No. 3, right side.
3. Connect small red and black test leads from analyzer to:
   a. Black wire and red wire on positive (+) ground type rectifiers or
   b. Red wire and ground bolt on negative (-) type rectifier.
4. Note reading of figures on lower band, scale No. 3.
5. Reverse test leads on rectifier and note readings again.
6. Ratio of two readings should be 10:1 or greater.
7. Remove analyzer test leads and connect to the 2 alternator leads or lead terminals on rectifier. Note reading of figures on lower band scale No. 3.
8. Reverse test leads on rectifier and note readings again.
9. The ratio of the two readings should be no more than 2:1.
10. This is only a preliminary test to determine condition of rectifier. If questionable, as a final test, rectifier should be installed on engine and checked with ammeter while engine is running.

TESTING DIODE TYPE RECTIFIER

1. Turn Magneto Analyzer selector switch to position No. 3 (Coil Continuity) and connect small red and black test leads together.
2. Turn meter adjustment knob for scale No. 3 until meter pointer lines up on right side (set position).
3. Testing positive diodes.
   a. Connect small red test lead to either alternating terminal and connect black lead to positive terminal of rectifier. (Figure 2) Meter pointer should move to right of scale No. 3.
   b. Reverse test leads on rectifier. Meter pointers should remain stationary at left side of scale No. 3.
   c. Repeat Steps "a" and "b" on the opposite alternator terminal.
   This will determine condition of positive diodes.

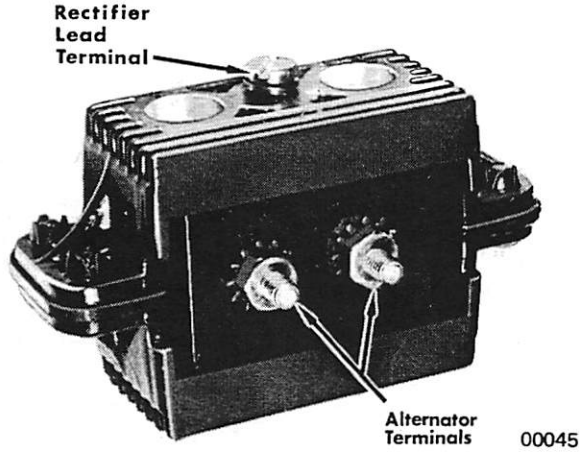


Figure 2. Testing Positive Diodes

4. Testing negative diodes.
   a. Connect small red test lead to either alternator terminal and connect black test lead to rectifier ground stud. (Figure 3) Meter pointer should remain stationary at left side of scale No. 3.
   b. Reverse test leads on rectifier. Meter pointer should move to right side of scale No. 3.
   c. Repeat Steps "a" and "b" on opposite alternator terminal. This will determine condition of negative diodes.

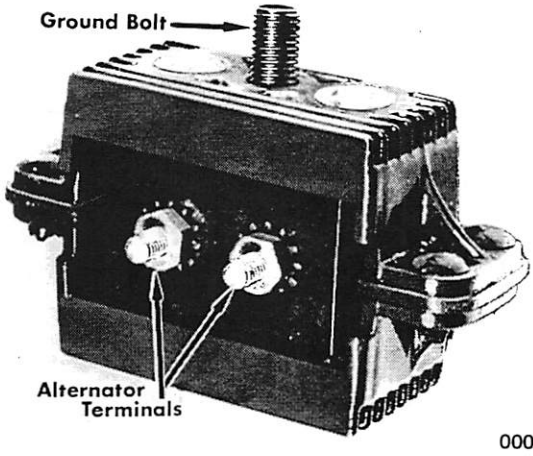


Figure 3. Testing Negative Diodes

NOTE: If any of the diodes do not check good, rectifier is defective and must be replaced.

CAUTION: Do not attempt to check polarity of battery leads by "sparking" lead terminals against battery terminals. This action may result in a burned-out rectifier.

FINDING CAUSE of TROUBLE

Burned-out rectifiers are greatly discolored and/or have a "baked" appearance. Unless condition which caused failure is corrected, new rectifier will provide no better service than old rectifier. See preceding for analysis of rectifier failure.

Rectifiers usually are rendered useless (burned-out) when battery leads of the electrical control harness are connected to the wrong terminals on the battery, or if battery leads are disconnected from battery terminals during operation of motor. Burned-out rectifiers are greatly discolored and/or have a "baked" appearance.

Kiekhaefer Mercury will not honor warranty on any rectifiers which are burned out, as described above.

REPLACEMENT

Rectifer replacement is a nut-and-bolt operation.

CAUTION: Make sure that battery is disconnected before connecting or disconnecting any wires in electrical system.

TESTING THUNDERBOLT IGNITION TYPE RECTIFIER

Rectifier will protect switch box from damage if harness plug becomes loose during engine operation, however, it will damage the rectifier.

Disconnecting battery leads during engine operation or reversing battery leads also will damage the rectifer. Leaving battery leads connected to wrong terminals will damage the switch box.

NOTE: Engine can be operated without rectifier, if alternator leads are disconnected and properly insulated.

Kiekhaefer Mercury will not honor warranty on rectifiers and switch boxes which are damaged under conditions described here. To check a rectifier, proceed as follows:

1. Remove rectifier from engine. (Figure 4)

2. Set Magneto Analyzer (C-91-25213) on scale No. 3, "Continuity".
3. Connect red (positive) lead to rectifier case.
4. Connect black (negative) lead alternately to terminals 1 and 3. On each terminal, the meter pointer should move to right of Scale 3. If the pointer does not move when connected to either terminal, the rectifier must be replaced.
5. Connect black lead to rectifier case.

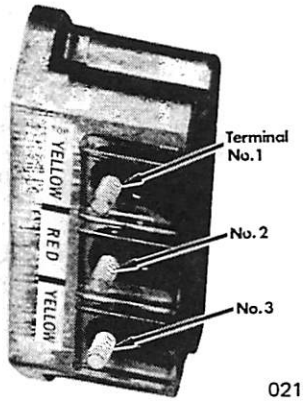


Figure 4. Rectifier Terminals

6. Connect red lead alternately to terminals 1 and 3. On each terminal, the meter pointer should remain stationary on the left side of Scale 3. If pointer moves when connected to either terminal, the rectifier must be replaced. DO NOT use an early type rectifier as a replacement.
7. Connect black lead to terminal 2.
8. Connect red lead alternately to terminals 1 and 3. On each terminal, the meter pointer should move to right of Scale 3. If the pointer does not move when connected to either terminal, the rectifier must be replaced.
9. Connect red lead to terminal 2.
10. Connect black lead alternately to terminals 1 and 3. On each terminal, the meter pointer should remain stationary on the left side of Scale 3. If pointer moves when connected to either terminal, the rectifier must be replaced. DO NOT use an early type rectifier as a replacement.

MERC 402 and 650 (3-Cyl.) TYPE RECTIFIERS

NOTE: Use VOA Electrical Tester (C-91-52751) to test rectifier. Red and yellow/red wires must be removed from rectifier before testing.

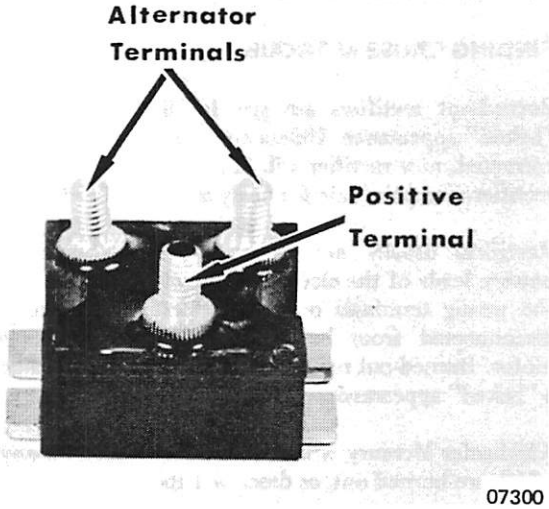


Figure 5. Merc 402 and 650 (3-Cyl.) Type Rectifier

IMPORTANT: Before making any tests with VOA Tester, turn meter selector to range specified and adjust pointer to ohms set position with small red and black leads clipped together. Ohms set position MUST BE readjusted each time meter range is changed.

NOTE: Refer to Figure 5 for rectifier terminal identification.

Check	Range	Reading
Red VOA lead to ground, black lead alternately to terminals one (1) and 3.	Rx1000	Continuity
Black VOA lead to ground, red lead alternately to terminals one (1) and 3.	Rx1000	No continuity
Black VOA lead to terminal 2, red lead alternately to terminals one (1) and 3.	Rx1000	Continuity
Red VOA lead to terminal 2, black lead alternately to terminals one (1) and 3.	Rx1000	No continuity

TESTING ALTERNATOR STATOR

Disconnect alternator leads at rectifier. Stator need not be removed from engine.

Check	Scale	Reading
Tester leads to alternator leads (yellow/red).	(1) Rx1 (2) Scale 2	See "Specifications"
Red tester lead to either alternator lead, black lead to ground (if mounted) or to steel frame of stator (if off engine).	(1) Rx1000 (2) Scale 3	No continuity

(1) VOA Electrical Tester
(2) Merc-O-Tronic Magneto Analyzer

RECTIFIER OUTPUT CHECKS

NET DC AMPERAGE OUTPUT on ALL 2-4 and 6-CYLINDER ENGINES

(Use VOA Tester [C-91-52751].)

TEST NO. 1

1. With engine stopped, disconnect red harness lead from positive (+) terminal of battery and connect negative (-) ammeter terminal to red harness lead.
2. Connect positive (+) side of ammeter to positive (+) terminal of battery. Turn ignition key to "On" position (START ENGINE) and read ammeter.
3. With a partially discharged battery, ammeter should change from discharge to charge at between 800-to-1000 RPM. With a fully-charged battery, this RPM may be somewhat higher. Increase engine RPM to 5200-to-5500, at which time reading should be approximately 10-to-12 amperes with partially discharged battery. With fully-charged battery, a somewhat lower reading will be obtained because of self-regulating characteristics of generating systems.

GROSS DC AMPERAGE OUTPUT of RECTIFIERS on ALL 4 and 6-CYLINDER ENGINES with GENERATORS

(Use VOA Tester [C-91-52751].)

1. Connect an ammeter between red output lead from the rectifier and electrical internal harness red lead.
2. Open disconnects and connect ammeter, attaching lead from rectifier to one terminal of ammeter and lead from internal harness to second terminal.
3. Start engine and check amperage ouput. Maximum output with a low battery at full throttle is 14 amperes. Maximum output for 4-cylinder engines at full throttle is 7 amperes with a low battery.

STARTER SOLENOID

1. Turn selector switch of Magneto Analyzer (C-91-25213) to position No. 2 (Distributor Resistance) and clip small red and black leads together.
2. Turn meter adjustment knob for scale No. 2 until meter pointer lines up with set position on left side of "OK" block on scale No. 2.
3. Unclip small red and black leads.
4. Connect small red test lead to one large terminal of solenoid and connect small black test lead to other large terminal as shown in Figure 1.
5. Using 12-volt battery and jumper leads, connect positive (+) lead to small "S" terminal of solenoid.
6. Connect negative (-) battery lead to "I" terminal of solenoid.
7. Meter pointer hand must move into the "OK" block, or solenoid is defective and must be replaced.

SOLENOID COIL CHECK

1. Turn Magneto Analyzer (C-91-25213) selector switch to position No. 2 (Distributor Resistance).
2. DO NOT clip small red and black lead together.
3. Turn No. 2 scale meter adjustment knob to adjust meter needle with red line on right side of scale No. 2.

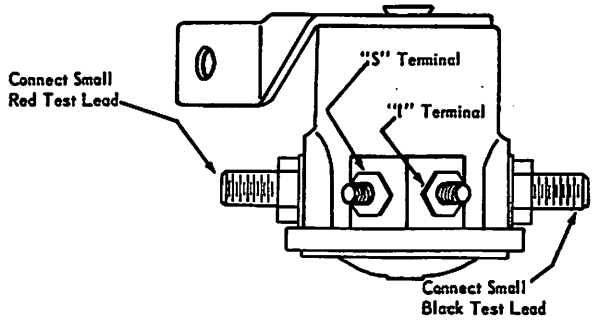


Figure 1. Terminals on Standard Solenoid

CAUTION: DO NOT connect battery leads to large terminals of solenoid, or meter will be damaged.

4. Connect small red test lead to "S" terminal and black test lead to "I" terminal.
5. An ohm reading of 2.1 to 2.7 (Scale 2) indicates a good solenoid.

CHOKE SOLENOID

1. Using a VOA Tester (C-91-52751) on the Rx1 scale, connect black lead to unpainted portion of block. Connect red lead to terminal of choke solenoid. Refer to "Specifications" Section 8.
2. Check to make sure that choke plunger is pulled into choke solenoid when key switch is turned to start.

BATTERY PRECAUTIONS

When charging batteries, an explosive gas mixture forms in each cell. Part of this gas escapes thru holes in vent plugs and may form an explosive atmosphere around battery if ventilation is poor. This explosive gas may remain in or around battery for several hours after it has been charged. Sparks or flames can ignite this gas and cause an internal explosion which may shatter the battery.

The following precautions should be observed to prevent an explosion.

1. DO NOT smoke near batteries being charged or which have been charged very recently.
2. DO NOT break live circuits at terminals of batteries because a spark usually occurs at the point where a live circuit is broken. Always be careful when connecting or disconnecting cable clamps on chargers. Poor connections are a common cause of electrical arcs which cause explosions.
3. DO NOT reverse polarity of battery terminal to cable connections or Thunderbolt Ignition, as components can be severely damaged.

CAUTION: If battery acid comes into contact with skin or eyes, wash skin immediately with a mild soap. Flush eyes with water immediately and see a doctor.

GENERAL

The battery comprises a number of separate elements, each located in an individual cell in a hard rubber case. Each element consists of an assembly of positive plates and negative plates which contain dissimilar active materials kept apart by separators. Elements are immersed in electrolyte composed of dilute sulfuric acid. Plate straps (located on top of each element) connect all positive plates and all negative plates into groups. Elements are connected in series electrically by connectors which pass directly thru case partitions between cells. Battery top is a one-piece cover. Cell connectors, which by-pass thru cell partitions, connect elements along shortest practical path.

With length of electrical circuit inside battery reduced to a minimum, internal voltage drop is decreased and results in improved performance, particularly during engine cranking at low temperatures.

A battery generally has 2 classifications of ratings: (1) a 20 hour rating at 80°F and (2) a cold rating at 0°F which indicates cranking load capacity. Ampere-hour rating (found on batteries) was based on 20-hour rating. For example, a battery capable of furnishing 3 amperes for 20 hours, while maintaining a specified average individual cell voltage, would be classified as a 60 ampere hour battery (e.g. 3 amperes x 20 hours = 60 A.H.).

SPECIFIC GRAVITY READINGS

Use a hydrometer to measure specific gravity of electrolyte in each cell. (Figure 2)

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Figure 2. Checking Specific Gravity

Hydrometer measures precentage of sulphuric acid in battery electrolyte in terms of specific gravity. As a battery drops from a charged to a discharged condition, acid leaves the solution and enters the plates, causing a decrease in specific gravity of electrolyte. An indication of concentration of electrolyte is obtained with a hydrometer.

When using a hydrometer, observe the following points:

1. Hydrometer must be clean (inside and out) to insure an accurate reading.
2. Never take hydrometer readings immediately after water has been added. Water must be thoroughly mixed with electrolyte by charging for at least 15 minutes at a rate high enough to cause vigorous gassing.
3. If hydrometer has built-in thermometer, draw liquid in several times to ensure correct temperature before taking reading.
4. Hold hydrometer vertically and draw in just enough liquid from battery cell so that float is free-floating. Hold hydrometer at eye level so that float is vertical and free of outer tube, then take reading at surface of liquid. Disregard curvature where liquid rises against float stem due to capillarity.
5. Avoid dropping battery fluid on boat or clothing, as it is extremely corrosive. Wash off immediately with baking soda solution.

Specific gravity of electrolyte varies not only with percentage of acid in liquid but also with temperature. As temperature increases, electrolyte expands, so that specific gravity is reduced. As temperature drops, electrolyte contracts, so that specific gravity increases. Unless these variations in specific gravity are taken into account, specific gravity obtained by hydrometer may not give a true indication of concentration of acid in electrolyte.

A fully charged battery will have a specific gravity reading of approximately 1.270 at an electrolyte temperature of 80° F. If electrolyte temperature is above or below 80° F, additions or subractions must be made in order to obtain a hydrometer reading corrected to 80° F standard. For every 10° above 80° F, add 4 specific gravity points (.004) to hydrometer reading. Example: A hydrometer reading of 1.260 at 110° F would be 1.272 corrected to 80° F, indicating a fully charged battery.

For every 10° below 80° F, subtract 4 points (.004) from the reading. Example: A hydrometer reading of 1.272 at 0° F would be 1.240 corrected to 80° F, indicating a partially charged battery.

SPECIFIC GRAVITY CELL COMPARISON TEST

This test may be used when an instrumental tester is not available. To perform this test, measure specific gravity of each cell, regardless of state of charge, and interpret results as follows: If specific gravity readings show a difference between highest and lowest cell of .050 (50 points) or more, battery is defective and should be replaced.

ELECTROLYTE LEVEL

Check electrolyte level in battery regularly. A battery, in use in hot weather, should be checked more frequently because of more rapid loss of water. If electrolyte level is found to be low, then colorless, orderless drinking or distilled water should be added to each cell until liquid level rises approx. 3/16" over plate. DO NOT OVERFILL, because this will cause loss of electrolyte and result in poor performance, short life and excessive corrosion.

CAUTION: During service, only water should be added to the battery, not electrolyte.

Liquid level in cells should never be allowed to drop below top of plates, as portion of plates exposed to air may be permanently damaged with a resulting loss in performance.

CHARGING

The following basic rule applies to any battery charging situation:

1. Any battery may be charged at any rate (in amperes) or as long as spewing of electrolyte (from violent gassing) does not occur and for as long as electrolyte temperature does not exceed 125° F. If spewing of electrolyte occurs, or if electrolyte temperature exceeds 125° F, charging rate (in amperes) must be reduced or temporarily halted to avoid damage to the battery.
2. Battery is fully charged when, over a 2-hour period at a low charging rate (in amperes), all cells are gassing freely (not spewing liquid electrolyte), and no change in specific gravity occurs. Full charge specific gravity is 1.260-1.275, corrected for electroyte temperature with electrolyte level at split ring, unless electrolyte loss has occured (from age or over-filling) in which case specific gravity reading will be lower. For most satisfactory charging, lower charging rates in amperes are recommended.
3. If, after prolonged charging, specific gravity of at least 1.230 on all cells cannot be reached, battery is not in optimum condition and will not provide optimum performance; however, it may continue to provide additional service, if it has performed satisfactorily in the past.
4. To check battery voltage while cranking engine with electric starting motor, place red (+) lead of tester on positive (+) battery terminal and black (-) lead of tester on negative (-) battery terminal. If the voltage drops below 9½ volts while cranking, the battery is weak and should be recharged or replaced.
5. A quick voltage check to determine condition of the battery can be completed by attaching the leads as stated above. Meter will indicate voltage. If below 12 volts, it indicates a weak battery.

CLEANING

External condition of battery should be checked periodically for damage, such as cracked cover, case and vent plugs or for presence of dirt and corrosion.

Keep battery clean in area of terminals. Accumulation of acid film and dirt may permit current to flow between terminals, which will slowly discharge the battery. For best results when cleaning batteries, wash first with a diluted ammonia or a soda solution to neutralize any acid present, then flush with clean water. Care must be taken to keep vent plugs tight, so that neutralizing solution does not enter cells.

CABLES

To ensure good electrical contact, cables should be clean and tight. If cable terminals are corroded, cables should be disconnected and terminals cleaned separately with a soda solution and a wire brush. After cleaning and installing clamps, apply a thin coating of petroleum jelly on cable clamps to retard corrosion.

CAUTION: Connect red cable to positive (+) battery terminal. Failure to observe correct polarity will result in the destruction of rectifier and/or switch box.

STORAGE

All lead acid batteries have an inherent self-discharge characteristic when not in use. Recharge every 48 days, or when specific gravity drops below 1.230. Before charging, cover plates with distilled water, but not over 3/16" (4.8mm) above perforated baffles. Charge rate should not be more than 6 amperes. Discontinue charging when specific gravity reaches 1.260 and 80° F (27° C).

Store battery as follows:

1. Remove battery from its installation as soon as possible and remove all grease, sulfate and dirt from top surface by cleaning as previously described.
2. Cover plates with distilled water, but not over 3/16" above perforated baffles.
3. Lubricate terminal bolts well with cup grease or petroleum jelly.
4. With battery in a fully-charged condition (specific gravity 1.260-1.275), store in a dry place, where temperature will not fall below freezing.
5. Remove battery from storage EVERY 45 days. Check water level and put on charge for 5 to 6 hours at 6 amperes. DO NOT FAST CHARGE.
6. When ready to place battery back into service, remove excess grease from terminals (leaving small amount on), recharge as necessary and reinstall in your equipment.

CAUTION: A discharged battery can be damaged by freezing.

ELECTRICAL ACCESSORIES CONNECTIONS

Any accessories, such as horns, running lights, etc, should be installed with electrical connections attached directly to battery terminals via the screws on the battery lugs.

SECTION 3 - ELECTRICAL SYSTEMS

MERCURY
OUTBOARDS

PART C - TROUBLESHOOTING and COMPONENT TESTING

INDEX

STANDARD IGNITION PRECAUTIONS

WARNING: DANGER - HIGH VOLTAGE. DO NOT touch or disconnect any ignition system parts while engine is running or with battery connected.

1. When checking for spark, do not hold wire far away from plug, and only make this test for a brief instant. It puts a strain on coil and might break down a perfectly good coil if overdone.
2. When assembling spark plug protectors to cables, make sure that prong of spring goes thru the center of the cable to make solid contact with the ignition wire. If this is not a good electrical contact, a weak spark may result.
3. Never use a plated gauge in checking point gap, as plating may come off.
4. Avoid using a spark plug tester with hypodermic type needle on the end. It will puncture leads or spark plug protectors and will cause electrical leakage through the punctured hole.
5. Do not use pliers to bend contact point springs. Do not make a sharp bend.
6. Remove ignition components from powerhead prior to cleaning, as lacquer thinner will deteriorate oil seals.

TROUBLESHOOTING

Symptom	Probable Cause
Engine won't start,but fuel and spark are OK.	A. Defective spark plugs. B. Spark plug gap set too wide. C. Improper spark timing.
Engine misfires at idle.	A. Incorrect spark plug gap. B. Defective or loose spark plugs. C. Spark plugs of incorrect heat range. D. Sticking breaker arm. E. Incorrect breaker point gap. F. Breaker points not synchronized. G. Loose wire in primary circuit. H. Defective distributor rotor. I. Corroded or pitted breaker points. J. Cracked distributor cap. K. Leaking or broken high tension wires. L. Weak armature magnets. M. Worn cam lobes on distributor or magneto shaft. N. Worn distributor or magneto shaft bushings. O. Defective coil or condenser. P. Defective ignition switch. Q. Spark timing out of adjustment. R. Magneto adaptor flange worn out of round.
Engine misfires at high speed.	A. Check all of above. B. Weak breaker arm spring. C. Coil breaks down. D. Coil shorts through insulation. E. Breaker points improperly adjusted. F. Poor breaker point contact. G. Spark plug gap set too wide. H. Too much spark advance. J. Wrong type spark plugs.
Engine Backfires. A - Through exhaust B - Through carburetor	A. Cracked spark plug insulator. B. Carbon path in distributor cap. C. Crossed spark plug wires. D. Improper timing. Improper ignition timing.

Symptom	Probable Cause
Engine pre-ignition	A. Spark advanced too far. B. Incorrect type spark plug. C. Burned spark plug electrodes. D. Incorrect breaker setting.
Engine noises - Knocking at powerhead	Spark advanced too far.
Breaker points oxidized or carbon-up.	A. High battery voltage. B. Resistor of incorrect capacity. C. High resistance in condenser circuit. D. Incorrect type ignition coil.
Ignition coil fails.	A. Extremely high voltage B. Moisture formation C. Excessive heat from engine.
Spark plugs burn and foul.	A. Incorrect type plug. B. Too rich fuel mixture. C. Inferior grade of gasoline. D. Overheated engine. E. Too much carbon in combustion chambers.
Ignition causing high gas consumption	A. Incorrect spark timing. B. Leaking high tension wires. C. Incorrect spark plug gap. D. Fouled spark plugs. E. Worn breaker points. F. Incorrect spark advance. G. Defective condenser. H. Weak ignition coil. J. Pre-ignition.

COMPONENT TESTING
HIGH and LOW SPEED COIL TEST

1. Place a piece of cardboard or paper between breaker points to separate points.
2. Using Magneto Analyzer (C-91-25213), connect small black test lead to coil primary ground wire. Connect small red test lead to coil primary lead or breaker point assembly terminal. Connect large red test lead to terminal of spark plug wire.
3. With current control knob turned to the extreme left, beyond "Low" position, turn selector switch to position No. 1 (Coil Power Test).
4. Slowly turn current control knob clockwise and note the current value on scale No. 1. When it reaches the operating amperage specification for that particular winding (see "Specifications" Section 8), stop turning current control knob and note the spark gap. It should fire steadily.
5. If the spark is faint, intermittent or no spark has occurred at this reading, the coil is defective and must be replaced. If a steady spark occurs below specifications, the coil is good.
6. Continue turning current control knob clockwise (to the right) for maximum reading of meter. The spark gap should fire steadily. If the spark is faint, intermittent or no spark occurs, the coil is defective at high speed and must be replaced.

NOTE: Complete this test as quickly as possible and turn selector switch and power control to "Off" position.

All coils should start firing 1 and 3 divisions before rated specification. Coils, which start to fire on "Rated" specifications, are considered marginal, would give considerable trouble in starting engine and should be considered defective.

A-332-2983 SERIES IGNITION COILS

1. Disconnect primary leads from switch box and secondary lead from distributor or spark plug.
2. Check resistance between primary leads, between either primary lead and the secondary and check resistance between a primary lead and coil bracket and between the secondary lead and coil bracket.

Check	Range	Ohm Scale Reading
1. Between primary leads	R x 1	0
2. Between a primary lead and the secondary	R x 100	3.0 - 3.6
3. Between a primary lead and the bracket	R x 1000	No continuity
4. Between the secondary and the bracket	R x 1000	No continuity

COIL SECONDARY CONTINUITY TEST

NOTE: Scale 3 of the later model analyzer has 2 scales. The upper scale is the number shown in specification section or comparative numbers in place if actual ohm resistance which are the lower numbers.

1. Turn selector switch of Magneto Analyzer to position No. 3 (Coil Continuity). (Figure 1)
2. Clip small red and black test leads together. Turn meter adjustment knob for scale No. 3 until meter pointer lines up on set position on right side of scale No. 3.
3. Connect small black test lead to coil ground wire and connect small red test lead to spark plug "high tension" lead. Reading must be between the two values for that particular coil (see "Specifications" Section 8). Reading of actual resistance in ohms can be obtained by reading lower numbers on same scale. If reading is lower than the lowest value, the secondary winding is shorted, and coil must be replaced. If reading is higher than the highest value shown, the secondary winding is open, and coil must be replaced.

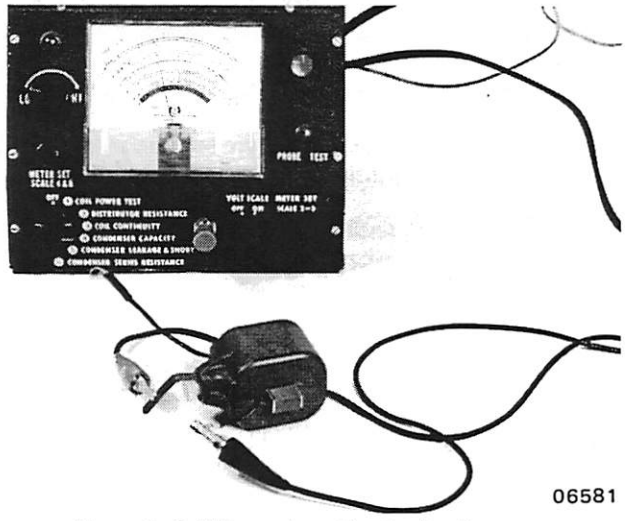

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Figure 1. Coil Secondary Continuity Test

COIL PRIMARY TEST

1. Turn selector switch of Magneto Analyzer to Position No. 2 (Distributor Resistance).

   NOTE: Do not clip test leads together.

2. Turn meter adjustment knob for scale No. 2 until meter needle lines up on "Set" position on right side of scale No. 2. This is low ohms scale for checking 0-30 ohms.
3. Connect small black test lead to primary, negative side of coil. Read red figures on scale No. 2. Reading must be between the 2 values for that coil listed in "Specifications" Section 8. If reading is lower than the lowest value, the primary winding is shorted and must be replaced. If reading is higher than the highest value, the winding is open and must be replaced.

WARNING: DANGER - HIGH VOLTAGE. DO NOT touch or disconnect any ignition system parts while engine is running or with battery connected.

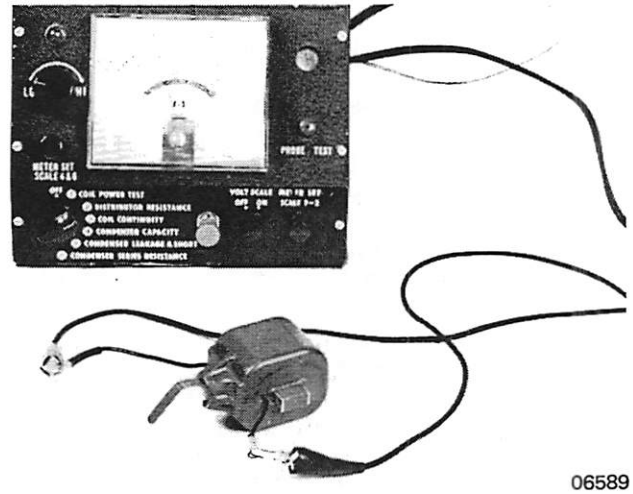

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Figure 2. Testing Magneto Coil - Selector Switch on No. 2

INSULATION TEST

1. Using Magneto Analyzer, connect small red test lead to coil primary lead after lead has been removed from breaker point terminal. Small black lead is attached to housing.
2. Plug insulation test prob into "Jack" on front of analyzer.
3. Turn selector switch to position No. 1. Turn current control knob to "Hi" position for maximum current reading on meter.

   NOTE: DO NOT exceed meter reading.

4. Pass end of insulation test probe over insulating surface of coil and spark plug wires. If coil insulation is cracked, leaking or damaged, a spark discharge will be noted at cracked or leaking surface.

CAUTION: DO NOT permit test probe to linger too long in any one position, as insulation burning could result. Complete the test as rapidly as possible, as this is a severe test on a coil.

NOTE: A faint spark, which occurs around coil insulation during probing, is a corona spark and does not illlustrate a defective coil.

DISTRIBUTOR RESISTANCE TEST

1. Turn selector switch of Magneto Analyzer to position No. 2 (Distributor Resistance.)
2. Clip small red and black test leads together. Turn meter adjustment knob for scale No. 2. Unclip small red and black test leads.
3. Connect small red test lead to breaker point terminal. Connect small black test lead to stator plate or any part of engine.
4. Turn crankshaft until cam allows breaker points to close. Meter pointer must return to the "OK" block. If meter pointer is in high resistance band, dirt is present between breaker points.

NOTE: Although breaker points are made of non-corrosive metal, a current-resisting, tough film may form on breaker points after engine stands for a period of time, especially if stored in a damp place. This film will cause hard starting of the engine. By running a piece of stiff paper between the points several times, the film will wear and dirt or oil will be removed. After cleaning points in the above manner, the meter should be in the "OK" block. If not, replace breaker points.

CONDENSER CAPACITY TEST

1. Plug Magneto Analyzer into 115-volt, 60-cycle AC outlet.
2. Place a piece of cardboard between breaker points.
3. Place selector switch on position No. 4 (Condenser Capacity).
4. Clip small red and black test leads together. Depress red button, turn meter adjustment knob on scale No. 4 to set line on scale No. 4 on right side of meter. Unclip test leads.
5. Connect small red test lead to breaker terminal or, if loose, to condenser lead. Connect small black test lead to stator plate, if condenser is mounted, otherwise to body of condenser. Depress red button to read scale No. 4. Condenser must be within specifications. See "Specifications" Section 8. A condenser, which is over or under specification, could cause burned breaker points.

CONDENSER LEAKAGE and SHORT TEST

WARNING: DANGER - HIGH VOLTAGE. DO NOT touch or disconnect any ignition system parts while engine is running or with battery connected.

1. Plug Magneto Analyzer into 115-volt, 60-cycle AC outlet.
2. Place a piece of cardboard between breaker points.
3. Connect small black test lead to stator plate, if condenser is mounted, otherwise to body of condenser. Connect small red lead to breaker terminal or, if unmounted, to condenser lead.
4. Turn selector switch to No. 5 (Leakage and Short). Depress red button, hold a minimum of 15 seconds and read scale No. 5. Meter pointer will move to the right and must return within range of the narrow black bar at the left. Any readings to the right of the black bar indicate that condenser is leaking or shorted and must be replaced.

   NOTE: On Kiekhaefer type magnetos, condenser lead must be removed from the breaker point terminal when testing on complete magneto. Condenser should be tapped against an insulated board, while testing, to show up loose element.

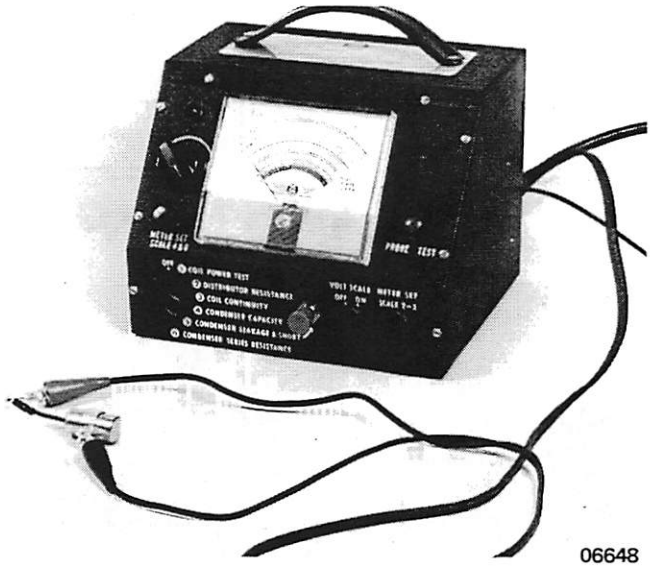

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Figure 3. Testing Condenser Leakage and Short - Selector Switch on No. 4

CONTINUITY TEST

1. To test ignition or electrical harness or parts for "open circuits", turn selector switch to position No. 3 (Coil Continuity). Zero meter by connecting small black and red test leads together and adjusting scale No. 3 meter adjustment knob for zero ohms on scale No. 3. Disconnect small black and red leads.
2. Connect small black test lead to one end of wire and small red test lead to opposite end of same wire. Meter pointer must move fully to the right of meter. If meter pointer stays at left, wire is broken. Flex the lead wire back and forth, while making test, to check for intermittent opens.

CONDENSER SERIES RESISTANCE TEST

1. Place selector switch of Magneto Analyzer (C-92-25213) on position No. 6 (Condenser Series Resistance).
2. Clip small red and black test leads together.
3. Adjust meter set scale No. 6 to set line on right side of dial for scale No. 6.
4. Unclip test leads.
5. With condenser removed, connect small red test lead to condenser lead.
6. Connect small black test lead to body of condenser.
7. Meter pointer must be within "OK" green block on scale No. 6 on right side of meter.
8. While testing, move and "wiggle" the lead coming out of the condenser. Observe meter pointer for any movement. Loose connections can cause trouble if the condenser is subject to a great deal of vibration. If meter pointer remains within "OK" green bar on scale No. 6, the condenser is good. If meter pointer moves into the red section on Scale 6 or, if by wiggling the condenser lead, pointer moves into red section, then the condenser is defective.

RESISTOR TEST

1. With Magneto Analyzer on scale No. 2 (Distributor Resistence), turn No. 2 scale meter adjustment knob to adjust meter needle with red line on right side of scale No. 2. DO NOT clip test leads together.
2. Clip small red and small black test leads to opposite terminals of resistor, as shown, and read red figures on scale No. 2. Replace resistor which does not meet specifications. See "Specifications" Section 8.

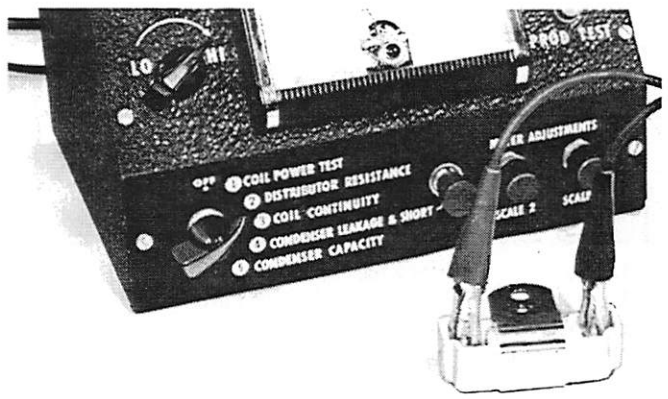

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Figure 4. Testing Resistor - Selector Switch on No. 2

RECTIFIER

Refer to "Electrical Starting Systems" Section 3B for rectifier tests.

WARNING: DANGER - HIGH VOLTAGE. DO NOT touch or disconnect any ignition system parts while engine is running or with battery connected.

LIGHTNING ENERGIZER IGNITION

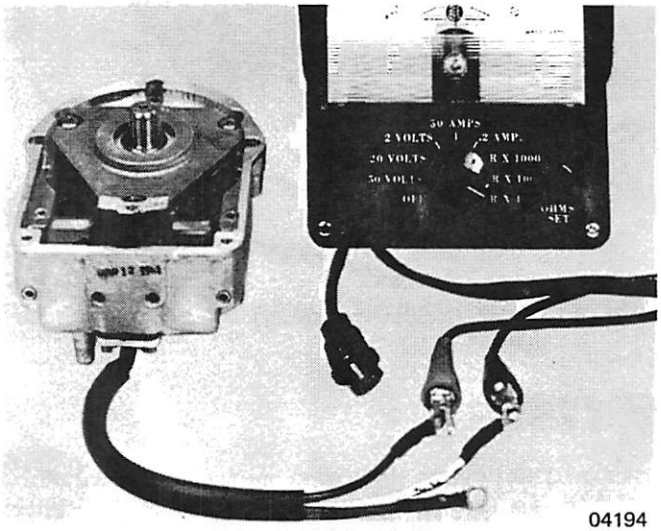

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Figure 1. Testing Coils

1. If bearings are worn or rough, replace with new bearings. Wipe off sealed bearings; do not wash in a solvent.
2. Check ignition driver frame housing for dirt, rust or corrosion. Any rust or corrosion should be removed with No. 320 carborundum paper and wiped out clean.

Check	Range	Ohms Scale Reading
1. Between white and red	R x 100	3.5 - 4.5
2. Between white and blue	R x 1	10.0 - 11.0
3. Between red and ground	R x 1000	No continuity
4. Between blue and ground	R x 1000	No continuity
5. Between white and ground (both coils)	R x 1000	No continuity

3. Check rotating magnet and shaft assembly for rust or corrosion. Clean thoroughly with No. 320 carborundum paper (not a wire brush) and wipe clean.
4. Test high and low coils with VOA Electrical Tester (C-91-52751), following specifications in chart, above. Coils also can be tested without removing from ignition driver. (Figure 1)
5. Check condition of high tension leads. Test high tension leads for resistance.
6. Check condition of end cap assembly. Test end cap for leakage paths which could be caused by broken leads, poor connections or moisture, dirt, carbon or corrosion within the ignition driver.
7. Before reassembly of ignition driver, make certain that all components are thoroughly tested and cleaned. Discard and replace any parts which do not meet standards.

TROUBLESHOOTING MERC 500 SWITCH BOX

Disconnect all leads connected to the switch box terminals and make the following measurements with a VOA Electrical Tester. Be sure the VOA pointer is adjusted to the ohms set position with the small red and black VOA leads shorted.

Check	VOA Range	Ohms Scale Reading
1. Red VOA lead to green switch box terminal and black VOA lead to ground.	R x 1000	No continuity
2. Reverse the VOA leads in measurement No. 1.	R x 1000	4 to 6
3. Red VOA lead to red switch box terminal and black VOA lead to ground.	R x 1000	4 to 6
4. Reverse leads in measurement No. 3.	R x 1000	No continuity
5. Red VOA to white switch box terminal and black VOA lead to ground.	R x 1000	4 to 6
6. Reverse leads in measurement No. 5.	R x 1000	No continuity
7. Red VOA lead to blue switch box terminal and black VOA lead to ground.	R x 1000	4 to 6
8. Reverse leads in measurement No. 7.	R x 1000	No continuity

THUNDERBOLT IGNITION - PRECAUTIONS

WARNING: Danger, high voltage. DO NOT touch or disconnect any ignition system parts while engine is running or with battery connected.

1. Do not reverse battery terminals.
2. Do not spark battery terminals with battery leads to check polarity.
3. Do not attempt to run engine without the shorting clipper connected in alternator system, as switch box could be damaged.
4. Do not install resistor type lead wires or resistor type spark plugs. Radio interference is less with this system than with conventional ignition systems.
5. Do not ground any wires to engine block. Ground only to bottom cowl or front cover plate to which switch box is mounted.
6. Do not disconnect battery leads while engine is running.
7. For testing, use Mercury Marine Service Tachometer (C-91-31591).
8. Amperage draw for engine operation is approximately ½ ampere at idle, increasing to 4 amperes at full throttle.

TROUBLESHOOTING and TESTING
6-CYLINDER THUNDERBOLT BREAKER IGNITION

WARNING: Danger, high voltage. DO NOT touch or disconnect any ignition system parts while engine is running or with battery connected.

IF ENGINE DOES NOT START, CHECK as FOLLOWS -

SWITCH BOX

1. With key switch in "Off" position and battery disconnected:
   a. Place throttle control lever in "Neutral" (closed) position.

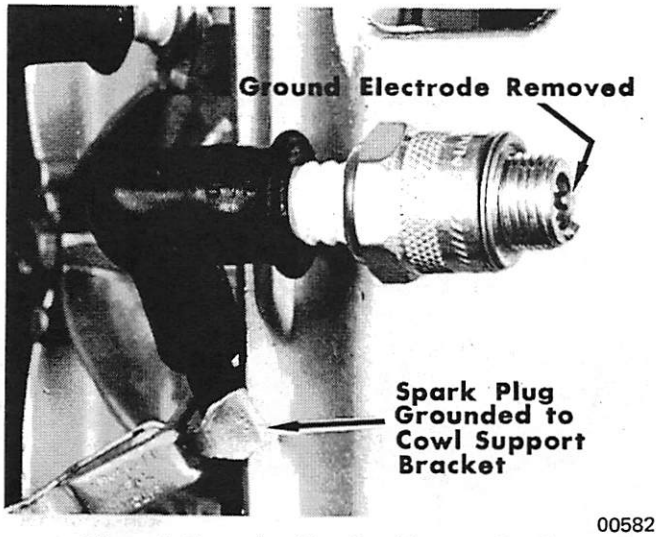

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Figure 1. Ground to Top Cowl Support Bracket

   b. Rotate engine one full revolution to approximately TDC (top dead center) of No. 1 piston. Mark on flywheel aligns with mark "CYL. #1 T.D.C." on decal.
2. Place spark gap tester on No. 1 spark plug lead and ground to top cowl support bracket. (Figure 1)
3. Remove distributor and mercury switch lead wires from switch box terminal "A". (Figure 2)
4. Connect battery leads to battery and turn ignition key to "On" position. Scratch terminal "A" against switch box metal frame with screwdriver (insulated handle) to obtain spark on gap tester.
5. If spark occurs, system is functioning to this point and distributor should be checked. If no spark, check the following:
   a. With key switch in "Off" position, connect one lead of volt tester (Magneto Analyzer, C-91-25213) to red terminal on switch box. (Figure 3) Connect other lead to ground. If no voltage, check battery, battery connections or for broken lead wire in harness.
   b. If red terminal has voltage, connect volt tester lead to white terminal of switch box. (Figure 3) Connect the other lead to the ground terminal.
   Turn key switch to "On" position. If no voltage, key switch or wiring is defective.

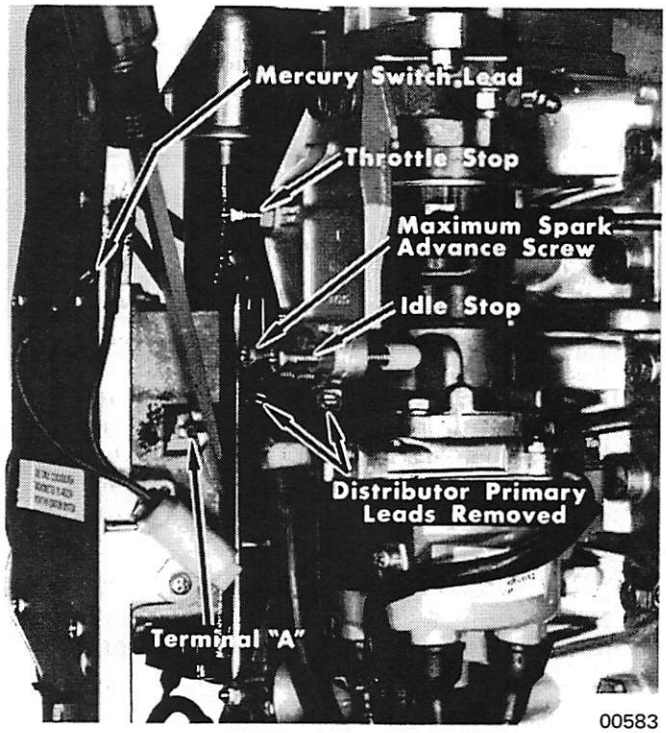

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Figure 2. Removing Lead Wires from Switch Box Terminal "A"

   c. If "click" is heard, but no spark occurs, this indicates existence of a faulty coil, coil high voltage wiring, distributor cap, rotor or connecting leads.
6. If preceding parts test satisfactorily, then replace switch box assembly. Repeat tests 1, 2 and 3, preceding, to check for spark.

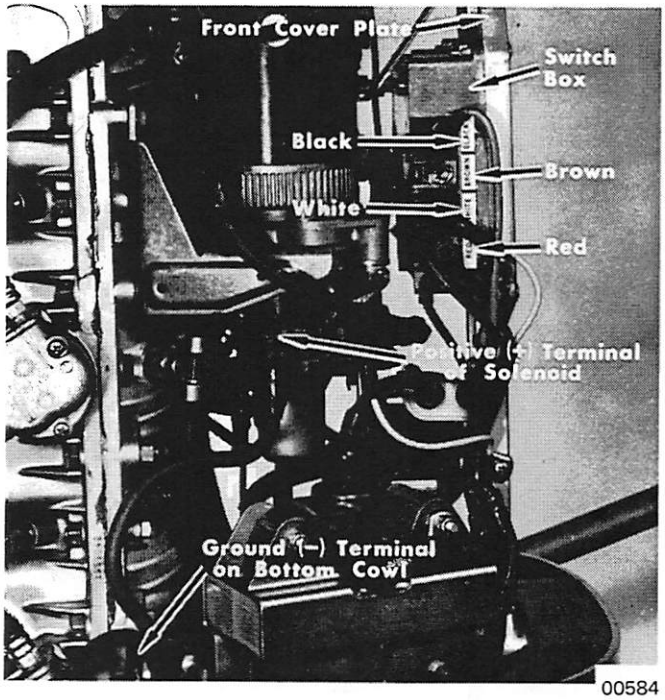

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Figure 3. Switch Box Terminals

DISTRIBUTOR

1. If spark occurs at spark gap tester during test procedure, as outlined under "Switch Box", preceding, then switch box and coil are functioning properly.
2. Reconnect distributor and mercury switch leads to switch box terminal "A". (Figure 2)
3. Remove any one spark plug lead from spark plug.
4. Remove ground electrode from standard type spark plug (not Polar-Gap) and ground to cowl support bracket. (Figure 1)

WARNING: High voltage! DO NOT hold spark plug in hand for the following check. DO NOT pull "sparky" off spark plug to check for spark while engine is running.

5. Turn engine over with starter and watch for spark across air gap.
6. If no spark, check dwell with Tachometer Dwell Tester (C-91-31591). If dwell is incorrect, or none is indicated, check "a" thru "f", following, or attempt to start engine with one set of breaker points (remove one distributor lead from terminal "A") at a time to determine which one is not functioning.

   NOTE: Engine can be operated on one set of points, providing that the other breaker point lead is disconnected from terminal "A". Engine will run on 3 cylinders.

   a. Breaker points in distributor closed, because of worn cam follower on breaker assembly.
   b. Worn cam shaft.
   c. Broken primary lead wire.
   d. Bluish tint on breaker point contact faces is characteristic of this ignition system.
   e. It is not unusual for breaker points to have a relatively high resistance when testing with Magneto Analyzer or ohmeter. These would be satisfactory for reuse.
   f. There will be no pitting nor build-up on breaker point contact faces.
7. A 45° dwell is correct setting for distributor tester. Second breaker point opens 60° from first to synchronize points. If is necessary to install capacitors (condensers) between breaker point leads and ground on the distributor to test on distributor testers. (Figure 4) The Allen Synchrograph (C-91-37362 or C-91-30166) function properly without capacitors in the distributor.

   NOTE: Using the 6-cyl. selection on synchrograph machines, the cam angle will be 22½°.

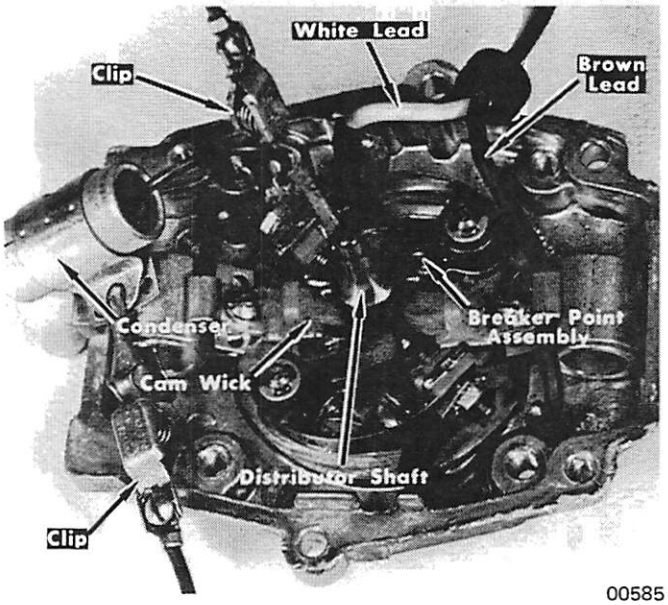

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Figure 4. Testing Distributor

IGNITION COIL

1. Because of design of coil, significant values cannot be obtained with normal test procedures or equipment. Part must be replaced.
2. DO NOT disassemble coil and bracket, as this is a special assembly whose individual parts are not available.
3. Coil secondary lead wire is secured in coil tower with Sealing Compound No. 47 (A-399-673).

SHORTING CLIPPER

1. Purpose: To protect the switch box from damage if battery cable terminals or harness plug becomes loose during engine operation.
2. Shorting clipper test.

CAUTION; Be sure to place selector switch on scale No. 3 before connecting leads for the following test, since going thru scale No. 1 could damage the shorting clipper.

   a. Use Magneto Analyzer scale No. 3. No continuity should occur. Reverse test lead and recheck. (Figure 5)

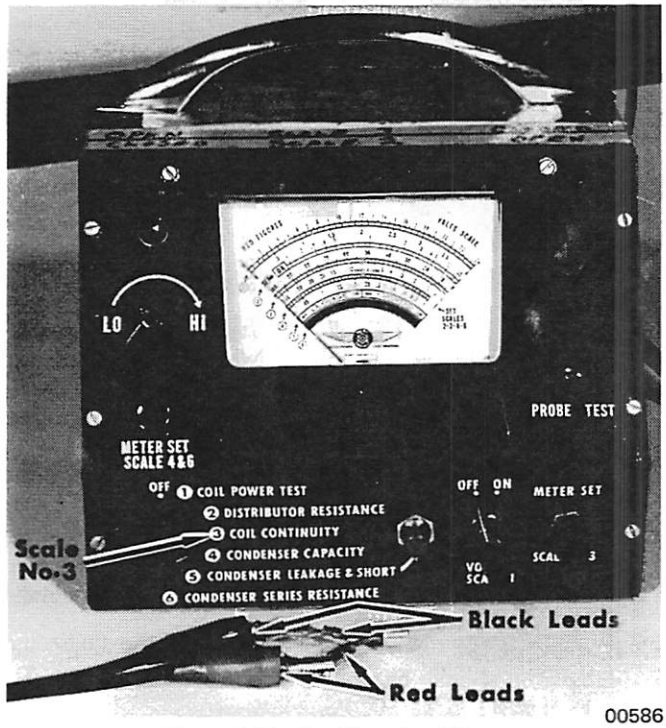

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Figure 5. Testing Shorting Clipper

   b. Use a battery and suitable light bulb of 12 volts or less output. Bulb should not illuminate.
3. If shorting clipper fails, check entire alternator system. In particular, check battery and harness terminal connections for cause of failure and replace with new shorting clipper replacement kit (A-332-2910A2).

   NOTE: Later production engines have shorting clipper incorporated into the rectifier.

4. Install shorting clipper with red lead on bottom terminal. (Figure 6)
5. Engine can run safely without shorting clipper, provided that alternator leads are disconnected from rectifier. Tape lead terminals separately with electrical tape.

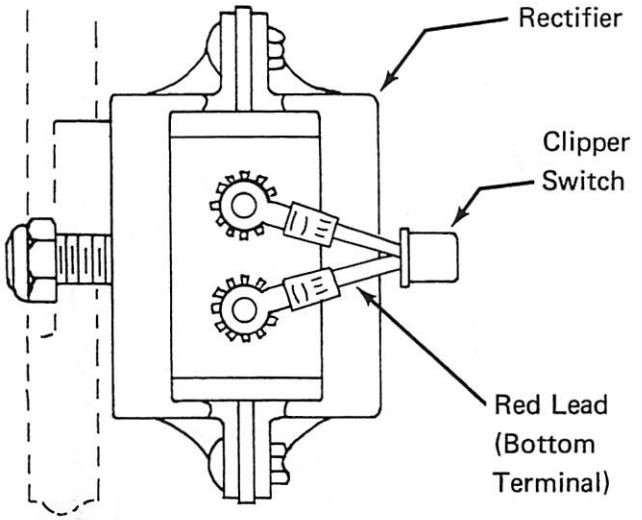

Figure 6. Shorting Clipper Installed

SPARK PLUGS

1. If spark plug center electrode is not burned back 1/32" (.8mm) below insulator, it will function properly. (Figure 7) Do not replace for other than this reason.

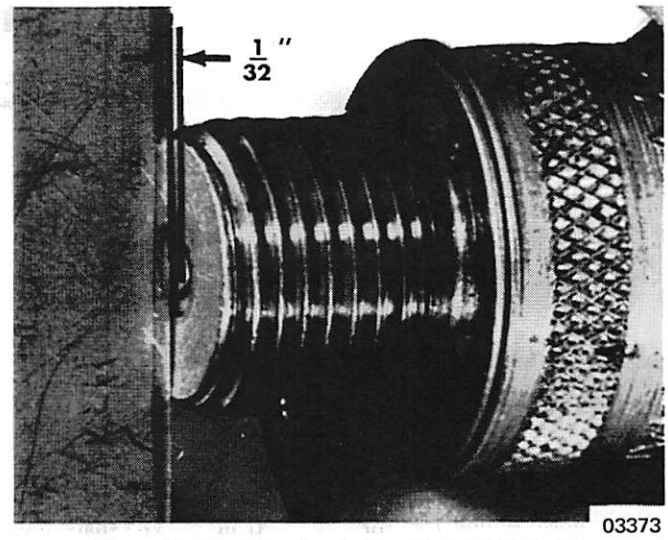

Figure 7. Checking Spark Plug Center Electrode

2. Heavily carboned spark plugs will fire properly with this system.
3. The only spark plug not capable of functioning properly in this system is one with a cracked external insulator. A cracked insulator around the electrode will not harm spark plug performance.

COMPRESSION CHECK

Remove white wire from switch box terminal before taking a compression check, thus preventing engine from starting.

3, 4 and 6-CYLINDER THUNDERBOLT

BREAKER-LESS IGNITION

WARNING: Danger, high voltage. DO NOT touch or disconnect any ignition system parts while engine is running or with battery connected.

IF ENGINE DOES NOT START, CHECK as FOLLOWS -

CHECKING for SPARK

1. Remove any one spark plug lead from spark plug.
2. Remove ground electrode from standard type spark plug (not Polar-Gap) and ground to cowl support bracket. (Figure 1)

WARNING: High Voltage Is Present! DO NOT hold spark plug in hand for the following check. DO NOT pull "sparky" off spark plug to check for spark while engine is running.

3. Turn engine over with starter and watch for spark across air gap. If no spark is observed, perform the wiring check, following.

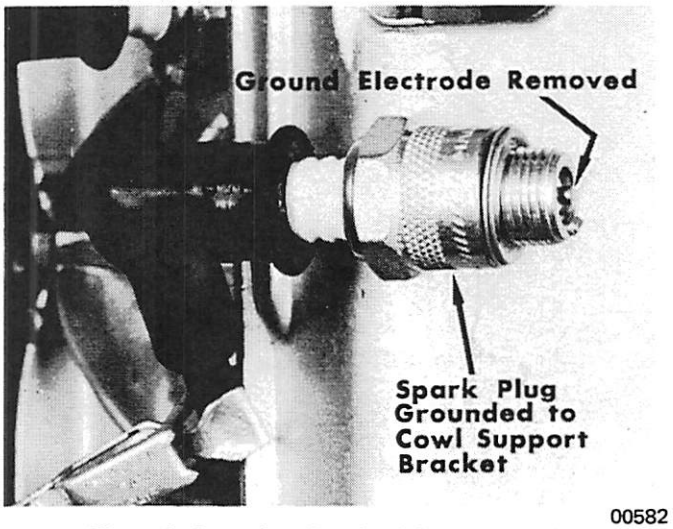

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Figure 1. Ground to Top Cowl Support Bracket

WIRING and CONNECTION CHECK

1. With key switch in "Off" position, connect one lead of volt tester (Magneto Analyzer, C-91-25213) to red terminal on switch box. (Figure 2) Connect other lead to ground. If no voltage, check battery, battery connections or for broken lead wire in harness. Volt scale No. 1 is read in the "On" position with selector switch off.
2. Remove lead from red terminal and connect to white terminal of switch box. (Figure 2) Turn key switch to "On" position. If no voltage is indicated, key switch or wiring is defective. Complete "Checking Ignition Components", following, if wiring and connectors are not defective.

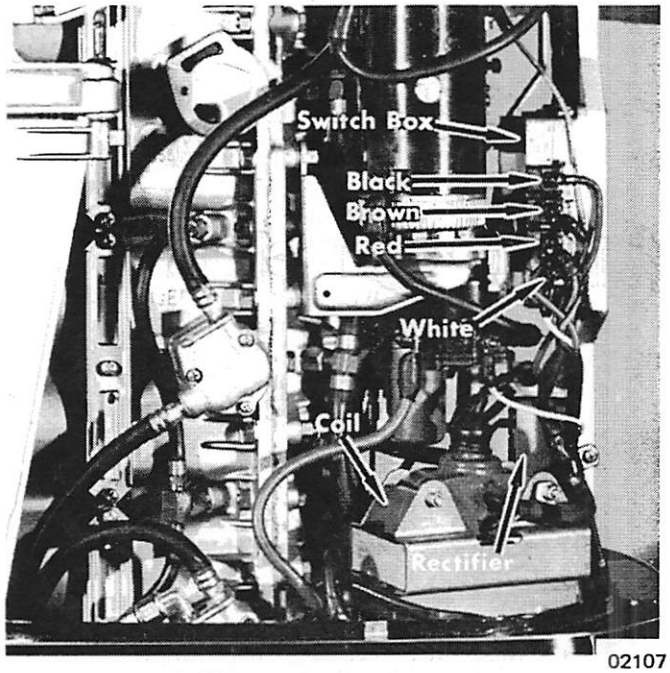

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Figure 2. Wiring - Port Side

CHECKING IGNITION COMPONENTS

A process of elimination must be used when checking out the trigger housing, switch box and coil. This can be accomplished with the aid of a spare trigger housing assembly.

1. Remove distributor trigger housing black, white and brown leads from switch box. (Figure 3)

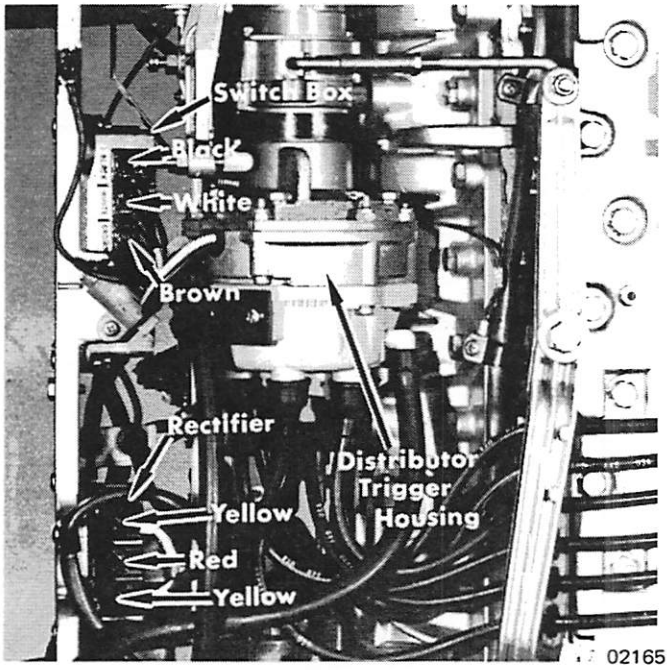

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Figure 3. Wiring - Starboard Side

2. Install black, white and brown leads from spare trigger housing to switch box and ground spare trigger housing to engine.
3. Remove coil secondary lead, install spark gap tester into coil tower and ground opposite end to front cowl support bracket.
4. With battery and control harness connected, turn ignition key switch to "On".
5. Pass a metal object (feeler gauge, nail file, etc) between the inductance coils of the spare trigger housing. (Figure 4)

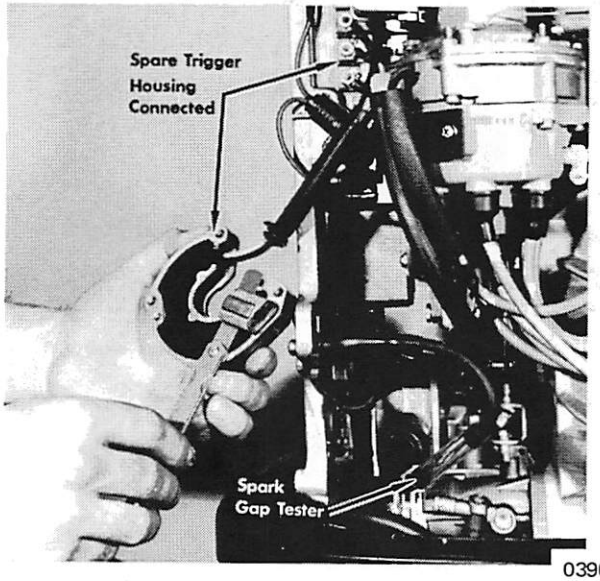

Figure 4. Checking Trigger Housing

6. If a spark occurs across spark gap when metal object is passed between inductance coils, this indicates that original trigger housing was not functioning and requires replacement.
7. When making spark check (Step "5", above) and no spark occurs, but a "click"-like noise emits from the coil, this indicates that coil is shorted and requires replacement.
8. If no spark or "click" occurs in Step "6", above, replace switch box, if switch box was cause of spark loss. DO NOT run engine without first checking rectifier in alternator system ("Rectifier Check", following).

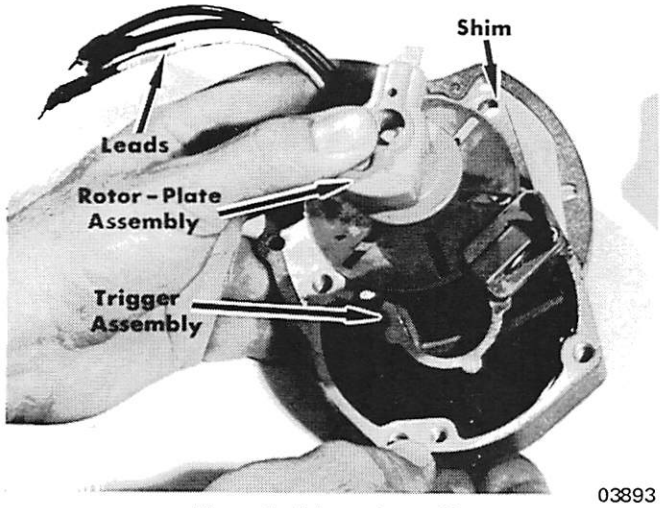

Figure 5. Trigger Assembly

TRIGGER ASSEMBLY REMOVAL and INSTALLATION (Figure 5)

1. Remove distributor cap. DO NOT attempt to remove rotor. Remove trigger housing from distributor pilot.
2. Separate trigger housing by removing 2 screws and stop nuts.
3. Remove 2 screws, which hold trigger assembly to base, and slip out trigger assembly and shim. (Figure 5)
4. Hold rotor shaft in base when installing trigger assembly, keeping rotor plate between trigger and body of assembly. Align shim and reverse Steps "1" to "4". Shim trigger assembly so that rotor does not touch trigger finger or trigger assembly when assembled.

RECTIFIER CHECK

The rectifier will protect the switch box from damage if the harness plug becomes loose during engine operation, however, if will damage the rectifier.

Disconnecting the battery leads during engine operation or reversing the battery leads also will damage the rectifier. Leaving the battery leads connected to the wrong terminals will damage the switch box.

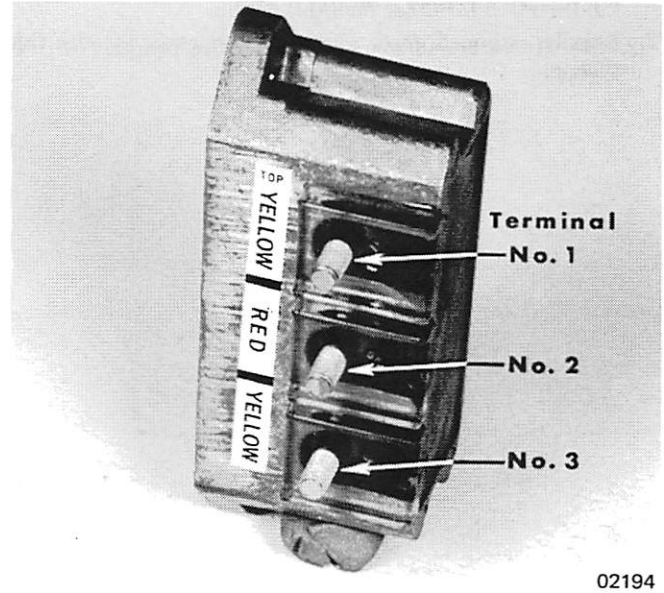

Figure 6. Rectifier Terminals

NOTE: The engine can be operated without the rectifier, if the alternator leads are disconnected and properly insulated.

Kiekhaefer Mercury will not honor warranty on rectifiers and switch boxes which are damaged under conditions described here. To check a rectifier, proceed as follows:

1. Remove rectifier from engine.
2. Set Magneto Analyzer (C-91-25213) scale on No. 3 (Continuity).
3. Connect red (positive) lead to rectifier case.
4. Connect black (negative) lead alternately to Terminals 1 and 3. On each terminal, the meter pointer should move to right of scale No. 3. If the pointer does not move when connected to either terminal, the rectifier must be replaced.

5. Connect black lead to rectifier case.
6. Connect red lead alternately to Terminals 1 and 3. On each terminal, the meter pointer should remain stationary on the left side of scale No. 3. If pointer moves when connected to either terminal, the rectifier must be replaced. DO NOT use an early type rectifier as a replacement.
7. Connect black lead to Terminal 2.
8. Connect red lead alternately to Terminals 1 and 3. On each terminal, the meter pointer should move to right of scale No. 3. If the pointer does not move when connected to either terminal, the rectifier must be replaced.
9. Connect red lead to terminal No. 2.
10. Connect black lead alternately to Terminals 1 and 3. On each terminal, the meter pointer should remain stationary on the left side of scale No. 3. If pointer moves when connected to either terminal, the rectifier must be replaced. DO NOT use an early type rectifier as a replacement.

SPARK PLUG CHECK

1. If spark plug center electrode is not burned back 1/32" below insulator, it will function properly. (Figure 7) Do not replace for other than this reason.
2. Heavily carboned spark plugs can fire properly with this system.
3. The only spark plug not capable of functioning properly in this system is one with a cracked external insulator. An insulator cracked around the electrode will not harm spark plug performance.

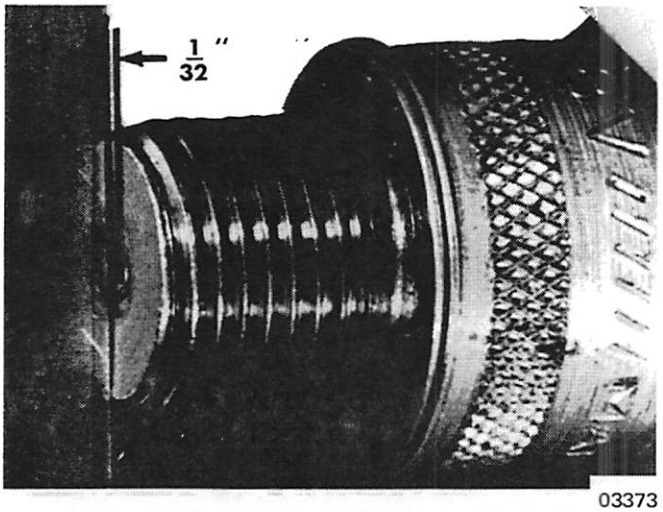

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Figure 7. Checking Spark Plug Center Electrode

COMPRESSION CHECK

Remove white wire from switch box terminal before taking a compression check, thus preventing engine from starting.

MERC 40-75-110-200 THUNDERBOLT IGNITION

Stator for Thunderbolt Ignition System has low speed and high speed energizing windings. Low speed windings provide ignition power at low engine speeds, and high speed windings provide ignition power at high engine speeds. If stator is suspected of causing an ignition problem, check with a VOA Meter (C-91-52751) in the following manner.

NOTE: Before each resistance measurement is made with a VOA Electrical Tester, short the small red and black resistance measuring leads and (with the ohms set adjustment) adjust pointer to "Set" position at extreme right of meter scale.

TWO CYLINDER STATOR

1. Disconnect green and salmon stator leads.
2. Make the following resistance measurements with a VOA Tester.

Measurement	VOA Range	Reading
1. Plus VOA lead connected to green stator lead and negative VOA lead connected to salmon stator lead.	R x 1000	No continuity
2. Plus VOA lead connected to salmon stator lead and negative VOA lead connected to green stator lead.	R x 1000	20-50
3. Plus or negative VOA lead connected to green stator lead and other VOA lead connected to ground.	R x 1000	No continuity
4. Plus or negative VOA lead connected to salmon stator lead and other VOA lead connected to ground.	R x 1000	No continuity

SINGLE CYLINDER STATOR

1. Disconnect green stator lead.
2. Make the following resistance measurements with a VOA Tester (C-91-52751).

Measurement	VOA Range	Reading
1. Plus VOA lead connected to green stator lead and negative VOA lead connected to ground.	R x 1000	No continuity
2. Negative VOA lead connected to green stator lead and plus VOA lead connected to ground.	R x 1000	20-50

COIL CHECK

Check Thunderbolt Ignition coil with a VOA Tester (C-91-52751) as follows:

1. Disconnect leads connected to plus (+) and minus (-) terminals of ignition coils.
2. Disconnect "HT" lead from spark plug.
3. Make the following resistance measurements.

Measurement	Coil Color	VOA Range	Reading
1. Between positive and negative marked coil terminals.	Red, Brown	R x 1	0
	Green	R x 1	.2 - .4
2. Between "HT" lead and ground	Red, Brown	R x 100	1.2 - 1.6
	Green	R x 100	5 - 6

MERC 400 THUNDERBOLT IGNITION

NOTE: Use VOA Electrical Tester (C-91-52751). Before each measurement is made, make sure that pointer is adjusted to "Set" position with red and black VOA leads connected together.

MERC 400 IGNITION STATOR CHECK

Stator for Merc 400 Thunderbolt Ignition System has low speed and high speed energizing windings. Low speed windings provide ignition power at low engine speeds and high speed windings provide ignition power at high engine speeds. If stator is suspected of causing an ignition problem, check with a VOA Tester in the following manner:

1. Disconnect blue and white leads from switch box.
2. Use VOA meter; calibrate meter before each use.
3. Check between blue lead and ground (R x 1000 - 2000-2400 ohms resistance). This reading would affect idle.
4. Check between white lead and ground (R x 1 - 90-130 ohms resistance). This reading would affect top end.

If VOA readings are more than above readings on 3 and 4, stator windings are broken (open).

If VOA readings are lower than reading in 3 and 4, stator is grounded.

IGNITION COIL CHECK

1. To check primary winding, connect one VOA lead to green coil lead and other VOA lead to ground. On R x 1 scale, VOA Tester should indicate 0 (zero) ohms.
2. To check secondary winding, connect one VOA lead to high voltage tower termination and other VOA lead to ground. On R x 100 scale, VOA tester should indicate 20-30 ohms.

MERC 400 TRIGGER COIL CHECK

Make the following electrical test on the Merc 400 trigger coil with VOA Tester.

Disconnect brown trigger lead from switch box and measure resistance from brown trigger lead to ground. On R x 1 scale, VOA Tester should indicate 27-41 ohms.

MERC 400 SWITCH BOX CHECK

Disconnect all lead wires from switch box terminals before making measurements in chart below.

NOTE: If chart readings are not obtained, switch box will malfunction and must be replaced.

Switch Box Measurement	Scale	Reading
1. Connect red VOA lead to blue terminal and black VOA lead to orange terminal.	R x 1	10-15
2. Connect red VOA lead to white terminal and black VOA lead to orange terminal.	R x 100	20-35
3. Connect black VOA lead to orange terminal and red VOA to ground.	R x 1	10-15
4. Connect black VOA lead to blue terminal and red VOA lead to ground.	R x 1	10-15
5. Connect black VOA lead to orange terminal and red VOA lead to green terminal.	R x 1	10-15 (Serial No. 06501 and up)
	R x 1000	No continuity (Serial No. 06500 and below)
6. Connect black VOA lead to blue terminal and red VOA lead to orange terminal.	R x 1000	No continuity (pointer will initially swing up scale)
7. Connect black VOA lead to white terminal and red VOA lead to orange terminal.	R x 1000	No continuity
8. Connect red VOA lead to orange terminal and black VOA lead to ground.	R x 1000	No continuity (pointer will initially swing up scale)
9. Connect red VOA lead to blue terminal and black VOA lead to ground.	R x 1000	No continuity (pointer will initially swing up scale)
10. Connect red VOA lead to orange terminal and black VOA lead to green terminal.	R x 1000	No continuity

1972 MERC 200-110-75-40 and 1973 MERC 110-75-40

PHASED-MAKER CONTACT CD IGNITION

The Phased-Maker Contact CD Ignition System basically consists of a low speed and a high speed generating coil. The maker contacts and generating coils are phased (rotate together for ignition timing change), thereby resulting in a very efficient ignition power source. The voltage generated by the coils is rectified and used to charge a capacitor. The capacitor is allowed to discharge into the primary of the ignition coil when the contacts make.

TROUBLESHOOTING

The following troubleshooting procedure is recommended, if the ignition system is suspected as the source of a problem. A VOA Electrical Meter (C-91-52751) and a Magneto Analyzer (C-91-25213) will be used for completing the measurements. Disconnect the four generating coil leads, the capacitor lead and the heavy green leads from the electrical module.

HARD STARTING or POOR LOW SPEED PERFORMANCE

Measurement	VOA Range	Reading
1. Resistance of low speed coil; between red and yellow coil leads.	R x 100	32 - 40
2. Forward resistance of rectifier. Red VOA lead to electrical module terminal where red coil lead was connected and black VOA lead to terminal where capacitor was connected.	R x 1000	10 - 15
3. Reverse resistance of rectifer. Reverse VOA leads from position used in previous measurement.	R x 1000	No reading

** A limited number of 1971 models (listed, following) were built with the Phased-Maker Ignition System Serial Nos. as follows:*

Merc 110 Ser. No. 3089350 thru 3089840
Merc 200 Ser. No. 3069232 thru 3069631

POOR HIGH SPEED PERFORMANCE

Measurement	VOA Range	Reading
1. Resistance of high speed coils between blue and yellow coil leads.	R x 100	1.6 - 2.0
2. Forward resistance of rectifier. Red VOA lead to electrical module terminal where blue coil lead was connected and black VOA lead to terminal where capacitor was connected.	R x 1000	4 - 5
3. Reverse resistance of rectifier. Reverse VOA leads from position used in previous measurement.	R x 1000	No reading

NO IGNITION OUTPUT

Measurement	Mag. Anal. Position	Reading
1. Capacitance; one Mag Analyzer lead connected to capacitor lead and other connected to ground.	4	.45 - .55
2. Condenser leakage and short. Mag Analyzer leads connected as in previous measurement.	5	Pointer should return to left of scale.

If above readings are not obtained, the defective component (low speed coil, high speed coil, electrical module or capacitor) must be replaced.

NOTE: Before making a measurement, VOA and Magneto Analyzer must be adjusted to "Set Position" with leads shorted.

IGNITION COIL

Following are VOA readings for 1972 Merc 200-110-75-40 and 1973 Merc 110-75-40 ignition coil (A-336-4528A1):

Lead Hookup	VOA Scale	Reading
1. VOA leads to each primary stud on coil	R x 1	0 to .2
2. VOA lead on secondary in tower and other lead on small pigtail	R x 100	5 to 7
3. VOA lead to primary stud and other lead to secondary in tower	R x 1000	0

MERC 800 (Serial Nos. 3051041 thru 3052380 and Nos. 3144219 thru 3192962)

IGNITION TROUBLESHOOTING

CAUTION: Use the following test procedures only on Merc 800 Outboards in the above listed serial numbers.

NO SPARK at PLUGS

CHECK

1. Ground straps from cylinder head to bottom cowl must be in place and tight. (Without this, switch box will be burned out.)
2. All terminals must be tight on switch box. (Loose terminals will cause switch box failure.)

TEST PROCEDURE

1. Check voltage between white lead at junction of coil lead retainer and ground. It should be a minimum of 12 volts (not cranking).
2. Set No. 1 cylinder at T.D.C. Remove ground electrode from a conventional type spark plug and ground to cowl support bracket. (Figure 1) Remove blue lead from switch box terminal. Connect a jumper lead to ground and touch the other end to the blue terminal on switch box. When a jumper lead is lifted off the blue terminal, a spark should occur at spark plug.
   a. If spark occurs, the trigger assembly is faulty and should be replaced.
   b. If no spark occurs, the coil or switch box is faulty. Replace the switch box and repeat spark test. No spark would indicate faulty coil.

ENGINE MISFIRES

CHECK

1. Spark plugs.
2. Short in wiring.
3. Low battery voltage.
4. Weak coil. (Replace coil.)
5. Trigger assembly.

Symptom: Engine will not run over approximately 4300 RPM. (Replace trigger assembly.)

COIL (C-337-4456A1) TEST

The coil (C-337-4456A1) is blue in color and is not electrically interchangeable with the coils used on the small 2-cylinder outboards.

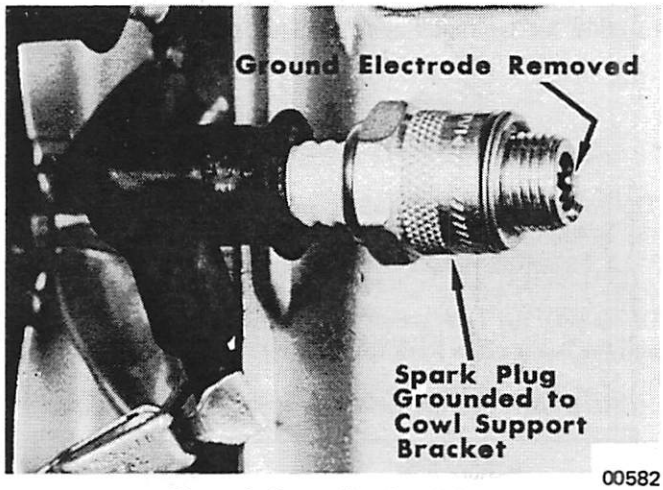

Figure 1. Grounding Spark Plug

The blue coil can be checked on the VOA Tester (C-91-52751) as follows:

Note: Before making a measurement with the VOA Electrical Tester, adjust the pointer to the set position with the ohms set adjustment with the small red and black VOA leads shorted.

Test	Range	Reading
1. Primary continuity; between GRD marked and CONV marked terminals.	R x 1	0
2. Secondary continuity; between high voltage tower connector and GRD marked terminal.	R x 100	5 to 6
3. Primary to secondary breakdown; between small braided pigtail and either the GRD or CONV marked terminal.	R x 1000	No continuity

ENGINE RUNS BACKWARD

There are 2 possible causes for the above Merc 800 Engines running backward. They may, if the idle ignition timing is retarded further than 8° ATDC. If this is not the cause, then the trigger assembly is faulty and should be replaced.

SECTION 3 - ELECTRICAL SYSTEMS

MERCURY
OUTBOARDS

PART D - IGNITION SYSTEM

INDEX

IGNITION SYSTEM

DESCRIPTION

The ignition system consists of a magneto or distributor, spark plugs and associated wiring. This part covers removal, disassembly, installation and synchronizing of all types of magnetos and distributors used on Mercury Outboards.

Magneto type ignition has coil(s), condenser(s), laminated core(s) and one or two sets of breaker points. This type of ignition system is self-energizing and requires no outside source of electrical current, such as a battery.

The distributor type ignition contains coils, condensers and breaker points, but is not self-energizing and requires an outside source of electrical current supplied by a battery.

Thunderbolt Ignition Systems are a capacitance discharged (CD) type of ignition, and the removal, disassembly, reassembly, installation and synchronization of this type system is covered in this part.

NOTE: Refer to "Electrical Troubleshooting and Component Testing" Part C for component testing.

PHELON MAGNETO

REMOVAL

FLYWHEEL

1. To work on the Phelon Magneto, the flywheel must first be removed. Refer to "Powerhead" Section 5 for flywheel removal.
2. Magneto now is ready for inspection. See Part C, preceding, for test procedure of ignition parts.

MAGNETO

Entire magneto may be removed from the motor by completing the following:

1. Remove high tension leads from spark plug terminals.
2. Remove clamp screws which hold high tension leads to cylinder block on some models.
3. Turn stator plate in clockwise direction and lift stator plate off.

NOTE: The magnet unit is an integral part of the flywheel. Assembled permanently and machined with the flyhweel, it should never be removed and should not require recharging. Any attempt to recharge the magnet unit by ordinary means will discharge it and require replacing.

DISASSEMBLY

1. Remove primary connection and spark plug wire.
2. Bend down clip which holds coil down on core, taking care not to break off the clip.
3. Remove coil from core.
4. Remove condenser mounting screws and remove condensers.
5. Remove breaker point mounting screws and remove breaker point assemblies. (Figure 1)

CLEANING and INSPECTION

1. Wash all parts in cleaning solvent, except coil and condenser. Degreasing compound may damage insulation of these parts.
2. Check lead wire to see if spark is leaking through insulation at some point.
3. Replace points if pitted. Check condenser, since a defective condenser may be the cause of badly pitted points.
4. If magneto does not function properly, check coil with Magneto Analyzer (C-91-25213). Refer to "Specifications" Section 8.
5. Check condenser on a condenser tester. For capacities, refer to "Specifications" Section 8.

CAUTION: DO NOT substitute another condenser of a different capacity. Check leakage, series resistance and breakdown.

6. Inspect coil for insulation leakage or for evidence that spark has been leaking to ground from terminal where spark plug lead is connected. Check coil on a coil tester in accordance with specifications (see chart) given by coil tester manufacturer.

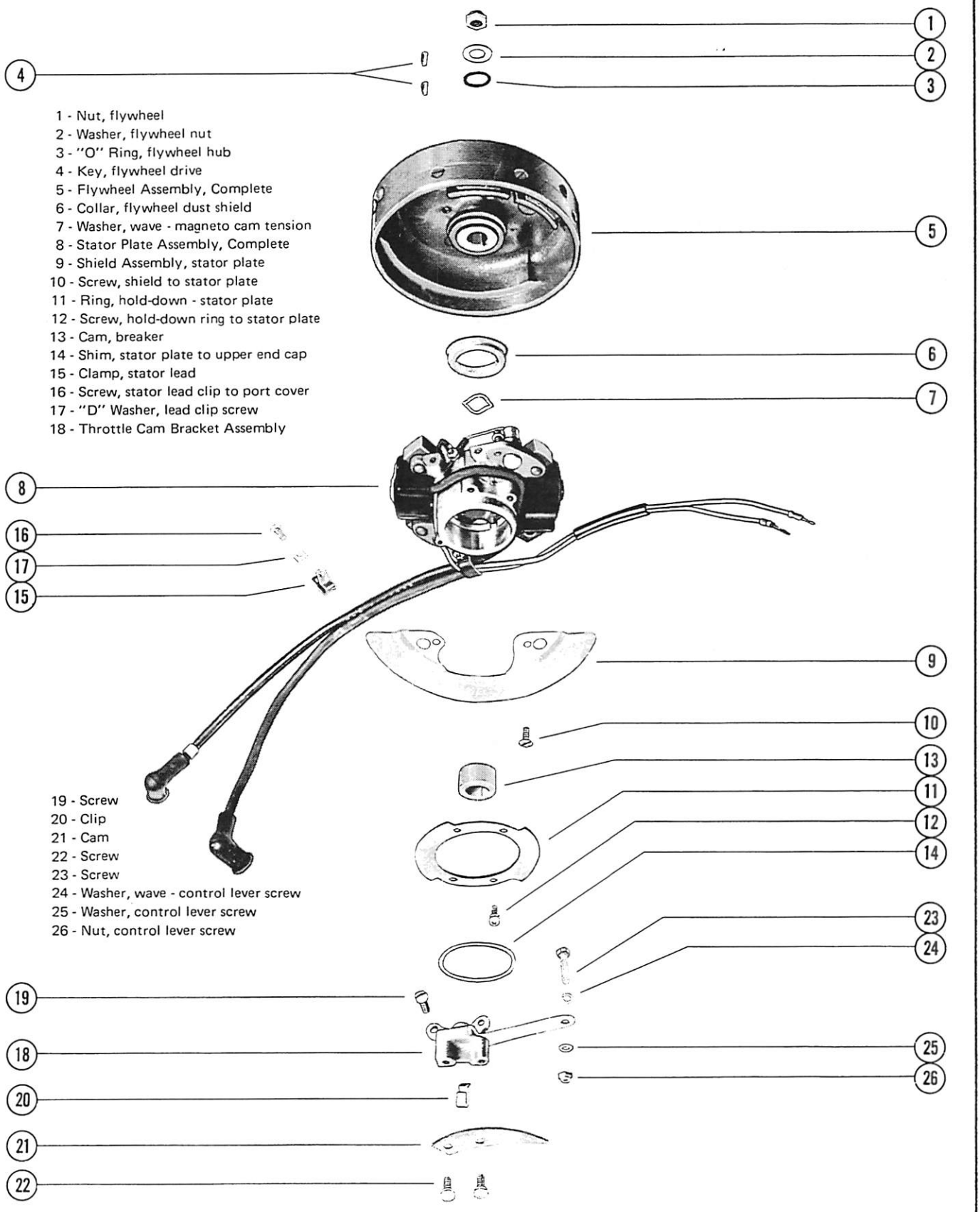

Figure 1. Phelon Magneto Exploded View

REASSEMBLY

MAGNETO

After magneto assembly has been thoroughly checked and repaired, as instructed previously, reinstall in the following manner:

1. Replace cam breaker (on engines equipped with cam) on crankshaft with "Top" up. Insert key into slotted keyway on crankshaft.
2. Replace thrust washer, spring or wave washer and flywheel key, whichever is used on this particular model motor.
3. Set magneto on upper end cap and rotate to seat. Clamp ring hold-down screws can be adjusted to increase or decrease tension on magneto.

COIL

1. In replacing coil on core, great care must be taken not to bend core which, being laminated, is quite easily distorted. Make sure that coil is "bottomed" before bending tab.
2. Check ground connection to be sure that it is making a good contact both under screw and at crimped part of terminal. Check for good contact at live terminal ends.
3. Check insulation at breaker point connection to be sure that lead does not ground against spring or fixed contact.
4. If cam wick becomes dry, it should be replaced. (DO NOT oil wick.) If breaker arm pivot is dry, lubricate lightly with New Multipurpose Lubricant (C-92-49588). DO NOT use any amount of oil and avoid excess lubrication which might get on points.

SYNCHRONIZING BREAKER POINTS MERC 350-200-110-75-60 (1966-thru-69)

INSTALLING SYNCHRONIZING PLATE

1. Place Synchronizing Plate (C-91-36454A1) on rim of stator plate. Move stator to position where magneto cam touches carburetor pickup lever. Leave stator set at this position throughout rest of settings.
2. Thread proper size indicator arm (included with tool) onto threaded end of crankshaft until it seats on shoulder.

PHELON MAGNETO

Model	Thread size
Merc 110-75-60 Merc 200-350	7/16"-20 5/8"-18

3. Thread flywheel nut against indicator arm to hold arm securely in position (nut acts as a jam nut). Remove spark plugs to relieve compression when turning crankshaft. Turn crankshaft (not indicator arm) to prevent bending indicator arm.

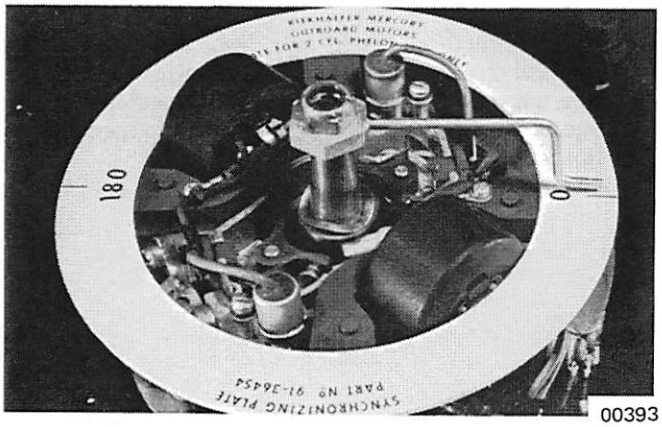

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Figure 2. Degree Plate (C-91-36454A1) on Stator

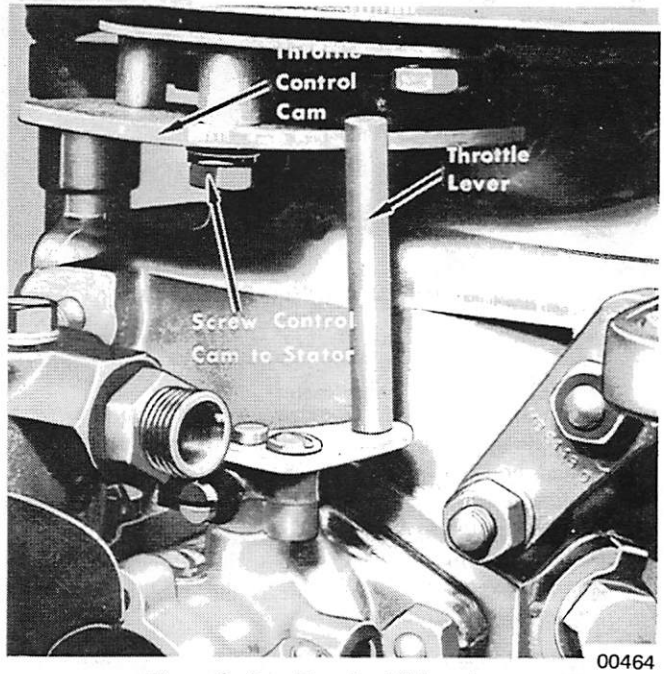

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Figure 3. Cam Touches Pickup Lever

ADJUSTING BREAKER POINTS

1. Adjust breaker points so that breaker cam follower arm is at high point on cam (about ¼" rotation after points open).

   NOTE: Care must be taken when adjusting breaker point gap. High point of cam is located as shown in Figure 4 (not at the keyway).

2. Set first breaker assembly clearance with a feeler gauge. Refer to "Specifications" Section 8.

3. Set Magneto Analyzer (C-91-25213) selector switch on No. 2 (Resistance) or, employing Continuity Meter (C-91-22966), attach one small test lead to stator plate (ground) and second small test lead to spring arm of breaker point.
4. Rotate indicator arm clockwise to allow breaker to close. Continue to rotate crankshaft and indicator arm (turn crankshaft, not indicator arm, to prevent bending indicator arm) clockwise until meter hand moves (breaker points open). This will be indicated by sudden movement of meter pointer hand.
5. Move degree plate in either direction required to place 0° mark directly under indicator arm.

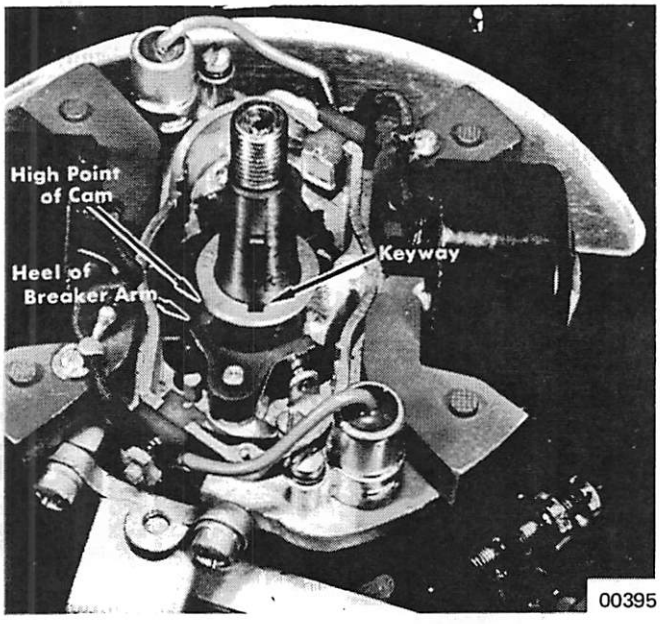


Figure 4. Location of High Point of Cam

6. Move small test lead from first breaker point spring to second point spring and attach.
7. Rotate indicator arm clockwise toward second breaker assembly until indicator arm is directly over 180° mark. Second breaker must open exactly at this time. If not, readjust breaker points until they just begin to open, as indicated by the meter pointer hand movement.
8. Recheck settings on No. 1 and No.2 breaker points to assure that settings have not changed, due to possible movement of degree plate.

NOTE: If degree plate is not avialable, set breaker arms at highest point on lobe of cam. Using feeler gauge (C-91-24262) between open faces of points. set gap at specified clearance. (Figure 5) To set other breaker point opening, rotate crankshaft 180° and set gap the same.

The breaker cam should be checked for looseness. Install with arrow or Part No. to the top. It should be tight on the crankshaft. If loose, it may cause misfire at idling speed. (Some models have cam cut on shaft.)

SYNCHRONIZATION

Synchronization between magneto cam and carburetor throttle shaft is important.

NOTE: Refer to "Timing, Testing and Adjusting" Part E, following, for 2-cylinder engines.

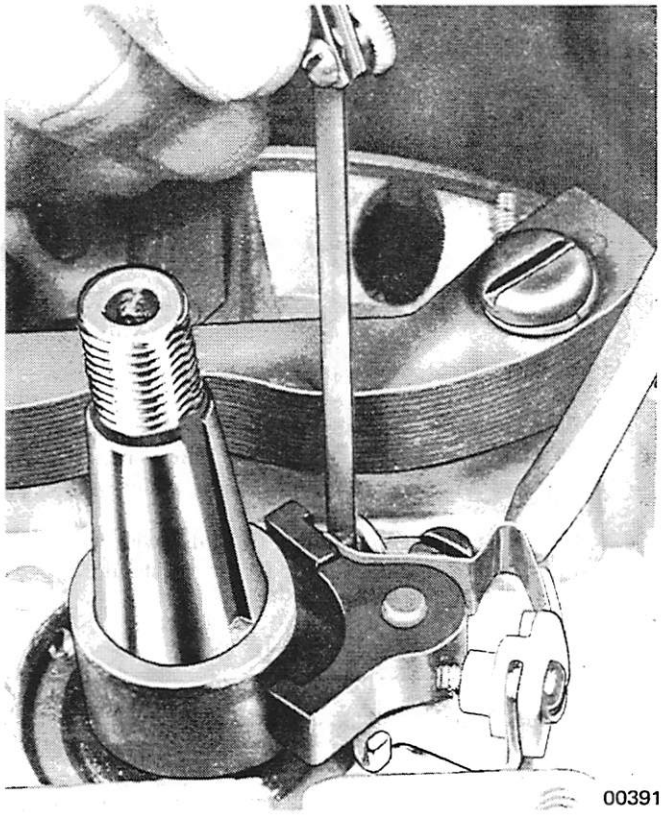


Figure 5. Setting Breaker Points

FLYWHEEL

After points have been set, flywheel may be installed as follows:

1. Place flywheel on shaft over key. Place flat washer (optional on some models) on top of flywheel.
2. Place nut on crankshaft on top of washer and tighten. Use Torque Wrench (C-91-32610) and tighten to specifications shown in Section 8.

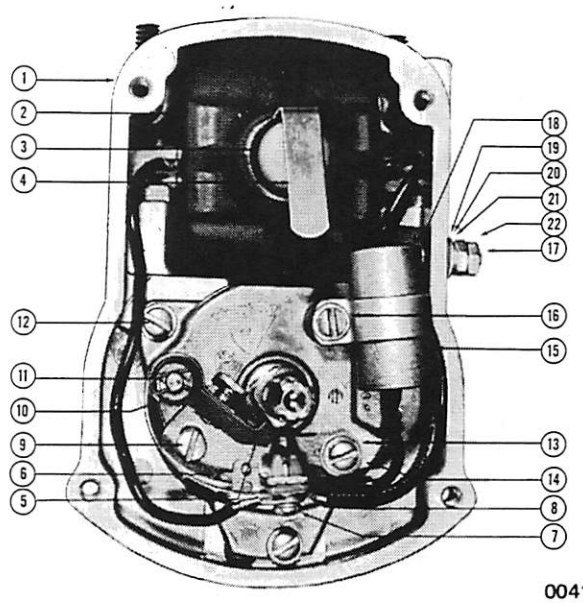
KIEKHAEFER 4-CYLINDER TYPE MAGNETO

DESCRIPTION

The Kiekhaefer magneto is a special type used on 4-cylinder Mercury Outboard Motors. (Figure 1)

These motors, with 4 cylinders in-line, are 2-stroke cycle design and require an ignition spark every 90° of crankshaft rotation. The magneto has a 3-pole rotor and 4-lobe cam and meet this requirement by producing 4 sparks-per-revolution of the rotor which runs at crankshaft speed.

1 - Frame
2 - Coil
3 - Knob, high tension coil
4 - Clip, high tension
5 - Breaker Arm Assembly
6 - Breaker Assembly Complete
7 - Screw, 6-32 self-tapping
8 - Washer
9 - Screw, bracket support
10 - Washer, breaker arm
11 - Hair Pin
12 - Screw and Lockwasher
13 - Screw, fastening
14 - Washer
15 - Condenser
16 - Screw and Lockwasher
17 - Screw, primary ground
18 - Insulator Ground Switch
19 - Washer, grnd. screw insul.
20 - Washer, ground screw
21 - Lockwasher, lockscrew
22 - Nut, ground screw



00413

Figure 1. Four-cylinder Kiekhaefer Magneto

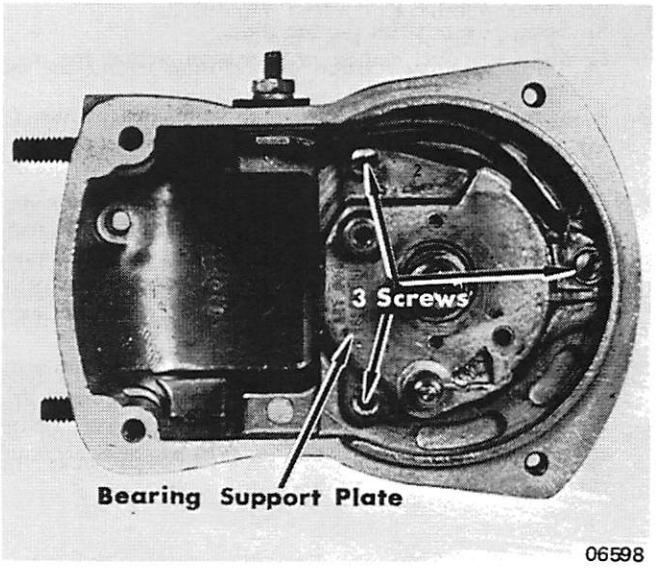
REMOVAL

1. Remove screws from 2 hold-down clips on exhaust side of engine to release high tension leads from engine.
2. Disconnect braided ground strap by detaching crankcase screw, leaving strap attached to magneto.
3. Remove lockwasher and nut from primary ground screw which holds lead to magneto.

DISASSEMBLY

1. Remove end cap, rotor and cover, being careful not to damage.
2. Remove breaker assemblies by detaching breaker terminal screw, which holds primary ground lead wire, condenser lead and primary coil lead. (Figure 1)
3. Remove condenser hold-down screw, condenser and cam wick assembly.
4. Detach movable breaker assembly from pivot by removing lockring.
5. Remove stationary breaker assembly by removing hold-down screw.
6. Remove coil after disconnecting ground wire, lockwire and 2 lockwire coil bridge set screws.
7. Remove screws and lockwashers which hold bearing support plate to magneto frame. (Figure 2)
8. Press out magnetic rotor and shaft. Bearing support plate also will come out.

CAUTION: Be careful not to damage magnetic rotor or support plate.



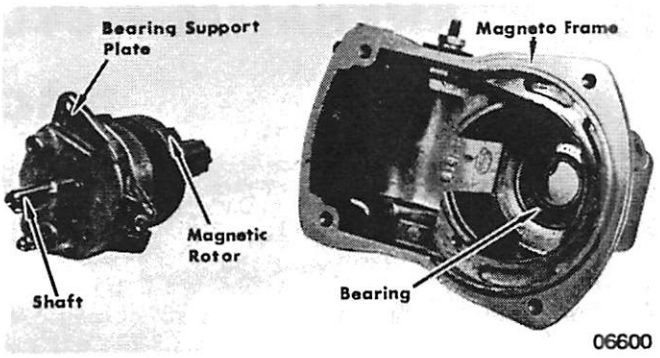
06598

Figure 2. Coil and Breaker Point Assembly Removed

9. To remove bearing support plate from rotating magnet, place in vise with vise jaw protectors. Hold magnetic rotor and tap on shaft opposite of drive end. (Figure 3)
10. If bearings are worn, replace with new bearing assemblies.

NOTE: WIPE OFF, DO NOT WASH SEALED BEARINGS. Lubrication of magneto with sealed ball bearings is not necessary, as it is grease-packed when manufactured and requires no further lubrication.

Figure 3. Removing Bearing Support Plate



CLEANING and INSPECTION

1. Clean exterior magneto frame. Use compressed air, a wire brush or solvent, if necessary, to remove any accumulated foreign matter.

CAUTION: DO NOT submerge unit in liquid.

2. Mount magneto on test block and turn rotor over slowly by hand. If there is a noticeable binding or rubbing action, make no further rotative testing until disassembly. Such a condition indicates badly worn or rough bearings. The pull, due to the magnetic break which occurs during rotation, should not be confused with binding or rubbing action.
3. Check all parts disassembled for wear or damage.
4. Test coil, condenser, rotor, end caps, high tension leads and breaker assemblies.
5. Make resistance test on high tension leads.
6. Occasionally, a vertical crack appears in the magnetic rotor of the 4-cylinder magneto. These cracks in no way affect the performance magnetically or physically.

LEAKAGE PATHS

1. The high voltage surge of the secondary circuit occasionally establishes a path to ground by a route different than across the spark plug gap. Once such a path is established, the ignition spark is likely to continue to spark across to ground.
2. Among the various causes of leakage paths are the following:
   A. Broken leads or poor lead connections.
   B. Spark plug or point gap too wide.
   C. Moisture, dirt, carbon or corrosion within the magneto.
3. A surface leakage path usually can be located because of the burning effect the high voltage spark has on plastic or other insulating materials. (Figure 4)
4. The first step in servicing units with one or more leakage paths is to remedy the condition which causes the high voltage spark to stray from its established circuit. Actual repair of unit should be made very carefully, usually discarding any insulating parts which give evidence of high voltage flash-over.
5. If leakage path is heavy - or more than one path occurs (Figure 4) - it is recommended that the part be discarded. When making leakage test, be sure that high tension clips are removed from high tension leads to assure an accurate check.

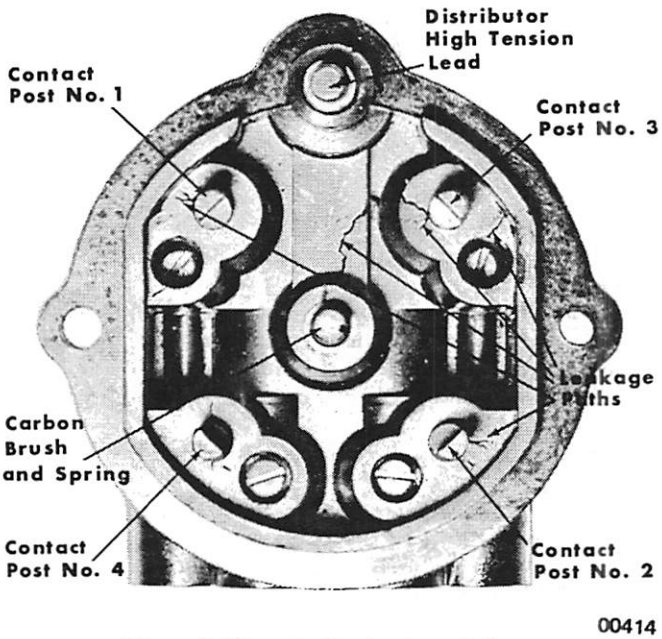


Figure 4. Magneto Cap Leakage Paths

CORROSION CAUSED by OXIDATION

1. Continued high voltage arcing within a magneto housing results in oxidation, a likely cause of complete failure. Interior corrosion is readily apparent once the unit is opened, since it causes a green discoloration of copper and brass parts (the ozone formed by the high voltage arc reacts with copper to form an oxide.) A brown deposit also usually is found throughout the unit, and sometimes there is evidence of moisture condensation.
2. To eliminate oxidation, the cause first must be located. There are several common causes:
   a. A spark gap across a loose connection in secondary (high voltage) circuit within the magneto.
   b. Carbon paths within magneto.
   c. Broken or sticking brush leads.
   d. Plugged vents.

In most cases, magnetos, which are subjected to interior oxidation, can be cleaned and placed into satisfactory shape for re-use.

BREAKER POINTS

1. Ignition breaker points should be aligned accurately to provide the best contact surface for maximum contact area between point surfaces and to assure normal point life. (Figure 1)
2. Any misalignment of breaker point surfaces will result in premature wear or pitting and may change the cam angle with the breaker point opening, although the actual distance of movement between the points is the same.
3. Breaker points in magneto should be aligned correctly by bending or twisting the fixed contact point only. Correct alignment and misalignment are shown in Figure 1.
4. When new breaker points are installed in magneto, be sure to follow the preceding procedure and use breaker point alignment tool.

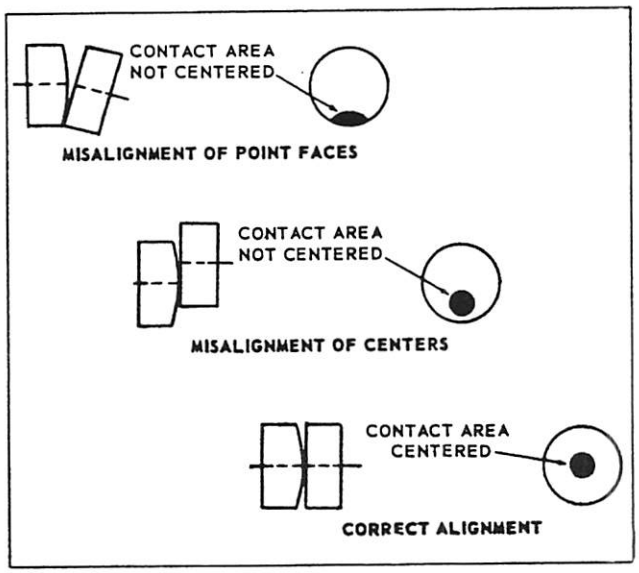


Figure 1. Point Alignment

BREAKER POINT SPRING TENSION

Breaker point life can be maintained on all 4-cylinder engine magnetos and 6-cylinder distributor by adjusting the spring tension of the movable breaker point to a 33 to 37 oz. tension. If spring tension is in excess of 37 oz., the breaker point cam follower rubbing block will wear rapidly and result in breaker points closing after 4-to-6 hours or less operation. If spring tension is below the recommended 33 oz., the breaker arm will flutter at high speed and result in engine miss at high RPM.

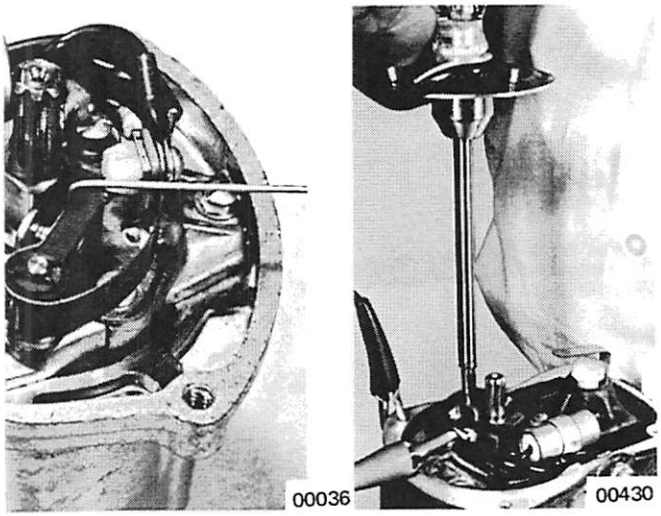


Figure 2. Gauging Spring Tension

CAUTION: DO NOT use pliers to bend point springs. DO NOT make a sharp bend. Bend with fingers.

Breaker point spring tension is measured with a Breaker Spring Tension Scale (C-91-28993 or C-91-29406).

1. Attach small test lead of Continuity Meter (C-91-22966) or Magneto Analyzer (C-91-25213, Scale 3) to primary lead wire of magneto and second small lead to frame of magneto.
2. To check spring tension with C-91-28993 tool, place hook end in crook of fibre cam follower (Figure 2) and pull the tension scale at a right angle 90° and horizontal to the movable arm (Figure 2) until the breaker point just begins to open, as indicated by a sudden movement of the Magneto Analyzer or Continuity Meter pointer hand. If tension gauge is located at any other position on cam follower, the scale reading will be false.
3. When checking spring tension with Spring Tension Torque Tool (C-91-29406), as shown in Figure 2, place hook on end of tool over breaker assembly and turn toward breaker point spring. Read tension on scale of tool.

   NOTE: Some breaker point tension scales available attach around the point contact face. DO NOT use this type scale, as tension will change completely, since the point contact face is closer to the fulcrum point.

4. If spring tension is too great, bend breaker point spring inward to fibre cam follower. If spring tension is too low, bend breaker point spring outward (away) from cam follower.

CAUTION: DO NOT use pliers to bend point springs and DO NOT make a sharp bend! Bend with fingers.

SETTING BREAKER POINTS

1. The 4-cylinder magneto breaker point Dwell Plate (C-91-31483A2) is designed to adjust breaker point gap more accurately than is possible with a feeler gauge.
2. Points must be closed for 48° of rotation to allow sufficient current buildup in coil.

NOTE: A breaker point dwell setting of 48° is recommended for later model 4-cylinder engines.

3. For optimum performance, these recommendations must be followed:
   a. Prior to synchronization, clean face of points with piece of paper to remove oil and dirt film.
   b. Check breaker point resistance with Magneto Analyzer (C-91-25213, Scale 2) to be sure that points are in good condition. If they do not conform to tests, replace with new points.
   c. Check point contact faces for proper alignment.

NOTE: Breaker points will pit slightly after a few minutes of running. This does not mean that points are bad. Check with analyzer to determine if they are bad before replacing.

   d. Check breaker point spring tension (33 to 37 oz. in.) with Breaker Point Spring Torque Scale (C-91-29406).

SYNCHRONIZING with DWELL PLATE

INSTALLING DWELL PLATE

1. With magneto dwell plate face up, set magneto housing drive end collar into center opening of dwell plate with air intake nozzle extended into slot on side of dwell plate.
2. Install the 2 flat-head 1/4-20 screws from underneath thru slots of dwell plate into magneto mounting screw holes. DO NOT tighten, as travel must be allowed for the mounting slots in degree plate.

NOTE: Set screw in the base of indicator arm must be aligned with blank spline of drive coupling.

3. Install base of indicator arm on large splined drive coupling of magneto.
4. Tighten set screw in base of indicator arm.
5. Clamp large square end of indicator arm in vise (with vise jaw protectors) to allow use of both hands for adjusting. DO NOT over-tighten.

DWELL ADJUSTMENT

1. Set breaker point gap to .008" (0.203mm) for an approximate setting of 48° dwell.
2. With magneto analyzer selector switch on scale No. 2 (Resistance) or employing Continuity Meter (C-91-22966), attach one small lead to housing of magneto (ground) and second small lead to primary ground screw.
3. With breaker points open, rotate magneto slowly in a clockwise direction until meter hand moves, indicating points closed.
4. Holding magneto housing in this position, rotate dwell plate in either direction so that "Points Close" mark is in line with indicator arm.
5. Holding dwell plate and magneto housing together, rotate assembly in clockwise direction, observing meter hand movement, indicating "Points Close" which must fall on 0° and remain closed until pointer indicates 48° "Points Open" position.
6. If rotation is LESS than 48°, breaker points open too soon, and point gap must be closed slightly. If rotation is MORE than 48°, breaker points open too late, and gap must be increased slightly.
7. After each point gap adjustment, repeat Paragraphs 3, 4 and 5.

NOTE: If a dwell plate is not available, set breaker point gap at .008"+.000"-.002" (0.203mm+.000-0.051mm) when cam follower fibre arm is on highest part of cam lobe.

REASSEMBLY

1. Press ball bearing drive end into magneto frame housing.
2. Press ball bearing opposite drive end into bearing support. Bearing support should be tapped with a mallet or pressed into housing, being careful that bearing support and housing are lined up.
3. Install 4 screws and lockwashers to support frame. Tighten screws evenly.
4. Turn rotating magnet assembly, making sure there is no binding on shaft. Place frame in vise, using jaw protectors.

CAUTION: DO NOT overtighten.

NOTE: Before installing movable point on pivot post, clean post and apply a very light film of New Multipurpose Lubricant (C-92-49588) on post. Breaker assembly should be kept clean of oil and grease.

5. Install breaker point assembly with 2 screws and washers. DO NOT tighten.
6. Install coil in magneto housing, being sure bridge set screws are in place and tightened. Insert lockwire into coil bridge set screws to secure.
7. Install holder and cam wick assembly and condenser on top of holder with screw through condenser and holder.
8. Install a new cam wick which is supplied with each new breaker assembly. The cam wick holder must be set so that wick has 1/64" (1.6mm) clearance to the flat of the cam shaft (between lobes). Use .015" (.38mm) feeler gauge. Tighten hold-down screw. (Figure 3) If cam wick is set too tight against flat of the camshaft, it may result in loosened fibre wick particles and/or excessive grease throw-out from the wick. If set too lightly, cam wick will not lubricate the cam shaft, and will result in rapid wear of the cam follower portion of breaker assembly, thus allowing point gap to close. Any one of these could cause possible ignition failure and result in rapid breaker point burning and pitting. The cam wick is specially lubricated and requires no further lubrication. Any additional lubrication would be detrimental to breaker point life. A new cam wick should be installed every 100 hours of engine operation and each time a breaker assembly is installed. Breaker point gap is .008" (.203mm).
9. Place washer on terminal screw and insert screw in primary lead of coil. Place condenser lead on terminal screw. Place ground lead on screw and (being careful not to short leads on support plate) insert screw in movable and stationary points and tighten.

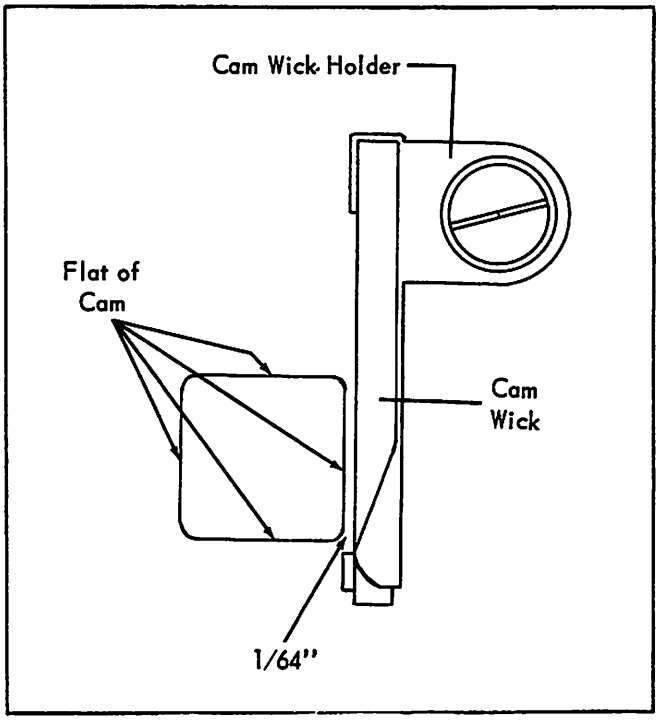


Figure 3. Cam Wick and Holder

10. Place 4 cover screws through new gasket and cover. Start screws but do not tighten.
11. Insert magneto cap Aligning Tool (C-91-26351) for Kiekhaefer magneto.
12. Install gasket and magneto end cap over cover with 2 screws and tighten screws.
13. Tighten 4 screws on cover, thus properly aligning an equal air gap between contact post of magneto cap and magneto rotor contact point, thereby resulting in better and equal spark at magneto cap.
14. Remove 2 screws from magneto end cap, end cap and aligning tool.
15. Install rotor. Being sure that it lines up with spline.
16. Reinstall gasket, end cap and 2 screws (with ground strap on one end cap screw) and tighten.
17. Attach other end of ground strap on crankcase screw after magneto is test run satisfactorily on drill press.
18. To test run, place in drill press and run at low, medium and high speeds so that ignition spark produced can be tested on a standard spark gap at each speed for a short length of time. If no misfire takes place and magneto operates satisfactorily, it is ready to be installed on engine.

INSTALLATION

1. Magneto rotor shaft and shaft extension are splined with one spline blanked on each shaft for easy replacement of magneto after repair. Rotate timing pulley until shaft sets in place.
2. Replace 4 cap screws and secure magneto to adaptor.

REPLACING FLYWHEEL

1. To replace flywheel, if removed, insert flywheel key into keyway in crankshaft. Tap to seat. Timing belt driven pulley is pressed onto flywheel and need not be removed, unless necessary, for replacement because of breakage or wear. If removed, place locating dowel in recess and locate keyway of pulley over dowel. Press on with arbor press.
2. Place timing belt on driving pulley on flywheel and position flywheel on crankshaft over key.

TIMING and SYNCHRONIZING

If magneto has been removed from motor, it must be accurately retimed to the motor at time of reassembly. Proper timing of magneto to the engine produces an ignition spark in each cylinder at the exact instant that fuel mixture should be ignited for best engine performance. This instant usually is designated as a given number of degrees of annular travel of crankshaft before piston reaches its uppermost position in cylinder.

NOTE: See following for timing and synchronization of 4-cylinder models.

SYNCHRONIZING MAGNETO to CARBURETOR

Refer to "Timing, Testing and Adjusting" Part E.

KIEKHAEFER 6-CYLINDER TYPE DISTRIBUTOR REMOVAL

1. Unscrew 4 hex head cap screws which secure distributor assembly to distributor adaptor.
2. Remove ground strap from distributor frame and spark plug leads from spark plugs and loosen screws which hold high tension lead to exhaust plate.
3. Pull air vent tubes from nylon elbows and pull secondary leads out of coils.
4. Disconnect primary leads, thus freeing all distributor lead wires.
5. Remove distributor assembly from engine.

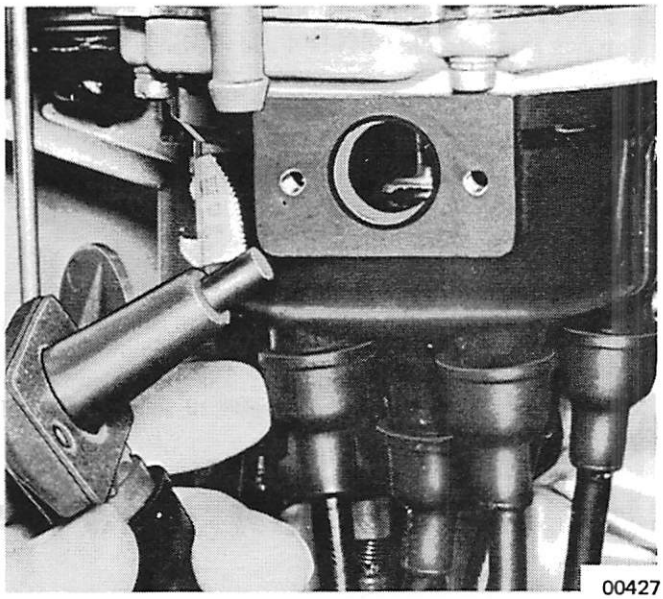


Figure 1. Removing Side Inlet

DISASSEMBLY

(Includes Ignition, Coils and Resistors)

DISTRIBUTOR ASSEMBLY

1. Remove 2 screws, which secure side inlet assembly to distributor cap, and pull off side inlet assembly. (Figure 1)

   IMPORTANT: Side inlet cap must be removed before distributor cap is removed, as carbon brush on side inlet extends to inside of distributor rotor and can be broken off.

2. Remove secondary lead wires, which are threaded into distributor housing and side inlet, by pulling neoprene caps down and unscrewing leads.
3. Detach distributor cap and gasket from distributor cap to housing adaptor by removing 2 screws which secure cap.
4. Pull distributor rotor off distributor shaft. (Figure 2) If rotor is secured rigidly on shaft with Loctite, remove with Rotor Pulling Pliers (C-91-32477A1).

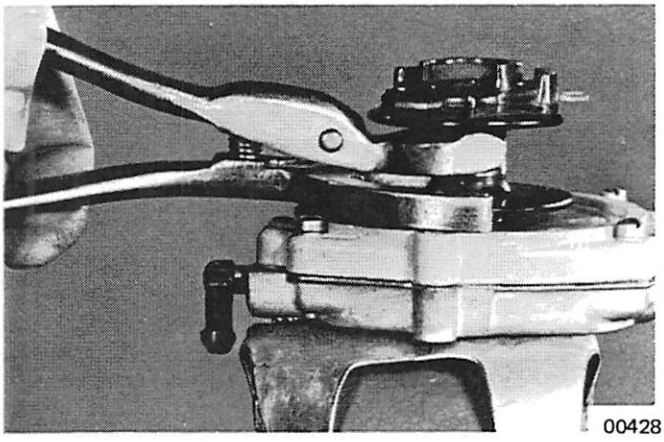


Figure 2. Removing Rotor

5. Remove 4 screws which secure housing adaptor to distributor frame.
6. Separate housing adaptor from distributor frame. All working parts are accessible for checking or removal. (Figure 3)

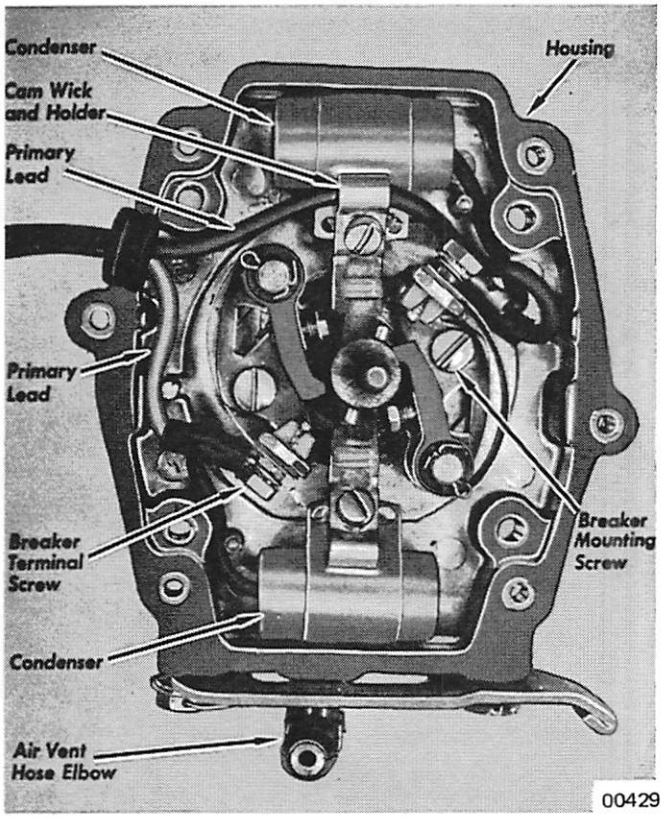


Figure 3. Distributor Open for Checking

CONDENSERS and BREAKER ASSEMBLIES

1. Remove nut which secures leads to breaker assemblies.

   NOTE: One condenser has cam wick and holder bracket which also holds one primary lead wire in place. (Figure 3)

2. Remove hold-down screw which secures condenser and cam wick holders to frame.
3. Remove cotter pins and fibre washers from pivot pins. (Figure 3)
4. Remove mounting screws which hold breaker assemblies to frame.
5. Lift breaker assemblies off pivot pins.

DISTRIBUTOR ROTOR SHAFT and FRAME

1. After removing breaker points and condensers, tap distributor cam shaft assembly and 2 sealed ball bearings from distributor frame with mallet by tapping against rotor shaft.
2. Remove wave washers.
3. Because distributor rotor drive pin is a tight fit in rotor, and to prevent bending rotor shaft, be sure to support cam shaft assembly when driving pin out for replacement of ball bearings.
4. Remove ball bearings from rotor shaft by tapping or pressing off (if necessary to remove).

CLEANING and INSPECTION

NOTE: Refer to "Kiekhaefer 4-Cylinder Type Magneto", preceding.

1. Inspect distributor cap closely for carbon paths or cracks. High Voltage surge of secondary circuit occasionally establishes a path to ground other than normal spark gap.
2. Corrosion, moisture and dirt formations on inside of distributor cap can be cleaned and cap may be reused by cleaning contact posts with fine steel wool and liquid household detergent.
3. Before washing, remove carbon brush and springs.
4. Clean and rinse thoroughly to remove all traces of water and detergent. Cap then can be checked out thoroughly for high tension leakage by using a Magneto Analyzer.
5. Be sure that carbon brush is not worn and spring is not corroded and that brush can be depressed easily and returned to position. Replace if worn or corroded.
6. Check side inlet for cracks or leakage and replace if defective.
7. Check carbon brush and spring of inlet for wear and corrosion and be sure that brush and spring can be depressed easily and will return to position.

REASSEMBLY

ROTOR SHAFT and FRAME

1. Press sealed ball bearings onto shaft, applying pressure against inner ball race to prevent damage to ball bearing. One bearing is pressed on from each end of cam shaft, as they seat against shoulder of cam shaft.
2. Press distributor cam drive pin in cam shaft hole, centering it evenly. Replace, if damaged when removed.
3. Place 2 wave washers in bearing recess of distributor frame, applying light film of New Multipurpose Lubricant (C-92-49588) in bore, and insert cam shaft assembly. Bearings slip freely into housing.
4. Install plastic vent elbow into frame, if removed.

INSTALLING POINTS

1. Although replacement 6-cylinder distributor breaker assemblies are one-piece units, pre-tensioned and pre-aligned, they should be rechecked.
2. Check breaker points for evidence of pitting or pyramiding.
3. Lubricate both pivot pins with New Multipurpose Lubricant (C-92-49588). Place breaker assembly on pivot pins, making sure that stationary point is flush with frame of housing. To be sure that breaker assembly is flush with frame, depress cam shaft.
4. Place hold-down screw into position but do not tighten.
5. Place fibre washer on pivot pin and install cotter pin in pivot pin.
6. Replace other breaker assembly in same way.
7. Set breaker assemblies with feeler gauge. See "Specifications" Section 8.
8. Check spring tension setting with Spring Tension Gauge (C-91-20406). Tension should be 33 to 37 ounces.
9. Place primary leads and condenser leads on primary terminals of breaker assemblies and tighten with nut.
10. Place condensers into position in frames.
11. Place cam and cam wick holders and one primary lead into position and tighten-down holders and condensers with screw. New cam wick should be installed every 100 hours of engine operation and each time a breaker assembly is installed. Cam wick is specially lubricated and requires no further lubrication. Any additional lubrication would be detrimental to breaker point life.

    NOTE: New breaker assembly contains new cam wick for installation.

12. Set cam wick holder so that wick has 1/64" (0.397mm) clearance to flat of cam shaft (between lobes). (Figure 4) Use .015" (0.381mm) feeler gauge.

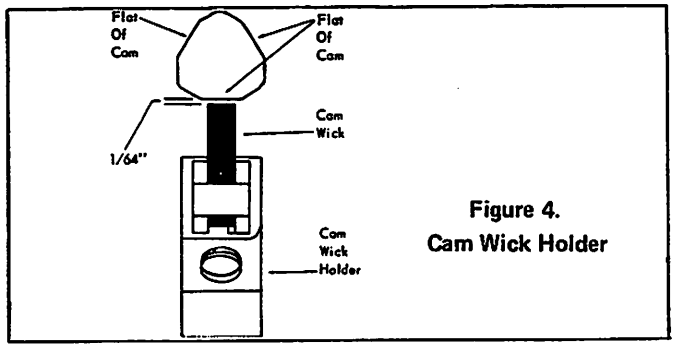


Figure 4.
Cam Wick Holder

13. Tighten hold-down screw. If cam wick is set too tight against flat of cam shaft, it may result in loosened fibre wick particles and/or excessive grease throwout from wick. If set too lightly, cam wick will result in rapid wear of cam follower portion of breaker assembly, thus allowing point gap to close. Any one of these could cause possible ignition failure and also will result in rapid cam wear or breaker point burning and pitting.
14. Replace fibre glass adaptor and place new gasket on frame, securing with 4 screws and lockwashers. Adaptor has recess to fit over rubber grommet on primary lead wire.

15. Test distributor rotor for possible leakage or cracks. Replace if defective.
16. Place new "O" ring and nylon sleeve in cam shaft recess.
17. Apply 4 drops of Loctite "A" (C-92-32609) in rotor shaft bore and install rotor on shaft.
18. Press on rotor until it is seated on drive pin. Note that pin is located off center and rotor will fit only one way.
19. Thread hi-tension lead for coil No. 1 into center terminal of distributor housing and thread hi-tension lead of coil No. 2 into side inlet assembly.
20. Set new gasket on distributor housing and place distributor housing on frame and adaptor. Notch in housing and adaptor must match for correct alignment.
21. Fasten cap with 2 screws and tab washers. Tighten screws down equally to prevent cap from cracking.
22. Set new gasket on inlet and place inlet assembly into distributor cap, making sure that brush is in position on rotor.
23. Secure inlet to distributor housing with 2 screws and tighten equally to prevent inlet from cracking.

6-CYLINDER DISTRIBUTOR COMPONENTS

Although there have been several design changes on the distributor cap, adaptor and primary housing for 6-cylinder models, any combination of parts is satisfactory.

CAUTION: When matching late style distributor cap with early style adaptor, secure distributor cap with 2 screws only, or cap may break.

6-CYLINDER DISTRIBUTOR BREAKER POINT SETTING and SYNCHRONIZING

1. Before synchronizing points, clean face of points with a piece of paper to remove oil and dirt film.
2. Check spring tension setting with Spring Tension Gauge (C-91-29406). Place end of tool over breaker assembly and turn toward breaker point spring to 33-37 oz. tension. (Figure 5)
3. Check breaker point resistance with Magneto Analyzer (C-91-25213) (scale No. 2) to be sure that points are in good condition. On Thunderbolt Ignition System, high point resistance is permissable.
4. Check breaker point alignment. Breaker assemblies are prealigned at the factory; however, if points are not properly aligned as shown in Figure 6, bend or twist FIXED CONTACT POINT ONLY with Breaker Point Alignment Tool (C-91-28883).

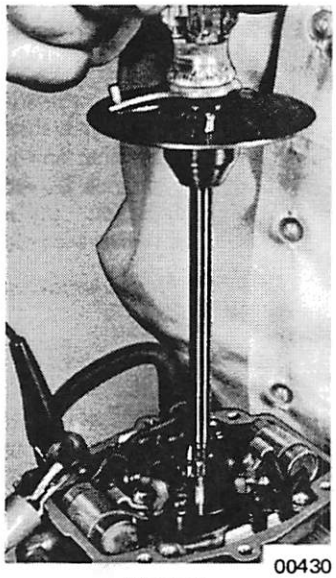


Figure 5.
Gauging Spring Tension

NOTE: Correct alignment will provide best contact surface for maximum contact area between point surfaces and to assure normal point life. Misalignment of breaker point surfaces will result in premature wear, pitting and may change cam angle with breaker point opening, although actual distance of movement between points is the same.

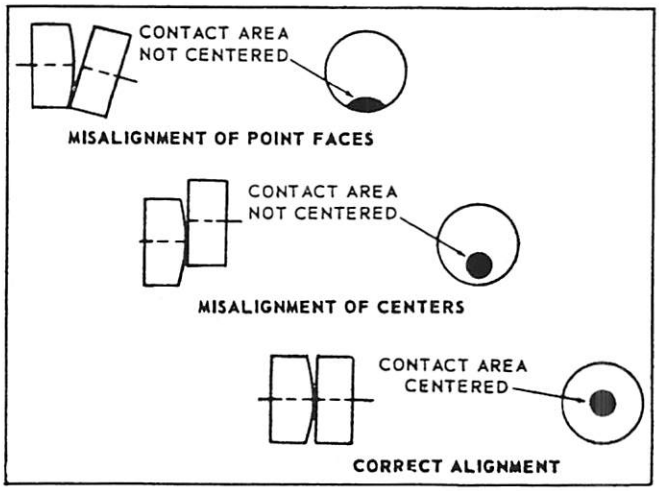


Figure 6. Point Alignment

5. It is essential that both distributor breaker point gaps are of equal opening, or it will result in erratic engine operation. Three cylinders, being fired by one set of points, will be out-of-time (out-of-synchronization) with second set. If available, an automotive-type distributor synchroscope (or syncrograph) will allow breakers to be equally adjusted and synchronized. The dwell is 90°.
6. When adjusting with synchrograph, breakers are set at 45° cam angle. Breaker points fire at 120° intervals, but second breaker point fires at 60° intervals from the first. One fires 0°-120°-240°; the second fires 60°-180°-300°.

DWELL PLATE INSTALLATION

1. With distributor dwell plate face up, set distributor assembly frame collar into center opening of dwell plate with primary lead extending into slot on side of plate.
2. Thread 2 slotted flat head 1/4-20 screws into slots thru degree plate into 1/4-20 threaded distributor mounting holes. DO NOT tighten.
3. Mount frame collar in vise (with vise jaw protectors) to allow freedom of both hands for adjusting. DO NOT overtighten in vise.

SYNCHRONIZATION

1. Place rubbing block of No. 1 set of points (white lead; brown lead for Thunderbolt Ignition models) on high lobe of distributor cam and set points at .007" (.178mm). This is a primary setting required to obtain appropriate dwell.
2. Set indicator arm over rotor shaft. Note that indicator arm groove is off center; therefore, it will be set over rotor shaft cross pin only one way.
3. With Magneto Analyzer selector switch on No. 3 (Continuity) or employing a Continuity Meter (C-91-22966), attach small red test lead to white primary lead wire (brown lead on Thunderbolt) of distributor and small black test lead to frame of distributor.
4. With breaker points open, rotate indicator arm counterclockwise until hand moves (breaker points close). This will be indicated by sudden movement of Magneto Analyzer or Continuity Meter pointer hand.
5. Move degree plate in either direction that is required to place "Points Close" mark directly under indicator arm. (Figures 7 and 8)

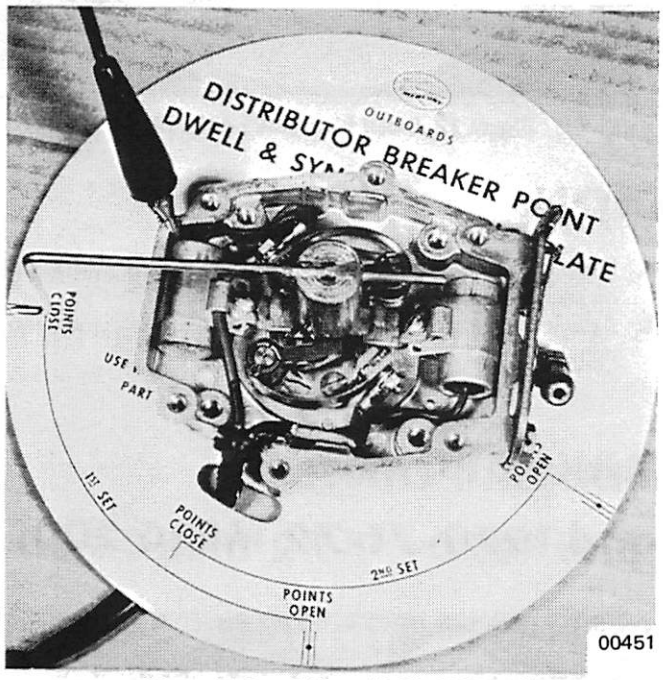


Figure 7. Dwell Plate (C-91-30356A1)

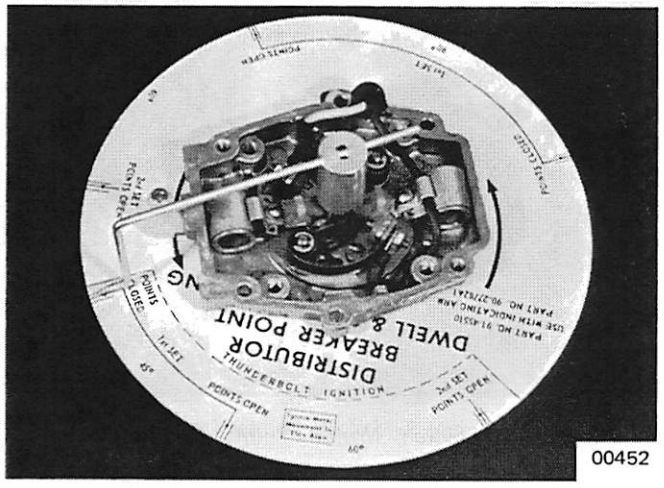


Figure 8. Dwell Plate (C-91-45510A1)

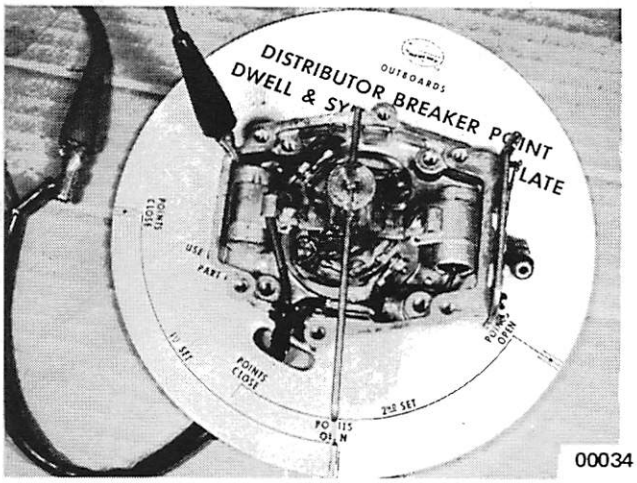


Figure 9. Dwell Plate (C-91-30356A1)

6. Rotate indicator arm counterclockwise until breaker points open, which will be indicated by the sudden movement in opposite direction of meter pointer hand. Indicator hand must be exactly on centerline marked "Points Open". (Figures 9 and 10)
   a. If breakers open too soon (before mark), move indicator hand counterclockwise half way to mark. At this time, readjust breaker points until they just begin to close and reopen, as indicated on meter.
   b. If points open too late (after mark), move indcator hand back halfway (clockwise) to mark. At this point readjust points until they just begin to open. Above divides distance betweeen starting point and breaking to get correct setting.
7. After making adjustment "a" or "b", preceding, return to instruction No. 3 and proceed as before, as adjustment of breakers under "a" or "b" changes starting point, and degree plate must be readjusted.
8. After obtaining 90° dwell (45° on Thunderbolt Ignition), tighten degree plate with two 1/4-20 screws and recheck that dwell was not changed while tightening screws.
9. This completes No. 1 breaker assembly settings. No further adjustment of the breaker point is required, but DO NOT remove degree plate under any circumstances.
10. Brown lead, No. 2 breaker point setting (white lead on Thunderbolt Ignition):

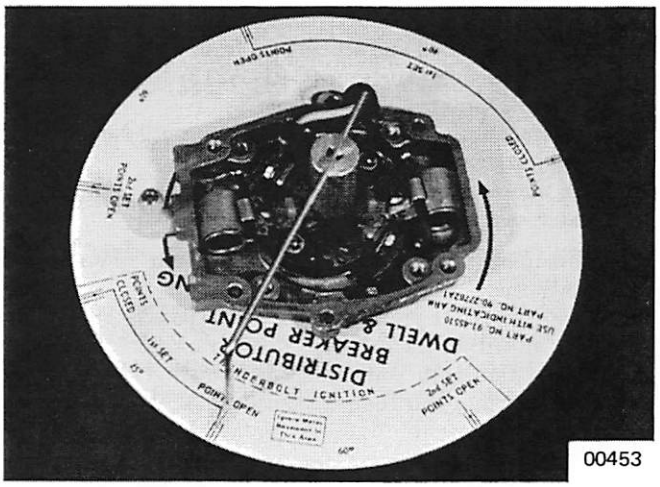


Figure 10. Dwell Plate (C-91-45510A1)

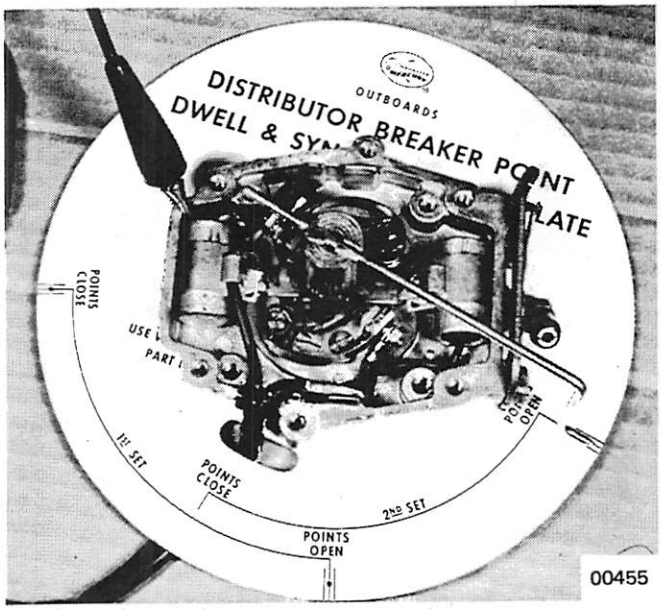


Figure 11. Dwell Plate (C-91-30356A1)

a. Move test lead from No. 1 lead and attach to No. 2 lead terminal.
b. Move indicator arm to align "Points Open" and adjust brown (white on Thunderbolt Ignition) lead breaker points until meter pointer hand indicates points just begin to open. (Figure 11 or 12) If points open too soon, point gap must be closed slightly.
c. Always recheck after tightening breaker assembly to plate so that point setting does not change. This completes breaker point settings.

NOTICE: Observe "Ignore Meter Movement in This Area" on C-91-45510A1 Dwell Plate. (Figure 12)

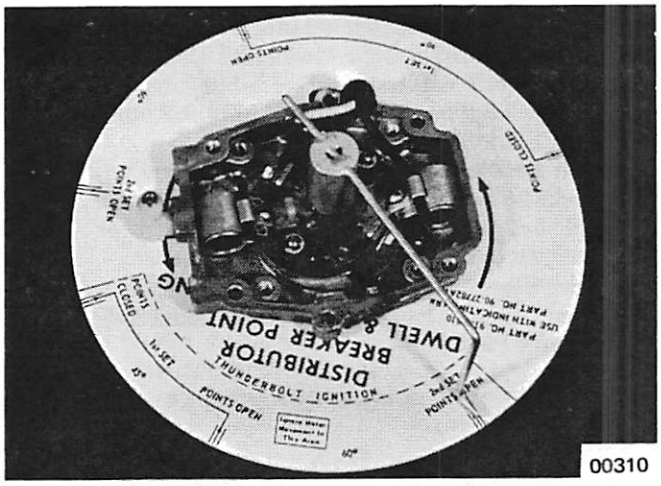


Figure 12. Dwell Plate (C-91-45510A1)

INSTALLATION

1. Secure with 4 hex head cap screws and attach ground straps from crankcase to distributor frame.
2. Replace vent tubes to air vent elbow on distributor frame and distributor cap and attach primary wires to correct location. See wiring diagrams in "Starter" Section 3F.
3. Place high tension leads so that 2 leads will be positioned on each clamp on rear side of manifold cover.
4. Attach high tenison leads to respective spark plug terminals.

SYNCHRONIZING MAKER POINTS

1970-thru-73 MERC 110-75-40 and 1970-71-72 MERC 200

1. Place contact housing in full throttle position.
2. Gap both sets of points to .020" on high side of cam, then lock points.
3. Install Phasing Tool (C-91-59096A1) onto crankshaft. Install flywheel nut to lock phasing tool in position.
4. Remove white lead and brown lead from coils.
5. Connect Magneto Analyzer (C-91-25213) from white lead to ground. Place analyzer on Scale 3.
6. Turn crankshaft in clockwise direction until No. 1 set of points just close.
7. Place masking tape under pointer of phasing tool and mark pointer location on tape. (Figure 6)
8. Move magneto analyzer connection from white lead to brown lead.
9. Turn crankshaft until opposite end of phasing tool pointer lines up with mark on tape. No. 2 set of points should just close within 1/16" on either side of mark. If points do not close or close too soon, readjust No. 2 set of points and lock points.

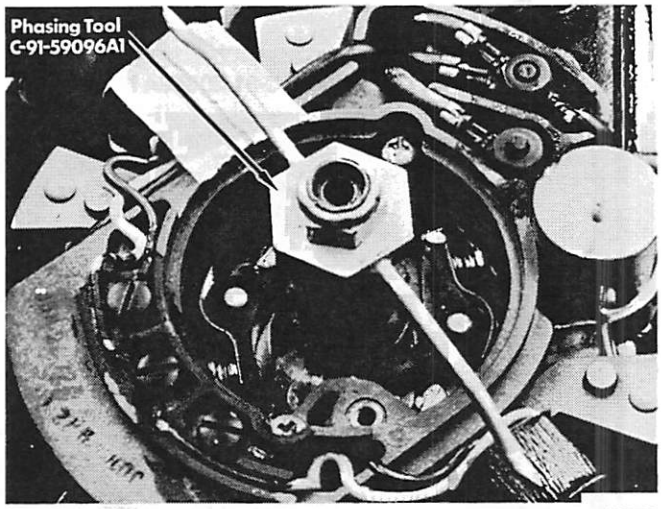


Figure 6. Marking Pointer Location

THUNDERBOLT BREAKER-LESS BATTERY IGNITION

4 and 6-CYLINDER DISTRIBUTOR HOUSING

with BUILT-IN TRIGGER

REMOVAL

1. Remove wrap-around and top cowl assemblies.
2. Top cowl support frame and rear support bracket can be removed as follows:
   a. Remove 3 nuts from top cowl frame rubber mounts.
   b. Remove 2 screws and lockwashers at forward top of cowl support frame and 4 screws and lockwashers at bottom of rear support.
   c. Disconnect choke solenoid wire.
   d. Lift top cowl support frame and rear support bracket from powerhead.
3. Remove high tension leads from spark plugs and remove high tension lead retainer. Remove high tension cable from coil and remove air vent tubes.
4. Disconnect 3 trigger lead wires from switch box assembly.
5. Remove screw and driven pulley flange and remove timing belt from driven pulley.
6. Disconnect link rod from vertical throttle lever and remove ground strap.
7. Remove 3 nuts and washers from distributor housing screws and remove distributor and adaptor assembly.

DISASSEMBLY

1. Bend tabs of adaptor cap tab washer open and unscrew distributor housing cap from adaptor. (Figure 1)
2. With distributor housing cap removed, pull distributor housing assembly from economizer collar and distributor adaptor. (Figure 1)
3. Remove screw and nut from distributor cap clamp and remove clamp from distributor cap and distributor housing.
4. Remove distributor cap and spark plug lead assembly. Clean and inspect distributor cap, brush and spring and spark plug wires. Replace as necessary.
5. Remove upper ball bearing from distributor housing by pressing on the outer race of the bearing thru hole on each side of housing. DO NOT press against ball bearing retainer.
6. Remove nut from upper end of rotor shaft and tap lightly on upper end of rotor shaft to remove from distributor.
7. Remove retaining ring from lower end of distributor housing and remove lower ball bearing.

CLEANING and INSPECTION

1. Inspect ball bearings for wear, dirt or corrosion. Replace if necessary.
2. Clean and inspect component parts of distributor housing and replace as necessary.
3. Check condition of high tension leads.
4. Test distributor cap for leakage paths which could be caused by broken leads, poor connections or moisture, dirt, carbon or corrosion in distributor.

REASSEMBLY

1. Install lower ball bearing into distributor housing and reinstall bearing retaining ring.
2. Place rotor disc into slot of distributor housing. Observe Figure 2 for proper relationship of disc to rotor.
3. Install rotor and shaft assembly thru disc, rotor shaft spacer and ball bearing, making certain that disc key is inserted into rotor shaft keyway.
4. Place rotor shaft sleeve over rotor shaft and install nut on upper end of rotor shaft. Torque nut to 75-80 in. lbs. (13-14kg/cm).
5. Press upper ball bearing into distributor housing.
6. Place economizer collar washer in distributor housing and install economizer collar on distributor housing.
7. Place adaptor washer on economizer collar and install adaptor assembly.
8. Install distributor housing washer, tab washer, wave washer (install wave washer with wave toward cap) and distributor housing cap onto distributor housing. Screw cap onto housing until tight, back off cap to first notch and bend up tabs.

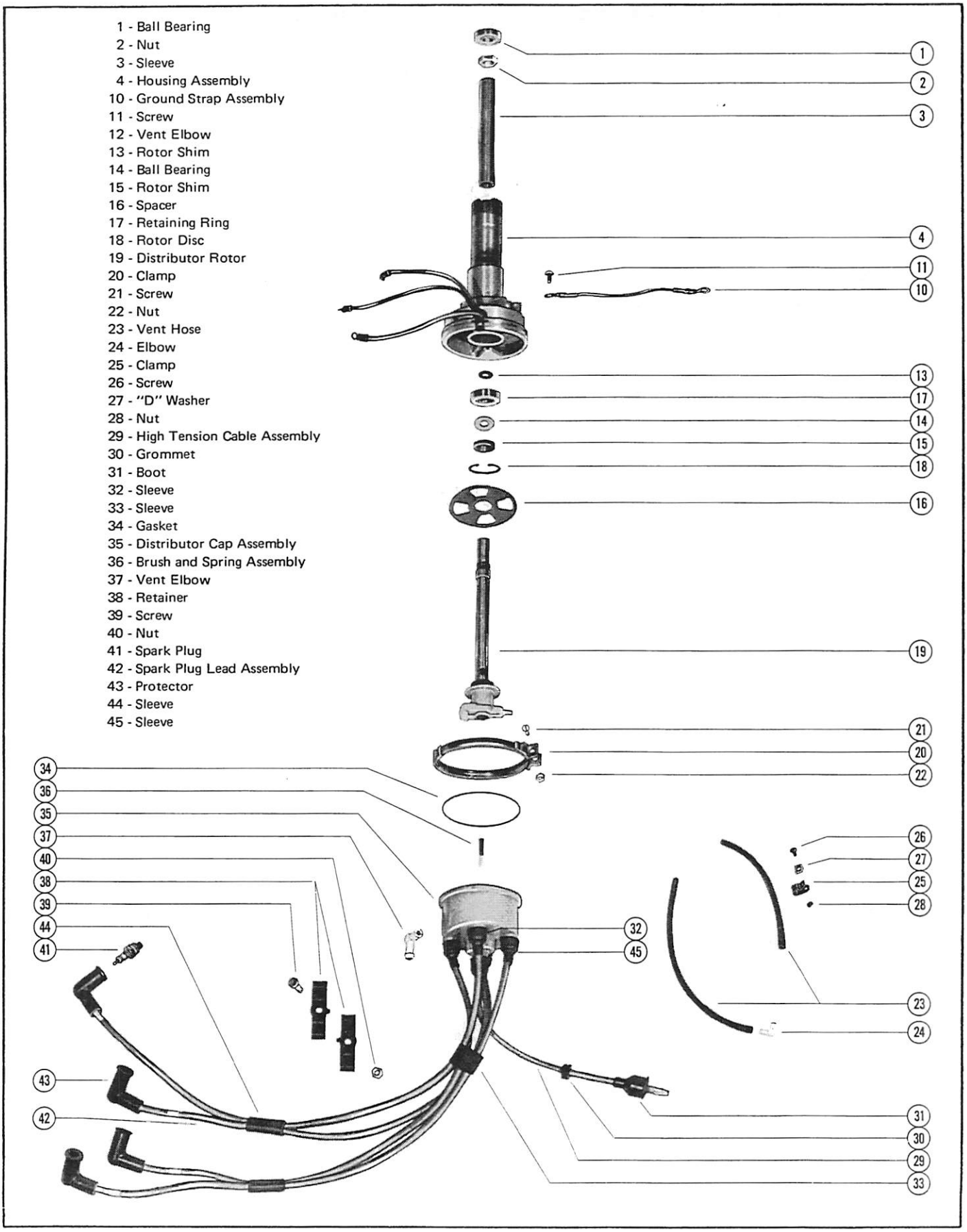


Figure 1. Distributor Assembly

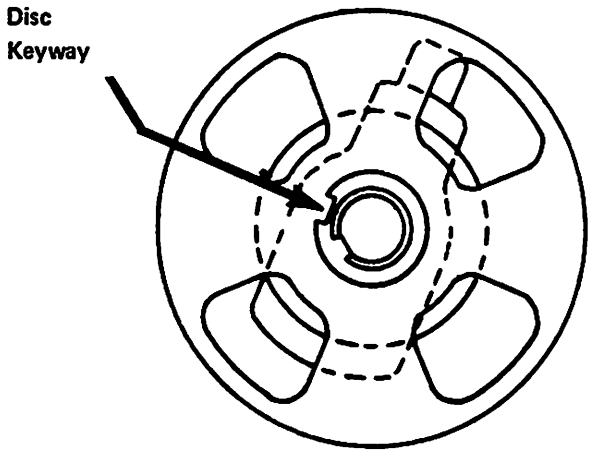
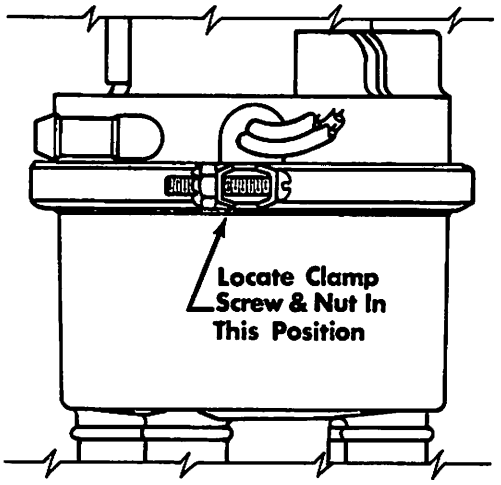


Figure 2. Installing Rotor Disc in Distributor Housing

Figure 3. Installing Distributor Cap Assembly

9. Place distributor cap assembly onto distributor housing, being cautious that brush and spring are not damaged. Install distributor cap clamp and retainer with screw and nut. Locate clamp screw and nut as shown in Figure 3.



INSTALLATION

1. Position distributor and distributor adaptor assembly into cylinder block mounting flange. Be certain that driven pulley spacer and distributor drive key are in position.
2. Fasten distributor adaptor to cylinder block with 3 screws, washers and nuts.
3. Line up arrow on pulley with timing mark on flywheel and install timing belt.
4. Install driven pulley flange with screw and torque to 60 in. lbs. (10.7kg/cm).
5. Reinstall ground strap and connect link rod to vertical lever.
6. Install high tension lead to coil and reinstall air vent tube.
7. Install high tension leads to spark plugs and install high tension lead retainer.
8. Connect 3 trigger lead wires to switch box, following color code on wires and terminals. Cover terminals with Liquid Neoprene (C-92-25711).
9. Reinstall all cowl support brackets.
10. After distributor has been reinstalled, complete all timing, testing and adjusting checks and install cowls.

THUNDERBOLT BREAKER-LESS BATTERY IGNITION

4 and 6-CYLINDER REMOVABLE TRIGGER ASSEMBLY

REMOVAL

1. Remove wrap-around and top cowl assemblies.
2. Remove high tension leads from spark plugs and high tension cable from coil, then remove air vent tubes.
3. Disconnect 3 trigger lead wires from switch box assembly.
4. Remove 4 cap screws from adaptor and remove distributor and adaptor assembly.
5. Remove distributor housing.

DISASSEMBLY

1. Remove 4 nuts, washers and screws from distributor housing cap and remove distributor cap from adaptor. (Figure 1)
2. Remove 2 nuts, washers and screws from adaptor plate, separate adaptor plate from trigger housing assembly and remove gasket. (Figure 2)

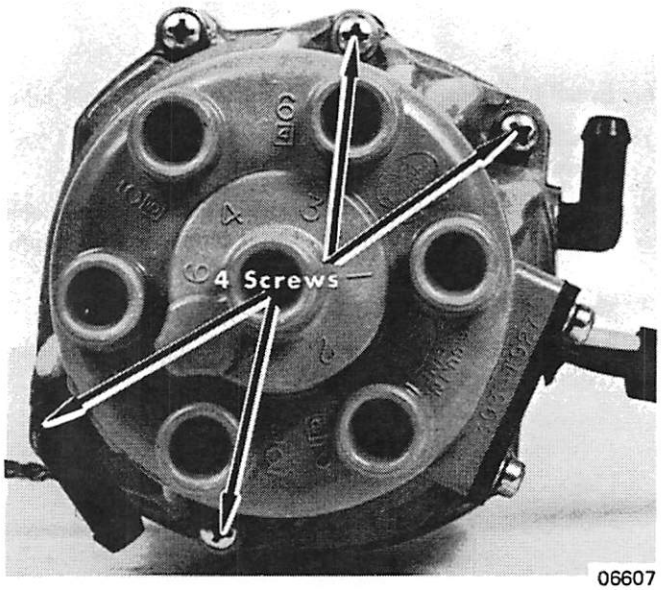


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Figure 1. Removing Distributor Cap

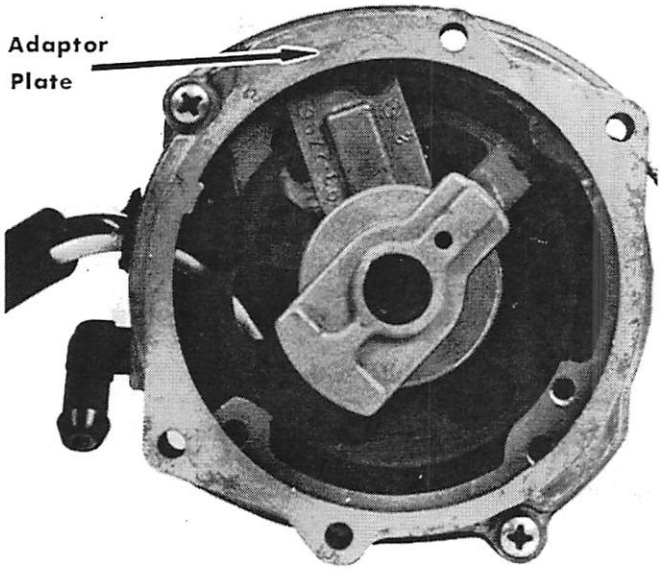

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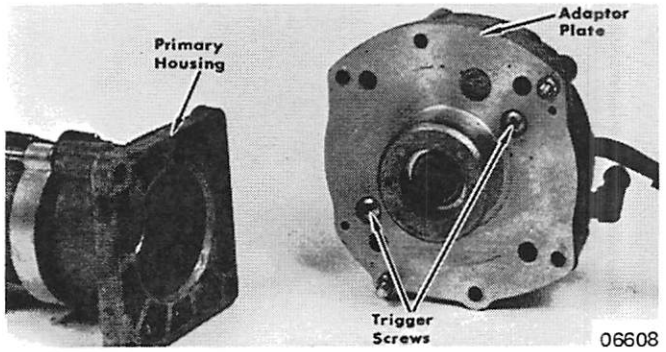
Figure 2. Removing Adaptor Plate from Trigger Housing

3. Remove 2 screws from primary housing and separate trigger assembly, shim, rotor shaft assembly and primary housing. (Figure 3)

CLEANING and INSPECTION

1. Inspect upper and lower ball bearings for wear, dirt or corrosion. Replace if necessary.
2. Clean and inspect component parts of distributor adaptor and replace parts as necessary.
3. Check condition of high tension leads.
4. Test distributor cap for leakage paths which could be caused by broken leads, poor connections or moisture, dirt, carbon or corrosion in distributor.

Figure 3. Removing Trigger Assembly



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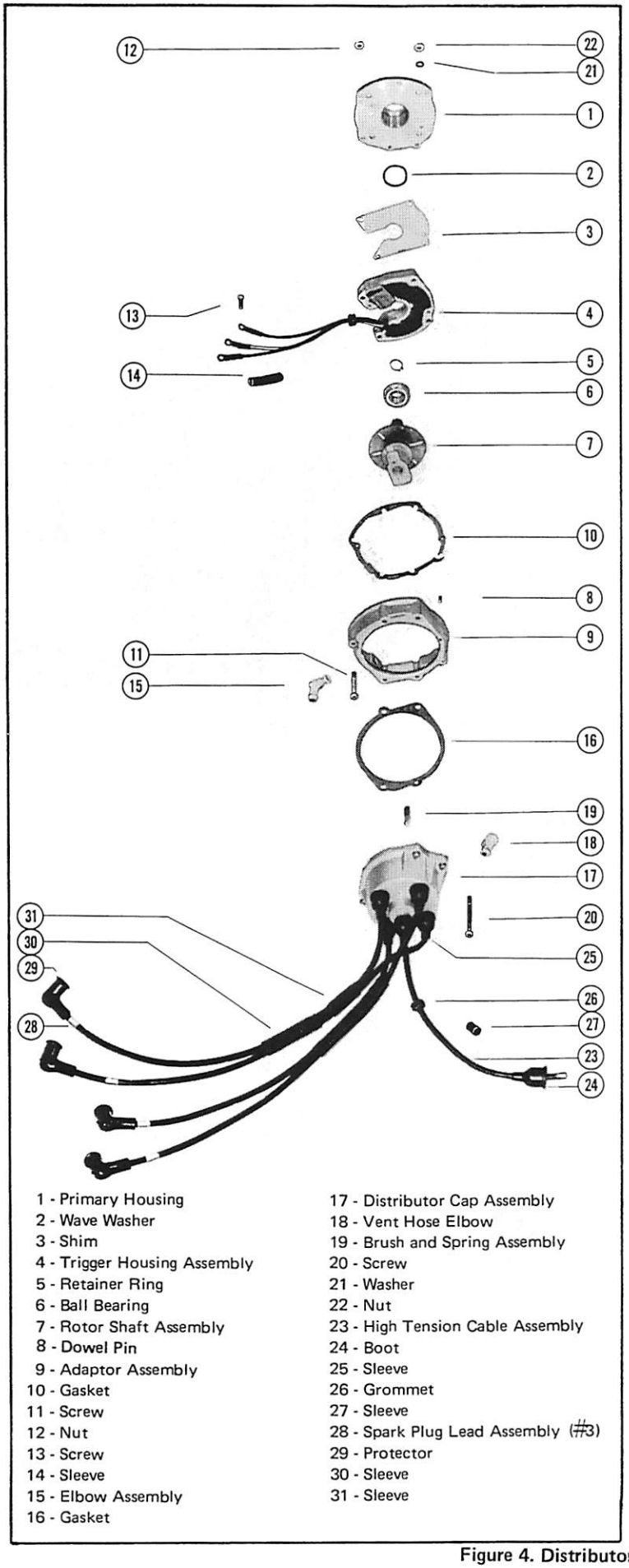
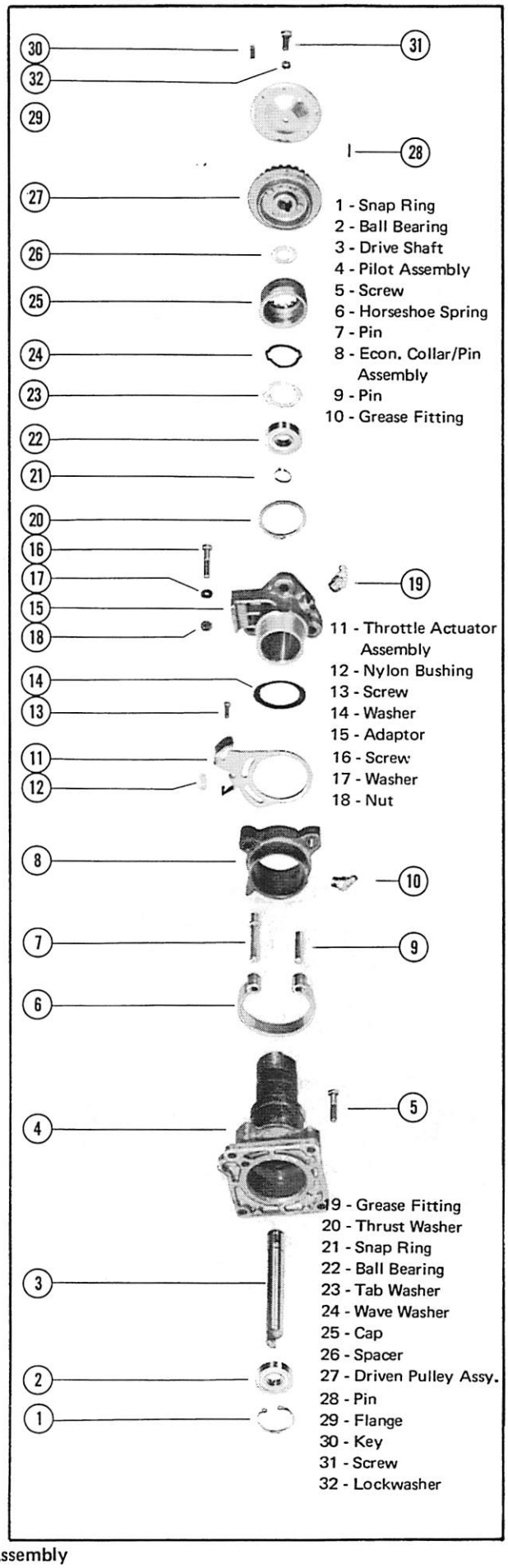


1 - Primary Housing
2 - Wave Washer
3 - Shim
4 - Trigger Housing Assembly
5 - Retainer Ring
6 - Ball Bearing
7 - Rotor Shaft Assembly
8 - Dowel Pin
9 - Adaptor Assembly
10 - Gasket
11 - Screw
12 - Nut
13 - Screw
14 - Sleeve
15 - Elbow Assembly
16 - Gasket
17 - Distributor Cap Assembly
18 - Vent Hose Elbow
19 - Brush and Spring Assembly
20 - Screw
21 - Washer
22 - Nut
23 - High Tension Cable Assembly
24 - Boot
25 - Sleeve
26 - Grommet
27 - Sleeve
28 - Spark Plug Lead Assembly (#3)
29 - Protector
30 - Sleeve
31 - Sleeve



1 - Snap Ring
2 - Ball Bearing
3 - Drive Shaft
4 - Pilot Assembly
5 - Screw
6 - Horseshoe Spring
7 - Pin
8 - Econ. Collar/Pin Assembly
9 - Pin
10 - Grease Fitting
11 - Throttle Actuator Assembly
12 - Nylon Bushing
13 - Screw
14 - Washer
15 - Adaptor
16 - Screw
17 - Washer
18 - Nut
19 - Grease Fitting
20 - Thrust Washer
21 - Snap Ring
22 - Ball Bearing
23 - Tab Washer
24 - Wave Washer
25 - Cap
26 - Spacer
27 - Driven Pulley Assy.
28 - Pin
29 - Flange
30 - Key
31 - Screw
32 - Lockwasher

Figure 4. Distributor Assembly

REASSEMBLY

1. Place wave washer and rotor shaft assembly into primary housing. (Figure 4)
2. Assemble shim and trigger assembly onto primary housing and secure with 2 screws. (Figure 5)
3. Install new gasket and secure adaptor plate to trigger housing with 2 nuts, washers and screws.
4. Install distributor cap onto adaptor with 4 nuts, washers and screws. Make sure that spring and brush assembly is in distributor cap.

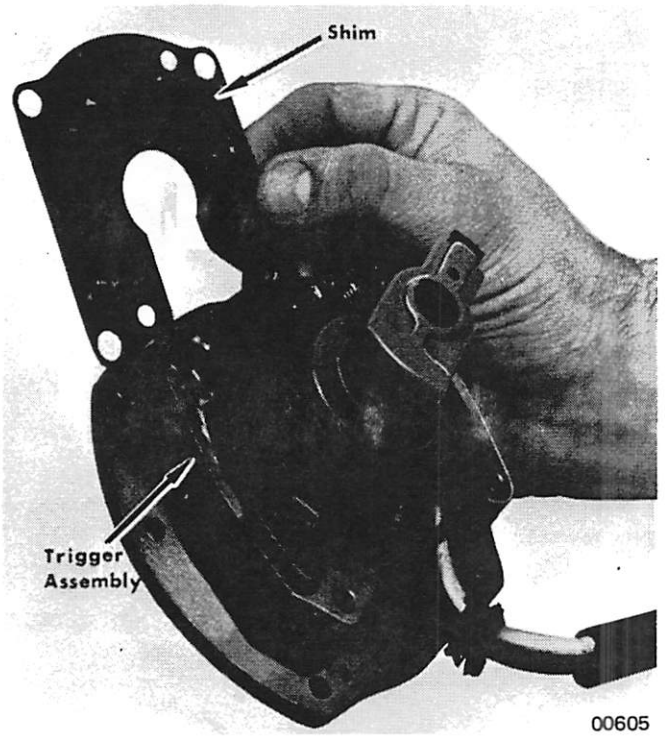
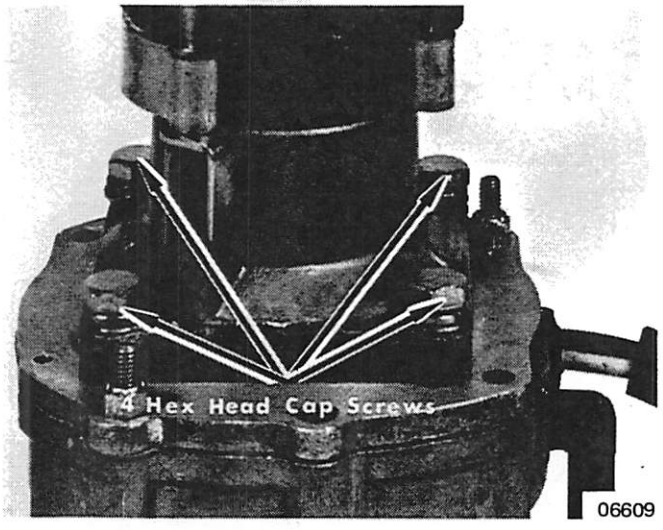


Figure 5. Installing Shim

INSTALLATION



1. Refer to installing distributor in respective "Timing, Adjusting, Testing" part of Section 3E.
2. Secure distributor with 4 hex head cap screws and attach ground straps from crankcase to distributor frame. (Figure 6)
3. Replace vent tubes to air vent elbows.
4. Attach trigger lead wires to switch box assembly.
5. Install high tension leads to distributor cap and spark plugs and secure with lead retainer.
6. Install coil high tension lead.
7. Install top cowl and wrap-around assembly.

Figure 6. Installing Distributor to Distributor Frame

LIGHTNING ENERGIZER BREAKER-LESS IGNITION

REMOVAL

1. Remove vent hoses from ignition driver.
2. Remove ignition driver ground strap from engine.
3. Remove red, white and blue leads from switch box.
4. Remove spark plug wires from ignition driver assembly.
5. Remove 4 hex head cap screws, which secure ignition driver to adaptor, and remove ignition driver assembly.

DISASSEMBLY

1. Remove 6 screws from end cap and cover and remove end cap, rotor and cover. (See exploded view, Figure 3.)
2. Remove low and high speed coil assemblies by disconnecting soldered connection (remove solder connection only if coils are to be replaced) on terminal board (Figure 1) and loosening coil bridge set screws. (Figure 2)

   NOTE: Coil bridge set screws have Loctite applied. Apply a light amount of heat to break screws loose.

3. Remove 3 screws (Figure 1) which hold bearing cap to ignition drive frame and press out magnetic rotor and shaft and bearing cap. Be careful not to damage magnetic rotor or bearing cap.
4. To remove bearing cap from rotating magnet, place in vise (use vise jaw protectors), hold magnetic rotor and tap on shaft opposite driven end.
5. If bearings are worn or rough, replace with new bearings. Wipe off sealed bearings; DO NOT wash in solvent.

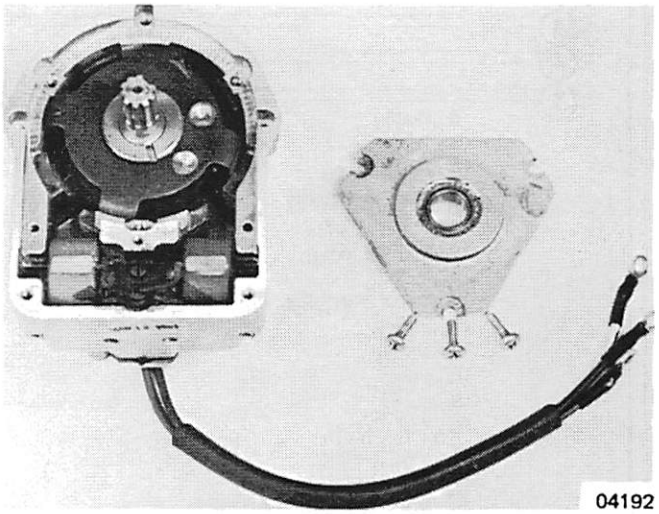


Figure 1. Bearing Cap Removal

CLEANING and INSPECTION

1. Check ignition driver frame housing for dirt, rust or corrosion. Any rust or corrosion should be removed with No. 320 carborundum paper and wiped out clean.
2. Check rotating magnet and shaft assembly for rust or corrosion. Clean thoroughly with No. 320 carborundum paper (not a wire brush) and wipe clean.
3. Check condition of high tension leads. Test high tension leads for resistance.
4. Check condition of end cap assembly. Test end cap for leakage paths which could be caused by broken leads, poor connections or moisture, dirt, carbon or corrosion within the ignition driver.
5. Before reassembly of ignition driver, make certain that all components are thoroughly tested and cleaned. Discard and replace any parts which do not meet standards.

REASSEMBLY

1. Install magnetic rotor and bearing assembly into ignition driver housing. Place bearing cap over magnetic rotor and tighten 3 screws securely (place a small amount of Loctitie on screws) and evenly. (Figure 2) Turn magnetic rotor assembly over by hand, checking that there is no binding of shaft.
2. Install high and low coils into ignition driver housing. Low (red) coil goes into housing on left side when viewing assembly from driven end.
3. Place a small amount of Loctite on coil bridge screws, hold coils against bottom stops and tighten screws. Torque to specification.
4. If coil leads had been removed previously from the terminal board, resolder leads to terminal board, using 50-50 solder with resin flux. Coat terminals after soldering with Liquid Neoprene (C-92-25711-1).
5. Install new cover gasket and install ignition driver housing cover.
6. Clean splines of rotor and rotor shaft. Apply 3 drops of Loctite to bottom of splined hole in rotor and install rotor. Make certain that spring is pressed into bottom of splined hole of rotor before applying Loctite.
7. Install new distributor cap gasket and install distributor cap.

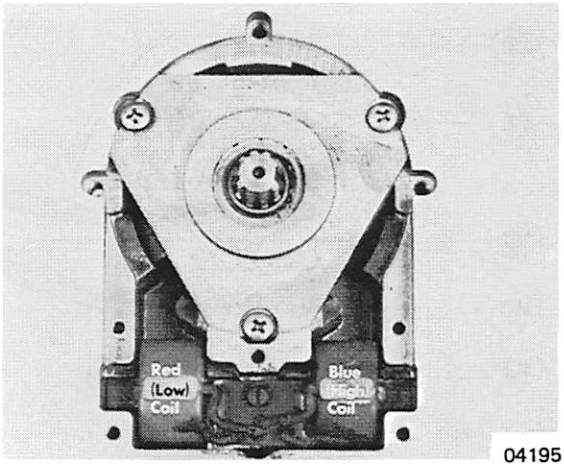


Figure 2. Bearing Cap Installed

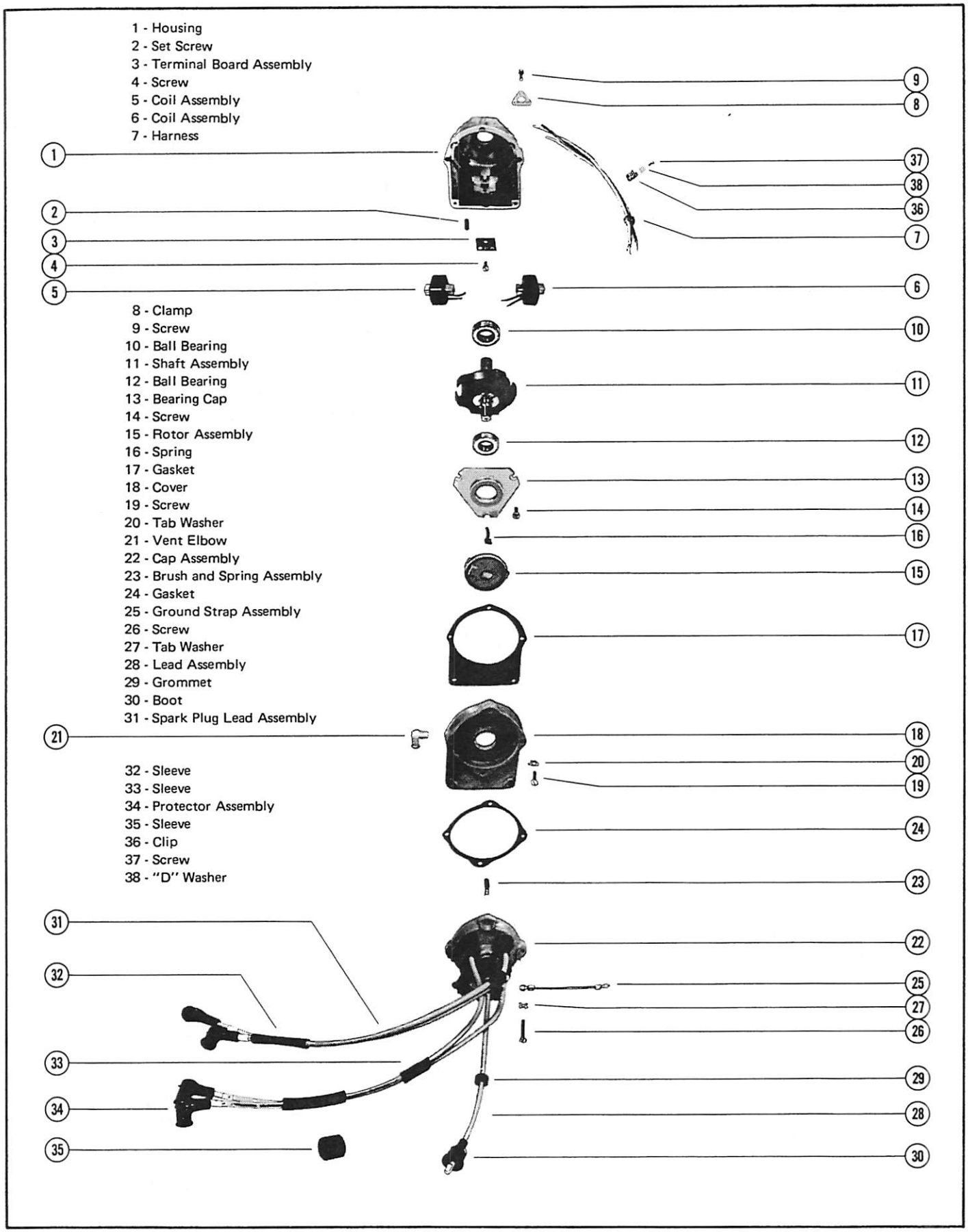
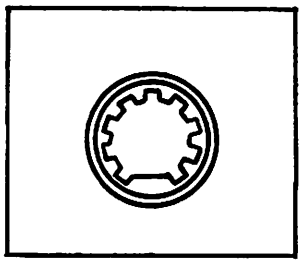


Figure 3. Ignition Driver Assembly

INSTALLATION

1. Ignition driver rotor shaft and shaft extension are provided with one spline tooth omitted (or space) on each shaft for easy installation. (Figure 4)
2. With flywheel aligned with pulley, install ignition driver on engine.



3. Rotate timing pulley until shaft sets in place. A 1/16" (1.6mm) groove is located at end of shaft coupling in centerline of blank tooth to locate for easy installation.
4. Secure ignition drive to adaptor with 4 hex head cap screws.

Figure 4. Space on Shaft

THUNDERBOLT BREAKER-LESS IGNITION
MERC 400 (2-CYL.)
REMOVAL and DISASSEMBLY

1. Remove wrap-around cowl. Remove 3 nuts which hold top cowl to powerhead. Remove starter rope handle and top cowl.
2. Remove rewind starter.
   a. Remove cotter pin washer and cap screw from neutral starter lockout cable and remove cable from rewind starter (Figure 1)

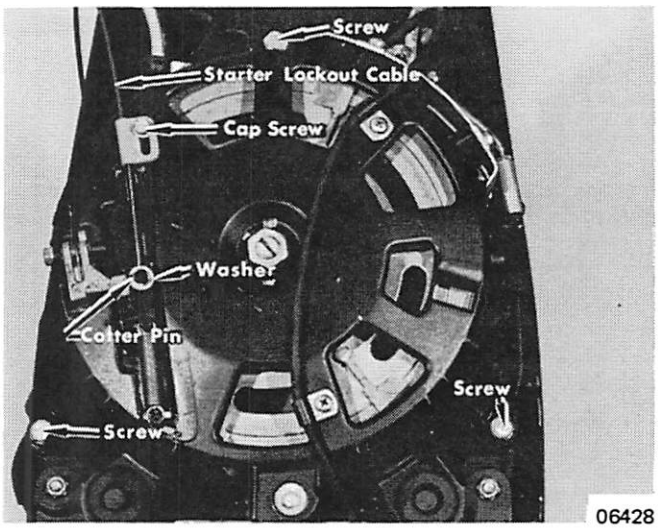


Figure 1. Removing Lockout

   b. Remove brown and black wires from switch box.
   c. Remove linkage screw from spark advance lever.
   d. Remove 3 cap screws and nuts from rewind starter and remove rewind starter.

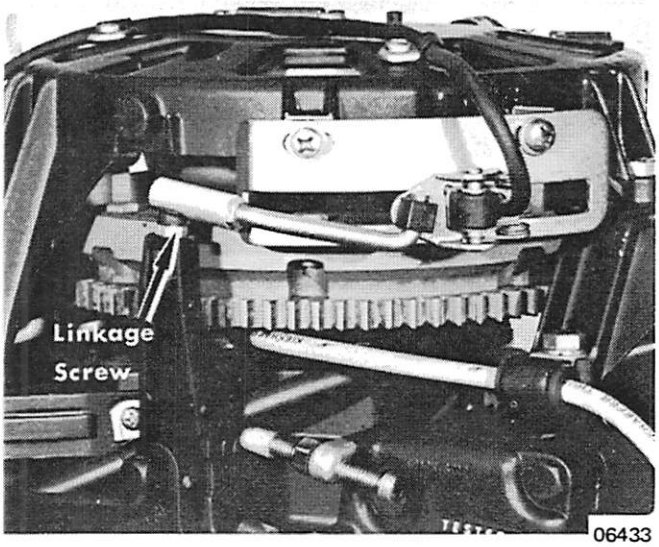


Figure 2. Removing Linkage Screw

3. Remove two 7/16 center hub screws with lockwashers underneath.
4. Remove flywheel nut and washer with Flywheel Holder (C-91-45246).
5. Remove flywheel with Crankshaft Protector and Flywheel Puller (C-91-24695A2) and 2 bolts.

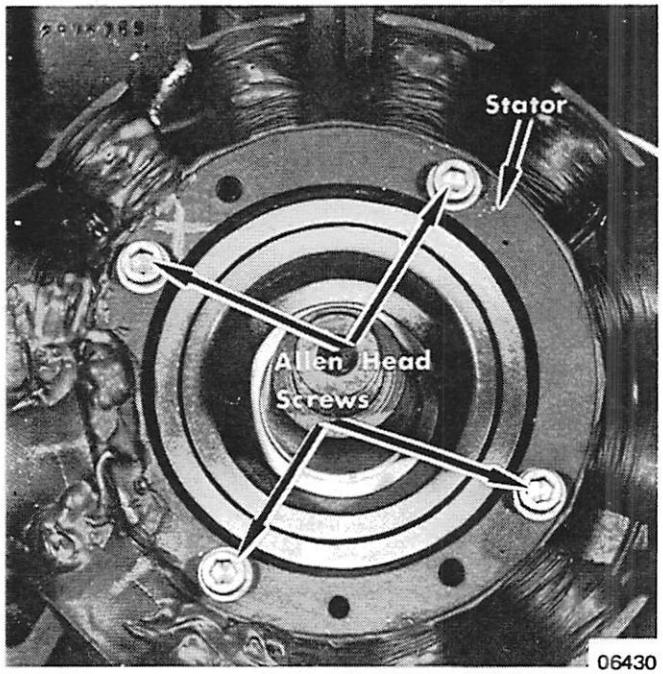


Figure 3. Removing Stator

6. To replace stator.
   a. Remove 4 allen head screws and washers.
   b. Remove screw and "D" washer from clamp.
   c. If manual model, remove blue and white wire from switch box.
   d. If electric model, remove blue and white wire from switch box and 2 yellow wires from rectifier.
   e. Remove stator.
7. To remove distributor body assembly.
   a. Remove high tension leads from spark plugs.
   b. Pry lead clip open and remove H.T. (high tension) lead from clip.

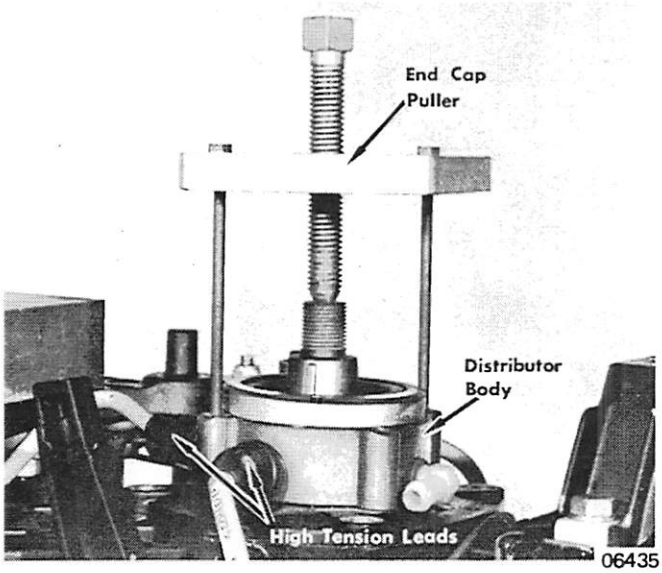


Figure 4. Removing Distributor Body Rotor

c. Remove H.T. lead from coil.
d. Remove vent hose from body assembly.

NOTE: On early Merc 400 engines, rotor was not secured in place with Loctite and will come off when distributor body is pryed up with screwdriver. Later 400's have rotor secured with Loctitie and must be removed as follows.

(1) Remove 4 end cap screws.
(2) Using universal end cap puller (installed with 10-32x3½" bolts in any 2 holes of distributor body), pull end cap assembly. Rotor and body will disassemble with end cap.

e. Unscrew high tension lead from distributor body.
f. Remove front support and remove coil and switch box.

CLEANING and INSPECTION

1. Check high tension leads.
2. Check for leakage.

REASSEMBLY and INSTALLATION

1. Install coil and switch box on front cowl support and install front support.
2. Check "O" ring and install end cap with 4 cap screws.
3. To reduce possible wear and fretting on the distributor housings and shoulder of distributor rotor, the rotor must be installed with Loctite Grade "AV" (C-92-58295A1).

   NOTE: If Loctite Grade "AV" is not available, use Loctite Pipe Sealant which can be obtained locally. DO NOT use Loctite Type "A".

4. Apply Loctite as follows:

   CAUTION: LocQuic primer must be sprayed on crankshaft before distributor body is installed, as primer will cause deterioration (dissolving) of the plastic body.

   a. Spray LocQuic Primer Grade "T" on crankshaft between top oil seal and taper.
   b. Install new distributor body and stator in place.
   c. Apply Loctite Grade "AV" to bottom of bore in distributor rotor.

   CAUTION: DO NOT allow Loctite to run into top oil seal, or it will cause leakage.

   d. Press rotor firmly in place by hand.
5. Remove high tension lead wires from old distributor housing and install into new distributor housing on engine. Use new longer boots (A-60096) on lead wires. Place a quantity of No. 47 Sealing Compound (A-399-673) on post before installing boots.
6. Place vent tube restrictor into upper end of vent tube. Push restrictor into vent tube about 1" (25.4mm) and install vent tube to elbow.
7. Reinstall flywheel assembly, using new "O" ring supplied in kit.
8. Install starter rewind housing assembly with 3 cap screws and nut.
9. Replace linkage on spark advance lever.
10. Install brown and black wires on switch box.
11. Install neutral starter lock and cable with screw, washer and cotter pin.
12. Pull rewind rope through top cowl.
13. Install top cowl.
14. Install starter rope handle.
15. Install wrap-around cowl.

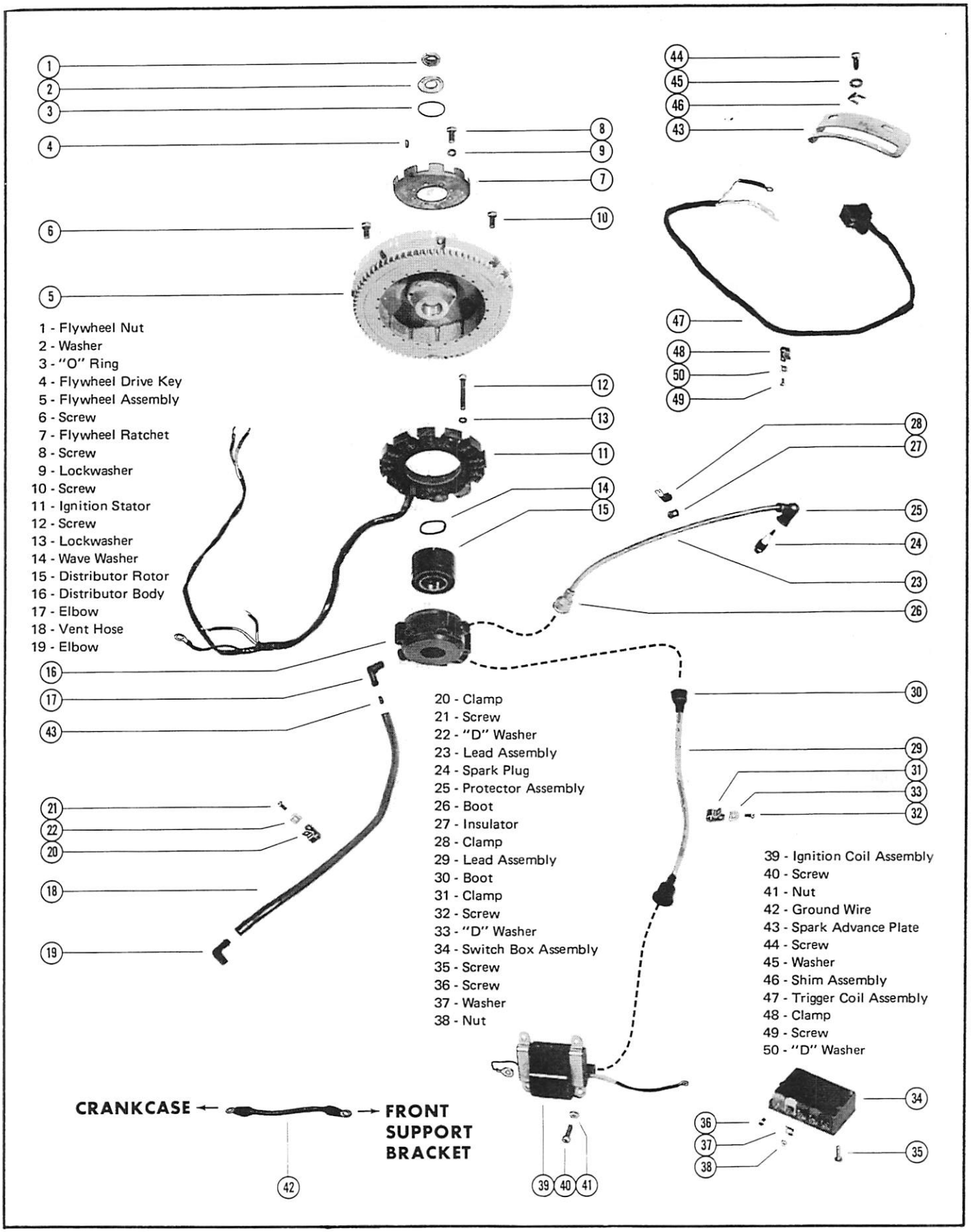


Figure 5. Ignition Components

THUNDERBOLT MAKER-POINT IGNITION
MERC 200-110-75-40
REMOVAL and DISASSEMBLY

1. Remove top cowl.
2. Remove 3 phillips head screws from rewind starter. Loosen coil retaining screws and nuts. Remove rewind starter.
3. Remove flywheel nut and washer with Flywheel Holder (C-91-24937A1).
4. Pull flywheel with Crankshaft Protector and Puller (C-24695A2) and 3 bolts.
5. To replace stator and housing assembly:
   a. Remove cap screw from stator advance arm. (Figure 1)

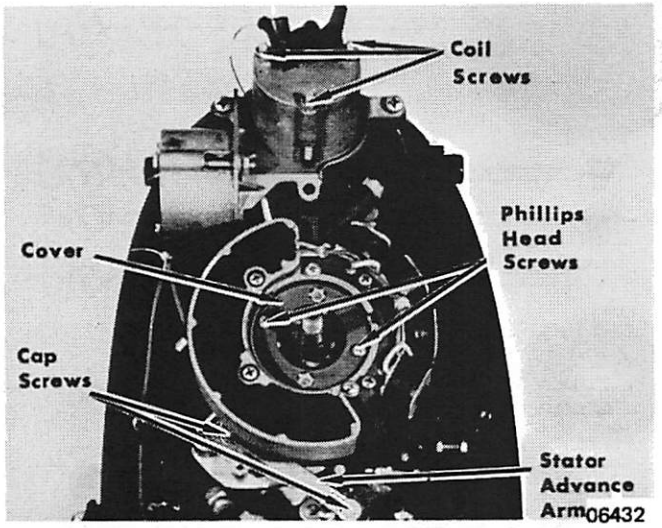


Figure 1. Removing Stator Advance Arm

   b. Disconnect wires from stop switch and coil.
   c. Remove 4 phillips screws and "D" washer from wire clamp.
   d. Remove screw and stator ground strap.
   e. Remove stator and housing assembly.

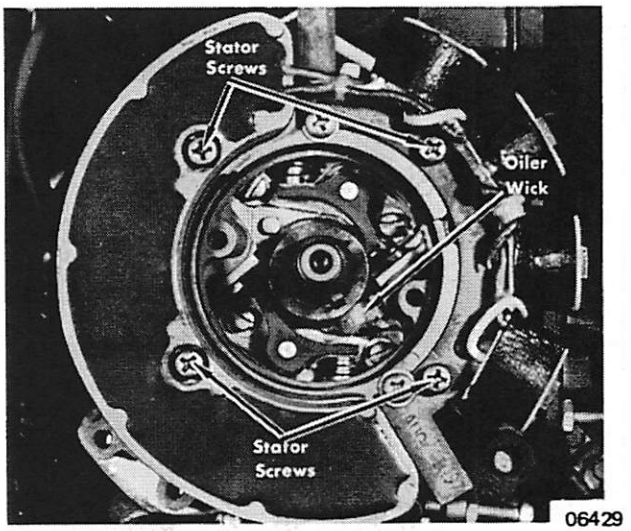


Figure 2. Removing Points

6. To replace or adjust components:
   a. Remove 2 phillips head screws from cover assembly.

   NOTE: To replace points, it is necessary to remove 4 screws and remove stator assembly. (Figure 2)

   b. Remove 4 phillips screws and startor assembly.
   c. Remove contact housing holder.
   d. Remove 2 screws and 1/4" nut from each set of points and remove contact points. (Figure 2)
   e. Replace oiler wick, if necessary.
   f. To remove coils, remove 3 nuts and cap screws from bracket, then remove coil. (Figure 1)

CLEANING and INSPECTION

1. Using Magneto Analyzer scale No. 2, check resistance of brown and white wires from wire to point insulator. (Figure 3)
2. Check points.

   NOTE: High primary voltage in Thunderbolt Ignition System will darken and roughen the maker points within a short period of time. DO NOT BE ALARMED. While points in this condition would not operate satisfactorily in the conventional magneto, they will continue to perform in Thunderbolt System. DO NOT, therefore, replace Thunderbolt Ignition points unless an obvious malfunction exists, or contacts are loose or burned away. Rough or discolored contact surfaces are not evidence for replacement in Thunderbolt Ignition System. In general, cam follower will have worn away by the time points become unserviceable.

3. Check stator under "Timing, Adjusting, Testing" in Section 3E, following.
4. Check coils.

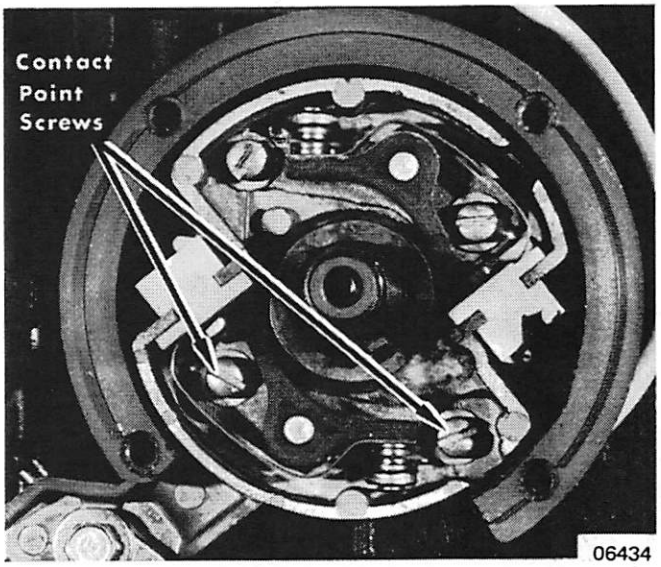


Figure 3. Checking Wiring

REASSEMBLY and INSTALLATION

1. Install points, using screws and nut for each set. Preset points to .020" on high part of cam. Set points - see "Timing, Adjusting, Testing" in Section 3E, following.
2. Install contact housing holder and stator assembly, securing with 4 phillips head screws.
3. Install cover assembly with 2 phillips head screws.
4. Install flywheel washer and nut. Torque nut to specifications.
5. Install starter rewind.

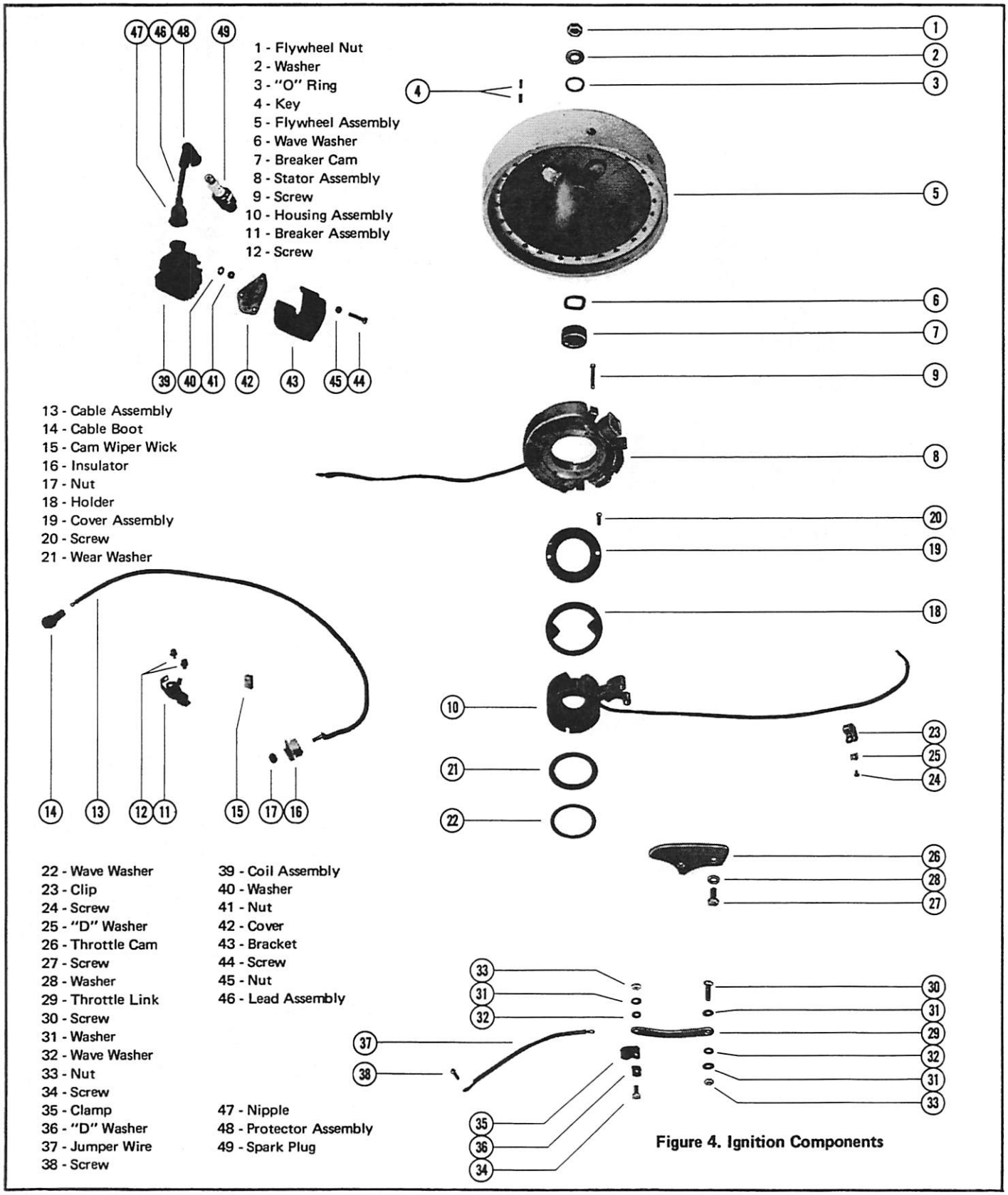


Figure 4. Ignition Components

THUNDERBOLT MAKER-POINT IGNITION with MODULE MERC 200-110-75-40 (1971-72); MERC 110-75-40 (1973)

REMOVAL and DISASSEMBLY

1. Remove top cowl.
2. Remove 3 cap screws from rewind starter and remove rewind starter.
3. Remove flywheel nut and washer, using Flywheel Holder (C-91-24937A1) to hold flywheel.
4. Place crankshaft protector on crankshaft. Pull flywheel with Puller Assembly (C-91-24695A2).
5. Remove stator to powerhead ground strap from stator.
6. Remove green (+) and brown (-) leads and green (+) and white (-) leads from coils. Remove salmon lead from stop switch. (Figure 1)

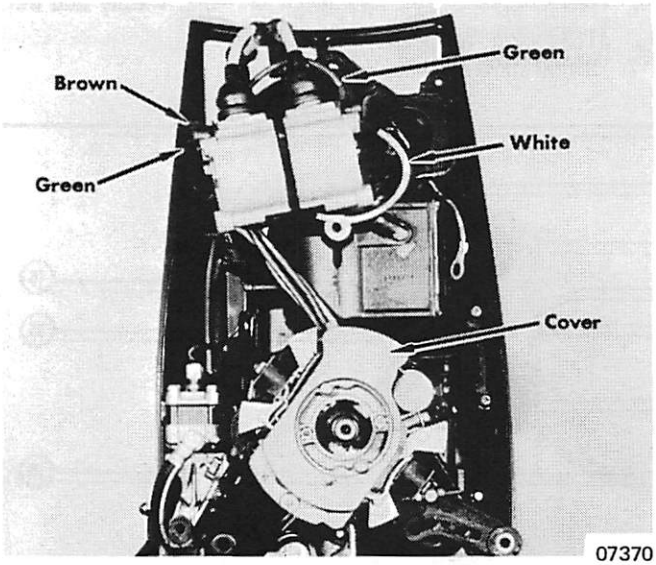


Figure 1. Ignition Coil Leads

7. To remove or adjust components, remove 2 phillips head screws and remove cover. (Figure 2)
8. To replace points, remove ¼" spring locking nut and 2 screws from each point set. (Figure 3)
9. To replace capacitor, remove green lead from module.

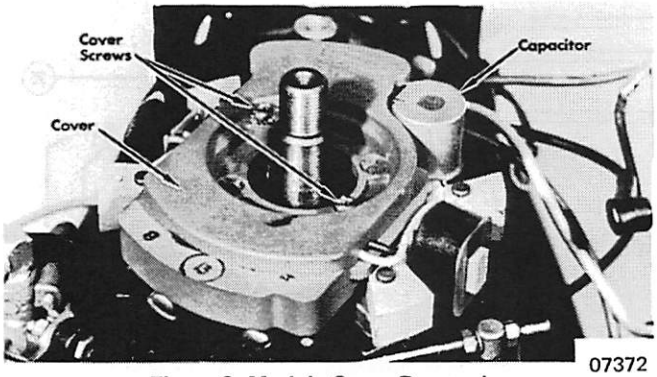


Figure 2. Module Cover Removal

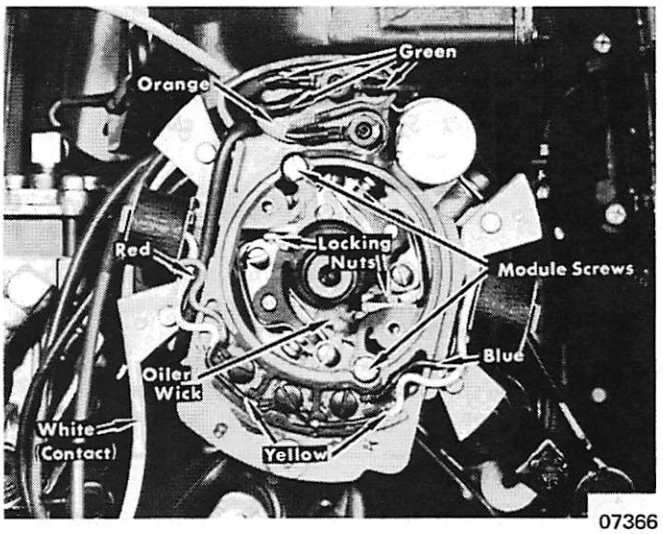


Figure 3. Ignition Wire Connection

Remove ground wire screw (if not removed) and capacitor mounting bracket screw.

10. Remove module by disconnecting 2 nuts, which hold coil leads, and 3 screws which hold stator leads. Remove 2 screws and module will come loose. (Figure 3)
11. Coils may be replaced by removing clips and pulling coil off plate. (Figure 4)
12. Rotate stator plate and remove.

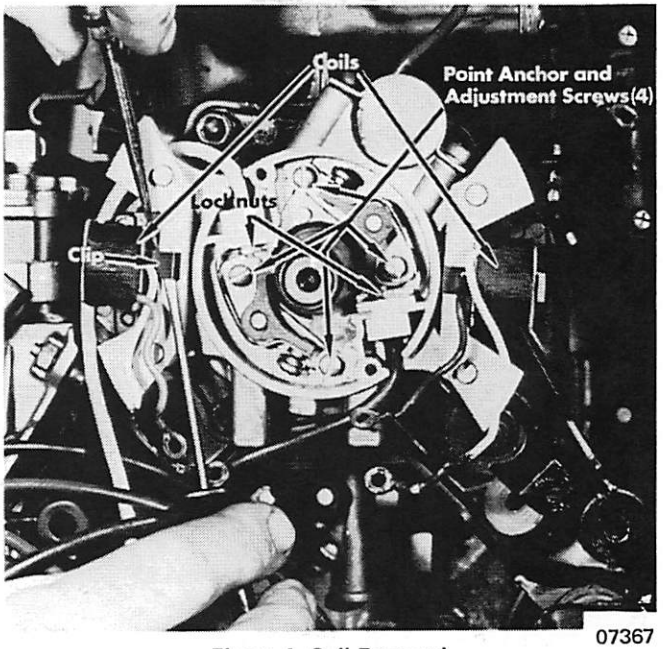


Figure 4. Coil Removal

CLEANING and INSPECTION

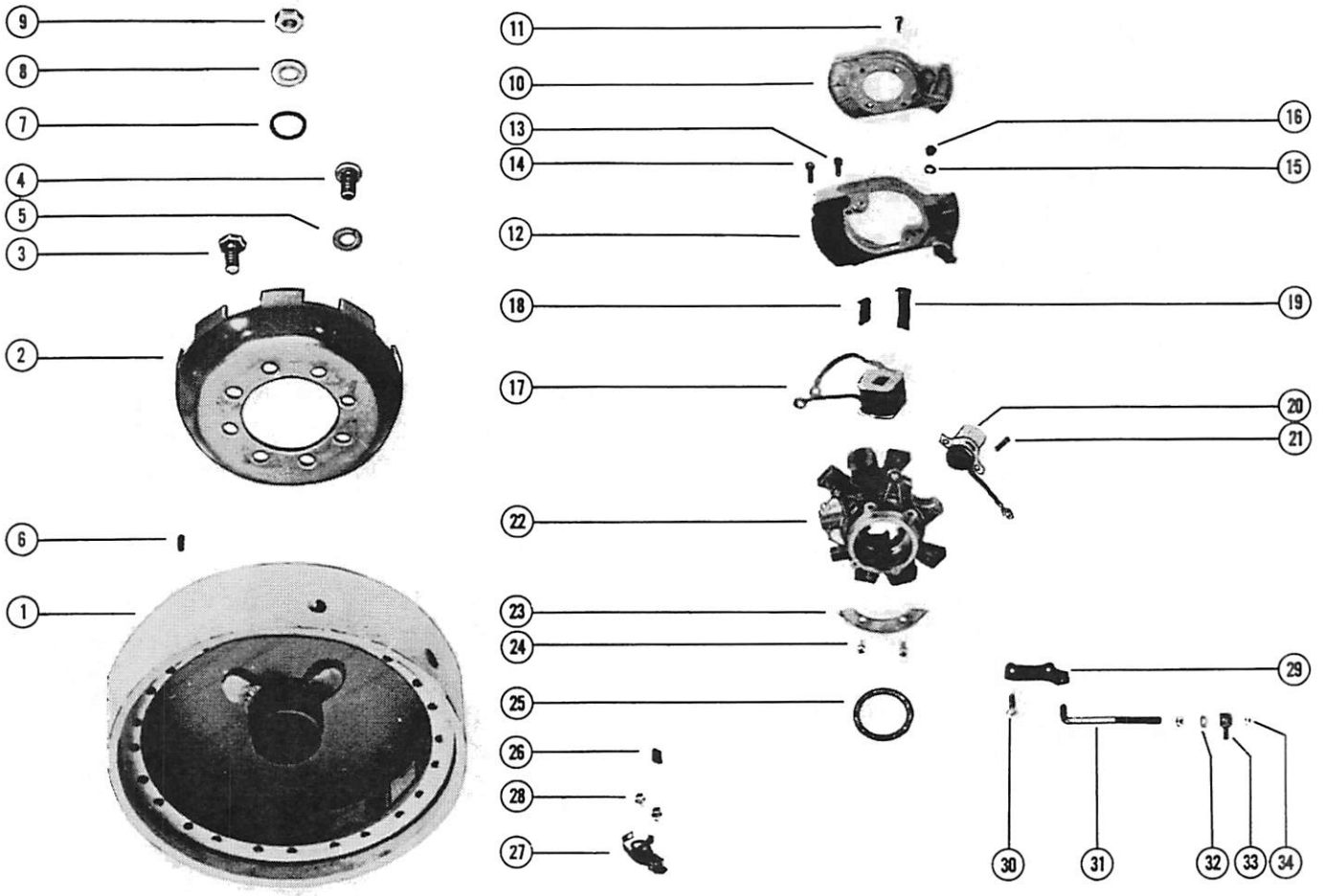
1. Using Magneto Analyzer scale No. 2, check resistance of brown and white wires from wire to point insulator. (Figure 3)
2. Check points.

   NOTE: High primary voltage in Thunderbolt Ignition System will darken and roughen the maker points within a short period of time. DO NOT BE ALARMED. While points in this condition would not operate satisfactorily in the conventional magneto, they will continue to perform in Thunderbolt System. DO NOT, therefore, replace Thunderbolt Ignition points, unless an obvious malfunction exists, or contacts are loose or burned away. Rough or discolored contact surfaces are not evidence for replacement in Thunderbolt Ignition System. In general, cam follower will have worn away by the time points become unserviceable.

3. Check stator under "Timing, Adjusting, Testing" in Section 3E, following.
4. Refer to Section 3, Part C and check coils and condensers.

REASSEMBLY and INSTALLATION (Figure 5)

1. Install points with screws for each set. Preset points to .020" on high part of cam. Refer to "Timing, Adjusting, Testing" in Section 3E.
2. Install stator assembly and rotate to lock.
3. Install coils, clips and condensers (if removed).
4. Install ignition module with 2 phillips head screws. Secure lead wires to module. (Figure 3)
5. Install cover assembly with 2 phillips head screws.
6. Install breaker cam, flywheel, "O" ring, washer and nut. Torque nut to specifications.
7. Install starter rewind.



1 - Flywheel Assembly
2 - Ratchet Assembly
3 - Screw
4 - Screw
5 - Lockwasher
6 - Flywheel Drive Key
7 - "O" Ring
8 - Washer
9 - Flywheel Nut
10 - Cover Assembly
11 - Screw
12 - Ignition Module Assembly
13 - Screw
14 - Screw
15 - Lockwasher
16 - Nut
17 - Coil
18 - Coil Retaining Clip
19 - Coil Retaining Clip
20 - Condenser Assembly
21 - Screw
22 - Stator Assembly
23 - Plate
24 - Screw
25 - Shim
26 - Wick
27 - Maker Assembly
28 - Screw
29 - Bracket
30 - Screw
31 - Throttle Link
32 - Washer
33 - Throttle Link Swivel
34 - Throttle Link Nut

Figure 5. Exploded View - Maker Point Ignition with Module

THUNDERBOLT BREAKER-LESS IGNITION
MERC 402 (2-Cyl.)
REMOVAL and DISASSEMBLY

1. Remove wrap-around cowl and 3 nuts which hold top cowl to powerhead. Remove starter rope handle and top cowl.
2. Remove rewind starter.
   a. Remove cotter pin washer and cap screw from neutral starter lockout cable and remove cable from rewind starter. (Figure 1)

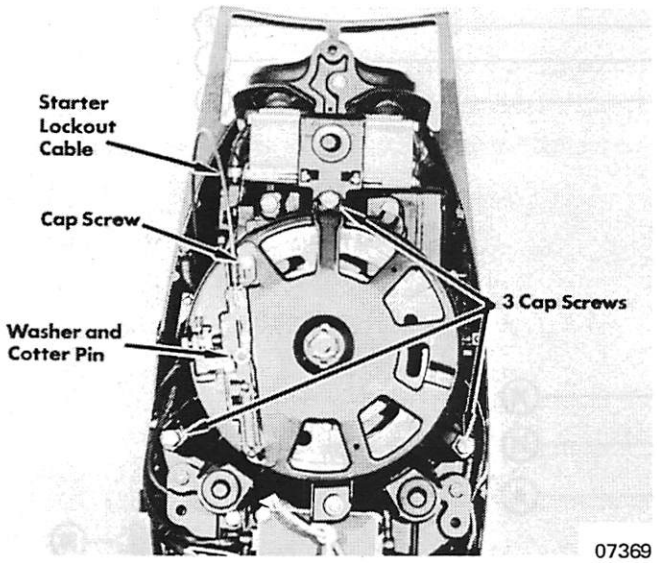


Figure 1. Removing Lockout

   b. Remove brown and black wires from switch box.
   c. Remove 3 cap screws and nuts from rewind starter and remove rewind starter. (Figure 1)
3. Remove two 7/16" center hub screws (with lockwashers underneath) from flywheel.
4. Remove flywheel nut and washer, using Flywheel Holder (C-91-45246) to hold flywheel.
5. Remove flywheel with Crankshaft Protector and Flywheel Puller (C-91-24695A2) and 2 bolts.
6. To remove stator -
   a. Remove 4 allen head screws and washers. (Figure 2)
   b. Remove screw and "D" washer from clamp.
   c. If manual model, remove blue and red wire from switch box.
   d. If electric model, remove blue and red wire from switch box and 2 yellow/red wires from rectifier.
   e. Remove stator.

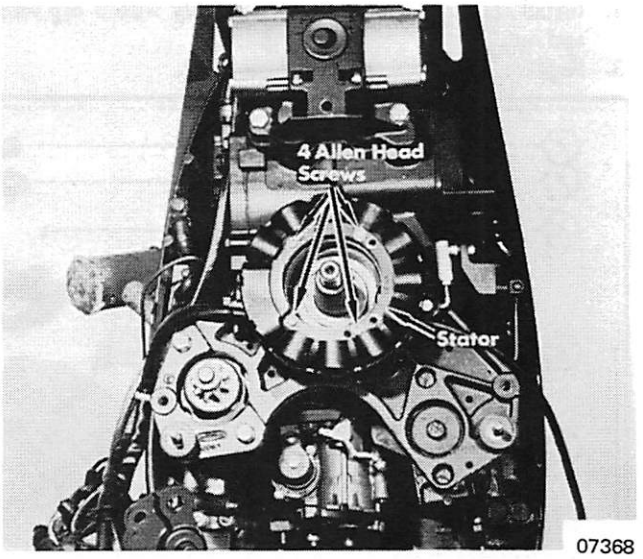


Figure 2. Removing Stator

7. To remove trigger -
   a. Trigger is spring-loaded to open position. Remove linkage from trigger by removing screw on bottom of trigger. (Figure 3) Remove trigger.
   b. Remove washer, wave washer and washer. (Figure 3)

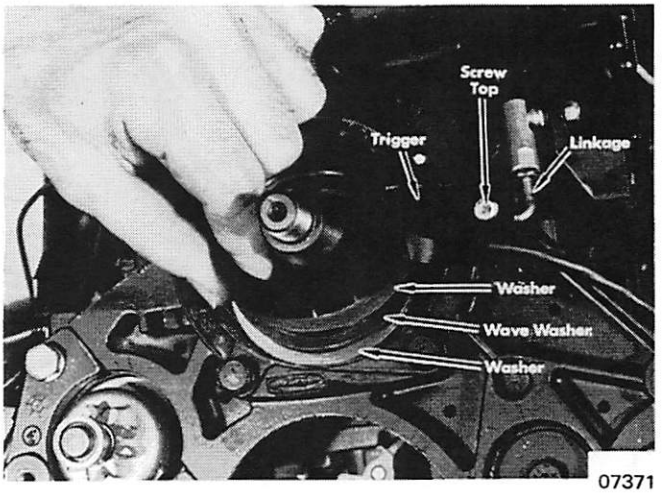


Figure 3. Removing Trigger

CLEANING and INSPECTION

1. Check high tension leads for leakage.
2. Inspect parts for wear or damage.

REASSEMBLY and INSTALLATION

1. Install washer, wave washer, washer and trigger onto end cap. (Figure 3)
2. Install stator and connect wires.
3. Install flywheel, washer and flywheel nut. Torque to specifications.
4. Install starter rewind housing assembly with 3 cap screws and nut.
5. Replace linkage on spark advance lever.
6. Install brown and black wires on switch box.
7. Install neutral starter lock and cable with screw, washer and cotter pin.
8. Pull rewind rope through top cowl.
9. Install top cowl.
10. Install starter rope handle.
11. Install wrap-around cowl.

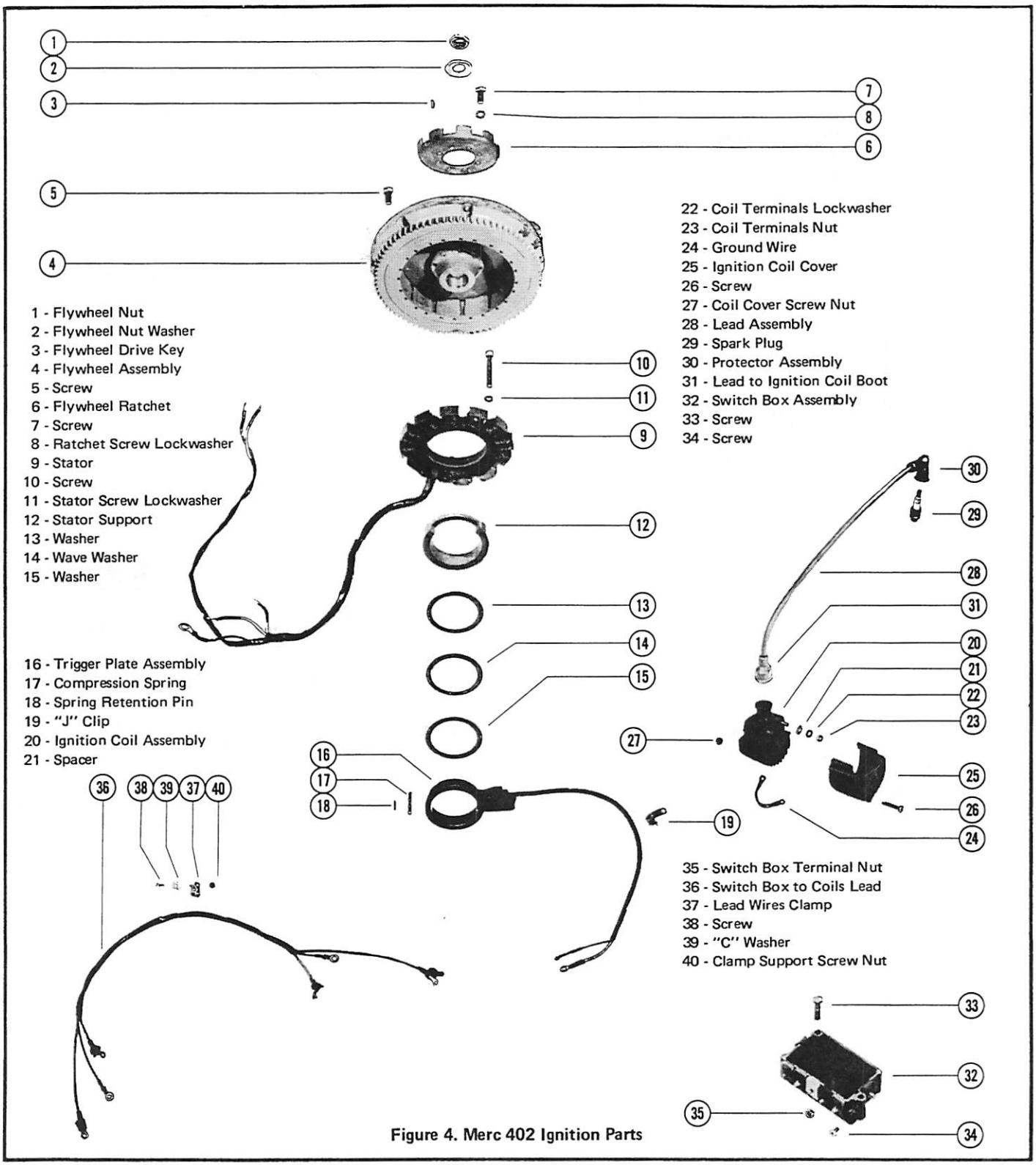
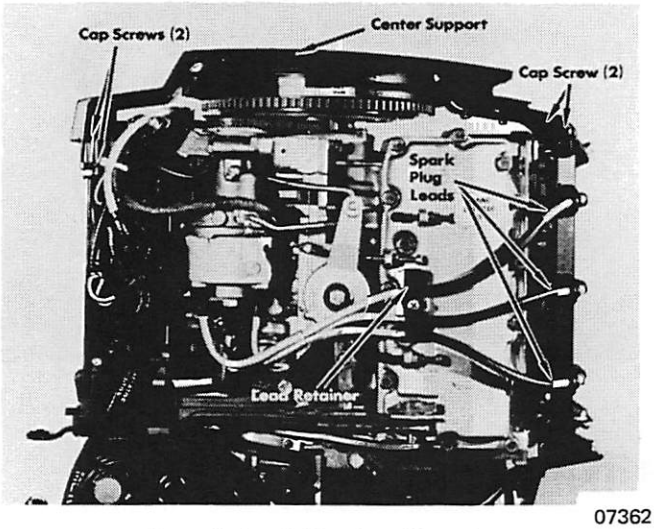


Figure 4. Merc 402 Ignition Parts

THUNDERBOLT BREAKER-LESS IGNITION
MERC 650 (3-Cyl.)
REMOVAL

1. Remove clam shell cowl.
2. Remove 4 cap screws from front and rear center support and remove center support assembly. (Figure 1)



07362

Figure 1. Spark Plug Lead Location

3. Remove flywheel nut and washer.
4. Remove flywheel with Flywheel Puller (C-91-48501A1) and Flywheel Holder (C-91-52344). (Figure 2)
5. Remove 4 screws and remove stator. (Figure 3)

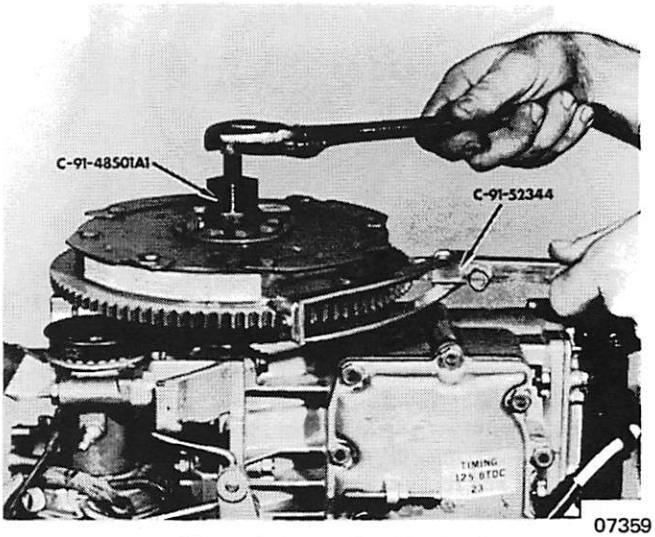


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Figure 2. Removing Flywheel

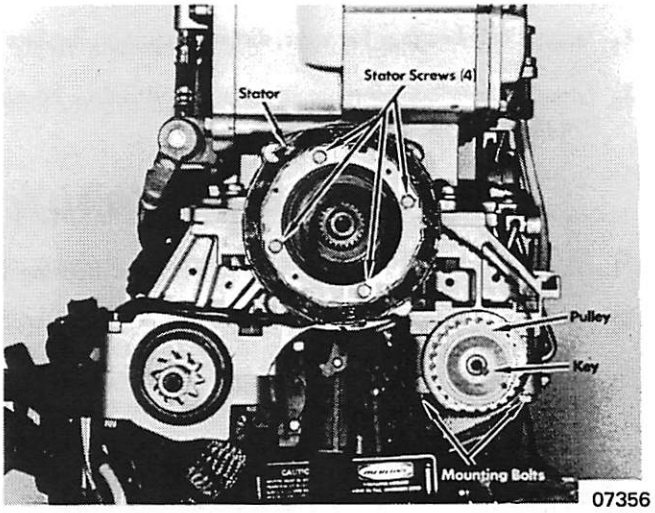

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Figure 3. Removing Stator

DISASSEMBLY

1. Remove phillips head screw from distributor ground strap.
2. Remove spark plug leads from spark plugs. (Figure 1)
3. Remove lead retainer from exhaust cover. (Figure 1)
4. Remove distributor actuating arm linkage from distributor.
5. Remove coil high tension lead from coil. Remove coil lead clamp.
6. Remove 2 cap screw mounting bolts. (Figure 3)
7. Using 2 screwdrivers, remove pulley, key and spacer.

DISTRIBUTOR DISASSEMBLY

1. Bend open tabs of adaptor cap tab washer and unscrew distributor housing cap from adaptor. (Figure 4)
2. With distributor housing cap removed, pull distributor housing assembly from economizer collar and distributor adaptor.
3. Remove screw and nut from distributor cap clamp and remove clamp from distributor cap and distributor housing.
4. Remove distributor cap and spark plug lead assembly. Clean and inspect distributor cap, brush and spring and spark plug wires. Replace as necessary.
5. Remove upper ball bearing from distributor housing by pressing on the outer race of the bearing thru hole on each side of housing. DO NOT press against ball bearing retainer. (Figure 5)
6. Remove nut from upper end of rotor shaft and tap lightly on upper end of rotor shaft to remove from distributor.

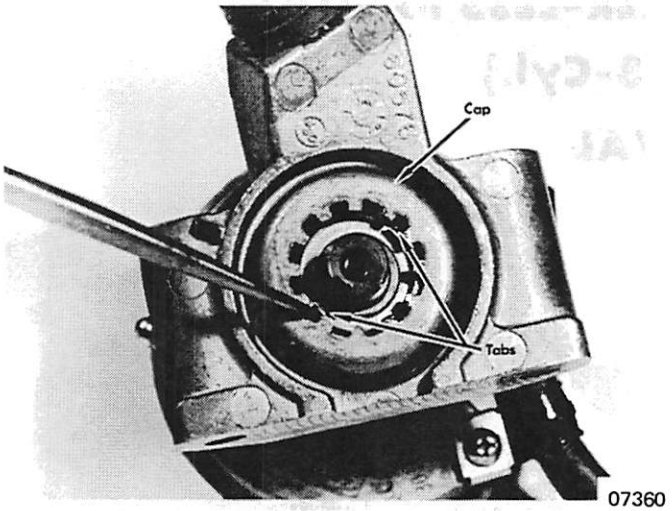


Figure 4. Disassembling Distributor

7. Remove retaining ring from lower end of distributor housing and remove lower ball bearing. Inspect upper and lower ball bearings and replace if necessary.
8. Clean and inspect all component parts of distributor adaptor and replace parts as necessary.

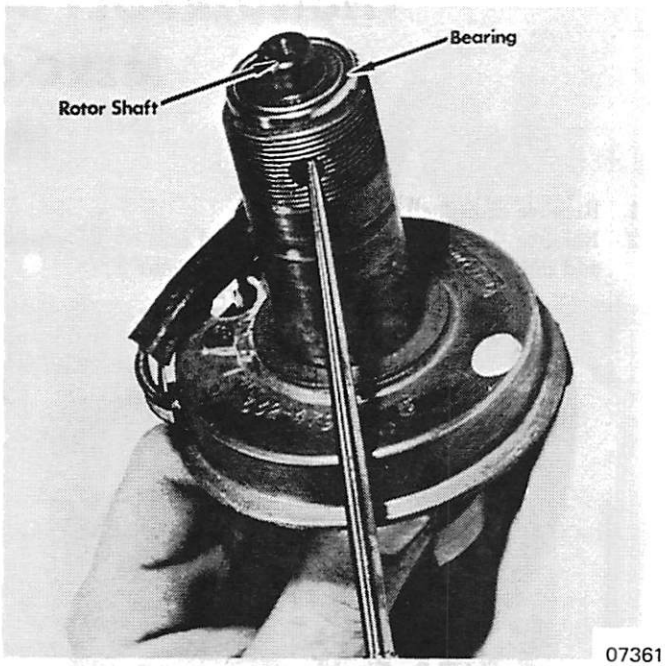


Figure 5. Removing Rotor Shaft Bearing

CLEANING and INSPECTION

1. Inspect ball bearings for wear, dirt or corrosion. Replace if necessary.
2. Clean and inspect component parts of distributor housing and replace as necessary.
3. Check condition of high tension leads.
4. Test distributor cap for leakage paths which could be caused by broken leads, poor connections or moisture, dirt, carbon or corrosion in distributor.

REASSEMBLY and INSTALLATION

1. Install lower ball bearing into distributor housing and reinstall bearing retaining ring.
2. Place rotor disc into slot of distributor housing. Observe Figure 7 for proper relationship of disc to rotor.
3. Install rotor and shaft assembly thru disc, rotor shaft spacer and ball bearing, making certain that disc key is inserted into rotor shaft keyway.
4. Place rotor shaft sleeve over rotor shaft and install nut on upper end of rotor shaft. Torque nut to 75-80 in. lbs. (13-14kg/cm).
5. Press upper ball bearing into distributor housing.
6. Place economizer collar washer on distributor housing and install economizer collar on distributor housing.

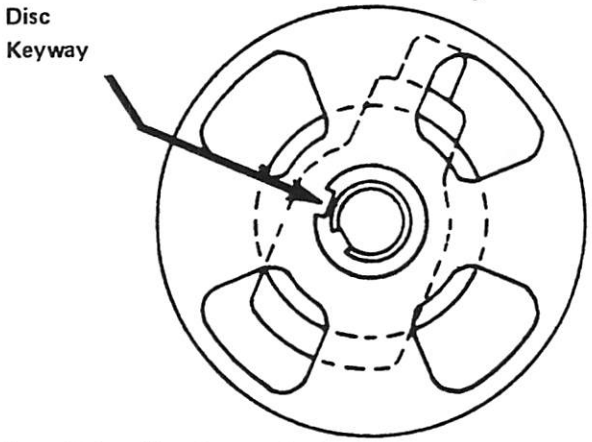


Figure 7. Installing Rotor Disc in Distributor Housing

7. Place adaptor washer on economizer collar and install adaptor assembly.
8. Install distributor housing washer, tab washer, wave washer (install wave washer with wave toward cap) and distributor housing cap onto distributor housing. Screw cap onto housing until tight, back off cap to to first notch and bend up tabs.
9. Place distributor cap assembly onto distributor housing, observing caution so that brush and spring will not be damaged. Install distributor cap clamp and retainer with screw and nut. Locate clamp screw and nut as shown in Figure 8.

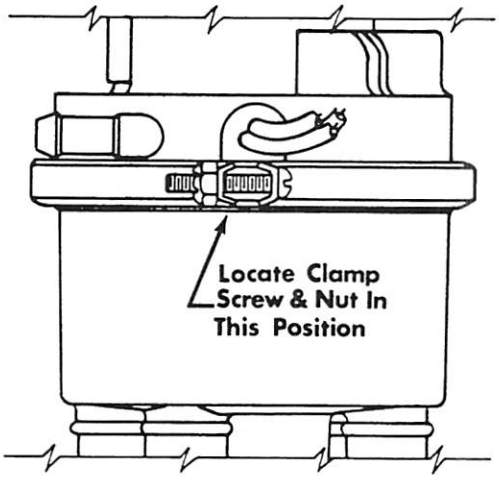


Figure 8. Installing Distributor Cap Assembly

INSTALLING DISTRIBUTOR

1. Position distributor and distributor adaptor assembly into cylinder block mounting flange. Be certain that driven pulley spacer and distributor drive key are in position.
2. Fasten distributor adaptor to cylinder block with 3 screws, washers and nuts.
3. Line up arrow on pulley with timing mark on flywheel and install timing belt.

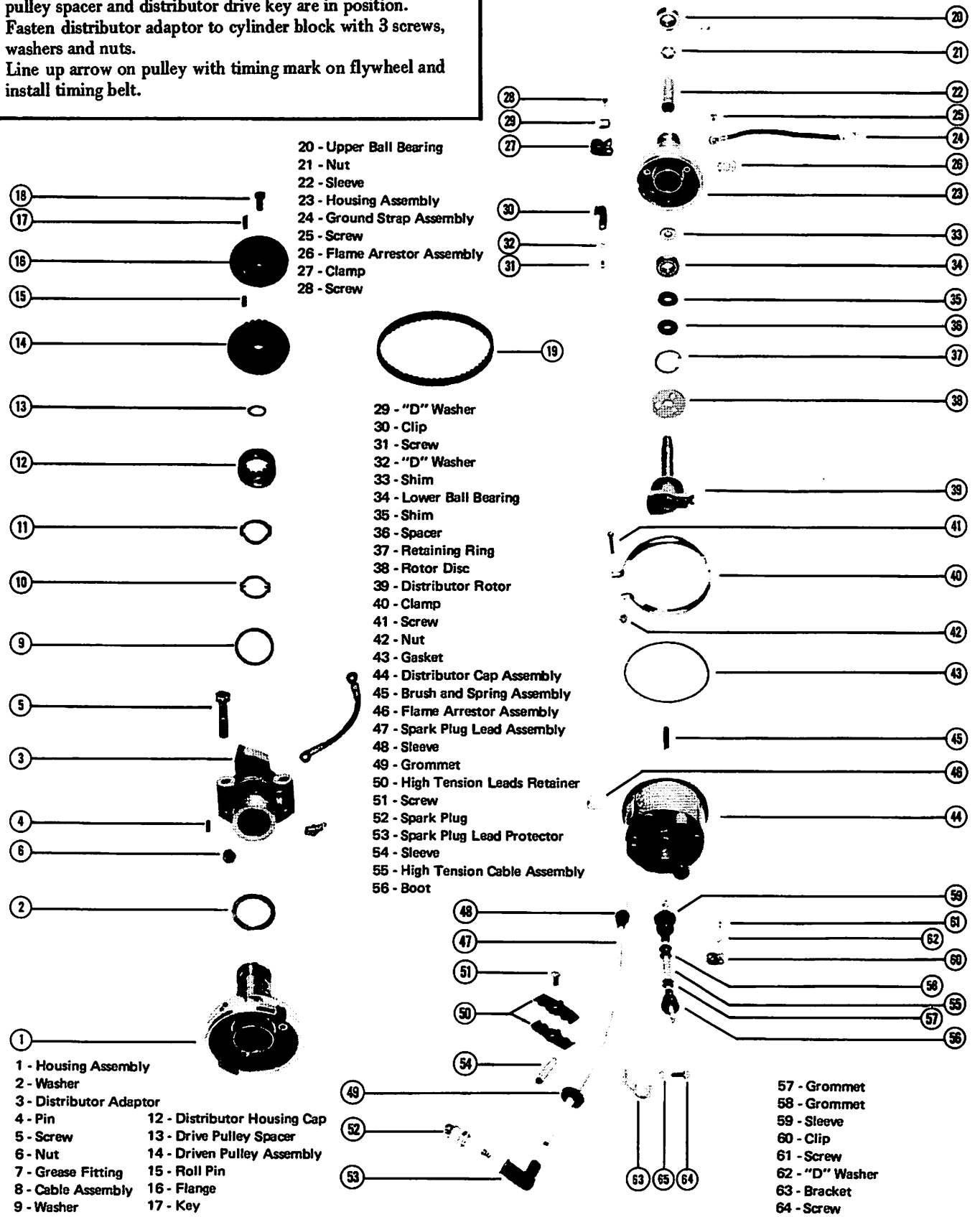


Figure 6. Distributor Exploded View

THUNDERBOLT BREAKER-LESS IGNITION

MERC 200 (1973)

REMOVAL and DISASSEMBLY

1. Remove front cowl and wrap-around cowl. Remove 3 nuts which hold top cowl to powerhead. Remove starter rope handle and top cowl.
2. Remove rewind starter by removing 3 starter housing cap screws and nuts. (Figure 1) If electric, remove 2 starter nuts.

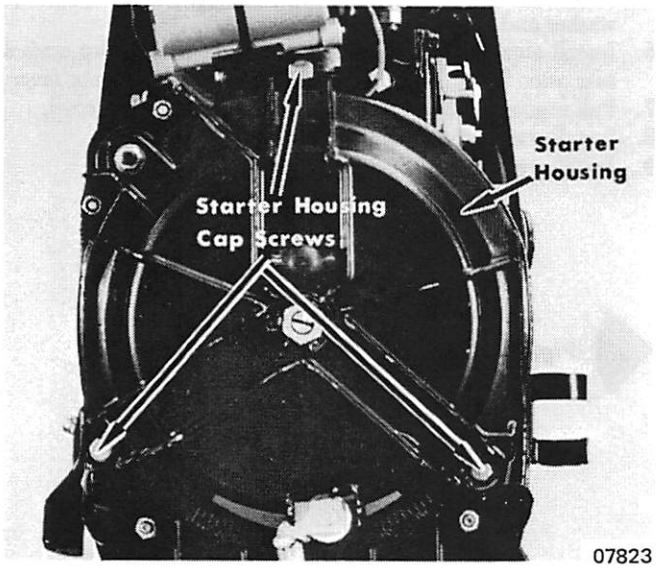
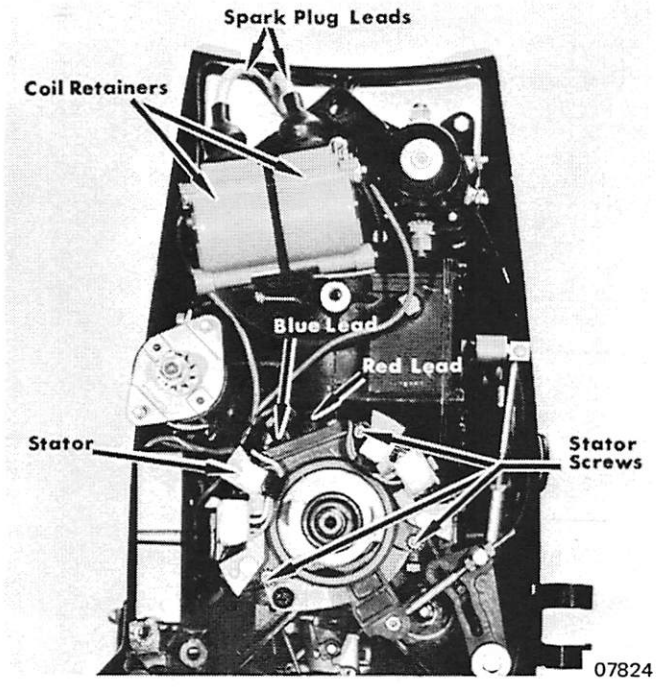


Figure 1. Removing Rewind Starter Housing

3. Remove two 7/16 screws (with lockwashers underneath) from flywheel center hub.



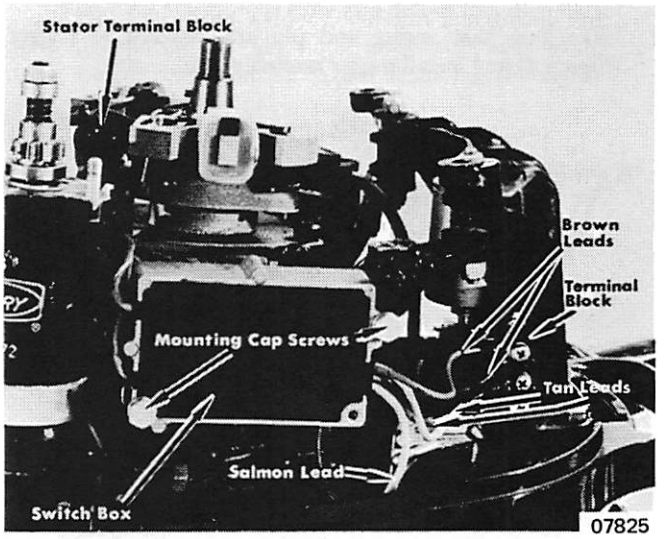


Figure 3. Stator and Switch Box Connections

4. Remove flywheel nut and washer with Flywheel Holder (C-91-45246).
5. Remove flywheel with Crankshaft Protector and Flywheel Puller (C-91-24695A2) and 2 bolts.
6. Remove blue and red wires from stator terminal block (Figures 2 and 3) and remove stator.
7. Remove 3 phillips head screws and washers from stator.
8. To remove trigger assembly, remove brown and white trigger and switch box leads from terminal block. (Figure 3) Remove outer nuts on trigger arm and slide arm off lever.

CAUTION: DO NOT lose spring or pin which are located under trigger. (Figure 4)

9. Disconnect green switch box to coil leads at coils. Separate black ground lead from switch box and salmon switch box lead connection. (Figure 3)
10. Remove 2 cap screws and remove switch box. (Figure 3)
11. Remove spark plug leads from coils. Remove electrical connections from coils. Remove 3 phillips head screws and nuts and remove coil retainers and coils.

Figure 2. Removing and Installing Stator

CLEANING and INSPECTION

Check high tension leads and check for leakage.

REASSEMBLY and INSTALLATION

1. Install coils and switch box with appropriate hardware.
2. Make sure that spring and pin are installed in trigger (Figure 4) and install trigger assembly onto engine.

3. Install stator and secure with 3 washers and phillips head screws. (Figure 2)
4. Connect spark plug leads to coils. Connect white/green switch box lead to No. 2 coil and green switch box lead to No. 1 coil. Connect red and blue switch box leads to stator terminal block as shown in Figures 2 and 3.
5. Reinstall flywheel assembly to crankshaft and secure with washer and nut.
6. Install starter rewind housing assembly with 3 cap screws and nuts. Make sure that linkage is on spark advance lever.
7. Pull rewind rope through top cowl and install top cowl.
8. Install starter rope handle.
9. Install wrap-around and front cowls.

Figure 4. Trigger Assembly

SECTION 3 - ELECTRICAL SYSTEMS

MERCURY
OUTBOARDS

PART E - TIMING, ADJUSTING, TESTING

INDEX

TIMING, ADJUSTING, TESTING

MERC 110-75-60-40-39 (THRU 1969)

IGNITION DATA

Description		Merc 39-40	Merc 60-75	Merc 110
Firing Sequence		Single Cylinder	Alternate Firing	Alternate Firing
Spark Plug		J8J (1966) L9J or AC-M45FF (1967-69)	J7J (1966) L7J or AC-M43FF (1967-69)	J7J (1966) L4J or AC-M42FF (1967-69)
Spark Plug Gap		J8J - .025" L9J - .030"	J7J - .025" L7J - .030"	J7J - .025" L4J - .030"
Timing	Max. Advance	Not Adjustable	Not Adjustable	Not Adjustable
	Full Throttle	Not Adjustable	Not Adjustable	Not Adjustable
Throttle Pickup	Primary	Not Applicable	Not Applicable	Not Applicable
	Secondary	Not Applicable	Not Applicable	Not Applicable
Breaker Point Setting		.020"	.020"	.020"
Full Throttle RPM		5000-5400	5000-5400	5000-5400
Idle RPM		500-550	500-550	500-550

Metric Conversion: 1" = 25.4mm

ADJUSTING and SYNCHRONIZING POINTS

See information in "Electrical Systems" Section 3C.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

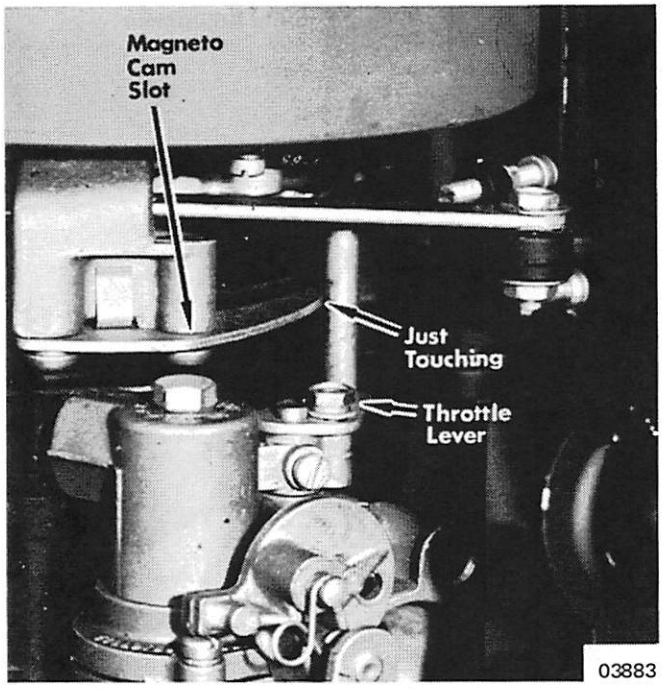


Figure 1. Throttle Pick-up Adjustment

PICKUP ADJUSTMENT

1. With engine running in "Forward" gear, turn twist grip throttle to obtain 1000 to 1100 RPM. At this point, magneto cam should just touch throttle lever on carburetor. (Figure 1)
2. If recommended RPM is not obtained, loosen screws, which secure throttle lever to carburetor, and adjust. Throttle lever is slotted for this purpose.

NOTE: On later model 1968 engines, the magneto cam (Figure 1) also is slotted for a finer adjustment of pickup point.

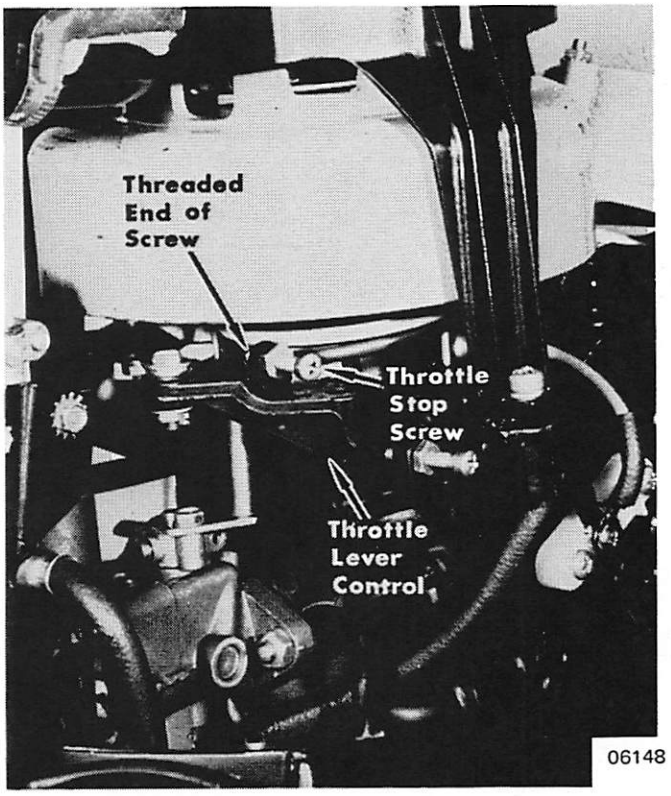


Figure 2. Throttle Stop Adjustment

THROTTLE STOP ADJUSTMENT

Merc 110, Serial No. 1580203 and Above

Adjust throttle stop screw so that threaded end of screw extends ¼" (6.35mm) through throttle lever control. (Figure 2)

Merc 60, Serial No. 1610265 and Above

Adjust throttle stop screw so that threaded end of screw extends 5/16" (8mm) through throttle lever control. (Figure 2)

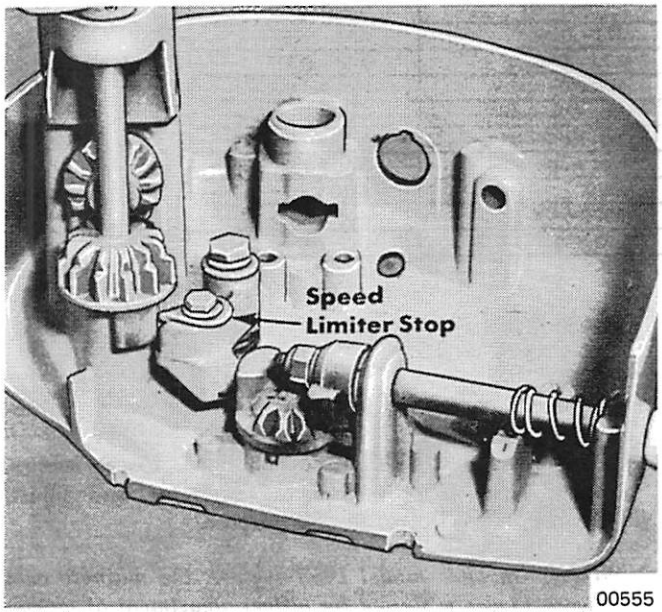


Figure 3. Neutral RPM Adjustment

MAXIMUM NEUTRAL RPM

Merc 110, Serial No. 1492282 and Up

1. Shift into neutral gear.
2. Adjust neutral speed limiter stop to obtain a maximum speed of 2400-2700 RPM. (Figure 3)

TILLER HANDLE ADJUSTMENT

1. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 4)
2. If twist grip is not properly aligned, loosen allen screw at bottom of twist grip and realign.
3. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

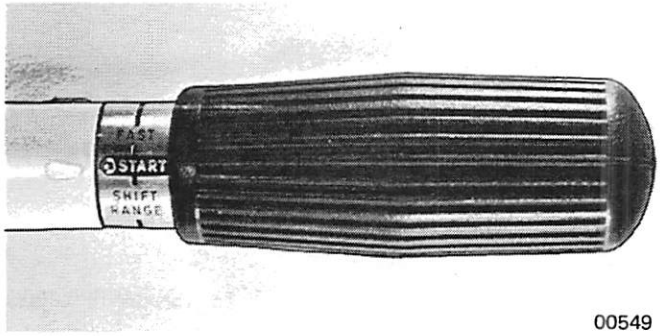


Figure 4. "Start" Position Adjustment

TIMING, ADJUSTING, TESTING

MERC 110-75-40 (1970)

WITH THUNDERBOLT IGNITION

IGNITION DATA

Description		Merc 40	Merc 75	Merc 110
Firing Sequence		Single Cylinder	Alternate Firing	Alternate Firing
Spark Plug		AC-V40FFK	AC-V40FFK	AC-V40FFK
Spark Plug Gap		Not Adjustable	Not Adjustable	Not Adjustable
Timing	Max. Advance	Not Adjustable	.193" BTDC	.193" BTDC
	Full Throttle	Not Applicable	Not Applicable	Not Applicable
Throttle Pickup	Primary	.005" ATDC	.002" ATDC	.002" ATDC
	Secondary	Not Applicable	Not Applicable	Not Applicable
Breaker Point Setting		.020"	.020"	.020"
Full Throttle RPM		4500-5500	4500-5500	4500-5500
Idle RPM		650-700	500-550 In Forward Gear	500-550 In Forward Gear

Metric Conversion: 1" = 25.4mm

TIMING and PICKUP ADJUSTMENT

MERC 40

1. Shift outboard into forward gear.
2. Remove flywheel to expose contact point.

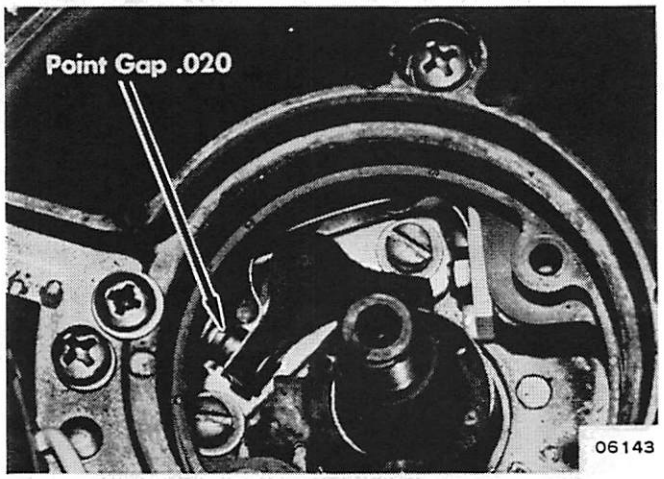


Figure 1. Checking Contact Point Gap

3. Rotate crankshaft to position contact point cam follower at high point on cam. Adjust point to .020". (Figure 1) Reinstall flywheel assembly.
4. Turn twist grip to obtain maximum stator plate advance. (Figure 2) Maximum spark advance on Merc 40 is not adjustable.
5. Adjust throttle lever to allow approximately .050" play between throttle lever and throttle cam. (Figure 2)

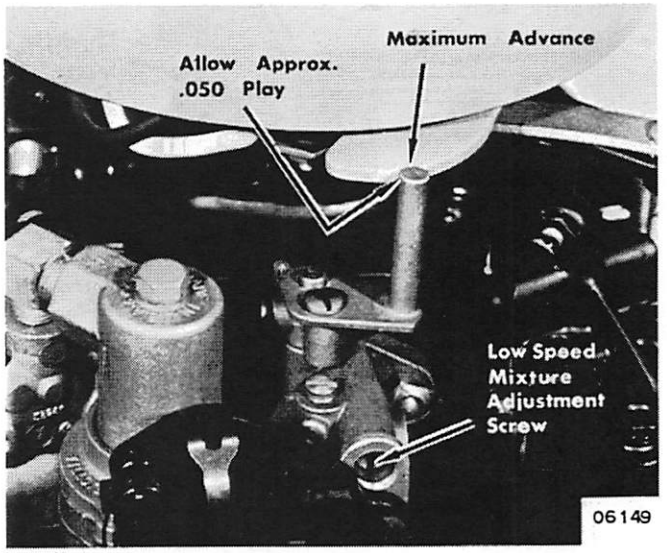


Figure 2. Maximum Stator Plate Advance - Merc 40

6. Remove spark plug and install Dial Indicator (C-91-58222). (Figure 3)
7. Connect one meter lead to white contact lead and other meter lead to contact housing arm.
8. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator at 0°. (Figure 3)
9. Rotate crankshaft clockwise to place dial at .005" ATDC.
10. Close throttle with twist grip until meter indicates point just opens. Adjust throttle cam to just touch lever. (Figure 4)
11. Remove meter and dial indicator and reinstall spark plug.

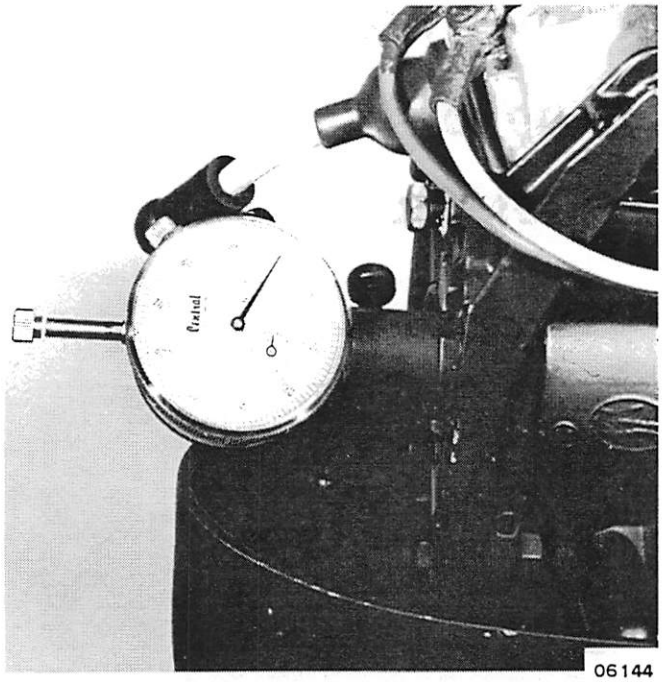


Figure 3. Dial Indicator Installed - Merc 40

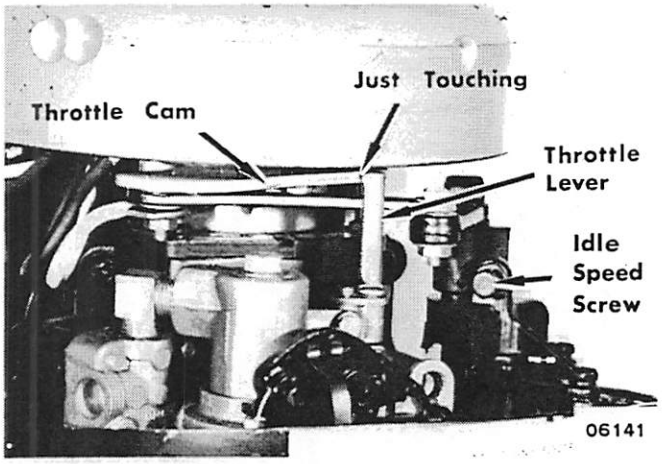


Figure 4. Throttle Pickup Adjustment - Merc 40

MERC 110 and 75

1. Shift outboard into forward gear.
2. Remove flywheel to expose contact points.
3. Rotate crankshaft to position contact point cam follower at high point on cam. Adjust point to .020". Repeat procedure on second set of points and reinstall flywheel assembly.
4. Remove No. 1 spark plug and install Dial Indicator (C-91-58222).
5. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator at 0°.
6. Rotate crankshaft counterclockwise to place dial at .193" BTDC.
7. Turn twist grip to open throttle to maximum spark advance point. (Figure 5)
8. Connect one meter lead to white contact lead and other meter lead to contact housing arm.
9. Adjust maximum advance stop screw so that meter indicates point just opens by .193" BTDC. Tighten stop screw locknut.
10. Adjust throttle lever to allow approximately .050" play between throttle lever and throttle cam. (Figure 5)
11. Rotate crankshaft until dial indicator reads .002" ATDC.
12. Close throttle with twist grip until meter indcates point just opens. Adjust throttle cam to just touch throttle lever. (Figure 6)
13. Remove meter and dial indicator and reinstall spark plugs.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

MAXIMUM NEUTRAL RPM and TILLER HANDLE ADJUSTMENT

IDLE SPEED ADJUSTMENT

NOTE: Steps 1 and 2 apply to Merc 75 and 110 only.

1. Shift into neutral gear.
2. Adjust neutral speed limiter stop to obtain a maximum speed of 2400-2700 RPM. (Figure 7)
3. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 8)

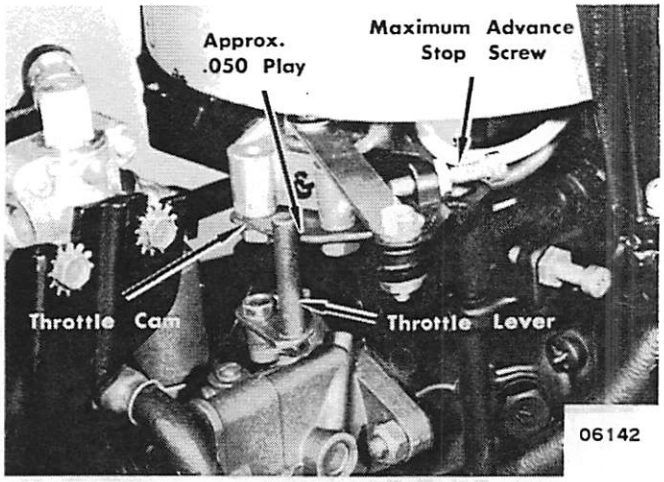


Figure 5. Maximum Spark Advance - Merc 110-75

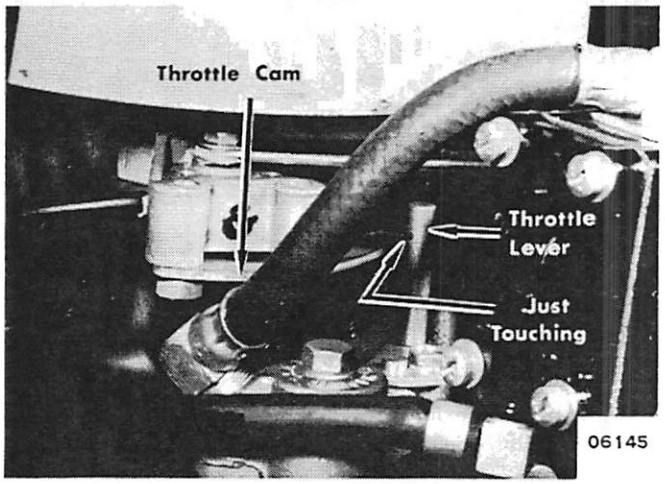


Figure 6. Throttle Pickup Adjustment - Merc 100-75

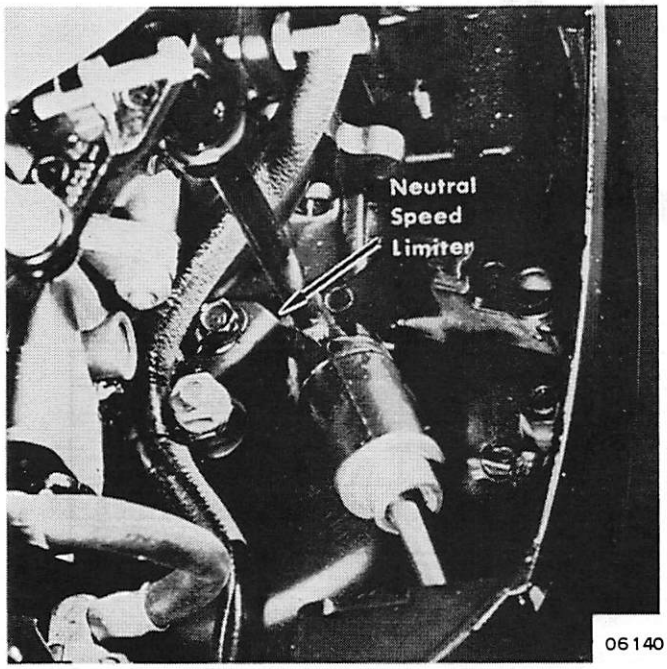


Figure 7. Maximum Neutral RPM - Merc 110-75

4. If twist grip is not properly aligned, loosen allen screw at bottom of twist grip and realign.
5. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

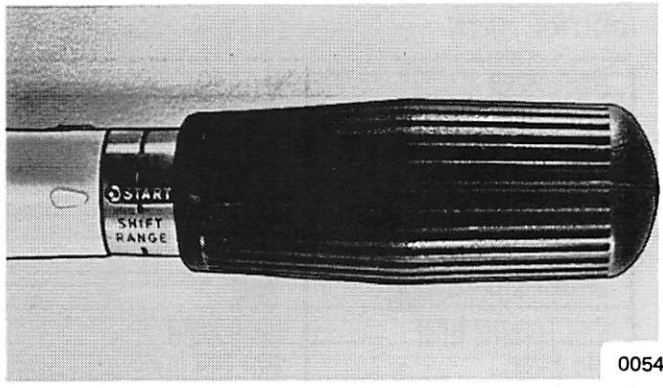


Figure 8. "Start" Position Adjustment

TIMING, ADJUSTING, TESTING

MERC 110-75-40

WITH PHASE MAKER IGNITION

IGNITION DATA

Description	Merc 40	Merc 75	Merc 110
Firing Sequence	Single Cylinder	Alternate Firing	Alternate Firing
Spark Plug	AC-V40FFK & L78V	AC-V40FFK & L78V	AC-V40FFK & L78V
Spark Plug Gap	Not Adjustable	Not Adjustable	Not Adjustable
Timing Max. Advance	.198" BTDC*	.193" BTDC* 34° BTDC§	.193" BTDC* 34° BTDC§
Throttle Pickup	5° ATDC	2° ATDC	2° ATDC
Breaker Point Setting	.020"	.020"	.020"
Full Throttle RPM	4500-5500	4500-5500	4500-5500
Idle RPM	650-700 in Forward Gear	500-550 in Forward Gear	500-550 in Forward Gear

** Engine Stopped* §*Engine Running* *Metric Conversion: 1" = 25.4 mm*

TIMING and PICKUP ADJUSTMENT

MERC 40 (Engine Stopped)

1. Shift outboard into forward gear.
2. Remove flywheel to expose contact point.

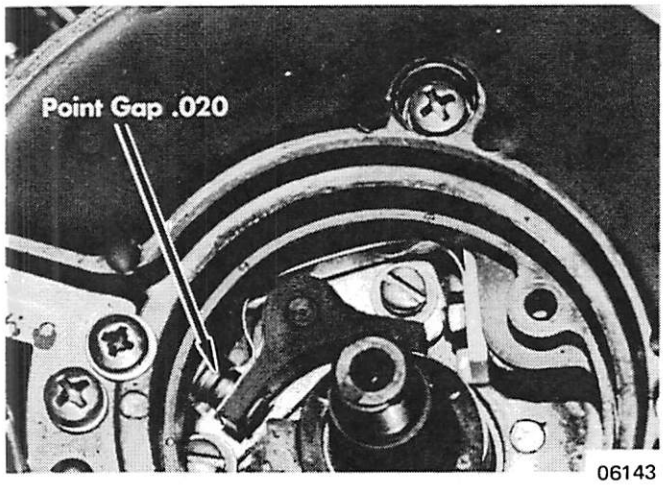


Figure 1. Checking Contact Point Gap

3. Rotate crankshaft to position contact point cam follower at high point on cam. Adjust point to .020". (Figure 1) Reinstall flywheel assembly.
4. Remove spark plug and install Dial Indicator (C-91-58222).
5. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator at 0°.
6. Rotate crankshaft counterclockwise to place dial at .198" BTDC.

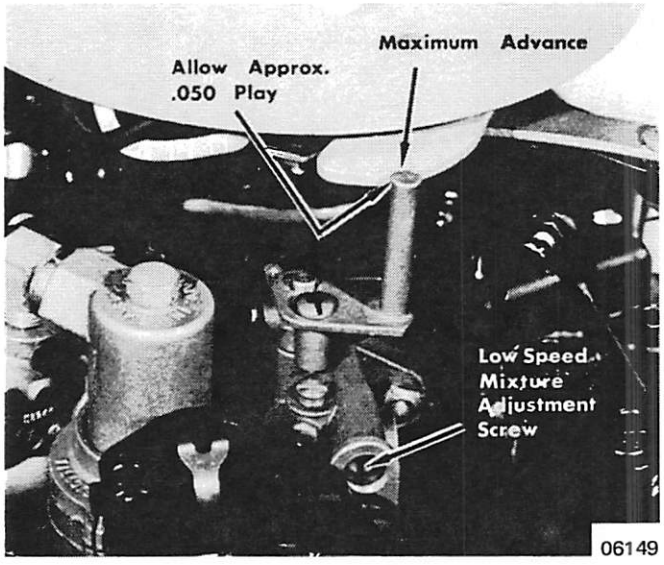


Figure 2. Maximum Stator Plate Advance - Merc 40

7. Turn twist grip to open throttle to maximum spark advance point. (Figure 5)
8. Connect one meter lead to white contact lead and other meter lead to contact housing arm.
9. Adjust maximum advance stop screw so that meter indicates point just opens by .198" BTDC. Tighten stop screw locknut.
10. Adjust throttle lever to allow approximately .050" play between throttle lever and throttle cam. (Figure 5)
11. Rotate crankshaft clockwise to place dial at .005" ATDC.
12. Close throttle with twist grip until meter indicates point just opens. Adjust throttle cam to just touch lever. (Figure 4)
13. Remove meter and dial indicator and reinstall spark plug.

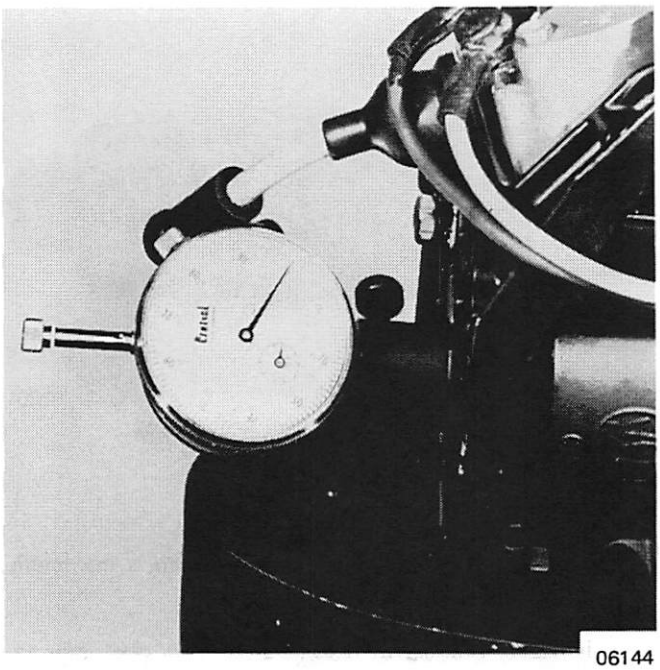


Figure 3. Indicator Installed - Merc 40

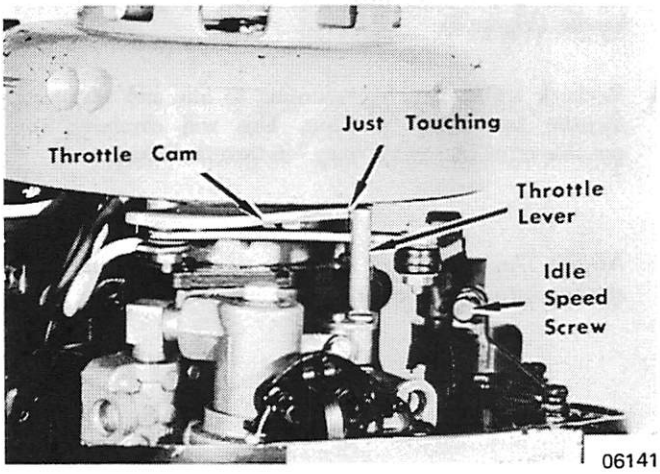


Figure 4. Throttle Pickup Adjustment - Merc 40

MERC 110 and 75 (Engine Stopped)

1. Shift outboard into forward gear.
2. Remove flywheel to expose contact points.
3. Rotate crankshaft to position contact point cam follower at high point on cam. Adjust point to .020". Repeat procedure on second set of points and reinstall flywheel assembly.
4. Remove No. 1 spark plug and install Dial Indicator (C-91-58222).
5. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator at 0°.
6. Rotate crankshaft counterclockwise to place dial at .193" BTDC.
7. Turn twist grip to open throttle to maximum spark advance point. (Figure 5)
8. Connect one meter lead to white contact lead and other meter lead to contact housing arm.
9. Adjust maximum advance stop screw so that meter indicates point just opens by .193" BTDC. Tighten stop screw locknut.
10. Adjust throttle lever to allow approximately .050" play between throttle lever and throttle cam. (Figure 5)
11. Rotate crankshaft until dial indicatjor reads .002" ATDC.
12. Close throttle with twist grip until meter indicates point just opens. Adjust throttle cam to just touch throttle lever. (Figure 6)
13. Remove meter and dial indicator and reinstall spark plugs.

MERC 110-75-40 (Engine Running)

1. Adjust contact points as described in previous paragraph.
2. Place engine in test tank and hook up fuel line.
3. Install Timing Lite (C-91-35507) by connecting large red lead to No. 1 spark plug and connect one small lead to negative (-) battery post and other small lead to positive (+) post.
4. Start engine and hold timing lite in line with degree markings on top cowl support frame.
5. Open throttle with twist grip to align timing mark on flywheel with specified BTDC mark on cowl frame and adjust 2 elastic stop nuts on throttle control link rod.
6. While holding timing lite in line with degree markings, close throttle with twist grip until timing mark on flywheel aligns between BTDC and ATDC, as specified. Adjust carburetor pickup screw until screw just touches.
7. Stop engine and remove timing lite.
8. Turn twist grip to full throttle.
9. Adjust upper screw in vertical shaft while wiggling carburetor cluster until there is .050" play between pickup screw and carburetor cluster.

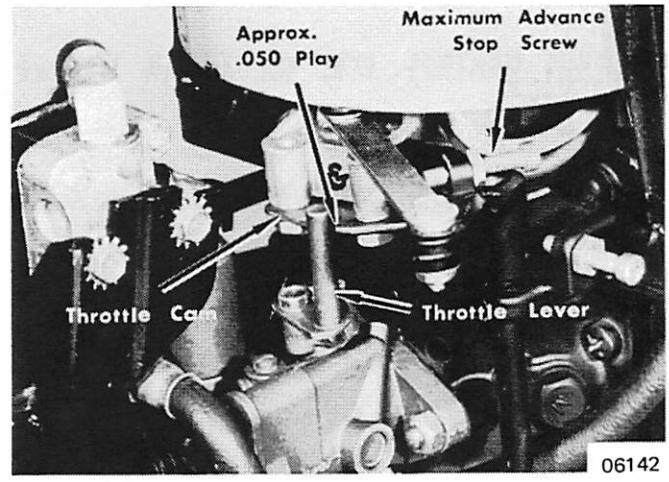


Figure 5. Maximum Spark Advance - Merc 110-75

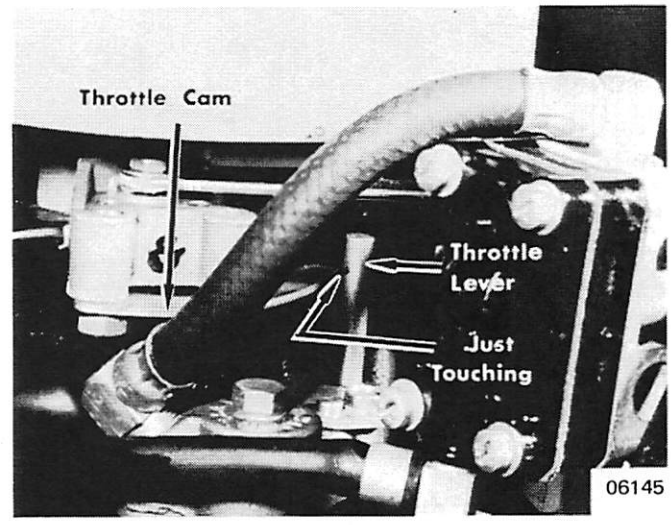


Figure 6. Throttle Pickup Adjustment - Merc 110-75

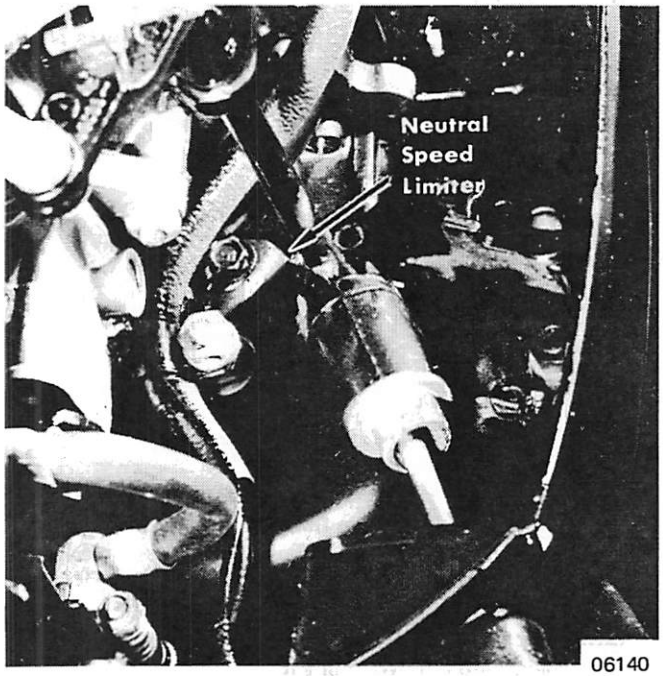


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Figure 7. Maximum Neutral RPM - Merc 110-75

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

MAXIMUM NEUTRAL RPM and TILLER HANDLE ADJUSTMENT.

IDLE SPEED ADJUSTMENT

NOTE: Steps 1 and 2 apply to Merc 110 and 75 only.

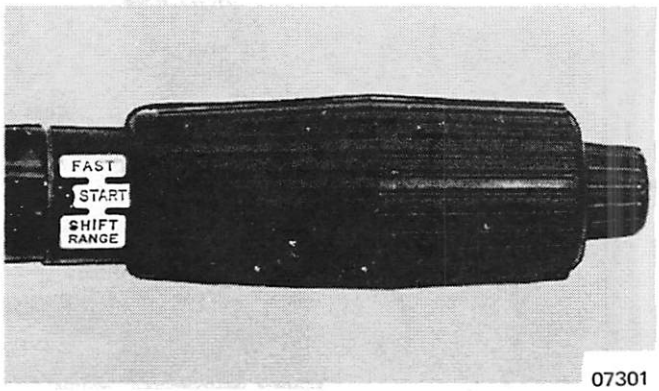

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Figure 8. "Start" Position Adjustment

1. Shift into neutral gear.

2. Adjust neutral speed limiter stop to obtain a maximum speed of 2400-2700 RPM. (Figure 7)

3. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 8)

4. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

TIMING, ADJUSTING, TESTING

MERC 200 (1966) FULL GEAR SHIFT

IGNITION DATA

Description		Merc 200 (1966)
Firing Sequence		Alternate Firing
Spark Plug		J6J
Spark Plug Gap		.025"
Timing	Max. Advance	.275" BTDC
	Full Throttle	Not Applicable
Throttle Pickup	Primary	Not Applicable
	Secondary	Not Applicable
Breaker Point Setting		.020"
Full Throttle RPM		5000-5400
Idle RPM		500

Metric Conversion: 1" = 25.4mm

TIMING and SYNCHRONIZING

SYNCHRONIZE BREAKER POINTS

See information in "Electrical Systems" Section 3C.

LINKAGE ADJUSTMENT

1. Place engine in neutral, then turn twist grip throttle to maximum throttle position (neutral).
2. Set throttle lever on vertical shaft until fore and aft position is obtained. Lock screw. (Figure 1)

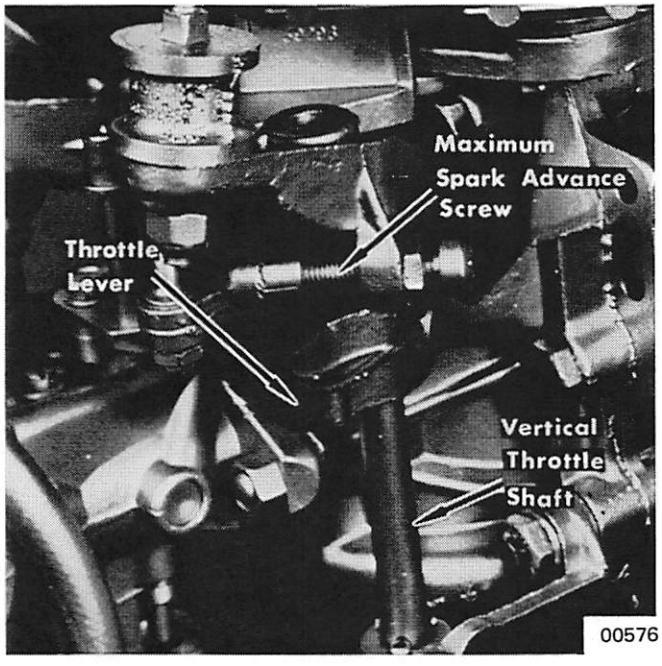


Figure 1. Adjusting Maximum Spark

MAXIMUM SPARK ADVANCE

NOTE: Before installing flywheel, maximum spark advance must be set.

1. Place No. 1 piston at .275" (7.985mm) BTDC (before top dead center) by rotating crankshaft in a clockwise (forward) direction from BDC (bottom dead center).
2. Thread Timing Gauge (C-91-30292A1) into No. 1 spark plug hole.
3. Turn crankshaft until No. 1 piston strikes Timing Gauge.
4. While turning crankshaft, thread Timing Gauge in or out so that piston can "rock" over center shaft of gauge, which indicates that Timing Gauge is set at top dead center position.
5. Rotate crankshaft clockwise ¼ turn.
6. Depress center shaft of Timing Gauge and rotate ¼ turn to seat on tool body shoulder (.275" [6.985mm] BTDC position). Be careful that tool body does not move, or preceding procedure must be repeated.
7. Rotate crankshaft clockwsie until No. 1 piston strikes Timing Gauge center shaft. This is .275" (6.985mm) BTDC.
8. Connect one test lead of Timing Meter (C-91-22966) or Magneto Analyzer C-91-25213 (selector switch on No. 2, Distributor Resistance) to No. 1 breaker point.
9. Connect second lead of timing unit to stator plate (ground).
10. Advance magneto slowly until point breaks, as indicated by timing unit used.
11. Hold magneto at this position and adjust magneto advance stop screw to just touch magneto stop and tighten lock nut. (Figure 1)
12. Recheck magneto advance to insure correct setting.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustment.

PICKUP ADJUSTMENT

NOTE: No pickup adjustment is necessary on this model.

MAXIMUM NEUTRAL ADJUSTMENT

1. Shift into neutral gear.
2. Adjust maximum neutral speed by loosening lockscrew and rotating throttle lever to get 2400 RPM with throttle grip rotated against neutral stop.

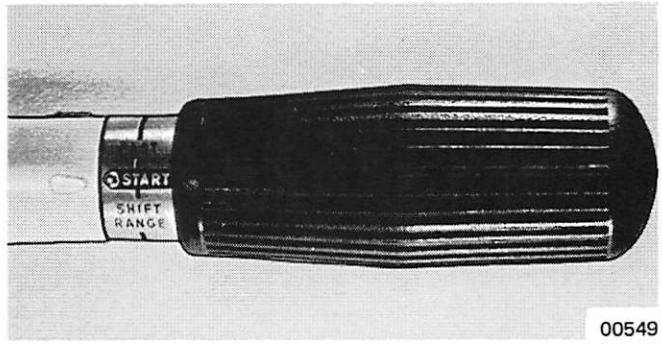


Figure 2. "Start" Position Adjustment

TILLER HANDLE ADJUSTMENT

1. With engine running in neutral gear, turn twist grip to obtain 2200 to 2400 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 2)
2. If twist grip is not properly aligned, loosen allen screw at bottom of twist grip and realign. (Figure 3)
3. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

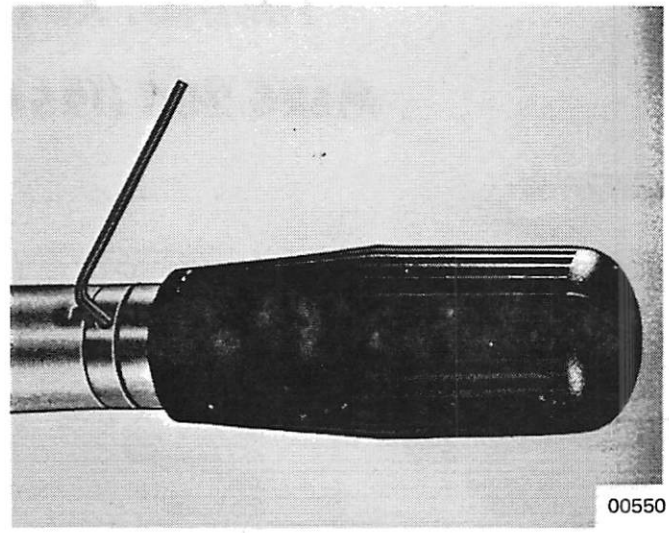


Figure 3. Twist Grip Alignment

TIMING, ADJUSTING, TESTING

MERC 200 (1967-68-69) FULL GEAR SHIFT

IGNITION DATA

Description		Merc 200 (1967-68-69)
Firing Sequence		Alternate Firing
Spark Plug		L4J or AC-M42FF
Spark Plug Gap		.030"
Timing	Max. Advance	(To Serial No. 2432535) .375" BTDC (Above Serial No. 2432535) .300 BTDC
	Full Throttle	(To Serial No. 2432535) (38°) .275" BTDC (Above Serial No. 2432535) .235 BTDC
Throttle Pickup	Primary	Not Applicable
	Secondary	Not Applicable
Breaker Point Setting		.020"
Full Throttle RPM		5000-5400
Idle RPM		500

Metric Conversion: 1" = 25.4mm

TIMING and SYNCHRONIZING

SYNCHRONIZE BREAKER POINTS

See information in "Electrical Systems" Section 3C.

MAXIMUM SPARK ADVANCE

NOTE: Before installing flywheel, maximum spark advance must be set.

1. Install Timing Gauge* in No. 1 spark plug hole.
2. Turn crankshaft until No. 1 piston lightly touches timing gauge.
3. While turning crankshaft, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing gauge is set at top dead center (TDC) position.
4. Rotate crankshaft clockwise ¼-turn.
5. Depress center shaft of timing gauge and rotate gauge shaft ¼-turn to seat on tool body shoulder. Be careful that tool body does not move, or preceding procedure must be repeated.
6. Rotate crankshaft clockwsie until No. 1 piston strikes timing gauge center shaft.
7. Connect one test lead of Magneto Analyzer (C-91-25213) (selector switch on scale No. 2, "Distributor Resistance") to No. 1 set of breaker points.
8. Connect second lead of analyzer to stator plate (ground).
9. Place engine in forward gear.
10. Advance throttle until the pin on the intermediate magneto lever is positioned as shown in Figure 1.
11. No. 1 set of breaker points should open at this time, as indicated by meter used. If points do not break, loosen jam nuts on magneto lever and adjust lever until points break. (Figure 2) Tighten jam nuts.

FULL THROTTLE SPARK ADVANCE

1. Install Timing Gauge* and place No. 1 piston at required timing BTDC. Connect one lead from Magneto Analyzer to

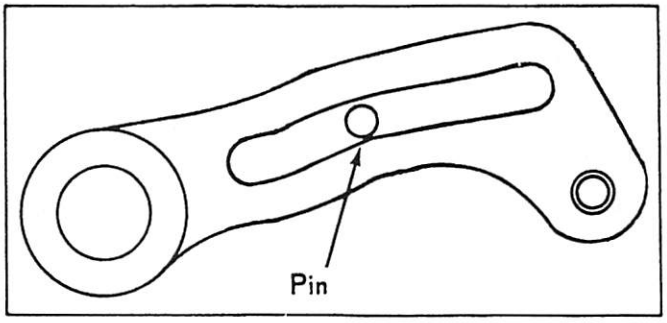


Figure 1. Intermediate Magneto Lever

No. 1 set of breaker points. Connect the other lead to the stator plate (ground). Back off full throttle screw. Advance throttle to full throttle position. While holding slight pressure on the twist grip handle in full throttle position, turn in full throttle screw (Figure 2) until points break, as indicated by meter used. Tighten nut.

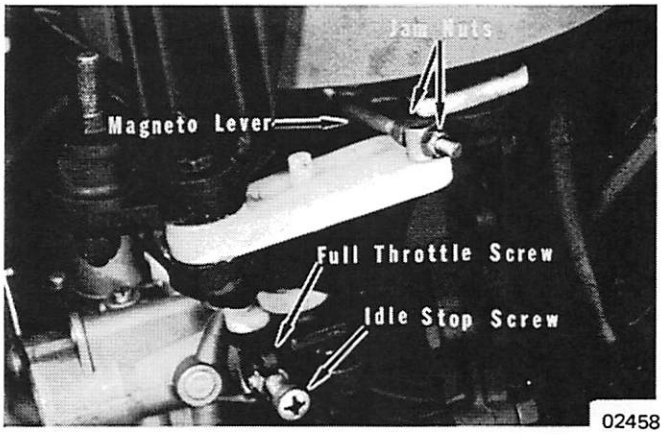


Figure 2. Location of Jam Nuts and .275" Stop

2. Advance throttle against full throttle stop. Carburetor shutter should be in the full throttle position. Adjust screw (Figure 3) in or out to obtain correct setting. Allow

.005"-.015" play in carburetor cluster to prevent forcing linkage.

3. Idle engine and adjust idle stop screw (Figure 2) so that engine idles at 500 RPM in forward gear.

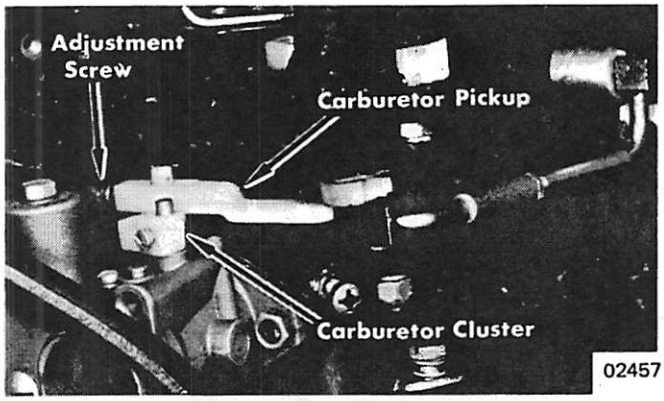


Figure 3. Carburetor Pickup and Cluster

** Up to Serial No. 2432535*
.375" Timing Gauge - C-91-46707A1
.275" Timing Gauge - C-91-30292A1
Above Serial No. 2432535
.300" Timing Gauge - C-91-39735A1
.235" Timing Gauge - C-91-26916A1

CARUBRETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

PICKUP ADJUSTMENT

NOTE: No pickup adjustment is necessary on this model.

Figure 5. Twist Grip Alignment

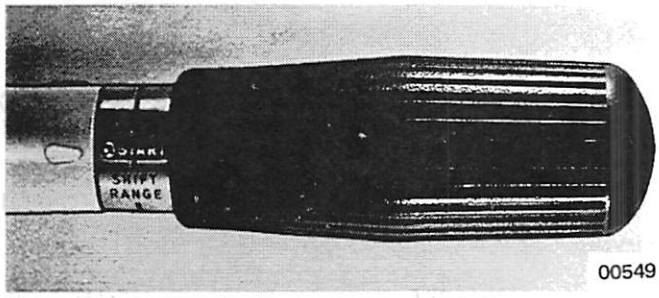
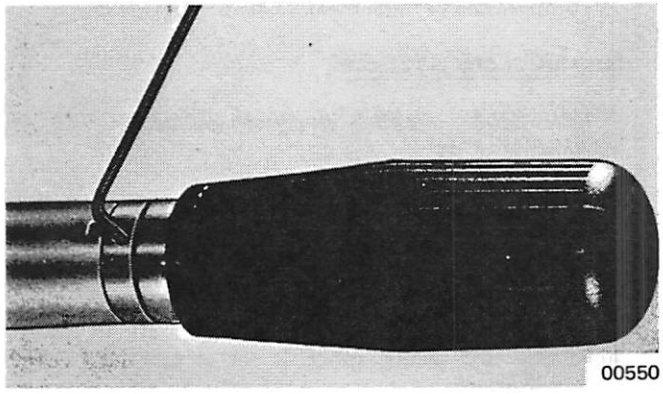


Figure 4. "Start" Position

TILLER HANDLE ADJUSTMENT

1. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 4)
2. If twist grip is not properly aligned, loosen allen screw at bottom of twist grip and realign. (Figure 5)
3. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.



TIMING, ADJUSTING, TESTING

MERC 200 (1970-71) WITH THUNDERBOLT IGNITION

IGNITION DATA

Description		Merc 200 (1970-71)
Firing Sequence		Alternate Firing
Spark Plug		AC-V40FFK
Spark Plug Gap		Not Adjustable
Timing	Max. Advance	.196" (or 33°) BTDC
	Full Throttle	Not Applicable
Throttle Pickup	Primary	.002" BTDC (1° BTDC to 4° ATDC)
	Secondary	Not Applicable
Breaker Point Setting		.020"
Full Throttle RPM		4800-5500
Idle RPM		550-600 In Forward Gear

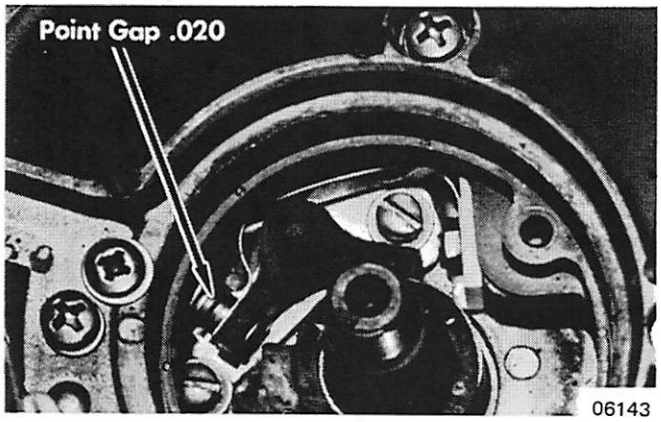
Metric Conversion: 1" = 25.4mm

TIMING and PICKUP ADJUSTMENT

Use "Engine Stopped" OR "Engine Running" Method.

ENGINE STOPPED

1. Shift outboard into forward gear.
2. Remove flywheel to expose contact points.
3. Rotate crankshaft to position contact point cam follower at high point on cam. Adjust point to .020". (Figure 1) Repeat procedure on second set of points and reinstall flywheel assembly.



06143

Figure 1. Point Adjustment

4. Remove No. 1 spark plug and install Dial Indicator (C-91-58222).
5. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator to 0°. (Figure 2)
6. Rotate crankshaft counterclockwise to place dial at .196" BTDC. (Figure 2)
7. Turn twist grip to open throttle to maximum spark advance point. (Figure 3)
8. Connect one meter lead to white contact lead and other meter lead to contact housing arm.
9. Adjust 2 elastic stop nuts on throttle control link rod so that meter indicates point just closes at .196" BTDC. Tighten locknuts. (Figure 3)
10. Rotate crankshaft until dial indicator reads .002" BTDC.

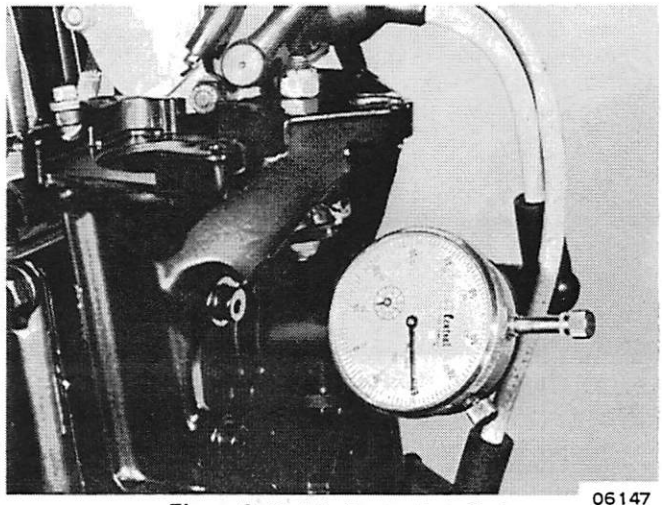


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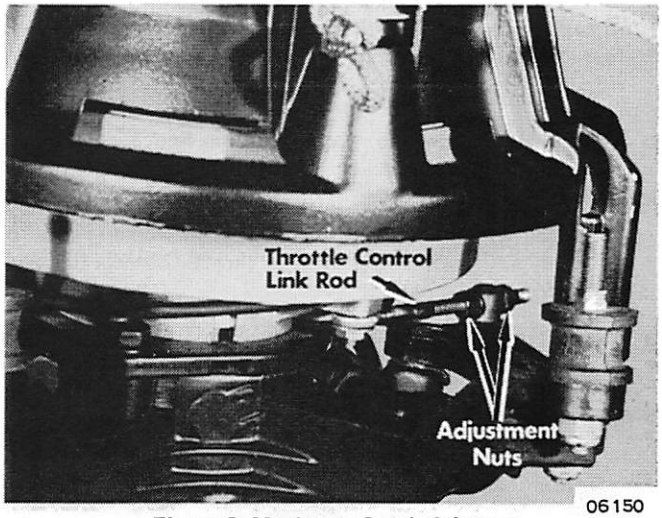
Figure 2. Dial Indicator Installed



06150

Figure 3. Maximum Spark Advance

11. Close throttle with twist grip until meter indicates point just opens. Adjust carburetor pickup screw until screw just touches. (Figure 4)
12. Turn twist grip to full throttle.
13. Adjust upper screw in vertical shaft while wiggling carburetor cluster until there is .035" - .048" play between pickup screw and carburetor. (Figure 5)
14. Remove meter and dial indicator and reinstall spark plugs.

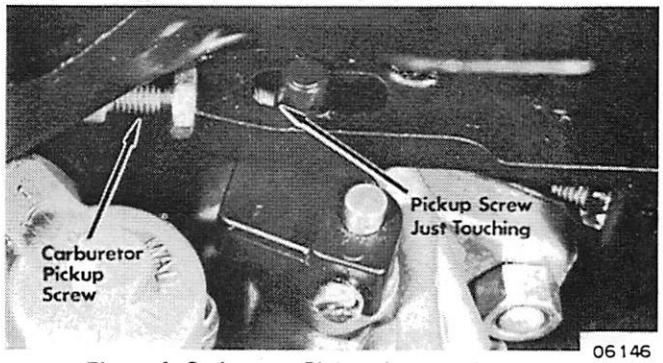


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Figure 4. Carburetor Pickup Screw Adjustment

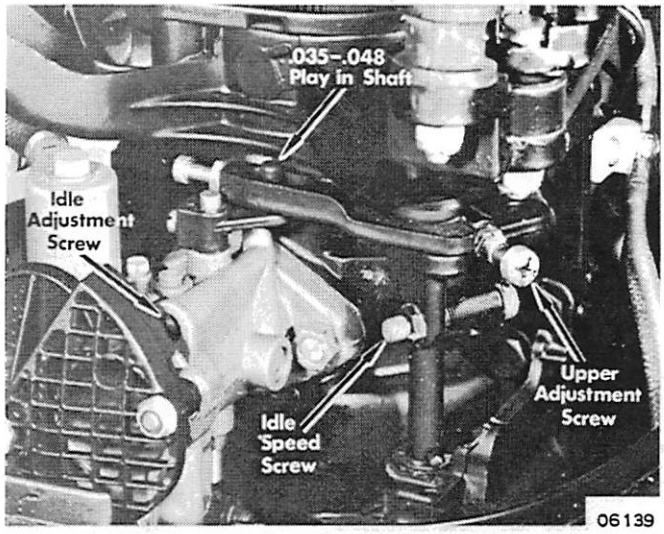


Figure 5. Carburetor Cluster Adjustment

ENGINE RUNNING

1. Adjust contact points as described in previous paragraph.
2. Place engine in test tank and hook up fuel line.
3. Install Timing Lite (C-91-35507) by connecting large red lead to No. 1 spark plug and connect one small lead to negative (-) battery post and other small lead to positive (+) post.
4. Start engine and hold timing lite in line with degree markings on top cowl support frame. (Figure 6)
5. Open throttle with twist grip to align timing mark on flywheel with 33° BTDC mark on cowl frame (Figure 6) and adjust 2 elastic stop nuts on throttle control link rod. (Figure 3)

Figure 6. Timing at 33° BTDC

6. While holding timing lite in line with degree markings, close throttle with twist grip until timing mark on flywheel aligns between 1° BTDC and 4° ATDC. (Figure 7) Adjust carburetor pickup screw until screw just touches. (Figure 4)
7. Stop engine and remove timing lite.
8. Turn twist grip to full throttle.
9. Adjust upper screw in vertical shaft while wiggling carburetor cluster until there is .035" - .048" play between pickup screw and carburetor. (Figure 5)

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

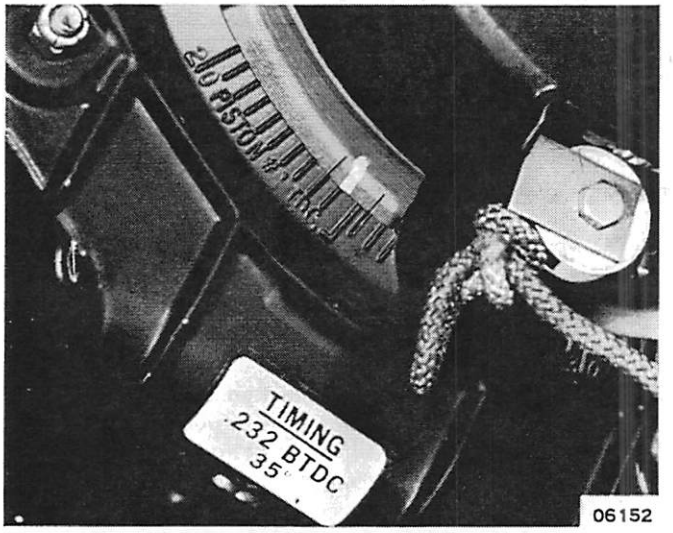


Figure 7. Timing Mark Alignment

MAXIMUM NEUTRAL RPM and TILLER HANDLE ADJUSTMENT

1. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 8)
2. If twist grip is not properly aligned, loosen allen screw at bottom of twist grip and realign.
3. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

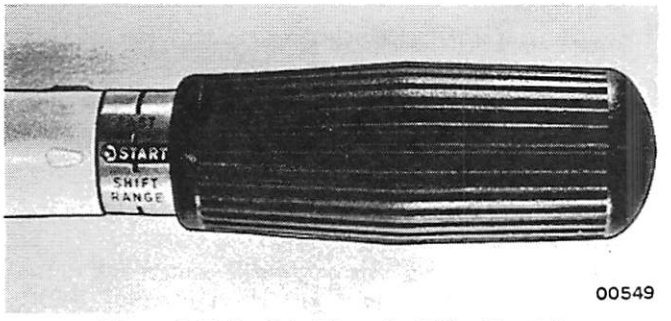


Figure 8. Twist Grip Throttle (Tiller Handle)

TIMING, ADJUSTING, TESTING

MERC 200 WITH PHASE MAKER THUNDERBOLT IGNITION

IGNITION DATA

Description		Merc 200 (1972)
Firing Sequence		Alternate Firing
Spark Plug		AC-V40FFK
Spark Plug Gap		Not Adjustable
Timing	Max. Advance	*.196" (or 33°) BTDC §31°-36°
	Full Throttle	Not Applicable
Throttle Pickup	Primary	.002" BTDC (1° BTDC to 4° ATDC)
	Secondary	Not Applicable
Breaker Point Setting		.020"
Full Throttle RPM		4800-5500
Idle RPM		550-600 in Forward Gear

**Engine Stopped* *§Engine Running*

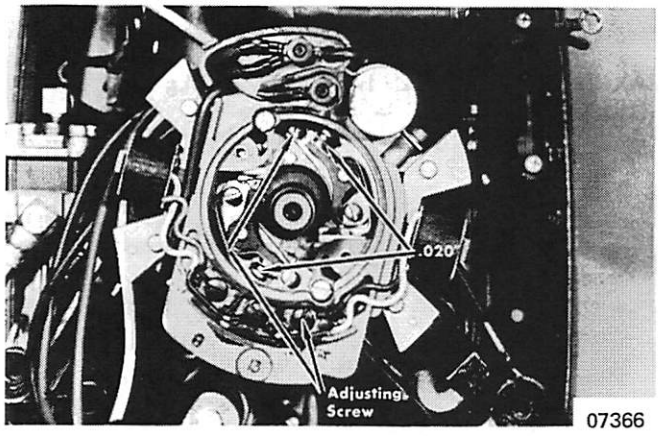
Metric Conversion: 1" = 25.4mm

TIMING and PICKUP ADJUSTMENT

Use "Engine Stopped" OR "Engine Running" Method.

ENGINE STOPPED

1. Shift outboard into forward gear.
2. Remove flywheel to expose contact points.
3. Rotate crankshaft to position contact point cam follower at high point on cam. Adjust point to .020". (Figure 1) Repeat procedure on second set of points and reinstall flywheel assembly.



07366

Figure 1. Point Adjustment

4. Remove No. 1 spark plug and install Dial Indicator (C-91-58222).
5. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator to 0°. (Figure 2)
6. Rotate crankshaft counterclockwise to place dial at .196" BTDC. (Figure 2)
7. Turn twist grip to open throttle to maximum spark advance point. (Figure 3)
8. Connect one meter lead to white contact lead and other meter lead to contact housing arm.
9. Adjust 2 elastic stop nuts on throttle control link rod so that meter indicates point just closes at .196" BTDC. Tighten locknuts. (Figure 3)
10. Rotate crankshaft until dial indicator reads .002" BTDC.

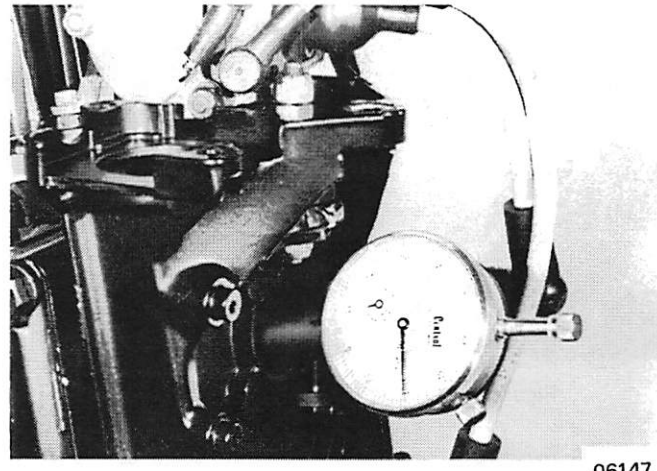


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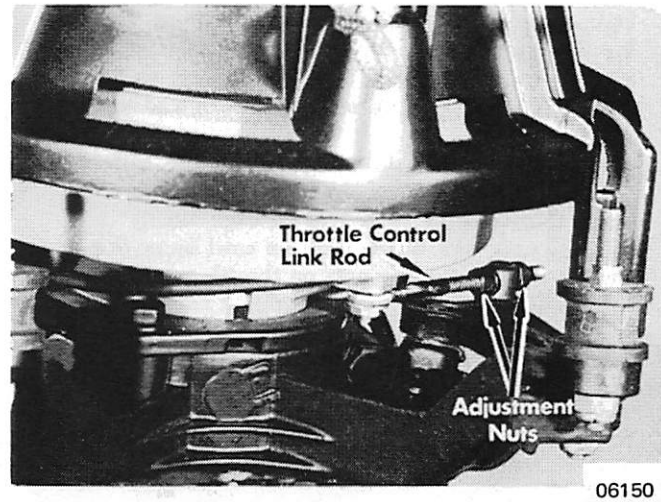
Figure 2. Dial Indicator Installed



06150

Figure 3. Maximum Spark Advance

11. Close throttle with twist grip until meter indicates point just opens. Adjust carburetor pickup screw until screw just touches. (Figure 4)
12. Turn twist grip to full throttle.
13. Adjust upper screw in vertical shaft while wiggling carburetor cluster until there is .035" - .048" play between pickup screw and carburetor. (Figure 5)
14. Remove meter and dial indicator and reinstall spark plugs.

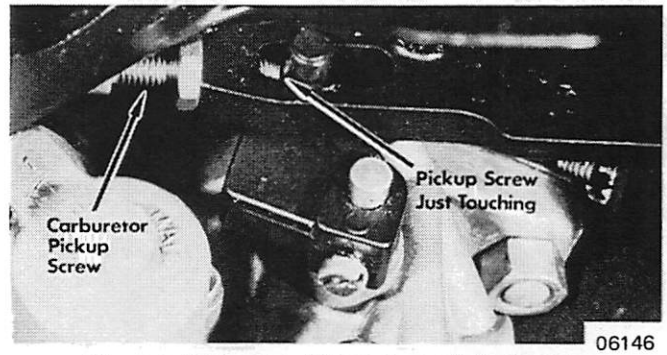


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Figure 4. Carburetor Pickup Screw Adjustment

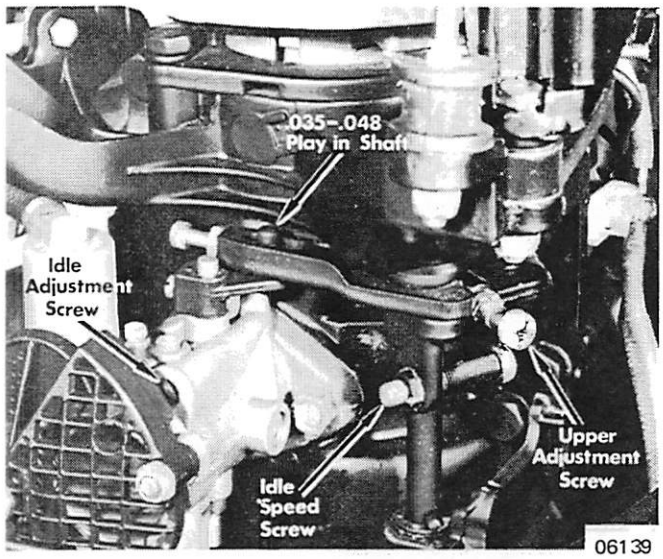

Figure 5. Carburetor Cluster Adjustment

ENGINE RUNNING

1. Adjust contact points as described in previous paragraph.
2. Place engine in test tank and hook up fuel line.
3. Install Timing Lite (C-91-35507) by connecting large red lead to No. 1 spark plug and connect one small lead to negative (-) battery post and other small lead to positive (+) post.
4. Start engine and hold timing lite in line with degree markings on top cowl support frame. (Figure 6)
5. Open throttle with twist grip to align timing mark on flywheel with 33° BTDC mark on cowl frame (Figure 6) and adjust 2 elastic stop nuts on throttle control link rod. (Figure 3)

Figure 6. Timing at 33° BTDC

6. While holding timing lite in line with degree markings, close throttle with twist grip until timing mark on flywheel aligns between 1° BTDC and 4° ATDC. (Figure 7) Adjust carburetor pickup screw until screw just touches. (Figure 4)
7. Stop engine and remove timing lite.
8. Turn twist grip to full throttle.
9. Adjust upper screw in vertical shaft while wiggling carburetor cluster until there is .035" - .048" play between pickup screw and carburetor. (Figure 5)

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

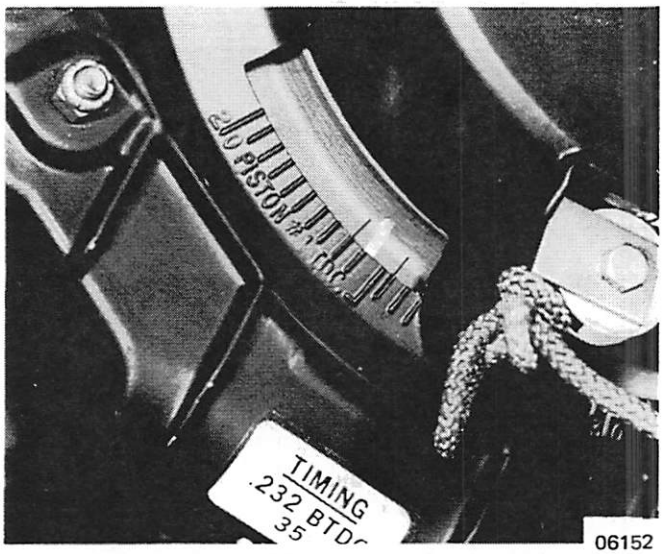

Figure 7. Timing Mark Alignment

MAXIMUM NEUTRAL RPM and TILLER HANDLE ADJUSTMENT

1. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 8)
2. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

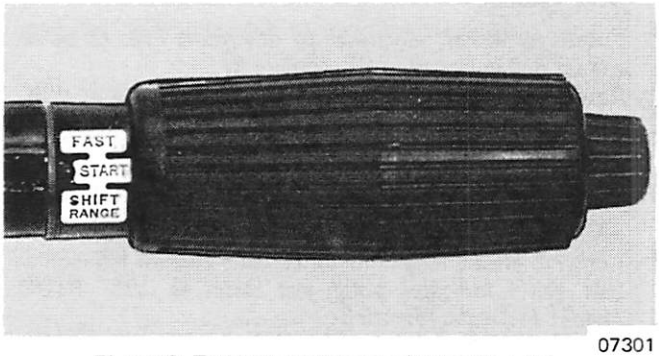

Figure 8. Twist Grip Throttle (Tiller Handle)

TIMING, ADJUSTING, TESTING
MERC 350 (1966-67-68-69) FULL GEAR SHIFT

IGNITION DATA

Description		Merc 350
Firing Sequence		Alternate Firing
Spark Plug		J4J (1966), L4J or AC-M42FF
Spark Plug Gap		J4J (.025"), L4J or AC-M42FF (.030")
Timing	Max. Advance	.300" BTDC
	Full Throttle	Not Applicable
Throttle Pickup	Primary	Not Applicable
	Secondary	Not Applicable
Breaker Point Setting		.020"
Full Throttle RPM		4800-5200
Idle RPM		500

Metric Conversion: 1" = 25.4mm

TIMING and SYNCHRONIZING

SYNCHRONIZE BREAKER POINTS

See information in "Electrical Systems" Section 3C.

MAXIMUM SPARK ADVANCE

NOTE: Before installing flywheel, maximum spark advance must be set.

1. Place No. 1 piston at .300" (7.62mm) BTDC (before top dead center) by rotating crankshaft in a clockwise (forward) direction from BDC (bottom dead center).
2. Thread Timing Gauge (C-91-39735A1) into No. 1 spark plug hole.
3. Turn crankshaft until No. 1 piston strikes timing gauge.

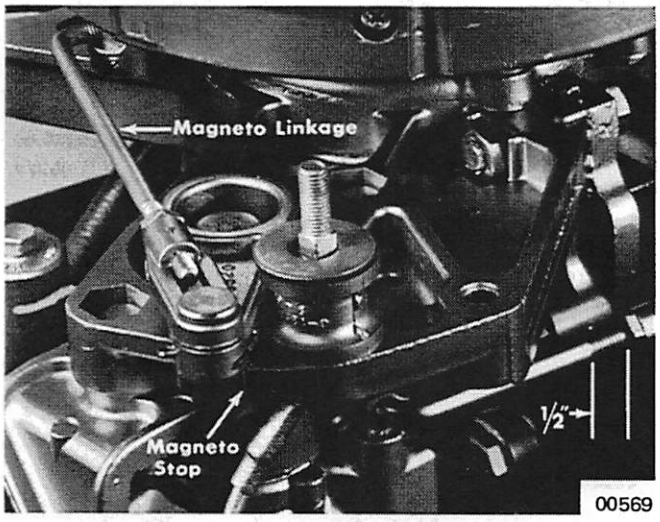

Figure 1. Magneto Stop and Linkage

4. While turning crankshaft, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, which indicates that timing gauge is set at top dead center position.
5. Rotate crankshaft clockwise 1/4-turn.
6. Depress center shaft of timing gauge and rotate 1/4-turn to seat on tool body shoulder (.300" [7.62mm] BTDC position). Be careful that tool body does not move, or preceding procedure must be repeated.
7. Rotate crankshaft clockwise until No. 1 piston strikes timing gauge center shaft. This is .300" (7.62mm) BTDC.
8. Connect one test lead of Timing Meter (C-91-22966) or Magneto Analyzer (C-91-25213) (selector switch on No. 2, Distributor Resistance) to No. 1 breaker point.
9. Connect second lead of timing unit to stator plate (ground).
10. Advance magneto slowly against magneto stop. (Figure 1) At this time the breaker points should open as indicated by meter used. If the breaker points did not open (or opened before touching magneto stop), adjust linkage (Figure 1) and tighten locknut.
11. Recheck magneto advance to insure correct setting.
12. Advance magneto against magneto stop. Loosen 2 screws on carburetor pickup plate and adjust to obtain full throttle, then tighten screws. Allow .010" (.254mm) to .015" (.381mm) play in carburetor shaft to prevent forcing linkage. (Figure 2) Do not bend pickup with nylon sleeve.

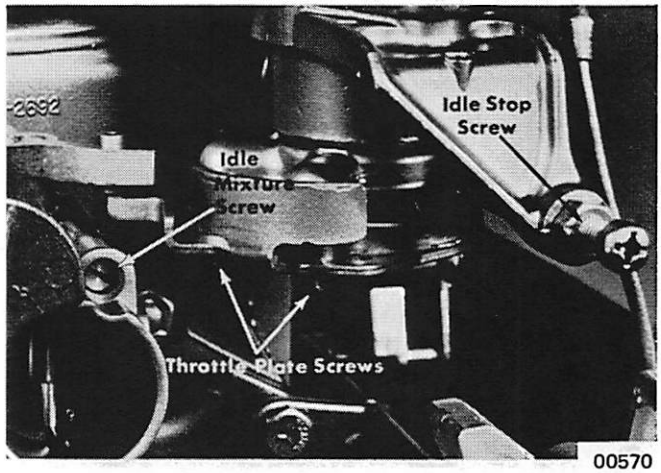

Figure 2. Full Throttle Adjustment

13. It should not be necessary to adjust the linkage on left (port) side of engine. It is pre-set at the factory, however, should the setting be disturbed, adjust linkage so that ½" of threads remain exposed. (Figure 1)

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

PICKUP ADJUSTMENT

Pickup adjustment is not necessary on this model.

TIMING, ADJUSTING, TESTING
MERC 400 (1970-71)

IGNITION DATA

Description		Merc 400 (1970-71)
Firing Sequence		Alternate Firing
Spark Plug		AC-V40FFM
Spark Plug Gap		Not Adjustable
Timing	Max. Advance	Not Applicable
	Full Throttle	Not Applicable
Throttle Pickup	Primary	5°-7° BTDC
	Secondary	27° BTDC
Breaker Point Setting		Not Applicable
Full Throttle RPM		4800-5300
Idle RPM		650-750
Trigger Gap (Thunderbolt)		.050"-.060"

Metric Conversion: 1" = 25.4mm

TIMING and SYNCHRONIZING

1. Check that trigger pickup in trigger plate is positioned approximately in center of elongated slots. (Figure 1)

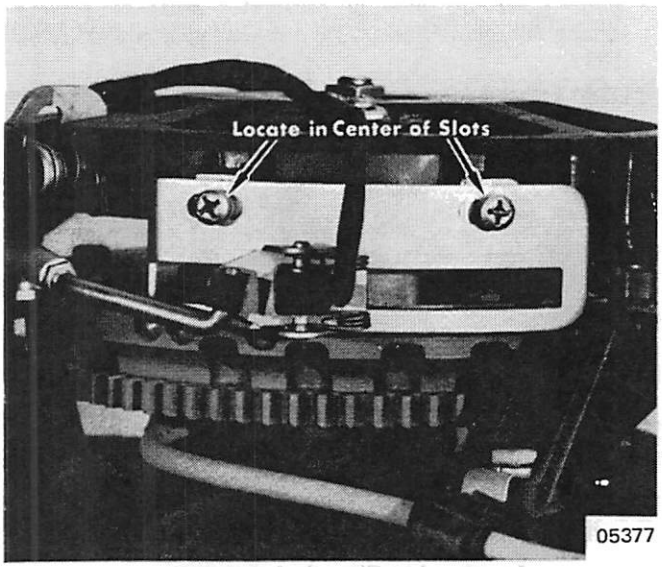

Figure 1. Position of Trigger Plate

2. If necessary to readjust, position throttle lockout cam as shown in Figure 2.
3. Check that trigger gap between trigger pickup head and trigger housing (Figure 1) is .050" - .060" (1.27mm - 1.52mm). Adjust, if necessary, by shimming trigger plate to starter housing.
4. Connect Timing Lite (C-91-35507A1) and Tachometer (C-91-31591) to engine.
5. With engine running, align flywheel timing mark (2 white dots) in timing window. (Figure 3) Loosen 2 screws on carburetor pickup plate and slide plate so that cam just touches primary pickup arm on carburetor cluster. (Figure 4) Tighten 2 screws.
6. Advance engine speed to 5000 - 5200 RPM. Adjust spark stop screw (Figure 5) to align flywheel timing mark (white line) in timing window. Tighten locknut.
7. With spark arm against stop but not actuating throttle arm, (Figure 5) adjust throttle pickup arm to just touch

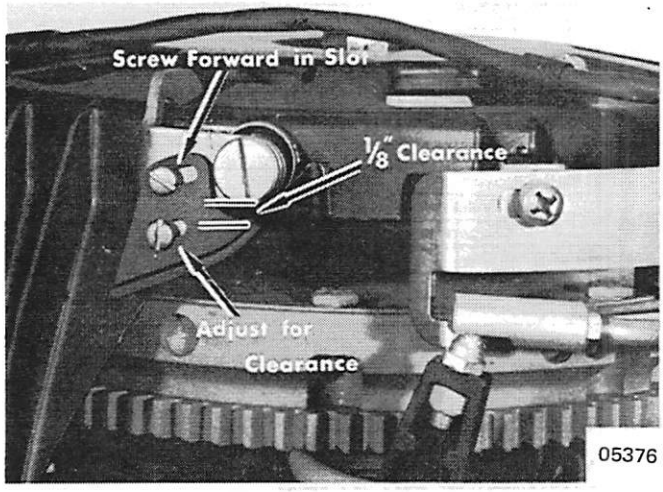

Figure 2. Position of Throttle Lockout Cam

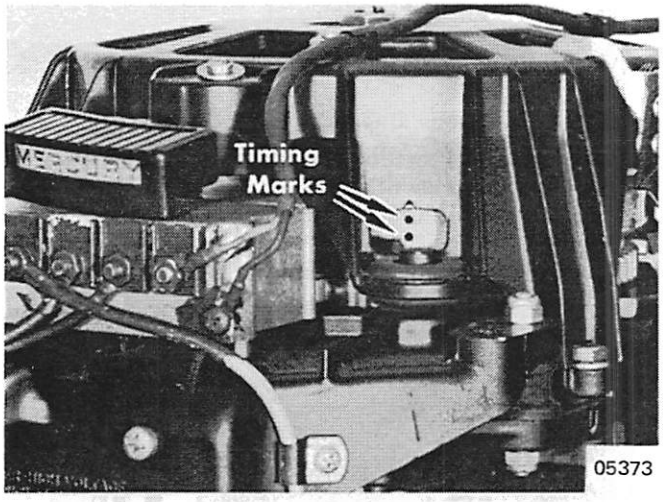

Figure 3. Primary Timing Marks Aligned

secondary pickup on carburetor cluster. (Figure 6) Bend arm as required to adjust.

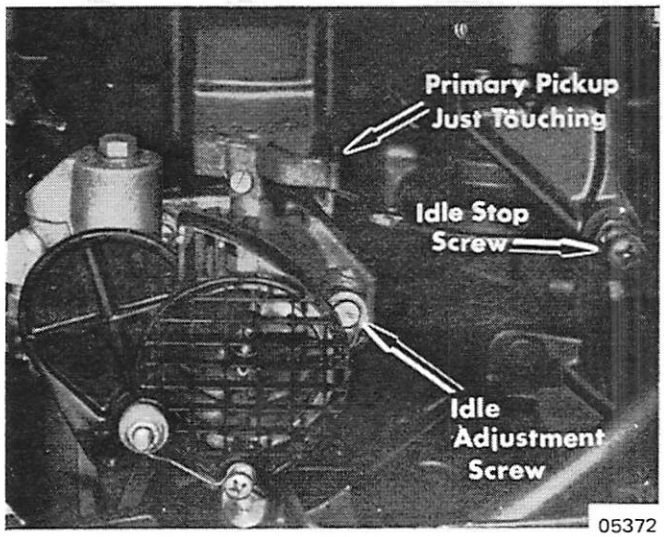

Figure 4. Primary Pickup and Idle Adjustment

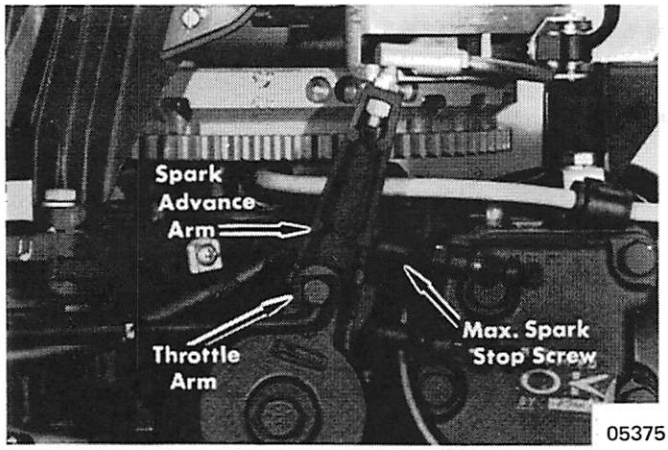

Figure 5. Setting Maximum Spark Stop Screw

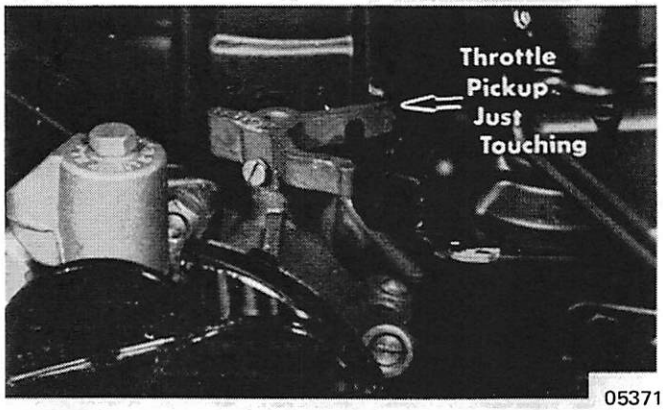

Figure 6. Adjusting Secondary Throttle Pickup

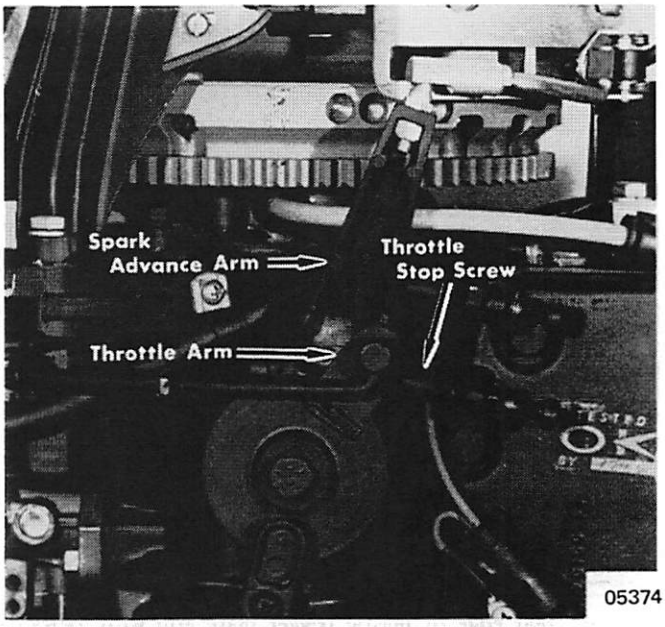

Figure 7. Adjusting Maximum Throttle

8. Rotate throttle arm to wide open throttle and adjust throttle stop screw (Figure 7) to allow full carburetor shutter opening with sufficient clearance (.010" - .015") (.25mm - .38mm) to prevent throttle linkage from binding. Tighten locknut.
9. Remove timing lite from engine.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

TIMING, ADJUSTING, TESTING

MERC 402

IGNITION DATA

Description		Merc 402
Firing Sequence		Alternate Firing
Spark Plug		Champion L-77V
Spark Plug Gap		Not Adjustable
Timing	Max. Advance	Not Applicable
	Full Throttle	Not Applicable
Throttle Pickup	Primary	5° to 7° BTDC
	Secondary	27° BTDC
Full Throttle RPM		5200 RPM
Idle RPM		550 to 600 RPM

TIMING and PICKUP ADJUSTMENT

ENGINE STOPPED

1. Align rear edge of plastic trigger plate arm with forward timing dot. Timing dot is located on upper end cap under flywheel. (Figure 1)
2. Hold control arm in above position and adjust turnbuckle so that cam just touches primary pickup arm (located on carburetor cluster). (Figure 2) Tighten 2 jam nuts.

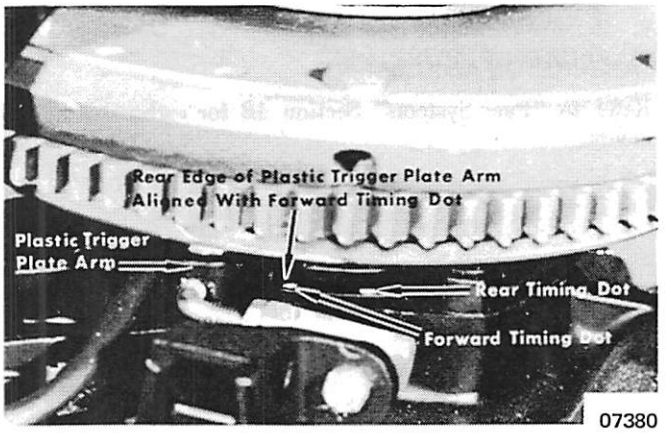

Figure 1. Position of Trigger Plate

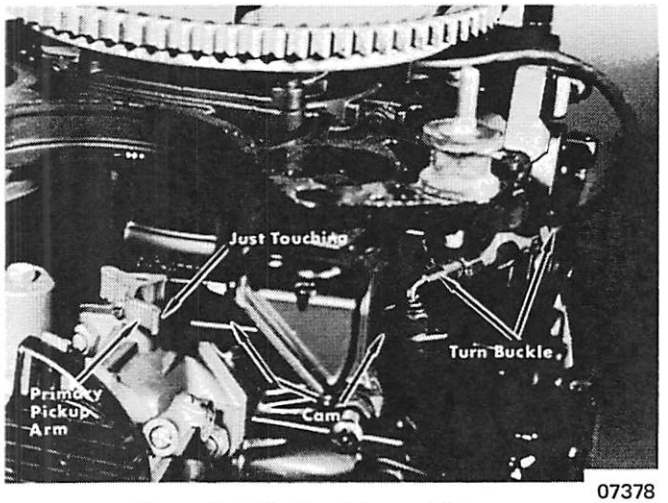

Figure 2. Adjusting Primary Pickup

3. Hold spark arm against spark stop screw. Adjust spark stop screw to position rear edge of trigger plate arm in line with rear timing dot (located on upper end cap under flywheel). Tighten locknut after adjustment. (Figure 3)
4. Position spark advance arm against spark stop screw. DO NOT actuate throttle arm. Adjust throttle pickup screw so that it just touches secondary pickup arm (located on carburetor cluster). Tighten locknut after adjustment. (Figure 4)

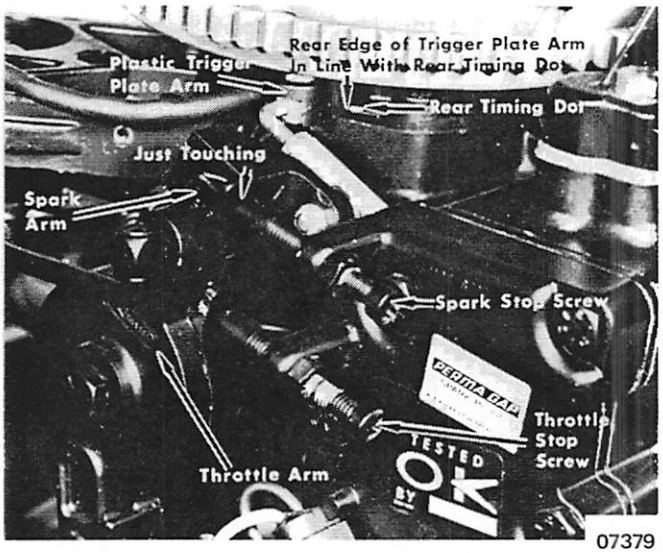

Figure 3. Adjusting Spark Stop Screw

5. Rotate throttle to wide-open position. Adjust throttle stop screw to allow full carburetor butterfly opening. To prevent throttle linkage from binding, allow a clearance of .010"-.015" (.25mm - .38mm). Tighten locknut. (Figure 5)

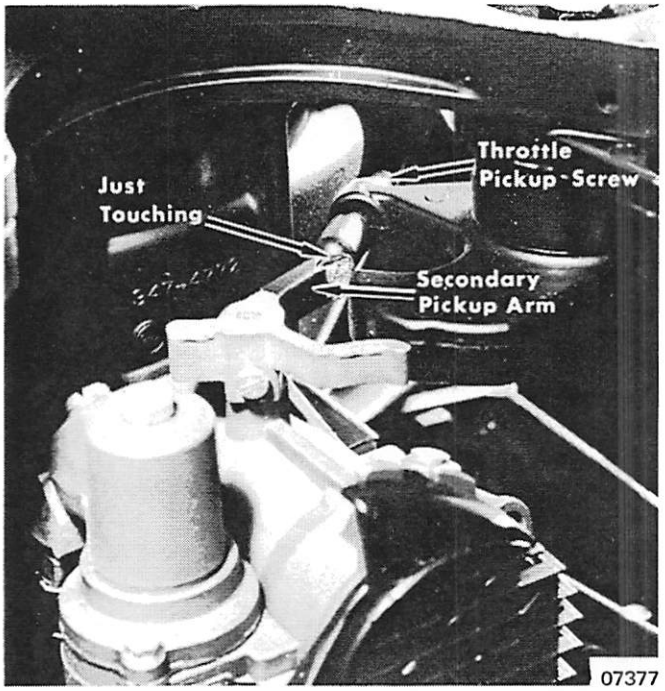

Figure 4. Adjusting Secondary Throttle Pickup

ENGINE RUNNING

1. Connect timing light and tachometer to engine.
2. With engine running, align flywheel timing mark (two white dots) in timing window. (Figure 6)
3. Adjust turnbuckle so that cam just touches primary pickup arm on carburetor cluster. Tighten 2 locknuts. (Figure 2)
4. Advance engine speed to 5000-5200 RPM. Adjust spark stop screw to align flywheel timing mark (white bar) in timing window. Tighten locknut. (Figure 7)

07376

Figure 5. Adjusting Maximum Throttle

5. Hold spark arm against spark stop screw. DO NOT actuate throttle arm. Adjust throttle pickup screw so that it just touches secondary pickup on carburetor cluster. Tighten locknut. (Figure 8)

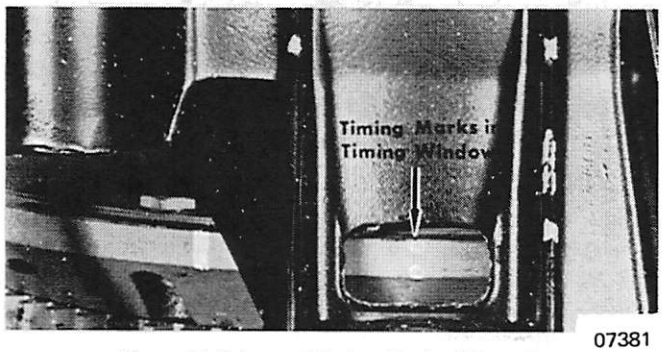

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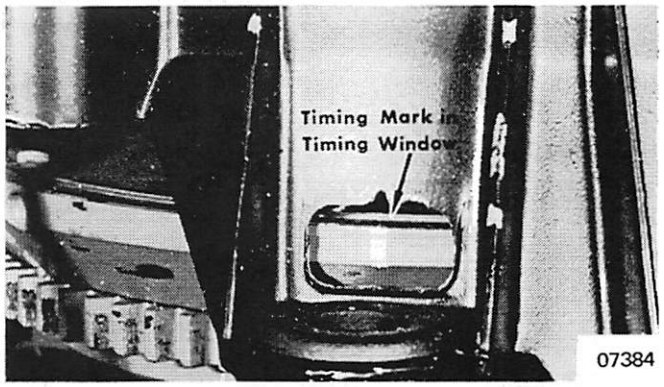
Figure 6. Primary Timing Marks Aligned



07384

Figure 7. Setting Maximum Spark

6. Rotate throttle to wide-open position. Adjust throttle stop screw to allow full carburetor butterfly opening. To prevent throttle linkage from binding, allow a clearance of .010" - .015" (.25mm - .35mm). Tighten locknut. (Figure 5)
7. Reduce engine speed to idle. Adjust idle stop screw so that engine runs at 550 to 600 RPM. (Figure 8)
8. Remove timing light and tachometer from engine.

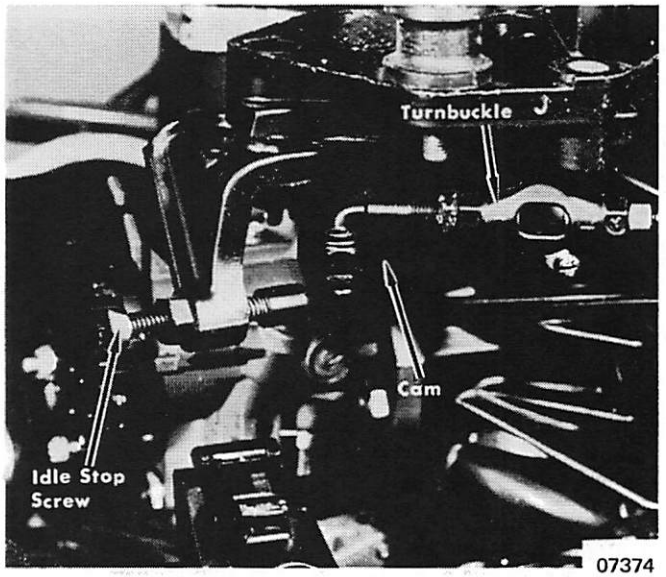


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Figure 8. Adjusting Idle Stop Screw

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for Carburetor Adjustments.

TIMING, ADJUSTING, TESTING
MERC 500 (1966-67)

IGNITION DATA

Description	Merc 500
Firing Sequence	90° Consecutive
Spark Plug	J4J (1966) L4J (1967)
Spark Plug Gap	,025" (J4J) .030" (L4J)
Timing	.200" BTDC (32½°)
Breaker Point Setting	48° Dwell (.003"+.000"-.002")
Full Throttle RPM	5200-5600
Idle RPM	550

Metric Conversion: 1" = 25.4mm

TIMING AND LINKAGE ADJUSTMENT

TIMING FLYWHEEL and MAGNETO PULLEY

1. Flywheel has one mark, a straight line, which times the motor to top dead center (TDC) when positioned with arrow on magneto driven pulley.
2. Rotate flywheel until timing mark (straight line stamped on rim) is in a straight line with center of crankshaft and distributor pulley center. (Figure 1)

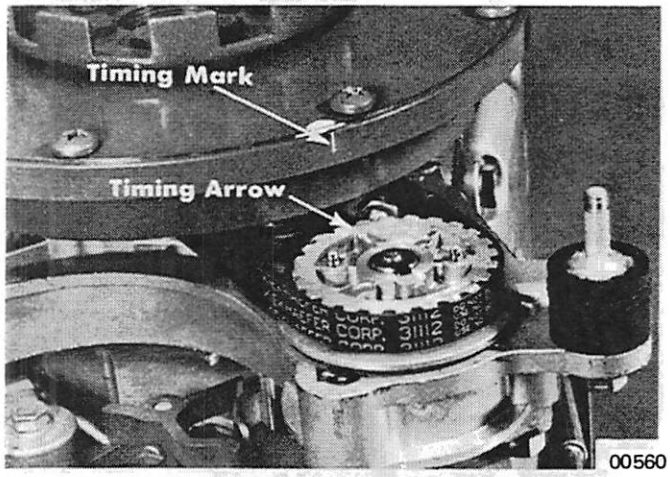


Figure 1. Flywheel and Magneto Pulley Timing

3. Position arrow on pulley to point at timing mark.
4. Replace timing belt, plate, cap screw and washers.

INSTALLING MAGNETO

1. Magneto rotor shaft and shaft extension are splined with one blanketed spline on each shaft for easy installation.
2. With flywheel and pulley in position described in the preceding, install magneto on engine.
3. Rotate timing pulley until shaft sets in place. A 1/16" (1.588mm) groove is located at end of shaft coupling in centerline of blanketed shaft to locate for easy installation.
4. Secure magneto to magneto adaptor with 4 hex head cap screws.

SETTING MAXIMUM SPARK ADVANCE

1. Thread Timing Gauge (C-91-45123A1) into No. 1 spark plug hole.
2. Turn flywheel until No. 1 piston strikes timing gauge.
3. While turning flywheel, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing guage is set at top dead center (TDC) position.
4. Rotate flywheel clockwise 1/4-turn.
5. Depress center shaft of timing guage.
6. Rotate gauge shaft 1/4-turn to seat on tool body shoulder (.200" [5.08mm] BTDC position). Be careful that tool body does not move, or preceding procedure will have to be repeated.
7. Rotate flywheel clockwise by hand until No. 1 piston strikes timing gauge center shaft. This is .200" (5.08mm) BTDC.
8. Attach one test lead of timing meter or Magneto Analyzer (C-91-25213) (on No. 2 Resistance) to magneto frame.
9. Attach second lead of tester to primary ground terminal of magneto.
10. Slowly advance magneto until points break, as indicated by tester used.
11. Hold magneto in this position and adjust spark advance screw to just touch pilot assembly, then tighten locknut. (Figure 2)
12. Recheck setting by actuating magneto with throttle control lever.

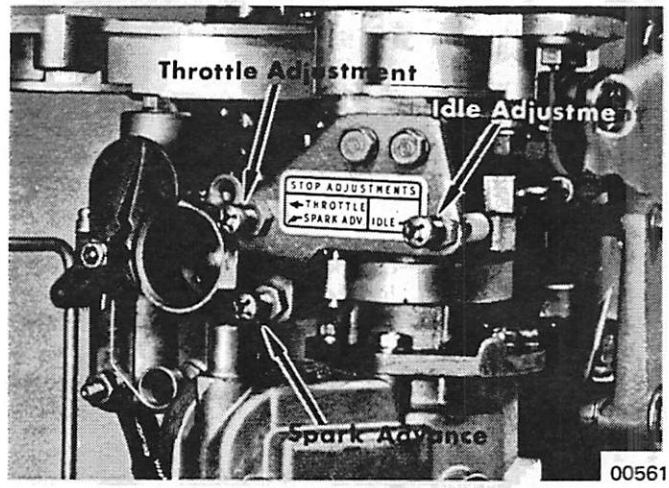


Figure 2. Magneto Stop Bracket Adjustment

ADJUSTING CARBURETOR THROTTLE PICKUP PLATE

Adjust carburetor throttle pickup plate position with .015" (.381mm) feeler gauge to obtain 1/64" (0.397mm) clearance between second pickup pin and No. 2 lever on carburetor cluster when magneto is against the stop in full advance position. (Figure 3)

NOTE: Be sure that throttle moves freely throughout range and both throttle shutters close fully at idle position.

FULL THROTTLE STOP ADJUSTMENT SCREW

Set full throttle stop adjustment screw to allow 1/64" (0.397mm) free movement of cluster lever in clockwise direction when throttle is held against its full throttle stop. (Figure 4) Push cluster lever with finger.

NOTE: If timing stop is readjusted, "Setting Maximum Spark Advance", preceding, must be repeated.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

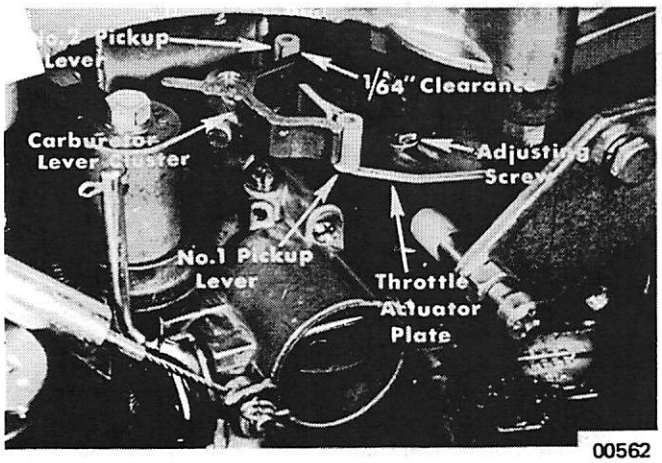


Figure 3. Throttle Pickup Plate Adjustment

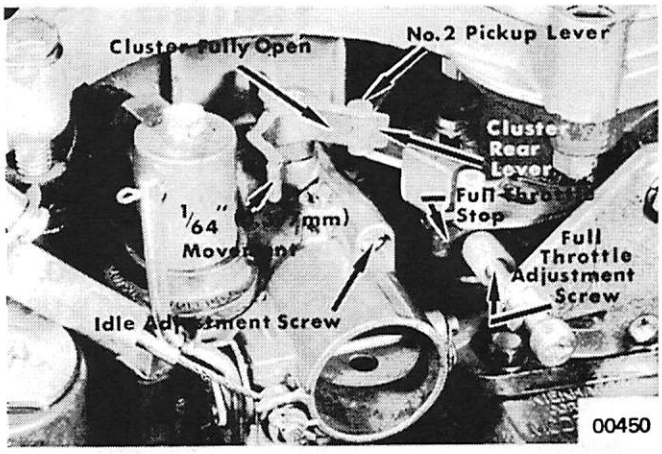


Figure 4. Throttle Stop Adjustment

TIMING, TESTING, ADJUSTING
LIGHTNING ENERGIZER IGNITION SYSTEM

MERC 650S (SERIAL NO. 2312311 THRU 2446775) **MERC 650E** (SERIAL NO. 2446775 THRU 2606853) **MERC 500S** (SERIAL NO. 2306756 & UP)

MERC 500M (SERIAL NO. 2307056 & UP) **MERC 500E** (SERIAL NO. 2406035 & UP)

IGNITION DATA

Description	Merc 650	Merc 500
Cylinder Firing Order	1-3-2-4	1-3-2-4
Firing Sequence	90°	90°
Spark Plug - Std. Install.	L19V or AC-V40FF	L19V or AC-V40FF
Spark Plug Gap	No Adjustment	No Adjustment
Primary Throttle Pickup	7°-9°	7°-9°
Timing	38° BTDC	35° BTDC
Full Throttle RPM RAnge	4800-5200	5200-5600
Idle RPM	550-600	550-600

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, DISTRIBUTOR PULLEY and BELT ASSEMBLY

1. Rotate flywheel until "alignment mark" (a straight, white line stamped on rim of Merc 500 or the 3 white dots stamped on side surface of Merc 650 flywheel) is aligned with arrow on distributor pulley. (Figures 1 and 2)
2. Install timing belt, plate, cap, washers and screw and tighten to 60 in. lbs. (10.65kg/cm).

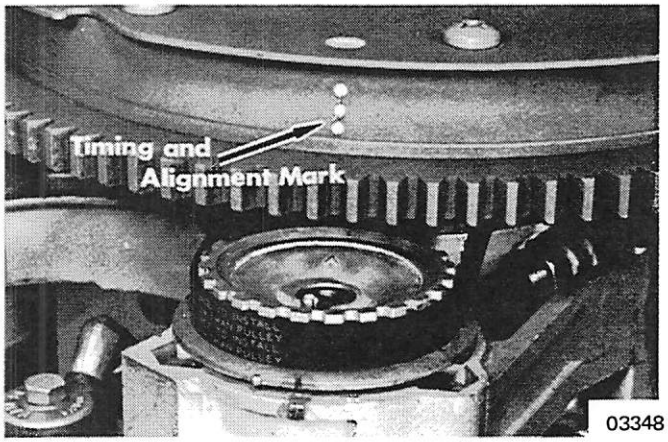


Figure 1. Alignment Marks - Merc 650

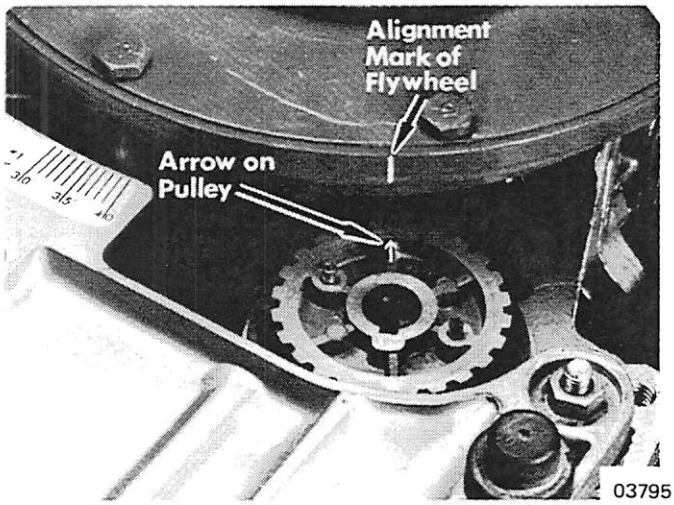


Figure 2. Alignment Marks - Merc 500

INSTALLING IGNITION DRIVER

1. Ignition driver rotor shaft and shaft extension are provided with one spline tooth omitted (or space) on each shaft for easy installation. (Figure 3)
2. With flywheel and pulley in position, which is described in the preceding, install ignition driver on engine.

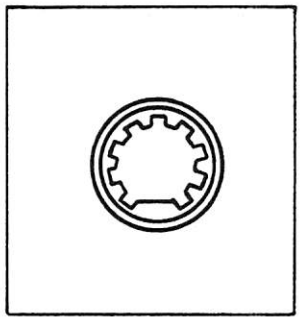


Figure 3. Space on Shaft

3. Rotate timing pulley until shaft sets in place. A 1/16" (1.6mm) groove is located at end of shaft coupling in centerline of blank tooth to locate for easy installation.
4. Secure ignition driver to adaptor with 4 hex head cap screws.

INSTALLING TIMING LITE

1. Timing Lite (C-91-35507A1) must be used when making all timing adjustments.
2. Connect large, red lead to No. 1 spark plug and connect one lead to negative post on battery and one lead to positive post on battery.

   NOTE: On manual starting engines, install a jumper wire from the negative battery post to ground on the bottom cowl or front cover plate.
3. Depress button on timing lite and, if properly connected, the timing lite will "buzz".
4. Before cranking engine, be certain that all connections are made.

SPARK ADVANCE ADJUSTMENT

1. Start engine and hold ignition driver at full retard. Adjust "Idle Stop" screw to produce idle speed of 550-to-600 RPM in forward gear. (Figure 4)
2. With engine still running, advance ignition driver so that timing mark lines up 7° to 9° BTDC. (Figure 5)
3. Slide throttle actuator plate forward so that primary pickup on throttle plate just touches primary pickup arm on carburetor cluster. (Figure 6) Tighten screws.

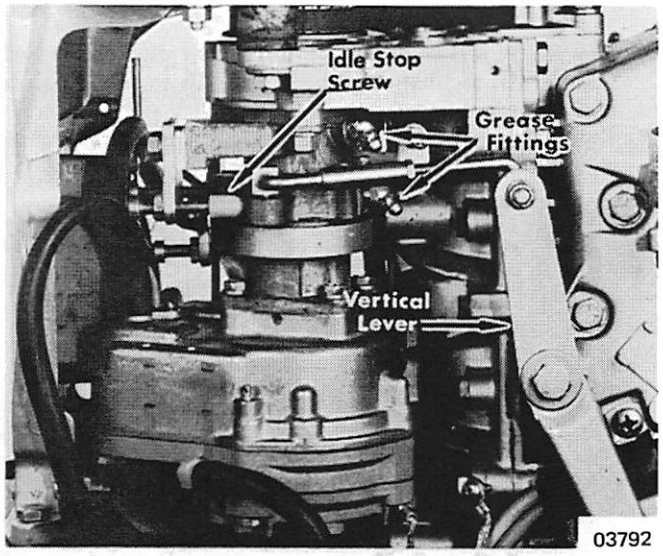


Figure 4. Idle Stop Adjustment Screw

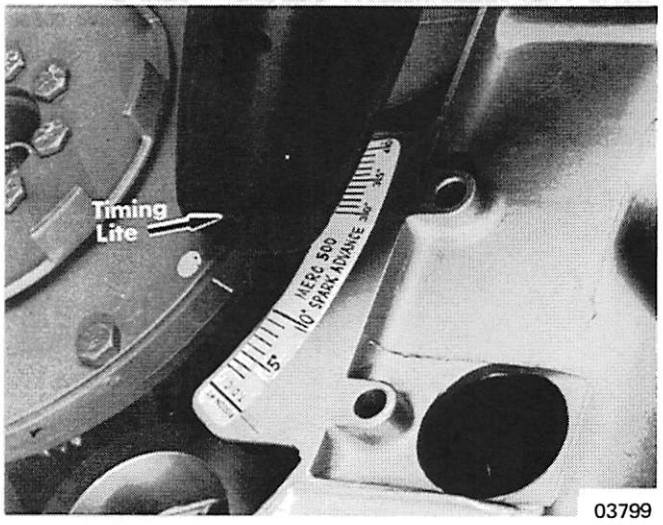


Figure 5. Timing Mark at 7° to 9° BTDC

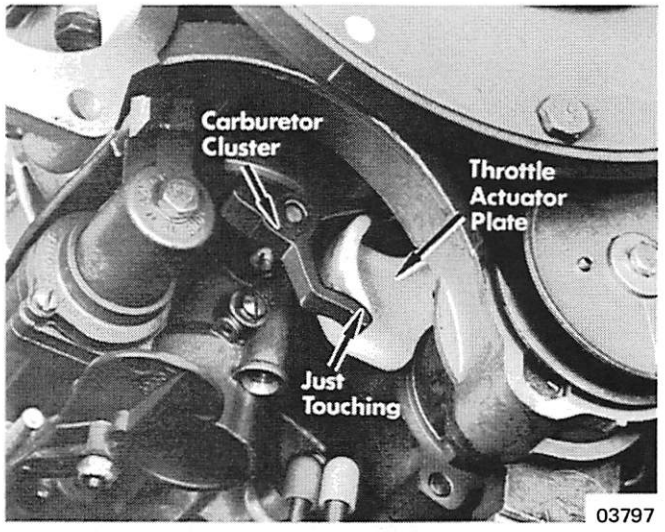


Figure 6. Primary Pickup Just Touching Arm on Carburetor Cluster

4. Due to the electronic timing characteristic, it is necessary to run the engine at wide open throttle and to know the approximate RPM when adjusting for maximum spark advance. Refer to following chart for maximum spark advance adjustments at different wide-open throttle RPM's. The RPM's will vary according to pitch of propeller used and level of water in test tank.

   NOTE: Engine may be timed on boat, but it must be timed at wide-open throttle.

Wide-Open Throttle RPM	Spark Advance Merc 650S	Spark Advance Merc 500S & M
2000-4000	41°-42° BTDC	38°-39° BTDC
4000-4800	40°-41° BTDC	37°-38° BTDC
4800-5200	38° BTDC	----------
5200-5600	----------	35° BTDC (Figure 7)

5. With engine running at wide open throttle, adjust spark advance screw in or out to align the flywheel timing mark to correspond to degree mark on timing decal (Figure 7) as determined by the engine RPM in chart above. Tighten spark advance screw jam nut and recheck timing.

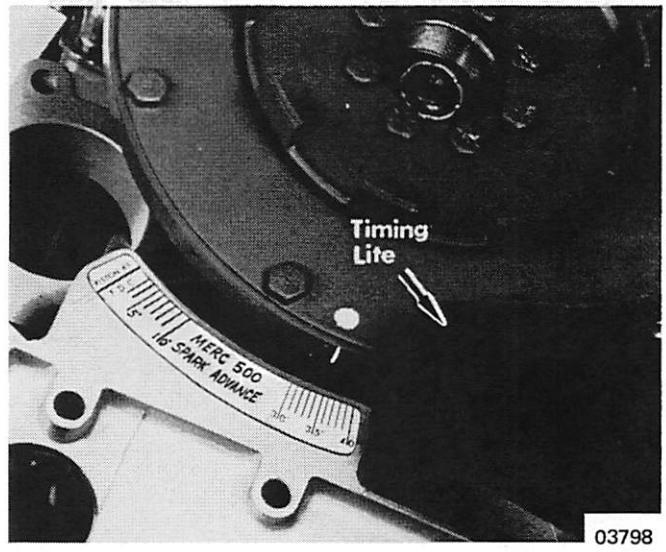


Figure 7. Merc 500 Spark Advance

6. With ignition driver against spark advance stop (but not actuating Economizer collar), adjust secondary pickup with screw on throttle actuator plate. (Figure 8) Turn screw until it just touches secondary pickup arm on carburetor cluster. Tighten jam nut.

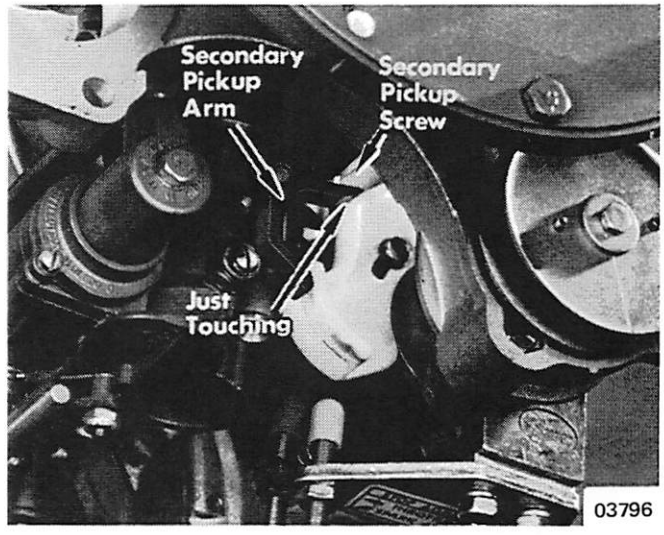


Figure 8. Secondary Pickup Adjustment

THROTTLE STOP ADJUSTMENTS

1. Rotate Economizer collar to wide open throttle position.
2. Adjust "Throttle Stop" screw on stop bracket (Figure 9) to allow full throttle shutter opening but not to allow throttle shutters to act as a stop or the carburetor cluster to hit carburetor filter bowl.

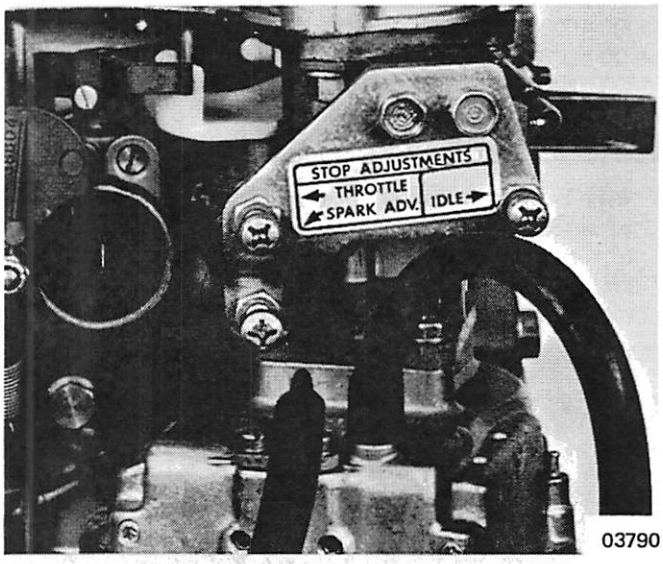


Figure 9. Throttle Stop Screw

3. Idle engine and adjust "Idle Stop" screw on stop bracket (Figure 10) so that engine idles at 550 to 600 RPM in forward gear.
4. Run engine between 4500 and 5000 RPM to clear engine and recheck idle stop.

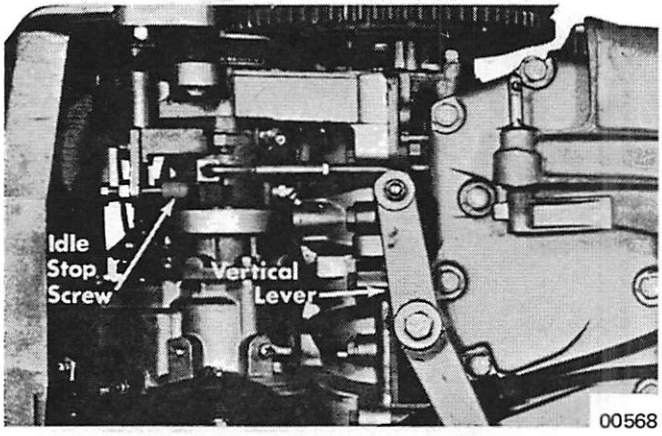


Figure 10. Vertical Lever and Idle Stop Screw

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

TIMING, ADJUSTING, TESTING
MERC 650 (1966-67)

IGNITION DATA

Description	Merc 650
Firing Sequence	90° Consecutive
Spark Plug	J4J (1966) L4J (1967)
Spark Plug Gap	.025" (J4J) .030" (L4J)
Timing	.222" (32½°) BTDC
Breaker Point Setting	48° Dwell (.008"+.000"-.002")
Full Throttle RPM	4800-5200
Idle RPM	550

Metric Conversion 1" = 25.4mm

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, MAGNETO PULLEY and BELT ASSEMBLY

1. Rotate flywheel until timing mark (a straight line stamped on upper surface) is in a straight line with center of crankshaft and magneto pulley center. (Figure 1)
2. Position arrow on pulley (not plate) to point at timing mark on flywheel.
3. Install timing belt, plate, cap, washers and screws and tighten to 60 in. lbs. (10.65 kg/cm)

INSTALLING MAGNETO

Magneto rotor shaft and shaft extension are splined with one blanketed spline on each shaft for easy installation.

1. With flywheel and pulley in position described above, install magneto on engine.
2. Rotate timing pulley until shaft sets in place. A 1/16" (1.588mm) groove is located at end of shaft coupling in centerline of blanketed shaft to locate for easy installation.
3. Secure magneto to magneto adaptor with 4 hex head cap screws.

SETTING MAXIMUM SPARK ADVANCE

1. Thread Timing Gauge (C-91-32253A1) into No. 1 spark plug hole.
2. Turn flywheel until No. 1 piston strikes timing gauge.

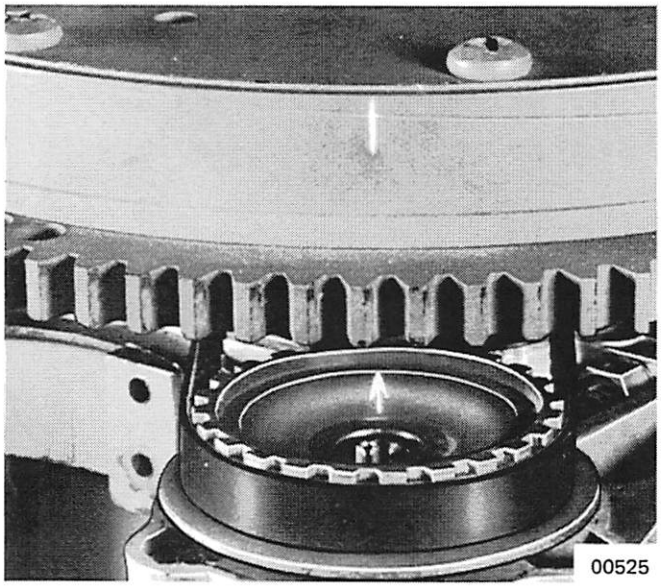


Figure 1. Timing Marks on Flywheel and Pulley

3. While turning flywheel, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing gauge is set at top dead center (TDC) position.
4. Rotate flywheel clockwise 1/4-turn.
5. Depress center shaft of timing gauge.
6. Rotate gauge shaft 1/4-turn to seat on tool body shoulder (.222" [5.6388mm] BTDC position). Be careful that tool body does not move, or preceding procedure will have to be repeated.
7. Rotate flywheel clockwise by hand until No. 1 piston strikes timing gauge cneter shaft. This is .222" (5.6388mm) BTDC.
8. Attach one test lead of Timing Meter (C-91-22966) or Magneto Analyzer (C-91-25213) (on No. 2, Resistance) to magneto frame.
9. Attach second lead of tester to primary ground terminal of magneto.
10. Slowly advance magneto until points break, as indicated by tester used.
11. Hold magneto in this position and adjust spark advance stop screw to just touch pilot assembly and tighten lock-nut. (Figure 2)
12. Recheck setting by actuating magneto with throttle control lever on side of bottom cowl.

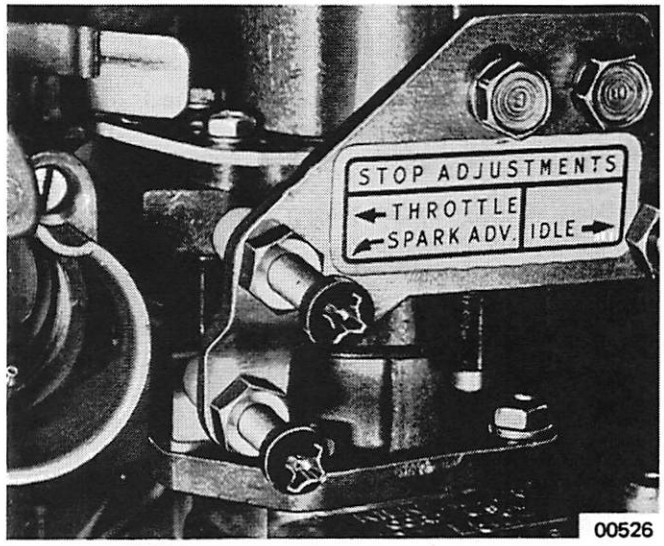


Figure 2. Spark Advance Adjustment

PICKUP PLATE ADJUSTMENT

1. Thread .015" (0.381) Timing Gauge (C-91-31161A1) into No. 1 spark plug hole.
2. Turn flywheel until piston strikes timing gauge.
3. While turning flywheel, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing gauge is set at top dead center (TDC) position.
4. Rotate flywheel clockwise 1/4-turn.
5. Depress center shaft of timing gauge and rotate 1/4-turn to seat on tool body shoulder (.015" [0.381mm] BTDC).

NOTE: Be careful that tool body does not move, or preceding steps will have to be repeated.

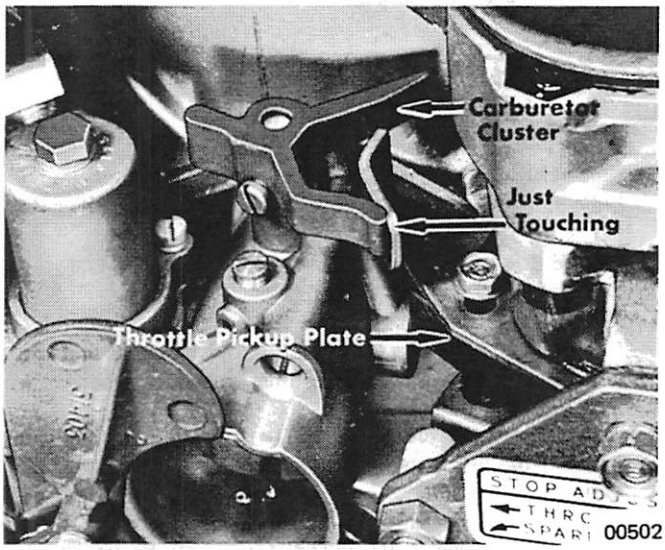


Figure 3. First Throttle Pickup Tab Adjustment

6. Continue to rotate flywheel clockwise until piston strikes timing gauge.
7. Connect one test lead of Timing Meter (C-91-22966) or Magneto Analyzer (C-91-25213) (selector switch on No. 2, Distributor Resistance) to magneto frame.
8. Attach second lead of tester to primary ground terminal of magneto.
9. Retard magneto against idle stop screw. (Figure 2)
10. Rotate magneto slowly counterclockwise until points break, as indicated by timing unit used.
11. Loosen throttle pickup plate screws. (Figure 3)
12. Slide throttle pickup plate so that tab (without nylon sleeve) just touches carburetor cluster. (Figure 3)
13. Tighten throttle pickup plate screws.
14. Turn magneto against .222" (5.6388mm) ("Spark Advance") stop.
15. Bend second throttle pickup pin (with nylon sleeve) against carburetor cluster (.000" to .015" [0.381mm] gap). (Figure 4)
16. Lubricate cam and nylon pin with New Multipurpose Quicksilver Lubricant (C-92-49588).

THROTTLE STOP ADJUSTMENTS

1. Rotate Economizer collar to wide open throttle position.
2. Adjust "Throttle Stop" screw on stop bracket (Figure 2) to allow full throttle shutter opening but not to allow throttle shutters to act as a stop or the carburetor cluster to strike carburetor filter bowl.
3. Idle engine and adjust "Idle Stop" screw on stop bracket (Figure 2) so that engine idles at 550 to 600 RPM in forward gear.
4. Run engine between 4500 and 5000 RPM to clear engine and recheck idle stop.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

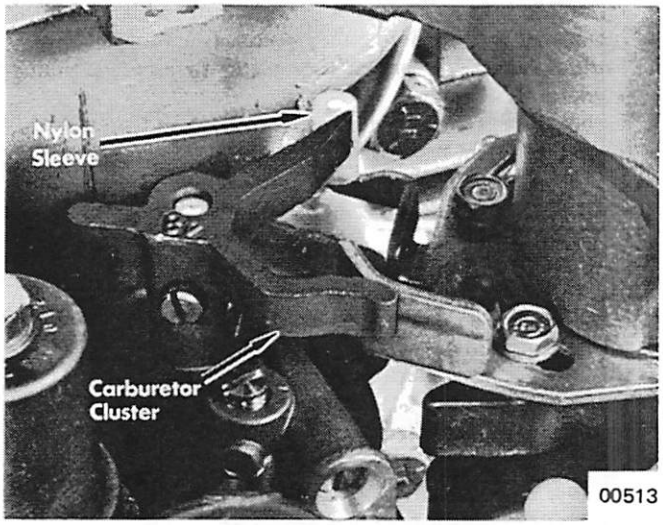


Figure 4. Second Throttle Pickup Pin Adjustment

TIMING, ADJUSTING, TESTING
MERC 850-800 and MERC 650 (1970-71)
THUNDERBOLT BREAKER-LESS IGNITION SYSTEM

IGNITION DATA

Description	Merc 850	Merc 800	Merc 650
Firing Sequence	90° Consecutive	90° Consecutive	90° Consecutive
Spark Plug	AC-V40FFM or Champion L-77V		
Spark Plug Gap	No Adjustment	No Adjustment	No Adjustment
Timing	27° BTDC	23° BTDC	38° BTDC
Throttle Pickup - Primary	3° - 5° BTDC	5° - 7° BTDC	7° - 9° BTDC
Full Throttle RPM	4800-5500	4800-5300	4800-5300
Idle RPM	550-600	550-600	550-600

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, DISTRIBUTOR and BELT ASSEMBLY

1. Rotate flywheel until "alignment mark" (a white dot and punch marks) is aligned with arrow on distributor pulley (not plate). (Figure 1)

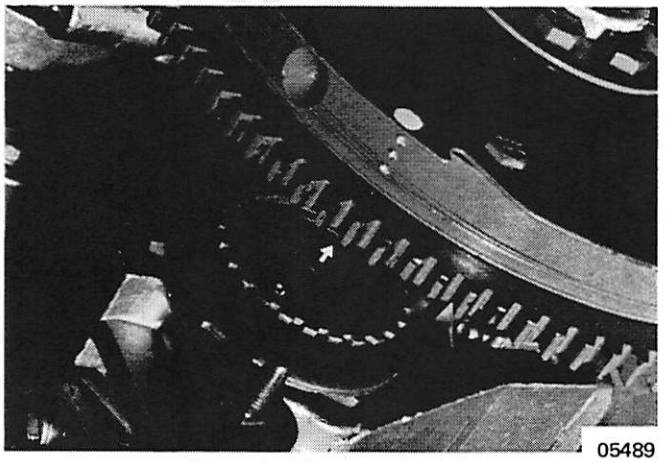

05489

Figure 1. Alignment Marks

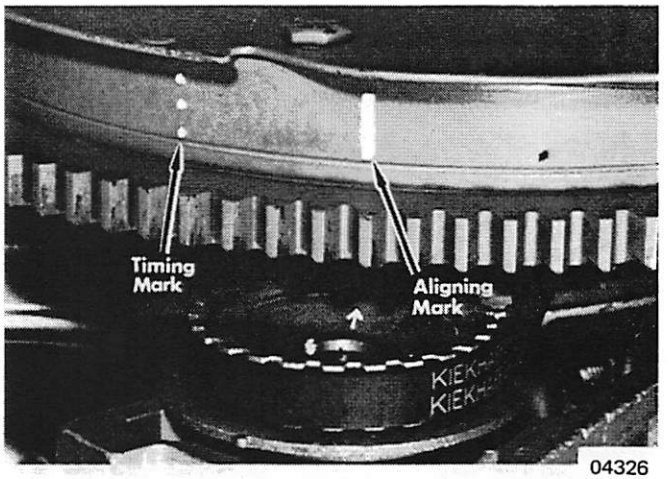
NOTE: Merc 800 engines (Serial No. 2881081 and below) have a straight white line on flywheel. On those below Serial No. 2881081, line up the distributor pulley arrow with the straight line and proceed with timing and testing. (Figure 2)

2. Install timing belt, plate, cap, washers and screw and tighten to 60 in. lbs. (10.65kg/cm).

CONNECTING TIMING LITE

CAUTION: Disconnect fuel tank from engine and run carburetors dry by running engine in test tank before performing the following checks and adjustments.

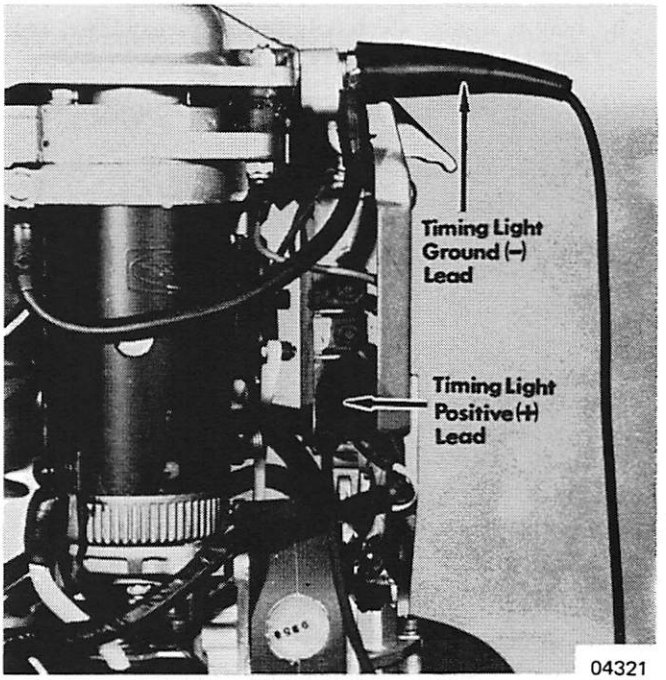
1. Disconnect throttle cable from engine.
2. Use Timing Lite (C-91-35507A1) for spark advance adjustment.



04326

Figure 2. Alignment Marks (Merc 800, Serial No. 2881081 and Below)

3. Connect large, red lead to No. 1 spark plug and connect one lead to ground terminal on bottom cowl or front cover plate (Figure 3) and one lead to hot side of starter or red terminal on switch box.
4. Depress button on timing lite and, if properly connected, the timing lite will "buzz".
5. Before cranking engine, be certain that all connections are made. If timing adjustment is to be made without help, use Remote Starter Switch (C-91-52024A1) to crank engine.



04321

Figure 3. Timing Lite Connected

SPARK ADVANCE ADJUSTMENT

1. Turn ignition key on, crank engine and hold timing lite in line with degree marking on top cowl support frame. Advance the vertical lever until timing mark (3 dots) on the flywheel is aligned with timing mark on timing decal. (Figure 4)

   NOTE: White dot on flywheel top near edge is over timing mark. It is used to locate timing mark.

2. Adjust spark advance stop screw (Figure 4) in or out until correct timing is obtained.
3. Tighten nut and recheck timing.

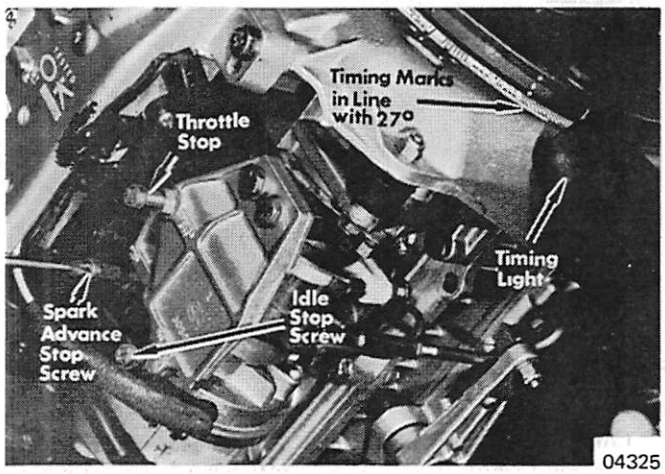


Figure 4. Spark Advance Adjustment

4. Pickup plate adjustment
   a. Using timing lite, advance throttle until timing mark (3 dots) on flywheel aligns with line on timing decal for proper primary throttle pickup shown under "Ignition Data" on preceding page. At this point, carburetor pickup should just touch carburetor cluster (.000" to .005" [.127mm] clearance). (Figure 5)
   b. Loosen screws, which hold throttle pickup plate, and adjust if necessary. (Figure 5)

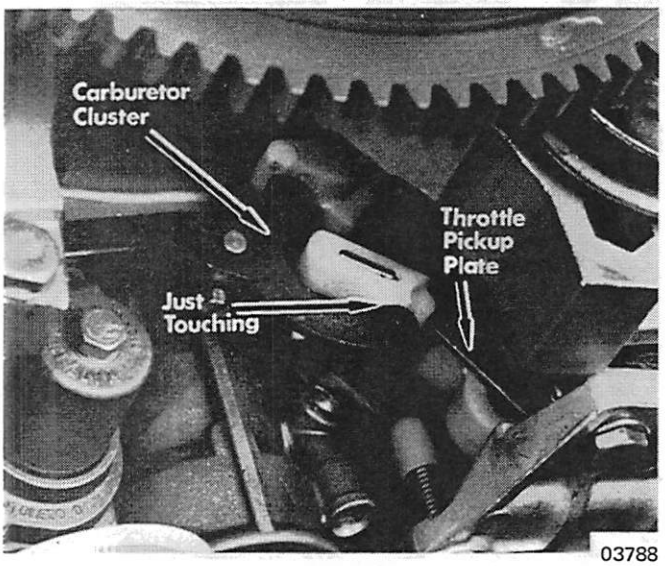


Figure 5. Carburetor Pickup.

   c. Without running engine, rotate distributor against spark advance stop. Adjust secondary pickup with screw on throttle actuator plate. (Figure 6) Turn screw until actuator plate just touches secondary pickup arm on carburetor cluster. (Figure 7) Tighten jam nut on adjusting screw.

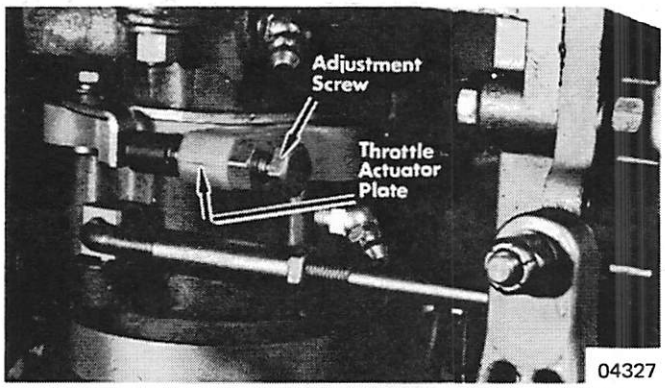


Figure 6. Adjustment Screw on Throttle Actuator Plate

THROTTLE STOP ADJUSTMENT

1. Rotate Economizer collar to wide open throttle position.
2. Adjust "throttle stop" screw on stop bracket (Figure 4) to allow full throttle shutter opening but not to allow throttle shutters to act as a stop or the carburetor cluster to hit carburetor filter bowl.

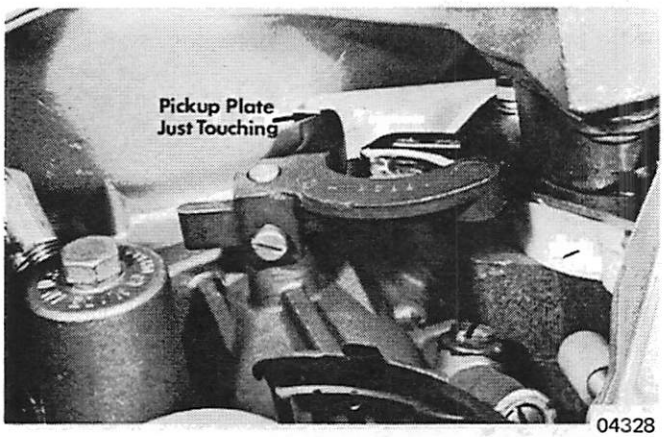


Figure 7. Secondary Pickup

TIMING DECAL LOCATION

1969 MERC 800

When replacing timing decal on 1969 Merc 800's, the No. 1 piston TDC mark on decal must be aligned with the mark "6" on top cowl support bracket. (Figure 8) If not as specified, the adjusting and timing cannot be completed.

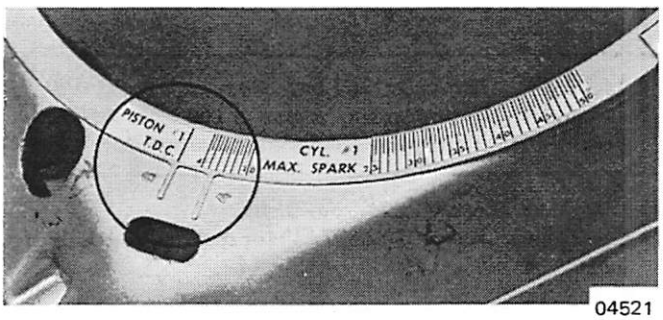


Figure 8. Timing Decal Location

A number of 1970 model Merc 650 Outboards has the timing decal incorrectly located on the cowl support frame. The "T.D.C." mark on the decal must be centered on the short rib located on cowl support frame, as shown in Figure 9. Figure 10 shows incorrect location. Merc 650E (Serial No. 2804101 and up) and Merc 650EL (Serial No. 2804834 and up) have the decal located correctly. Replace the decal (A-37-54108) and retime the engine when customer brings engine in for other service.

NOTE: For future service replacement on 1968-69 model Merc 650 engines, it will be necessary to move the decal 5° (7/16") counterclockwise from the marker for correct timing. (Figure 11)

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

CORRECT

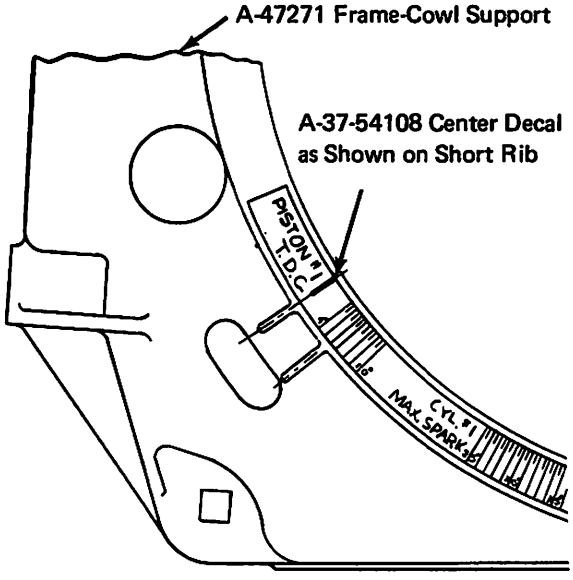


Figure 9. Correct Location

INCORRECT

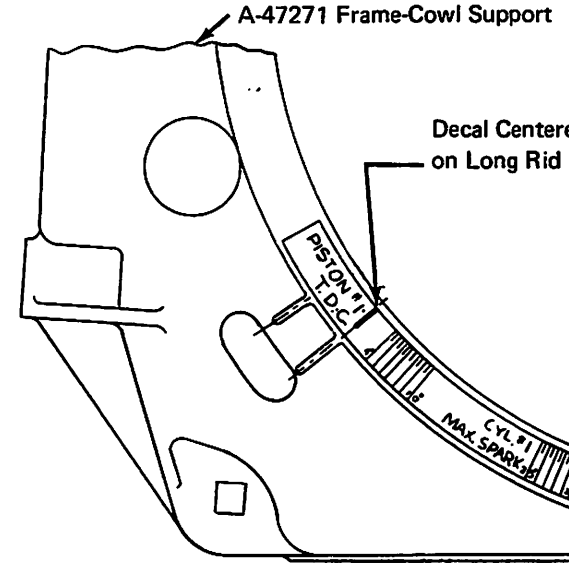


Figure 10. Incorrect Location

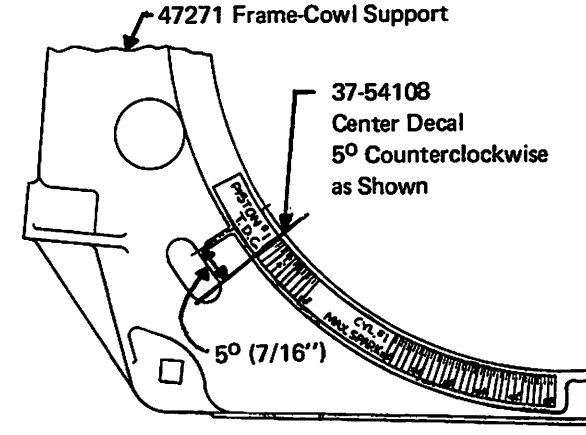


Figure 11. Locating Decal

TIMING, ADJUSTING, TESTING

MERC 650 (3-CYL.)

IGNITION DATA

Description	*	**
Firing Sequence	1-2-3	1-2-3
Spark Plug	Champion L-77V	Champion L-77V
Spark Plug Gap	Not Adjustable	Not Adjustable
Timing Max. Advance	23° BTDC	23° BTDC
Throttle Pickup Primary	0°-2° BTDC	3°-5°BTDC
Full Throttle RPM	5300 RPM	5300 RPM
Idle RPM	550-600 RPM	550-600 RPM

** Merc 650 Below Serial No. 3552906*

*** Merc 650 Serial No. 3552906 and Above*

TIMING and PICKUP ADJUSTMENT

1. Align belt mark on flywheel perimeter with plastic timing indicator on crankcase. (Figure 1)
2. Align cast tab on driven pulley with cast mark on distributor adaptor (Figure 1) and install timing belt, plate, washer and screw.
3. Connect timing light and tachometer to engine.

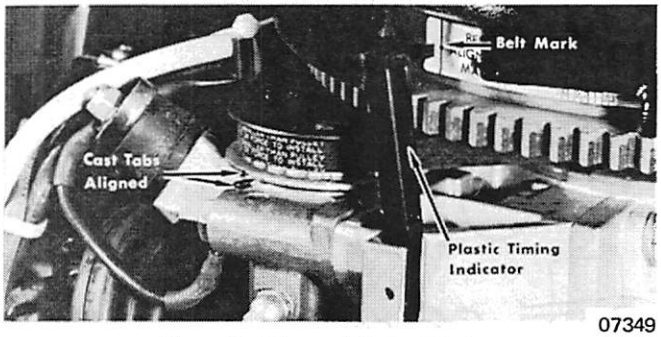


Figure 1. Primary Timing Marks

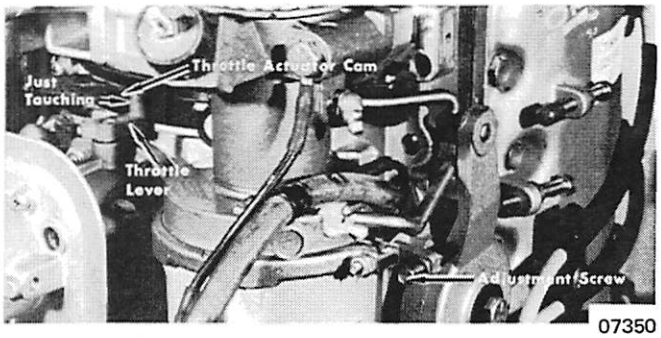


Figure 2. Adjusting Primary Pickup

4. To set primary pickup (Figure 2), advance spark as specified above and advance throttle actuator cam until it just touches throttle lever. Tighten locknut on adjustment screw between spark and throttle advance arms.
5. Turn engine over with starter at 400 RPM. Adjust maximum spark advance screw to align the plastic timing indicator with mark on timing decal at 23°. Tighten locknut. (Figure 3)

THROTTLE STOP ADJUSTMENTS

1. Advance throttle arm to wide-open. Adjust throttle stop screw to allow full carburetor butterfly opening, but do not allow throttle shutters to act as a stop. Allow sufficient clearance (.010"-.015") to prevent throttle linkage from binding. Tighten locknut. (Figure 4)

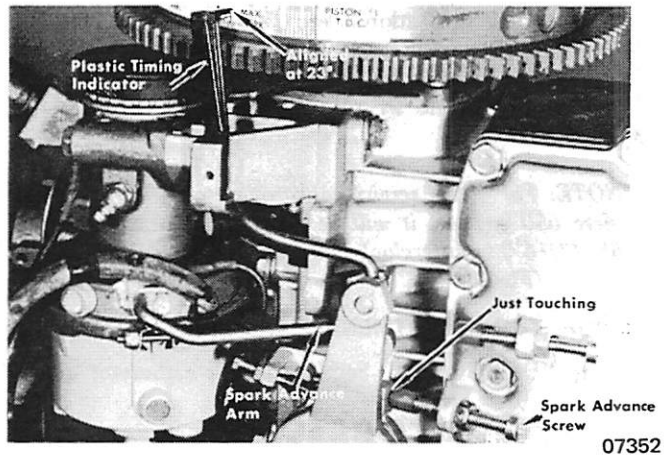


Figure 3. Adjusting Maximum Spark Advance

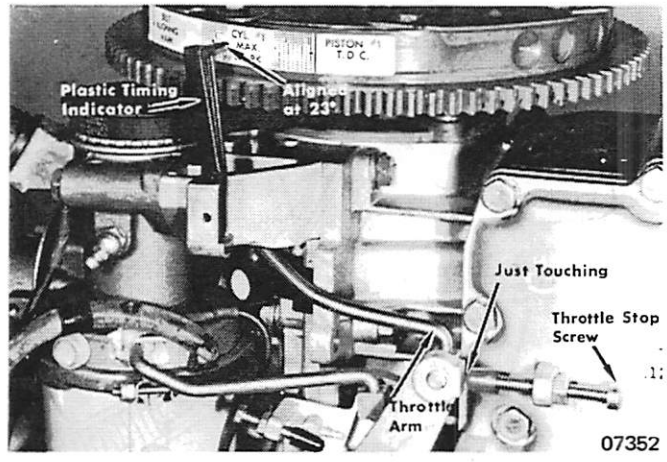


Figure 4. Adjusting Throttle Stop Screw

2. Set idle mixture and adjust idle stop screw to 550-600 RPM in forward gear. (Figure 5)

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

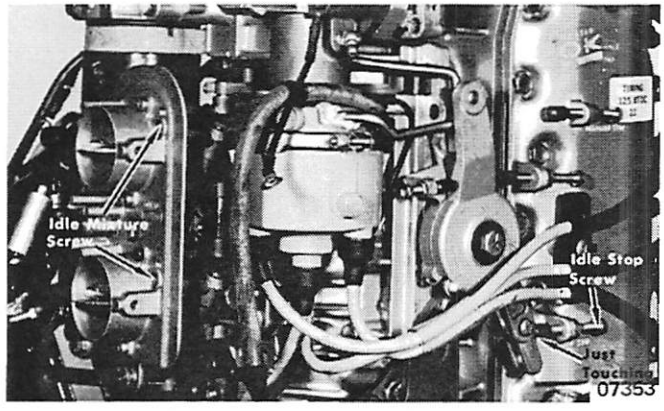


Figure 5. Adjusting Idle Stop Screw

TIMING, ADJUSTING, TESTING

MERC 1100-950 (1966) STANDARD IGNITION

IGNITION DATA

Description	Merc 1100-950
Firing Sequence	60° Consecutive
Spark Plug	L4J
Spark Plug Gap	.030"
Timing	.235" (34½") BTDC
Breaker Point Setting	90° Dwell
Full Throttle RPM	4800-5200
Idle RPM	550

Metric Conversion: 1" = 25.4mm

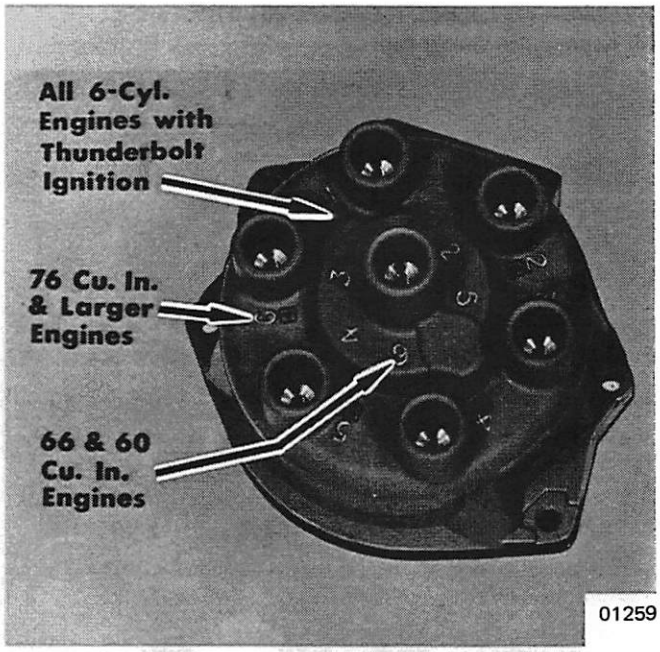


Figure 1. Distributor (Outside Ring of Numbers for 76 Cu. In. [1245.424cm3] and Larger Engines)

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, DISTRIBUTOR PULLEY and BELT ASSEMBLY

1. Rotate flywheel until timing mark (a straight line stamped on upper surface) is in a straight line with center of crankshaft and distributor pulley center. (Figure 2)
2. Position arrow on pulley (not plate) to point at timing mark on flywheel.
3. Install timing belt, plate, cap, washers and screw and tighten to 60 in. lbs. (10.65kg/cm).

DISTRIBUTOR DRIVE COUPLING

1. When reassembling distributor, leave distributor cap off to aid in timing engine as described in following instructions.

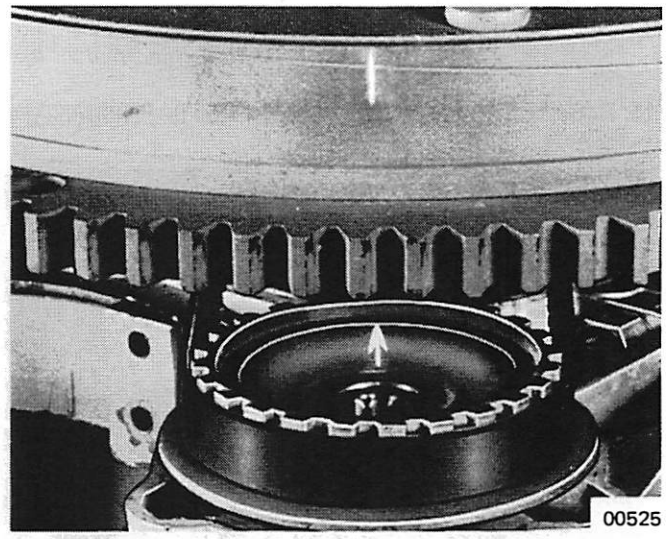
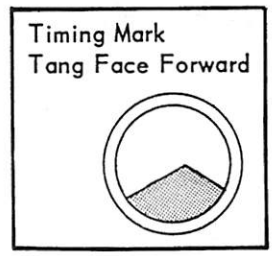


Figure 2. Timing Marks on Flywheel and Pulley

2. When distributor is reassembled to engine, flywheel and distributor pulley should be aligned as explained in the preceding. The radius of the tang at drive end of distributor shaft should point forward (direction engine will travel when distributor is bolted in place). (See drawing on left.)



3. Secure distributor adaptor with 4 hex head cap screws.

SPARK ADVANCE STOP ADJUSTMENT

1. Position distributor with air vent elbow facing approximately forward.
2. Place No. 3 piston at .235" (5.969mm) (34½° BTDC) by rotating flywheel in a clockwise (forward) direction from BDC (bottom dead center).
3. Thread Timing Gauge (.235" [C-91-26916A1]) into No. 3 spark plug hole.
4. Turn flywheel until No. 3 piston strikes timing gauge.
5. While turning flywheel, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing gauge is set at top dead center position.
6. Rotate flywheel clockwise 1/4-turn.
7. Depress center shaft of timing gauge and rotate 1/4-turn to seat on tool body shoulder. Be careful that the tool body does not move, or preceding procedure will have to be repeated.
8. Rotate flywheel clockwise until No. 3 piston strikes timing gauge center shaft. This is .235" (5.969mm) BTDC.
9. Connect one test lead of Timing Meter (C-91-22966) or Magneto Analyzer (C-91-25213) (selector switch on No. 2, Distributor Resistance) to white lead (No. 1 coil primary) at terminal block.

10. Attach second lead of tester to distributor frame.
11. Retard distributor against "idle speed" stop screw. (Figure 3)
12. Turn distributor rotor slowly counterclockwise to touch drive coupling.
13. Turn distributor (holding rotor) slowly counterclockwsie until points break, as indicated by timing unit used.
14. Hold distributor in this position and adjust spark advance stop screw to just touch pilot assembly and tighten locknut.
15. Recheck Steps 11, 12 and 13 to be sure that adjustment is correct.

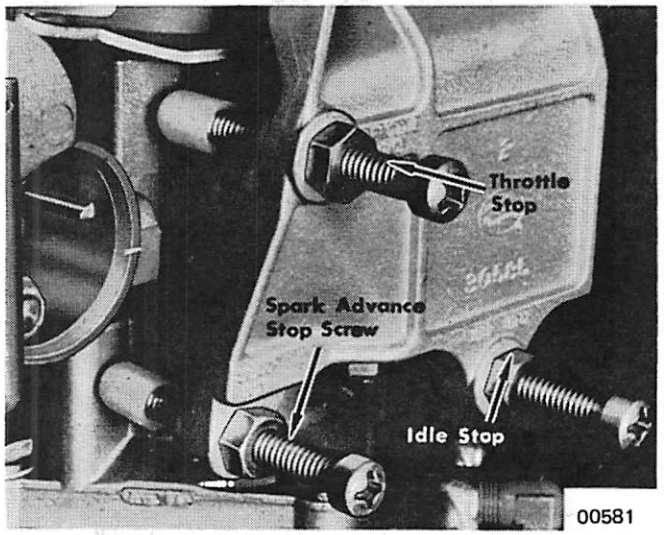


Figure 3. Spark Advance Adjustment

PICKUP PLATE ADJUSTMENT

1. Thread .015" (0.381mm) Timing Gauge (C-91-31161A1) into No. 3 spark plug hole.
2. Turn flywheel until piston strikes timing gauge.
3. While turning flywheel, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing gauge is set at top dead center (TDC) position.
4. Rotate flywheel clockwise 1/4-turn.
5. Depress center shaft of timing gauge and rotate 1/4-turn to seat on tool body shoulder (.015" [0.381mm] BTDC). Be careful that tool body does not move, or preceding steps will have to be repeated.
6. Continue to rotate flywheel clockwise until piston strikes timing gauge.
7. Connect one test lead of Timing Meter (C-91-22966) or Magneto Analyzer (C-91-25213) (selector switch on No. 2, Distributor Resistance) to white lead (No. 1 coil primary) at terminal block.
8. Attach second lead of tester to distributor frame.
9. Retard distributor against idle stop screw.
10. Turn distributor rotor slowly counterclockwise to touch drive coupling.
11. While holding rotor in this position, rotate distributor slowly counterclockwise until points break, as indicated by timing unit used.
12. Loosen throttle pickup plate screws. (Figure 4)
13. Slide throttle pickup plate so that first throttle tab (without nylon sleeve) just touches carburetor cluster. (Figure 4)
14. Tighten throttle pickup plate screws.
15. Turn distributor against "Spark Advance" stop.

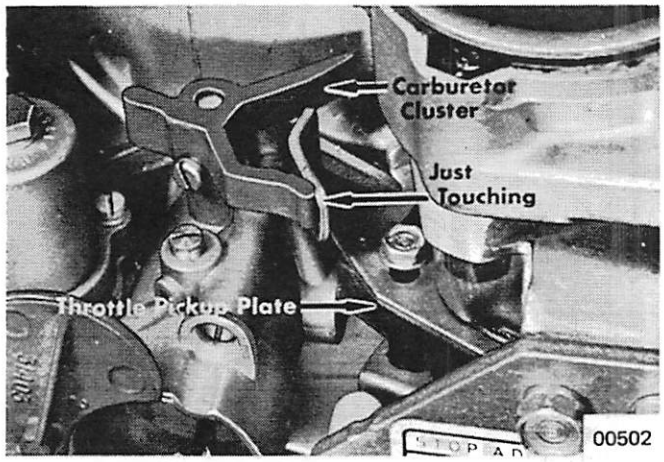


Figure 4. First Throttle Pickup Tab Adjustment

16. Bend second throttle pickup pin (with nylon sleeve) against carburetor cluster (.000"-to-.015" gap). (Figure 5)
17. Lubricate cam and nylon pin with New Multipurpose Quicksilver Lubricant (C-92-49588).
18. Replace distributor cap.

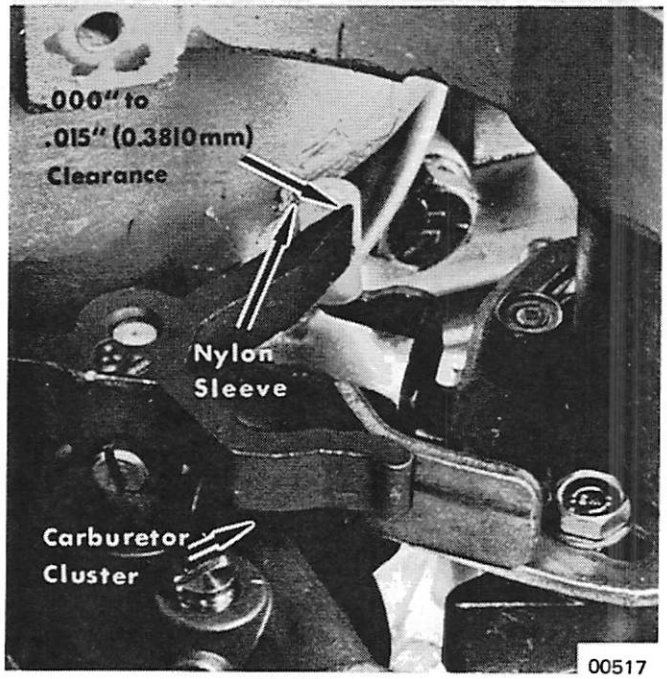


Figure 5. Second Throttle Pickup Tab Adjustment

THROTTLE STOP ADJUSTMENTS

1. Rotate "Economizer" collar to wide open throttle position.
2. Adjust throttle stop screw on stop bracket (Figure 3) to allow full throttle shutter opening, but not to allow throttle shutters to act as a stop or the carburetor cluster to hit carburetor filter bowl.
3. Idle engine and adjust "idle stop" screw on stop bracket (Figure 3) so that engine idles at 550 to 600 RPM in forward gear.
4. Run engine between 4500 and 5000 RPM to clear engine and recheck idle stop.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

TIMING, ADJUSTING, TESTING

MERC 1100SS-950SS (1966) THUNDERBOLT IGNITION

Thunderbolt Ignition: Brown Lead - No. 1 Set of Breaker Points; White Lead - No. 2 Set of Breaker Points

IGNITION DATA

Description	Merc 1100SS-950SS
Firing Sequence	60° Consecutive
Spark Plug	L19V
Spark Plug Gap	No Adjustment
Timing	.275" (36½°) BTDC
Breaker Point Setting	45° Dwell
Full Throttle RPM	4800-5200
Idle RPM	550

Metric Conversion: 1" = 25.4mm

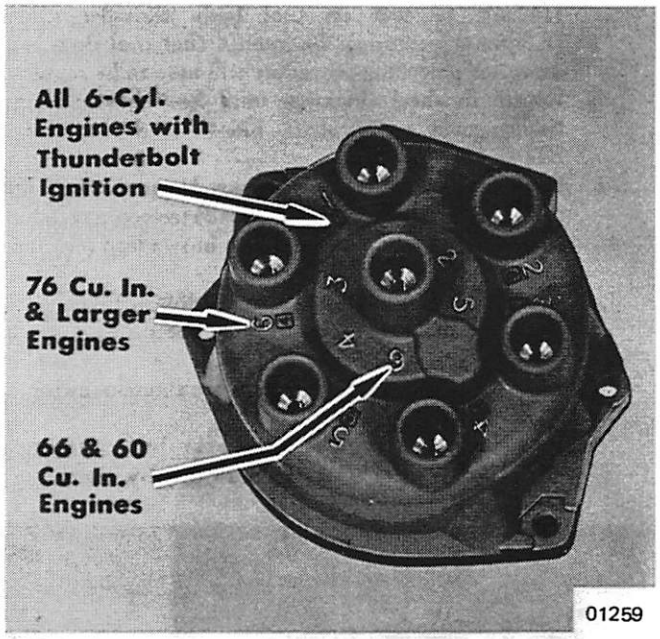


Figure 1. Distributor (Use Numbers Enclosed in Square)

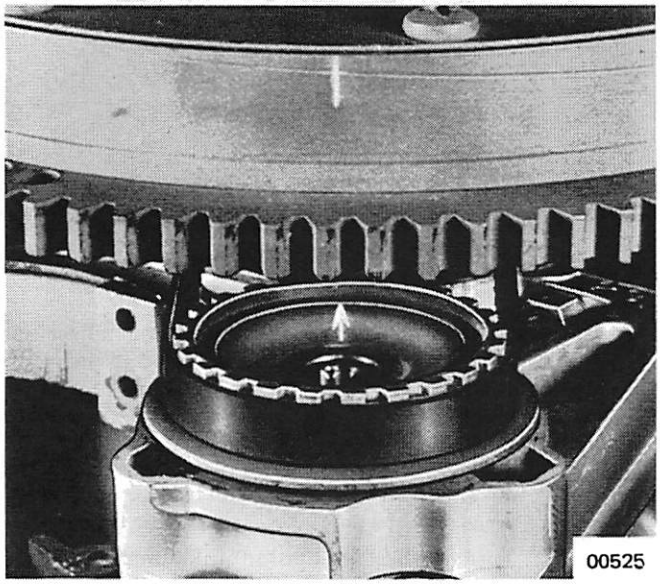


Figure 2. Timing Marks on Flywheel and Pulley

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, DISTRIBUTOR PULLEY and BELT ASSEMBLY

1. Rotate flywheel until timing mark (a straight line stamped on upper surface) is aligned with arrow on pulley (not plate). (Figure 2)
2. Install timing belt, plate, cap, washers and screw and tighten to 60 in. lbs. (10.65kg/cm).

DISTRIBUTOR DRIVE COUPLING

1. When distributor is reassembled to engine, flywheel and distributor pulley should be aligned as explained in the preceding. The radius of the tang at drive end of distributor shaft should point forward (direction engine will travel when distributor is bolted in place). (Figure 3)

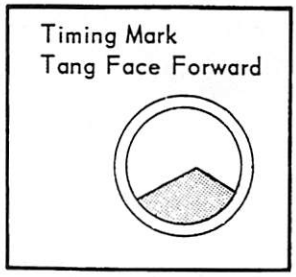


Figure 3. Tang Facing Forward

2. Secure distributor adaptor with 4 hex head cap screws.

SPARK ADVANCE ADJUSTMENT

1. Using Timing Lite (C-91-35507)
   a. Place Timing Lead (C-91-39212) on No. 1 spark plug. Connect large red lead to timing lead and connect black lead to ground terminal on bottom cowl or front cover plate (Figure 4) and red lead to hot side of starter solenoid.

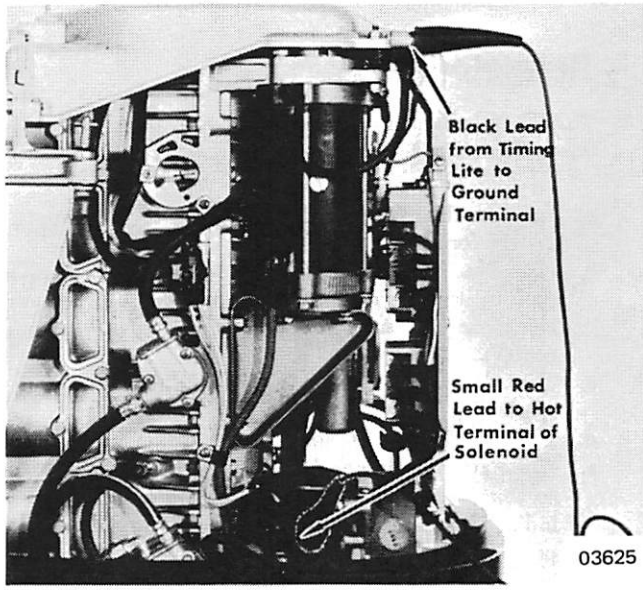


Figure 4. Black Lead Connected to Ground Terminal

b. Depress button on timing lite and, if properly connected, the timing lite will "buzz".
c. Before starting engine, be certain that all connections are made.
d. Start engine and permit it to run for a few minutes.
e. While holding the timing lite in line with degree marking on top cowl support frame, advance throttle until timing mark on flywheel is aligned with the 36½° mark on timing decal.
f. Adjust advance stop screw in or out until correct timing is obtained.
g. Tighten nut and recheck timing.
h. Return throttle lever to neutral position.

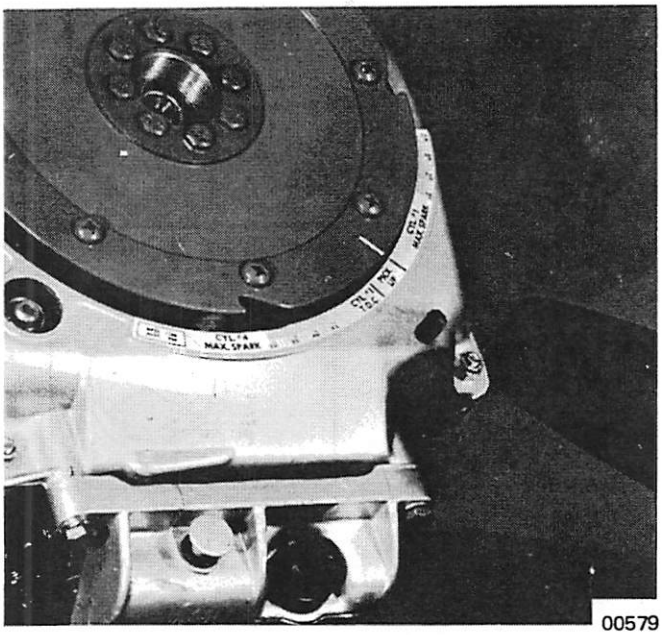


Figure 5. Spark Advance Adjustment

i. Pickup plate adjustment
   1) Using timing lite, advance throttle until line on flywheel aligns with throttle pickup line on timing decal. (Figure 5) At this point, carburetor pickup should just touch carburetor cluster.
   2) Loosen screws, which hold throttle pickup plate, and adjust if necessary. (Figure 6)

2. Mechanical Adjustment

NOTE: Disconnect battery leads and remove distributor leads (brown and white) from terminal "A".

a. Position distributor air vent elbow to face approximately forward.
b. Place No. 1 piston at .275" (6.985mm) (36½°) BTDC (before top dead center) by rotating flywheel in a clockwise (forward) direction from BDC (bottom dead center).
c. Thread Timing Gauge (C-91-30292A1) into No. 1 spark plug hole.
d. Turn flywheel until No. 1 piston strikes timing gauge.
e. While turning flywheel, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing gauge is set at top dead center position.

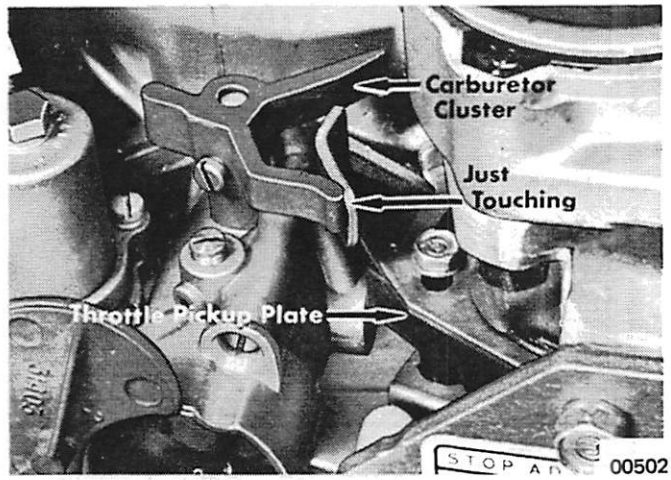


Figure 6. Throttle Pickup Tab Adjustment

f. Rotate flywheel clockwise 1/4-turn.
g. Depress center shaft of timing gauge and rotate 1/4-turn to seat on tool body shoulder (.275" [6.985mm]position). Be careful that tool does not move, or preceding procedure will have to be repeated.
h. Rotate flywheel clockwise until No. 1 piston strikes timing gauge center shaft. This is .275" (6.985mm) BTDC.
i. Connect one test lead of Timing Meter (C-91-22966) or Magneto Analyzer (C-91-25213) (selector switch on No. 2 Distributor Resistance) to brown lead (No. 1 set of breaker points).
j. Attach second lead of tester to distributor frame.
k. Retard distributor against "Idle Speed" stop screw. (Figure 7)
l. Turn distributor rotor slowly counterclockwise to touch drive coupling.
m. Turn distributor (holding rotor) slowly counterclockwise until points break, as indicated by timing unit used.

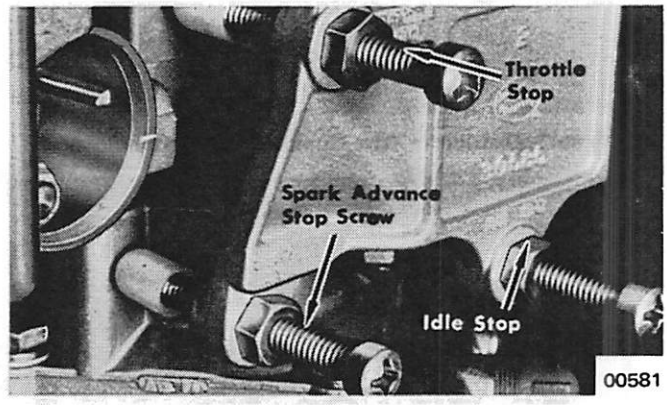


Figure 7. Idle Stop Screw

n. Hold distributor in this position and adjust spark advance stop screw to just touch pilot assembly, then tighten locknut.
o. Recheck steps "k", "l" and "m" to be certain that adjustment is correct.
p. Pickup plate adjustment
   1) Thread .015" (.381mm) Timing Gauge (C-91-31161A1) into No. 3 spark plug hole.
   2) Turn flywheel until piston strikes timing gauge.

3) While turning flywheel, thread timing gauge in or out so that piston can "rock" over center shaft of gauge, indicating that timing gauge is set at top dead center (TDC) position.
4) Rotate flywheel clockwise 1/4-turn.
5) Depress center shaft of timing gauge and rotate 1/4-turn to seat on tool body shoulder (.015" [.381mm] BTDC). Be careful that tool body does not move, or preceding steps will have to be repeated.
6) Continue to rotate flywheel clockwise until piston strikes timing gauge.
7) Connect one test lead of Timing Meter (C-91-22966) or Magneto Analyzer (C-91-25213) (selector switch on No. 2, Distributor Resistance) to brown lead (No. 1 set of breaker points).
8) Attach second lead of tester to distributor frame.
9) Retard distributor against idle stop screw.
10) Turn distributor rotor slowly counterclockwise to touch drive coupling.
11) While holding rotor in this position, rotate distributor slowly counterclockwise until points break.
12) Loosen throttle pickup plate screws. (Figure 6)
13) Slide throttle pickup plate so that first throttle tab (without nylon sleeve) just touches carburetor cluster. (Figure 6)
14) Tighten throttle pickup plate screws.
15) Turn distributor against .275" (6.985mm) ("Spark Advance") stop.
16) Bend second throttle pickup pin (with nylon sleeve) against carburetor cluster (.000" to .015" [.381mm]gap). (Figure 8)
17) Lubricate cam and nylon pin with New Multipurpose Quicksilver Lubricant (C-92-49588).
18) Replace distributor cap.

THROTTLE STOP ADJUSTMENTS

1. Rotate Economizer collar to wide open throttle position.

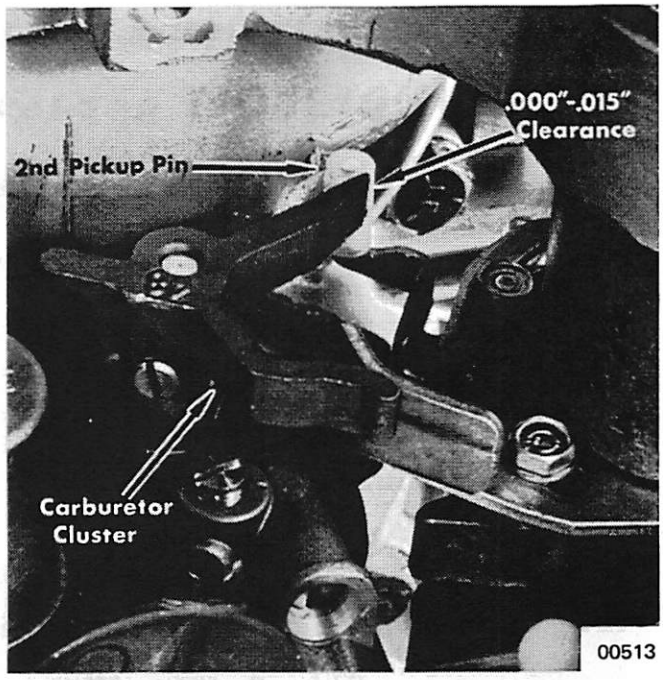


Figure 8. Second Throttle Pickup Tab Adjustment

2. Adjust "Throttle Stop" screw on stop bracket (Figure 7) to allow full throttle shutter opening but not to allow throttle shutters to act as a stop, or the carburetor cluster to hit carburetor filter bowl.
3. Idle engine and adjust "Idle Stop" screw on stop bracket (Figure 7) so that engine idles at 550 to 600 RPM in forward gear.
4. Run engine between 4500 and 5000 RPM to clear engine and recheck idle stop.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

TIMING, ADJUSTING, TESTING
THUNDERBOLT BREAKER-LESS IGNITION SYSTEM
MERC 1100SS-950SS-650SS-500SS (1967)

IGNITION DATA

Description	Merc 1100SS-950SS	Merc 650SS	Merc 500SS
Firing Sequence	60° Consecutive	90°	90°
Spark Plug	L19V	L19V	L19V
Spark Plug Gap	No Adjustment	No Adjustment	No Adjustment
Timing	36½° BTDC (.275")	38° BTDC (.300")	35° BTDC (.232")
Full Throttle RPM	4800-5200	4800-5200	5200-5600
Idle RPM	550	550	550

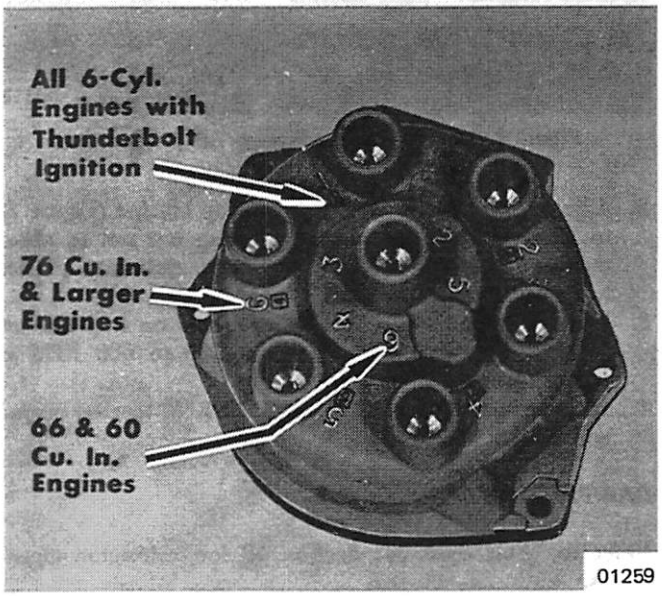


Figure 1. Six-Cylinder Distributor (Use Numbers Enclosed in Square)

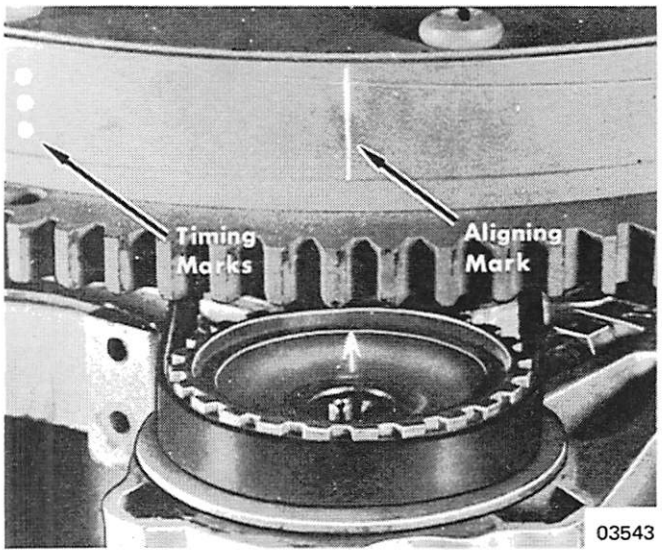


Figure 2. Alignment and Timing Marks on Flywheel and Pulley - Merc 1100SS-950SS

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, DISTRIBUTOR PULLEY and BELT ASSEMBLY

1. Merc 1100SS and 950SS: Rotate flywheel until "alignment mark" (a straight white line stamped on side surface of flywheel) is aligned with arrow on distributor pulley (not plate). (Figure 2)
2. Merc 650SS: Rotate flywheel until "timing mark" (three white dots stamped on side surface of flywheel) is aligned with arrow on distributor pulley. (Figure 3)

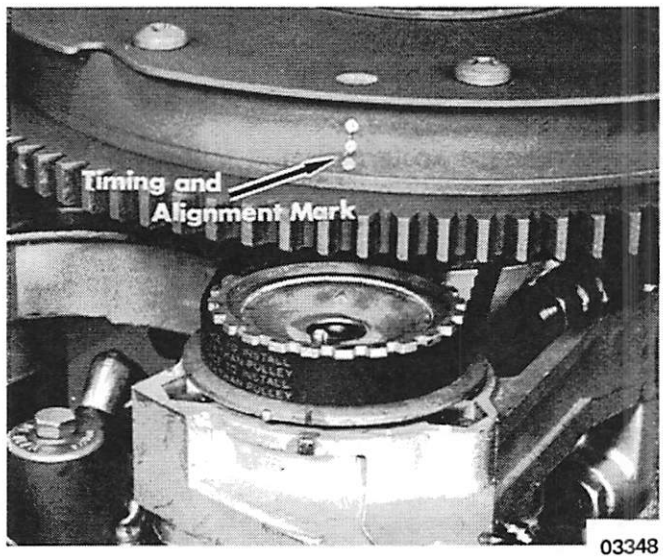


Figure 3. Alignment and Timing Marks on Flywheel and Pulley - Merc 650SS

3. Merc 500SS: Rotate flywheel until "alignment mark" (a straight white line stamped on rim of flywheel) is aligned with arrow on distributor pulley.
4. Install timing belt, plate, cap, washers and screw and tighten to 60 in. lbs. (10.65kg/cm).

NOTE: Some early engines have been timed via a different procedure, and these engines will function properly as timed. If they are timed with the above procedure, readjustment of stops and controls will be necessary.

DISTRIBUTOR DRIVE COUPLING

1. When reinstalling distributor assembly, align timing marks as described in the preceding. The distributor drive has a flat-sided tang. (Figure 4) The tang should be forward.
2. Secure distributor adaptor with 4 hex head cap screws.

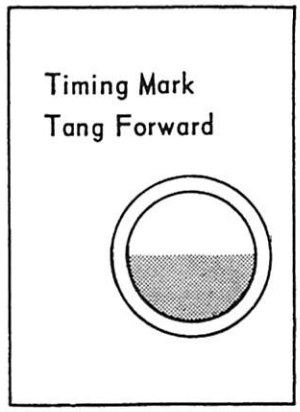


Figure 4. Tang Facing Forward

SPARK ADVANCE ADJUSTMENT

NOTE: Disconnect fuel tank from engine and run carburetors dry by running engine in test tank before performing the following checks and adjustments.

1. Disconnect throttle cable from engine.
2. Use Timing Lite (C-91-35507) for spark advance adjustment.
3. Connect large, red lead to No. 1 spark plug and connect one lead to ground terminal on bottom cowl or front cover plate (Figure 5) and one lead to hot side of starter solenoid.

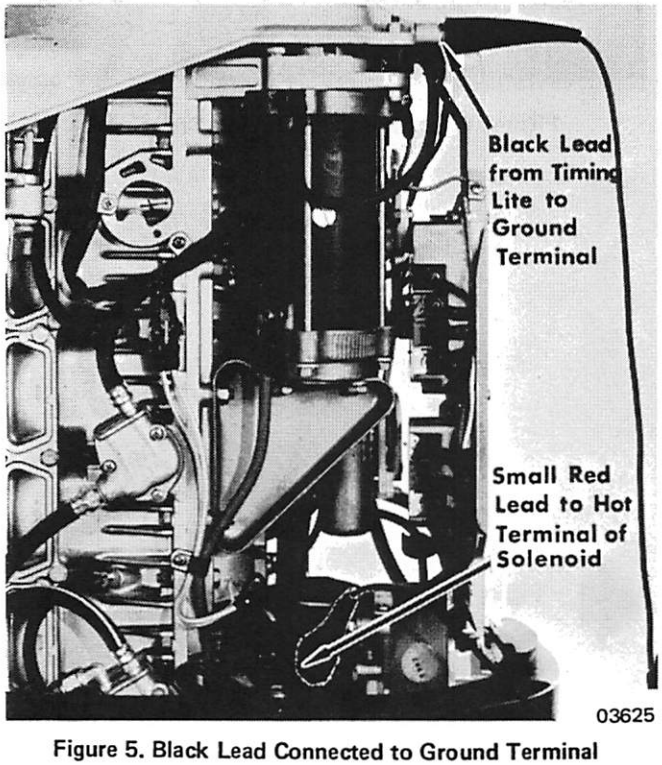


Figure 5. Black Lead Connected to Ground Terminal

4. Depress button on timing lite and, if properly connected, the timing lite will "buzz".
5. Before cranking engine, be certain that all connections are made.

NOTE: If timing adjustment is to be made without help, a remote starter button may be used to crank the engine.

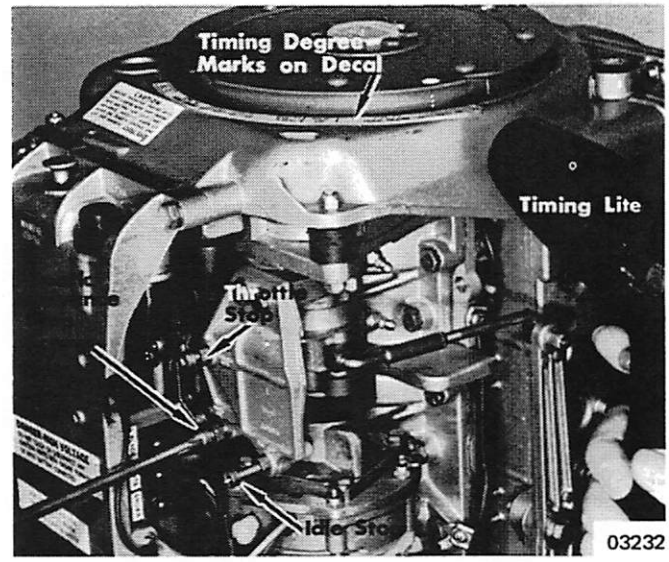


Figure 6. Spark Advance Adjustment - Merc 1100SS-950SS

6. Turn ignition key on, crank engine and hold the timing lite in line with the degree marking on the top cowl support frame. Advance the vertical lever until the timing mark (dots) on the flywheel is aligned with timing mark (36½° BTDC for Merc 1100SS-950SS, 38° for Merc 650SS or 35° for Merc 500SS) on the timing decal. (Figures 6 and 7)

NOTE: White dot on flywheel top near edge is over timing mark. It is used to locate timing mark.

Figure 7. Spark Advance Adjustment - Merc 500SS

7. Adjust spark advance stop screw (Figure 6) in or out until correct timing is obtained.
8. Tighten nut and recheck timing.
9. Pickup plate adjustment
   a. Merc 1100SS-950SS and 650SS only: Using timing lite, advance the throttle until timing mark (3 dots) on flywheel aligns with throttle pickup line on timing decal. At this point, carburetor pickup should just touch carburetor cluster (.000" to .005" [.127mm] clearance). (Figure 8)

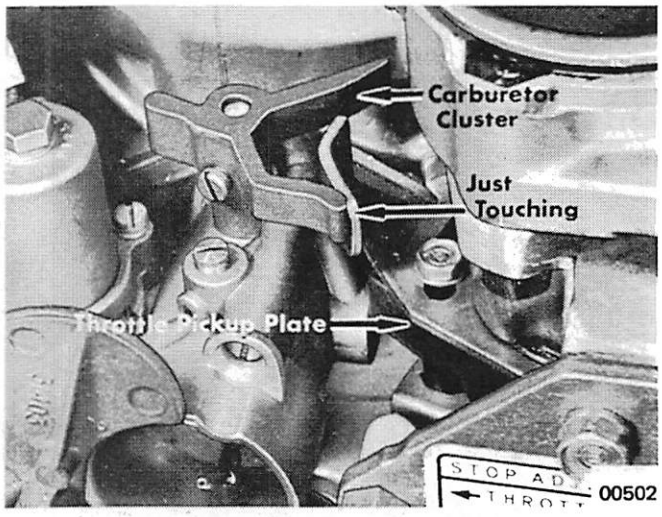


Figure 8. Throttle Pickup Tab Adjustment

b. Merc 500SS only: Using timing lite, advance throttle until timing marks (2 dots) on flywheel align with cylinder No. 1 TDC line on timing decal. At this point, carburetor pickup should just touch carburetor cluster (.000" to .005" [.127mm] clearance). (Figure 8)
c. Loosen screws, which hold throttle pickup plate, and adjust if necessary. (Figure 8)
d. Without running engine, rotate distributor against spark advance stop. (Figure 6)
e. Bend second throttle pickup pin (if necessary) so that it touches carburetor cluster (.000" to .015" [.381mm] gap). (Figure 9)
f. Lubricate nylon pin with New Quicksilver Multipurpose Lubricant (C-92-49588).

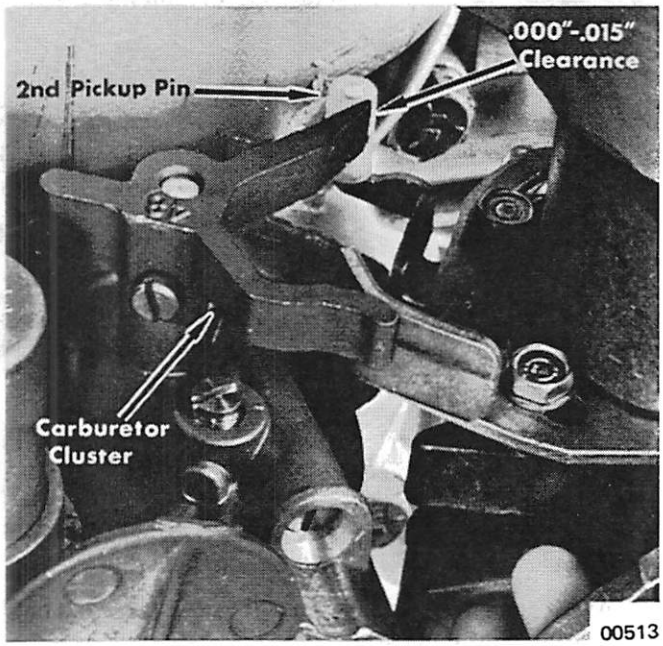


Figure 9. Second Throttle Pickup Tab Adjustment

THROTTLE STOP ADJUSTMENTS

1. Rotate Economizer collar to wide open throttle position.
2. Adjust "Throttle Stop" screw on stop bracket (Figure 6) to allow full throttle shutter opening but not to allow throttle shutters to act as a stop, or the carburetor cluster to hit carburetor filter bowl.
3. Idle engine and adjust "Idle Stop" screw on stop bracket (Figure 10) so that engine idles at 550 RPM in forward gear.
4. Run engine between 4500 and 5000 RPM to clear engine and recheck idle stop.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

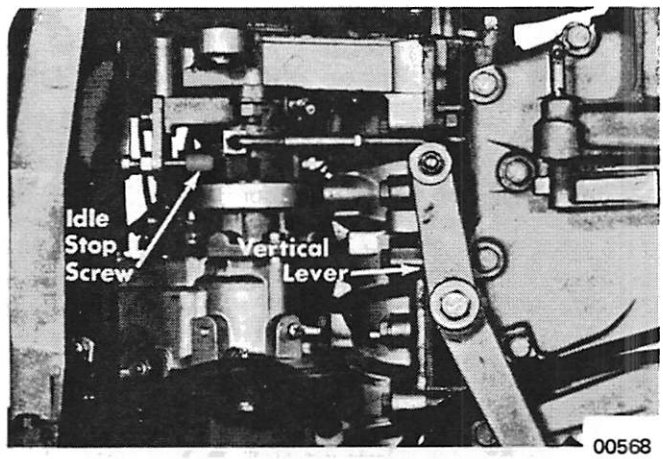


Figure 10. Vertical Lever and Idle Stop Screw

TIMING, ADJUSTING, TESTING
MERC 1250SS and 1000SS (1968-69) MODELS
THUNDERBOLT BREAKER-LESS IGNITION SYSTEM

IGNITION DATA

Description	Merc 1250SS	Merc 1000SS
Firing Sequence	60° Consecutive	60° Consecutive
Spark Plug	L19V or AC-V40FF	L19V or AC-V40FF
Spark Plug Gap	No Adjustment	No Adjustment
Timing	34° BTDC	36½° BTDC
Throttle Pickup - Primary	7°-9°	5° - 7°
Full Throttle RPM	4800-5200	4800-5200
Idle RPM	550-600	550-600

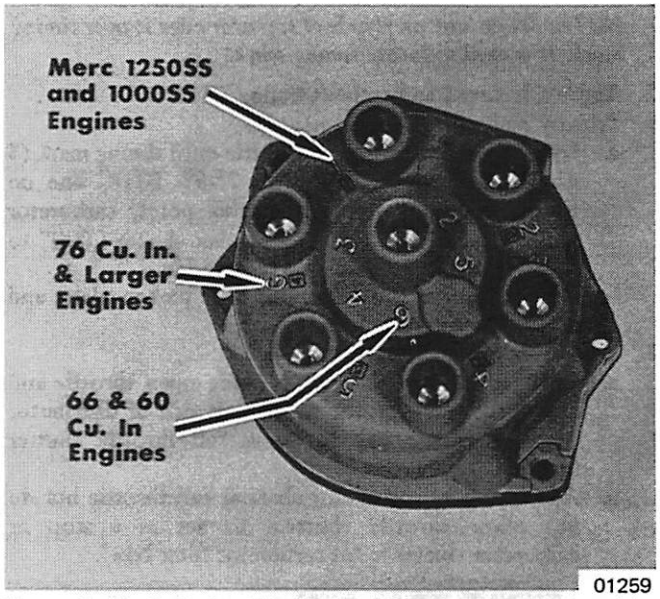


Figure 1. Six-Cylinder Distributor (Use Numbers Enclosed in Squares)

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, DISTRIBUTOR and BELT ASSEMBLY

1. Rotate flywheel until "alignment mark" (a straight white line stamped on side surface of flywheel) is aligned with arrow on distributor pulley (not plate). (Figure 2)

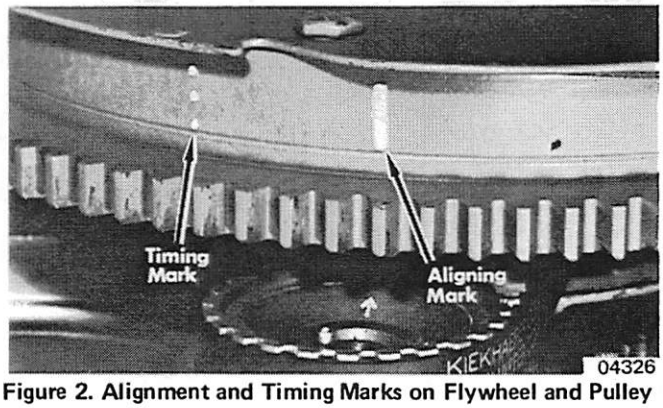


Figure 2. Alignment and Timing Marks on Flywheel and Pulley - Merc 1250SS-1000SS

2. Install timing belt, plate, cap, washers and screw and tighten to 60 in. lbs. (10.65kg/cm).

DISTRIBUTOR DRIVE COUPLING

1. When reinstalling distributor assembly, align timing marks as described in the preceding. The distributor drive has one tooth omitted (or space) on each shaft for easy installation. The space should face forward. (Figure 3)
2. Secure distributor adaptor with 4 hex head cap screws.

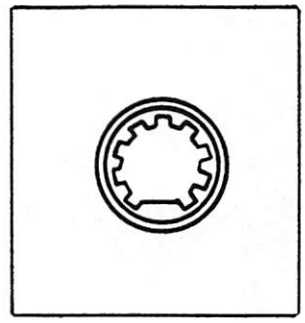


Figure 3. Space Facing Forward

CONNECTING TIMING LITE

NOTE: Disconnect fuel tank from engine and run carburetors dry by running engine in test tank before performing the following checks and adjustments.

1. Disconnect throttle cable from engine.
2. Use Timing Lite (C-91-35507) for spark advance adjustment.

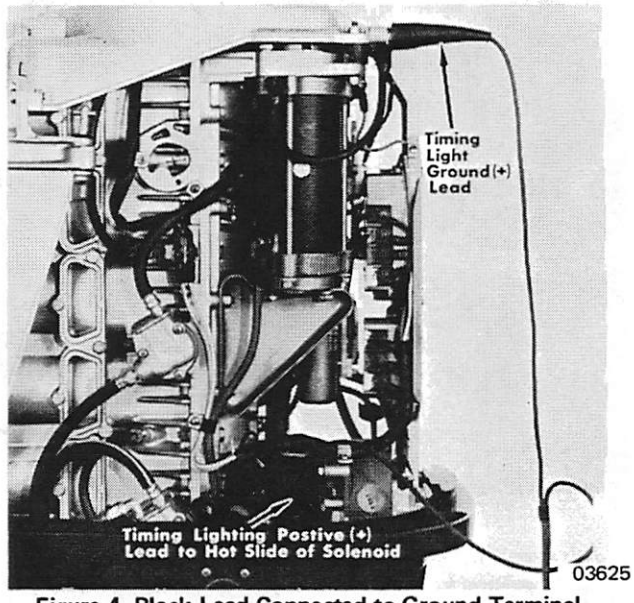


Figure 4. Black Lead Connected to Ground Terminal

3. Connect large, red lead to No. 1 spark plug and connect one lead to ground terminal on bottom cowl or front cover plate (Figure 4) and one lead to hot side of starter solenoid.
4. Depress button on timing lite and, if properly connected, the timing lite will "buzz".

5. Before cranking engine, be certain that all connections are made. If timing adjustment is to be made without help, use remote starter switch (C-91-52024A1) to crank the engine.

SPARK ADVANCE ADJUSTMENT

MERC 1250SS

1. Back the throttle stop screw out all the way. (Figure 5)

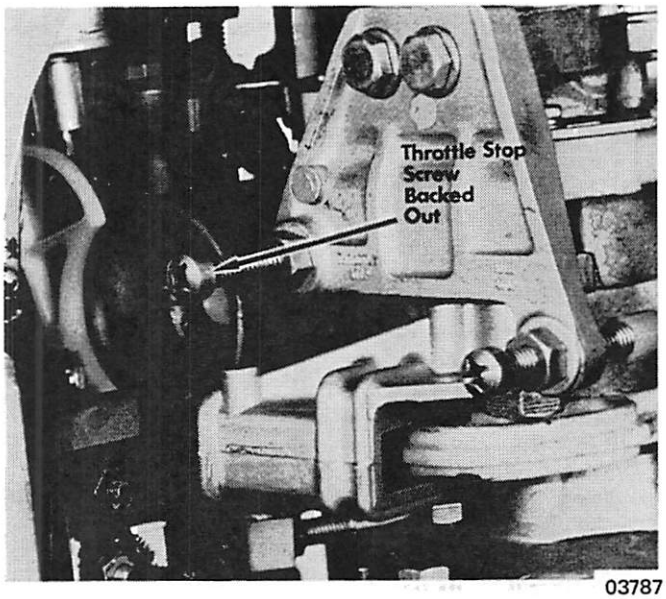


Figure 5. Throttle Stop Screw

2. Advance the vertical lever to wide open throttle and adjust the throttle stop screw until it touches the throttle stop. (Figure 6)
3. Turn the throttle stop screw in 3/4 additional turn to prevent forcing linkage.

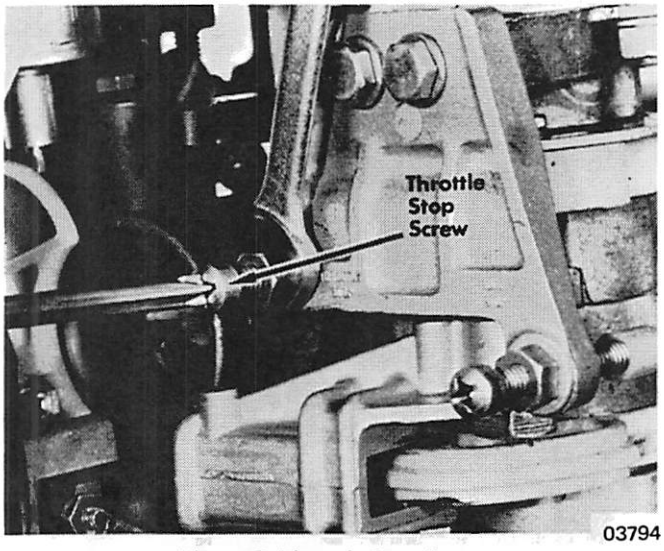


Figure 6. Throttle Stop Screw

4. Advance the vertical lever to wide open throttle position. Turn ignition key on, crank engine and hold the timing lite in line with the degree marking on the top cowl support frame. Adjust spark advance linkage (Figure 8) in or out until the timing mark (dots) on the flywheel are aligned with the 34° BTDC timing mark on the timing decal. (Figure 7)

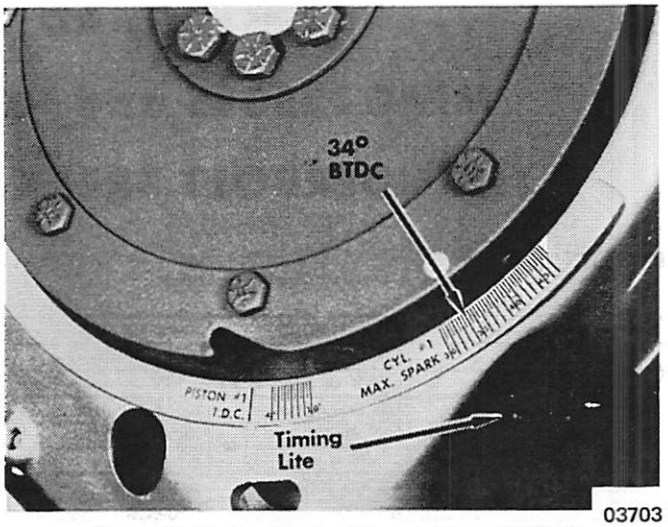


Figure 7. Timing Marks Aligned (Merc 1250SS)

NOTE: White dot on flywheel top near edge is over timing mark. It is used to locate timing mark.

5. Tighten locknuts and recheck timing.
6. Primary pickup plate adjustment
   a. Using timing lite, advance throttle until timing mark (3 dots) on flywheel align with 7°-9° BTDC line on timing decal. (Figure 9) At this point, carburetor pickup should just touch carburetor cluster (.000" to .005" [.127mm] clearance). (Figure 10)
   b. Loosen screws, which hold throttle pickup plate, and adjust if necessary.
7. Secondary pickup adjustment
   a. Advance the vertical lever to wide open throttle and adjust the screw on the nylon (left side of distributor adaptor, Figure 11) to allow full throttle shutter opening.
   b. Allow play in carburetor shaft at full throttle but do not allow throttle shutters to act as a stop or carburetor cluster to hit carburetor filter bowl.

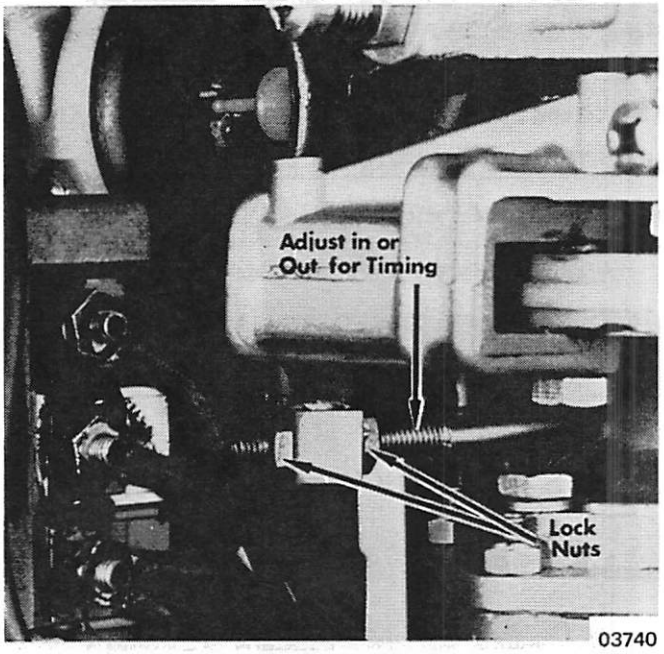


Figure 8. Spark Advance Linkage

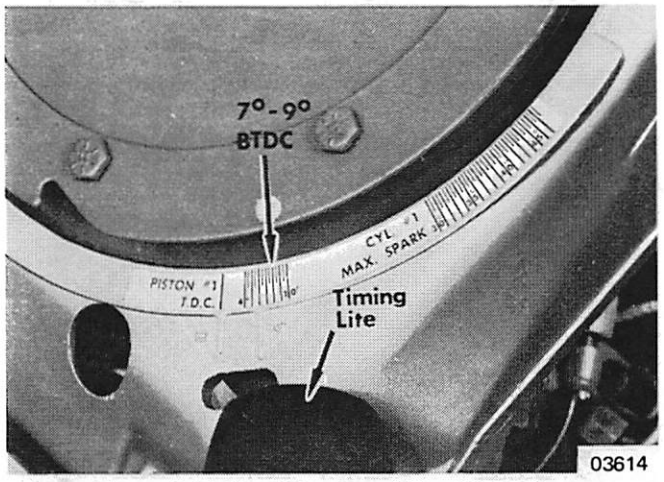


Figure 9. Timing Alignment (Merc 1250SS)

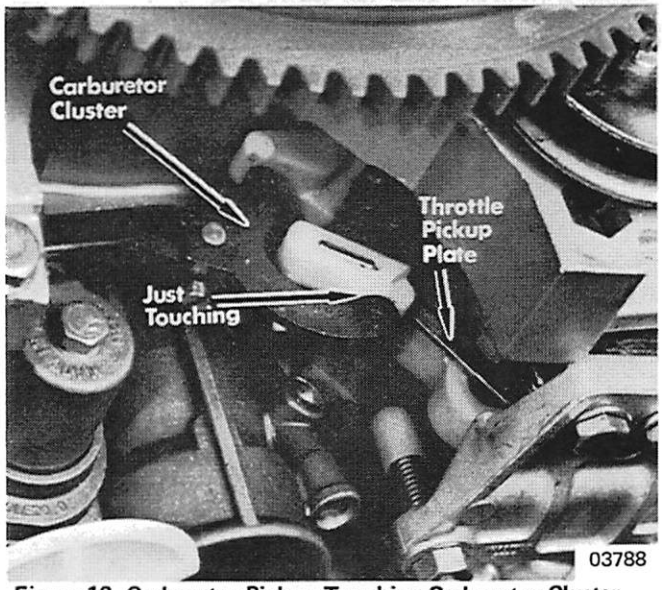


Figure 10. Carburetor Pickup Touching Carburetor Cluster

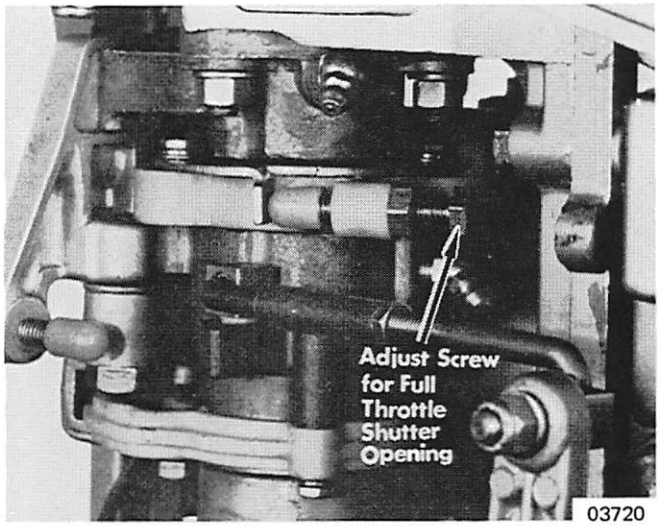


Figure 11. Adjustment Screw (Merc 1250SS)

1. Turn ignition key on, crank engine and hold timing lite in line with degree marking on top cowl support frame. Advance the vertical lever until timing mark (dots) on the flywheel are aligned with timing mark (36½° BTDC) on timing decal. (Figure 12)

   NOTE: White dot on flywheel top near edge is over timing mark. It is used to locate timing mark.

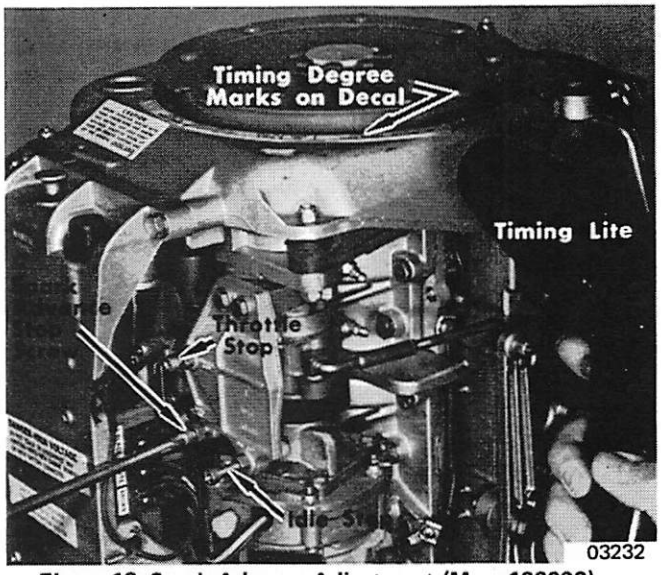


Figure 12. Spark Advance Adjustment (Merc 1000SS)

2. Adjust spark advance stop screw (Figure 12) in or out until correct timing is obtained.
3. Tighten nut and recheck timing.
4. Pickup plate adjustment
   a. Using timing lite, advance throttle until timing mark (3 dots) on flywheel align with 5°-7° BTDC line on timing decal. At this point, carburetor pickup should just touch carburetor cluster (.000" to .005" [.127mm] clearance). (Figure 13)

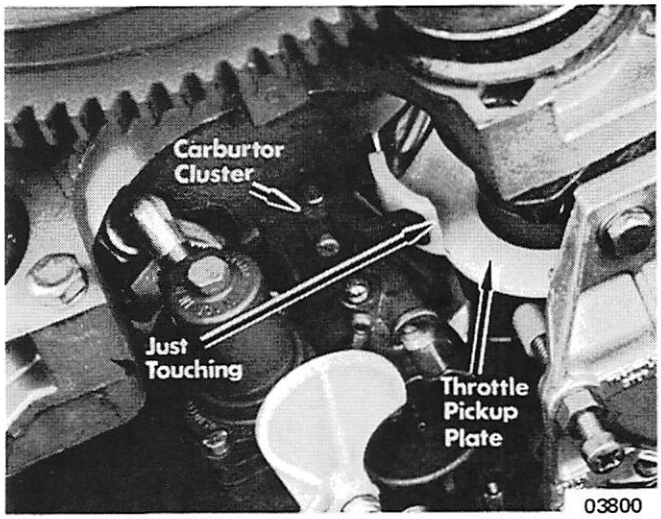


Figure 13. Throttle Pickup Tab Adjustment (Merc 1000SS)

b. Loosen screws, which hold throttle pickup plate, and adjust if necessary. (Figure 13)

c. Without running engine, rotate distributor against spark advance stop. (Figure 14) Adjust secondary pickup with screw on throttle actuator plate. Turn screw until it just touches secondary pickup arm on carburetor cluster. Tighten jam nut.

THROTTLE STOP ADJUSTMENTS

1. Rotate Economizer collar to wide open throttle position.
2. Adjust "throttle stop" screw on stop bracket (Figure 12) to allow full throttle shutter opening but not to allow throttle shutters to act as a stop or the carburetor cluster to hit carburetor filter bowl.
3. Idle engine and adjust "idle stop" screw on stop bracket so that engine idles at 500 to 550 RPM in forward gear.
4. Run engine between 4500 and 5000 RPM to clear engine and recheck idle stop.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

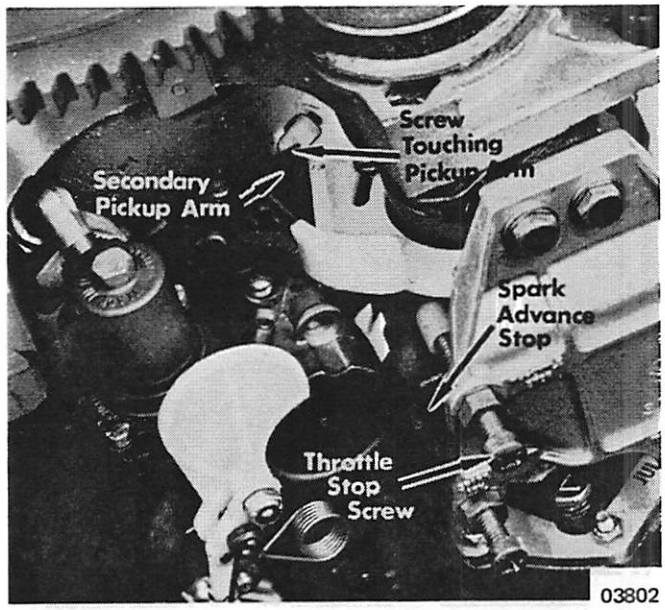


Figure 14. Secondary Pickup Adjustment

TIMING, ADJUSTING, TESTING

MERC 1500 (Below Serial No. 3628318)-1400-1350-1150

IGNITION DATA

Description	Merc 1500-1400-1350-1150
Firing Sequence	60° Consecutive
Spark Plug - Std. Install.	AC-V40FFM or L-77V
Spark Plug Gap	No Adjustment
Timing - Maximum	23° BTDC*
Throttle Pickup - Primary	See Note Below
Full Throttle RPM	4800-5300 (Merc 1500 & 1400 4800-5800)
Idle RPM	550-600

** Merc 1500 Only: 23° BTDC in U.S. and Canada; 21° BTDC Elsewhere*

NOTE: Up to Serial No. 2928768 - 5° to 7° BTDC
Serial No. 2928768 and Up - TDC to 2° BTDC

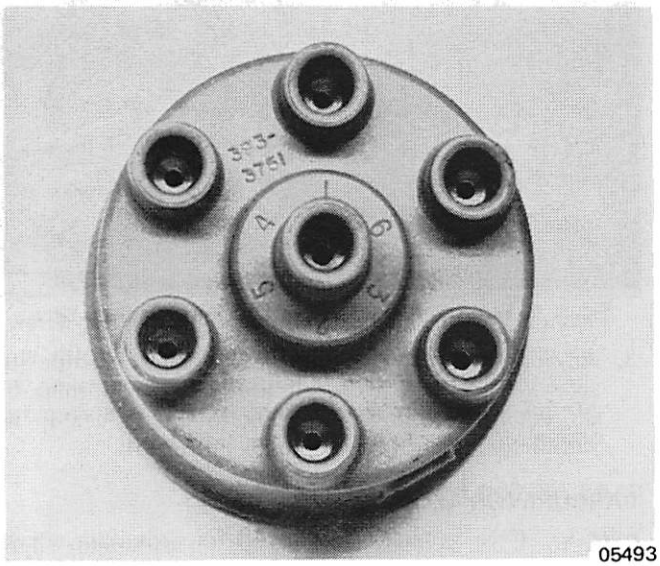


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Figure 1. Six Cylinder Distributor Cap

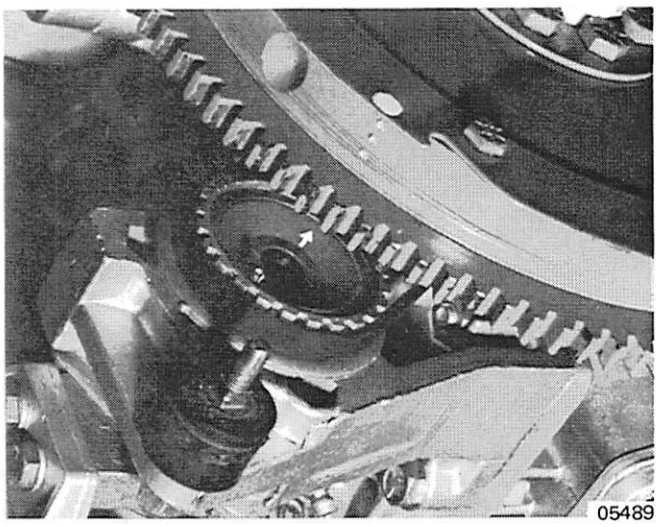
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Figure 2. Alignment and Timing Marks on Flywheel and Pulley

TIMING and LINKAGE ADJUSTMENT

FLYWHEEL, DISTRIBUTOR and BELT ASSEMBLY

1. Rotate flywheel until "alignment mark" (white dot and punch marks stamped on side surface of flywheel) is aligned with arrow on distributor pulley (not plate). (Figure 2)
2. Install timing belt, plate, cap, washers and screw and tighten to 60 in. lbs. (10.65kg/cm).

CONNECTING TIMING LITE

1. Connect throttle cable to engine.
2. Use Timing Lite (C-91-35507) for spark advance adjustment.
3. Connect large, red lead to No. 1 spark plug and connect one lead to ground terminal on bottom cowl or front cover plate and one lead to hot side of starter solenoid.
4. Depress button on timing lite and, if properly connected, the timing lite will "buzz".
5. Before cranking engine, be certain that all connections are made. If timing adjustment is to be made without help, use remote starter switch (C-91-52024A1) to crank the engine.

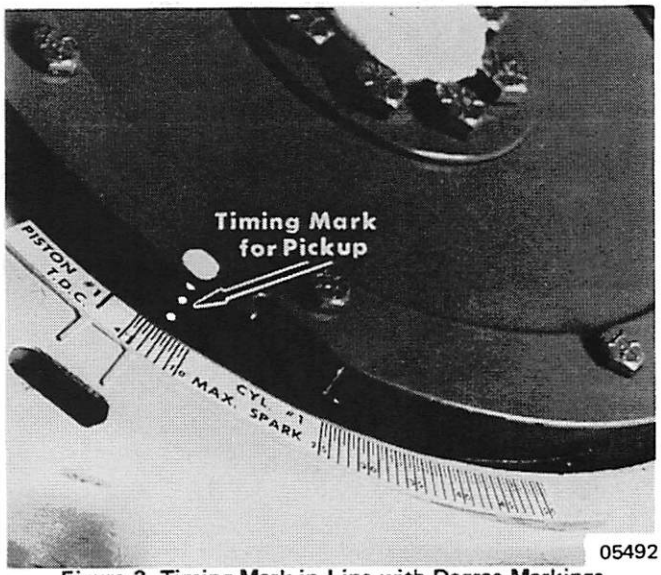

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Figure 3. Timing Mark in Line with Degree Markings

PRIMARY THROTTLE PICKUP ADJUSTMENT

1. With timing lite installed, turn ignition key on and start engine. Hold timing lite in line with degree markings on top cowl support frame (Figure 3) and advance throttle until timing mark (3 dots) aligns on timing decal at 5°-7° BTDC (up to Serial No. 2928768) or TDC to 2° BTDC (Serial No. 2928768 and up).
2. With flywheel timing mark aligned as above, the primary pickup should just touch carburetor cluster. (Figure 4)
3. Loosen screws which hold throttle pickup plate and adjust if necessary. Tighten screws after adjusting.

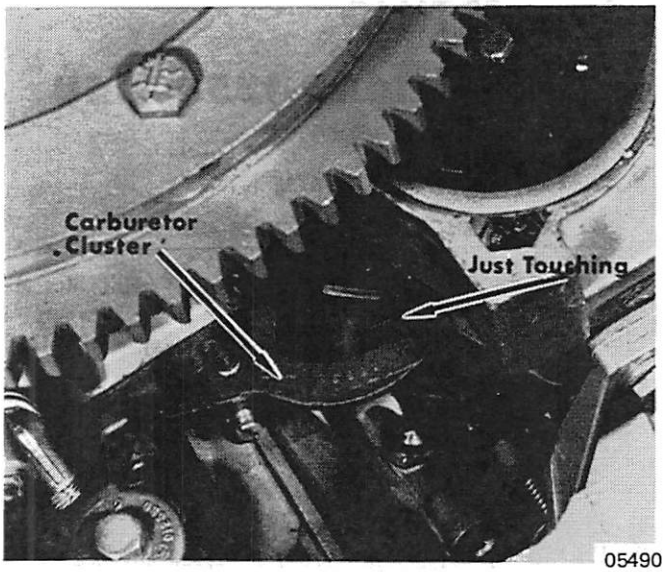


Figure 4. Primary Pickup and Carburetor Cluster

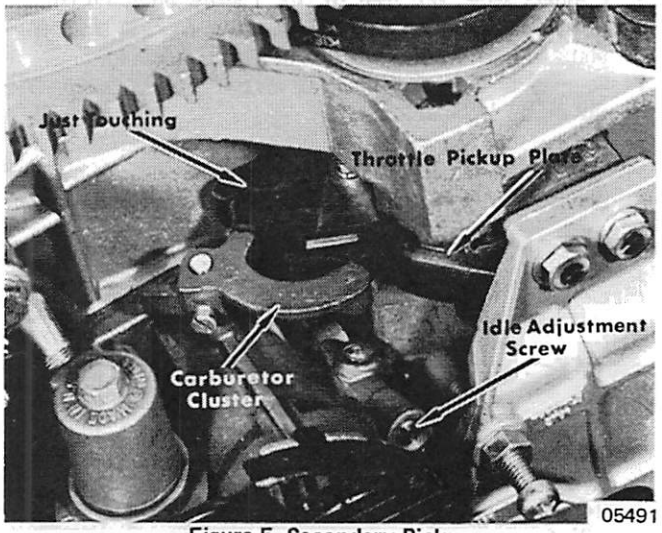


Figure 5. Secondary Pickup

MAXIMUM THROTTLE PICKUP

1. With engine running and timing lite attached, advance distributor until timing mark (3 dots) aligns with 23° on timing decal and adjust the maximum spark advance screw to just touch distributor. Tighten locknut. Stop engine and remove timing lite.
2. With distributor against spark advance screw, but not actuating Economizer collar spring, adjust throttle pickup screw on throttle actuator (Figure 6) so that it just touches secondary pickup on carburetor cluster. (Figure 5) Tighten locknut.

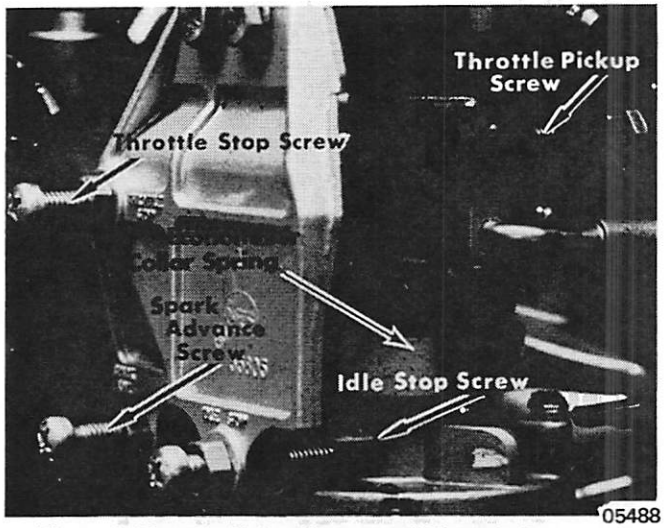


Figure 6. Throttle Pickup Screw and Throttle Stop Screw

3. Advance to wide open throttle and adjust throttle stop screw (Figure 6) to allow full throttle shutter opening, but do not allow throttle shutters to act as a stop nor carburetor cluster to hit carburetor filter bowl.

CARBURETOR ADJUSTMENTS

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

TIMING, ADJUSTING, TESTING
MERC 110-75-40 (1973)
WITH PHASE MAKER IGNITION

IGNITION DATA

Description	Merc 40 (1973)	Merc 75 (1973)	Merc 110 (1973)
Firing Sequence	Single Cylinder	Alternate Firing	Alternate Firing
Spark Plug	AC-V40FFK & L78V	AC-V40FFK & L78V	AC-V40FFK & L78V
Spark Plug Gap	Not Adjustable	Not Adjustable	Not Adjustable
Timing Max. Advance	.198" BTDC*	.193" BTDC* 34° BTDC§	.193" BTDC* 34° BTDC§
Throttle Pickup	5° ATDC	7° ATDC* 6°ATDC§	7° ATDC* 6° ATDC§
Maker Point Setting	.020"	.020"	.020"
Full Throttle RPM	4500-5500	4500-5000	5000-5400
Idle RPM	650-700 in Forward Gear	500-750 in Forward Gear	500-600 in Forward Gear

**Engine Stopped* §*Engine Running* *Metric Conversion: 1" = 25.4 mm*

TIMING and PICKUP ADJUSTMENT

MERC 40 (Engine Stopped)

1. Shift outboard into forward gear.
2. Remove rewind starter, flywheel and module cover to expose contact point. (Figure 1)

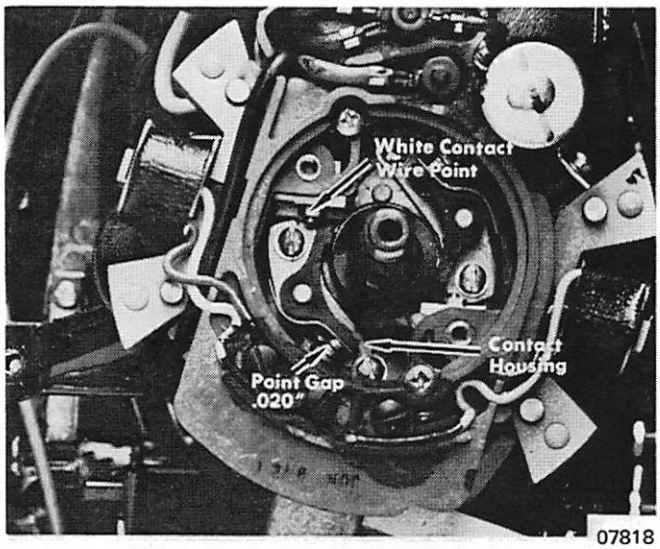


Figure 1. Checking Contact Point Gap

3. Rotate crankshaft to position contact point cam follower at high point on cam. (Figure 2) Adjust point to .020". (Figure 1) Reinstall flywheel assembly.
4. Remove spark plug and install Dial Indicator (C-91-58222).
5. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator at 0°.
6. Rotate crankshaft counterclockwise to place dial at .198" BTDC. (Figure 3)

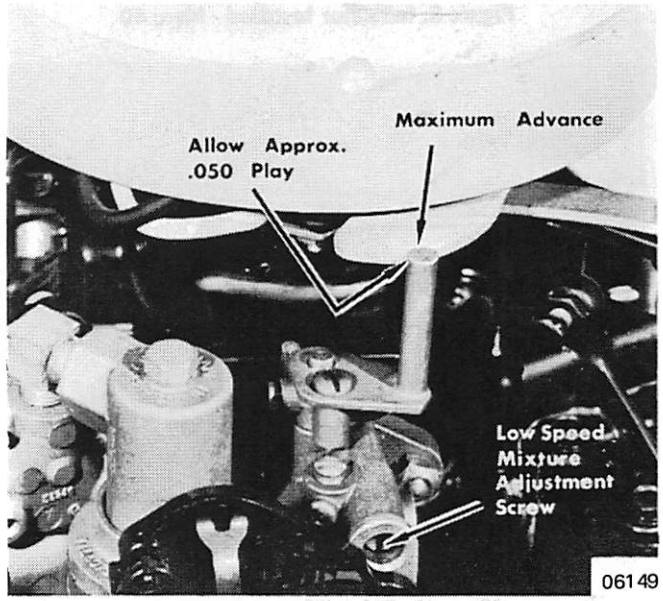


Figure 2. Maximum Stator Plate Advance - Merc 40

7. Turn twist grip to open throttle to maximum spark advance point. (Figure 5)
8. Connect one meter lead to white contact lead and other meter lead to contact housing arm. (Figure 1)
9. Adjust maximum advance stop screw so that meter indicates point just opens by .198" BTDC. Tighten stop screw locknut.
10. Adjust throttle lever to allow approximately .050" play between throttle lever and throttle cam. (Figure 5)
11. Rotate crankshaft clockwise to place dial at .005" ATDC.
12. Close throttle with twist grip until meter indicates point just opens. Adjust throttle cam to just touch lever. (Figure 4)
13. Remove meter and dial indicator and reinstall spark plug.

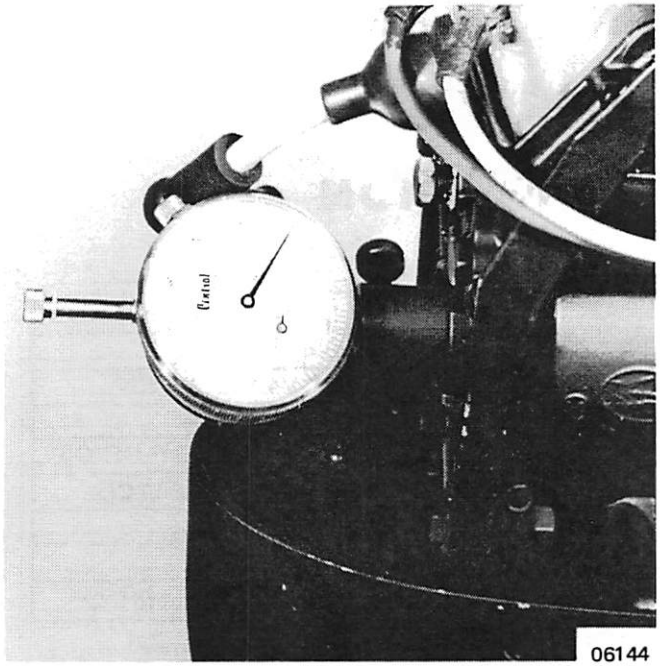


Figure 3. Indicator Installed - Merc 40

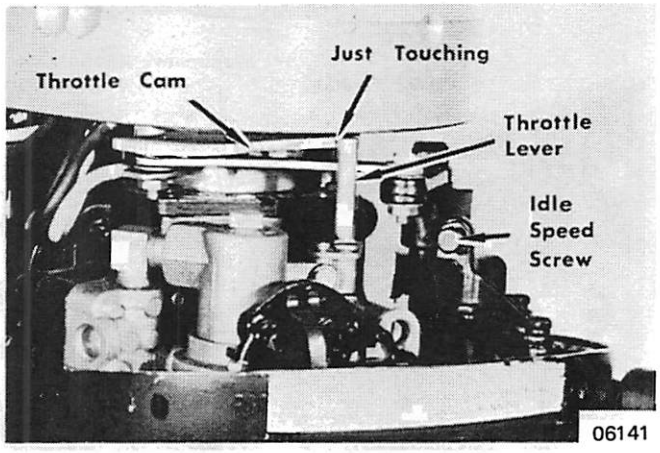


Figure 4. Throttle Pickup Adjustment - Merc 40

MERC 110 and 75 (Engine Stopped)

1. Shift outboard into forward gear.
2. Remove rewind starter, flywheel and module cover to expose contact points.
3. Rotate crankshaft to position contact point cam follower at high point on cam. Adjust point to .020". Repeat procedure on second set of points.
4. Refer to "Point Synchronization", Section 3 Part D, and synchronize points at this time.
5. Reinstall flywheel assembly.
6. Remove No. 1 spark plug and install Dial Indicator (C-91-58222).
7. Rotate crankshaft clockwise to determine TDC of piston and set dial indicator at 0 °.
8. Rotate crankshaft counterclockwise to place dial at .193" BTDC.
9. Turn twist grip to open throttle to maximum spark advance point. (Figure 5)
10. Connect one meter lead to white contact lead and other meter lead to contact housing arm.
11. Adjust maximum advance stop screw so that meter indicates point just close by .193" BTDC. Tighten stop screw locknut.
12. Rotate crankshaft until dial indicator reads .007" ATDC.
13. Close throttle with twist grip until meter indicates point just opens. Adjust throttle cam to just touch throttle lever. (Figure 6)
14. Remove meter and dial indicator and reinstall spark plugs.

MERC 110-75-40 (Engine Running)

1. Adjust contact points as described in previous paragraph.
2. Place engine in test tank and hook up fuel line.
3. Install Timing Lite (C-91-35507) by connecting large red lead to No. 1 spark plug and connect one small lead to negative (-) battery post and other small lead to positive (+) post.
4. Start engine and hold timing lite in line with degree markings on top cowl support frame.
5. Open throttle with twist grip to align timing mark on flywheel with specified BTDC mark on cowl frame and adjust screw and locknut on throttle control link rod.
6. While holding timing lite in line with degree markings, close throttle with twist grip until timing mark on flywheel aligns ATDC as specified. Adjust carburetor pickup plate until plate just touches.
7. Stop engine and remove timing lite.
8. Turn twist grip to full throttle.

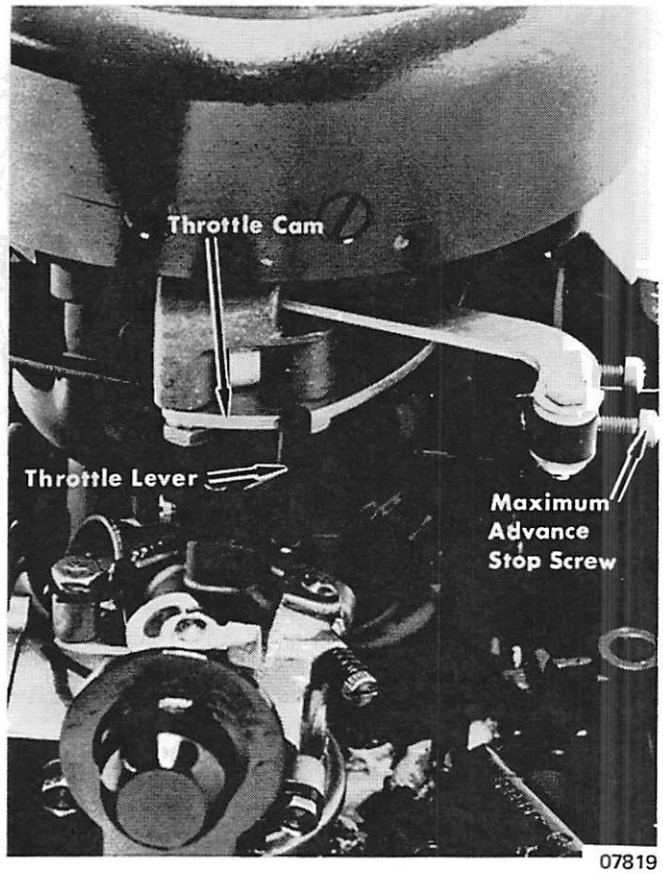


Figure 5. Maximum Spark Advance - Merc 110-75

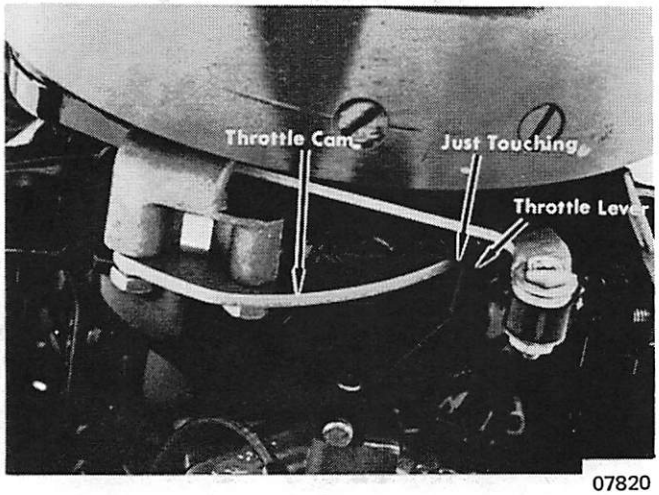
CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

MAXIMUM NEUTRAL RPM and TILLER HANDLE ADJUSTMENT

IDLE SPEED ADJUSTMENT

NOTE: Steps 1 and 2 apply to Merc 110 and 75 only.



07820

Figure 6. Throttle Pickup Adjustment - Merc 110-75

1. Shift into neutral gear.
2. Adjust neutral speed limiter stop to obtain a maximum speed of 2400-2700 RPM. (Figure 7)
3. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 8)
4. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

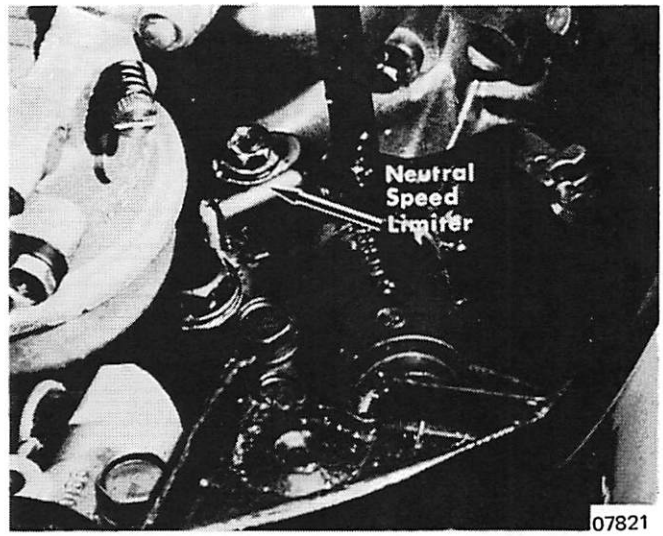


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Figure 7. Maximum Neutral RPM - Merc 110-75

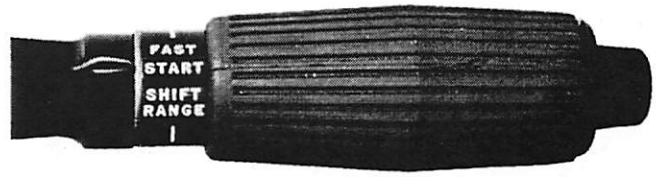

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Figure 8. "Start" Position Adjustment

TIMING, ADJUSTING, TESTING

MERC 200 with BREAKER-LESS THUNDERBOLT IGNITION

IGNITION DATA

Description	Merc 200
Firing Sequence	Alternate Firing
Spark Plug	AC-V40FFK or Champion L-78V
Spark Plug Gap	Polar Gap
Timing	33° BTDC
Throttle Pickup - Primary	2° BTDC to 2° ATDC *
Full Throttle RPM	5000 to 5400
Idle RPM	550 to 650 in Gear

** 3° to 7° BTDC above Serial No. 4102790*

TIMING and PICKUP ADJUSTMENT

Use "Engine Stopped" OR "Engine Running" method, following.

> CAUTION: If engine is timed, using "Engine Stopped" method, it MUST BE re-checked, using "Engine Running" method, which follows.

ENGINE STOPPED

1. Remove front cowl and wrap-around cowl. Remove nuts which hold top cowl to powerhead.
2. Remove starter rope handle and top cowl.

   NOTE: Tie rope in knot to make sure that rope does not slip all-the-way into rewind starter.
3. Remove cap screws and nuts which secure rewind starter housing to powerhead.
4. Shift outboard into forward gear.
5. Turn twist grip to open throttle to maximum spark advance point.
6. Adjust 2 elastic stop nuts on link rod until side of trigger arm is aligned with timing mark on stator bracket. (Figure 1)

   NOTE: It is not necessary to remove flywheel to line up trigger with timing marks. Flywheel has been removed for clarity. Look up under flywheel for maximum spark and look thru front cowl hole for pickup.

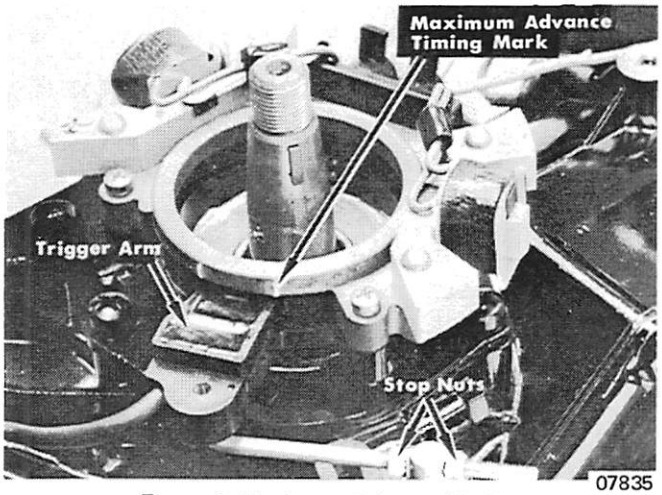


Figure 1. Maximum Advance Timing

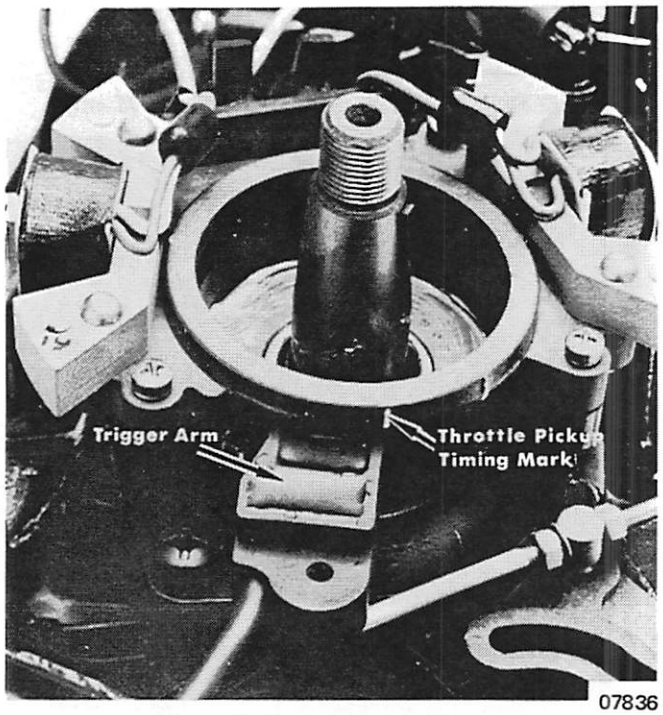


Figure 2. Throttle Pickup Timing

7. Close throttle with twist grip.
8. Turn twist grip to open throttle to align side of trigger arm with timing mark as shown in Figure 2.
9. Adjust throttle pickup screw until end of screw just touches pin on carburetor cluster. (Figure 3) Tighten jam nut after adjustment is completed.
10. Open throttle with twist grip to full throttle and adjust upper screw on vertical throttle shaft lever for .035" to .048" (.89 to 1.22mm) (3/64 drill) clearance between end of throttle pickup screw and carburetor cluster pin. Tighten jam nut after adjustment is completed. (Figure 4)

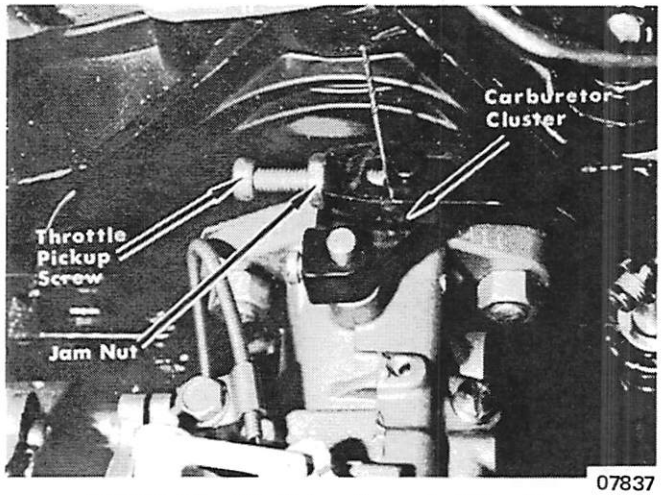
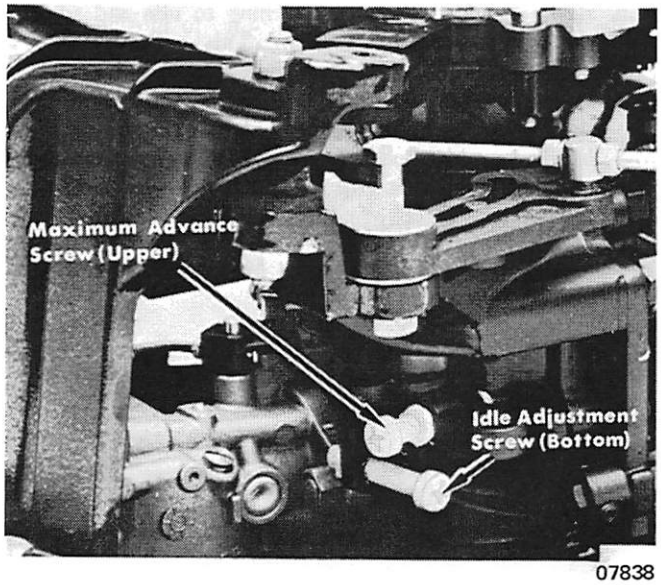


Figure 3. Throttle Pickup Screw Just Touching



07838

Figure 4. Clearance Adjustment

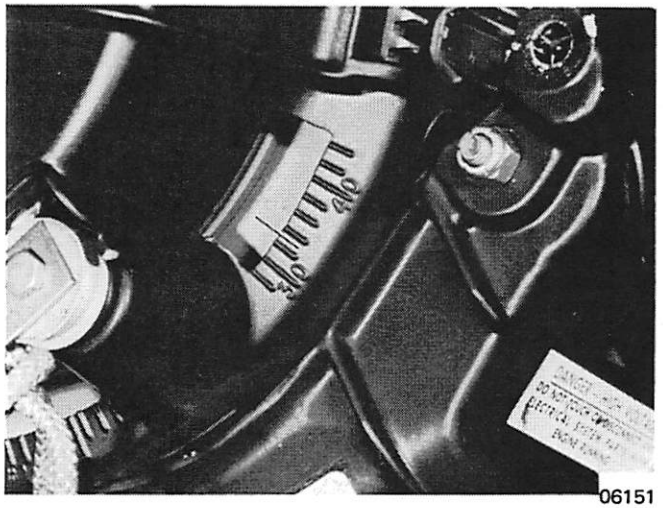
ENGINE RUNNING

1. Place engine in test tank and hook up fuel line.

2. Install Timing Lite (C-91-35507) by connecting large red lead to No. 1 spark plug, then connect one small lead to negative (-) battery post and other small lead to positive (+) post.

3. Start engine and place engine in forward gear. Turn twist grip to full throttle.

4. Adjust 2 elastic stop nuts on link rod until timing line on top side of ring gear is aligned with timing mark (33° BTDC) on starter housing. (Figure 5)

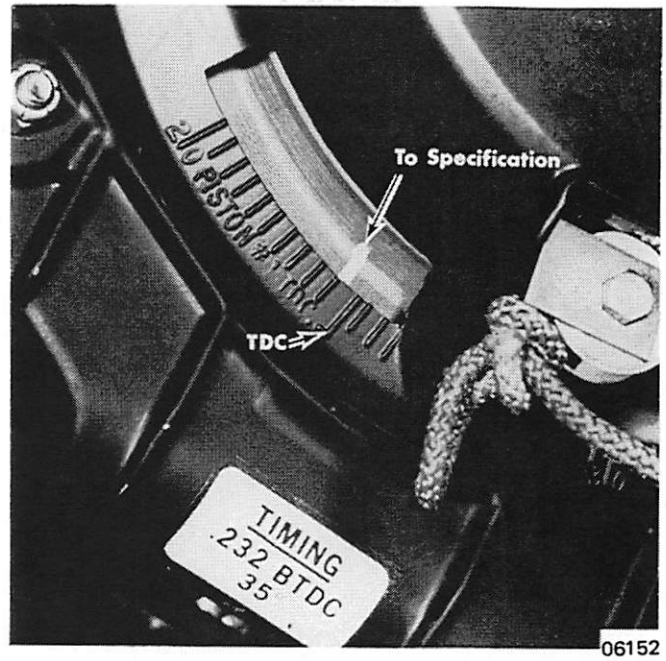


06151

Figure 5. Timing at 33° BTDC

5. Close throttle with twist grip. Open throttle to align timing line on top side of ring gear with timing mark specifications shown on starter housing. (Figure 6)

6. Adjust throttle pickup screw until end of screw just touches pin on carburetor cluster. Tighten jam nut after adjustment is completed. (Figure 3)
7. Open throttle with twist grip to full throttle and adjust upper screw on vertical throttle shaft lever for .035" to .048" (.89 to 1.22mm) (3/64" drill) clearance between end of throttle pickup screw and carburetor cluster pin. Tighten jam nut after adjustment is completed. (Figure 4)



06152

Figure 6. Timing Mark Alignment

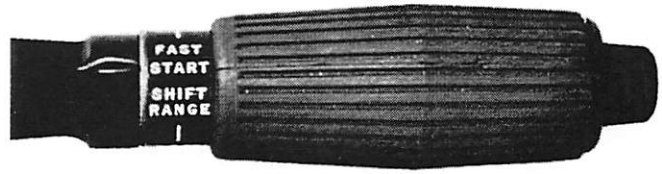
8. Close throttle with twist grip and adjust bottom screw on vertical throttle shaft (Figure 4) for idle RPM of 550 to 650. Tighten jam nut after adjustment is completed. Set idle stop screw at 550 to 650 RPM in forward gear.

CARBURETOR ADJUSTMENT

Refer to "Fuel Systems" Section 4B for carburetor adjustments.

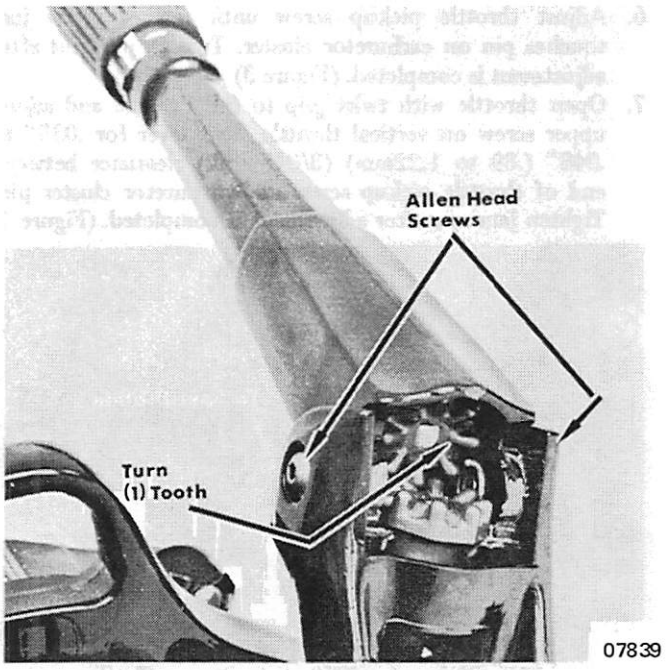
MAXIMUM NEUTRAL RPM and TILLER HANDLE ADJUSTMENT

1. With engine running in neutral gear, turn twist grip to obtain 2400 to 2700 RPM. At this point, "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 7)



07822

Figure 7. Twist Grip Throttle (Tiller Handle)



2. Recheck adjustment by returning to idle and advancing throttle to "Start" position. This will eliminate any possible error caused by "play" in throttle linkage.
3. If tiller handle does not line up properly with "Start" position, remove 2 allen head screws (Figure 8) at tiller handle knuckle. Pull handle apart far enough to clear teeth of gears. Turn twist grip to right or left one tooth of gear to line up. Reinstall allen head screws.

NOTE: This adjustment must be accurate to ensure easy starting with a cold motor.

Figure 8. Tiller Handle Adjustment

TIMING, ADJUSTING, TESTING
MERC 1500 and 1150 with Serial Nos. Listed Below

IGNITION DATA

Description	Merc 1500 (Serial No. 3628318 thru 3751849)	Merc 1500 (Serial No. 3751850 thru 3752839)	Merc 1500 (Ser. No. 3752840 and Above)	Merc 1150 (above Ser. No. 3761035)
Firing Sequence	60° Consecutive	60° Consecutive	60° Consecutive	60° Consecutive
Spark Plug - Standard Installation	AC-V40FFM or L-77V	AC-V40FFM or L-77V	AC-V40FF or L-77V	AC-V40FF or L-77V
Timing - Maximum	23° BTDC *	23° BTDC *	23° BTDC *	23° BTDC *
Throttle Pickup - Primary	2°-4° BTDC	6° BTDC	1°-3° BTDC	1°-3° BTDC
Full Throttle RPM	5800 RPM	5800 RPM	5800 RPM	5300 RPM
Idle RPM	550-600 RPM	550-600 RPM	550-600 RPM	550-600 RPM

** Merc 1500 Only: 23° BTDC in U.S. and Canada; 21° BTDC Elsewhere*

TIMING and LINKAGE ADJUSTMENT

Flywheel, Distributor and Belt Assembly

1. Rotate flywheel until "alignment mark" (three dots on side surface of flywheel) is aligned with cast arrow on distributor pulley. (Figure 1)

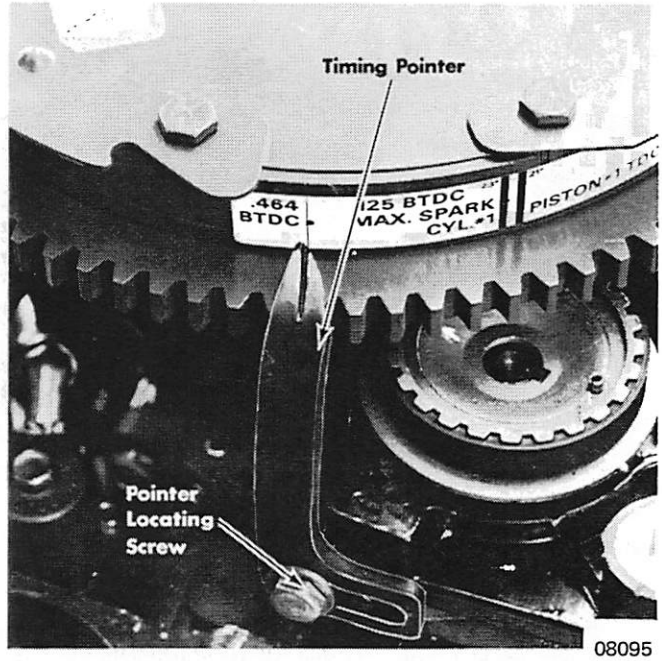
08094

Figure 1. Cast Arrow Aligned with Three Dots

2. Install timing belt, plate, washers and screw and tighten to 60 in. lbs. (69kg-cm).
3. Install dial indicator in No. 1 cylinder. Rotate flywheel in a clockwise direction to top dead center. Rotate flywheel in a counterclockwise direction until dial indicator measures more than .464 BTDC. Rotate flywheel in a clockwise direction to exactly .464 BTDC. Position timing pointer with the .464 mark on the flywheel decal. (Figure 2) Tighten the pointer locating screw.

CONNECTING TIMING LIGHT

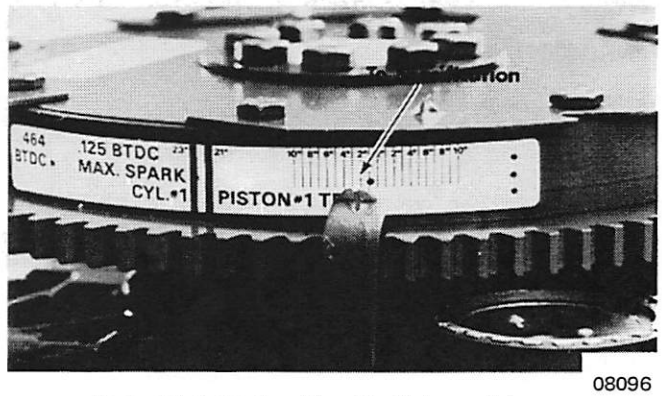
1. Use Timing Light (C-91-35507) for spark advance adjustment.



08095

Figure 2. Timing Pointer at .464"

2. Connect large red lead to No. 1 spark plug and connect one lead to ground terminal on bottom cowl or front cover plate and one lead to hot side of starter solenoid.
3. Depress button on timing light and, if properly connected, the timing light will "buzz".
4. Before cranking engine, be certain that all connections are made. If timing adjustment is to be made without help, use Remote Starter Switch (C-91-52024A1) to crank the engine.

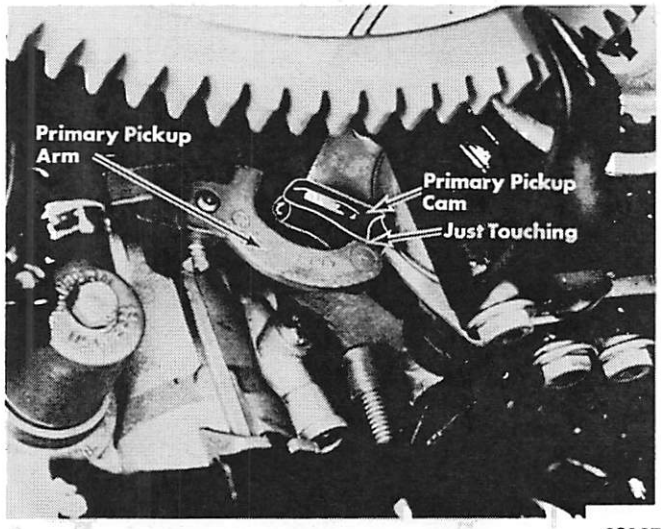


08096

Figure 3. Adjusting Throttle Pickup - Primary

PRIMARY THROTTLE PICKUP ADJUSTMENT

1. With timing light installed, turn ignition key on and start engine. Hold timing light in line with degree markings on flywheel decal (Figure 3) and advance throttle until timing pointer aligns on timing decal to specification.
2. With flywheel timing pointer aligned as above, the primary pickup cam should just touch primary pickup arm on carburetor cluster. (Figure 4)
3. Loosen screws which hold throttle pickup plate and adjust if necessary. Tighten screws after adjusting.



08097

Figure 4. Primary Pickup Just Touching

MAXIMUM SPARK ADVANCE

1. With engine running and timing light attached, advance distributor until timing pointer aligns to specification on timing decal (Figure 5) and adjust the maximum spark advance screw (Figure 6) to just touch distributor. Tighten locknut. Stop engine and remove timing light.

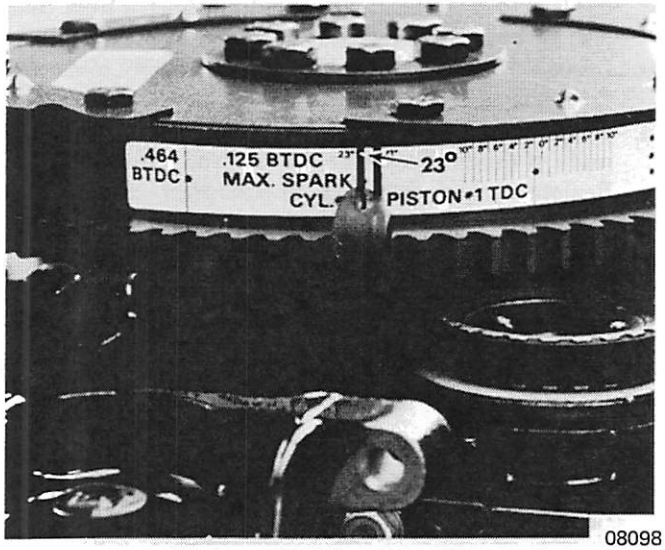


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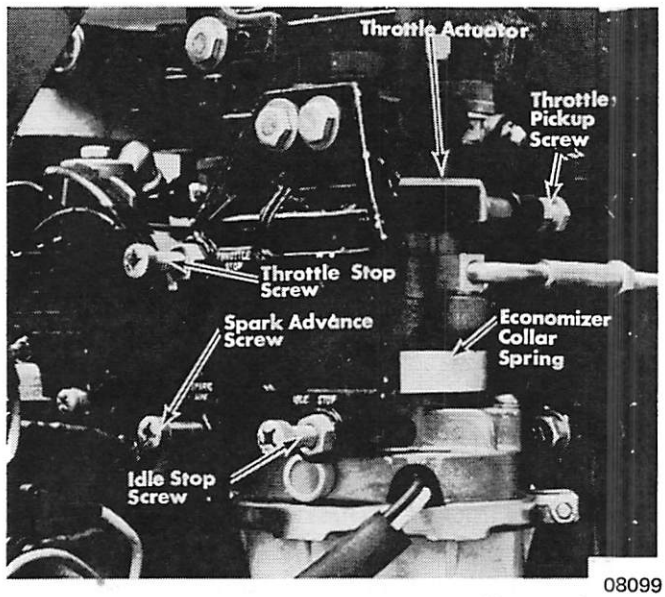
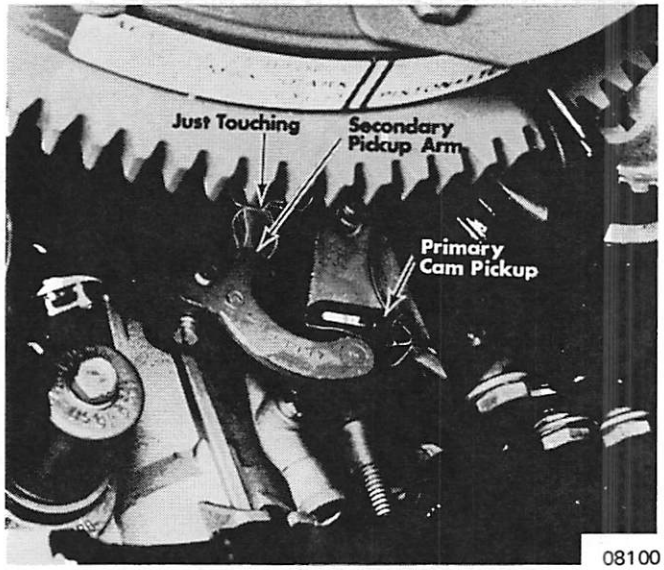
Figure 5. Timing Pointer in Line with 23°



08099

Figure 6. Adjusting Throttle Pickup Screw on Throttle Actuator

2. With distributor against spark advance screw, but not actuating economizer collar spring, adjust throttle pickup screw on throttle actuator (Figure 6) so that it just touches secondary pickup on carburetor cluster. (Figure 7) Tighten locknut.



08100

Figure 7. Secondary Pickup

3. Advance to wide open throttle and adjust throttle stop screw (Figure 6) to allow full throttle shutter opening with sufficient clearance to prevent throttle linkage from binding. Tighten locknut.

CARBURETOR ADJUSTMENTS

Refer to "Fuel Systems" Section 4B for carburetor adjustment.

TIMING, ADJUSTING, TESTING
MERC 110 and 75 with BREAKER-LESS THUNDERBOLT IGN.

IGNITION DATA

Description	Merc 110 and 75
Firing Order	Alternate Firing
Spark Plug	L-77V or AC-V40FFM
Spark Plug Gap	Polar Gap
Timing	34½°
Throttle Pickup - Primary	Not Adjustable
Full Throttle RPM	4500 to 5500
Idle RPM	500 to 750

TIMING ADJUSTMENTS

1. Use "Engine Stopped" or "Engine Running" method, following.

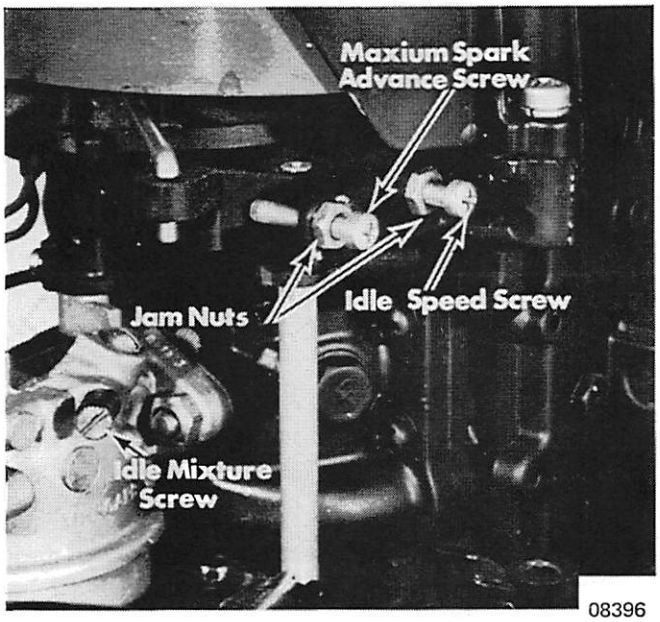


Figure 1. Maximum Spark Screw and Idle Speed Screw

2. Remove top cowl and shift outboard into forward gear.

Engine Stopped

1. Turn twist grip to open throttle to maximum spark advance point.
2. Adjust maximum spark advance screw (Figure 1), as needed, to align timing mark on trigger assembly with timing reference on end cap. (Figure 2)

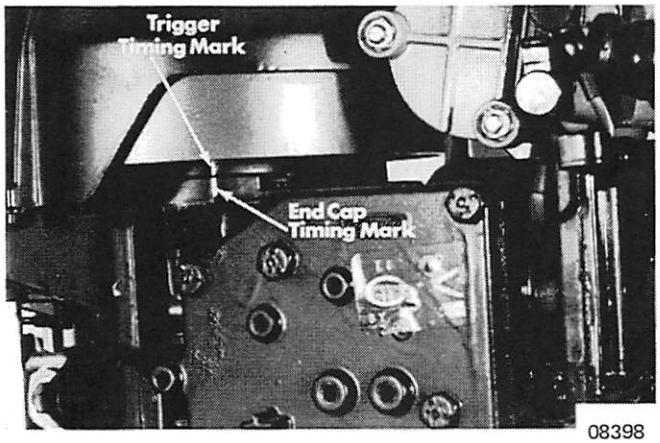


Figure 2. Timing Alignment Marks

NOTE: It is not necessary to remove the flywheel for this adjustment.

3. Tighten jam nut on spark advance screw after adjustment is made.

Engine Running

1. Place engine in test tank and attach fuel line.
2. Install Timing Light (C-91-35507) by connecting large red lead to No. spark plug, then connect one small lead to battery negative (-) post and other lead to positive (+) post.
3. Start engine and shift into forward gear. Turn twist grip to full throttle.
4. Adjust maximum spark advance screw (Figure 1) until timing line on flywheel aligns with timing specification on starter housing decal. (Figure 3)

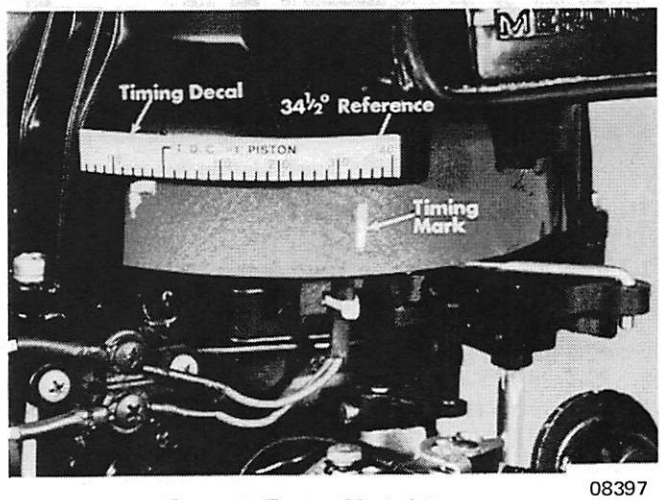


Figure 3. Timing Mark Alignment

5. Tighten jam nut on spark advance screw after adjustment is made.
6. Close throttle with twist grip. Shut engine off and remove timing light.

CARBURETOR ADJUSTMENTS

1. Start engine and adjust idle mixture screw. Refer to "Fuel Systems" Section 4B for carburetor adjustment. This engine is equipped with an integral fuel pump carburetor. Follow proper idle mixture instructions. Do not set carburetor leaner than necessary, as a lean setting causes hard starting.
2. Set engine idle speed stop screw to attain 500 to 600 RPM's in forward gear.

MAXIMUM NEUTRAL RPM LIMITER

1. With engine running in neutral gear, loosen neutral RPM limiter screw (located in the bottom cowl). Move limiter toward rear of engine and tighten the screw only enough to place light tension on the speed limiter. (Figure 4)
2. Turn twist grip to attain 2400 to 2700 RPM's, then tighten the limiter screw securely. Recheck limiter RPM by

returning to idle, then opening throttle to the limit stop. Readjust if necessary.

3. Check that neutral speed limiter does not interfere with throttle operation in forward gear. If it should interfere, move end of limiter toward cylinder block and recheck neutral RPM.

NOTE: This adjustment must be accurate to assure easy starting when engine is cold.

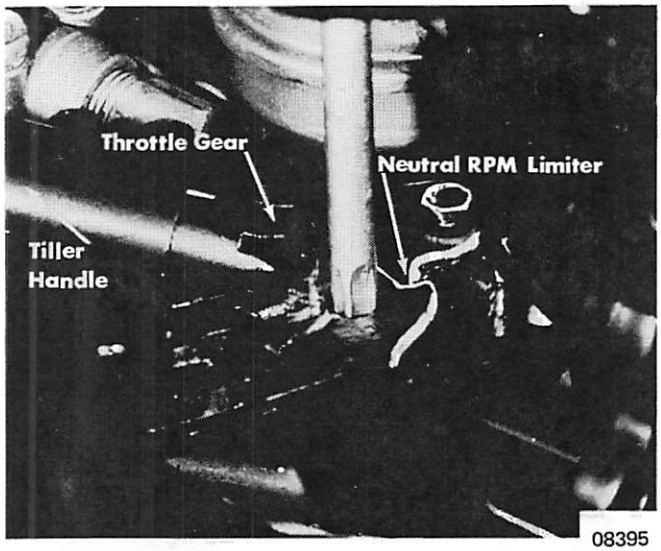


Figure 4. Neutral RPM Speed Limiter Adjustment

TILLER HANDLE ADJUSTMENT

1. With engine running in neutral gear, turn twist grip to attain 2400 to 2700 RPM's. At this point the "START" position on twist grip should align with indicator arrow on tiller handle. (Figure 5)
2. Reposition twist grip, if necessary, by removing 2 allen head screws at tiller handle knuckle. (Figure 6)
3. Pull handle apart far enough to clear teeth of gears. Turn twist grip to align marks and install screws.

NOTE: This adjustment must be accurate to assure easy starting when engine is cold.

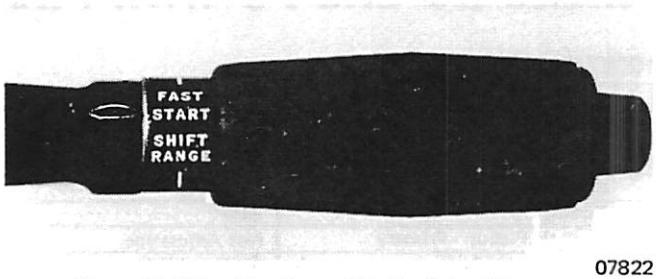


Figure 5. Tiller Handle and Twist Grip Alignment

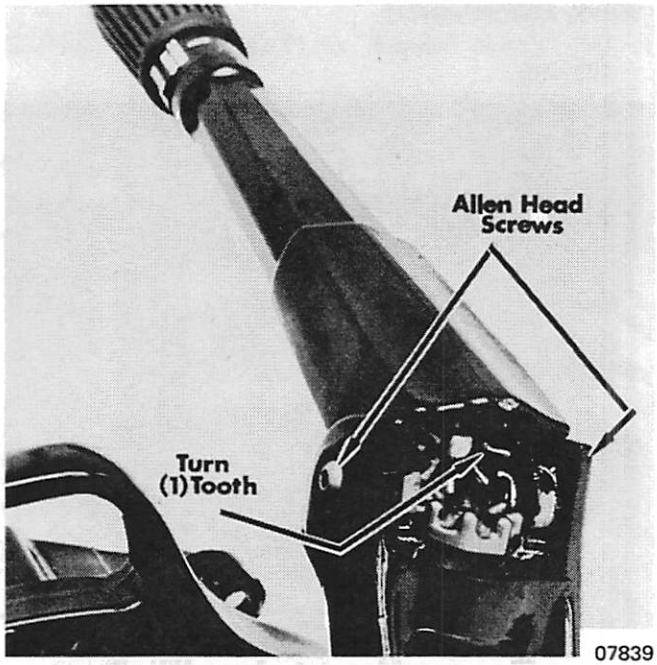


Figure 6. Tiller Handle Adjustment

TIMING, ADJUSTING, TESTING

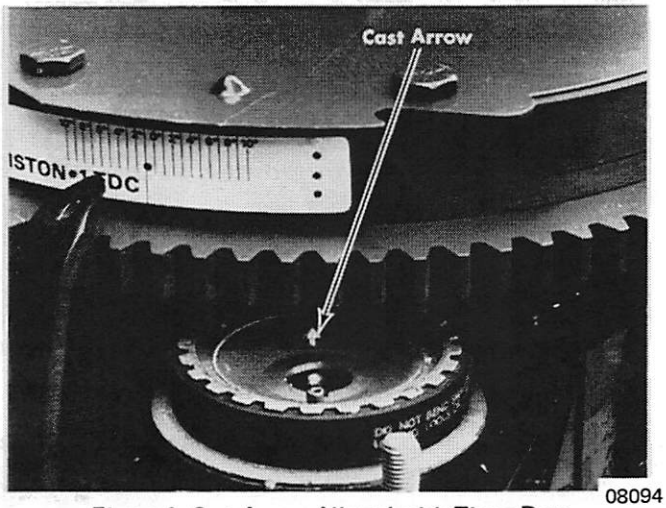
MERC 850 (Above Serial No. 3865694)

IGNITION DATA

Description	Merc 850
Firing Order	90° Consecutive
Spark Plug	Champion L-77V or AC-V40FFM
Timing - Maximum	27°BTDC
Throttle Pickup - Primary	3°-5°BTDC
Full Throttle RPM	5500 RPM
Idle RPM	550-600 RPM

TIMING and LINKAGE ADJUSTMENTS

1. Rotate flywheel until "alignment mark" (three dots on flywheel side surface) is aligned with cast arrow on distributor pulley. (Figure 1)



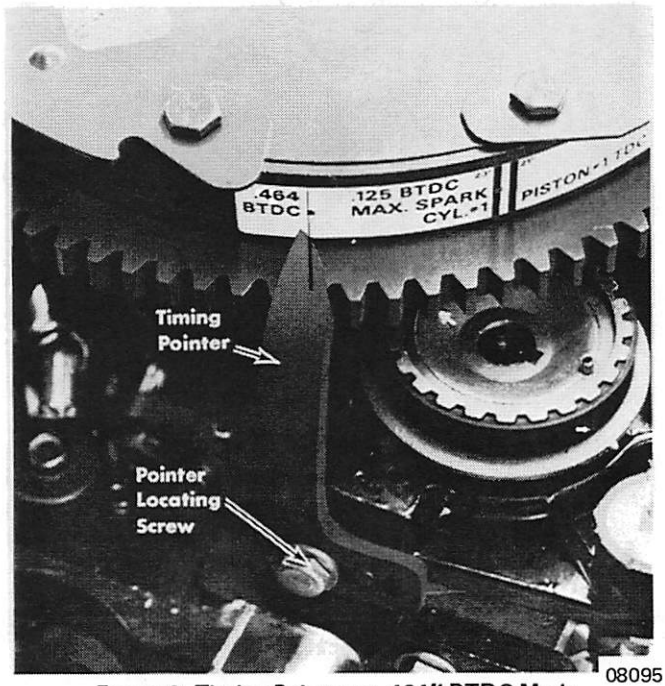
08094

Figure 1. Cast Arrow Aligned with Three Dots

2. Install timing belt, plate and screw and tighten to 60 in. lbs. (69kg-cm).
3. Install a dial indicator into No. 1 cylinder. Rotate flywheel in a clockwise direction to top dead center (TDC). Position face of dial indicator to "O" (zero).
4. Rotate flywheel in a counterclockwise direction until dial reads more than .464" BTDC.
5. Rotate flywheel in a clockwise direction to exactly .464" BTDC.
6. Position timing pointer to align with .464" mark on flywheel decal. (Figure 2) Tighten the pointer attaching screw.

CONNECT TIMING LIGHT

1. Connect Timing Light (C-91-35507A1) to engine for spark advance adjustments.
2. Connect large lead to No. 1 spark plug lead (use timing lead [91-39212]) and one small lead to engine ground (bottom cowl or front support frame), then connect the other small lead to the battery side of starter solenoid.
3. Depress button on timing light and, if properly connected, the timing light will "buzz".
4. Before cranking engine, be certain that all connections are made. If timing adjustments are to be made without help, use Remote Starter Switch (C-91-52024A1) to crank engine.



08095

Figure 2. Timing Pointer at .464" BTDC Mark

PRIMARY THROTTLE PICKUP ADJUSTMENTS

1. With timing light installed, turn ignition key to "On" position if using remote starter switch, or start engine if in a test tank. Hold timing light in line with timing pointer and advance throttle until timing pointer as aligned with the primary pickup specification on the flywheel decal. (Figure 3)
2. With the flywheel aligned as above, primary pickup cam should just touch primary lever on carburetor cluster. (Figure 4)

08096

Figure 3. Adjusting Primary Throttle Pickup

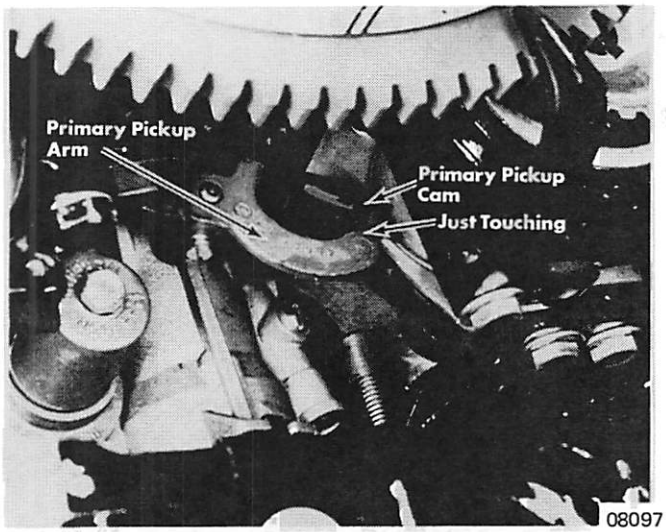


Figure 4. Primary Pickup Cam Just Touching Carburetor Primary Lever

3. If primary pickup does not "just touch" as described previously, adjust as follows. Loosen screws, which hold throttle pickup plate, and adjust primary pickup plate, as necessary, to just touch carburetor primary pickup lever.
4. Tighten screws to secure primary pickup plate.

NOTE: DO NOT move distributor while making this adjustment, or primary pickup will not be correct.

MAXIMUM SPARK ADVANCE ADJUSTMENT

1. With Timing Light (C-91-35507A1) installed, turn ignition key to "On' position, if using remote starter switch, or start engine if in a test tank. Hold timing light in line with timing pointer and advance throttle until timing pointer is aligned with maximum spark advance specification on flywheel decal. (Figure 5)

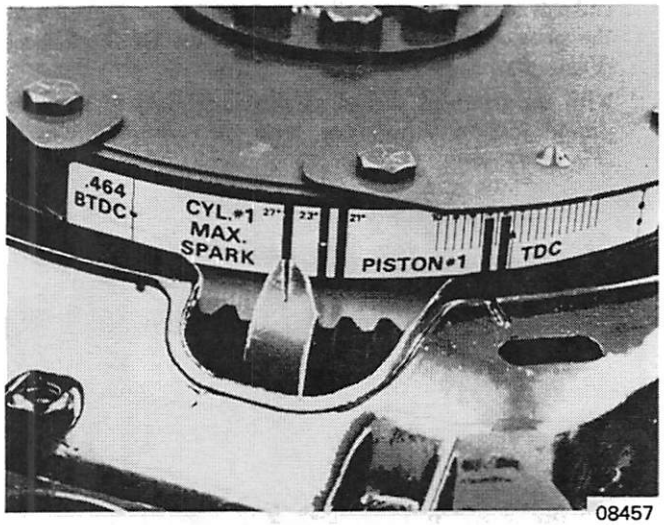


Figure 5. Timing Pointer in Line with Maximum Spark Advance Specification

2. With flywheel and pointer aligned as above, distributor should be touching maximum spark advance screw. If it does not align, turn spark advance screw "in" to decrease or "out" to increase spark timing. Tighten locknut and recheck timing. Stop engine or turn off igntion key and remove timing light.

ADJUSTING SECONDARY THROTTLE PICKUP

1. With distributor against spark advance screw but not actuating the economizer collar spring, adjust the secondary throttle pickup screw on throttle actuator (Figure 6) so that it just touches secondary lever on carburetor cluster. (Figure 7) Tighten locknut.
2. Advance throttle to wide open position and adjust throttle stop screw (Figure 6) to allow full throttle shutter opening with sufficient clearance to prevent throttle linkage damage (approximately 1/32" [.8mm] is sufficient). Tighten locknut and recheck clearance.

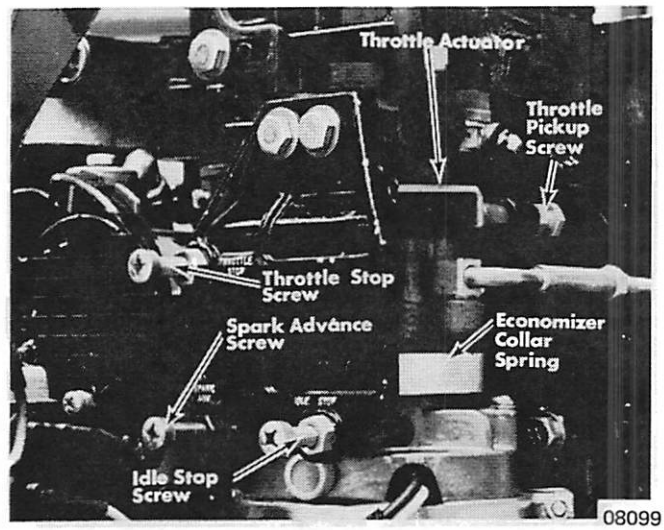


Figure 6. Adjusting Throttle Pickup Screw on Throttle Actuator

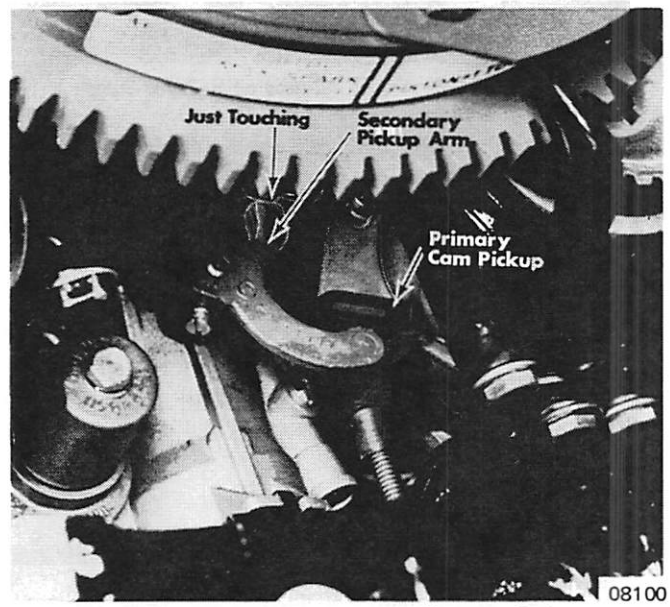


Figure 7. Adjusting Secondary Throttle Pickup

CARBURETOR ADJUSTMENTS

Refer to "Fuel System " Section 4B for carburetor adjustments.

SECTION 3 - ELECTRICAL SYSTEMS

MERCURY
OUTBOARDS

PART F - INSTRUMENTATION

INDEX

TRANSISTOR TACHOMETER

The Mercury Transistor Tachometer (A-33550 for 4 and 6-cylinder models) (Figure 1) is designed to operate on 12-volt negative grounded electrical systems (without Thunderbolt Ignition) only.

Package includes transmitter and meter which have been calibrated together. Accuracy is not guaranteed if interchanged. Serial numbers on meter and transmitter must be identical. Meter to transmitter wires, a light socket assembly, mounting hardware and instructions also are in package.

Instructions must be observed to assure proper operation.

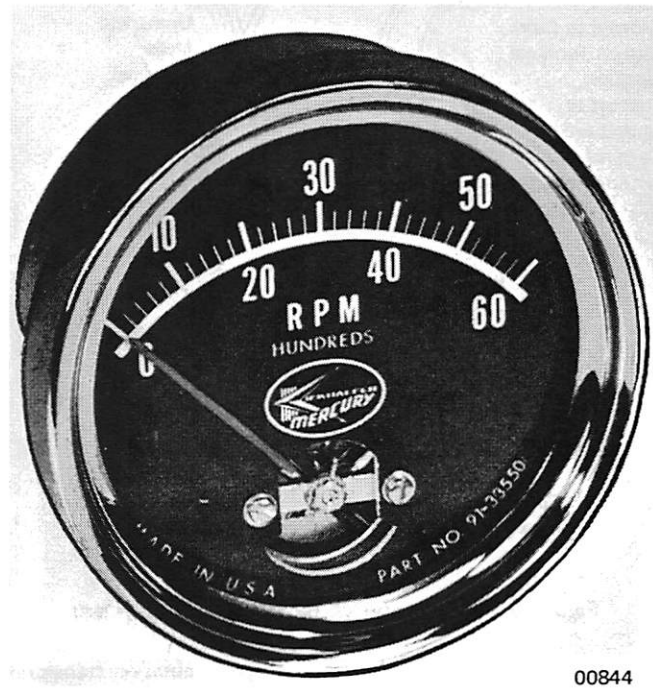


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Figure 1. Tachometer A-33550 for 4 and 6-Cylinder Models

TRANSMITTER WIRING

4-CYLINDER MAGNETO IGNITION SYSTEM

1. Connect terminals Nos. 2 and 3 together on transmitter with U-shaped strap. (Figure 2)
2. Connect white wire from transmitter terminal No. 3 to positive (+) terminal on meter.
3. Connect black wire from transmitter terminal No. 10 to unmarked meter terminal. DO NOT shorten wires. Excess should be coiled and taped.
4. Connect ground wire from No. 10 terminal on transmitter to any convenient grounded screw on engine.
5. Disconnect knife connector in red rectifier lead and slide rubber insulating sleeve supplied on one of the wires. Reconnect wires with connector adaptor (A-34419), supplied.

NOTE: On "S" models (electrical starter, no alternator), red rectifier lead is folded back and taped against internal wiring harness.

6. Install a switch in wire that connects between red rectifier lead and No. 6 terminal on transmitter to prevent battery from discharging when motor is not running.
7. Connect a wire from No. 6 terminal on transmitter to connector adaptor in rectifier lead with screw and nut supplied. Before tightening screw and nut, position wire so that rubber sleeve can be pulled over connector adaptor to insulate it.
8. Connect a wire from No. 7 terminal on transmitter to magneto grounding stud.

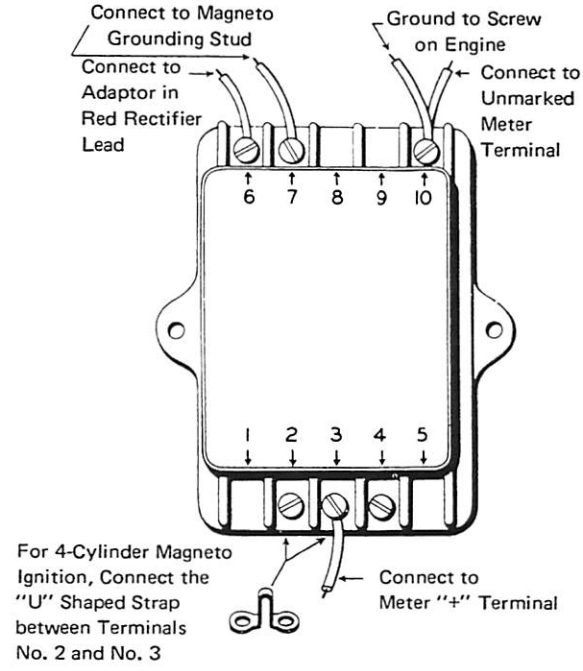


Figure 2. Wiring for 4-Cyl. Magneto Ignition System

6-CYLINDER BATTERY IGNITION SYSTEM

1. Connect terminals Nos. 3 and 4 together with "U" - shaped strap. (Figure 3)
2. Connect white wire from transmitter terminal No. 3 to positive (+) terminal on meter.
3. Connect black wire from transmitter terminal No. 10 to unmarked meter terminal. DO NOT shorten wires. Excess should be coiled and taped.

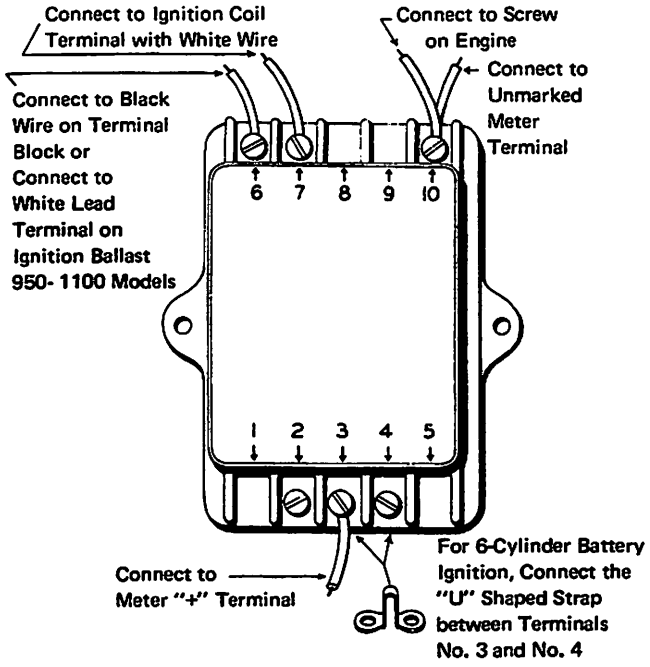


Figure 3. Wiring for 6-Cyl. Battery Ignition System

4. Connect a ground wire from No. 10 terminal on transmitter to any convenient grounded screw on engine.
5. Connect a wire from No. 6 terminal on transmitter to "black" wire on 3-terminal block near ignition ballast resistor.
6. Connect a wire from ignition coil terminal, to which white distributor wire is connected, to transmitter terminal No. 7.

NOTE: On Merc 1100 and 950 models without Thunderbolt Ignition, connect wire from No. 6 terminal on transmitter to white lead terminal on ignition ballast which is located on right side of engine. Connect one wire from battery meter "IGN" terminal to white lead terminal on ignition ballast.

IMPORTANT: For Service, return BOTH transmitter and meter to Kiekhaefer Mercury, Parts and Service Division, Fond du Lac, Wisconsin, along with details of difficulty encountered.

TACHOMETER EFFECT on ENGINE PERFORMANCE

Tachometers of various types, other than those listed here, have caused engine malfunction or misfire when installed on 6-cylinder Mercury Outboards.

The greatest offenders are tachometers which are wired in series with the ignition points. A number of acceptance tests have been run on this type tachometer and have been found unsuitable for use on Mercury Outboards because of inaccurancy of operation and reduction in available ignition system voltage. As a result, poor engine performance may occur.

Engine warranty is void if an engine is operated with accessories that are not of Kiekhaefer Mercury manufacture and/or are not recommended by Kiekhaefer Mercury.

THUNDERBOLT IGNITION TACHOMETER (A-45294A1-A2)
MERC 1100SS and MERC 950SS
BREAKER POINT IGNITION - ELECTRICAL CONNECTION

NOTE: Tachometers A-45294A1 and A2 are designed for use with Merc 1100SS and 950SS Models with Mercury Thunderbolt Ignition System only.

1. Install one wire end to center terminal and the other wire end to lower left terminal on tachometer. (Figures 1 and 2)

NOTE: DO NOT loosen or make any connections to lower right terminal.

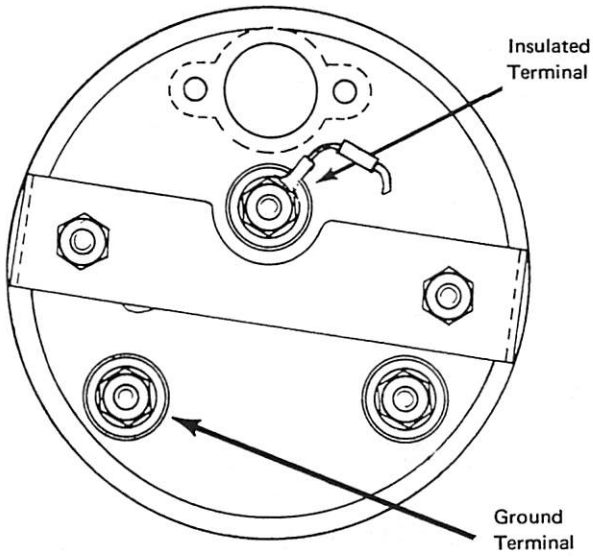


Figure 1. A-45294A1 Tachometer Terminals

2. On A-45294A1 Tachometer, install opposite end of wire from insulated terminal (on A-45294A2 install opposite end of wire from lower left terminal) to "brown" terminal on switch box and the other terminal wire to clamp screw on front frame. (Figure 3) DO NOT use coil ground terminal on switch box for other than coil connections under any circumstances.
3. If polarity is reversed (needle reads down scale), reverse lead wire terminal ends on tachometer.

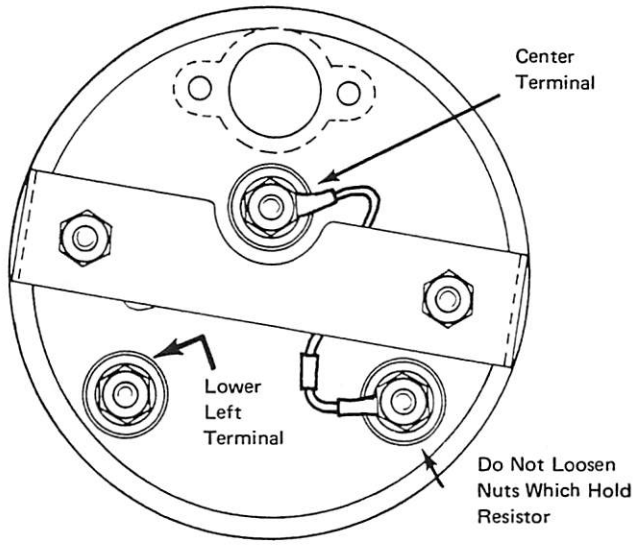


Figure 2. A-45294A2 Tachometer Terminals

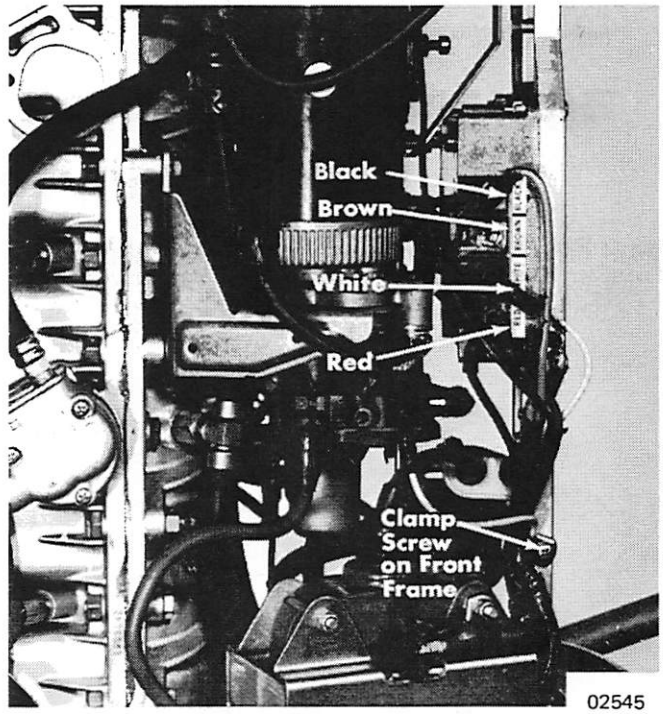


Figure 3. Engine Terminals

THUNDERBOLT IGNITION TACHOMETER (A-45294A3)
Merc 1100SS - 950SS - 650SS - 500SS
BREAKER-LESS IGNITION - ELECTRICAL CONNECTION

NOTE: Tachometer A-45294A3 is designed for use with Merc 1100SS-950SS-650SS and 500SS models with the Mercury Thunderbolt Breaker-Less Ignition System.

1. Connect terminal end of brown lead to lower left terminal of tachometer. Connect terminal end of black lead from tachometer wiring harness opposite end of short black lead to center terminal of tachometer. (Figure 4)

CAUTION: DO NOT loosen or make any connections to lower right terminal.

2. Slip neoprene sleeve on white lead from remote control box.
3. Connect lead from instrument light to white lead from remote control box with nut and bolt. Slip neoprene sleeve over connection.
4. Plug in connection from tachometer harness to receptacle on control box.
5. If polarity is reversed (needle reads down scale), reverse leads on tachometer.

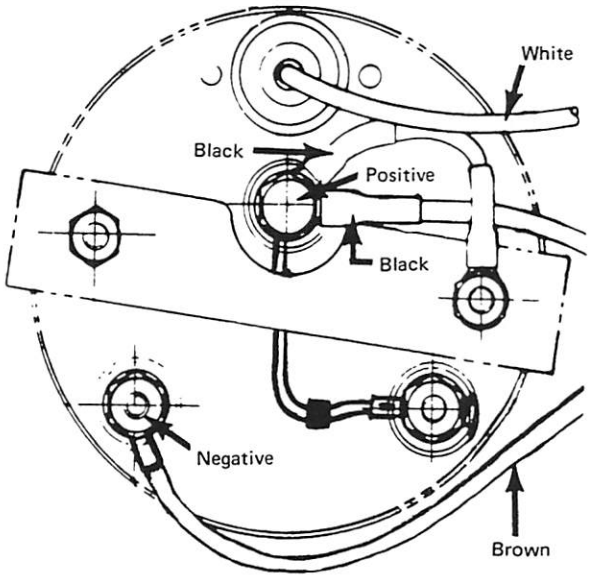


Figure 4. Tachometer Terminals

THUNDERBOLT IGNITION TACHOMETER INSTALLATION
MODELS with BREAKER-LESS IGNITION

Merc 650S, Merc 500S and Merc 500M Models with Lightning Energizer Ignition require the addition of tachometer module A-52552A3 to adapt to the tachometer assembly. (Figure 5)

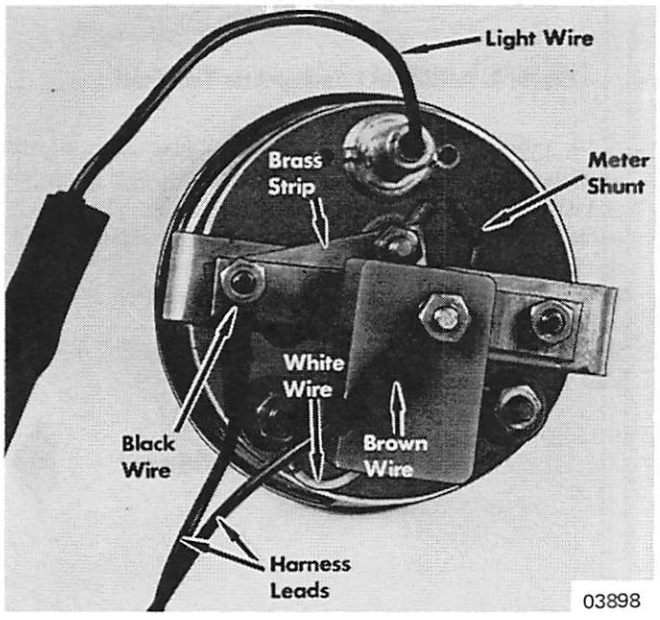


Figure 5. Module Installed - Merc 650S-500S-500M

THUNDERBOLT IGNITION TACHOMETER (A-53667A1)
Merc 1250SS-1250BP-1100SS-1000SS-1000BP-950SS-800SS-650SS*-500SS*
ELECTRICAL CONNECTION

To Be Used with Mercury Thunderbolt Breaker-Less Battery Ignition System Only

**Merc 650S-650E-500S-500E-500M models with Lightning Engerizer Ignition require the addition of tachometer module A-52552A3 to adapt to the tachometer assembly. (Figure 2)*

1. Connect brown wire of tachometer harness to negative (-) terminal on back of tachometer. (Figure 1) Connect black lead of tachometer harness to positive (+) terminal of tachometer. DO NOT disturb resistor or any other nuts on back of the case.
2. If a light is to be installed, a jumper must be placed from positive (+) terminal on tachometer to one of the two tachometer clamp screws in order to connect tach case to engine-battery ground. Connect black lead of lamp socket to white wire of tachometer harness. Tape this connection to prevent an accidental short.
3. Plug in connection from tachometer harness to receptacle on control box.

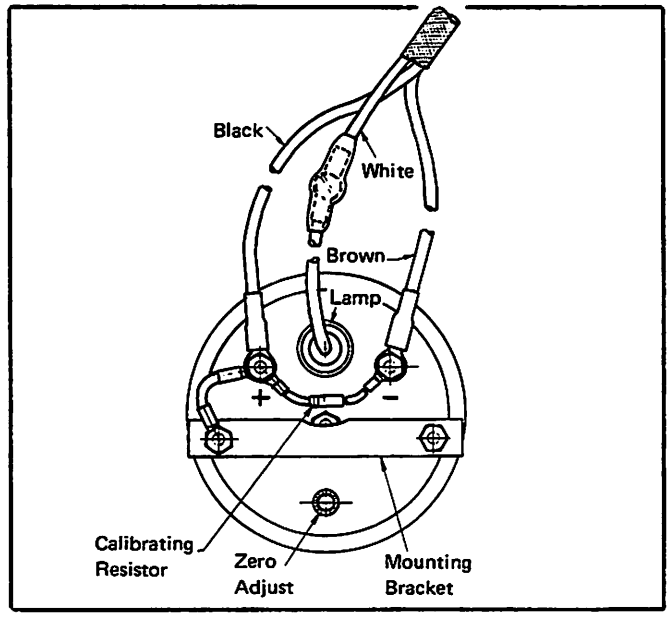
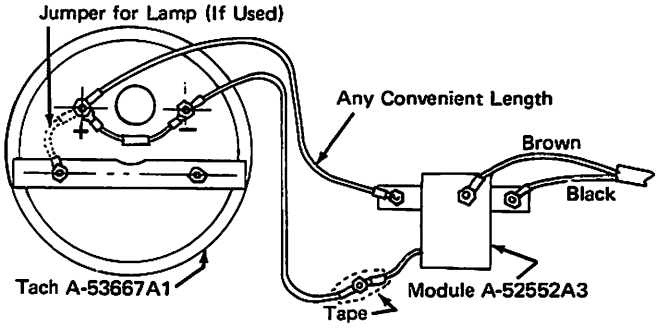


Figure 1. Installing Tachometer

TACHOMETER 0-8000 RPM (A-53667A1)
OUTBOARDS with LIGHTNING ENERGIZER IGNITION



1. Since this module was designed to mount to back of a different tachometer, it must be connected in a location remote from the tachometer, as shown in Figure 2.
2. The 2 brass feet of the module are at engine ground potential so that they may be affixed to any convenient mounting without danger of shorting the ignition.

Figure 2. Installation with Module

WATER PRESSURE GAUGE ASSEMBLY (A-33371A2)

1. Remove top cowl.
2. Remove pipe plug from top of cylinder block.
3. Coat threads of 1½" (38.1mm) long adaptor with Gasket Sealer (C-92-28804) and install adaptor into threaded hole in top of cylinder block. (Figure 1)

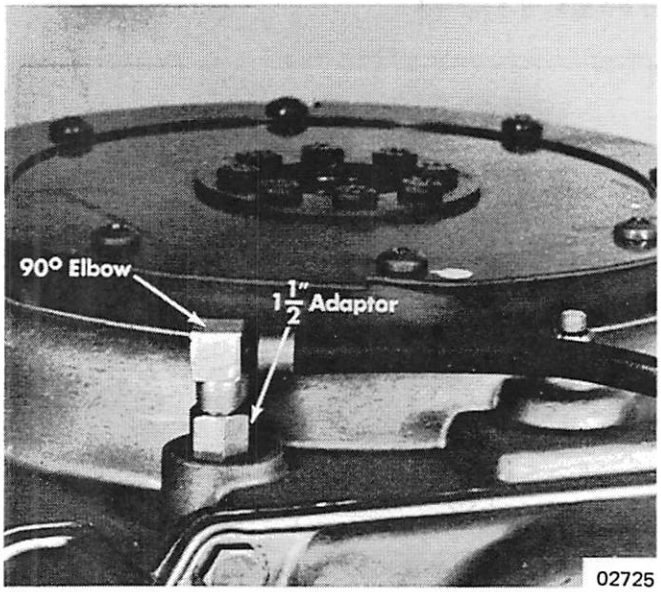


Figure 1. Hose Installed on Cylinder Block

4. Coat threads with Gasket Sealer (C-92-28804) to prevent leaking and install 90° elbow with outlet facing toward intake port side. (Figure 1)
5. Drill 5/16" (7.94mm) hole in bottom cowl. (Figure 2)

NOTE: Locate hole carefully to avoid chafing or kinking hose.

6. Install water pressure gauge in dash panel and install straight hose fitting in water gauge.
7. Install hose on water pressure gauge and secure with hose clamp.
8. Attach hose along upper gunnel of boat with nylon clips. Space clips as required.
9. Thread hose thru hole, previously drilled in bottom cowl, and attach to 90° elbow. Secure with hose.
10. Position hose on powerhead and tape in position, if necessary, to prevent chafing or kinking hose.
11. Provide sufficient slack between motor and motor well to prevent kinking and still allow motor to turn fully each way with no interference.

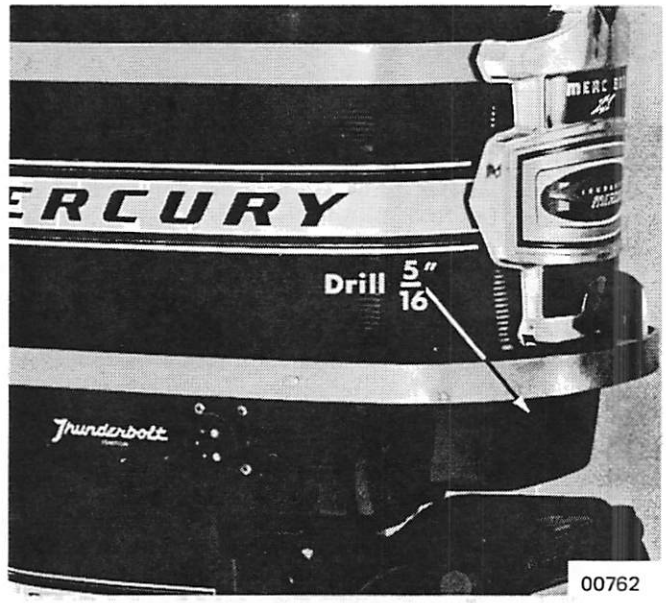


Figure 2. Hole in Bottom Cowl

VOLTMETER KIT (C-55342A1 and C-58380A1)

ELECTRICAL CONNECTION

IMPORTANT: Positive (+) battery cable must be disconnected from battery to prevent shorting positive leads while installing meter and connecting wiring.

SIX (6) CYLINDER OUTBOARD MODEL (1966)

1. On Merc 950 and 1100 without Thunderbolt Ignition, connect wire from voltmeter "+" terminal to white harness lead wire at ballast terminal.
2. On Merc 950SS and 1100SS with Thunderbolt Ignition, connect wire from "+" terminal of voltmeter to white terminal on switch box. (Figure 3)
3. Connect wire from "GND" terminal of voltmeter to a suitable ground such as the clamp screw on front frame. (Figure 3)

NOTE: Voltmeter will indicate system voltage only when ignition key is in "Run" or "Start" position.

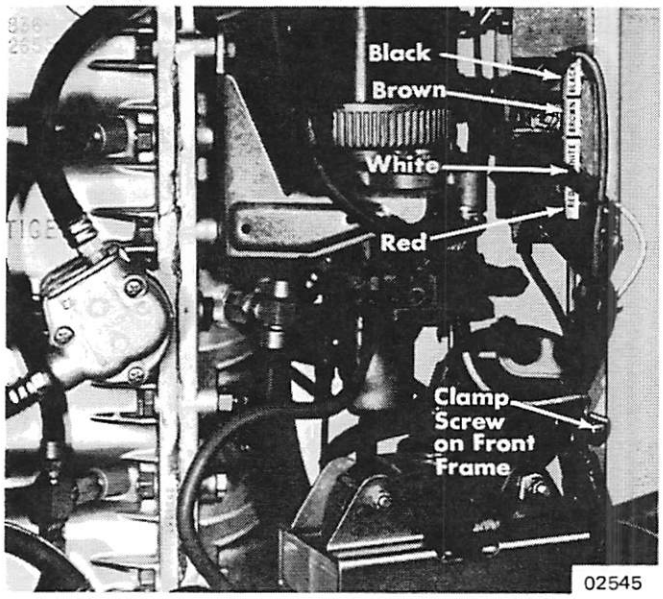


Figure 3. Installing Wires to Switch Box

FOUR (4) CYLINDER OUTBOARD MODELS (Without Thunderbolt Ignition)

1. Disconnect red rectifier lead at knife disconnect and discard rubber sleeve. Place new rubber sleeve over either lead and hook one knife connector to each lead.
2. Connect one wire from voltmeter "+" terminal to ring terminal and connect all 3 together with nut and screw provided. Slide rubber sleeve over this connection to provide insulation.

NOTE: On 1966 and later models, it will be necessary to install a switch in the wire that connects between the voltmeter "+" terminal and the red rectifier lead, to prevent the battery from discharging when the motor is not running.

3. Connect second wire from voltmeter "+" terminal to a clean metal ground.

FOUR (4) CYLINDER OUTBOARD MODELS (With Lightning Energizer Ignition)

1. Open remote control box and disconnect solder connection on white (F) and black (D) terminals on key switch assembly.
2. Using resin core solder, connect wire from "+" terminal of voltmeter into "F" terminal with white wires.
3. Using resin core solder, connect wire from "GND" terminal of voltmeter into "D" terminal with black wires.
4. Cover key switch terminals with Liquid Neoprene (C-92-25711-1) and reassemble control box.

FOUR (4) CYLINDER OUTBOARD MODELS (With Thunderbolt Ignition)

1. Connect wire from "+" terminal of voltmeter to white terminal on starboard side of switch box.
2. Connect wire from "GND" terminal of voltmeter to a suitable ground, such as the clamp screw on front frame.

NOTE: Voltmeter will indicate system voltage only when ignition key is in "Run" or "Start" position.

BATTERY METER (C-58380A3 and C-60070A2)

1. Install battery meter in dash with bracket, nuts and washers. DO NOT distort battery meter case and bracket by over-tightening.
2. If no tachometer is used, plug harness (supplied with battery meter) into connector on remote control box, as shown in dotted lines on drawing, following.
3. If tachometer is installed, cut harness to a convenient length and splice into tachometer leads as shown.

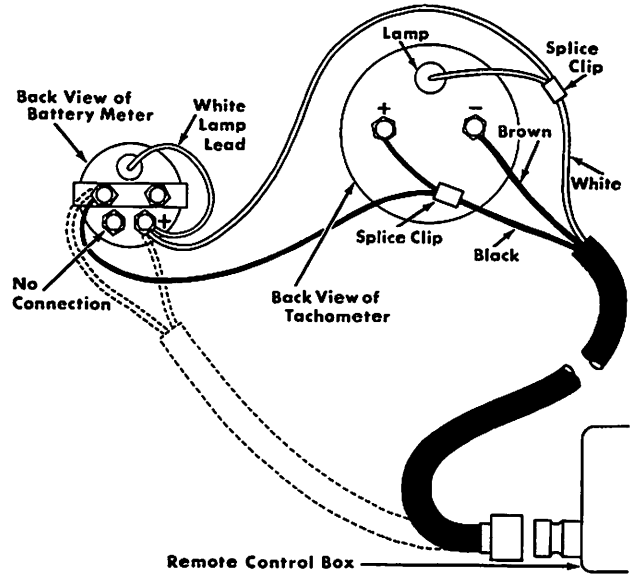


Figure 4. Battery Meter Installation

TACHOMETER ASSEMBLY (A-59777A1)

CAUTION: Disconnect battery leads from battery before installing tachometer.

1. Remove old gauge and harness from panel or drill a 3-7/16" hole in dash and install new gauge.
2. Wire new gauge as follows:
   a. Connect brown lead to terminal marked "ALT". (Figure 1)
   b. Connect white harness lead and lamp lead to terminal marked "12V".
   c. Connect black lead to stud as shown. (Figure 1)
   d. Connect plug end of harness to remote control.

6-CYLINDER MODELS

Remove brown lead from switch box (located on 4 terminal side of switch box) and connect to either yellow terminal on rectifier.

Merc 650 (3 and 4-Cy.)*, 800 and 850 Installation (Figure 2)

Brown lead does not reach to rectifier. Complete the following:

1. Remove brown lead from switch box.
2. Install terminal block onto brown terminal of switch box as shown. (Figure 2)
3. Connect brown lead and jumper lead (of appropriate length) to terminal block.
4. Connect opposite end of jumper lead to either yellow (yellow/red) terminal on rectifier.

**On 4-cyl. Merc 650's, which have an ignition switch box with terminals on 2 sides, wire per preceding instructions. For 4-cyl. Merc 650's, having a switch box with terminals on one side only, wire per following instructions.*

MERC 400 thru 500 and 4-CYL. MERC 650*

1. From alternator terminal, install a separate lead (16-gauge, not supplied with kit) of sufficient length to reach rectifier on outboard. (Figure 3)
2. Attach opposite end of this wire to either yellow (yellow/red) terminal of rectifier.
3. Connect black lead from harness to stud on back of tachometer and white lead to terminal marked "12V". (Figure 3)
4. Tape back and insulate brown harness lead and plug harness into receptacle on control assembly.
5. Properly insulate all lead wires and protect them from shorting and physical damage from vibration.

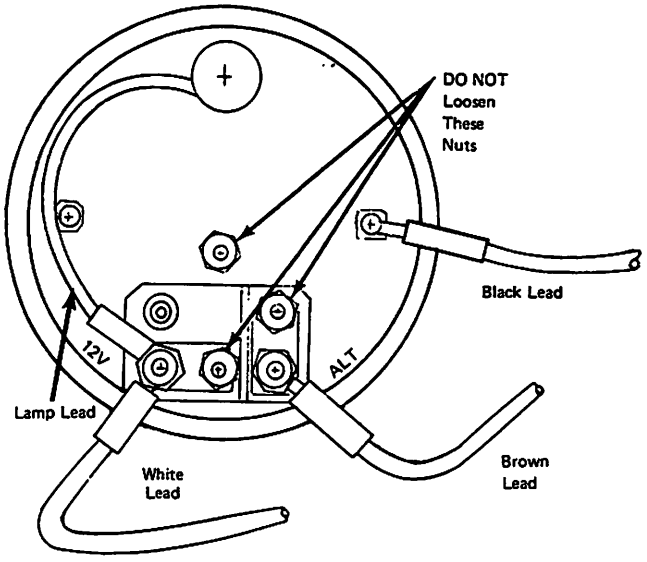


Figure 1. Tachometer Wiring

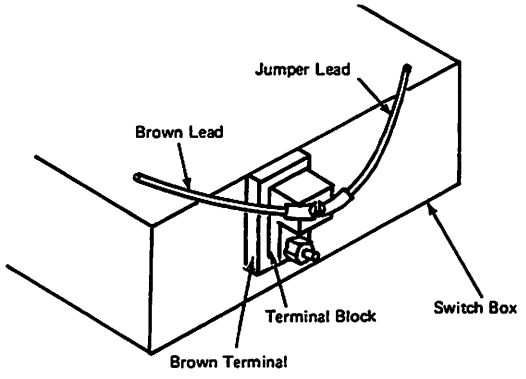


Figure 2. Merc 650 (3 and 4-Cyl.)*, 800 and 850 Installation

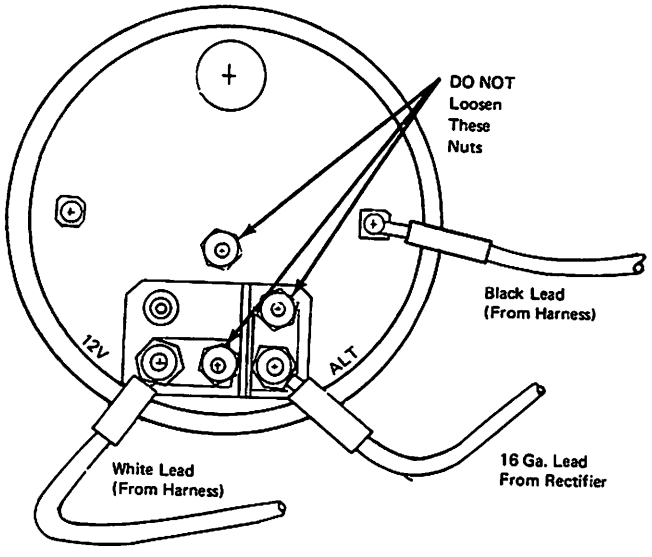


Figure 3. Merc 400 thru 500 and 4-Cyl. Merc 650 Installation

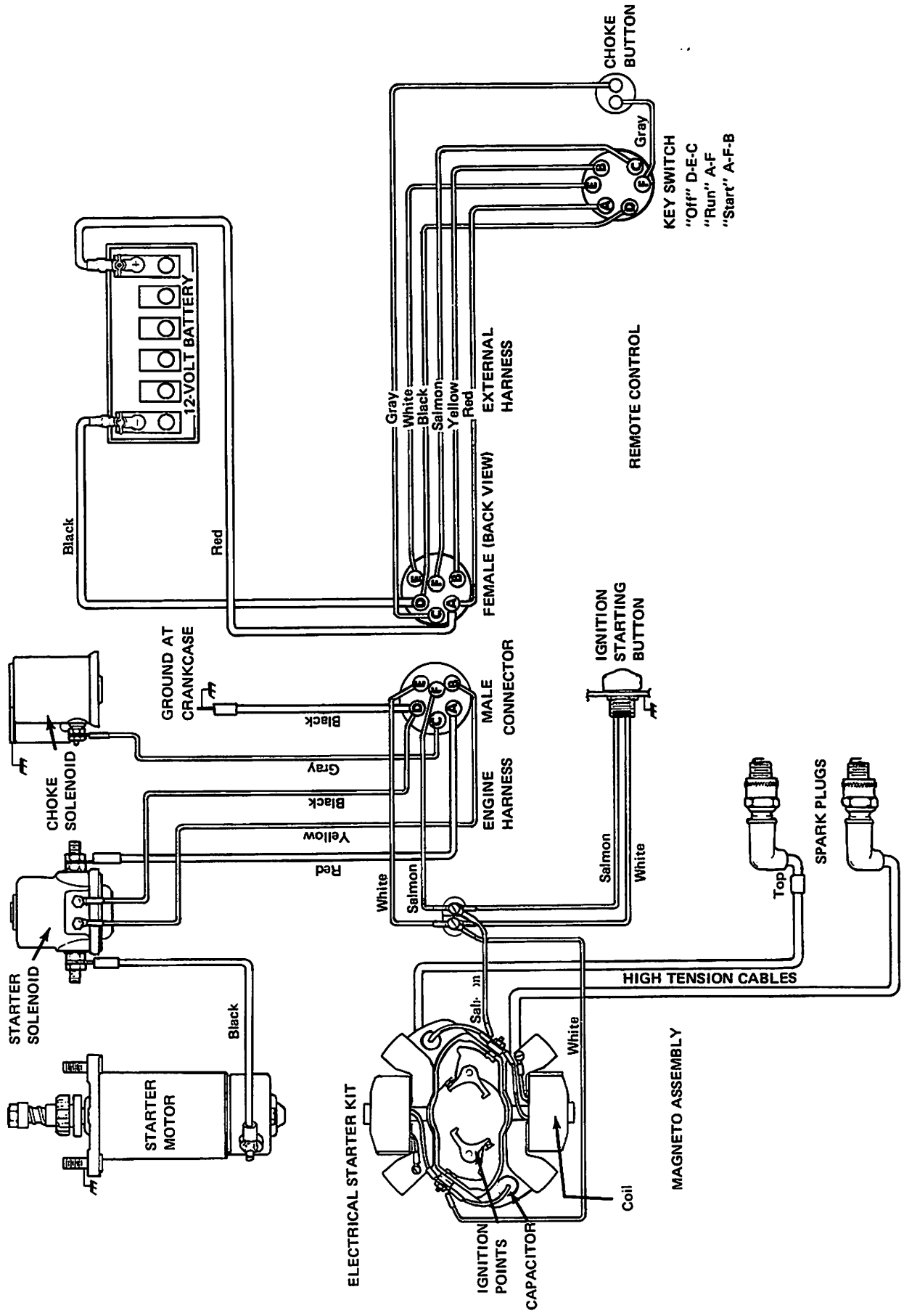
SECTION 3 - ELECTRICAL SYSTEMS

MERCURY
OUTBOARDS

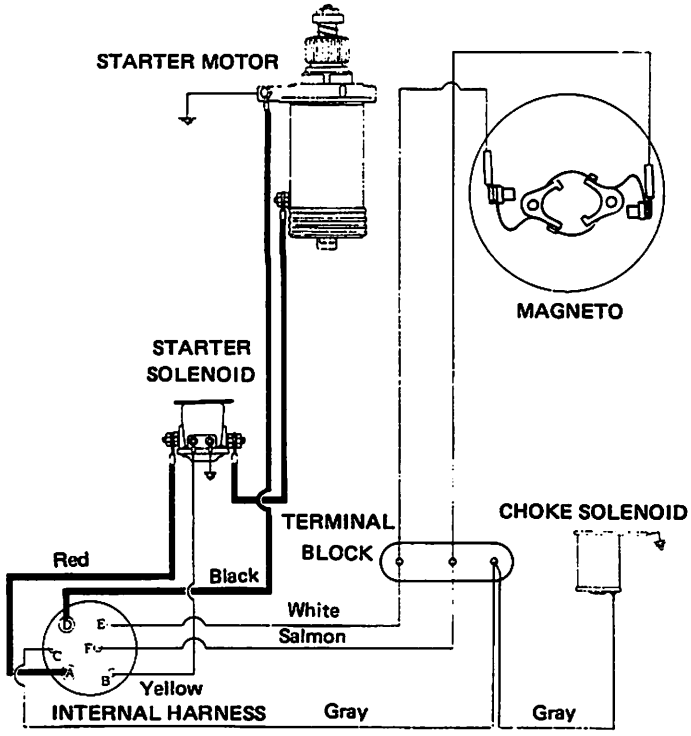
PART G - WIRING DIAGRAMS

INDEX

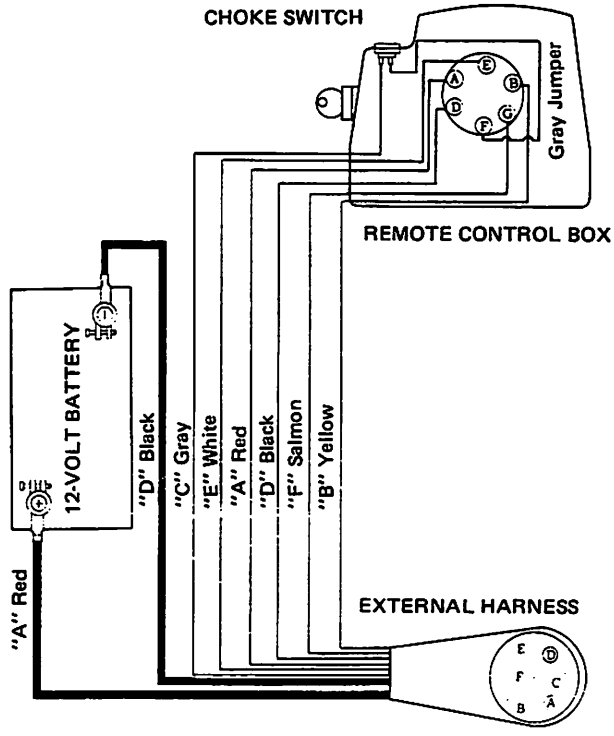
MERC 200 WIRING DIAGRAM



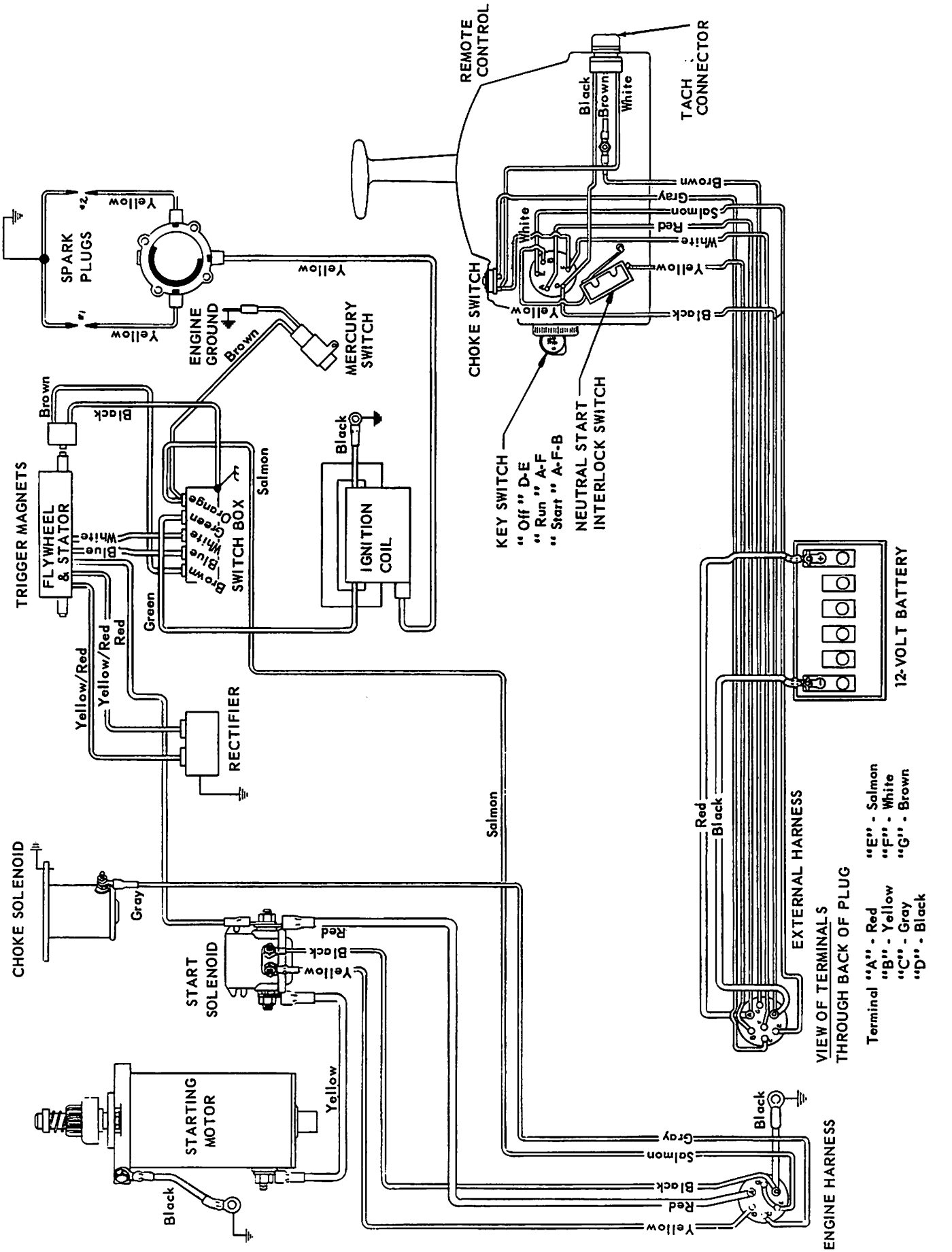
MERC 350 (2-CYL.) MERCELECTRIC WIRING DIAGRAM



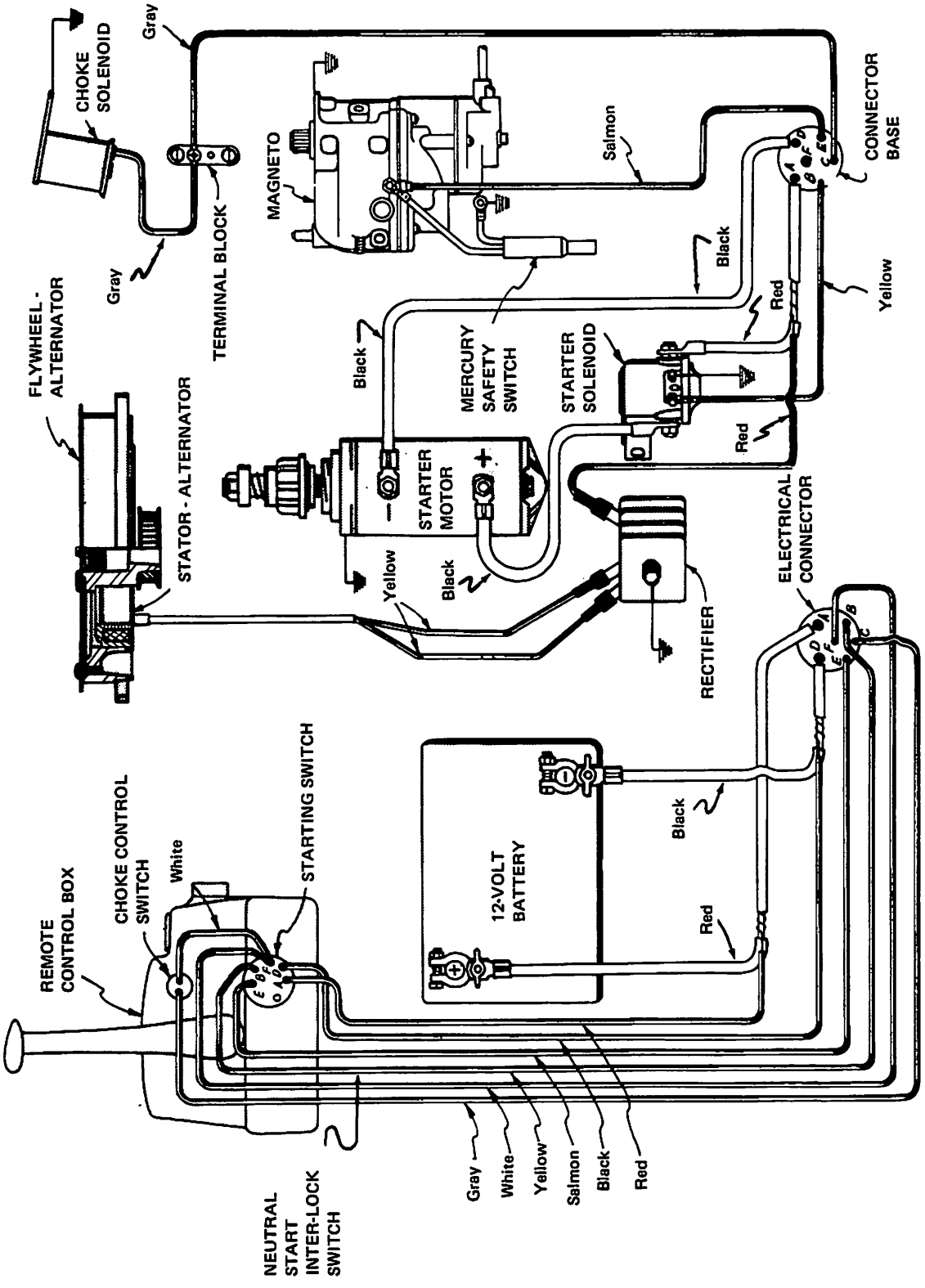
MERC 350 (2-CYL.) MERCELECTRIC HARNESS



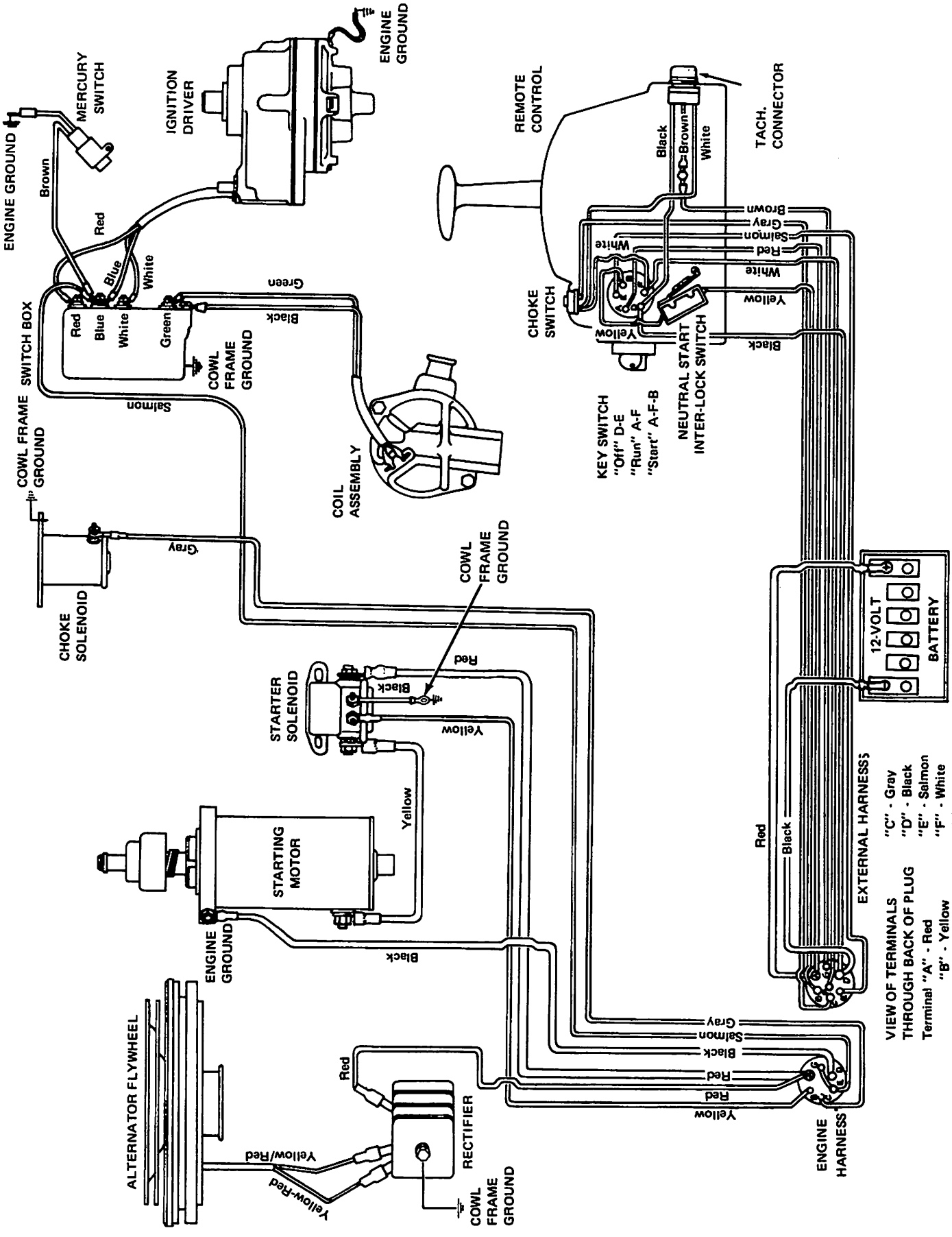
MERC 400 WIRING DIAGRAM



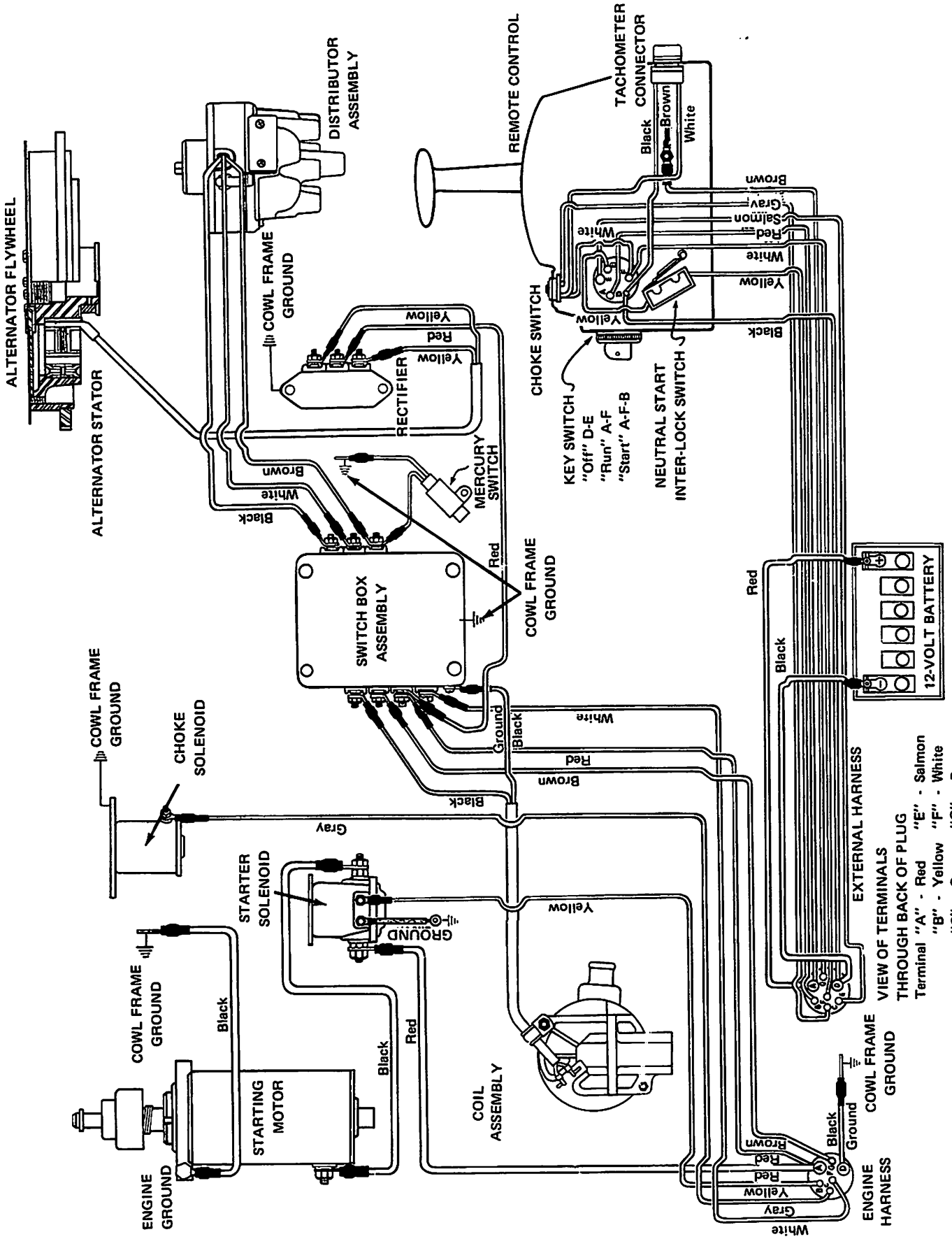
4-CYL. with KIEKHAEFER MERCURY MAGNETO WIRING DIAGRAM



MERC 500 THUNDERBOLT IGNITION WIRING DIAGRAM

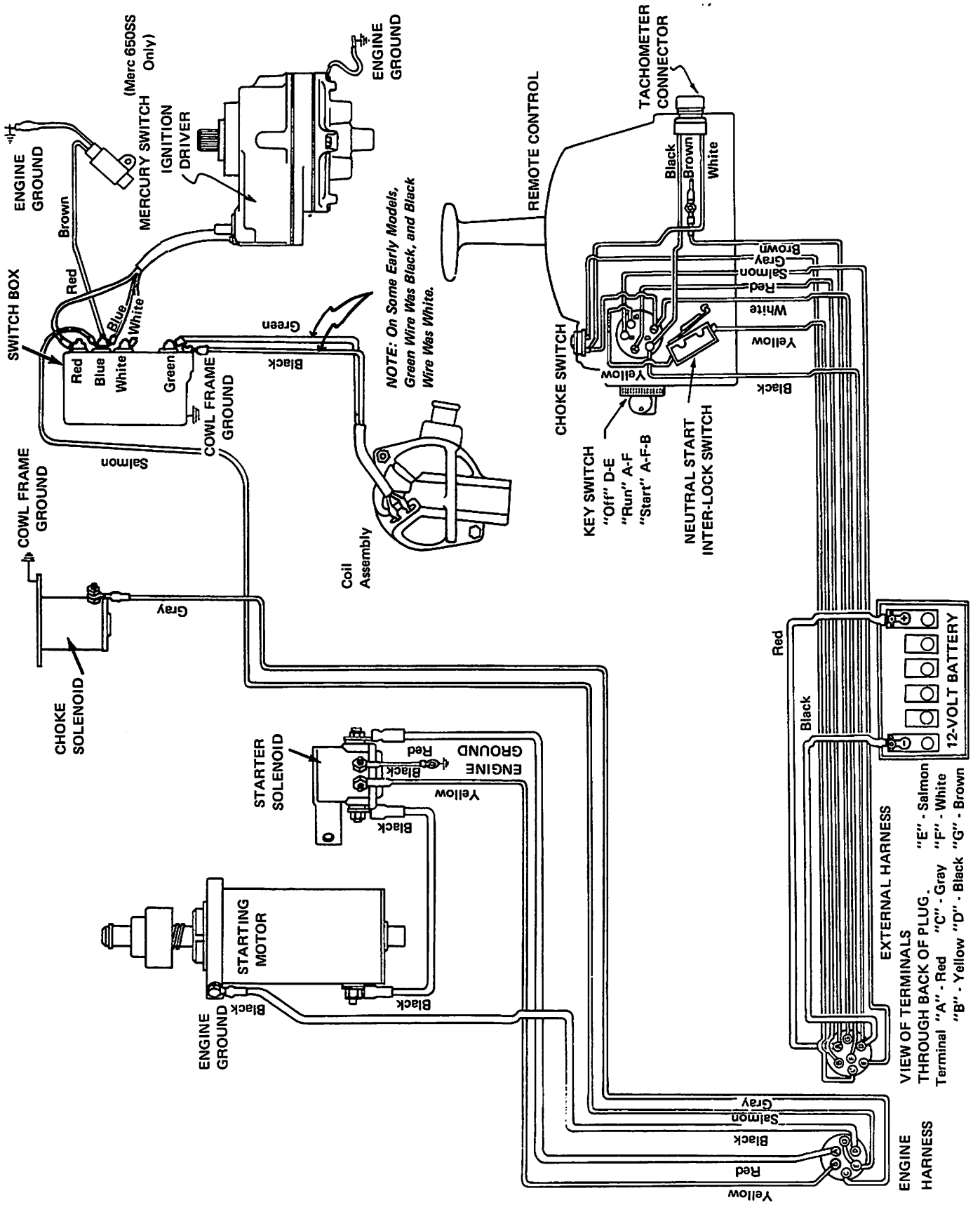


MERC 650SS and 500SS BREAKER-LESS WIRING DIAGRAM



MERC 650S and 500S BREAKER-LESS

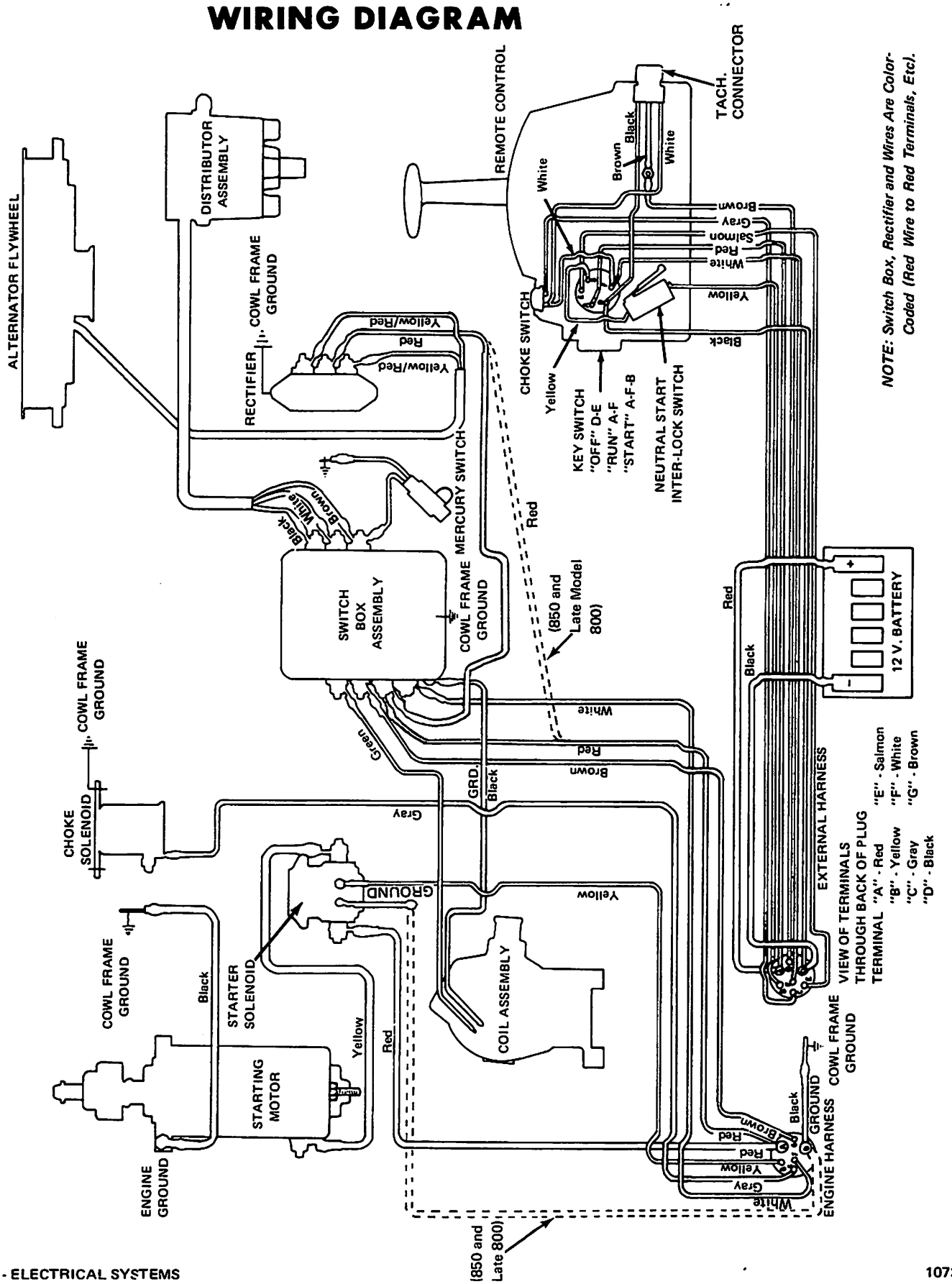
WIRING DIAGRAM with IGNITION DRIVER



MERC 850-800*-650 (4-Cyl.) THUNDERBOLT IGNITION

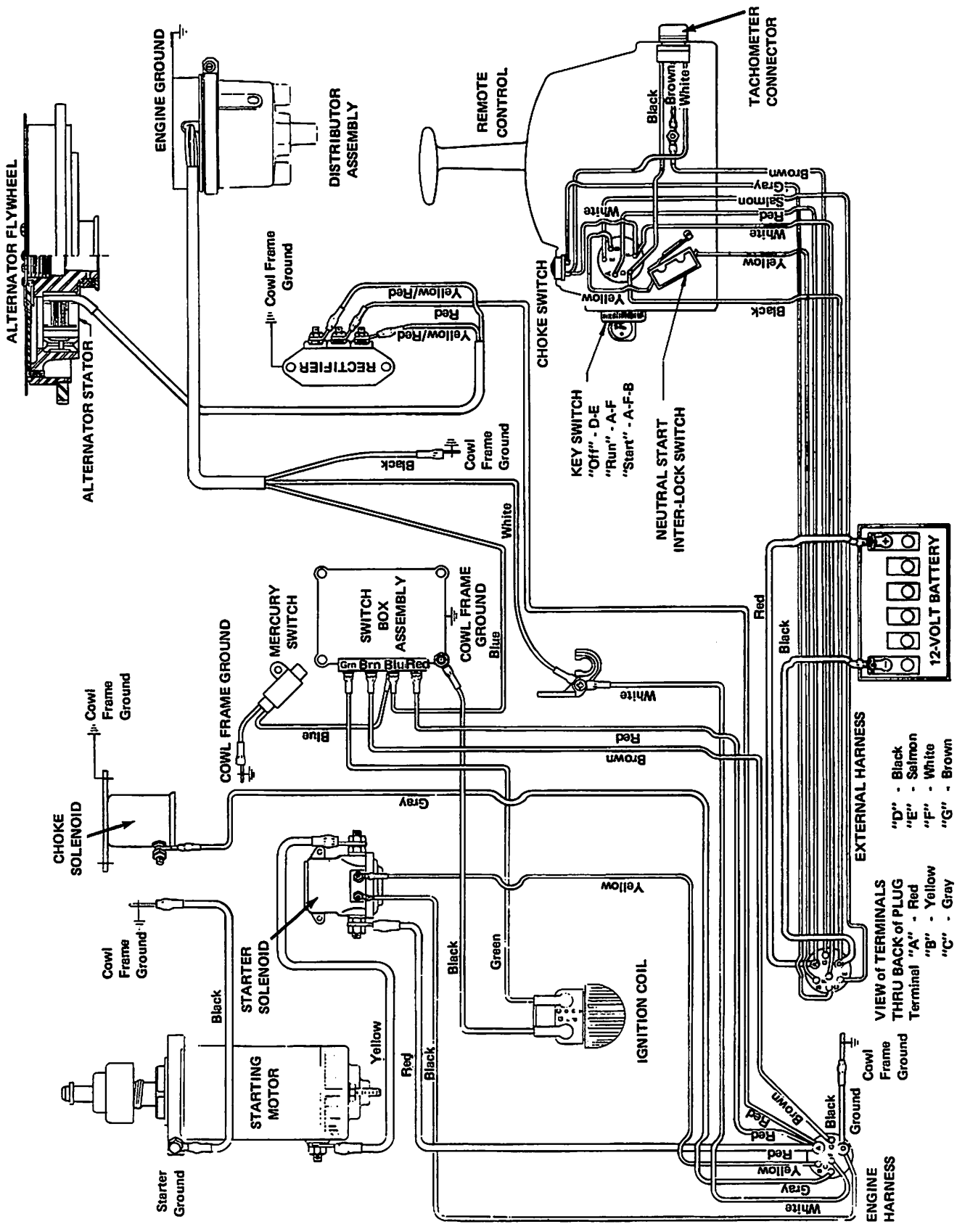
(*Serial No. 2991033 and Below; Serial No. 3052381 thru 3059821; and Serial No. 3307347 and Up)

WIRING DIAGRAM

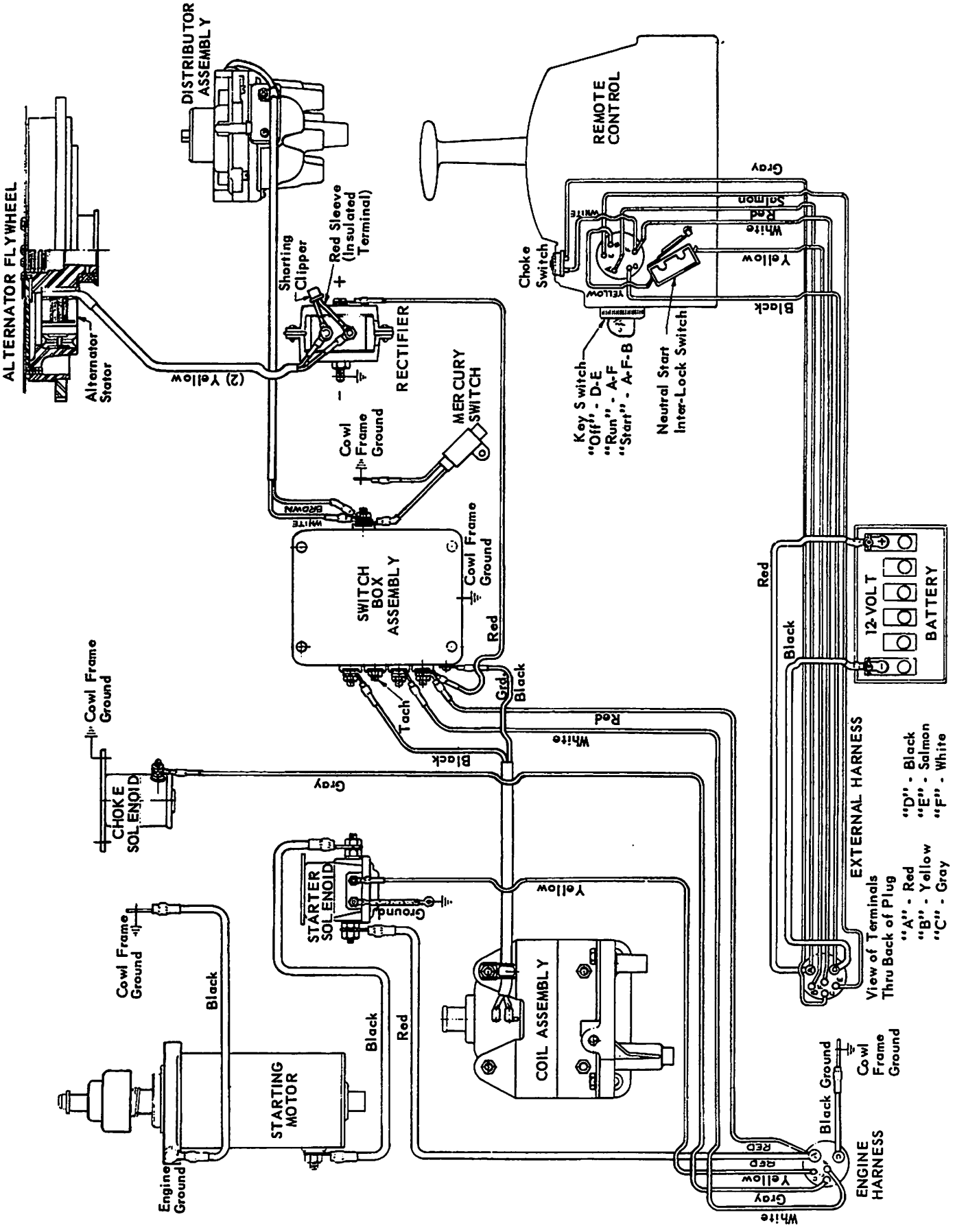


NOTE: Switch Box, Rectifier and Wires Are Color-Coded (Red Wire to Red Terminals, Etc).

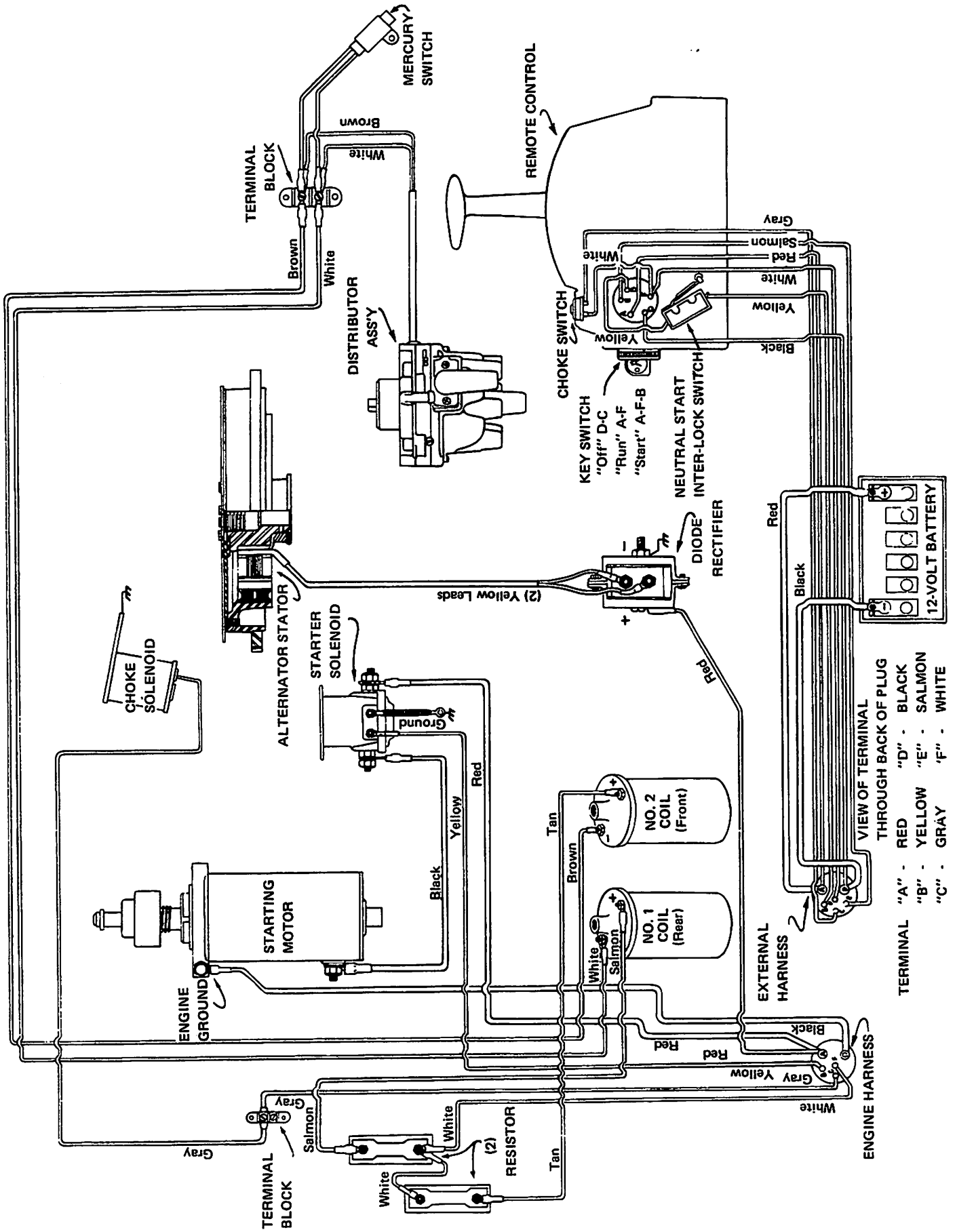
MERC 800 THUNDERBOLT IGNITION
(With Serial Nos. Not Listed on Page 3G-8)
WIRING DIAGRAM



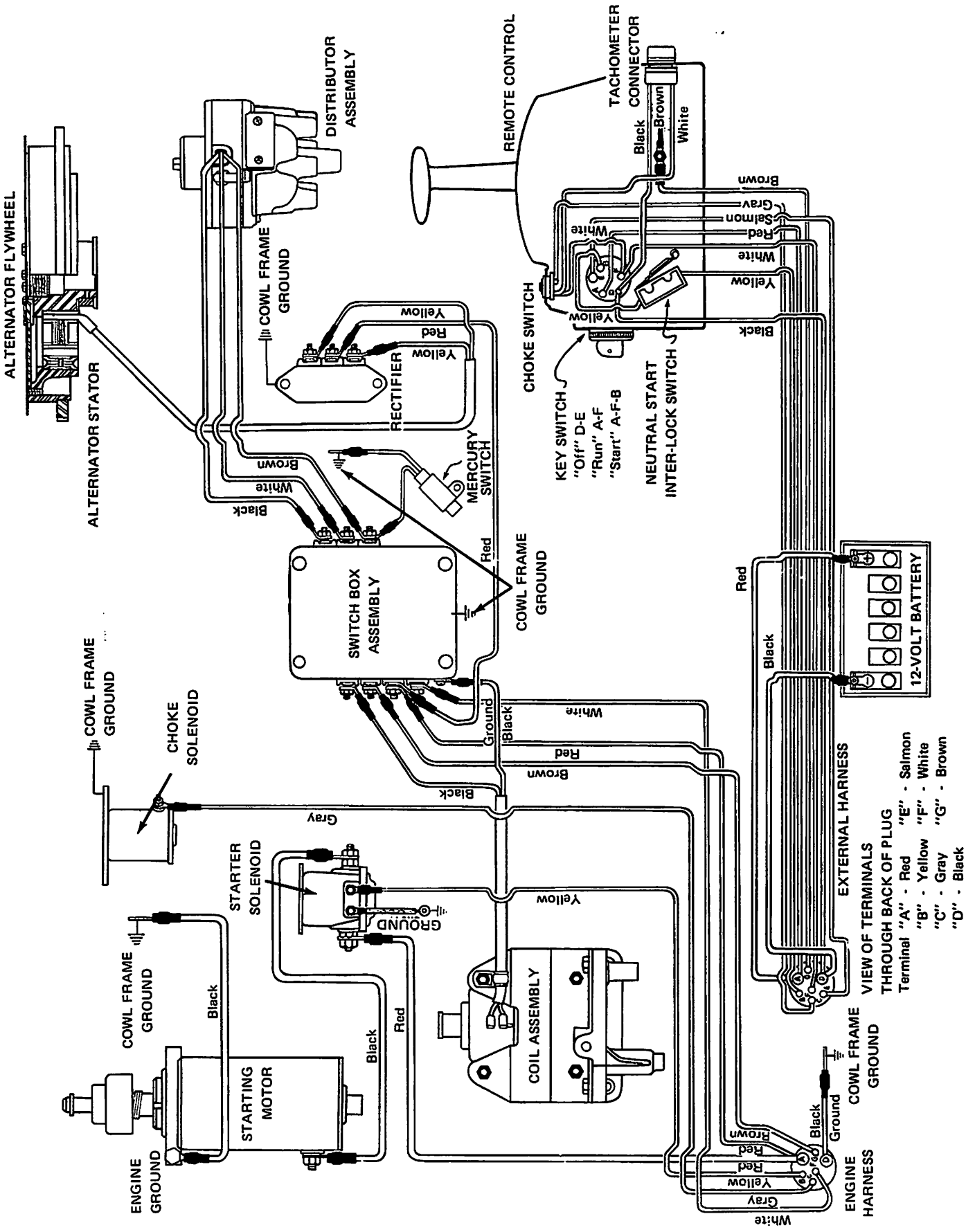
MERC 1100SS and 950SS WIRING DIAGRAM



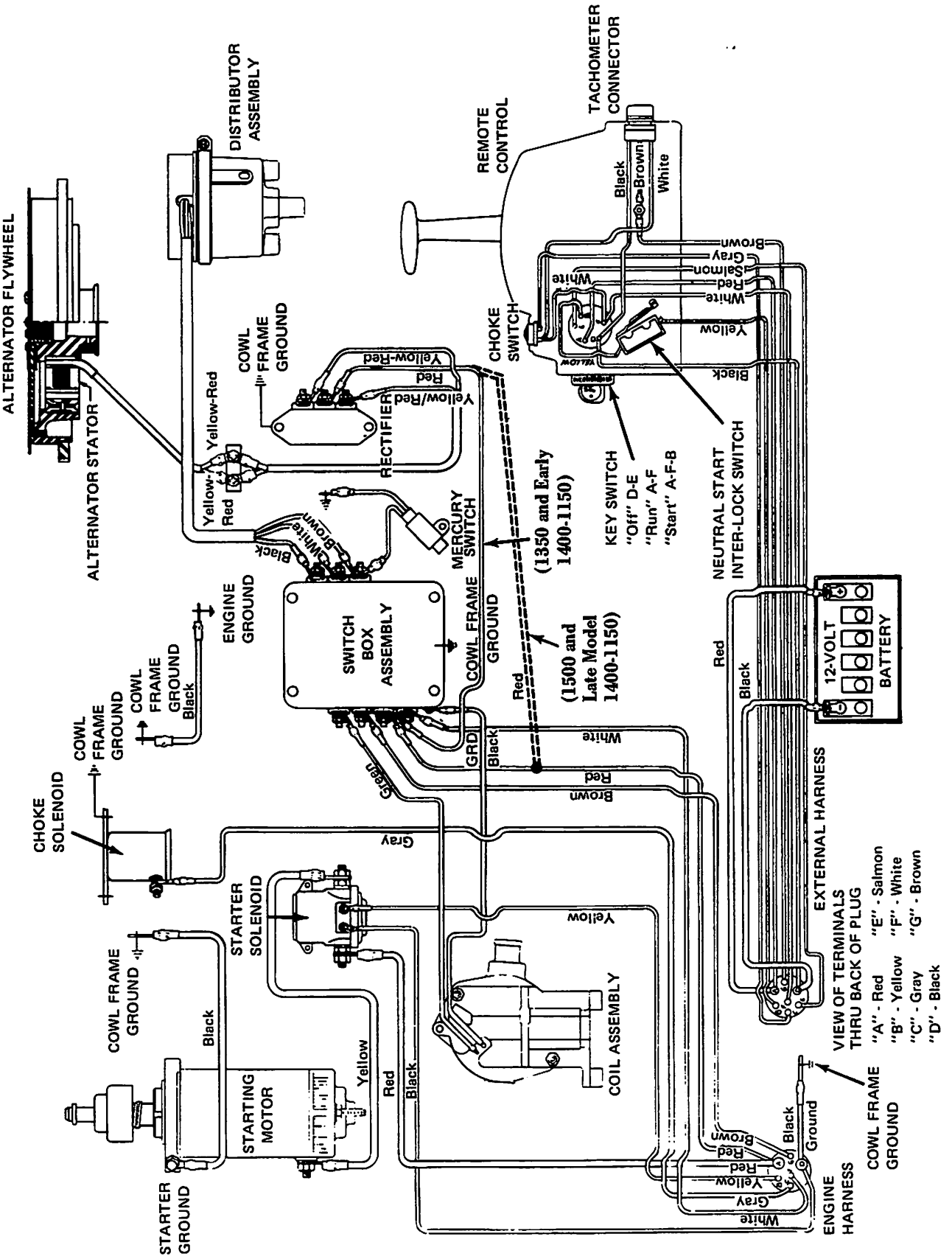
MERC 1100 and 950 WIRING DIAGRAM



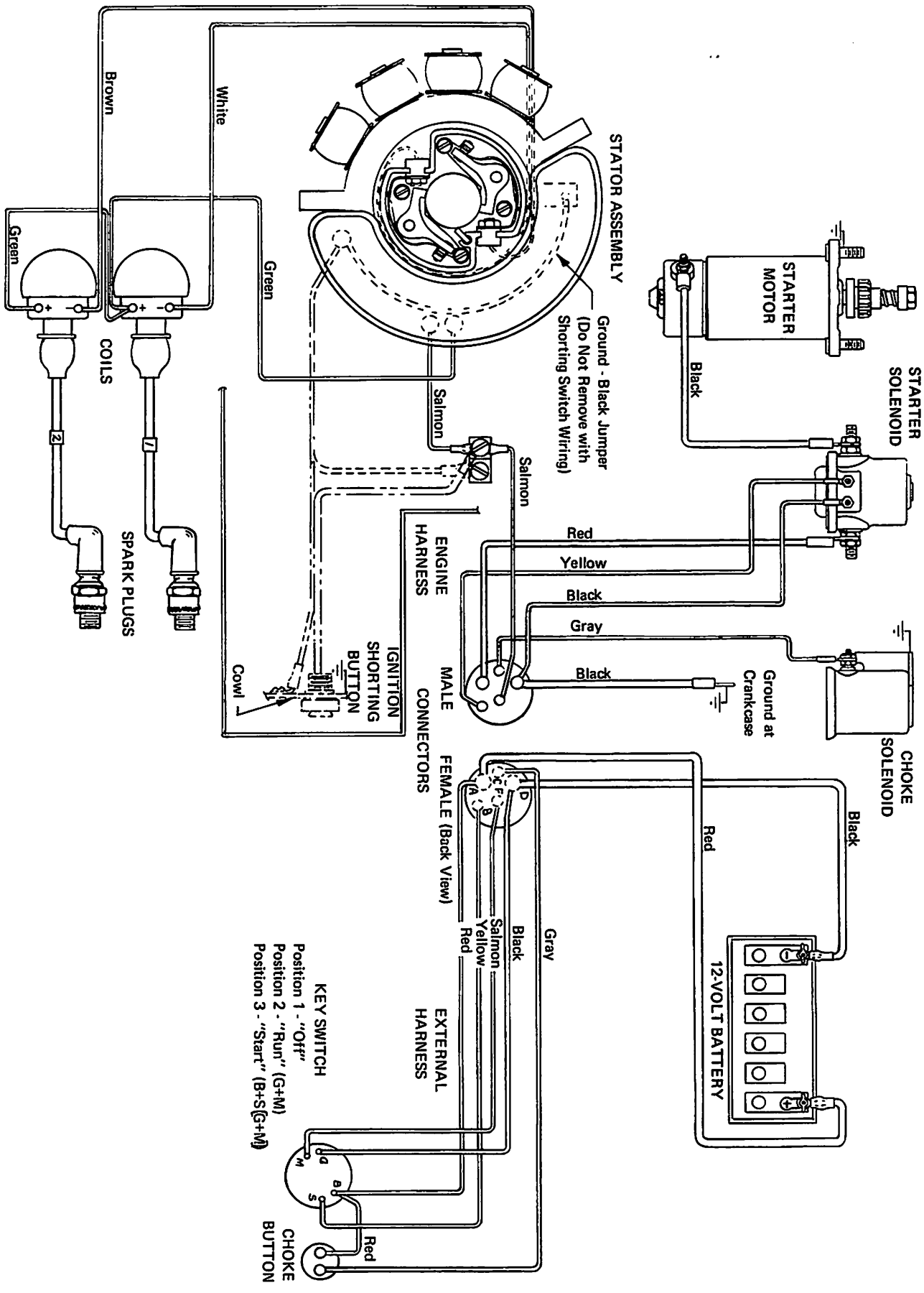
MERC 1250-1100-1000-950
BREAKER-LESS WIRING DIAGRAM



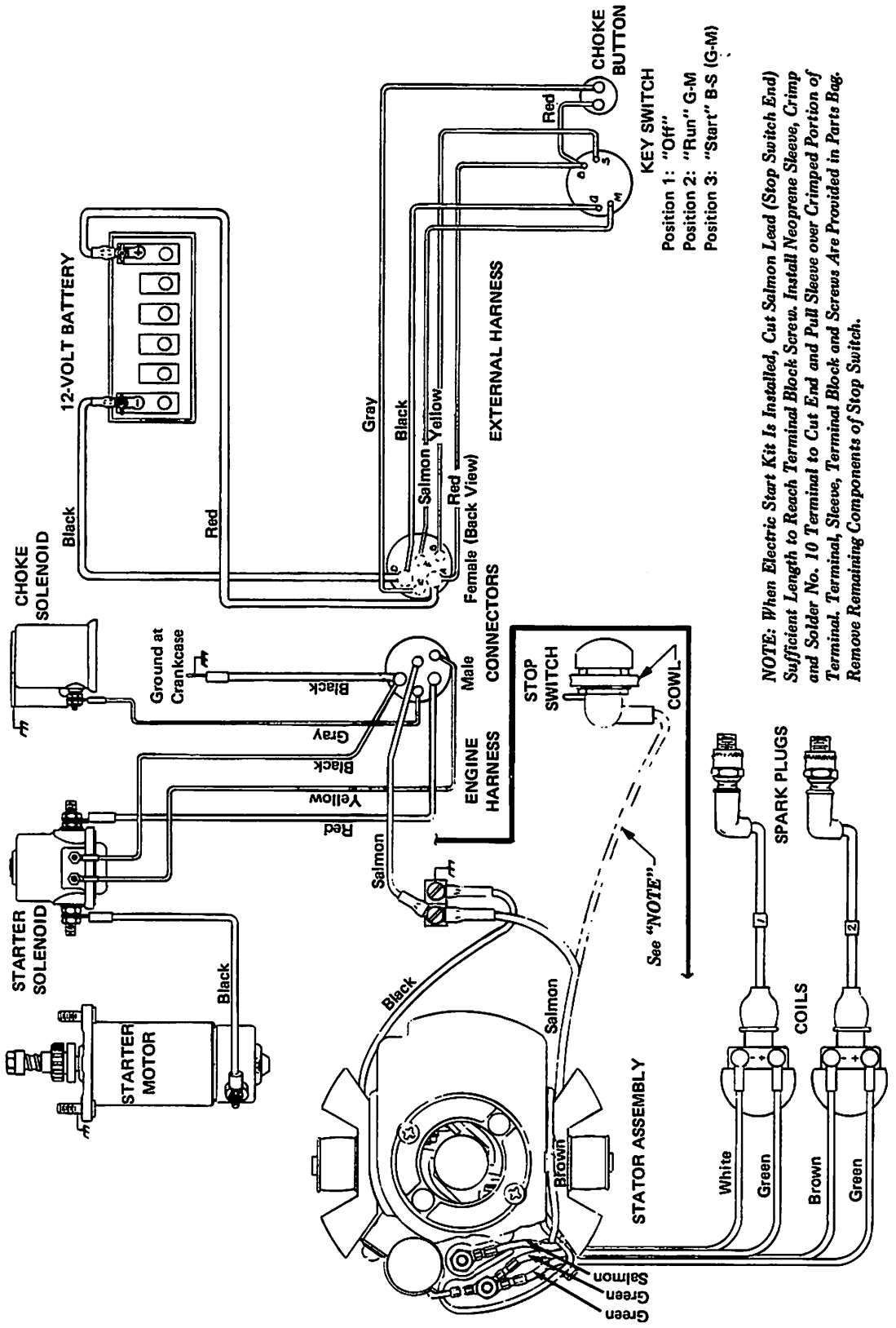
MERC 1500-1400-1350-1150
THUNDERBOLT IGNITION WIRING DIAGRAM



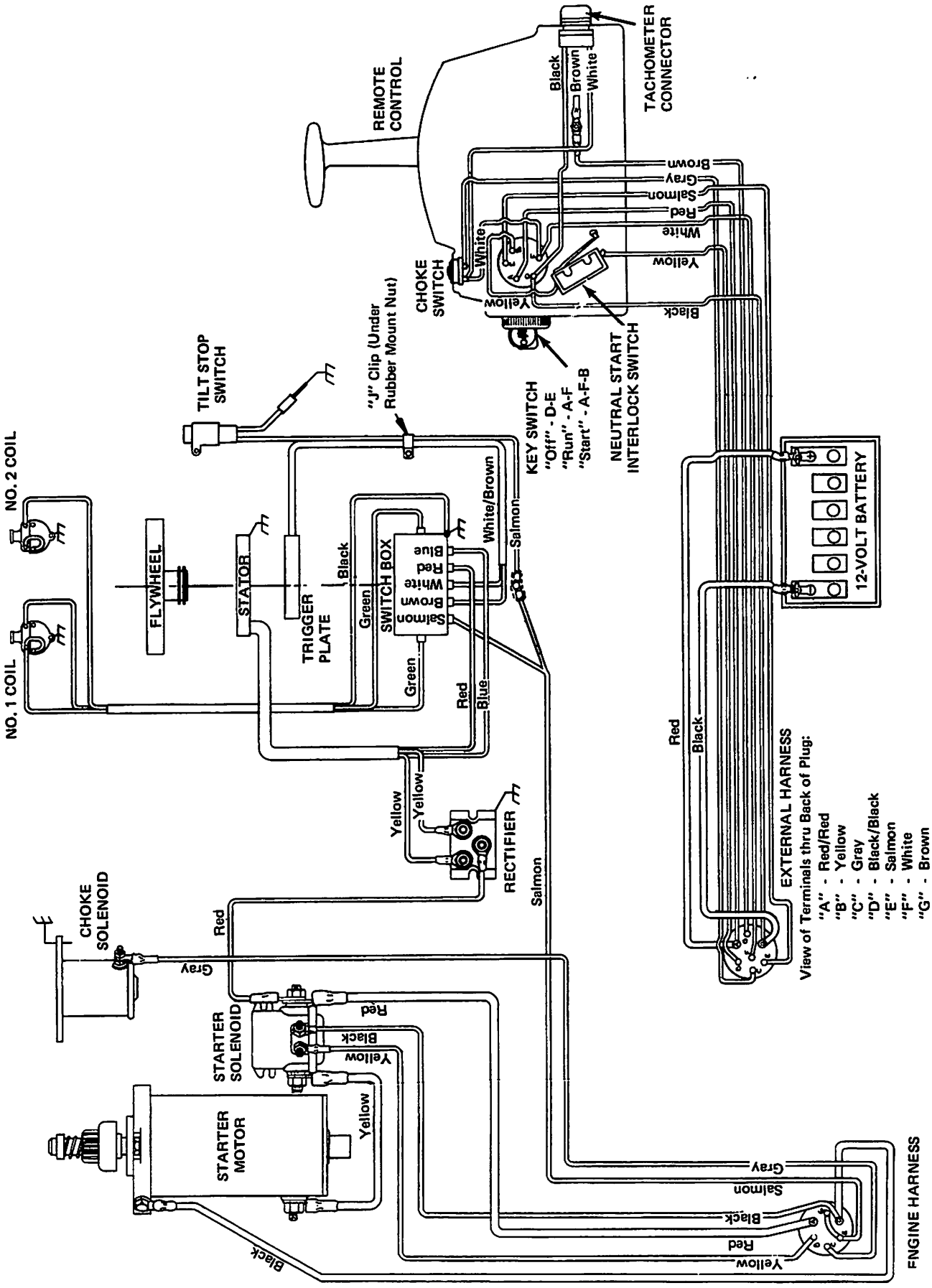
MERC 200 (1970-71) WIRING DIAGRAM



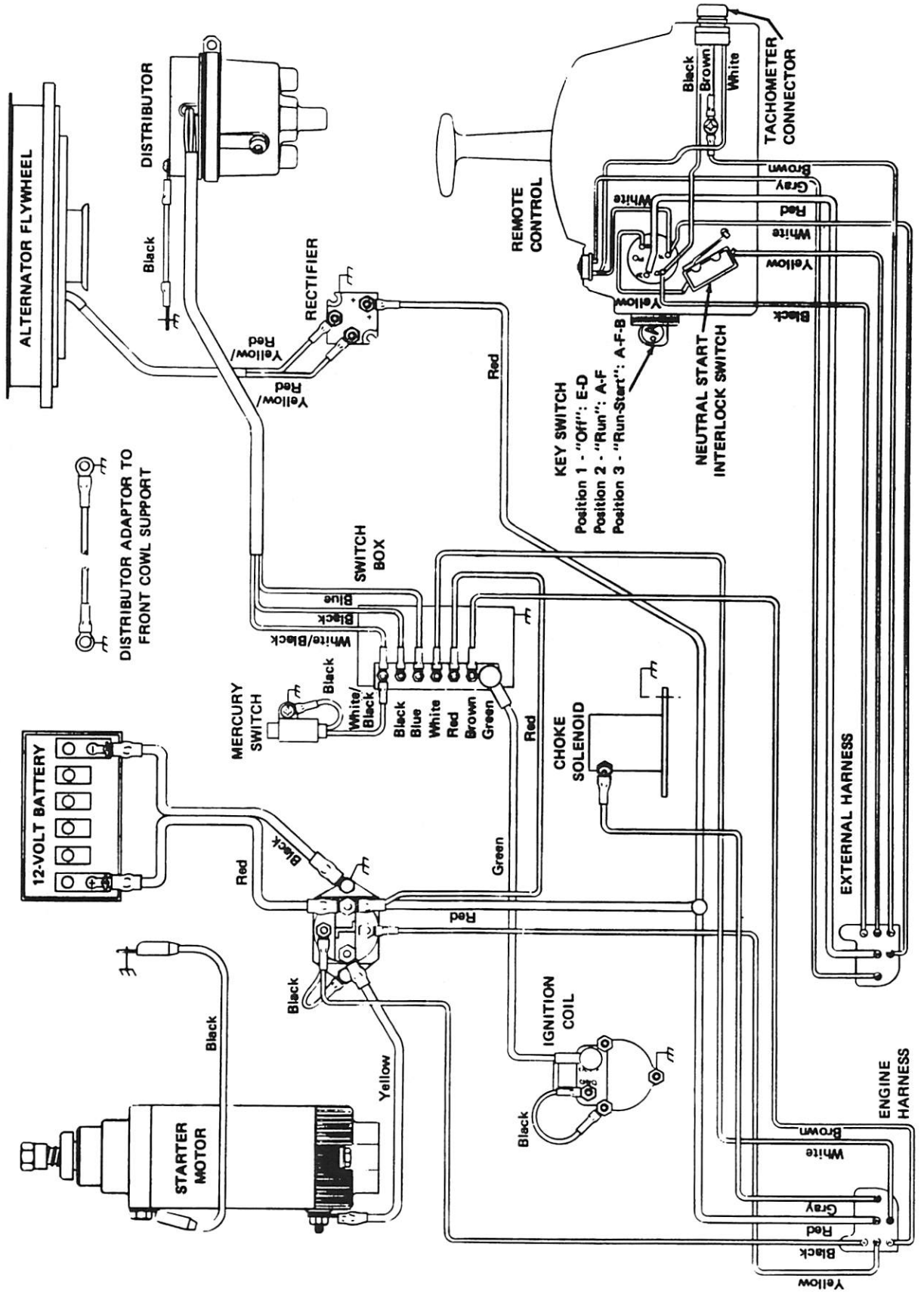
MERC 200 (1972) WIRING DIAGRAM



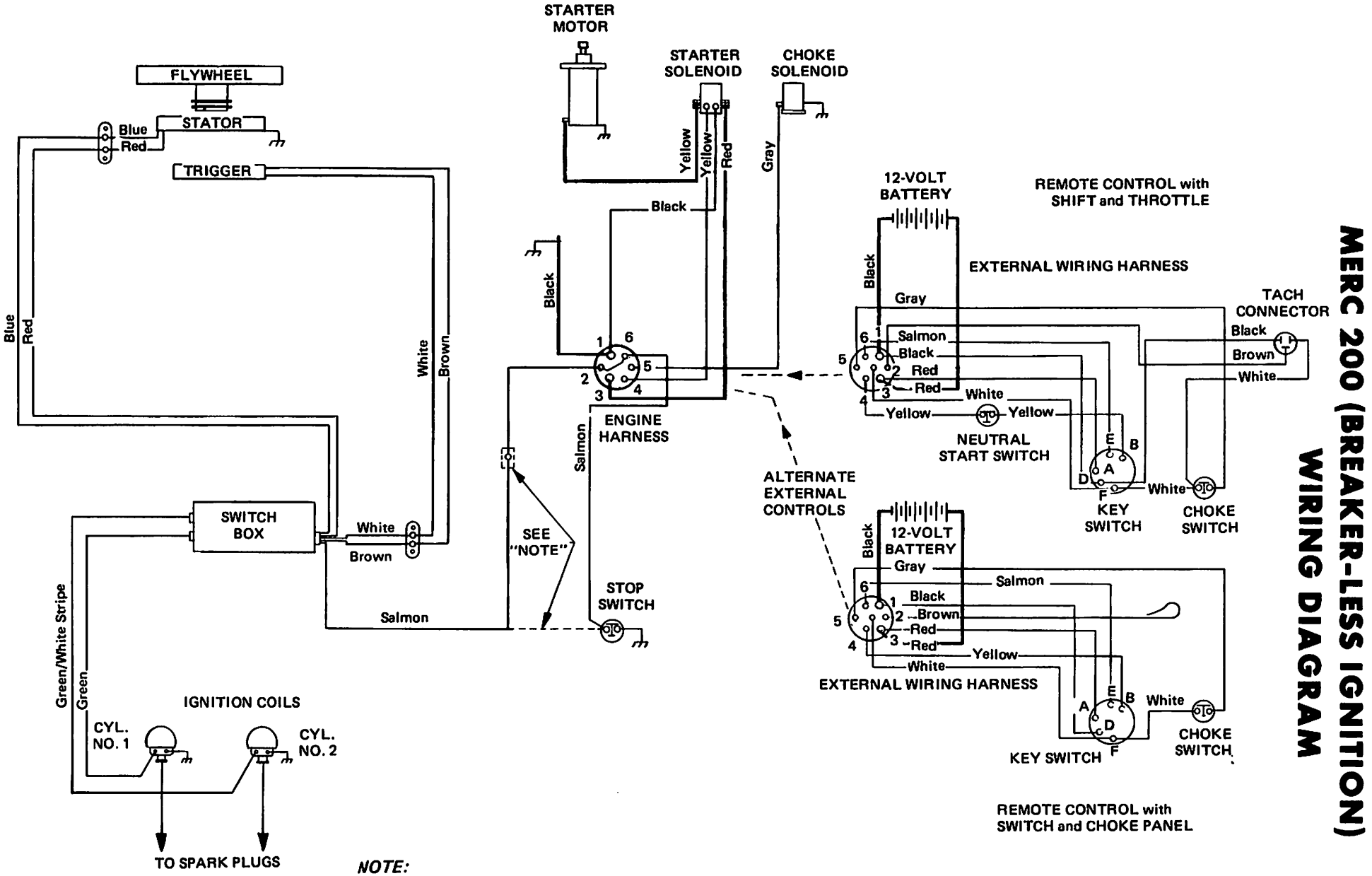
MERC 402 WIRING DIAGRAM



MERC 650 (3-CYL.) WIRING DIAGRAM



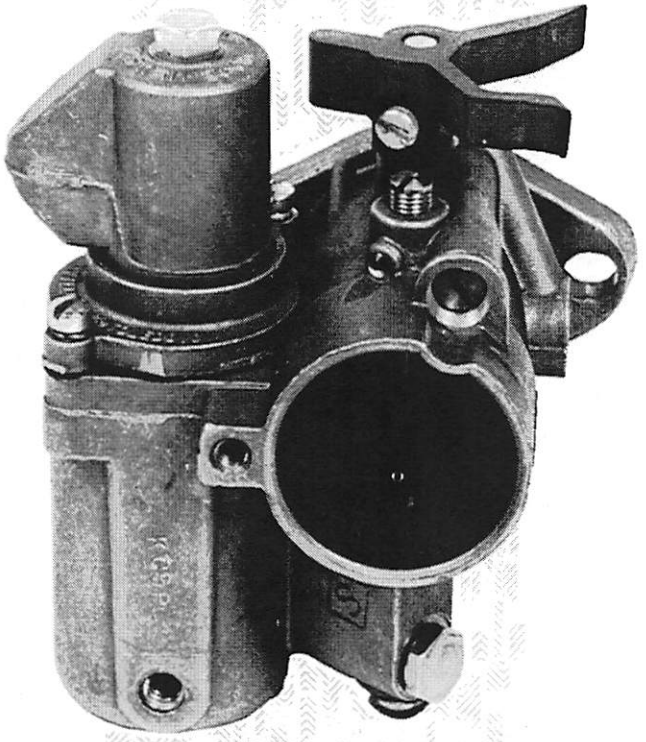
MERC 200 (BREAKER-LESS IGNITION) WIRING DIAGRAM



NOTE:
When Electric Start Kit Is Installed, Disconnect Salmon Lead from Stop Switch and Remove Boot from End of Lead. Install Neoprene Sleeve over End of Lead and Connect Lead to Short Salmon Lead in Engine Harness With Screw and Nut Provided. Slip Neoprene Sleeve over Connection. Connect the Long Salmon Lead with Boot in Harness to Stop Switch.

OUTBOARD

SECTION 4



FUEL SYSTEM

TABLE of CONTENTS

SECTION 4 - FUEL SYSTEMS

MERCURY
OUTBOARDS

PART A - FUEL PUMPS

INDEX

FUEL PUMPS

DESCRIPTION

Crankcase pulsating pressure is transferred to the fuel pump diaphragm. The diaphragm pressure draws fuel from the fuel tank. Before servicing fuel pump, be sure to have the necessary replacement parts.

NOTE: Model 1966-67-68 small one and 2-cylinder fuel pumps had check valves pressed into pump housing. Check valves may be replaced individually or with the housing. (Figure 1)

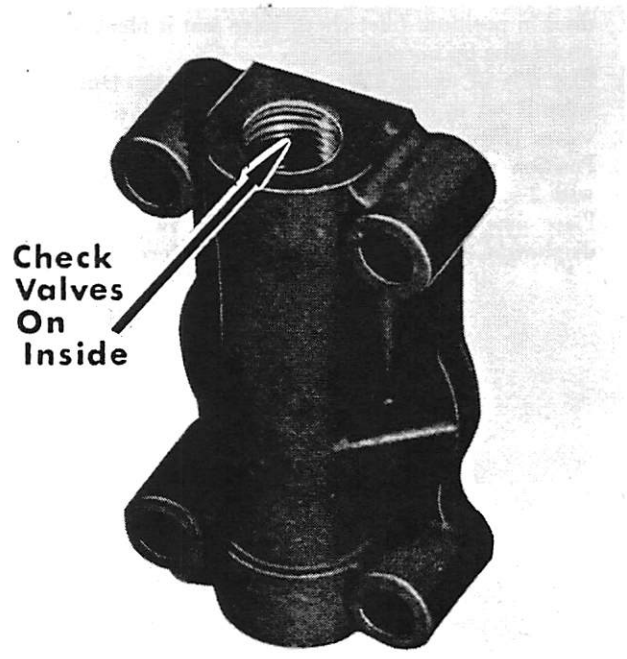


Figure 1. Check Valve Location

06723

REMOVAL

1. Remove fuel tank line from adaptor.
2. Remove fuel lines from pump.
3. Remove screws which secure fuel pump assembly to crankcase.

DISASSEMBLY

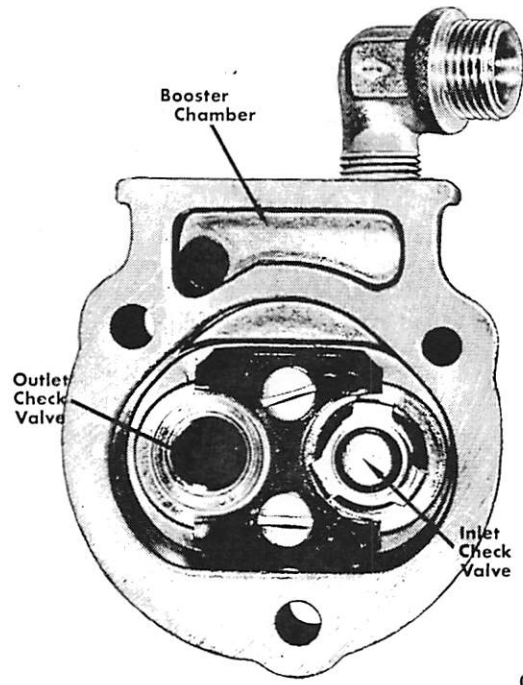
1. Separate fuel pump components.
2. Remove gaskets, diaphragm & check valve retainer screw.
3. Refer to Figures 4-5-6 and 7 for disassembly.

CLEANING and INSPECTION

1. Wash all parts thoroughly and use compressed air to clean all parts.
2. Inspect each part carefully for wear or damage.
3. Replace pulsator diaphragm and gaskets.
4. Be sure that valve seats provide flat contact area for valve disc.
5. Tighten elbows and check valve connections firmly when replacing.
6. Do not use Permatex on valve retainer gasket.
7. Inspect check valves after reassembling fuel pump cover by blowing thru outlet hole. Air should be drawn thru valve but should close immediately when attempting to blow thru it.
8. Check inlet valve by reverse procedure. If leakage is encountered, check for free operation and accurate setting of valves.
9. Worn or slightly warped valve will cause leakage. Replace with new valves for more accurate setting.

REASSEMBLY

1. Inspect all parts, making certain that all are usable, clean and ready for reassembly.
2. Place new check valve gaskets in seats and set check valve discs in position. Inlet check valve seat is identified by its protruding tip in casting.
3. Flat side of check valve seats over this tip. Outlet check valve is set in opposite (flat end up) so tension is against valves. (Figure 2)
4. Position retainer on check valves in housing and secure with 2 screws.
5. Place new gasket on pump body, followed by neoprene diaphragm, another gasket and fuel pump cover.



00637

Figure 2. Check Valve Location

INSTALLATION

1. Position fuel pump on crankcase and secure with screws.
2. Connect fuel lines and open fuel shut off.

A-39082A_ TYPE FUEL PUMP
CHECK VALVE REPLACEMENT

1. Remove check valves by pressing out with 9/32" (7.2mm) drift from intake side, thru to outside. *Replace check valves with new valves, if removed.*
2. Press new check valves into fuel pump housing from inlet of housing. (Figure 3)
3. Press first check valve in until top of valve housing is 1-3/8" (35mm) from face of inlet side.
4. Press second check valve in 7/16" (11.1mm) from face of inlet side.

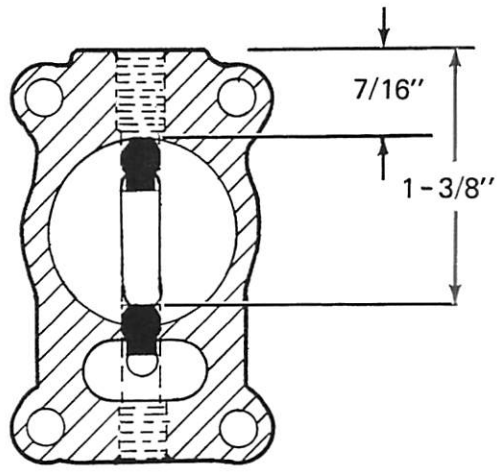


Figure 3. Check Valve Replacement

TESTING

FUEL PRESSURE CHECK

1. Fuel pressure at the top carburetor should be checked whenever insufficient fuel is suspected, or if other than Mercury fuel tank is used. Check "foreign" fuel tanks for the following:
   a. Adequate air vent in fuel cap.
   b. Fuel line large enough (5/16-to-3/8") (8-to-9.5mm).
   c. Filter on end of pickup too small or clogged, or fuel pickup tube too small. Use C-32-33909A4 Fuel Pickup Assembly as a comparison.
2. Insufficient fuel supply will cause engine to run lean, lose RPM or cause piston scoring.
3. The fuel pressure gauge should be installed at the end of the fuel line that leads to the upper carburetor. Fuel pressure must be 2 psi (lbs. per sq. in.) (.14kg/cm^2) or more at full throttle.

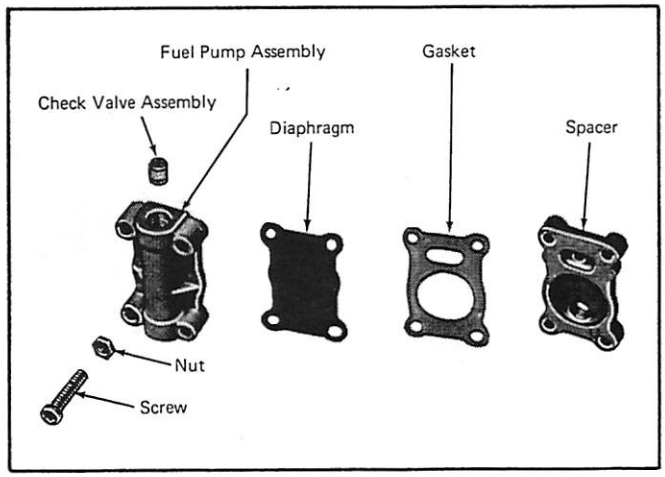


Figure 4. Fuel Pump A-39082A4 Type, Exploded View

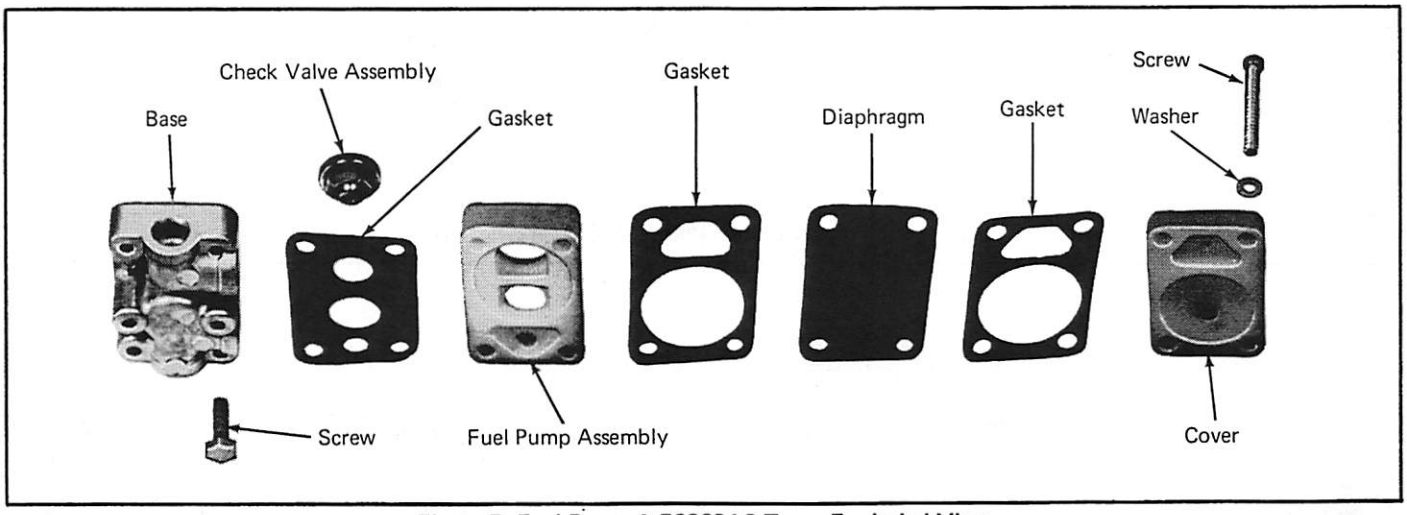


Figure 5. Fuel Pump A-53238A3 Type, Exploded View

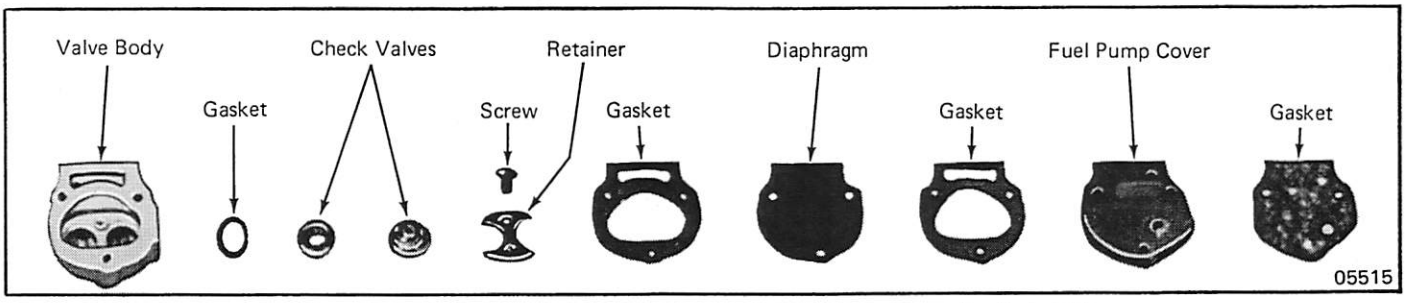


Figure 6. Fuel Pump A-30269A2 and A-23009A1 Type, Exploded View

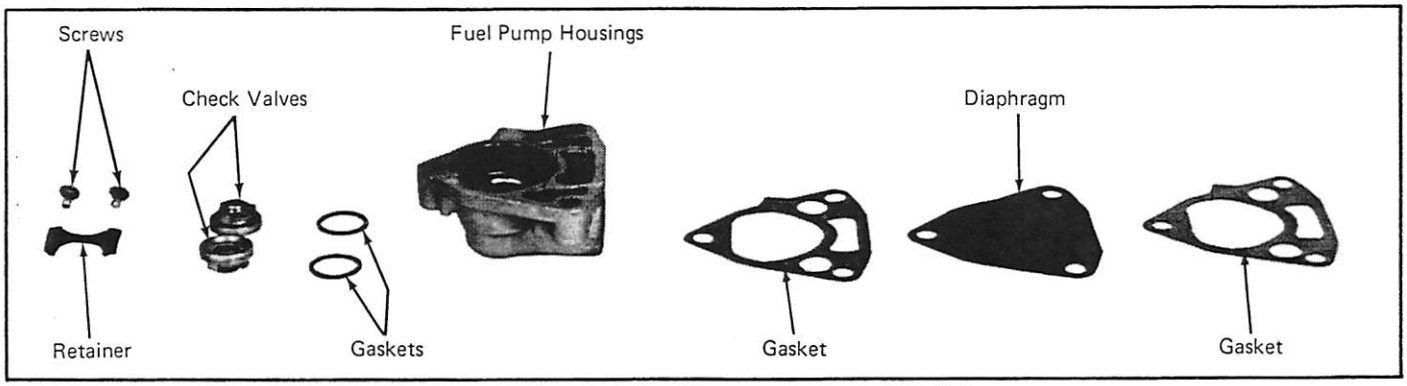


Figure 7. Fuel Pump A-55156A5 Type, Exploded View

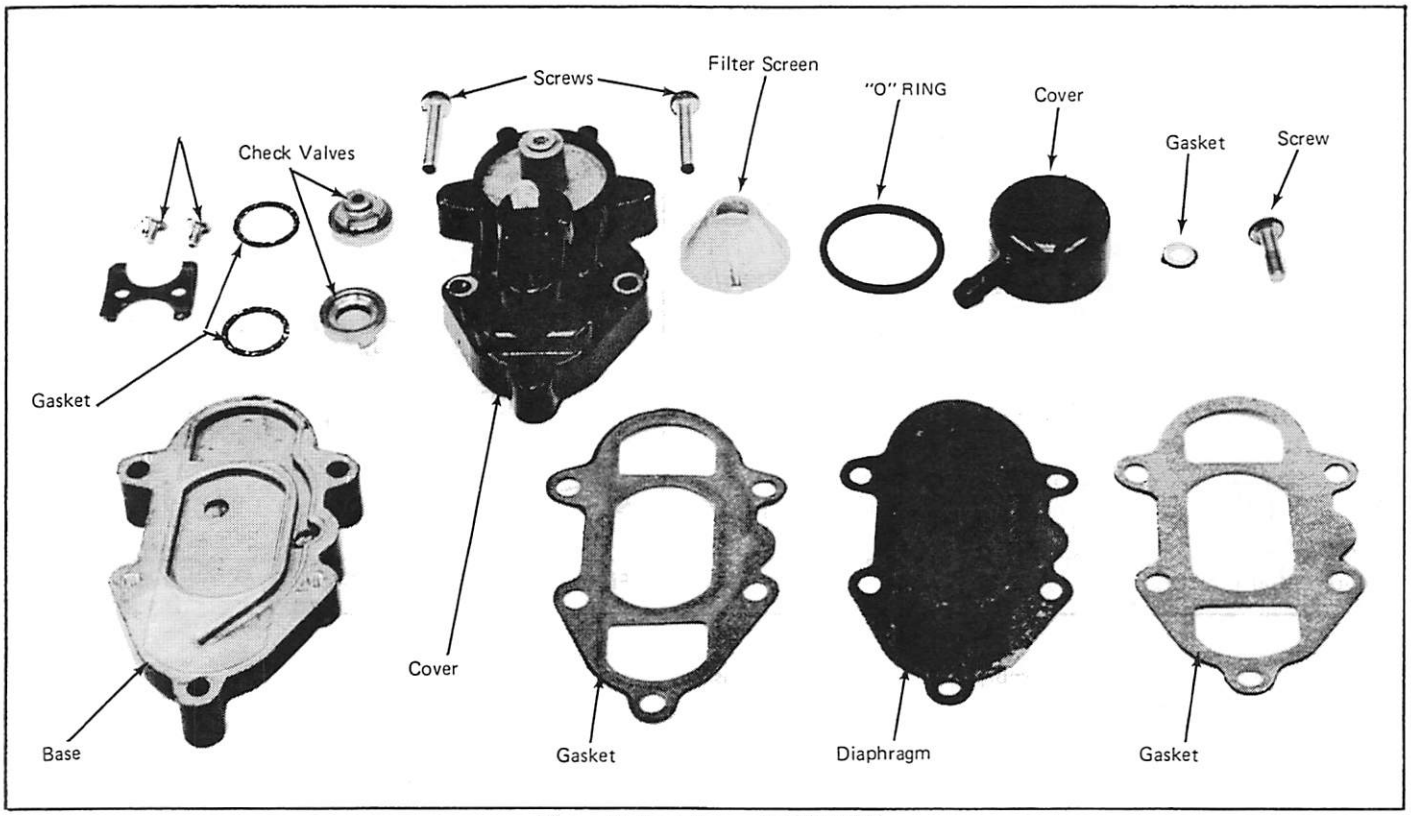


Figure 8. Fuel Pump A-66530A2

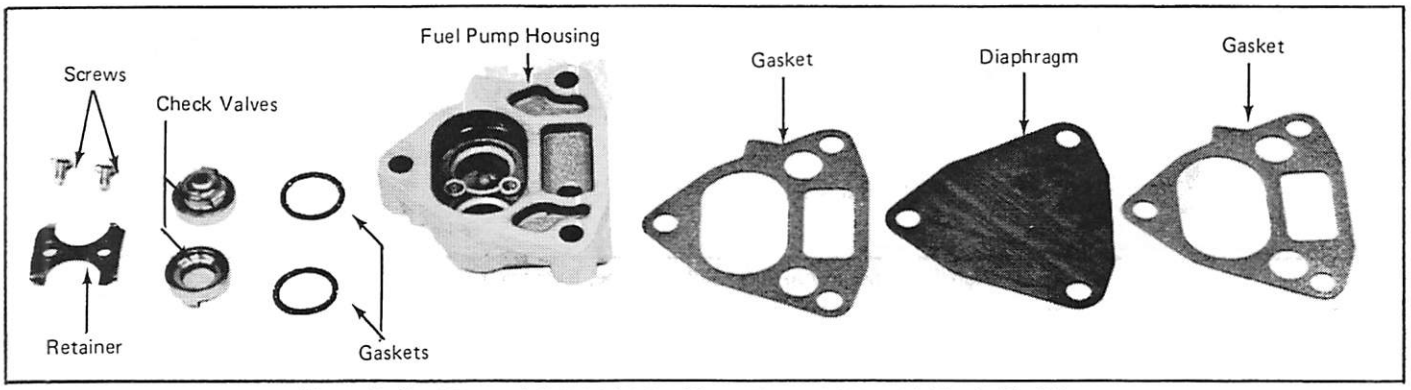


Figure 9. Fuel Pump A-58888A4 for Merc 850 and 800 with Single Fuel Pump

SECTION 4 - FUEL SYSTEMS

MERCURY
OUTBOARDS

PART B - CARBURETORS

MERCURY
MARINE

INDEX

CARBURETORS
PRESSURE TYPE
TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE
Engine Won't Start	
1. No fuel at carburetor	a. Empty gas tank b. Clogged fuel filter c. Restricted vent in gas tank d. Defective fuel pump e. Air leak in line from tank f. Clogged or broken fuel line
2. Fuel at carburetor	a. Flooding at carburetor b. Choke not operating c. Restricted carburetor jets d. Water in gasoline
3. Flooding at carburetor	a. Choke out of adjustment b. High float level c. Float stuck d. Excessive fuel pump pressure e. Float saturated beyond buoyancy
Rough Operation	a. Dirt or water in fuel b. Reed valve open or broken c. Incorrect fuel level in carburetor bowl d. Carburetor loose at mounting flange e. Throttle shutter not closing completely f. Throttle shutter valve installed incorrectly
Engine Misfires at High Speed	a. Dirty carburetor b. Lean carburetor adjustment c. Restriction in fuel system d. Low fuel pump pressure

SYMPTOM	PROBABLE CAUSE
Engine Backfires	a. Poor quality fuel b. Air/fuel mixture too lean c. Excessive lean or too rich mixture d. Improperly adjusted carburetor
Engine Pre-Ignition	a. Excessive oil in fuel b. Poor grade of fuel c. Lean carburetor mixture
Spark Plugs Burn & Foul	a. Too rich fuel mixture b. Inferior grade of gasoline
High Gas Consumption	
1. Flooding or leaking	a. Cracked carburetor casting b. Leaking line connections c. Defective carburetor bowl gasket d. High float level e. Plugged vent hole in cover f. Loose needle and seat g. Defective needle valve seat gasket h. Worn needle valve and seat i. Foreign matter clogging needle valve j. Worn float pin or bracket k. Float binding in bowl l. High fuel pump pressure
2. Over-rich mixture	a. Choke lever stuck b. High float level c. High fuel pump pressure
Abnormal speeds	a. Carburetor out-of-adjustment b. Too much oil in fuel

REMOVAL and INSTALLATION

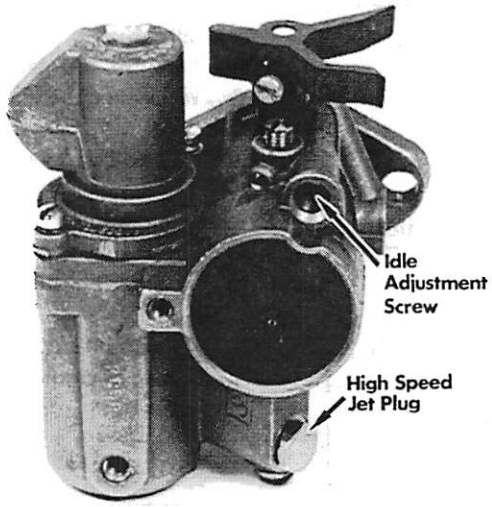
1. Remove choke and throttle linkage from carburetor.
2. Remove fuel line from carburetor.
3. Remove 2 carburetor to crankcase nuts and remove carburetor.
4. Installation is the reverse of removal.

NOTE: Starter motor may require removal on some models.

DISASSEMBLY

FUEL FILTER

1. Remove 3/8" cap screw and gasket from fuel filter cover.
2. Detach filter housing, gasket and filter element and gasket. (Figure 6)

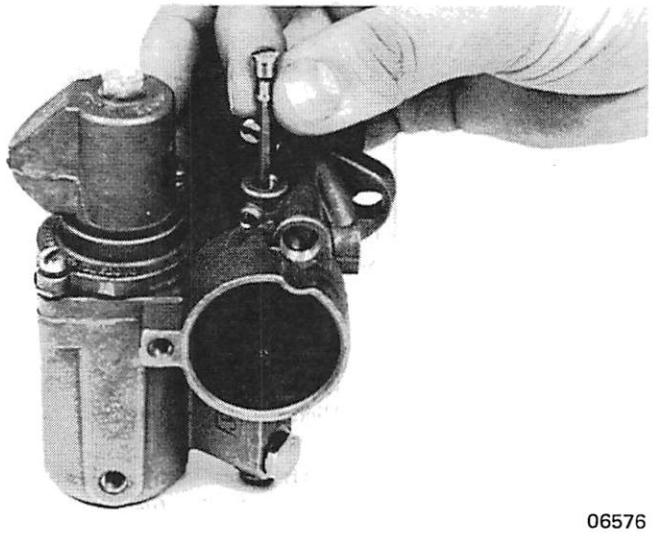


06574

Figure 1. Typical Carburetor

IDLE ADJUSTMENT SCREW

Unscrew idle adjustment screw and remove spring. (Figure 1)



06576

Figure 2. Removing and Installing Idle Restriction Tube

IDLE RESTRICTION

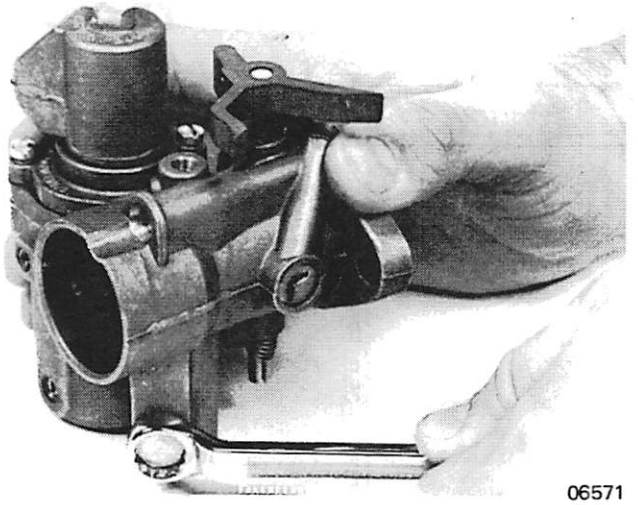
Unscrew idle restriction tube, which extends inside main discharge nozzle, from top carburetor. (Figure 2) Be sure not to lose small restriction tube gasket.

MAIN DISCHARGE NOZZLE

Remove discharge jet plug screw and then, with a screwdriver of exact size, unscrew high speed discharge nozzle.

FIXED HIGH SPEED JET

1. Remove brass hex head plug and gasket from carburetor body with 3/8" wrench. (Figure 3)
2. Remove fixed jet and gasket (where applicable) with Fixed Jet Screwdriver (C-91-29795) or standard screwdriver of exact size. (Figure 4)



06571

Figure 3. Removing Plug

FLOAT

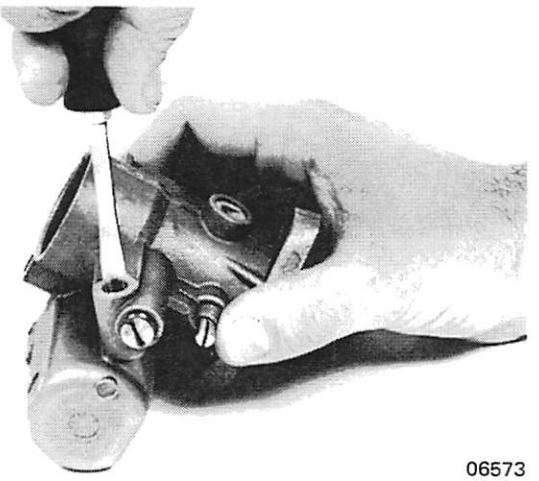
1. Remove 2 screws which hold float bowl cover and gasket to carburetor body.
2. Lift off cover and gasket.
3. Remove lower (primary) float lever pin and lever, allowing upper (secondary) lever to pivot back, thus freeing inlet needle.
4. Pull out inlet needle.
5. Remove inlet needle seat (right hand thread) with a 3/8" socket wrench. Do not lose small gasket beneath inlet seat.
6. Remove float by tipping carburetor upside down.
7. Remove welch plug, which covers idle by-pass chamber, by tapping with a sharp center punch, then prying off.

THROTTLE SHUTTER

1. Remove 2 screws and lockwashers which secure throttle shutter to carburetor throttle shaft.
2. Pull throttle shaft out from top of carburetor.
3. Pull throttle shutter return spring out of carburetor body.

CHOKE SHUTTER

1. Remove 2 nuts from choke shutter and screen and remove screen and shutter.
2. If applicable, remove choke linkage from shutter.



06573

Figure 4. Removing Fixed Jet

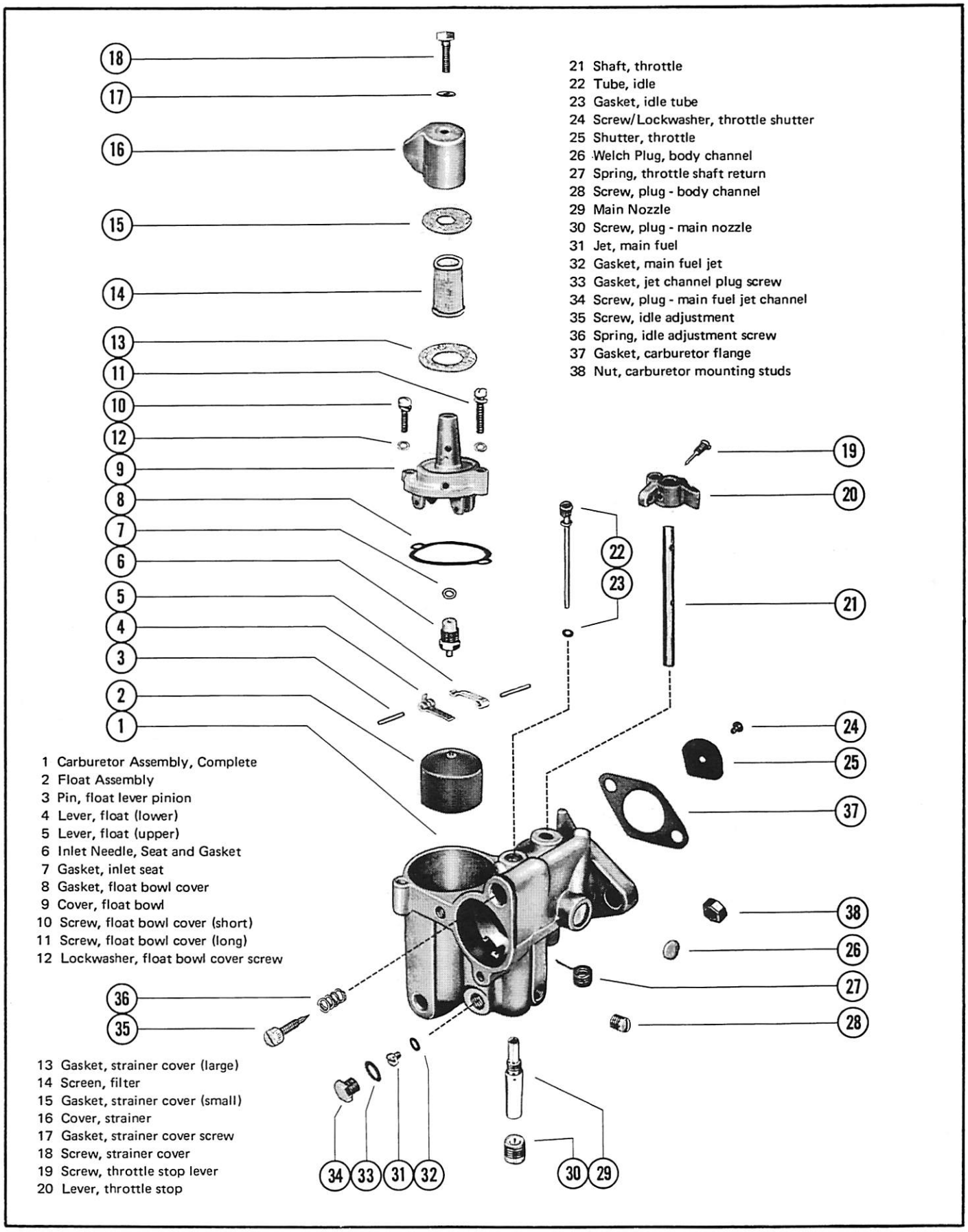


Figure 6. Pressure Type Carburetor

CLEANING and INSPECTION

1. Place carburetor body in a carburetor cleaning solution for a short period of time to remove all dirt, gum and varnish which may have accumulated.

   NOTE: Carburetor cleaners are available through local automotive supply stores.

2. After removing carburetor from cleaner, rinse thoroughly in clean solvent and blow off with compressed air. Be sure to blow through all passages, orifices and nozzles.

3. Check fuel filter for chips or cracks.

REASSEMBLY

FLOAT

1. Check for deterioration and saturation.
2. Check float spring adjustment.
3. Check that spring has not been stretched.
4. Place float in bowl on float pin.
5. Place inlet needle seat gasket in float bowl cover and thread inlet needle securely in place. Torque to 60 in. lbs. (69.1 kg-cm).
6. Set inlet needle in seat (neoprene).
7. Place upper (secondary) float lever in postion and insert float lever pin(Figure 7)
8. Replace lower (primary) float lever and pin.

FLOAT LEVEL and DROP ADJUSTMENT

1. Invert float bowl cover. Distance from face of shoulder in primary lever is 13/32" (10mm), plus or minus 1/64" (.4mm). (Figure 7) Bend primary lever as required.

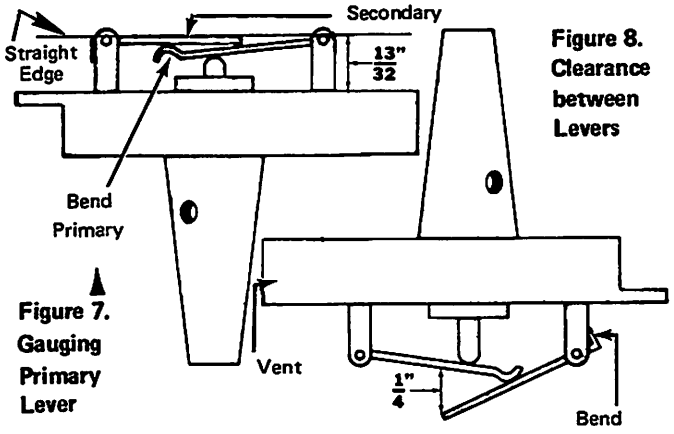


Figure 7. Gauging Primary Lever

Figure 8. Clearance between Levers

2. Be sure needle does not stick in seat. Tip unit upright, and needle should move freely on actuating primary lever.
3. Hold float bowl cover upright. (Figure 8) Distance between levers is ¼" (6.4mm). Bend tab on secondary lever as required.
4. Check that float spring measures approximately 3/32" (2.4mm) from top of float (not insert) to end of exposed spring. (Figure 9)
5. Install new gasket on float bowl cover and replace on carburetor float bowl, securing with 2 screws and lock-washers. Vent hole in cover must be installed toward carburetor mounting flange.

FUEL FILTER

1. Install fuel filter gasket, fuel filter element, another gasket and filter bowl cover.
2. Replace filter bowl cover gasket and secure filter on carburetor with 3/8" cap screw.

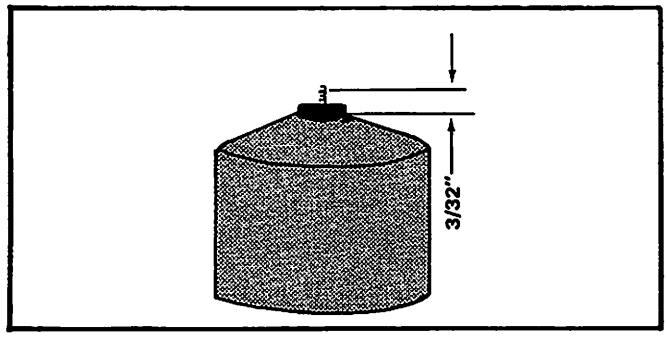


Figure 9. Carburetor Float Assembly

CHOKE SHUTTER

1. Reassemble shutter and screen on carburetor throat studs and secure with 2 nuts.
2. If applicable, reassemble choke linkage to shutter.

THROTTLE SHUTTER

NOTE: There are 2 throttle shutter return springs in the carburetor repair kit. The higher tension spring is used on single carburetor engines or on the upper carb on multi-carb (3, 4 or 6-cylinder) engines. The lighter tension spring is used on carburetors which are operated by the carburetor above it (3, 4 and 6-cylinder engines).

1. Insert throttle shaft return spring in recess at lower end of carburetor.
2. Insert throttle shaft into top of carburetor and into return spring slot. Be sure to have one coil of spring turned to allow sufficient return of throttle shutter to closed postion from spring tension.
3. Insert throttle shutter into carburetor throat and secure to throttle shaft with 2 screws and lockwashers.

MAIN DISCHARGE NOZZLE

1. Position plastic boost ventura in carburetor throat.
2. Insert the main nozzle into receptacle at bottom of carburetor and, with proper size screwdriver, thread in securely.
3. Thread discharge plug into carburetor.

FIXED HIGH SPEED JET

1. Place gasket (where applicable) on correct fixed jet and insert jet (chart by models in "Specifications" Section 8) into carburetor.
2. Place gasket on 3/8" (9.5mm) brass hex head plug and secure plug with wrench.

IDLE RESTRICTION TUBE

1. Place gasket (where applicable) on idle restriction tube and insert into top of carburetor. (Figure 2)

2. Insert new welch plug over idle by-pass chamber and tap center of plug to hold plug in place.
3. Seal with Liquid Neoprene (C-92-25711).

IDLE ADJUSTMENT SCREW

Place spring on idle adjustment screw and thread into carburetor.

ADJUSTMENTS

HIGH SPEED ADJUSTMENT

1. Jet size recommendations are intended as a guide (like a propeller chart). Try size larger or smaller if in doubt. See jet sizes in "Specifications" Section 8.
2. No change in spark advance is recommended for elevation operation. Propellers of lower pitch should be used at high elevations to allow proper engine RPM.
3. Engine can be tested in test tank with propeller or test wheel.

IDLE ADJUSTMENT (Figure 10)

1. Idle adjustment also has been set at factory. If readjustment is necessary, it can be done with a test wheel or regular propeller in test tank or on boat.
2. Start with all idle needles one turn open and adjust for maximum RPM with distributor retarded to give about 600-700 RPM. (Figure 10)
3. Warm engine before attempting adjustment.
4. With engine running at idling speed while in forward gear, turn low speed mixture adjusting needle counterclockwise until affected cylinders start to "load up" or fire unevenly due to over-rich mixture. (Figure 10)
5. Slowly turn needle clockwise until cylinders fire evenly and engine picks up speed.
6. Continue turning clockwise until too-lean a mixture is obtained and engine slows down and misfires.
7. Set adjustment screw ½ to ¾-turn counterclockwise from lean-out position to gain approximate true setting.
8. Do not adjust leaner than necessary to attain reasonably smooth idling.
9. When in doubt, it is preferable to have mixture set slightly rich rather than too lean.

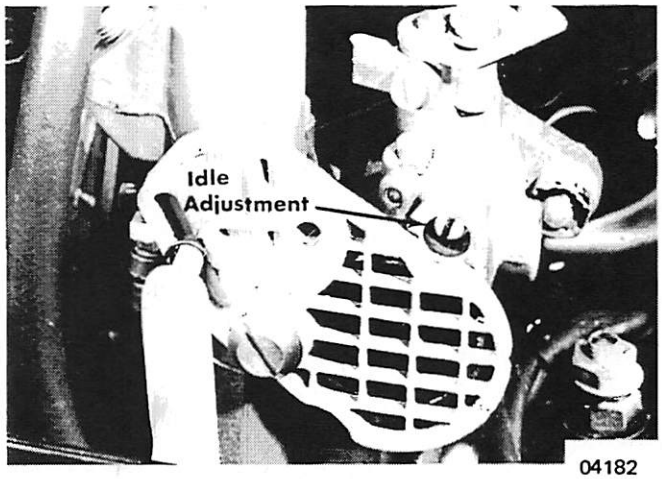


Figure 10. Idle Speed Adjustment

10. If engine hesitates during acceleration after adjusting mixture idle, it is too lean, and idle mixture should be enriched slightly until engine accelerates correctly.
11. Idle engine and adjust "idle stop" screw on stop bracket so that engine idles at recommended RPM (see Section 3E) in forward gear.
12. Run engine in forward gear (4000 to 5000 RPM) to clear engine and recheck idle speed.

INTEGRAL FUEL PUMP TYPE TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	REMEDY
Carburetor Floods	Dirt or foreign particles preventing inlet needle from seating. Worn inlet needle Incorrect float setting	Flush out inlet seat and clean inlet needle. Remove and replace with a new inlet needle and seat assembly. Reset float to correct level.
Engine Will Not Idle	Idle by-pass tube plugged. Idle channels plugged. Idle by-pass holes plugged. Incorrect idle setting Fuel line pinched. Perfect seal from gas tank fitting in fuel line Welch plug leaking.	Blow out with compressed air. Blow out with compressed air. Blow out with compressed air. Re-adjust. Relocate fuel line. Clean out line. Replace and seal.
Engine Will Not Accelerate	Float level is low. Incorrect idle speed adjustment Restricted fuel flow to carburetor Main nozzle is damaged. Main nozzle is plugged.	Reset float to correct level. Re-adjust. Check fuel lines and filters for restricted flow. Remove and replace. Blow out with compressed air.
Engine Runs Lean	Float set too low. Restricted fuel flow to the carburetor Main orifice plugged. Main nozzle damaged. Idle set too lean.	Reset float to correct level. Check fuel lines to the carburetor to see that a full fuel flow is maintained. Check fuel filters for restricted flow. Blow out with compressed air. Remove and replace. Adjust carburetor richer.
Engine Runs Rich	Float set too high. Idle air bleed plugged. Carburetor floods. Nozzle air bleed plugged or damaged.	Reset float to proper level. Blow out with compressed air. See above. Clean or replace.

NOTE: In making carburetor adjustments, turn adjustments carefully and gently - do not force adjustments into seats.

REMOVAL and INSTALLATION

1. Disconnect choke cable from choke lever. Remove cap screw and spacer which secures choke cable to carburetor.
2. Remove 2 carburetor to powerhead nuts.
3. Remove cap screw, then remove fuel line and fuel connector with carburetor.
4. Installation is the reverse of removal.

DISASSEMBLY

FUEL STRAINER

Remove strainer cover screw, cover, cover gasket and strainer screen. (Figure 1)

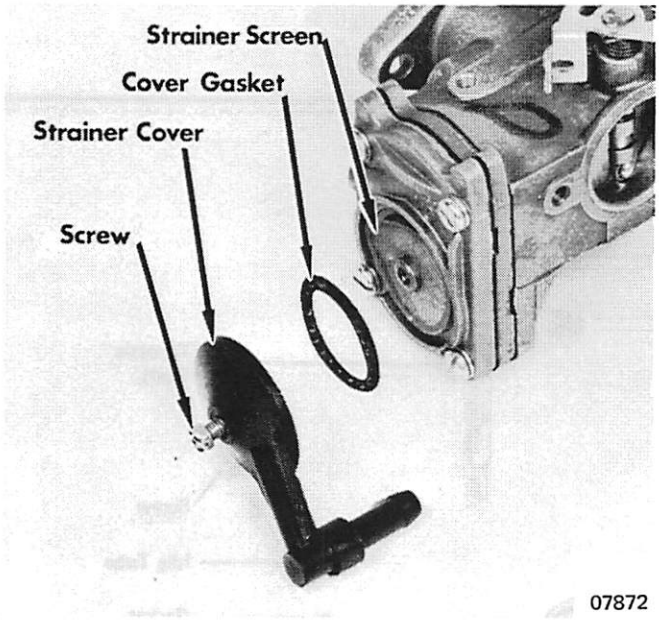


Figure 1. Strainer Cover and Screen Removal

FUEL PUMP

1. Remove 4 screws from fuel pump side of carburetor.
2. Remove strainer body, pump diaphragm, gasket, pump body, diaphragm and gasket. (Figure 4)

IDLE MIXTURE SCREW

Unscrew idle mixture screw and remove spring. (Figure 4)

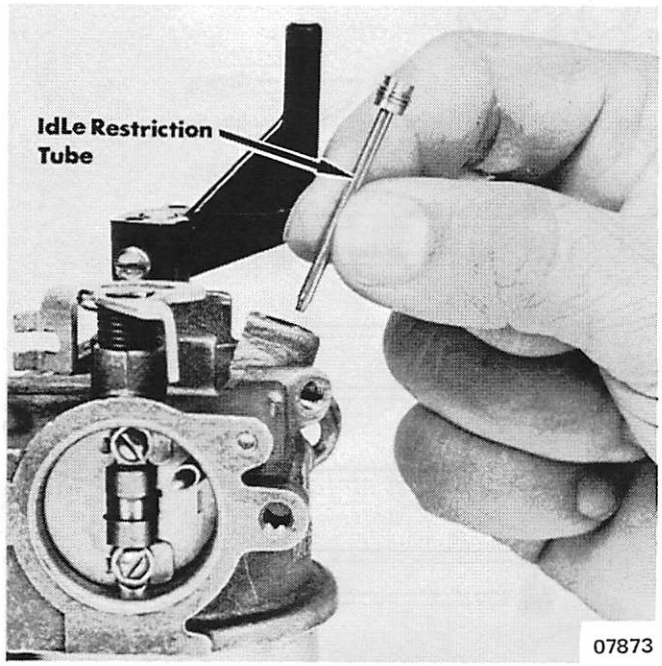


Figure 2. Idle Restriction Tube Removal

IDLE RESTRICTION TUBE

1. Remove plug screw. (Figure 4)
2. Unscrew idle restriction tube from inside main discharge nozzle on top of carburetor. (Figure 2) Be sure not to lose washers.

FLOAT and FIXED HIGH SPEED JET

1. Remove float bowl screw, gasket, float bowl and gasket and float bowl gasket. (Figure 4)
2. Remove float fulcrum pin and float. (Figure 3)
3. Inlet needle and spring assembly will drop out.
4. Remove fixed high speed jet. (Figure 3)
5. Using a screwdriver of proper width, remove main nozzle. (Figure 3)

NOTE: Plastic venturi will drop from carburetor throat when main nozzle is removed.

THROTTLE SHUTTER

1. Remove screw and washer which secures throttle shutter to throttle shaft. (Figure 4)
2. Remove throttle shutter return spring from throttle shaft. (Figure 4)
3. Pull throttle shaft out from top of carburetor.

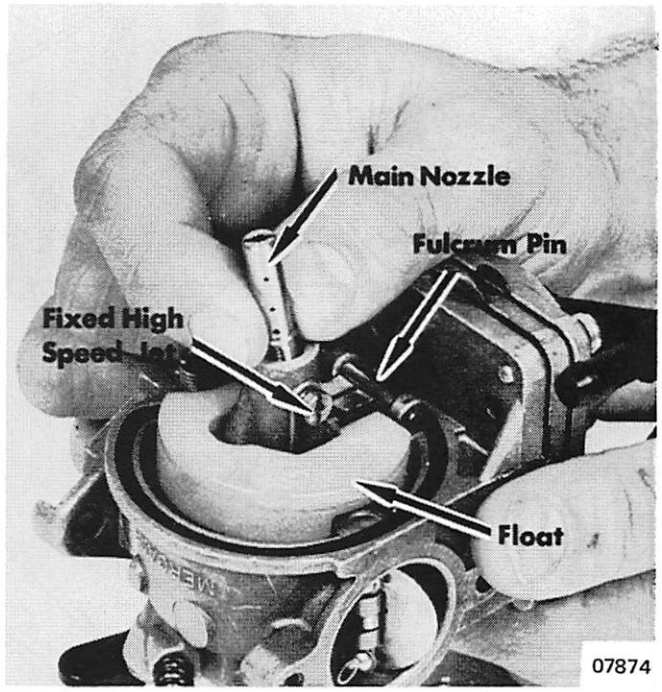


Figure 3. Float Removal

CHOKE SHUTTER

1. Remove 2 cap screws and remove trash screen. (Figure 4)
2. Remove 2 screws and washers from choke shutter and remove ½ of choke shutter.
3. Pull choke shutter and spring from top of carburetor.
4. Remove other ½ of choke shutter and shutter spring from carburetor throat.

CLEANING and INSPECTION

1. Place carburetor body in a carburetor cleaning solution for a short period of time to remove all dirt, gum and varnish which may have accumulated.

   NOTE: Carburetor cleaners are available through local automotive supply stores.

2. After removing carburetor from cleaner, rinse thoroughly in clean solvent and blow off with compressed air. Be sure to blow through all passages, orifices and nozzles.

3. Check float for deterioration.

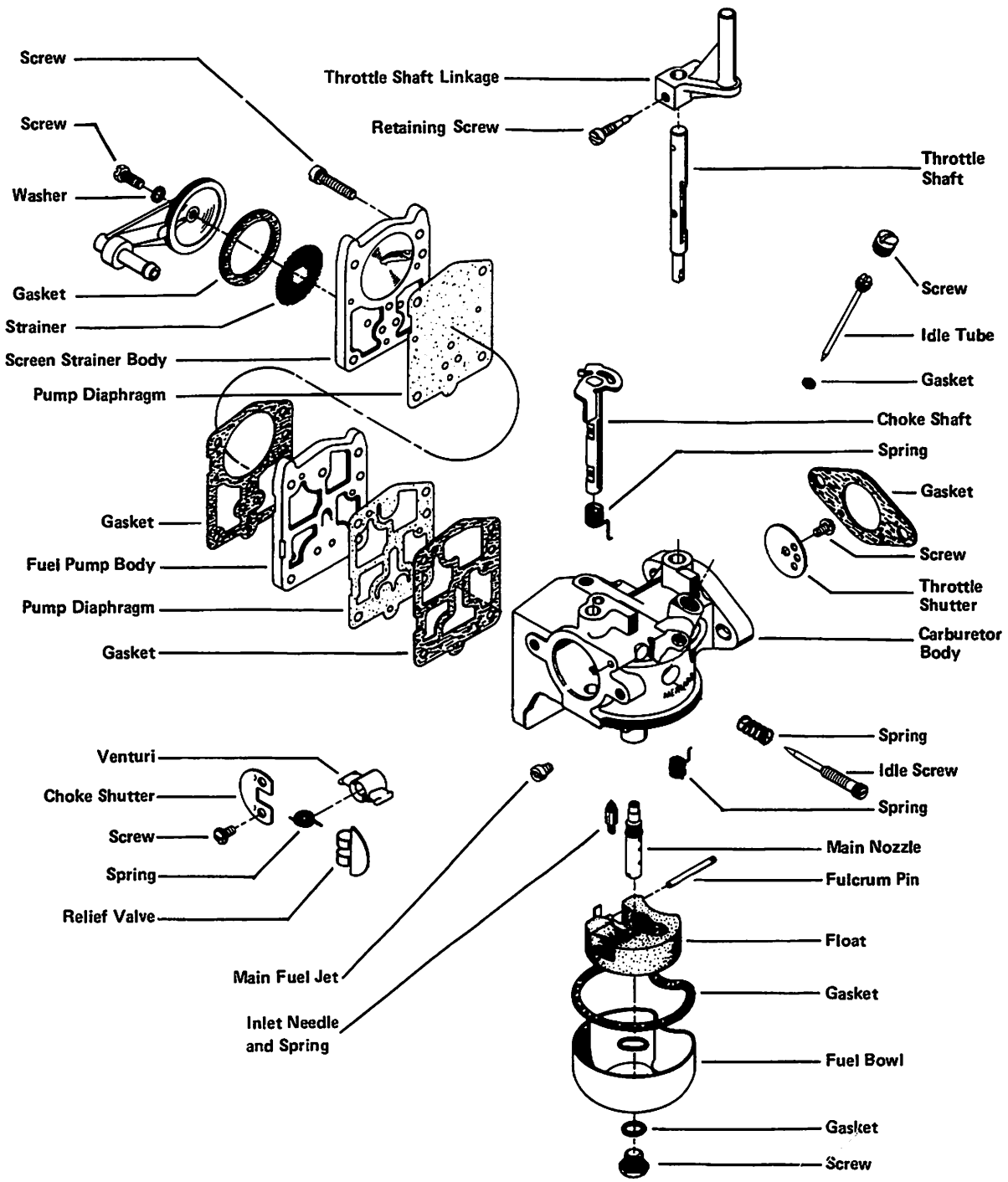


Figure 4. Carburetor - Integral Fuel Pump Type

REASSEMBLY

FLOAT and FIXED HIGH SPEED JET

1. Insert venturi inside carburetor throat (tapered end toward choke).
2. Using a screwdriver of proper width, install and tighten main nozzle. (Figure 3)
3. Insert inlet needle and spring assembly into seat. Make sure that inlet needle does not stick in seat.
4. Install float and float fulcrum pin. (Figure 3)
5. Insert fixed high speed jet as shown in Figure 3.

FLOAT LEVEL and DROP ADJUSTMENT

1. Adjust float level to ¼" (6.4mm) ± 1/64" (.4mm) from float bottom to casting. Adjust by bending tab in. (Figure 5)

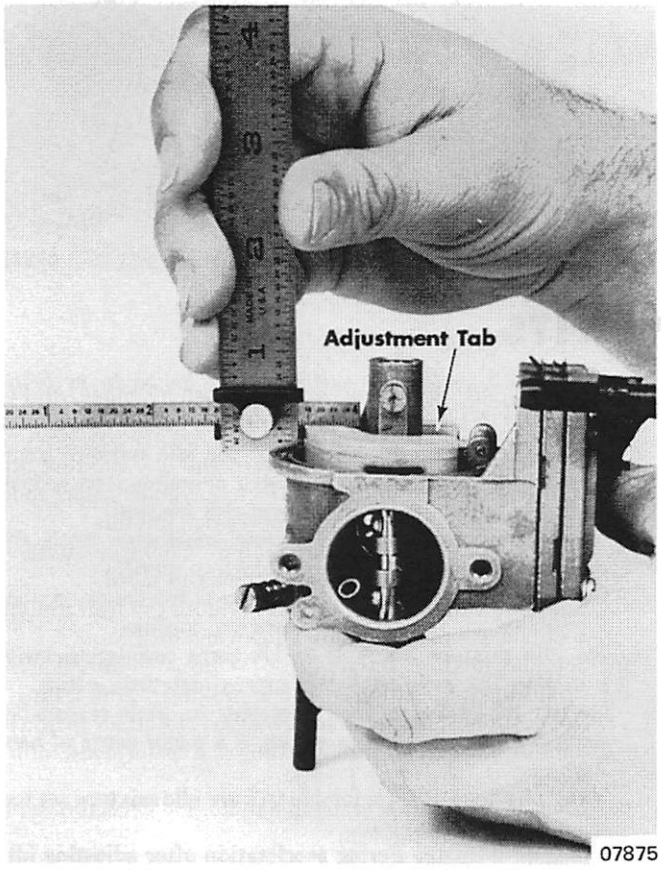


Figure 5. Float Level Adjustment

NOTE: Hold carburetor upside down for ease of measurement.

2. Adjust float drop to get 1/16" (1.6mm) to 1/32" (.8mm) between bottom of float and fixed jet. (Figure 6) Adjust by bending tang on float.
3. Install new float bowl gasket. Secure float bowl with 2 fiber washers and screw. (Figure 4)

FUEL PUMP and STRAINER

1. Install, gasket, diaphragm, pump body, gasket, pump diaphragm and strainer body on carburetor. Secure with 4 washers and screws. (Figure 4)

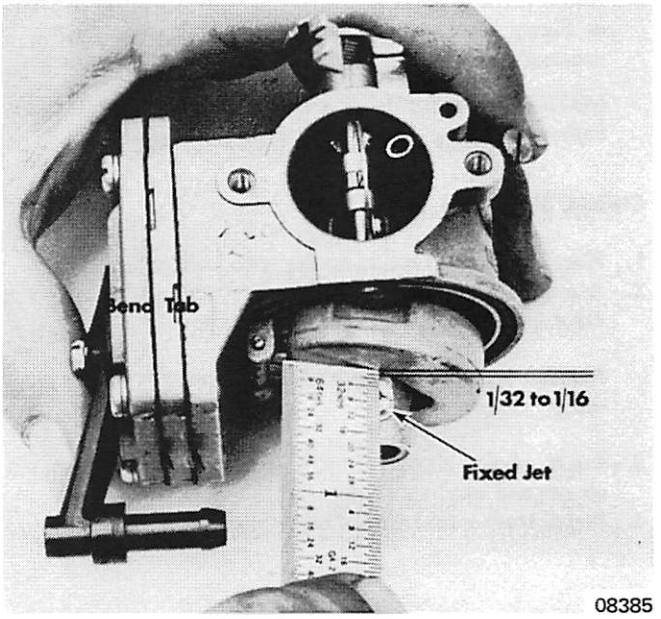


Figure 6. Float Drop Adjustment

2. Assemble strainer screen, gasket and strainer cover and secure with washer and screw. (Figure 1)

IDLE RESTRICTION TUBE and IDLE MIXTURE SCREW

1. Install idle restriction tube and washers. (Figure 2)
2. Install plug screw.
3. Install spring onto idle mixture screw and install screw.

THROTTLE SHUTTER

1. Insert throttle shaft into carburetor.

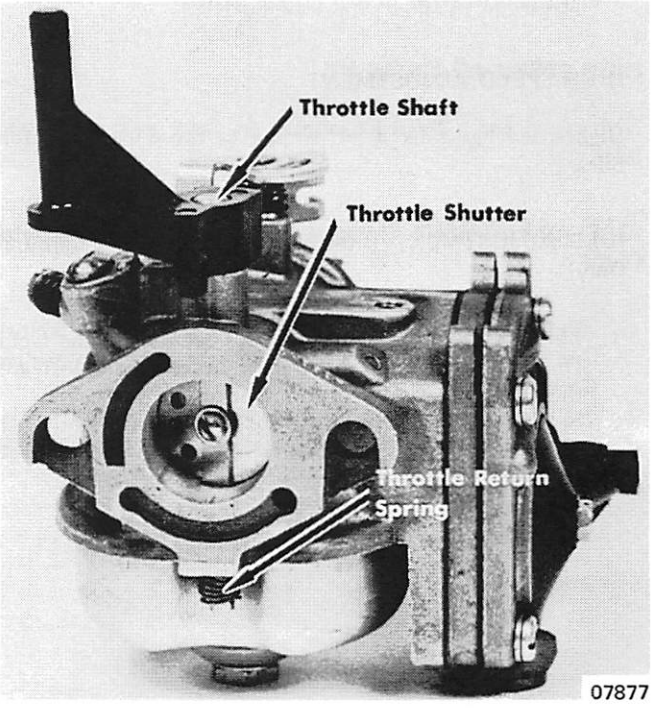


Figure 7. Throttle Shutter Installed

2. Install throttle shaft return spring onto throttle shaft with approximately ¼-turn windup. Hold tension on spring.
3. Install throttle shutter into slot in throttle shaft as shown in Figure 7 and secure with washer and screw. It may be necessary to move shutter to center it in carburetor body.

   NOTE: Press cam lever down tight against carburetor body before tightening shutter screw.

CHOKE SHUTTER

1. Place choke shaft return spring onto choke shaft.
2. Assemble choke shaft, choke relief valve and choke relief valve spring into carburetor. (Figure 8)

   NOTE: Assemble spring with approximately ¼-turn wind-up.

3. Insert choke shutter into choke shaft and secure with screws and washers. (Figure 8)
4. Install trash screen with 2 cap screws.

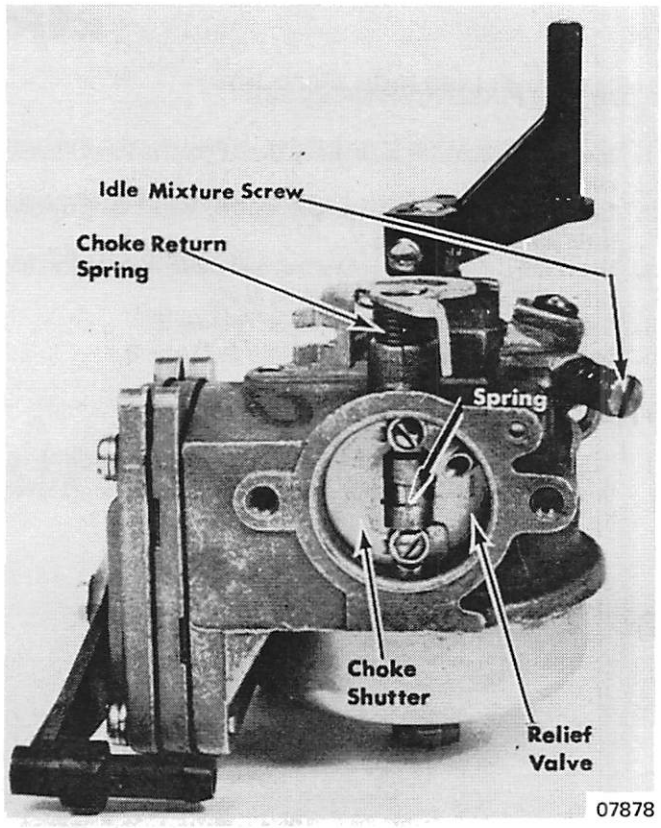


Figure 8. Choke Shutter Assembled

ADJUSTMENTS

CARBURETOR ADJUSTMENT

1. Jet size recommendations are intended as a guide (like a propeller chart). Try a size larger or smaller if in doubt. See jet sizes in "Specifications" Section 8.
2. No change in spark advance is recommended for elevation operation. Propellers of lower pitch should be used at high elevations to allow proper engine RPM.

HIGH SPEED ADJUSTMENT

High speed has a fixed jet, similar to those used in automobiles.

IDLE ADJUSTMENT (Integral Fuel Pump Type Carburetor Only)

1. Idle mixture and idle speed have been set at the factory. Due to local conditions, it may be necessary to readjust the carburetor (in the test tank or on the boat).
2. Set idle mixture screw 1½ turns open from a lightly seated position. Start engine and allow it to warm up to operating temperature in forward gear.

   NOTE: All carburetor settings must be made in FORWARD GEAR with the engine properly warmed-up.

3. With engine running, slowly turn the idle mixture screw counterclockwise until the affected cylinders start to load up or fire unevenly, due to an over-rich mixture.
4. Slowly turn idle mixture screw clockwise until the cylinders fire evenly and engine picks up speed.
5. Continue turning clockwise slowly until too lean a mixture is obtained and engine slows down and misfires.
6. Set idle mixture screw 1 to 1¼ turns counterclockwise from lean-out position to gain approximate true setting.
7. Do not adjust leaner than necessary to attain reasonably smooth idling. Too lean a setting is a major cause of hard starting.
8. When in doubt, it is preferable to have idle mixture set too rich rather than too lean.
9. If engine hesitates during acceleration after adjusting idle mixture, it is too lean, and idle mixture should be richened slightly until the engine accelerates correctly.
10. Idle engine and adjust "idle stop screw" on stop bracket so that engine idles at recommended RPM (see Section 3 by models) in forward gear.
11. Run engine in forward gear (4000 to 5000 RPM) to clear engine and recheck idle speed.

SECTION 4 - FUEL SYSTEMS

MERCURY OUTBOARDS

PART C - FUEL TANKS

MERCURY MARINE

INDEX

VACUUM FUEL TANK

DESCRIPTION

Because fuel pump on motor pumps fuel from tank to carburetor, following initial priming and starting of motor, only one flexible fuel line is necessary between tank and motor.

IMPORTANT: All gasoline containers must be painted red by law.

IMPORTANT: "Tank Traps" (A-24016, set of 3) are recommended to hold all remote and auxiliary fuel tanks (with bottom rim) in boat for convenience and safety. (Figure 1)

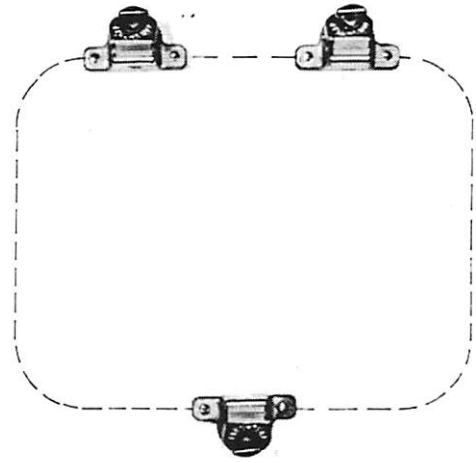


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Figure 1. Tank Traps (A-24016)

PRIMING

00628

Figure 2. Priming Vacuum Fuel System

1. Priming on vacuum tanks (6 gal. and 3¼ gal.) (22.7 and 12.3 liters) is done by squeezing primer bulb on fuel line. (Figure 2)
2. Carburetor is filled with fuel by slowly actuating primer bulb on fuel line. (Figure 2) When fully primed, pressure will be felt on bulb.

REPAIR of VACUUM TANK and FUEL LINE

1. Remove filler cap assembly and check parts for wear and possible replacement.
2. Remove 4 fastening screws and washers which secure fuel tank cover.
3. Remove fuel tank cover assembly and disassemble component parts to check for possible wear, filter on end of pickup tube in particular.
4. Replace any worn part.
5. Check fuel line and component parts for wear and replace a worn part.
6. Primer bulb replacement.
   a. Remove damaged or inoperative primer bulb by cutting fuel line as close as possible to bulb.
   b. Place a small clamp over end of long fuel line (fuel tank to primer bulb) and install small end of check valve assembly into end of fuel line.
   c. Place a large clamp over end of primer bulb and place primer bulb over large end of check valve assembly. (Figure 3)
   d. Use Primer Bulb Adhesive (C-92-27813) where connections are made.

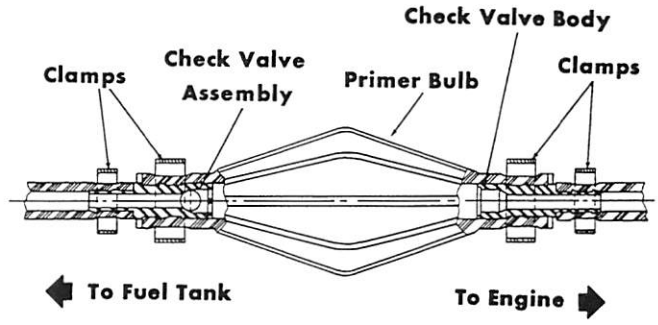

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Figure 3. Primer Bulb Repair (New Style)

e. Position clamps on fuel line and primer bulb as shown in Figure 3 and pinch sides of clamp with a pair of end cutter pliers. Do not pinch the clamp any more than is necessary to make a good seal on the fuel line.
f. Repeat procedure with primer bulb to engine end of fuel line, installing check valve body into primer bulb. (Figure 3)

7. Finding fuel tank leaks
   a. Remove filler cap and fuel tank cover assembly.
   b. If point of leak is known, circle hole with pencil, drain tank thoroughly and flush with hot water and soap.
   c. If point of leak is not known, drain tank thoroughly and flush with hot water and soap. Submerge tank in water and observe bubbles rising from hole in tank.
8. Repair leak in sheet metal tank: Use necessary equipment to weld according to recommended procedures for steel gas tanks.

OTHER FUEL TANKS

CUSTOM-MADE FUEL TANKS

When using vacuum system with these tanks, an air vent is only requirement. A special pickup tube can be made but should have a large pre-filter attached to prevent excessive dirt in carburetor filters.

"FOREIGN" FUEL TANKS

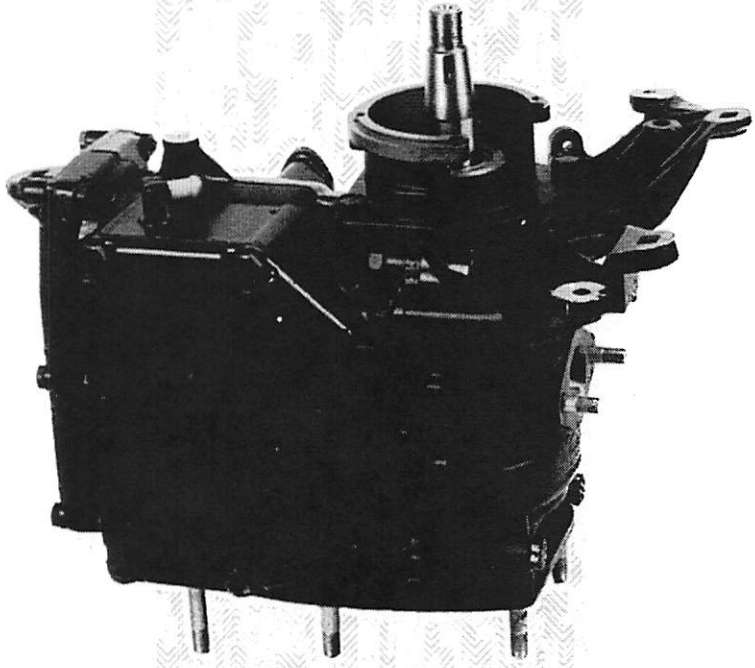
1. If other than Mercury Marine fuel tank is used, engine may run lean, lose RPM or cause piston scoring.
2. Check "foreign" fuel tanks for the following:
   a. Adequate air vent in fuel cap.
   b. Fuel line large enough (5/16-to-3/8" [8mm to 9.5mm] inside diameter).
   c. Filter on end of pickup too small or clogged, or fuel pickup tube too small.

TROUBLESHOOTING FUEL TANKS

Symptom	Probable Cause	Remedy
No fuel at engine	a. No gas in tank	a. Fill tank
	b. Air vent in gas cap not open	b. Open vent
	c. Air vent in gas cap clogged	c. Clean vent
	d. Fuel tank sitting on fuel line	d. Move fuel line
	e. Fuel line fittings not properly connected to engine or fuel tank	e. Reconnect properly
	f. Air leak at fuel connection	f. Coat mating surface of male fuel fitting with Multipurpose Lubricant (C-92-49588 or C-92-63250) as a temporary sealer, check operation, replace parts as necessary
	g. Fuel pickup clogged	g. Clean or replace pickup

NOTE: Some oils, when mixed with gasoline and stored in a warm place, achieve an accelerated bacterial formation. This bacterial formation is a clear substance that covers the fuel pickup, as well as the carburetor strainer screens, and restricts the flow of fuel to the engine. Mercury Marine Quicksilver Oil contains additives which prevent this condition. The bacterial formation can be removed by using Quicksilver Engine Cleaner (C-92-63214).

OUTBOARD
SECTION 5



POWERHEAD

TABLE of CONTENTS

SECTION 5 - POWERHEAD

MERCURY
OUTBOARDS

PART A - 1 and 2-CYLINDER POWERHEADS

INDEX

POWERHEAD

DESCRIPTION

Although repair procedure will vary between individual models, basic repair is similar. All repairs are to be made with required special service tools which can be obtained from Mercury Marine. Refer to Section 9 for special tools and their applications.

Cleanliness of all parts and the surrounding area is extremely important. All component parts must be cleaned and thoroughly inspected before reassembly. Proper lubricants are to be applied where required. Refer to "Lubrication Chart", Section 1.

All torque specifications must be adhered to (where required). Refer to "Torque Chart" in "Specifications" Section 8.

Powerhead components, such as carburetors, magnetos, fuel pumps, filters, starters, etc, are found in their respective sections in this manual.

NOTE: For purposes of continuity, powerhead disassembly and reassembly will exclude magnetos, carburetors, fuel filters and starters. Refer to respective sections in this manual.

REMOVAL

1. Remove front panel (if applicable) and side cowl. On Merc 110-75-60-40-39 models, remove cowling.
2. Pull starter rope and tie in slip knot. Remove rope handle. (Figure 1)

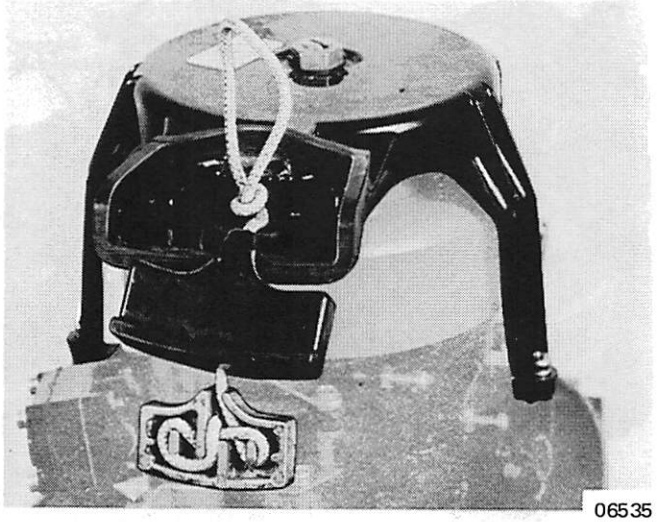


Figure 1. Removing Starter Rope Handle

3. On Merc 200, remove 3 nuts and top cowl. (Figure 2)
4. Slide starter rope thru top cowl and tie slip knot to prevent starter rope from retracting inside starter housing. (Figure 3)

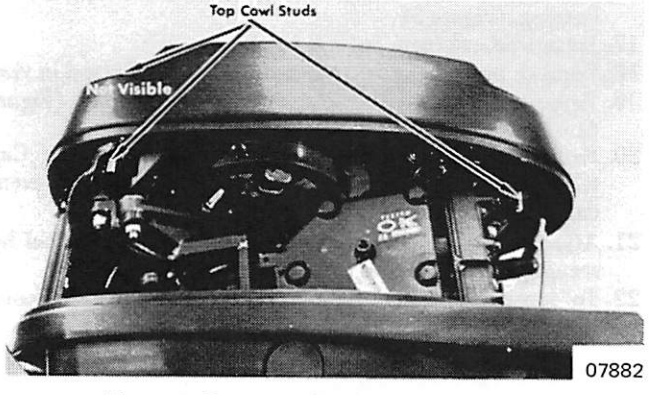


Figure 2. Removing Rewind on Merc 200

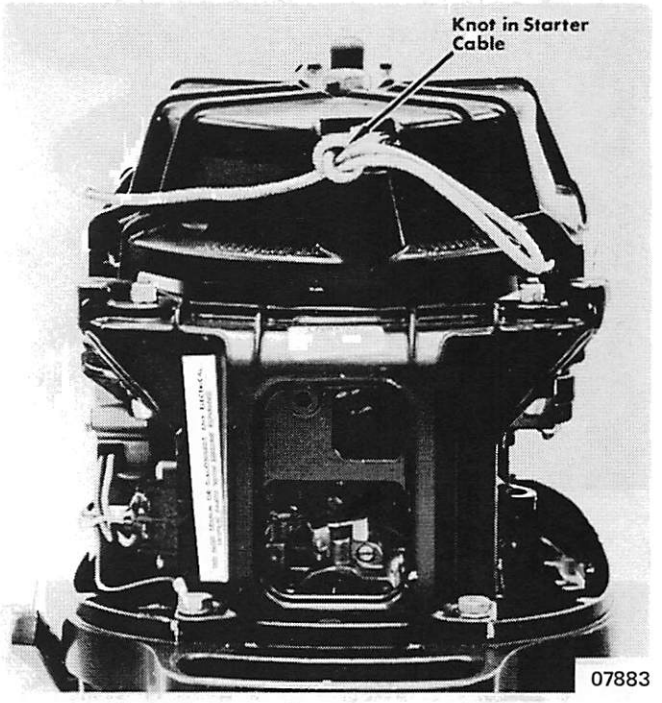


Figure 3. Starter Rope Stopped at Housing

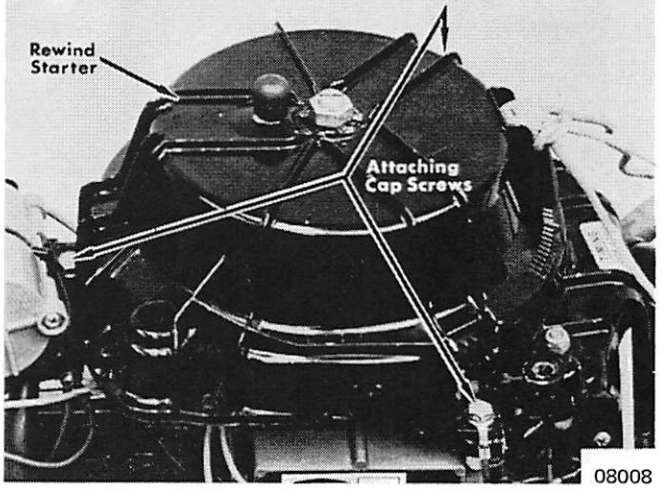


Figure 4. Merc 200 Rewind Removal

5. Remove nuts, bolts and screws and remove rewind starter. (Figures 1 and 4)
6. Remove phillips head screws and wires from terminal block (if applicable).
7. Remove 2 nuts and bolts and remove front cowl support (if applicable).
8. Remove choke cable anchor screw from carburetor and remove choke cable from carburetor.
9. Remove wiring from coils and spark plug leads from spark plugs.
10. Remove 2 bolts and one nut, then remove rear cowl support and coils (if applicable).
11. Remove water tell-tale hose from powerhead.
12. Using allen wrench (some models), remove screws from tiller handle. Remove tiller handle and flexible throttle linkage shaft.
13. Remove fuel adaptor screw(s).
14. Remove wiring from stop button.

Figure 5. Removing Drive Shaft Housing Cover and Powerhead Nuts

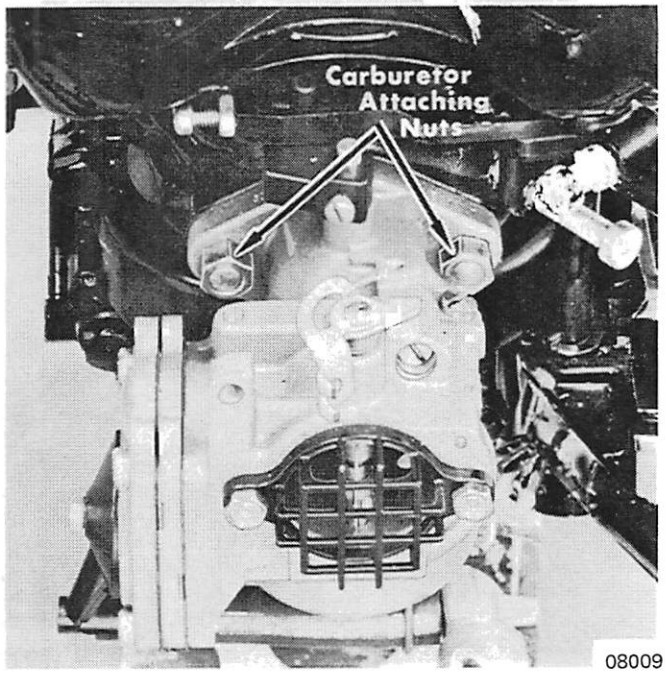


Figure 6. Removing Carburetor

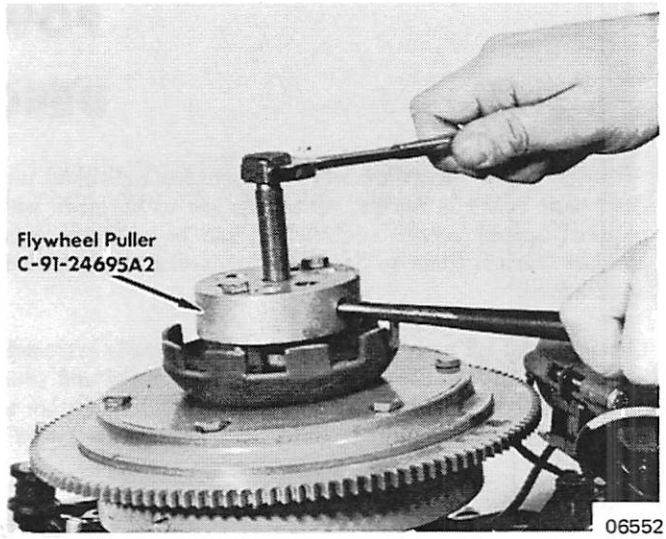


Figure 7. Removing Flywheel

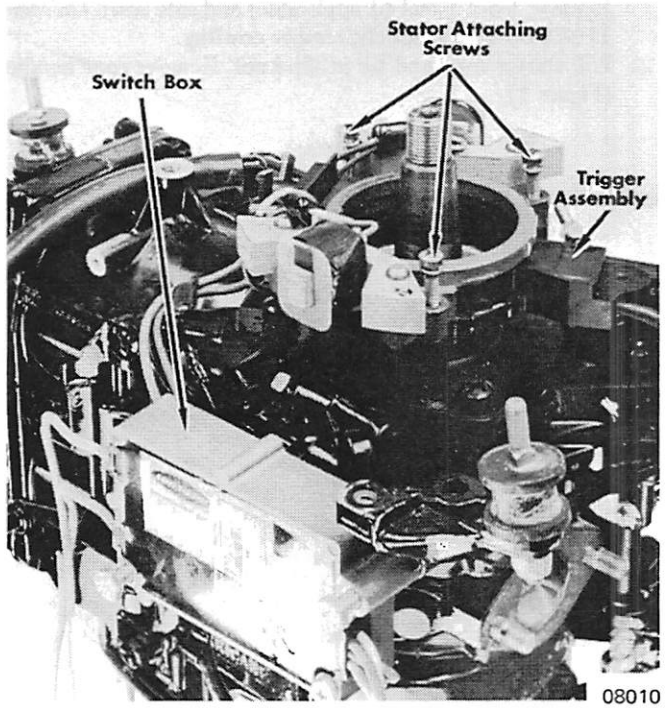


Figure 8. Removing Ignition Components

15. Remove 3 phillips head screws and drive shaft housing cover. (Figure 5)
16. Remove 6 nuts which hold powerhead to drive shaft housing. (Figure 5)
17. Jar powerhead from bottom cowl.
18. Remove powerhead and place on powerhead stand in vise.
19. Remove 2 nuts and remove carburetor assembly. (Figure 6)
20. Remove flywheel nut and washer. Place Protector Cap (C-91-24161) on threaded end of crankshaft to prevent damage to threads.
21. Attach Flywheel Puller (C-91-24695A2) to flywheel by securing with screws to top of flywheel.
22. To loosen flywheel, tighten center screw with wrench while holding puller. Remove flywheel. (Figure 7)

NOTE: If flywheel is exceptionally tight, tap on center screw with hammer to free.

23. Remove flywheel key from crankshaft with pair of end-cutting pliers.
24. Remove ignition components. (Figure 8)
25. Remove 2 cap screws and 3 nuts and vertical throttle shaft assembly. (Figure 9)

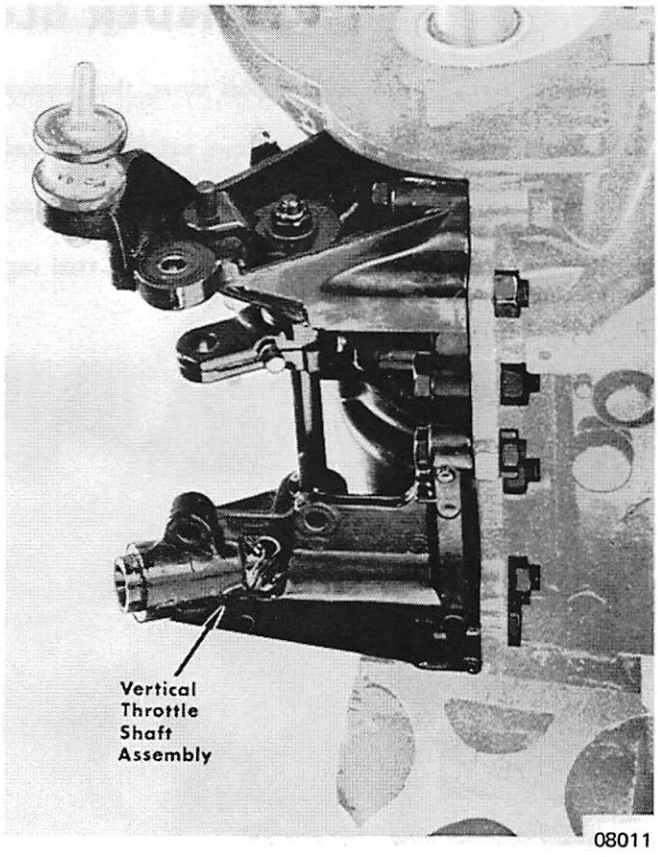


Figure 9. Removing Vertical Throttle Shaft Assembly (if Applicable)

CYLINDER BLOCK DISASSEMBLY

1. Remove screws from transfer port cover, then remove cover. (Figure 1)
2. Remove cylinder block cover screws and cylinder block cover. (Figure 2)
3. Remove exhaust cover screw and lift exhaust cover and deflection plate. (Figure 3)
4. Remove seal (if new block), end cap screws, reed cage locking screw and crankcase cover screws.
5. Remove crankcase cover. (Figure 4)

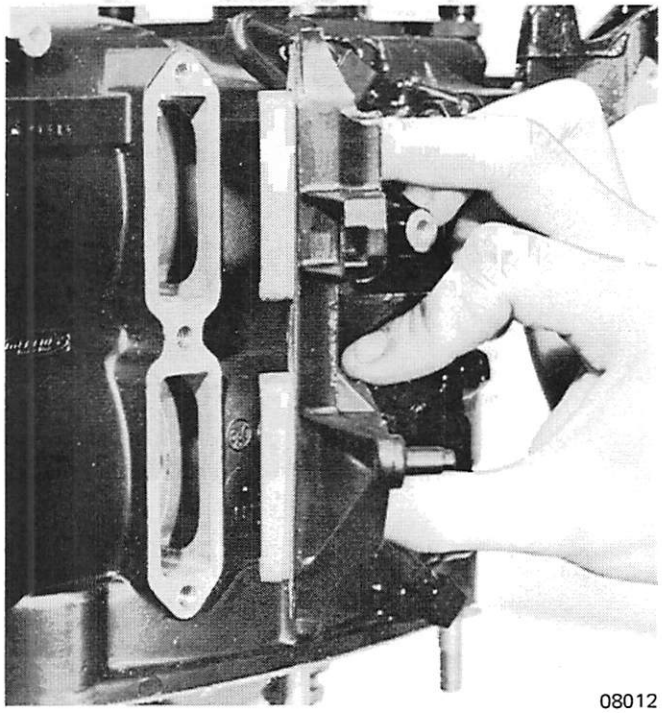


Figure 1. Removing Transfer Port Cover

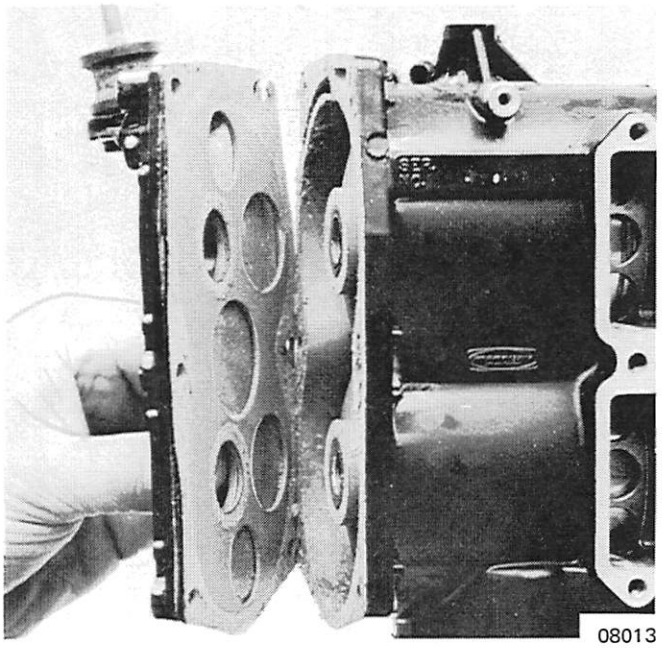


Figure 2. Removing Cylinder Block Cover

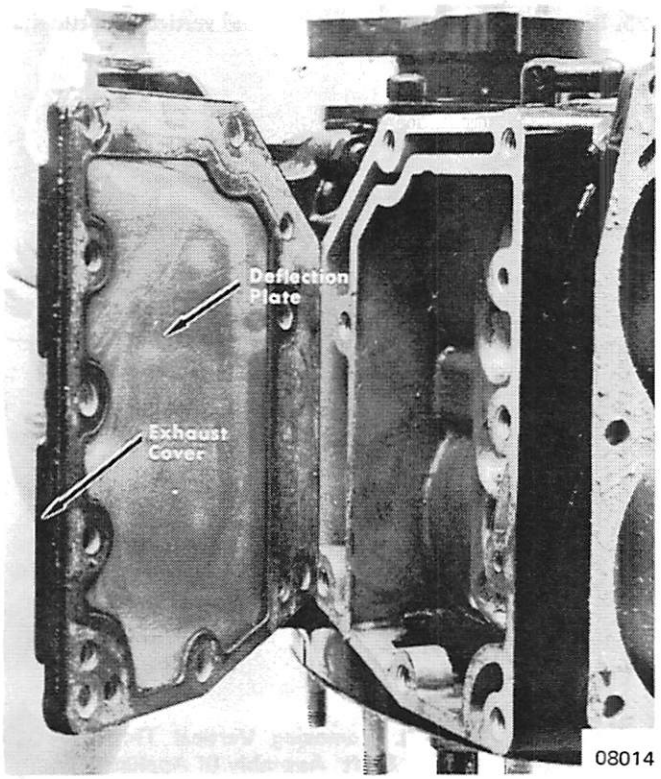


Figure 3. Removing Exhaust Cover and Deflection Plate

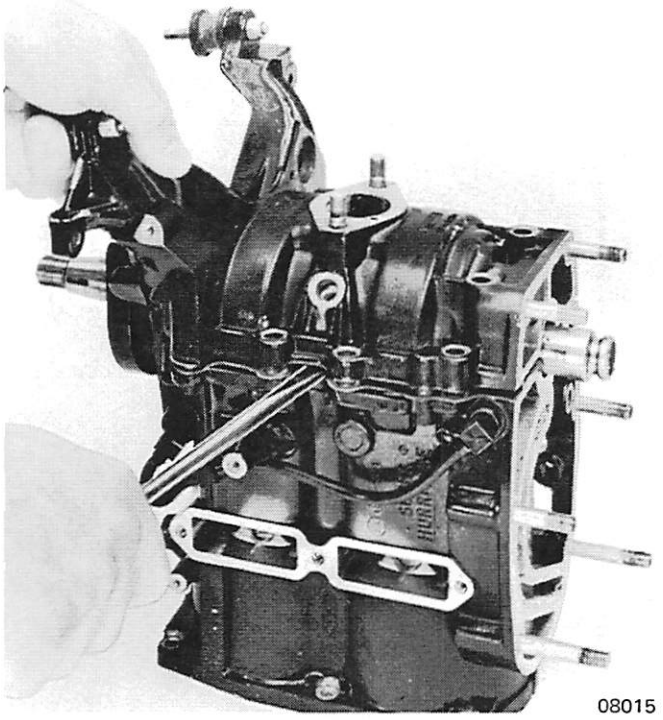


Figure 4. Removing Crankcase Cover

6. Tap on end cap with mallet and remove end cap. (Figure 5)
7. Remove crankshaft and piston assembly. (Figure 6)

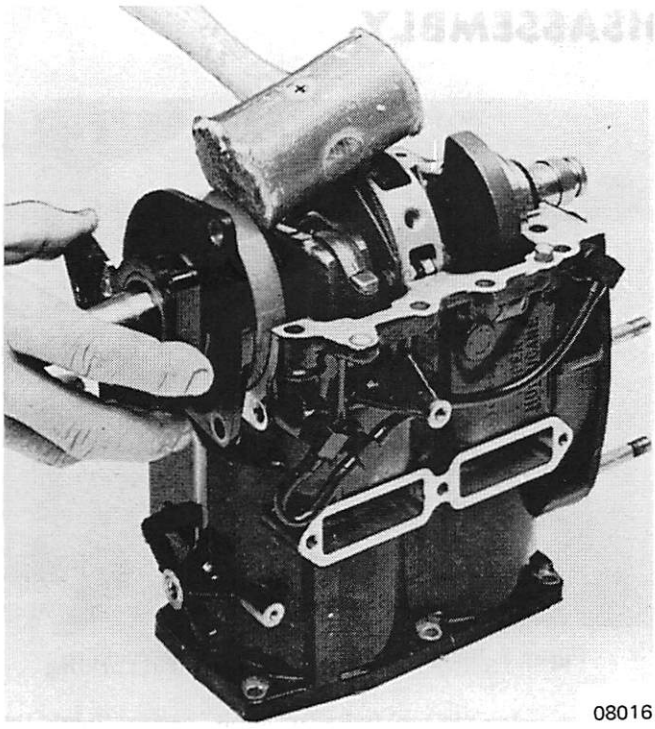


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Figure 5. Removing End Cap

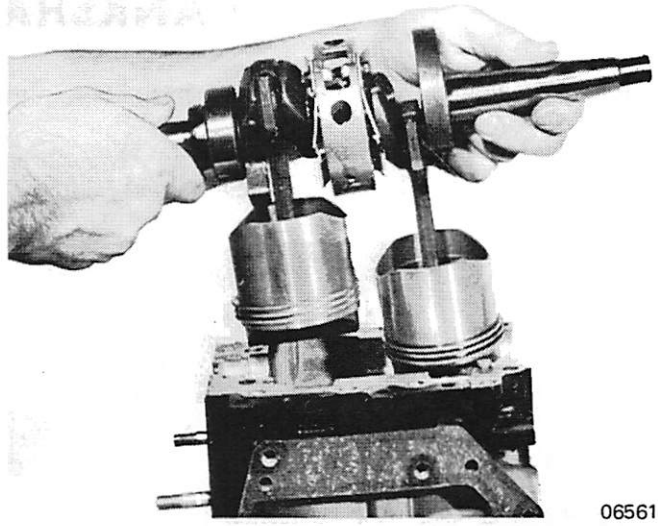

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Figure 6. Removing Crankshaft Assembly

CRANKSHAFT DISASSEMBLY

1. Remove piston rings from pistons with Piston Ring Expander (C-91-24697). (Figure 1)
2. Remove reed valve type center main bearing by removing 2 phillips head screws. Be careful not to bend or distort reed valves and reed valve stops.

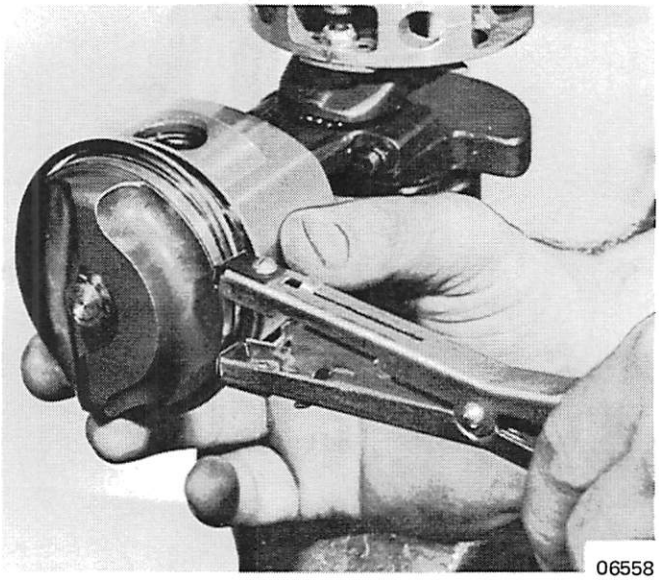

Figure 1. Removing Piston Rings

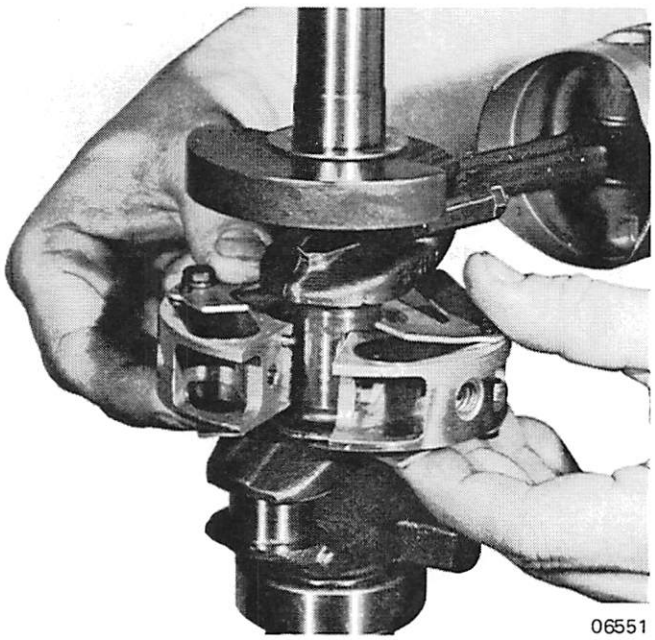

Figure 2. Removing Reed Cage

3. Tap side (solid section) with mallet to separate halves of reed valve cage.
4. Number pistons and connecting rods from top down. Mark piston on inside of skirt and rod on "I" beam.

CAUTION: Wear eye protection when removing piston pin lockrings.

5. Remove lockrings from both ends of piston pin with needle-nosed pliers. (Figure 3)

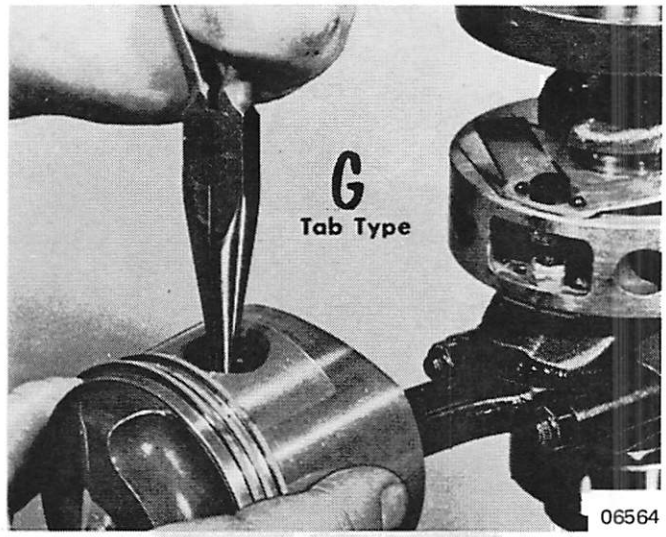

Figure 3. Removing "G" Type Piston Pin Lockring

6. Place piston pin tool (refer to "Tools" Section 9) into top of piston. Hold bottom of piston with hand and drive piston pin out of piston. (Figure 4)
7. Remove rod cap nuts. Place crankshaft and rod assembly on clean bench. Tap rod cap screws until rod cap separates from rod. Keep needle bearings with rod or place in numbered tray. (Figure 5)
8. If applicable, carefully remove crankshaft seal retainer from end of crankshaft with drift by taping alternately on each side. (Figure 6)
9. Slide oil seal and ball bearing from crankshaft. (Figure 6)
10. Pry oil seals from end cap with a screwdriver.

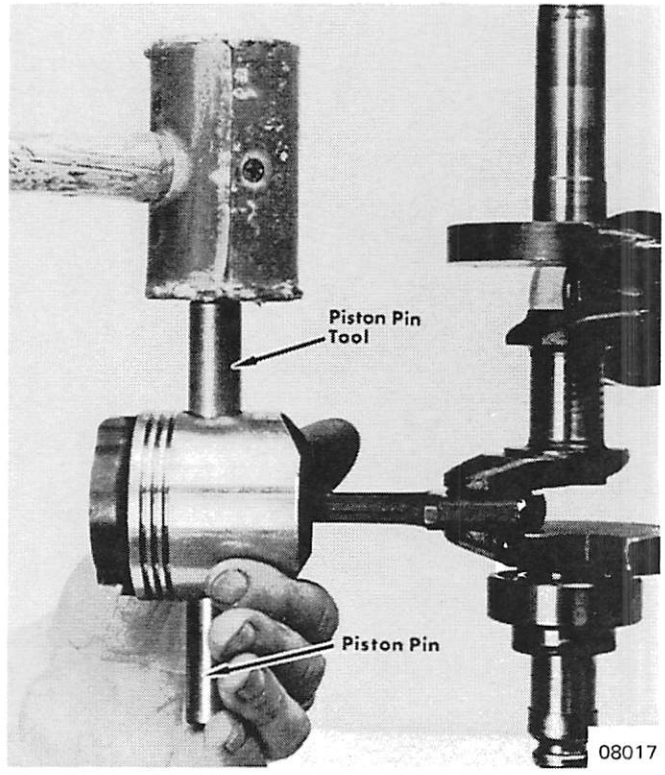

Figure 4 Removing Piston Pin

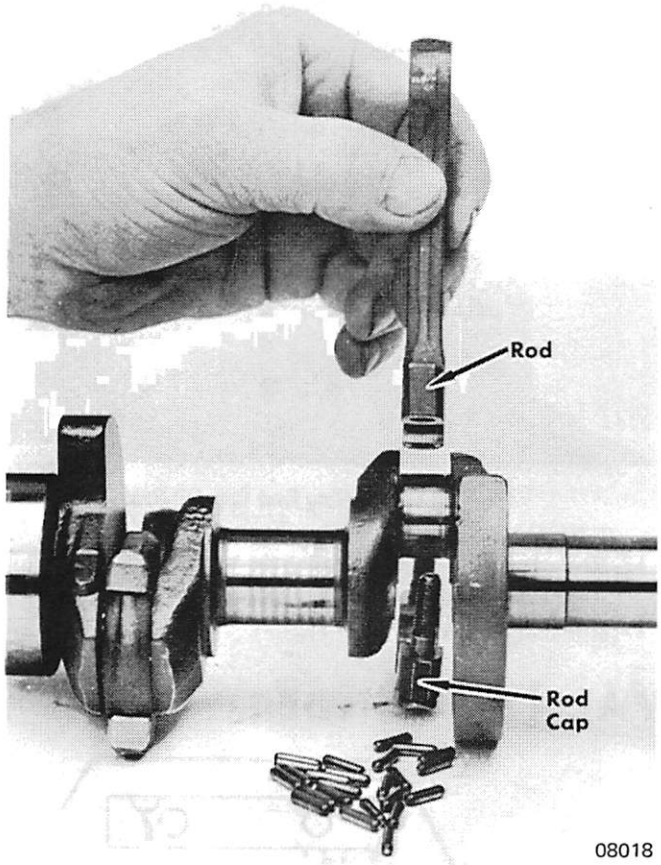

Figure 5. Removing Rod

11. Remove ball bearing and roller bearing from end cap with Ball Bearing Puller (C-91-24100A1). (Figures 7 and 8) Place mandrel into roller bearing (Figure 9) and press out toward ball bearing end to remove roller and ball bearing.

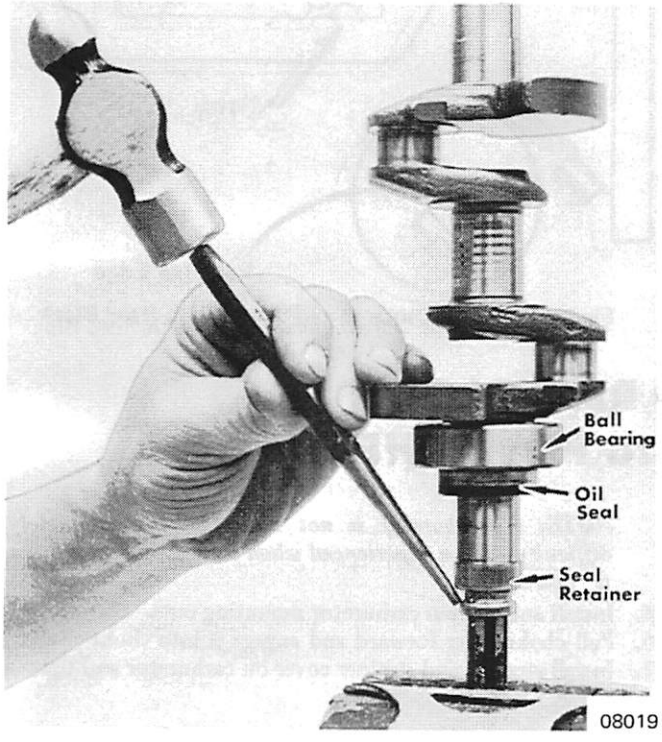

Figure 6. Removing Crankshaft Seal Retainer

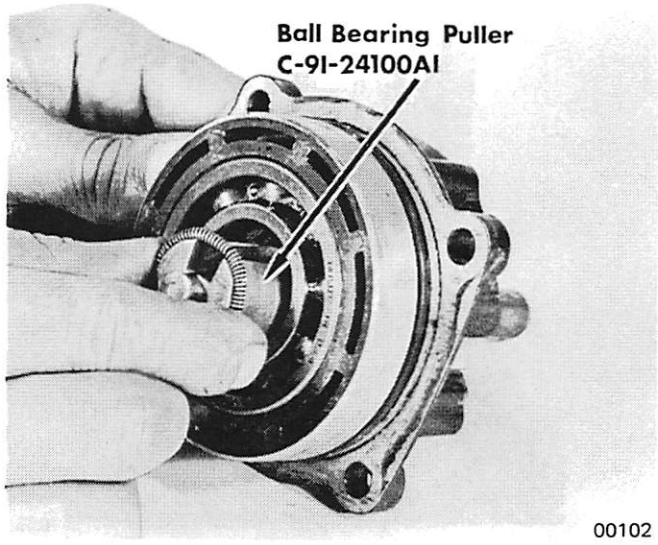

Figure 7. Inserting Ball Bearing Puller into End Cap Ball Bearing

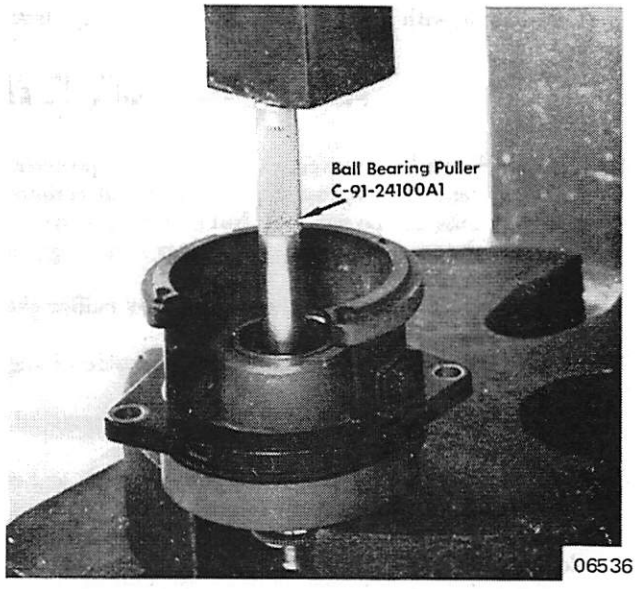

Figure 8. Pressing Ball Bearing out of End Cap

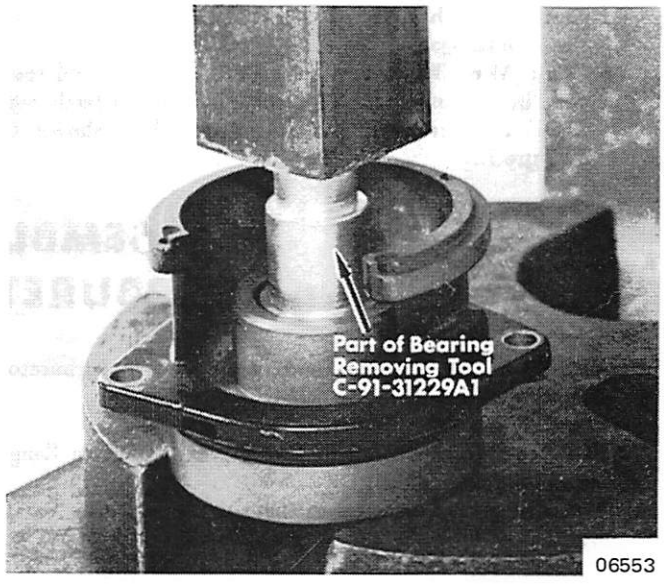

Figure 9. Removing Roller Bearing from End Cap

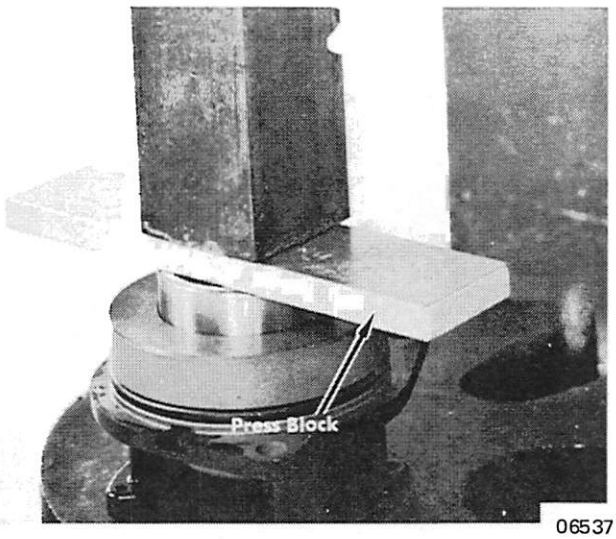

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Figure 10. Installing End Cap Roller Bearing

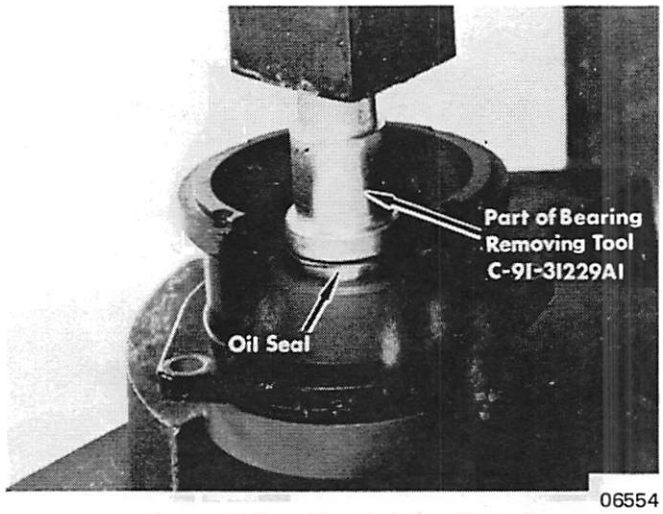

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Figure 11. Installing End Cap Oil Seal

12. Replace roller bearing. (Figure 9) Use Bearing Mandrel (C-91-25045 with Tool Collar "A") or Bearing Mandrel (C-91-24715A2). (Figure 10)
13. Replace ball bearing, pressing in with arbor press while using Press Block (C-91-49193). (Figure 10)
14. Install oil seal. (Figure 11)

REED BLOCK REMOVAL - 1-CYLINDER

1. Reed block can be removed without removing powerhead.
2. Remove strainer cover from carburetor so that carburetor mounting nuts can be removed. Nut on right side need not be removed completely, since carburetor mounting flange is slotted on that side.
3. Disengage choke lever from choke shutter by pulling choke lever forward.
4. Remove carburetor by tilting toward port side of engine and pulling forward.
5. With carburetor removed, reed block can be removed by pulling forward off carburetor mounting studs.
6. Refer to Figure 12 for proper assembly of reeds and reed block. When assembling reeds to reed block, care must be taken so that reeds are centered and square with reed block.
   a. Reeds have an identification notch. Install reed with notch positioned as shown in Figure 12. Install reed retainer with rounded edge toward reed to prevent reed breakage.
   b. Late Merc 39 engines have both the reed and reed retainer notched for identification. Install reeds and reed retainers with notch positioned as shown in Figure 12.

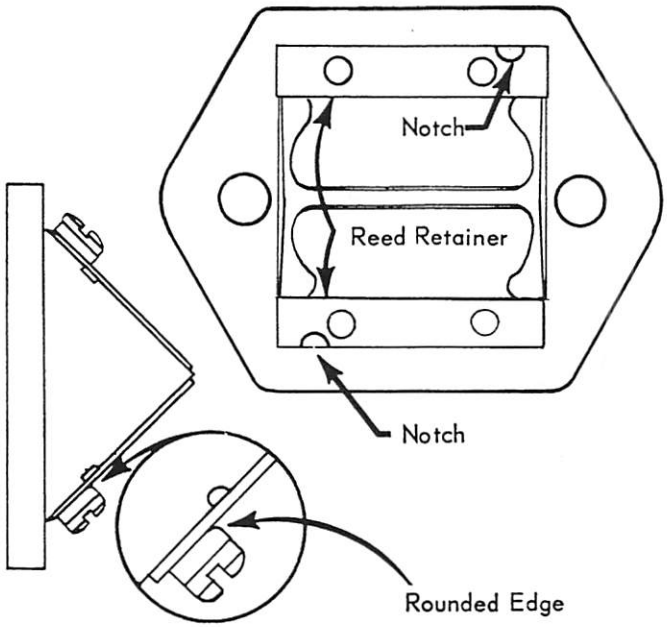

Figure 12. Reeds Centered and Square with Reed Block

REASSEMBLING REED BLOCK and CARBURETOR to POWERHEAD

1. Install reed block gasket and reed block to carburetor mounting studs.
2. Install carburetor gasket.
3. Tilt carburetor to left side and engage mounting flange onto port stud.
4. Tilt carburetor downward so that slotted mounting hole is completely down on stud.

NOTE: If carburetor is not down in slot completely, difficulty will be experienced when setting up synchronization on engine.

5. Install and tighten carburetor mounting nuts.
6. Pull choke lever forward and engage it into choke shutter.
7. Install strainer and strainer cover on carburetor and tighten screw.

CLEANING and INSPECTION

CYLINDER BLOCK

1. Inspect cylinder block thoroughly for cracks and condition of cylinder bore.
2. Remove carbon and varnish with fine wire wheel on a shaft attached to an electric drill, or use carbon remover.
3. Finish hone walls slightly to seat new rings. (See "Honing Procedure", following.)

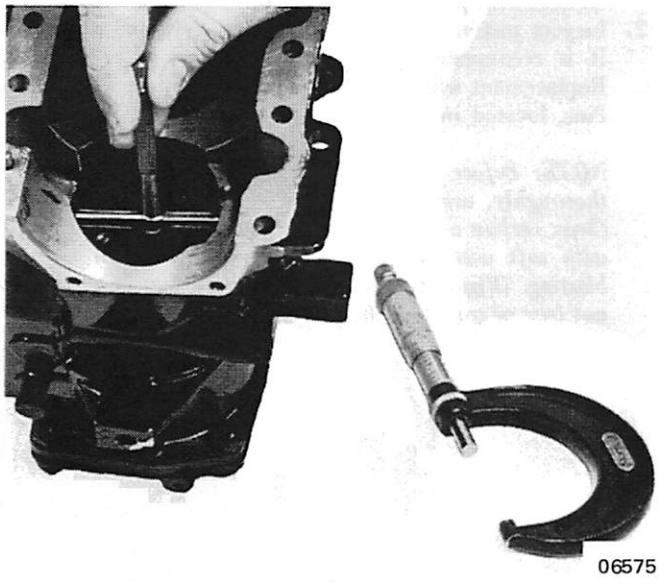

Figure 1. Checking Cylinder

4. Check cylinders for wear with an inside telescopic gauge and micrometer. (Figure 1) On engines, which display evidence of over-heating, bore should be checked for out-of-round. If worn or out-of-round (maximum .003"-.004"), rebore to .015" and install oversize piston and rings (if available).
5. If sleeves have been scored, but not out-of-round, or, for some other reason, sleeve is rough, clean up surface of sleeve with a cylinder hone. Polishing should be done with a finishing hone. (See "Honing Procedure",following.)
6. Remove carbon from top of cylinder with closed-cup brush.

NOTE: Cylinder sleeves are an integral part of the die cast cylinder blocks and cannot be resleeved. Cylinders can be bored .015" oversize, unless scored more than .0075" deep. Oversize replacement parts are permitted and accepted by the American Power Boat Association. Oversize replacement parts are not available for all powerheads.

7. Check bleed holes (located under transfer port covers on cylinder block) to make sure that plastic restrictor is in hole. If restrictor is missing, it will cause a flooding-effect in cylinder.

CRANKSHAFT

1. Check all bearing surfaces for rust and pit marks.
2. The crankshaft journal can be cleaned, if necessary, by using a 320 grit carborundum cloth. (Figure 2) DO NOT polish crankshaft journals or bearings will slide.

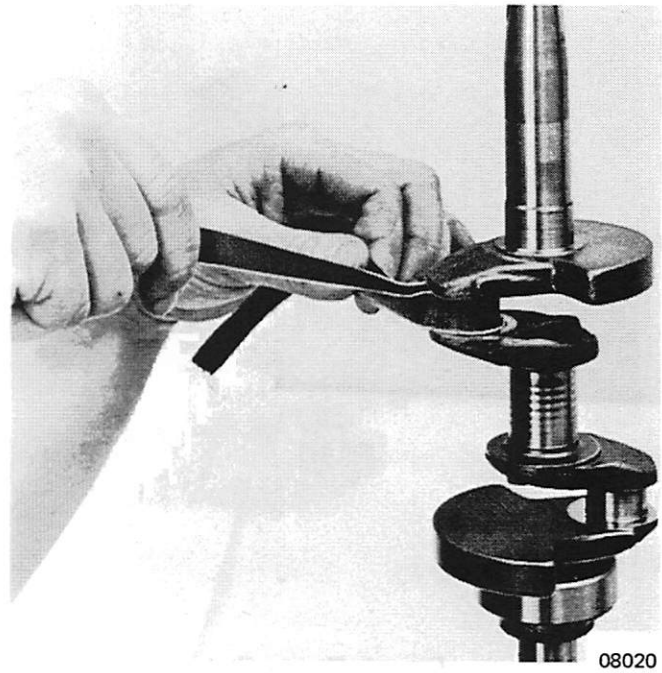

Figure 2. Cleaning Crankshaft Journal

NOTE: Chatter marks on crankshaft bearing surfaces can be seen with a good magnifying glass. These marks will cause a sound (like gear noise) when engine is in operation and resemble a very tiny washboard. This surface condition can be repaired if a total of not over .001" (.0254mm) is removed while eliminating marks. If both connecting rod and crankshaft have chatter marks, a total of not over .002" on both parts can be removed. Use 320 grit carborundum cloth.

CONNECTING RODS

1. Rust checks (explained for crankshafts, previously) will hold true for connecting rods.
2. Check rods for alignment by placing rods flat on a surface plate. If light can be seen under any portion of machined surfaces, or rod has a slight wobble on plate, rod is bent and should be discarded.

NOTE: Always count bearings when removing rods to be sure that all bearings have been removed. Also count bearings when assembling so that all bearings have been installed. Always rotate rod after installation, checking that there is no binding.

NOTE: When repairs are made on connecting rod, it will be necessary that each bearing assembly for each individual rod be kept separate. DO NOT intermix bearings from different rods!

3. If necessary, place rod cap on rod. Using shaft with slit in end, place 320 grit carborundum in slit and clean crankshaft end and piston pin end of rod with drill press. (Figure 3)

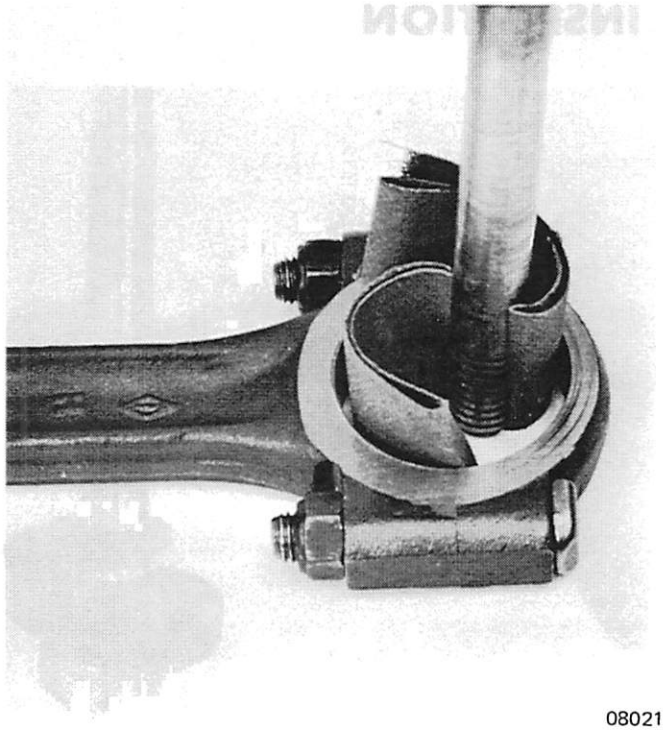

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Figure 3. Cleaning Rods

REED BLOCKS

1. Place reed cage together and torque to specifications. Check reed cage for warp. Make sure that inside diameter is not sprung.
2. Check for chipped or broken reeds and that reeds are not standing open. Replace reeds in sets only. DO NOT flip used reeds over for reuse. Reeds should have no preload.
3. Adjust reeds by setting reeds squarely over their respective openings and at "no preload". (This means that reed valves do not adhere tightly to seat but have a slight opening, never more than .007".)
4. Refer to "Specifications" Section 8 and set reed stop openings. (Figure 4)

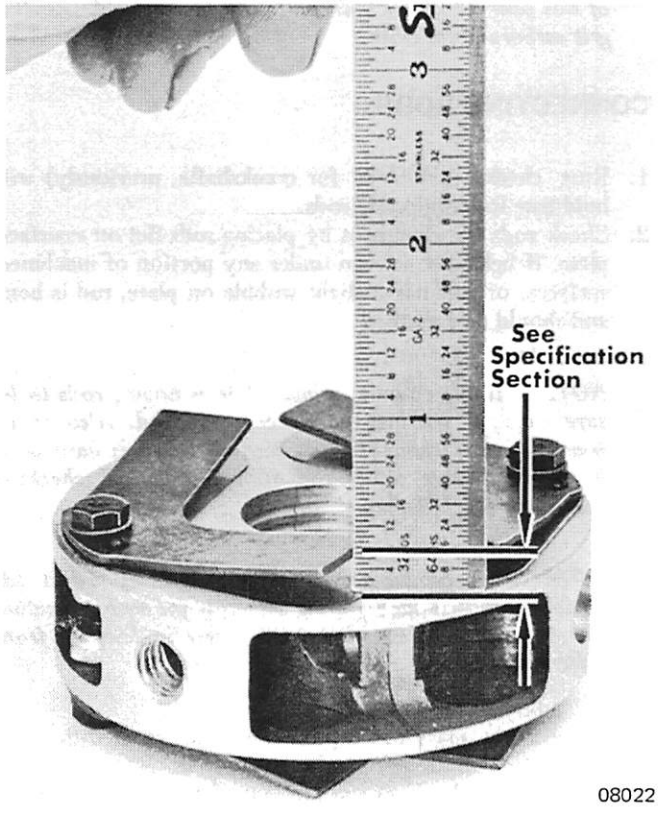

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Figure 4. Reed Valve Stop Setting

PISTONS

1. Check pistons for scoring, cracks, carbon, etc. If pistons have been scored or metal has been damaged, they must be replaced. Check piston pin bosses for cracks. Replace if cracked or if piston pins are worn.
2. Inspect piston ring grooves for wear, burn and distortion. It is recommended that new piston rings be installed. Replacement will ensure good repair and future operation. Pins, located in ring grooves, prevent rings from rotating.

   NOTE: Before replacing piston rings, clean out grooves thoroughly, using recessed end of broken ring. (Figure 5) Clean carbon and varnish deposits from top sides of piston with soft wire brush, carbon remover solution or sand blasting. (Figure 6) When wire brushing top of piston, do not burr or round machined edges.

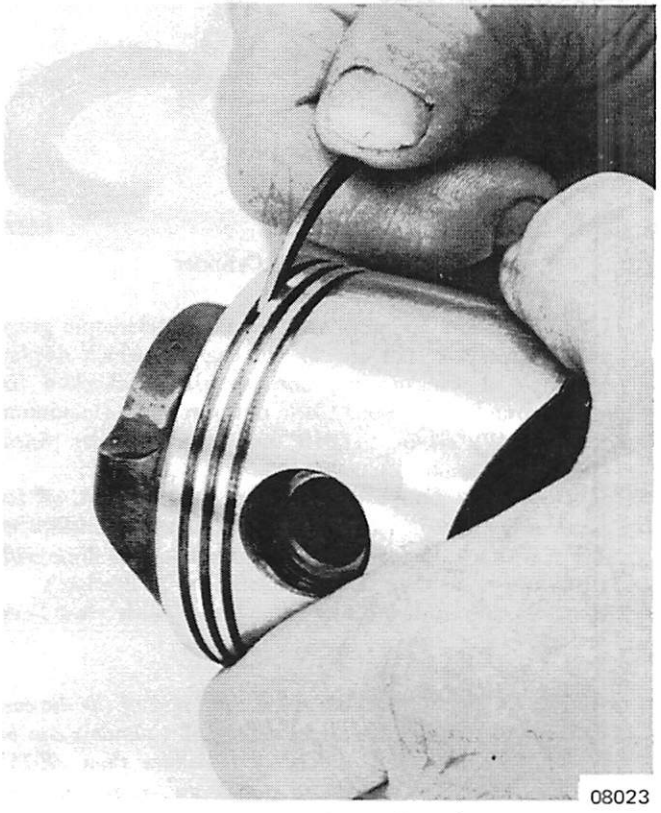

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Figure 5. Cleaning Piston Ring Grooves

3. To assure a positive seat of piston rings to cylinder walls, hone and/or deglaze cylinder walls whenever pistons are removed from cylinder block. See "Cylinder Block Installation" for honing and deglazing cylinder walls.
4. Gum, varnish and softer carbon deposits can be removed by soaking in a carbon remover solution (Gunk), Bendix parts cleaner or others.
5. Piston skirt can be polished with crocus cloth to remove burrs.
6. Check pin and pin boss, especially if engine has been submerged. Piston pins are not sold separately because of slight variation in sizes and correct "fit" into piston. If pin is bent, it elongates piston pin boss when removed.

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Figure 6. Cleaning Top of Piston

.015" OVERSIZE PISTONS and PISTON RINGS

1. The major purpose for oversize pistons and rings is for salvaging scored cylinder blocks. If the score is over .0075" (0.19mm) deep, it cannot be effectively rebored for future use.
2. Oversize .015" (0.38mm) replacement pistons and rings are available for all larger bore engines. Refer to Parts Manual for particular model.

END CAP and END BEARINGS

1. Needle bearings always should be replaced at overhaul and when rust conditions are present. Caged needle bearings also should be replaced at overhaul, or if they have become wet and rusty.
2. Clean and dry ball bearings before checking.
3. With one hand, grasp outer race firmly and, with other hand, attempt to work inner race in-and-out. There should not be excessive play. Spin outer race after lubricating with oil. Discard if bearing sounds or feels rough or has "catches". Bearing should have smooth action, no rust stains. Compare with new bearing.
4. Inspect oil seals for leaking or damaged lips and replace if necessary. Use Loctite Type "A" (C-92-32609) on oil seals when replacing.

HONING PROCEDURE

1. When cylinders are to be honed, follow the hone manufacturer's recommendations for the use of the hone and cleaning and lubrication during honing.
2. Start stroking at smallest diameter. Maintain firm stone pressure against cylinder walls to assure fast stock removal and accurate results. (Figure 7)
3. Localize stroking in the smaller diameter until drill speed is constant throughout length of bore. Expand stones as necessary to compensate for stock removal and stone wear. Stroke at a rate of approximately 30 complete cycles per minute to produce best cross-hatch pattern. Use honing oil generously.
4. For roughing operation, a coarse grit should be used to remove stock rapidly. The softer the material, the coarser the grit that can be used for roughing. In cast iron, approximately .002" (.051mm) must be left for finishing operations.
5. For finishing operation, finer grit stones are used to bring the bore to size and produce the desired surface finish. In cast iron, one (or possibly two) finishing operations are necessary (using progressively finer stones) depending upon the finish specified.
6. For best honing results, a continuous flow of honing oil should be pumped into the work. If pumping oil is not practical, use an oil can. Apply oil generously and frequently on both stones and work.
7. Thoroughly clean cylinder bores with hot water and detergent. Scrub well with a stiff bristle brush and rinse thoroughly with hot water. It is extremely essential to perform a good cleaning operation. If any of the abrasive material is allowed to remain in the cylinder bores, it will rapidly wear new rings and cylinder bores in addition to bearings. Bores should be swabbed several times with light engine oil and clean cloth, then wiped with a clean dry cloth. Cylinders should not be cleaned with kerosene or gasoline. Clean remainder of cylinder block to remove excess material spread during honing operation.

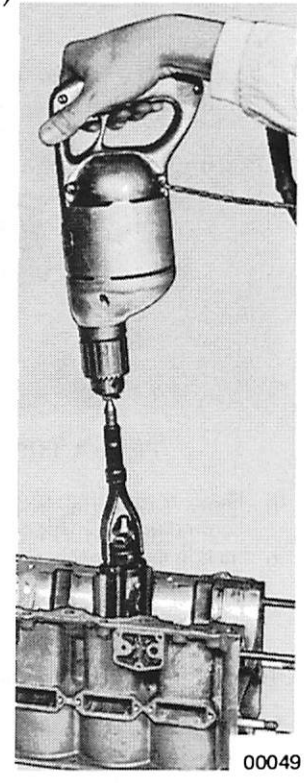

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Figure 7. Finish Honing Cylinders

CAUTION: Handle pistons with care and do not attempt to force them into the cylinder until cylinder has been honed to correct size. Piston can be distorted by careless handling.

8. Permanently mark the piston for corresponding cylinder to which it has been fitted.

POWERHEAD REASSEMBLY

1. Place crankshaft on powerhead stand in vise.

   IMPORTANT: Always check reed stops for proper opening. Larger opening can cause breakage; smaller opening will not allow sufficient fuel to enter at high RPM.

2. After rechecking reed valves and reed stops, lubricate reed cage halves with Multipurpose Lubricant (C-92-49588).
3. Install reed cage on crankshaft. (Figure 1) Tighten 2 integral screws securely on reed cage to assure tight fit.

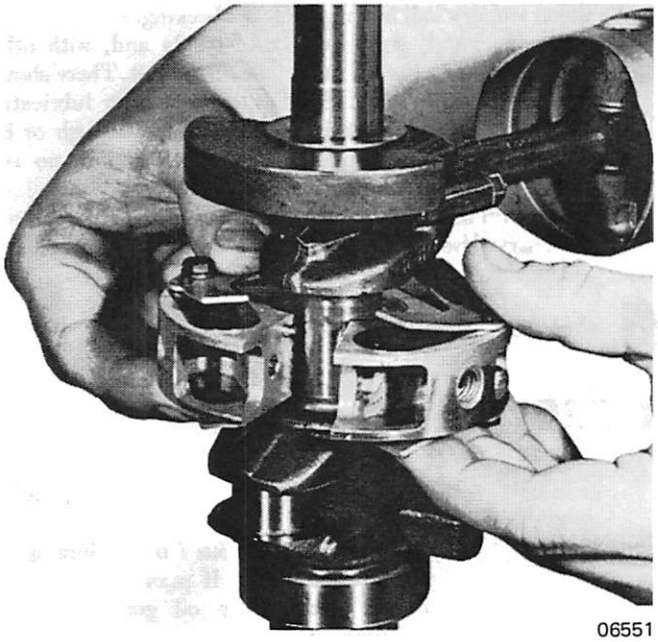

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Figure 1. Installing Reed Cage

4. Recheck reed valve spacing over openings and clearance between reed valve and stop.
5. Prepare connecting rods, opening matched assemblies (one at a time) by removing cap. Watch knob markings on cap and rod for reassembly. (Figure 2)
6. Place a small amount of Multipurpose Lubricant on each half of connecting rod bearing race to hold bearings in place.
7. Place roller bearings around both sides for reassembly.

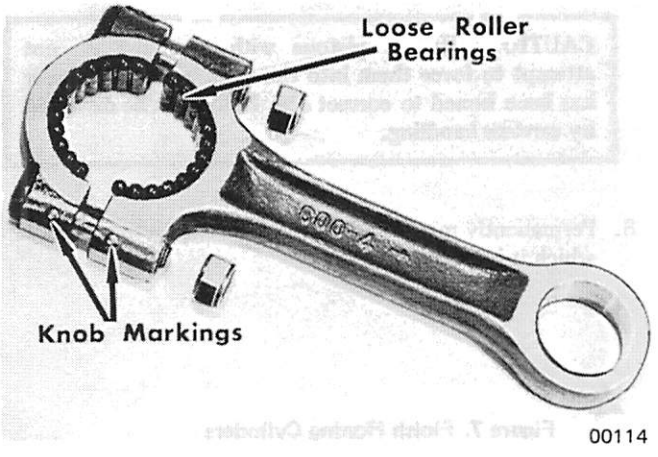

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Figure 2. Knob Markings

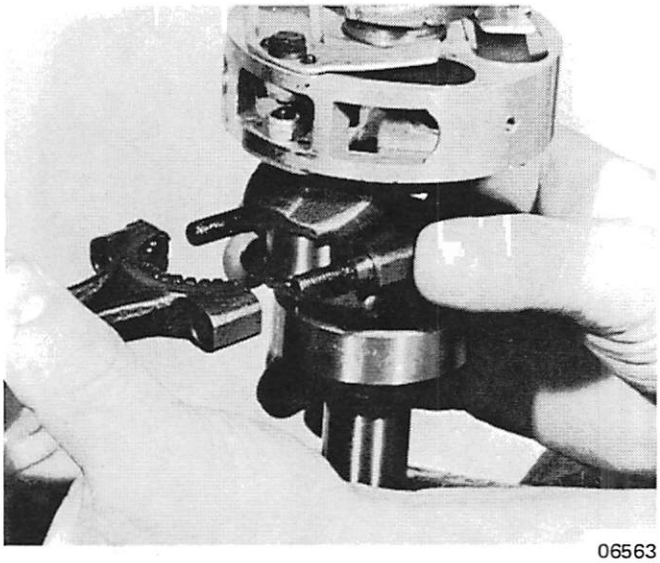

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Figure 3. Installing Connecting Rod

Check parts list in Parts Manual for required quantity. (Figure 3)

CAUTION: Never intermix new roller bearings with used bearings in the same connecting rod. If a quantity of bearings requires replacement, replace all bearings in a connecting rod.

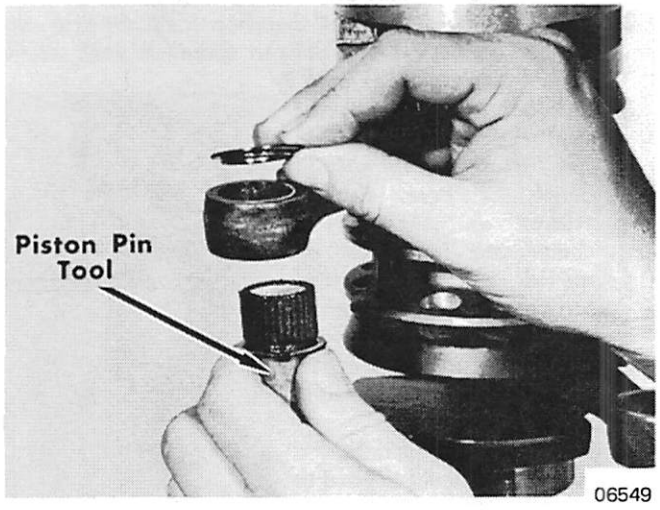

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Figure 4. Installing Piston Pin Bearings

8. Place connecting rod cap so that knob markings match connecting rod. (Figure 2)
9. Install new fasteners and tighten each evenly with torque wrench for perfect fit. Refer to "Torque Specification Chart" in "Specification" Section 8 for correct torque value.
10. Rotate connecting rod after torquing and check that it rotates freely. If rough, remove and check race and rollers.
11. Repeat preceding procedure for other connecting rod.
12. Always recheck knob markings on reassembled rods for correct and perfect match.
13. Install retainer and piston pin bearings on Tool

C-91-22803A1. Leave one bearing out. Push bearings and tool into rod race. Install last bearing and top retainer. (Figure 4) Place piston over bearing assembly (observe intake side of piston). Hold bearings in place with sleeve part of tool.

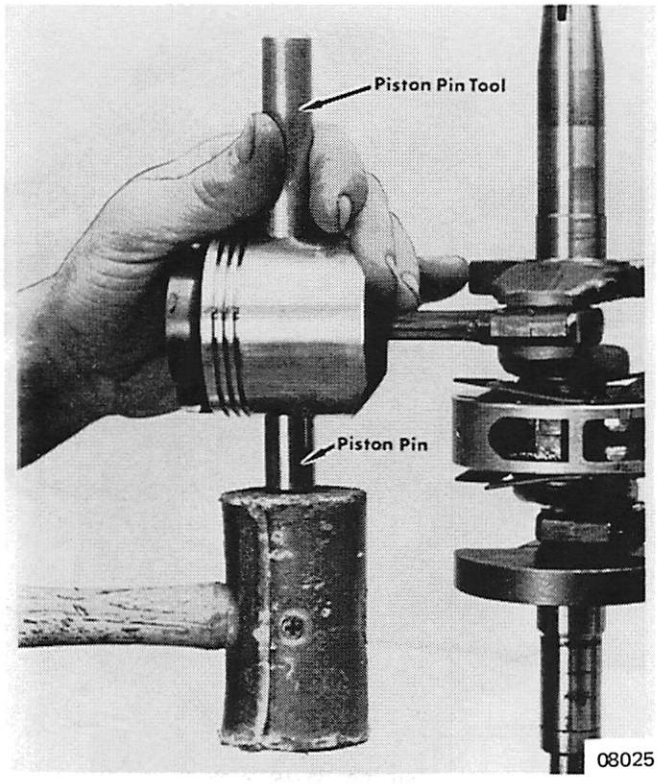

Figure 5. Installing Piston Pin

14. Install piston pin from bottom. (Figure 5)
15. Install new lockrings with needle nose pliers. Double check that ring is seated in groove. (Figure 6)
16. Using Piston Ring Expander tool (C-91-24697), install new rings on piston. After placed in groove, rings should rotate freely. Lubricate rings, then rotate and align rings with lockpins in ring grooves.
17. Install ball bearing, oil seal and seal retainer onto crankshaft end. (Figure 7)
18. Install ring compressors with one crank throw down and one crank throw up. (Figure 8)

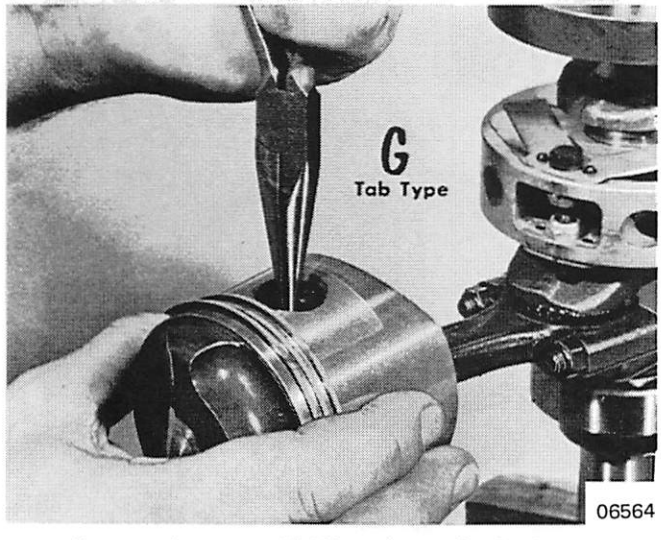

Figure 6. Installing "G" Type Piston Pin Lockring

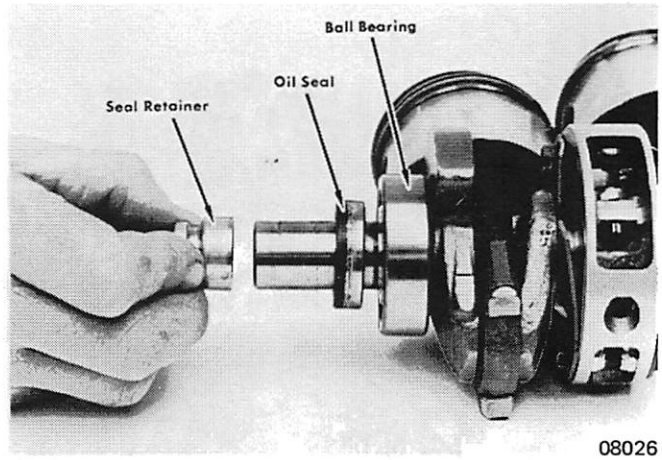

Figure 7. Installing Ball Bearing, Oil Seal and Seal Retainer

19. Make sure that piston rings are located with piston ring locating pins.
20. Lubricate rings and cylinder block with oil.
21. Install crankshaft assembly into cylinder block. Remove compressors as pistons are placed in cylinder. Crankshaft can be installed incorrectly. Always install crank with "stand end" toward cylinder block mounting studs. Make sure that reed cage alignment hole aligns with locating pin in cylinder block.

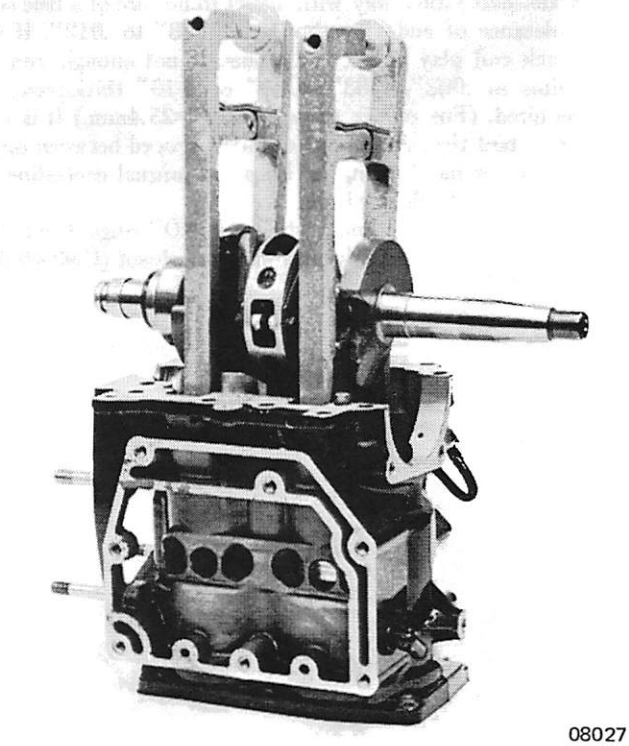

Figure 8. Placing Crankshaft Assembly and Compressors in Cylinder Block

22. Check each piston ring for spring tension thru the exhaust or intake ports by pressing with screwdriver. (Figure 9) If no spring action occurs, or ring does not return to position, it is likely that ring has been broken on reassembly. Be careful not to burr piston rings.
23. Install upper end cap temporarily on crankshaft, being careful not to damage oil seal. Tap end cap down so that it seats against cylinder block.

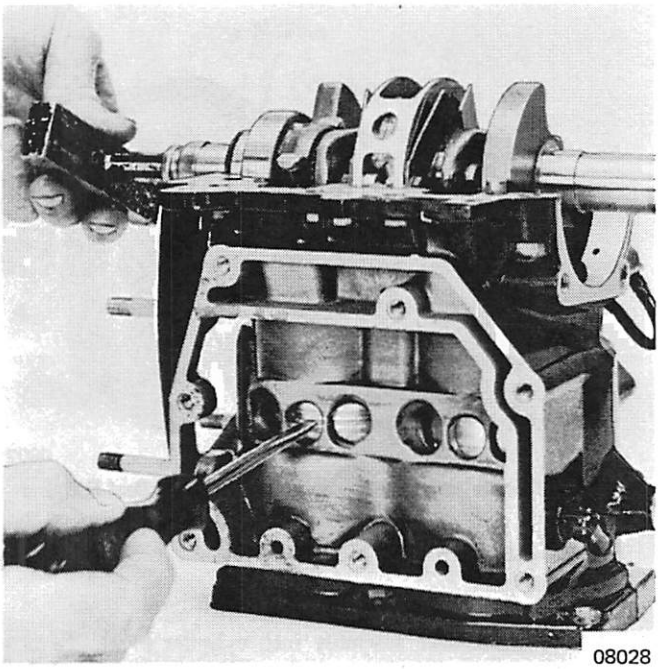

Figure 9. Checking Piston Rings

24. Install cylinder block to end cap screw; tighten and check for end play between crankshaft ball bearing journal thrust face and inner race of ball bearings. (Figure 10) Tap crankshaft either way with mallet to be sure of a true seat. Tolerance of end play should be .008" to .012". If too much end play exists, add shims. If not enough, remove shims in .002", .003", .005" or .010" thicknesses, as required. (For metric conversion, 1"=25.4mm.) It is very important that shimming be equally spaced between upper and lower ball bearings to keep rod journal centerlines in centerline of cylinder bore.
25. Remove end caps and install new "O" rings. Coat "O" rings and seals with Multipurpose Lubricant (C-92-49588) to form seal.

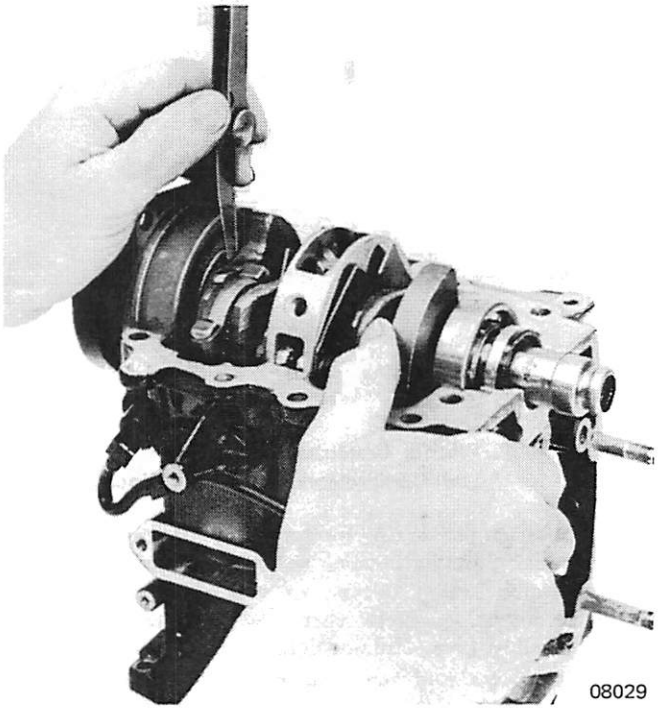

Figure 10. Checking Crankshaft End Play

26. Coat joint face of crankcase with Gasket Sealer (C-92-28804) for metal-to-metal seal.
27. Install end caps but not screws and crankcase cover. Make sure that reed cage is centered in carburetor inlet.
28. Mount powerhead on powerhead stand in vise and rotate

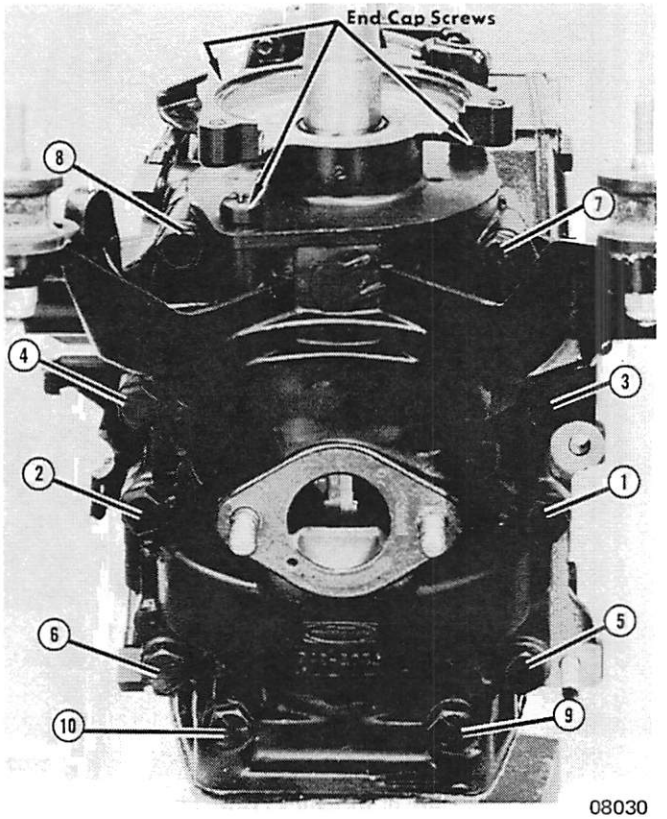

Figure 11. Torque Sequence, Crankcase

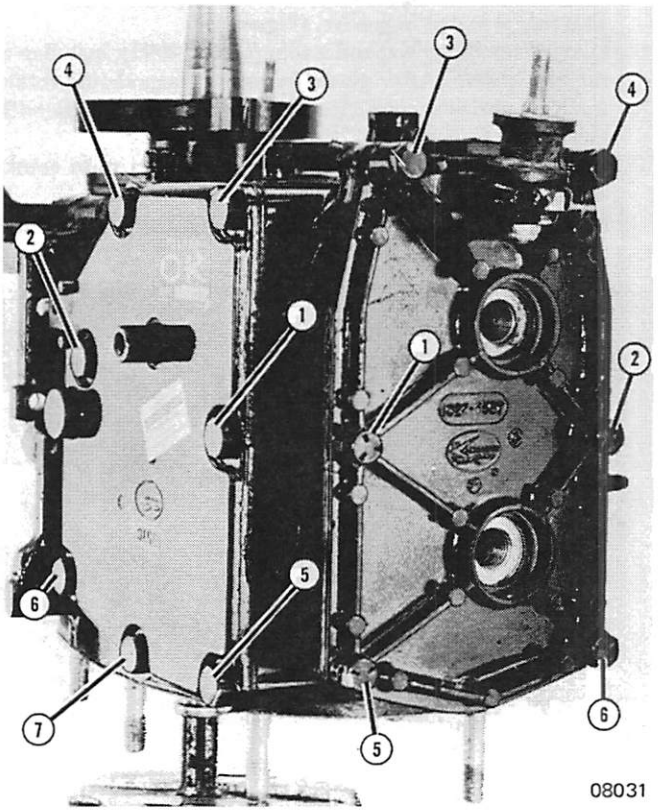

Figure 12. Torque Sequence, Covers

several times to make sure that entire powerhead assembly is free.

29. Tighten crankcase bolts (starting with center bolts and working to top, then from center to bottom alternately) to prevent distortion of covers and possible leakage. (Figure 11) Torque crankcase cover to specification. (Figure 11) Install end cap screws and tighten.
30. Mount completed powerhead on powerhead stand in vise and rotate several times to make sure that entire powerhead assembly is free.
31. Install transfer port gasket and cover. Torque to specifications and in sequence. (Figure 12)
32. Install cylinder block cover gasket and cover. (Figure 12) Torque to specification and in sequence.
33. Attach vertical shaft assembly to powerhead.
34. Install exhaust deflection and exhaust cover and gaskets. Torque to specification and in sequence.
35. Install ignition components.

POWERHEAD REPLACEMENT

1. Install flywheel key and flywheel. Secure with washer and elastic stop nut. Torque to specification. Install flywheel puller cap screws and torque to specification.
2. Install carburetor gasket and carburetor assembly to powerhead. Make sure that carburetor impulse hole lines up with hole in gasket. (Figure 1) Torque nuts to specification.
3. Replace powerhead to exhaust plate gasket. Make sure that gasket surfaces are clean of old gasket material.
4. Place powerhead onto exhaust plate and secure with powerhead to drive shaft housing nuts.

CAUTION: Use care not to damage choke linkage when installing powerhead.

5. Install fuel line connector with mounting screw.
6. Install choke and throttle linkage.
7. Install water hose to tell-tale.
8. Install throttle link and tiller handle. Make sure that "Start" position lines up with mark in neutral.
9. Install front and rear cowl support bracket.
10. Install spark plugs and spark plug wires.
11. Attach electrical wires and coat connections with Liquid Neoprene (C-92-25711).

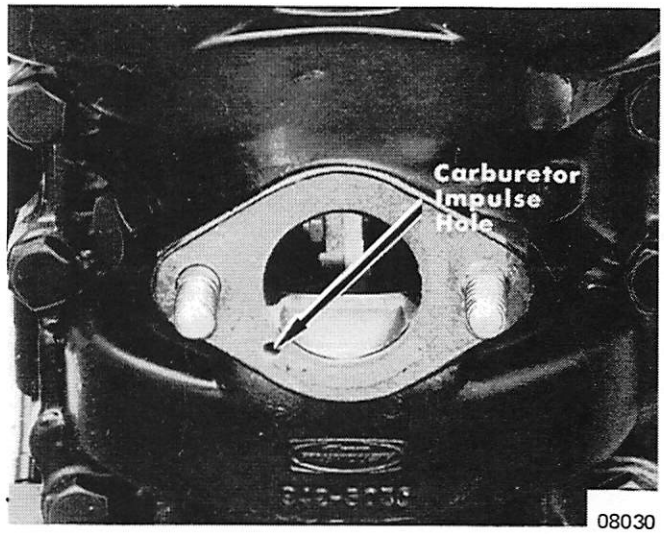

Figure 1. Carburetor Impulse Hole

12. Install drive shaft housing cover.
13. Install rewind starter.
14. Install top cowl and rewind handle.

SECTION 5 - POWERHEAD

MERCURY
OUTBOARDS

PART B - 3-CYLINDER MODELS

MERCURY
MARINE

INDEX

3-CYLINDER POWERHEAD

POWERHEAD REMOVAL

1. Remove front cowl and clamshell cowl.
2. Place shift arm in neutral position.

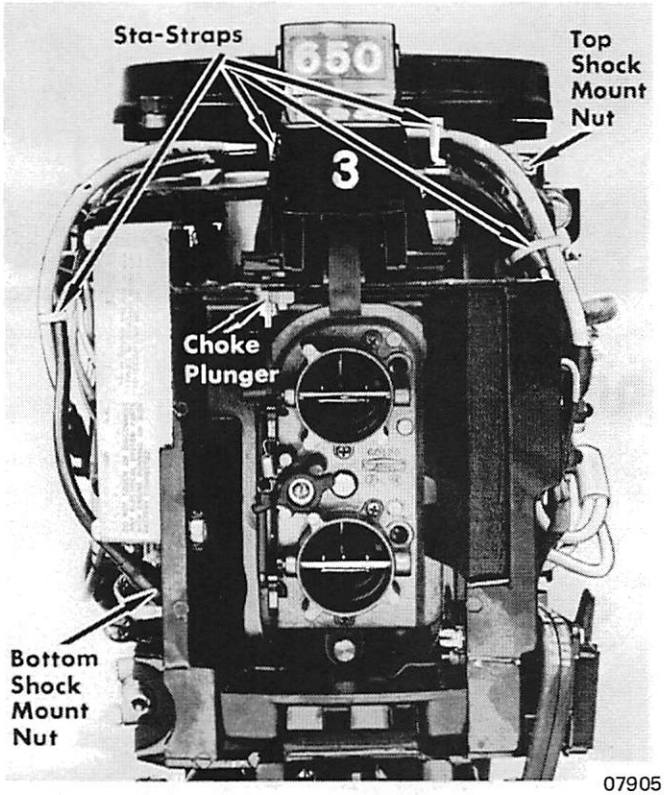

Figure 1. Powerhead, Front View

3. Remove locknuts from top and bottom front cowl support shock mounts (Figure 1) and remove front cowl support.
4. Remove fuel connector from fuel pump. (Figure 2)
5. Remove water hose from exhaust plate. (Figure 2)

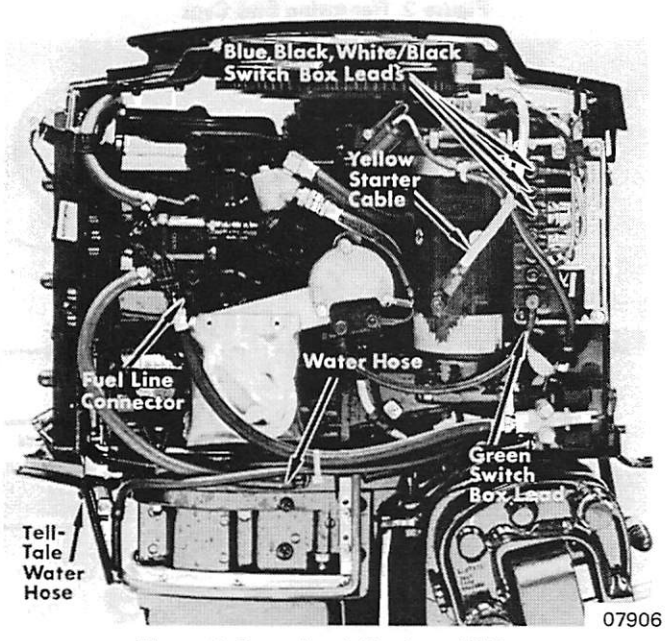

Figure 2. Powerhead, Starboard Side

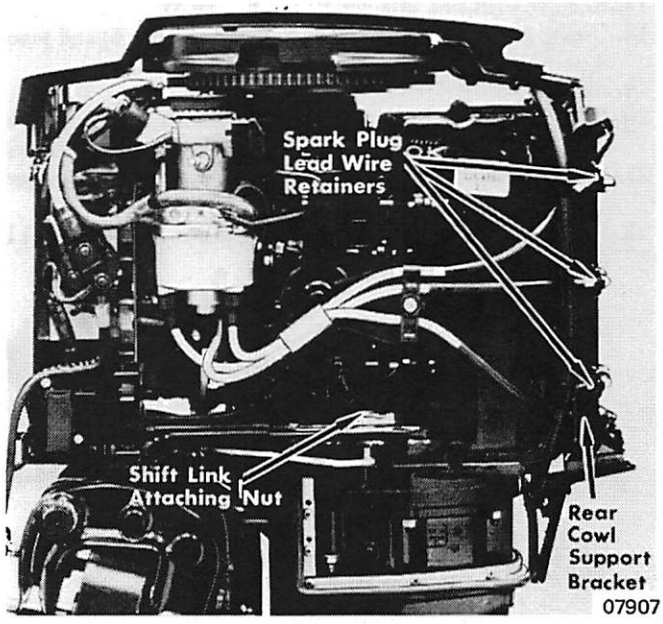

Figure 3. Powerhead, Port Side

6. Remove water hose from telltale. (Figure 2)
7. Remove gray lead from choke solenoid and pull choke solenoid plunger down from solenoid. (Figure 1)
8. Remove yellow cable from starter motor. (Figure 2)
9. Remove green, blue, white/black and black leads from switch box. (Figure 2)
10. Remove powerhead to drive shaft housing nuts.

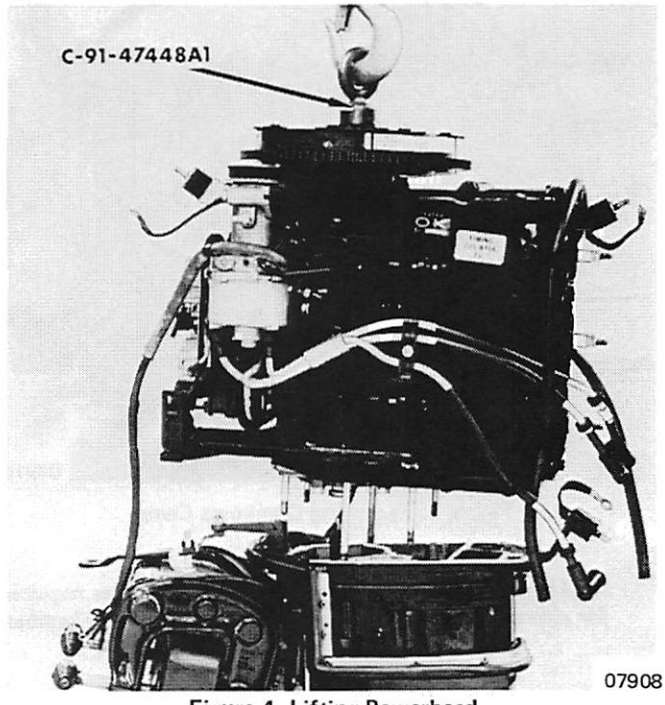

Figure 4. Lifting Powerhead

11. Remove 4 sta-straps. (Figure 1)
12. Remove lead wires from spark plugs and lead wire retainers.
13. Remove 3 exhaust plate to powerhead cap screws.

14. Remove center cowl support.
15. Remove plastic protector from flywheel nut and install lifting eye (C-91-47448A1).
16. Remove 2 rear cowl support shock mount nuts and rear cowl support bracket. (Figure 3)
17. Remove shift link attaching nut. (Figure 3)
18. Useing a suitable hoist, lift powerhead (Figure 4) and place it on powerhead stand.
19. Remove carburetors as an assembly.
20. Lift distributor by removing belt retainer screw, ground lead, spark plug leads and lead retainer and 2 cap screws.
21. Remove elastic stop nut and washer which hold flywheel to crankshaft.
22. Remove flywheel with Flywheel Tool C-91-48501A1. (Figure 5)

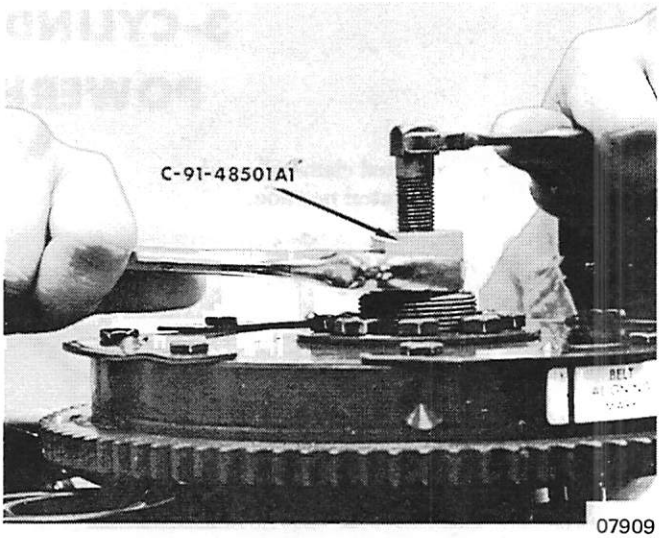

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Figure 5. Removing Flywheel

CYLINDER BLOCK DISASSEMBLY

NOTE: For "End Cap and Bearing Cleaning and Inspection". Refer to Page 5B-7 this part.

1. Remove crankcase cover screws and end cap screws and remove crankcase cover. (Figure 1)
2. Tap end caps off with a rawhide mallet. DO NOT tap on shims. (Figure 2)
3. Pry out both ends of crankshaft to loosen locating pins and lift out crankshaft assembly. (Figure 3) Place on powerhead stand in vise.

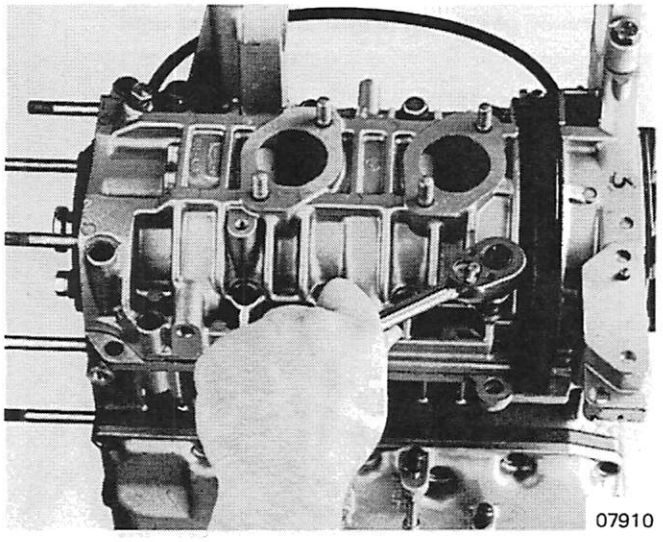
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Figure 1. Removing Crankcase Cover

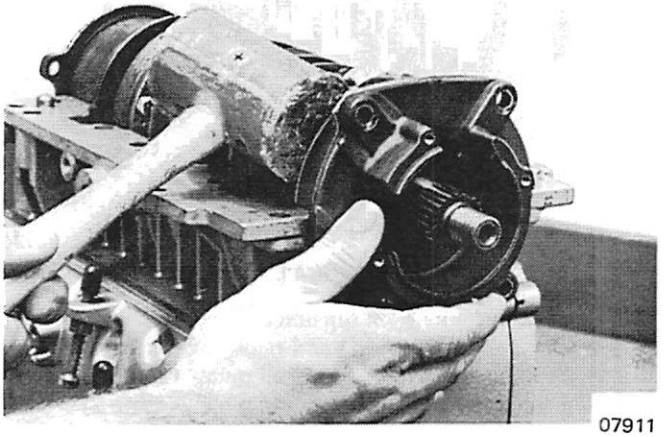
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Figure 2. Removing End Caps

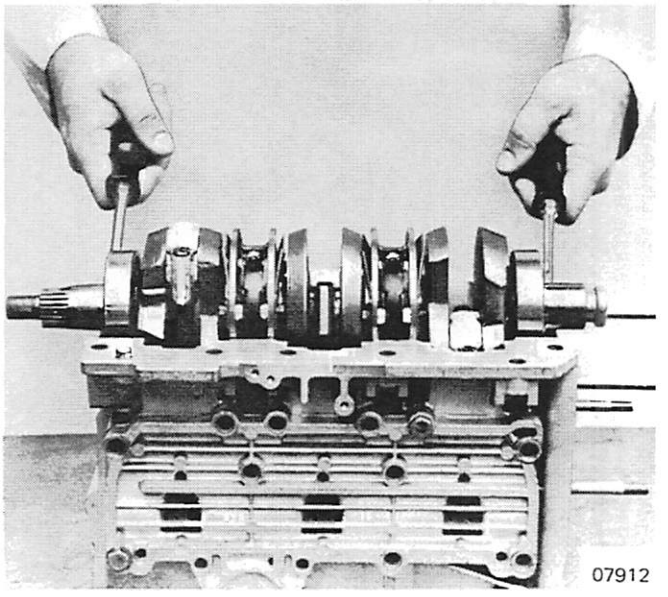
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Figure 3. Lifting Out Crankshaft

NOTE: These covers need not be removed, unless required for cleaning exhaust chamber and water cooling chamber.

4. Remove screws from exhaust cover and remove exhaust cover and exhaust deflection plate. (Figure 4)
5. Turn cylinder block and remove screws from transfer port covers, then remove covers. (Figure 5)
6. Remove screws from cylinder block cover and remove cover. (Figure 6)

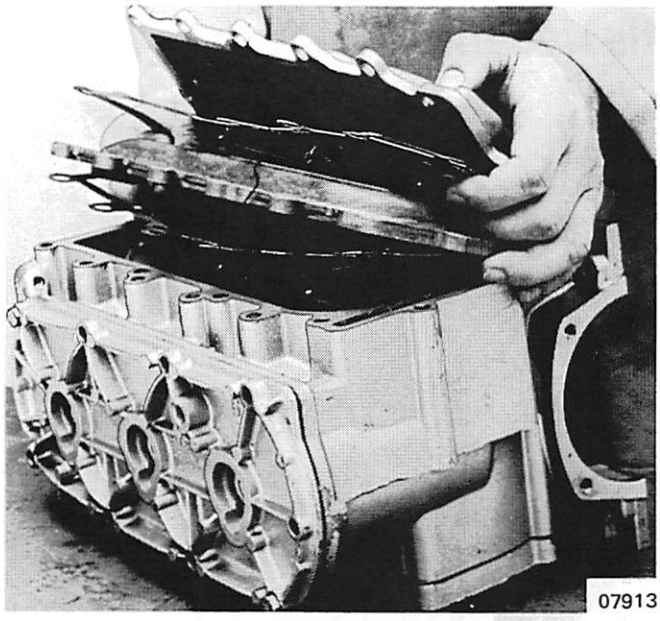

Figure 4. Removing Exhaust Cover

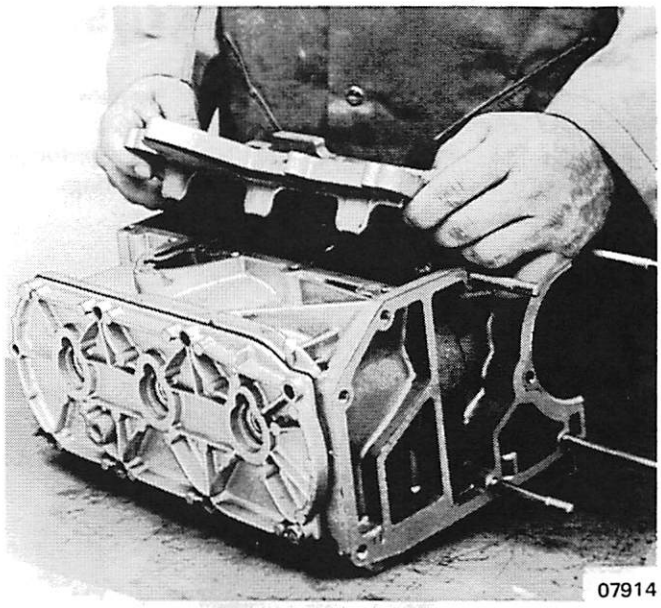

Figure 5. Removing Transfer Port Cover

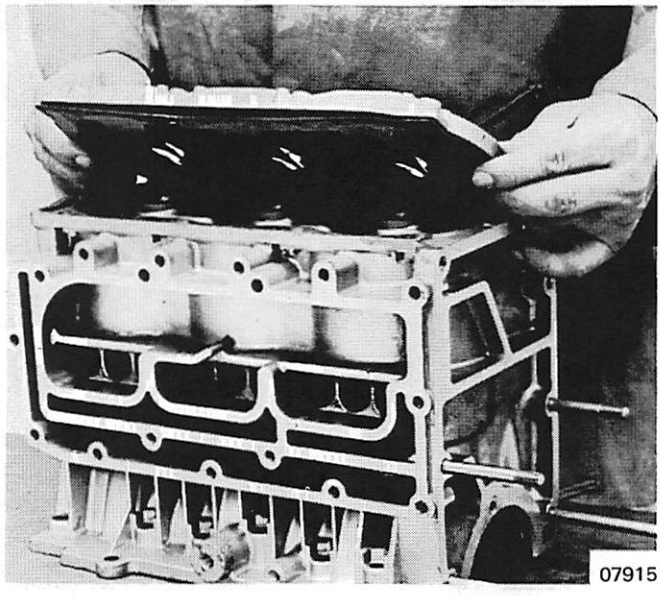

Figure 6. Removing Cylinder Block Cover

CRANKSHAFT DISASSEMBLY

1. Using Piston Ring Expander (C-91-24697), remove piston rings. (Figure 1)
2. Remove piston pin lockrings from both ends of piston pin and discard. (Figure 2) Never reinstall used lockrings.

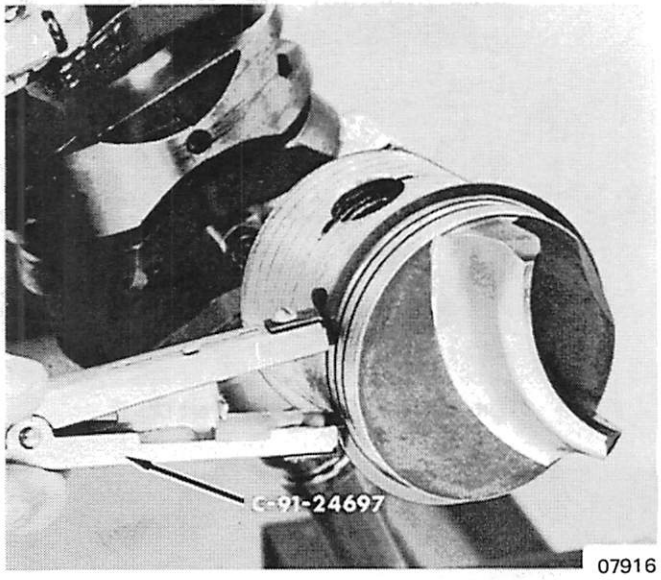

Figure 1. Removing Piston Rings

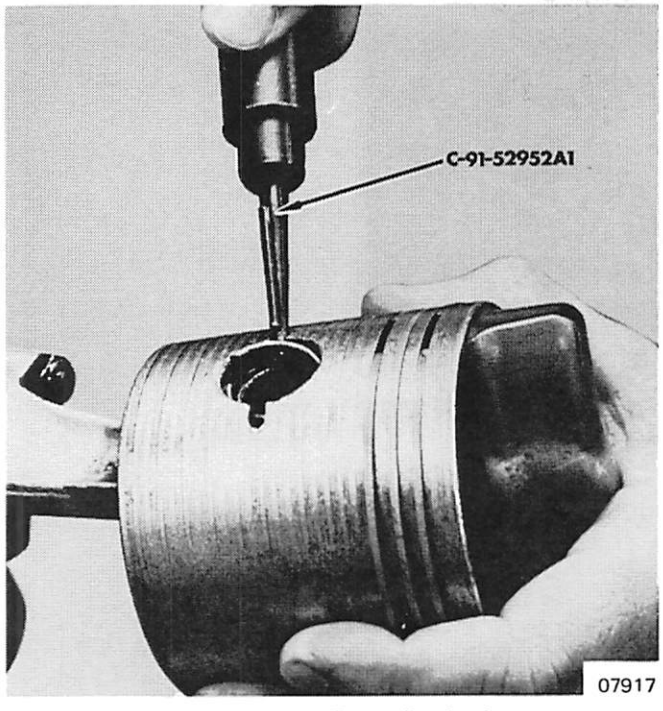

Figure 2. Removing Piston Pin Lockring

3. Heat top of piston to 190° to 200° F (after 50-100 hours of operation, heat only to 130°) with heat lamp.
4. Using Piston Pin tool (C-91-30766A1), remove piston pins. (Figure 3) Place piston pin bearing retainer over end of piston pin tool and slide bearing retainer tool into center of piston pin bearings. Remove piston pin tool and remove piston. Bearings will remain in place until bearing retainer tool is removed.
5. Remove piston pin needle bearings and retainers.

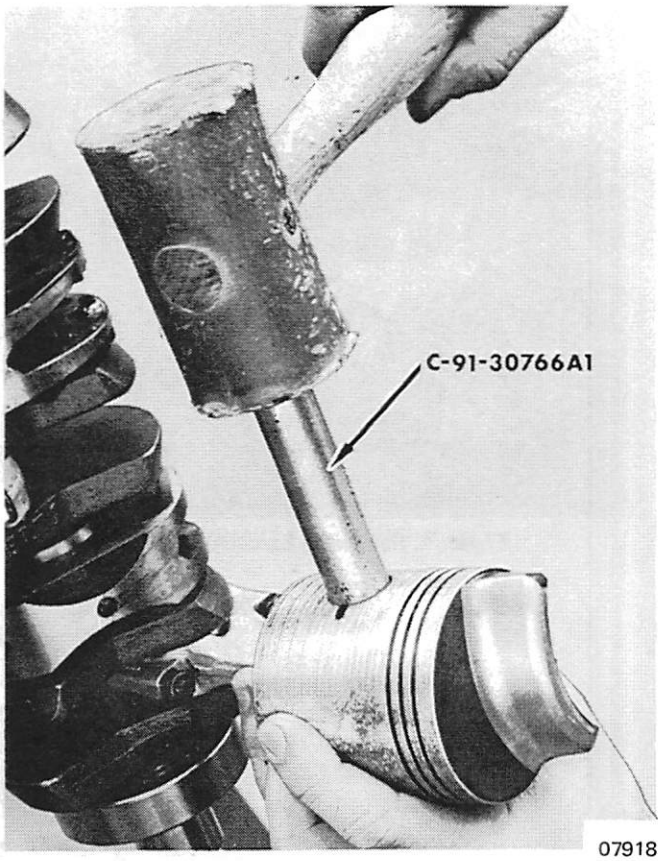

Figure 3. Removing Piston Pin

NOTE: Cleanliness is essential when handling bearings. Use care not to get dirt or lint on needle bearings.

6. Remove connecting rod nuts and bolts and remove rod caps and connecting rods, bearings and cages. (Figure 4) Keep rod caps, connecting rods and bearings together.

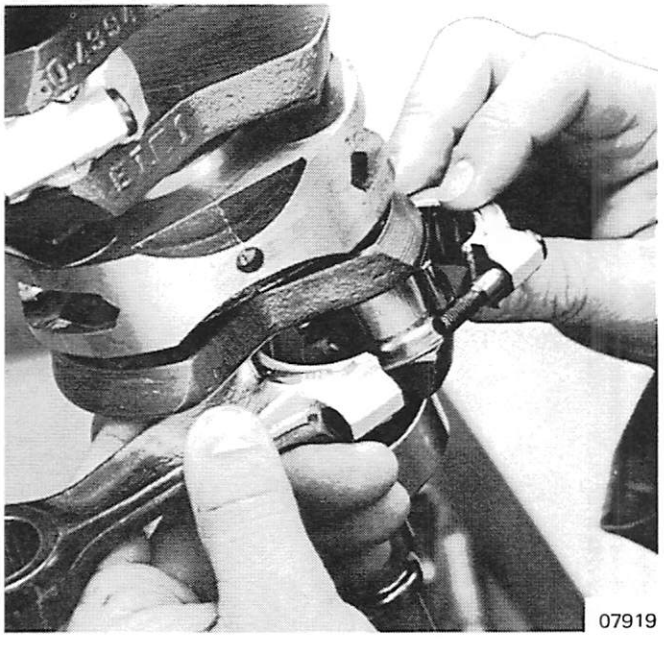

Figure 4. Removing Connecting Rod

Discard connecting rod nuts and bolts. Number rods during removal.

CAUTION: Immediately after disassembling rod from crankshaft, rematch cap and rod to be certain that they are not separated or mismatched on reassembly. Rematch with markings on side of cap and rod. Number connecting rods so that they are reinstalled on same crankpin throw.

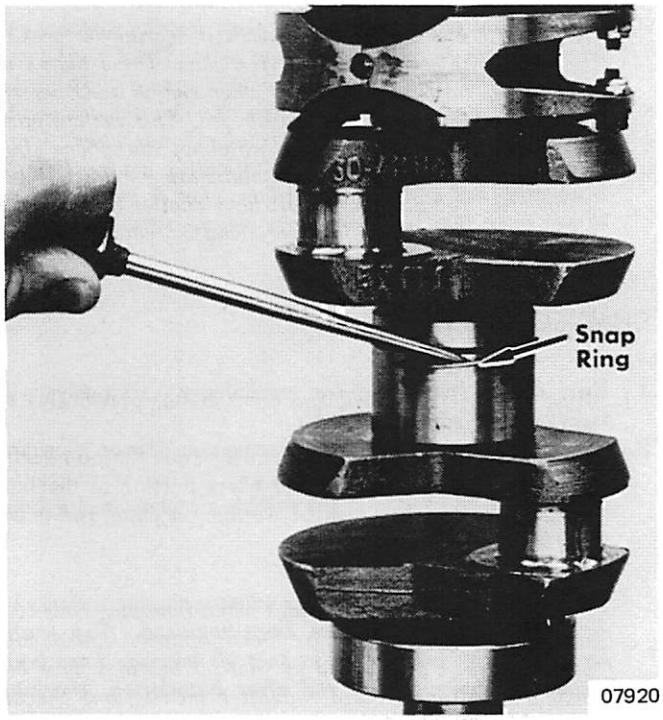

Figure 5. Removing Center Main Roller Bearing

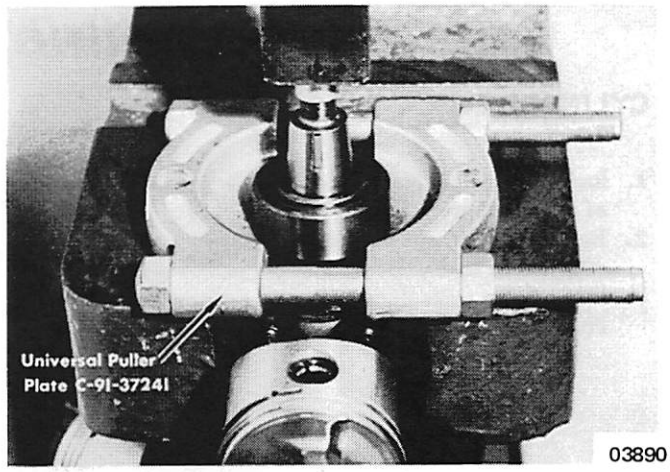

Figure 6. Removing Ball Bearing with Universal Puller Plate

7. Remove reed valve type center main bearing by removing 2 Phillips head screws. Be careful not to bend or distort reed valves and reed valve stops on bearings.
8. Tap side (solid section) with mallet to separate halves of reed valve cage.

NOTE: Rematch bearing halves on removal to be sure of proper match on reassembly.

9. Remove reed valves and reed valve stops on center main bearing by removing cap screws.
10. Remove snap ring from main bearings and remove bearing outer race and bearings. (Figure 5)
11. Check end bearings for roughness and damage. Remove only if necessary. Remove end bearing with Universal Puller Plate (C-91-37241). (Figure 6)

CLEANING and INSPECTION

CYLINDER BLOCK

1. Inspect cylinder block thoroughly for cracks and condition of cylinder bore.
2. Remove carbon and varnish with fine wire wheel on a shaft attached to an electric drill, or use carbon remover.
3. Finish hone walls slightly to seat new rings. (See "Honing Procedure", following)

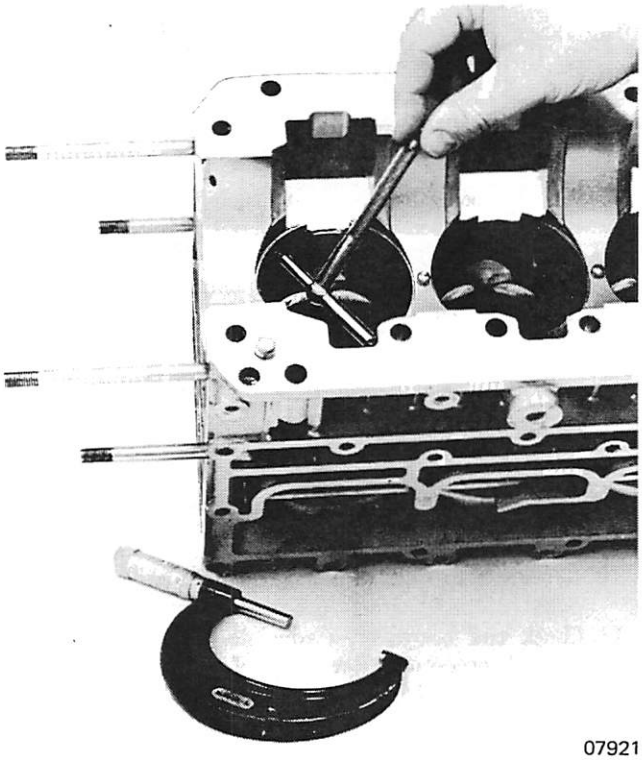

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Figure 1. Checking Cylinder

4. Check cylinders for wear with an inside telescopic gauge and micrometer. (Figure 1) On engines, which display evidence of over-heating, bore should be checked for out-of-round. If worn or out-of-round (maximum .003"-.004"), rebore to .015" and install oversize piston and rings.
5. If sleeves have been scored, but not out-of-round, or, for some other reason, sleeve is rough, clean up surface of sleeve with a cylinder hone. Polishing should be done with a finishing hone. (See "Honing Procedure" following.)
6. Remove carbon from top of cylinder with closed-cup brush.

NOTE: Cylinder sleeves are an integral part of the die cast cylinder blocks and cannot be resleeved. Cylinders can be bored .015" oversize, unless scored more than .0075" deep. Oversize replacement parts are permitted and accepted by the American Power Boat Association.

7. Check bleed holes (located under transfer port covers on cylinder block) to make sure that plastic restrictor is in hole. If restrictor is missing, it will cause a flooding-effect in cylinder.

CRANKSHAFT

1. Check all bearing surfaces for rust and pit marks.
2. The crankshaft journal can be cleaned, if necessary, by using a 320 grit carborundum cloth. DO NOT polish crankshaft journals, or bearings will slide.

NOTE: Chatter marks on crankshaft bearing surfaces can be seen with a good magnifying glass. These marks will cause a sound (like gear noise) when engine is in operation and resemble a very tiny washboard. This surface condition can be repaired if a total of not over .001" (.0254mm) is removed while eliminating marks. If both connecting rod and crankshaft have chatter marks, a total of not over .002" on both parts can be removed. Use 320 grit carborundum cloth.

CONNECTING RODS

1. Rust checks (explained for crankshafts, previously) will hold true for connecting rods.
2. Check rods for alignment by placing rods flat on a surface plate. If light can be seen under any portion of machined surfaces, or rod has a slight wobble on plate, rod is bent and should be discarded.

NOTE: Always count bearings when removing rods to be sure that all bearings have been removed. Also count bearings when assembling so that all bearings have been installed. Always rotate rod after installation, checking that there is no binding.

NOTE: When repairs are made on connecting rod, it will be necessary that each bearing assembly for each individual rod be kept separate. DO NOT intermix bearings and bearing carriers from different rods! This bearing carrier assembly is available only with roller bearings and must be replaced as a complete assembly. When servicing, do not clean large bore of connecting rod with emery cloth, as it will roughen the surface. Bearing setup requires that connecting rod surface be smooth.

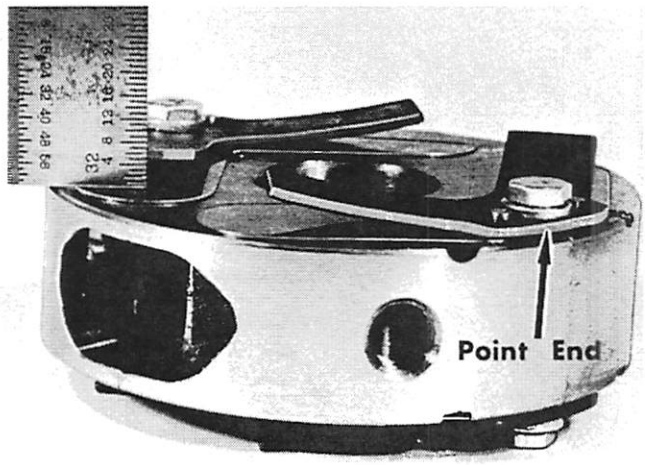

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Figure 2. Reed Valve Stop Setting

REED BLOCKS

1. Place reed cage together and torque to specifications. Check reed cage for warp. Make sure that inside diameter is not sprung.
2. Check for chipped or broken reeds and that reeds are not standing open. Replace reeds in sets only. DO NOT flip used reeds over for reuse. Reeds should not have a preload.
3. Refer to "Specifications" Section 8 and set reed stop openings. (Figure 2)

PISTONS

1. Check pistons for scoring, cracks, carbon, etc. If pistons have been scored or metal has been damaged, they must be replaced. Check piston pin bosses for cracks. Replace if cracked or if piston pins are worn.
2. Inspect piston ring grooves for wear, burn and distortion. It is recommended that new piston rings be installed. Replacement will ensure good repair and future operation. Pins, located in ring grooves, prevent rings from rotating.

NOTE: Before replacing piston rings, clean out grooves thoroughly, using recessed end of broken ring. (Figure 3) Clean carbon and varnish deposits from top sides of piston with soft wire brush or carbon remover solution. When wire brushing top of piston, do not burr or round machined edges.

3. To assure a positive seat of piston rings to cylinder walls, hone and/or deglaze cylinder walls whenever pistons are removed from cylinder block. See "Cylinder Block Installation" for honing and deglazing cylinder walls.
4. Gum, varnish and softer carbon deposits can be removed by soaking in a carbon remover solution (Gunk), Bendix parts cleaner or others.
5. Piston skirt can be polished with crocus cloth to remove burrs.
6. Check pin and pin boss, especially if engine has been submerged. Piston pins are not sold separately because of slight variation in sizes and correct "fit" into piston. If pin is bent, it elongates piston pin boss when removed.

06371

Figure 3. Cleaning Ring Grooves

.015" OVERSIZE PISTONS and PISTON RINGS

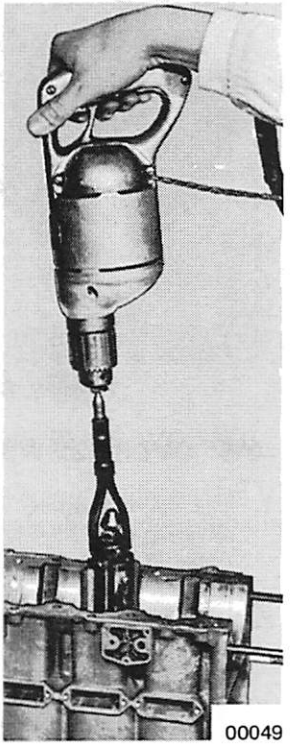
1. The major purpose for oversize pistons and rings is for salvaging scored cylinder blocks. If the score is over .0075" (.19mm) deep, it cannot be effectively rebored for future use.
2. Oversize .015" (.38mm) replacement pistons and rings are available for all larger bore engines. Refer to Parts Manual for particular model.

END CAP and END BEARINGS

1. Needle bearings always should be replaced at overhaul and when rust conditions are present. Caged needle bearings also should be replaced at overhaul, or if they have become wet and rusty.
2. Clean and dry ball bearings before checking.
3. With one hand, grasp outer race firmly and, with other hand, attempt to work inner race in-and-out. There should not be excessive play. Spin outer race after lubricating with oil. Discard if bearing sounds or feels rough or has "catches". Bearing should have smooth action, no rust stains. Compare with new bearing.
4. Inspect oil seals for leaking or damaged lips and replace if necessary.

HONING PROCEDURE

1. When cylinders are to be honed, follow the hone manufacturer's recommendations for the use of the hone and cleaning and lubrication during honing.
2. Start stroking at smallest diameter. Maintain firm stone pressure against cylinder walls to assur fast stock removal and accurate results. (Figure 4)
3. Localize stroking in the smaller diameter until drill speed is constant throughout length of bore. Expand stones as necessary to compensate for stock removal and stone wear. Stroke at a rate of approximately 30 complete cycles per minute to produce best cross-hatch pattern. Use honing oil generously.
4. For roughing operation, a coarse grit should be used to remove stock rapidly. The softer the material, the coarser the grit that can be used for roughing. In cast iron, approximately .002" (.051mm) must be left for finishing operations.
5. For finishing operation, finer grit stones are used to bring the bore to size and produce the desired surface finish. In cast iron, one (or possibly two) finishing operations are necessary (using progressively finer stones) depending upon the finish specified.
6. For best honing results, a continuous flow of honing oil should be pumped into the work. If pumping oil is not practical, use an oil can. Apply oil generously and frequently on both stones and work.
7. Thoroughly clean cylinder bores with hot water and detergent. Scrub well with a stiff bristle brush and rinse thoroughly with hot water. It is extremely essential to perform a good cleaning operation. If any of the abrasive material is allowed to remain in the cylinder bores, it will rapidly wear new rings and cylinder bores in addition to bearings. Bores should be swabbed several times with light engine oil and clean cloth, then wiped with a clean dry cloth. Cylinders should not be cleaned with kerosene or gasoline. Clean remainder of cylinder block to remove excess material spread during honing operation.



CAUTION: Handle pistons with care and do not attempt to force them into the cylinder until cylinder has been honed to correct size. Piston can be distorted by careless handling.

8. Permanently mark the piston for corresponding cylinder to which it has been fitted.

Figure 4. Finish Honing Cylinders

POWERHEAD REASSEMBLY

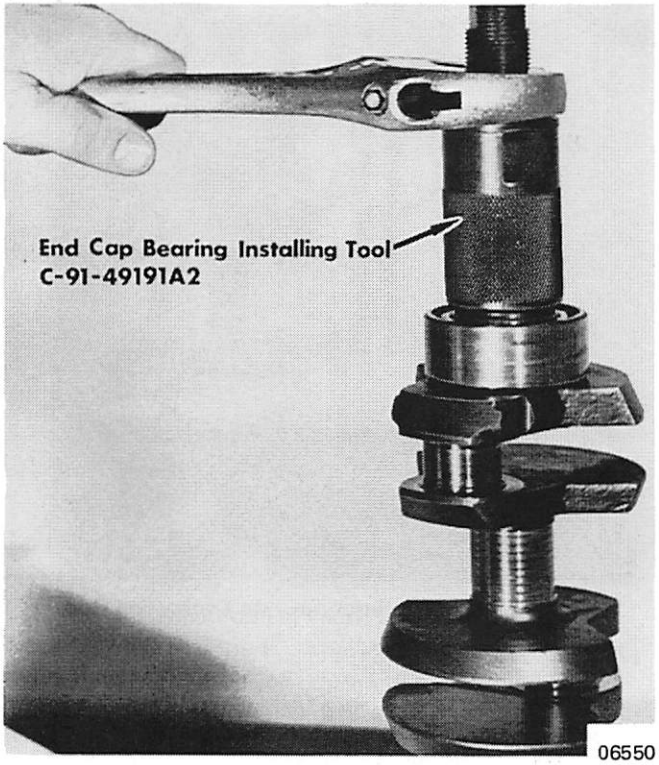


Figure 1. Installing End Cap Ball Bearings

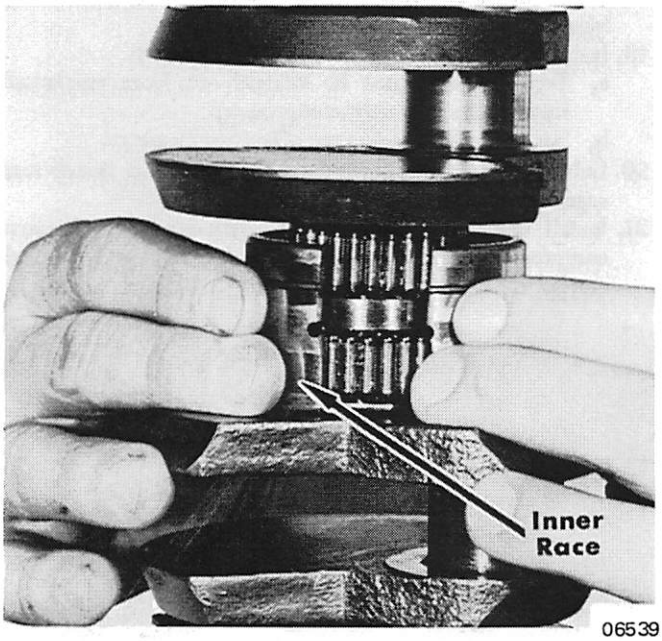


Figure 2. Removing and Installing Center Main Roller Bearings and Outer Race

1. If end bearings were removed, refer to Figure 1 for reassembly.
2. Install bearings, bearing cage and snap ring onto crankshaft. Refer to parts list to make sure of number of bearings. (Figure 2)

   IMPORTANT: Always check reed stops for proper opening. Larger opening can cause breakage; smaller opening will not allow sufficient fuel to enter at high RPM.

3. After rechecking reed valves and reed stops, lubricate reed cage halves with Multipurpose Lubricant (C-92-49588).
4. Install reed cage on crankshaft. (Figure 3) Tighten 2 integral screws securely on reed cage to assure tight fit.
5. Recheck reed valve spacing over openings and clearance between reed valve and stop.
6. Prepare connecting rods, opening matched assemblies (one at a time) by removing cap. Watch knob markings on cap and rod for reassembly. (Figure 4)

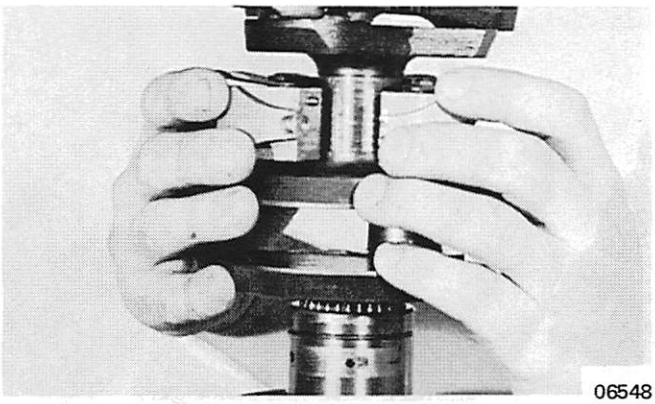


Figure 3. Removing and Installing Center Main Bearing Reed Cage

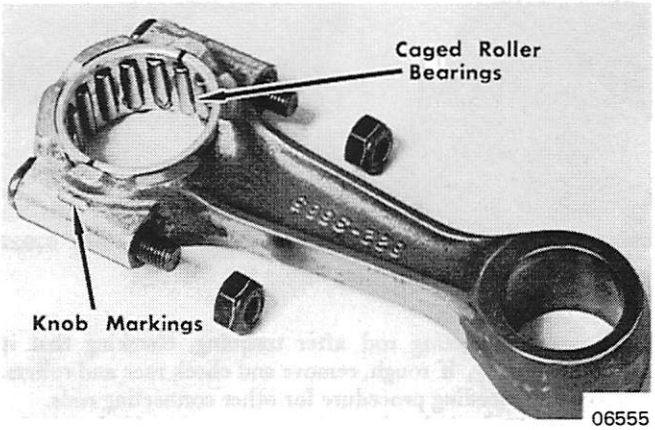


Figure 4. Rod and Rod Bearings

7. Place a small amount of Multipurpose Lubricant on each half of connecting rod bearing race to hold bearings in place.
8. Place bearing retainer race in connecting rod (where applicable).
9. Place roller bearings around both sides for reassembly. Check parts list in Parts Manual for required quantity.

CAUTION: Never intermix new roller bearings with used bearings in the same connecting rod. If a quantity of bearings requires replacement, replace all bearings in a connecting rod.

10. Place connecting rod cap so that knob markings match connecting rod. (Figure 4)
11. Install new fasteners and tighten each evenly with torque wrench for perfect fit. Refer to Torque Specification Chart in "Specifications" Section 8 for correct torque value.

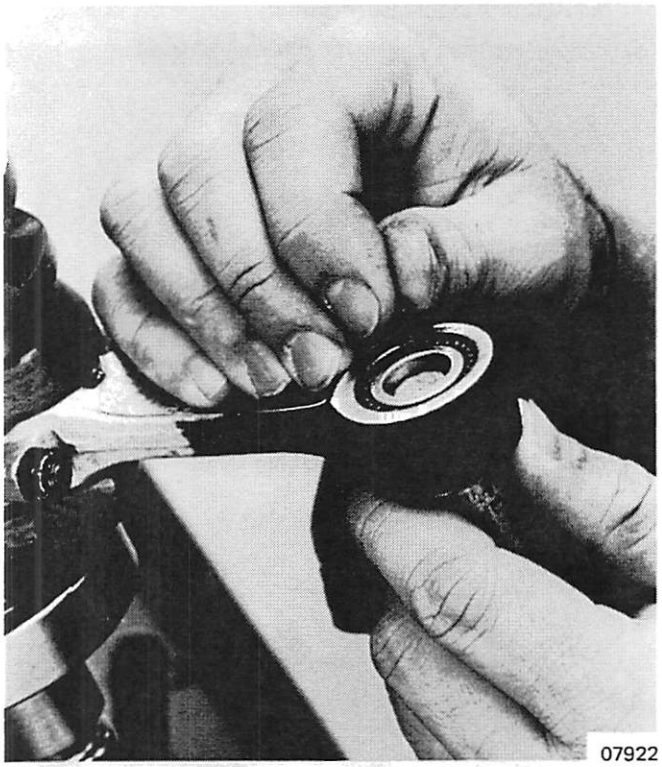


Figure 5. Installing Piston Pin Bearings

12. Rotate connecting rod after torquing, checking that it rotates freely. If rough, remove and check race and rollers.
13. Repeat preceding procedure for other connecting rods.
14. Always recheck knob markings on reassembled rods for correct and perfect match.
15. Install retainer and piston pin bearings on Tool C-91-30766A1. Leave one bearing out. Push bearings and tool into rod race. Install last bearing and top retainer (Figure 5) on opposite side of rod. Place piston over bearing assembly (watch intake side of piston). Hold bearings in place with sleeve part of tool. Heat piston to 125° to 135° F.
16. Install piston pin (Figure 6) with punch part of tool. Install new lockrings with Lockring Tool (C-91-60837A1). (Figures 7 and 8) Double-check that ring is seated in groove.

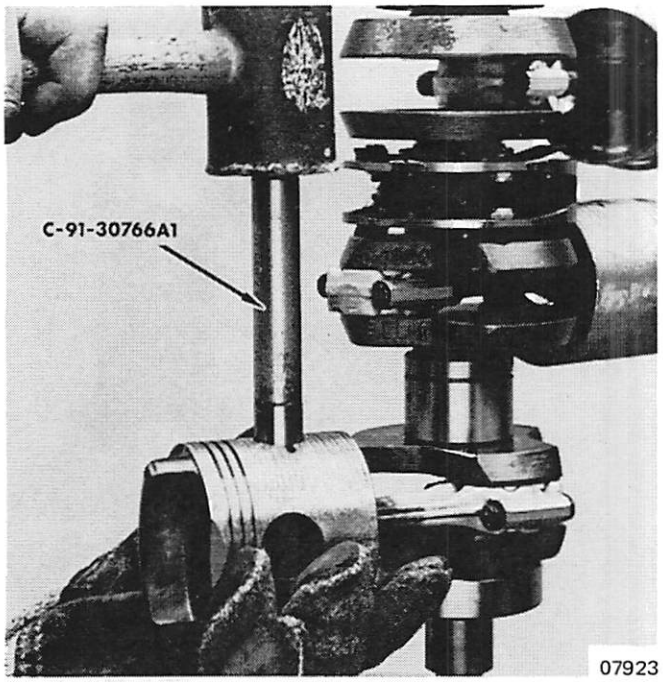


Figure 6. Inserting Piston Pin into Connecting Rod

17. Using Piston Ring Expander Tool (C-91-24697), install rings on pistons. After placed in groove, rings should rotate freely. Lubricate rings with Quicksilver 2-Cycle Engine Oil (C-92-33005), rotate and align rings with lockpins in ring grooves.
18. Make sure that piston rings are located with piston ring locating pins.
19. Install ring compressors as follows: (Figure 9)
    a. Top cylinder must be straight out from crankshaft throw (uses a straight compressor).
    b. No. 2 and 3 cylinders use offset compressors.
20. Lubricate rings and cylinder block with oil. Install reed cage locating pins into cylinder block.
21. Install crankshaft assembly into cylinder block. Remove compressors as pistons are being placed in cylinder. Install crankshaft assembly correctly, with the splined end toward

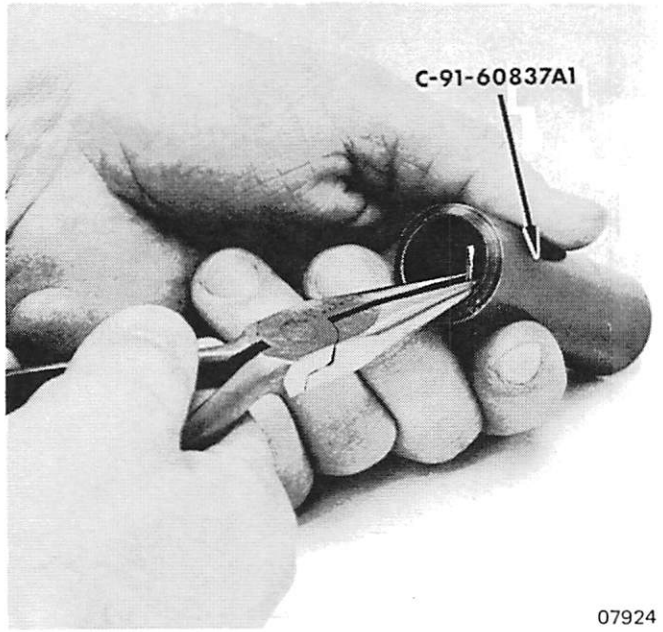


Figure 7. Inserting Piston Pin Retaining Lockring into Tool

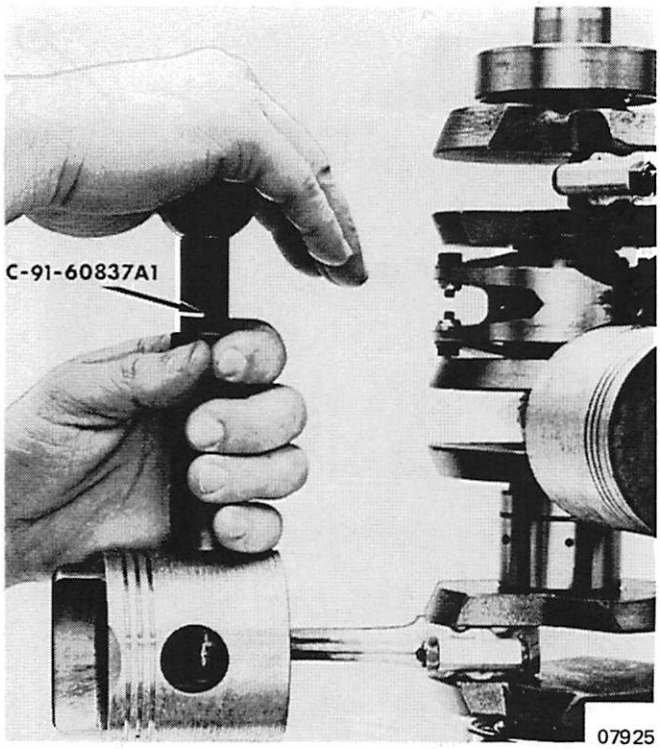


Figure 8. Installing Piston Pin Lockring

the cylinder block mounting studs. (Figure 9) Make sure that reed cage alignment hole aligns with locating pin in cylinder block.

22. Check each piston ring for spring tension thru exhaust or intake ports by pressing with screwdriver. (Figure 10) If no springing action occurs, or ring does not return to position, it is likely that ring has been broken in reassembly. Be careful not to burr piston rings.
23. Remove "O" rings from end caps and, with original shims intact, temporarily install upper and lower end caps on crankshaft (do not install crankcase) and secure to cylinder block with end cap screws.

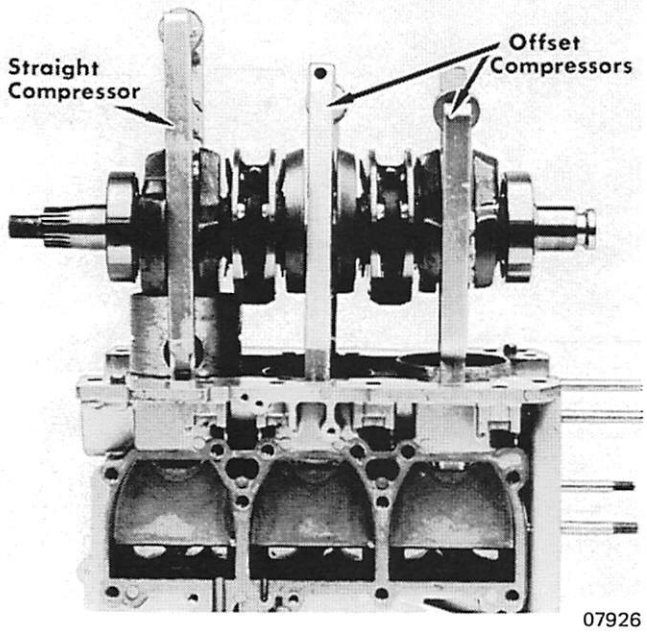


Figure 9. Placing Crankshaft Assembly in Cylinder Block with Compressors

24. To ensure a true seat, tap crankshaft either direction with a mallet. Use a "feeler gauge" to check measurement between inner face of upper end cap and top (first) counterweight of crankshaft (approx. .050" starting point). (Figure 11) After reading is obtained, tap crankshaft in opposite direction, again acquiring a true seat, and recheck this measurement. Difference between the 2 readings obtained is amount of crankshaft end play. Tolerance of end play should be .004" to .008". If reading obtained does not meet this specification, add shims to increase end play or remove shims to decrease end play.

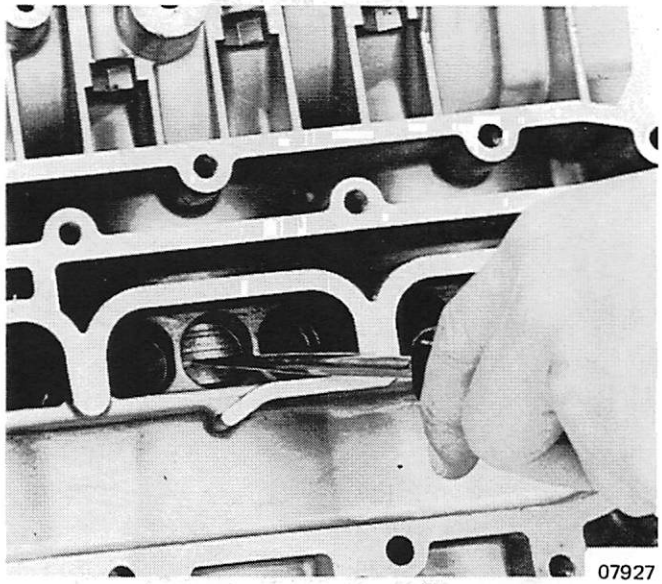


Figure 10. Checking Piston Rings

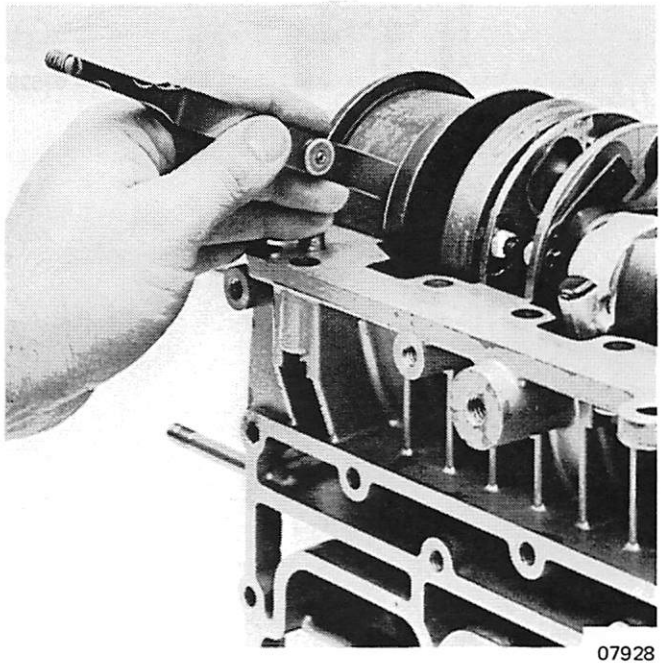


Figure 11. Checking Crankshaft End Play

25. Remove end caps and install new "O" rings. Coat "O" rings and seals with Multipurpose Lubricant (C-92-49588) to form a seal.
26. Install new gaskets into crankcase cover and coat joint face of crankcase with Gasket Sealer (C-92-28804) for metal-to-metal seal.

27. Install end caps and crankcase cover. Make sure that reed cage is centered in carburetor inlet. Tighten crankcase bolts (starting with center bolts and working to top, then from center to bottom, etc) to prevent distortion of covers and possible leakage. (Figure 12) Torque crankcase cover to specification. (Figure 12) Install end cap bolts and tighten.
28. Mount completed powerhead on powerhead stand in vise and rotate several times to make sure that entire powerhead assembly is free.
29. Install transfer port gasket and cover. Torque to specifications and in sequence.
30. Install cylinder block cover gasket and cover (Figure 13) and torque to specification and sequence.
31. Install exhaust deflector and exhaust cover and gaskets. (Figure 13) Torque to specification.

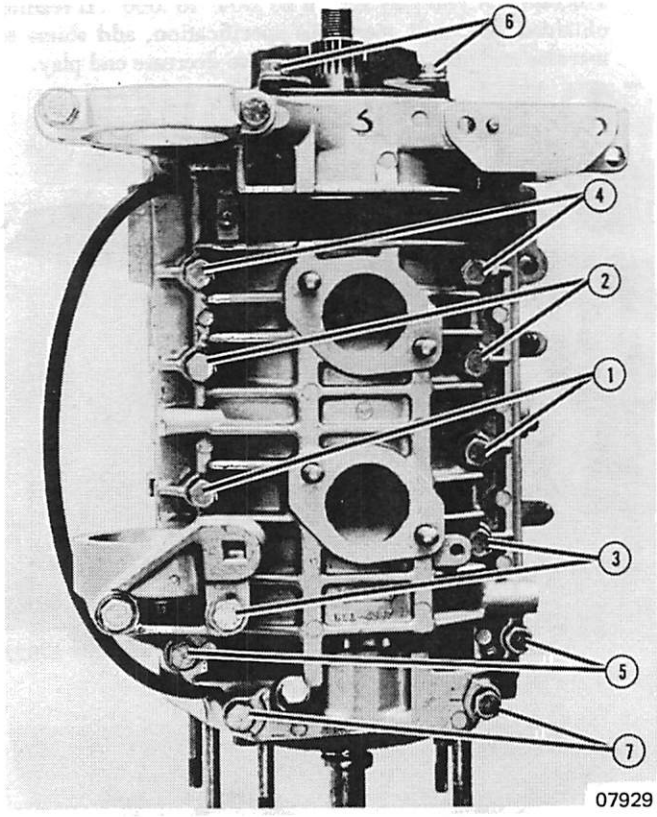


Figure 12. Correct Torquing Sequence

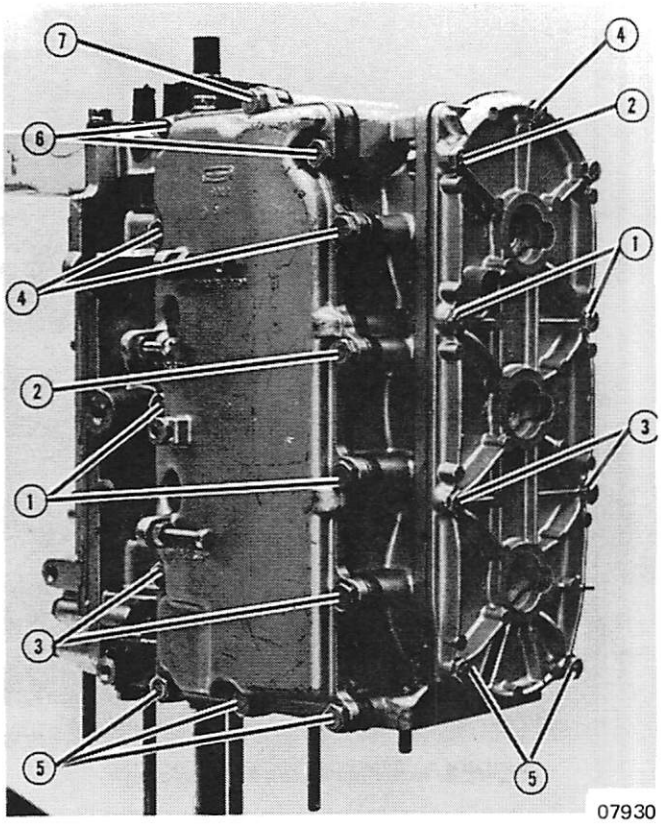


Figure 13. Correct Torquing Sequence

POWERHEAD REPLACEMENT

1. Install flywheel with timing belt and secure with washer and elastic stop nut. Install distributor assembly. Align flywheel, timing belt and distributor as follows:
   a. Insert plastic timing marker into powerhead, as shown in Figure 1.

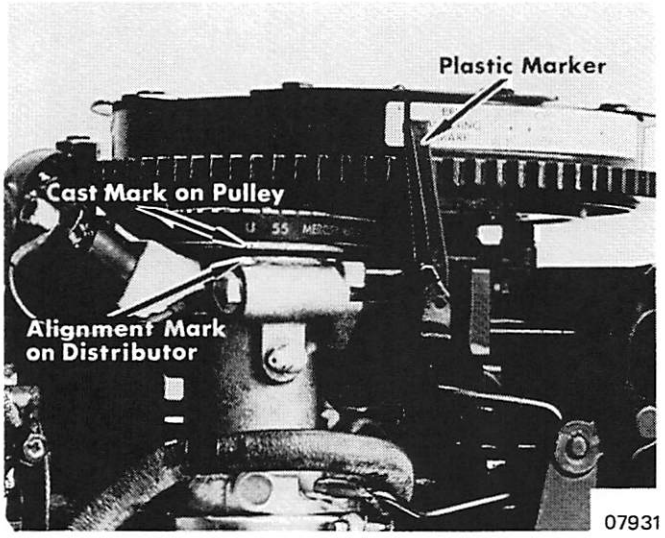


Figure 1. Timing Belt Alignment

   b. Align plastic timing marker with "BELT ALIGNING MARK" on flywheel decal. (Figure 1)
   c. Align cast notch on pulley with alignment mark on distributor. (Figure 1)
   d. Slip timing belt onto distributor pulley.
2. Install carburetor assemblies to powerhead.
3. Replace powerhead to exhaust plate gasket. Make sure that gasket surfaces are clean of old gasket material.
4. Using a hoist, lower powerhead onto exhaust plate and install exhaust plate to powerhead screws and drive shaft housing nuts.
5. Install rear cowl support bracket. Install water hose to tell-tale on bracket.
6. Install water hose to exhaust plate connection.
7. Install link attaching nut.
8. Reinstall choke solenoid lead, switch box leads and starter motor cable.

   NOTE: Coat electrical connection surfaces with Liquid Neoprene (C-92-25711).

9. Install fuel line connector to fuel pump.
10. Install 4 new sta-straps to harness.
11. Attach wire harness cable clamps where removed.
12. Install spark plugs and spark plug wires.
13. Install center cowl support, clamshell cowl and front cowl.

SECTION 5 - POWERHEAD

MERCURY
OUTBOARDS

PART C - 4 and 6-CYL. POWERHEADS

INDEX

4 and 6-CYLINDER MODELS
POWERHEAD REMOVAL

1. Remove front cowl, wrap-around cowl and top cowl.
2. Remove powerhead frame supports (front, top and rear). (Figure 1)

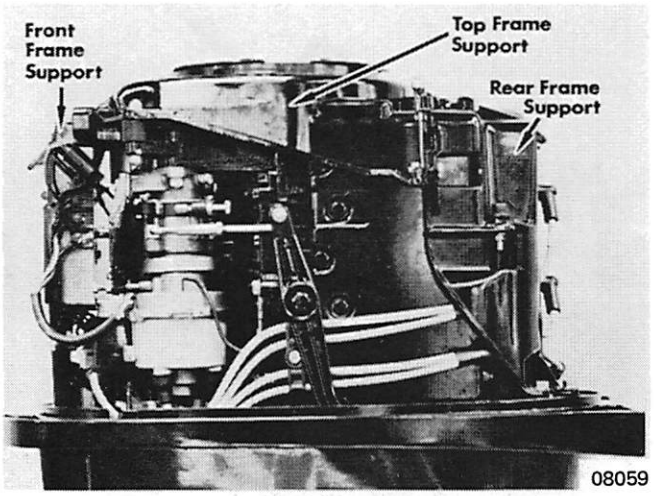


Figure 1. Powerhead Frame Supports

3. Remove trim cover from drive shaft housing. (Figure 2)
4. Remove powerhead to drive shaft housing nuts.
5. Disconnect starter, rectifier, switchbox (trigger side), wiring, powerhead to drive shaft housing ground straps and high tension wire from coil.
6. Remove shift link attaching nut.
7. Remove fuel line from fuel pump.

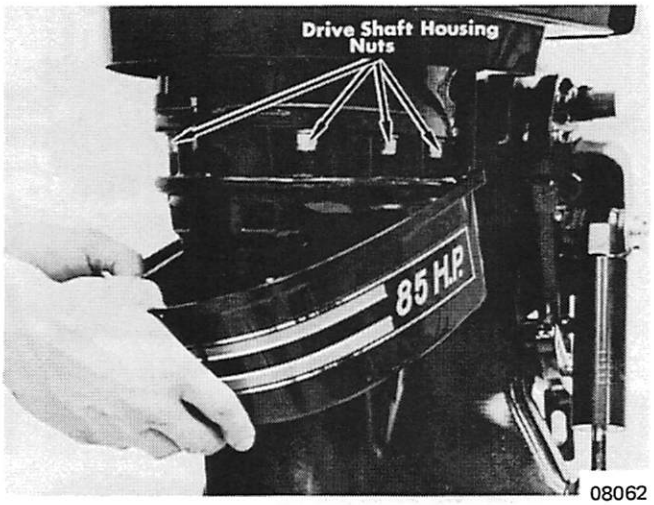


Figure 2. Removing Trim Cover

8. Remove manual choke link cable from carburetor choke.
9. Remove water hose from tell-tale outlet.
10. Remove plastic protector from flywheel nut and install Lifting Eye (C-91-47448A1).
11. Using a suitable hoist, lift powerhead (Figure 3) and place it on powerhead stand.

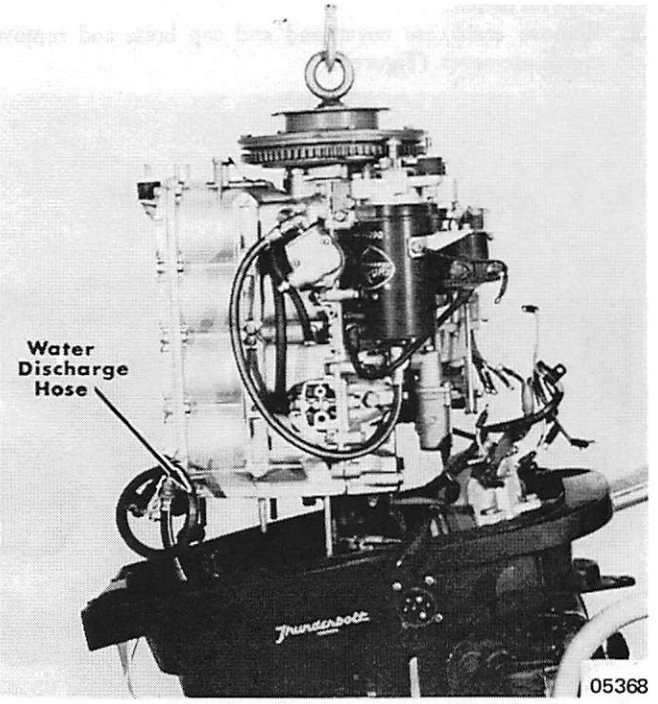


Figure 3. Lifting Powerhead

12. Remove timing belt pulley cover.
13. Remove flywheel nut and washer and remove flywheel with Crankshaft Protector and Flywheel Tool (C-91-48901A1). (Figure 4)
14. Remove starter by removing starter retaining bolts.
15. Pull spark plug wires from spark plugs. Remove throttle arm attaching bolt and spark plug wire retainers. Remove timing belt pulley and distributor.
16. Remove carburetor mounting nuts and all carburetors as an assembly.

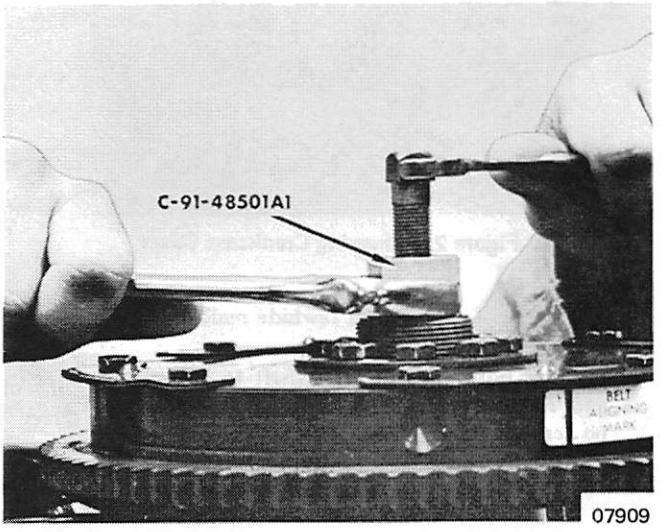


Figure 4. Removing Flywheel

CYLINDER BLOCK DISASSEMBLY

1. Bend center main locking tab (2 on 6-cylinder models). (Figure 1) Loosen crankcase cover bolts and place powerhead on bench.
2. Remove crankcase cover and end cap bolts and remove crankcase cover. (Figure 2)

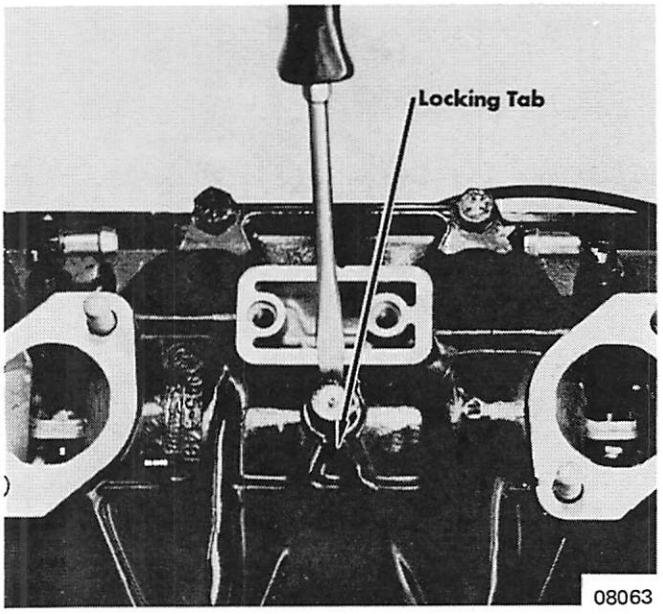


Figure 1. Center Main Locking Tab

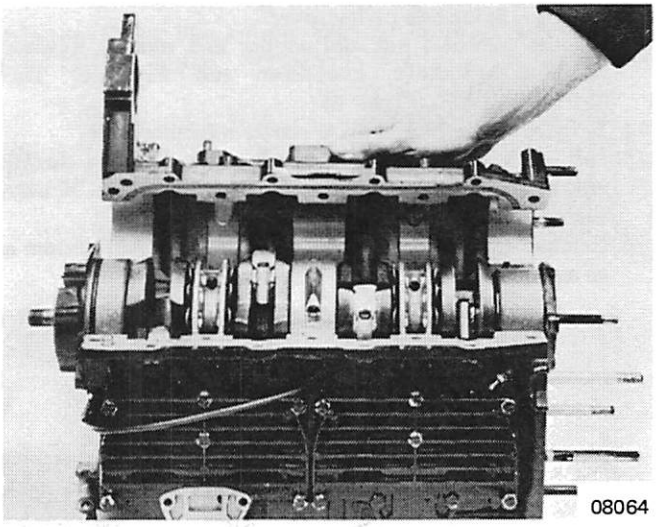


Figure 2. Removing Crankcase Cover

3. Tap off end caps with a rawhide mallet. DO NOT tap on shims. (Figure 3)
4. Pry out both ends of crankshaft to loosen locating pins and lift out crankshaft assembly. (Figure 4) Place on powerhead stand in vise.

NOTE: The split crankcase and cylinder block are matched assemblies, line bored, and never should be mismatched by using a different crankcase or cylinder block. Never place machined surfaces on concrete or in any place where surfaces may become marred. This will result in leaking surfaces, since no gasket is used between crankcase and cylinder block.

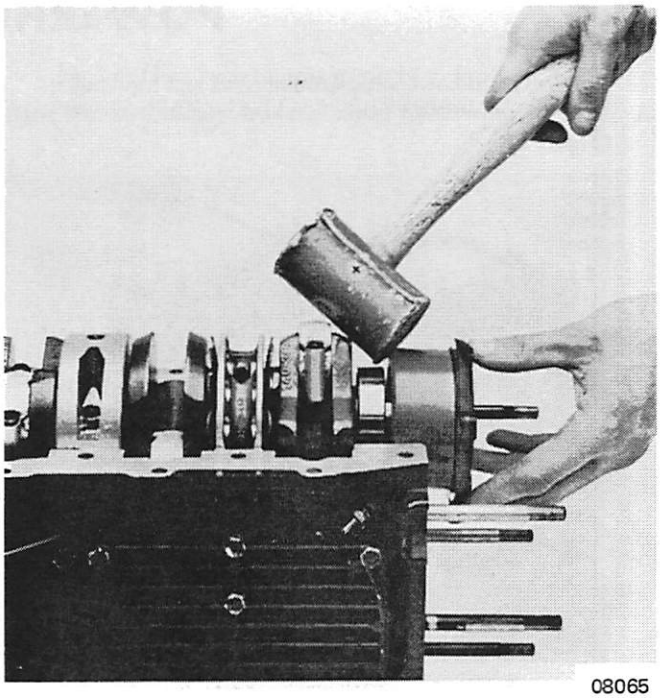


Figure 3. Removing End Caps

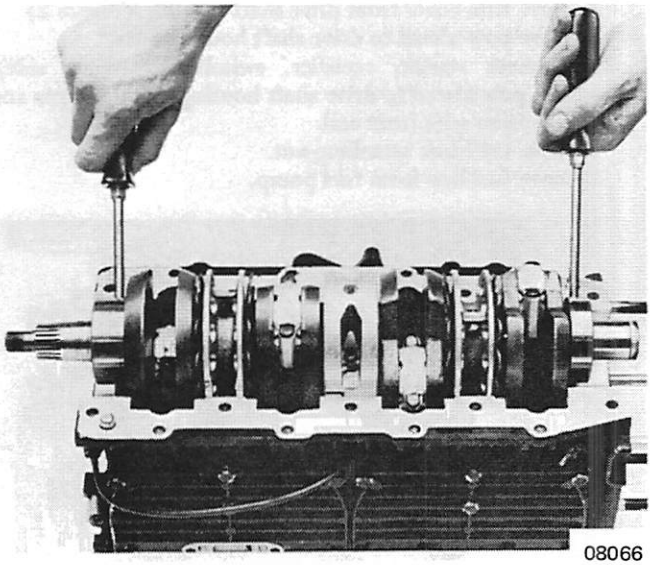


Figure 4. Lifting Out Crankshaft

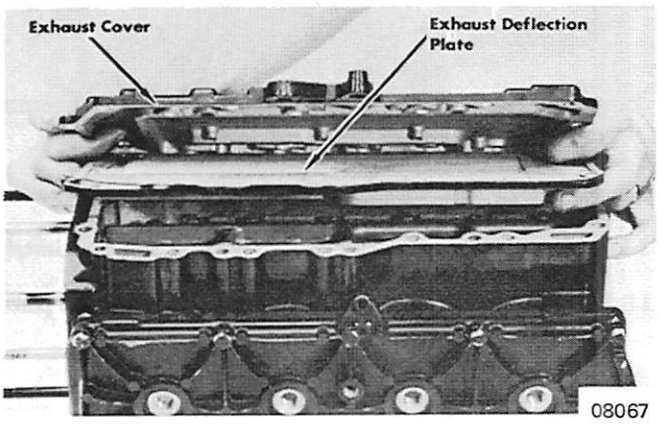


Figure 5. Removing Exhaust Cover

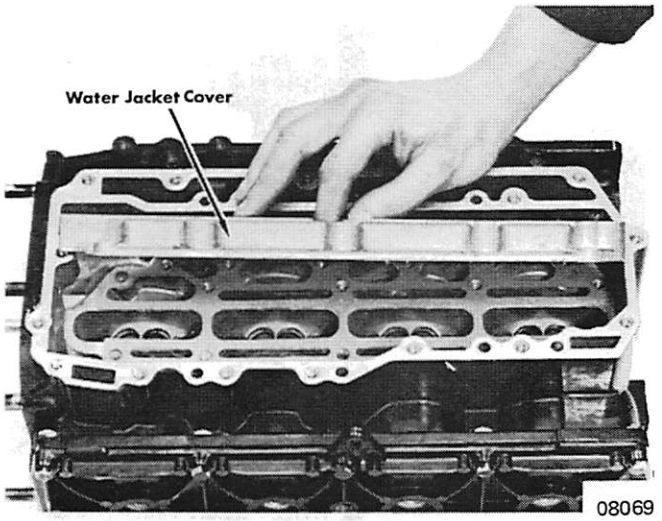


Figure 6. Removing Water Jacket Cover

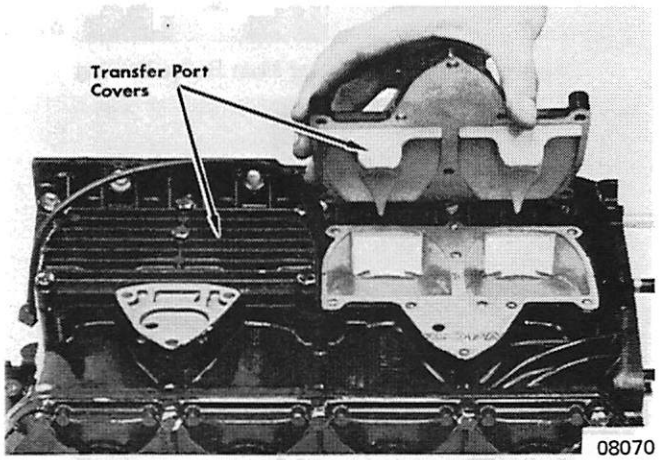


Figure 7. Removing Transfer Port Covers

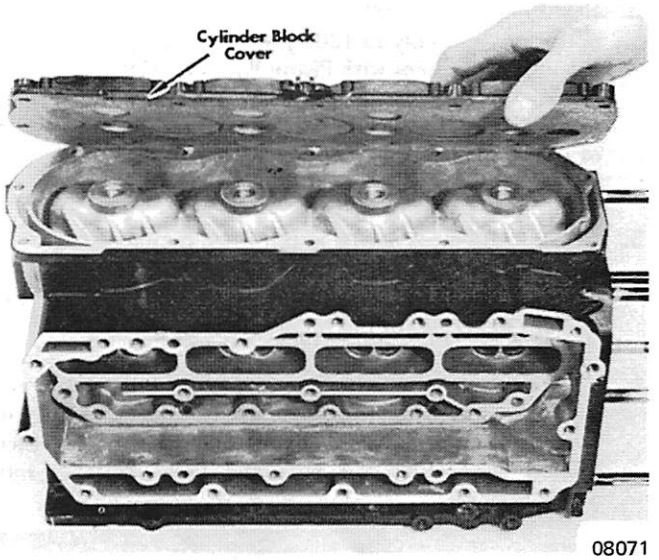


Figure 8. Removing Cylinder Block Cover

5. Remove screws from exhaust cover and remove exhaust cover and exhaust deflection plate. (Figure 5)
6. Remove screws from water jacket cover and remove cover. (Figure 6)
7. Turn cylinder block and remove screws from transfer port covers, then remove covers. (Figure 7)
8. Remove screws from cylinder block cover and remove cover. (Figure 8)

CRANKSHAFT DISASSEMBLY

1. Remove piston rings with Piston Ring Expander (C-91-24697). (Figure 1)
2. Remove piston pin lockrings from both ends of piston pin and discard. (Figure 2) Never reinstall used lockrings.

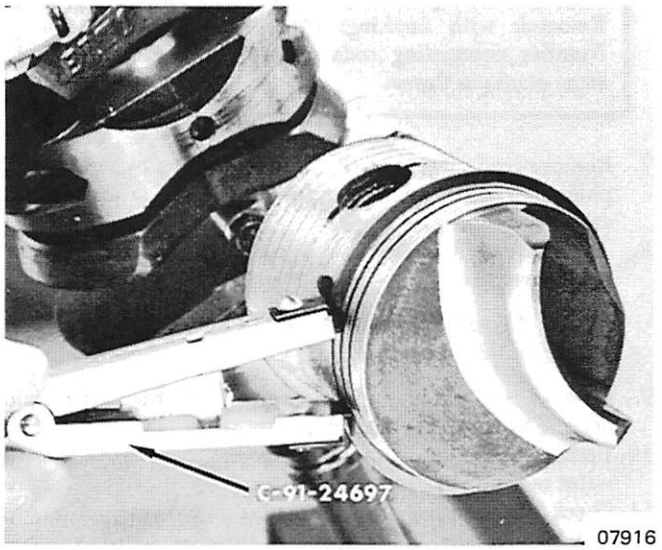


Figure 1. Removing Piston Rings

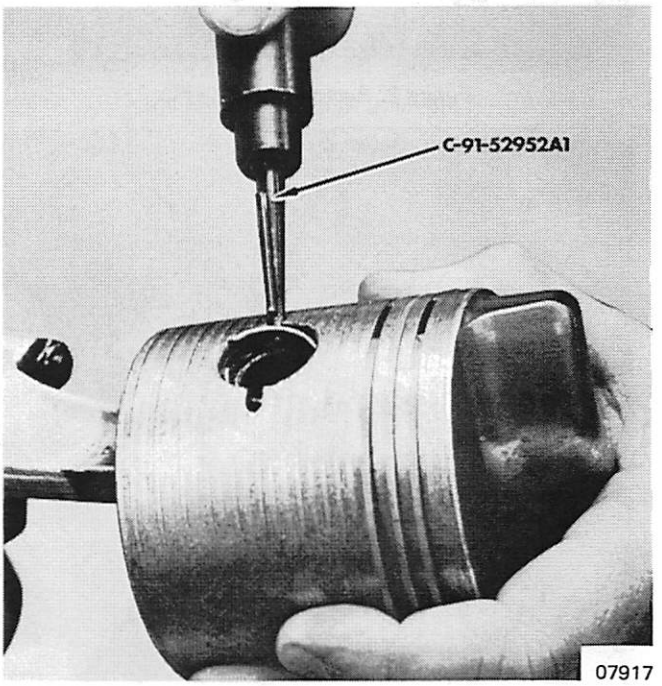


Figure 2. Removing Piston Pin Lockrings

3. Heat top of piston 190° to 200° F (after 50-100 hours of operation, heat only to 130°) with heat lamp.
4. Remove piston pins with Piston Pin Tool (C-91-30766A1). (Figure 3) Place piston pin bearing retainer over end of piston pin tool and slide bearing retainer tool into center of piston pin bearings. Remove piston pin tool and remove piston. Bearings will remain in place until bearing retainer tool is removed.
5. Remove piston pin needle bearings and retainers.

   NOTE: Cleanliness is essential when handling bearings. Use care not to get dirt or lint on needle bearings.

6. Remove connecting rod nuts and bolts and remove rod caps and connecting rods, bearings and cages. (Figure 4) Keep rod caps, connecting rods and bearings together. Discard connecting rod nuts and bolts. Number rods during removal.

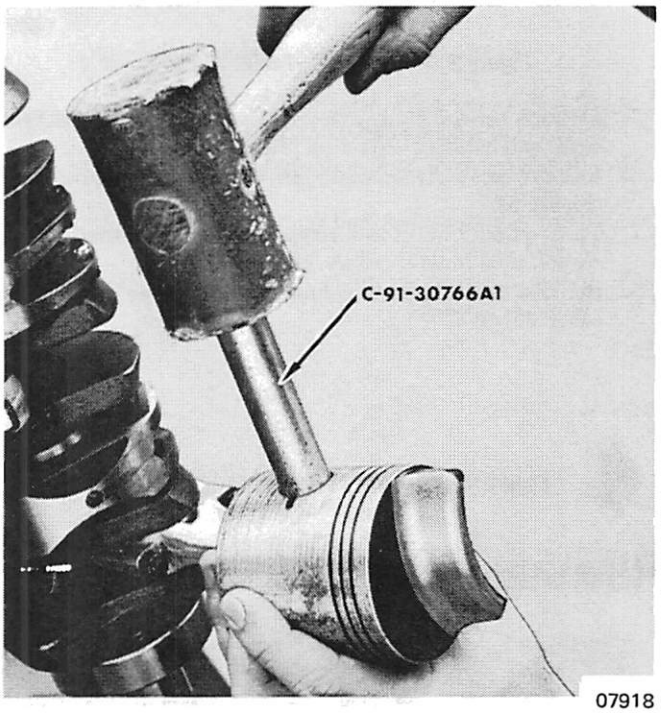


Figure 3. Removing Piston Pin

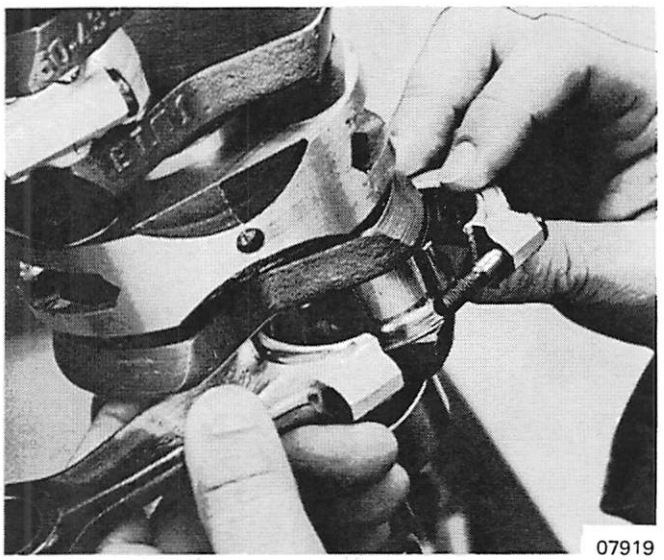


Figure 4. Removing Connecting Rod

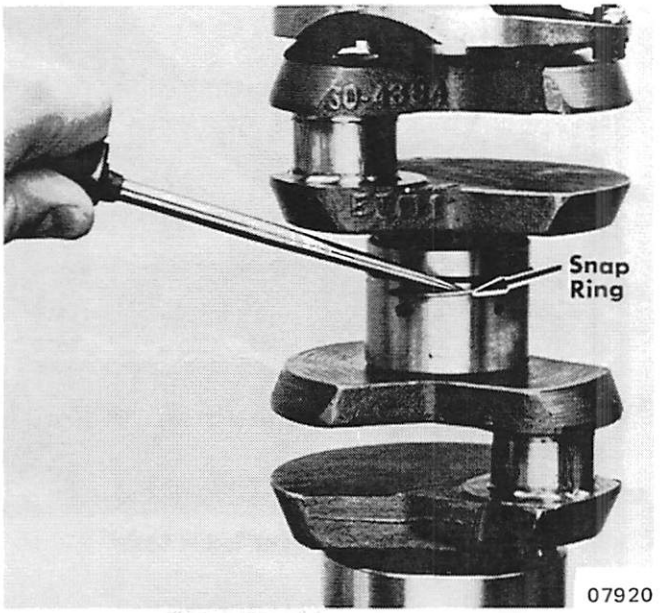


Figure 5. Removing Center Main Roller Bearing

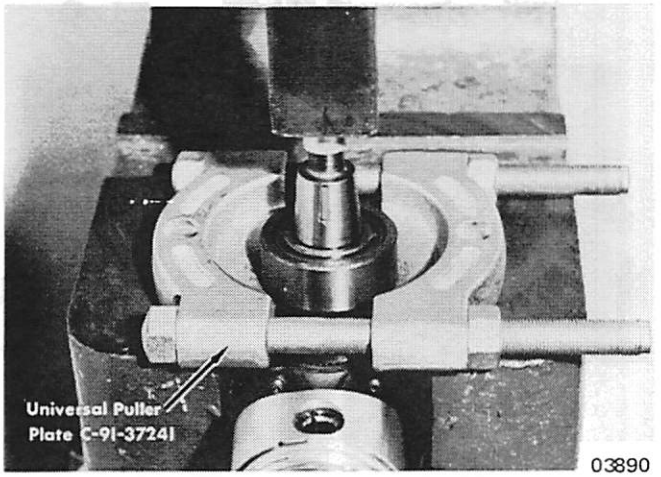


Figure 6. Removing Ball Bearing with Universal Puller Plate

CAUTION: Immediately after disassembling rod from crankshaft, rematch cap and rod to be certain that they are not separated or mismatched on reassembly. Rematch with markings on side of cap and rod. Number connecting rods so they are reinstalled on same crankpin throw.

7. Remove reed valve type center main bearing by removing 2 phillips head screws. Be careful not to bend or distort reed valves and reed valve stops.
8. Tap side (solid section) with mallet to separate halves of reed valve cage.

   NOTE: Rematch bearing halves on removal to be sure of proper match on reassembly.

9. Remove reed valves and reed valve stops on center main bearing by removing cap screws.
10. Remove snap ring from main bearings and remove bearing outer race and bearings. (Figure 5)
11. Check end bearings for roughness and damage. Remove only if necessary. Remove end bearing with Universal Puller Plate (C-91-37241). (Figure 6)

CLEANING and INSPECTION

CYLINDER BLOCK

1. Inspect cylinder block thoroughly for cracks and condition of cylinder bore.
2. Remove carbon and varnish with fine wire wheel on a shaft attached to an electric drill, or use carbon remover.
3. Finish hone walls slightly to seat new rings. (See "Honing Procedure", following.)

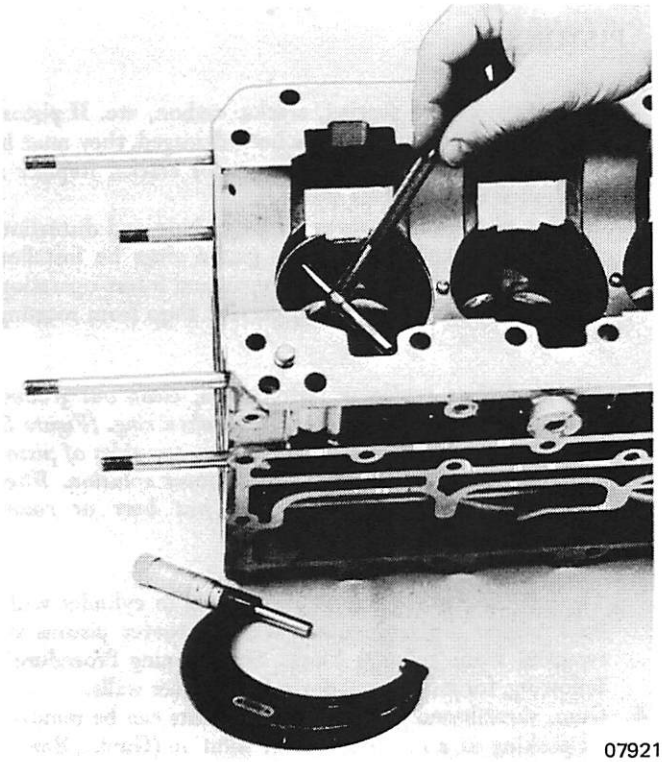


Figure 1. Checking Cylinder

4. Check cylinders for wear with an inside telescopic gauge and micrometer. (Figure 1) On engines, which display evidence of over-heating, bore should be checked for out-of-round. If worn or out-of-round (maximum .003"-.004"), rebore to .015" and install oversize piston and rings.
5. If sleeves have been scored, but not out-of-round, or, for some other reason, sleeve is rough, clean up surface of sleeve with a cylinder hone. Polishing should be done with a finishing hone. (See "Honing Procedure", following.)
6. Remove carbon from top of cylinder with closed-cup brush.

NOTE: Cylinder sleeves are an integral part of the die cast cylinder blocks and cannot be resleeved. Cylinders can be bored .015" oversize, unless scored more than .0075" deep. Oversize replacement parts are permitted and accepted by the American Power Boat Association.

7. Check bleed holes (located under transfer port covers on some cylinder blocks; refer to parts list for particular model) to make sure that plastic restrictor is in hole. If restrictor is missing, it will cause a flooding-effect in cylinder.

CRANKSHAFT

1. Check all bearing surfaces for rust and pit marks.
2. The crankshaft journal can be cleaned, if necessary, by using a 320 grit carborundum cloth. DO NOT polish crankshaft journals, or bearings will slide. (Figure 2)

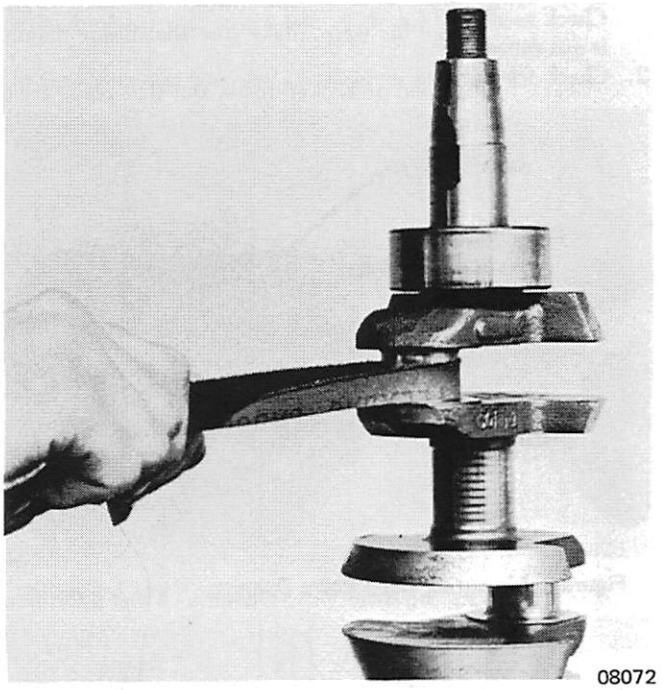


Figure 2. Cleaning Crankshaft Journals

NOTE: Chatter marks on crankshaft bearing surfaces can be seen with a good magnifying glass. These marks will cause a sound (like gear noise) when engine is in operation and resemble a very tiny washboard. This surface condition can be repaired if a total of not over .001" (.0254mm) is removed while eliminating marks. If both connecting rod and crankshaft have chatter marks, a total of not over .002" on both parts can be removed. Use 320 grit carborundum cloth.

CONNECTING RODS

1. Rust checks (explained for crankshafts, previously) will hold true for connecting rods.
2. Check rods for alignment by placing rods flat on a surface plate. If light can be seen under any portion of machined surfaces, or rod has a slight wobble on plate, rod is bent and should be discarded.

NOTE: Always count bearings when removing rods to be sure that all bearings have been removed. Also count bearings when assembling so that all bearings have been installed. Always rotate rod after installation, checking that no binding exists.
When repairs are made on connecting rods, be sure that each bearing assembly for each individual rod is kept separate. DO NOT intermix bearings and bearing carriers from different rods! This bearing carrier assembly is

available only with roller bearings and must be replaced as a complete assembly. When servicing, do not clean large bore of connecting rod with emery cloth, as it will roughen the surface. Bearing setup requires that connecting rod surface be smooth.

REED BLOCKS

1. Place reed cage together and torque to specifications. Check reed cage for warp. Make sure that inside diameter is not sprung.
2. Check for chipped or broken reeds and that reeds are not standing open. Replace reeds in sets only. DO NOT flip used reeds over for reuse. Reeds should have no preload.
3. Adjust reeds by setting reeds squarely over their respective openings. Install reed stops and cap screws and torque to specifications. Reeds should have "no preload". (This means that reed valves adhere to seat but may have a slight opening -- never more than .007".) (Figures 3 and 4)
4. Tighten reed stop screws.
5. Check all reed valves for proper setting. See Torque Specification Chart, Section 8. Measure from top of closed reed valve to bottom of reed valve stop.

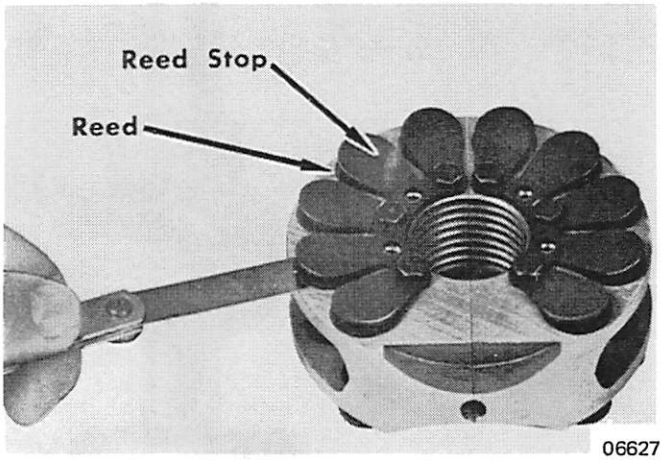


Figure 3. Measuring Reed Valve Opening - 4 and 6-Cylinder

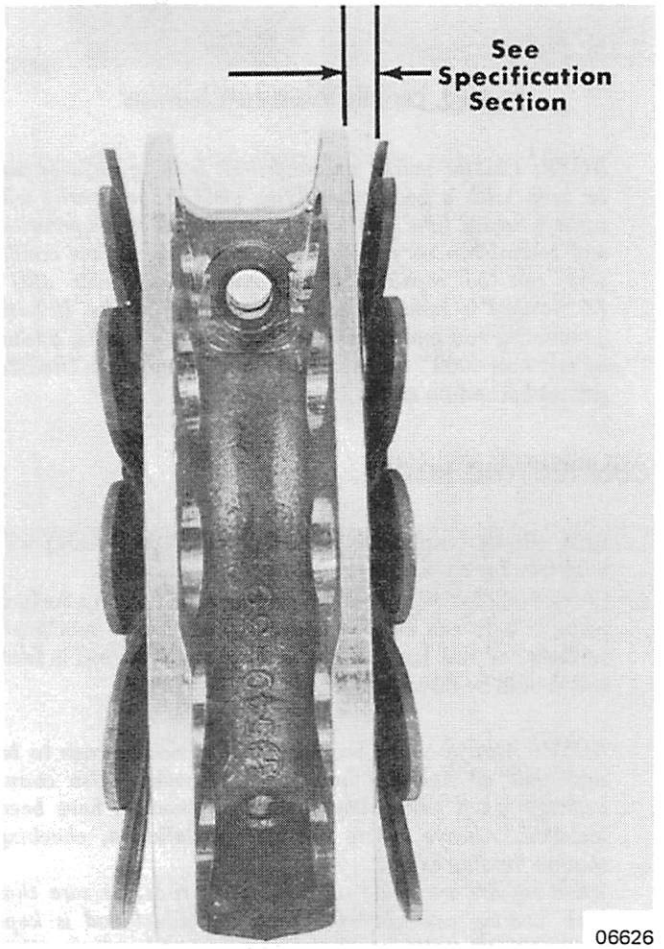


Figure 4. Reed Valve Stop Opening - 4 and 6-Cylinder

PISTONS

1. Check pistons for scoring, cracks, carbon, etc. If pistons have been scored or metal has been damaged, they must be replaced. Check piston pin bosses for cracks. Replace if cracked or if piston pins are worn.
2. Inspect piston ring grooves for wear, burn and distortion. It is recommended that new piston rings be installed. Replacement will ensure good repair and future operation. Pins (located in ring grooves) prevent rings from rotating.

NOTE: Before replacing piston rings, clean out grooves thoroughly, using recessed end of broken ring. (Figure 5) Clean carbon and varnish deposits from top sides of piston with soft wire brush or carbon remover solution. When wire brushing top of piston, do not burr or round machined edges.

3. To assure a positive seat of piston rings to cylinder walls, hone and/or deglaze cylinder walls whenever pistons are removed from cylinder block. See "Honing Procedure", following, for honing and deglazing cylinder walls.
4. Gum, varnish and softer carbon deposits can be removed by soaking in a carbon remover solution (Gunk), Bendix parts cleaner or others.

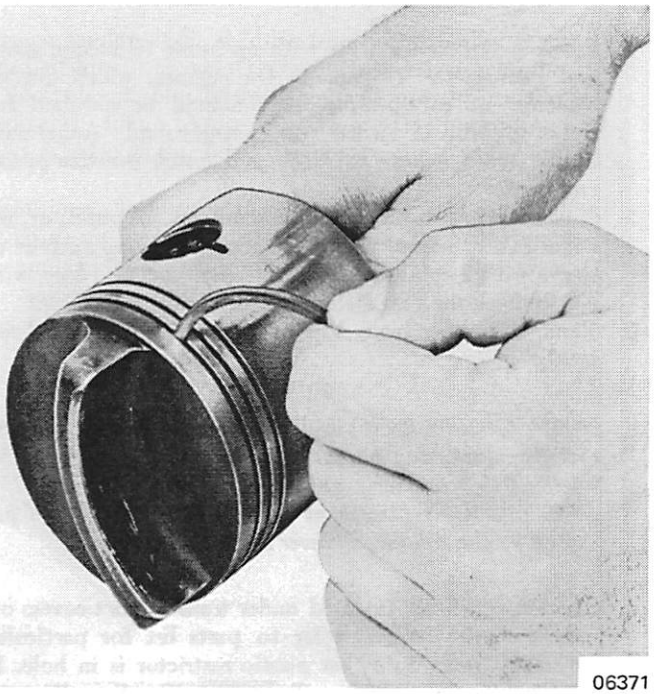


Figure 5. Cleaning Ring Grooves

5. Piston skirt can be polished with crocus cloth to remove burrs.
6. Check pin and pin boss, especially if engine has been submerged. Piston pins are not sold separately because of slight variation in sizes and correct "fit" into piston. If pin is bent, it elongates piston pin boss when removed.

.015" OVERSIZE PISTONS and PISTON RINGS

1. The major purpose for oversize pistons and rings is for salvaging scored cylinder blocks. If the score is over .0075" deep, it cannot be effectively rebored for future use.
2. Oversize .015" replacement pistons and rings are available for all larger bore engines. Refer to Parts Manual for particular model.

END CAP and END BEARINGS

1. Needle bearings always should be replaced at overhaul and when rust conditions are present. Caged needle bearings also should be replaced at overhaul, or if they have become wet and rusty.
2. Clean and dry ball bearings before checking.
3. With one hand, grasp outer race firmly and, with other hand, attempt to work inner race in-and-out. There should not be excessive play. Spin outer race after lubricating with oil. Discard if bearing sounds or feels rough or has "catches". Bearing should have smooth action, no rust stains. Compare with new bearing.
4. Inspect oil seals for leaking or damaged lips and replace if necessary. Use Loctite Type "A" (C-92-32609-1) on new oil seals when installing.

HONING PROCEDURE

1. When cylinders are to be honed, follow the hone manufacturer's recommendations for the use of the hone and cleaning and lubrication during honing.
2. Start stroking at smallest diameter. Maintain firm stone pressure against cylinder walls to assure fast stock removal and accurate results. (Figure 6)
3. Localize stroking in the smaller diameter until drill speed is constant throughout length of bore. Expand stones as necessary to compensate for stock removal and stone wear. Stroke at a rate of approximately 30 complete cycles per minute to produce best cross-hatch pattern. Use honing oil generously.
4. For roughing operation, a coarse grit should be used to remove stock rapidly. The softer the material, the coarser the grit that can be used for roughing. In cast iron, approximately .002" (.051mm) must be left for finishing operations.
5. For finishing operation, finer grit stones are used to bring the bore to size and produce the desired surface finish. In cast iron, one (or possibly two) finishing operations are necessary (using progressively finer stones) depending upon the finish specified.
6. For best honing results, a continuous flow of honing oil should be pumped into the work. If pumping oil is not practical, use an oil can. Apply oil generously and frequently on both stones and work.
7. Thoroughly clean cylinder bores with hot water and detergent. Scrub well with a stiff bristle brush and rinse thoroughly with hot water. It is extremely essential to perform a good cleaning operation. If any of the abrasive material is allowed to remain in the cylinder bores, it will rapidly wear new rings and cylinder bores in addition to bearings. Bores should be swabbed several times with light engine oil and a clean cloth, then wiped with a clean dry cloth. Cylinders should not be cleaned with kerosene or gasoline. Clean remainder of cylinder block to remove excess material spread during honing operation.


00049

CAUTION: Handle pistons with care and do not attempt to force them into the cylinder until cylinder has been honed to correct size. Piston can be distorted by careless handling.

8. Permanently mark the piston for corresponding cylinder to which it has been fitted.

Figure 6. Finish Honing Cylinders

POWERHEAD REASSEMBLY

Figure 1. Installing End Cap Ball Bearing

1. If end bearings were removed, refer to Figure 1 for reassembly.
2. Install bearings, bearing cage and snap ring onto crankshaft. Refer to parts list to make sure of number of bearings. (Figure 2)

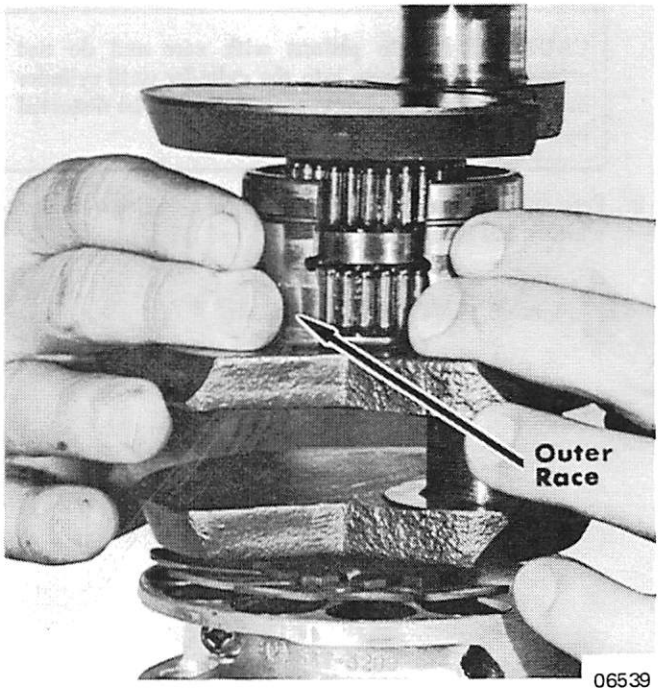


Figure 2. Installing Center Main Roller Bearings and Outer Race

IMPORTANT: Always check reed stops for proper opening. Larger opening can cause breakage; smaller opening will not allow sufficient fuel to enter at high RPM.

3. After rechecking reed valves and reed stops, lubricate reed cage halves with Multipurpose Lubricant (C-92-49588).
4. Install reed cages onto crankshaft. (Figure 3) Tighten 2 integral screws securely on reed cage to assure tight fit.
5. Recheck reed valve spacing over openings and clearance between reed valve and stop.
6. Prepare connecting rods, opening matched assemblies (one at a time) by removing cap. Watch knob markings on cap and rod for reassembly. (Figure 4)

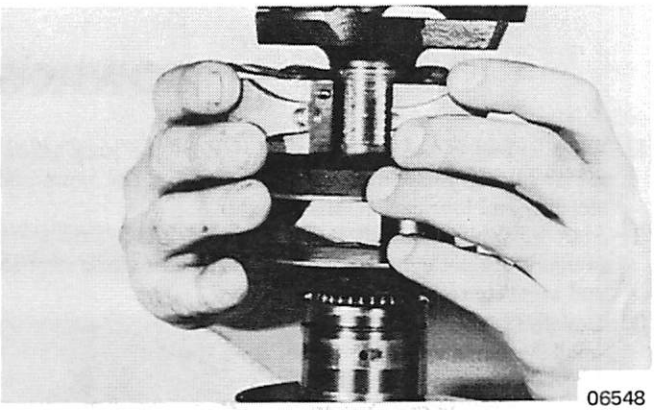


Figure 3. Reed Valve Installation

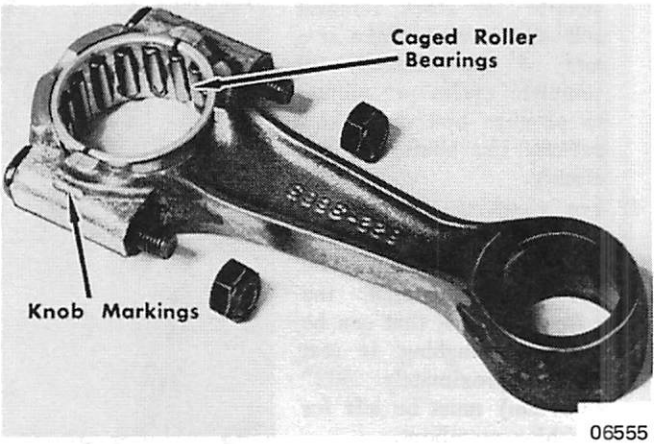


Figure 4. Rod and Reed Bearings

7. Place a small amount of Multipurpose Lubricant on each half of connecting rod bearing race to hold bearings in place.
8. Place bearing retainer race in connecting rod (where applicable).
9. Place roller bearings around both sides for reassembly. Check parts list in Parts Manual for required quantity.

CAUTION: Never intermix new bearings with used bearings in the same connecting rod. If a quantity of bearings requires replacement, replace all bearings in a connecting rod.

10. Place connecting rod cap so that knob markings match connecting rod. (Figure 4)
11. Install new fasteners and tighten each evenly with torque wrench for perfect fit. Refer to Torque Specification Chart in "Specifications" Section 8 for correct torque value.
12. Rotate connecting rod after torquing, checking that it rotates freely. If rough, remove and check race and rollers.
13. Repeat preceding procedure for other connecting rods.
14. Always recheck knob markings on reassembled rods for correct and perfect match.

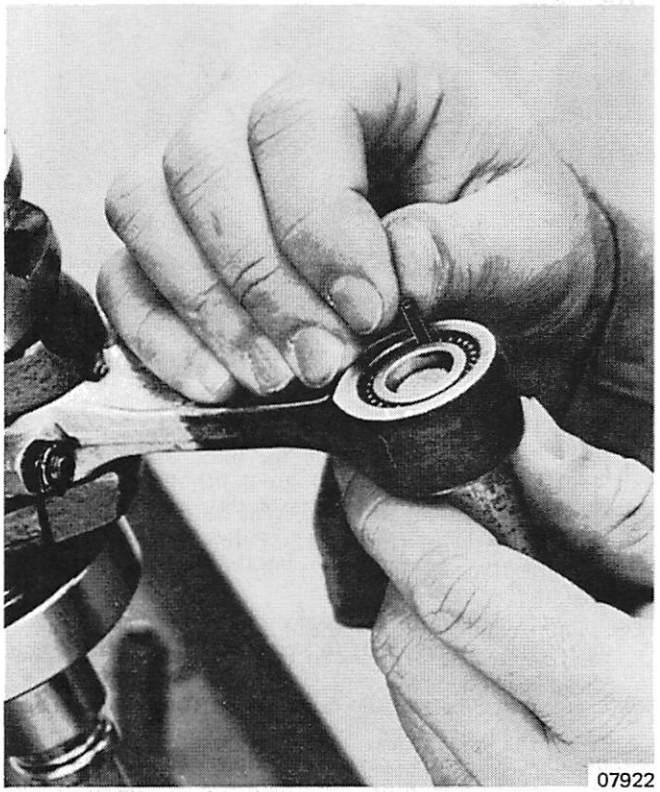


Figure 5. Installing Piston Pin Bearings

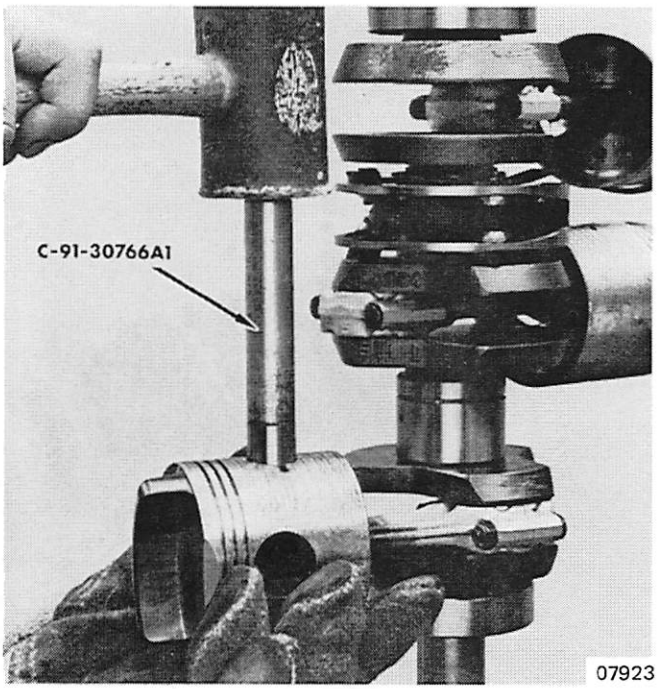


Figure 6. Inserting Piston Pin into Connecting Rod

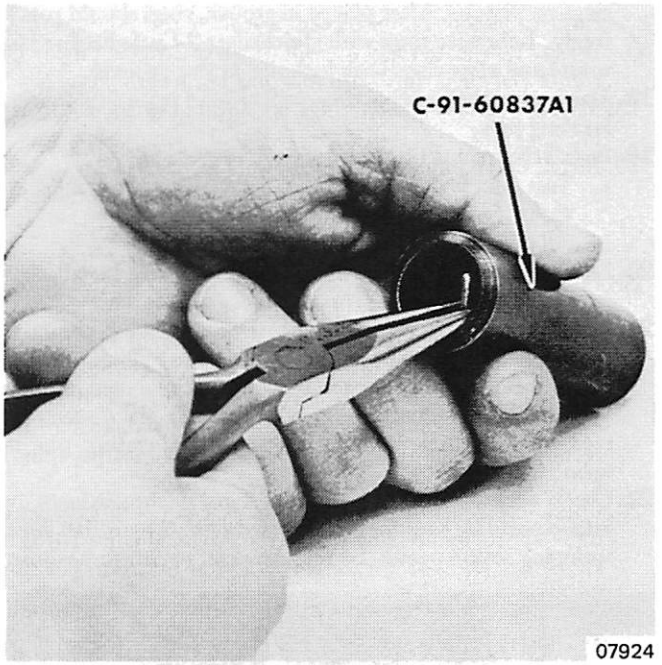


Figure 7. Inserting Piston Pin Retaining Locking into Tool

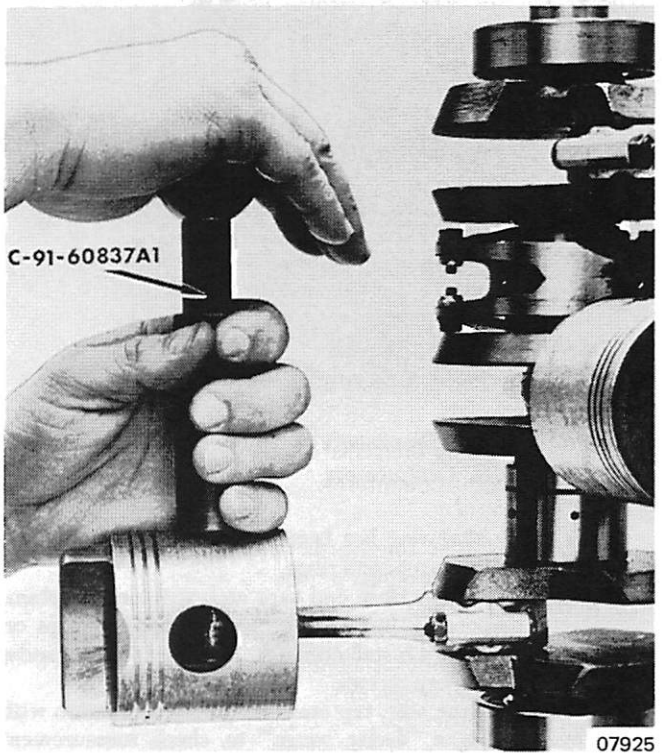


Figure 8. Installing Piston Pin Lockring

15. Install retainer and piston pin bearings on Tool C-91-30766A1. Leave one bearing out. Push bearings and tool into race. Install last bearing and top retainer (Figure 5) on opposite side of rod. Place piston over bearing assembly (watch intake side of piston). Hold bearings in place with sleeve part of tool. Heat piston to 125° to 135°F.
16. Install pin (Figure 6) with punch part of tool. Install new lockrings with Lockring Tool (C-91-60837A1). (Figures 7 and 8) Double-check that the ring is seated in groove.
17. Using Piston Ring Expander Tool (C-91-24697), install

rings on pistons. After placed in groove, rings should rotate freely. Lubricate rings with Quicksilver 2-Cycle Engine Oil; rotate and align rings with lockpins in ring grooves.

18. Make sure that piston rings are located with piston ring locating pins.
19. Install ring compressors as follows: (Figure 9)
    a. Top 2 cylinders must be straight out from crankshaft throw (uses straight compressors).
    b. All other cylinders use offset compressors.
20. Lubricate rings and cylinder block with oil. Install reed cage locating pins into cylinder block.
21. Install crankshaft assembly into cylinder block. Remove compressors as pistons are being placed in cylinder. Install crankshaft assembly correctly, with splined end toward cylinder block mounting studs. (Figure 9) Make sure that reed cage alignment hole aligns with locating pin in cylinder block.
22. Check each piston ring for spring tension thru exhaust or intake ports by pressing with screwdriver. (Figure 10) If no springing action occurs, or ring does not return to position,

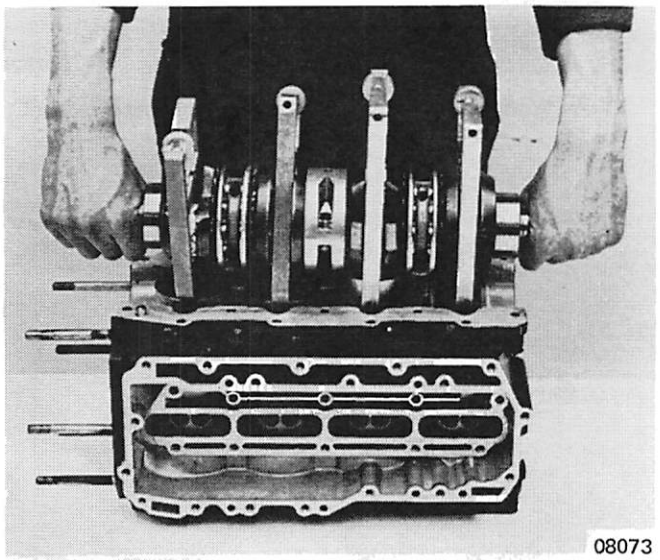


Figure 9. Placing Crankshaft Assembly in Cylinder Block with Compressors

it is likely that ring has been broken in reassembly. Be careful not to burn piston rings.

23. Remove "O" rings from end caps and, with original shims intact, temporarily install upper and lower end caps on crankshaft (do not install crankcase) and secure to cylinder block with end cap screws.
24. To ensure a true seat, tap crankshaft either direction with a mallet. Use a "feeler gauge" to check measurement between inner face of upper end cap and top (first) counterweight of crankshaft (approximately 0.50" starting point). (Figure 11) After reading is obtained, tap crankshaft in opposite direction, again acquiring a true seat, and recheck this measurement. Difference between the two readings obtained is amount of crankshaft end play. Tolerance of end play should be 0.004" to 0.008". If reading obtained does not meet this specification, add shims to increase end play or remove shims to decrease end play.
25. Remove end caps and install new "O" rings. Coat "O" rings and seals with Multipurpose Lubricant (C-92-49588) to form a seal.
26. Install new gaskets into crankcase cover and coat joint face

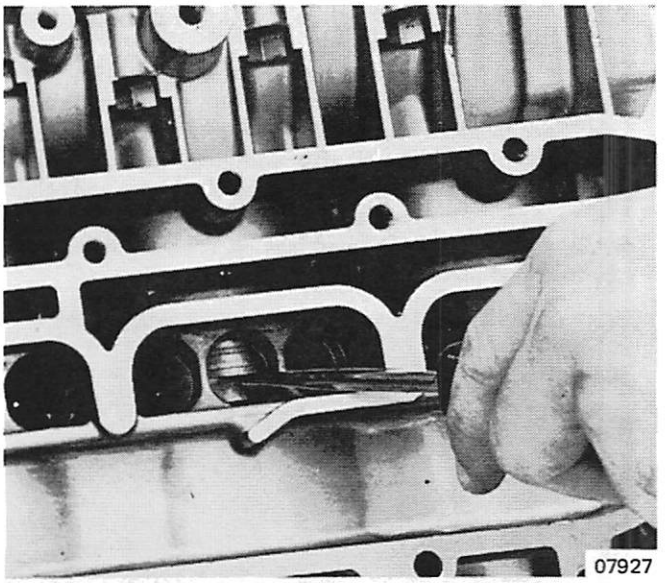


Figure 10. Checking Piston Rings

of crankcase with Gasket Sealer (C-92-28804) for metal-to-metal seal.

27. Install end caps and crankcase cover. Make sure that reed cage is centered in carburetor inlet. Tighten crankcase bolts (starting with center bolts and working alternately to top, then bottom, etc) to prevent distortion of covers and possible leakage. (Figure 12) Torque crankcase cover to specifications. (Figure 12) Install end cap bolts and tighten.
28. Mount completed powerhead on powerhead stand in vice and rotate several times to make sure that entire powerhead assembly is free.
29. Install transfer port gaskets and cover. Torque to specifications and in sequence.
30. Install water jacket cover. Apply Epoxy (C-92-33749-1) to cap screws and torque in sequence to specifications. (Figure 13)

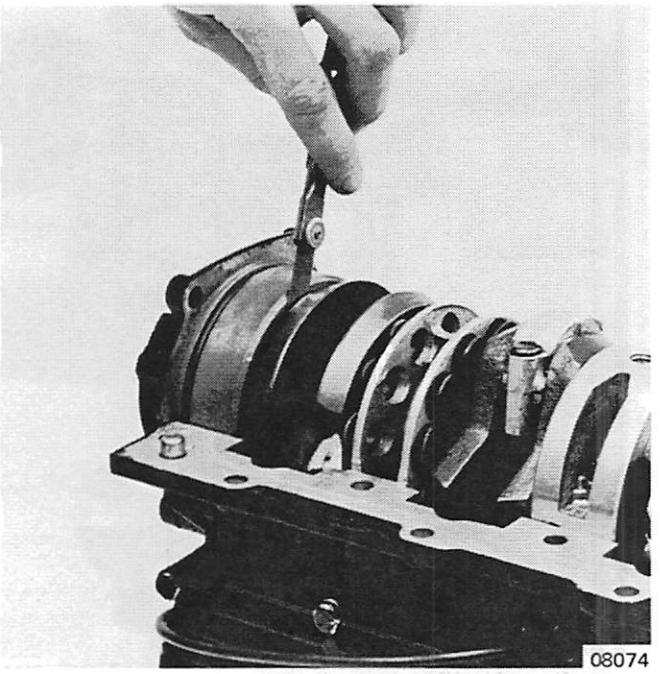


Figure 11. Checking Crankshaft End Play

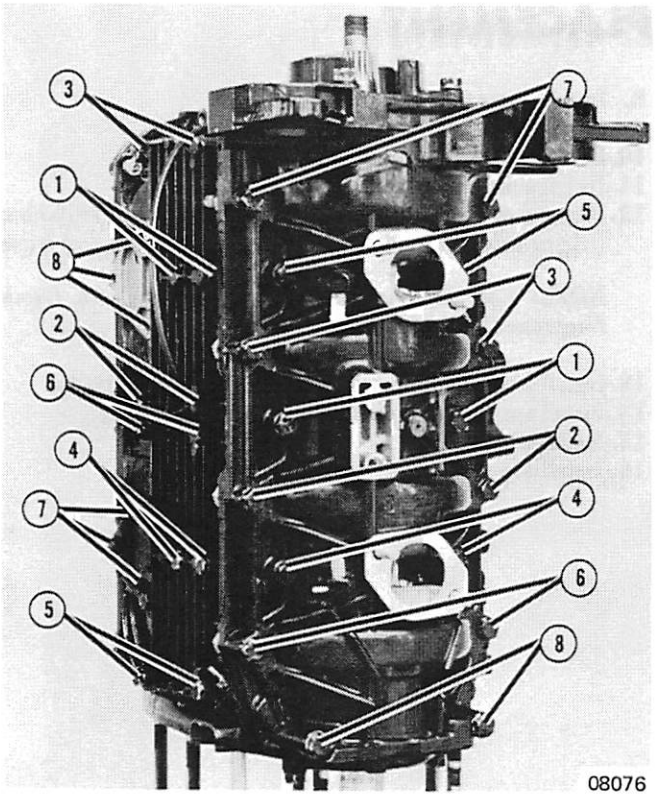


Figure 12. Correct Torquing Sequence

31. Install exhaust deflector, exhaust cover and gaskets and torque to specifications and in sequence.
32. Install cylinder block cover gasket and cover (Figure 14) and torque to specifications and in sequence.

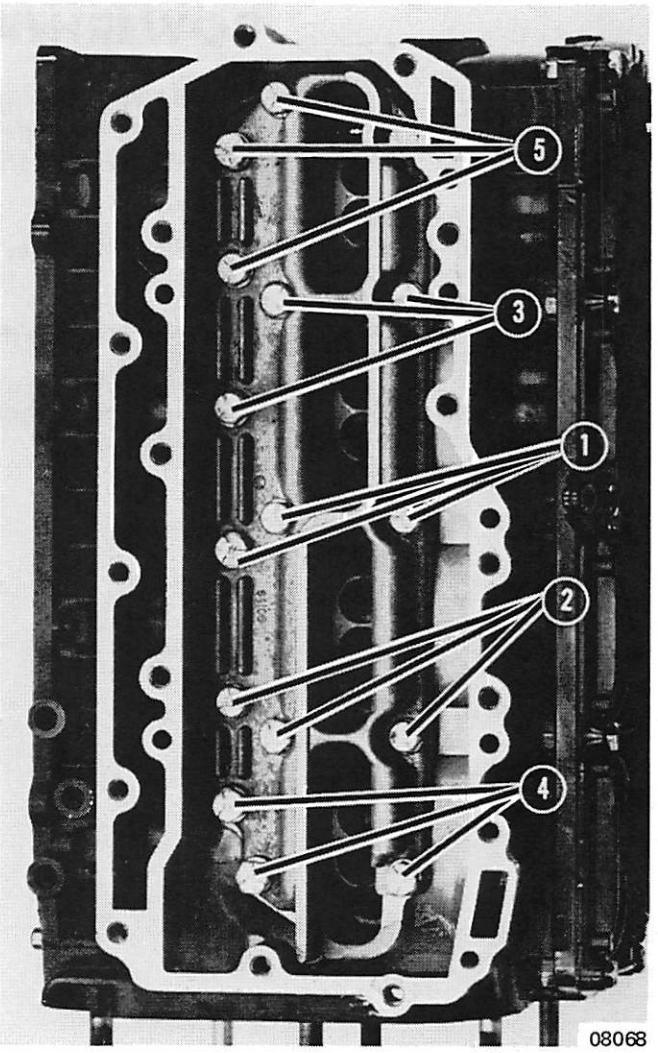


Figure 13. Correct Torquing Sequence

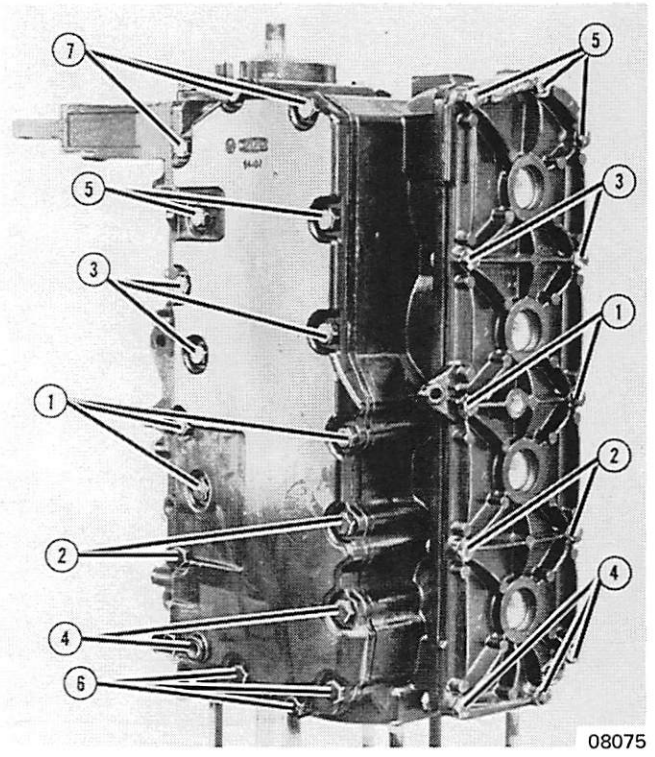


Figure 14. Correct Torquing Sequence

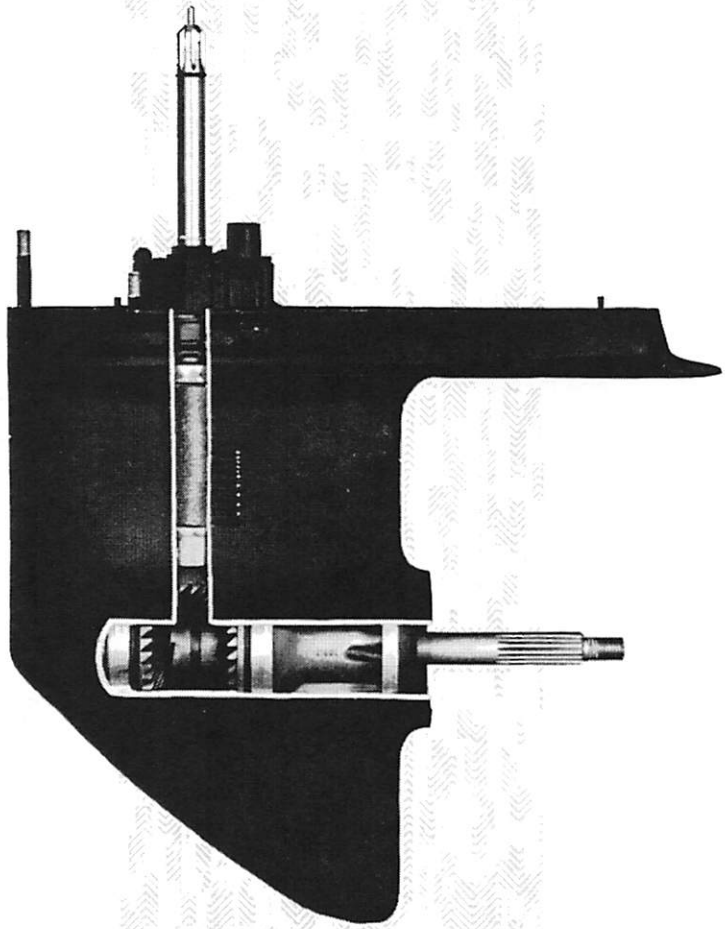
POWERHEAD REPLACEMENT

1. Place timing belt in position on flywheel pulley first, then driven pulley, while placing flywheel on crankshaft. Refer to "Electrical System" Section 3E for timing and adjusting.
2. Place flange on top of driver pulley.
3. Install flywheel washer and elastic stop nut and torque to specifications.
4. Install carburetor assemblies to powerhead.
5. Replace powerhead to exhaust plate gasket. Make sure that gasket surfaces are clean of old gasket material.
6. Using a hoist and Lifting Eye (C-91-47448A1), lower powerhead onto exhaust plate and install drive shaft housing nuts. Install trim cover to drive shaft housing.
7. Install plastic flywheel nut protector.
8. Install water tell-tale hose.
9. Connect carburetor and choke linkage.
10. Connect fuel line to fuel pump.
11. Install shift link attaching nut.
12. Reconnect electrical wiring to starter, rectifier, switchbox (trigger side), ground strap and to high tension coil wires.

    NOTE: Coat electrical connection surfaces with Liquid Neoprene (C-92-25711).

13. Install front, top and rear powerhead frame supports.
14. Install spark plugs, spark plug wires and retainers.
15. Install throttle arm.
16. Install top cowl, wrap-a-round and front cowl.

OUTBOARD
SECTION 6



LOWER UNIT

TABLE of CONTENTS

SECTION 6 - LOWER UNIT

MERCURY
OUTBOARDS

PART A - MERC 200-110-75-60-40-39

INDEX

MERC 39-40-60-75-110-200

GEAR HOUSING

REMOVAL

REMOVING GEAR HOUSING from DRIVE SHAFT HOUSING

1. Drain lubricant from gear housing by removing filler hole screw and vent screw. (Figure 1) DO NOT lose washers. Replace washers and screws after draining.
2. Remove propeller.
3. Remove one 9/16" hexagon head locknut which holds gear housing assembly to drive shaft housing (leading edge).
4. Remove one ½" hexagon head locknut (located in center bottom side of anti-cavitation plate).
5. Separate gear housing from drive shaft housing.

NOTE: On Merc 200, remove anode plate with ¼" allen wrench. Remove ½" hexagon head locknut from under plate.

Figure 1. Vent and Fill Screw Locations

INSTALLATION

JOINING GEAR HOUSING and DRIVE SHAFT HOUSING

(See Information on Right for Long Shaft Models.)

1. If water inlet tube-to-powerhead is pulled out when gear housing was removed, coat tube upper end with New Multipurpose Quicksilver Lubricant (C-92-49588), so that it will slip easily into rubber seal in bottom cowl, and insert into recess in powerhead.
2. Place light coat of New Multipurpose Lubricant on bottom end of water tube.
3. Apply heavy coat of New Multipurpose Lubricant on drive shaft splines.
4. Check that shift control lever and lower unit are in forward gear before installing gear housing.
5. Insert drive shaft into drive shaft housing, aligning water tube with water pump body outlet and drive shaft splines with crankshaft, then sliding into place while joining housing.

NOTE: Be careful that water inlet tube enters plastic water tube guide in water pump body recess and rubber seal in water pump cover.

6. Place shift control lever in neutral, then in forward to check that upper and lower shift shaft splines are properly aligned.
7. Rotate propeller shaft by pulling lightly on starter rope to cause drive shaft splines to enter crankshaft splines. Upper and lower shift shaft splines also must be aligned.
8. With 2 housings joined, install and tighten elastic stop nuts.

JOINING GEAR HOUSING and DRIVE SHAFT HOUSING

(Long Shaft Models)

NOTE: On early models, if nylon block (A-31455) was dislodged when removing lower unit, powerhead must be removed to reinstall nylon block on drive shaft of long shaft models. On later models, the nylon block is held in place by a screw.

1. Remove powerhead.
2. If water inlet tube-to-powerhead was pulled out when gear housing was removed, coat tube upper end with New Multipurpose Quicksilver Lubricant (C-92-49588) so that it will slip easily into rubber seal in bottom cowl, and insert into recess.
3. Place light coat of New Multipurpose Lubricant on bottom end of water tube.
4. Insert drive shaft part way into drive shaft housing.
5. Reach through exhaust opening of bottom cowl and install nylon block on drive shaft.
6. Join gear housing and drive shaft housing.

NOTE: Be careful that water inlet tube enters plastic water tube guide in water pump body recess and rubber seal in water pump cover.

7. Place shift control lever in neutral, then in forward to check that upper and lower shift shaft splines are properly aligned.
8. With 2 housings joined, install and tighten elastic stop nuts.
9. Before installing powerhead, check that nylon block is in proper position. Nylon block should be wedged lightly between drive shaft housing and drive shaft. The radius side of the nylon block should face toward rear of engine.
10. Apply heavy coat of New Multipurpose Lubricant on drive shaft splines.
11. Install powerhead.
12. Turn flywheel to align crankshaft splines and drive shaft splines.
13. Reinstall anode plate (if applicable).
14. Refer to "General Information" Section 1C and fill gear case.

INSTALLING PROPELLER (Figure 2)

1. Place collar guide into propeller hub (shoulder into recess of propeller).
2. Apply thin coat of New Multipurpose Quicksilver Lubricant (C-92-49588) on splines of propeller shaft.
3. Align propeller hub splines with splines of propeller shaft and slide propeller on shaft. Tap into position if necessary.
4. Replace splined washer and plain washer.
5. Replace propeller nut and tighten with ½" socket wrench.

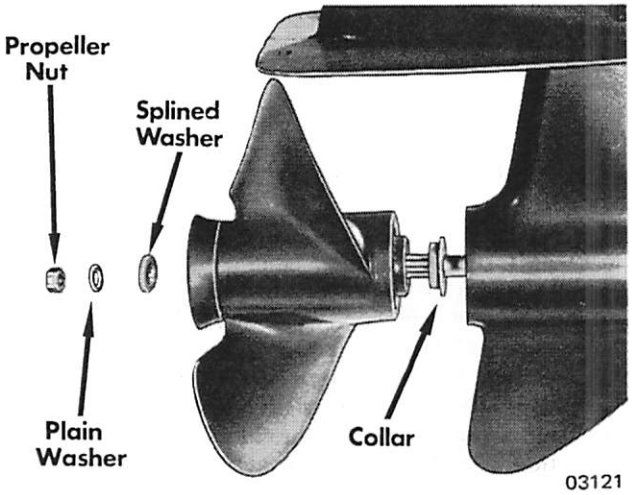


Figure 2. Propeller Installation

WARNING: Use of other than recommended Quicksilver propellers will void the factory warranty.

PROPELLER SHAFT

DISASSEMBLY

REMOVING PROPELLER SHAFT and COMPONENTS

1. Place gear housing assembly in vise between 2 blocks of soft wood to prevent marring surface.
2. Place a piece of wood flat between propeller and anti-cavitation plate to prevent propeller from turning while removing propeller nut.
3. Remove propeller by removing propeller nut (right hand thread), thrust washer, propeller and thrust hub and washer assembly.
4. At this time, lash between gears should be checked for future reference. Pull on drive shaft with one hand and push on propeller shaft with other. (Figure 1) *Refer to backlash later in "Reassembly".*
5. Remove gear housing cover and washer with Gear Housing Cover Tool (C-91-30798). Place tool over end of propeller shaft and set tool into cover, turning clockwise (see marking on cover) to loosen. (Figure 2) If tight, strike handle of tool with mallet to loosen.
6. Bearing carrier assembly can be removed while removing propeller shaft. Place propeller shaft in vise between 2 pieces of soft wood. Shaft assembly then can be removed by tapping lightly and evenly on skeg of gear housing with a mallet.
7. Remove propeller shaft from bearing carrier.
8. Remove reverse gear from bearing carrier with C-91-27780 tool, as shown in Figure 3.
9. Remove "O" ring from carrier.

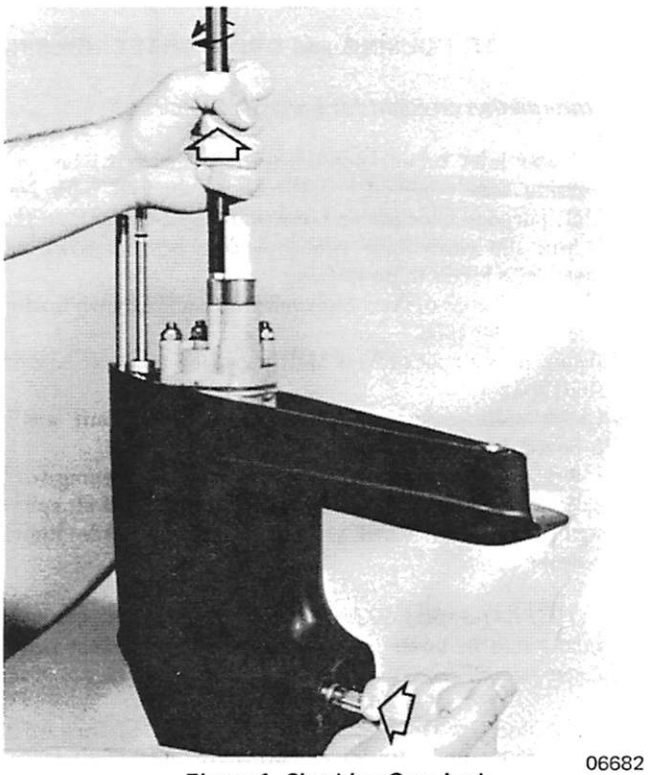


Figure 1. Checking Gear Lash

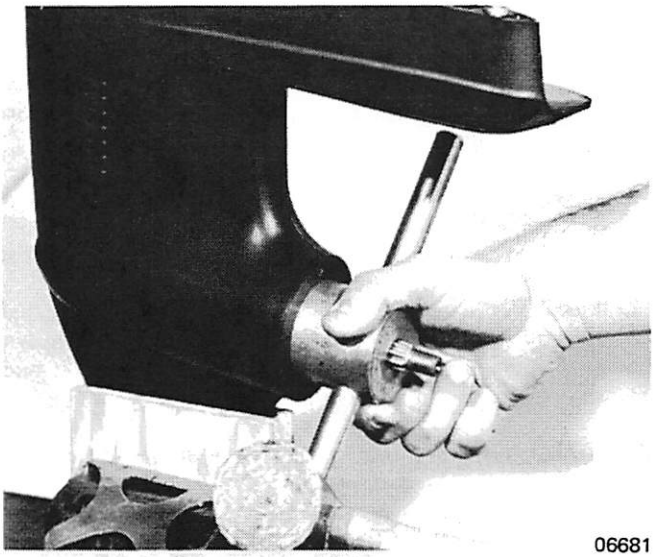


Figure 2. Removing Gear Housing Cover

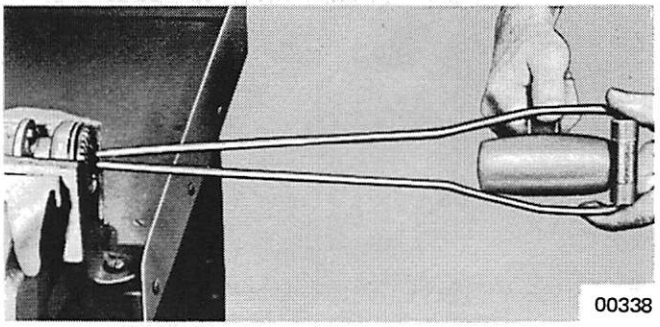


Figure 3. Pulling Reverse Gear from Bearing Carrier

10. Remove ball bearing from reverse gear with Gear Puller Plate (C-91-22115). (Figure 4) Place halves of plate between ball bearing and gear and tap halves together. Insert cap screws and tighten. With gear facing down, press out against rear shoulder of gear.
11. Press roller bearing and seal from carrier assembly on arbor press with Bearing Mandrel (C-91-24273). (Figure 5)

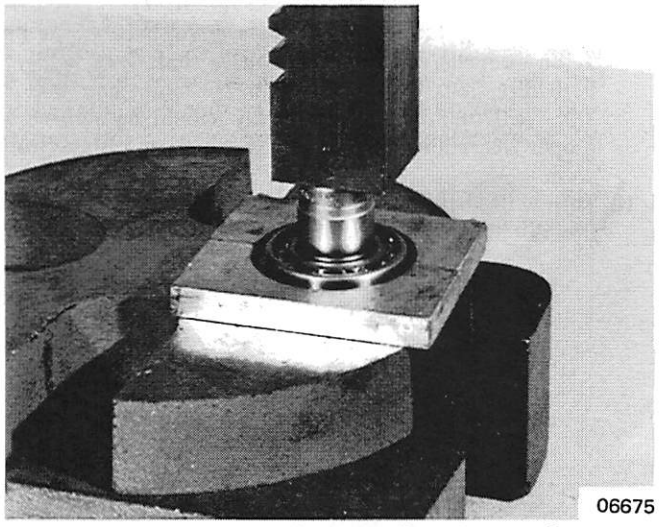


Figure 4. Removing Ball Bearing from Reverse Gear

DISASSEMBLY of PROPELLER SHAFT and GEAR ASSEMBLY

1. Use screwdriver to detach retaining ring from sliding clutch. Do not over-stretch or ring will lose its shape and tension (Figure 6)

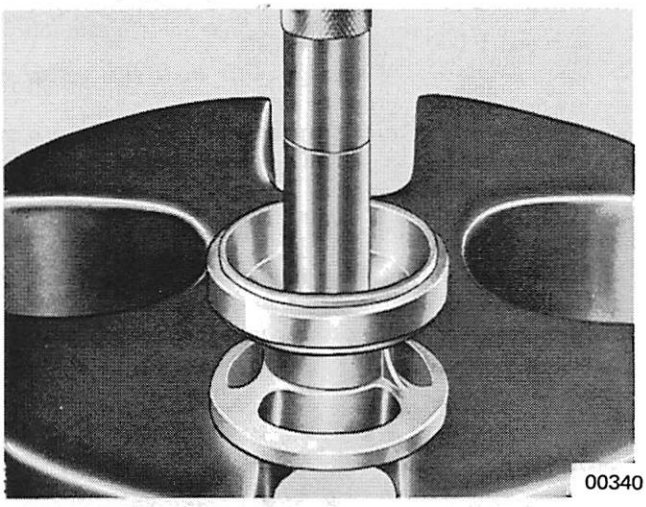


Figure 5. Pressing Bearings Out of Carrier

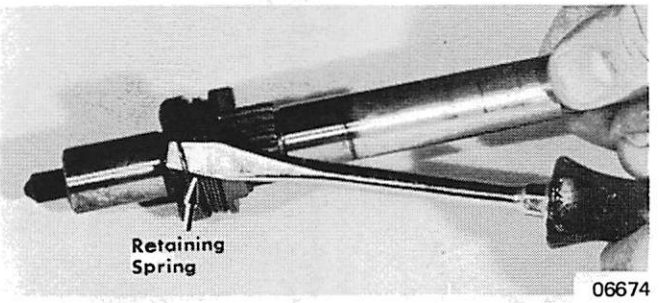


Figure 6. Removing Retaining Spring

2. Remove sliding clutch from propeller shaft by setting cam follower in place in end of propeller shaft. Press against cam follower and, with small punch, push cross pin out of sliding clutch. (Figure 7)
3. Sliding clutch is now free to be removed from propeller shaft, with cross pin slide and spring dropping free from inside of propeller shaft.

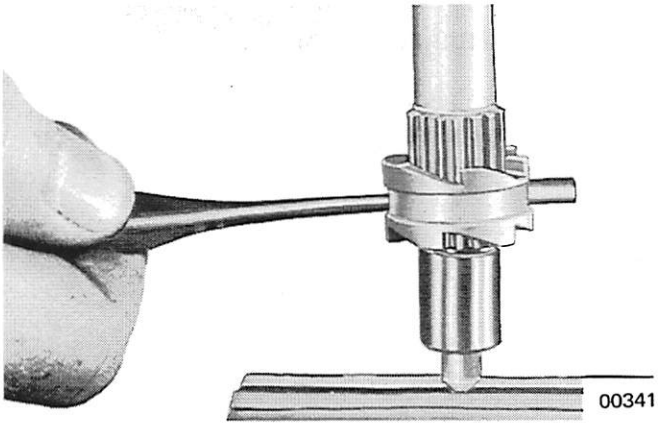


Figure 7. Removing Cross Pin from Sliding Clutch

REASSEMBLY

REASSEMBLING PROPELLER SHAFT COMPONENTS

1. Install cam follower spring and cam follower slide inside hollow end of propeller shaft so that holes in cam follower slide match hole in propeller shaft.
2. Place sliding clutch onto propeller shaft and install cam follower in end of propeller shaft.
3. Compress spring inside propeller shaft by pressing on cam follower until holes in sliding clutch, propeller shaft and cross pin slide all line up.
4. Place cross pin thru sliding clutch, propeller shaft and slide.
5. Install cross pin retaining ring around sliding clutch. DO NOT over-stretch spring when installing.
6. Place propeller shaft assembly into forward gear assembly in gear housing.

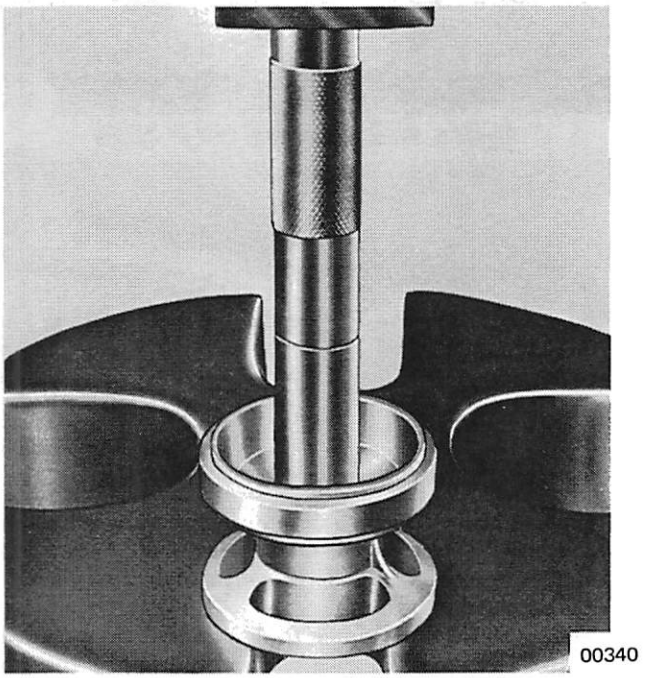


Figure 8. Installing Roller Bearings in Carrier

INSTALLING BEARING CARRIER

1. Press roller bearing into bearing carrier from rear of housing with Bearing Mandrel (C-91-24273). (Figure 8)
2. Press oil seal into bearing carrier flush with face of carrier, seal lips facing inward. (Figure 9)
3. Press large ball bearing into bearing carrier.
4. Replace large "O" ring on outside diameter bearing carrier and ball bearing thrust washer on bearing carrier.
5. Press reverse gear into large ball bearing in bearing carrier.
6. Install shims in gear housing.
7. Install plastic guide tube (C-23-30960) over propeller shaft to protect oil seals. Push bearing carrier into gear housing until it seats against ball bearing thrust ring. Plastic guide tube may be removed from propeller shaft.

NOTE: It is a good idea to keep one of these plastic sleeves on hand to use as an oil seal sleeve.

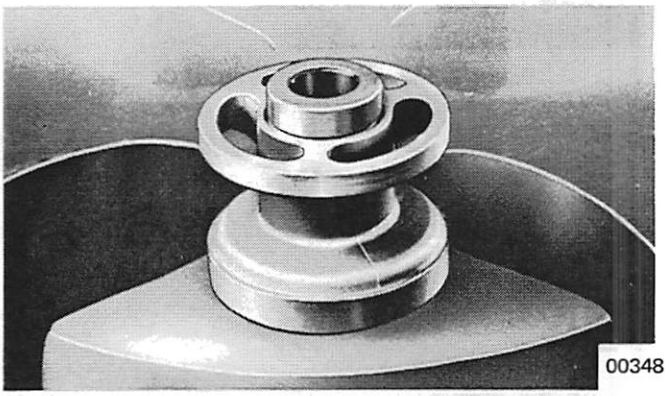


Figure 9. Installing Oil Seals in Carrier

8. Coat threads of gear housing with Gasket Sealer (C-92-28804) or Liquid Neoprene (C-92-25711) to facilitate easy future removal of gear housing cover.
9. Place gear housing cover washer on bearing carrier shoulder.
10. Thread gear housing cover onto gear housing and tighten with Gear Housing Cover Tool (C-91-30798).
11. Check gear lash by pulling out on drive shaft and pushing in on propeller shaft. Rotate drive shaft very lightly in both directions to feel gear lash. No more than .003" to .005" (.076mm to .127mm) play should be allowed for proper operation. Add or remove shims to obtain proper mesh.
12. Turn shift shaft clockwise until cam follower is felt against first notch on shift cam. This is forward gear.

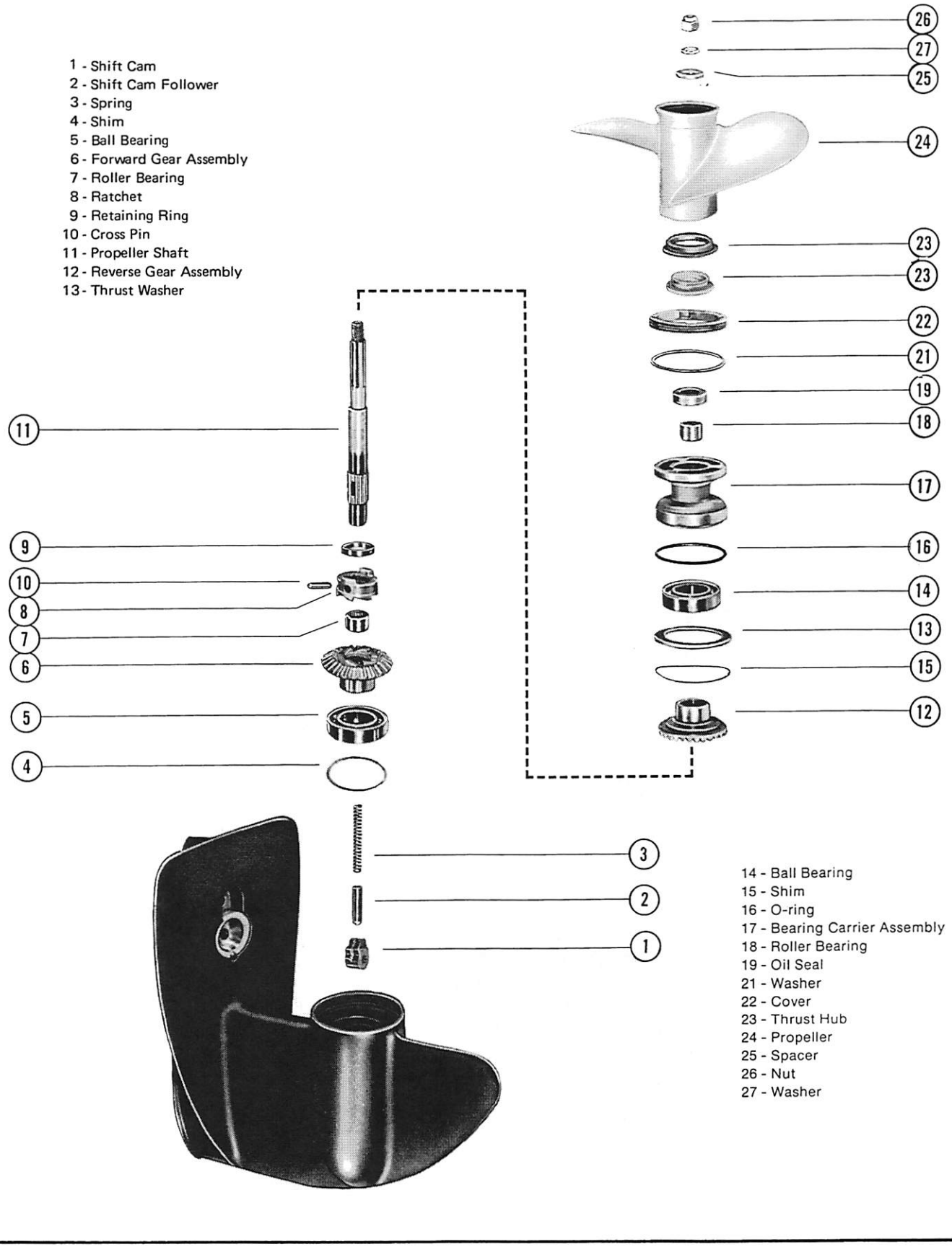
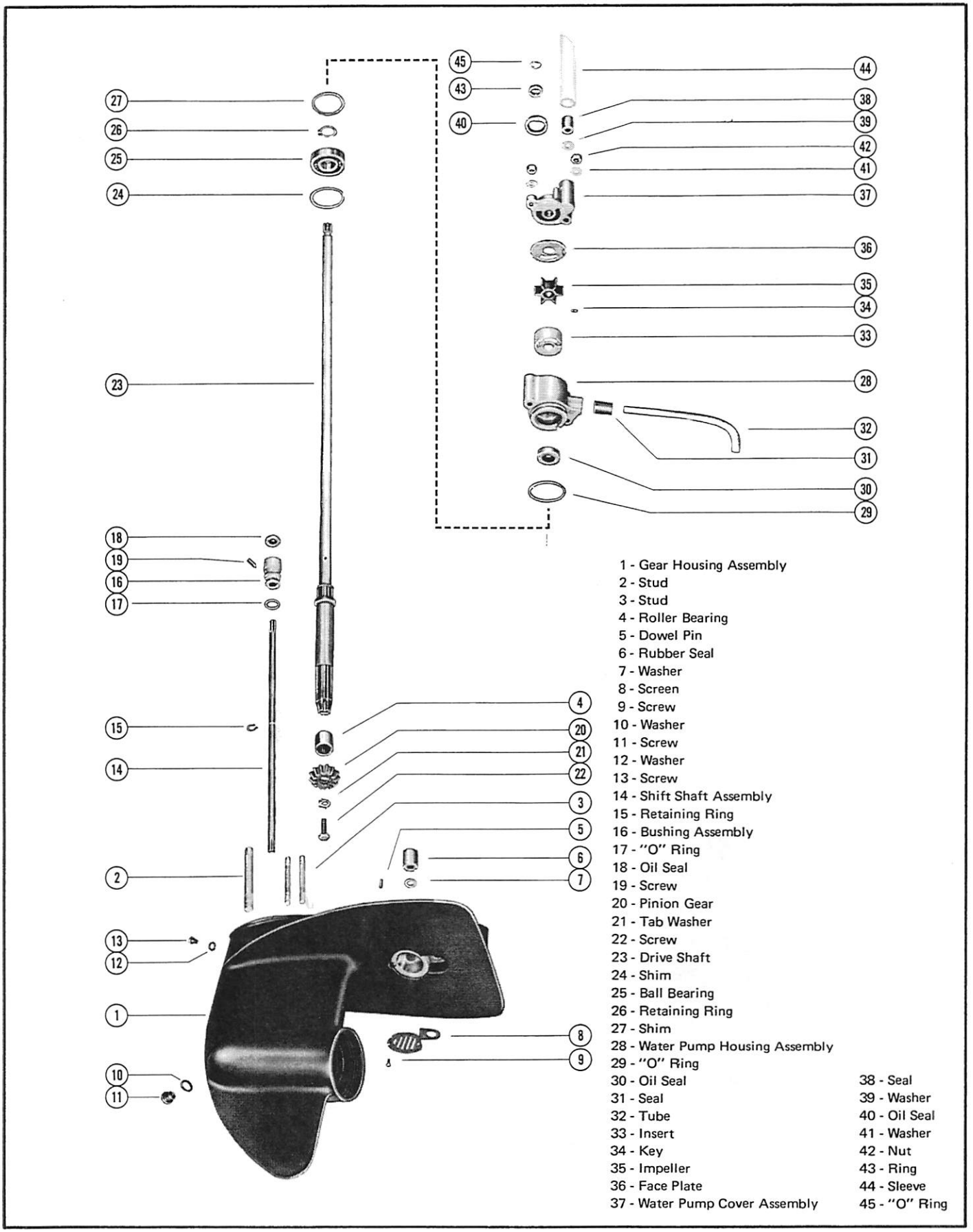


Figure 10. Gear Housing, Exploded View



1 - Gear Housing Assembly
2 - Stud
3 - Stud
4 - Roller Bearing
5 - Dowel Pin
6 - Rubber Seal
7 - Washer
8 - Screen
9 - Screw
10 - Washer
11 - Screw
12 - Washer
13 - Screw
14 - Shift Shaft Assembly
15 - Retaining Ring
16 - Bushing Assembly
17 - "O" Ring
18 - Oil Seal
19 - Screw
20 - Pinion Gear
21 - Tab Washer
22 - Screw
23 - Drive Shaft
24 - Shim
25 - Ball Bearing
26 - Retaining Ring
27 - Shim
28 - Water Pump Housing Assembly
29 - "O" Ring
30 - Oil Seal
31 - Seal
32 - Tube
33 - Insert
34 - Key
35 - Impeller
36 - Face Plate
37 - Water Pump Cover Assembly
38 - Seal
39 - Washer
40 - Oil Seal
41 - Washer
42 - Nut
43 - Ring
44 - Sleeve
45 - "O" Ring

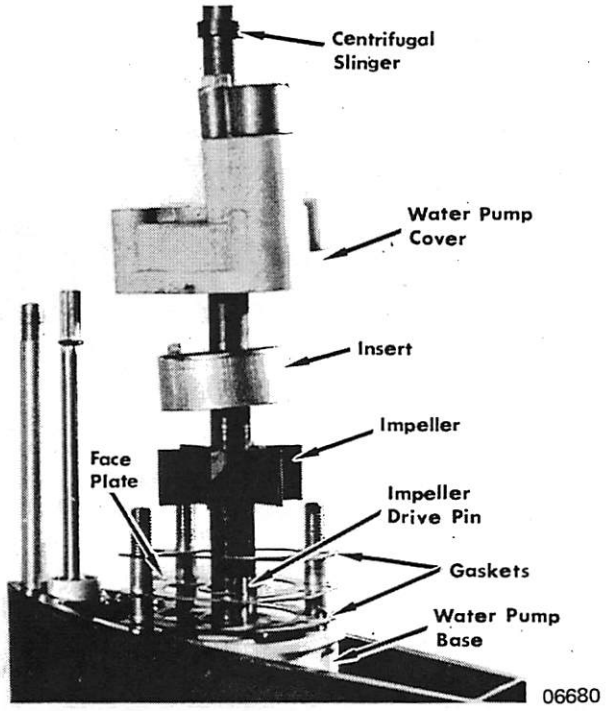
Figure 11. Gear Housing, Exploded View

WATER PUMP

DISASSEMBLY

REMOVE WATER PUMP (Figure 1)

1. Set gear housing in vise in upright position with skeg held between blocks of wood.
2. Remove drive shaft "O" ring and centrifugal slinger from drive shaft.
3. Remove water pump housing assembly by removing nuts and washers. (Figure 11)



4. Remove water pump cover and water pump face plate.
5. Remove impeller and impeller drive pin.
6. Check impeller and water pump insert closely for wear or damage.
7. Remove water pump base assembly and water inlet tube. (Figure 2)
8. Remove "O" ring and oil seal from base plate assembly and watch for shims under base assembly.

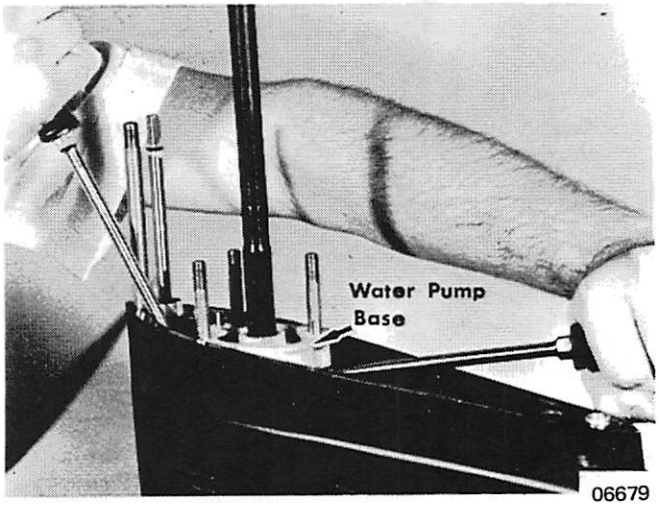


Figure 2. Removing Water Pump Base

Figure 1. Water Pump Removal - Merc 200

REASSEMBLY

INSTALLING WATER PUMP BASE and BODY ASSEMBLIES

1. Place water pump base assembly in position in gear housing.
2. There should be no play between bearing and water pump base assembly when water pump base assembly is depressed. Add or remove shim as required. No play may be obtained by over-shimming. Place a feeler gauge between gear housing and water pump body. If gap measured between gear housing and water pump body is .010" (.254mm), remove .010" shim; if .005" (.127mm), remove .005" shim. This will give a zero gap which is correct and should not be altered. (In metric scale, 1" = 25.4mm)
3. Insert stainless water pump cartridge in water pump body.
4. Place drive pin in drive shaft, holding in position with dab of Multipurpose Lubricant (C-92-49588).
5. Check condition of impeller closely and set in place in water pump cartridge.
6. Turn drive shaft clockwise, at same time seating impeller. Be sure that impeller drive pin is in position in drive pin groove of impeller.
7. Replace stainless steel face plate, wave washer, water pump cover assembly and water inlet tube.
   Merc 200 procedure is as shown in Figure 1.
8. Replace two 7/16" locknuts and tighten evenly.
9. Place plastic water tube guide in water pump body recess.
10. Replace drive shaft slinger and drive shaft "O" ring.
11. Place gear housing in vise so that gear housing cover is facing up. Use jaw protectors or wood blocks so gear housing will not be marred.
12. Check forward gear lash (at least .003" to .005") between forward gear and pinion gear at this time. If too tight, remove forward shim until correct back lash is obtained. If too much, add shims 'til correct. Be sure that conical angle of gears is true. Gears should fully engage each other on length of tooth. Shimming of drive shaft ball bearing may be necessary to obtain correct back lash (.003" to .005"), if unable to do so with forward gear shims.

DRIVE SHAFT

REMOVAL

REMOVING DRIVE SHAFT and COMPONENTS

1. Remove water pump and housing (see this section).
2. Place drive shaft in vise as close to gear housing as possible.
3. Bend back tab washer and remove screw from drive shaft pinion gear nut with a thin box-end wrench (right hand thread). (Figure 3)

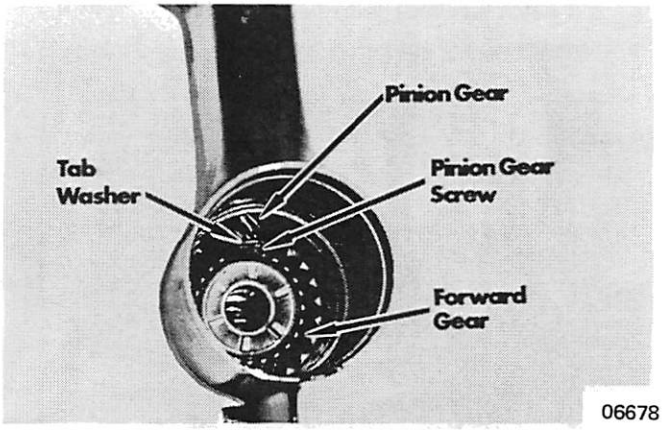


Figure 3. Removing Pinion Gear

4. To loosen drive shaft, hold drive shaft in vise and tap lightly on gear housing with rawhide mallet. (Figure 4)
5. Observe any shims under drive shaft ball bearing.
6. Remove ball bearing retaining ring with snap ring pliers.
7. Ball bearing can be removed from drive shaft by placing against open vise jaws and tapping on splined end of drive shaft with mallet. (Figure 5)
8. Remove forward gear and bearing assembly from gear housing by tapping open end of gear housing against block of soft wood.
9. Remove ball bearing from forward gear with Gear Puller Plate (C-91-22115). Place halves of plate between ball bearing and gear and tap halves together. Insert cap screws and tighten. With gear facing down, press out against rear shoulder of gear.
10. Remove needle bearing from forward gear only if bearing is worn or rough. This bearing cannot be removed without damaging it. Place gear in vise between jaw protectors and remove bearing with a pin punch.

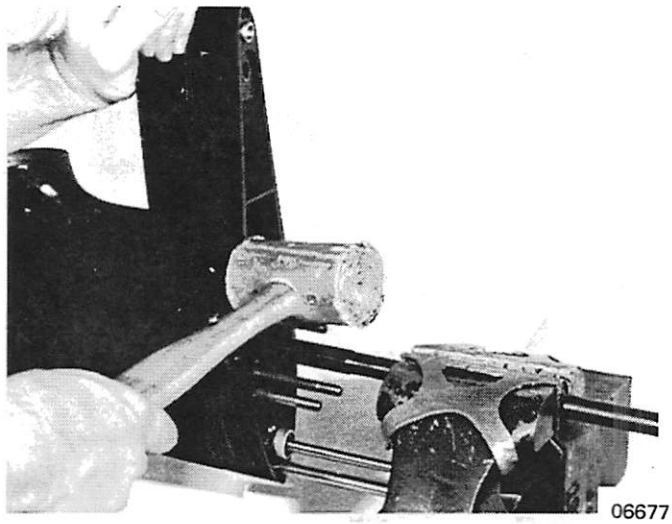


Figure 4. Removing Drive Shaft

REMOVING NEEDLE BEARINGS from GEAR HOUSING

1. Remove drive shaft needle bearings from gear housing with Bearing Mandrel (C-91-24273).
2. Place mandrel in drive shaft end of gear housing cavity.
3. Press bearing out with arbor press.

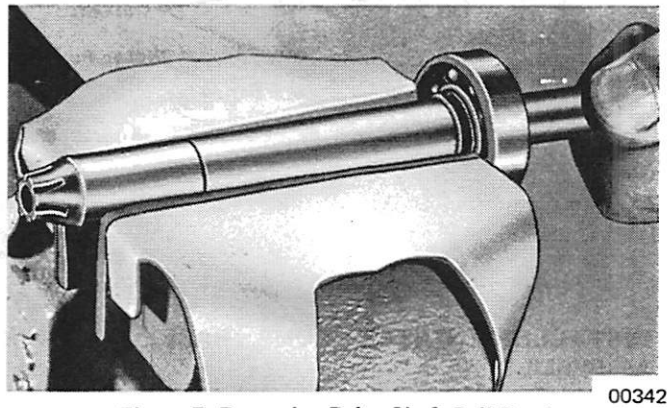


Figure 5. Removing Drive Shaft Ball Bearing

REASSEMBLY

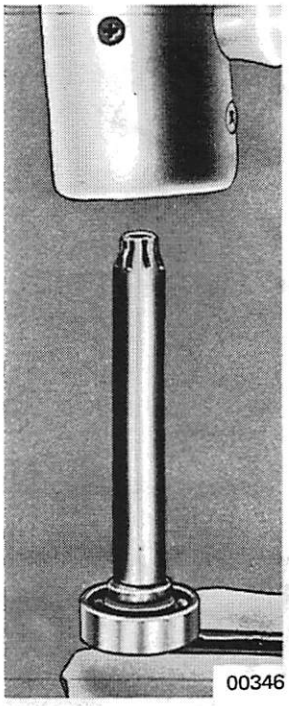
REPLACING NEEDLE BEARING in GEAR HOUSING

1. Install drive shaft bearing cartridge into gear housing with Bearing Mandrel (C-91-24273).
2. Press drive shaft needle cartridge bearing in until bearing is recessed evenly on shoulder between upper drive shaft cavity and lower gear cavity. Always press against the numbered side of cartridge type bearing. Numbered side of cartridge must face up.
3. Place gear housing in vise between 2 blocks of soft wood at thin section of gear housing so that gear cover end is up.
4. Insert shifting cam into gear housing with notches up and to left when viewing in from skeg. Cam operates to right (cam operates to left on 1970 and earlier models).
5. Insert shift shaft lower half so that splines engage shifting cam splines inside housing. Short spline on shift shaft engages with shift cam, and long spline on shift shaft engages with upper shift shaft.
6. Install shift shaft bushing and tighten securely with 3/32" allen screw.
7. Replace shims which were removed originally from under forward gear assembly.

8. Install new needle bearing in forward gear (if previously removed) with Mandrel (C-91-24273).
9. Press ball bearing onto forward gear.
10. Place gear and bearing assembly into gear housing.
11. Place propeller shaft (ratchet end) into center of forward gear assembly.
12. Place forward gear assembly into gear housing, using bearing carrier as a guide.
13. Lubricate needle and ball bearings in gear housing with oil.

INSTALLING DRIVE SHAFT

1. Place ball bearing on drive shaft. (Figure 6)
2. Place drive shaft in vise loosely, tapping against pinioned spline end until bearing seats.



3. Replace locking ring on drive shaft to hold ball bearing in place.
4. Place shims as required, or as previously removed, into drive shaft ball bearing recess in gear housing.
5. Lubricate ball bearing and insert drive shaft assembly into gear housing. DO NOT seat drive shaft.
6. Place pinion gear on splind end of drive shaft. Tap drive shaft assembly to seal in gear housing.
7. Place drive shaft in vise close to housing and tighten screw at pinion with box end 3/8" wrench. Bend tab washer down over side of screw head to secure.
8. Remove drive shaft from vise and install skeg of gear housing in vise between jaw protectors or 2 blocks of soft wood with drive shaft facing up.
9. Replace shims, as required, on top of drive shaft bearing before replacing water pump base assembly.

NOTE: If a powerhead noise exists on Merc 200 model, after short block, crankshaft or drive shaft replacement, grind a small amount of metal (approximately .060") from the top end of the drive shaft. This will remove the load condition which is causing the noise.

Figure 6. Installing Drive Shaft Ball Bearing

SHIFTING and REVERSE LOCK MECHANISM

REMOVAL

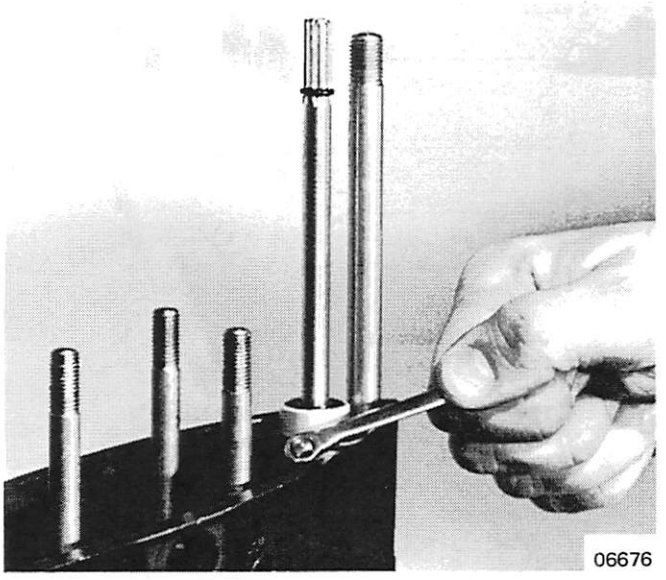
REMOVING SHIFT SHAFT and CAM

1. Remove screw which holds shift shaft bushing in place. (Figure 1)
2. Place shift shaft in vise. Use jaw protectors so that spline will not be damaged.
3. Tap gear housing lightly with rawhide mallet to remove shift shaft, shift shaft bushing and shift cam.

All parts now should be washed in cleaning solvent and inspected for wear, replacing those which are worn, not useable or damaged.

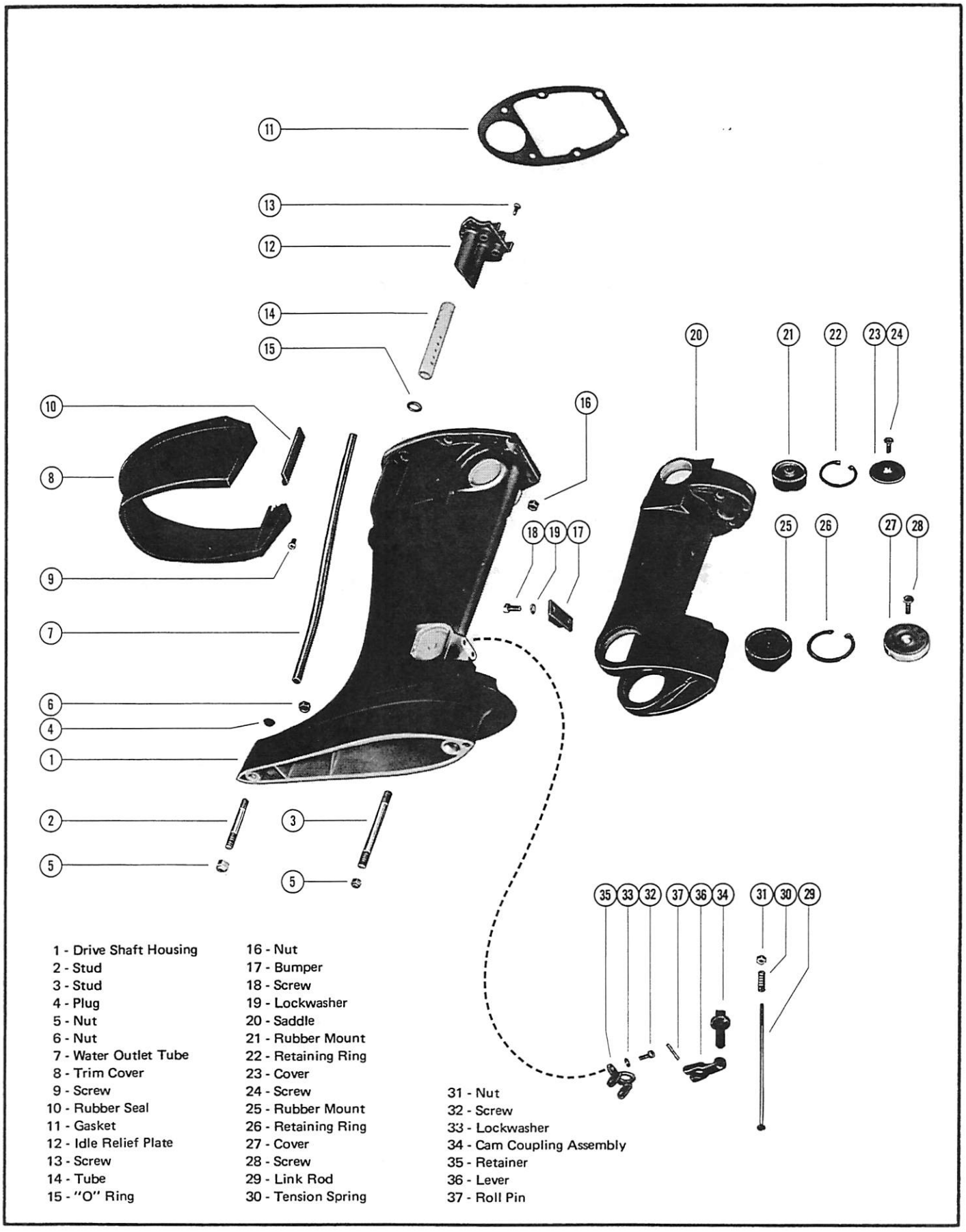
NOTE: Forward-Neutral-Reverse position on the 1971 72-73 Merc 40-75-110-200 is opposite of prior models.

Figure 1. Removing Shift Shaft



REASSEMBLY

1. Insert shifting cam into gear housing with notches up and to left when viewing in from skeg. Cam operates to right (cam operates to left on 1970 and earlier models.)
2. Insert shift shaft lower half so that splines engage shifting cam splines inside housing. Short spline on shift shaft engages with shift cam, and long spline on shift shaft engages with upper shift shaft.
3. Install shift shaft bushing and tighten securely with 3/32" allen screw.



1 - Drive Shaft Housing
2 - Stud
3 - Stud
4 - Plug
5 - Nut
6 - Nut
7 - Water Outlet Tube
8 - Trim Cover
9 - Screw
10 - Rubber Seal
11 - Gasket
12 - Idle Relief Plate
13 - Screw
14 - Tube
15 - "O" Ring
16 - Nut
17 - Bumper
18 - Screw
19 - Lockwasher
20 - Saddle
21 - Rubber Mount
22 - Retaining Ring
23 - Cover
24 - Screw
25 - Rubber Mount
26 - Retaining Ring
27 - Cover
28 - Screw
29 - Link Rod
30 - Tension Spring
31 - Nut
32 - Screw
33 - Lockwasher
34 - Cam Coupling Assembly
35 - Retainer
36 - Lever
37 - Roll Pin

Figure 2. Drive Shaft Housing, Exploded View

DRIVE SHAFT HOUSING and DYNA-FLOAT SUSPENSION

REMOVAL

1. Remove screws from trim cover and remove trim cover.
2. Refer to "Powerhead" Section 5 to remove powerhead.
3. Refer to "Disassembly", following, and remove saddle and clamp-and-swivel bracket. (Figure 2)

DISASSEMBLY

Kiekhaefer engineered Dyna-Float suspension employs rubber shear mounts, the same vibration dampeners used to cushion powerful aircraft engines. These mounts are found on the drive shaft housing. (Figures 3 and 4) Dyna-Float Suspension keeps engine vibration away from the boat without sacrificing horsepower or other performance.

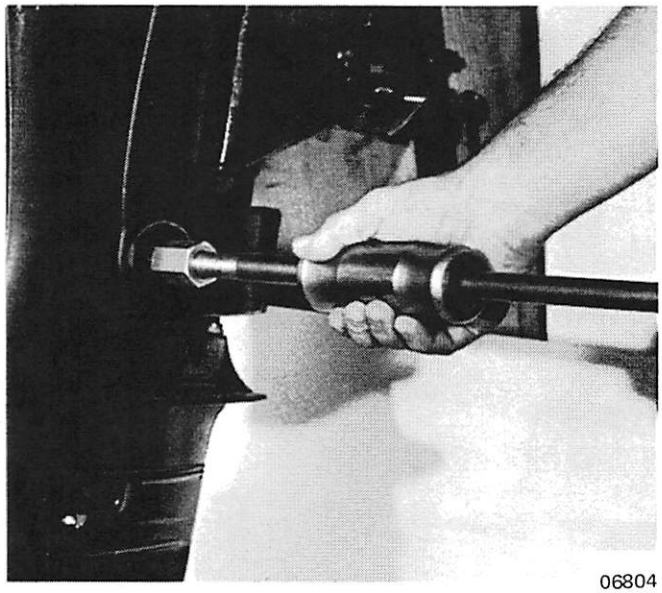


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Figure 3. Compressing Mount and Removing Retainer Ring

1. Remove screws from cover plates. Using "C" clamp, tighten clamp on lower rubber mounts to compress rubber mounts for removal of retaining rings. (Figure 3)
2. Remove retaining ring from each mounting recess with Snap Ring Pliers (C-91-25081). Compress ring to remove. (Figure 3)

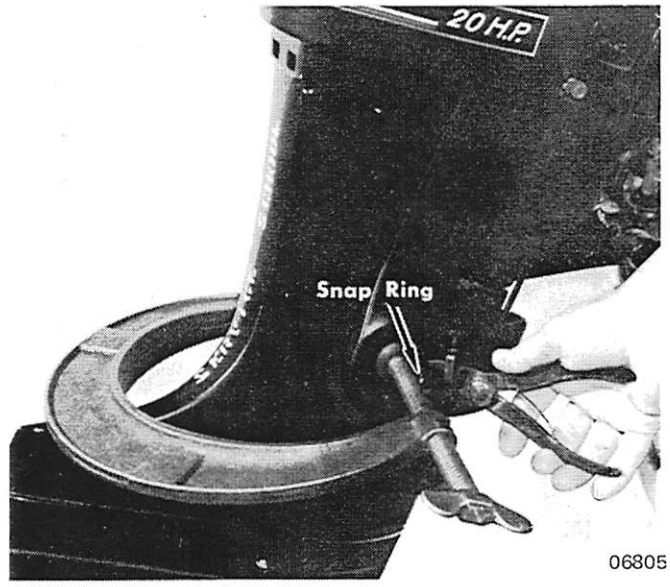

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Figure 4. Pulling Dyna-Float Mount

3. Remove "C" clamp, and rubber mounting bushing can be pulled out. To remove the Dyna-Float mounting bushings, thread small end of Rubber Mount Puller (C-91-36062) securely into rubber mount. (Figure 4)
4. Using a slide hammer puller, remove rubber mounts.

Repeat above procedure for upper rubber mounts.

NOTE: Flexible shift shaft connector can be pulled off upper and lower shift shaft in saddle mount when gear housing assembly is removed.

REASSEMBLY

1. Locate drive shaft housing in saddle mounting. Set upper rubber mounts in drive shaft housing recess through saddle mount. Be sure screw hole faces out.

2. Place "C" clamp on mounts and tighten to compress. Insert retainer ring in grooves in saddle mounting. Be sure that retainer rings are seated properly.

3. Remove "C" clamps.

4. Replace covers and secure in place with screws. Be sure that small slot in cover is to bottom to drain out water. Repeat above process for lower rubber mounts.
5. Place flexible shift shaft connector in position on gear housing shift shaft spline.
6. Set in forward gear and insert unit into drive shaft housing, locating flexible connector on upper shift shaft splines (also in forward gear). Be sure to coat splines with New Multipurpose Quicksilver Lubricant (C-92-49588) before installing.

SECTION 6 - LOWER UNIT

MERCURY
OUTBOARDS

PART B - MERC 500-402-400 and 350

MERCURY
MARINE

INDEX

MERC 350 and 400 (2-CYL.) and 500

GEAR HOUSING

REMOVAL

REMOVING GEAR HOUSING from DRIVE SHAFT HOUSING

1. Drain lubricant from gear housing by removing filler hole screw and vent plug. DO NOT lose washers under screw and plug. Replace washers, screw and plug after draining.
2. Remove propeller.
3. Remove 2 hexagon head locknuts which hold gear housing assembly to drive shaft housing (leading edge).
4. Remove hexagon head locknut from center bottom side of anti-cavitation plate.
5. Remove water pickup or trim tab under trailing edge of anti-cavitation plate by removing plastic plug and screw from rear of drive shaft housing.
6. Remove hexagon head locknut from inside trim tab cavity.
7. Separate gear housing from drive shaft housing.

INSTALLATION

JOINING GEAR HOUSING and DRIVE SHAFT HOUSING

1. If water inlet tube-to-powerhead is pulled out when gear housing was removed, coat tube upper end with New Multipurpose Quicksilver Lubricant (C-92-49588), so that it will slip easily into rubber seal in bottom cowl, and insert into recess in powerhead.
2. Place light coat of Multipurpose Lubricant on bottom end of water tube.
3. Apply heavy coat of Multipurpose Lubricant on drive shaft splines.
4. Insert allen head water pickup or trim tab screw in place on top of gear housing.
5. Check that shift control lever and lower unit are in forward gear before installing gear housing.
6. Insert drive shaft into drive shaft housing, aligning water tube with water pump body outlet and drive shaft splines with crankshaft, then sliding into place while joining housings.

   NOTE: Be careful that water inlet tube enters water pump body recess and rubber seal in water pump cover.

7. Place shift control lever in neutral, then in forward to check that upper and lower shift shaft splines are properly aligned.
8. Rotate propeller shaft to permit drive shaft splines to enter crankcase splines. Upper and lower shift shaft splines also must be aligned.
9. With 2 housings joined, install and tighten elastic stop nuts.
10. Install water pickup or trim tab and tighten allen head screw thru plastic plug hole in drive shaft housing, then replace plastic plug.
11. Refer to "Lubrication" Section 1C and lubricate gear housing.

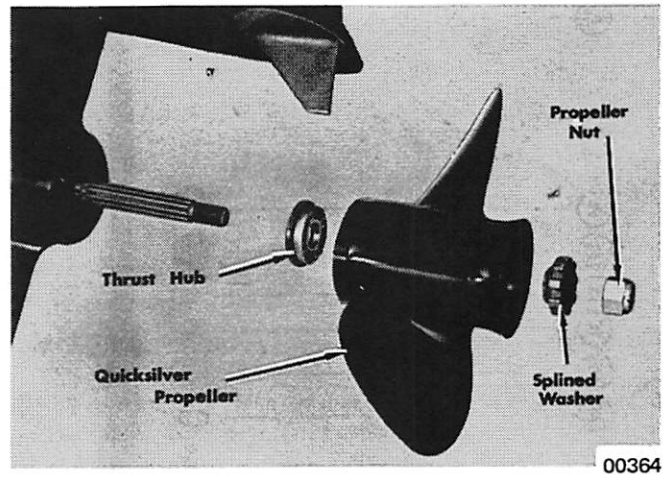


Figure 1. Propeller Installation

INSTALLING PROPELLER (Figure 1)

1. Replace backing washer, then place thrust hub and washer assembly into propeller hub (shoulder into recess of propeller).
2. Apply thin coat of New Multipurpose Quicksilver Lubricant (C-92-49588) on splines of propeller shaft. (Figure 1)
3. Align propeller hub splines with splines of propeller shaft and slide propeller on shaft. Tap into position if necessary.
4. Replace splined washer.
5. Replace propeller nut and tighten with adjustable wrench.

WARNING: Use of other than recommended Quicksilver Propellers will void warranty.

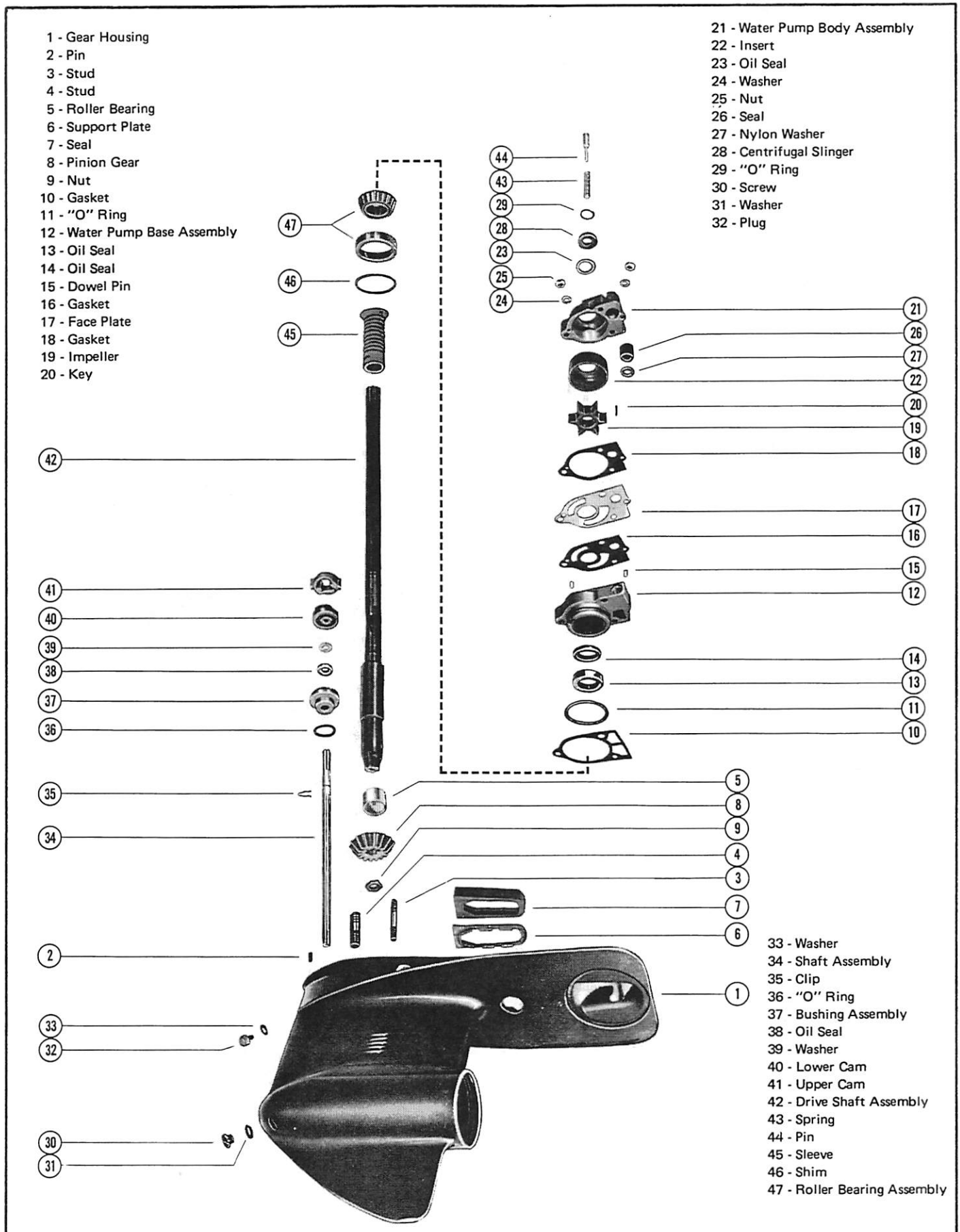
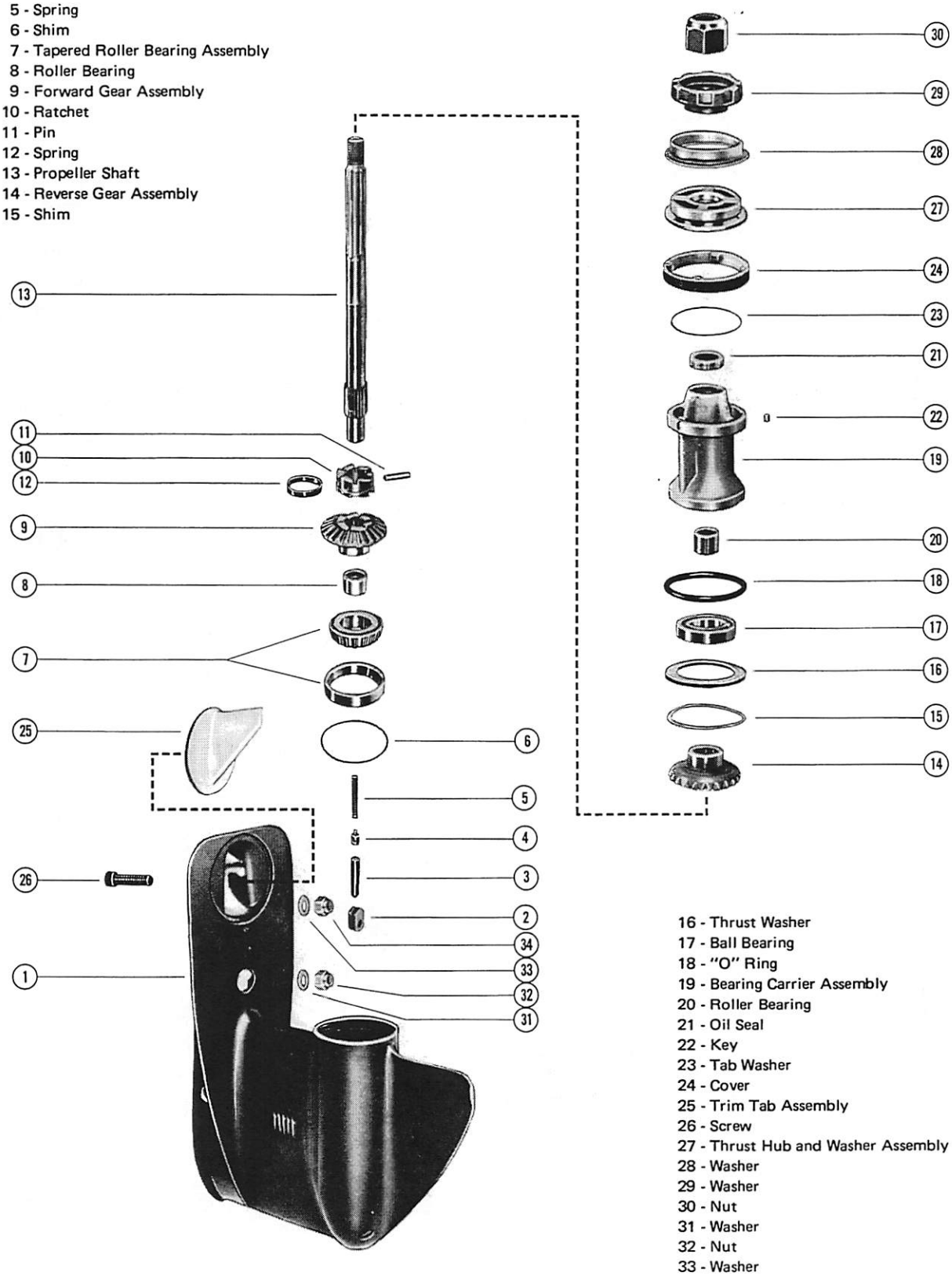


Figure 2. Gear Housing, Drive Shaft

1 - Gear Housing
2 - Shift Cam
3 - Cam Follower
4 - Cross Pin Slide
5 - Spring
6 - Shim
7 - Tapered Roller Bearing Assembly
8 - Roller Bearing
9 - Forward Gear Assembly
10 - Ratchet
11 - Pin
12 - Spring
13 - Propeller Shaft
14 - Reverse Gear Assembly
15 - Shim



16 - Thrust Washer
17 - Ball Bearing
18 - "O" Ring
19 - Bearing Carrier Assembly
20 - Roller Bearing
21 - Oil Seal
22 - Key
23 - Tab Washer
24 - Cover
25 - Trim Tab Assembly
26 - Screw
27 - Thrust Hub and Washer Assembly
28 - Washer
29 - Washer
30 - Nut
31 - Washer
32 - Nut
33 - Washer
34 - Nut

Figure 3. Gear Housing, Propeller Shaft

PROPELLER SHAFT

DISASSEMBLY

1. Drain Super-Duty Gear Lubricant from gear housing by removing filler hole screw and vent screw. (Figure 1) Do not lose washers. Replace washers and screws after draining.

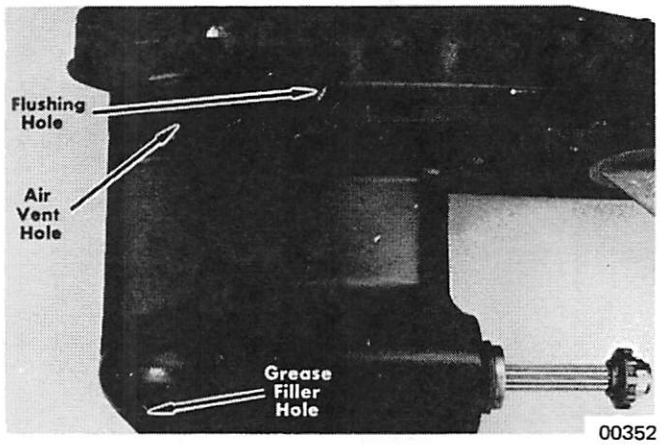


Figure 1. Filler Hole and Vent Screw

2. Place gear housing assembly in vise between 2 blocks of soft wood to prevent marring surface.
3. Place a piece of wood flat between propeller and anti-cavitation plate to prevent propeller from turning while removing the propeller nut.
4. Remove propeller by removing propeller nut (right hand thread), splined washer, propeller and thrust hub and backing washer.
5. At this time, lash between gears should be checked for future reference. Pull on drive shaft with one hand and push on propeller shaft with other. (Figure 2) Refer to backlash.

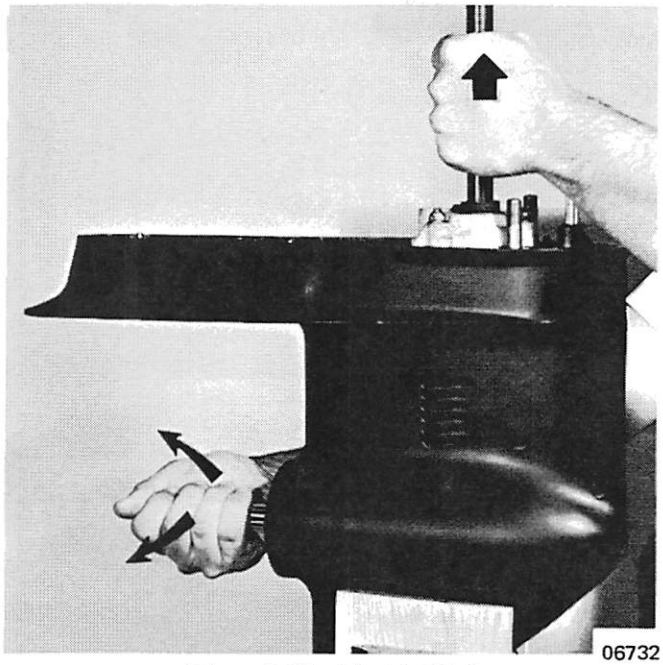


Figure 2. Checking Backlash

6. Bend tab or tab washer. Remove gear housing cover and washer with Gear Housing Cover Tool (C-91-30291A2). Place tool over end of propeller shaft and set tool into cover, turning counterclockwise (right hand thread) to loosen. (Figure 3) If tight, strike handle of tool with mallet to loosen.

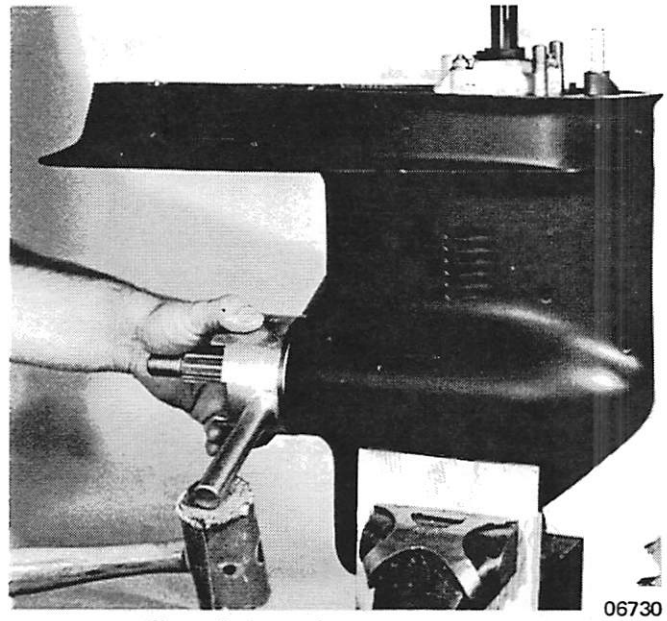


Figure 3. Removing Gear Case Cover

7. Bearing carrier assembly can be removed while removing propeller shaft. Place propeller shaft in vise between 2 pieces of soft wood. (Figure 4) Shaft assembly then can be removed by tapping lightly and evenly on skeg of gear housing with a mallet. Remove key from keyway from inside bottom of gear housing.

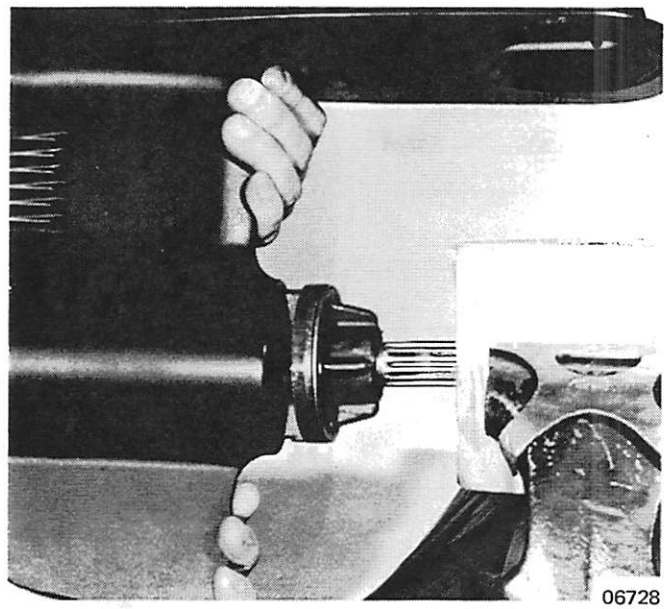


Figure 4. Removing Bearing Carrier

8. Remove propeller shaft from bearing carrier.
9. Remove reverse gear and ball bearing from bearing carrier with C-91-27780 tool, as shown in Figure 5.

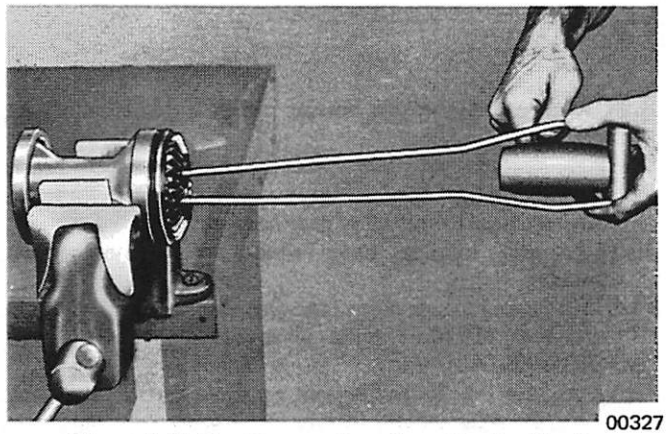

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Figure 5. Pulling Reverse Gear from Bearing Carrier

10. Remove "O" ring from carrier.
11. Press or tap roller bearing and seal from carrier with Driver Head (C-91-37311). (Figure 6)

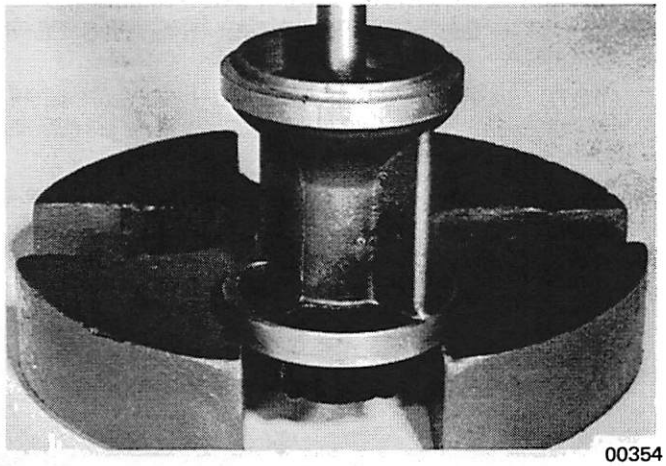
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Figure 6. Pressing Bearing out of Carrier

DISASSEMBLY of PROPELLER SHAFT and GEAR ASSEMBLY

1. Use screwdriver to detach retaining ring from sliding clutch. (Figure 7) Do not over-stretch, or ring will lose its shape and tension.

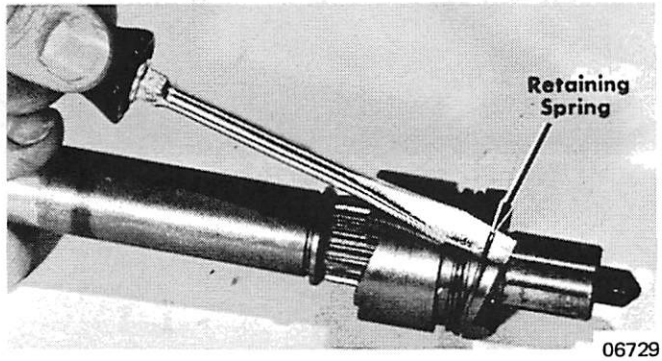

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Figure 7. Removing Clutch Retaining Spring

2. Remove sliding clutch from propeller shaft by setting cam follower in place in end of propeller shaft. Press against cam follower and, with small punch, push cross pin out of sliding clutch. (Figure 8)

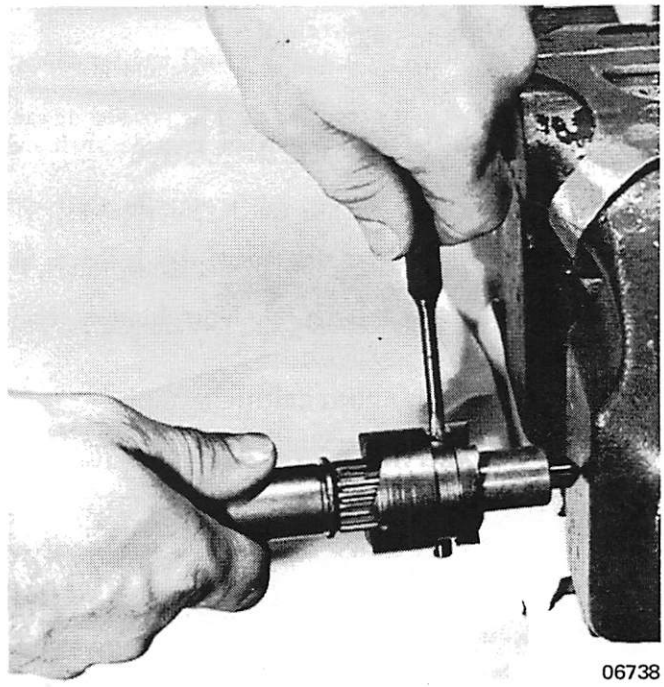
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Figure 8. Removing Clutch Pin

3. Sliding clutch now is free to be removed from propeller shaft, with cross pin slide and spring dropping free from inside of propeller shaft.
4. Remove lower reverse locking cam from shift shaft bushing. Remove shift shaft bushing with Shift Shaft Tool (C-91-23033) (Figure 9) and pull shift shaft out of gear housing. Shifting cam then will fall out of gear housing.

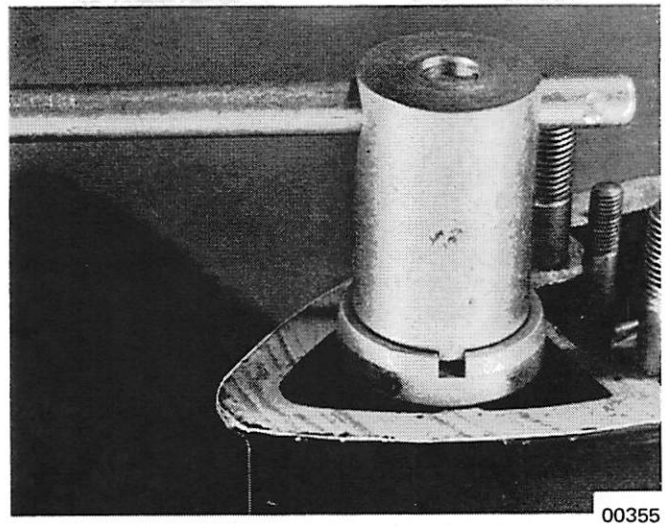
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Figure 9. Removing Shift Shaft Bushing

REASSEMBLY

1. Install cam follower spring and cam follower slide inside hollow end of propeller shaft so that holes in cam follower slide match hole in propeller shaft.
2. Place sliding clutch onto propeller shaft and install cam follower in end of propeller shaft.
3. Compress spring inside propeller shaft by pressing on cam follower until holes in sliding clutch, propeller shaft and cross pin slide all line up.
4. Place cross pin thru sliding clutch, propeller shaft and slide.
5. Install cross pin retaining ring around sliding clutch. Do not over-stretch spring when installing.
6. Place propeller shaft assembly into forward gear assembly in gear housing.

INSTALLATION of BEARING CARRIER

1. Press or tap roller bearing into bearing carrier from rear of housing with Driver Head (C-91-37311). (Figure 10)

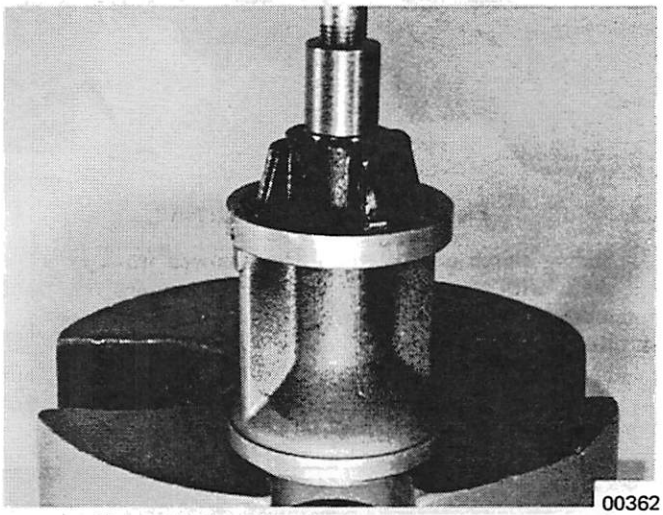


Figure 10. Installing Roller Bearings in Carrier

2. Press oil seal in to seat on shoulder in front of roller bearing with lip of seal facing in.
3. Press large ball bearing into bearing carrier.
4. Replace large "O" ring on outside diameter bearing carrier and ball bearing thrust washer on bearing carrier.
5. Press reverse gear into large ball bearing in bearing carrier.
6. Install shims in gear housing.
7. Push bearing carrier into gear housing until it seats against ball bearing thrust ring.
8. Place key in keyway in bearing carrier and bottom of gear housing.
9. Coat threads of gear. housing with Gasket Sealer (C-92-28804) or Liquid Neoprene (C-92-25711) to facilitate easy future removal of gear housing cover.
10. Place gear housing cover washer on bearing carrier shoulder.
11. Thread gear housing cover onto gear housing and tighten in clockwise direction with Gear Housing Cover Tool (C-91-30291A2).
12. Check gear lash by pulling out on drive shaft and pushing in on propeller shaft. Rotate drive shaft very lightly in both directions to feel gear lash. No more than .003" to .005" play should be allowed for proper operation. Add or remove shims to obtain proper mesh.
13. Turn shift shaft counterclockwise until cam follower is felt against first notch on shift cam. This is forward gear.
14. With lower unit in forward gear, place reverse lock cam on shift shaft.

    NOTE: Shift shaft must be in forward gear position, and the lower reverse lock cam installed with the 2 tabs aligned with left front stud. (Figure 11)

15. After replacing shift cam, lubricate heavily with New Multipurpose Lubricant (C-92-49588).

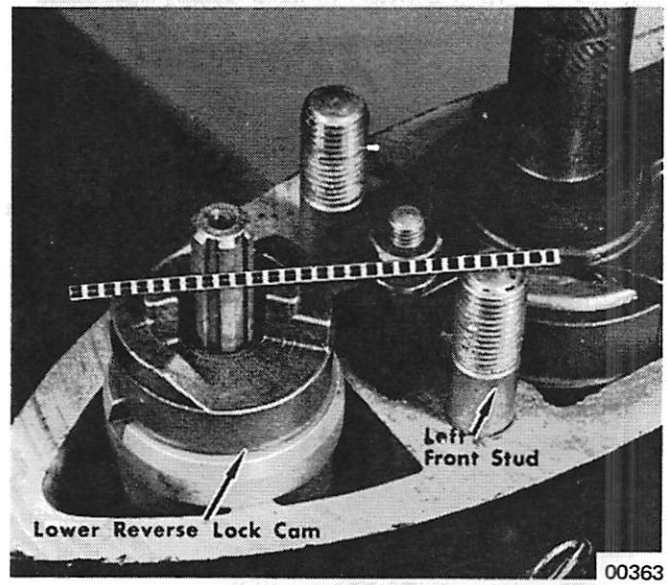


Figure 11. Installing Lower Reverse Lock Cam

WATER PUMP

DISASSEMBLY

1. Set gear housing in vise in upright position with skeg held between blocks of wood.
2. Remove centrifugal slinger from drive shaft.
3. Remove water pump body assembly.
4. Remove water pump insert, impeller and impeller pin along with water pump body, gasket, water pump face plate and gasket face plate to gear housing and oil seal. (Figure 12)
5. Check impeller and water pump insert closely for wear or damage.
6. Remove flushing screw, seal and gasket to allow water pump base assembly to be lifted out.

   NOTE: Water pump base in late style gear housing has a threaded hole, located next to forward stud, to aid removal. Install a 10-24 screw and turn in until water pump base is forced away from gear housing.

7. Remove "O" ring and oil seal from base plate assembly and watch for shims under base assembly.

   NOTE: Gear housing with water intake in strut has an additional gasket located between water pump base and gear housing.

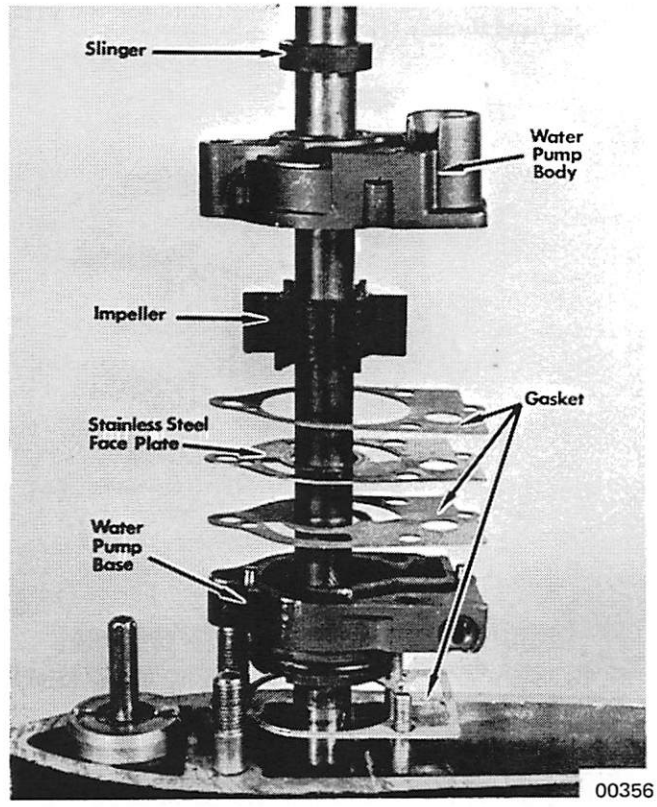


Figure 12. Removing Water Pump Assembly

REASSEMBLY

INSTALLATION of WATER PUMP BASE and BODY ASSEMBLIES

1. Place seal in water pump base assembly with lips facing down.

   NOTE: On later model 4-cylinder gear housing, water pump base has 2 oil seals. Upper oil seal is installed with lips facing up. Lower seal is installed with lips down.

2. Place water pump base assembly in position in gear housing.

   NOTE: Gear housing with water intake in strut requires a gasket between water pump base and gear housing.

3. There should be no play between bearing and water pump base assembly when water pump base assembly is depressed. Add or remove shims as required. No play may be obtained by over-shimming. Place a feeler gauge between gear housing and water pump body. If gap (measured between gear housing and water pump body) is .010", remove .010" shim; if .005", remove .005" shim. This will give the correct zero gap.
4. Install water pump base-to-face gasket and replace stainless face plate. (Figure 1)

   NOTE: Gear housing with water intake in trim tab must have water intake tube installed in water pump base before installing stainless steel face plate.

5. Place drive pin on drive shaft, holding in position with dab of Multipurpose Lubricant (C-92-49588).
6. Check condition of impeller closely and set in place over drive shaft.
7. Insert stainless water pump cartridge in water pump body and place water pump body-to-face-plate gasket on water pump body. (Figure 12)
8. Slide water pump body assembly over drive shaft and impeller. (Figure 12)
9. Turn drive shaft clockwise and press water pump body assembly into place, at same time seating impeller. Be sure that impeller drive pin is in position in drive pin groove of impeller.
10. Replace lockwashers and tighten nuts.
11. Replace drive shaft slinger.
12. Place gear housing in vise so that gear housing cover is facing up. Use jaw protectors or wood blocks to protect gear housing surface.

    IMPORTANT: Be sure that conical angle of gears is true. Gears should fully engage each other on length of tooth. Shimming of drive shaft ball bearing may be necessary to obtain correct backlash (.003" to .005"), if unable to do so with forward gear shims.

13. Check forward gear lash (at least .003" to .005") between forward gear and pinion gear. If too tight, remove forward shims until correct backlash is obtained or, if too much, add shims until correct.

DRIVE SHAFT DISASSEMBLY

1. Place drive shaft in vise as close to gear housing as possible.
2. Remove pinion nut from drive shaft with box-end wrench (right hand thread). (Figure 1)

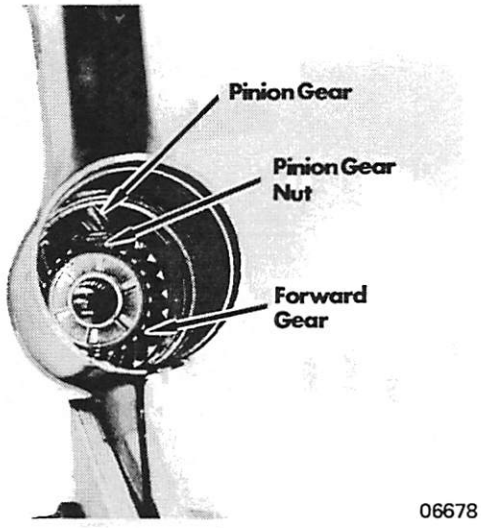


Figure 1. Removing Pinion Nut from Drive Shaft

3. To loosen drive shaft, hold gear housing in one hand and tap lightly on gear housing with rawhide mallet.
4. Observe any shims under drive shaft ball bearing.
5. Remove ball bearing retaining ring with snap ring pliers.
6. Ball bearing can be removed from drive shaft by placing against open vise jaws and tapping on splined end of drive shaft with a mallet. (Figure 2)

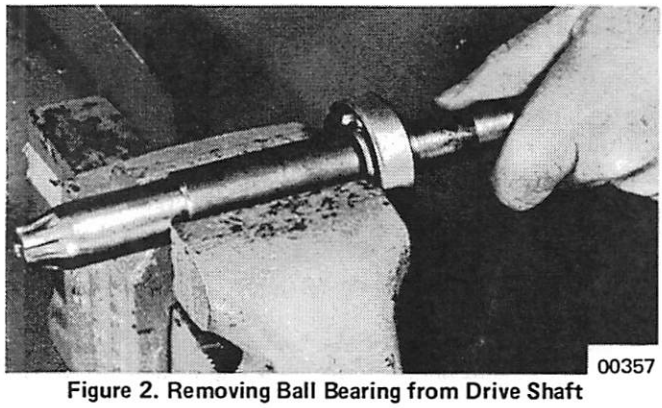


Figure 2. Removing Ball Bearing from Drive Shaft

7. Remove forward gear and bearing assembly from gear housing.
8. Remove bearing cup from gear housing with Slide Hammer Puller (C-91-34569A1). (Figure 3)

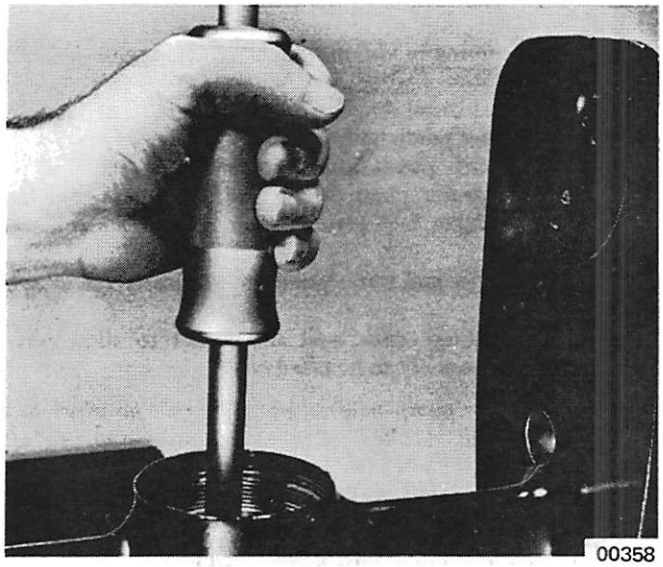


Figure 3. Removing Cup from Gear Housing

REMOVING BEARING RACE from GEAR HOUSING

1. Remove drive shaft needle bearing from gear housing with Driver Head (C-91-37312).
2. Place tool in drive shaft end of gear housing cavity.
3. Press bearing out with arbor press or tap on tool with heavy mallet to remove bearing. (Figure 4)
4. Remove lubrication sleeve (if applicable).

This completes disassembly of gear housing. All parts should be washed in cleaning solvent and inspected for wear, replacing those which are worn, not useable or damaged.

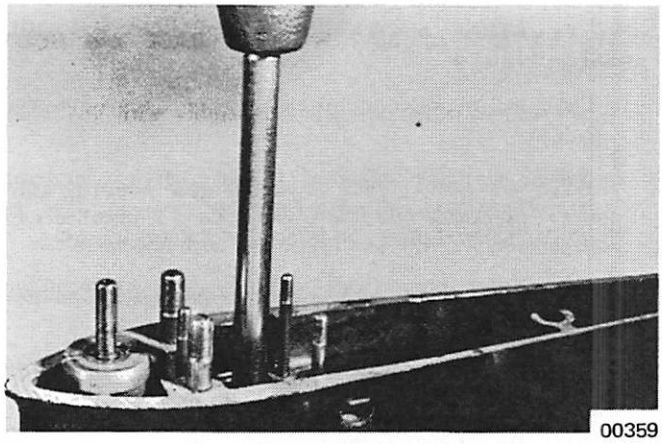


Figure 4. Removing Drive Shaft Needle Bearing from Gear Housing

REASSEMBLY

REPLACING BEARING RACE in GEAR HOUSING

1. Install drive shaft needle bearing into gear housing with Driver Head (C-91-37312). (Figure 4)
2. Press drive shaft needle cartridge bearing in until bearing is recessed evenly on shoulder between upper drive shaft cavity and lower gear cavity. Always press against the numbered side of cartridge type bearing. Numbered side of cartridge must face up.
3. Replace shims, which were removed originally, from forward gear bearing cup of gear housing.
4. Place bearing cup on Driver Cup Tool (C-91-31361) with tapered end of cup against driver cup.
5. Set cup with tool into gear housing bearing shoulder and place propeller shaft (ratchet end) into center hole of driver cup.
6. Place bearing carrier assembly into housing to act as a guide to hold shaft straight when pressing cup into position.
7. Press forward gear roller bearing outer cup into gear housing.
8. Lubricate needle and roller bearings in gear housing with oil.
9. Place gear housing in vise between jaw protectors at thin section of gear housing so that gear cover end is up.
10. Insert shifting cam into gear housing with notches up and to left when viewing in from skeg. Cam operates to right. (Figure 5)

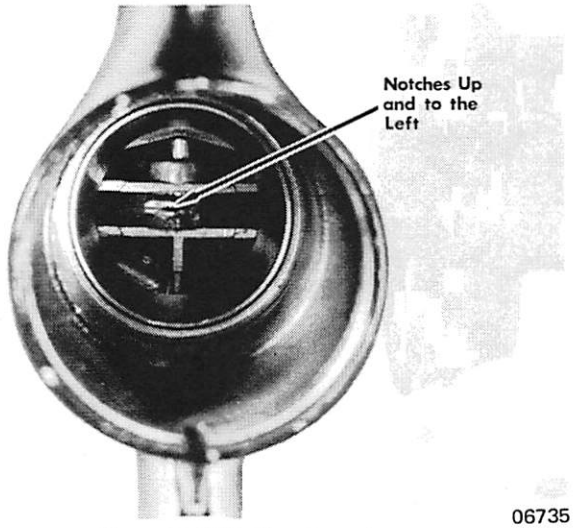


Figure 5. Shift Cam Location

11. Insert shift shaft lower half so that splines engage shifting cam splines inside housing.
12. Install shift shaft bushing and tighten securely with Shift Shaft Tool (C-91-23033).
13. Press roller bearing onto forward gear (taper of bearings to face away from gear).
14. Place gear and bearing assembly into bearing outer cup.

INSTALLING DRIVE SHAFT

1. Place ball bearing on drive shaft.
2. Place drive shaft in vise loosely, tapping against pinioned spline end until bearing seats. (Figure 6)

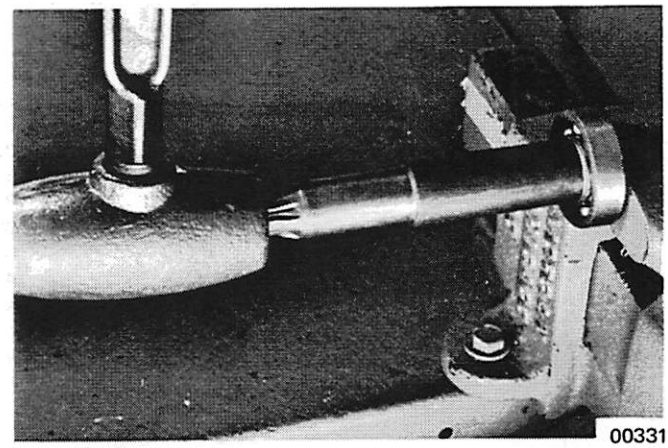


Figure 6. Install Ball Bearing on Drive Shaft

3. Replace locking ring on drive shaft to hold ball bearing in place.
4. Place shims as required, or as previously removed, into drive shaft ball bearing recess in gear housing.
5. Lubricate ball bearing and insert drive shaft assembly into gear housing. DO NOT seat drive shaft.
6. Place pinion gear on spline end of drive shaft. Tap drive shaft assembly to seat in gear housing.
7. Place drive shaft in vise close to housing and install pinion nut. (Chamfer on nut must be toward pinion gear.) (Figure 1)
8. Remove drive shaft from vise and install skeg of gear housing in vise between 2 blocks of wood or jaw protectors with drive shaft facing up.
9. Replace shims, as required, on top of drive shaft bearing before replacing water pump base assembly.

1 - Drive Shaft Housing
2 - Stud
3 - Stud
4 - Plastic Plug
5 - Washer
6 - Trim Cover
7 - Screw
8 - Seal
9 - Retaining Spring
10 - Screw
11 - Washer
12 - Water Outlet Tube
13 - Rubber Sleeve
14 - Exhaust Tube
15 - Nut
16 - Ground Strap
17 - Screw
18 - Gasket
19 - Rubber Cap
20 - Nut
21 - Washer
22 - Rubber Washer
23 - Washer
24 - Cover
25 - Cover
26 - Rubber Mount
27 - "U" Cup Packing
28 - Screw
29 - Screw
30 - Nut
31 - Rubber Bumper
32 - Screw
33 - Washer
34 - Rubber Washer
35 - Rubber Mount
36 - Washer
37 - Nut
38 - Clamp
39 - Screw
40 - Spring Tension
41 - Cover
42 - Screw
43 - Nut
44 - Nut
45 - Grease Plug
46 - Reverse Lock Lever
47 - Pin
48 - Tension Spring
49 - Push Rod
50 - Cotter Pin,
51 - Push Rod Guide
52 - Push Rod
53 - Jam Nut
54 - Rod End
55 - Pin
56 - Cotter Pin

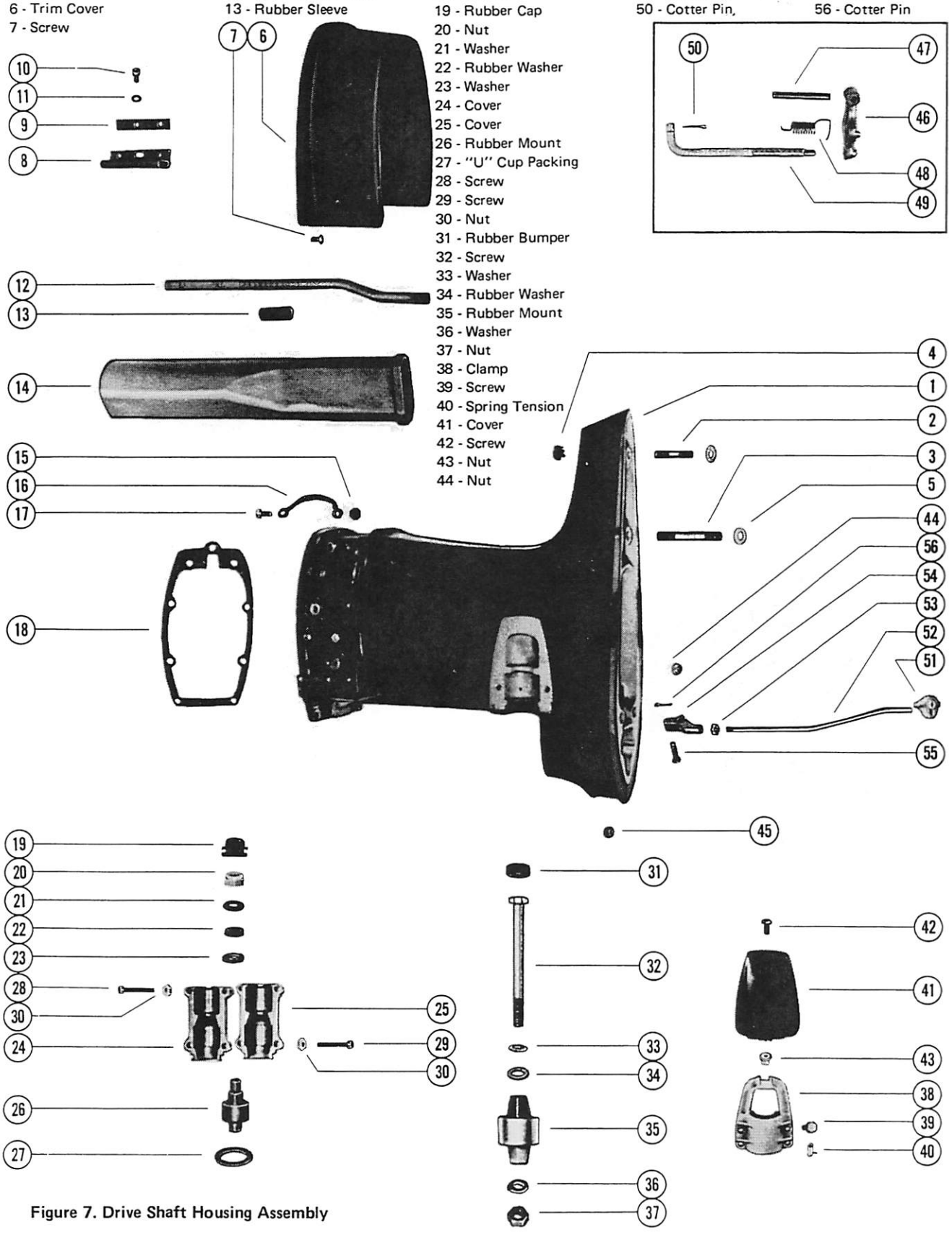
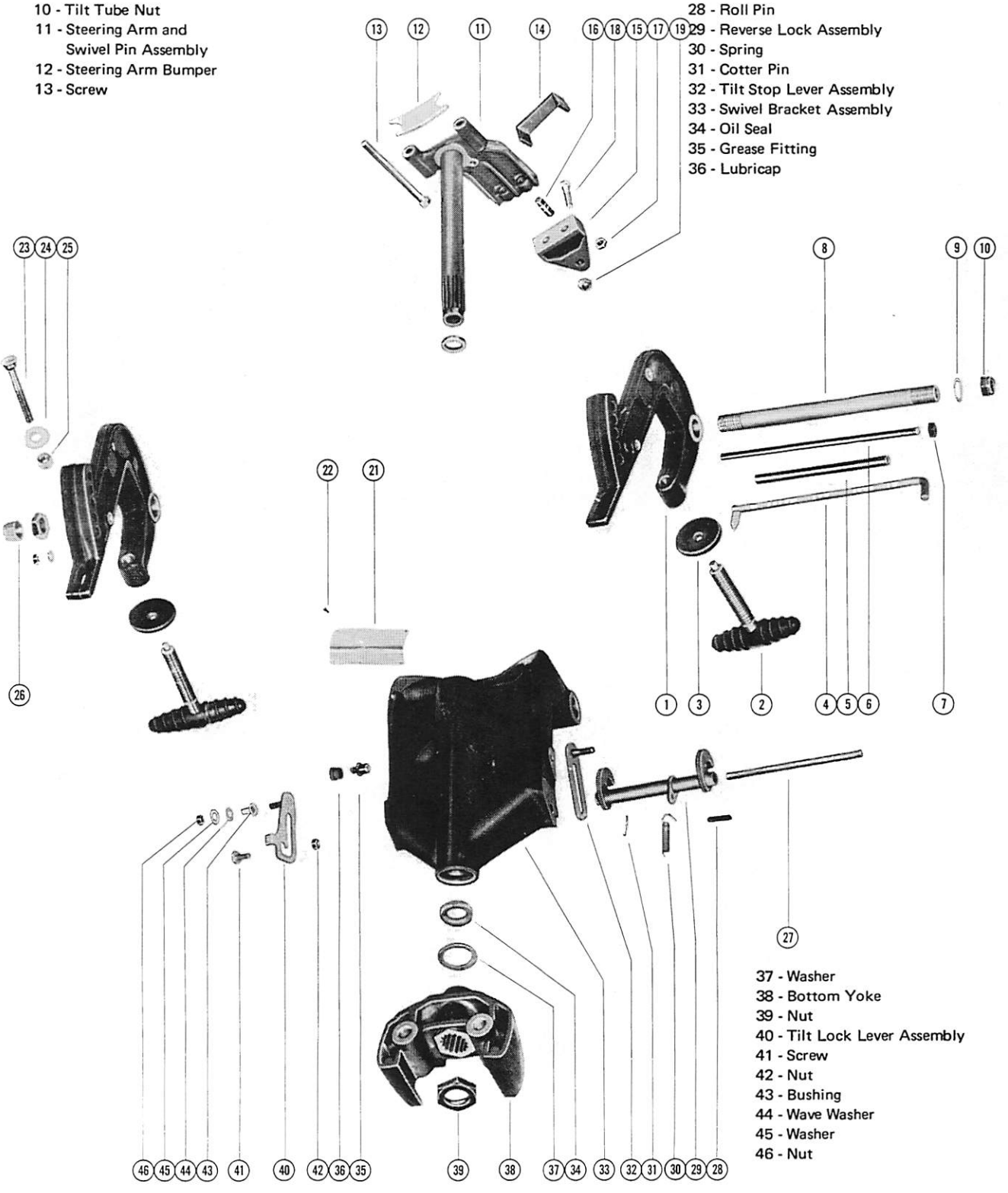


Figure 7. Drive Shaft Housing Assembly

1 - Clamp Bracket Assembly
2 - Thumb Screw Assembly
3 - Washer
4 - Tilt Lock Pin Assembly
5 - Spacer
6 - Stud
7 - Nut
8 - Tilt Tube
9 - Washer
10 - Tilt Tube Nut
11 - Steering Arm and Swivel Pin Assembly
12 - Steering Arm Bumper
13 - Screw
14 - Steering Arm Bumper
15 - Remote Steering Bracket
16 - Stud
17 - Nut
18 - Screw
19 - Nut
20 - Washer
21 - Serial Plate
22 - Drive Screw
23 - Bolt
24 - Washer
25 - Nut
26 - Cap
27 - Reverse Lock to Swivel Bracket Shaft
28 - Roll Pin
29 - Reverse Lock Assembly
30 - Spring
31 - Cotter Pin
32 - Tilt Stop Lever Assembly
33 - Swivel Bracket Assembly
34 - Oil Seal
35 - Grease Fitting
36 - Lubricap



37 - Washer
38 - Bottom Yoke
39 - Nut
40 - Tilt Lock Lever Assembly
41 - Screw
42 - Nut
43 - Bushing
44 - Wave Washer
45 - Washer
46 - Nut

Figure 1. Clamp and Swivel Bracket Assembly

DRIVE SHAFT HOUSING, DYNA-FLOAT SUSPENSION and MOUNTING YOKES

REMOVAL

1. Remove screws from trim cover and remove trim cover.
2. Refer to "Powerhead" Section 5 and remove powerhead.
3. Refer to "Disassembly", following, and remove saddle, clamp and swivel bracket.

DISASSEMBLY

1. Remove cross pin which holds reverse lock lever in drive shaft housing. (Figure 1)
2. Remove Dyna-Float mount covers. (Figure 2)

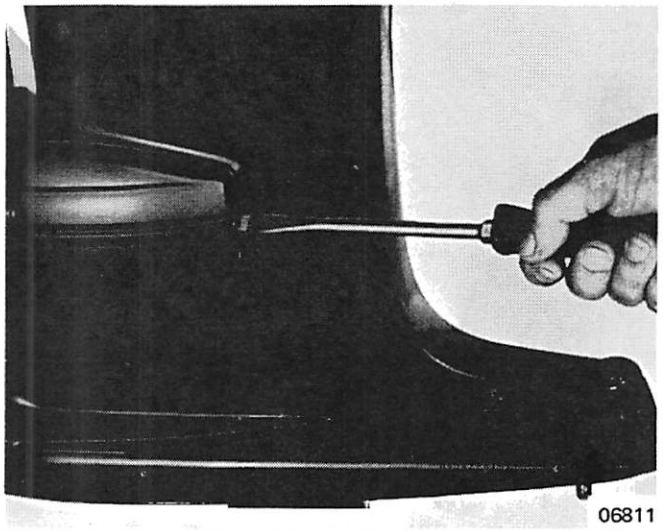


Figure 2. Removing Covers

CAUTION: Covers are spring loaded.

3. Pull rubber bumpers from heads of mounting bolts.
4. Remove nuts from lower mounting bolts. (Figure 3)

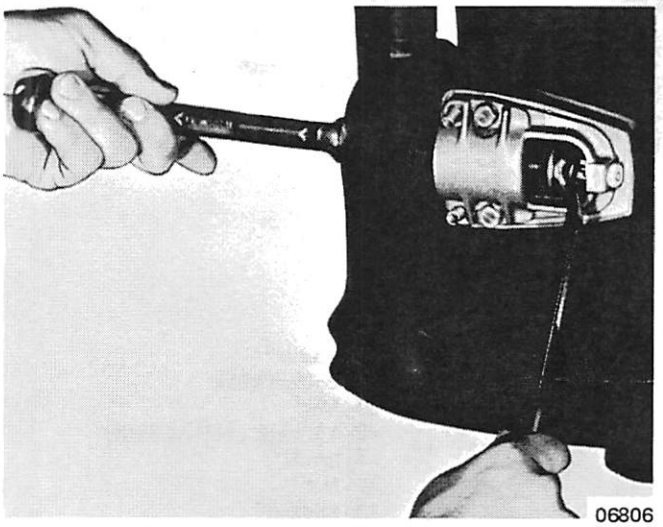


Figure 3. Removing Mounting Nuts

5. Remove rubber caps from upper mounts.
6. Remove nuts from upper yoke studs.
7. Remove drive shaft housing by pulling from top and bottom yokes. (Figure 4)

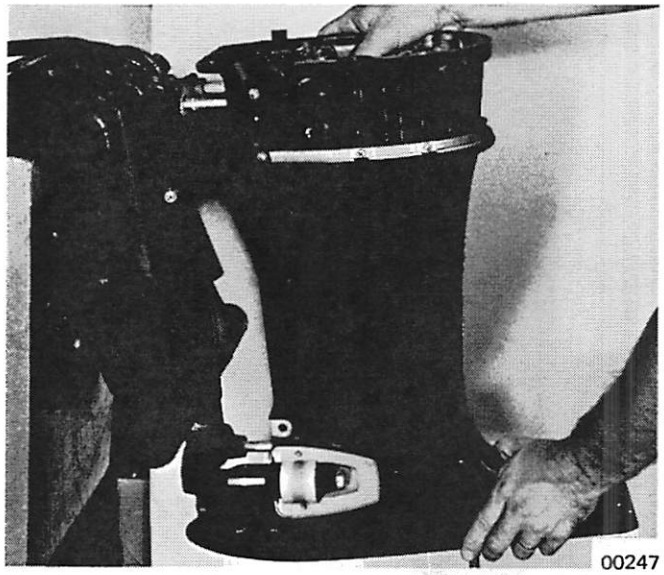


Figure 4. Removing Drive Shaft Housing

8. Remove top mounts by removing 4 screws.
   a. Remove "U" cup packing seal.
   b. Separate inner and outer halves.
9. Remove 2 cap screws and remove mount clamp. Rubber mount may be removed. (Figure 5)

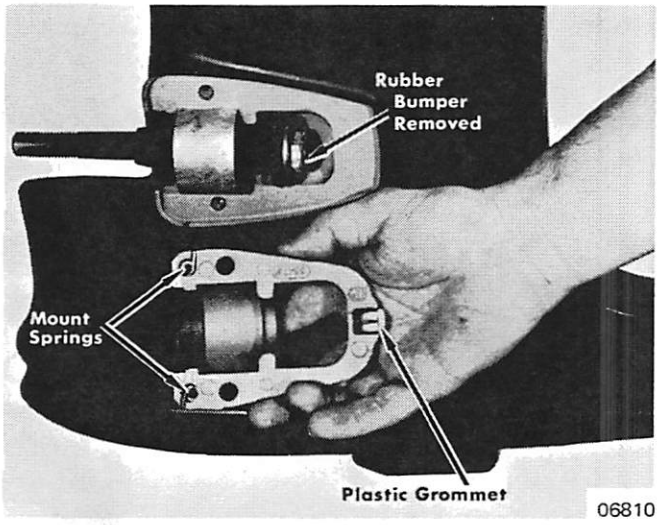


Figure 5. Rubber Mount Clamp Removal

10. Remove self-locking nut from bottom of swivel pin. Earlier models have a snap ring in place of locknut.
11. Tap lower yoke from swivel pin with a mallet.
12. Pull or tap swivel pin from swivel bracket. On earlier engines, the co-pilot assembly first must be removed.

REASSEMBLY

1. Lubricate swivel pin with Quicksilver Multipurpose Lubricant (C-92-49588).
2. Drive swivel pin into swivel bracket. Replace co-pilot assembly on earlier models.
3. Insert lower yoke on splines of swivel pin. Be sure that lower yoke aligns squarely with top yoke.
4. Replace snap ring or nut. DO NOT over-tighten nut, as swivel pin must turn freely.
5. Place top mounts into inside and outside covers and install "U" cup seal.
6. Install upper mount assemblies into drive shaft housing. DO NOT tighten screws at this time.
7. Place lower mounts on bolts and position in recesses in drive shaft housing. (Figure 5) Place washers on threaded end of bolt. Install mount clamp.
8. With upper and lower yoke bracket in position, place drive shaft housing onto yoke brackets. (Figure 4)
9. Place large inside diameter steel washer, spacer and rubber washer on each top yoke stud and tighten nuts.
10. Tighten 4 screws and nuts on each top mount cover.
11. Insert rubber cap.
12. Install washers and nuts on lower mounts and tighten. (Figure 3)

TRIM TAB INSTALLATION

1. Remove plug (located in drive shaft housing directly above trim tab).
2. Loosen socket head screw (located in drive shaft housing) with an allen wrench until trim tab can be removed.
3. Scrape small area of gear housing surface, that touches trim tab, down to bare metal.

   IMPORTANT: In order to be effective, new trim tab must make good contact with surface to which it is being fastened.
4. Place new trim tab in position and thread socket head screw into it. Before tightening screw, place trim tab in position that old tab was in before removal. See Section 1 for "Trim Tab Adjustment".

   NOTE: Trim tab should be positioned so that steering wheel will turn with equal ease in each direction at cruising speed. If boat turns more easily to right than to left, loosen socket head screw and move trim tab trailing edge to the right. Reverse procedure if boat turns more easily to left than right.
5. Tighten socket head screw securely and replace plug.

SECTION 6 - LOWER UNIT

MERCURY
OUTBOARDS

PART C - 6-CYL. and 800 (4-CYL.) - 650

MERCURY
MARINE

INDEX

GEAR HOUSING

REMOVAL

REMOVING GEAR HOUSING from DRIVE SHAFT HOUSING

1. Drain lubricant from gear housing by removing filler hole screw and vent screw. (Figure 1) Do not lose washers. Replace washers and screws after draining.
2. Remove the propeller.
3. Remove three 5/8" hexagon head locknuts which hold gear housing assembly to drive shaft housing (leading edge).
4. Remove two 5/8" hexagon head locknuts (located in center bottom side of anti-cavitation plate).
5. Remove trim tab under trailing edge of anti-cavitation plate by removing plastic plug and screw from drive shaft housing.
6. Remove screw from rear bottom of drive shaft housing.
7. Separate gear housing from drive shaft housing.
8. Remove upper reverse locking cam and nylon spool sleeve from upper shift shaft.

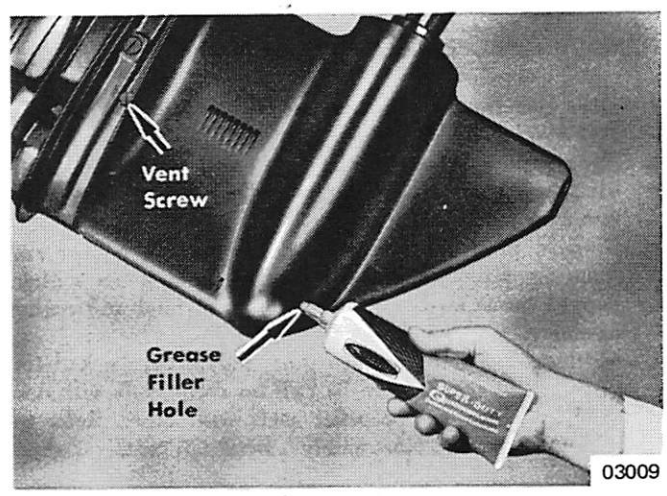


Figure 1. Gear Housing

INSTALLATION

JOINING GEAR HOUSING and DRIVE SHAFT HOUSING

1. If water inlet tube-to-powerhead is pulled out when gear housing was removed, coat tube upper end with New Multipurpose Quicksilver Lubricant (C-92-49588), so that it will slip easily into rubber seal in bottom cowl, and insert into recess in powerhead.
2. Place light coat of Multipurpose Lubricant on bottom end of water tube.
3. Apply heavy coat of Multipurpose Lubricant on drive shaft splines.
4. Insert 7/32" allen head water pickup screw in place on top of gear housing.
5. Check that shift control lever and lower unit are in forward gear before installing gear housing.
6. Insert drive shaft into drive shaft housing, aligning water tube with water pump body outlet and drive shaft splines with crankshaft, then sliding into place while joining housings.

   NOTE: Be careful that water inlet tube enters plastic water tube guide in water pump body recess and rubber seal in water pump cover.

7. Place shift control lever in neutral, then in forward to check that upper and lower shift shaft splines are properly aligned.
8. Rotate propeller shaft by pulling lightly on starter rope to cause drive shaft splines to enter crankshaft splines. Upper and lower shift shaft splines also must be aligned.
9. With 2 housings joined, install and tighten 5 elastic stop nuts and one 5/16" allen head screw.
10. Install water pickup and trim tab and torque 7/32" allen head screw to 180 in. lbs. thru plastic plug hole in drive shaft housing, then replace plastic plug.
11. Refer to "General Information" Section IC and fill gear housing with lubricant.

INSTALLING PROPELLER (Figure 2)

1. Place thrust hub and washer assembly into propeller hub (shoulder into recess of propeller).
2. Apply thin coat of New Multipurpose Quicksilver Lubricant (C-92-49588) on splines of propeller shaft. (Figure 2)
3. Align propeller hub splines with splines of propeller shaft and slide propeller on shaft. Tap into position if necessary.
4. Replace splined washer and tab washer.
5. Replace propeller nut and tighten with adjustable wrench.
6. Bend three tabs on tab washer to lock.

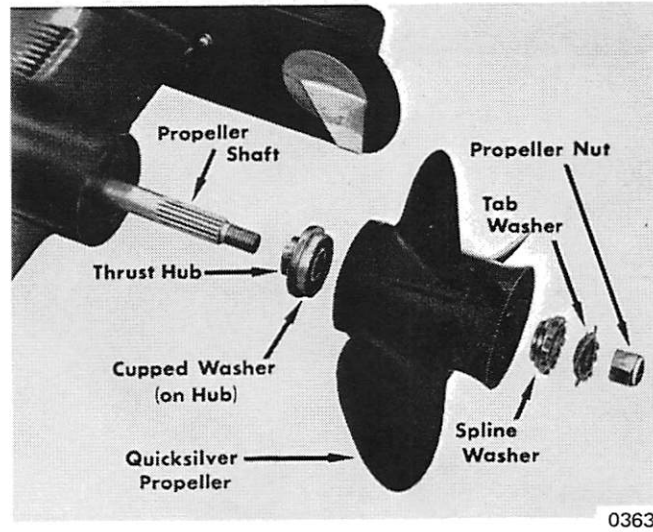


Figure 2. Propeller Installation - Merc 650 and 800 (4-Cyl.)

PROPELLER SHAFT

DISASSEMBLY

REMOVING PROPELLER SHAFT and COMPONENTS

1. Place gear housing assembly in vise between 2 blocks of soft wood to prevent marring surface.
2. Place a piece of wood flat between propeller and anti-cavitation plate to prevent propeller from turning while removing the propeller nut.
3. Remove propeller by bending tabs on tab washer and removing propeller nut (right hand thread), tab washer, cupped thrust washer, propeller and thrust hub and washer assembly.
4. At this time, lash between gears should be checked for future reference. (Figure 3) Pull on drive shaft with one hand and push on propeller shaft with other. Refer to backlash later in "Reassembly". Bend tab on tab washer.

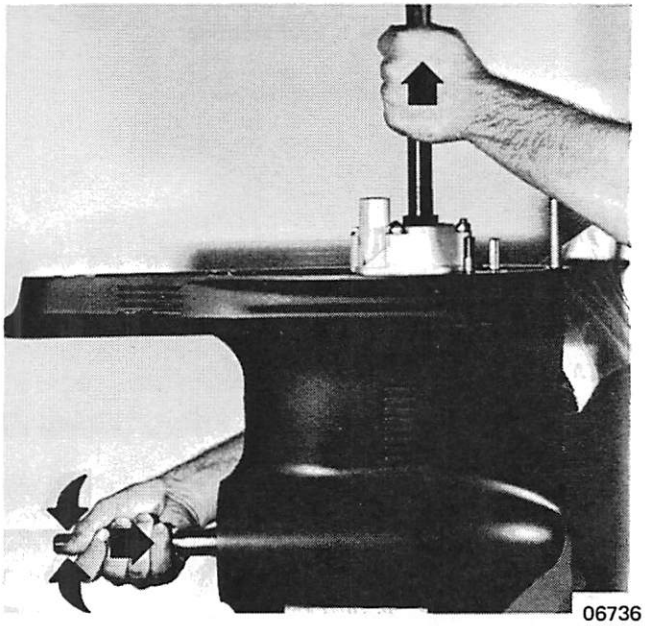


Figure 3. Checking Gear Lash

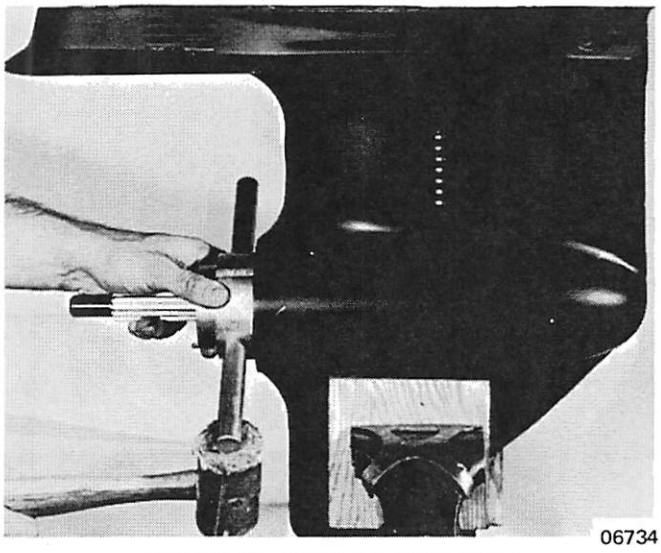


Figure 4. Removing Gear Case Cover

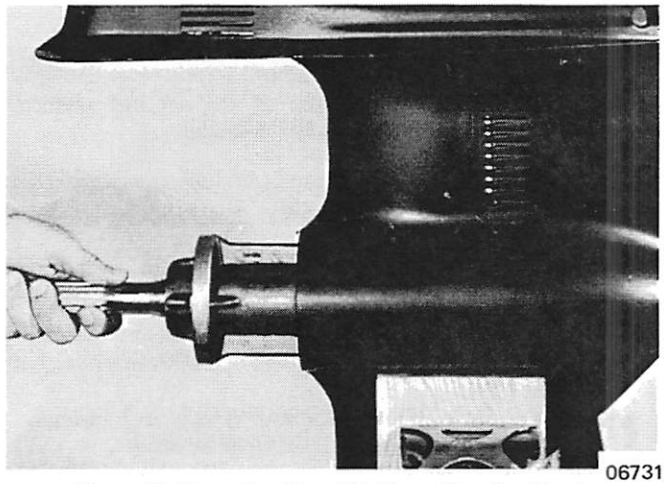


Figure 5. Removing Prop Shaft and Bearing Carrier

5. Remove gear housing cover and washer with Gear Housing Cover Tool (C-91-30291A1). Place tool over end of propeller shaft and set tool into cover, turning counter-clockwise (right hand thread) to loosen. (Figure 4) If tight, strike handle of tool with mallet to loosen.
6. Bearing carrier assembly can be removed while removing propeller shaft. (Figure 5) Place propeller shaft in vise between 2 pieces of soft wood. Shaft assembly then can be removed by tapping lightly and evenly on skeg of gear housing with a mallet. Remove key from keyway from inside bottom of gear housing.
7. Remove propeller shaft from bearing carrier.
8. Remove reverse gear from bearing carrier with C-91-27780 tool, as shown in Figure 6.

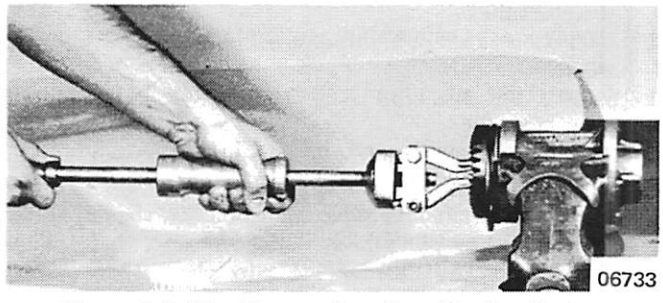


Figure 6. Pulling Reverse Gear from Bearing Carrier

9. Remove "O" ring from carrier.
10. Press roller bearing and seal from carrier assembly on arbor press with Bearing Mandrel C-91-24288A3) and Bearing Adaptor (C-91-30406). Adaptor must be put on mandrel with large shoulder facing bearing.

DISASSEMBLY of PROPELLER SHAFT and GEAR ASSEMBLY

1. Use screwdriver to detach retaining ring from sliding clutch. Do not over-stretch, or ring will lose its shape and tension. (Figure 7)
2. Remove sliding clutch from propeller shaft by setting cam follower in place in end of propeller shaft. (Figure 8) Press

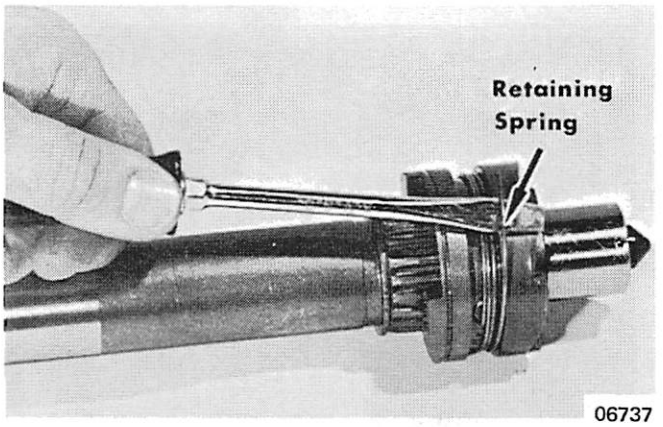


Figure 7. Removing Sliding Clutch Retaining Ring

against cam follower and, with small punch, push cross pin out of sliding clutch.

3. Sliding clutch now is free to be removed from propeller shaft, with cross pin slide and spring dropping free from inside of propeller shaft.
4. Remove lower reverse locking cam from shift shaft bushing. Remove shift shaft bushing, using Shift Shaft Tool (C-91-31107) and pull shift shaft out of gear housing. Shifting cam then will fall out of gear housing.

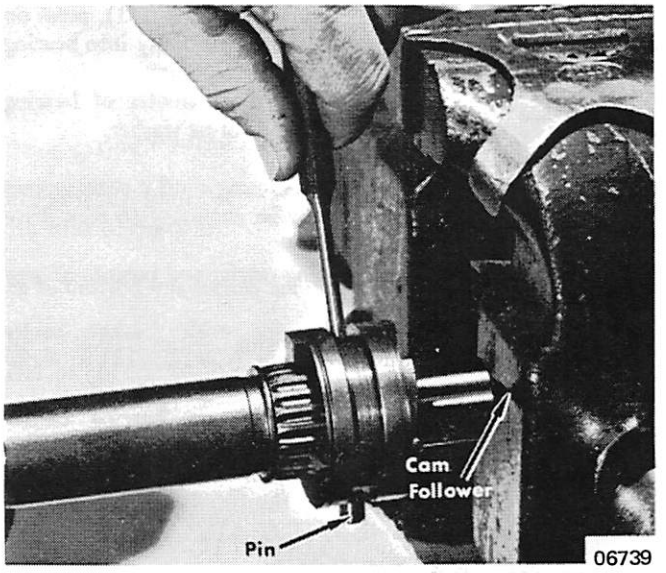


Figure 8. Removing Sliding Clutch

REASSEMBLY

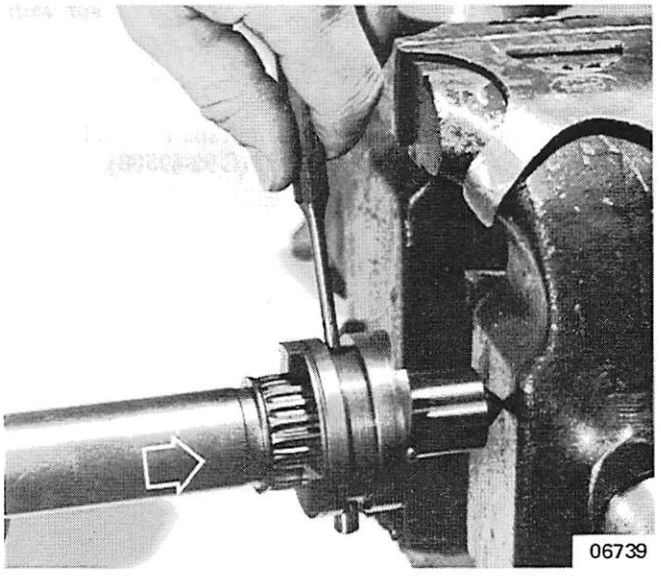


Figure 1. Installing Cam Follower

1. Install cam follower spring and cam follower slide inside hollow end of propeller shaft so that holes in cam follower slide match hole in propeller shaft. (Figure 1)
2. Place sliding clutch onto propeller shaft and install cam follower in end of propeller shaft.
3. Compress spring inside propeller shaft by pressing on cam follower until holes in sliding clutch, propeller shaft and cross pin line up.
4. Place cross pin thru sliding clutch, propeller shaft and slide.
5. Install cross pin retaining ring around sliding clutch. Do not over-stretch spring when installing.
6. Place propeller shaft assembly into forward gear assembly in gear housing.

INSTALLATION of BEARING CARRIER

1. Press roller bearings into bearing carrier from rear of housing with Needle Bearing Driver (C-91-31109). (Figure 2) Press first bearing in with long end of needle bearing driver, second bearing with short end of tool.

   NOTE: Later production engines have only one roller bearing. Press bearing into bearing carrier with bearing part numbers facing outward (aft).

2. Press oil seals in with Oil Seal Driver (C-91-31108) to seat on shoulder in front of roller bearing. (Figure 3) Seat first one with lip inward, using deep shouldered end of oil seal driver, and second with lip of seal out, using opposite end of tool.

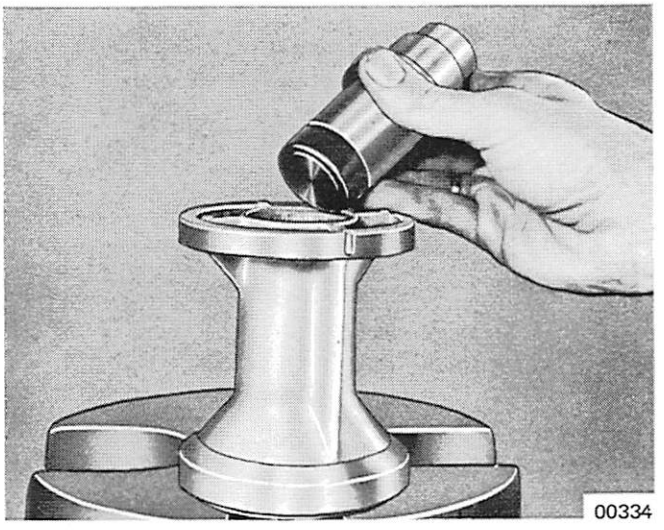


Figure 2. Installing Roller Bearings in Carrier

3. Install reverse gear ball bearing and thrust washer (with beveled side of thrust washer toward reverse gear).
4. With Propeller Shaft Gear Tool (C-91-26376A1), press on inner race of bearing and press gear assembly into bearing carrier.
5. Replace large "O" ring on outside diameter of bearing carrier between bearing carrier and thrust washer.
6. Install shims in gear housing.
7. Push bearing carrier into gear housing until it seats against ball bearing thrust ring. It may be necessary to turn drive shaft.
8. Place key in keyway in bearing carrier and bottom of gear housing.
9. Coat threads of gear housing with Gasket Sealer (C-92-28804) or Liquid Neoprene (C-92-25711) to facilitate easy future removal of gear housing cover.
10. Place gear housing cover washer on bearing carrier shoulder.
11. Thread gear housing cover onto gear housing and tighten in clockwise direction with Gear Housing Cover and Propeller Gear Locknut Tool (C-91-30291A1).
12. Check reverse gear lash as follows:
    a. Shift into reverse gear.
    b. Turn propeller shaft counterclockwise to take up free play.
    c. Shift into neutral.
    d. Turn propeller shaft 1/8" counterclockwise.
    e. Try to shift into reverse and hold, while pulling out on propeller shaft in both directions. A .008" to .012" backlash should be felt.
    f. Add or subract shims under carrier to obtain correct lash.
13. Bend tab washer into gear housing cover notch to hold cover.
14. Turn shift shaft counterclockwise until cam follower is felt against first notch on shift cam. This is forward gear.

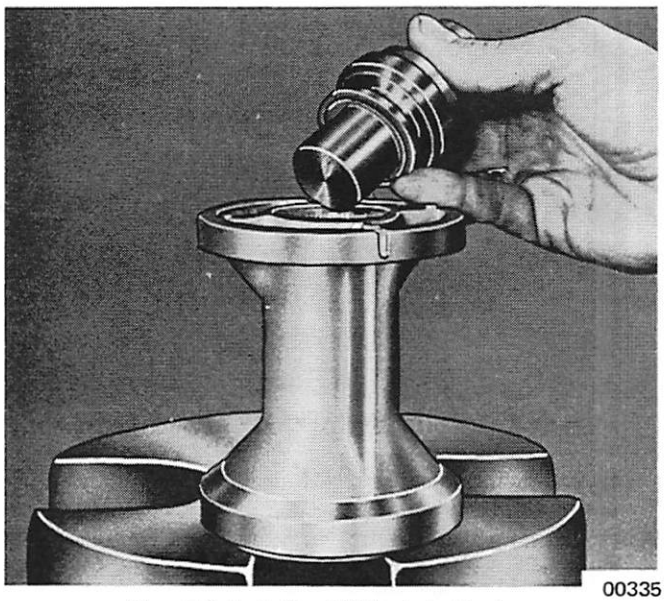


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Figure 3. Installing Oil Seals in Carrier

15. With lower unit in forward gear, place reverse lock cams on shift shaft.

NOTE: Place lower spacer on bottom, reverse locking cam in middle and nylon spacer on top. It is important that lower unit is in forward gear and reverse lock cams are installed in proper sequence, or motor will not shift properly.

16. After replacing shift cams and nylon spacer cam, lubricate parts with Multipurpose Lubricant (C-92-49588).

WATER PUMP DISASSEMBLY

1. Set gear housing in vise in upright position with skeg held between blocks of wood.
2. Remove water intake hose from water pump housing.
3. Remove centrifugal slinger from drive shaft.
4. Remove water pump body assembly by removing one ½" nut and lockwasher, two 7/16" nuts and lockwashers, plus one 7/16" cap screw and lockwasher.
5. Remove water pump insert, impeller and impeller pin along with water pump body, gasket, water pump face plate and gasket face plate to gear housing and oil seal (Figure 5).
6. Check impeller and water pump insert closely for wear or damage.
7. Remove flushing screw, seal and gasket to allow water pump base assembly to be lifted out.
8. Remove "O" ring and oil seal from base plate assembly and watch for shims under base assembly.

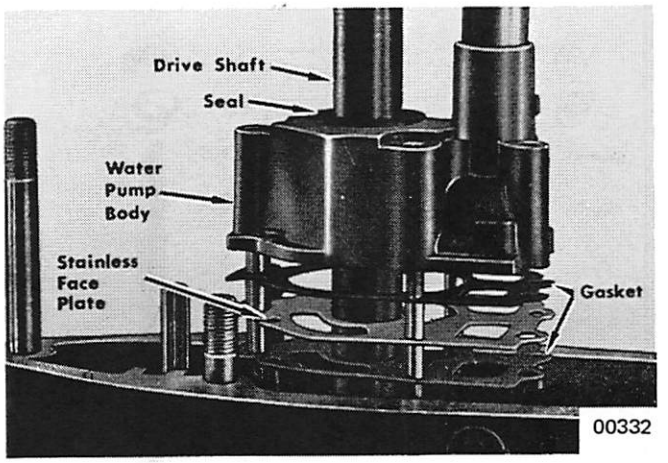


Figure 5. Removing Water Pump Assembly

REASSEMBLY

1. Place seal in water pump base assembly. Upper oil seal is installed with lips facing up. Lower seal is installed with lips down.
2. Place water pump base assembly in position in gear housing, using Water Pump Base Assembly Tool (C-91-38461), on drive shaft. Place grease on seals.
3. There should be no play between bearing and water pump base assembly when water pump base assembly is depressed. Add or remove shims as required. No play may be obtained by over-shimming. With a new gasket installed, place a feeler gauge between gear housing and water pump body. If gap, measured between gear housing and water pump body, is .010" (0.254mm), remove .012" (.305mm) shim; if .005" (0.127mm), remove .007" (.178mm) shim. This will allow for .002"-.003" (.051mm-.076mm) compression of gasket and give a zero gap which is correct and should not be altered.
4. Install water pump base-to-face-plate gasket and replace stainless face plate. (Figure 5)
5. Place drive pin on drive shaft, holding in position with dab of New Multipurpose Lubricant (C-92-49588).
6. Check condition of impeller closely and set in place over drive shaft.
7. Insert stainless water pump cartridge in water pump body and place water pump body-to-face-plate gasket on water pump body. (Figure 5)
8. Slide water pump body assembly over drive shaft and impeller. (Figure 6)
9. Turn drive shaft clockwise and press water pump body assembly into place, at same time seating impeller. Be sure that impeller drive pin is in position in drive pin groove of impeller.
10. Replace lockwashers and tighten nuts and cap screw.
11. Place plastic water tube guide in water pump body recess. (Figure 6) Install centrifugal slinger onto drive shaft.
12. Place gear housing in vise so that gear housing cover is facing up. Use jaw protectors or wood blocks to prevent marring gear housing.
13. Check forward gear lash (at least .006" to .008") between forward gear and pinion gear at this time. If too tight, remove forward shim until correct back lash is obtained. If too much, add shims 'til correct. Be sure that conical angle of gears is true. Gears should fully engage each other on length of tooth. Shimming of drive shaft ball bearing may be necessary to obtain correct backlash (.006"-.008"), if unable to do so with forward gear shims.

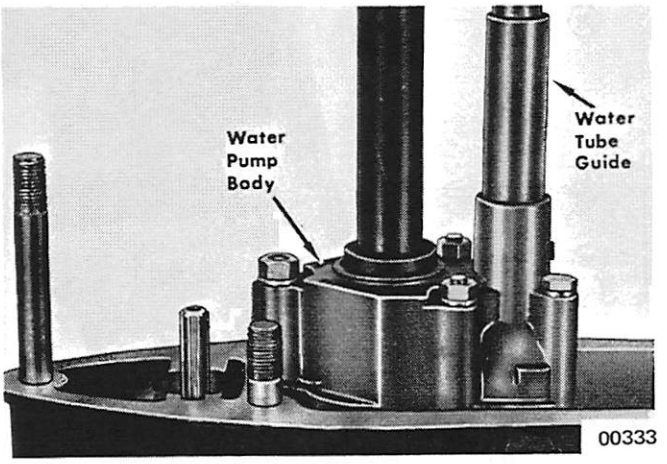
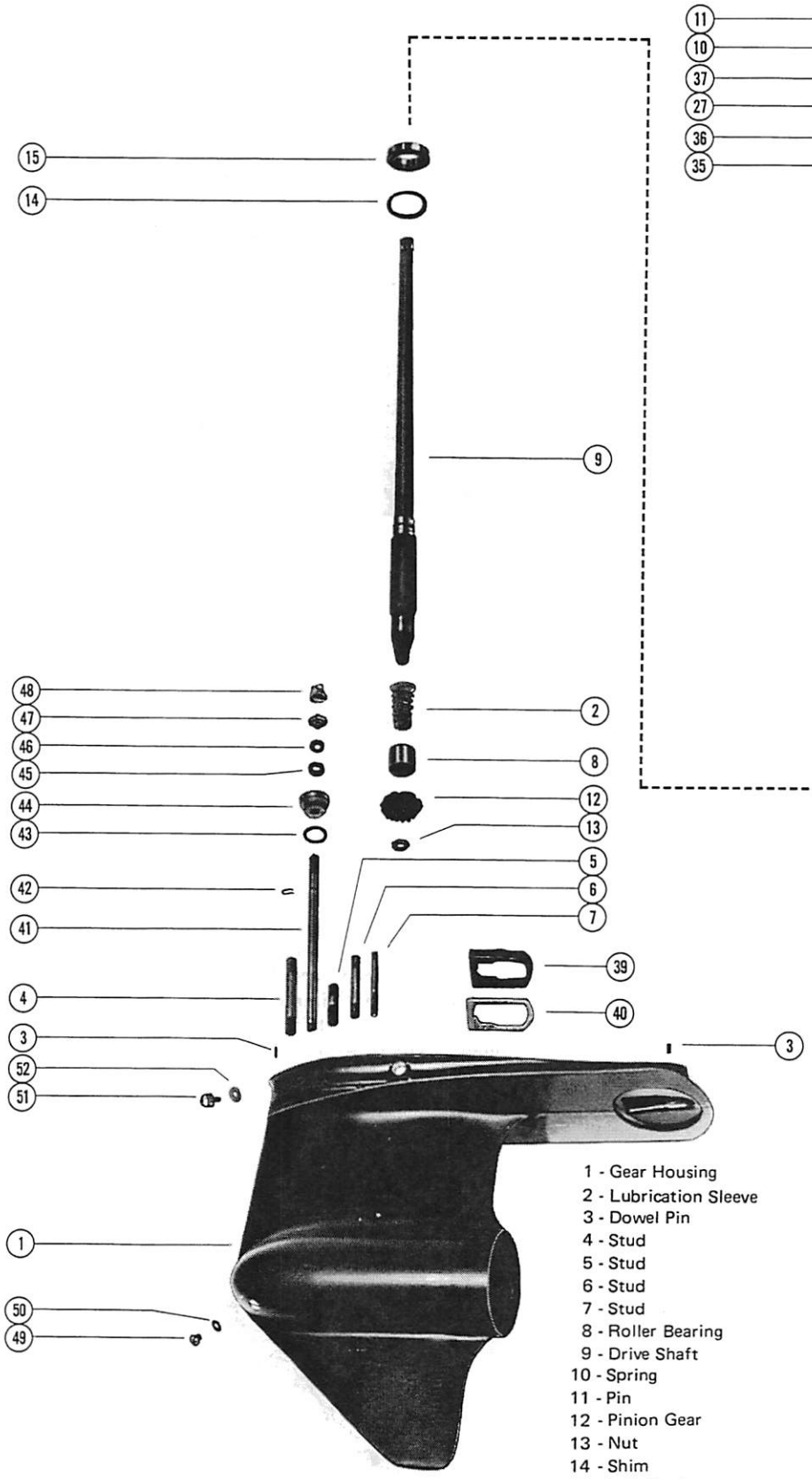


Figure 6. Water Pump Assembly Installed



1 - Gear Housing
2 - Lubrication Sleeve
3 - Dowel Pin
4 - Stud
5 - Stud
6 - Stud
7 - Stud
8 - Roller Bearing
9 - Drive Shaft
10 - Spring
11 - Pin
12 - Pinion Gear
13 - Nut
14 - Shim
15 - Ball Bearing
16 - Gasket
17 - "O" Ring
18 - Water Pump Base Assembly
19 - Oil Seal
20 - Oil Seal
21 - Dowel Pin
22 - Lower Gasket
23 - Face Plate
24 - Upper Gasket
25 - Water Pump Body Assembly
26 - Insert
27 - Oil Seal
28 - Rubber Seal
29 - Impeller
30 - Key
31 - Screw
32 - Lockwasher
33 - Washer
34 - Nut
35 - Washer
36 - Nut
37 - Ring
38 - Guide Sleeve
39 - Exhaust Tube Seal
40 - Support Plate
41 - Shift Shaft
42 - Retaining Clip
43 - "O" Ring
44 - Bushing Assembly
45 - Oil Seal
46 - Rubber Washer
47 - Lower Spacer
48 - Reverse Locking Cam
49 - Screw
50 - Gasket
51 - Plug
52 - Washer

Figure 7. Typical Gear Housing Assembly

1 - Gear Housing
2 - Shift Cam
3 - Cam Follower
4 - Cross Pin Slide
5 - Compression Spring
6 - Shim
7 - Tapered Roller Bearing Assembly
8 - Roller Bearing
9 - Forward Gear Assembly
10 - Sliding Clutch Ratchet
11 - Cross Pin
12 - Retaining Spring
13 - Propeller Shaft
14 - Reverse Gear Assembly
15 - Shim
16 - Thrust Washer
17 - Ball Bearing
18 - "O" Ring
19 - Bearing Carrier Assembly
20 - Roller Bearing
21 - Oil Seal
22 - Key
23 - Tab Washer
24 - Gear Housing Cover
25 - Trim Tab Assembly
26 - Screw
27 - Washer
28 - Nut
29 - Screw
30 - Thrust Hub and Washer Assembly
31 - Cupped Washer
32 - Splined Washer
33 - Tab Washer
34 - Propeller Nut

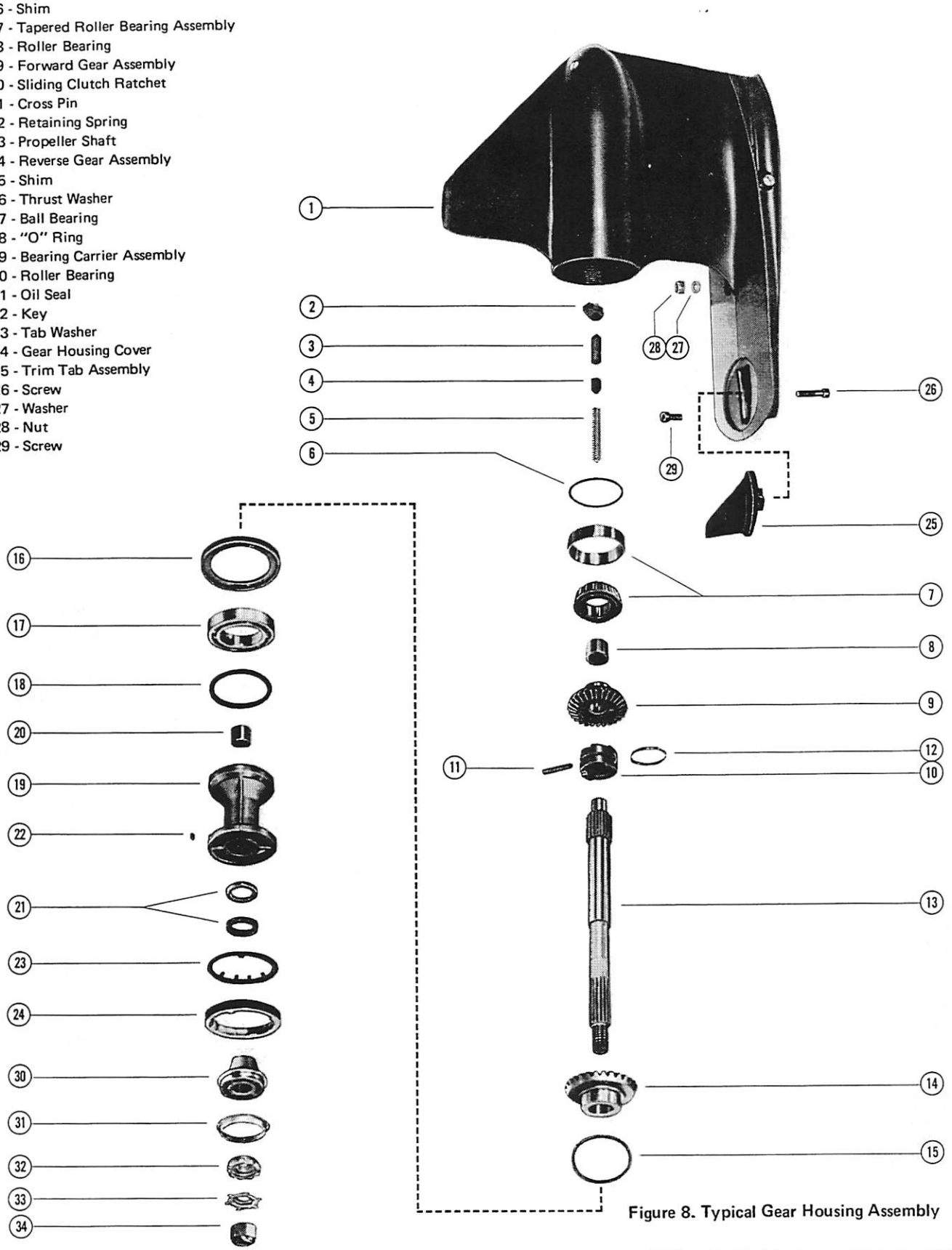


Figure 8. Typical Gear Housing Assembly

DRIVE SHAFT

DISASSEMBLY

REMOVING DRIVE SHAFT and COMPONENTS

1. Place drive shaft in vise as close to gear housing as possible.
2. Remove ¾" nut from drive shaft pinion gear with a thin ¾" box-end wrench (Figure 1) (standard thread).

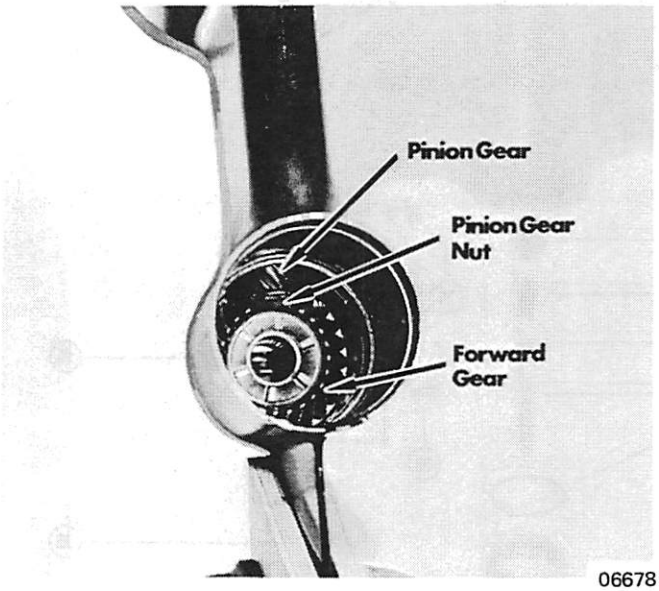


Figure 1. Removing Drive Shaft Pinion Gear

3. To loosen drive shaft, hold gear housing in one hand and tap lightly on gear housing with rawhide mallet.
4. Observe any shims under drive shaft ball bearing.
5. Remove ball bearing retaining ring with snap ring pliers.
6. Ball bearing can be removed from drive shaft by placing against open vise jaws and tapping on splined end of drive shaft with a mallet. (Figure 3)
7. Remove forward gear and bearing assembly from gear housing.
8. Remove bearing cup from gear housing with service tool C-91-31228A1. (Figure 2)

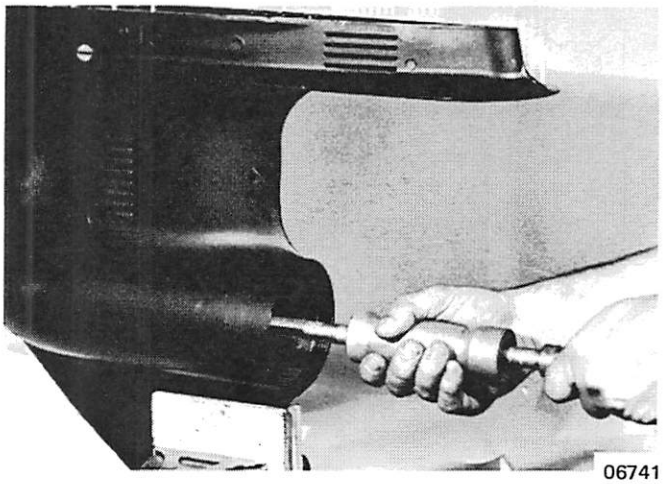


Figure 2. Removing Cup from Gear Housing

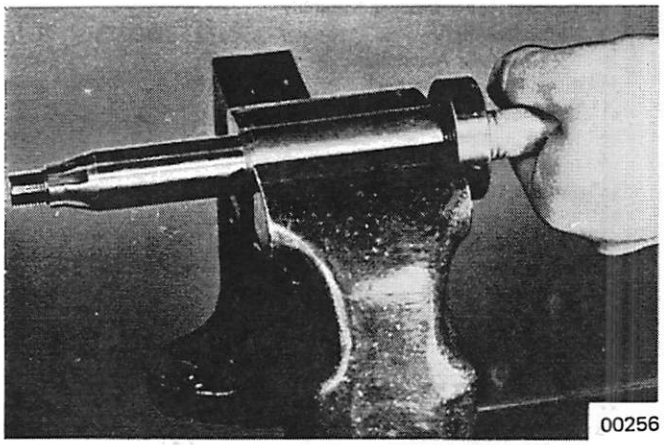


Figure 3. Removing Ball Bearing from Drive Shaft

REMOVING NEEDLE BEARINGS from GEAR HOUSING

1. Remove drive shaft needle bearings from gear housing with Bearing Mandrel (C-91-24288A3) and C-91-30490 sleeve. Use guide collar of correct diameter in bearing seat.
2. Place mandrel in drive shaft end of gear housing cavity.
3. Press bearing out with arbor press or tap on tool with heavy mallet to remove bearing. (Figure 4)

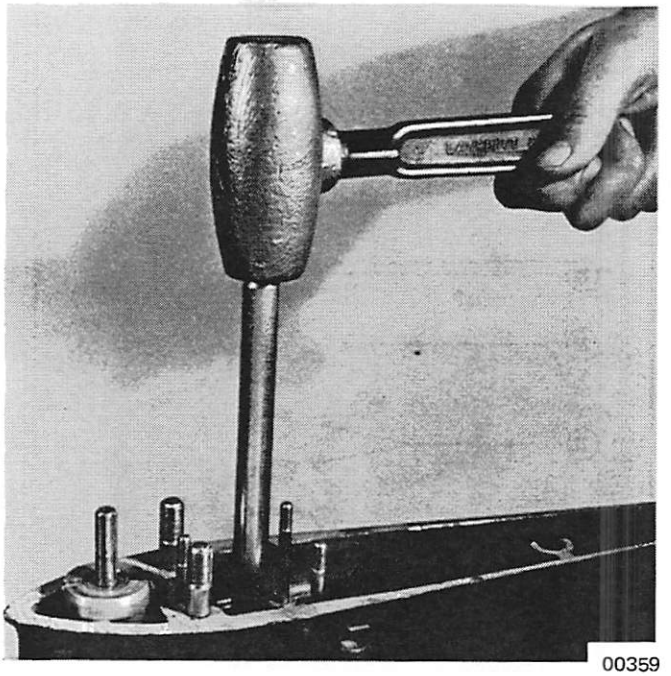


Figure 4. Removing Drive Shaft Needle Bearing from Gear Housing

This completes disassembly of gear housing. All parts now should be washed in cleaning solvent and inspected for wear, replacing those which are worn, not useable or damaged.

REASSEMBLY

REPLACING NEEDLE BEARING in GEAR HOUSING

1. Install drive shaft bearing cartridge into gear housing with Bearing Removing and Installing Kit (C-91-31229A1) and Bearing Puller Head (C-91-36569) which is part of C-91-31229A2 assembly.
2. Place bearing on puller head with numbered side of cartridge facing outward. Numbered side of cartridge must face up. Pull drive shaft needle cartridge bearing in until bearing is recessed evenly on shoulder between upper drive shaft cavity and lower gear cavity.

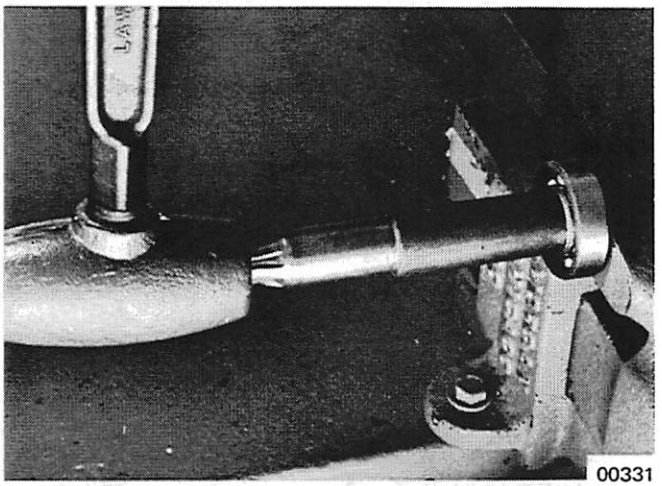


Figure 5. Install Ball Bearing on Drive Shaft

3. Replace shims which were originally removed from forward gear bearing cup of gear housing.
4. Place bearing cup on Driver Cup Tool (C-91-31106) with tapered end of cup against driver cup.
5. Set cup with tool into gear housing on bearing shoulder and place propeller shaft (ratchet end) into center hole of driver cup.
6. Place bearing carrier assembly into housing to act as a guide to hold shaft straight when pressing cup into position.
7. Press forward gear roller bearing outer cup into gear housing.
8. Lubricate needle and roller bearings in gear housing with oil.
9. Place gear housing in vise between jaw protectors at thin section of gear housing so that gear cover end is up.
10. Insert shifting cam into gear housing with notches up and to left when viewing in from skeg. Cam operates to right. (Figure 6)
11. Insert shift shaft lower half so that splines engage shifting cam splines inside housing.
12. Install shift shaft bushing and tighten securely with Shift Shaft Tool (C-91-31107).
13. Press roller bearing onto forward gear (taper of bearings to face away from gear).
14. Place gear and bearing assembly into bearing outer cup.

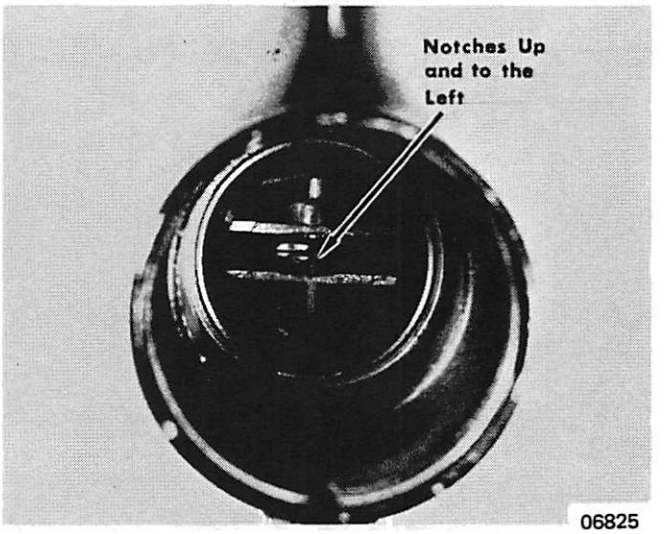


Figure 6. Installing Shifting Cam

INSTALLING DRIVE SHAFT

1. Place ball bearing on drive shaft.
2. Place drive shaft in vise loosely, tapping against pinioned spline end until bearing seats. (Figure 5)
3. Replace locking ring on drive shaft to hold ball bearing in place.
4. Place shims as required, or as previously removed, into drive shaft ball bearing recess in gear housing.
5. Lubricate ball bearing and insert drive shaft assembly into gear housing. DO NOT seat drive shaft.
6. Place pinion gear on splined end of drive shaft. Tap drive shaft assembly to seat in gear housing.
7. Place drive shaft in vise close to housing and install ¾" nut at pinion. Torque to 60 ft. lbs. (8.295mkg). Chamfer on nut must be toward pinion.
8. Remove drive shaft from vise and install skeg of gear housing in vise between 2 blocks of wood or jaw protectors with drive shaft facing up.
9. Replace shims, as required, on top of drive shaft bearing before replacing water pump base assembly.

REVERSE HOOK

DISASSEMBLY

1. Remove gear housing.
2. Remove 3 nylon cams.
3. Remove reverse latch and push rod assembly.

REASSEMBLY

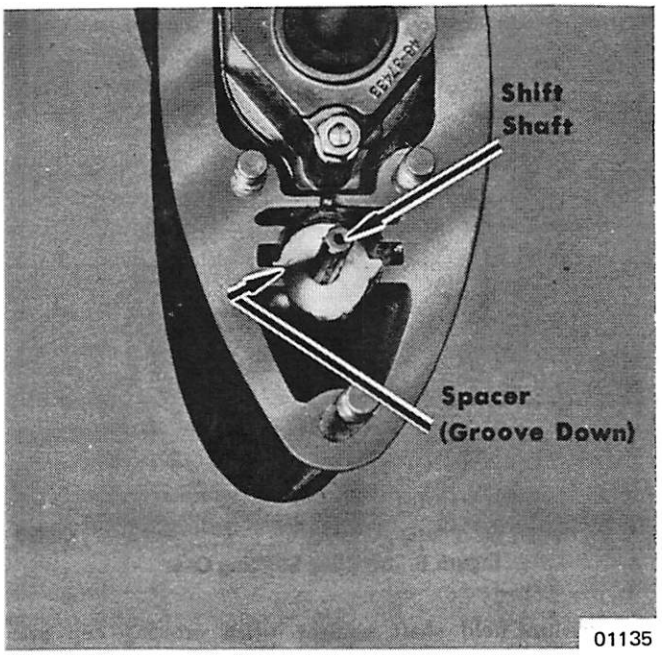


Figure 1. Spacer Installed

1. Install spacer over gear housing shift shaft with groove down. (Figure 1)
2. Install cam over gear housing shift shaft while unit is in reverse. Note that cam must be positioned so that upper flat of cam is facing front of gear housing when in reverse shift position. (Figure 2) To check cam for correct positioning on shift shaft, shift lower unit into neutral. Cam then should be positioned as shown in Figure 3.

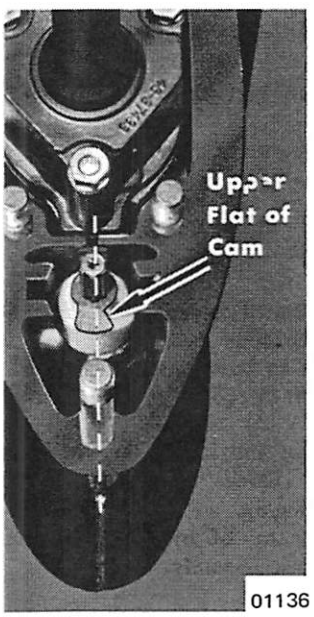


Figure 2. Cam in Reverse

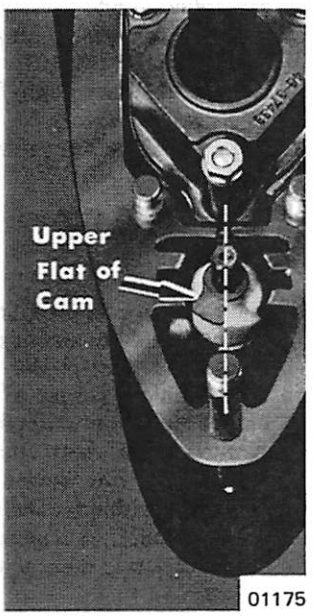


Figure 3. Cam in Neutral

3. Install new reverse lock and shaft assembly and connect tension spring to reverse lock. (Figure 4)
4. Install push rod guide into drive shaft housing, sliding over upper shift shaft coupling and push rod. (Figure 5)

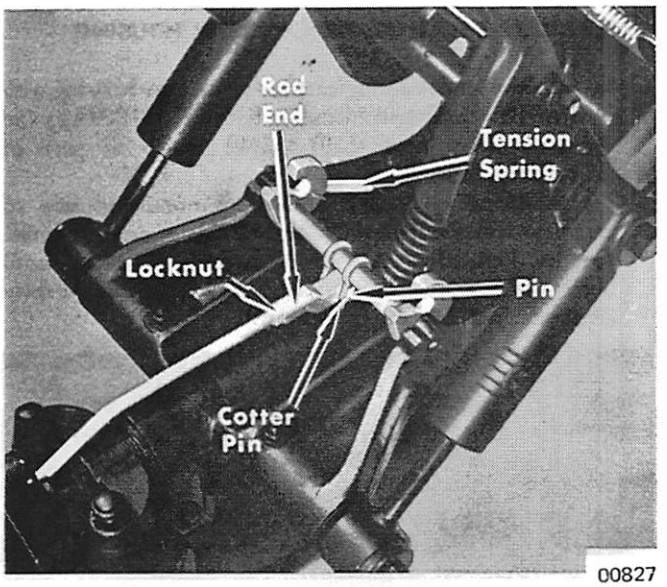


Figure 4. Reverse Latch Hook Assembly

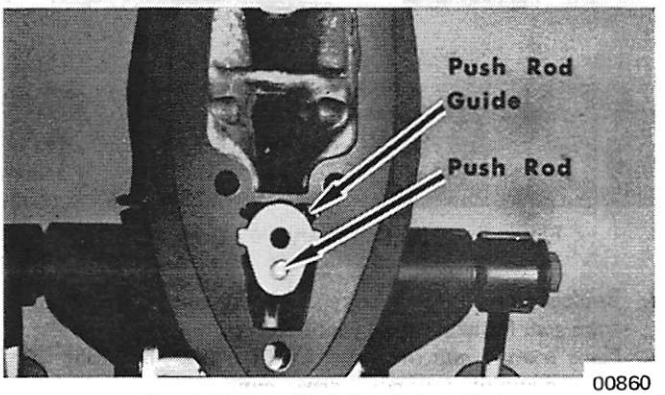


Figure 5. Push Rod Guide Installed

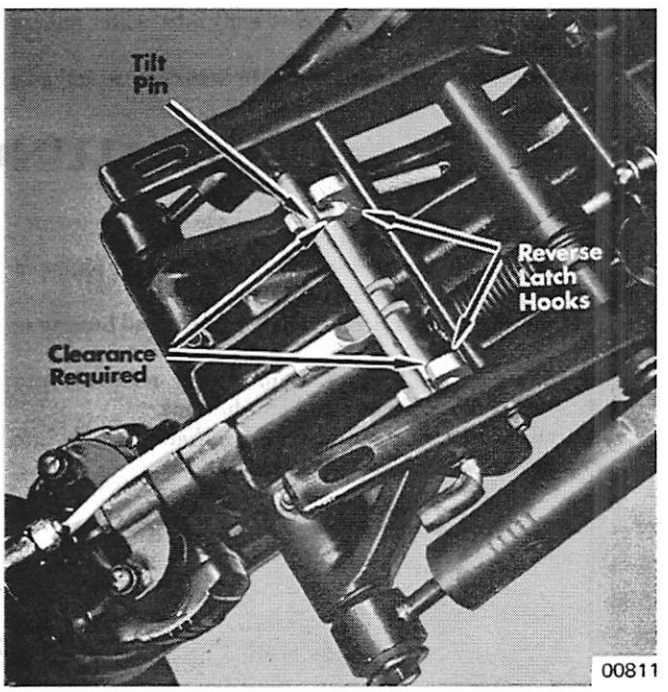


Figure 6. Latch Hooks Position in Forward Gear

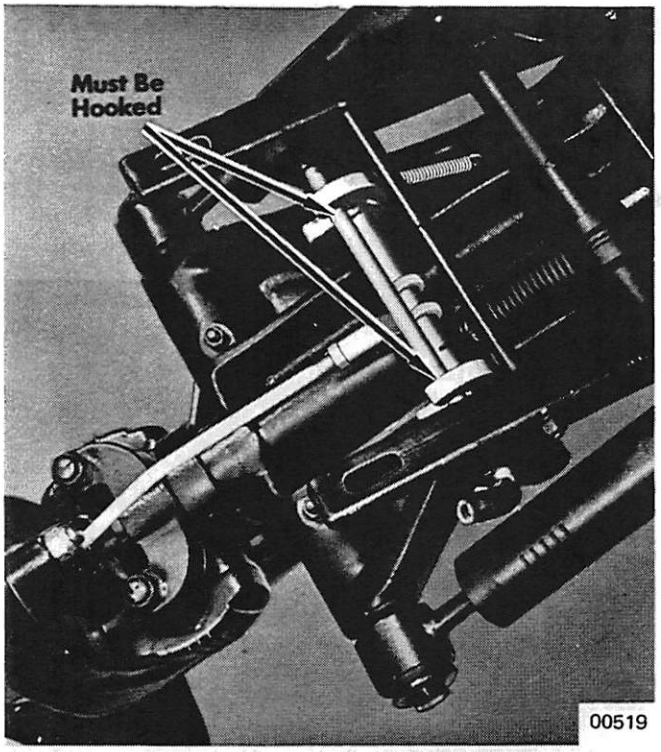


Figure 7. Latch Hooks Position in Reverse Gear

5. Check that both shift control lever and lower unit are in neutral gear, then install gear housing to drive shaft housing.

6. Place engine in forward gear and check reverse latch. Be certain that reverse latch hooks clear tilt pin when tilting. (Figure 6)
7. Check in neutral and reverse gear positions and make sure that reverse latch is hooked in both positions when tilting. (Figure 7) To check, pull back on lower unit, and reverse latch hook must be positioned against tilt pin as shown in Figures 7 and 8.

NOTE: If adjustment is necessary, remove cotter key and pin from rod end and adjust in or out until latch operates as described in Steps 6 and 7, preceding.

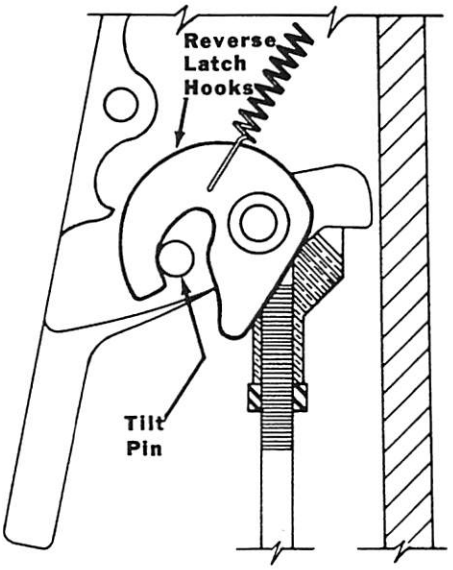


Figure 8. Reverse Latch Hook

DRIVE SHAFT HOUSING and DYNA-FLOAT SUSPENSION

3, 4 and 6 CYLINDER MODELS

REMOVAL

1. Remove screws from trim cover and remove trim cover. (Figure 1)
2. Refer to "Powerhead" Section 5 and remove powerhead.
3. Refer to "Disassembly", following, and remove saddle, clamp and wrench bracket.

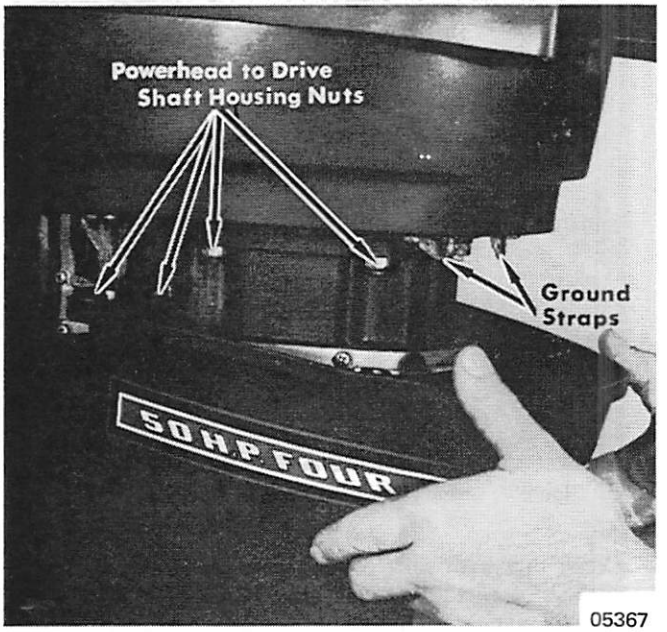


Figure 1. Trim Cover

DISASSEMBLY

DRIVE SHAFT HOUSING & DYNA-FLOAT MOUNTS (Fig. 3)

1. Remove cross pin which holds reverse lock lever in drive shaft housing. Remove lower mount covers.
2. Remove Dyna-Float mount covers (if not already removed in previous step).
3. Pull rubber bumpers from heads of mounting bolts.

4. Remove nuts from lower mounting bolts.
5. Remove rubber caps from upper mounts.
6. Remove nuts from upper yoke studs.
7. Remove drive shaft housing by pulling from top and bottom yokes. (Figure 2)
8. Remove top mounts by removing 4 screws.
   a. Remove "U" cup packing seal.
   b. Separate inner and outer halves.

UPPER and LOWER MOUNTING YOKE

1. Remove self-locking nut from bottom of swivel pin. Earlier models had a snap ring in place of locknut.
2. Tap lower yoke from swivel pin with a mallet.
3. Pull or tap swivel pin from swivel bracket. On earlier engines, the co-pilot assembly first must be removed.

Figure 2. Removing Drive Shaft Housing

1 - Drive Shaft Housing
2 - Stud
3 - Plastic Plug
4 - Screw
5 - Screw
6 - Trim Cover
7 - Screw
8 - Seal
9 - Retaining Strip
10 - Retaining Strip
11 - Water Inlet Tube
12 - Exhaust Tube
13 - Screw
14 - Nut
15 - Nut
16 - Nut
17 - Washer
18 - Gasket
19 - Push Rod Guide
20 - Push Rod
21 - Jam Nut
22 - Push Rod Yoke
23 - Pin
24 - Cotter Pin
25 - Rubber Mount
26 - Cover
27 - Cover
28 - "U" Cup Packing
29 - Screw
30 - Screw
31 - Washer
32 - Nut
33 - Washer
34 - Rubber Washer
35 - Washer
36 - Nut
37 - Rubber Mount
38 - Screw
39 - Washer
40 - Nut
41 - Rubber Bumper
42 - Nut
43 - Washer
44 - Nut
45 - Washer
46 - Clamp
47 - Tension Spring
48 - Screw
49 - Cover
50 - Nut
51 - Screw

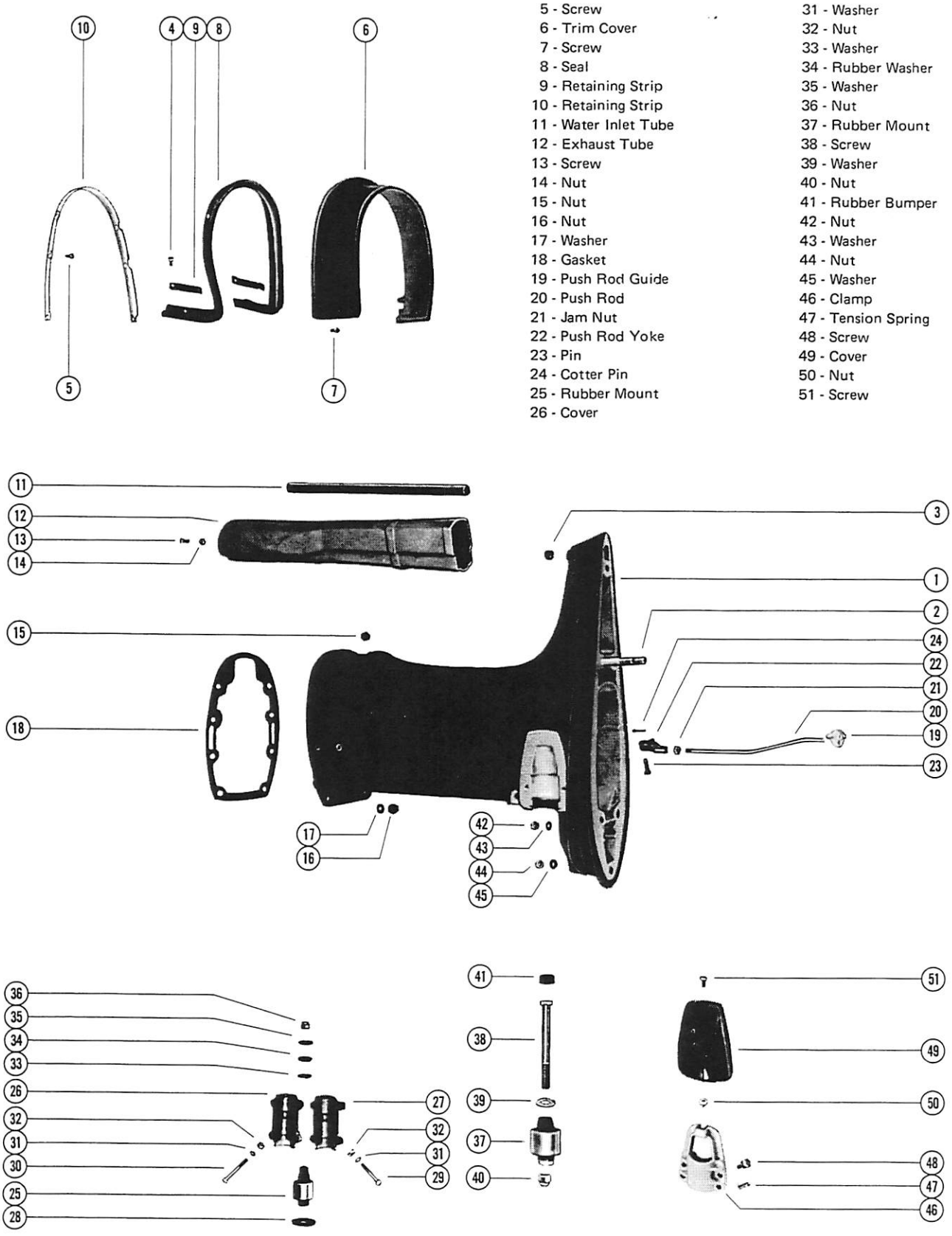


Figure 3. Drive Shaft Housing

REASSEMBLY

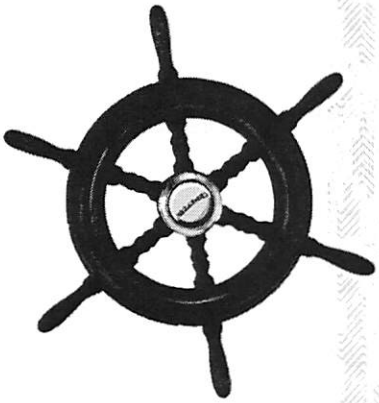
DRIVE SHAFT HOUSING & DYNA-FLOAT MOUNTS (Fig. 3)

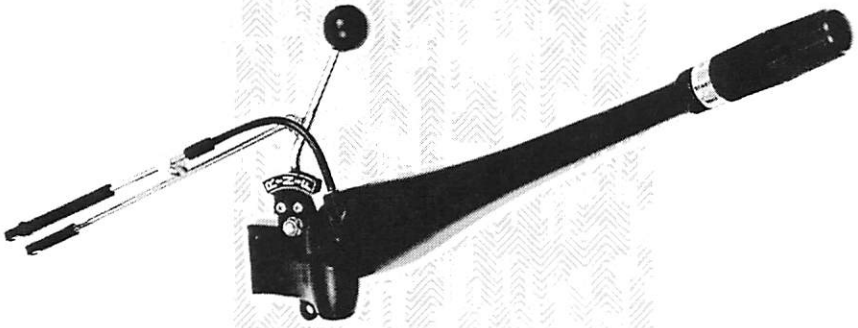
1. Place top mounts into inside and outside covers and install "U" cup seal.
2. Install upper mount assemblies into drive shaft housing. DO NOT tighten screws at this time.
3. Place lower mounts on bolts and position in recesses in drive shaft housing. Place washers on threaded end of bolt.
4. With upper and lower yoke bracket in position, place drive shaft housing onto yoke brackets. (Figure 2)
5. Place large inside diameter steel washer, spacer, rubber washer and small inside diameter steel washer on each top yoke stud and tighten nuts.
6. Tighten 4 screws and nuts on each top mount cover.
7. Insert rubber cap.
8. Install washers and nuts on lower mounts and tighten.
9. Install rubber bumper caps and mount covers.

UPPER and LOWER YOKE BRACKETS

1. Lubricate swivel pin with New Multipurpose Lubricant (C-92-49588).
2. Drive swivel pin into swivel bracket. Replace co-pilot assembly on earlier models.
3. Insert lower yoke on splines of swivel pin. Be sure that lower yoke aligns squarely with top yoke.
4. Replace snap ring or nut. DO NOT over-tighten nut, as swivel pin must turn freely.

OUTBOARD
SECTION 7





ACCESSORIES

TABLE of CONTENTS

SECTION 7 - ACCESSORIES

MERCURY
OUTBOARDS

PART A - STEERING SYSTEM

INDEX

RIDE-GUIDE STEERING

STEERING WHEEL INSTALLATION on DASH PANEL

INDICATOR WHEEL

NOTE: Refer to parts identification numbers in Figure 3.

1. Place steering wheel bracket studs (37 and 41) into holes in dash panel. Note that plastic bushings (13) are already installed in opposite ends of steering wheel bracket (14).
2. Fasten steering wheel bracket in place with 2 nuts (39) and washers (38) and one nut (43) and washer (42) and tighten.
3. Position gear housing bracket (31) on ends of 2 steering wheel post spacers (37) and fasten with 2 cap screws (36).

STANDARD WHEEL

NOTE: Refer to parts identification numbers in Figure 4.

1. Place steering wheel post studs (11 and 7) in holes drilled in dash panel.
2. Fasten steering wheel post in place with 2 nuts (13) and washers (12) and one nut (9) and washer (8) and tighten.
3. Position gear housing bracket (14) on ends of 2 steering wheel post studs (11) and fasten with 2 cap screws (15) and washers (16).

POSITION of PINION in RELATION to GEAR RACK

Before installing gear rack and pinion assembly on steering wheel mounting bracket behind dash panel, note that pinion is on bottom of rack. Check that boat will turn to right when wheel is turned to right and that boat will turn to left when wheel is turned to left. (Figure 1)

INSTALLING GEAR RACK and PINION ASSEMBLY

INDICATOR WHEEL

NOTE: Refer to parts identification numbers in Figure 3.

1. Place large washer (17) on gear rack pinion (24) and slide steering wheel shaft (16) over splined end of gear rack pinion.

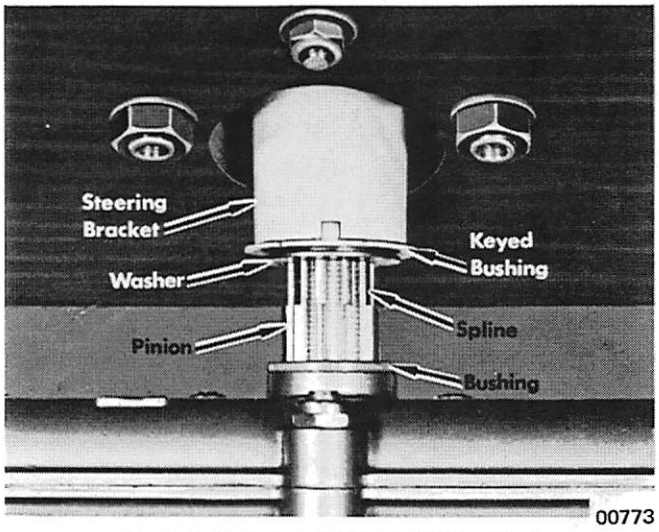


Figure 1. Pinion on Bottom of Gear Rack

2. Slide gear rack and steering wheel shaft into position in steering wheel bracket.
3. Place gear rack and pinion assembly positioning screw (32) thru gear rack housing (19), spacer (33), washer (34) and choice of 3 holes in gear rack housing bracket (31) and secure with washer (34) and elastic lock nut (35).
4. Apply a thin coat of New Multipurpose Quicksilver Lubricant (C-92-49588) on nylon pinion shaft (11) and install in recess of steering wheel.

NOTE: Letter "F" on end of nylon pinion shaft must face up toward steering wheel.

5. Position steering wheel over steering wheel shaft, being careful to align teeth of nylon pinion shaft with gear on steering wheel bracket.
6. Slip thru-bolt (12) thru hole in center of steering wheel and steering wheel shaft.
7. Slide large washer (29) and elastic locknut (30) on thru-bolt and torque to approximately 80 in. lbs. (14.2kg/cm).
8. Place indicator hub (4) in steering wheel and secure with screw (8), washer (10) and lockwasher (9).
9. Center steering wheel and place indicator button (2) with indicator mark pointing straight ahead on indicator hub (4) and snap into position.

STANDARD WHEEL

NOTE: Refer to parts identification numbers in Figure 4.

1. Slide gear rack and pinion assembly snugly into splined end of steering wheel shaft (21). (Figure 2)

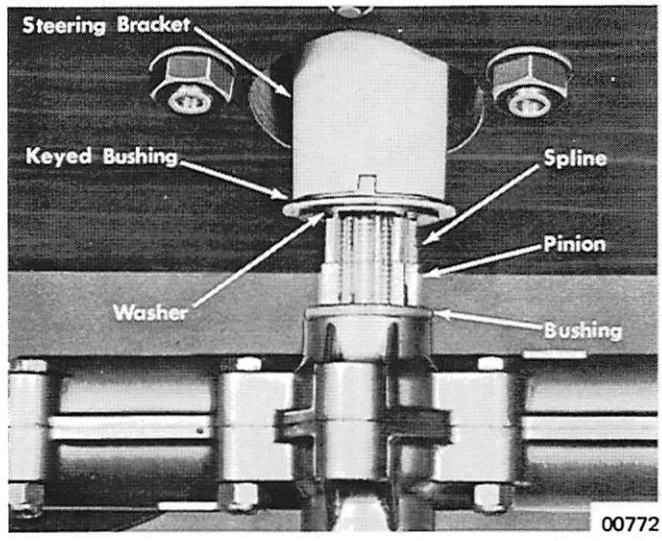
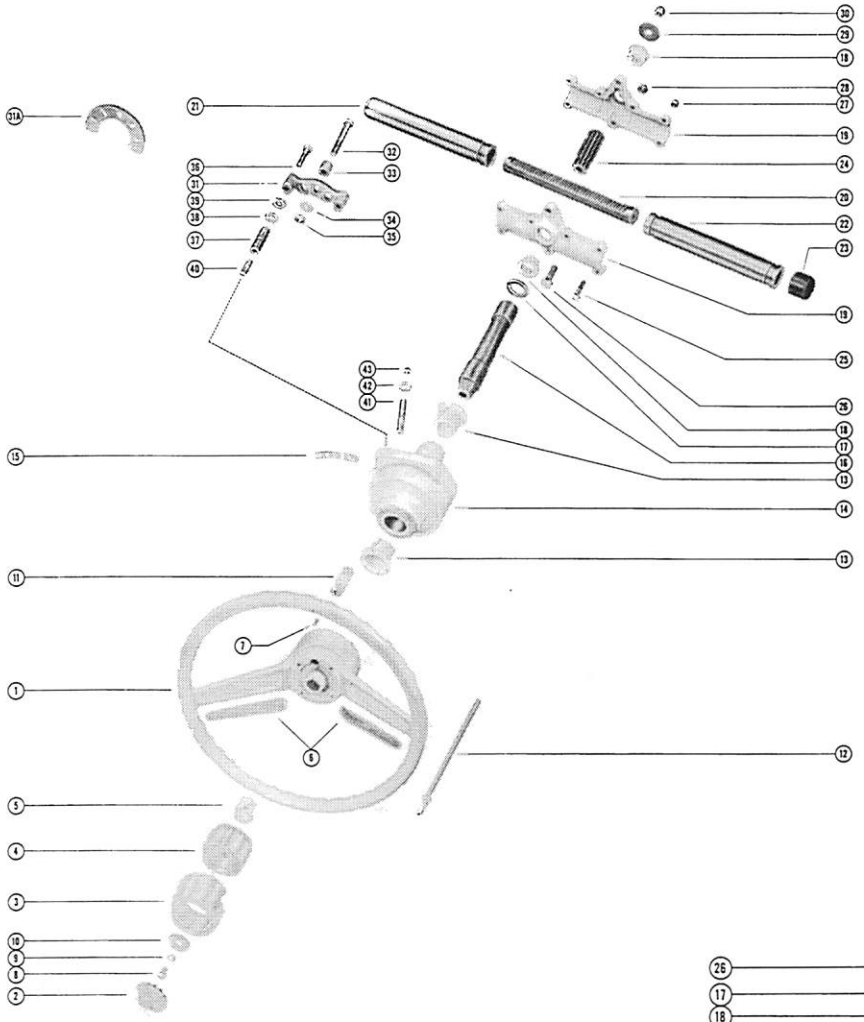


Figure 2. Thru-the-Dash Mounting

2. Slide large washer (34) and lockwasher (35) over thru bolt (4) and fasten lightly with elastic stop nut (36) to hold in place.
3. Place gear rack and pinion assembly positioning screw (17) thru gear rack housing (25), spacer (18), washer (19) and choice of 3 holes in gear rack housing bracket (14) and secure with washer (19) and elastic stop nut (20).
4. Torque elastic stop nut (36), previously placed on thru bolt (4), to approximately 80 in. lbs. (14.2kg/cm). (Figure 1)

CABLE INSTALLATION in GEAR RACK

1. Remove neoprene cap from end of tube. (Figure 1)
2. Place large locknut on larger threaded end of cable.
3. Thread cable into cable end tube (one with large, tapped hole).
4. Turn locknut against end of tube to secure cable to tube.
5. Push inner wire to full length inside of end tube.
6. Secure cable to gear rack by threading 2 locknuts onto threaded end of cable. First nut draws up on cable; second nut is locknut and secures first nut in place.
7. Replace neoprene cap on end of tube. Walls of end tubes and gear rack teeth have been coated with gear lubricant. Be careful not to over-lubricate! (Figures 3 and 4)

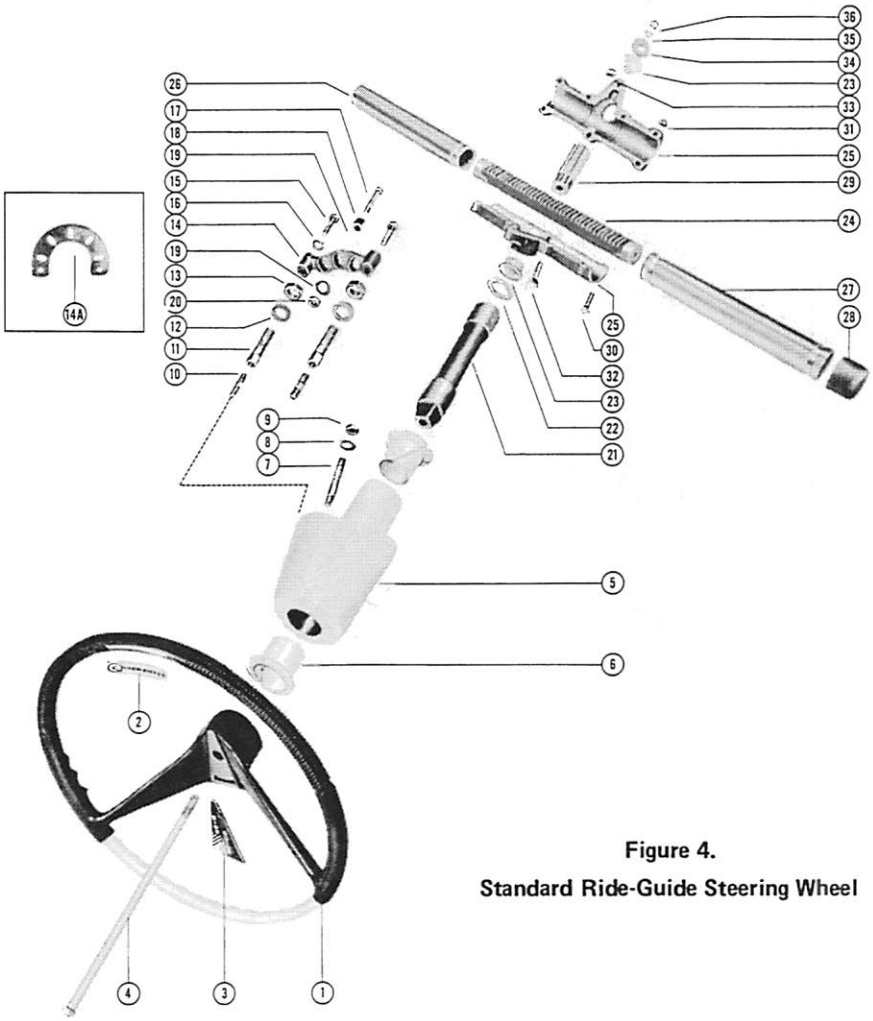


1 - Steering Wheel Assy.
2 - Button
3 - Cap
4 - Hub
5 - Bushing
6 - Decal
7 - Screw
8 - Screw
9 - Lockwasher
10 - Washer
11 - Pinion Shaft
12 - Bolt (20°)
12 - Bolt (90°)
13 - Bushing
14 - Bracket (20°)
14 - Bracket (90°)
15 - Insignia (Quicksilver)
16 - Shaft (20°)
16 - Shaft (90°)
17 - Washer
18 - Bushing
19 - Housing
20 - Gear Rack
21 - Tube (Cable end)
22 - Tube (Open end)
23 - Rubber Cap
24 - Gear Rack Pinion
25 - Screw
26 - Screw
27 - Nut
28 - Nut
29 - Lower Washer
30 - Nut
31 - Bracket (20°)
31A - Bracket (90°)
32 - Screw
33 - Spacer (20°)
33 - Spacer (90°)
34 - Washer
35 - Nut
36 - Screw (20°)
36 - Screw (90°)
37 - Spacer
38 - Washer
39 - Nut
40 - Stud
41 - Stud
42 - Washer
43 - Nut

NOTE: Parts are interchangeable for standard 20° wheel and 90° wheel, except where indicated.

Figure 3. Indicator Ride-Guide Steering Wheel

1 - Steering Wheel
2 - Insignia
3 - Plate
4 - Bolt
5 - Bracket
6 - Bushing
7 - Stud
8 - Washer
9 - Nut
10 - Stud
11 - Spacer
12 - Washer
13 - Nut
14 - Bracket
14A - Bracket (90°)
15 - Screw
16 - Lockwasher
17 - Screw
18 - Spacer
19 - Washer



20 - Nut
21 - Shaft
22 - Washer
23 - Bushing
24 - Rack
25 - Housing
26 - Tube
27 - Tube
28 - Cap
29 - Pinion
30 - Screw
31 - Nut
32 - Screw
33 - Nut
34 - Washer
35 - Lockwasher
36 - Nut

Figure 4.
Standard Ride-Guide Steering Wheel

SUPER RIDE-GUIDE KIT (C-48366A1) INSTALLATION

Complete "Steering Wheel Installation on Dash Panel", preceding, up to the point of "Position of Pinion in Relation to Gear Rack", then install second Ride-Guide cable in Super Ride-Guide tube, following instructions under paragraph "Cable Installation in Gear Rack."

INSTALLING GEAR RACK ASSEMBLIES

1. Lubricate nylon bushings with Multipurpose Lubricant (C-92-49588) and place bushings on each end of both gear rack housings.
2. Install the longer gear rack pinion (supplied with Super Ride-Guide Kit) thru both gear rack housings.
3. Install both gear rack and pinion assemblies on steering wheel mount housing behind dash panel, using two 5-3/4" (14.6cm) length screws which are supplied with the Super Ride-Guide Kit.
4. Note the gear rack mount screws are located on bottom of rack, and gear rack tubes face so cable will protrude from the right side. (Figure 1)

   NOTE: After completing installation, make certain that boat will turn to the right when steering wheel is turned to the right and that boat will turn to left when wheel is turned to left.
5. Install steering wheel to the mounting bracket, as described in the "Steering Wheel Installation on Dash Panel", preceding, using the 13-5/16" (33.8cm) long thru bolt which is supplied with the Super Ride-Guide Kit.
6. Complete the Super Ride-Guide installation by following the remaining steps in "Steering Wheel Installation on Dash Panel", preceding.

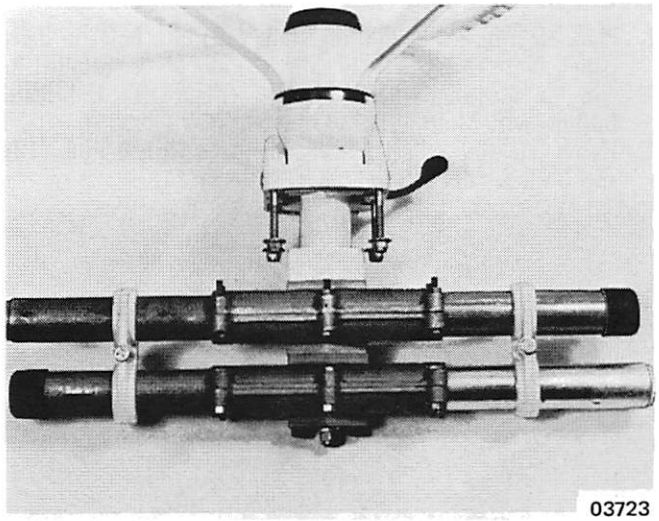


Figure 1. Super Ride-Guide Installation

RIDE-GUIDE TILT MOUNT INSTALLATION

STEERING WHEEL INSTALLATION on DASH PANEL

1. Place steering wheel housing studs (10) into holes in dash panel. Note that plastic bushing (3) already is installed in end of steering wheel housing. (Figure 1) Lubricate bushing with Multipurpose Lubricant (C-92-49588).
2. Fasten steering wheel housing in place with 4 nuts (12) and washers (11) and tighten. (Figure 1)

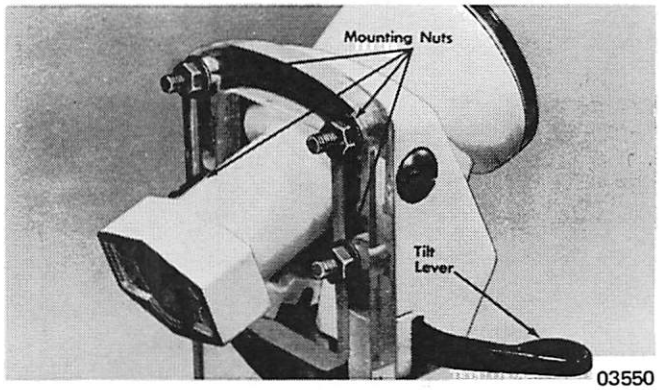


Figure 1. Steering Wheel Housing Installed

POSITION of PINION in RELATION to GEAR RACK (Figure 2)

1. Lubricate nylon bushings (26) with Multipurpose Lubricant and place one bushing on each end of gear rack housing (27).
2. Install pinion (34) thru gear rack housing (27).
3. Before installing gear rack and pinion assembly on steering wheel mounting housing behind dash panel, note that 2 gear rack mounting screws are located on bottom of rack, as shown in Figure 2.

   NOTE: Normal installation requires right hand installation of steering wheel with steering cable protruding from right side of gear rack. However, if it becomes necessary to have steering cable protrude from left of gear rack, turn the gear rack around so cable protrudes from the left as shown in Figure 3.

4. Check that boat will turn to right when steering wheel is turned to right, and that boat will turn to left when wheel is turned to left.

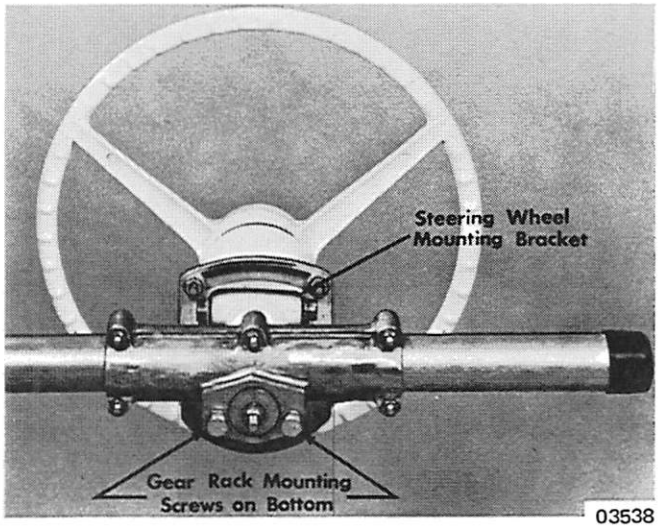


Figure 2. Steering Wheel Mounted

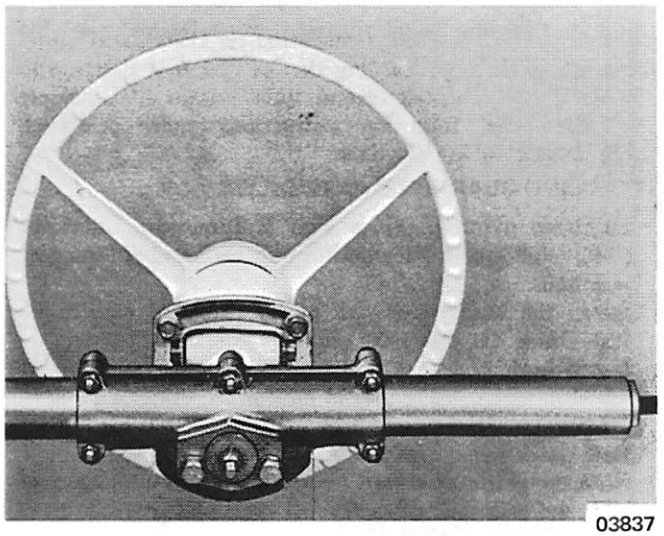


Figure 3. Left Hand Cable Installation

INSTALLING GEAR RACK and PINION ASSEMBLY (Captain's Wheel and Plastic Wheel)

1. Slide steering wheel shaft (24) in position in steering wheel post (1). (Figure 4)

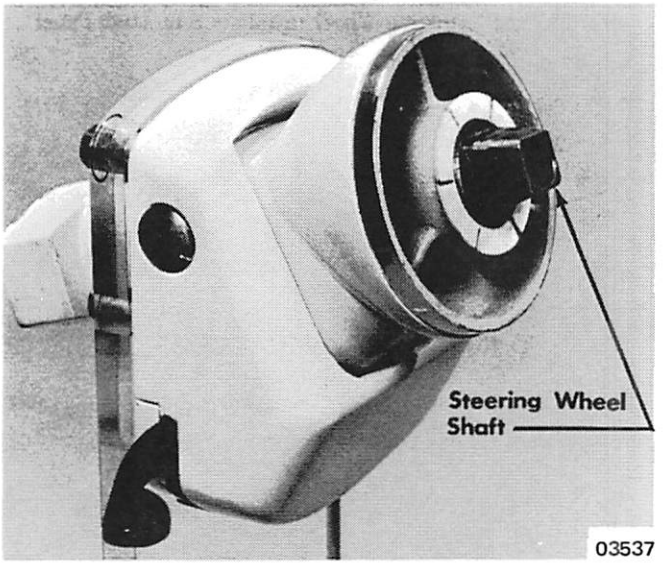


Figure 4. Steering Wheel Shaft Installed

2. Install gear rack and pinion assembly onto the steering wheel post, placing washer (25) between gear rack housing and post. Fit pinion into splined end of steering wheel shaft (24) and install 2 gear rack housing screws and lockwashers (35 and 36) and tighten securely.
3. Slip thru bolt (4) thru hole in center of steering wheel and steering wheel shaft.
4. Position steering wheel on steering wheel post.
5. Slide large washer (37) over thru bolt and fasten with elastic stop nut (38) to hold in place.
6. Torque elastic stop nut on thru bolt to approximately 80 in. lbs. (14.2kg/cm).
7. Place button on steering wheel hub.

   NOTE: Operate the boat for a short period of time before installing the button into the wheel hub. This will allow the steering wheel to stabilize position,and button can be installed with decal aligned properly.

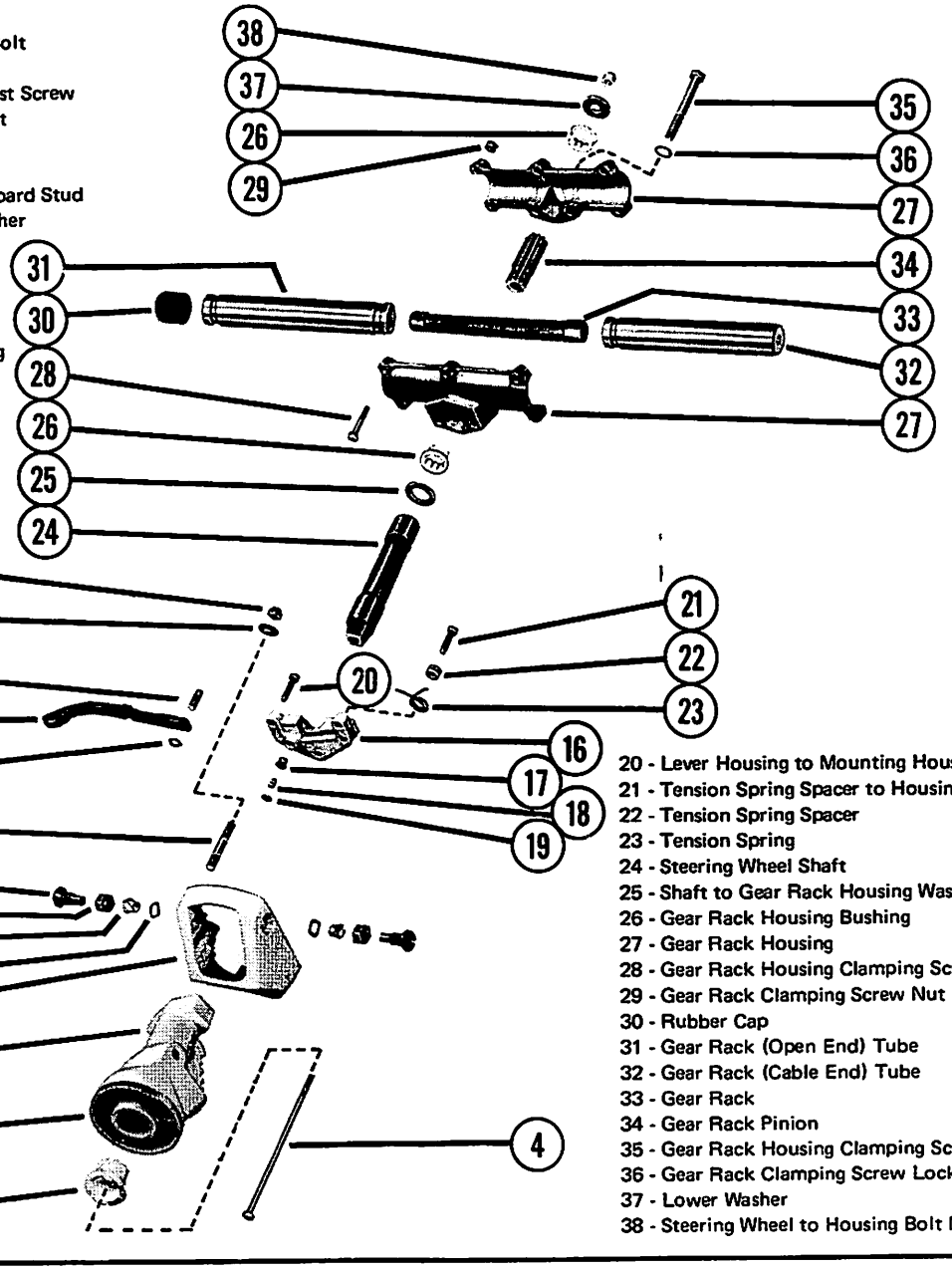
INSTALLING GEAR RACK and PINION ASSEMBLY (Custom Ski Wheel)

1. Slide steering wheel shaft (24) into position in steering wheel post. (Figure 4)
2. Install steering wheel hub and snap plate to steering wheel with 3 socket head cap screws.
3. Slip thru bolt (4) thru washer and hole in center of steering wheel and steering wheel shaft.
4. Position steering wheel on steering wheel post (1).
5. Slide gear rack and pinion assembly over thru bolt, fitting snugly into splined end of steering wheel shaft (24).
6. Slide large washer (37) over thru bolt (4) and fasten with elastic stop nut (38) to hold in place.
7. Torque elastic stop nut on thru bolt to approximately 80 in.lbs. (14.2kg/cm).
8. Place chrome cover on snap plate on steering wheel hub.

CABLE INSTALLATION in GEAR RACK

1. Remove thru bolt (item 4 in Figure 5) from packing position in cable tube (31) and set aside temporarily.
2. Remove neoprene cap (30) from end of cable tube (31).
3. Place large locknut (from plastic bag in steering cable carton) on large, threaded end of cable.
4. Place New Multipurpose Lubricant (C-92-49588) on cable end and thread cable into cable end tube (32).
5. After cable is threaded in, turn large locknut against end of tube to secure cable to tube.
6. Secure cable to gear rack (33) by threading 2 locknuts (from plastic bag in steering cable carton) onto threaded end of cable. First nut draws up on cable against rack; second nut is locknut and secures first nut in place.
7. Replace neoprene cap (30) on end of tube (31).
8. Walls of end tubes (31 and 32) and gear rack teeth have been coated with gear lubricant. Be careful not to over-lubricate!

Figure 5. Tilt Mount Assembly



ROTARY RIDE-GUIDE STEERING

STEERING WHEEL POST INSTALLATION

1. Place steering wheel post studs into holes in dash panel. (Figure 1 and 2) Note that plastic bushing already is installed in end of steering wheel post. (Figure 4) Lubricate bushing with New Multipurpose Lubricant (C-92-49588).
2. Fasten steering wheel post in place with nuts and washers and tighten. (Figure 1 and 2)

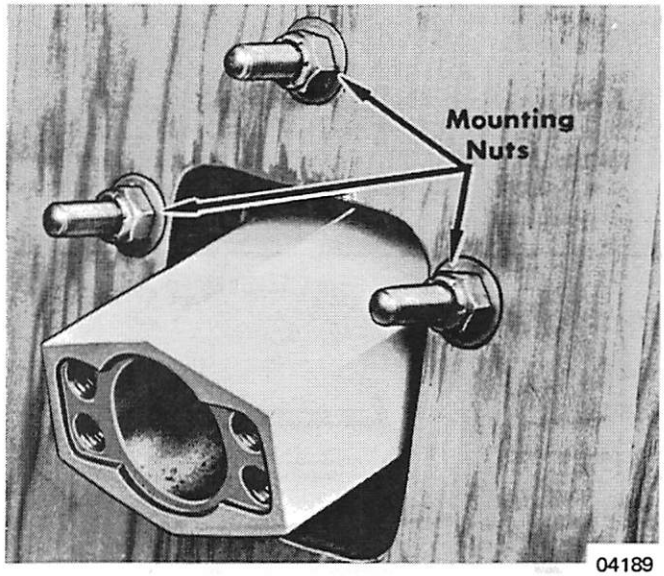


Figure 1. Steering Wheel Post Installed – 20° and 90°

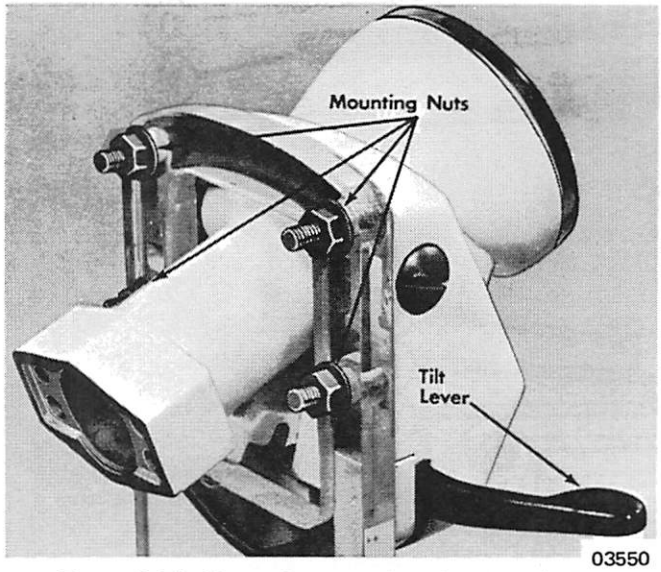


Figure 2. Tilt Mount Steering Wheel Post Installed

INSTALLING ADAPTOR to STEERING WHEEL POST

1. Place two 3/8 - 24 x 2-1/2 hex head screws into hexagon-shaped, recessed areas of adaptor.

   NOTE: Install adaptor to steering wheel post (in position previously determined) to allow cable to extend in direction desired.

2. Place large 1-1/2" dia. washer between adaptor and steering wheel post and install adaptor to steering wheel post with two 3/8 - 16 x 1-1/2 socket cap screws. (Figure 3)

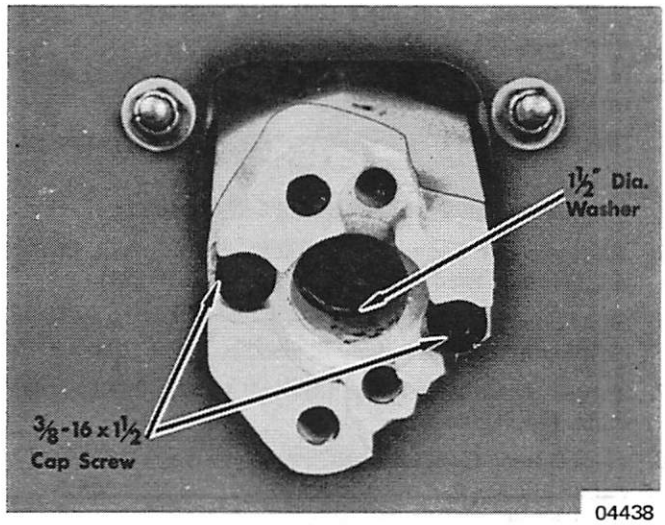


Figure 3. Adaptor on Steering Post

INSTALLING GEAR HOUSING and PINION ASSEMBLY (Captain's Wheel and Plastic Wheel)

1. Slide steering wheel shaft in position in steering wheel post. (Figures 4 and 5)
2. Install gear housing and pinion assembly onto the steering wheel post adaptor. Fit pinion into splined end of steering wheel shaft, install 2 washers and nuts and tighten securely. (Figure 6)
3. Slip thru bolt with washer thru hole in center of steering wheel and steering wheel shaft.
4. Position steering wheel on steering wheel post.

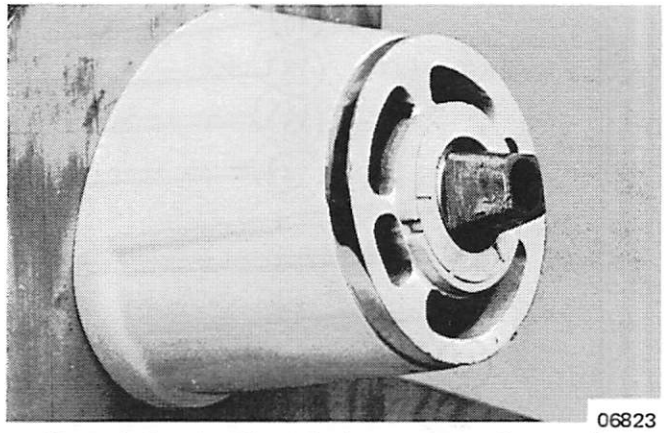


Figure 4. Steering Wheel Shaft Installed - 20° and 90°

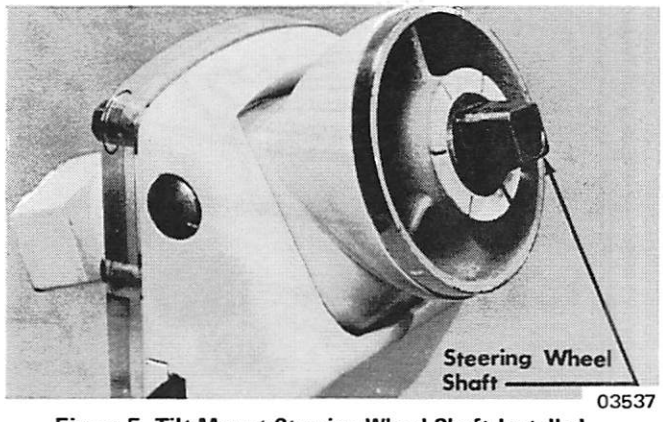


Figure 5. Tilt Mount Steering Wheel Shaft Installed

5. Slide large washer over thru bolt and fasten with elastic stop nut to hold in place.
6. Torque elastic stop nut on thru bolt to approximately 80 in. lbs. (14.2kg/cm).
7. Place button on steering wheel hub.

NOTE: Operate boat for a short period of time before installing button into wheel hub. This will allow steering wheel to stabilize its position, and button can be installed with decal aligned properly.

INSTALLING GEAR HOUSING and PINION ASSEMBLY (Custom Ski Wheel)

1. Slide steering wheel shaft into position in steering wheel post. (Figure 4 and 5)
2. Install steering wheel hub and snap plate to steering wheel with 3 socket head cap screws.
3. Slip thru bolt thru washer and hole in center of steering wheel and steering wheel shaft.
4. Position steering wheel on steering wheel post.
5. Slide gear housing and pinion assembly over thru bolt, fitting snugly into splined end of steering wheel shaft. (Figure 6) Attach housing to adaptor with 2 washers and nuts.

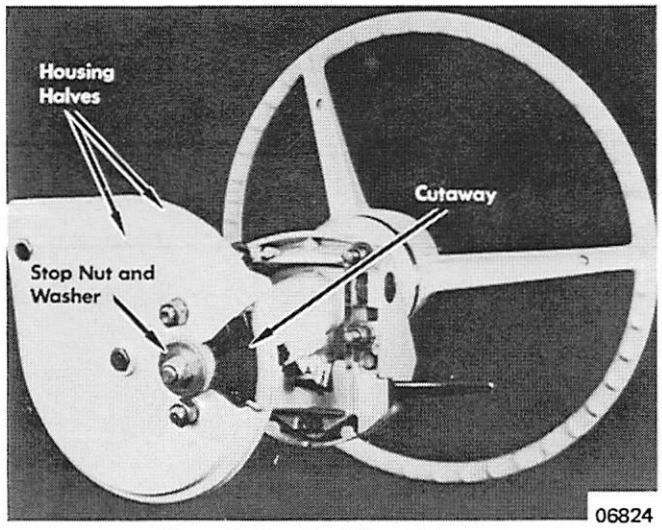


Figure 6. Steering Wheel Mounted

6. Slide large washer over thru bolt and fasten with elastic stop nut to hold in place.
7. Torque elastic stop nut on thru bolt to approximately 80 in. lbs. (14.2kg/cm).
8. Place chrome cover on snap plate on steering wheel hub.

CABLE INSTALLATION

Cable is installed into ring gear housing when received. To repair or replace cables, install cable as follows:

1. Lubricate ring gear, left and right housings and center hub with New Multipurpose Lubricant.
2. While holding ring gear with gear teeth toward left side, install cable end into retaining hole in ring gear with cable extended in a counterclockwise direction. (Figure 7) Tap hooked end of cable lightly to seat into hole.
3. Wrap cable approximately ½-turn around ring gear in a counterclockwise direction and install retaining tool over ring gear and cable as shown in Figure 8. Retaining tool is supplied with kit.

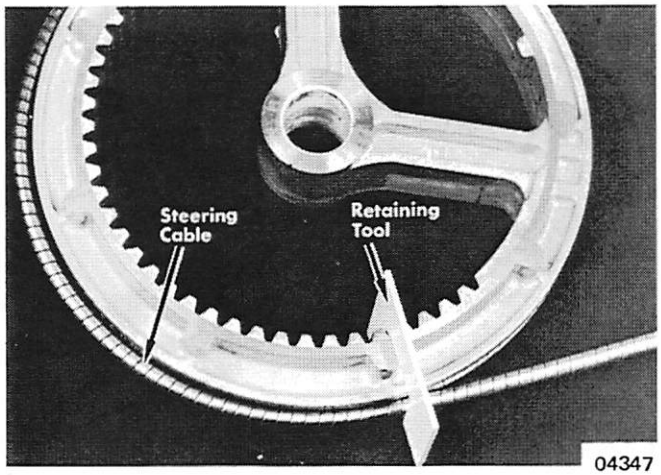


Figure 7. Installing Cable with Retaining Tool

4. Install nylon liner over ring gear and cable. Use grease (that is supplied) in groove of liner. Do not use New Multipurpose Lubricant in this groove. Butt one end of liner against retaining tool.

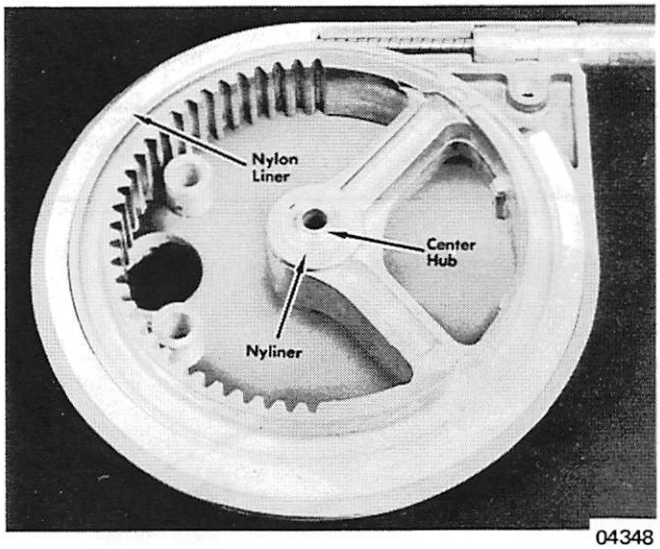


Figure 8. Ring Gear Installed

5. Make certain that nyliner is in center hole of ring gear and install ring gear over hub in housing. Press down evenly on ring gear and nylon liner to install in housing. (Figure 8 Remove retainer tool.
6. Place cable guide end into slots in housing, place opposite housing over assembly and fasten with a 5/16-24x1-3/4 screw, 5/16-24x1-1/8 screw, plain washers and 2 Eslok nuts.
7. Lubricate 2 nylon splined bushings with New Multipurpose Lubricant and install a bushing into opening on both sides of gear and housing assembly.
8. Place pinion gear into ring gear with small daimeter end extending out from side which will mount to steering wheel post adaptor.

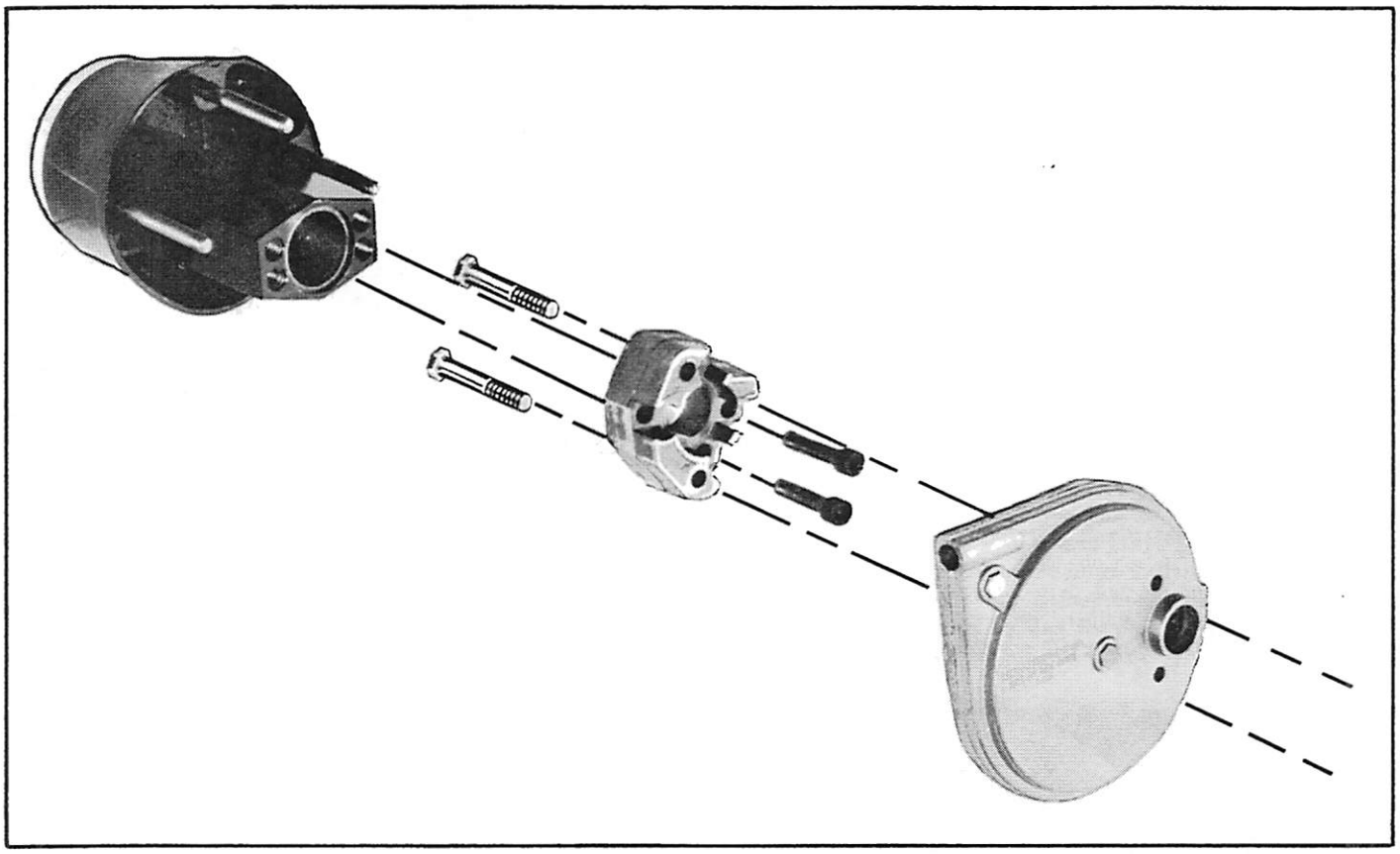


Figure 9. Recommended Mounting

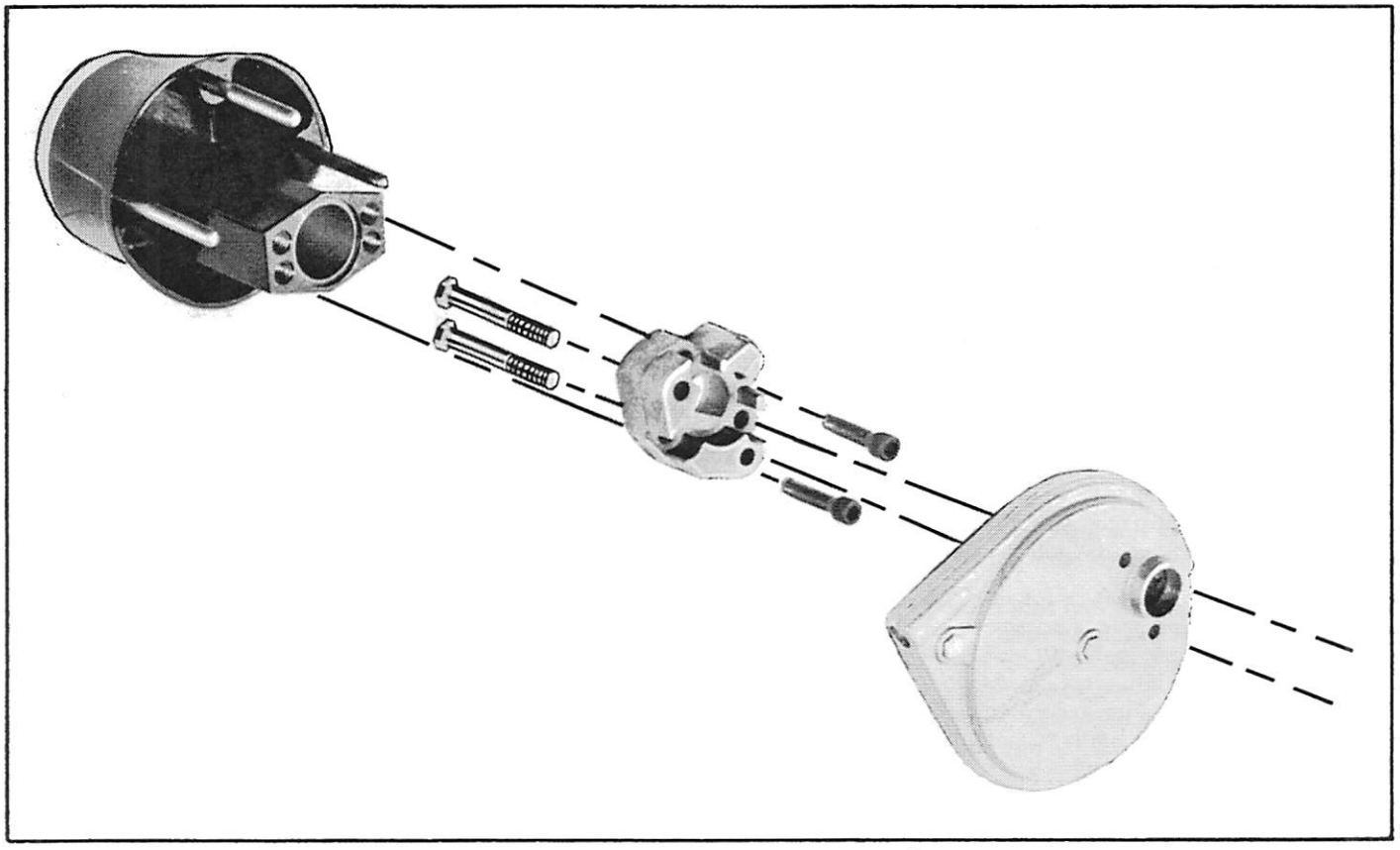


Figure 10. Recommended Mounting for 30°

RIDE-GUIDE ENGINE ATTACHMENT
STANDARD RIDE-GUIDE for MERCURY MODELS

3, 4-and 6-CYLINDER 1965-and-NEWER MODELS

1. Install attaching kit on steering arm as shown in Figure 1.

   NOTE: 6-cylinder models are attached as shown; 4-cylinder models have the steering link rod beneath the steering arm.

2. Attaching bolt will be found in bag with transom mounting bolts.

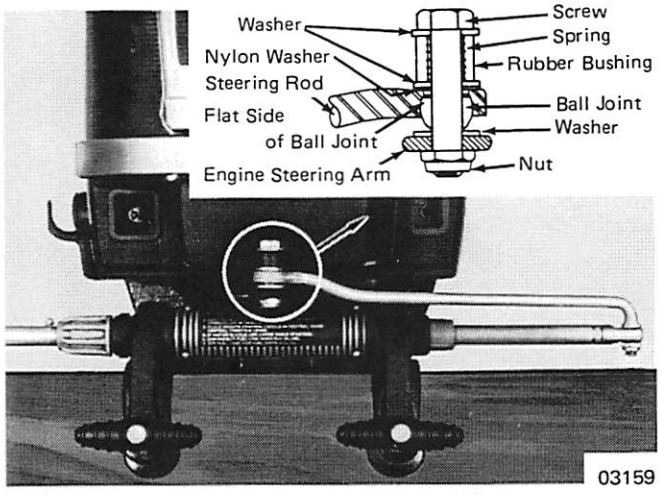


Figure 1. Attaching Kit Installed

2-CYLINDER FULL GEAR SHIFT MODELS

1. Remove 2 plastic caps and 2 elastic stop nuts on end of tilt tube.
2. Replace hollow tilt tube with new, longer tilt tube from kit. (Figure 2)

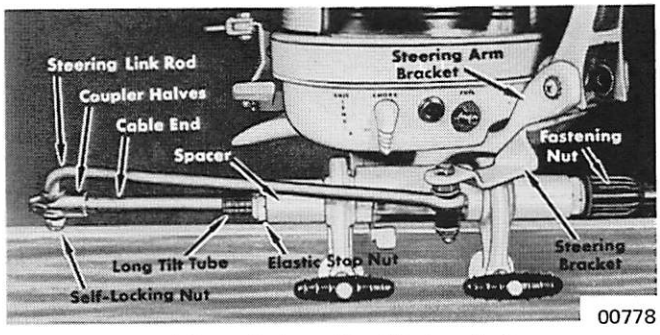


Figure 2. Attaching Kit Installed

3. Place spacers from kit on tilt tube and secure with elastic stop nuts from engine. (Figure 2)
4. Place plastic open end cap from kit on end of tilt tube.
5. Place steering bracket from kit into position on steering arm bracket. (Figure 2) Steering handle assembly need not be removed.
6. Secure steering bracket with 2 slotted screws and 2 lockwashers from kit.
7. Attach steering link rod assembly to steering bracket.

ATTACHING STEERING CABLE

1. Lubricate steering cable tube end with Anti-Corrosion Grease (C-92-45134A1), insert cable end thru tilt tube and secure with large hand-type fastening nut. (Figures 1 & 2)
2. Thread red plastic cap with hole on opposite end of tilt tube.
3. Turn steering wheel so that cable end is out far enough to attach coupler halves into groove at end of cable.
4. Early Steering Cable: Tighten self-locking nut on steering link below bottom coupler.

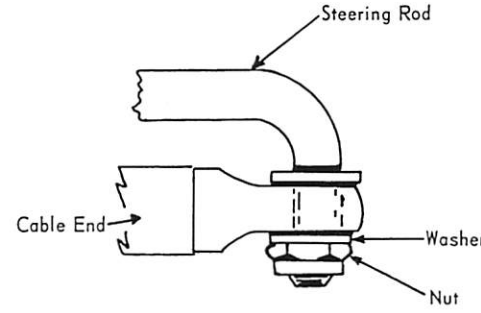


Figure 3. Cable Assembled on Steering Link Rod

Late Steering Cable: Assemble cable on steering link rod as shown in Figure 3. Tighten nut securely, then back off ¼-turn.

CENTERING STEERING WHEEL

Under normal conditions, steering wheel will be correctly centered with gear rack; however, should the steering wheel be slightly out of correct position, it will be necessary to move gear rack one tooth to the right or left of pinion gear. (Figure 3)

DUAL ENGINE INSTALLATION

4-and-6-CYLINDER MODELS

NOTE: On earlier models, the pivot pin on left engine (Figure 4) must be replaced with longer pivot pin from kit to accommodate the 2 link rods.

1. Dual control Ride-Guide attachment kit includes all parts necessary to connect both engines to cable.(Figure 4)
2. Cable attaches to far engine; i.e., right side mounting of Ride-Guide steering wheel, cable attaches to left engine; left mounting to right engine.
3. Assemble parts from kit to protruding pivot pin in the following order: Right hand engine in Figure 4 - flat washer, stainless steel ball (with flat side up), adjusting link, nylon washer, flat washer, spring and rubber sleeve,

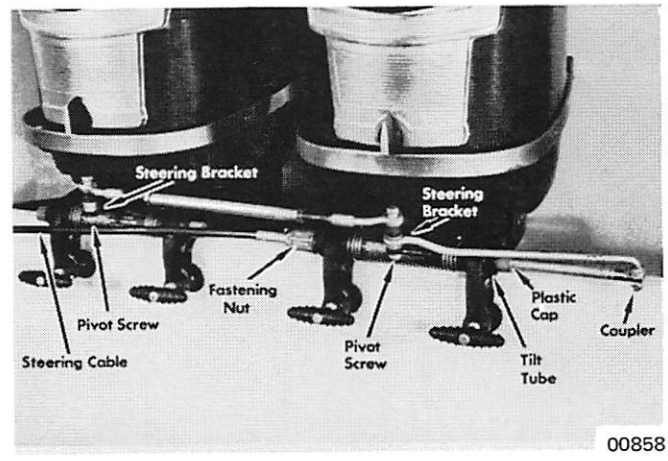


Figure 4. Dual Engine Installation

flat washer and elastic stop nut. Left hand engine in Figure 4 - flat washer, stainless steel ball (with flat side up), adjusting link, nylon washer, flat washer, spring and rubber sleeve, flat washer, nylon washer, link rod, stainless steel ball (with flat side up), flat washer and elastic stop nut.

4. Install rod between adjusting links.
5. For centering second engine with first, turn adjusting rod either way to center. This is important, or engine may run at an angle in relation to the other.

2-CYLINDER MODELS

1. Dual control kits include all parts necessary to connect both engines to Ride-Guide cable. Installation of dual control assembly follows same procedure as single installation with the following additions:
2. Do not replace tilt tube on secondary (right) engine.
3. Mount engines on transom on 18¼" (46.4cm) centerlines.
4. Adjust dual steering link to align engines on these centers and attach to steering brackets. Ride-Guide cables will cross in front of first engine and be anchored thru tilt tube on second engine.
5. Secure coupler to cable end to complete installation.

RIDE-GUIDE DUAL ENGINE FRONT ATTACHMENT
MERC 1500-1400-1350-1250-1150-1100-1000-950-900-850-800-650

Attachment kit includes all parts necessary to connect both engines to Ride-Guide cable.

INSTALLING RIDE-GUIDE CABLE

1. Ride-Guide cable may be routed on either the right or left side of boat. It is, however, necessary to install cable on the far engine; i.e., cable is installed on left engine if cable is routed on right side of boat (Figure 1), and cable is installed on right engine if cable is routed on left side of boat.

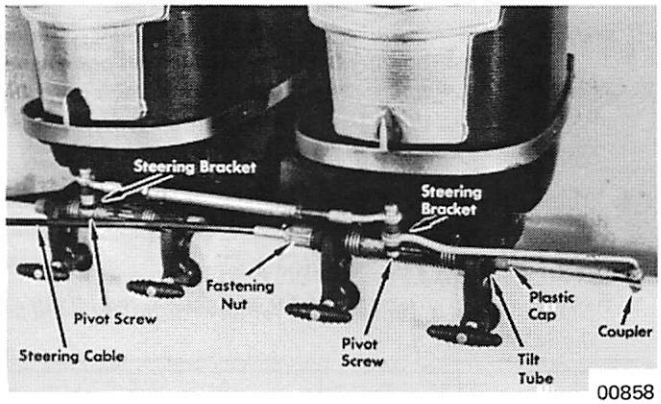


Figure 1. Attachment Kit Installed, Merc 1100-1000-950-900 and 4-Cyl. 650 (1966 and Newer) Models

2. Lubricate inside of engine tilt tube with New Multipurpose Lubricant (C-92-49588). (Figure 1)
3. Insert cable end thru tilt tube and secure with large hand-type fastening nut. (Figure 1)
4. Thread red plastic cap with hole on opposite end of tilt tube.

INSTALLING ATTACHMENT KIT

NOTE: If kit is disassembled for any reason, reassemble as shown in Figure 2.

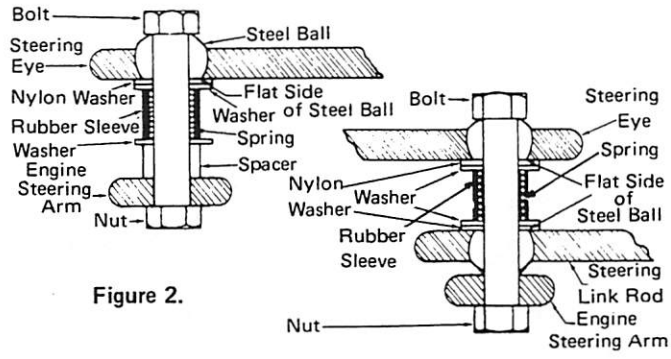


Figure 2.

1. Attach kit to engines as shown in Figure 1.
2. Tighten pivot screws only until rubber sleeve contacts washers on either side of rubber sleeve. DO NOT OVER-TIGHTEN. Install elastic stop nuts and tighten securely.
3. Assemble cable on steering link rod, as shown in Figure 3.
4. Tighten nut securely, then back off ¼-turn. (Spacers will be found in the plastic bag in cable carton.)

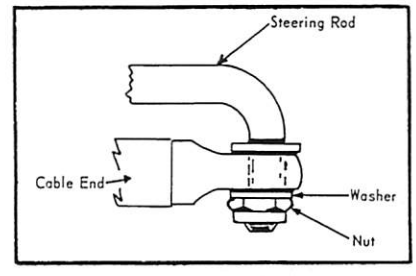


Figure 3.

MERC 500-402-400 MODELS

Attachment kit includes all parts necessary to connect both engines to Ride-Guide cable.

INSTALLING RIDE-GUIDE CABLE

1. Ride-Guide cable may be routed on either the right or left side of boat. It is, however, necessary to install cable on the far engine; i.e., cable is installed on left engine if cable is routed on right side of boat (Figure 4), and cable is installed on right engine if cable is routed on left side of boat.

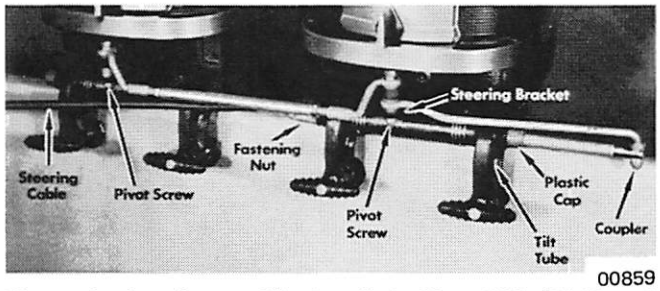


Figure 4. Attachment Kit Installed, Merc 500 (1966 and Newer Models)

2. Lubricate inside of engine tilt tube with New Multipurpose Lubricant (C-92-49588). (Figure 4)
3. Insert cable end thru tilt tube and secure with large hand-type fastening nut. (Figure 4)
4. Thread red plastic cap with hole on opposite end of tilt tube.

INSTALLING ATTACHMENT KIT

NOTE: If kit is disassembled for any reason, reassemble as shown in Figure 2.

1. Attach kit to engines as shown in Figure 4.

   NOTE: It may be necessary to pry between the steering bracket and bottom cowl, exerting only enough pressure to flex the upper mounts sufficiently to allow clearance to install pivot screw.

2. Tighten pivot screws only until rubber sleeve contacts washers on either side of rubber sleeve. DO NOT OVER-TIGHTEN. Install elastic stop nuts and tighten securely.
3. Assemble cable on steering link rod, as shown in Figure 3.
4. Tighten nut securely, then back off ¼-turn. (Spacers will be found in the plastic bag in cable carton.)

MERC 650 (3-Cyl.) DUAL FRONT INSTALLATION

(16" to 19" Engine Centerline Spacing)

INSTALLING RIDE-GUIDE CABLE

1. Ride-Guide cable may be routed on either the right or left side of boat. It is, however, necessary to install the cable on the far engine; i.e., cable is installed on left engine if cable is routed on right side of boat (Figure 5 or 6), and cable is installed on right engine if cable is routed on left side of boat.

   NOTE: Check that boat will turn to right when steering wheel is turned right, and that boat will turn to left when wheel is turned to left.

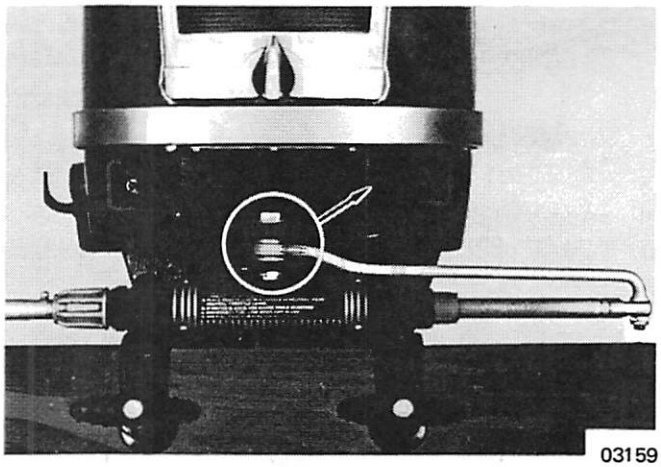


Figure 5. Attachment Kit Installed

2. Lubricate inside of engine tilt tube with Multipurpose Lubricant (C-92-49588)
3. Insert cable end thru tilt tube and secure with large fastening nut. (Figure 5 or 6)

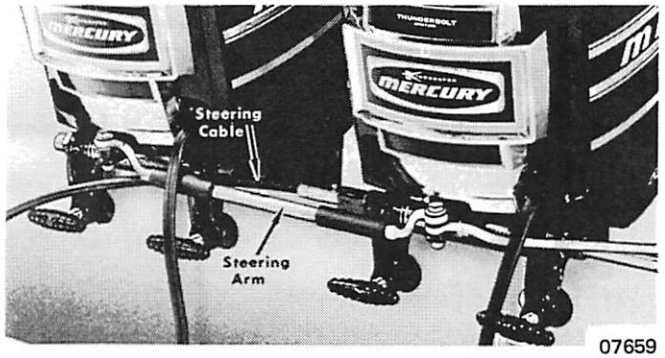


Figure 6. Steering Cable Installation (Optional)

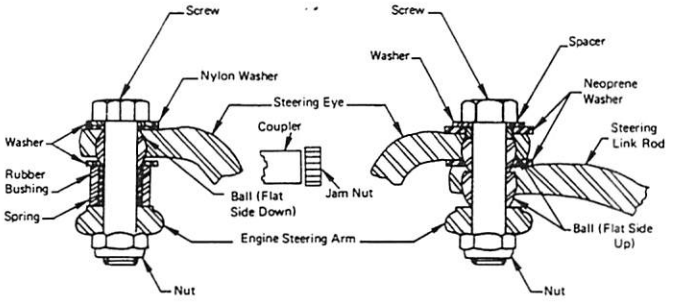


Figure 7. Attachment Parts Sequence

NOTE: For a neat-appearing and efficient cable installation, place Ride-Guide cable thru tilt tube on one engine (Figure 5) by sliding steering wheel end of cable thru tilt tube before installing to the steering wheel. If unable to complete this installation, install as shown in Figure 6.

4. Thread red plastic cap with hole on opposite end of tilt tube.

INSTALLING ATTACHMENT KIT

NOTE: If kit is disassembled for any reason, reassemble as shown in Figure 8.

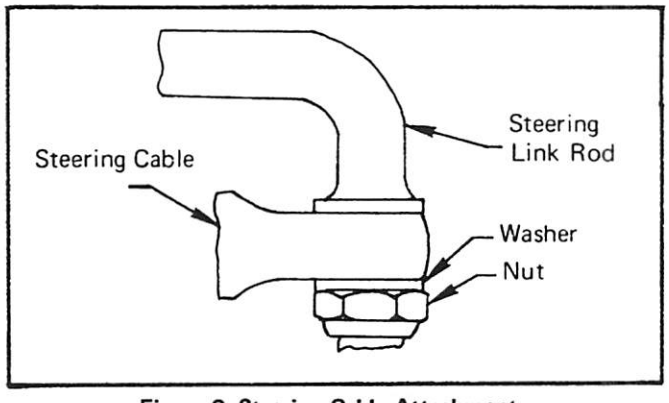


Figure 8. Steering Cable Attachment

1. Attach kit to engines as shown in Figure 5 or 6.
2. Steering eye must have a minimum ¾" thread engagement into coupler. Tighten jam nut securely to coupler.
3. Tighten pivot screws only until rubber sleeve contacts washers on either side of rubber sleeve. DO NOT overtighten. Install elastic stop nuts and tighten securely.
4. Assemble cable on steering link rod, as shown in Figure 8.
5. Tighten nut securely, then back off ¼-turn.

STEERING EXTENSION BAR (C-30320A2)

DUAL ENGINE INSTALLATION on WIDE BEAM BOATS

1. Turn the 16" (40.64cm) link rod extension bar all the way onto the steering link rod of right (starboard) ball joint assembly (one with stop nut threaded on). (Refer to Figure 9 throughout.)
2. Remove the 2 rear elastic stop nuts from studs which hold drive shaft housing to bottom cowl of both engines.

   NOTE: On engines equipped with drive shaft housing trim cover, it will be necessary to remove trim cover (secured with 4 screws) to expose elastic stop nuts.

3. Attach ball joint and steering plate assembly (plate faces up) on right engine with the thin elastic stop nuts in kit.
4. Center engines on transom and turn steering link rod of left ball joint assembly into the 16" link rod extension bar.
5. Adjust 16" link rod extension bar to desired width and attach the ball joint assembly (with steering plate up) on left (port) engine with the other 2 thin elastic stop nuts from kit.
6. Tighten stop nut against 16" link rod extension bar to complete the installation.
7. To reinstall trim cover (on models so equipped), it will be necessary to mark and cut trim cover to provide clearance for the steering plate.

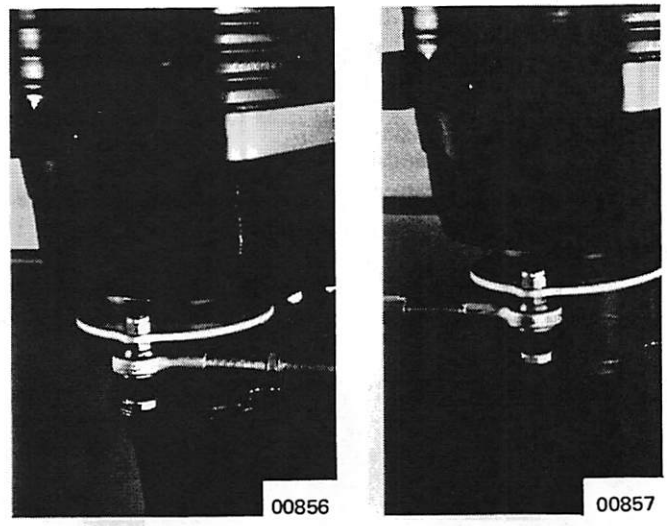


Figure 9.
Steering Extension Bar Installed

8. To check engine alignment, measure distance between gear housings' center lines at front and rear of gear housing. Dimensions must be equal for efficient steering.

WIDER EXTENSION

Should further extension be required, add a 4" (10.16cm) extension bar and lockwasher (Part No. A-30311A1) or another 16" extension link rod bar (A-30310), not included in kit.

When using 4" extension bar, lockwasher must be placed over threaded end of extension, then screw 4" bar securely into 16" extension bar, making certain that lockwasher is fully compressed.

Should it be necessary to use an additional 16" extension rod, join the two 16" rods with coupler (male fitting) link rod and 2 lockwashers (A-30318A1), not included in kit, to accommodate the female fittings of the 16" extension rods.

Any combination of 4" and 16" extensions can be used to bridge the engines and, in addition, 2" adjustment is provided on the steering link rod of the ball join assemblies to take up to 4" of adjustment.

Following is a list of additional parts to make wider extensions:

A-30318A1	Coupler Link Rod Assembly
A-30311A1	4" (10.16cm) Extension Bar Assembly
A-30310	16" (40.64cm) Extension Link Rod

DUAL RIDE-GUIDE ATTACHMENT KIT NO. A-39959A2

REAR INSTALLATION

1. It will be necessary to remove trim cover (secured with 4 screws) to expose elastic stop nuts.
2. Remove the 2 rear elastic stop nuts from studs which hold drive shaft housing to bottom cowl of both engines.
3. Remove right (starboard) rear stud from both engines by using 2 jam nuts. (Figure 1)
4. Install long studs furnished with kit.
5. Attach steering plate assembly (welded bushing faces up) on both engines with the thin elastic stop nuts in kit. (Figure 1)
6. Modify both trim covers by installing template C-90-45747 over trim covers and cutting out area as indicated on template.

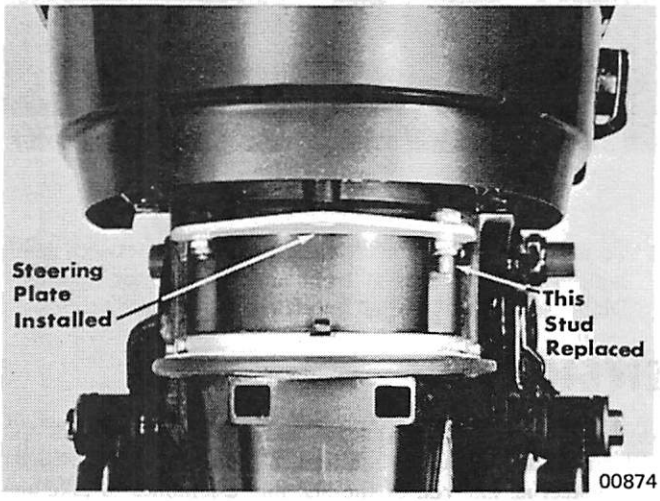


Figure 1. Removing Right (Starboard) Rear Stud

7. Install modified trim covers, using the long screws and nuts from kit.
8. Attach ball joint to steering plate on right (starboard) engine. (Figure 2)
9. Center engines on transom. Adjust 16" (40.64cm) link rod extension bar to desired width and attach the ball joint assembly on left (port) engine. (Figure 3)

   NOTE: The 16" (40.64cm) extension bar should be centered so that an even amount of threads remain on each end of bar.

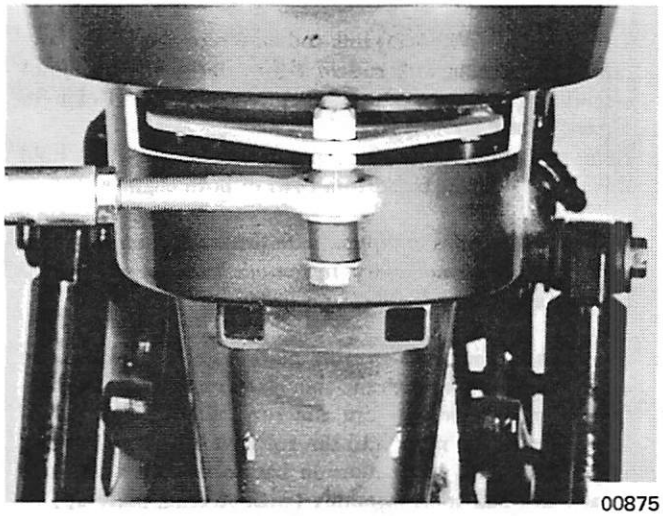


Figure 2. Balljoint and Steering Plate Installed Right (Starboard) Engine

10. Tighten stop nut against 16" (40.64cm) link rod extension bar to complete the installation.
11. To check engine alignment, measure distance between gear housings' center lines at front and rear of gear housings. Dimensions must be equal for efficient steering.

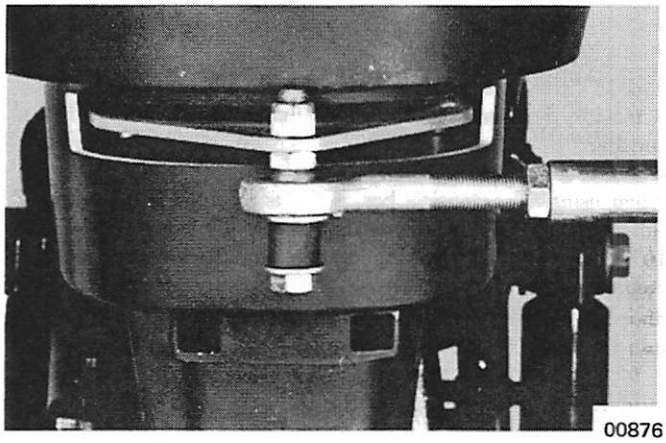


Figure 3. Balljoint and Steering Plate Installed Left (Port) Engine

WIDER EXTENSION

(Refer to "Wider Extension" on Page 13.)

UNIVERSAL RIDE-GUIDE for ALL OUTBOARD MOTORS

ENGINE STEERING BRACKET

1. Replace bayonet-type attaching pin in steering bracket, which comes with engine (except Mercury, which does not require), with cap screw and nut of correct size from kit. (Figure 1)
2. Secure steering bracket to engine (or engines, if dual installation).

NOTE: If steering bracket is not included with engine, purchase separately from engine dealer.

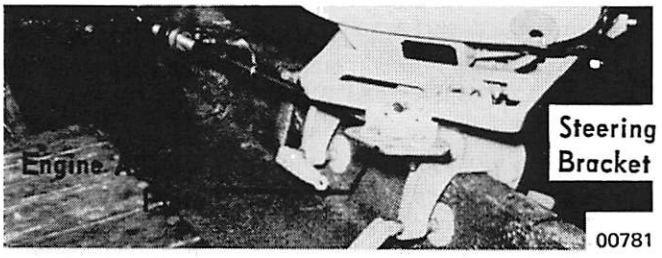


Figure 1. Universal Ride-Guide Attaching Kit

ENGINE ADAPTOR PLATE

Engine adaptor plate has 11 holes for various attachments, (See Figure 2 for reference to hole numbering.)

NOTE: Before attaching engine adaptor plate to steering bracket on Evinrude-Johnson V-75's, V-50's and 40 HP models, first attach primary link bracket to top of adaptor with screws in holes 2 and 7 for both single and dual engine installation with steering wheel mounted on right side of dash panel. Use holes 2 and 6 with steering wheel on left side. (Figure 3)

1. Place 11-hole engine adaptor plate in position under steering bracket and attach to steering bracket with 2 screws and nuts in holes as shown in following chart:

Engine	Figure 5 Hole Nos.
Evin.-John. 75's & 50's	10 and 11
Evin.-John 40 & 18 HP	10 and 11
Scott 60's	8 and 9
Scott 40's & 25's	6 and 7

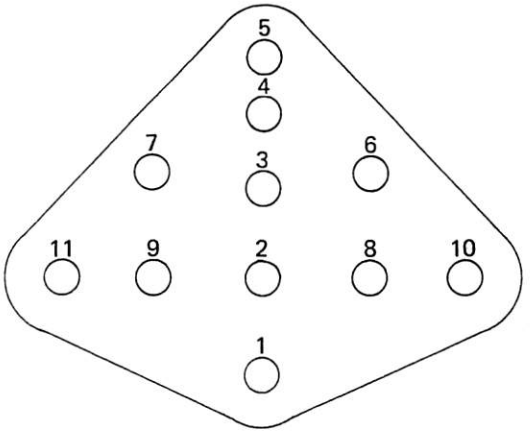


Figure 2. Engine Adaptor Plate

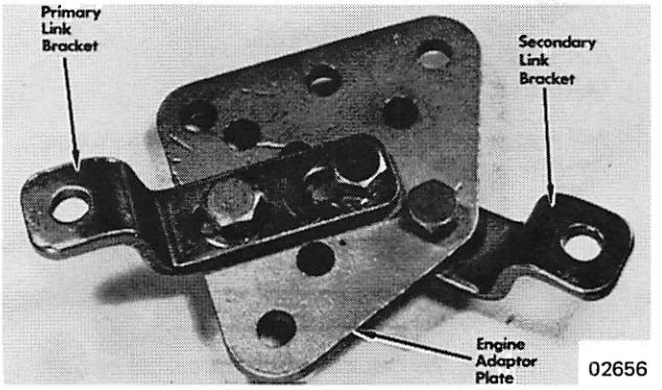


Figure 3. Adaptor Plate with Primary and Secondary Links

2. Pivot pin and ball socket is assembled ready for installation on engine adaptor plate for most engines. (Figure 4)
3. Refer to chart, following, for engines requiring realignment of pivot pin and ball socket components, as shown in Figures 5 and 6.

Engine	Ball Joint Assy. Figure No.
All Scotts	7
Evin.-Johnson 40 HP	7
Evin.-Johnson 75-50 Single	8
Evin.-Johnson 75-50 Dual	8 and 9
Evin. Johnson 18 HP	8

4. Remove coupler halves from pivot pin and ball socket assembly. (Figure 7)
5. Attach pivot pin and ball socket assembly to one of center holes 2-thru-5 in Figure 2 or to primary link bracket. (Figure 9)

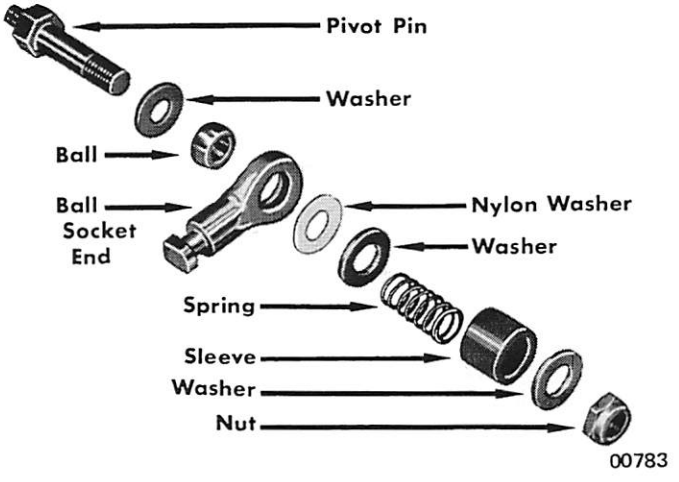


Figure 4. Pivot Pin and Ball Socket Assembly, Single Engine

6. Attach boat transom bracket to pivot block assembly. (Figure 10)
7. Insert Ride-Guide cable thru guide tube and attach cable end to ball socket end. (Figure 7 or 8)

NOTE: With 34451A_ cable, assemble coupler halves to ball socket end loosely, insert flat cable end in other end of coupler, install second screw and nut and tighten both nuts securely. (Figure 8)

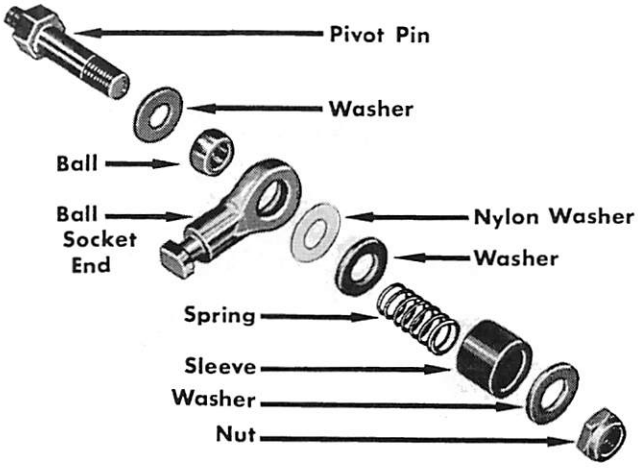


Figure 5. Pivot Pin and Ball Socket Assembly, Single Engine

INSTALLING TRANSOM BRACKET

Location of yoke hole (center hole in boat transom bracket, as shown in Figure 10) can vary from ¾" (19mm) above top of transom to 2" (50.8mm) below top of transom.

1. Locate bracket laterally by centering engine and steering wheel.
2. Mount boat transom bracket to transom with two 3/4 x 5/16" carriage bolts.

ADJUSTMENT

It may be necessary to relocate pivot pin ball joint to a different center hole in engine adaptor plate. This is determined by engine tilt angle and amount of angular movement for complete steering control.

CENTERING STEERING WHEEL

1. If steering wheel has moved from center, readjust large nuts on each side of pivot rod and yoke either way, depending upon whichever way wheel must be turned to center.
2. After adjustment is made, tighten nuts against neoprene yoke bushings to compress neoprene.

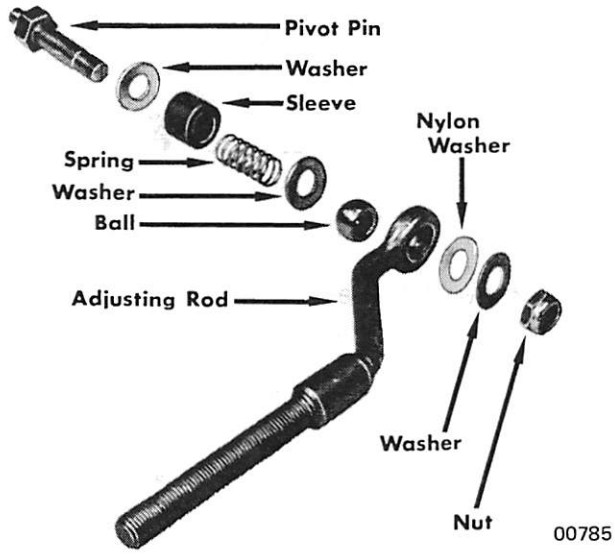


Figure 6. Pivot Pin and Ball Socket Assembly, Dual Engine

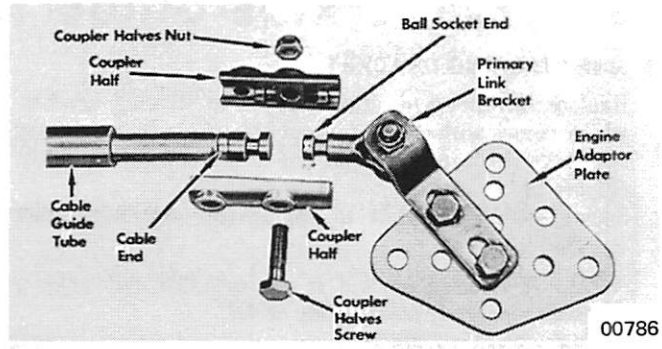


Figure 7. Ball Socket and Pivot Pin Assembly Attached to Primary Bracket on Engine Adaptor Plate with A-30509A__and A-25917__Cables

NOTE: When mounting Ride-Guide steering wheel and attachment kit on boat and motor, it may be necessary to modify steering pinion and gear rack assembly to obtain correct steering. By this we mean that when turning steering wheel to right, boat turns to right. Make changes at time Ride-Guide steering wheel assembly is mounted. Refer to Steering Wheel Mounting Instructions, preceding.

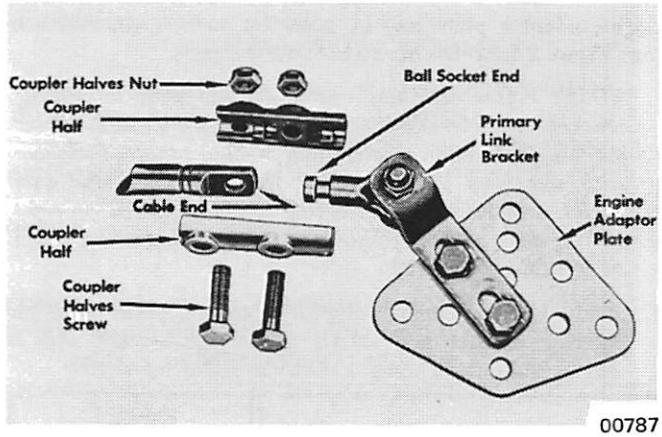


Figure 8. Ball Socket and Pivot Pin Assembly Attached to Primary Bracket on Engine Adaptor Plate with A-34451A__Cable

DUAL INSTALLATION

1. Complete single engine attachment of 11-hole engine adaptor plate to steering bracket on engine for both engines, as explained, preceding.

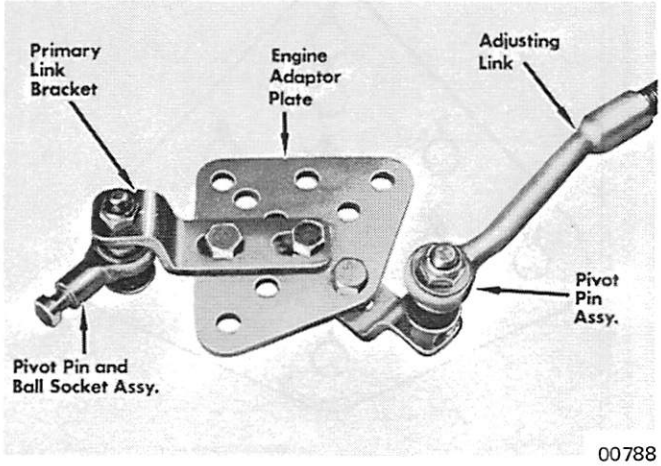


Figure 9. Pivot Pin Installed on Primary Link Bracket

2. Use 11-hole plate from kit for second engine.

NOTE: On Evinrude-Johnson V-75's, V-50's and 40 HP models, attach secondary link bracket from single engine kit to underside of 11-hole plate into holes 1 and 2 for both engines, as shown in Figure 3.

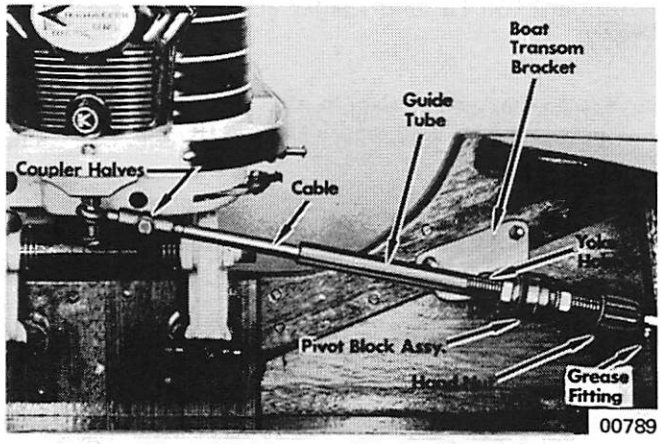


Figure 10. Transom Bracket Installed

3. Install ball joint assemblies (Figures 5 and 6) from dual kit on link rod from dual kit. (Figure 11)
4. Attach assembled piece (Figure 11) on top of hole No. 1 of 11-hole plate of both engines *(on top of secondary link brackets on both engines for Evinrude-Johnson V-75's, V-50's and 40's).*
5. Complete instructions as explained, preceding.

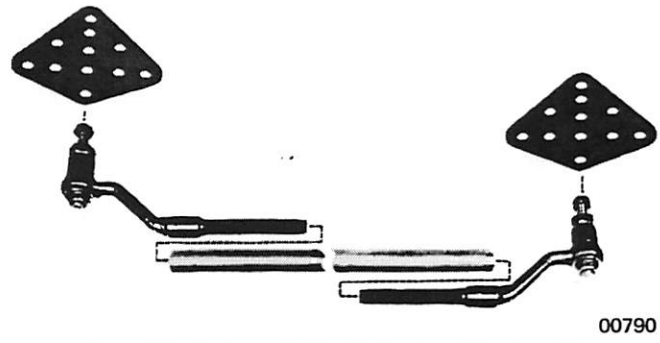


Figure 11. Universal Ride-Guide Dual Engine Kit

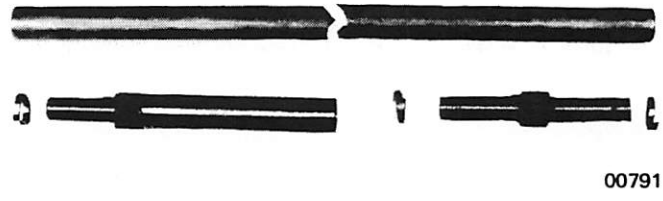


Figure 12. Additional Dual Engine Ride-Guide Extensions

UNIVERSAL RIDE-GUIDE
Engine and Transom Attachment Kits A-38047A9 and A10

Universal Ride-Guide Engine and Transom Attachment Kit (A-38047A9) Will Fit Any Current Mercury Outboard, (Merc 350 and Larger after 1964), Chrysler Outboard (35 HP and Larger after 1967) and All Evinrude and Johnson Outboards (33 HP and Larger after 1967).

TRANSOM BRACKET INSTALLATION

1. To locate transom bracket on transom, it will be necessary to install the Ride-Guide cable thru the guide tube and attach cable to engine. See "Engine Attachment Kit" instructions, following, for attaching cable to engine.
2. Locate transom bracket by centering engine, centering steering wheel and positioning transom bracket on transom. (Figures 1 and 2)

NOTE: The transom bracket can be positioned with transom mounting bolts located either above or below the guide tube, depending upon boat construction.

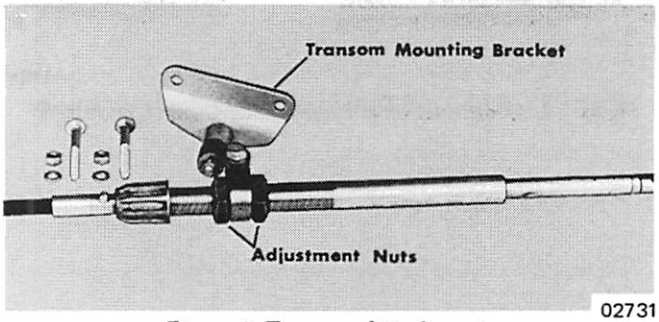


Figure 1. Transom Attachment

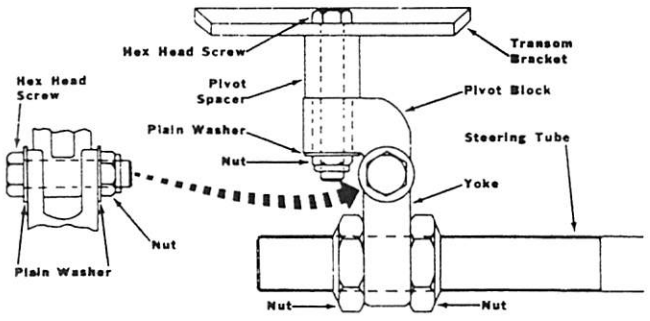


Figure 2. Drawing of Transom Attachment

3. Drill holes for mounting bolts and secure bracket to transom with two 2-3/4"x5/16" carriage bolts.
4. If steering wheel is slightly off center, adjust nuts on guide tube to center wheel. Tighten nuts securely.

ENGINE ATTACHMENT - For All Evinrude & Johnson Motors, Except 40 HP and Larger

1. It will be necessary to enlarge the required attaching hole in the steering bracket (depending upon which side the clevis is attached) with a 25/64" drill.
2. Secure steering bracket to engine, following manufacturer's instructions.

NOTE: If steering bracket is not included with engine, purchase separately from engine dealer.

3. Attach clevis and cable to steering bracket. Refer to Figures 3-4-5-6 for all models thru 33 HP. For 40 HP and larger, see Figure 7.

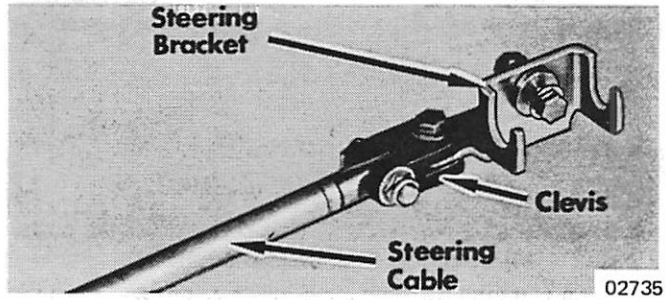


Figure 3. Engine Attachment (Except 40 HP and Larger)

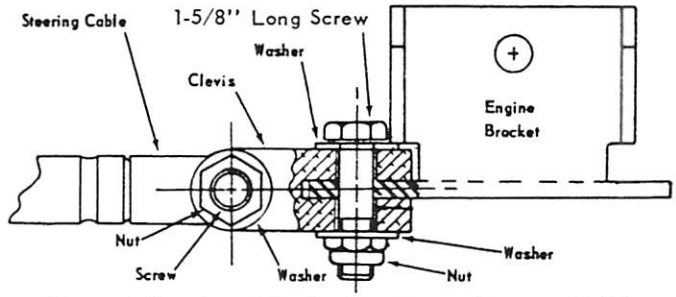


Figure 4. Drawing of Engine Attachment (Except 40 HP and Larger)

NOTE: Do not over-tighten screw which secures steering cable to clevis, as cable must be free to pivot in clevis.

4. In boats with narrow engine wells, cable end may be attached to steering bracket by either method shown in Figures 5 and 6. Use bracket hole furthest from transom attachment.

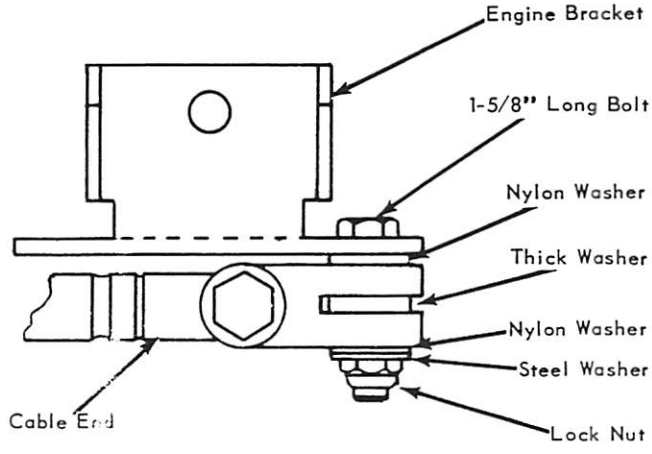


Figure 5. Engine Attachment - 33 HP

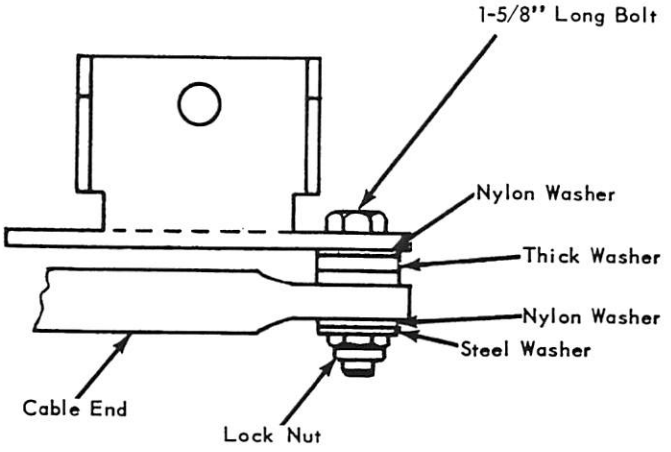


Figure 6. Drawing of Engine Attachment - 33 HP

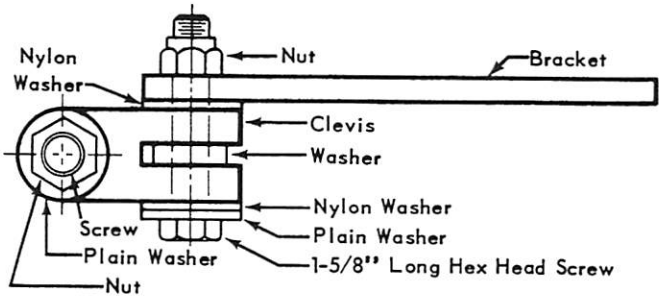


Figure 7. Drawing of Engine Attachment - 40 HP and Larger

ENGINE ATTACHMENT - Evinrude & Johnson 40 HP and Larger

1. Attach clevis to end of cable.
2. Attach clevis to end of steering arm as shown in Figures 9 and 10. Some models may require that clevis be attached below arm. (Figure 7)

   NOTE: Do not over-tighten screws, as clevis must be free to pivot on bracket, and cable must be free to pivot in clevis.

ENGINE ATTACHMENT - Chrysler 35 HP and Up Models (Figure 8)

ENGINE ATTACHMENT - Mercury Marine Models 1965 and Later

1. Attach clevis and cable to engine steering arm. (Figures 9 and 10)

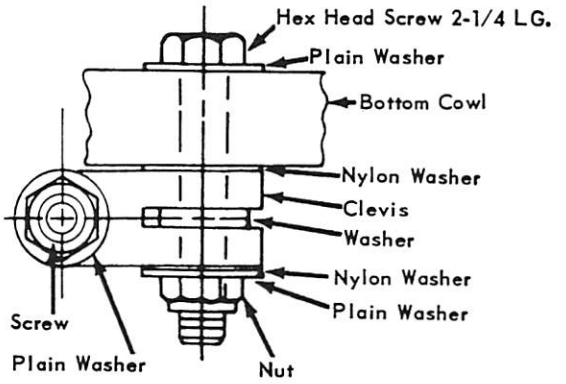


Figure 8. Engine Attachment - Chrysler (35 HP and Up)

2. Clevis must be attached to top of arm at point "A". (Figure 9)

   NOTE: Do not over-tighten screws, as clevis must be free to pivot on engine steering arm, and cable must be free to pivot in clevis.

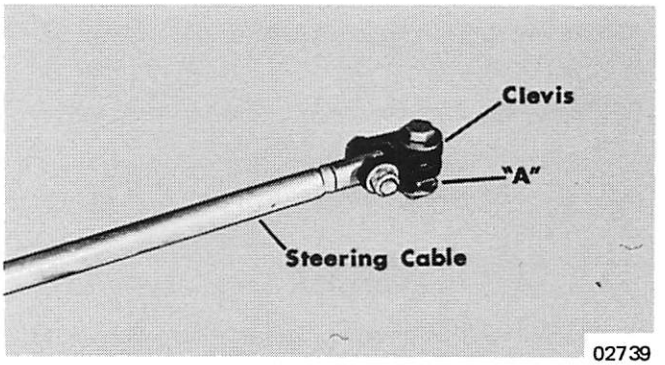


Figure 9. Engine Attachment - Mercury Models 1965 & Later

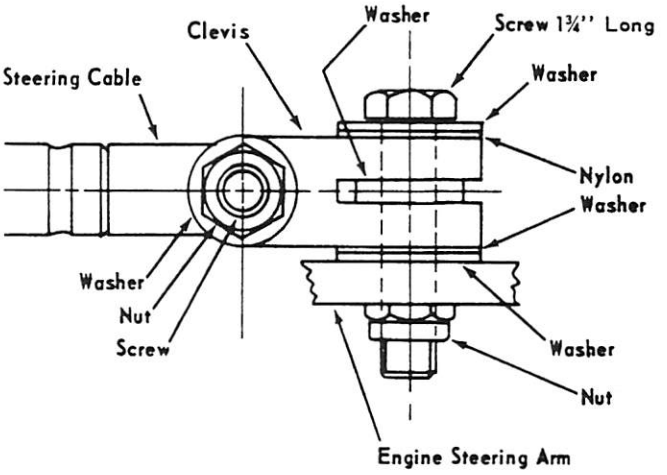


Figure 10. Drawing of Engine Attachment - Mercury Models 1965 and Later

SECTION 7 - ACCESSORIES

MERCURY
OUTBOARDS

PART B - REMOTE CONTROL SYSTEMS

MERCURY
MARINE

INDEX

CABLES

REPLACING NYLON BARREL on C-34555A_ CABLE

If nylon barrel on remote control cable C-34555_ becomes loose or damaged, replace as follows:

1. Remove inner core wire.

   NOTE: Remove burrs (made by set screws on core wire) with a file so that inner liner of cable will not be damaged when core wire is removed. Round off end of core wire so that inner lining is not damaged when core wire is reinserted.

2. Remove damaged nylon barrel.
3. Install new brass barrel assembly (C-38685A1). Larger diameter of hole in barrel faces cable.
4. Distance from end of cable to center line of brass barrel assembly must measure exactly 1-3/8" (3.5cm). (Figure 1)

   NOTE: Brass barrel assembly must be staked or locked in place with Loctite Type "A" (C-92-32609).

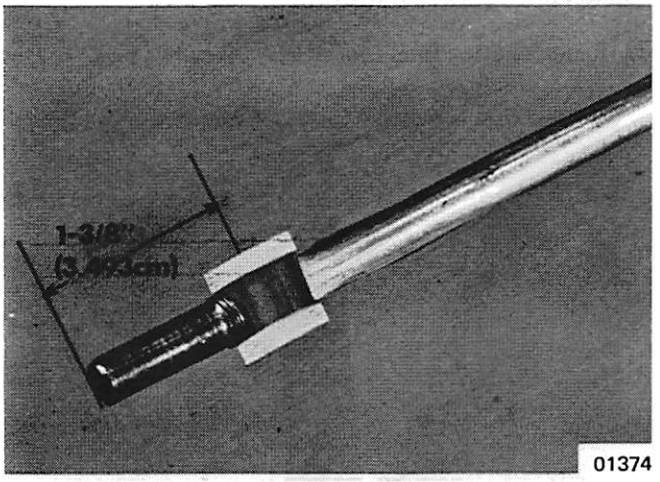


Figure 1. Distance from Cable End to Center of Brass Barrel

REPLACEMENT INNER CORE WIRE for C-34555A_ REMOTE CONTROL CABLE

The replacement inner core wire assembly (C-36201A20 or C-36201A40 for C-34555A_ remote control cable) has the stainless steel terminal end installed and is available only in 20 ft. (6.1m) and 40 ft. (12.2m) lengths.

INSTALLATION

1. Round off end (without terminal end) of new wire to prevent damaging inner liner of cable when wire is inserted.
2. Lubricate inner core wire while sliding into outer cable.
3. Continue to insert core wire until able to grip opposite end.
4. Pull core wire until distance from centerline of hole in steel terminal end and centerline of brass barrel measures exactly 2-7/16" (6.19cm). (Figure 2)
5. Measure exactly 4" (10.16cm) from end of cable insert and cut off excess core wire. (Figure 2)
6. Install cable end guide to core wire. Tighten screws securely.

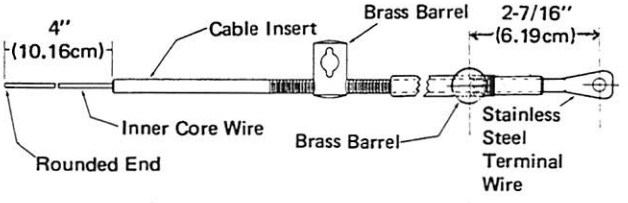


Figure 2. C-34555A__Remote Control Cable

MERCONTROL C-37782A1-A2
SHIFT and THROTTLE CABLE REPLACEMENT

REMOVING CONTROL HANDLE

1. Remove button from control shaft. (Figure 1)

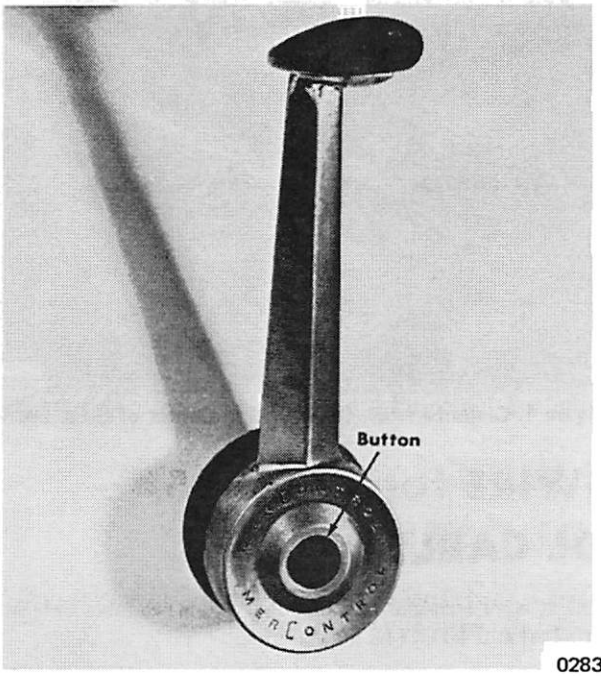


Figure 1. Control Handle

2. Loosen set screw in handle (Figure 1) and remove control handle.
3. Remove screws which hold bezel and control to panel. (Figure 2)
4. Control and control cables may be removed.

NOTE: New control shaft assemblies are held in place by a set screw which is recessed into shoulder of throttle cam. Set screw locks into a recess in control shaft. Previous models had control shaft assembly held in place with a screw and washer located on side opposite control handle. When installing control handle on early style control, caution must be taken to hold control shaft assembly in from opposite side. If control shaft assembly is not held in place, control handle will push control shaft out and control handle will not fit on serrations properly. This may cause handle to loosen in a short time. If control handle continues to become loose on early style control, control shaft and throttle cam may be replaced by correct style which holds unit in place by set screw. Also, if control handle is not fully engaged on serrated control shaft, neutral button cannot be depressed to allow disengagement of shift control. This, in turn, would not allow acceleration of engine while in neutral gear. Repair procedure of new style is same as previous models, except that set screw must be loosened to remove control shaft assembly from throttle cam.

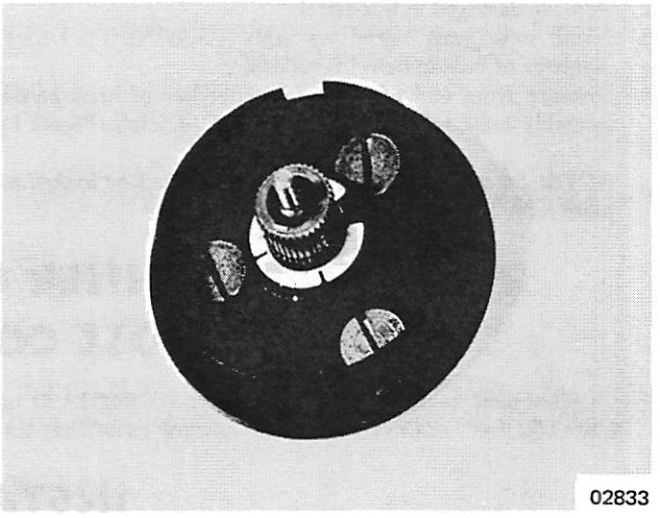


Figure 2. Bezel Installed

IMPORTANT: In order to assure proper operation of remote control, adhere to the following:

- **Control cables must be correct length. Cables, which are too long or too short, will cause hard shifting and throttle action.**
- **Bends should be kept to a minimum and not form less than a 12" (30.48cm) radius.**
- **Cables should follow the shortest route to engine.**
- **Cables C-34555A_ must be used with this control.**
- **These cables are available in lengths of 5 ft. (1.5m) to 40 ft. (12.2m) by 1 ft. (.3m) increments; ie., 5, 6, 7, 8 etc. Longer cables are available on special order.**

CABLE REPLACEMENT

NOTE: It is not necessary to disassemble control housing to install control cables. Cable replacement procedures are the same for port or starboard controls.

1. Remove cotter pins and covers. (Figure 3)

2. Place handle on splined shaft, then move handle approximately 45° toward reverse position and remove handle. This will position shift and throttle levers so that control cables can be removed or installed.

3. Control cables are held in position with pins and hair pin clips. (Figure 4)

   NOTE: Port control throttle cable is on side furthest from control handle and starboard throttle cable is on side nearest control handle.

4. Reinstall covers and cotter pins in control housing. (Figure 5)

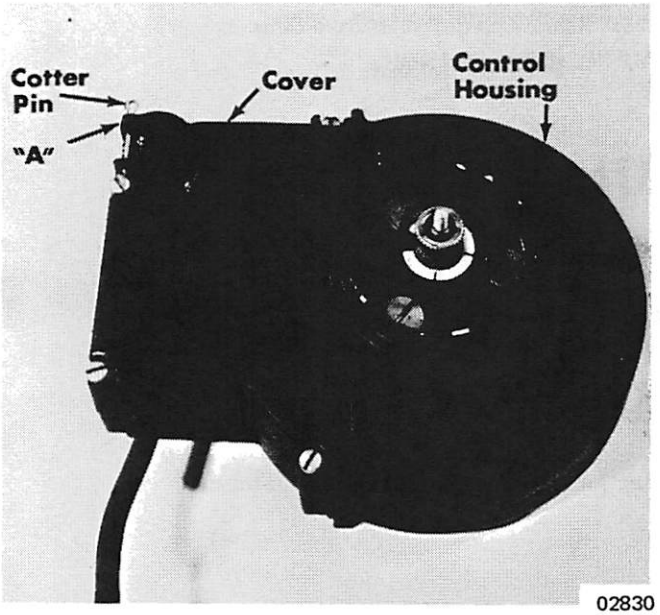


Figure 3. Cotter Pin and Cover Location

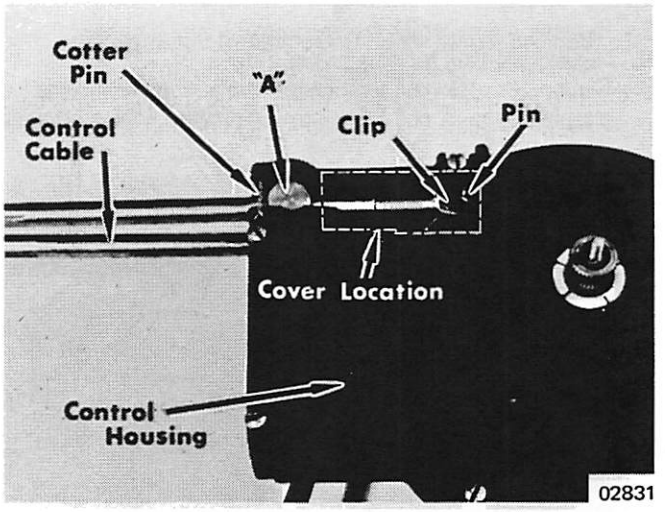


Figure 4. Control Cables Installed in Control Housing

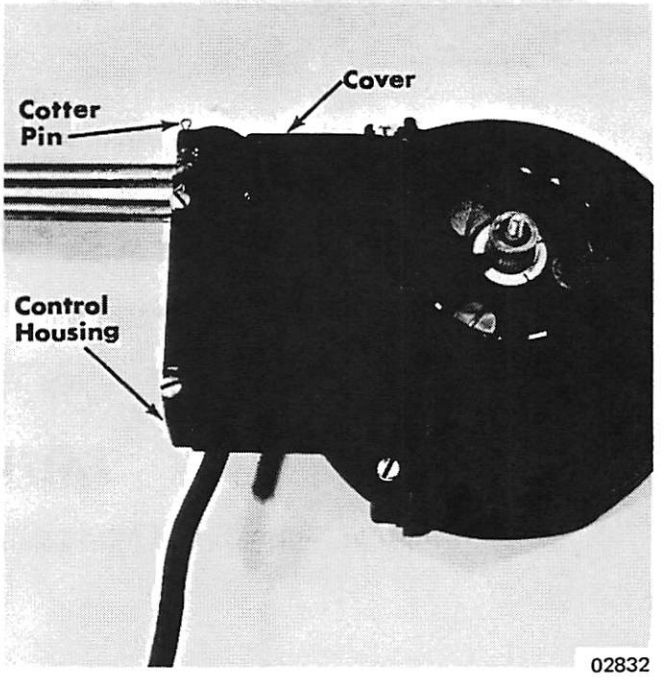


Figure 5. Cover and Cotter Pin Installation

REMOVING CONTROL SHAFTS

1. Remove screws which fasten control housing halves.
2. Separate control housing halves. (Figure 6)
3. Remove throttle and shift cams from starboard housing by grasping splined end of control shaft and lifting straight up. (Figure 6)

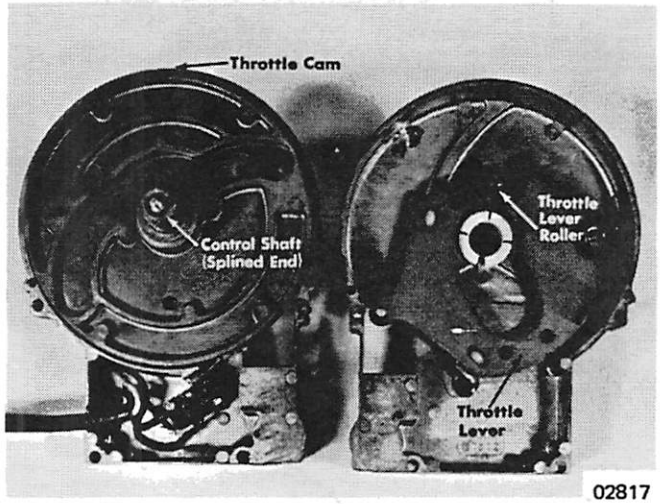


Figure 6. Control Housing Separated

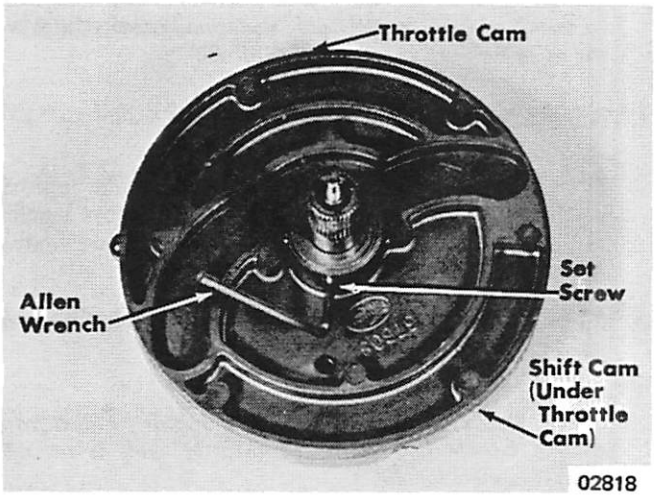


Figure 7. Loosening Set Screw

4. Remove set screw which secures control shaft to throttle cam. (Figure 7)
5. Remove control shaft from cams.
6. Reinstall control shaft.

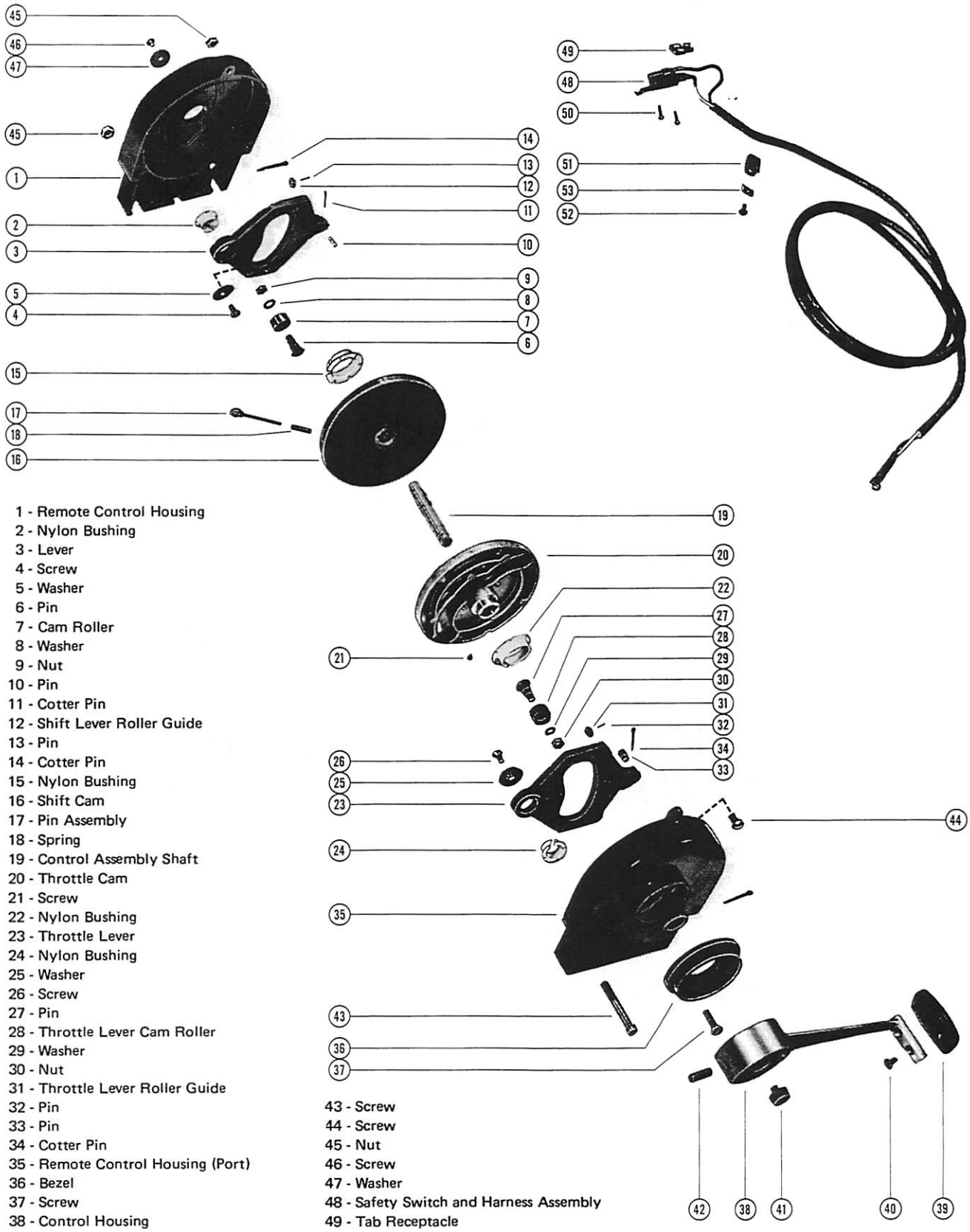
REASSEMBLY (Figure 8)

Reassemble in the reverse order of disassembly

NOTE: Console control shaft is installed in shift cam either way for left or right side control handle location.

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.



1 - Remote Control Housing
2 - Nylon Bushing
3 - Lever
4 - Screw
5 - Washer
6 - Pin
7 - Cam Roller
8 - Washer
9 - Nut
10 - Pin
11 - Cotter Pin
12 - Shift Lever Roller Guide
13 - Pin
14 - Cotter Pin
15 - Nylon Bushing
16 - Shift Cam
17 - Pin Assembly
18 - Spring
19 - Control Assembly Shaft
20 - Throttle Cam
21 - Screw
22 - Nylon Bushing
23 - Throttle Lever
24 - Nylon Bushing
25 - Washer
26 - Screw
27 - Pin
28 - Throttle Lever Cam Roller
29 - Washer
30 - Nut
31 - Throttle Lever Roller Guide
32 - Pin
33 - Pin
34 - Cotter Pin
35 - Remote Control Housing (Port)
36 - Bezel
37 - Screw
38 - Control Housing
39 - Grip
40 - Screw
41 - Button
42 - Set Screw
43 - Screw
44 - Screw
45 - Nut
46 - Screw
47 - Washer
48 - Safety Switch and Harness Assembly
49 - Tab Receptacle
50 - Screw
51 - Clip
52 - Screw
53 - "D" Washer

Figure 8. Remote Control, Exploded View

CONSOLE MODEL MERCONTROL C-37580A1
REMOVING CONTROL HANDLE

1. Remove button from control shaft
2. Loosen set screw to remove handle. (Figure 1)

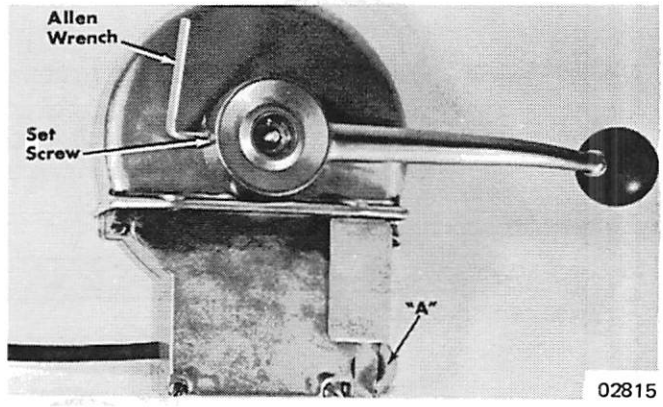


Figure 1. Tightening Set Screw

CABLE REPLACEMENT

NOTE: It is not necessary to disassemble control housing to install control cables.

1. Remove cotter pins and covers. (Figure 2)
2. Move handle approximately 45° toward reverse position. This will position shift and throttle levers so that control cables can be removed or installed.

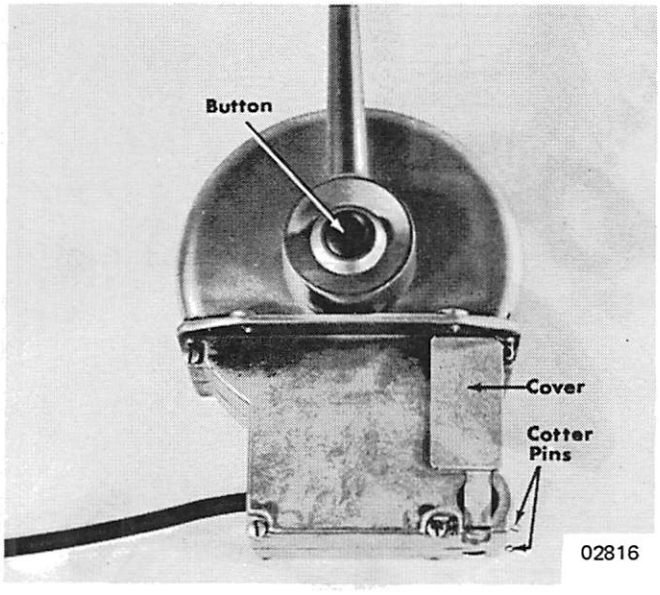


Figure 2. Control Button Installed

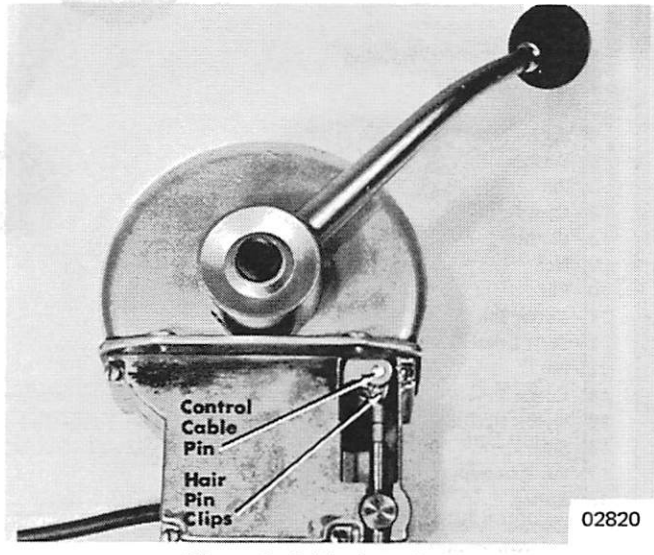


Figure 3. Cables Installed

3. Control cables are held in place with pins and hair pin clips. (Figure 3)

   NOTE: Throttle is cable on port (left) side of control housing.

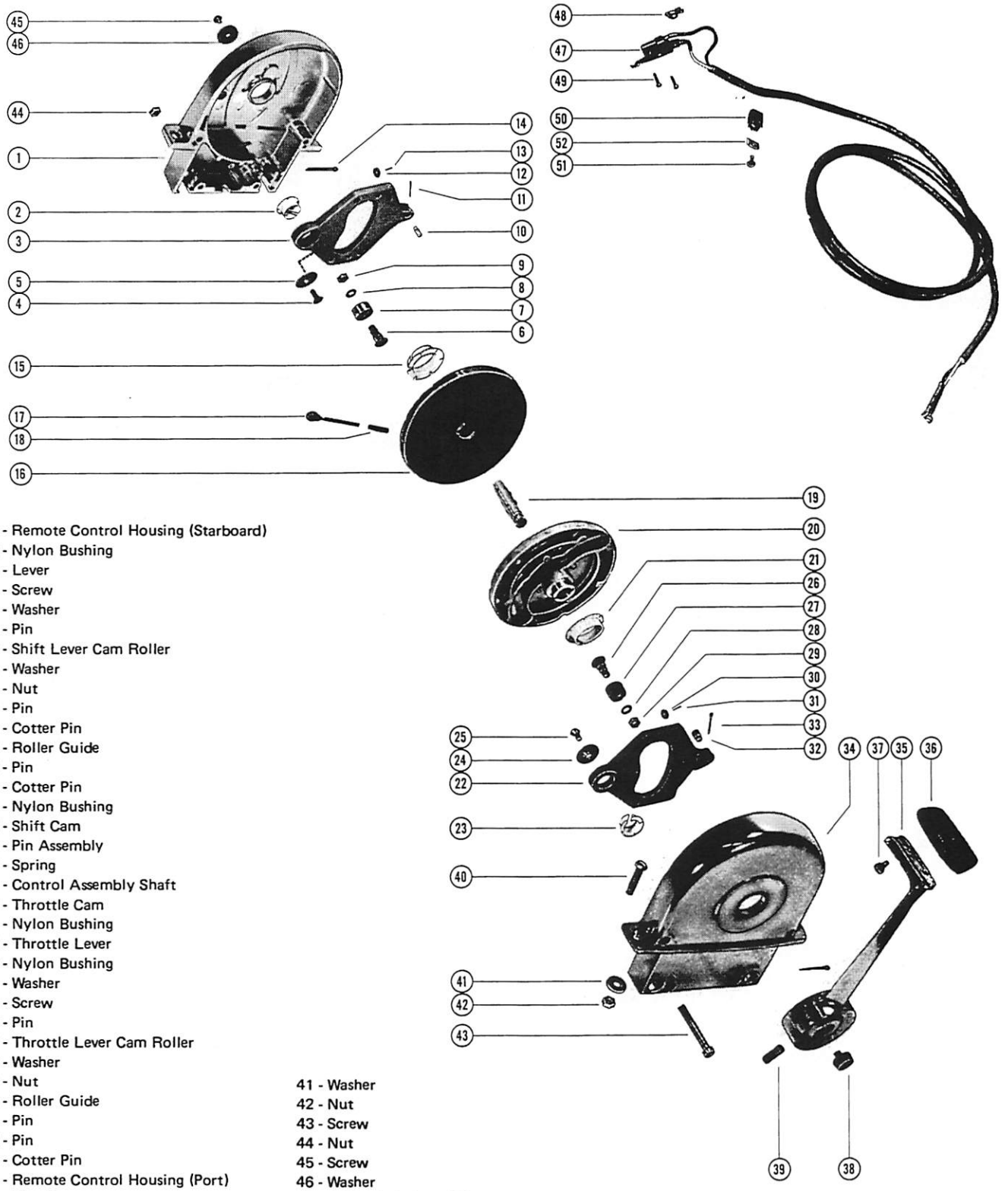
4. Reinstall covers and cotter pins in control housing. (Figure 2)

LUBRICATION

Lubricate panel controls and console controls in area where blocking pin roller rides on housing before assembling control housings. Also lubricate this area with Quicksilver Anti-Corrosion Grease (C-92-45134) when servicing these controls.

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.



1 - Remote Control Housing (Starboard)
2 - Nylon Bushing
3 - Lever
4 - Screw
5 - Washer
6 - Pin
7 - Shift Lever Cam Roller
8 - Washer
9 - Nut
10 - Pin
11 - Cotter Pin
12 - Roller Guide
13 - Pin
14 - Cotter Pin
15 - Nylon Bushing
16 - Shift Cam
17 - Pin Assembly
18 - Spring
19 - Control Assembly Shaft
20 - Throttle Cam
21 - Nylon Bushing
22 - Throttle Lever
23 - Nylon Bushing
24 - Washer
25 - Screw
26 - Pin
27 - Throttle Lever Cam Roller
28 - Washer
29 - Nut
30 - Roller Guide
31 - Pin
32 - Pin
33 - Cotter Pin
34 - Remote Control Housing (Port)
35 - Handle
36 - Grip
37 - Screw
38 - Button
39 - Screw
40 - Screw
41 - Washer
42 - Nut
43 - Screw
44 - Nut
45 - Screw
46 - Washer
47 - Safety Switch and Harness Assembly
48 - Tab Receptacle
49 - Screw
50 - Clip
51 - Screw
52 - "D" Washer

Figure 4. Remote Control, Exploded View

DUAL CONSOLE MERCONTROL C-37580A2
SHIFT and THROTTLE CABLE REPLACEMENT

NOTE: It is not necessary to disassemble control housing to install control cables.

1. Remove cotter pins and covers, screws and center cover.
2. Move both control handles to vertical (neutral) position. (Figure 1)

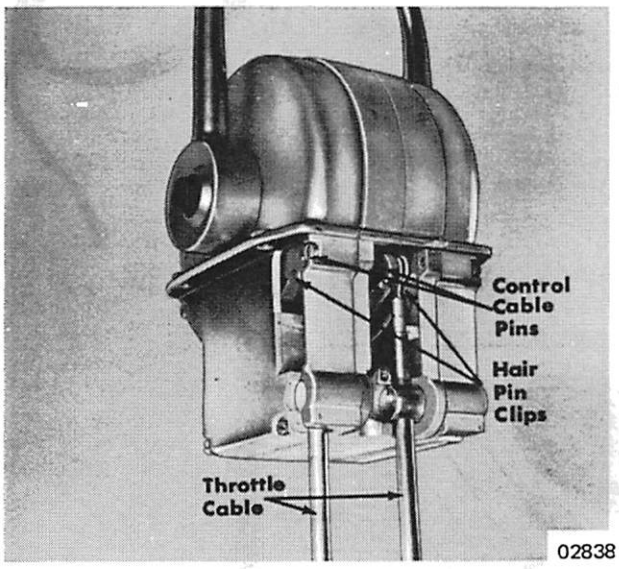


Figure 1. Throttle Cable Installed

3. Throttle cables are held in position with cable pin and hair pin clip. (Figure 2)

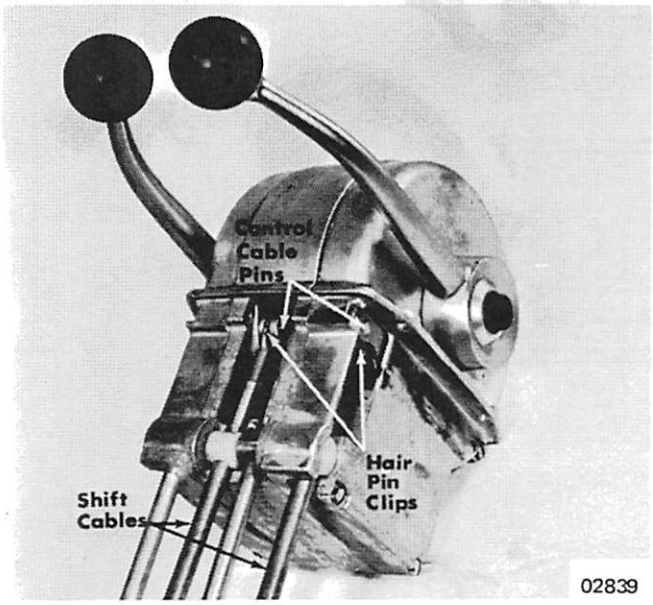


Figure 2. Shift Cables Installed

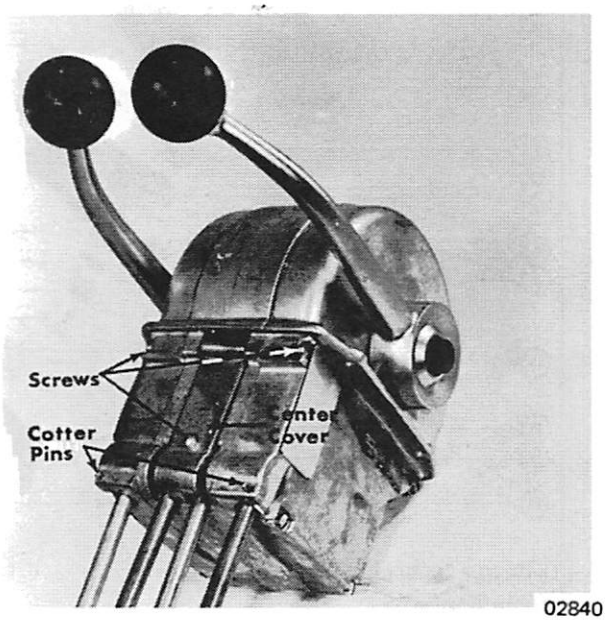


Figure 3. Cover Installed

4. Move both control handles to reverse position.
5. Shift and throttle cables are held in position with pins and hair pin clips.
6. Reinstall cotter pins, covers and screw. (Figure 3)

NOTE: New control shaft assemblies are held in place by a set screw which is recessed into shoulder of throttle cam. Set screw locks into a recess in control shaft. Previous models had control shaft assembly held in place with a screw and washer located on side opposite control handle. When installing control handle on early style control, caution must be taken to hold control shaft assembly in from opposite side. If control shaft assembly is not held in place, control handle will push control shaft out and control handle will not fit on serrations properly. This may cause handle to loosen in a short time. If control handle continues to become loose on early style control, the control shaft and throttle cam may be replaced by current style which holds unit in place by the set screw. Also, if control is not fully engaged on serrated control shaft, neutral button cannot be depressed to allow disengagement of shift control. This, in turn, would not allow acceleration of engine while in neutral gear. Repair procedure of new style is same as previous models, except that set screw must be loosened to remove control shaft assembly from throttle cam.

7. Reassemble in reverse order of disassembly. (Figure 4)

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.

1 - Remote Control Housing (Starboard)
2 - Control Housing Cover (Starboard)
3 - Cotter Pin
4 - Shift Lever
5 - Shift Lever Nylon Bushing
6 - Retaining Washer
7 - Screw
8 - Shift Lever Cam Roller
9 - Cam Roller to Shift Lever Pin
10 - Cam Roller Pin Washer
11 - Cam Roller Pin Nut
12 - Shift Lever Roller Guide
13 - Roller Guide to Shift Lever Pin
14 - Nylon Bushing
15 - Shift Cam
16 - Shift Cam Blocking Pin Assembly
17 - Blocking Pin Compression Spring
18 - Blocking Pin to Shift Cam Fastener
19 - Control Shaft Assembly
20 - Throttle Cam
21 - Throttle Cam Set Screw
22 - Nylon Bushing
23 - Throttle Lever
24 - Nylon Bushing
25 - Retaining Washer
26 - Washer
27 - Throttle Lever Cam Roller
28 - Cam Roller to Throttle Lever Pin
29 - Cam Roller Pin Washer
30 - Cam Roller Pin Nut
31 - Throttle Lever Roller Guide
32 - Roller Guide to Throttle Lever Pin
33 - Pin
34 - Control Cable Pin (Hair)
35 - Remote Control Housing (Center)
36 - Center Housing Plate Retainer
37 - Retainer Plate to Center Hsg. Screw
38 - Safety Switch and Harness Assembly
39 - Safety Switch Tab Receptacle
40 - Safety Switch to Control Hsg. Screw
41 - Remote Control Housing (Port)
42 - Control Housing Cover (Port)
43 - Control Housing Clamping Screw
44 - Remote Control to Boat Screw
45 - Remote Control Screw Washer
46 - Remote Control Screw Nut
47 - Control Handle
48 - Control Handle Grip (Black)
49 - Set Screw
50 - Control Handle Button

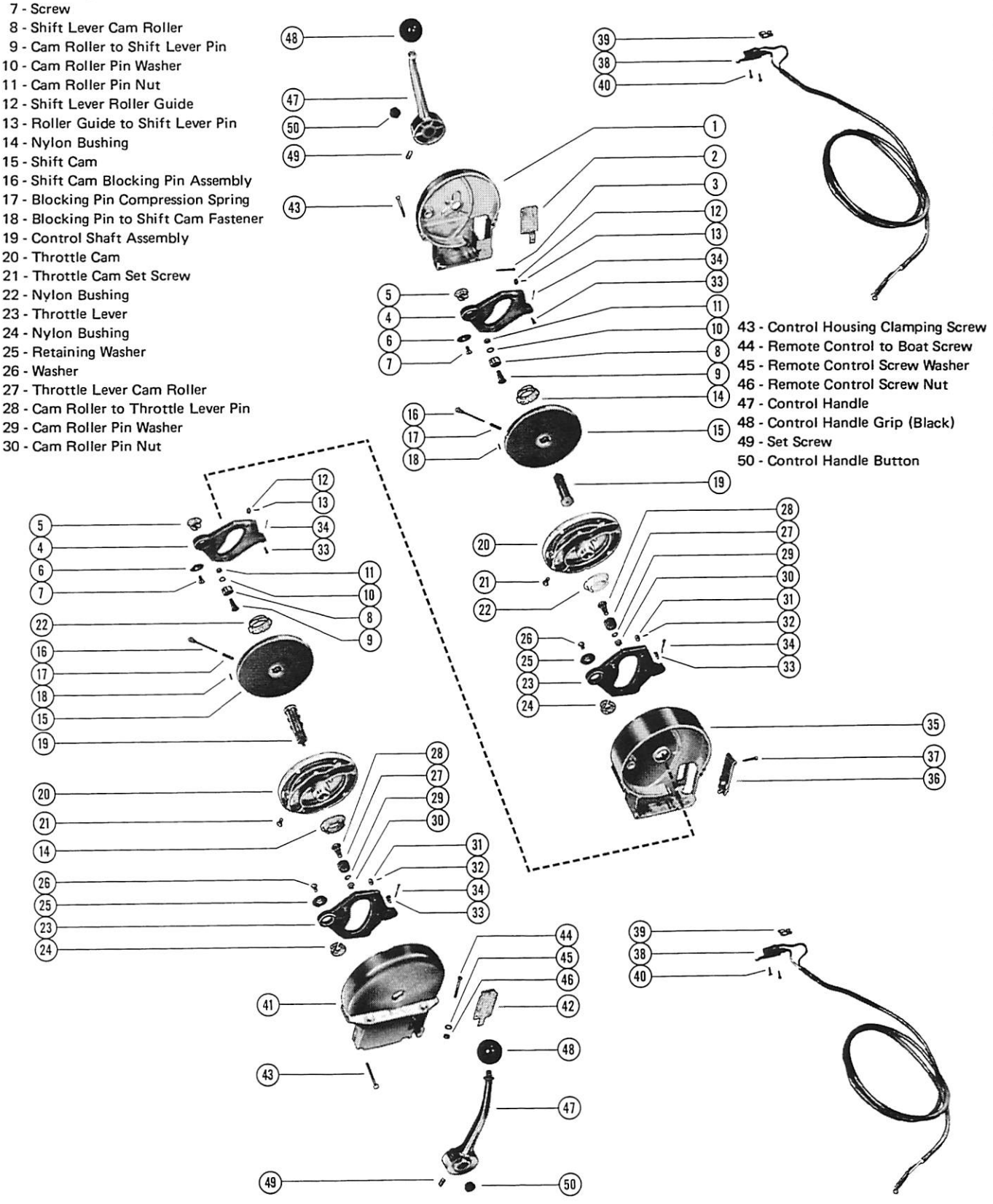


Figure 4. Panel Mounted Remote Control, Exploded View

TWO-LEVER CONSOLE MODEL MERCONTROL C-38290A1 SHIFT and THROTTLE CONTROL CABLE REPLACEMENT

NOTE: It is not necessary to disassemble control housing to install control cables.

1. Remove cotter pins and covers. (Figure 1)
2. Move throttle handle to idle position and shift handle to reverse position. This will position shift and throttle levers so that control cables can be removed or installed.

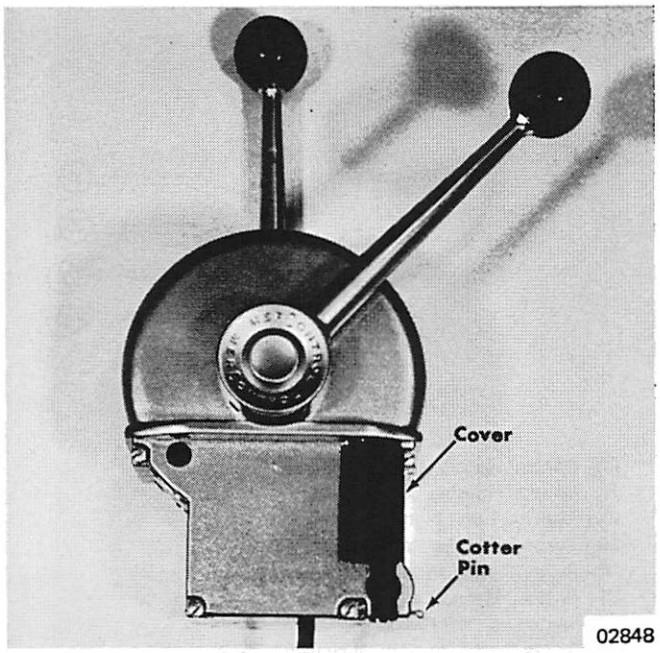


Figure 1. Removing Covers

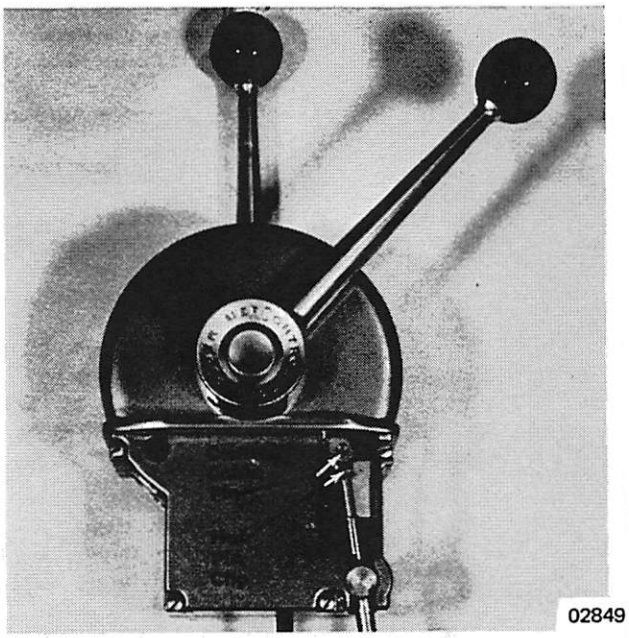


Figure 2. Cables Installed

3. Control cables are held in position with pins and hair pin clips. (Figure 2)

   NOTE: Throttle is cable on port (left) side of control housing.

4. Reinstall covers and cotter pins. (Figure 3)

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.

1 - Remote Control Housing (Starboard)
2 - Control Housing Stop Block
3 - Stop Block to Control Housing Screw
4 - Shift Lever
5 - Shift Lever Detent Pin Assembly
6 - Compression Spring
7 - Detent Pin to Shift Lever Fastener
8 - Control Shaft
9 - Control Cable to Shift Lever Pin
10 - Control Cable to Shift Lever Pin Pin
11 - Cotter Pin
12 - Control Housing Cover (Starboard)
13 - Shift Lever Nylon Bushing
14 - Throttle and Shift Handle
15 - Shift Handle Knob (Black)
16 - Set Screw
17 - Remote Control to Boat Screw
18 - Remote Control Screw Washer
19 - Remote Control Screw Nut
20 - Throttle Lever
21 - Control Cable to Throttle Lever Pin
22 - Control Cable to Throttle Lever Pin Pin
23 - Remote Control Housing (Port)
24 - Control Housing Stop Block
25 - Stop Block to Control Housing Screw
26 - Control Housing Clamping Screw
27 - Control Housing Cover (Port)
28 - Throttle Lever Nylon Bushing
29 - Throttle Handle Knob (Red)
30 - Safety Switch and Harness Assembly
31 - Switch Harness Tab Receptacle
32 - Switch Harness Clamp
33 - Safety Switch to Control Housing Screw

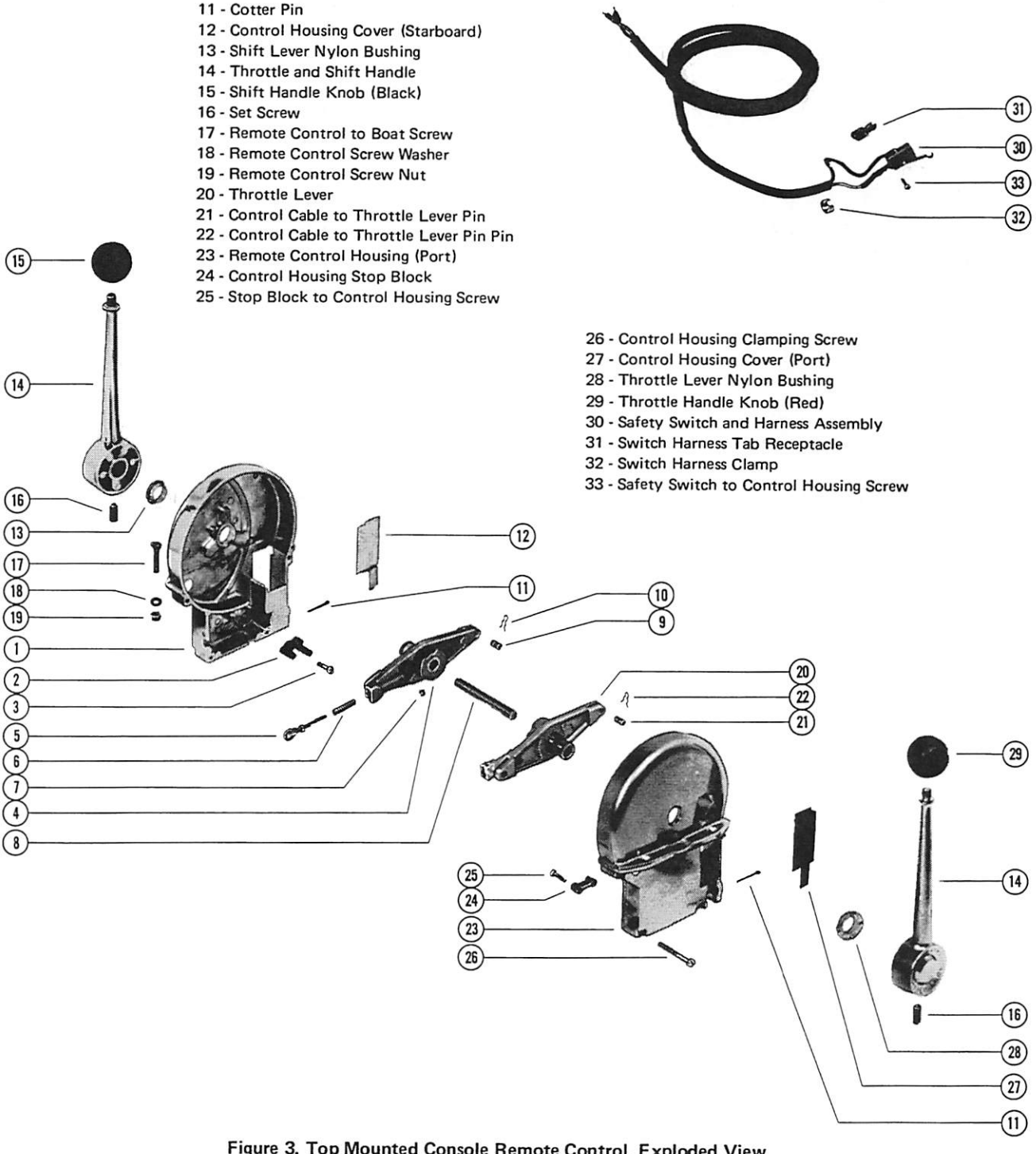


Figure 3. Top Mounted Console Remote Control, Exploded View

DUAL STATION CONTROL KIT C-38290A2

2-LEVER CONSOLE MOUNTED MERCONTROL DUAL STATION (Single Motor)

SHIFT and THROTTLE CONTROL CABLE REPLACEMENT

CONTROL STATION NO. 1

1. Use two C-38286A_ control cables of desired length.
2. Remove cotter pins and covers from control housing. (Figure 1)
3. Move throttle handle to idle position and shift handle to reverse position. This will position shift and throttle levers so that control cables can be installed.

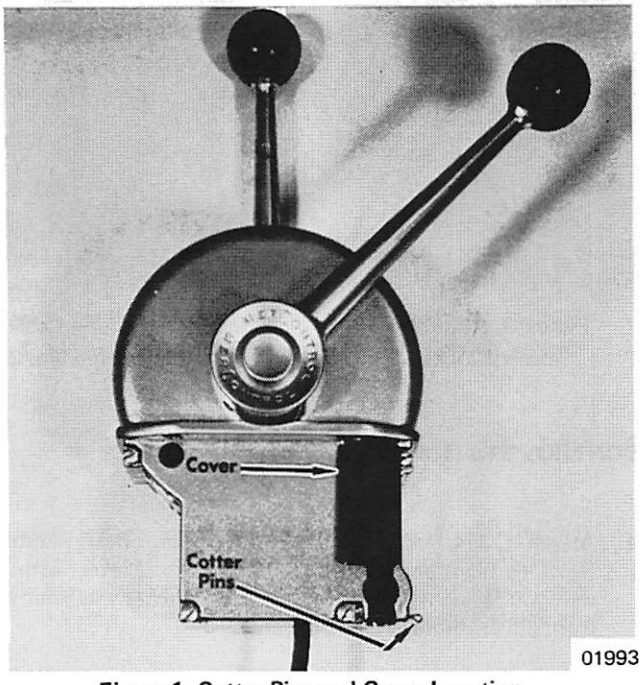


Figure 1. Cotter Pins and Cover Location

4. Position control cables in control housing and install control cable pins and hair pin clips. (Figure 2)

   NOTE: Throttle cable is on port (left) side of control housing.

5. Reinstall covers and cotter pins in control housing.

CONTROL STATION NO. 2

1. Use two C-38286A_ control cables of desired length.
2. Move throttle handle to fast position and shift handle to forward position. This will position throttle and shift levers so that control cables can be removed or installed.

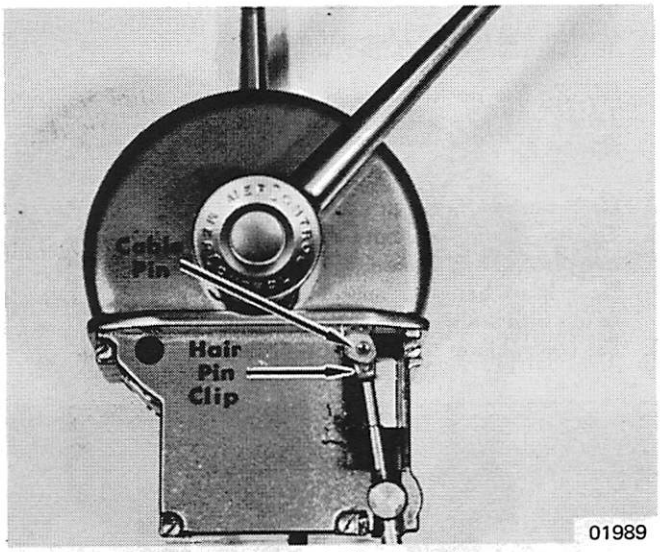


Figure 2. Pins and Clips Location

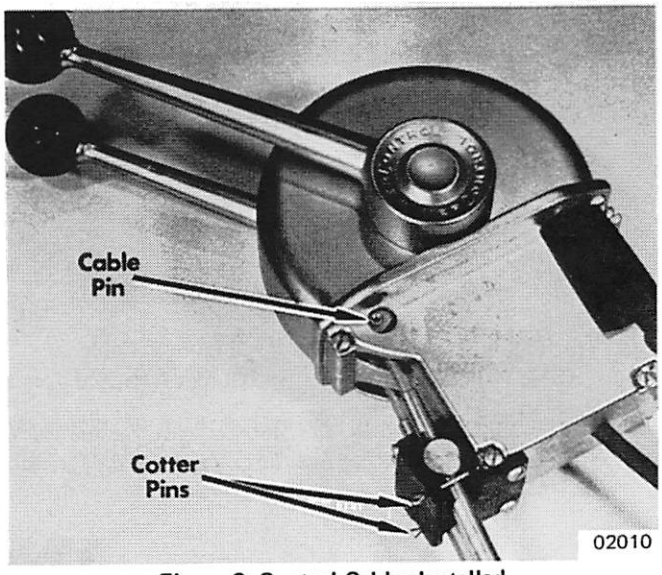


Figure 3. Control Cables Installed

3. Control cables are held in position with pins and hair pin clips. (Figure 3)

   NOTE: Throttle cable is on port (left) side of control.

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.

2-LEVER TOP MOUNTED CONTROL
C-32669A1 - DUAL STATION
SHIFT and THROTTLE CONTROL CABLE REPLACEMENT

CONTROL STATION NO. 1

1. Cable end guides are attached to rear end of control box levers with 1" screws. (Figure 1) (Outside mounting bracket was removed for clarification.)

   NOTE: Use anchor hole at end of lever. Allen head set screws and hex head cap screws must face each other. (Figure 2)

2. Place washers between cable ends and control box levers.
3. Tighten elastic stop nuts and back off slightly to permit free pivot of cable guide.
4. Place brass barrel in spacer block halves (Figure 1) and fasten with screws and elastic stop nuts. (Figure 3)
5. Use control lever with detent positions for shift cable.

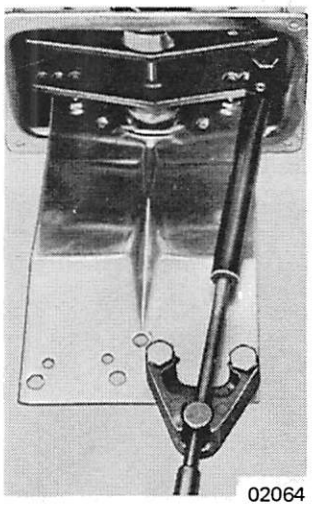


Figure 1. Cable Position

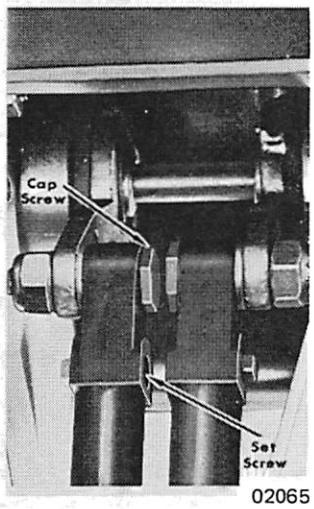


Figure 2. Cable Guides Attached

NOTE: Handles, knobs and detents may be moved or interchanged in the control box, as desired, for each particular installation.

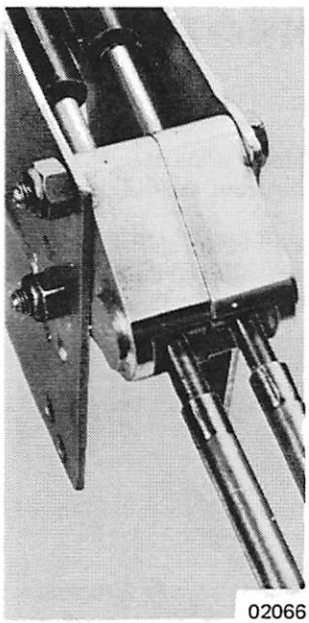


Figure 3. Attaching Spacer Blocks

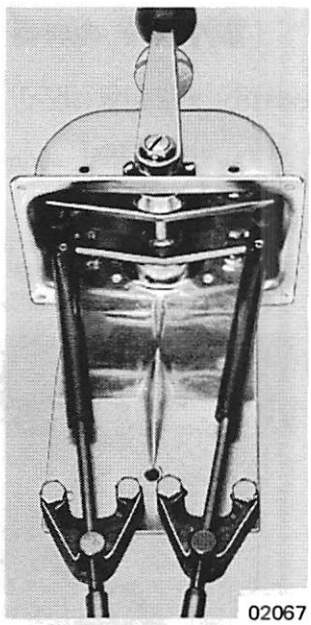


Figure 4. Attaching Cables to Control Station No. 2

CONTROL STATION NO. 2

1. Attach C-37404A_ Control cables from control station No. 1 to front end of control station No. 2 levers with 1" screws. (Figure 4) (Outside mounting bracket was removed from illustration for clarification.)

2. Follow preceding instructions for attaching spacer blocks and control cables. (Figure 5)

   NOTE: Two C-29564-S control cables are required from station No. 2 to engine.

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.

MERCONTROL SINGLE-LEVER FULL GEAR SHIFT SHIFT and THROTTLE CABLE REPLACEMENT

NOTE: For dual installation, order Dual Mounting Bracket Kit (C-34766A1).

DISASSEMBLY of CONTROL STATION

1. Remove 4 screws which hold control housing halves together and lift left side housing off (housing without neutral warm-up lever) to separate halves.
2. Remove detent springs and detent roller from left side housing. (Figure 1)
3. On 6-cylinder models and 4-cylinder electric models only, remove 2 screws which secure neutral safety switch to left side housing and move neutral safety switch out of position. (Figure 1)
4. Lift face cam out of left side housing.

NOTE: On electric models, it is not necessary to remove key switch or choke switch from housing.

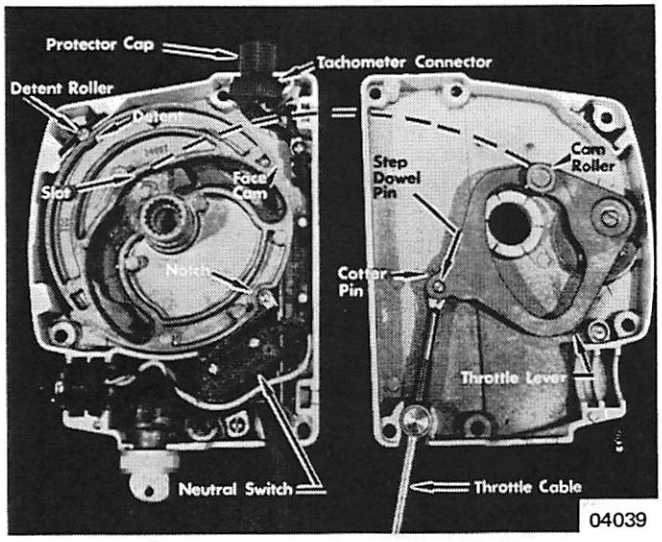


Figure 1. Control Station Halves (Electric Model)

CONTROL CABLE INSTALLATION

Use control cables C-34555A5 thru C-34555A40 with this control. Choose control cable of correct length. Check throttle and shift cables before installing in control station to insure that set screws in cable end guides are tight.

SHIFT LEVER

1. Remove cotter pin and step dowel pin from shift lever. (Figure 2)
2. Place Anti-Corrosion Grease (C-92-45134A1) into cable socket and install shift cable into position. Coat step dowel pin with a thin film of Anti-Corrosion Grease and install step dowel pin thru shift lever cable end. (Figure 2)
3. Align cotter pin holes and install cotter pin with head of cotter pin toward forward end of control box. Bend back both ends of cotter pin.
4. Place face cam in position over shift lever. Tooth on face cam must fit into notch of shift lever. (Figure 2)

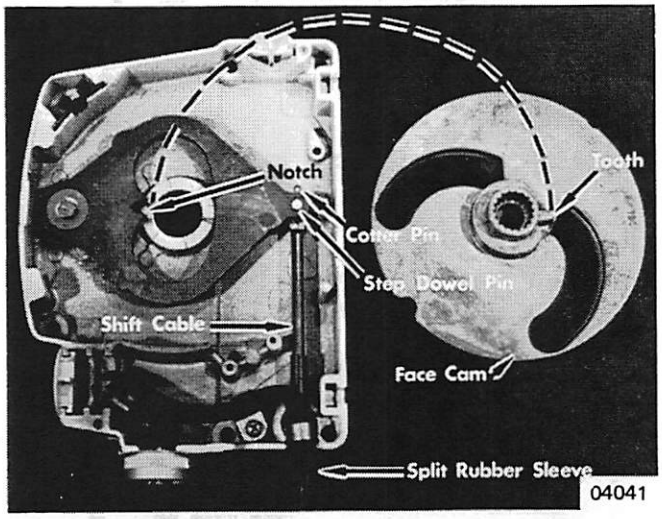


Figure 2. Shift Cable Installation

NOTE: On 6-cylinder models and 4-cylinder electric models, be sure neutral safety switch is aligned with notch in face cam.

5. Install detent springs and detent roller. (Figure 1)

NOTE: On non-electric installations, position the split rubber sleeve on the shorting switch cable over the ends of the shift and throttle cable brass barrels to keep cables in position. (Figure 2)

THROTTLE LEVER

1. Remove cotter pin and step dowel pin from throttle lever (Figure 1, right half).
2. Place Anti-Corrosion Grease into cable socket and install throttle cable into position. Coat step dowel pin with a thin film of Anti-Corrosion and install step dowel pin thru throttle lever and throttle cable end. (Figure 1, right half)
3. Align cotter pin holes and install cotter pin with head of cotter pin toward forward end of control box. Bend back both ends of cotter pin.

REASSEMBLY

1. Before placing halves together, be sure face cam and throttle lever are positioned as shown in Figure 1.
2. Place halves together. If housing halves do not fit together, cam roller is not entering face cam slot. Reposition as shown in Figure 1.
3. Place screws thru housing halves and tighten evenly.
4. Set handle into splined hub on desired side and turn until detent (neutral position) is noted. Reset handle so handle is in vertical position. Install handle screw and lockwasher and tighten securely.
5. Hand grip may be repositioned on control handle to suit individual preference.

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.

MERCONTROL A-59369A1 for 1971 MERC 200-110-75-40
SINGLE-LEVER FULL GEAR SHIFT
SHIFT and THROTTLE CABLE REPLACEMENT

NOTE: For dual installation, order Dual Mounting Bracket Kit (C-34766A2).

DISASSEMBLY of CONTROL STATION

1. Remove 4 screws, which hold control housing halves together, and lift left side housing off (housing without neutral warm-up lever) to separate halves.
2. Remove detent springs and detent roller from left side housing. (Figure 1)
3. Lift face cam out of left side housing.

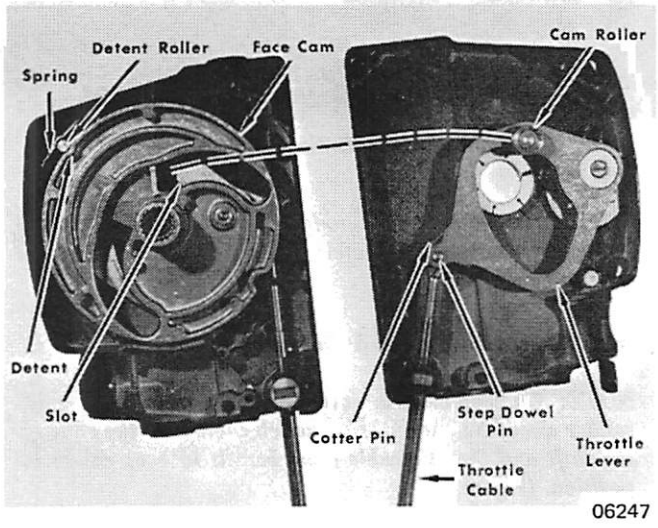


Figure 1. Control Station Halves

CONTROL CABLE INSTALLATION

Use control cables C-34555A5 thru C-34555A40 with this control. Choose control cable of correct length. Check throttle and shift cables before installing in control station to insure that set screws in cable end guides are tight.

SHIFT LEVER

1. Remove cotter pin and step dowel pin from shift lever. (Figure 2)
2. Place Anti-Corrosion Grease (C-92-45134A1) into cable socket and install shift cable into position. Coat step dowel pin with a thin film of Anti-Corrosion Grease and install step dowel pin thru shift lever cable end. (Figure 2)
3. Align cotter pin holes and install cotter pin with head of cotter pin toward forward end of control box. Bend back both ends of cotter pin.

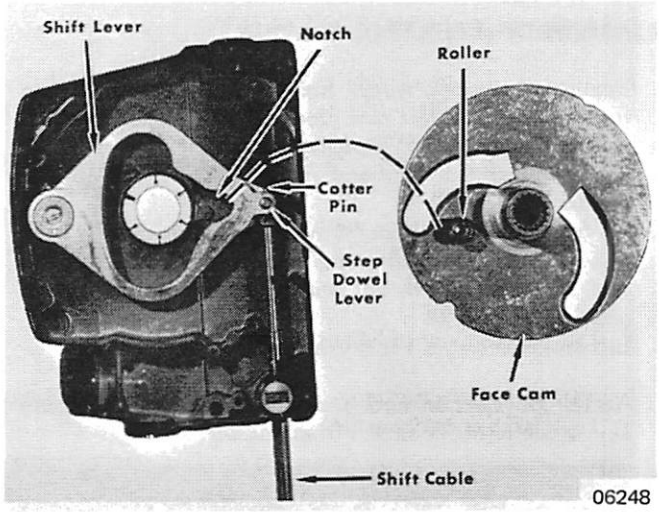


Figure 2. Shift Cable Installation

4. Place face cam in position over shift lever. Roller on face cam must fit into notch of shift lever. (Figure 2)
5. Install detent springs and detent roller. (Figure 1)

THROTTLE LEVER

1. Remove cotter pin and step dowel pin from throttle lever. (Figure 1, right half)
2. Place Anti-Corrosion Grease into cable socket and install throttle cable into position. Coat step dowel pin with a thin film of Anti-Corrosion and install step dowel pin thru throttle lever and throttle cable end. (Figure 1, right half)
3. Align cotter pin holes and install cotter pin with head of cotter pin toward forward end of control box. Bend back both ends of cotter pin.

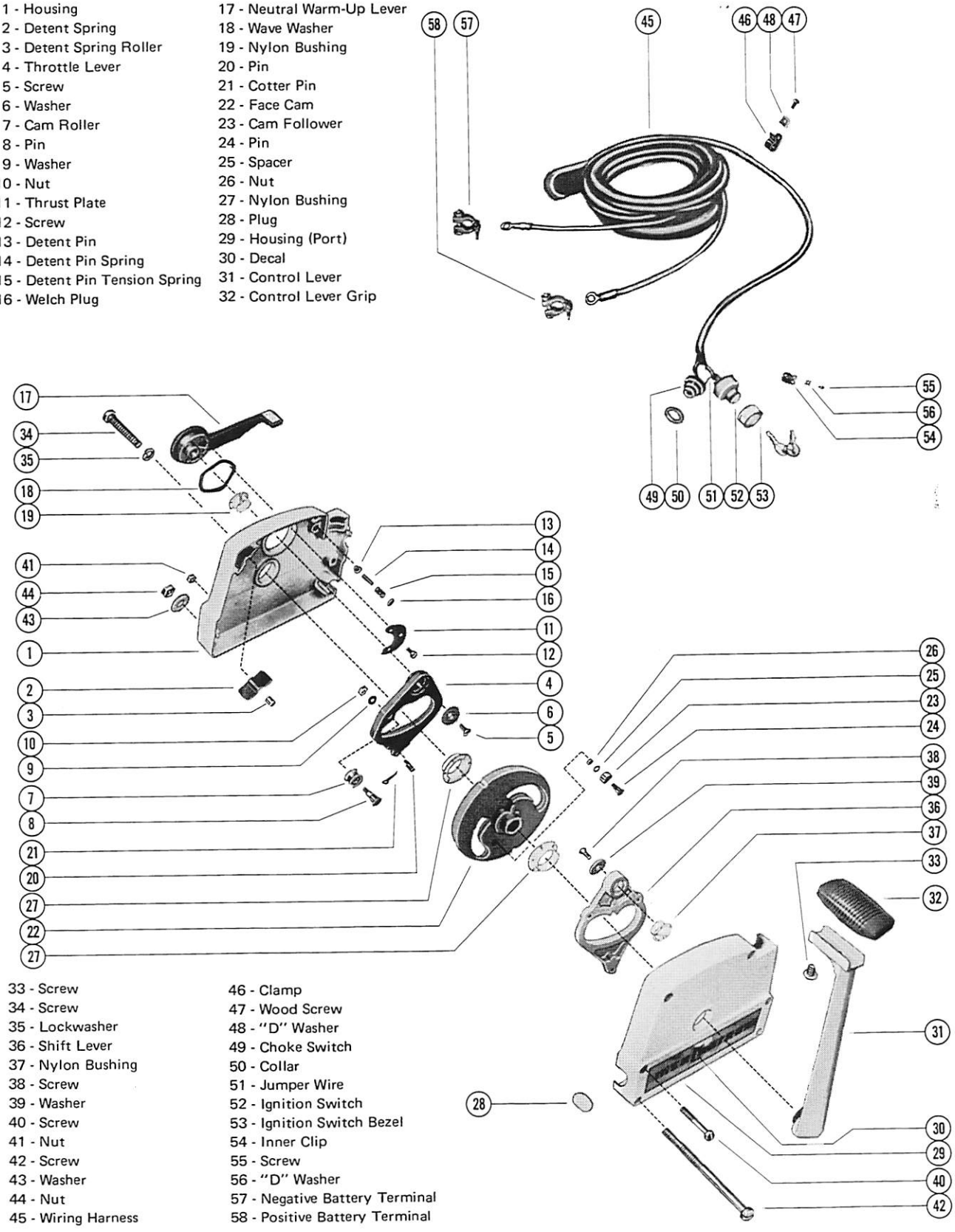
REASSEMBLY

1. Before placing halves together, be sure face cam and throttle lever are positioned as shown in Figure 1.
2. Place halves together. If housing halves do not fit together, cam roller is not entering face cam slot. Reposition as shown in Figure 1.
3. Place screws thru housing halves and tighten evenly.
4. Set handle into splined hub on desired side and turn until detent (neutral position) is noted. Reset handle so handle is in vertical position. Install handle screw and lockwasher and tighten securely.
5. Hand grip may be repositioned on control handle to suit individual preference.

ADJUSTMENT

Refer to "Remote Control Attachment", this part, for shift and throttle cable adjustment.

1 - Housing
2 - Detent Spring
3 - Detent Spring Roller
4 - Throttle Lever
5 - Screw
6 - Washer
7 - Cam Roller
8 - Pin
9 - Washer
10 - Nut
11 - Thrust Plate
12 - Screw
13 - Detent Pin
14 - Detent Pin Spring
15 - Detent Pin Tension Spring
16 - Welch Plug
17 - Neutral Warm-Up Lever
18 - Wave Washer
19 - Nylon Bushing
20 - Pin
21 - Cotter Pin
22 - Face Cam
23 - Cam Follower
24 - Pin
25 - Spacer
26 - Nut
27 - Nylon Bushing
28 - Plug
29 - Housing (Port)
30 - Decal
31 - Control Lever
32 - Control Lever Grip



33 - Screw
34 - Screw
35 - Lockwasher
36 - Shift Lever
37 - Nylon Bushing
38 - Screw
39 - Washer
40 - Screw
41 - Nut
42 - Screw
43 - Washer
44 - Nut
45 - Wiring Harness
46 - Clamp
47 - Wood Screw
48 - "D" Washer
49 - Choke Switch
50 - Collar
51 - Jumper Wire
52 - Ignition Switch
53 - Ignition Switch Bezel
54 - Inner Clip
55 - Screw
56 - "D" Washer
57 - Negative Battery Terminal
58 - Positive Battery Terminal

Figure 3. Remote Control Assembly (Electric)

REMOTE CONTROL CABLE ATTACHMENT

MERC 39 (SERIAL NO. 1912759 and UP) and 40 (1969-71)

1. Be certain that throttle and shift cables and stop switch have been installed in the remote control housing, according to instructions in the housing carton, before installing cables on engine. Note that approximately the first 45° of control handle travel . . . forward and reverse . . . shifts the engine. Remainder advances throttle. Mount control station on right hand side of boat where possible.
2. To install throttle and shift cables, place single lever remote control handle in neutral position and smaller neutral throttle lever (on side of box) down all the way.
3. Move throttle lever (on motor) forward to stop.

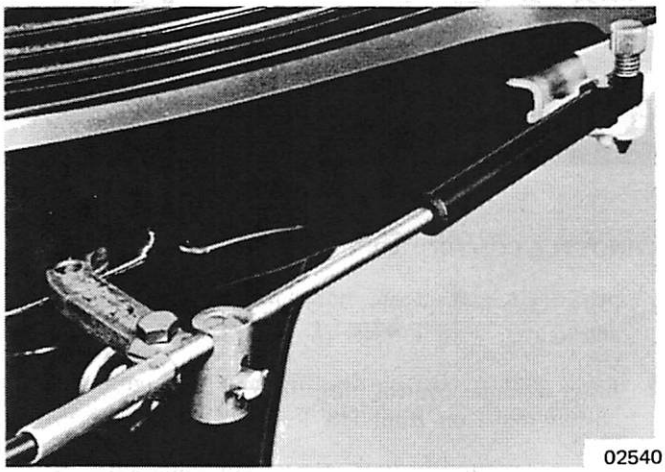


Figure 1. Throttle Cable Installed

4. Attach brass throttle barrel and anchor pin on motor. (Figure 1) Note that shift cable travels first, throttle cable second, when moving control handle.
5. With single lever remote control handle and shift lever both in neutral position, attach brass shift barrel and anchor pin on motor (Figure 2) without disturbing setting. Brass barrels may be adjusted on cables for correct position and to compensate for cable backlash.

   NOTE: If control cables are not properly adjusted, motor will not operate satisfactorily.

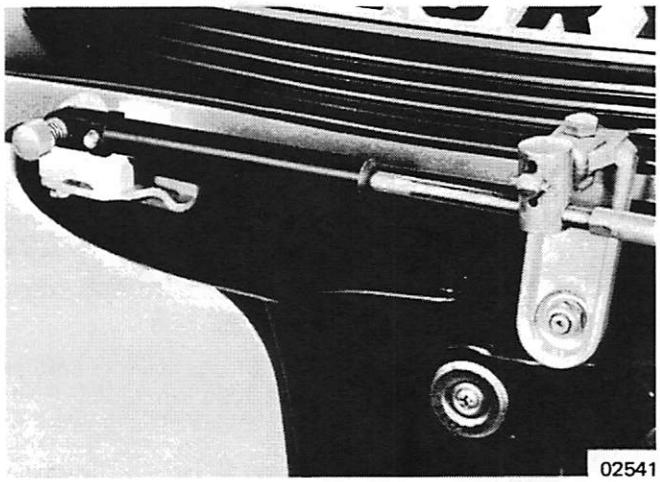


Figure 2. Shift Cable Installed

WARNING! There is no throttle-shift interlock on the engine, therefore, do not shift from full throttle in forward to reverse gear without reducing throttle to slow position to reduce engine RPM, or damage may result.

REMOTE CONTROL ATTACHMENT for MERC 60-75-110

SHIFT CONTROL CABLE

1. Place single lever remote control handle in forward position (slow speed) and neutral warmup lever (on side of box) down all the way.

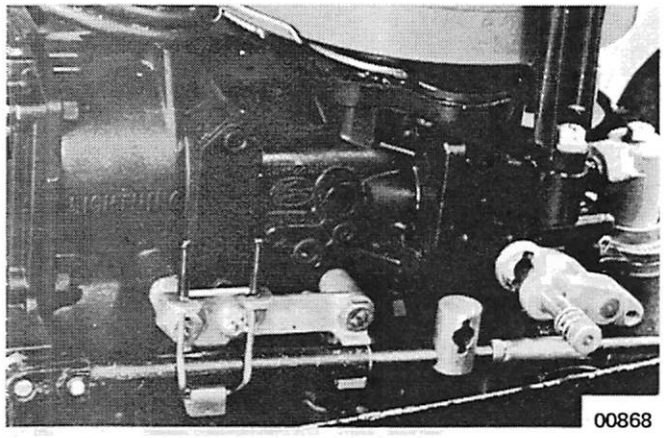


Figure 3. Fastening Shift Cable End

2. Insert remote control shift cable into grommet in bottom cowl on front right hand side with brass barrel inside cowl.
3. With motor in neutral gear, place cable end guide over peg on cylinder head cover. The cable passes under the shift lever clevis. Fasten cable end in place by latching "hairpin" spring clamp. (Figure 3)
4. Move shift lever and clevis assembly (rearward) into forward gear position with spring-loaded clevis pin withdrawn as far as possible. (Figure 4)

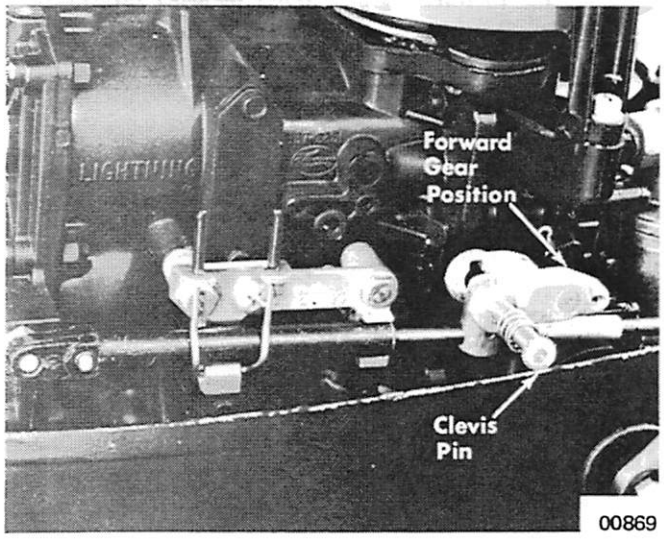


Figure 4. Shift Lever in Forward Gear

5. Adjust brass barrel connector hole so that it aligns with clevis pin with shift lever in forward detent spring notch (under carburetor). Insert clevis pin thru barrel and opposite side of clevis and turn 90° to lock pin in place. (Figure 5)
6. Place single lever remote control handle in neutral position and check that motor is in neutral gear. If not in neutral gear, repeat steps Nos. 4 and 5, preceding.

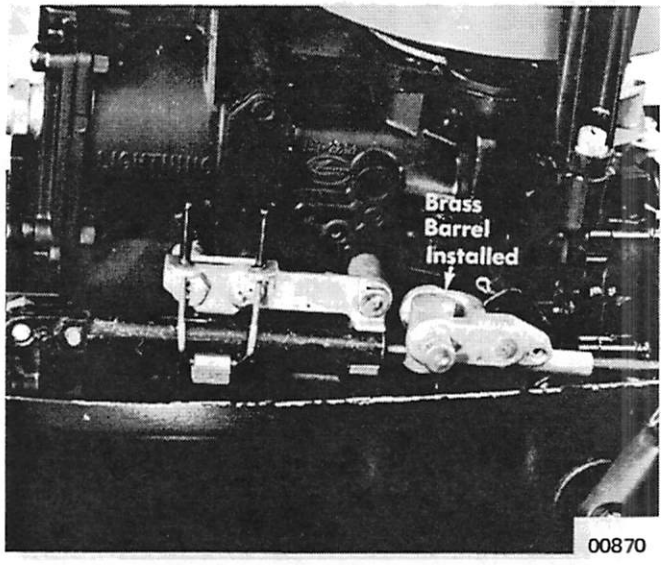


Figure 5. Clevis Pin in Position

THROTTLE CONTROL CABLE

1. Place single lever remote control handle in neutral position and neutral warmup lever (on side of box) down all the way.
2. Insert remote control throttle cable into grommet in bottom cowl on front left hand side with brass barrel inside.
3. With upper throttle lever against idle stop screw, place barrel on upstanding pin in throttle lever link with cable inside the pin. (Figure 6)

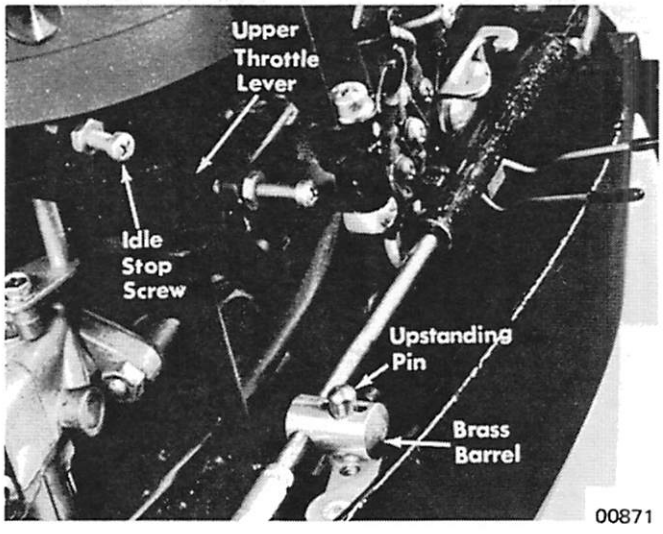


Figure 6. Attaching Brass Barrel

4. Place cable end over peg in cylinder head cover and adjust barrel, if necessary, to hold lever against stop and to compensate for backlash. Fasten cable end in place by latching "hairpin" spring clamp. (Figure 7)
5. Move single lever remote control handle to forward position and then back to neutral position. Check that upper throttle lever rests lightly against idle stop screw when control handle is in neutral position.

INSTALLING STOP SWITCH

1. Unscrew and remove rubber stop switch cover and contact-and-spring (nylon plunger on later models) on bottom cowl to accomodate stop switch receptacle from control station.
2. Remove insulator sleeve from inner switch terminals (earlier models only).
3. Attach stop switch receptacle.
4. Replace front and wrap-around cowls.

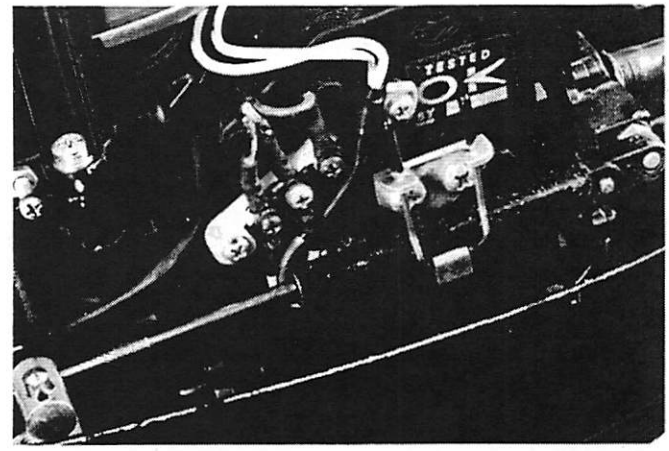


Figure 7. Fastening Throttle Cable End

REMOTE CONTROL ATTACHMENT for MERC 200

SHIFT CONTROL CABLE

1. Place single lever remote control handle in forward position (wide open throttle) and neutral warmup lever (on side of box) down all the way.
2. Insert remote control shift cable into grommet in bottom cowl on front right hand side with brass barrel inside cowl.

   NOTE: It may be necessary to open slits in grommets with a sharp knife or razor. Small tab (where cable passes through) can be left in to cover hole when cables are not used.

3. With motor in forward gear, pass cable under shift lever clevis. Adjust brass barrel connector on cable so that hole in barrel aligns with hole in clevis and hole in cable end aligns with peg on shift cable end anchor bracket. (Figure 1 or 2)

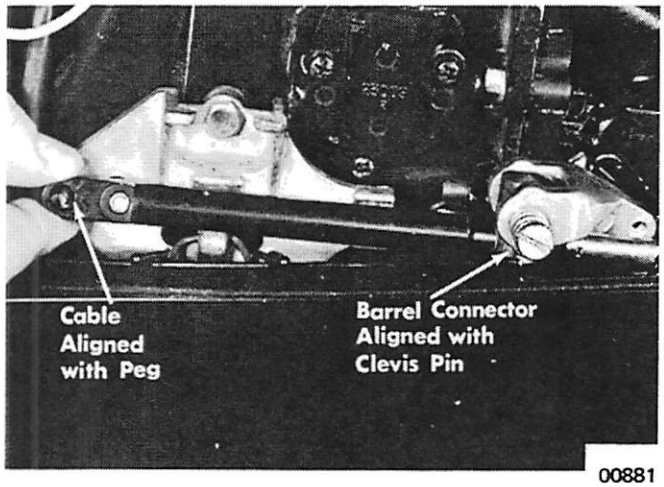


Figure 1. Adjusting Barrel Connector on Shift Cable - 1967

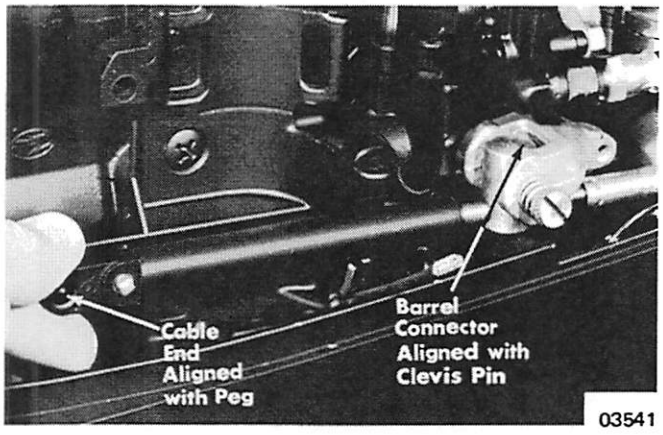


Figure 2. Adjusting Barrel Connector on Shift Cable - 1968-thru-73

NOTE: Use clevis assembly No. 39453 with 1973 outboards and clevis No. 39488 with 1968 thru 72 outboards.

4. When alignment is achieved, insert clevis pin thru barrel and opposite side of clevis and turn 90° to lock pin in place. (Figure 3 or 4)
5. Anchor shift cable as follows:
   a. 1967 Model: Place hole in end of cable guide over peg on shift cable end anchor bracket. Fasten cable end in place by latching "hairpin" spring clamp. (Figure 3)
   b. 1968-thru 73 Models: Place hole in end of cable guide over peg on mounting bracket. Fasten cable end in place by latching shift cable retainer spring. (Figure 4)
6. Place single lever remote control handle in neutral position and check that motor is in neutral gear. If not in neutral gear, repeat step Nos. 3, 4 and 5, preceding.

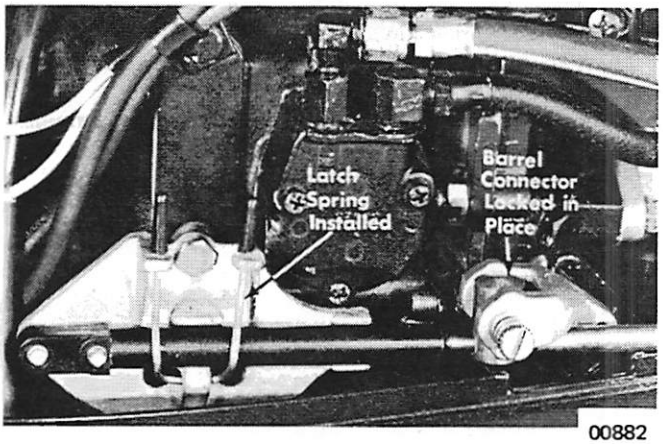


Figure 3. Shift Cable Installed - 1967

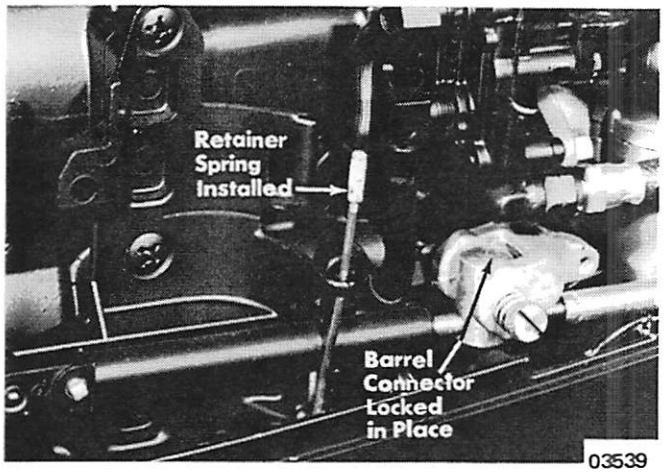


Figure 4. Shift Cable Installed - 1968-thru-73

THROTTLE CONTROL CABLE

1. Place single lever remote control handle in neutral position and neutral warmup lever (on side of box) down all the way.
2. Insert remote control throttle cable into grommet in bottom cowl on front left hand side with brass barrel inside.
3. Adjust brass barrel on throttle cable to measure 8½" (21.6cm) between center of brass barrel and hole in cable end. (Figure 5)
4. When proper alignment of brass barrel connector is achieved, snap cable end latch over cable end and lock brass barrel in socket by pressing locking pin thru barrel and turning 90° to lock in place. (Figure 6)
5. Move single lever remote control handle to forward position and then back to neutral position. Check that idle stop screw rests lightly against idle stop when control handle is in neutral position.

6. If excessive pressure is required to advance control handle into forward gear, it may be necessary to make the following adjustments:

NOTE: On 1972-73 models, a "Troll Set" knob is located on end of control handle. When removed controls are attached, "Troll Set" knob must be turned full counter-clockwise to relieve friction on throttle.

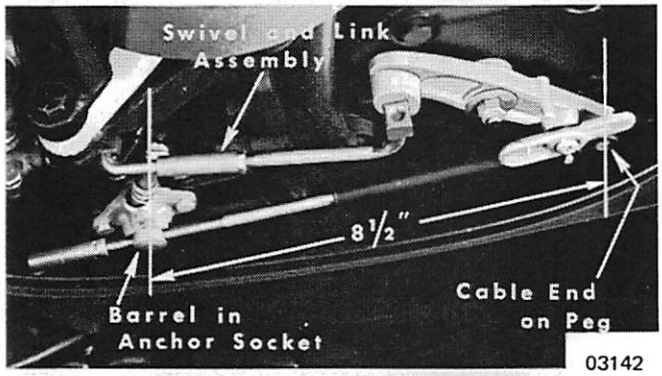


Figure 5. Installing Throttle Cable

a. Lubricate all working parts of the linkage with New Multipurpose Lubricant (C-92-49588).
b. Loosen upper intake port cover screw which holds spark plug lead wire clip. Push spark plug lead wires up toward magneto, thus allowing more play in lead wire between clip and magneto.
c. Retighten screw.
d. Lightly lubricate contact housing assembly and contact housing holder (1970 models).
e. Remove paint from hole in vertical shaft throttle lever.
f. Properly adjust throttle cable to provide minimum amount of pre-load to hold idle screw against idle stop.
g. Replace production contact housing to crankcase top wave washer with .020" thick wave washer C-13-59145 (1970 model).

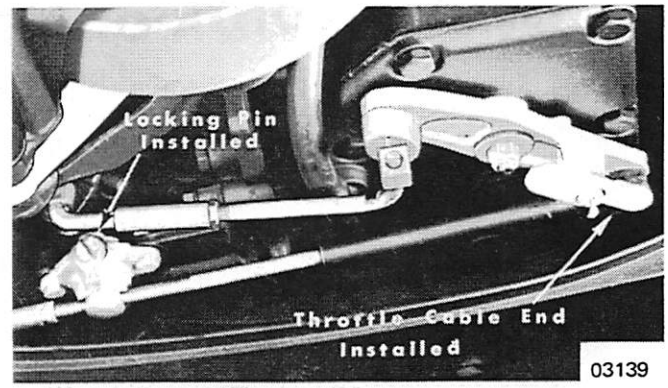


Figure 6. Throttle Cable Installed

7. After installing both throttle and shift cables, the following check must be made:
   a. Shift single lever remote control into neutral position.
   b. Remove latch spring (retaining spring) from shift cable end and remove cable end from peg.
   c. Move engine shift lever into neutral position and check alignment of hole in cable end with peg. If they are not in line, move shift lever into forward position, remove barrel from connector and adjust.
   d. Recheck hole and peg alignment with remote control and engine shift lever in neutral.

INSTALLING STOP SWITCH

1. Unscrew and remove rubber stop switch cover and contact-and-spring on bottom cowl to accommodate stop switch receptacle from control station.
2. Remove insulator sleeve from inner switch terminals.
3. Attach stop switch receptacle.
4. Replace front and wrap-around cowls.

REMOTE CONTROL ATTACHMENT for MERC 350

Right side mounting in boat is recommended. If left side mounting is necessary, remove throttle-shift remote control handle and place on opposite side of control housing. Install the control cables on the motor in the following manner:

1. Remove front cowl and wrap-around cowl.
2. Place remote control handle and motor in neutral position and smaller neutral warmup lever (on side of box) down all the way.
3. Remove knurled pin and spring from end of shift and throttle cables.

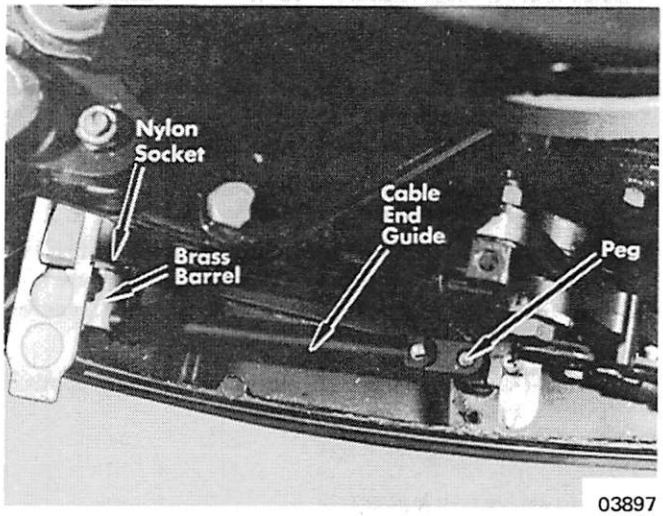


Figure 1. Shift Cable

SHIFT CABLE INSTALLATION

1. Place cable thru opening in bottom cowl.
2. Place brass barrel in recess in nylon socket and cable end guide over peg without disturbing neutral setting. (Figure 1) If necessary, readjust brass barrel for correct position and to compensate for backlash.
3. Position clamp lever over cable end guide. (Figure 2) Check that motor is in neutral when control handle is in neutral. If not, adjust shift cable.

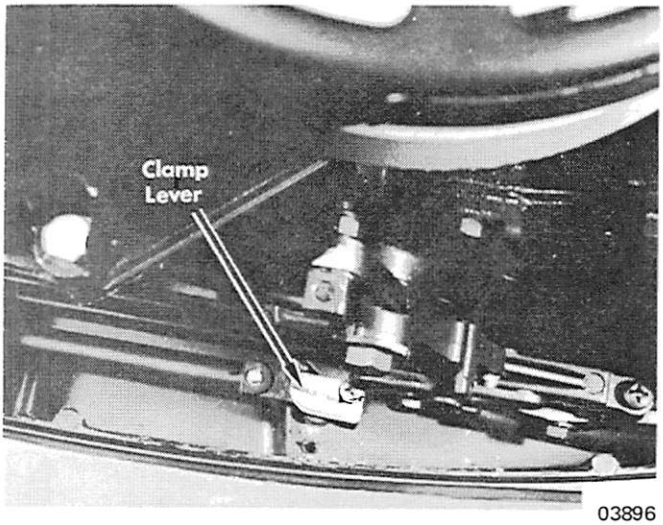


Figure 2. Shift Cable

THROTTLE CABLE INSTALLATION

1. Place cable thru opening in bottom cowl.
2. Place brass barrel in nylon socket. (Figure 3)

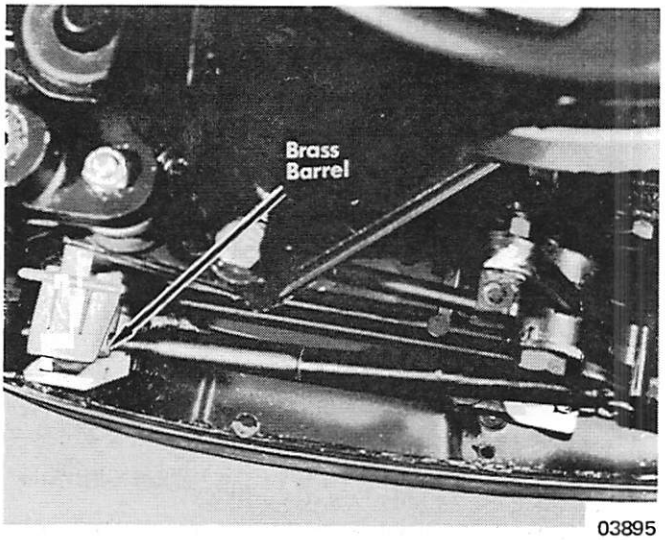


Figure 3. Throttle Cable

3. Position vertical lever so that magneto actuator is held lightly against idle stop screw. (Figure 4) Attach cable end guide to vertical lever without disturbing setting and position clamp lever over cable end guide. (Figure 4) If necessary, readjust brass barrel for correct position and to compensate for cable backlash.
4. Secure brass barrels in nylon socket by moving barrel retainer to lock position. (Figure 4)
5. Move single lever remote control handle to forward position, then back to neutral. Check that magneto actuator is held lightly against idle stop screw when control handle is in neutral.

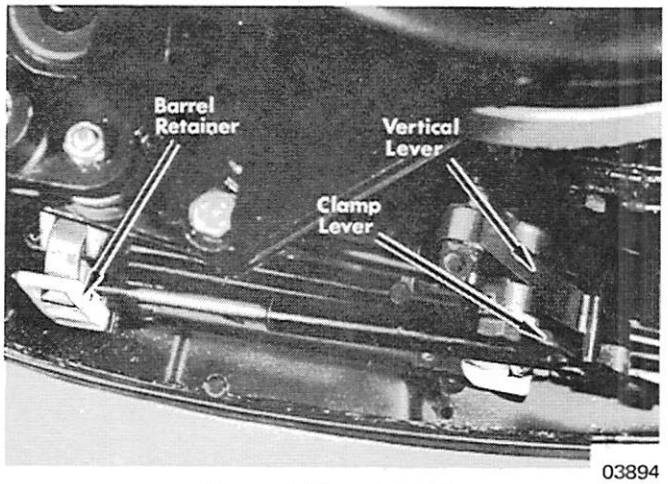


Figure 4. Throttle Cable

INSTALLING "STOP" SWITCH

Install stop switch (to stop motor) between remote control housing and "Stop" button on front of bottom cowl by removing rubber grommet over "Stop" button and attaching connector.

REMOTE CONTROL ATTACHMENT
MERC 400-402-500-650 (4-Cyl.)-800
SINGLE LEVER MERCONTROL

Right side mounting in boat is recommended. If left side mounting is necessary, remove throttle-shift remote control handle and place on opposite side of control housing. Install the control cables on the motor in the following manner:

1. Remove front cowl and wrap-around cowl.
2. Place remote control handle and motor in neutral position and smaller neutral warmup lever (on side of box) down all the way.

SHIFT CABLE INSTALLATION

MERC 800-650-402-400

1. Place cable thru opening in bottom cowl.
2. Place brass barrel in recess in nylon socket and cable end guide over peg without disturbing neutral setting. (Figure 1 or 2) If necessary, readjust brass barrel for correct position and to compensate for backlash.

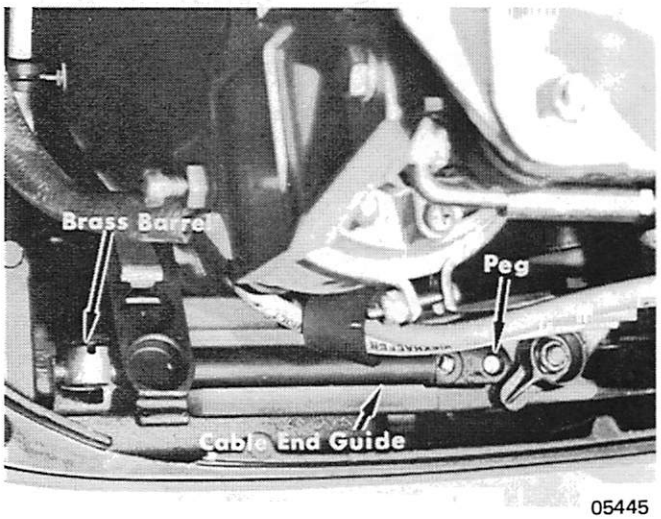


Figure 1. Merc 800-650 Shift Cable

3. Position clamp lever over cable end guide. (Figure 3 or 4) Check that motor is in neutral when control handle is in neutral. If not, adjust shift cable.

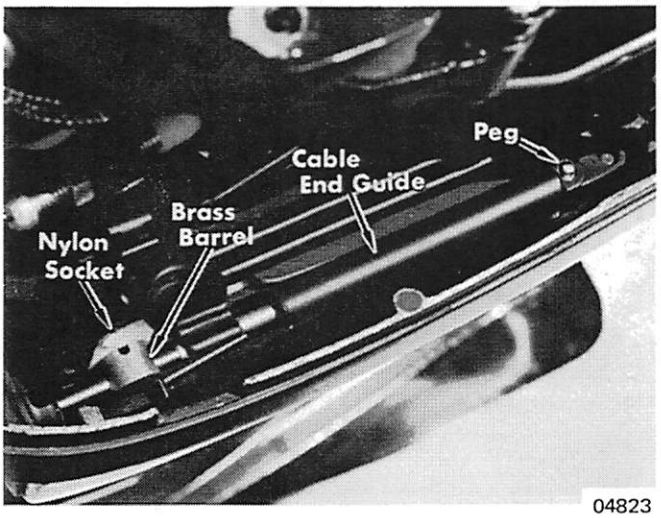


Figure 2. Merc 400 and 402 Shift Cable

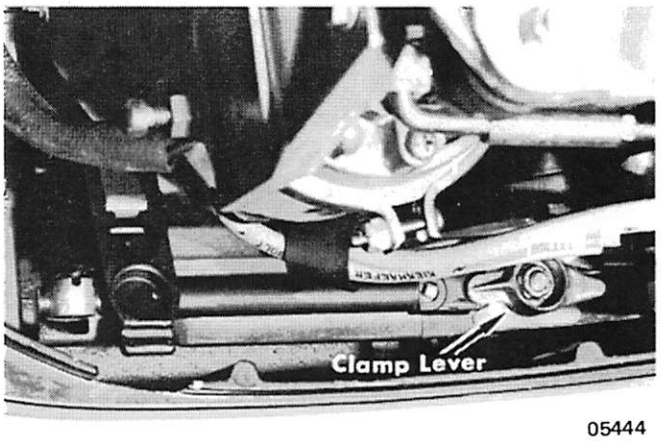


Figure 3. Merc 800-650 Shift Cable

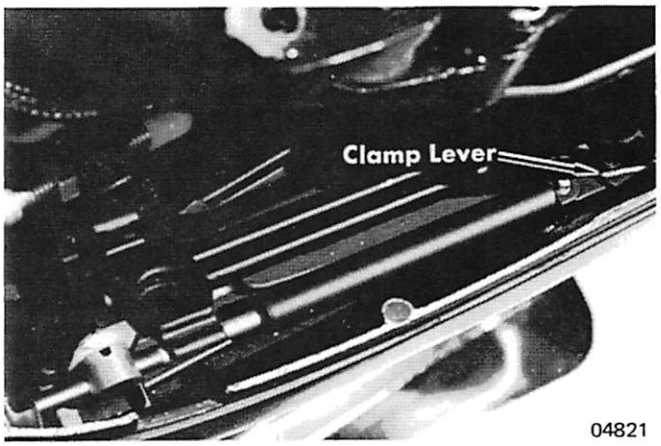


Figure 4. Merc 400 and 402 Shift Cable

MERC 500

1. Place cable thru opening in bottom cowl.
2. Position cable end guide over peg, as shown on Figure 5, and secure brass barrel for correct position.
3. Push latch forward and over cable end to secure shift cable end guide over peg. (Figure 6) Press latch in place.

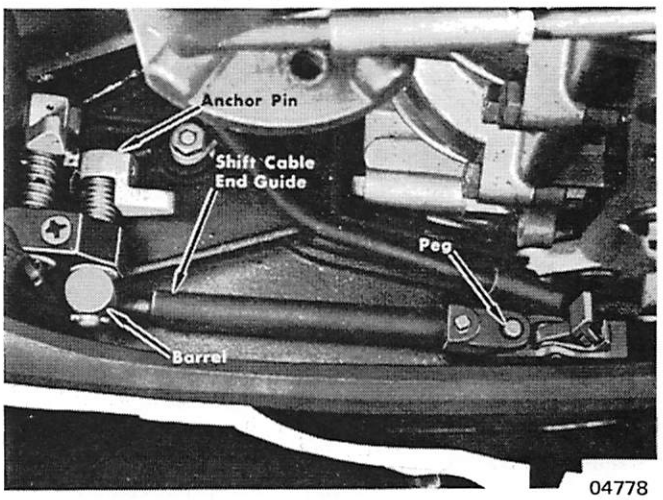
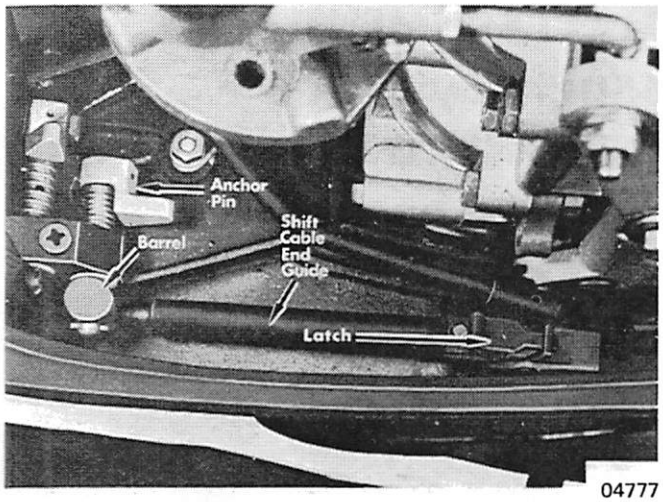


Figure 5. Merc 500 Shift Cable



04777

Figure 6. Merc 500 Shift Cable

THROTTLE CABLE INSTALLATION

Merc 800-650-402-400

1. Place cable thru opening in bottom cowl.
2. Place brass barrel in nylon socket.(Figure 7 or 8)
3. Position vertical lever so that distributor (throttle actuator on Merc 400 and 402) is held lightly against idle stop screw. Attach cable end guide to vertical lever without disturbing setting. (On Merc 400 and 402 model, now position clamp lever over cable end guide.) (Figure 7 or 8) If necessary, readjust brass barrel for correct position and to compensate for cable backlash.
4. Secure brass barrels in nylon socket by moving barrel retainer to lock position. (On Merc 800-650 models, now place nut on cable end guide to vertical lever attachment.) (Figure 9 or 10)

MERC 500

1. Place cable thru opening in bottom cowl.
2. Position cable end guide over peg on vertical lever and secure end guide by placing cable end latch over cable end guide (Figure 11) so that latch is centered over peg.
3. Position vertical lever so that distributor is held lightly against idle stop screw, then secure brass barrel with anchor pin. (Figure 11)
4. If necessary, readjust brass barrel for correct position.
5. Move remote control handle to forward position, then back to neutral. Check that distributor is held lightly against idle stop screw and motor is in neutral. If necessary, readjust brass barrel to compensate for cable backlash.

INSTALLING "STOP" SWITCH

On manual starting Merc 400 model, install stop switch (to stop motor) between remote control housing and "Stop" button on starboard side of bottom cowl by removing rubber grommet over "Stop" button and attaching connector. On all electric starting models, the stop switch is incorporated in the wiring harness and requires no separate installation.

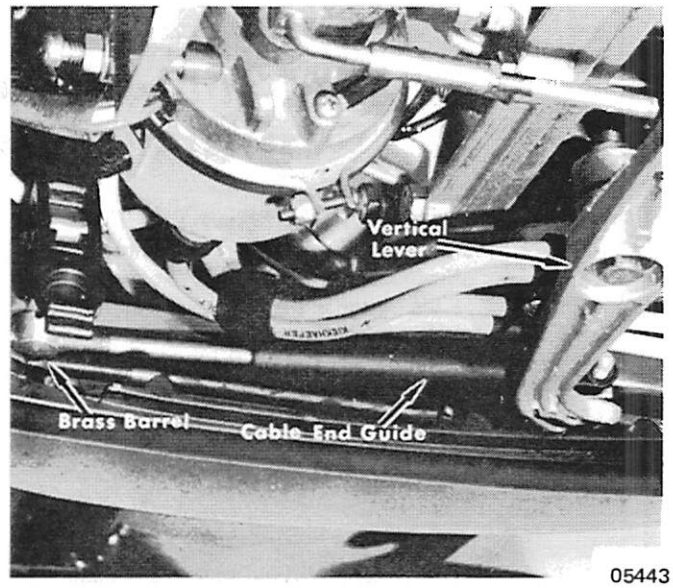


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Figure 7. Merc 800-650 Throttle Cable

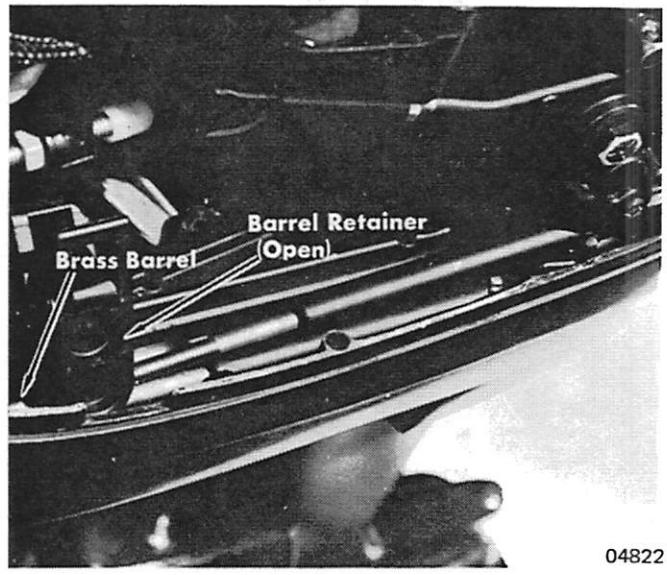

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Figure 8. Merc 400 and 402 Throttle Cable

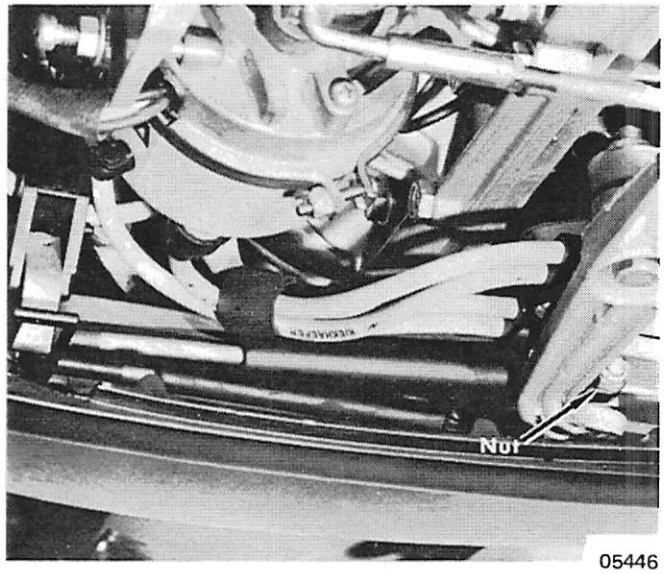

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Figure 9. Merc 800-650 Throttle Cable

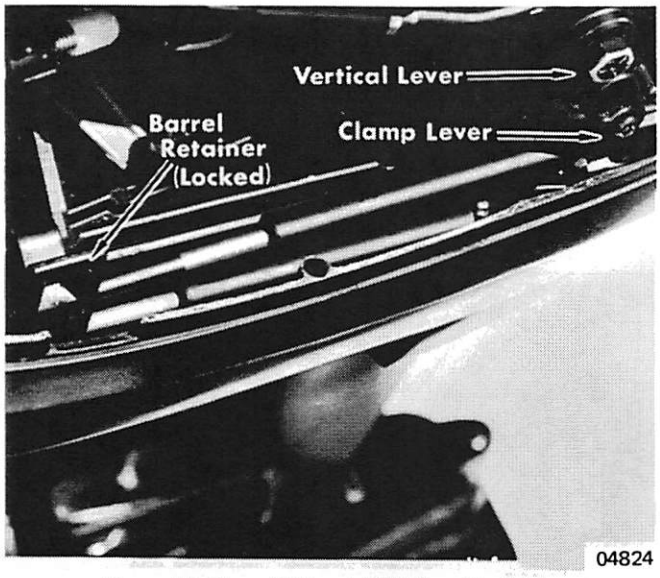


Figure 10. Merc 400 and 402 Throttle Cable

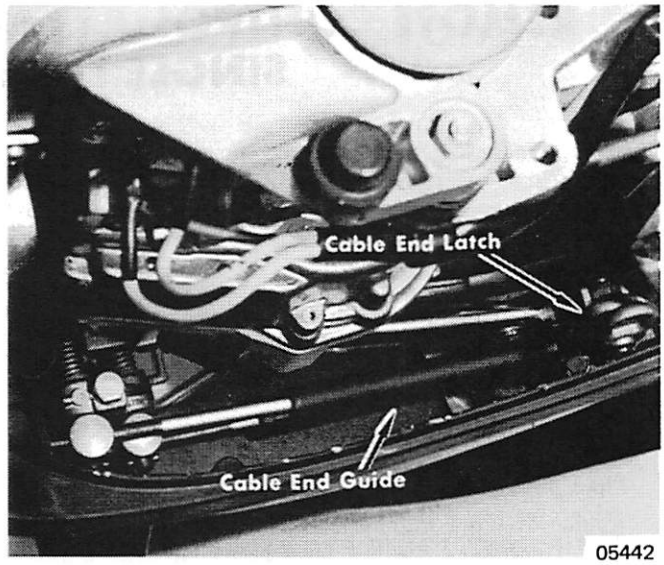


Figure 11. Merc 500 Throttle Cable

REMOTE CONTROL ATTACHMENT
MERC 1500-1400-1350-1250-1150-1100-1000-850
SINGLE LEVER MERCONTROL

Right side mounting in boat is recommended. If left side mounting is necessary, remove throttle-shift control handle and place on opposite side of control housing. Install control cables on motor in the following manner:

1. Remove front cowl and wrap-around cowl.
2. Place remote control handle and motor in neutral position and smaller neutral warmup lever (on side of box) down all the way.

SHIFT CABLE INSTALLATION

1. Place cable thru opening in bottom cowl.
2. Place brass barrel in recess in nylon socket and cable end guide over peg without disturbing neutral setting. (Figure 1) If necessary, readjust brass barrel for correct position and to compensate for backlash.
3. Position clamp lever over cable end guide. (Figure 2) Check that motor is in neutral when control handle is in neutral. If not, adjust shift cable.

THROTTLE CABLE INSTALLATION

1. Place cable thru opening in bottom cowl.
2. Place brass barrel in nylon socket. (Figure 3)
3. Position vertical lever so that distributor is held lightly against idle stop screw. Attach cable end guide to vertical lever without disturbing setting. (Figure 3) If necessary, readjust brass barrel for correct position and to compensate for cable backlash.
4. Secure brass barrels in nylon socket by moving barrel retainer to lock position and placing nut on cable end guide to vertical lever attachment. (Figure 3)
5. Move single lever remote control handle to forward position, then back to neutral. Check that distributor is held lightly against idle stop screw when control handle is in neutral.

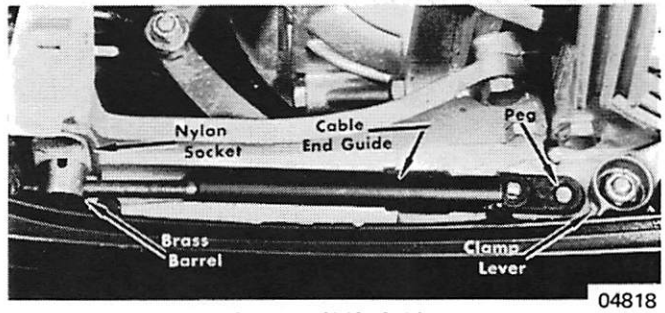


Figure 1. Shift Cable

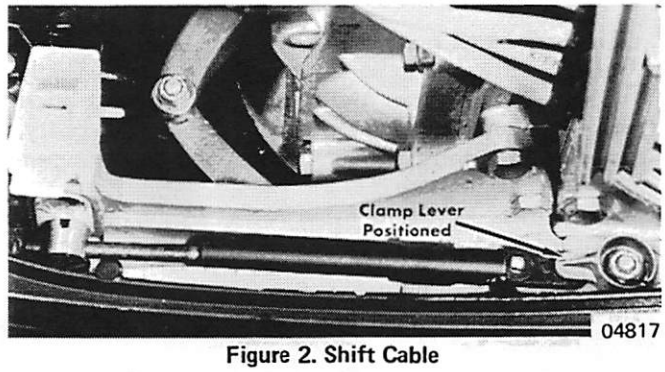


Figure 2. Shift Cable

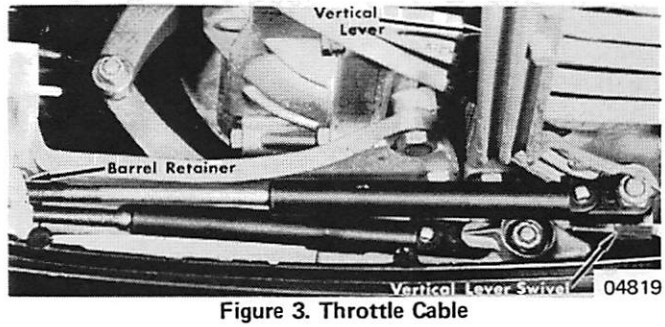


Figure 3. Throttle Cable

REMOTE CONTROL ATTACHMENT - MERC 650 (3-Cyl.) SINGLE LEVER MERCONTROL

Right side mounting in boat is recommended. If left side mounting is necessary, remove throttle-shift control handle and place on opposite side of control housing. Install control cables on motor in the following manner:

1. Remove front cowl and wrap-around cowl.
2. Place remote control handle and motor in neutral position and smaller neutral warmup lever (on side of box) down all the way.

SHIFT CABLE INSTALLATION

1. Place brass barrel in recess in nylon socket and cable end guide over peg without disturbing neutral setting. (Figure 4) If necessary, readjust brass barrel for correct position and to compensate for backlash.

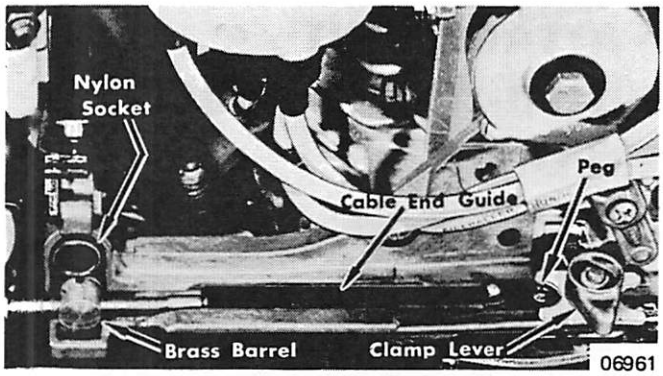


Figure 4. Merc 650 (3-Cyl.) Shift Cable

2. Position clamp lever over cable end guide. (Figure 5) Check that motor is in neutral when control handle is in neutral. If not, adjust shift cable.

THROTTLE CABLE INSTALLATION

1. Place brass barrel in nylon socket. (Figure 6)
2. Position vertical lever so that distributor is held lightly against idle stop screw. Attach cable end guide to vertical lever without disturbing setting. (Figure 6) If necessary, readjust brass barrel for correct position and to compensate for cable backlash.
3. Secure brass barrels in nylon socket by moving barrel retainer to lock position and moving clamp lever over cable end guide. (Figure 6)

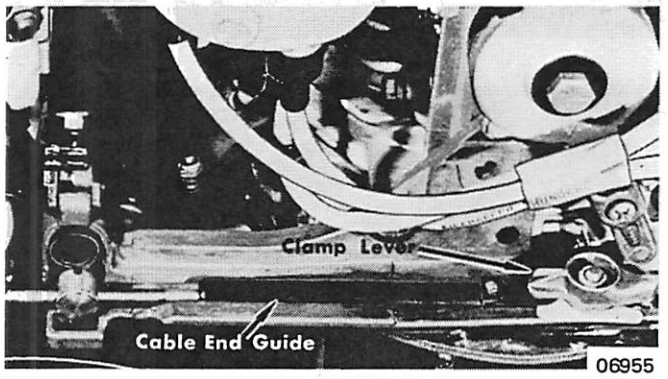


Figure 5. Merc 650 (3-Cyl.) Shift Cable

4. Move single lever remote control handle to forward position, then back to neutral. Check that distributor is held lightly against idle stop screw when control handle is in neutral.

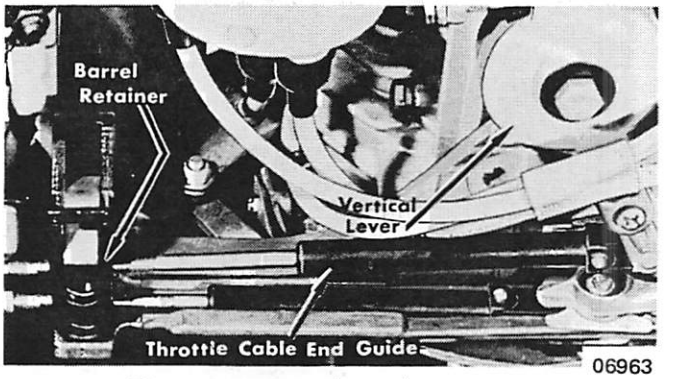


Figure 6. Merc 650 (3-Cyl.) Throttle Cable

5. Check location of battery leads which MUST BE positioned as shown in Figures 7 and 8 to prevent chaffing the insulation.

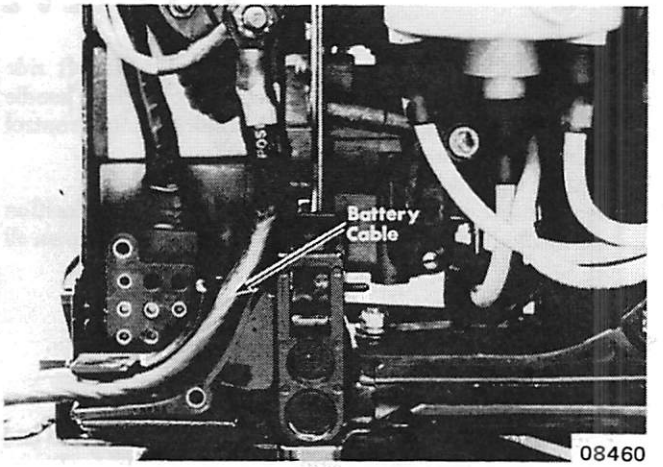


Figure 7. Battery Leads (Cable) in Position

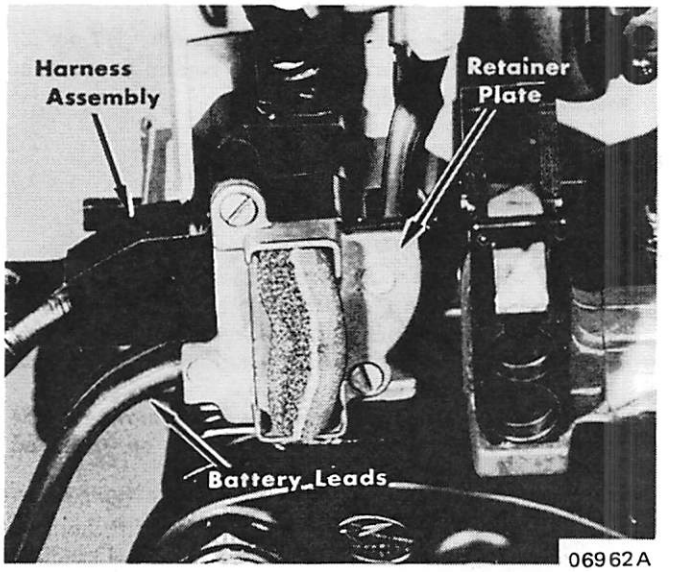


Figure 8. Retainer Plate Securing Battery Leads

SECTION 7 - ACCESSORIES

MERCURY OUTBOARDS

PART C - POWER TRIM

MERCURY MARINE

INDEX

OUTBOARD POWER TRIM

TROUBLESHOOTING

MECHANICAL

Outboard Hydraulic System Operates Normally, but:

Malfunction	Causes	Remedy
1. Will only trim up part way.	a. Internal resistance in cylinder. b. Tilt pin installed through safety strap.	a. Replace cylinder. b. Remove tilt pin and reinstall after tilting full up.
2. Will not pivot freely within clamp bracket flanges.	Clamp bracket flanges too close together.	Check for proper installation of spacer.
3. Will not trail out easily when going slowly over obstructions.	*NOTE: Engine is held in position by reverse lock control at all times. Release by turning control knob fully in or trim unit out to clear obstructions.*	

ELECTRICAL

Outboard Hydraulic System Operates Normally, but:

1. Will only trim up part way.	a. Low battery charge. b. Defective key, push button or rocker switch.	a. Charge battery. b. Test, replace defective parts.
2. Trims out beyond bracket flanges.	a. Limit switch improperly adjusted. b. Defective key, push button or rocker switch.	a. Refer to installation or service manual for adjustment procedure. b. Test, replace defective parts.
3. Pump motor runs only in "Down" direction.	a. Improper wiring. b. Proper switch not operated. c. Limit switch open or disconnected. d. Solenoid inoperative. e. High resistance in wiring, grounds or solenoids. f. Defective pump motor. g. Defective key, push button or rocker switch.	a. Trace wire and correct connections. b. Refer to "Operation", following. c. Replace switch or reconnect leads. d. Test, replace defective parts. e. Test, replace defective parts. f. Test, replace defective parts. g. Test, replace defective parts.
4. Pump motor runs only in "Up" direction.	a. Improper wiring. b. Proper switch not operated. c. High resistance in wiring, grounds or solenoid. d. Defective pump motor. e. Defective key, push button or rocker switch.	a. Trace wiring and correct connections. b. Refer to "Operation", following. c. Test, replace defective parts. d. Test, replace defective parts. e. Test, replace defective parts.
5. Pump motor does not run.	a. Low battery charge. b. Improper wiring. c. High resistance in wiring, grounds or solenoid. d. Defective pump motor. e. Defective key, push button or rocker switch.	a. Charge battery. b. Trace wiring and correct connections. c. Test, replace defective parts. d. Test, replace defective parts. e. Test, replace defective parts.
6. Unit tilts up while unattended.	Moisture in key switch.	Test, replace defective parts.

HYDRAULIC

Outboard Hydraulic System Operates Normally, but:

1. Will not hold trimmed position in forward gear.	a. External leaks (fittings and parts leak) b. Internal cylinder leaks. c. Pump check valve leak (high pressure).* d. Dirt in system.*	a. Tighten fittings or replace if defective. b. Replace or repair cylinder c. Replace pump base assembly. d. Flush system with clean oil, fill & bleed system.

Malfunction	Causes	Remedy
2. Will not hold trimmed position in reverse gear.	a. External leaks (fittings and parts leak). b. Internal cylinder leaks. c. Control valve assembly inoperative. d. Reverse lock control turned full in.	a. Tighten fittings or replace if defective. b. Replace or repair cylinder. c. Replace assembly. d. Turn full out to engage reverse locks.
3. Will only trim up part way.	a. Oil level low. b. Too low or no pump pressure.	a. Add oil (Formula 4 20W) b. Replace pump body assembly.
4. Will not tilt up manually.	a. Control valve assembly inoperative. b. Reverse control not turned fully in.	a. Replace assembly. b. Turn full in to disengage reverse locks.
5. Engine swings in and out when shifting from forward to reverse to forward.	Air in system.	Check for leaks and bleed system properly.
6. Will not release from power tilted "Full Up" position.	Too low or no "Down" pump pressure.	Replace pump body assembly.
7. Trails out when backing off throttle from high speed.	a. Control valve assembly inoperative. b. Air in system. c. Reverse lock control knob turned full in.	a. Replace assembly. b. Check for leaks and bleed system properly. c. Turn full out to activate reverse locks.
8. Oil foams out of pump vent.	a. Oil level low. b. "Can" is not properly installed.	a. Add oil (Formula 4 20W) b. Reinstall "can" over oil filter screen.
9. Will not remain tilted full up.	a. External leaks (fittings and parts leak). b. Internal cylinder leaks. c. Pump check valve leak (high pressure).* d. Dirt in system.*	a. Tighten fittings or replace if defective. b. Replace or repair cylinder. c. Replace pump assembly. d. Flush system with clean oil, fill & bleed system.

**Pump check valve may contain entrapped foreign particles which can be cleared by operating system up-and-down several times when flushing system. If flushing system fails to correct the problem, the check valve is defective.*

DESCRIPTION

Outboard Power Trim has been designed for Mercury Outboard Model Merc 500 (1970) and larger engines. The application of Outboard Power Trim to the engine is such that, under power-trimming circumstances, additional high stresses are placed on the swivel bracket and, therefore, a heavy-duty swivel bracket must be installed on models prior to 1967. (Models 1967 and later incorporate heavy-duty swivel brackets.)

CAUTION: Do not attempt to install trim kit on pre-1967 engine without first installing heavy-duty swivel bracket, or failure and serious damage may occur.

INSTALLATION

POWER TRIM PUMP and HOSES

NOTE: Make certain that pump control knob (Figure 1) has been turned full left (counterclockwise) before uncapping valve ports, or oil will drain from pump.

Figure 1. Pump Installed in Vertical Position

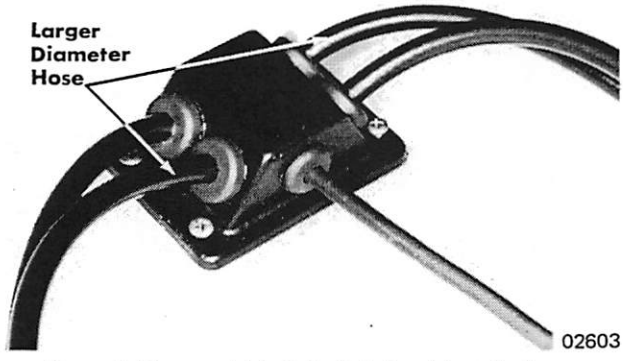


Figure 2. Hose and Limit Switch Lead Installed

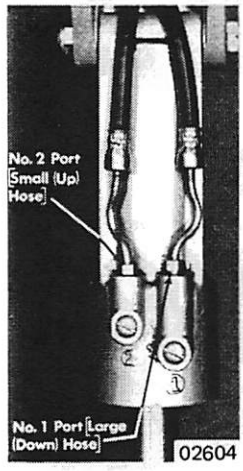


Figure 3. Hoses Connected to Cylinders

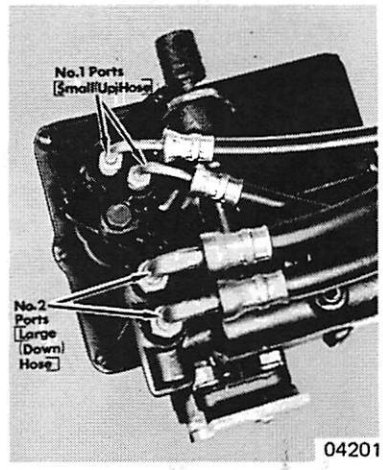


Figure 4. Hydraulic Hoses Installed on Pump

1. Feed left cylinder hoses and limit switch leads down thru inlet cover and hole in well (Figure 2), then attach hoses to pump valve. Hoses, which are attached to No. 1 ports on cylinders, must connect to No. 1 ports on pump valve. Hoses to No. 2 ports on cylinders must connect to No. 2 ports on pump valve. (Figures 3 and 4)

   NOTE: Hoses must be connected to pump before placing a load on cylinder pistons, or oil will be lost when uncapping hoses.

2. Tilt and lock engine in "up" position. Remove reverse lock assembly, spring and actuating rod from the lower unit. (Figure 5)
3. Place tilt stop around upper shock mounting pin between starboard clamp bracket and return spring. (Figure 6) Slip both end loops onto lower mounting tube (strap must lie flat) and place washer between cotter pin hole and loops. (Figure 6)
4. Assemble mounting tube to swivel bracket by sliding shaft thru reverse lock hole and tube. Secure with cotter pin. Cotter pin and washer must be nearest port side of swivel bracket. (Figure 6)

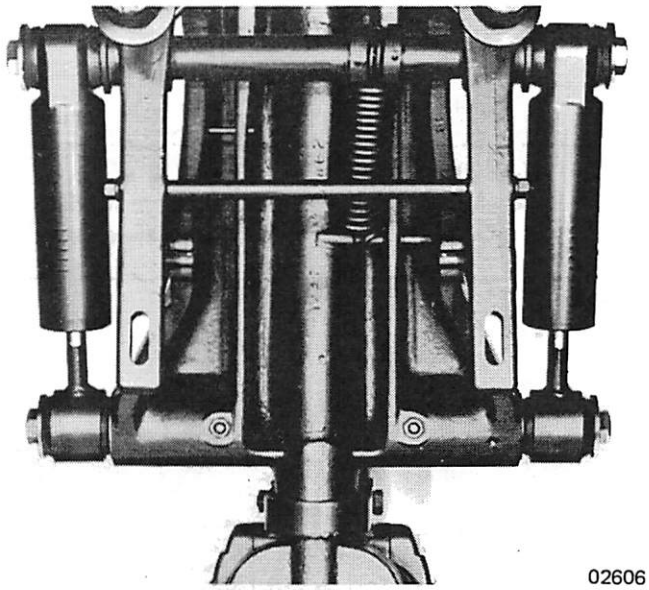


Figure 5. Reverse Lock Assembly Removed

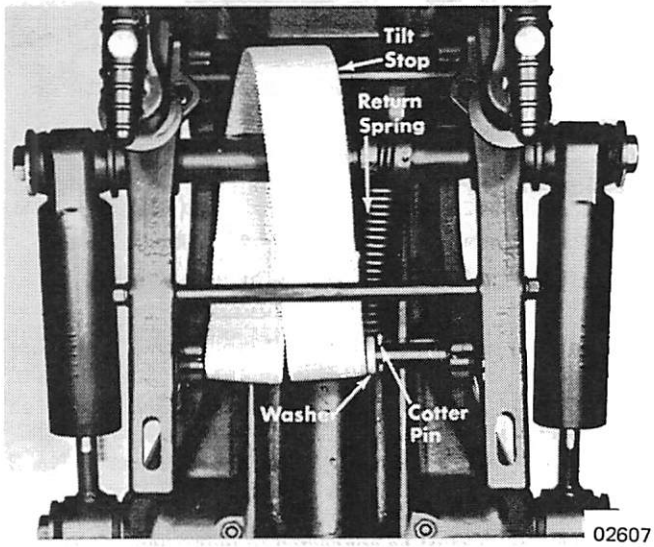


Figure 6. Tilt Stop Installed

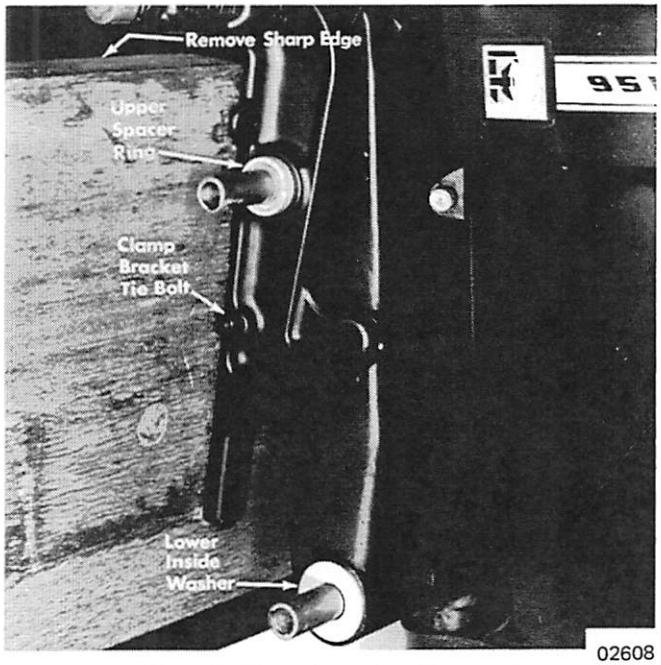


Figure 7. Shock Absorbers Removed

INSTALLING HYDRAULIC TILT CYLINDERS

NOTE: If the top inside edge of the transom is square or sharp, it should be rounded off to prevent damage to hoses from rubbing. (Figure 7)

1. Remove 4 shock absorber retaining screws, 4 outside retaining washers (save retaining washers to reinstall), both shock absorbers and rubber bushings and only the upper inside washers. Allow upper spacer rings and lower inside washers to remain on their respective pins. (Figure 7)
2. Remove clamp bracket tie bolt and slide new, longer bolt thru brackets and spacer tube. (Figure 7)

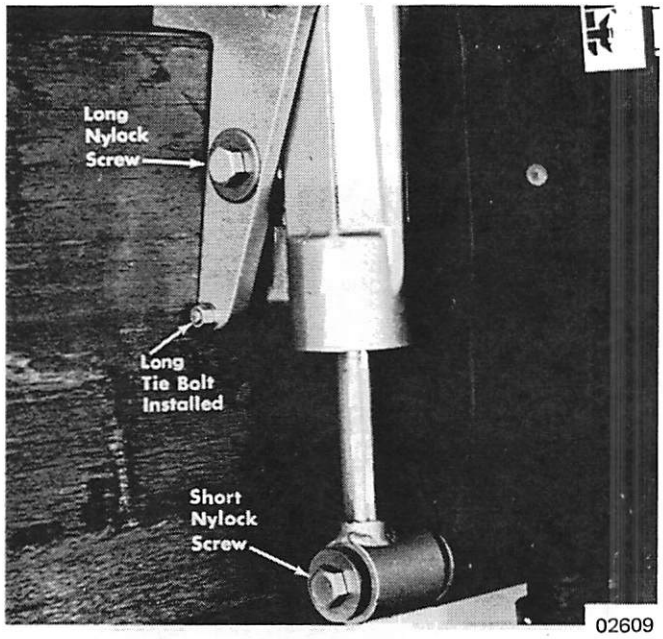


Figure 8. Port Cylinder and Bracket Installed

3. Reinstall port and starboard cylinder bracket assemblies. Secure in place by installing nuts and washers on tie bolt and installing long, nylock screws and washer (retained from step No. 1) on upper shock mount and spacers, short nylock screws and washers (from step No. 1) on lower shock mounts. (Figures 8 and 9)

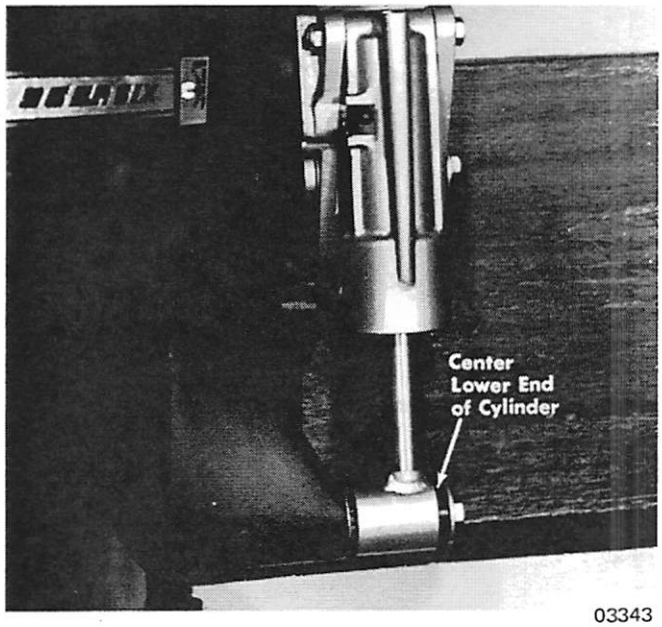


Figure 9. Starboard Cylinder and Bracket Installed

4. Secure mounting brackets to transom thru 4 holes.
5. Center lower end of cylinder on the rubber bushings (Figure 9) and torque nylock screws to 65 ft. lbs. (8.97mkg).

NOTE: Apply a coating of New Multipurpose Lubricant (C-92-49588) on rubber bushings. This will ease installation, offer less resistance and improve action of the tilt.

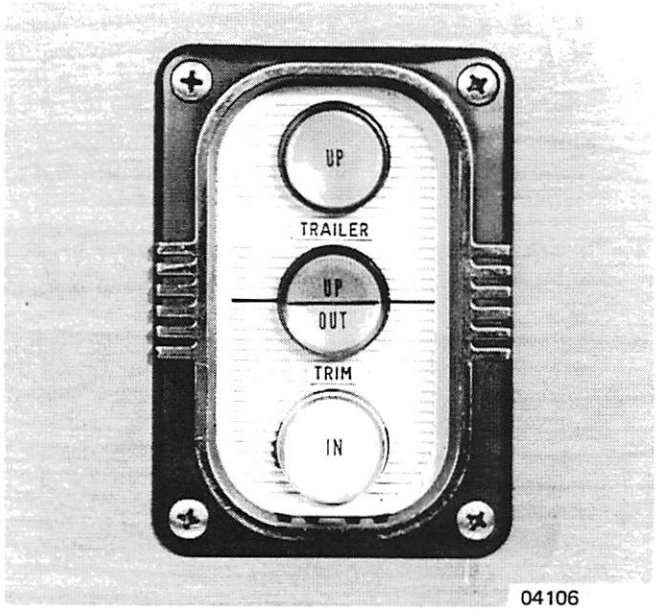


Figure 10. Switch Panel Installed

6. Loosen hoses in grommets on inlet cover (apply liquid soap or other lubricant to hoses) and, with engine remaining in "up" position, adjust all 4 hoses to a slack position. Hoses must not be allowed to pull tight when engine is tilted "Full Up".

WIRING CONNECTIONS

1. Place clamp over end of harness connector and one plug connector onto receptacle of hydraulic pump. (Figure 11)

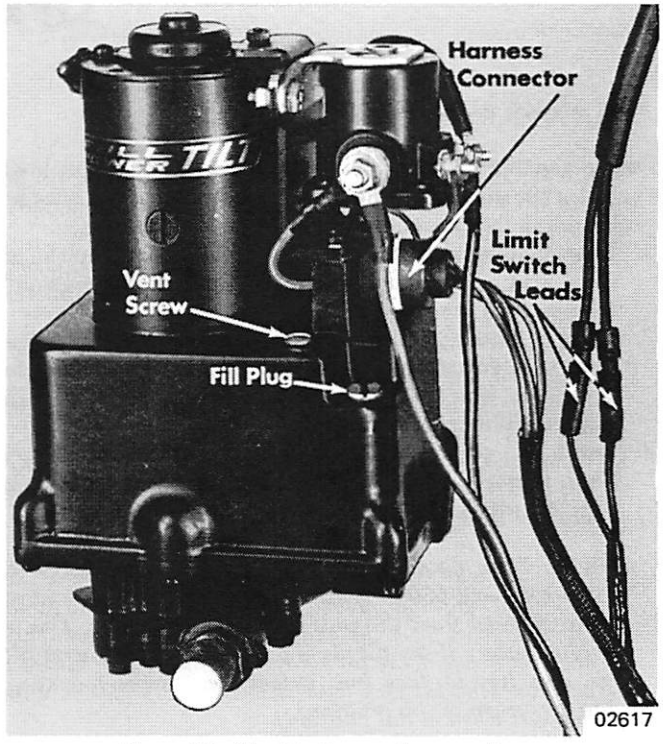


Figure 11. Electric Connections on Pump

2. Install 8-32 screw thru clamp, place nut on screw and tighten securely.
3. Plug limit switch leads (from lift cylinder bracket) into 2 female receptacles on control panel harness. (Figure 11)
4. Coil up excess control panel harness and secure to boat where desired.
5. Connect black (negative) pump lead to negative battery post and red (positive) pump lead to positive battery post.
6. Open pump reservoir vent seal. Note that vent must be open for proper operation.
7. With unit tilted up, check oil level by removing fill plug. (Figure 11) If necessary, fill to bottom of threads with Formula 4 SAE 20W Quicksilver Oil (C-92-33157-1).
8. Unit now is ready for operation.

OPERATION

TILT ANGLE ADJUSTMENT

Due to variations in transom angles and to assure proper boat control while underway, the tilt angle adjustment pin must be positioned in the clamp bracket tilt pin holes as follows:

1. Determine required tilt pin hole to place boat on plane or even keel when underway. (See "General Information" Section 1A.)
2. After determining tilt pin hole that places boat on plane or even keel, reposition tilt pin into the next lowest tilt pin hole (one hole nearer to transom) for operation with outboard Power Trim kit.
3. Punch roll pin from tilt pin assembly and remove swivel head. Replace swivel head with washer and cotter pin supplied with kit.

NOTE: When installing this Power Trim kit on later Merc 1250-1000 and 650 models, it will be necessary to remove some material from the ends of the tilt lock lever. This is only necessary if the tilt pin is positioned in the lowest tilt pin hole (the tilt lock lever strikes the cylinder mounting brackets when in this position).

SWITCHES

1. The outboard Power Trim is actuated by push button switches mounted in the trim control panel. (Figure 10, preceding)
2. Operate Power Trim when the boat is underway or at rest.
3. Outboard also can be tilted up manually, as outlined under Paragraph "Tilting Up Manually", following.

TILTING and TRIMMING UP and DOWN for FORWARD OPERATION under HIGH THRUST

NOTE: DO NOT run at high speed with outboard tilted out beyond tilt pin flanges of clamp bracket, as outboard will have no side thrust support when tilted that high.

RAISING with POWER TRIM

Press "Up/Out" button and hold button until outboard has moved out to angle required to properly trim boat. Power Trim unit is equipped with a cutout switch which will stop the outboard from moving out beyond the last tilt pin hole in the clamp bracket.

LOWERING with POWER TRIM

Press "In" button and hold button until outboard has moved in to angle required to properly trim boat or until end of downward travel has been reached.

TRAILERING BOAT or REDUCED THROTTLE OPERATION (BEACHING, SHALLOW WATER, ETC)

To facilitate launching and loading boat, the outboard may be raised up beyond the clamp bracket flanges by pressing the trailer "Up" and "Up/Out" buttons at the same time. Lower by using the "In" button. The outboard also may be raised and lowered when operating in shallow water at reduced throttle by using these buttons.

1. To raise outboard, press "Up" and "Up/Out" buttons and hold buttons until outboard has raised up to desired position or reaches end of upward travel.

   NOTE: If buttons remain depressed after outboard reaches end of upward travel, an overload cutout switch will open and pump motor will stop. To prevent cutout from opening, it is recommended that "Up" and "Up/Out" buttons be released as soon as outboard reaches the end of upward travel. If cutout should open, do not depress switches for approx. one minute. After this period of time, cutout will close and unit may be operated.

2. To lock outboard up for repairs, etc, pump full up, then tilt by hand an additional small amount and engage tilt lock.
3. To lower outboard, press "In" button (disengage tilt lock if previously locked) and hold button until outboard has moved down to desired position or reaches end of downward travel.

CAUTION: Exercise care when operating engine at extreme tilt angles in shallow water. Should the water level fall below the water intake ports, overheating or water pump impeller damage could result.

TILTING-UP MANUALLY

1. Rotate control knob (Figure 1, preceding) full to the "Right" (clockwise). This releases reverse lock and allows tilting up by hand from the down position only. Manual control knob will not release unit to the down position when it has been tilted up with the pump.
2. To re-engage reverse lock in hydraulic pump, rotate knob fully to the "Left" (counterclockwise) and press "In" button to return outboard to full down position.

NOTE: Unit will not hold reverse thrust if lock is not re-engaged.

ADJUSTING TRIM LIMIT SWITCH

NOTE: Trimming up and down for operation under high thrust is done by using only the "Up/Out" and "In" buttons. This control allows a limit switch to stop pumping action while the engine is still within the clamp bracket for protection against breakage. Adjust trim limit switch, if necessary, as follows:

1. Press "Up/Out" button and hold until engine tilts up and stops. Engine should not tilt beyond last tilt pin hole of clamp brackets.
2. Determine position to which engine has tilted by pulling out on lower unit to take up slack in hydraulic cylinders and attempt to install a tilt pin in the last pin hole. Proper adjustment is made when the tilt pin just inserts completely into the last hole.

   NOTE: If piston rods retract into cylinder more than 1/8" while pulling out on lower unit, it will be necessary to bleed air from the system. See bleeding instructions, following.

3. If engine tilts out beyond last tilt pin hole of clamp bracket or does not tilt out far enough (as determined in Paragraph 2, preceding), loosen limit switch. (Figure 1) Turn nut out (counterclockwise), if engine tilts out beyond last tilt pin hole, or turn nut in (clockwise) to allow engine to tilt out further.
4. Repeat steps No. 2 and 3, as necessary, to obtain proper trim position. Tighten limit switch screw.
5. To tilt engine up completely, see "Raising with Power Trim", preceding.

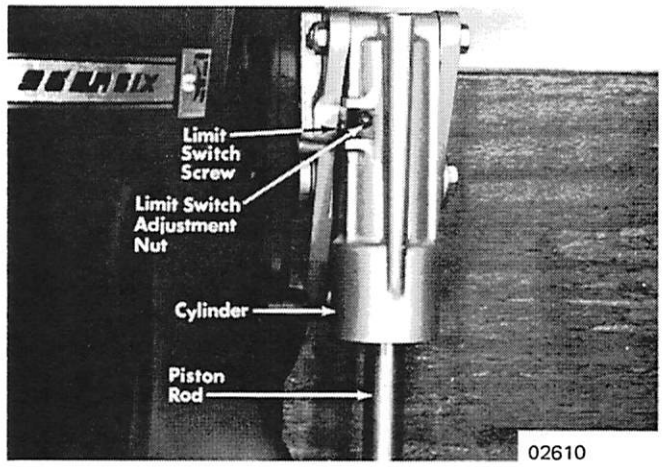


Figure 1. Trim Limit Switch

MAINTENANCE

CHECKING OIL LEVEL

Check hydraulic system oil level periodically as follows:
1. Tilt outboard to full up position.
2. Remove "Fill" plug. (Figure 1 on Page 7C-3)
3. Fill to bottom of threads with Formula 4 SAE 20W Quicksilver Oil (C-92-33157-1). If not available, use a high quality, name brand SAE 20-20W specification MS automotive oil. DO NOT over-fill.
4. Replace "Fill" plug and return outboard to normal operating position.

BLEEDING HYDRAULIC SYSTEM

If it becomes necessary to bleed air from system, proceed as follows:

NOTE: Keep pump reservoir filled in the "full up" position only during bleeding. Add Kiekhaefer Formula 4 20W Oil or SAE 20-20W specification MS automotive oil. Bleed only one cylinder at a time.

BLEEDING "DOWN" SIDE of HYDRAULIC SYSTEM

1. Remove "Down" bleed screw and "O" ring at top of cylinder. (Figure 2)

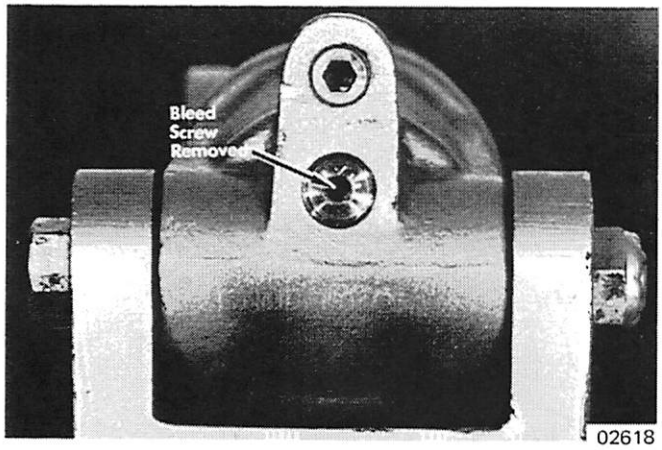


Figure 2. Top of Cylinder

2. Press "In" button for a few seconds, release and wait for approx. one minute. Repeat pumping procedure until oil, which flows from bleed port, is free of air bubbles.
3. Replace bleed screw and "O" ring seal and tighten securely.
4. Repeat preceding procedure with opposite cylinder.

BLEEDING "UP" SIDE of HYDRAULIC SYSTEM

1. Loosen hose grommets from inlet cover and remove hydraulic lift cylinder from its mounts.
2. Place cylinder in a horizontal position with hose ports facing up. (Figure 3)
3. Remove "Up" bleed screw and "O" ring seal from No. 1 port. (Figure 3)

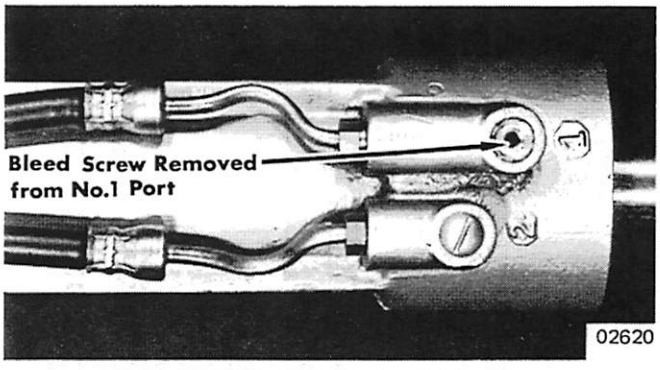


Figure 3. Cylinder in Horizontal Position

4. Press "Up/Out" button for a few seconds. release and wait for approx. one minute. Repeat pumping procedure until oil, which flows from bleed port, is free of air bubbles.
5. Replace bleed screw and "O" ring seal and tighten securely.
6. Reinstall cylinder and hose grommets according to instructions under "Installation" and "Operation", preceding.
7. Repeat above procedure with opposite cylinder.

NOTE: Bleeding is improved by pumping both cylinders up-and-down several times after completing bleeding, then repeat bleeding procedure.

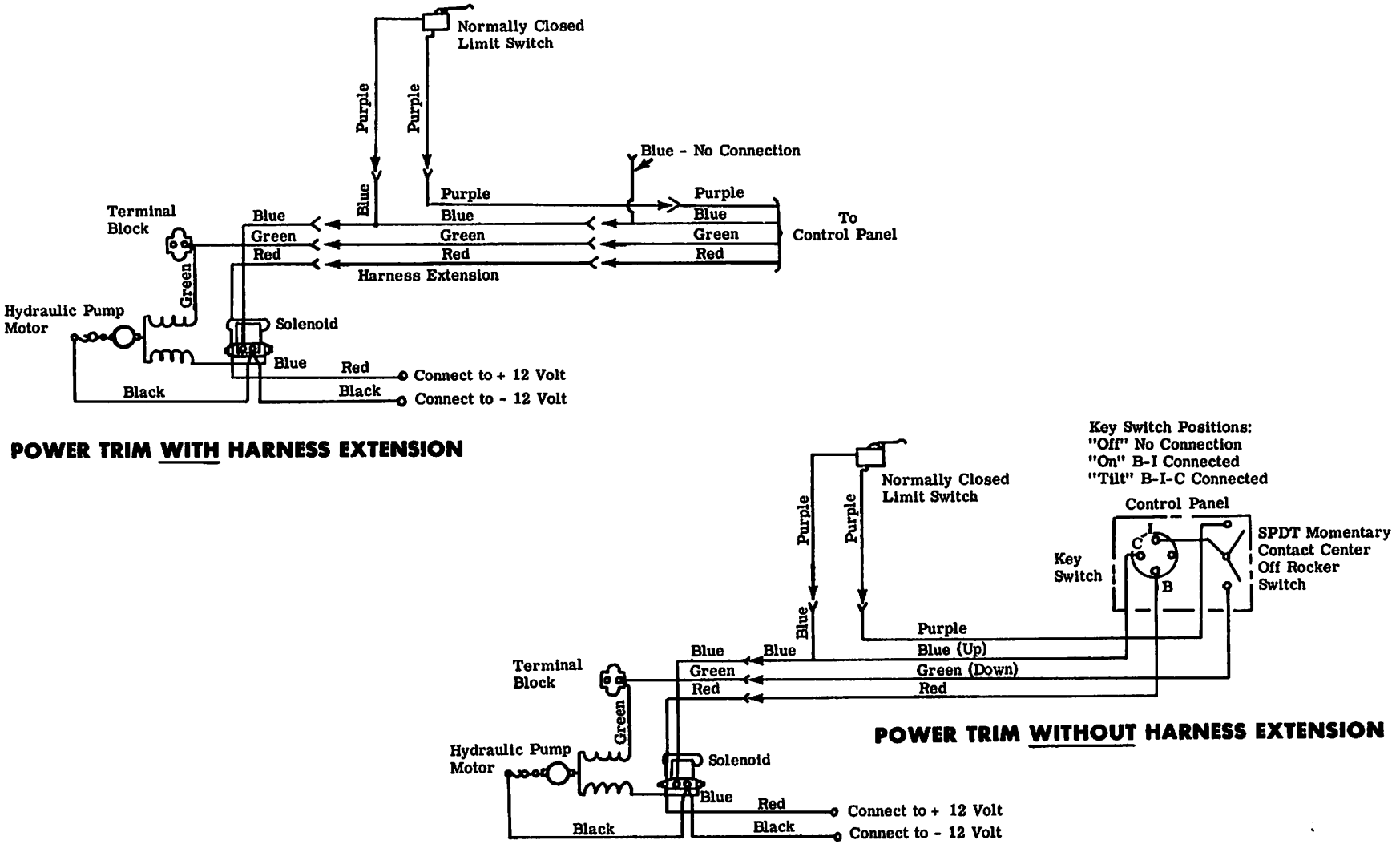


Figure 1. Power Trim Schematic Wiring Diagram WITH and WITHOUT Harness Extension

SECTION 7 - ACCESSORIES

MERCURY
OUTBOARDS

PART D - GENERAL ACCESSORIES

MERCURY
MARINE

INDEX

STEERING HANDLE ASSEMBLY (A-39926A1)

INSTALLATION

MERC 350 ENGINES (SERIAL NO. 1976427 and UP)

INSTALLING MAGNETO SHORTING SWITCH ASSEMBLY

1. Remove front cowl and wrap-around cowl from engine.
2. Disconnect magneto shorting switch leads from terminal block (Figure 1) and remove switch from bottom cowl.

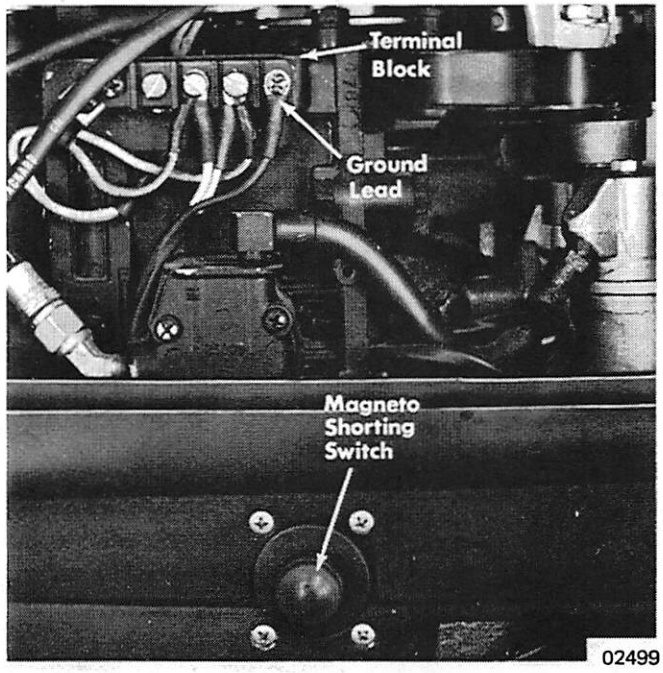


Figure 1. Magneto Shorting Switch Assembly

3. Insert plug and fastener in opening in bottom cowl. (Figure 2)
4. Install magneto shorting switch in new plug cover.
5. Remove 4 screws and nuts, which secure plug cover to bottom cowl, and remove plug cover.
6. Place magneto shorting switch in position and secure with 4 screws. (Figure 1)

   NOTE: Black lead is ground and must be attached under one of 4 screws. Remove paint under lead to ensure a good electrical connection to bottom cowl.

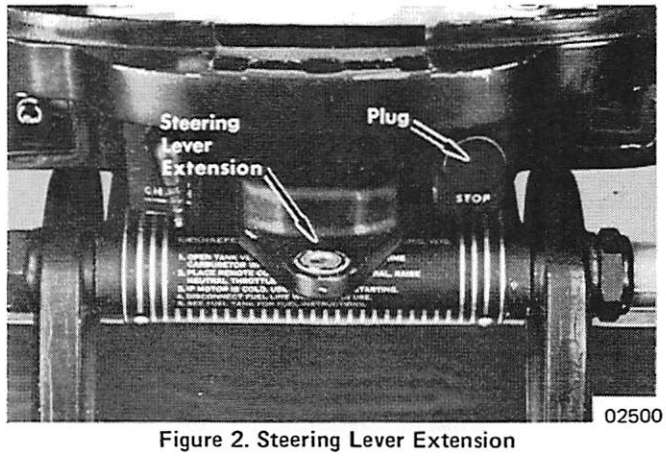


Figure 2. Steering Lever Extension

7. Attach magneto shorting switch leads to terminal block as shown in Figure 1.

   NOTE: Black lead is ground and must be attached as shown in Figure 1.

INSTALLING HANDLE ASSEMBLY

1. Remove nuts, which secure steering lever extension to steering lever, and remove extension. (Figure 2)
2. Place cover in position on steering handle bracket and secure cover to bracket with 2 screws. (Figure 3)

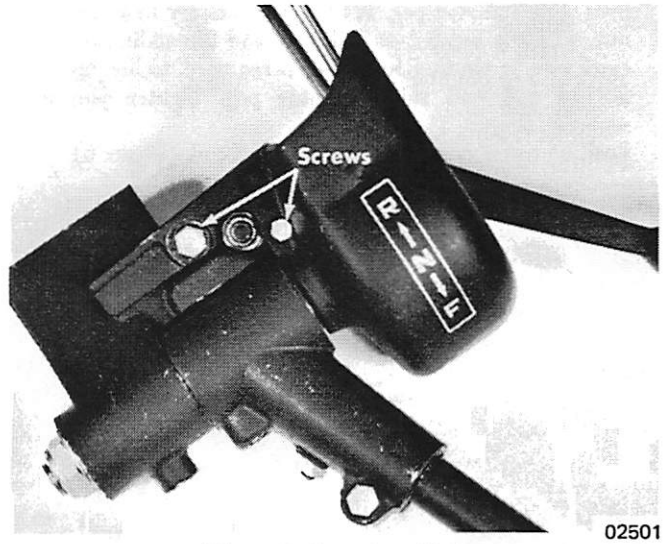


Figure 3. Cover Installed

3. Insert throttle and shift link rods thru opening in left side of cowl and place handle assembly in position on engine steering lever.(Figure 4)
4. Secure handle assembly to engine steering lever with 2 nuts and tighten nuts securely. (Figure 4)
5. Place shift lever, which is located on handle assembly, in forward gear position.

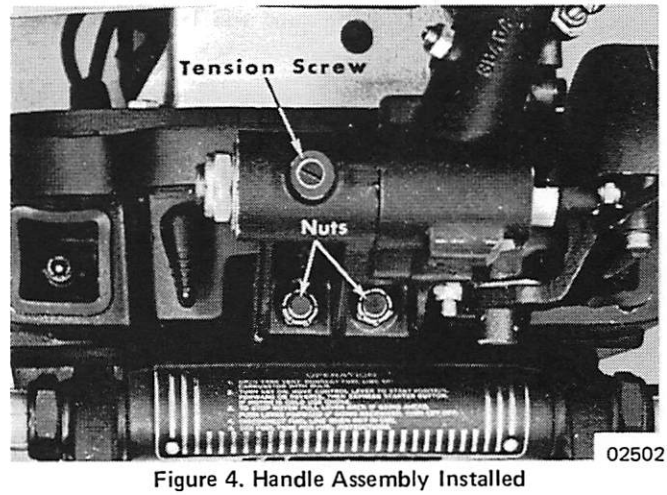


Figure 4. Handle Assembly Installed

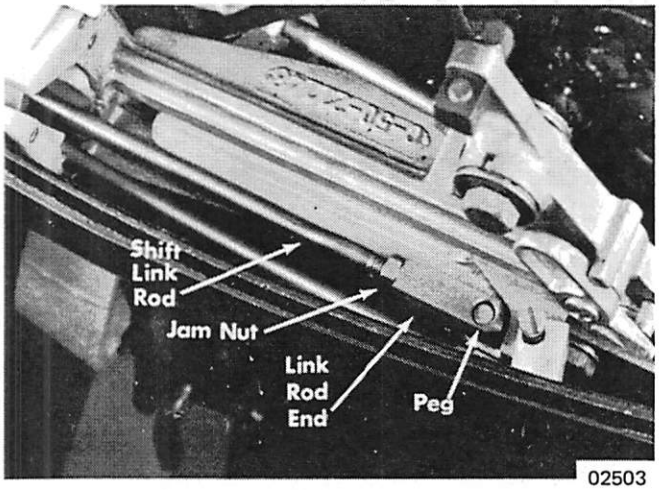


Figure 5. Installing Shift Link Rod

6. With motor in forward gear, place end of shift link rod over shift actuator peg. It may be necessary to loosen jam nut, which is located on link rod, and thread link rod end clockwise or counterclockwise, as required, to line up hole in rod end and shift actuator peg. Tighten jam nut securely. (Figure 5)
7. Position rod end retainer over link rod end. (Figure 6)

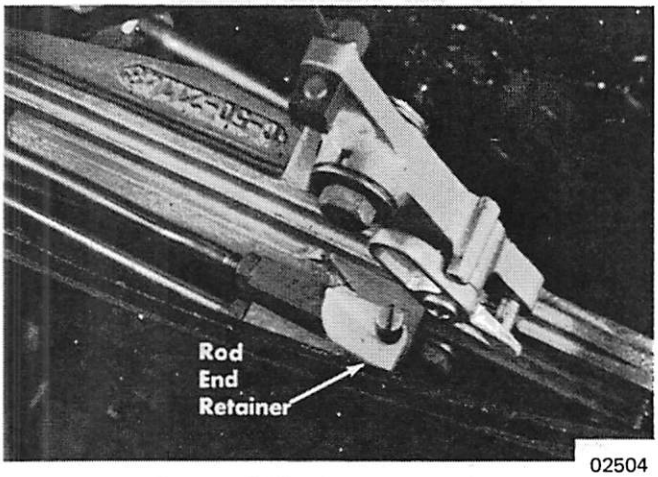


Figure 6. Shift Link Rod Installed

8. Place shift lever in neutral position and check that motor is in neutral gear. If link rod end is not correctly adjusted, motor will not shift properly.
9. Turn handle grip clockwise until grip stops. Markings on grip indicator and mark on tube will be positioned as shown in Figure 7.

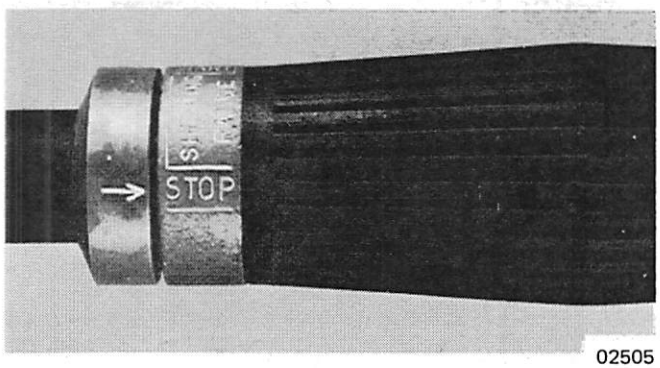


Figure 7. Handle Grip Position

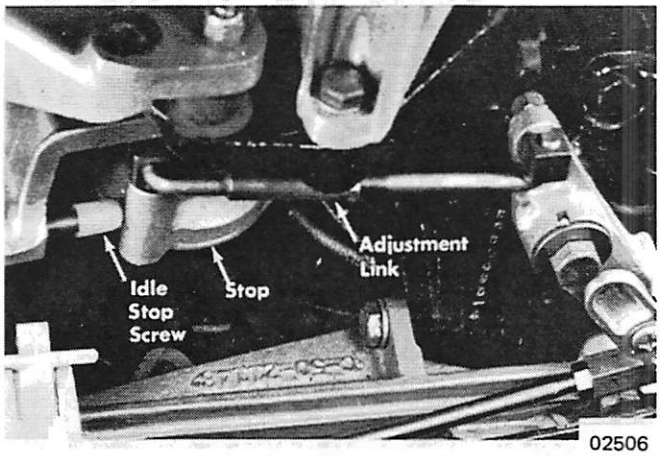


Figure 8. Idle Stop Screw

10. Position vertical lever so that magneto is held lightly against idle stop screw. (Figure 8)
11. With vertical lever in this position and handle grip positioned as outlined in step No. 9, adjust throttle link rod end, as required, to place rod end over peg on vertical lever. (Figure 9)
12. Position rod end retainer over link rod end. (Figure 9)
13. Turn handle grip to full throttle position and back to idle. Check that magneto is held lightly against idle stop screw. (Figure 8) If more adjustment is required, it can be obtained by adjusting link between throttle lever and throttle control shaft. (Figure 8)

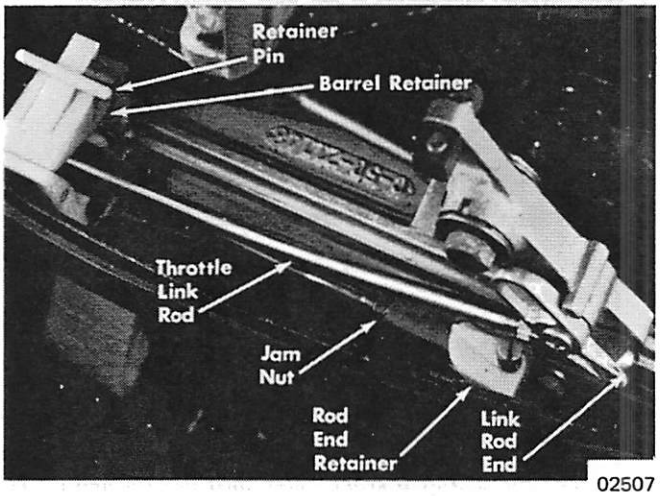


Figure 9. Throttle Link Rod Installed

14. If link rod end is not correctly adjusted, magneto will not return to idle stop and motor will not idle at approximately 500 RPM in forward gear.

    NOTE: Barrel retainer (Figure 9) is not required when steering handle is installed. Barrel retainer may be removed by tapping out retainer pin. (Figure 9)

15. Install wrap-around cowl and front cover.

CO-PILOT INSTALLATION and ADJUSTMENT

1. To install co-pilot (Figure 10), slide clamp plate assembly from kit thru slot (friction button side down) in bottom face of swivel bracket. (Figure 10)
2. Fasten clamp plate assembly to swivel bracket with screw and 5/16" internal lockwasher. (Figure 10)

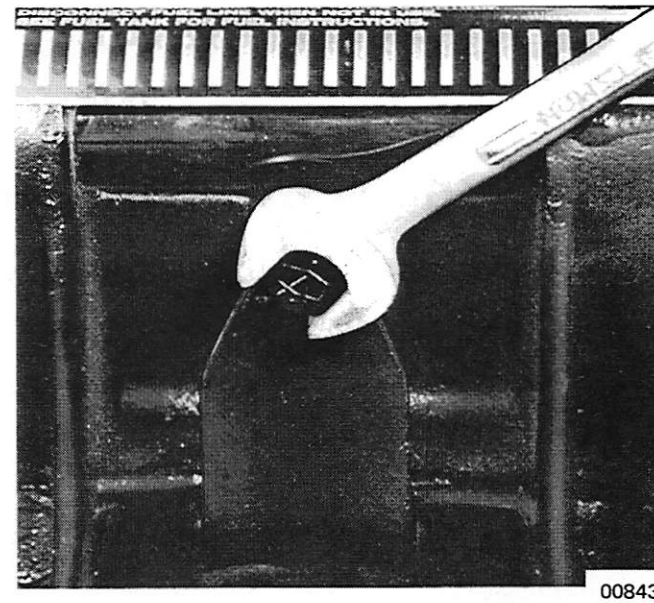
3. Adjust co-pilot so that motor will remain in a fixed course position, without need of manual control, yet will not be too tight to allow free-and-easy steering.
4. Tighten adjusting screw (Figure 10) to increase friction; loosen to decrease friction.

OPERATING INSTRUCTIONS

1. Position twist grip handle so that "Start" is lined up with mark on steering handle tube.
2. Place shift lever in "N" (neutral) position.
3. Start engine.
4. Turn twist grip handle to "Shift Range".
5. Move shift lever to desired gear.

> **CAUTION: Do not shift gears unless twist grip handle is in "Shift Range" position. Do not shift into reverse gear when engine is not running, as shifting mechanism will be damaged.**

6. To stop motor, return twist grip handle to "Stop" position and depress stop button on bottom cowl.



00843

Figure 10. Co-Pilot Adjustment

STEERING HANDLE ASSEMBLY (A-38445A1)

INSTALLATION

MERC 500M ENGINES (SERIAL NO. 1770179 and UP)

INSTALLING MAGNETO SHORTING SWITCH ASSEMBLY

1. Remove 3 screws, which fasten magneto vent tube baffle to bottom cowl, and remove baffle.
2. Fasten new baffle (with shorting switch) in position with 3 screws removed, previously in step No. 1. (Figure 1)
3. Fasten connector, which is located on end of shorting switch lead wire, to connector which is located in bottom cowl. (Figure 1)
4. Remove paper backing from "Off" - "On" decal and place decal in position on protector rim directly above shorting switch. (Figure 1)

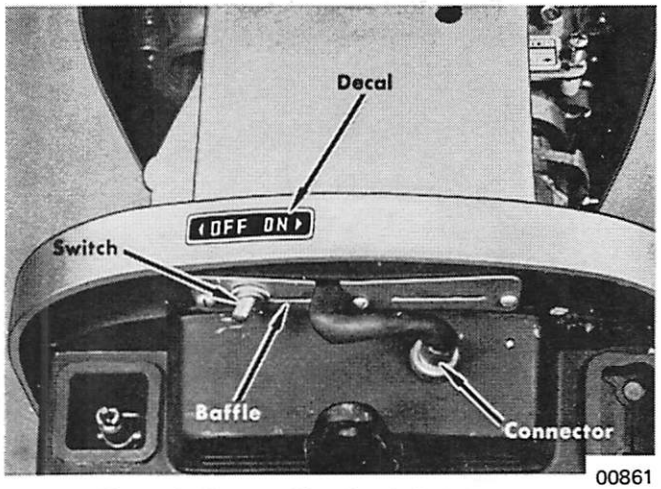


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Figure 1. Magneto Shorting Switch Installed

INSTALLING SUPPORT PLATE

1. Remove 2 elastic stop nuts from engine tilt tube.
2. Place a block of wood on one end of tilt tube and drive tilt tube toward clamp bracket until end is flush with clamp bracket.
3. Place one ear of support plate over tilt tube and place support plate in position under steering lever.

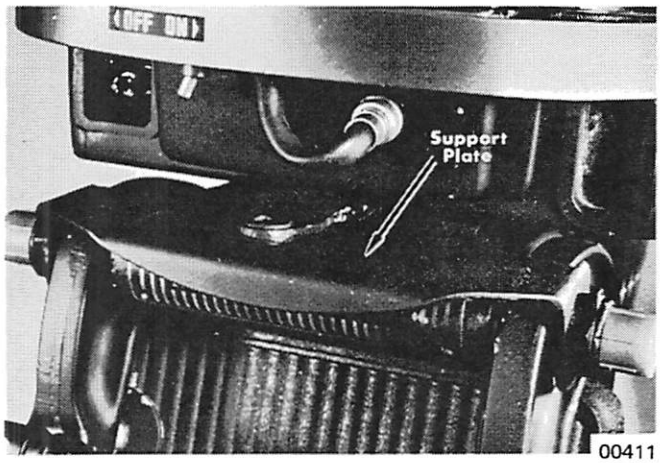

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Figure 2. Support Plate Installed

4. Place wood block on exposed end of tilt tube and drive tilt tube back thru support plate until tube is centered.
5. Thread elastic stop nuts on tilt tube and, while holding leading edge of support plate up, tighten nuts securely. (Figure 2)

NOTE: To keep tilt tube centered, tighten one nut until it just touches support plate. Then tighten the other nut securely.

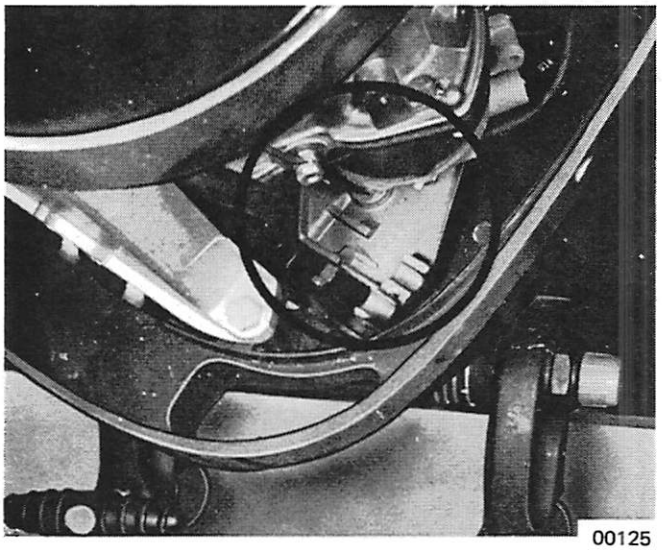
00125

Figure 3. Anchor Pin Assemblies Removed

INSTALLING HANDLE ASSEMBLY

1. Remove front cover and wrap around cowl from engine.
2. Remove screw, which fastens anchor pin assemblies to bracket, and remove anchor pin assemblies. (Figure 3)
3. Place cover in position on steering handle bracket and fasten cover to bracket with 2 self-tapping screws. (Figure 4)

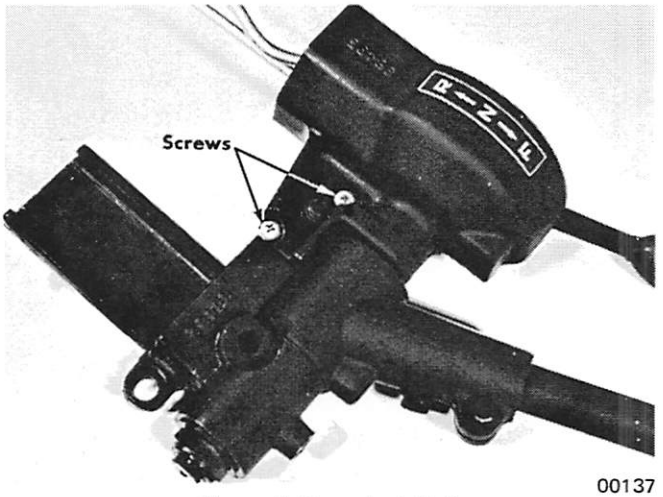

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Figure 4. Cover Installed

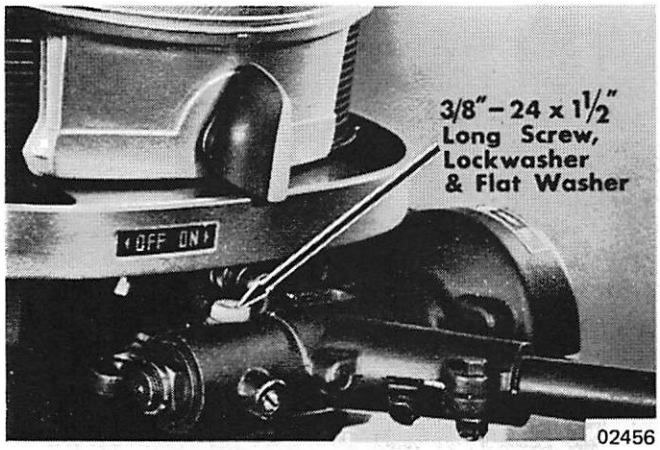

Figure 5. Handle Assembly Installed and Set Screw

4. Insert throttle and shift link rods thru opening in left side of cowl and place handle assembly in position on engine steering lever. (Figure 5)
5. Fasten handle assembly to engine steering lever with 3/8-24x1-1/2" long screw, lockwasher and flat washer which are in plastic bag. Tighten screw securely. (Figure 5)
6. Tighten set screws ("A" in Figure 5 and "B" in Figure 6) securely. Tighten jam nuts, which are threaded on set screws, securely.

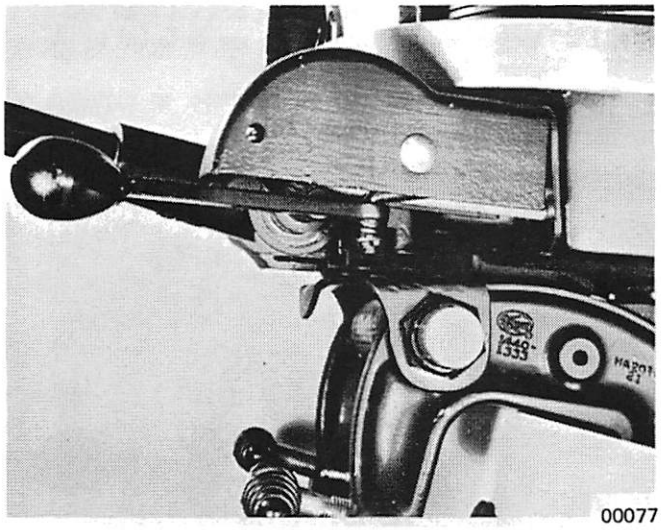

Figure 6. Handle Assembly Installed & Set Screw

7. Place shift lever, which is located on handle assembly, in forward gear position.
8. With motor in forward gear, place end of shift link rod over shift actuator peg. It may be necessary to loosen jam nut, which is located on link rod, and thread link rod end clockwise or counterclockwise, as required, to line up hole in rod end and shift actuator peg. Tighten jam nut securely. (Figure 7)
9. Slide spring retainer clip over link rod end. Be sure that hole in spring retainer clip is centered over peg. (Figure 8)
10. Place shift lever in neutral position and check that motor is in neutral gear. If link rod end is not correctly adjusted, motor will not shift properly.
11. Turn handle grip clockwise until grip stops. Markings on grip indicator and mark on tube will be positioned as shown in Figure 9.

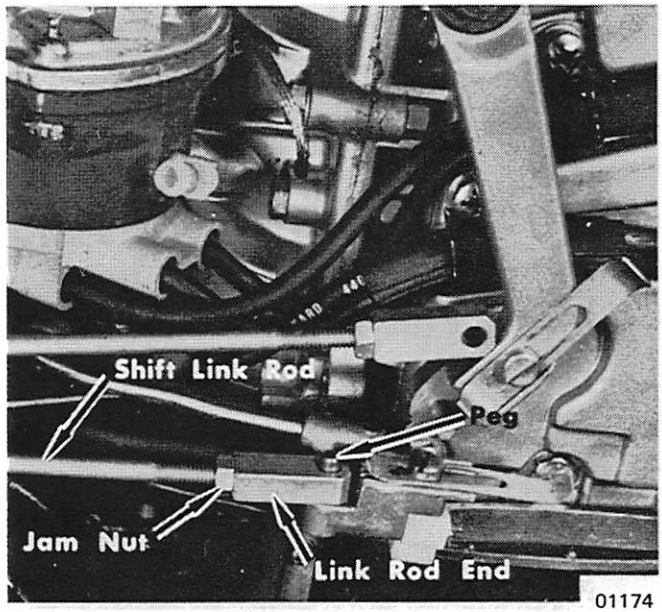

Figure 7. Installing Shift Link Rod

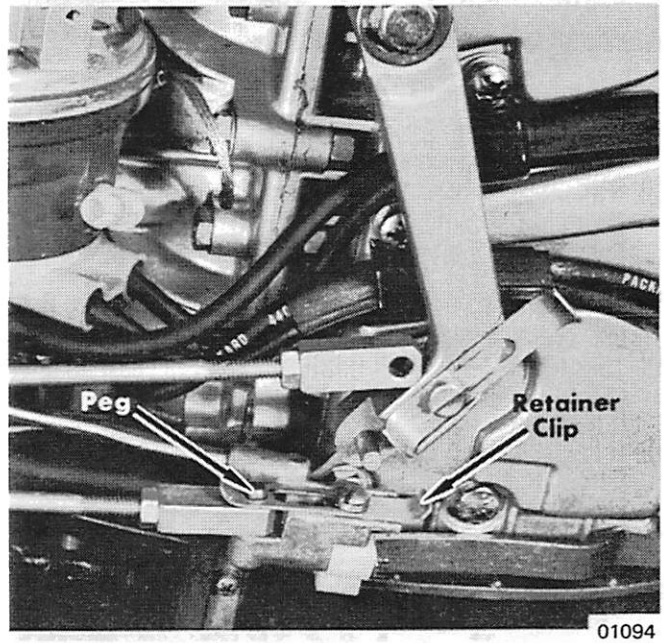

Figure 8. Shift Link Rod Installed

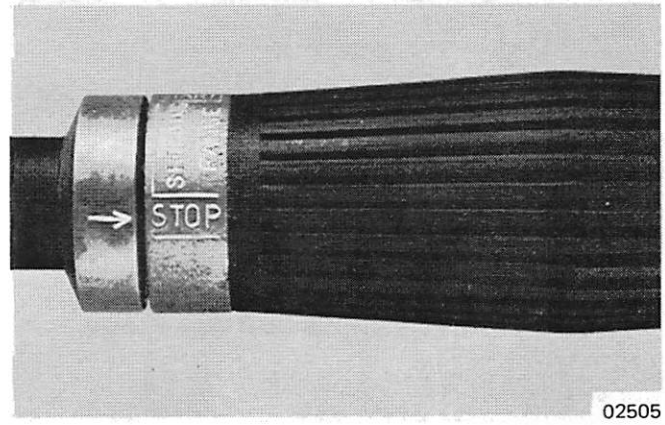

Figure 9. Handle Grip Position

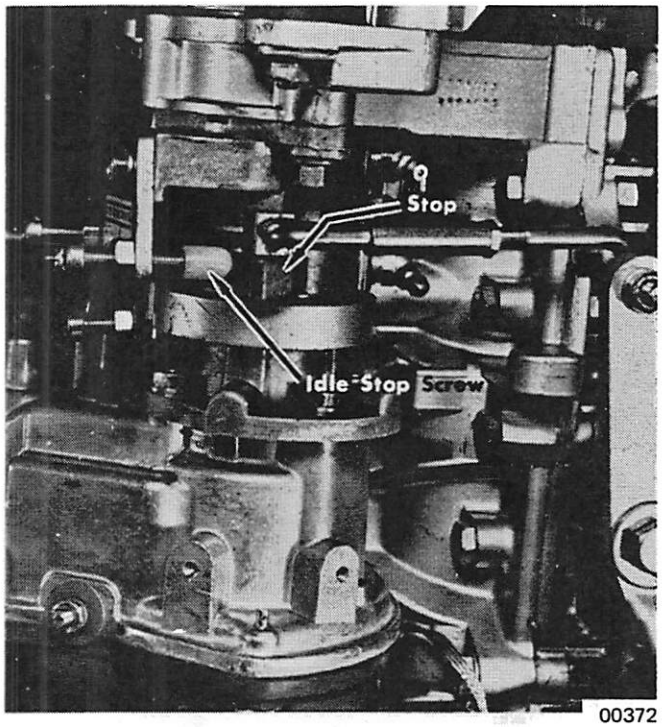

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Figure 10. Idle Stop Screw

12. Position vertical lever so that magneto is held lightly against idle stop screw. (Figure 10)
13. With vertical lever in this position and handle grip positioned as outlined in step No. 11, adjust throttle link rod end as required to place rod end over peg on vertical lever. (Figure 11)
14. Slide spring retainer clip over link rod end. Be sure that hole in spring retainer clip is centered over peg. (Figure 12)
15. Turn handle grip to full throttle position and back to idle. Check that magneto is held lightly against idle stop screw. (Figure 10)
16. If link rod end is not correctly adjusted, magneto will not return to idle stop and motor will not idle at approximately 500 RPM in forward gear.
17. Install wrap-around cowl and front cover.

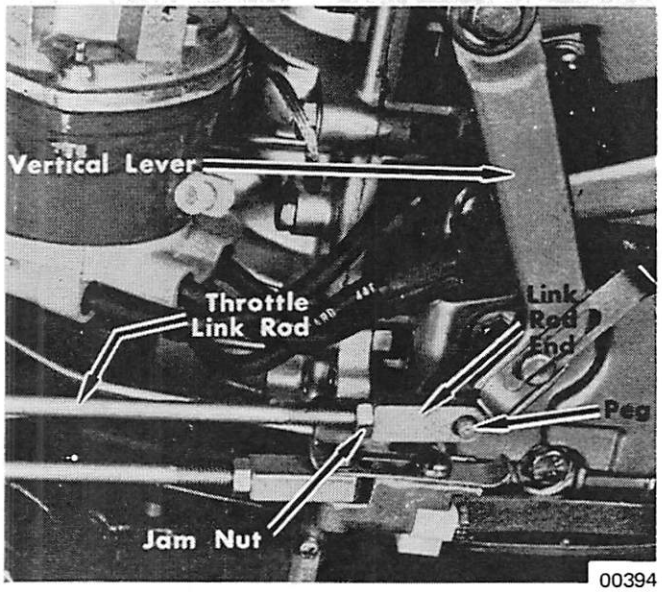

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Figure 11. Installing Throttle Link Rod

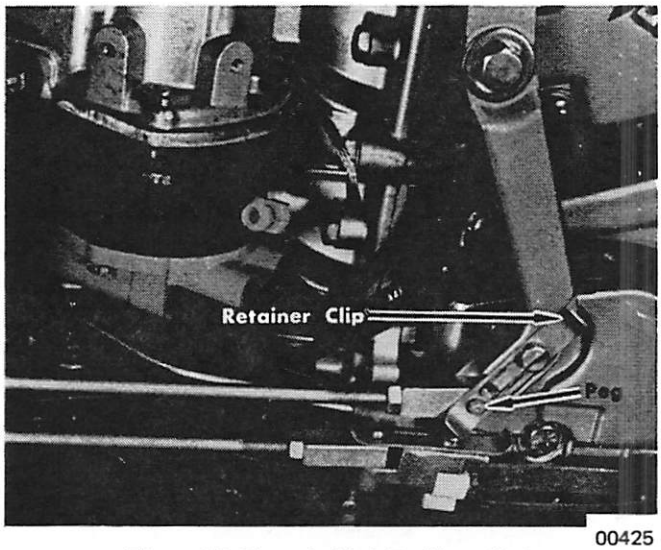

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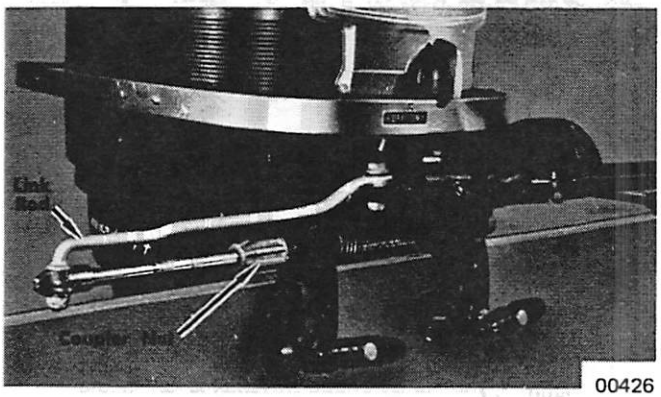
Figure 12. Throttle Link Rod Installed

CO-PILOT INSTALLATION

Co-pilot replacement kit (A-29738A5) may be used with this steering handle to provide steering tension. Kit is not supplied with handle assembly.

1. Remove red tilt tube cap from starboard end of tilt tube.
2. Place pilot rod into tilt tube. (Figure 13)
3. Fasten end of link rod to handle bracket with 3/8-24 x 1-1/2" long screw and nut which are included in plastic bag. (Figure 13)
4. Tighten large coupler nut on tilt tube, as required, to obtain desired tension. (Figure 13)



00426

Figure 13. Co-Pilot Kit Installed

OPERATING INSTRUCTIONS

1. Position twist grip handle so that "Start" is lined up with mark on steering handle tube.
2. Place shift lever in "N" (neutral) position.
3. Place magneto shorting switch in "On" position.
4. Start engine.
5. Turn twist grip handle to "Shift Range".
6. Move shift lever to desired gear.

CAUTION: Do not shift gears unless twist grip handle is in "Shift Range" position. Do not shift into reverse gear when engine is not running, as shifting mechanism will be damaged.

7. To stop motor, return twist grip handle to "Stop" position and move magneto shorting switch to "Off" position.

HEAVY-DUTY WATER PUMP KIT

REMOVAL

1. Remove water pump body assembly, impeller, impeller drive pin, face plate and water pump base assembly*, and discard.
2. Carefully clean gasket surface of gear housing.

INSTALLATION

1. Install pump base to gear housing gasket*, water pump base assembly*, base to plate gasket, face plate and plate to body gasket. Be sure that pump base is down, fully seated in gear housing.

   NOTE: Loosen oil vent screw if air lock makes this difficult.

   Squirt a little oil on the pump base oil seal after installation.
2. Place gear housing in a vise so that drive shaft is horizontal.
3. Using FRESH solvent (lacquer thinner is excellent) and a clean cloth, clean the drive shaft from the face plate up to the end of the spline. Also, clean the impeller insert and drive pin. Avoid getting solvent on the pump base oil seal. Wipe all cleaned surfaces dry.
4. Snip off one end of Type "HV" Loctite (C-92-36088) tube. Rotate drive shaft so that the flat is up. Squeeze about half the contents of the tube on the flat. Smear this Loctite evenly on the rest at the shaft section on which the impeller will ride. With the flat on the shaft up, squeeze the balance of the Loctite onto the flat.
5. Roll the drive pin in this puddle on the flat and leave it centered in the flat.
6. Slip the impeller onto the shaft with the keyway up so that it will align with drive pin. Slowly push impeller down to the face plate.
7. Rotate the impeller back and forth several times, as far as the drive pin will allow, to thoroughly wet the impeller insert with the Loctite.
8. Wipe off any excess Loctite which appears above the impeller.
9. Install pump body and fastening nuts and screw.
10. Looking down the drive shaft from the spline end, rotate the shaft clockwise at least one turn to seat the drive pin in the driving direction.
11. Allow gear housing to remain in a horizontal position at room temperature or warmer (not to exceed 120° F [49° C]) for 12 hours.
12. Gear housing assembly now can be reinstalled.

**Change required only on those kits which include a new water pump base. On those kits which do not include a new water pump base, it will be necessary to install the new, longer dowel pins in the old water pump base.*

KEENSERTS

DESCRIPTION

Keensert inserts are aluminum or stainless steel inserts which are used to replace damaged or stripped-out threads. They are easily installed with standard drills and taps and will not strip-out or turn-out. The inserts are mechanically locked in against rotation and vibration.

INSTALLATION

1. Drill out damaged thread with a standard (specified) drill.
2. Countersink hole.
3. Tap hole with a standard (specified) tap.

   NOTE: To reduce the length of the insert, cut insert off to required length with a cutting tool.

4. Screw insert into hole until thread is slightly below the surface.
5. Drive kees down with light taps on installation tool with a hammer.

REMOVING KEENSERTS

1. Drill with a standard (specified) drill to specified depth. This will remove insert material between kees and internal thread.
2. Using a punch, deflect kees inward and break off.
3. Remove insert with E-Z out type of tool.

   NOTE: A same-size replacement Keensert now can be installed into the original tapped hole.

Kit Part No.	Kit Description	Contents of Kit
C-91-59964	Spark Plug Master Kit	20 Aluminum Spark Plug Inserts, 14mm, ½" Reach and Installation Tools
C-91-59976	¼-20 Thread Repair Kit	10 Stainless Steel ¼-20 Inserts and Installation Tool
C-91-59983	5/16-18 Thread Repair Kit	6 Stainless Steel 5/16-18 Inserts and Installation Tool
C-91-59990	3/8-16 Thread Repair Kit	5 Stainless Steel 3/8-16 Inserts and Installation Tool
C-91-59970	Spark Plug Refill Kit	10 Aluminum Spark Plug Inserts and Rings 14mm, ½" Reach
C-91-59980	¼-20 Refill Kit	24 Stainless Steel ¼-20 Inserts
C-91-59988	5/16-18 Refill Kit	16 Stainless Steel 5/16-18 Inserts
C-91-59996	3/8-16 Refill Kit	13 Stainless Steel 3/8-16 Inserts

HELI-COIL

DESCRIPTION

Heli-Coil inserts are precision-formed stainless steel wire thread reliners for tapped holes. They take all the hard work and lost time out of repairing damaged threads. They are easily installed and are invisible in assembly . . . make permanent repairs that resist all future wear, stripping, corrosion, seizing and galling. Heli-Coils eliminate extraction of broken-off screw or stud . . . no more filling holes with weld metal that damages drills and taps . . . no more oversize threads, stepped studs, non-standard bolts, enlarged clearance holes, botched appearances and recurring failures. Saves much time and money!

NOTE: Each kit contains one tap, one inserting tool, inserts and instructions.

00763

Figure 1. Heli-Coil Kit

INSTALLATION

DRILLING

1. Follow regular drilling procedure. Use a drill equal in diameter to the screw thread; i.e., for a ¼ thread, use a ¼ drill.
2. Drill all the way to the bottom of a blind hole or all the way through a thru hole.

TAPPING

Retap the drill hole with the appropriately-marked Heli-Coil tap provided for the purpose. Standard taps will not do. The Heli-Coil tap will cut the right number of threads per inch, and it is made oversize enough to allow space for the insert. No counterboring or other machining is necessary.

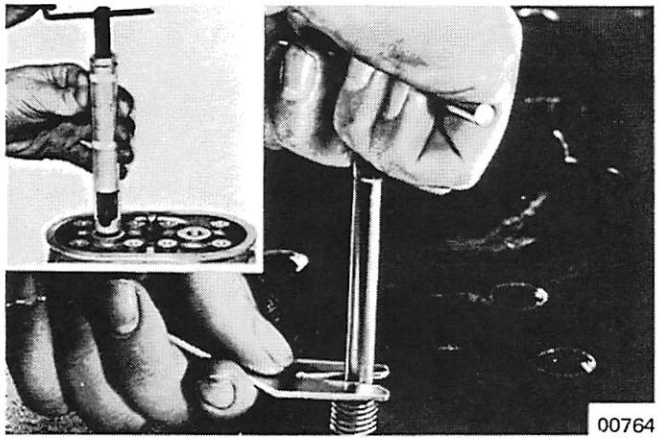


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Figure 2. Installing Heli-Coils

INSTALLING

1. Select the inserting tool recommended for the thread size involved.
2. Snap the inserting tool into place on the "T" handle.
3. Place the insert on the mandrel, tang end down, so that the tang is engaged in the mandrel slot.
4. Press the insert firmly against the hole, using the pressure plate provided, then wind the insert until it is seated from ¼ to 1½ turns below the surface.

If the tang must be recovered from the hole, agitate it rapidly up-and-down with long-nosed pliers, otherwise a sharp hammer blow against a punch will break it off. When installing spark plug Heli-Coil, it may be "staked" into position with staking tool (C-91-24135) to ensure against pulling out. Always thread a screw or spark plug into a newly-threaded hole to assure that the threads are correct.

NOTE: The staking tool is not part of the C-91-24133A2 kit.

REPLACEMENT PIECES

Part No.	Description
C-91-46830	14mm Heli-Coil Tap
C-91-24134	14mm Inserting Tool
C-91-24135	14mm Staking Tool
C-91-24142	Heli-Coil Tap, 5/16x18

HELI-COIL KITS

Kit No.	Size	Inserts
C-91-24683A1*	¼-28	30
C-91-24682A1	¼-20	30
C-91-24686A1	5/16-18	25
C-91-25823**	Tool Pack	
C-91-24133A2	14mm Spark Plug	20
C-91-35596	3/8-16	15
C-91-35597	7/16-14	10

** Because of fine threads, a special nylon prewinder is included to provide for easier installation.*

HELI-COIL INSERTS

Part No.	Size
C-91-24683	¼-28x3/8"
C-91-24681	¼-28x½"
C-91-24682	¼-20x3/8"
C-91-24684	¼-20x½"
C-91-24685	5/16-18x25/32"
C-91-24686	5/16-18x13/32"
C-91-29410	14mm x .242 (All Die Cast Blocks)

*** Tool pack contains one handle for inserting tool and a pressure plate for installing all sizes of inserts.*

HOW TO REMOVE INSERTS

1. With a small triangular file, cut a notch in the top coil of the insert about ¼-turn from the end of the wire. Be careful not to damage the threads in the tapped hole.
2. Place one edge of a 3-edge scraper in the notch.
3. While maintaining steady downward pressure, turn the scraper counterclockwise until the entire insert is backed out.

MARINE MERCATHODE ANTI-CORROSION SYSTEM

KIT NO. C-46733A1

INSTALLATION PROCEDURE and INFORMATION

DESCRIPTION

1. The automatically-controlled MerCathode Anti-Corrosion System for marine installations protects underwater metals from effects of corrosion on Mercury, MerCruiser and other marine outboards or stern drives.
2. The anode is identified by the letter "A" on the convex end. It has a male fitting connection, which is splash proof, on the lead wire. (Figure 1)
3. The reference electrode is identified by the letter "R" on the convex end. It has a female fitting connection, which is splash proof, on the lead wire. (Figure 1)
4. The protector control is rectangular with 2 mounting holes. It has one male connection for the reference electrode and one female connection for the anode with 2 leads for connection to a 12-volt battery. (Figure 1)
5. The negative lead has a terminal connection with a 5/16" (8mm) ID.
6. The positive lead has a terminal connection with a 3/8". (9.5mm) ID and is red for identification.

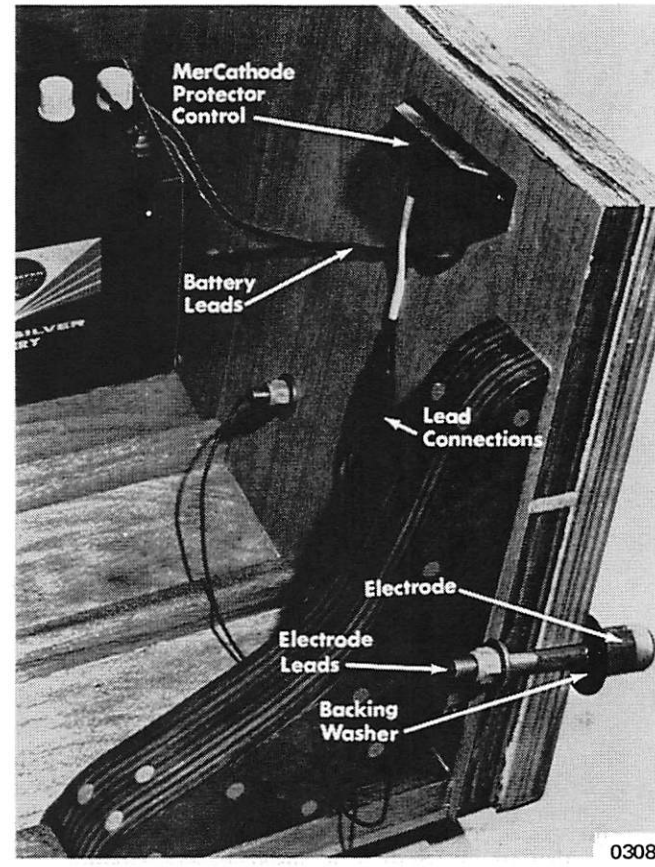

Figure 1. Component Identification

INSTALLATION

ON MARINE EQUIPMENT - GENERAL

1. The reference electrode is mounted on the starboard side of the outboard unit, drive unit or dual units.
2. The anode is mounted on the port side of the units.
3. Both of the electrodes must be installed on the transom below the water line (boat at rest) to be effective.
4. The protector control or controls must be mounted in a well-ventilated place which is protected from weather and bilge water.
5. Leads may be spliced, should the installation require additional lengths of lead. Be sure that the connections are soldered and waterproofed.
6. Switches or fuses in line are NOT required.
7. A direct connection to the battery is necessary to insure constant protective operation.
8. A fully-charged battery will protect the units for a considerable length of time (approx. 45 to 90 days) before the battery will require recharging. Amperage draw for protection is very slight.
9. Do not paint the electrodes.

NOTE: Cleaning, painting and lubrication of equipment is best for protection from effects of marine growth and deposits. Use Quicksilver Anti-Corrosion Grease (C-92-45134-12) and Anti-Corrosion Oil (C-92-39928-12) and anti-fouling paints which do not contain any copper or mercury compounds.

MERCATHODE ELECTRODE INSTALLATION thru TRANSOM on OUTBOARDS

1. Locate electrodes on transom below the water line.
2. At chosen locations, drill 9/16" (14mm) holes thru the transom.

3. Slip a rubber washer, large metal washer and rubber washer over electrode lead. Now, insert lead and electrode thru hole.

4. Slip flat washer and aluminum stop nut over lead. Use spanner wrench (C-91-46787) to hold electrode washer when tightening (20-25 ft. lbs. [2.76-3.45mkg]).

NOTE: A manual starting outboard motor can be protected by installing a 12-volt battery for the MerCathode System and by adding a ground from the engine block to the negative (-) terminal on the battery.

MERCATHODE PROTECTOR CONTROL INSTALLATION

1. Follow installation practices and select proper location.
2. Secure thru holes provided in power supply control.
3. Route electrode leads up from bilge and insert each splash-proof connection. Connect proper leads directly to the battery. (Figure 2)

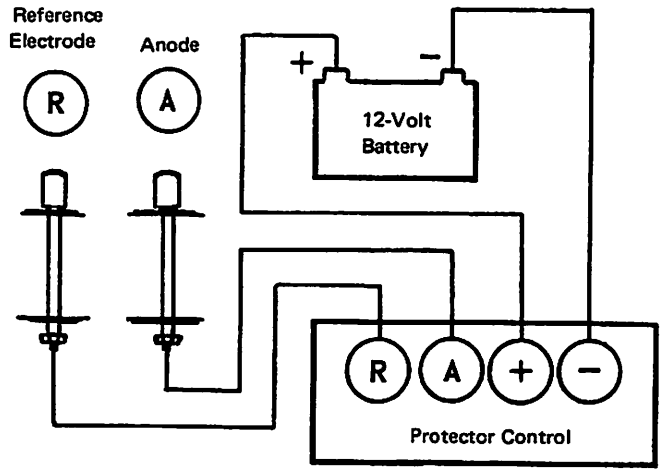

Figure 2. Schematic Wiring

SPECIAL APPLICATIONS

1. Various craft may require more than one MerCathode System. To determine the need for additional systems, use the following text as a guide, remembering that the only positive way to determine adequate protection of marine equipment is to use a MerCathode Tester (C-91-46802) with test instructions (C-90-46835). Use the tester after the MerCathode System is installed and monitor the system periodically thereafter.
2. Single or dual installations of outboards on metal hulls may be adequately protected with one MerCathode System, only if the metal hull bottom is painted with non-conducting paint and not painted with a highly conductive metal compound paint (anti-fouling). The paint used should be of good quality, with good coverage.
3. Installations on wood or fiber glass hulls can be adequately protected with one MerCathode System. A highly conductive anti-fouling paint is permissible on this kind of hull only if a 1" (2.54cm) border (non-conducting insulating median) is maintained around the clamp brackets or drives. A non-conductive bottom paint is best.
4. Larger and longer wood or metal hulls of the catamaran or wide transom type, which have a greater separation between drive units, may require 2 MerCathode Systems. Use the same format for painting as previously outlined for smaller hulls. DO NOT paint "anode" or "reference" electrodes!
5. For complete dual protection, ground the drive units or outboards together by a common ground between negative battery terminals. This is in addition to the grounding required, as previously described.

CHECKING

A properly installed MerCathode System will function trouble-free, however, to assure proper corrosion protection, it is recommended that the system be measured periodically with a MerCathode Tester (C-91-46802). A dealer or individual with a MerCathode tester and accompanying instructions will be able to measure, test and monitor the MerCathode System performance.

MERCATHODE TESTER (C-91-46802A1)

DESCRIPTION

The MerCathode Tester is a specially constructed test instrument used to monitor operation of the MerCathode Anti-Corrosion System and to check the operation of the components in order to locate any malfunction that may exist. Test Meter C-91-46802A1 is a combination DC voltmeter and milliameter. Test the MerCathode System periodically to assure proper protection. The MerCathode System consists of three components which are factory-sealed and cannot be repaired, thus, should be replaced individually.

1. The automatic protector control which is mounted inside the boat.
2. The "anode" electrode (identified by letter "A"), mounted thru the transom below the water line, delivers protective current.
3. The "reference" electrode (identified by letter "R"), mounted thru the transom below the water line, governs the protector control so that it continuously provides the proper protective current via the anode.

Protection against corrosion has been achieved when the reference potential reads between 0.8 and 1.05 on the red scale. If the outdrive or outboard is equipped with new clean zinc anodes, a satisfactory reference potential may be observed on the tester meter without the installation of the MerCathode System. However, zinc anodes are sacrificial, and continued protection can be achieved only by installation of the MerCathode System. Zinc anodes will provide interim protection, should the battery be removed from the boat or discharged.

Various craft may require more than one MerCathode System. The need for additional MerCathode Systems may be determined by the test within "Special Applications" which is located on Page 3 of "Installation Procedure and Information Instructions" (C-90-46735).

DO NOT paint "anode" or "reference" electrodes.

MERCATHODE TESTER FUNCTIONS

1. To monitor system, checking that components properly operate together to provide corrosion protection.
2. To check the performance of the reference electrode.
3. To check the effectiveness of the anode.
4. To check the performance of the automatic protector control.

   NOTE: During tests, use a fully-charged 12-volt battery and keep the boat in the water with the electrodes immersed below the waterline.

TEST PROCEDURES

TEST "PERFORMANCE" PROCEDURE

1. Place test meter switch in direction of red arrow. Connect ground lead of meter to engine ground or negative terminal side of battery. Immerse the half cell (red plastic unit with screen) into water behind the boat transom.
2. Read between 0.8 and 1.05 on meter red scale, then disconnect the reference electrode lead from the protector control at quick disconnect and wait one minute. If the meter reading increases, the system is operating properly and no further tests are necessary. Proceed with the following tests if readings were not as described above.

TEST "REFERENCE ELECTRODE" and "ANODE" PROCEDURE

1. Disconnect both electrode leads from the MerCathode protector control at quick disconnect and connect ground lead of meter to engine ground or negative (-) terminal side of battery.
2. Plug the adaptor (furnished with tester) into female quick disconnect on the reference electrode lead, then press the adaptor clip into the screen on the meter half cell.
3. Readings between .5 and 1.05 on meter red scale indicate proper reference electrode operation. If meter reading is not within this range, replace the "reference electrode". Check "anode" in Step 4, following.
4. Remove reference electrode lead from adaptor and connect "anode" lead at quick disconnect into adaptor, then press clip into the screen on the half cell.
5. Readings between .8 and 2.0 on meter red scale indicate proper "anode" operation, that it is not shorted and that platinum surface is intact. If meter reading is not within this range, replace the "anode".

TEST "PROTECTOR CONTROL" PROCEDURE

1. Place tester meter switch in direction of black arrow. Disconnect "reference electrode" and "anode" leads from protector at quick disconnect, if not already disconnected.

2. Disconnect (red band) lead of the protector control from the battery positive terminal side and connect it to tester lead which is marked "protector". Connect tester lead, marked "battery", to positive terminal side of battery.

   NOTE: DO NOT ground meter "battery" lead. If this accidentally happens, remove meter case and replace 3AG and AGC fuse (½ amp). A spare fuse is located in a clip above the fuse used in the meter circuit.

3. Readings between 3 and 15 on meter black scale indicate a satisfactory "no load" test. Replace the protector control if meter reading is not within this range. Perform "full load" test, following, if reading is within range.
4. Connect adaptor (furnished with tester) to protector's "reference electrode" and "anode" lead quick disconnections and ground to engine or negative terminal side of battery.
5. Readings between 120 and 200 on meter black scale indicate a satisfactory "full load" test. Replace the protector control if the meter reading is not within this range.

BONDING KIT - RADIO NOISE SUPPRESSION

KIT NO. A-47171A1

MERCURY OUTBOARDS with THUNDERBOLT IGNITION

1. Remove front cowl, wrap-around cowl and lower 2 spark plugs.
2. Remove 4 screws from drive shaft housing rim cover and remove cover.
3. Remove the 2 lower cylinder block cover mounting screws. (Figure 1)

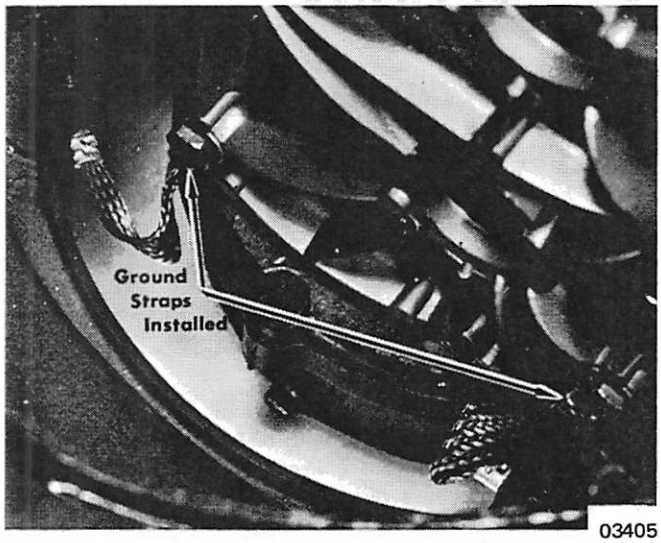

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Figure 1. Ground Straps Installed

4. Remove top trim cover seal retaining strip screw from each side of drive shaft housing.
5. Remove paint from trim cover screw lugs on the bottom cowl to insure a good connection. (Figure 2)
6. Place large ¼" (6.35mm) end ground strap on each lower cylinder block cover screw and replace screws. (Figure 1) Torque screws to 100 in. lbs. (17.75kg/cm).
7. Place a ground strap on each retaining strip screw and reinstall screws. (Figure 3)
8. Reinstall trim cover to drive shaft housing. Install the 4 trim cover screws, making certain that ends of ground straps are placed on screws between trim cover and bottom cowl. An awl or similar pointed object can be used to align holes in ends of strap with screw.
9. Reinstall lower 2 spark plugs, wrap-around cowl and front cowl.

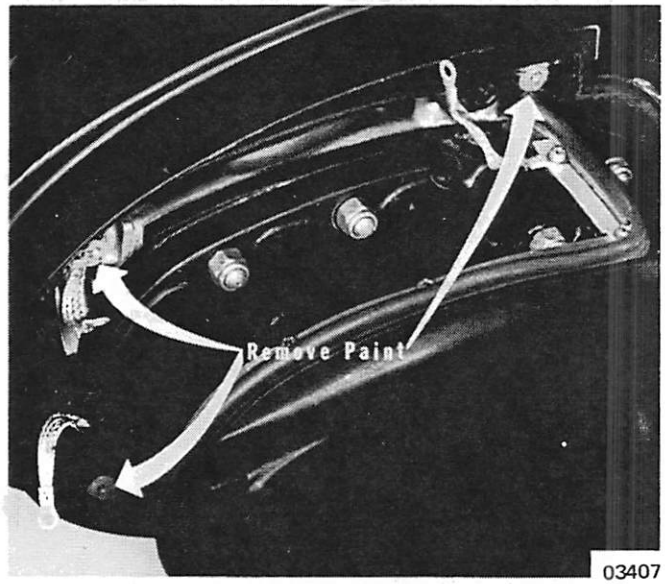

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Figure 2. Paint Removed

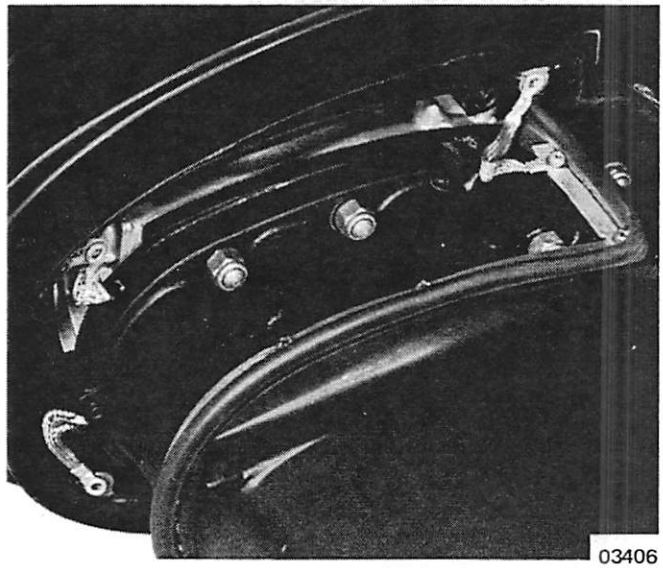
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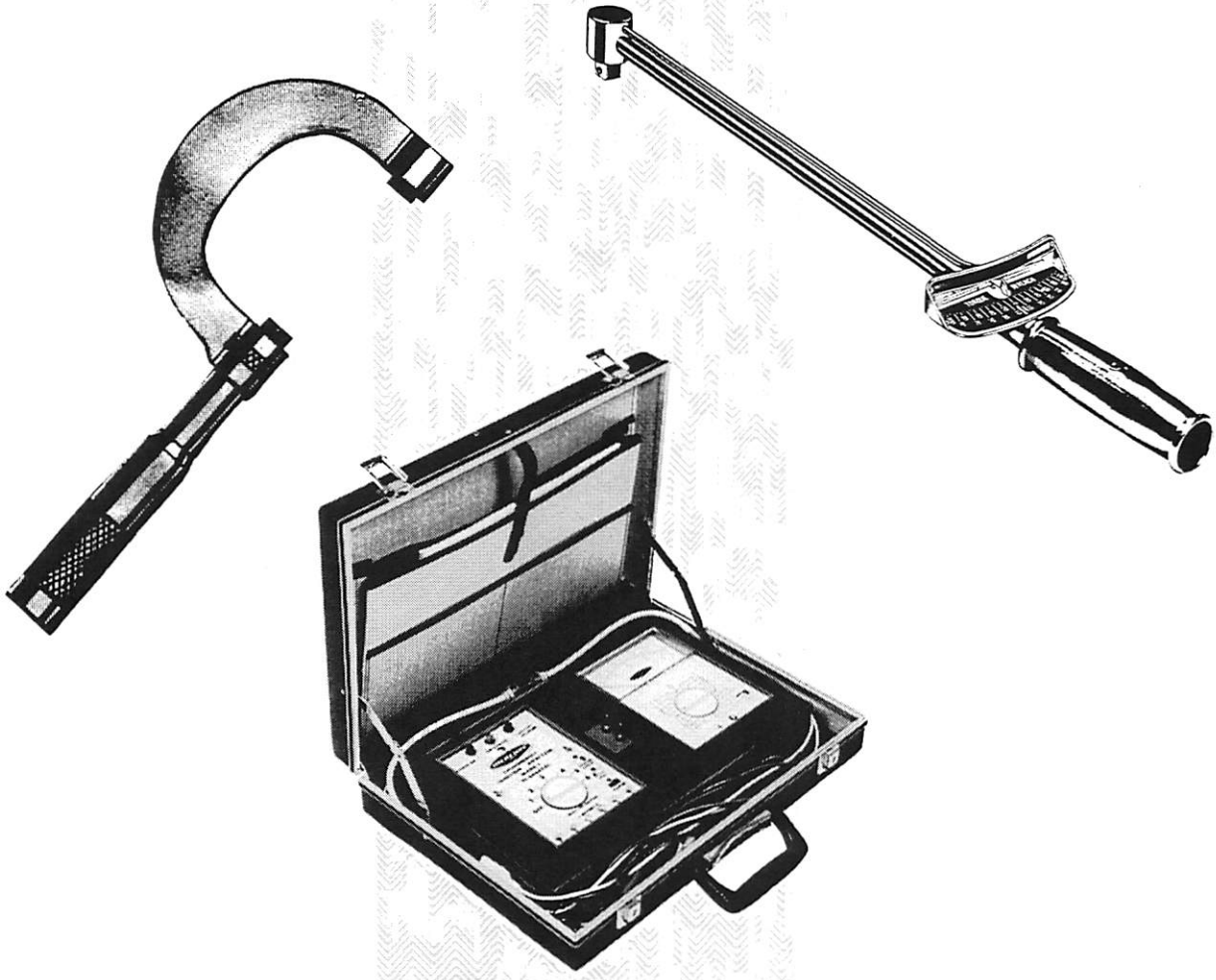
Figure 3. Ground Straps in Position

OUTBOARD
SECTION 8



SPECIFICATIONS

TABLE of CONTENTS

SECTION 8 - SPECIFICATIONS

MERCURY
OUTBOARDS

POWERHEAD - TORQUE - TUNE-UP -

LOWER UNIT and COMPONENT

INDEX

MASTER SPECIFICATIONS

Metric Conversion: 1" = 2.54cm; .001" = 0.0254mm; 1 Cu. In. = 16.39cc: 1 Oz. = .03 Liter; 1 Gal. = 3.78 liters.

** Use Degree Plate C-91-45510A1* *● Horsepower Varies with RPM* *§ Use Degree Plate C-91-31484A2*

NOTE: Engines Used for Commercial Applications Should Use Lower RPM Listed. *▲ Or 48° Dwell*

■ Use Degree Plate C-91-36454A1

"K" MODELS

1940

Model	Designation	HP	Cu. In. Displ.	Full Throttle RPM Range	Bore	Stroke	Spark Plug Type	Plug Setting	Ignition Type	Point Setting
K1	Special	2.5	5.5	3800	2"	1¾"	Ch. J8J	.025	Eiseman	.018
K2	Standard	3	5.5	4250	2"	1¾"	Ch. J8J	.025	Eiseman	.018
K3	Deluxe	3	5.5	4250	2"	1¾"	Ch. J8J	.025	Eiseman	.018
K4	Alternate	6	11	4250	2"	1¾"	Ch. J8J	.025	Eiseman	.018
K5	Alternate	6	11	4250	2"	1¾"	Ch. J8J	.025	Eiseman	.018

1941

KB1	Comet	2.9	5.5	4000	2"	1¾"	Ch. J8J	.025	Eiseman	.018
KB1A	Comet Deluxe	3.1	5.5	4000	2"	1¾"	Ch. J8J	.025	Eiseman	.018
KB2	Streamliner	3.2	5.5	4000	2"	1¾"	Ch. J8J	.025	Eiseman	.018
KB3	Torpedo	3.2	5.5	4000	2"	1¾"	Ch. J8J	.025	Wico	.018
KB4	Rocket	5.8	11	4000	2"	1¾"	Ch. J8J	.025	Eiseman	.018
KB5	Rocket Deluxe	6	11	4000	2"	1¾"	Ch. J8J	.025	Eiseman	.018

1942

KB3	Torpedo	3.2	5.5	4000	2"	1¾"	Ch. J8J	.025	Wico	.018
KB4	Rocket	5.8	11	4000	2"	1¾"	Ch. J8J	.025	Eiseman	.018

1946

KB4-1	Rocket	6	11	4000	2"	1¾"	Ch. J8J	.025	Eiseman	.018
KD3	Comet	3.2	5.5	4000	2"	1¾"	Ch. J8J	.025	Scin-Eise.	.018
KD4	Rocket	6	11	4000	2"	1¾"	Ch. J8J	.025	Scin-Eise.	.018

1947

KD3	Comet	3.2	5.5	4000	2"	1¾"	Ch. J8J	.025	Scin-Eise.	.018
KD4	Rocket	6	11	4000	2"	1¾"	Ch. J7J	.025	Scin-Eise.	.018
KD3S	Comet	3.2	5.5	4000	2"	1¾"	Ch. J8J	.025	Scin-Eise.	.018
KD4S	Rocket	6	11	4000	2"	1¾"	Ch. J7J	.025	Scin-Eise.	.018
KE3	Comet Deluxe	3.6	5.5	4000	2"	1¾"	Ch. J7J	.025	Scintilla	.018
KE4	Rocket Deluxe	7.5	11	4000	2"	1¾"	Ch. J7J	.025	Phelon	.018
KE4A	Rocket Deluxe	6	11	4000	2"	1¾"	Ch. J7J	.025	Scintilla	.018
KE7	Lightning Deluxe	10	19.8	4000	2-7/16"	2-1/8"	Ch. J7J	.025	Scintilla	.018

1948

Model	Designation	HP	Cu. In. Displ.	Full Throttle RPM Range	Bore	Stroke	Spark Plug Type	Plug Setting	Ignition Type	Point Setting
KE3	Comet Deluxe	3.6	5.5	4000	2"	1¾"	Ch. J7J	.025	Scintilla	.018
KE4	Rocket Deluxe	7.5	11	4000	2"	1¾"	Ch. J7J	.025	Phelon	.018
KE7	Lightning Deluxe	10	19.8	4000	2-7/16"	2 1/8"	Ch. J7J	.025	Scintilla	.018

1949

KF3	Comet	3.5	5.5	4000	2"	1¾"	Ch. J7J	.025	Phelon	.018
KF3	Comet	3.5	5.5	4000	2"	1¾"	Ch. J7J	.025	Scintilla	.018
KF7	Super 10	10	19.8	4000	2-7/16"	2-1/8"	Ch. J7J	.025	Scintilla	.018
KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Phelon	.018
KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Scintilla	.018
KF9	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch. J7J	.025	F-Morse	$.010 \pm \frac{.000}{.002}$

1950

KF3	Comet	3.5	5.5	4000	2"	1¾"	Ch. J7J	.025	Phelon	.018
KF3	Comet	3.5	5.5	4000	2"	1¾"	Ch. J7J	.025	Scintilla	.018
KF7	Super 10	10	19.8	4000	2-7/16"	2-1/8"	Ch. J7J	.025	Scintilla	.018
KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Phelon	.018
KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Scintilla	.018
KF9	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch. J7J	.025	F-Morse	$.010 \pm \frac{.000}{.002}$
KG4	Rocket Hurricane	7.5+	14.89	•	2-7/64"	2-1/8"	Ch. J7J	.025	Phelon	.018
KG4H	Rocket Hurricane	7.5+	14.89	•	2-7/64"	2-1/8"	Ch. J6J	.025	Phelon	.018
KG7	Super 10 Hurricane	10+	19.8	•	2-7/16"	2-1/8"	Ch. J6J	.025	Scintilla	.018
KG7H	Super 10 Hurricane	10+	19.8	•	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
KG9	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch. J6J	.025	F-Morse	$.010 \pm \frac{.000}{.002}$

1951

KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Phelon	.018
KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Scintilla	.018
KG4	Rocket Hurricane	7.5+	14.89	•	2-7/64"	2-1/8"	Ch. J7J	.025	Phelon	.018
KG4H	Rocket Hurricane	7.5+	14.89	•	2-7/64"	2-1/8"	Ch. J6J	.025	Phelon	.018
KG7	Super 10 Hurricane	10+	19.8	•	2-7/16"	2-1/8"	Ch. J6J	.025	Scintilla	.018
KG7H	Super 10 Hurricane	10+	19.8	•	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
KG9	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	$.010 \pm \frac{.000}{.002}$

1952

KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Phelon	.018
KF5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Scintilla	.018
KG4	Rocket Hurricane	7.5+	14.89	•	2-7/64"	2-1/8"	Ch. J7J	.025	Phelon	.018
KG4H	Rocket Hurricane	7.5+	14.89	•	2-7/64"	2-1/8"	Ch. J6J	.025	Phelon	.018
KG7	Super 10 Hurricane	10+	19.8	•	2-7/16"	2-1/8"	Ch. J6J	.025	Scintilla	.018
KG7H	Super 10 Hurricane	10+	19.8	•	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
KG9	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	$.010 \pm \frac{.000}{.002}$
KH7	Super 10 Hurricane Cruiser	10+	19.8	•	2-7/16"	2-1/8"	Ch. J6J	.025	Scintilla	.018

• *Horsepower varies with RPM*

MARK MODELS

1953

Mark Model	Designation	HP	Cu. In. Displ.	Throttle RPM Range	Bore	Stroke	Spark Plug Type	Plug Setting	Ignition Type	Point Setting
5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Phelon	.018
7	Rocket Deluxe	7.5	11	4000	2"	1¾"	Ch. J7J	.025	Phelon	.018
15	Rocket Deluxe	10	14.89	4000	2-7/64"	2-1/8"	Ch. J7J	.025	Phelon	.018
20	Rocket Deluxe	16	19.8	4000	2-7/16"	2-1/8"	Ch. J6J	.025	Scintilla	.018
40	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	.010±.000 .002
40H	Thunderbolt	25+	39 6	•	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	.010±.000 .002

1954

5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Phelon	.018
7	Rocket Deluxe	7.5	11	4000	2"	1¾"	Ch. J7J	.025	Phelon	.018
20	Rocket Deluxe	16	19.8	4000	2-7/16"	2-1/8"	Ch. J6J	.025	Scinitilla	.018
20H	Hurricane	16	19.8	•	2-7/16"	2-1/8"	Ch. J62R	.025	Phelon	.018
40	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch .J6J	.025	F - Morse	.018
40H	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch . J6J	.025	F - Morse	.018
50	Thunderbolt	40	39.6	5400	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	.010±.000 .002
50E	Thunderbolt MercElectric	40	39.6	5400	2-7/16"	2-1/8"	Ch . J6J	.025	F - Morse	.010±.000 .002

1955

5	Super 5	5	7.2	4200	1¾"	1½"	Ch. J7J	.025	Phelon	.018
6	Comet (Silent Six)	5.9	7.2	4500	1¾"	1½"	Ch. J7J	.025	Phelon	.018
7	Rocket Deluxe	7.5	11	4000	2"	1¾"	Ch. J7J	.025	Phelon	.018
20	Rocket Deluxe	16	19.8	4000	2-7/16"	2-1/8"	Ch. J6J	.025	Scintilla	.018
20H	Hurricane	16	19.8	•	2-7/16"	2-1/8"	Ch. J62R	.025	Phelon	.018
25	Hurricane	18	19.8	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
25E	Hurricane Merc-Electric	18	19.8	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
40H	Thunderbolt	25+	39.6	•	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	.010±.000 .002
55	Thunderbolt	40	39.6	5400	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	.010±.000 .002
55E	Thunderbolt Merc-Electric	40	39.6	5400	2-7/16"	2-1/8"	Ch. J6J	.025	F - Morse	.010±.000 .002

1956

6	Comet (Silent Six)	6	7.2	4500	1¾"	1½"	Ch. J7J	.025	Phelon or Scintilla	.018
20H	Hurricane Hydro	20+	19.8	•	2-7/16"	2-1/8"	Ch. J62R	.025	Phelon	.018
25	Hurricane	20	19.8	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
25E	Hurricane Merc-Electric	20	19.8	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
30	Turbo-Four	30	29.78	5400	2-7/64"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
30E	Turbo-Four Merc-Electric	30	29.78	5400	2-7/64"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
30H	Turbo-Four Hydro	30+	29.78	•	2-7/64"	2-1/8"	Ch. J62R	.025	F - Morse	.010±.000 .002
55	Thunderbolt	40	39.6	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	
55E	Thunderbolt Merc El.	40	39.6	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
55H	Thunderbolt Hydro	40+	39.6	•	2-7/16"	2-1/8"	Ch. J62R	.025	F - Morse	.010±.000 .002

• *Horsepower varies with RPM*

1957

Model	Designation	HP	Cu. In. Displ.	Full Throttle RPM Range	Bore	Stroke	Spark Plug Type	Plug Setting	Ignition Type	Point Setting
6	Comet (Silent Six)	6	7.2	4500	1¾"	1½"	Ch. J7J	.025	Phelon or Scintilla	.018
10	Trol-Twin Rocket	10	18.5	4500	2-11/32"	2-1/8"	Ch. J7J	.025	Phelon	.018
25	Hurricane	20	19.8	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
25E	Hurricane Merc-Electric	20	19.8	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
30	Turbo-Four	30	29.78	5400	2-7/64"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
30E	Turbo-Four Hydro	30	29.78	5400	2-7/64"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
30H	Turbo-Four Hydro	30+	29.78	●	2-7/64"	2-1/8"	Ch. J62R	.025	F - Morse	.010±.000 .002
55	Thunderbolt	40	39.6	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
55E	Thunderbolt Merc-Electric	40	39.6	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
55H	Thunderbolt Hydro	40+	39.6	●	2-7/16"	2-1/8"	Ch. J62R	.025	F - Morse	.010±.000 .002
75E	Marathon "Six"	60	59.4	5400	2-7/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer	90°Dwell*

1958

6	Comet (Silent Six)	6	7.2	4500	1¾"	1½"	J7J	.025	Phelon or Scintilla	.018
10	Trol-Twin Rocket	10	18.5	4500	2-11/32"	2-1/8"	J7J	.025	Phelon	.018
25	Hurricane	20	19.8	5400	2-7/16"	2-1/8"	J6J	.025	Phelon	.018
28	Super Hurricane	22	22	5400	2-9/16"	2-1/8"	J6J	.025	Phelon	.018
30	Turbo-Four	30	29.78	5400	2-7/64"	2-1/8"	J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
30E	Turbo-Four Merc El.	30	29.78	5400	2-7/64"	2-1/8"	J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
30H	Turbo-Four Hydro	30+	29.78	●	2-7/64"	2-1/8"	J62R	.025	F - Morse	.010±.000 .002
55	Thunderbolt	40	39.6	5400	2-7/16"	2-1/8"	J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
55E	Thunderbolt Merc El.	40	39.6	5400	2-7/16"	2-1/8"	J6J	.025	Kiekhaefer or F-Morse	.010±.000 .002
55H	Thunderbolt Hydro	40+	39.6	●	2-7/16"	2-1/8"	J62R	.025	F - Morse	.010±.000 .002
58E	Super Thun. MercEl.	45	44	5400	2-7/16"	2-1/8"	J6J	.025	Kiekhaefer	.010±.000 .002
75E	Marathon "6"	60	59.4	4500	2-9/16"	2-1/8"	J6J	.025	Kiekhaefer	90° Dwell*
78E	Super Marathon "6"	70	66	5400	2-9/16"	2-1/8"	J6J	.025	Kiekhaefer	90° Dwell*

1959

6A	Comet (Silent Six)	6	7.2	4500	1¾"	1½"	J7J	.025"	Phelon	.018"
10A	Trol Twin Rocket	10	18.5	4500	2-11/32"	2-1/8"	J7J	.025"	Phelon	.018"
15A	Rocket	15	18.5	4500	2-11/32"	2-1/8"	J7J	.025"	Phelon	.018"
28A	Super Hurricane	22	22	5400	2-9/16"	2-1/8"	J6J	.025"	Phelon	.018"
35A	Thunderbolt	35	40	5500-5800	2-7/16"	2-1/8"	J6J	.025"	Kiekhaefer	.010±.000 .002
55A	Thunderbolt	40	44	5500-5800	2-9/16"	2-1/8"	J6J	.025"	Kiekhaefer	.010±.000 .002
58A	Super Thunderbolt	45	44	5500-5800	2-9/16"	2-1/8"	J6J	.025"	Kiekhaefer	.010±.000 .002
75A	Marathon "Six"	60	66	5500	2-9/16"	2-1/8"	J6J	.025"	Kiekhaefer	90° Dwell*
78A	Super Marathon "Six"	70	66	5500	2-9/16"	2-1/8"	J6J	.025"	Kiekhaefer	90° Dwell*

● *Horsepower Varies with RPM*

**Use Degree Plate C-91-45510A1*

MERC MODELS

1960

Merc Model	HP	Cu. In. Displ.	Full Throttle RPM Range	Bore	Stroke	Spark Plug Type	Plug Setting	Ignition Type	Point Setting
100	10	18.5	4500	2-11/32"	2-1/8"	Ch. J7J	.025	Phelon	.018
150	15	18 5	4500	2-11/32"	2-1/8"	Ch. J7J	.025	Phelon	.018
200	22	22	5400	2-9/16"	2-1/8"	Ch. J6J	.025	Phelon	.018
300	35	40	5200-5600	2-7/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer	.010±.000/.002▲§
400	45	44	5200-5600	2-9/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer	.010±.000/.002▲§
600	60	66	5100-5500	2-9/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer	90° Dwell*
700 Dir. Rev.	70	66	5100-5500	2-9/16"	2-1/8"	Ch. J6J	.025	Kiekhaefer	90° Dwell*
800 Dir. Rev.		76	4800-5200	2¾"	2-1/8"	Ch. J4J	.025	Kiekhaefer	90° Dwell*

1961

60	6	7.2	5000-5400	1¾"	1½"	Ch J7J	.025	Phelon	.018
100	10	18.5	4500	2-11/32"	2-1/8"	Ch J7J	.025	Phelon	.018
150	15	18.5	4500	2-11/32"	2-1/8"	Ch J7J	.025	Phelon	.018
200	22	22	5400	2-9/16"	2-1/8"	Ch J7J	.025	Phelon	.018
350	40	40	5200-5600	2-7/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	.010±.000/.002▲§
400	45	44	5200-5600	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	.010±.000/.002▲§
500	50	44	5200-5600	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	.010±.000/.002▲§
700 Dir. Rev.	70	66	5100-5500	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	90° Dwell*
700 Gear Shift	70	66	5100-5500	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	90° Dwell*
800 Dir. Rev.	80	76	4800-5200	2¾"	2-1/8"	Ch J4J	.025	Kiekhaefer	90° Dwell*
800 Gear Shift	80	76	4800-5200	2¾"	2-1/8"	Ch J4J	.025	Kiekhaefer	90° Dwell*

1962

60	6	7.2	5000-5400	1¾"	1½"	Ch J7J	.025	Phelon	.018
110	9.8	11	5000-5400	2"	1¾"	Ch J7J	.025	Phelon	.018
250	25	22	5000-5400	2-9/16"	2-1/8"	Ch J6J	.025	Phelon	.018
450	45	44	5200-5600	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	.010±.000/.002▲§
500 Jet Prop	50	44	5200-5600	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	.010±.000/.002▲§
700 Gear Shift	70	66	5100-5500	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	90° Dwell*
850 (76 Cu. In.)	85	76	4800-5200	2¾"	2-1/8"	Ch J4J	.025	Kiekhaefer	90° Dwell*
1000	100	90	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	90° Dwell*

1963

60	6	7.2	5000-5400	1¾"	1½"	Ch J7J	.025	Phelon	.018
110	9.8	11	5000-5400	2"	1¾"	Ch J7J	.025	Phelon	.018
200 Gear Shift	20	22	5000-5400	2-9/16"	2-1/8"	Ch J6J	.025	Phelon	.018
350 (2 cyl)	35	30	4800-5200	2-7/8"	2.3"	Ch J6J	.025	Phelon	.020
500 (Jet Prop)	50	44	5200-5600	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	.010±.000/.002▲§
650	65	60	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	.010±.000/.002▲§
850 (90 Cu. In.)	85	90	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	90° Dwell*
1000	100	90	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	90° Dwell*

* *Use Degree Plate C-91-45510A1* § *Use Degree Plate C-91-31484A2* ▲ *Or 48° Dwell*

1964

Model	HP	Cu. In. Displ.	Full Throttle RPM Range	Bore	Stroke	Spark Plug Type	Plug Setting	Ignition Type	Point Setting
39	3.9	5.5	5000-5400	2"	1¾"	Ch J8J	.025	Phelon	.020
60	6	7.2	5000-5400	1¾"	1½"	Ch J7J	.025	Phelon	.020 ■
110	9.8	11	5000-5400	2"	1¾"	Ch J7J	.025	Phelon	.020 ■
200 Gear Shift	20	22	5000-5400	2-9/16"	2-1/8"	Ch J6J	.025	Phelon	.020 ■
350	35	30	4800-5200	2-7/8"	2.3"	Ch J6J	.025	Phelon	.020 ■
500 Jet Prop	50	44	5200-5600	2-9/16"	2-1/8"	Ch J6J	.025	Kiekhaefer	.010±.000 .002▲§
650	65	60	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	.010± .000 .002▲§
850 (90 Cu. In.)	85	90	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	90° Dwell*
1000	100	90	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	90° Dwell*

1965

39	3.9	5.5	5000-5400	2"	1¾"	Ch J8J	.025	Phelon	.020
60	6	7.2	5000-5400	1¾"	1½"	Ch J7J	.025	Phelon	.020 ■
110	9.8	11	5000-5400	2"	1¾"	Ch J7J	.025	Phelon	.020 ■
200 Gear Shift	20	22	5000-5400	2-9/16"	2-1/8"	Ch J6J	.025	Phelon	.020 ■
350	35	30	4800-5200	2-7/8"	2.3"	Ch J6J	.025	Phelon	.020 ■
500 Jet Prop	50	44	5200-5600	2-9/16"	2-1/8"	Ch J4J	.025	Kiekhaefer	.010±.000 .002▲§
650	65	60	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	.010±.000 .002▲§
900	90	90	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	90° Dwell*
1000	100	90	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	90° Dwell*

1966

39	3.9	5.5	5000-5400	2"	1¾"	Ch J8J	.025	Phelon	.020
60	6	7.2	5000-5400	1¾"	1½"	Ch J7J	.025	Phelon	.020 ■
110	9.8	11	5000-5400	2"	1¾"	Ch J7J	.025	Phelon	.020 ■
200 Gear Shift	20	22	5000-5400	2-9/16"	2-1/8"	Ch J6J	.025	Phelon	.020 ■
350	35	32.5	4800-5200	3"	2.3"	Ch J6J	.025	Phelon	.020 ■
500 Jet Prop	50	44	5200-5600	2-9/16"	2-1/8"	Ch J4J	.025	Kiekhaefer	.010±.000 .002▲§
650	65	60	4800-5200	2-7/8"	2.3"	Ch J4J	.025	Kiekhaefer	.010±.000 .002▲§
950	95	90	4800-5200	2-7/8"	2.3"	Ch L4J	.030	Kiekhaefer	45° Dwell*
950SS	95	90	4800-5200	2-7/8"	2.3"	Ch L19V	None	Kiekhaefer	90° Dwell*
1100	110	93.5	4800-5200	2-15/16"	2.3"	Ch L4J	.030	Kiekhaefer	90° Dwell*
1100SS	110	93.5	4800-5200	2-15/16"	2.3"	Ch L19V	None	Kiekhaefer	45° Dwell*

1967

39	3.9	5.5	5000-5400	2"	1¾"	Ch L9J	.030	Phelon	.020
60	6	7.2	5000-5400	1¾"	1½"	Ch L7J	.030	Phelon	.020 ■
110	9.8	11	5000-5400	2"	1¾"	Ch L4J	.030	Phelon	.020 ■
200	20	22	5000-5400	2-9/16"	2-1/8"	Ch L4J	.030	Phelon	.020 ■
350	35	32.5	4800-5300	3"	2.3"	Ch L4J	.030	Phelon	.020 ■
500M	50	44	5200-5600	2-9/16"	2-1/8"	Ch L4J	.030	Kiekhaefer	.010±.000 .002▲§
500S	50	44	5200-5600	2-9/16"	2-1/8"	Ch L4J	.030	Kiekhaefer	.010±.000 .002▲§
500SS	50	44	5200-5600	2-9/16"	2-1/8"	Ch L19V	None	Kiekhaefer	None
650S	65	62.4	4800-5200	2-15/16"	2.3"	Ch L4J	.030	Kiekhaefer	.010±.000 .002▲§
650SS	65	62.4	4800-5200	2-15/16"	2.3"	Ch L19V	None	Kiekhaefer	None
950SS	95	90	4800-5200	2-7/8"	2.3"	Ch L19V	None	Kiekhaefer	None
1100SS	110	93.5	4800-5200	2-15/16"	2.3"	Ch L19V	None	Kiekhaefer	None

§ *Use Degree Plate C-91-3148A2* ▲ *Or 48° Dwell* ■ *Degree Plate C-91-36454A1* * *Degree Plate C-91-45510A1*

1968

Model	HP	Cu. In. Displ.	Full Throttle RPM Range	Bore	Stroke	Spark Plug Type	Plug Setting	Ignition Type	Point Setting
39	3.9	5.5	5000-5400	2"	1¾"	Ch L9J	.030	Phelon	.020
60	6	7.2	5000-5400	1¾"	1½"	Ch L7J	.030	Phelon	.020■
110	9.8	11	5000-5400	2"	1¾"	Ch L4J	.030	Phelon	.020■
200	20	22	5000-5400	2-9/16"	2-1/8"	Ch L4J	.030	Phelon	.020■
350	35	32.5	4800-5300	3"	2.3	Ch L4J	.030	Phelon	.020■
500SS	50	44	5200-5500	2-9/16"	2-1/8"	Ch L19V △	None	Thunderbolt	None
650SS	65	62.4	4800-5300	2-15/16"	2.3	Ch L19V △	None	Thunderbolt	None
1000SS	100	90	4800-5300	2-7/8"	2.3	Ch L19V △	None	Thunderbolt	None
1250SS	125	99.81	4800-5300	2-7/8"	2-9/16"	Ch L19V △	None	Thunderbolt	None
1000BP	100	90	6200-6500	2-7/8"	2.3	Ch L19V △	None	Thunderbolt	None
1250BP	125	99.81	5000-5600	2-7/8"	2-9/16"	Ch L19V △	None	Thunderbolt	None

1969

40	4	5.5	4500-5500	2"	1¾"	Ch L9J	.030	Phelon	.020
75	7.5	11	4500-5500	2"	1¾"	Ch L7J	.030	Phelon	.020■
110	9.8	11	5000-5400	2"	1¾"	Ch L4J	.030	Phelon	.020■
200	20	22	5000-5400	2-9/16"	1¾"	Ch L4J	.030	Phelon	.020■
350	35	32.5	4800-5300	3"	2.3"	Ch L4J	.030	Phelon	.020■
500SS	50	44	5200-5500	2-9/16"	2-1/8"	Ch L19V △	None	Thunderbolt	None
650SS	65	62.4	4800-5300	2-15/16"	2.3	Ch L19V △	None	Thunderbolt	None
800	80	66.6	4800-5300	2-7/8"	2-9/16"	Ch L19V △	None	Thunderbolt	None
1000SS	100	90	4800-5300	2-7/8"	2.3	Ch L19V △	None	Thunderbolt	None
1250SS	125	99.81	4800-5300	2-7/8"	2-9/16"	Ch L19V △	None	Thunderbolt	None
1000 Super BP	100	99.81	6200-6500	2-7/8"	2.3	Ch L19V △	None	Thunderbolt	None
1250 Super BP	125	99.81	5000-5600	2-7/8"	2-9/16"	Ch L19V △	None	Thunderbolt	None

1970

40	4	5.5	4500-5500	2"	1¾"	AC-V40FFK		Thunderbolt	.020
75	7.5	10.9	4500-5500	2"	1¾"	AC-V40FFK		Thunderbolt	.020
110	9.8	16.7	4500-5500	2"	1¾"	AC-V40FFK		Thunderbolt	.020
200	20	21.9	4800-5500	2-9/16"	2-1/8"	AC-V40FFK		Thunderbolt	.020
400 (2 Cyl.)	40	33.3	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None
500	50	43.8	4800-5500	2-9/16"	2-1/8"	AC-V40FFM		Thunderbolt	None
650	65	62.42	4800-5300	2-15/16"	2.3	AC-V40FFM		Thunderbolt	None
800	80	66.6	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None
1150	115	99.81	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None
1350	135	99.81	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None

1971

40	4	5.5	4500-5500	2"	1¾"	AC-V40FFK		Thunderbolt	.020
75	7.5	10.9	4500-5500	2"	1¾"	AC-V40FFK		Thunderbolt	.020
110	9.8	16.7	4500-5500	2"	1¾"	AC-V40FFK		Thunderbolt	.020
200	20	21.9	4800-5500	2-9/16"	2-1/8"	AC-V40FFK		Thunderbolt	.020
400 (2 Cyl.)	40	33.3	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None
500	50	43.8	4800-5500	2-9/16"	2-1/8"	AC-V40FFM		Thunderbolt	None
650	65	62.42	4800-5300	2-15/16"	2.3	AC-V40FFM		Thunderbolt	None
800	80	66.6	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None
1150	115	99.81	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None
1350	135	99.81	4800-5300	2-7/8"	2-9/16"	AC-V40FFM		Thunderbolt	None

△ *Or AC-V40FFM*

■ *Use Degree Plate C-91-36454A1*

1972

Model	HP	Cu. In. Displacement	Full Throttle RPM Range	Bore	Stroke	Spark Plug	Spark Plug Setting	Ignition Type	Point Setting
40	4	5.5 (90cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	2 or 3			.020" (.51mm)
75	7.5	10.9 (179cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	2 or 3		Thunderbolt	.020" (.51mm)
110	9.8	10.9 (179cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	2 or 3		Phase-Maker	.020" (.51mm)
200	20	21.9 (359cc)	4800-5500	2-9/16" (65mm)	2-1/8" (54mm)	2 or 3			.020" (.51mm)
402	40	33.3 (546cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3	Perma Gap	↑	↑
500	50	43.8 (718cc)	4800-5500	2-9/16" (65mm)	2-1/8" (54mm)	1 or 3			
650 (3-Cyl.)	65	49.8 (816cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		Thunderbolt	None
800	80	66.6 (1091cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		Breakerless	
1150	115	99.8 (1635cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3			
1400	140	99.8 (1635cc)	4800-5800	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		↓	↓

1973

40	4	5.5 (90cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	2 or 3			.020" (.51mm)
75	7.5	10.9 (179cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	2 or 3		Thunderbolt	.020" (.51mm)
110	9.8	10.9 (179cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	2 or 3		Phase-Maker	.020" (.51mm)
200	20	21.9 (359cc)	4800-5500	2-9/16" (65mm)	2-1/8" (54mm)	2 or 3			
402	40	33.3 (546cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3	Perma	↑	↑
500	50	43.8 (718cc)	4800-5500	2-9/16" (65mm)	2-1/8" (54mm)	1 or 3	Gap		
650 (3-Cyl.)	65	49.8 (816cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		Thunderbolt	None
850 (4-Cyl.)	85	66.6 (1091cc)	4800-5500	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		Breakerless	
1150	115	99.8 (1635cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3			
1500	150	99.8 (1635cc)	4800-5800	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		↓	↓

1974

40	4	5.5 (90cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	2 or 3		TB Ph-Maker	.020" (.51mm)
75	7.5	10.9 (179cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	1 or 3		↑	↑
110	9.8	10.9 (179cc)	4500-5500	2" (51mm)	1-3/4" (44mm)	1 or 3			
200	20	21.9 (359cc)	4800-5500	2-9/16" (65mm)	2-1/8" (54mm)	2 or 3			
402	40	33.3 (546cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3	Perma		
500	50	43.8 (718cc)	4800-5500	2-9/16" (65mm)	2-1/8" (54mm)	1 or 3	Gap		
650 (3-Cyl.)	65	49.8 (816cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		Thunderbolt	
850 (4-Cyl.)	85	66.6 (1091cc)	4800-5500	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		Breakerless	None
1150	115	99.8 (1635cc)	4800-5300	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3			
1500	150	99.8 (1635cc)	4800-5800	2-7/8" (73mm)	2-9/16" (65mm)	1 or 3		↓	↓

1 - AC-V40FFM or Champion L-77V *2 - AC-V40FFK or Champion L-78V*

3 - AC-VR40FF Radio Noise Interference

STANDARD CYLINDER BLOCK FINISH HONE DIAMETER

Models	Piston Dia. (Above Rings)	Cyl. Block Finish Hone	0.015 Oversize Finish Hone
Merc 1500-1150 (1973-74)	2.863	2.875	2.890
Merc 1400-1350-1250-1250BP-1150	2.857	2.875	2.890
Merc 1000BP (1969)	2.861	2.875	2.890
Merc 1000 (1968-69) 1000BP (1968)	2.857	2.875	2.890
Merc 1100-650 (1967)	2.920	2.938	2.953
Merc 1100	2.920	2.938	2.953
Merc 1000-950-900-850 (90 Cu. In.)	2.857	2.875	2.890
Merc 950 (1967)	2.857	2.875	2.890
Merc 850 (1973-74)	2.863	2.875	2.890
Merc 800 (1969-70-71-72)	2.857	2.875	2.890
Merc 850-800-800 (Gear Shift)	2.736	2.751	2.766
Merc 700-600 & Mark 78-78A-75A	2.551	2.565	2.580
Merc 650 (3-Cyl.)	2.863	2.872	2.887
Merc 650 (1968-69-70-71)	2.920	2.938	2.953
Merc 650	2.857	2.875	2.890
Mark 75	2.428	2.442	2.457
Merc 500 (1968-thru-73)	2.551	2.565	2.580
Merc 500-450-400 & Mark 58-58A-55A	2.551	2.565	2.580
Merc 402 (1973-74)	2.863	2.875	2.890

Models	Piston Dia. (Above Rings)	Cyl. Block Finish Hone	0.015 Oversize Finish Hone
Merc 402 (1971-72)	2.859	2.875	2.890
Merc 400 (1970-71)	2.857	2.875	2.890
Merc 350 (1968-69)	2.986	3.000	3.015
Merc 350 (32.5 Cu. In.)	2.986	3.000	3.015
Merc 350 (30 Cu. In.)	2.857	2.872	2.887
Merc 350-300 & Mark 55-55H-35-35A	2.428	2.442	2.457
Merc 200 (1973-74)	2.553	2.566	2.581
Merc 200 (1968-thru-72)	2.551	2.565	2.580
Merc 200 (Gear Shift)	2.551	2.563	2.578
Merc 250-200 & Mark 28-28A	2.551	2.563	2.578
Merc 150-100 & Mark 15A-10-10A	2.335	2.347	2.362
Merc 110-75-40-39	1.990	2.000	2.015
Merc 60-60J	1.750	1.753	1.768
Mark 30-30H	2.100	2.113	2.128
Mark 25	2.428	2.441	2.456
Mark 20	2.428	2.441	2.456
Mark 20H	2.428	2.441	2.456
Mark 15	2.100	2.112	2.127
Mark 7	1.997	2.000	2.015
Mark 6-6A	1.750	1.753	1.768

GEAR RATIOS

Models	Propeller	Pinion	Gear Ratio
Speedmaster	14	14	1:1
Sportmaster	21	14	1.5:1
Merc 1500-1400-1250-1150 (1973 and Newer) 1100-1000 (1968-69) 950	28	14	2:1
Merc 1350-1150 (Up to 1972)	25	14	1.78:1
Merc 1000-900-850-800 (GS)-700 (GS)-650 (4-Cyl.)	28	14	2:1
Merc 800 (DR)-700 (DR)-600 (DR)	28	14	2:1
Merc 850 (1973)-800 (1969-72)-650 (1970-71)	30	13	2.3:1
Merc 650 (3-Cyl.)-500-450-400-350-300	23	14	1.64:1
Merc 500 (1970-73)-400 (1970-71)-402	26	13	2:1
Merc 350 (2-Cyl.)	24	13	1.85:1
Merc 250-200 (Auto-Transmission)	24	13	1.85:1
Merc 200 (1973)	24	14	1.71:1
Merc 200 (GS) Forward	24	13	1.85:1
Merc 200 (GS) Reverse	28	13	2.15:1
Merc 150-100	23	14	1.64:1
Merc 110-75-60 (Forward)	26	13	2:1
Merc 110-75-60 (Reverse)	30	13	2.3:1
Merc 40-39 (Forward)	26	13	2:1
Merc 40-39 (Reverse)	30	13	2.3:1

DR = Direct Reversing *GS = Gear Shift Model*

CARBURETOR JET SIZE

Engine Model	JET SIZES FOR ELEVATIONS						
	Up to 4000'	4000-7000'	7000-10000'	Up to 2500'	2500-5000'	5000-7500'	7500-10000'
Merc 1500★ - 1400 *	.080"	.078"	.076"				
Merc 1350	.078"	.076"	.074"				
Merc 1250SS	.082"	.080"	.0785"				
Merc 1150 (1973)	.072"	.070"	.068"				
Merc 1150	.066"	.064"	.062"				
Merc 1100SS-1100	.065"	.063"	.061"				
Merc 1000SS (1968)	.059"	.057"	.055"				
Merc 950	.051"	.049"	.047"				
Merc 950SS-900	.049"	.047"	.045"				
Merc 850 (1974)	.076"	.074"	.072"				
Merc 850 (1973)	.080"	.078"	.076"				
Merc 800 (4-Cyl.)	.074"	.072"	.070"				
Merc 650 (3-Cyl.)	.074"	.072"	.070"				
Merc 650	.061"	.059"	.057"				
Merc 500 (1966●-68 thru 74)	.063"	.061"	.059"				
Merc 500 (1967)	.065"	.063"	.061"				
Merc 500 (1966▲)	.057"	.055"	.053"				
Merc 402-400 (2-Cyl.)	.078"	.076"	.074"				
Merc 350-200 (1967-68)	.063"	.061"	.059"				
Merc 350 (2-Cyl.)	.069"	.067"	.065"				
Merc 200 (1973)	.057"	.055"	.053"				
Merc 200 (Thunderbolt)	.059"	.057"	.055"				
Merc 200 (Gear Shift)	.061"	.059"	.057"				
Merc 110 (1974)				.041"	.039"	.037"	.035"
Merc 110 (Thunderbolt)				.047"	.045"	.043"	.043"
Merc 110				.049"	.047"	.045"	.043"
Merc 75 (1974)				.034"	.033"	.031"	.031"
Merc 75 (Thunderbolt)				.035"	.033"	.031"	.031"
Merc 60	.045"	.043"	.041"				
Merc 40 (Thunderbolt)				.036"	.034"	.032"	.032"
Merc 39 (1967-68)	.036"	.034"	.032"				
Merc 39	.043"	.041"	.039"				

NOTE: Jet size recommendations are intended as a guide (like a propeller chart). Try size larger or smaller if in doubt.

No change in spark advance is recommended for elevation operation. Propellers of lower pitch should be used at high elevations to allow proper engine RPM.

● *Serial No. 2010163 and up*

▲ *Serial No. 2010162 and below*

* *Some Merc 1400 may have .084" or .082" as standard jet.*

★ *Some Merc 1500 may have .080" or .082" as standard jet.*

REED STOP OPENINGS

Engine Model	Reed Stop Opening
Merc 1500	5/32"
Merc 1400	5/32"
Merc 1350	5/32"
Merc 1250SS	5/32"
Merc 1150 (1973-74)	5/32"
Merc 1150	5/64"
Merc 1100SS-1100	3/16"
Merc 1000SS (1968)	3/16"
Merc 950	5/32"
Merc 950SS-900	5/32"
Merc 850 (1973-74)	5/32"
Merc 800 (4-Cyl.)	5/32"

Engine Model	Reed Stop Opening
Merc 650 (3-Cyl.)	11/64"
Merc 650	3/16"
Merc 500	5/32"
Merc 402	5/32"
Merc 400 (2-Cyl.)	5/32"
Merc 350-200 (1967-68)	5/32"
Merc 350 (2-Cyl.)	3/16"
Merc 200	3/16"
Merc 110	5/32"
Merc 75 (T-Bolt)	3/32"
Merc 60	7/64"
Merc 39-40	Not Applicable

TORQUE SPECIFICATIONS-1966-thru-1972
(1 and 2-CYL. MODELS)

MERC MODEL	350 (2-Cyl.)	250	200 GS	200-150-100	110-75	60	60-J	40-39
CONNECTING ROD NUTS	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	80 In. Lbs. 180 In. Lbs.	180 In. Lbs.	180 In. Lbs.
FLYWHEEL TO CRANKSHAFT	65 Ft. Lbs.	65 Ft. Lbs.	65 Ft. Lbs.	65 Ft. Lbs.	35 Ft. Lbs.	35 Ft. Lbs.	35 Ft. Lbs.	35 Ft. Lbs.
TRANSFER PORT COVER SCREWS	60 In. Lbs.	60 In. Lbs.	60 In. Lbs.	60 In. Lbs.	45 In. Lbs.	45 In. Lbs.	65 In. Lbs.	45 In. Lbs.
WATER PUMP (PLASTIC)	●	N/A	★	N/A	●	●	N/A	●
CLUTCH TORQUE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SPARK PLUGS	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.
CENTERMAIN BEARING LOCK SCREW (3)	3/8-24 Thread 150 In. Lbs.	■ ✸	3/8-24 Thread 150 In. Lbs.	3/8-16 Thread 120 In. Lbs.	40-45 In. Lbs.	30-35 In. Lbs.	30-35 In. Lbs.	N.A.
CENTERMAIN BEARING REED STOP SCREW	35-40 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.	20-25 In. Lbs.	20-25 In. Lbs.	20-25 In. Lbs.	10 In. Lbs.
EXHAUST INNER WATER JACKET COVER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EXHAUST OUTER COVER	150 In. Lbs. (5/16-18) 1966 & Up	80 In. Lbs.	150 In. Lbs.	150 In. Lbs.	70 In. Lbs.	70 In. Lbs.	70 In. Lbs.	70 In. Lbs.
CYLINDER BLOCK COVER	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 90 In. Lbs.	Bolt & Nut 70 In. Lbs.	☆ ✸	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	☆ ✸
CRANKCASE TO CYLINDER BLOCK	5/16" Bolt & Nut 150 In. Lbs.	185 In.Lbs.	185 In.Lbs. 5/16-24	185 In.Lbs.	90 In. Lbs. 1/4-28	90 In. Lbs.	90 In. Lbs.	90 In. Lbs. 1/4-28
GEAR HOUSING TO DRIVE SHAFT HOUSING	65 Ft. Lbs.	3/8" 55 Ft. Lbs. 5/16" 30 Ft. Lbs.			5/16" 30 Ft. Lbs 3/8" 55 Ft. Lbs	3/8" 55 Ft. Lbs. 5/16" 30 Ft. Lbs.		5/16" 30 Ft. Lbs 3/8" 55 Ft. Lbs.
STARTER MOTOR TO CRANKCASE	125 In. Lbs.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
POWERHEAD TO DRIVE SHAFT HOUSING NUTS	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	80 In. Lbs.	80 In. Lbs.	80 In. Lbs.	80 In. Lbs.
BOTTOM BEARING RETAINER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
UPPER & LOWER END CAPS	150 In.Lbs.	150 In.Lbs.	150 In.Lbs	150 In.Lbs.	40 In. Lbs.	40 In. Lbs.	40 In. Lbs.	40 In. Lbs.
DISTRIBUTOR SHAFT NUT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) No grease between discs; start with steel disc and alternate.
(2) Merc 110-75 is 40-45 in. lbs; Merc 60 is 30-35 in. lbs.

METRIC EQUIVALENTS: 1 In. Lb. = 1.15kg-cm; 1 Ft. Lb. = .14mkg; 1" = 25.4mm.

■ *3/8-16 Thread 120 In. Lbs.*
✸ *3/8-24 Thread 150 In. Lbs.*
● *Nuts - 1/4-28 Thread 30 In. Lbs.*
★ *Nuts - 5/16-24 Thread 40 In. Lbs.*
☆ *Bolt and Nut 70 In. Lbs.*
✸ *1/4" Bolt and Nut 90 In. Lbs.*

TORQUE SPECIFICATIONS (1973-74) 1 and 2-CYL. MODELS

MERC MODEL	402	200	110	75	40
CONNECTING ROD NUTS	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.
FLYWHEEL TO CRANKSHAFT	65 Ft. Lbs.	35 Ft. Lbs.	35 Ft. Lbs.	35 Ft. Lbs.	35 Ft. Lbs.
TRANSFER PORT COVER SCREWS	60 In. Lbs.	60 In. Lbs.	45 In. Lbs.	45 In. Lbs.	25 In. Lbs.
WATER PUMP (PLASTIC)	★ ●	40 In. Lbs.	30 In. Lbs.	30 In. Lbs.	30 In. Lbs.
THERMOSTAT COVER SCREWS	160 In. Lbs.	N/A	N/A	N/A	N/A
SPARK PLUGS	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.
CENTERMAIN BEARING LOCK SCREW (3)	■ □	■ □	45 In. Lbs.	45 In. Lbs.	N/A
CENTERMAIN BEARING REED STOP SCREW	25 In. Lbs.	40 In. Lbs.	24 In. Lbs.	24 In. Lbs.	10 In. Lbs.
EXHAUST INNER WATER JACKET COVER	N/A	N/A	N/A	N/A	N/A
EXHAUST OUTER COVER	200 In. Lbs.	88 In. Lbs.	88 In. Lbs.	88 In. Lbs.	88 In. Lbs.
CYLINDER BLOCK COVER	70 In. Lbs.	99 In. Lbs.	99 In. Lbs.	99 In. Lbs.	99 In. Lbs.
CRANKCASE TO CYLINDER BLOCK	200 In. Lbs.	130 In. Lbs.	99 In. Lbs.	99 In. Lbs.	99 In. Lbs.
GEAR HOUSING TO DRIVE SHAFT HOUSING	3/8-55 Ft. Lbs. 7/16-65 Ft. Lbs.	5/16-33 Ft. Lbs. 3/8-55 Ft. Lbs.	5/16-33 Ft. Lbs. 3/8-55 Ft. Lbs.	5/16-33 Ft. Lbs. 3/8-55 Ft. Lbs.	5/16-33 Ft. Lbs. 3/8-55 Ft. Lbs.
STARTER MOTOR TO CRANKCASE	100 In. Lbs.	N/A	N/A	N/A	N/A
BOTTOM BEARING RETAINER	100 In. Lbs.				
UPPER & LOWER END CAPS	150 In. Lbs.	150 In. Lbs.	40 In. Lbs.	40 In. Lbs.	40 In. Lbs.
DISTRIBUTOR SHAFT NUT	N/A	N/A	N/A	N/A	N/A
BEARING CARRIER NUT	110 Ft. Lbs.	100 Ft. Lbs.	60 Ft. Lbs.	60 Ft. Lbs.	60 Ft. Lbs.
PINION NUT	70 Ft. Lbs.	117 In. Lbs.	88 In. Lbs.	88 In. Lbs.	88 In. Lbs.
POWERHEAD TO DRIVE SHAFT HOUSING	180 In. Lbs.	80 In. Lbs.	80 In. Lbs.	80 In. Lbs.	80 In. Lbs.
EXHAUST EXT. PLATE TO CYL., BLOCK NUTS	N/A	N/A	N/A	N/A	N/A
EXH. EXT. PLATE TO DRIVE SHAFT HOUSING	100 In. Lbs.	N/A	N/A	N/A	N/A

METRIC EQUIVALENTS: 1 In. Lb. = 1.15kg-cm; 1Ft.Lb. = .14 mkg; 1" = 25.4mm

■ *3/8" x 16 Thread 120 In. Lbs.* ★ *5/16" Nuts 40 In. Lbs.*

□ *3/8" x 24 Thread 150 In. Lbs.* ● *1/4" Nuts 30 In. Lbs.*

TORQUE SPECIFICATIONS-1966-thru-1972
(2, 3 and 4-CYL. MODELS)

MERC MODEL	800 (4-Cyl.)	650 (4-Cyl.)	650 (3-Cyl.)	500-450-402-400 350-300	400 (1970-71) (2-Cyl.)
CONNECTING ROD NUTS	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.
FLYWHEEL TO CRANKSHAFT	85 Ft. Lbs.	65 Ft. Lbs.	85 In. Lbs.	65 Ft. Lbs.	65 Ft. Lbs.
TRANSFER PORT COVER SCREWS	60 In. Lbs.	60 In. Lbs.	160 In. Lbs.	60 In. Lbs.	60 In. Lbs.
WATER PUMP (PLASTIC)	● ★ O	● ★ O	● ★	● ★	● ★
THERMOSTAT COVER SCREWS	N/A	N/A	160 In. Lbs.	N/A	N/A
SPARK PLUGS	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.
CENTERMAIN BEARING LOCK SCREW	150 In. Lbs.	3/8-24 Thread 150 In. Lbs.	N/A	■ ✱	150 In. Lbs.
CENTERMAIN BEARING REED STOP SCREW	25 In. Lbs.	35-40 In. Lbs.	30 In. Lbs.	35-40 In. Lbs.	20-25 In. Lbs.
EXHAUST INNER WATER JACKET COVER	150 In. Lbs.	N/A	N/A	N/A	N/A
EXHAUST OUTER COVER	150 In. Lbs.	150 In. Lbs. (5/16-18) 1966 & Up	200 In. Lbs.	150 In. Lbs. (5/16-18) 1966 & Up	150 In. Lbs.
CYLINDER BLOCK COVER	70 In. Lbs.	Bolt & Nut 70 In. Lbs.	70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.
CRANKCASE TO CYLINDER BLOCK	150 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	200 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	5/16" Bolt &Nut 200-220 In. Lbs.
GEAR HOUSING TO DRIVE SHAFT HOUSING	3/8" 55 Ft. Lbs. 7/16" 65 Ft. Lbs.				
STARTER MOTOR TO CRANKCASE	125 In. Lbs.	125 In. Lbs.	125 In. Lbs.	85 In. Lbs.	85 In. Lbs.
BOTTOM BEARING RETAINER	N/A	N/A	N/A	N/A	100 In. Lbs.
UPPER & LOWER END CAPS	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.
DISTRIBUTOR SHAFT NUT	70 In. Lbs.	N/A	70 In. Lbs.	N/A	65-75 In. Lbs.
BEARING CARRIER NUT	150 Ft. Lbs.	150 Ft. Lbs.	110 Ft. Lbs.	110 Ft. Lbs.	110 Ft. Lbs.
PINION NUT	70 Ft. Lbs.	70 Ft. Lbs.	70 Ft. Lbs.	70 Ft. Lbs.	70 Ft. Lbs.
POWERHEAD TO DRIVE SHAFT HOUSING	35-40 Ft. Lbs.	350 In. Lbs. 30 Ft. Lbs.	180 In. Lbs.	Nut 180 In. Lbs.	Nut 180 In. Lbs.
EXHAUST EXT. PLATE TO CYL. BLOCK NUTS	180 In. Lbs.	250 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.
EXHAUST EXT. PLATE TO DRIVE SHAFT HOUSING	N/A	75 In. Lbs.	N/A	N/A	N/A

METRIC EQUIVALENTS: 1 In. Lb. = 1.15kg-cm; 1 Ft. Lb. = .14mkg; 1" = 25.4mm.

● *Nuts - 1/4-28 Thread 30 In. Lbs.* ★ *Nuts - 5/16-24 Thread 40 In. Lbs.* O *Bolts - 1/4-20 Thread 20 In. Lbs.*

✱ 3/8-24 Thread 150 In. Lbs. ■3/8-16 Thread 120 In. Lbs. *(3) Merc 650 (1970 and Newer)*

TORQUE SPECIFICATIONS (1973-74) 3 and 4-CYL. MODELS

MERC MODEL	800	650	500		
CONNECTING ROD NUTS	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.		
FLYWHEEL TO CRANKSHAFT	100 Ft. Lbs.	85 Ft. Lbs.	65 Ft. Lbs.		
TRANSFER PORT COVER SCREWS	70 In. Lbs.	60 In. Lbs	60 In. Lbs.		
WATER PUMP (PLASTIC)	●○★				
THERMOSTAT COVER SCREWS	N/A	160 In. Lbs.	N/A		
SPARK PLUGS	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.		
CENTERMAIN BEARING LOCK SCREW (3)	150 In. Lbs.	N/A	150 In. Lbs.		
CENTERMAIN BEARING REED STOP SCREW	25 In. Lbs.	32 In. Lbs.	32 In. Lbs.		
EXHAUST INNER WATER JACKET COVER	150 In. Lbs.	N/A	N/A		
EXHAUST OUTER COVER	200 In. Lbs.	200 In. Lbs.	200 In. Lbs.		
CYLINDER BLOCK COVER	70 In. Lbs.	70 In. Lbs.	70 In. Lbs.		
CRANKCASE TO CYLINDER BLOCK	200 In. Lbs.	200 In. Lbs.	200 In. Lbs.		
GEAR HOUSING TO DRIVE SHAFT HOUSING	3/8" 55 Ft. Lbs. 7/16" 65 Ft. Lbs.				
STARTER MOTOR TO CRANKCASE	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.		
BOTTOM BEARING RETAINER	N/A	N/A	N/A		
UPPER & LOWER END CAPS	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.		
DISTRIBUTOR SHAFT NUT	70 In. Lbs.	70 In. Lbs.	N/A		
BEARING CARRIER NUT	150 Ft. Lbs.	110 Ft. Lbs.	110 Ft. Lbs.		
PINION NUT	70 Ft. Lbs.	70 Ft. Lbs.	70 Ft. Lbs.		
POWERHEAD TO DRIVE SHAFT HOUSING	30 Ft. Lbs.	180 In. Lbs.	180 In. Lbs.		
EXHAUST EXT. PLATE TO CYL. (Front Nuts)	20 In. Lbs.	180 In. Lbs.	180 In. Lbs.		
EXHAUST EXT. PLATE TO DRIVE SHAFT HOUSING	5/16" Nut 17 Ft. Lbs. 5/16" Screw 35 Ft. Lbs.	250 In. Lbs.	75 In. Lbs.		

METRIC EQUIVALENTS: 1 In. Lb. = 1.15kg-cm; 1 Ft. Lb. = .14mkg; 1" = 25.4mm.

● *1/4" Nuts 30 In. Lbs.*

★ *5/16" Nuts 40 In. Lbs.*

○ *1/4" Bolts 20 In. Lbs.*

TORQUE SPECIFICATIONS-1966-thru-1972 (6-CYL. MODELS)

MERC MODEL	1400 1350-1150	1250 1000 (1968-69)	1250 BP Super BP	1100-1000	1000 BP	950-900-850 (90 Cu. In.)	850-800 GS-800 DR	700 GS 700 & 600 DR
CONNECTING ROD NUTS	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.	180 In. Lbs.
FLYWHEEL TO CRANKSHAFT	100 Ft. Lbs.	100 Ft. Lbs.	100 Ft. Lbs.	85 Ft. Lbs.	85 Ft. Lbs.	85 Ft. Lbs.	85 Ft. Lbs.	65 Ft. Lbs.
WATER PUMP COVER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WATER PUMP (PLASTIC)	● ★ ○	● ★ ○	N/A	● ★ ○	N/A	N/A	N/A	N/A
CLUTCH TORQUE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SPARK PLUGS	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.	17 Ft. Lbs.
CENTERMAIN BEARING LOCK SCREW	3/8-24 Thread 150 In. Lbs.	3/8-24 Thread 150 In. Lbs.	3/8-24 Thread 150 In. Lbs.	3/8-24 Thread 150 In. Lbs.	3/8-24 Thread 150 In. Lbs.	■ ✱	■ ✱	■ ✱
CENTERMAIN BEARING REED STOP SCREW	20-25 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.	35-40 In. Lbs.
EXHAUST INNER WATER JACKET COVER	150 In. Lbs. (5/16-18)	150 In. Lbs. (5/16-18)	150 In. Lbs. (5/16-18)	N/A	N/A	N/A	N/A	
EXHAUST OUTER COVER	200 In. Lbs.	150 In. Lbs. (5/16-18) 1966 & Up	150 In. Lbs. (5/16-18) 1966 & Up	150 In. Lbs. (5/16-18) 1966 & Up	150 In. Lbs. (5/16-18) 1966 & Up	150 In. Lbs. (5/16-18) 1966 & Up	80 In. Lbs.	80 In. Lbs.
CYLINDER BLOCK COVER	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.	Bolt & Nut 70 In. Lbs.
CRANKCASE TO CYLINDER BLOCK	5/16" Bolt & Nut 200 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.	5/16" Bolt & Nut 150 In. Lbs.
GEAR HOUSING TO DRIVE SHAFT HOUSING	← 3/8" 55 Ft. Lbs. 7/16" 65 Ft. Lbs. →							
STARTER MOTOR TO CRANKCASE	125 In. Lbs.	125 In. Lbs.	125 In. Lbs.	125 In. Lbs.	125 In. Lbs.	125 In. Lbs.	85 In. Lbs.	85 In. Lbs.
POWERHEAD TO DRIVE SHAFT HOUSING	30 Ft. Lbs.	350 In. Lbs.	350 In. Lbs.	350 In. Lbs.	350 In. Lbs.	350 In. Lbs.	350 In. Lbs. 30 Ft. Lbs.	350 In. Lbs.
BOTTOM BEARING RETRIVER	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
UPPER & LOWER END CAPS	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.	150 In. Lbs.
DISTRIBUTOR SHAFT NUT	65 to 75 In. Lbs.	N/A	N/A	N/A	N/A	N/A	N/A	N/A

METRIC EQUIVALENTS: 1 In. Lb. = 1.15kg-cm; 1 Ft. Lb. = .14mkg; 1" = 25.4mm.

● *Nuts - 1/4-28 Thread 30 In. Lbs.*
★ *Nuts - 5/16-24 Thread 40 In. Lbs.*
■ *3/8-16 Thread 120 In. Lbs.*
✱ *3/8-24 Thread 150 In. Lbs.*
○ *Bolts - 1/4-20 Thread 20 In. Lbs..*

TORQUE SPECIFICATIONS (1973-74) 6-CYL. MODELS

MERC MODEL	1500	1150			
CONNECTING ROD NUTS	180 In. Lbs.	180 In. Lbs.			
FLYWHEEL TO CRANKSHAFT	100 Ft. Lbs.	100 Ft. Lbs.			
TRANSFER PORT COVER SCREWS	70 In. Lbs.	70 In. Lbs.			
WATER PUMP (PLASTIC)	●★○	●★○			
THERMOSTAT COVER SCREWS	N/A	N/A			
SPARK PLUGS	17 Ft. Lbs.	17 Ft. Lbs.			
CENTERMAIN BEARING LOCK SCREW	150 In. Lbs.	150 In. Lbs.			
CENTERMAIN BEARING REED STOP SCREW	25 In. Lbs.	25 In. Lbs.			
EXHAUST INNER WATER JACKET COVER	150 In. Lbs.	150 In. Lbs.			
EXHAUST OUTER COVER	200 In. Lbs.	200 In. Lbs.			
CYLINDER BLOCK COVER	70 In. Lbs.	70 In. Lbs.			
CRANKCASE TO CYLINDER BLOCK	200 In. Lbs.	200 In. Lbs.			
GEAR HOUSING TO DRIVE SHAFT HOUSING	3/8" 55 Ft. Lbs. 7/16" 65 Ft. Lbs.				
STARTER MOTOR TO CRANKCASE	150 In. Lbs.	150 In. Lbs.			
REMOTE FUEL PUMP	25 In. Lbs.	25 In. Lbs.			
UPPER & LOWER END CAPS	150 In. Lbs.	150 In. Lbs.			
DISTRIBUTOR SHAFT NUT	70 In. Lbs.	70 In. Lbs.			
BEARING CARRIER NUT	150 Ft. Lbs.	150 Ft. Lbs.			
PINION NUT	70 Ft. Lbs.	70 Ft. Lbs.			
POWERHEAD TO DRIVE SHAFT HOUSING	30 Ft. Lbs.	30 Ft. Lbs.			
EXHAUST EXT. PLATE TO CYL.	20 Ft. Lbs.	20 Ft. Lbs.			
EXH. EXT. PLATE TO DRIVE SHAFT HOUSING	5/16" Nut 17 Ft. Lbs. 5/16" Screw 35-40 Ft. Lbs.				

METRIC EQUIVALENTS: 1 In. Lb. = 1.15kg-cm; 1 Ft. Lb. = .14mkg; 1" = 25.4mm.

● *1/4" Nuts 30 In. Lbs.*
★ *5/16" Nuts 40 In. Lbs.*
○ *1/4" Screws 20 In. Lbs.*

STARTER SOLENOIDS

Mercury Part. No.	Engine Application	Scale Reading (x1 Scale)	Ampere Reading
A-25661	*Refer to Parts List for Engine Application*	2.1 to 2.7	4.0 to 6.0 amp.
A-32082		2.1 to 2.7	4.0 to 6.0 amp.
A-32445		2.1 to 2.7	4.0 to 6.0 amp.
A-87-61053		2.0 to 3.0	4.0 to 5.0 amp.

CHOKE SOLENOIDS

Mercury Part No.	Engine Application	Scale Reading (x1 Scale)
A-37585	*Refer to Parts List for Engine Application*	0.52 to 0.63
A-45068		0.52 to 0.63
A-48187		0.52 to 0.63
A-54293A4		0.67 to 0.79
A-54293A5		0.67 to 0.79
A-60549A3		0.67 to 0.79

IGNITION SPECIFICATIONS (Conventional and Magneto)

COIL TEST DATA

Mercury Part No.	Manufacturer	Mfg. No.	Max. Amps.	Secondary Continuity		Primary Resist. (Ohms)	
				Min.	Max.	Min.	Max.
A-30-204	Scintilla	10-38222Y	2.3		60		
A-399-125	Scintilla	10-70132	2.1		50		
A-399-756	Scintilla	10-70100	2.1		50		
A-398-716	Phelon	F-608	2.5	42	65		
A-398-173	Phelon	F-1835	2.5	42	65		
A-398-2201	Phelon	FG-6446	2.0	45	60	.45	.60
A-398-2545	Phelon	FG-7168	2.0	35	50	.50	.65
A-398-2568	Phelon	FG-7202	1.8	40	60	.50	.65
A-397-361	Fair.-Morse	H-2477	2	40	60		
A-397-361	Fair.-Morse	T-2477	2	40	60		
A-397-361	Fair.-Morse	E-2477C	2	40	60		
A-397-430	Fair.-Morse	QY-2477C	2	45	60		
A-396-648	Eiseman	27894	1.60	40	60		
A-395-679	Wico	X-2156	1.90	40	60		
A-394-1128A1	Kiekhaefer	A-394-1128	1.80*	55	65		
A-26433	Delco-Remy	1115106	0.9	55	65	.9	1.2
A-32193	Auto-Lite	200673	1.1	60	70	1.1	1.5

* *Off Plate*

CONDENSER TEST DATA

Mercury Part No.	Manufacturer	Mfgr. No.	Mfd. Cap.
A-399-759	Scintilla	10-70141	.17-.21
A-399-123	Scintilla	10-82238	.17-.21
A-398-713	Phelon	FG-607	.15-.19
A-398-176	Phelon	FG-1807	.22-.27
A-398-693	Phelon	FG-1770	.14-.18
A-398-2203	Phelon	FG-6453	.14-.20
A-396-650	Eiseman	24235	.19-.23
A-395-684	Wico	X-2186	.16-.20
A-397-741	Fairbanks-Morse	"S"-2433	.28-.32
A-397-359	Fairbanks-Morse	M-2433	.18-.22
A-397-874	Fairbanks-Morse	KX-2433	.28-.35
A-394-1130	Kiekheafer		.28-.35
A-393-1283	Delco-Remy		.18-.23

IGNITION COIL BALLAST and RESISTOR TEST DATA

MERC-O-TRONIC 6-VOLT TESTER §

Part No.	Min.	Max.
A-393-1286	2.6	3.5
A-393-1482	3.4	3.6
A-393-1572	3.8	4.0

MERC-O-TRONIC DIRECT OHM SCALE READINGS

Part No.	Min.	Max.
A-393-1286	1.3	1.7
A-393-1482	2.0	2.4
A-393-1572	3.0	3.4
A-32227	.41	.52

§ *Conversion scale - not direct ohm readings*

LUBRICANT and SEALER APPLICATION CHART

Lubrication Point	Merc Model								
	39-40	60-75	110	200	350	400	402	500	650 (4-Cyl.)
Gear Housing	A	A	A	A	A	A	A	A	A
Drive Shaft Splines	C	C	C	C	C	C	C	C	C
Shift Shaft Coupling	B	B	B	B	B	B	B	B	B
Distributor Pilot Grease Fitting	-	-	-	-	-	-	-	C	C
Magneto Bushing	C	C	C	C	C	-	-	-	-
Swivel Pin Grease Fitting	C	C	C	C	C	C	C	C	C
Tilt to Swivel Bracket	D	D	D	D	D	D	D	D	D
Tilt Tube Inside Diameter (ID)	D	D	D	D	D	D	D	D	D
Propeller Shaft Splines	M	M	M	M	M	M	M	M	M
Reverse Lock Cams	-	-	-	C	C	-	-	-	-
Thumb Screws	D	D	D	D	D	D	D	D	D
Tilt Stop Levers	B	B	B	B	B	B	B	-	-
Reverse Lock Latch in Swivel Bracket	E	E	E	-	-	-	-	-	-
Throttle Linkage*	D	D	D	D	D	D	D	D	D
Throttle Cluster	-	-	-	-	D	D	D	D	D
Shift Linkage*	D	D	D	D	D	D	D	D	D
Tiller Handle Knuckle Pivot	D	D	D	D	-	-	-	-	-
Tiller Handle Knuckle Gears	D	D	D	D	-	-	-	-	-
Tiller Handle Universal Joint	D	D	D	D	-	-	-	-	-
Tiller Handle Knuckle Detent	D	D	D	D	-	-	-	-	-
Choke Shutter Stud	D	D	D	D	D	D	D	D	D
Choke Shaft in Bottom Cowl	-	-	-	D	C	D	D	-	-
Starter Sheave Pawls	C	C	C	C	C	C	C	C	-
Choke Grommets	-	-	-	-	-	-	-	F	F
Choke Solenoid Plunger Hole	-	-	-	-	-	F	F	F	F
Cylinder Bores	-	-	-	-	-	E	E	E	E
Piston Rod and Crank Needles	C	C	C	C	C	C	C	C	C
Centermain Needles	-	-	-	-	-	C	-	C	C
Top Cowl Mounts	B	B	B	-	-	-	-	B	B
Piston Rings	E	E	E	E	E	E	E	E	E
Bearing Carrier Spool - Gear Housing	M	M	M	M	M	M	M	M	M
Water Pump Base and Housing	A	A	A	A	A	A	A	A	C
Shift Shaft Threaded Bushing - Gear Housing	C	C	C	C	C	C	C	C	C
End Caps - Crankshaft	E	E	E	E	E	E	E	E	E
Impeller Pin and Drive Shaft	C	C	C	C	C	C	C	C	C
Screws - Exhaust Cover	D	D	D	D	D	D	D	D	D
Oil Seals (Outside Diameter) to Spool	-	-	-	-	H	H	H	H	H
Oil Seals (OD) to Threaded Shift Shaft Bushing	-	-	-	-	H	H	H	H	H
Oil Seals (OD) to Water Pump Base	-	-	-	-	-	H	H	H	H
Crankcase to Block Split Line	J	J	J	J	J	J	J	J	J
Pinion Nut	-	-	-	-	-	-	-	-	H
Apply to Inner Water Jacket Cover Screws	-	-	-	-	-	-	-	-	-
Distributor Rotor to Crankshaft	-	-	-	-	-	K	-	-	-
Starter Interlock Slide	-	-	-	-	-	D	D	D	-
High Tension Leads @ Distributor Tower	-	-	-	-	-	L	L	-	-
Anti-Reversing Wire	-	-	-	-	-	F	-	-	-
Spool Retaining Nut	M	M	M	M	M	M	M	M	M
Drive Shaft Needle Bearing Bore	C	C	C	C	C	C	C	C	C
Spark Plug Covers	F	F	F	F	F	F	F	F	F

** Includes all pivot points and sliding surfaces, unless stated elsewhere.*

A - Super-Duty Quicksilver Gear Lubricant (C-92-52650 or C-92-68617)
B - Anti-Corrosion Grease (C-92-45134 or C-92-63290)
C - Multipurpose Quicksilver Lubricant (C-92-49588 or C-92-63250)
D - Anti-Corrosion Oil (C-92-39928 or C-92-63281)
E - Formula 50 Quicksilver 2-Cycle Motor Oil (C-92-39450 or C-92-65183)
F - DC-4 Compound (C-92-24108)
G - Exhaust Tube Sealer (C-92-33749)
H - Loctite "A" (C-92-32609)
J - Gasket Sealer (C-92-28804)
K - Loctite Primer Grade "T" (C-92-59327) and Compound Grade "HV" (C-92-36088)
L - Bendix Sealing Compound #47
M - Perfect Seal (C-92-34227)

LUBRICANT and SEALER APPLICATION CHART

Lubrication Point	Merc Model								
	650 3-Cyl.	800	850	1000	1150	1250	1350	1400	1500
Gear Housing	A	A	A	A	A	A	A	A	A
Drive Shaft Splines	C	C	C	C	C	C	C	C	C
Shift Shaft Coupling	B	B	B	B	B	B	B	B	B
Distributor Pilot Grease Fitting	C	C	C	C	C	C	C	C	C
Magneto Bushing	-	-	-	-	-	-	-	-	-
Swivel Pin Grease Fitting	C	C	C	C	C	C	C	C	C
Tilt to Swivel Bracket	D	D	D	D	D	D	D	D	D
Tilt Tube Inside Diameter (ID)	D	D	D	D	D	D	D	D	D
Propeller Shaft Splines	M	M	M	M	M	M	M	M	M
Reverse Lock Cams	-	-	-	-	-	-	-	-	-
Thumb Screws	D	D	D	D	D	D	D	D	D
Tilt Stop Levers	-	-	-	-	-	-	-	-	-
Reverse Lock Latch in Swivel Bracket	-	-	-	-	-	-	-	-	-
Throttle Linkage*§	D	D	D	D	D	D	D	D	D
Throttle Cluster	D	D	D	D	D	D	D	D	D
Shift Linkage*	D	D	D	D	D	D	D	D	D
Tiller Handle Knuckle Pivot	-	-	-	-	-	-	-	-	-
Tiller Handle Knuckle Gears	-	-	-	-	-	-	-	-	-
Tiller Handle Universal Joint	-	-	-	-	-	-	-	-	-
Tiller Handle Knuckle Detent	-	-	-	-	-	-	-	-	-
Choke Shutter Stud	D	D	D	D	D	D	D	D	D
Choke Shaft in Bottom Cowl	C	C	C	C	C	C	C	C	C
Starter Sheave Pawls	-	-	-	-	-	-	-	-	-
Choke Grommets	-	F	F	F	F	F	F	F	F
Choke Solenoid Plunger Hole	F	F	F	F	F	F	F	F	F
Cylinder Bores	E	E	E	E	E	E	E	E	E
Piston Rod and Crank Needles	C	C	C	C	C	C	C	C	C
Centermain Needles	C	C	C	C	C	C	C	C	C
Top Cowl Mounts	_	B	B	B	B	B	B	B	B
Piston Rings	E	E	E	E	E	E	E	E	E
Bearing Carrier Spool - Gear Housing	M	M	M	M	M	M	M	M	M
Water Pump Base and Housing	C	C	C	C	C	C	C	C	C
Shift Shaft Threaded Bushing - Gear Housing	C	C	C	C	C	C	C	C	C
End Caps - Crankshaft	E	E	E	E	E	E	E	E	E
Impeller Pin and Drive Shaft	C	C	C	C	C	C	C	C	C
Screws - Exhaust Cover	D	D	D	D	D	D	D	D	D
Oil Seals (Outside Diameter) to Spool	H	H	H	H	H	H	H	H	H
Oil Seals (OD) to Threaded Shift Shaft Bushing	H	H	H	H	H	H	H	H	H
Oil Seals (OD) to Water Pump Base	H	H	H	H	H	H	H	H	H
Crankcase to Block Split Line	-	-	J	J	J	-	-	J	J
Pinion Nut	-	H	H	H	H	H	H	H	H
Apply to Inner Water Jacket Cover Screws		G		G	G	G	G	G	G
Distributor Rotor to Crankshaft	-	-	-	-	-	-	-	-	-
Starter Interlock Slide	-	-	-	-	-	-	-	-	-
High Tension Leads @ Distributor Tower	L	L	L	L	L	L	L	L	L
Anti-Reversing Wire	-	-	-	-	-	-	-	-	-
Spool Retaining Nut	M	M	M	M	M	M	M	M	M
Drive Shaft Needle Bearing Bore	C	C	C	C	C	C	C	C	C
Spark Plug Covers	F	F	F	F	F	F	F	F	F

** Includes all pivot points and sliding surfaces, unless stated elsewhere.*

§ Merc 1500-1400-1150-850 do not lubricate contact surface between throttle actuator collar finger and plastic on carburetor cluster.

A - Super-Duty Quicksilver Gear Lubricant (C-92-52650 or C-92-68617)
B - Anti-Corrosion Grease (C-92-45134 or C-92-63290)
C - Multipurpose Quicksilver Lubricant (C-92-49588 or C-92-63250)
D - Anti-Corrosion Oil (C-92-39928 or C-92-63281)
E - Formula 50 Quicksilver 2-Cycle Motor Oil (C-92-39450 or C-92-65183)
F - DC-4 Compound (C-92-24108)
G - Exhaust Tube Sealer (C-92-33749)
H - Loctite "A" (C-92-32609)
J - Gasket Sealer (C-92-28804)
K - Loctite Primer Grade "T" (C-92-59327) and Compound Grade "HV" (C-92-36088)
L - Bendix Sealing Compound #47
M - Perfect Seal (C-92-34227)

CAPACITY of LUBRICANT in GEAR HOUSING

Models	Capacity
Merc 1500-1400-1350-1250-1150-1100-1000-950-900-850-850 (4-Cyl.)-800-700-650	17 Fl. Oz.
Merc 650 (3-Cyl.)-500-450-402-400-350-300	9 Fl. Oz.
Merc 250	7½Fl. Oz.
Merc 200	6 Fl. Oz.
Merc 110-75-60-40-39	3 Fl. Oz.
Metric conversion: 1 U.S. fl. oz. = .03 liter	

OUTBOARD LUBRICANT and MAINTENANCE CHART

(Non-Commercial Use)

Locations ▲	Every 30 Days	Every 60 Days	Once in Season	Twice in Season
Check Lubricant Level in Lower Drive Unit	A★			
Lubricate Propeller Shaft Splines	K - Each Prop Installation			
Lubricate Swivel Pin	§	D		
Lubricate Magneto/Distributor Adaptor*			D	§
Lubricate Ride-Guide Steering Tube	§	D		
Lubricate Ride-Guide Steering Cable	§	D		
Lubricate Ride-Guide Steering Pivot/Ball Joint	§	E		
Lubricate Throttle/Shift Linkage*	§	E		
Lubricate Thumb Screws	§	E		
Lubricate Upper Shift Shaft	§	E		
Lubricate Reverse Lock Lever*	§	E		
Lubricate Reverse Locking Cams	§	C		
Lubricate Tilt Stop Lever	§	E		
Lubricate Starter Motor Pinion Gear		§	J	
Lubricate Tiller Handle Knuckle Pivot/Gears *	§	E		
Lubricate Stator Plate Clamps			E	§
Check Lubricant Level in Power Trim Pump		1		
Check Condition of Battery/Terminals				●
Inspect Spark Plug Leads/ All Electrical Connections			●	
Clean Fuel Filter(s)			●	
Clean Fuel Tank Filter			●	
Inspect All Fuel Lines/Connections				●
Check Entire Unit/Loose, Damaged or Missing Parts			●	
Check Condition of Spark Plugs♦			●	
Inspect Breaker Points♦			●	
Inspect and Clean Entire Unit/Touch-Up Paint		§	L-M	§
Inspect or Replace Water Pump Impeller			●	

▲- *Complete list of maintenance is not applicable to all models.*

★- *For all 6-cylinder engines, Merc 500 and all 1962 and newer models (except Merc 250). All other (older) models use "Special Outboard Gear Lubricant" (C-92-29409, C-92-59949 or C-92-63200). Lubricate after 1st 10 days, then each 30 days.*

♦- *Does not apply to "Thunderbolt Ignition" when performance indicates service is required.*

§- *Units operated in salt water.*

*- *Includes all pivot points and sliding surfaces, unless stated elsewhere.*

A - Super-Duty Quicksilver Gear Lubricant (C-92-52650 or C-92-68617)
C - Anti-Corrosion Grease (C-92-45134 or C-92-63290)
D - Multipurpose Quicksilver Lubricant (C-92-49588 or C-92-63250)
E - Anti-Corrosion Oil (C-92-39928 or C-92-63281)
L - Quicksilver Marine Cleaner (C-92-32172 or C-92-63265)
M - Quicksilver Spray Paint
I - Quicksilver Formula 4 Oil (C-92-33157) or SAE 20-20W Specification SE
J - SAE 10 Oil
K - Perfect Seal (C-92-34227)

VOA and MULTI-METER TEST

THUNDERBOLT IGNITION COMPONENTS

Listed herein are resistance readings in OHMS of the various coils used in Mercury C-D Ignition Systems. For switch box and trigger assembly readings, refer to NOTE 1.

NOTE 1

Because of the difference in sensitivity between C-91-52751 and C-91-62562 VOA meters, readings on switch boxes or electric trigger assemblies are not included. The reading (through a semi-conductor device) is proportional to the current through it. The RXI scale normally is used, and this presents the greatest drain on the battery used in that meter. Some meters have 1½V, some 3 or 6 volt batteries; therefore, a different reading will be seen across the same diode, for example. Also, condition of battery will vary the reading. Very limited information can be gained from readings of these switch boxes and trigger assemblies, even for a competent technician.

The best way to test switch boxes and electric trigger assemblies is with the Thunderbolt Ignition Analyzer (C-91-62563A1).

NOTE 2

The primary DC resistance of these coils generally is less than one (1) OHM. If a reading resembling a short (complete circuit) is obtained, this would be proper. Copper wire is an excellent conductor, but will have a noticeable difference in resistance from cold to hot temperatures. Reasonable variations from these specified readings are acceptable.

NOTE 3

One reading from the case ground to the ground lead is given on each of the electric triggers, except A-337-4406A2. This reading should be a shorted condition. If this reading is not obtained, the trigger assembly is faulty and will not work. The analyzer test, when performed on a trigger of this condition, will show the trigger to be good, because the leads only to perform the test are used, and not case ground.

NOTE 4

Here are readings for meter C-91-62562. Similar readings from meter C-91-52751 should apply. You are looking for either a shorted condition or an open condition. Note No. 1 applies here. Capacitor should be checked by conventional means.

DC resistance measurements should be the same regardless which instrument is used. The only differences are discussed in Note No. 1.

NOTE 5

"Continuity" is any indicator needle movement.

THUNDERBOLT IGNITION STATOR CHECKS

Merc Model and Year	Stator Part No.	Ohm Scale	Tester Leads to --	See Note	Scale Reading
40 (1970-71) *	A-336-3962A4	X1000	Positive Lead to Green Stator Lead, Negative Lead to Ground		No Cont.
			Negative Lead to Green Stator Lead, Positive Lead to Ground		20-50
40 (1972-74)	A-336-4470A1	X100	(High Speed) Between Yellow and Blue Coil Leads		6 to 8
	A-336-4469A1	X1000	(Low Speed) Between Yellow and Red Coil Leads		5.3 to 6.1
75-110 (1970-71) *	A-336-3996A7	X1000	Positive Lead to Green Stator Lead, Negative Lead to Salmon Stator Lead		No Cont.
			Positive Lead to Salmon Stator Lead, Negative Lead to Green Stator Lead		20-50
			Positive Lead to Green Stator Lead, Negative Lead to Ground		No Cont.
			Positive Lead to Salmon Stator Lead, Negative Lead to Ground		No Cont.
75-110 (1972-73)	A-336-4468A1	X10	(High Speed) Between Yellow and Blue Coil Leads		18.5 to 20.5
	A-336-4467A1	X1000	(Low Speed) Between Yellow and Red Coil Leads		3.95 to 4.30
75-110 (1974 and Newer)	A-339-5312A1	X100	Between Yellow and White Coil Leads		7.5 to 9.5
	A-339-5313A1	X100	Between Yellow and White Coil Leads		7.5 to 9.5
200 (1970-71) *	A-336-3996A7	X1000	Positive Lead to Green Stator Lead, Negative Lead to Salmon Stator Lead		No Cont.
			Positive Lead to Salmon Stator Lead, Negative Lead to Green Stator Lead		20-50
			Positive Lead to Green Stator Lead, Negative Lead to Ground		No Cont.
			Positive Lead to Salmon Stator Lead, Negative Lead to Ground		No Cont.
200 (1972)	A-336-4468A1	X10	(High Speed) Between Yellow and Blue Coil Leads		18.5 to 20.5
	A-336-4467A1	X1000	(Low Speed) Between Yellow and Red Coil Leads		3.9 to 4.3
200 (1973-74)	A-338-4992A1	X10	Between Red and Blue		18.5 to 20.5
	A-338-4991A1	X1000	Between White and Blue		6-7
400 (1970-71)	A-398-4423 (Man.)	X1000	Between Blue and Ground		21-25
	A-398-4424 (Elec.)	X10	Between White and Ground		11.5 to 13
402 (1972 and Newer)	A-398-4799 (Man.)	X100	Between Red and Blue		50 to 64
	A-398-4770 (Elec.)	X1	Between Red and Ground		45 to 60
500 (1968 and Newer) §	A-333-3175	X10	(Low Speed) Between Red and White if Mounted (Red and Green If Unmounted)		38 to 43
	A-333-3176	X1	(Low Speed) Between Blue and White if Mounted (Blue and Green if Unmounted)		9 to 11
	Both	X1000	Between Ground and White, Red and Blue Leads (Alternately)		None

* *Disconnect Green and Salmon Stator Leads (Merc 40 Has No Salmon Lead).*

§ *Not Necessary to Disassemble Ignition Driver. Leads Must Be Disconnected from Switch Box.*

THUNDERBOLT IGNITION COIL CHECKS

(Disconnect Coil "Pos" and "Neg" and Coil Secondary Wire [Wire to Spark Plug or Distributor] Prior to Testing.)

Merc Model and Year	Coil Part No.	Test	Ohm's Scale	Tester Leads to --	Note P.8-21	Scale Reading
40 (1970 and 71)	A-336-4409A1 Rust Color or Brown	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.3 to .35
		Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower		5 to 6
40 (1972-73-74)	A-336-4528A1 Green Color	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.01 to .02
		Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower		5 to 6
75-110-200 (1970-71)	A-336-4409A1 Rust Color or Brown	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.3 to .35
		Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower		5 to 6
75-110 (1972-73)	A-336-4528A1 Green Color	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.3 to .35
		Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower		5 to 6
75-110-200 (1974)	A-339-5288A1	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.02 to .04
		Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower		9 to 12
200 (1973)	A-338-4995A1	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.02 to .04
		Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower		9 to 11
400 (1970-71)	A-332-4075A1	Primary	Rx1000	"Pos" (Green Wire) and Ground		0
		Secondary	Rx1000	Ground and Coil Tower		24 to 30
	A-336-4592A2	Primary	Rx1	"Pos" (Green Wire) and Ground	(2)	.01 to .015
		Secondary	Rx1000	Ground and Coil Tower		9 to 10.5
402 (1972-73-74)	A-338-4774A1	Primary	Rx1	"Pos" and "Neg" Terminal	(2)	.02 to .04
		Secondary	Rx1000	Ground (or Pigtail if Not Mounted) and Coil Tower		9 to 11
500 (1968 and Newer)	A-332-2983A20	Primary	Rx1000	"Pos" and "Neg" Lead Wires		0
		Secondary	Rx1000	Either Primary Lead Wire and Coil Tower		28 to 34
650 (1968-69-70)	A-332-2983A3	Primary	Rx1000	"Pos" and "Neg" Lead Wires		0
		Secondary	Rx1000	Either Primary Lead Wire and Coil Tower		28 to 34
650 (3-Cyl.) (1972-73-74)	A-336-4592A1 2-7/8" High	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.01 to .02
		Secondary	Rx1000	Ground (or Pigtail if Not Mounted) and Coil Tower		9 to 10.5
	A-332-4895A1 3-3/8" High	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.01 to .02
		Secondary	Rx10	Ground (or Pigtail if Not Mounted) and Coil Tower		57 to 73
800 (1971-72)	A-337-4456A1 Small Blue Coil	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.01 to .03
		Secondary	Rx10	Ground (or Pigtail if Not Mounted) and Coil Tower		54 to 60
850 (1973)	A-332-2983A19	Primary	Rx1	"Pos" and "Neg" Lead Wires	(2)	.01 to .02
		Secondary	Rx1000	Either Primary Lead and Ground		28 to 34
850 (1974)	A-332-4895A1	Primary	Rx1	"Pos" and "Neg" Terminals	(2)	.01 to .02
		Secondary	Rx10	Ground (or Pigtail if Not Mounted) and Coil Tower		57 to 73
1150-1350-1400-1500 (1971-72-73-74)	A-332-2983A5	Primary	Rx1	"Pos" and "Neg" Lead Wires		0
		Secondary	Rx1000	Either Primary Lead and Coil Tower		28 to 34

THUNDERBOLT TRIGGER TESTS

(Disconnect Trigger Leads Prior to Testing.)

Merc Model (Any Year)	Trigger Part No.	Test	Ohm's Scale	Tester Leads to --	Note P.8-21	Scale Reading
40 (1970-71)	Mechanical			See Note Below		
40 (1972-74)	Mechanical			See Note Below		
75-110-200 (1970-71)	Mechanical			See Note Below		
75-110 (1972-73)	Mechanical			See Note Below		
75-110 (1974)	A-338-5286A1		Rx10	To Each Brown Trigger Lead		10.8 to 16
200 (1973-74)	A-338-4996A1		Rx100	To Each Trigger Lead		8 to 10
400 (1970-71)	A-332-4315A1		Rx1	To Each Trigger Lead		27-41
	A-332-4608A2			Unable to Test with Ohm Meter		
402 (1972 and Newer)	A-338-4731A1		Rx100	Between White and Brown Trigger Leads		7 to 10
500 (1968 and Newer)				N/A - No Test		
650 (3-Cyl.) (1972 and Newer)	A-332-4797A3		Rx1	Black Lead and Trigger Housing (Ground)	3	Cont.
800 (1971-72)	A-337-4408A2 with Blue Coil			Unable to Test with Ohm Meter	3	
	A-332-4177A3		Rx1	White Trigger Lead and Case Ground	3	Cont.
850 (1973 and Newer)	A-332-4177A3		Rx1	White Trigger Lead and Case Ground	3	Cont.
1150-1350-1400-1500 (1971 and Newer)	A-393-3736A23		Rx1	Black Trigger Lead and Case Ground	3	Cont.

NOTE: SB71-2 Maker Points (with Some Time on Them) Normally Will Show Discoloration. This Is Not A Reason for Replacement. Points, That Show "O" Resistance across Contacts, Are Satisfactory. Maker Points, Which Show Slight Resistance, May Affect Idle Operation. Points with High Resistance May Cause Malfunction of Ignition System and Subsequent Loss of Spark. Check That Points Open (Movement to Left) and Close (Movement to Right) as Flywheel Is Rotated.

CAPACITOR and MODULE TEST
Merc 40-thru-200 Models (1970 and Newer)

Merc Model and Year	Capacitor/Module Part No.	Test Meter*	Scale	Test Leads to --	Scale Reading
40 (70-71)				Part of Stator (See Stator Checks)	
40 (72-74)	A-336-4516A2	1 or 2	X1000	Red to Red Terminal and Black to Capacitor Terminal	Cont.
				Black to Red Terminal and Red to Capacitor Terminal	No Cont.
				Red to Blue Terminal and Black to Capacitor Terminal	Cont.
				Black to Blue Terminal and Red to Capacitor Terminal	No Cont.
	A-336-4463	3	4	Black Lead to Ground and Red to Green Cap. Lead	.45-.55
			5	Black Lead to Ground and Red to Green Cap. Lead	Left Side
75-110 (1970-71)				Part of Stator (See Stator Checks)	
75-110 (1972-73)	A-336-4516A2	1 or 2	X1000	Red to Red Terminal and Black to Capacitor Terminal	Cont.
				Black to Red Terminal and Red to Capacitor Terminal	No Cont.
				Red to Blue Terminal and Black to Capacitor Terminal	Cont.
				Black to Blue Terminal and Red to Capacitor Terminal	No Cont.
	A-336-4516A2	3	4	Black Lead to Ground and Red to Green Lead	.45 to .55
			5	Black Lead to Ground and Red to Green Lead	
75-110 (1974)		2		Use Thunderbolt Ignition Analyzer Only	
200 (70-71)				Part of Stator (See Stator Check)	
200 (1972)	A-336-4515A2	1 or 2	X1000	Red to Red Terminal and Black to Capacitor Terminal	Cont.
			X1000	Black to Red Terminal and Red to Capacitor Terminal	No Cont.
			X1000	Red to Blue Terminal and Black to Capacitor Terminal	Cont.
			X1000	Black to Blue Terminal and Red to Capacitor Terminal	No Cont.
	A-336-4516A3	3	4	Black to Ground and Red to Green Capacitor Lead	.45 to .35
			5	Black to Ground and Red to Green Capacitor Lead	
200 (1973-74)		2		Use Thunderbolt Analyzer Only	

* *TEST METERS:*

1. *VOA Meter (C-91-52751), Black Case* §
2. *Thunderbolt Ignition Analyzer Meter (C-91-62563A1), Red Case* §
3. *Merc-O-Tronic Ignition Analyzer (C-91-25213)* §

§ *Zero Meter before Using.*

STARTER MOTOR AMPERES DRAW

Merc Model	Starter Motor Part No.	No Load Amp. Draw *	Normal Amp. Draw *
1500	A-50-57465A1	55	200
1400	A-50-57465A1	55	200
1350	A-50-57465A1	55	200
1250	A-50-48643A1	55	200-225
1150	A-50-64975 A-50-57465A1	55	200
1100	A-50-37274A1	55	175-225
1000SS	A-50-45822A1	50-65	175-225
1000	A-50-37274A1 A-50-31976	50-65	175-225
950	A-50-37274A1	50-65	175-225
900	A-50-37274A1	50-65	175-225
850 (4-Cyl.)	A-50-67341	35	175
800 (4-Cyl.)	A-50-58788	55	185
650 (3-Cyl.)	A-50-65436 A-50-60315	35 55	130 140
650 (4-Cyl.)	A-50-58788 A-50-57867A1 A-50-45822A1 A-50-37274A1	45-55	160
500	A-50-55601 A-50-38890A1 A-50-37345A1	45-55	160
402	A-50-55601	40	150
400	A-50-55601	40	150
350	A-50-38890A1 A-50-37345A1 A-50-30829	45-55	115-125
200	A-50-47216	25	100

**With a Good 70 Amp. Hr. Battery and a Minimum Specific Gravity of 1.260 at 80° F.*

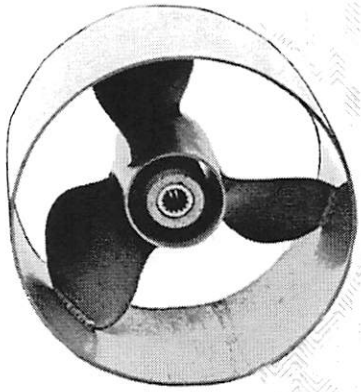
ALTERNATOR STATOR SPECIFICATIONS

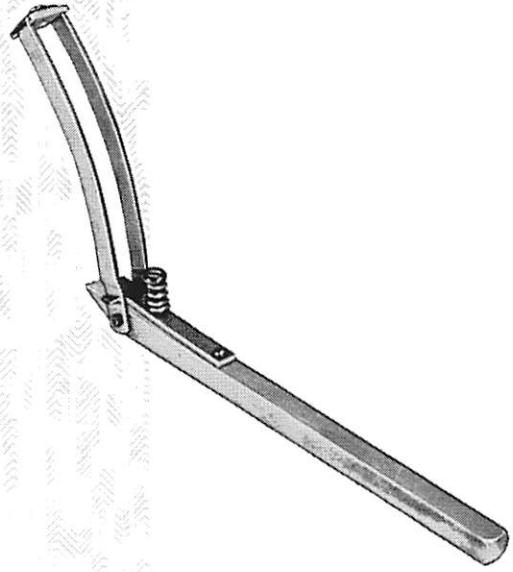
Merc Model	Year	Alernator Part No.	OHM Value Rx1 Scale Average (1)	Gross Amperes Output at Rectifier*	Net Amperes Output at Battery*
400	1970-71	A-398-4424	3	6 to 8	5 to 7
402	1972-73	A-398-4470	1	6 to 9	5 to 8
	1974-Newer	A-398-5255	1	6 to 9	5 to 8
500	1966	A-398-2171	.4	6 to 8	5 to 7
	1967-Newer	A-398-2996	.4	6 to 9	5 to 8
650	1966	A-398-2171	.4	6 to 8	5 to 7
	1967-68	A-398-2997	.4	6 to 8	4 to 7
	1969	A-398-3687	.3	6 to 8	5 to 7
	1970-71	A-398-3618	.4	6 to 8	5 to 7
	1972-Newer	A-398-4634	1.3	6 to 8	5 to 7
800	1969-72	A-398-4792	.3	6 to 9	5 to 8
850	1973	A-398-4792	.3	6 to 9	5 to 8
	1974-Newer	A-398-5232	.3	8 to 10	7 to 9
950	1966-67	A-398-2188	.4	12 to 13	10 to 11
1000	1968-69	A-398-3587	.3	12 to 13	10 to 11
1100	1966-67	A-398-2188	.3	12 to 13	10 to 11
1150	1970-Newer	A-398-4793	.3	12 to 13	10 to 12
1250	1968	A-398-3301	.3	12 to 13	10 to 12
1350	1970-71	A-398-3587	.3	12 to 13	10 to 12
1400	1972	A-398-4793	.3	12 to 13	10 to 12
1500	1973-Newer	A-398-4795	.3	12 to 14	10 to 13

** At Wide-Open Throttle with Somewhat Discharged Battery.*

(1) Primary DC Resistance of These Windings Generally Is Less Than One (1) Ohm. If a Reading, Resembling a Short, Is Obtained, This Would Be Proper. Copper Wire Is an Excellent Conductor, but Will Have Noticeable Differences from Cold to Hot. Reasonable Variations from Specified Readings are Acceptable.

OUTBOARD
SECTION 9





TOOLS

TABLE of CONTENTS

SECTION 9 - TOOLS

MERCURY
OUTBOARDS

INDEX

SPECIAL SERVICE TOOLS

Tools are listed within each model group by part number and in numerical order, starting with the lowest number.

Tools marked "(NLA)" are No Longer Available. If part number is superseded by a different part number, the new part number will follow the description.

Tool figures are shown for reference and identification.

SPECIAL OUTBOARD SERVICE TOOLS

MERC 200-110-75-60-40-39

1. C-91-24144A2 - PISTON PIN BEARING TOOL
   Merc 60, Mark 6A-6-5, KF5, KF3
   Required for removing and installing piston pins.

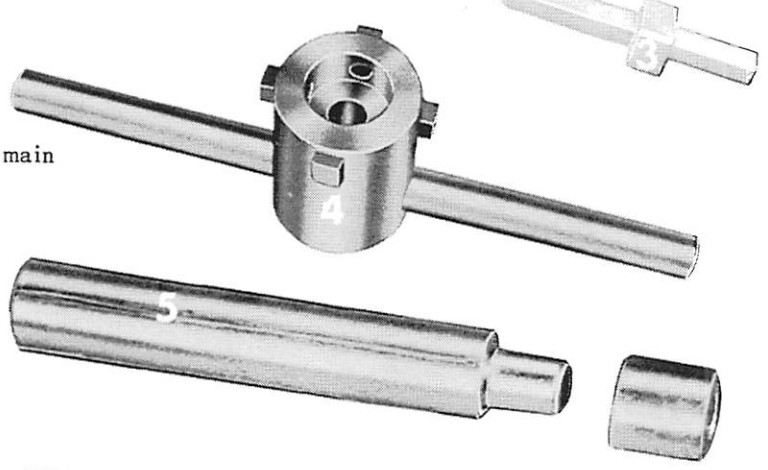
2. C-91-24273 - BEARING MANDREL
   Merc 110-60-39
   Removes and installs drive shaft needle bearing.

   Mark 6A-6-5, KF5, KF3
   Removes and installs drive shaft and prop shaft needle bearings.

   A and B Quicksilver Lower Unit
   Removes and installs drive shaft needle bearing.

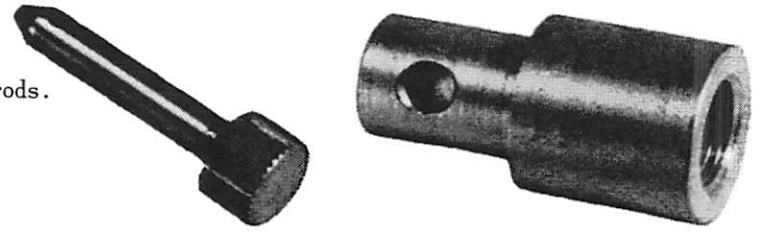
3. C-91-24282 - POWERHEAD STAND
   Merc 110-75-60-40-39, Mark 6A-6-5, KF5, KF3
   Holds powerhead in vise while servicing.

   Mark 6A-6-5, KF5, KF3
   Also used to install crankshaft and center main bearing and oil seal in lower crankcase.



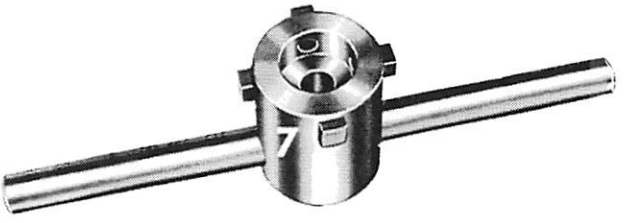
4. C-91-33450 - GEAR CASE COVER TOOL
   Merc 200 Gear Shift
   For removing and installing gear case cover.

5. C-91-34230 - PISTON PIN BEARING TOOL
   Merc 110-75-40-39
   Removes and installs pistons on connecting rods.

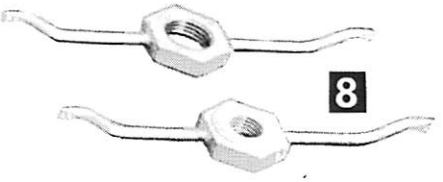


6. C-91-36553A1 - PULLER HEAD, SWIVEL PIN
   Merc 110-75-60-40-39
   Removes swivel pin with aid of Slide Hammer Puller (C-91-34569A1).

7. C-91-48830 - GEAR CASE COVER TOOL *(Similar to C-91-33450)*
   Merc 110-75-60-40-39
   Removes and installs gear case cover.



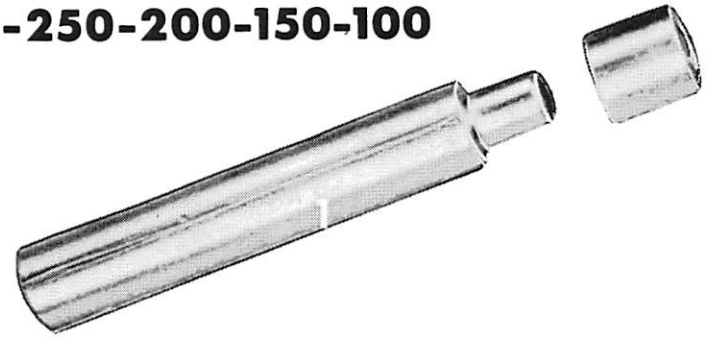
8. C-91-59096A1 - MAKER POINT PHASING TOOL
   Use on Merc 200-110-75 (starting 1970).
   To properly phase maker points to fire 180° apart.



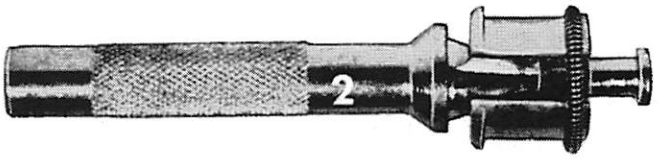
COMMON 2-CYLINDER
Required in Addition to Merc 110-75-60-40-39 and 402-400-350-250-200-150-100

1. C-91-22803A1 - PISTON PIN TOOL
   Removes and installs piston on connecting rod.

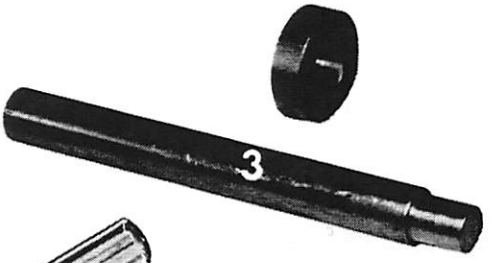
   NOTE: All pistons from 2-11/32" (59.533cm) thru 2-9/16" (65.088cm)



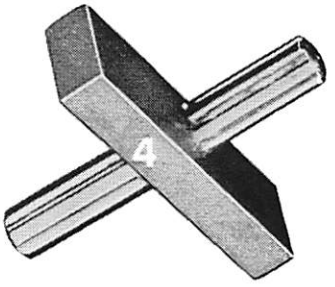
2. C-91-24100A1 - BALL BEARING PULLER
   Removes ball bearing from end cap or crankcase.



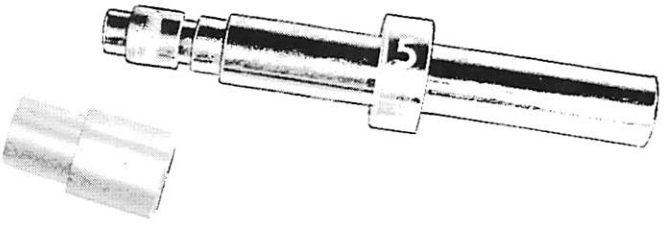
3. C-91-24147A1 - BEARING MANDREL
   Merc 200 Gear Shift - All Automatic Transmission Models
   Mark 30-25-20-15, KH7, D Quicksilver
   Removes and installs drive shaft and prop shaft needle bearing.



4. C-91-24259A1 - POWERHEAD STAND
   All 2-cylinder models excepting those using C-91-24282. Holds powerhead in vise while servicing.

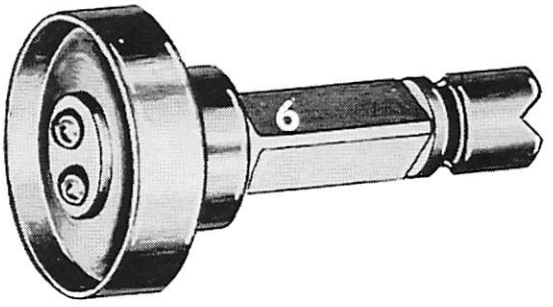


5. C-91-24715A2 - NEEDLE BEARING TOOL
   Mark 6A-6-5 & KF5
   Removes and installs lower crankcase needle bearing.



   Mark 7, KE7, KF7, KE4, KG4
   Removes and installs prop shaft and drive shaft needle bearing. Installs A & B Quicksilver prop shaft roller bearing.

   NOTE: Also used on earlier 2-cylinder models, 10 H.P. or higher.



6. C-91-24735 - CLAMP SCREW FLARING TOOL
   Reflares thumbscrew on thumbscrew washer.

7. C-91-28619A1 - DEGREE PLATE ASSEMBLY

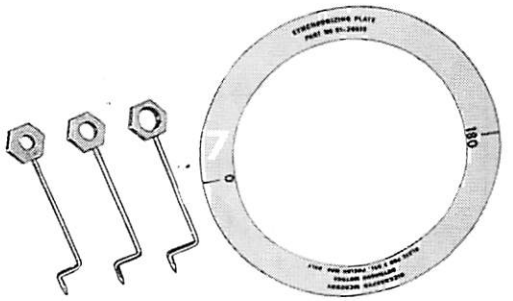
Accurately synchronizes points 180° for maximum performance at all engine speeds.

NOTE: Includes indicator arms for all models with Phelon magneto.

C-91-28623 - INDICATOR ARM (NLA)
Merc 110-60 & Mark 6-6A-7

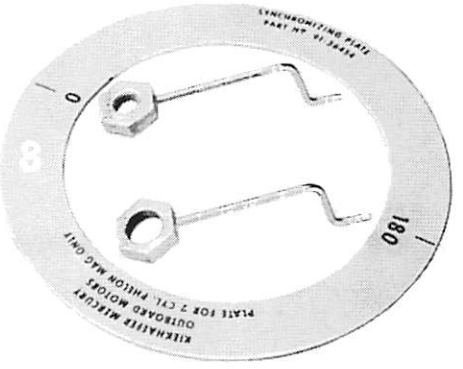
C-91-28885 - INDICATOR ARM
Mark 28-28A-25-15A-10-10A, Merc 200-150-100

C-91-28886 - INDICATOR ARM
Mark 15 & KG4



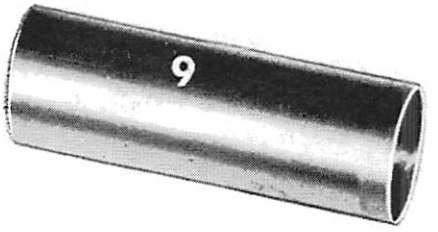
8. C-91-36454A1 - SYNCHRONIZING PLATE

Synchronizing Plate for 2-cyl. Merc 350-200-110 75-60 models which are equipped with the late-type Phelon magneto.



9. C-91-39014 - SEAL PROTECTOR
Merc 350 (2-Cyl.)

Used for installing upper end cap on Merc 350 to prevent damage to oil seal.

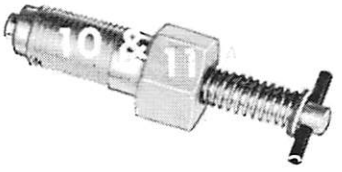


10. C-91-39735A1 - TIMING GAUGE .300 (NLA)
1966 Merc 350 (2-Cyl.)

Positions piston for accurate ignition timing.

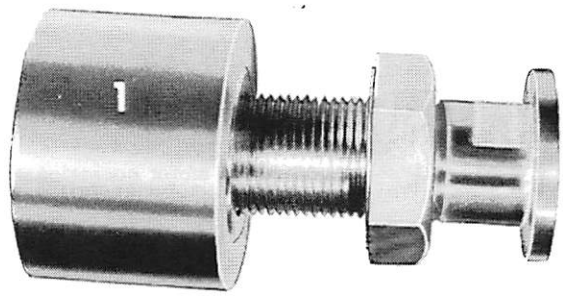
11. C-91-46707A1 - TIMING GAUGE .375 (NLA)
1967-68 Merc 200

Positions pistons for accurate ignition timing.



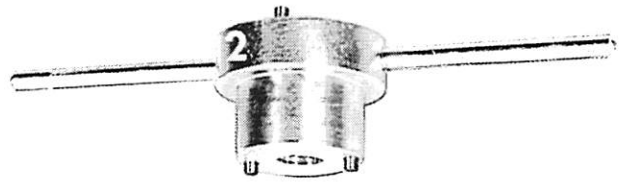
Merc 650-500-450-402-400-350-350 (2-Cyl.)-300 and Mark 58-58A-55-55A-35A

1. C-91-22118A1 - WATER PUMP CARTRIDGE PULLER
   Removes water pump cartridge on all 4-cylinder models except, late Merc 500 and Merc 650.

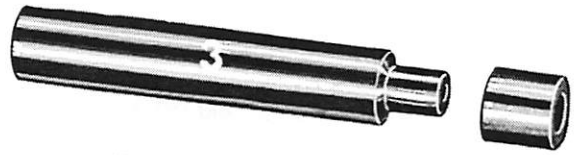


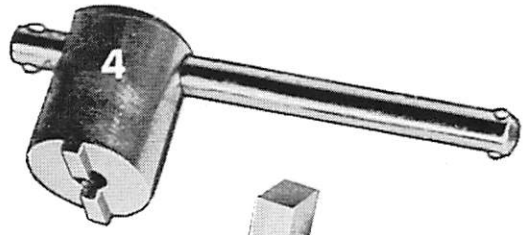
2. C-91-22119 - GEAR CASE & WATER PUMP COVER TOOL
   Removes and installs gear housing cover, all models except Merc 650 and late Merc 500 models.

   A-17-25104 Replacement Pin

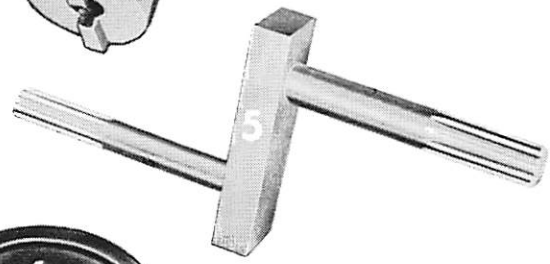


3. C-91-22803A1 - PISTON PIN BEARING TOOL
   (Also Listed under "Common 2 Cylinder")
   Removes and installs pistons on connecting rod.

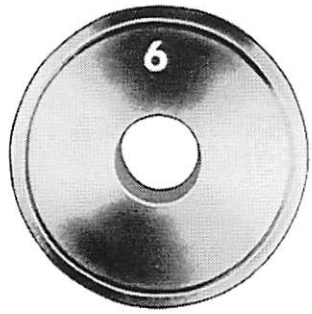




4. C-91-23033 - SHIFT SHAFT BUSHING TOOL
   Removes and installs shift shaft bushing in gear housing assembly.



5. C-91-25821A1 - POWERHEAD STAND
   Holds powerhead in vise while servicing.



6. C-91-31361 - DRIVER CUP
   Merc 500-450
   Installs tapered roller bearing cup in gear housing.

7. C-91-31483 - MAGNETO BEARING PULLER
   Removes ball bearing from magnetic rotor.

8. C-91-31484A2 - DWELL PLATE, 4-CYLINDER

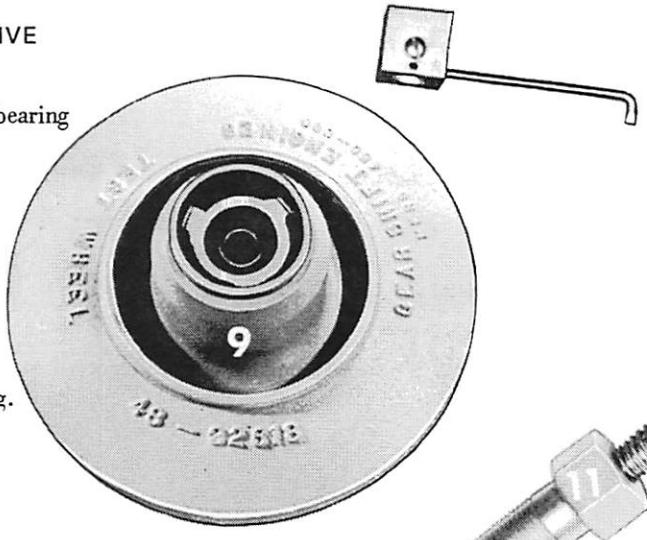
Adjusts point dwell much more accurately than is possible with a feeler gauge.

9. A-48-32618A1 - TEST WHEEL (Jet Exhaust)
(Superseded by C-91-32618A1)

For use in test tank to check motor operation.

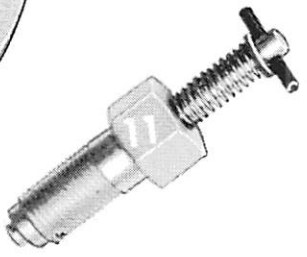
10. C-91-38918 - TAPERED BEARING RACE TOOL - DRIVE SHAFT

Used on Merc 650-500-402-400-350 to install bearing race on drive shaft.



11. C-91-45123A1 - TIMING GAUGE .200 (NLA)
1965 and 1966 Merc 500

Positions piston for accurate ignition timing.

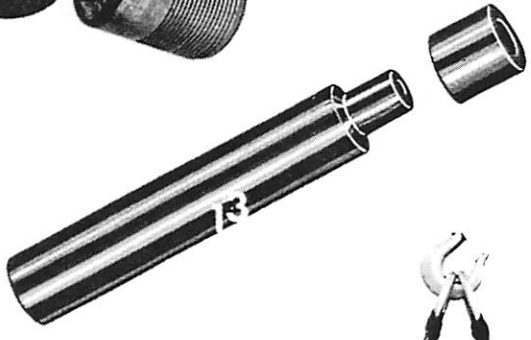


12. C-91-47448A1 - LIFTING EYE TOOL

Tool screws into flywheel for lifting outboard motors.

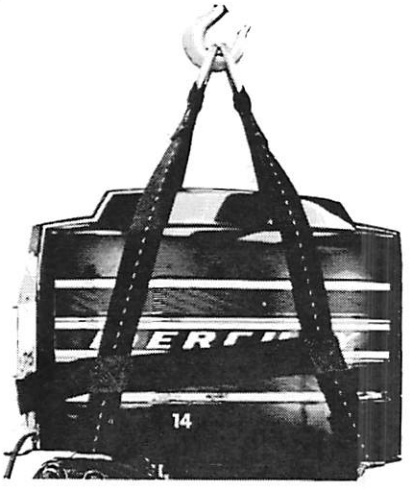
13. C-91-52395A1 - PISTON PIN TOOL
(Similar to C-91-22803A1 Tool)

For use on 1968 and later Merc 500 and Merc 200 to install pistons on connecting rods.



14. C-91-64400A2 - LIFT SLING

Sling fits 3-cyl. Merc 650 and Merc 500-402-400. For lifting outboard in and out of test tank, etc.

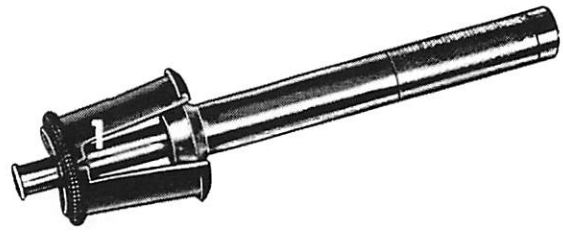


COMMON 4 and 6-CYLINDER TOOLS
Required in Addition to Tools Listed
Under 4-Cylinder and 6-Cylinder Tools

1. C-91-24100A1 - BALL BEARING PULLER

Removes ball bearing from crankcase end caps. Press out with arbor press.

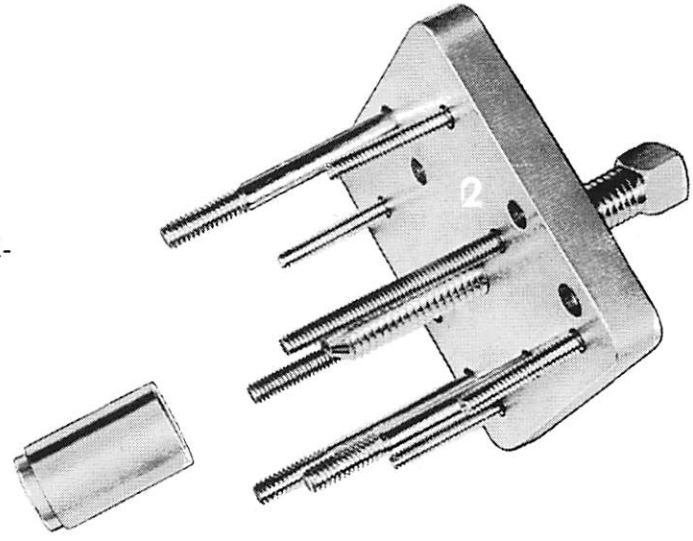
A-24-24131 - Replacement spring



2. C-91-25733A2 - END CAP PULLER - UNIVERSAL

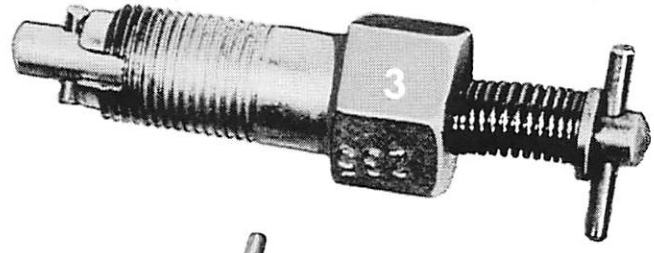
Removes crankcase end caps without disassembling powerhead.

C-10-20965 Screw 12-24 x 2¾
A-10-20967 Screw, center puller
C-10-20969 Screw ¼-20 x 3
C-10-26410 Screw 10-24 x 2-1/16
C-11-20890 Nut ¼-20



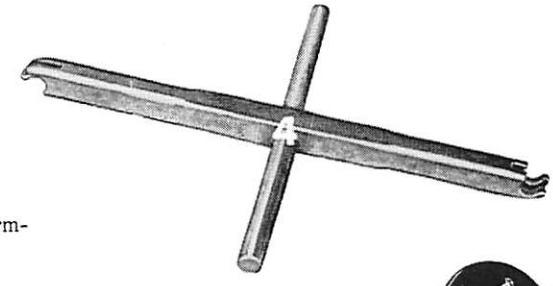
3. C-91-26916A1 - TIMING GAUGE .235" (5.969mm) (NLA)

Positions piston for accurate ignition timing.



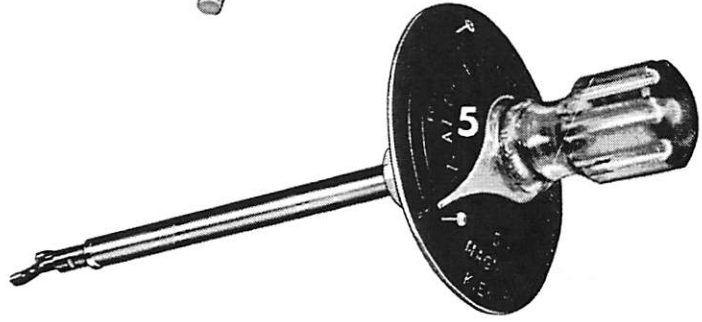
4. C-91-28883 - BREAKER POINT ALIGNING TOOL

Aligns breaker points to assure maximum performance.



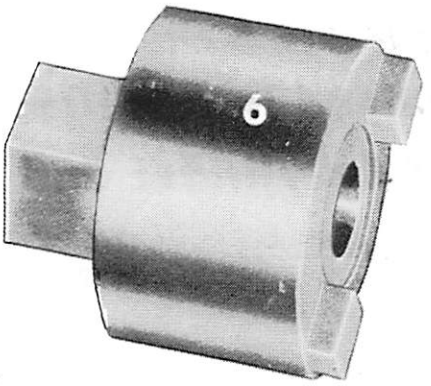
5. C-91-29406 - BREAKER SPRING TORQUE SCALE

Measures spring tension of moveable breaker arm.



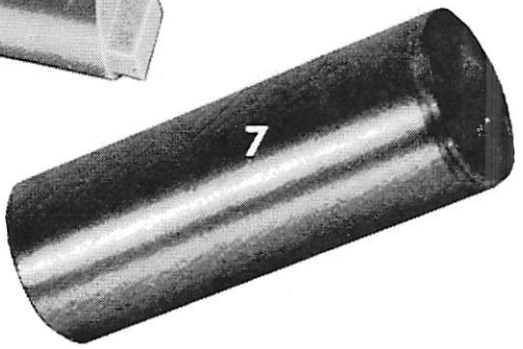
6. C-91-31107 - SHIFT SHAFT TOOL
Merc 1100-1000-950-900-850-800-700-650

Removes and installs shift shaft bushing in gear housing assembly.

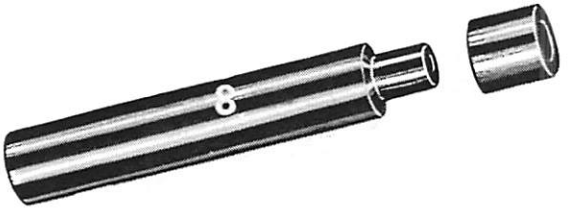


7. C-91-38461 - SLEEVE, OIL SEAL, WATER PUMP BASE

Used to protect oil seal when installing water pump base.



8. C-91-46739A2 - PISTON PIN TOOL
(Similar to C-91-22803A1 Tool)
To install pistons on connecting rods.

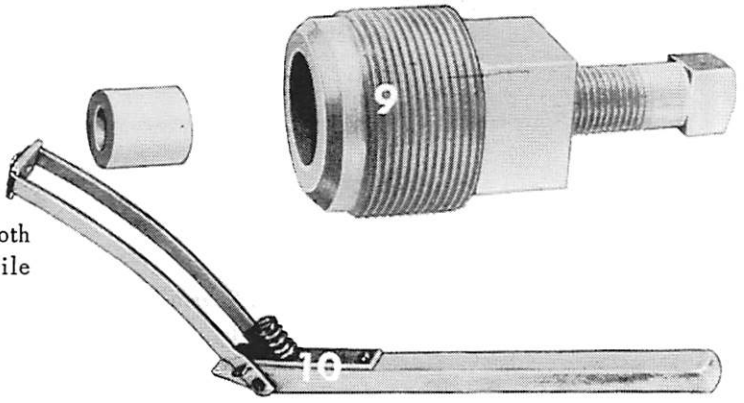


9. C-91-48501A1 - FLYWHEEL PULLER

Used to pull flex plate type flywheels.

10. C-91-52344 - FLYWHEEL HOLDING TOOL

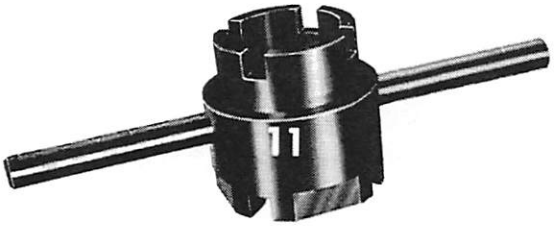
Holds the outboard flywheel (with starter gear tooth ring). Tool is designed to hold the flywheel while removing or torquing.



11. C-91-53126 - GEAR CASE COVER TOOL

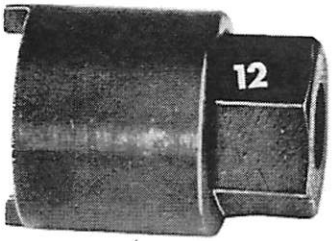
NOTE: Also for MerCruiser 60-80-90-I and II lower unit.

Removes and installs gear case cover.



12. C-91-64343 - SPANNER TOOL, DISTRIBUTOR HOUSING CAP

Removes and installs distributor housing cap.



MERC 1500-1400-1350-1250-1150-1100-1000-950-900-850-800-700-650 GEAR SHIFT

1. C-91-26930 - THUMB SCREW FLARING TOOL
   Reflares thumb screw on thumb screw washer.

2. C-91-30292A1 - TIMING GAUGE .275" (6.985mm) B.T.D.C. (NLA) Merc 1100-950
   Positions pistons for accurate ignition timing.

3. C-91-30591A1 - POWERHEAD STAND
   All 6-cylinder models and 650 4-cylinder.

4. A-48-30724A2 - TEST WHEEL (NLA)
   Merc 850 (76 Cu. In.) 800-700 Full Gear Shift.
   For checking motor operation in test tank.

5. C-91-30766A1 - PISTON PIN TOOL
   All models with 2¾" (69.850mm) piston and larger.
   Removes and installs piston on connecting rod.

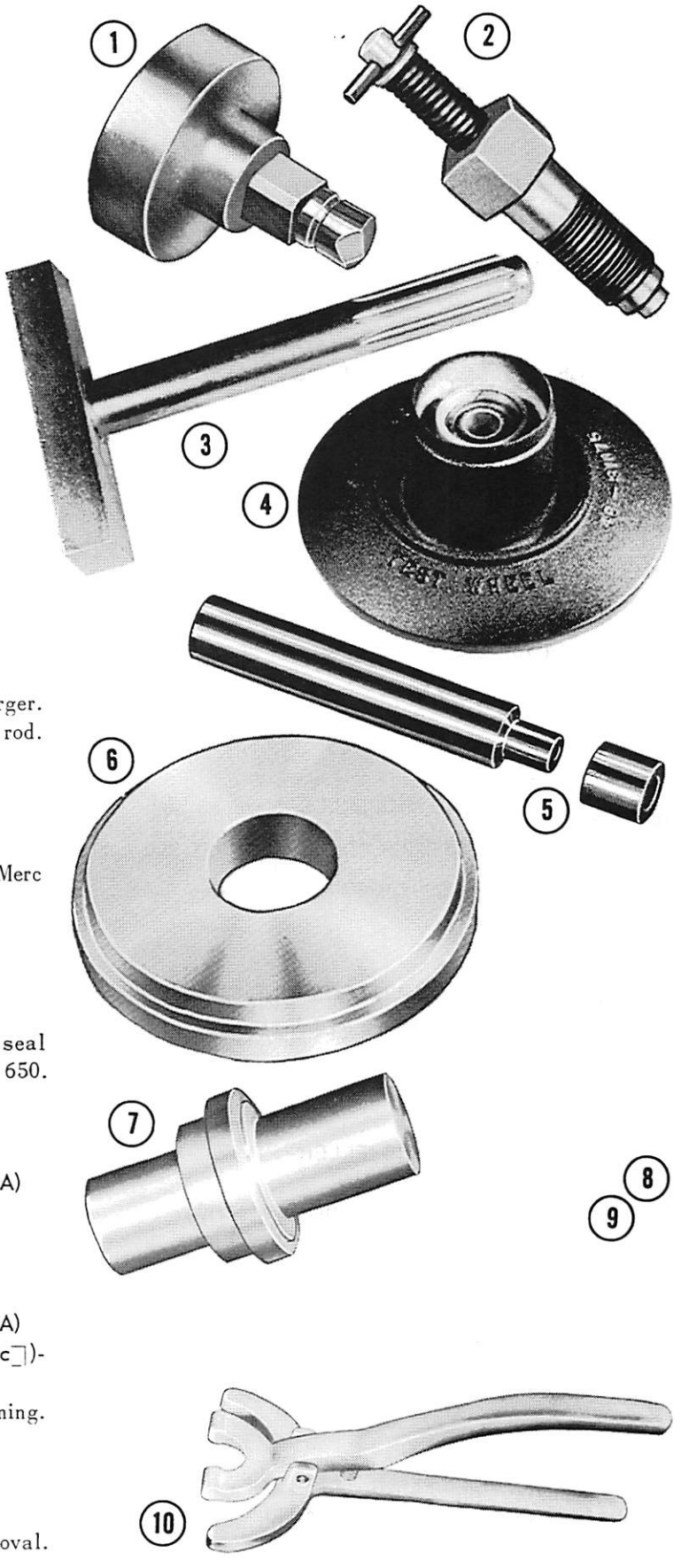
6. C-91-31106 - BEARING DRIVE CUP
   Installs forward gear bearing cup - including Merc 650 4-cylinder.

7. C-91-31108 - OIL SEAL DRIVER
   Installs and properly positions prop shaft oil seal in bearing carrier of lower unit. Includes Merc 650.

8. C-91-31161A1 - TIMING GAUGE .015" (0.381mm) (NLA)
   Accurately gauges forward throttle pickup.

9. C-91-32253A1 - TIMING GAUGE .222" (5.639mm) (NLA)
   Merc 1100-1000-950-900-850 (90 Cu. In. [1474.845cc])-650-350
   Positions pistons for accurate ignition timing.

10. C-91-32477A1 - ROTOR PULLER PLIERS
    Minimizes the breakage of rotors during removal.



11. C-91-32699 - OIL SEAL SLEEVE

Prevents damage to prop shaft oil seal when installing bearing carrier.

12. C-91-34377A1 - DRIVE SHAFT NUT

13. C-91-34379 - BEARING DRIVER CUP

For installing drive shaft tapered bearing race.

14. C-91-45510A1 - DEGREE PLATE ASSEMBLY

Accurately sets dwell and synchronization

C-10-21562 Replacement Screw
A-91-45510 Degree Plate
of breaker points.

15. C-91-49191A2 - UPPER CRANKSHAFT BEARING INSTALLATION TOOL

16. C-91-52832A2 - LOAD PROPELLER (Superseded by C-91-52831A2) Merc 1250-1000-800

For checking motor operation in test tank.

17. C-91-52952A1 - PISTON PIN LOCK RING TOOL

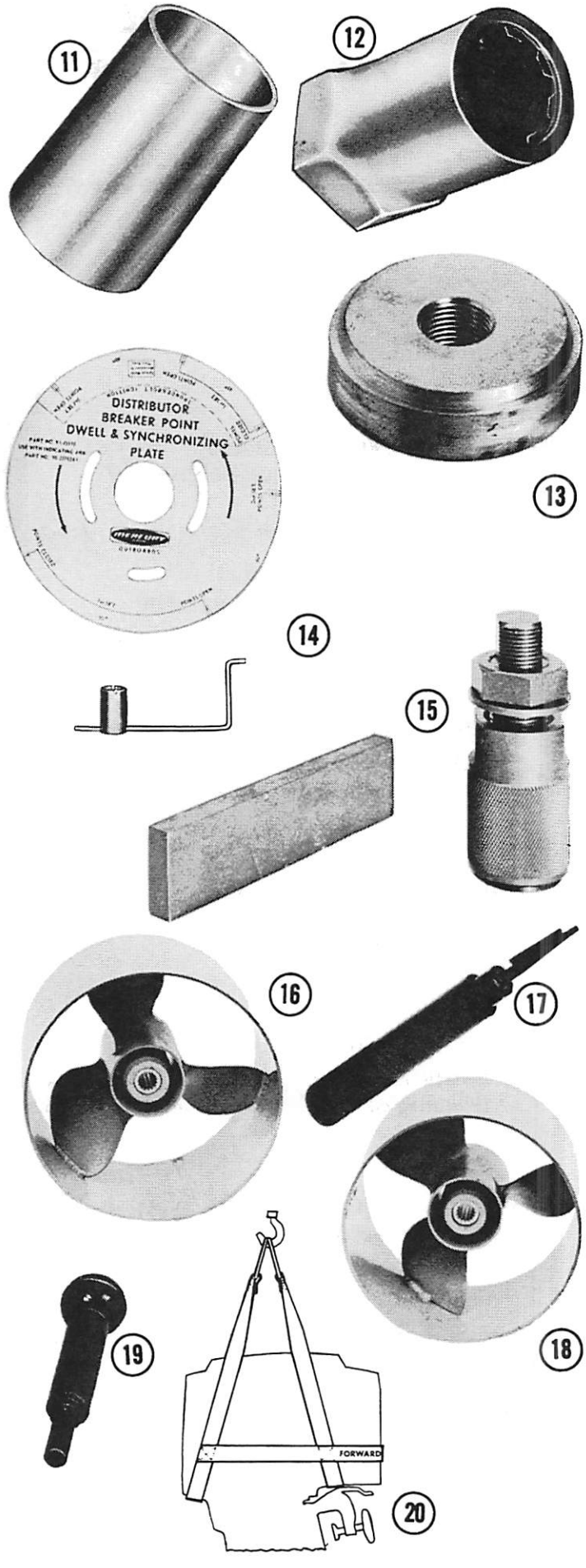
For removing tables pin retaining rings.

18. C-91-59165A1 - LOAD PROPELLER
Merc 1350-1150

For checking motor operation in test tank.

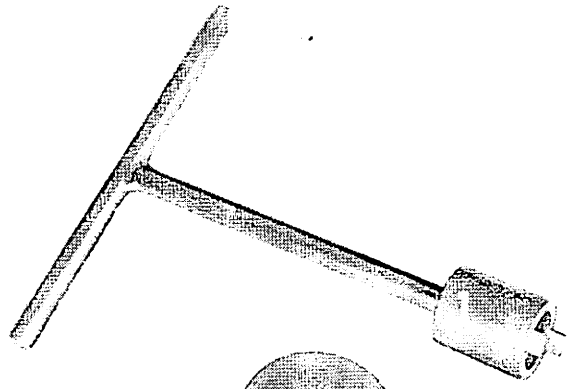
19. C-91-60837A1 - PISTON PIN LOCKRING INSTALLATION TOOL (For "C" Type Lockrings).

20. C-91-64400A2 - LIFT SLING - Merc 650
C-91-64400A5 - LIFT SLING - Merc 850 and All 6-Cyl. Models



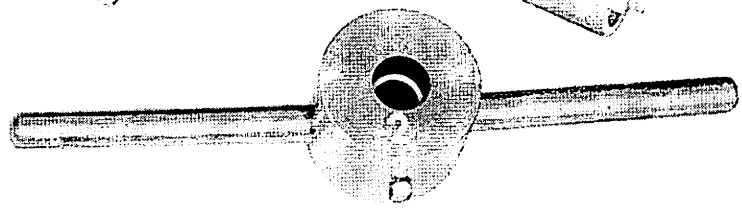
MERC 250-200-150-100 and MARK 28A-28-15A-10A-10
AUTOMATIC TRANSMISSION

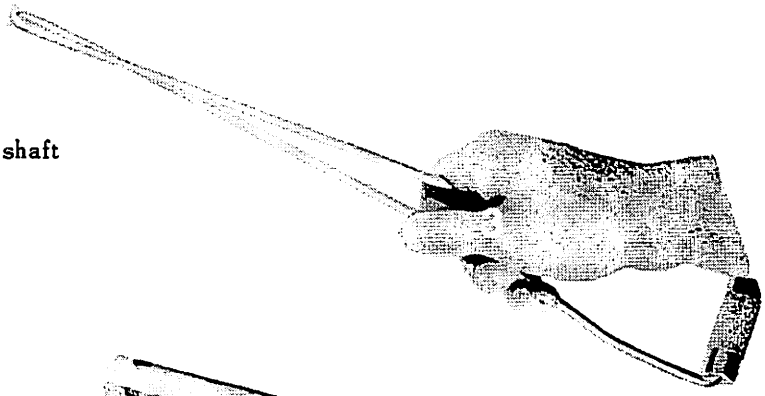
1. C-91-27532A1 - BALL BEARING RING TOOL
   Removes and installs ball bearing ring lock holding drive shaft ball bearing and water pump assembly in drive shaft housing.



2. C-91-27534A1 - GEAR HOUSING COVER TOOL
   Removes and installs gear housing cover.

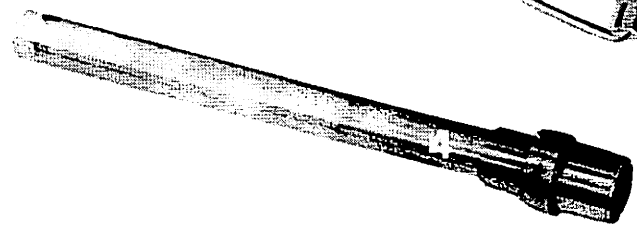
   C-10-20716 Replacement Screw

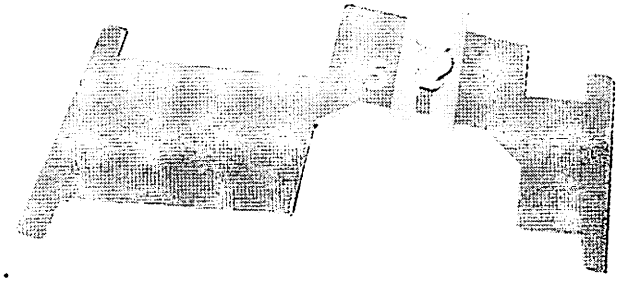




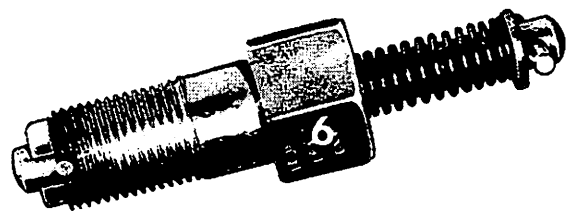
3. C-91-27780 - WATER PUMP CARTRIDGE PULLER
   Removes water pump cartridge from drive shaft housing.

4. C-91-28742A1 - WATER PUMP INSTALLATION SHAFT
   Used in conjunction with Ball Bearing Ring Tool (C-91-27532A1) to aid in installation of water pump cartridge, impeller, ball bearing and retainer ring.





5. C-91-28987A1 - TRANSMISSION GAUGE
   Necessary for accurate shimming of transmission.

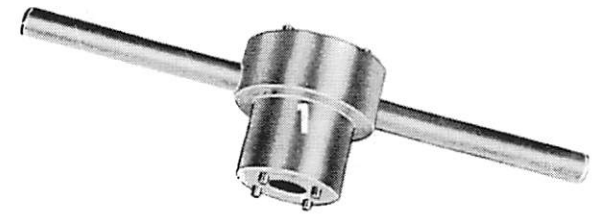


6. C-91-30292A1 - TIMING GAUGE .275" (6.985mm) B.T.D.C. (NLA)
   Positions piston for accurate ignition timing.
   (Plus Common 2-Cylinder Tools)

MERC 800-700-600 DIRECT REVERSING

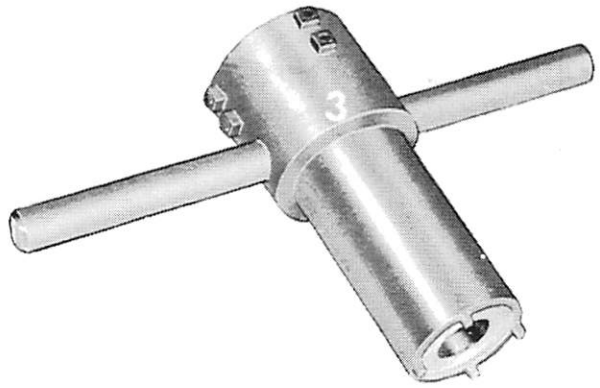
1. C-91-26374A1 - GEAR CASE COVER TOOL
   Merc 600 - Mark 78-78A-75A
   Removes and installs gear case cover.

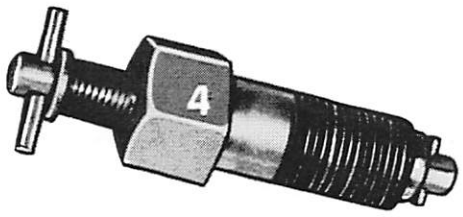
   A-17-25104 Replacement Pin



2. C-91-29312A1 - ROLLER BEARING PULLER
   All Direct Reversing Models
   Removes prop shaft roller bearing from gear housing.

3. C-91-29925A1 - GEAR HOUSING COVER and PROPELLER GEAR LOCKNUT
   Merc 700
   Removes and installs gear housing cover.
   Merc 800-700-600 - Mark 78-78A-75A
   Removes and installs gear locknut.





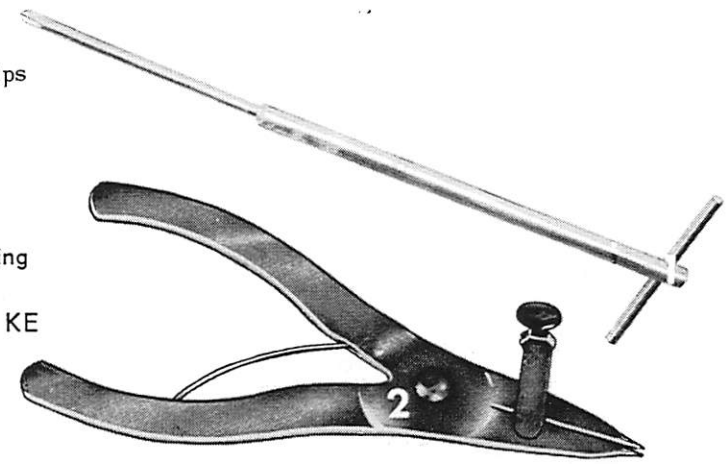
C-91-30290A1 - TIMING GAUGE .030" (0.762mm) (NLA)
Accurately gauges forward throttle pickup.

5. A-48-31075A1 - TEST WHEEL (NLA)
   Merc 800-700 Direct Reversing
   For checking motor operation in test tank.

TOOLS - GENERAL

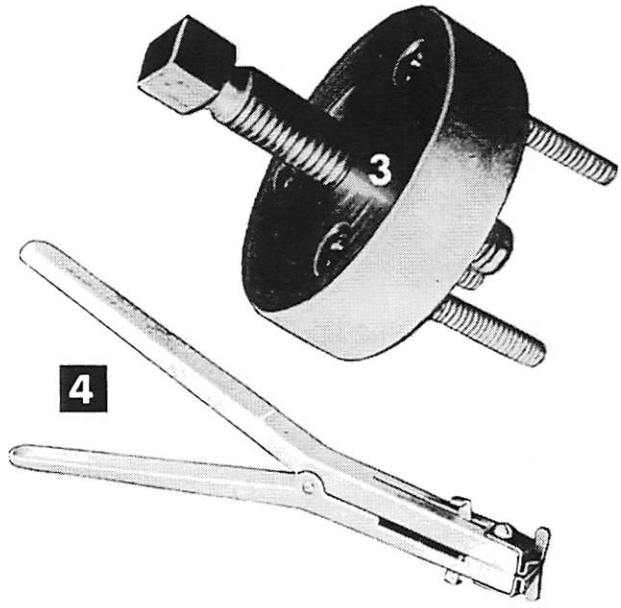
Required in Addition to Tools Specified by Models

1. C-91-24279 - WATER INLET CAP SCREWDRIVER
   Mark 6, Mark 5, and KF5
   Removes water inlet cap screws with Phillips No. 1 screwdriver tip.

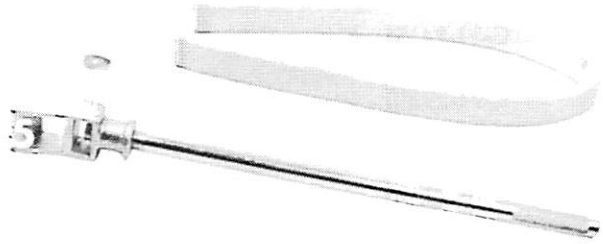


2. C-91-24283 - TRUARC SNAP RING PLIERS (Expanding Type)
   All Direct Reversing Models and Mark 6-5, KG, KF, KE Models
   Removes snap rings in lower units.

3. C-91-24695A2 - FLYWHEEL PULLER
   All Models, except Merc 1500-1400-1350-1250-1150-1100-1000-950-900-850-800 (4-Cyl.) (90 Cu. In.) and 650
   Pulls flywheel. Place plug over end of crankshaft to protect threads and prevent possible break of shaft tip. Attach puller to flywheel evenly and secure with 3 screws. Tighten center screw, tapping with hammer if flywheel is exceptionally tight.
   (a) A-10-20967 - Replacement Center Screw, ½-13
   A-10-27074 - Replacement Center Screw, ½-20
   (b) C-10-26948 - Replacement Screw, ¼-20
   C-10-24624 - Replacement Screw, ¼-28
   C-10-21449 - Replacement Screw, 5/16-24

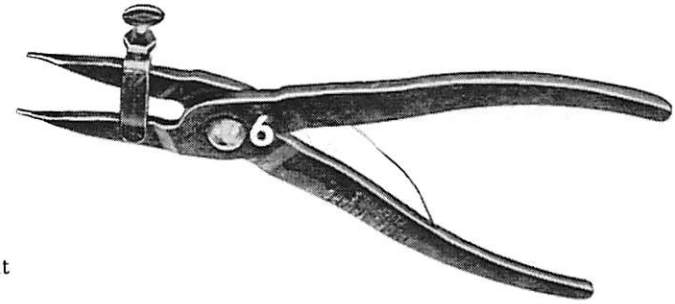


4. C-91-24697 - PISTON RING EXPANDER
   All Models
   Removes and installs piston rings from pistons.



5. C-91-24937A1 - UNIVERSAL FLYWHEEL HOLDER
   All Model Outboards. (See C-91-52344 for Electric Starting Models.)
   Holds flywheel while removing flywheel nut.

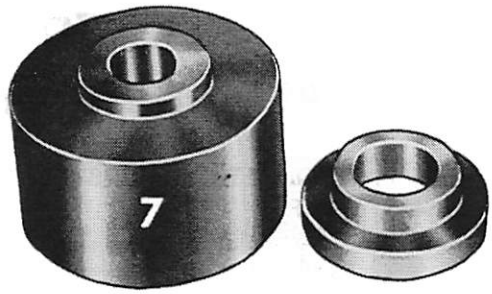
   Replacement Parts:
   A-91-24940 - Web Belt (Special)



6. C-91-25081 - TRUARC SNAP RING PLIERS (Compressing Type)
   All 2-Cylinder Models and Mark 30-25
   Removes and installs snap rings in Dyna-Float mounting.

7. C-91-26376A1 - PROPELLER SHAFT GEAR TOOL
All Models

Removes and installs propeller shaft ball bearings and gears. Open end of cup used to remove ball bearing; other end used to remove and install gear. Place collar on top of cup to replace ball bearing.



8. C-91-29287 - COMPRESSION TESTER
All Models

Tests compression in cylinders. Registers 0-to-200 lbs. per sq. in. (0-to-014.060kg/cm^3). When checking compression, a variation of more than 15 lbs. per sq. in. (1.055kg/cm^3) between cylinders indicates the lower compression cylinders are in some way defective, such as worn or sticking piston rings and/or scored pistons and cylinders.

Valve Cores (No. 1566 T-600) may be purchased from: Schrader
Divison of Scovill Automotive Products
Dickson, Tennessee 37055

9. C-91-29795A1 - FIXED JET REMOVAL TOOL
All Engines with Fixed High Speed Carburetor Jets

Assures easy removal of fixed high speed jets from carburetors.

10. C-91-31229A1 - MERCURY OUTBOARD BEARING REMOVING & INSTALLING KIT *(See Next Page.)*

A bearing removing and installing kit allows addition of various adaptors for Mercury Outboards. This eliminates the purchase of larger, more expensive mandrels for each bearing. It also provides for greater versatility and is adaptable to other products.

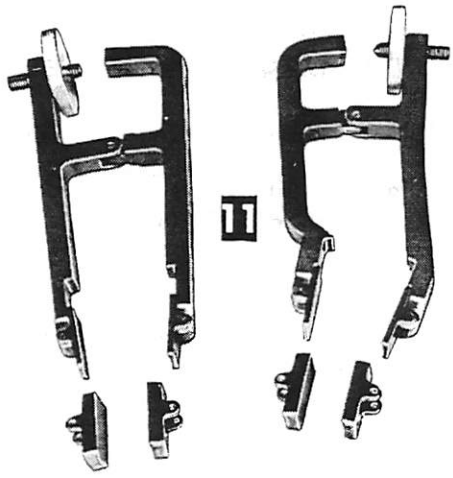
NOTE: DO NOT order individual tools if C-91-31229A1 is ordered.

C-11-24156 - Nut, puller
B-12-34961 - Washer, puller
C-91-29310 - Plate, puller
C-91-31229 - Shaft, puller
C-91-36569 - Driver Head
C-91-37263 - Adaptor, bearing
C-91-37292 - Puller, head
C-91-37311 - Driver Head
C-91-37312 - Driver Head
C-91-37323 - Rod, driver
C-91-37350 - Washer, pilot

11. C-91-31461A2 - RING COMPRESSOR KIT
All Models

Set of 3 ring compressors to install pistons into cylinder blocks. (For Merc 1500-1400-1350-1250-1150-800-400, use C-91-47844A2.)

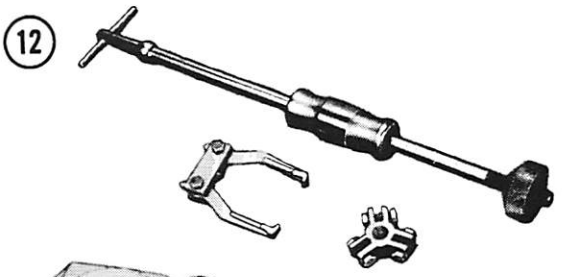
Replacement Shoe - C-91-28887



12. C-91-34569A1 - SLIDE HAMMER PULLER

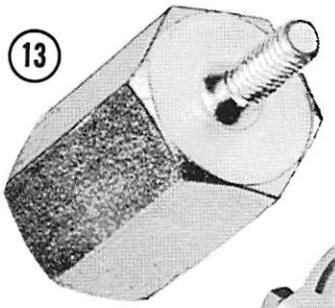
Removing all tapered roller bearing cups from Mercury Outboards. Removing reverse gear assembly from bearing carrier from Mercury Outboards. Will fit other applications as well.

C-91-34570 - Jaws - Replacement, Slide Hammer Puller



13. C-91-36062 - ADAPTOR, RUBBER MOUNT PULLER

The Rubber Mount Puller Adaptor, ¼-20 is used with Slide Hammer Puller (C-91-34569A1). Adaptor is designed to pull upper and lower rubber mounts from drive shaft housing.



14. C-91-37241 - UNIVERSAL PULLER PLATE

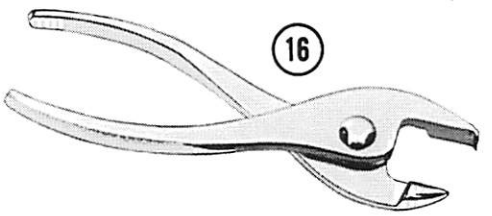
For pulling gears and bearings on all outboards. The "knife-like" edges of puller plates may be forced behind the part. The finest alloy steels and expert heat treating assures unequaled strength. This plate supersedes previous puller plates.

15. C-91-37299 - PISTOLUBER GREASE GUN

Squeeze-grip design permits one hand operation. High pressure 12" flexible hose allows easy access to grease fittings on outboards and stern drive units. Multi-purpose Lubricant (C-92-63250) tube screws directly on grease gun to prevent possible contamination of lubricant. Light-weight and easy-to-use, the Pistoluber Grease Gun is ideal for resale to customers.

16. C-91-38277 - PLIERS, PROP NUT TAB WASHER

Bends tab on propeller nut tab washer onto nut.



17. C-91-46086A1 - LONG JAWS

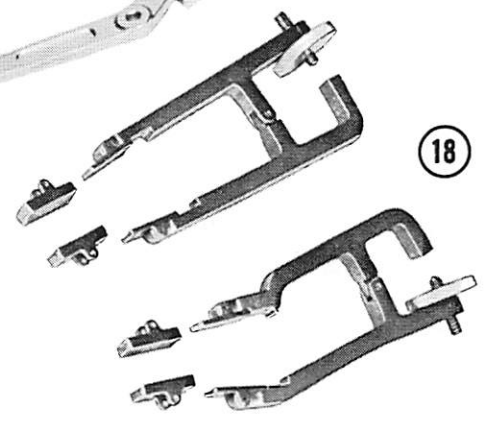
Used with Slide Hammer Puller (C-91-34569A1) for bearing carrier removal.

18. C-91-47844A2 - RING COMPRESSOR SET - 4 & 6-Cyl.

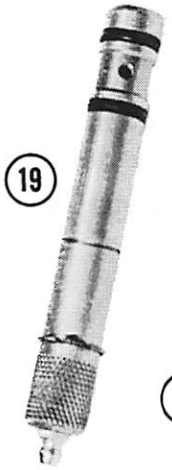
For All Direct-Charge and Power-Ported Type Pistons

Set of three ring compressors to install pistons into cylinder block.

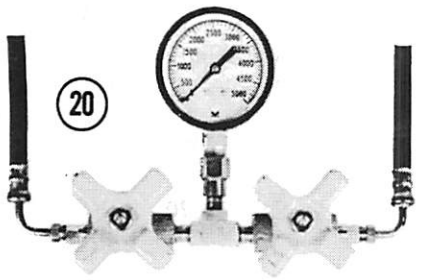
Replacement Shoes - C-91-47842A1 - For above ring compressors (1 set)



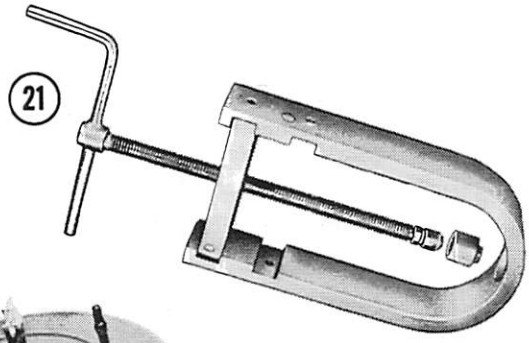
19. C-91-52561A1 - SWIVEL BRACKET LUBRICATING TOOL
Used to lubricate hinge points between swivel bracket and tilt tube; 1967 and newer outboards.



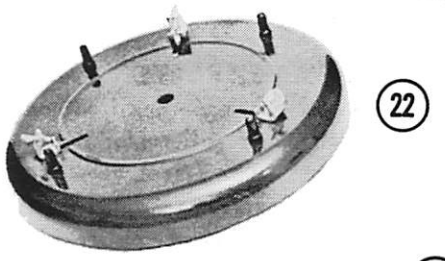
20. C-91-52915A2 - HYDRAULIC PUMP TEST GAUGE ASSEMBLY
For field-testing hydraulic pumps.



21. C-91-54453A1 - PISTON PIN TOOL
All Models
Remove and install piston pins on all models.



22. C-91-56979 - DOLLY, 120 LB. DRUM
To support 120 lb. oil drum (C-92-68637-1), following.

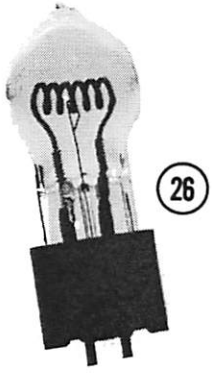


23. C-91-56982 - HAND PUMP, 120 LB. DRUM
Use with 120 lb. oil drum (C-92-68637-1), following.

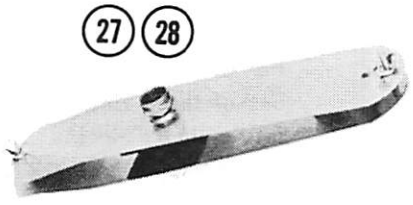
24. C-91-58222A1 - DIAL INDICATOR TIMING GAUGE
Used to set timing on all models.

25. C-91-63209 - TORCH LAMP
Use to heat pistons for piston pin removal and installation.

26. C-91-63210 - BULB
Replacement bulb for torch lamp



27. C-55585 - FLUSH TEST DEVICE
(Superseded by C-67832)



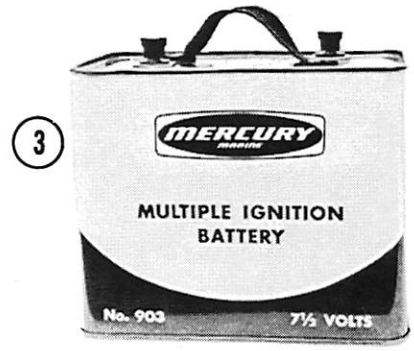
28. C-67832 - FLUSH TEST DEVICE

ELECTRICAL IGNITION TESTING EQUIPMENT

1. C-91-25213 - MAGNETO ANALYZER
   All Engines (United States and Canada)

   Analyzes complete ignition system without removing magneto or distributor from engine. Only portable ignition tester. Minimum operating experience required. Instruction book and testing values included. Tests the following:
   Coil -
   High and low speed . . . Coil continuity . . . .
   Insulation leakage . . . Primary test.
   Condenser -
   Capacity test . . . Leakage and short.
   Also times motor . . . Spark plug test . . . . . .
   Distributor resistance test . . . . . Continuity of electrical parts . . . Breaker point resistance.

2. C-91-31800 - MAGNETO ANALYZER
   220 Volt, 50 Cycle
   230 Volt, 50 Cycle (Export, except Canada.
   240 Volt, 50 Cycle PLEASE SPECIFY VOLTAGE)
   250 Volt, 50 Cycle



3. C-91-35540 - Battery, Analyzer (7½ Volt)

4. C-91-35507A2 - TIMING LITE

   Accurately "times" any 2 or 4-cycle engine with 12-volt DC system. Molded plastic case virtually unbreakable, lightweight, modern design. Operates without "spark lag" throughout entire RPM range, from idle position to wide-open throttle.

5. C-91-39212 - TIMING LEAD

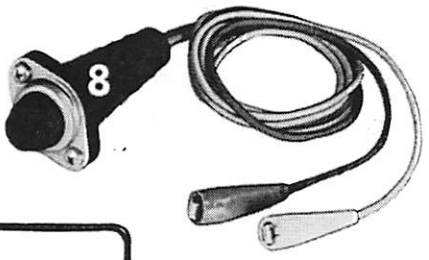
   Used to connect timing lite between spark plug and spark plug protector.

6. C-91-49700A2 - TACHOMETER TESTER (NLA)

   Will check out tachometers used on Mercury Thunderbolt Ignition.

8. C-91-52024A1 - REMOTE STARTER SWITCH

Used for remote starting of engines when setting timing or troubleshooting.



9. C-91-52751 - VOA ELECTRICAL TESTER

Used to test components of Lightning Energizer Ignition System.

10. C-91-59339 - UNIVERSAL ELECTRONIC SERVICE TACHOMETER and DWELL METER

All 2 and 4-Cycle Engines

Only tachometer and meter approved by factory. RPM, 0-to-10,000. Dwell reading for outboards, inboards and auto ignitions.

C-91-38346 - Sensing Ring (For C-91-59339)

11. C-91-62563A1 - THUNDERBOLT IGNITION ANALYZER

The analyzer will test and locate defective components in all Mercury Marine Thunderbolt Ignition Systems. Consists of a tester and VOA Meter.

EQUIPMENT - GENERAL

1. C-91-24682A1 - HELI-COIL KIT
(Superseded by C-91-59976)

Kit No.	Superseding Part No.	Size	No. of Inserts
C-91-24682A1	C-91-59976	1/4 - 20	30
C-91-24686A1	C-91-59983	5/16 - 18	25
C-91-24133A4	C-91-59964	14mm Spark Plug	20
C-91-35596	C-91-59990	3/8 - 16	--
C-91-35597		7/16 - 14	--

* *Because of fine threads, a special nylon prewinder is included to provide for easier installation.*

** *Tool pack contains one handle for inserting tool and a pressure plate.*

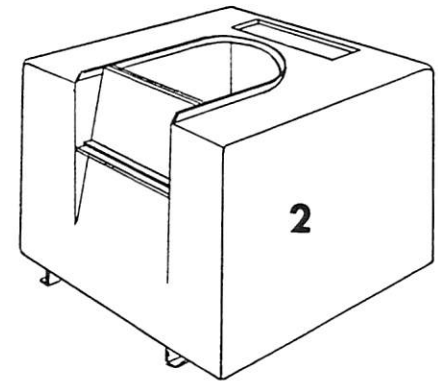
Each Heli-Coil Kit listed above contains one Heli-Coil tap, one inserting tool and a supply of inserts for the given thread, plus instruction pamphlet. Packed in reuseable clear plastic boxes.

Heli-Coil Inserts	
C-91-24683	1/4 - 28 x 3/8"
C-91-24682	1/4 - 20 x 3/8"
C-91-24686	5/16 - 18 x 13/32"
C-91-24691	3/8 - 16 x 1/2"
C-91-29410	14mm .242 (Die Cast Blocks)
C-91-45831	14mm Heli-Coil

Replacement Pieces

NOTE: Order separate replacement pieces if you already have the Heli-Coil Kits:

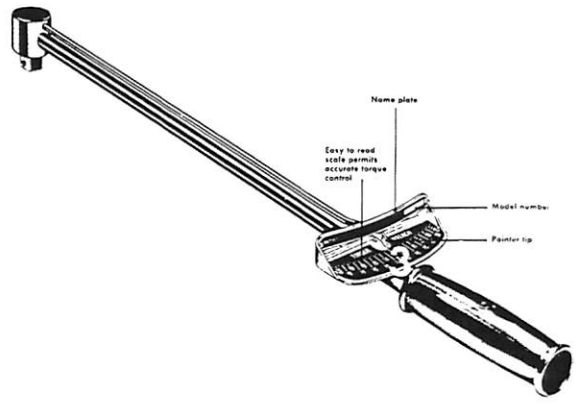
Part No.	Description
C-91-45830	14mm Heli-Coil Tap
C-91-24142	Heli-Coil Tap 5/16 x 18



2. C-91-24702A4 - TEST TANK
All Models

Includes splash plate assembly. Size 36x36x40" (91.440cm-91.440cm-101.600cm). Holds approximately 200 gallons (757.060 liters) of water. Equipped with overflow pipe. Exhaust system and fresh water supply can be readily installed.

C-91-26882 - Test Tank Splash Plate Kit



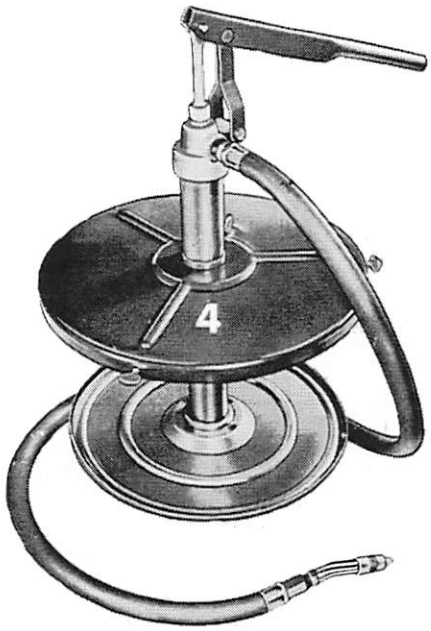
3. C-91-25666 - TORQUE WRENCH
All Models

A 300 in. lb. (53.2500kg/cm) torque wrench with 3/8" (9.525mm) drive. Used to accurately torque connecting rod nuts, screws and spark plugs.

4. C-91-26150 - PORTABLE LUBRICANT GUN & HOSE

A portable grease lubricant gun with 5 ft. (1.524m) hose and a non-drip nozzle. Gun attaches quickly and easily to the 25 lb. (11.340kg) container of Quicksilver Gear Lubricant (C-92-24164-1) or Super-Duty Quicksilver Gear Lubricant (C-92-56565-1 for 37 lb pail, C-92-65149-1 for 35 lb. pail) for easy filling of gear housings on all models of outboard motors.

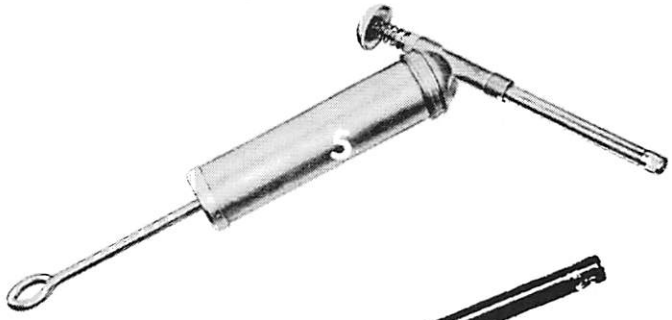
Gun incorporates a machined piston which assures maximum lubricant output per stroke. It is rust-proof and has a high gloss finish.

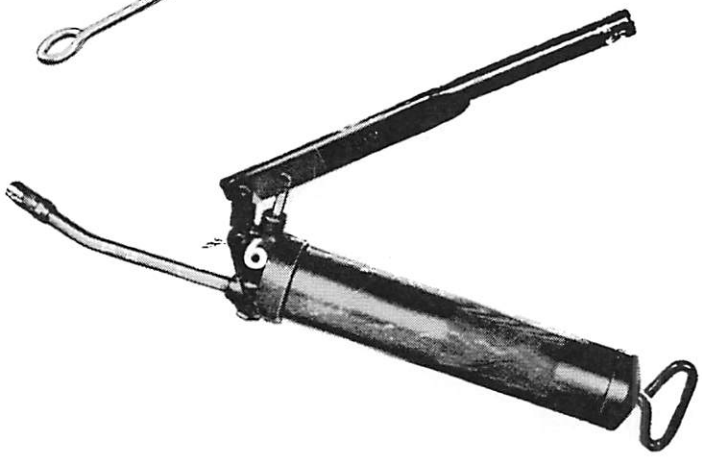


5. C-91-26151 - UTILITY PUSH TYPE GREASE GUN

A pressure push type grease gun designed for lubrication of various parts on the outboard or small equipment with grease fittings such as on the swivel bracket, Ride-Guide cables, magneto adaptor bracket and cross-shaft bushings.

Palm and finger grip design permits one-hand operation. Nozzle permits contacting all push-type fittings. Gun is light weight and exceptionally easy to operate . . . handles light or heavy pressure gun lubricants and can be filled quickly and easily by suction. Ideal for resale to customers.

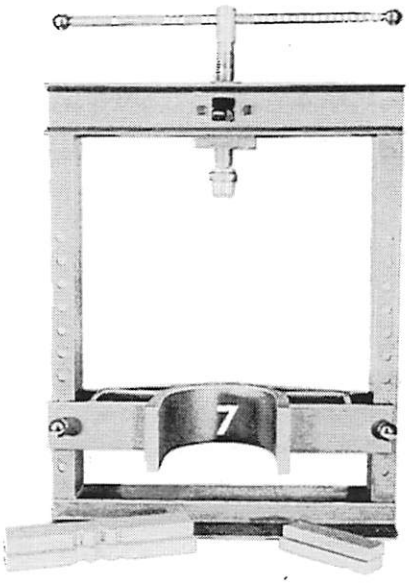




6. C-91-26152 - HIGH PRESSURE HEAVY-DUTY LEVER TYPE GREASE GUN

High pressure, lever type grease gun . . . . . recommended for larger service shops where fast and easy lubrication of parts with grease fittings is required. It has a greater capacity (16 oz.) (0.453kg) and faster delivery than the Utility Push Type Grease Gun (C-91-26151).

Gun can be refilled in 30 seconds. Sturdy steel construction . . . finished in high gloss, gunmetal blue . . . positively rust resistant.

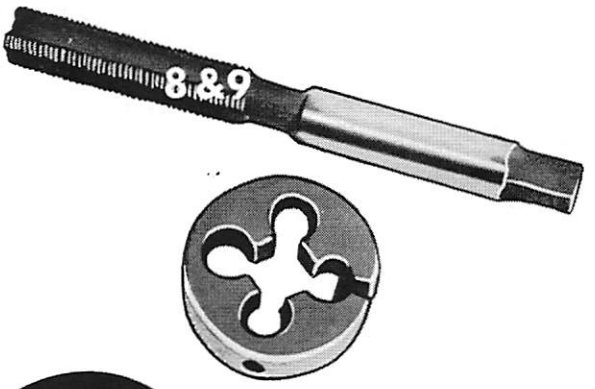


7. C-91-28058A1 - UTILITY PRESS

The universal utility press has a wide range of use in repair shops for outboard motors, other 2-cycle engines, implements, appliances and electrical and automotive equipment.

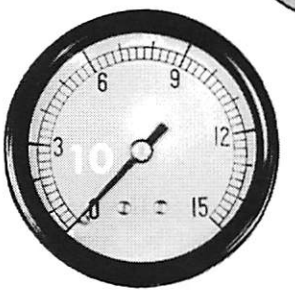
8. C-91-28486-¼-40 - THREAD TAP
9. C-91-28487-¼-40 - THREAD DIE
For Remote Control Cables

Serves for rethreading and clearing thread-damaged brass sleeves and anchor blocks.



10. C-91-30692 - FUEL PRESSURE GAUGE
All Engines

For engine testing . . . "clean" dial indicates fuel pressures up to 15 lb. sq. in. (1.055kg/cm^2).



11. C-91-32610 - TORQUE WRENCH
All Models*

A 200 ft. lb. (27.600mkg) torque wrench with ½" (12.700mm) drive. For torquing flywheel nuts, spark plugs, propeller clutch and Quicksilver gear case covers.

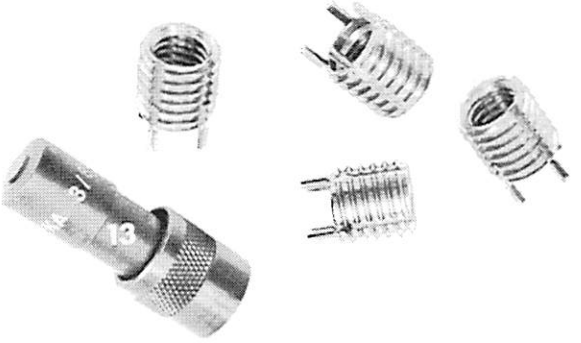
* *See Torque Specification Chart, Section VIII.*

12. KEENSERT KITS

Kit Part No.	Kit Description	Contents of Kit
C-91-59964	Spark Plug Master Kit	20 alum. spark plug inserts, 14mm, ½" reach & install. tools
C-91-59976	¼-20 Thread Repair Kit	8 stainless steel ¼-20 inserts and installation tool
C-91-59983	5/16-18 Thread Repair Kit	5 stainless steel 5/16-18 inserts and installation tool
C-91-59990	3/8-16 Thread Repair Kit	4 stainless steel 3/8-16 inserts and installation tool

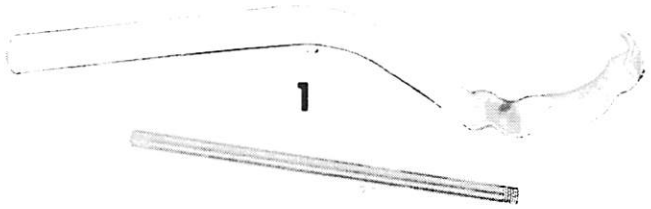
13. KEENSERT REFILL KITS

Kit Part No.	Kit Description	Contents of Kit
C-91-59970	Spark Plug Refill Kit	10 alum. spark plug inserts and rings 14mm, ½" reach
C-91-59980	¼-20 Refill Kit	25 stainless steel ¼-20 inserts
C-91-59988	5/16-18 Refill Kit	15 stainless steel 5/16-18 inserts
C-91-59996	3/8-16 Refill Kit	12 stainless steel 3/8-16 inserts



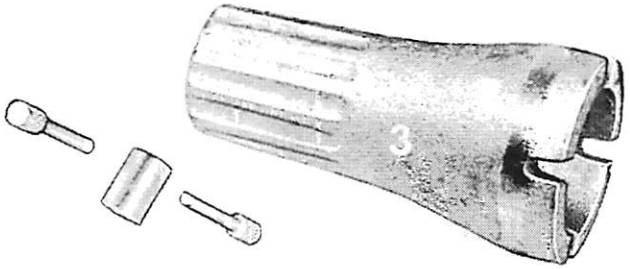
MISCELLANEOUS SPECIAL TOOLS

1. C-91-22802 - CONNECTING ROD CAP HOLDERS (NLA)
   Mark 20H and Mark 25
   Holds connecting rod cap (and screws) while assembling connecting rod to crankshaft.



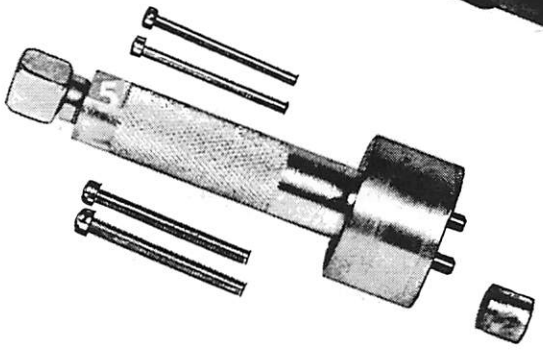
2. C-92-24112 - CONNECTING ROD WRENCH, ALLEN INSERT (NLA)
   All Models, "K" to Mark 7, Connecting Rods Screws

3. C-91-24117A1
   All Quicksilver Models
   Adaptor tool to remove and install water pump covers on Quicksilver lower units. Use sleeve on propeller shaft for A or B lower unit.
   C-91-24007 - Sleeve (NLA)
   C-91-24008 - Replacement Pin (NLA)

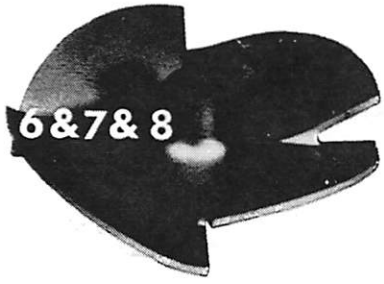


4. C-91-24147A1 - BEARING MANDREL
   (Also Listed Under Common 2-Cylinder)
   Mark 30, 25, 15, KH7 and D-Quicksilver
   Removes and replaces drive shaft and prop shaft needle bearings in lower unit.

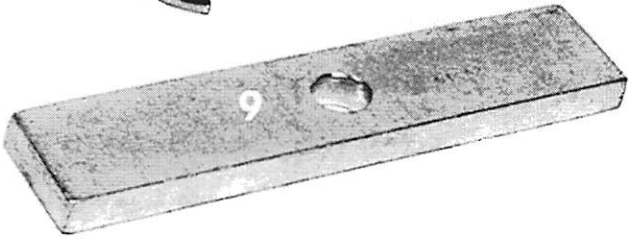
5. C-91-24267 - WATER PUMP CARTRIDGE PULLERS
   Mark 6-5, KF5, KF3 (Left Hand Thread)
   Type "A": Removes and replaces water pump cover and cartridge. Set dowels in cover holes and turn with wrench to remove or install cover. Attach 2 screws to cartridge and apply pressure to center screw for removal.
   Replacement Parts:
   C-10-24129 - Screw, 8-32 for Mark 6-5, KF5
   A-10-24130 - Screw, 6-32 for KF3



6. A-48-26575 - Test Wheel - Mark 75 (NLA)
7. A-48-26974 - Test Wheel - Mark 25 (NLA)
8. A-48-26975 - Test Wheel - Mark 30 - 1-2-3 (NLA)
   For checking motor operation in test tank.



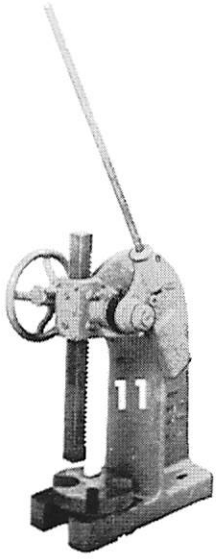
9. C-91-29310 - PLATE PULLER
   Used to pull propeller shaft roller bearing.

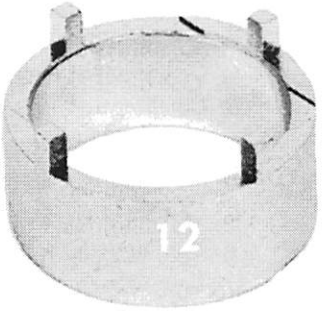


10. C-91-29950 - GEAR CASE & WATER PUMP COVER TOOL
Mark 30-25-20-15
A-17-24286 - Replacement Pin

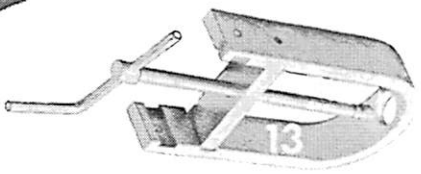
11. C-91-30304 - ARBOR PRESS
Used for pressing duties of all types.

C-91-30305 - FLOOR STAND FOR ARBOR PRESS (Above)
For All Outboards
Supports arbor press.



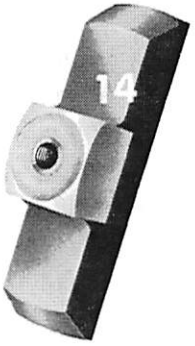


12. C-91-30367 - ADAPTOR PROP GEAR LOCKNUT (for C-91-29925A1)
Presses component parts from/into assemblies. Made of semi-steel . . . heavy stud teeth in rams and pinions . . . front and side gib adjustment for perfect alignment.



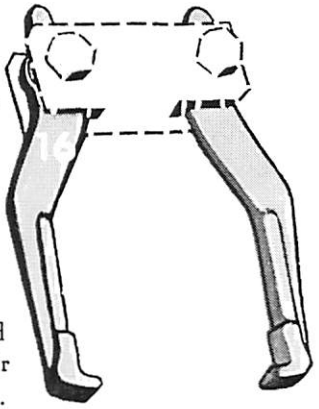
13. C-91-31400A2 - PISTON PIN TOOL
(Superseded by C-91-54453A1)
Removes and installs piston on connecting rod.

14. C-91-32741 - BEARING CUP PULLER (NLA)
Merc 450-500
Removes forward gear tapered bearing race from gear housing.



15. C-91-32906 - OUTBOARD MOTOR CARRIER (NLA)
Equipped with 2 small swivel wheels to accommodate today's larger engines and the severe daily use given by the average dealer. Made of 1¼" (31.750mm) tempered steel tube . . tested with over 500 lb. (226.795kg) load.

16. C-91-34570 - JAWS, REPLACEMENT, SLIDE HAMMER
Used in conjunction with Slide Hammer Puller (jaws only).



17. C-91-39222A1 - OUTBOARD MOTOR STAND
(Superseded by C-91-58996A1)
For display of your Kiekhaefer Mercury Outboard Motor . . . also can be used as a motor repair stand. Heavy cast iron . . . two sections . . . painted black . . . styled right.

HAND TOOLS

Recommended For Servicing Mercury Outboard Motors

WRENCHES

1. Combination Wrench, 7/16"
2. Combination Wrench, 1/2"
3. Combination Wrench, 9/16"
4. Combination Wrench, 5/8"
5. Combination Wrench, 11/16"
6. Combination Wrench, 3/4"
7. Combination Wrench, 7/8"
8. Combination Wrench, 1"
9. Box Wrench, 3/8" & 7/16"
10. Box Wrench, 5/8" & 9/16"
11. Box Wrench, 11/16" & 13/16"
12. Tap Wrench, 1/16" & 1/4"
13. Tap Wrench, 1/4" & 1/2"
14. Open End Wrench, 5/8" & 3/4"
15. Open End Wrench, 1/2" & 9/16"
16. Open End Wrench, 3/8" & 7/16"
17. Open End Wrench, 1/4" & 5/16"
18. Speeder Wrench, 3/8"
19. Pipe Wrench, 18"
20. Adjustable End Wrench, 12"
21. Ratchet Wrench, 3/8" Drive
22. Ignition Wrench, 8-Piece Set
23. Allen Wrench Set, 1/8"-5/16"
24. Ratcheting Box Wrench, 3/8" & 7/16"
25. Socket Wrench Adaptor, 3/8" & 1/2"
26. Drive Extension Bar, 6" x 3/8" Drive
27. Flex "T" Handle, 1/2" Drive (18")
28. Flex "T" Handle, 3/8" Drive (10")

SCREWDRIVERS

1. Phillips No. 1 Screwdriver
2. Phillips No. 2 Screwdriver
3. Stub Screwdriver
4. Screwdriver, 9" x 3/16"
5. Screwdriver, 6" x 1/4"
6. Screwdriver, 5" x 3/16"
7. Phillips No. 2 Screw Bit, 3/8" Drive
8. Phillips No. 3 Screw Bit, 3/8" Drive

CHISELS

1. Cap Chisel, Round Edge
2. Chisel, 1/2"

SOCKETS

1. 6 Pt. 3/8" Drive, 5/16"
2. 6 Pt. 3/8" Drive, 3/8"
3. 6 Pt. 3/8" Drive, 7/16"
4. 6 Pt. 3/8" Drive 1/2"
5. 6 Pt. 3/8" Drive, 9/16"
6. 6 Pt. 3/8" Drive, 11/16"
7. 12 Pt. 1/2" Drive, 15/16"
8. Deep Socket, 3/8" Drive 6 Pt., 13/16"
9. Deep Socket, 3/8" Drive 6 Pt., 5/8"
10. Drive Socket, 5/16" & 1/4"
11. Drive Socket, 3/4" & 3/8"
12. Universal Sockets, 7/16" Drive
13. Universal Drive, 3/8" Drive
14. Set of 1/4" Drive Sockets

PIN PUNCHES

1. Pin Punch, 1/8"
2. Pin Punch, 5/32"
3. Pin Punch, 3/16"

PLIERS

1. Diagonal Cutting Pliers
2. Vise Grip Pliers, 9"
3. Water Pump Pliers
4. Needle Nose Pliers

MISCELLANEOUS

1. Ball Peen Hammer, 12 oz.
2. Pry Bar
3. Soldering Gun, Electric
4. Scriber Awl
5. Putty Knife
6. Steel Rule, 6"
7. Feeler Gauge, Set 0-.025"

LUBRICANTS and ADHESIVE SEALERS

1. C-92-24108-1 - DC-4 COMPOUND (2 Oz. Tube)

2. C-92-24164-1 - QUICKSILVER SPECIAL GEAR LUBRICANT (25 Lb. Pail)
   C-92-63200 - 8 Oz. Tube

3. C-92-25143-1 - DECAL SOLUTION (1 Pint)
   All Models
   For applying decals to metal surfaces.

4. C-92-25234-1 - GLUE (2 Oz. Tube)
   Forms a seal between bottom cowl and drive shaft housing on Mark 30; and for fastening sound absorbing blanket on engines so equipped.

5. C-92-25711-1 - NEOPRENE (½ Pint)
   All Models
   Seals electrical connections to prevent corrosion.

6. C-92-27109-1 - ADHESIVE COMPOUND
   Models with Adhesive-Attached Emblem on Front Cowl
   Used to apply assorted-color emblems (medallions) on front cowl covers . . . 3½ oz. kit sufficient to apply 15 to 20 medallions.

7. C-92-27813-1 - PRIMER BULB ADHESIVE
   All Fuel Tanks with Primer Bulb
   One pint jar . . . sufficient adhesive for completing repair on over 50 fuel line-primer bulbs -- where check valve assembly and body and stem assembly of fuel line are inserted in primer bulb – when required.

8. C-92-28804-1 - GASKET SEALER COMPOUND (1 Pint)
   (Superseded by C-92-72592-1) All Engines
   Replaces white lead formerly used between crankcase and cylinder block as a machined surface seal. Also used between powerhead and drive shaft housing on Mark 40, KF9 and KG9 models and between lower cowl and drive shaft housing on Mark 30 engines.

9. C-92-30140-1 - ENGINE CLEANER (One Gallon Can)
   C-92-63214-12 (16 Oz. Spray Can)

10. C-92-32609-1 - LOCTITE TYPE "A" (10cc Bottle)

11. C-92-34227A1 - PERFECT SEAL (One Pint Can)
For propeller shaft when installing propeller.

12. C-92-48079-1 - NO. 47 SEALING COMPOUND (3 Oz. Tube)
All Models
Waterproof sealer for coil-ignition lead connection.

13. C-92-58295A1 - LOCTITE KIT
("AV" with Primer Grade "T")

14. C-92-59327-1 - LOCQUIC PRIMER GRADE "T"
(In Loctite Kit C-92-58295A1)

15. C-92-59328-1 - LOCTITE NO. 35

16. C-92-63233 - STORAGE SEAL (15 Oz. Spray Can)
Protects internal engine parts during storage.

17. C-92-63250 - MULTIPURPOSE LUBRICANT (8 Oz. Tube)
For lubrication of external parts.

18. C-92-63260 - CORROSION and RUST PREVENTIVE
(11 Oz. Spray Can)
Temporary protection from rust and corrosion.

19. C-92-63265 - MARINE CLEANER (16 Oz. Bottle)
Water-soluble for cleaning of external surfaces.

20. C-92-63281 - ANTI-CORROSION OIL (8 Oz. Can)
Provides a good lubricating coat for all external moving surfaces.

21. C-92-63290 - ANTI-CORROSION GREASE (8 Oz. Tube)
Provides a good lubricating coat for all external moving surfaces.

22. C-92-65150 - RESIWELD KIT
Used to secure inner water jacket cover bolts.

23. C-92-68617-12 - SUPER-DUTY LOWER UNIT LUBRICANT (Case of 8 Oz. Tubes)

24. C-92-68623-12 - SUPER-DUTY LOWER UNIT LUBRICANT (Case of 12 1-Qt. Cans)
Highest quality lower unit gear lubricant.

25. C-92-68630-1 - SUPER-DUTY LOWER UNIT LUBRICANT (35 Lb. Pail)

26. C-92-68637-1 - SUPER-DUTY LOWER UNIT LUBRICANT (120 Lb. Drum)
Use with C-91-56979 dolly and C-91-56982 hand pump, preceding.