SERVICE BULLETIN

MERCURY OUTBOARDS

Number: 77-5
Date : 1/19/77

CIRCULATE TO:	SERVICE MGR.	PARTS MGR.	MECHANICS	Place in Your "Service Bulletins Binder

MERC 40 IMPROVEMENT PROGRAM
All 2-Cylinder Merc 40 Serial No. 9075838-thru-9141798

This Service Bulletin Supersedes Information Published in Service Bulletin No. 77-1 (Dated 9/1/76). Destroy Bulletin 77-1.

Mercury Marine's policy of continuous development and refinement of new and existing products has brought about several design changes for 2-cylinder Merc 40 Outboard Motors. After extensive testing and evaluation of Merc 40 Outboards equipped with these design changes, we found the improvement in performance to be such that we want to offer a NO-CHARGE Improvement Program to owners of 1976 Merc 40 Outboards (within the specified serial number range, shown above).

Each registered owner will be sent a letter that explains the program and requests the owner to contact the selling dealer and arrange an appointment for improvement of his/her Merc 40.

To properly schedule work load involved with this program, we suggest that you also contact each of your Merc 40 customers to verify when the Improvement Program can be implemented.

Dealer participation (required in this program) involves: 1) Notice to each customer who purchased a Merc 40 Outboard, **2)** removal and return of the powerhead assembly complete, along with components requested and **3)** reinstall improved powerhead assembly, test and adjust engine. All design changes and/or component replacement on the complete powerhead assembly will be done by Mercury, at the factory.

IMPORTANT: For Mercury to expedite and effectively complete a program of this magnitude, it is imperative that the components requested for return (see instructions following) BE SHIPPED TO YOUR BRANCH OR DISTRIBUTOR NO LATER THAN MARCH 21, 1977. Processing of components returned after this date may be delayed.

Remove the powerhead assembly complete and return it, along with the components requested (refer to instructions following), to your branch or distributor. Tag each powerhead assembly with the engine serial number and package the components carefully to prevent shipping damage.

Upon completion of the Improvement Program, credit for 2.0 hours labor-per-outboard will be issued upon receipt of a completed warranty claim. More than one outboard per claim is permissible, provided that all serial numbers are listed.

Powerhead Removal

!VOTE: Retain all hardware (nuts, screws, etc), unless otherwise specified.

1. Remove top cowl.
2. Drain fuel from fuel tank.
3. Remove sound box cover (4 screws) and sound box (2 screws). (Figures 1 and 2)
4. Loosen jam nuts on **No.** 1 and **No.** 2 throttle cables and disconnect cables. (Figure 3)
5. Remove black ground wire from cylinder block (one screw). (Figure 4)
6. Remove orange stop wire from switch box (one screw). (Figure 4)
7. Cut clamp and remove fuel line from carburetor. (Figure 4)
8. Cut sta-strap and disconnect fuel line at in-line filter [1/2" (38mm) fuel line remains on fuel tank]. (Figure 5)

***NOTE:** If engine is not equipped with in-line fuel filter, cut fuel line, leaving 1/2 of fuel line on fuel tank.*

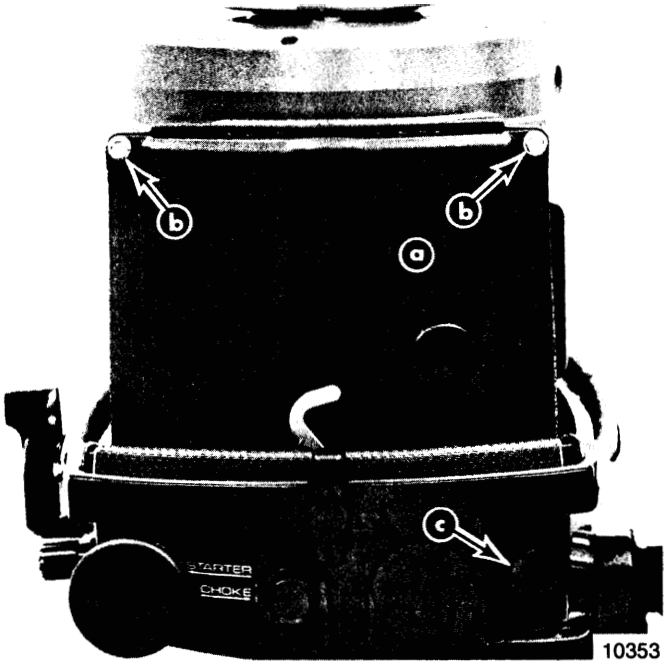

Figure 1. Front View of Merc 40

a - Sound Box Cover b - Cover Screws (2 Not Shown)
c - Plastic Plug

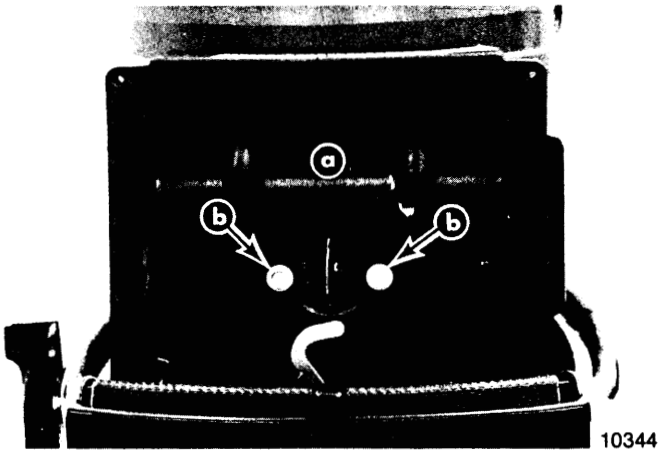

Figure 2. Sound Box Cover Removed

a - Sound Box b - Sound Box Screws (2)

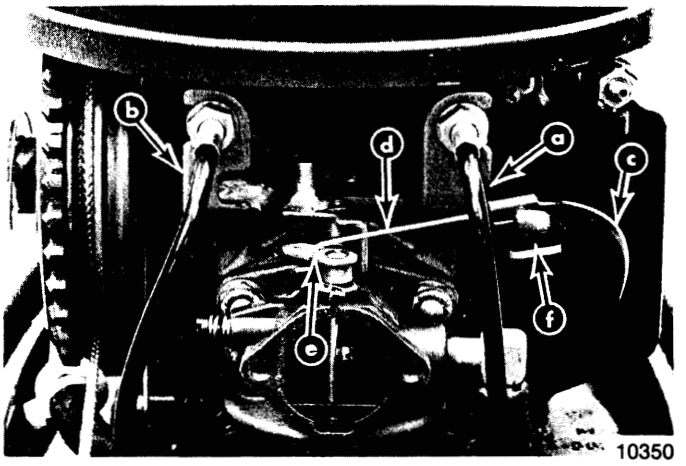

Figure 3. Sound Box Removed

a - No. 1 Throttle Cable
b - No. 2 Throttle Cable
c - Choke Cable
d - Choke Cable Core Wire
e - Inner Hole
f - Cable Retaining Clip

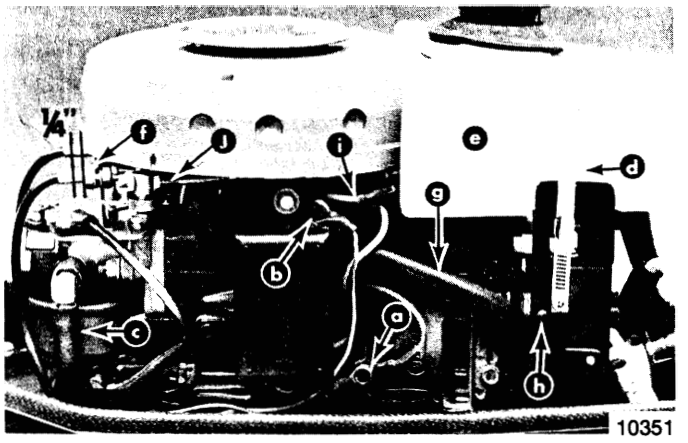

Figure 4. Left Side View of Merc 40

a - Black Ground Wire Screw
b - Orange Stop Wire Screw
c - Fuel Line
d - Fuel Tank Mounting Strap
e - Fuel Tank
f - 6 Threads **(1/4")** Exposed
g - Coil Primary Wire Harness
h - Secure Primary Wire Harness
i - Trigger Leads
j - Trigger Link Rod

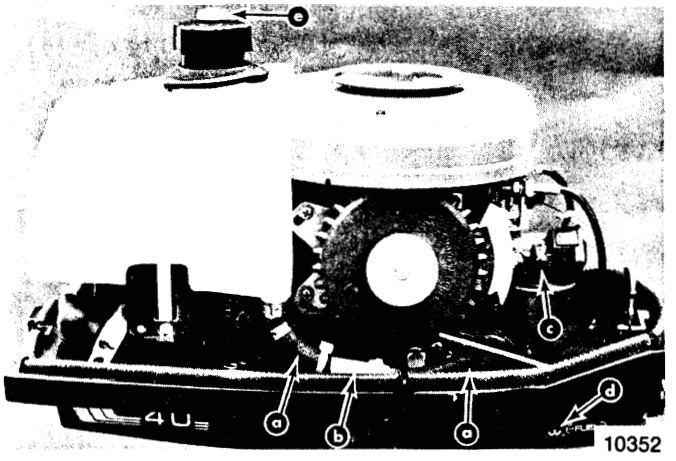

Figure 5. Right Side View of Merc 40

a - Fuel Line
b - In-Line Fuel Filter
c - Idle Mixture Screw
d - Fuel Shutoff Valve
e - Air Vent Screw

9. Disconnect choke cable at carburetor. (Figure 3)
10. Remove fuel tank mounting strap (if plastic, cut and discard) and fuel tank. (Figure 4)
11. Remove spark plug lead wires from spark plugs and remove spark plugs from cylinder block. (Figure 6)
12. Disconnect 4 coil primary lead wires from coils. (Figure 6)
13. Cut rewind starter rope at starter handle and release rewind spring tension.
14. Remove 6 nuts which secure powerhead assembly to drive shaft housing.

IMPORTANT: To prevent tearing the gasket (located between the bottom cowl and the drive shaft housing) when removing the powerhead assembly, be careful to lift powerhead straight up. Also, if the crankshaft and drive shaft splines bind and do not separate smoothly, it is possible for the drive shaft to pull up/out of gear housing and disengage the water pump impeller key.

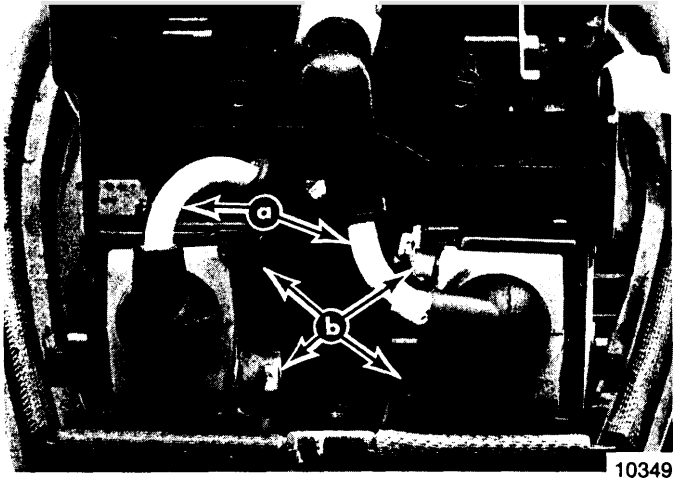

Figure 6. Rear View of Merc 40

a - Spark Plug Leads (2) b - Coil Primary Wires (4)

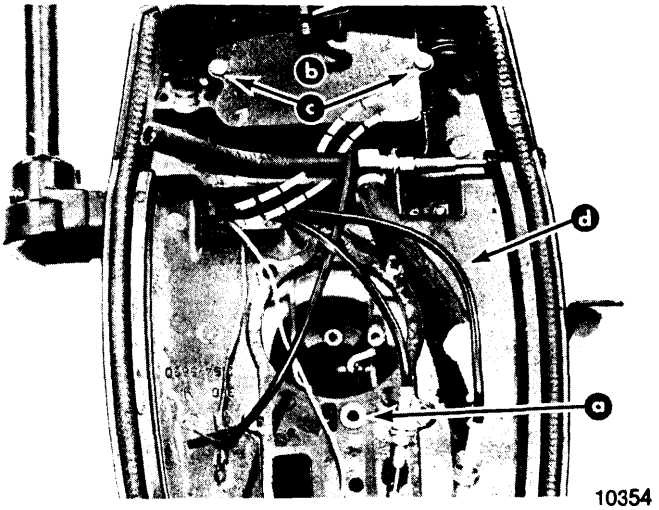

Figure 7. Powerhead Assembly Removed

a - Plastic Water Tube Seal c - Cover Screws (2)
b - Bottom Cowl Cover d - No. 2 Throttle Cable

15. Pry up on powerhead assembly to break gasket (powerhead to bottom cowl) and remove powerhead assembly from lower unit.

IMPORTANT: Check drive shaft height to determine if shaft has pulled up/out of gear housing.

- Place a straight edge across lower cowl and measure distance to top end of drive shaft.
- Push down on drive shaft to make sure that shaft is bottomed out in gear housing.
- If drive shaft moves downward more than 1/4" (6.4mm), it will be necessary to remove gear housing assembly and reinstall water pump impeller key.

16. Remove and retain white plastic water tube seal (Figure 7) to prevent dropping it into lower unit.

Choke Cable Removal

1. Remove bottom cowl cover (2 screws). (Figure 7)
2. Pull choke out, hold inner steel shaft and remove choke knob by turning knob counterclockwise.
3. Hold choke cable assembly (inside bottom cowl) and remove cable retaining nut. (Figure 8)
4. Remove choke cable assembly from bottom cowl.

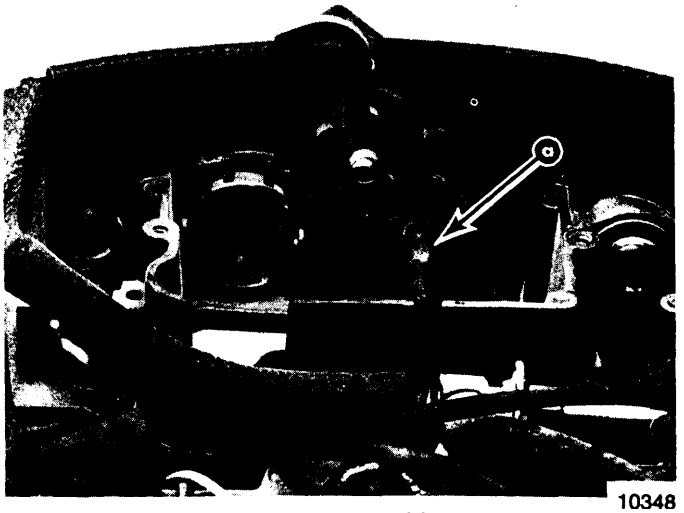

Figure 8. Bottom Cowl Cover Removed

a - Choke Cable

Return Components

Tag the powerhead assembly with the engine serial number and carefully package the following components (Figure 9) for return to your branch or distributor:

1. Powerhead assembly complete
   As removed from lower unit, LESS spark plugs.
2. Fuel tank and fuel cap assembly
   Make sure that tank is drained and blown dry with compressed air.
3. Fuel tank strap (2 pieces)
   If plastic, discard.
4. Choke cable -assembly, including choke knob

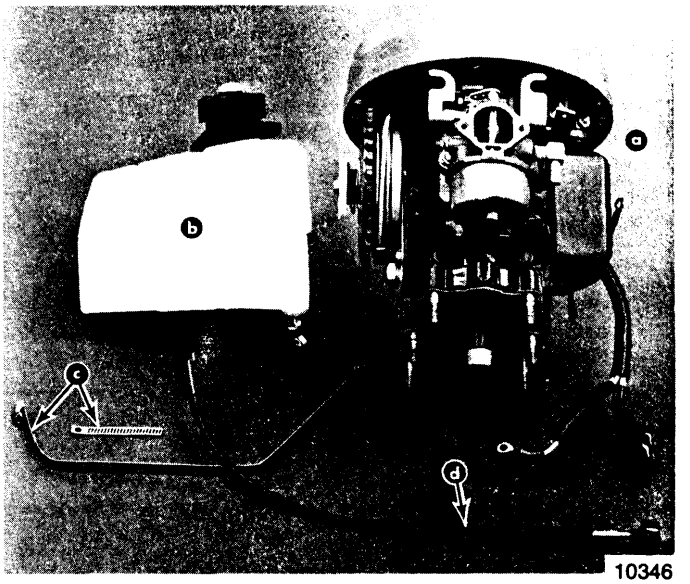

Figure 9. Return Components

a - Powerhead Assembly Complete
b - Fuel Tank and Cap Assembly
c - Fuel Tank Strap (2 Pieces)
d - Choke Cable Assembly Complete

Reassembly

1. Clean powerhead gasket from bottom cowl.
2. Using your fingernail or a plastic scraper, remove "Starter/Choke" decal (Figure 1) from bottom cowl.
3. Remove and discard small plastic plug (Figure 1) from bottom cowl.
4. Clean the front of the bottom cowl to remove any oil or grease and install 3 new decals (supplied "Idle Mixture", "Cold/Run", "Choke") in position, as own in Figure 10.
5. Clean the decal on the twist grip steering handle to remove any oil or grease and install new twist grip decal (supplied) over original decal, aligning decal to give same position indication.
6. Reinstall white plastic water tube seal (Figure 7) in position on top of water tube.
7. Place new powerhead gasket (supplied) on powerhead and install powerhead assembly on lower unit. Secure with 6 nuts, torqued to 80 in. lbs. (92kg-cm).

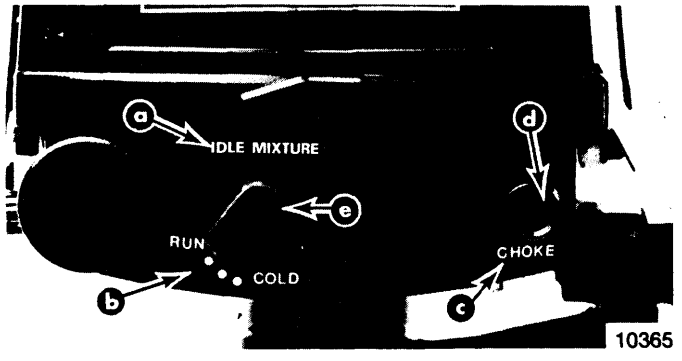

Figure 10. Front View of Merc 40

a - Position - Idle Mixture Decal
b - Position - Cold/Run Decal
c - Position - Choke Decal
d - Choke Knob
e - Remote Idle Mixture Knob

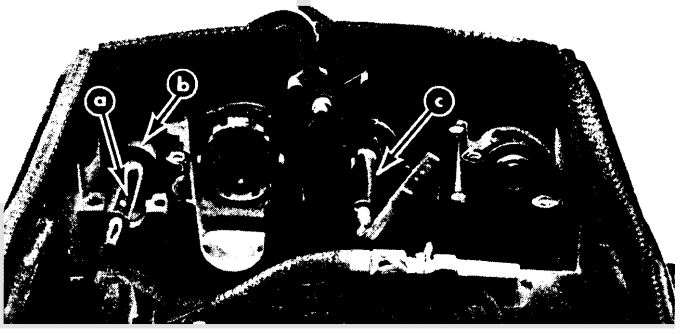

Figure 11. Choke Cable and Idle Mixture Linkage

a - Choke Cable **b - Inner (Shoulder) Spacer**
c - Remote Idle Mixture Linkage

8. Install new choke cable assembly (supplied).
   a. Insert cable core wire into inner hole (hole closest to shaft) of carburetor choke shaft. (Figure 3)
   b. Loosely attach cable retaining clip to mounting bracket. (Figure 3)
   c. Remove choke knob, plastic nut and outer spacer from cable. With inner (shoulder) spacer on cable, insert cable thru hole from inside of cowl. (Figures 10 and 11)
   d. Install outer spacer over cable and secure cable in cowl with plastic nut.

   NOTE: Make sure that cable has a free routing and has not become twisted.

   e. Secure cable retaining clip (attached in Step "b").
   f. Install choke knob.
9. Install remote idle mixture linkage (supplied).
   a. Insert partially assembled shaft thru hole from inside cowl. (Figure 11)
   b. Install plastic nut and secure shaft assembly in cowl.

   NOTE: Small jam nut should be just loose enough to allow steel shafi to rotate freely inside the plastic housing.

c. Thread remote idle knob onto steel shaft until tight, then back knob off one turn.
d. Turn the steel shaft counterclockwise (viewed from front of engine) as far as travel permits ("L" lever inside cowl now will be in a horizontal position and parallel with the fuel shut-off line).
e. Hold remote idle knob in "cold" position (Figure 10) and tighten jam nut against the knob.

10. Reinstall bottom cowl cover (2 screws). (Figure 7)
11. Connect coil primary lead wires.

IMPORTANT: Coil primary lead wires on coils and spark plug leads on spark plugs now will be REVERSED from original installation. (Figure 12)

a. Viewed from the rear of the engine, connect green primary wires to left coil and blue primary wires to right coil. (White stripe wires are connected to negative (-) coil terminals.)
b. Slip rubber boots over terminals.

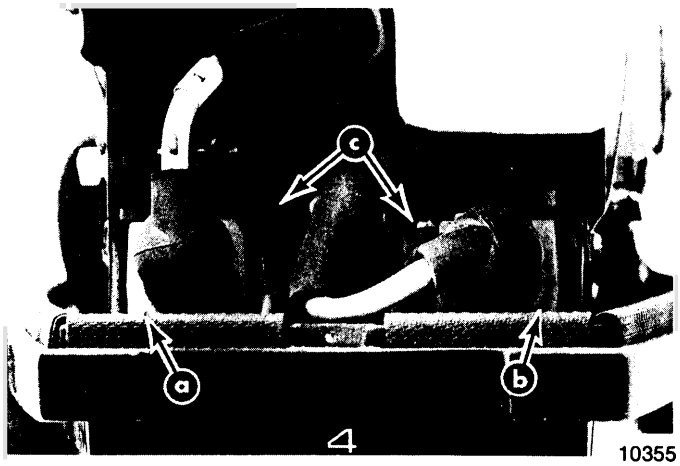

Figure 12. Rear View of Merc 40
a - Left Coil (No. 1 Cylinder)
b - Right Coil (No. 2 Cylinder)
c - Coil Primary Wires (2 Not Shown)

12. Secure primary wire harness to fuel tank support bracket with sta-strap thru hole in support bracket. (Figure 4)
13. Regap spark plugs at .050" (1.27mm) and install spark plugs in cylinder block. Torque to 20 ft. lbs. (277mkg).
14. Install spark plug lead from left coil to No. 1 (top) cylinder and right coil lead to No. 2 (bottom) cylinder.

NOTE: If No. 1 sparkplug lead is identified by either a "tape flag" or No. 1 sleeve, it will be necessary to switch the spark plug leads in the coils.

15. Install rewind starter handle and adjust return spring tension.
a. Insert rope thru hole in cowl and slip starter handle on rope.
b. Tie a double loop knot in the end of the rope and install starter handle cap (supplied).
c. Adjust return spring tension by looping the rope counterclockwise around the starter sheave (as indicated by arrow in Figure 5) between the starter pinion and flywheel and inside the rope guide at the bottom of the sheave.

IMPORTANT: Return spring tension should be just enough to assure that rope rewinds freely and that starter handle returns snugly against cowl. Applying excessive spring tension can cause the return spring to bind and result in damage to the starter assembly.

16. Install fuel tank assembly and in-line fuel filter. (Figures 4 and 5)
a. Position fuel tank assembly (supplied) on engine and secure with 2 piece steel mounting strap provided.

NOTE: If original strap was plastic, drill 2 holes in tank mounting bracket to accept self-tapping screws (supplied).

b. Install in-line fuel filter (supplied, large end of filter toward fuel shut-off valve). Secure fuel line on both ends of filter with sta-straps (supplied).

17. Install fuel line on carburetor and secure with sta-strap (supplied). (Figure 4)
18. Install orange stop wire, orange switch box wire and yellow stator wire on switch box. (Figure 4)
19. Install 2 black ground wires on cylinder block. (Figure 4)

NOTE: Make certain that trigger leads (Figure 4) are positioned down (behind switch box) to prevent rubbing on flywheel.

Preliminary Setup

1. Install cable No. 1 (Figures 3 and 4) and adjust cable so that approximately 6 threads [1/4" (6.4mm)] are exposed, as shown in Figure 4. Tighten jam nuts.

IMPORTANT: No. 2 cable (Figures 3 and 7) must be routed under fuel line as indicated by dotted lines in Figure 7.

2. Install No. 2 cable. (Figure 3) With both jam nuts loose and twist grip held against idle stop, pull on outer cable to remove all cable slack, then tighten jam nuts.
3. With twist grip held against idle stop, position throttle cam (Figure 13) for approximately .020" (.51mm) clearance between the cam and throttle lever pin.
4. With twist grip held against idle stop and both jam nuts loose on trigger link rod (Figure 4), pull trigger forward against the stop (maximum retard). Tighten jam nuts.

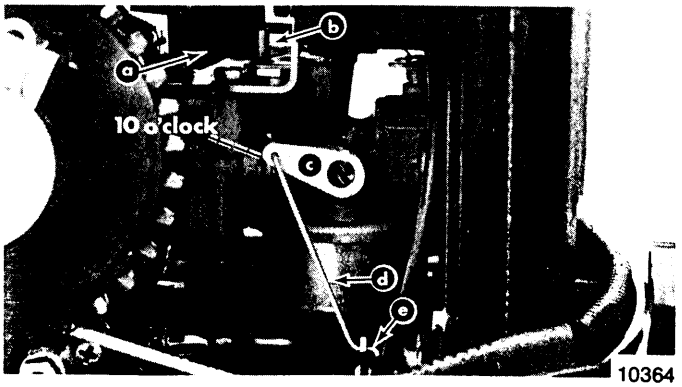

Figure 13. Right Side View of Carburetor Assembly
a - Throttle Cam
b - Throttle Lever Pin
c - Remote Idle Lever
d - Wire Link Rod
e - Bend Rod End To Secure

5. Set the carburetor idle mixture screw at 1-1/2 turns from seat. (Figure 5)
6. Remove and discard check valve fitting (located at bottom of sound box). Install pipe plug (supplied) in place of fitting.
7. Install sound box and sound box cover. (Figures 1 and 2)

Timing and Testing

1. Fill tank with fuel.
2. Open fuel shutoff valve and air vent screw on fuel cap. (Figure 5)
3. Connect timing light (No. 1 - top cylinder) and tachometer to engine.

   IMPORTANT: Immediately after starting engine, make certain that water pump is operating (check for water discharge from exhaust relief holes at rear of drive shaft housing).

4. Start engine, shift into forward gear and run at 1/2-throttle for approximately 5 minutes to warm up engine.
5. Set idle timing.
   a. With engine in gear and running at 1000-1500 RPM, observe ignition timing and quickly close throttle against the idle stop. The timing will fully retard to approximately 18°-20° ATDC but then will advance slightly (14"-16" ATDC) as the idle speed approaches 600 RPM.

   NOTE: This automatic advance characteristic is designed to maintain and stabilize idle speed.

   b. Adjust trigger link rod (Figure 4) to set idle timing at 2" below the advanced reading which is obtained as idle speed approaches 600 RPM.

   EXAMPLE: Timing fully retards to 18" ATDC as throttle is closed - advances to 15° ATDC at 600 RPM = Set idle timing at 17" ATDC.

6. Run engine at wide open throttle (WOT) and set maximum spark advance screw for 22"-24" BTDC maximum ignition timing.
7. Adjust throttle cam (if necessary) to contact throttle lever pin at 14° ± 2" ATDC. (Figure 13)
8. Adjust idle mixture screw for best idle with engine in gear. (Figure 5)

   NOTE: Engine responds very slowly to changes in idle mixture adjustment when at slowest idle (twist grip against idle stop).

   a. Pre-set idle mixture with engine speed at approximately 1000 RPM, where response to adjustment is more rapid.
   b. Rotate twist grip against idle stop (slowest idle) and readjust mixture, if necessary.
9. Install remote idle lever (supplied) on idle mixture screw. (Figure 13)
   a. After obtaining best idle, press remote idle lever (supplied) onto idle mixture screw at approximate 10 o'clock position.
   b. Turn remote idle mixture knob to "Run" position (Figure 10) and install wire link rod (supplied) between remote idle lever on carburetor and remote idle "L" shaft ("Z" bend end of link rod to lever on carburetor). After inserting wire link rod thru hole in "L" shaft. bend link rod end, as necessary, to prevent it from unhooking.
10. Install top cowl.

Customer Delivery

A new "Operation and Maintenance Manual" (reflecting engine operating changes) is supplied for owner benefit. Familiarize yourself with the following important points and advise owners accordingly:

1. Revised engine break-in procedure.
   a. New engine break-in IS REQUIRED.
   b. Standard 50:1 fuel mixture ratio during break-in (25:1 ratio no longer required).
   c. Shorter break-in period.
2. Starting and operating procedure: Proper use of remote idle mixture adjustment.
3. Fuel filter maintenance: Cleaning and/or replacement.

SERVICE BULLETIN Supplement

Attach This Supplement (as Page 7) to Outboard Service Bulletin NO.77-5, Dated 1/19/77, (Merc 40 - Improvement Program).

Early reports, concerning removal of the Merc 40 powerhead assembly (for the Improvement Program), indicate that in many instances the gasket between the bottom cowl and the drive shaft housing will tear when the powerhead is removed (see "IMPORTANT" following Step No. 14, Page 3).

In view of this development, we have added this gasket -- PLUS some shift linkage components -- to the replacement powerhead package. The shift linkage components include a new design horizontal shift shaft and O-ring which will prevent water from seeping out of the drive shaft housing via the shift shaft.

Labor allowance for the program has been increased to 2.5 hrs. per outboard (mark this change on bottom of Page 1 of Service Bulletin *77-5).*

Depending upon whether or not the gasket between the cowl and drive shaft housing has broken, select the appropriate repair procedure, following, and install the new shift linkage components before starting "Reassembly" (outlined on Page **4).**

BROKEN GASKET - Repair Procedure

1. Remove shift handle (one screw).

   NOTE: Use a Phillips tip that is in good condition. If screw head strips, it will be necessary to saw the handle off.

2. Remove trim cover (6 screws) from underside of bottom cowl.
3. Remove the shift arm stop from the outer end of the shaft.
4. Remove jam nuts and washers from throttle cables.
5. Lift up on cowl and disconnect the water tube. Lift the cowl off to the side while feeding the cables and wires thru the hole in the cowl.

   NOTE: If the water tube pulls up/out of the gear housing,it can be reinstalled from the top with the aid of a flashlight.

6. Clean the gasket from the underside of the bottom cowl and from the drive shaft housing.
7. Loosen set screw in shift arm (inside drive shaft housing) and remove horizontal shift shaft. Retain both shaft bushings for reuse. Discard the shaft and cam assembly.
8. Assemble the shift cam and roll pin on the new horizontal shift shaft and install O-ring on shift shaft (parts supplied).
9. Install new horizontal shift shaft in drive shaft housing.
10. Place new gasket in position and reinstall bottom cowl while feeding cables, wires and protector sleeve thru hole in cowl. Reinstall jam nuts and washers on cables.
11. Make certain that water tube is properly connected on both ends and positioned between the vertical shift shaft and housing (toward the shift handle side).
12. Reassemble and connect shift linkage. Use new components (supplied) where necessary.
13. Place shift arm stop in position on horizontal shift shaft and reinstall trim cover (6 screws).
14. Reinstall shift handle, using Loctite Type "A" (C-92-32609) on screw threads.

GASKET NOT BROKEN - Repair Procedure

1. Remove shift handle (one screw).

   NOTE: Use a Phillips tip that is in good condition. If screw head strips, it will be necessary to saw the handle off.

2. Remove trim cover (6 screws) from underside of bottom cowl.
3. Remove the shift arm stop from the outer end of the shaft.
4. Loosen set screw in shift arm (inside drive shaft housing) and remove horizontal shift shaft. Retain both shaft bushings for reuse. Discard the shaft and cam assembly.
5. Assemble the shift cam and roll pin on the new horizontal shift shaft and install O-ring on shift shaft (parts supplied).
6. Install new horizontal shift shaft in drive shaft housing.
7. Reassemble and connect shift linkage. Use new components (supplied) where necessary.
8. Place shift arm stop in position on horizontal shift shaft and reinstall trim cover (6 screws).
9. Reinstall shift handle, using Loctite Type "A" (C-92-32609) on screw threads.