MerCruiser

STERN DRIVES/INBOARD ENGINES

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CIRCULATE TO:
SERVICE MANAGER
PARTS MANAGER
MECHANICS

A. Checking Stern Drive Unit Seawater Pickup Pump Output - MerCruiser I Stern Drives
B. Insufficient Water Flow From MC-I Drive Unit Seawater Pickup Pump Troubleshooting Chart
C. MC-I Drive Shaft Housing Water Passage Improperly Drilled

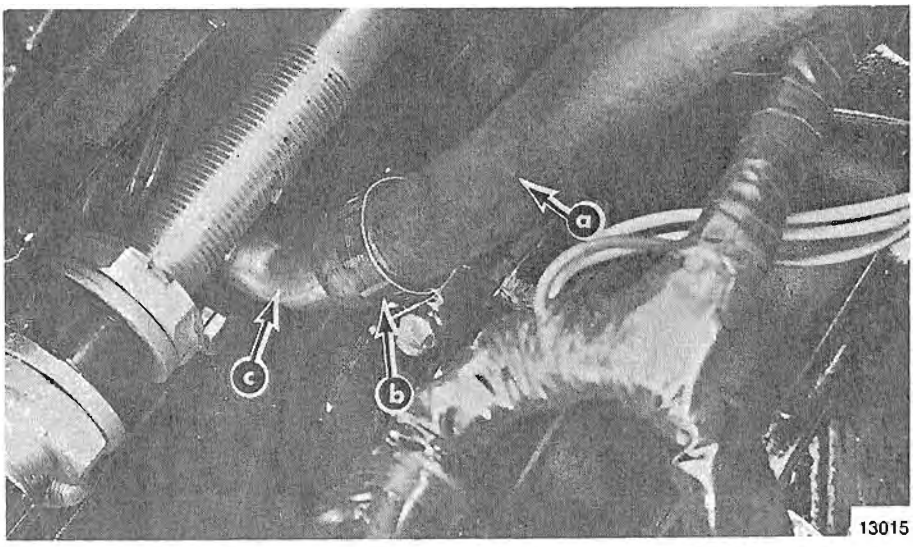
A. CHECKING STERN DRIVE UNIT SEAWATER PICKUP PUMP OUTPUT - MERCRUISER I STERN DRIVES

The following test can be used when troubleshooting an overheating condition to determine if cause is due to insufficient water flow from seawater pickup pump in drive unit.

IMPORTANT: The following information should be observed before proceeding with test:

- **BOAT MUST BE IN THE WATER FOR THIS TEST. This test CANNOT BE performed with a flush-test device and a water hose.**
- **The ability of this test to detect a problem is greatly dependent upon the accuracy in which it is performed. An error in setting the engine RPM, timing the test or measuring the water output will affect the overall accuracy of the test and may produce misleading results. To help ensure accurate results, a shop tachometer with an error of less than 5% should be used. The boat tachometer definitely should not be used as its accuracy is questionable. A stop watch should be used to time the duration of the test to help ensure that the accuracy is maintained within 1 second. A 6 quart (or larger) capacity container calibrated in ¼ quart increments should be used to measure water output.**
- **Due to the manner in which this test is performed, it may not be possible to detect a marginal condition or a high-speed water pump output problem. If test results are questionable or if adequate output is indicated but cause for overheating condition cannot be found, refer to the troubleshooting chart, following, and check the items indicated.**

1. Remove water inlet hose, which runs between gimbal housing water tube and engine (Figure 1), and replace with another hose of same diameter, but approximately 3 ft. (91.4cm) longer. Hose should be wire reinforced or of adequate wall thickness to prevent it from kinking when performing test. Clamp hose at gimbal housing water tube only. Do not clamp hose at engine end.



a - Water Inlet Hose
b - Hose Clamp
c - Gimbal Housing Water Tube

Figure 1. Water Inlet Hose (Typical)

2. Place a 6 quart (5.7 liter) or larger container near unclamped end of hose.

CAUTION: Do not run engine for more than 15 seconds with hose disconnected, in next step, as internal damage to engine and exhaust system may result.

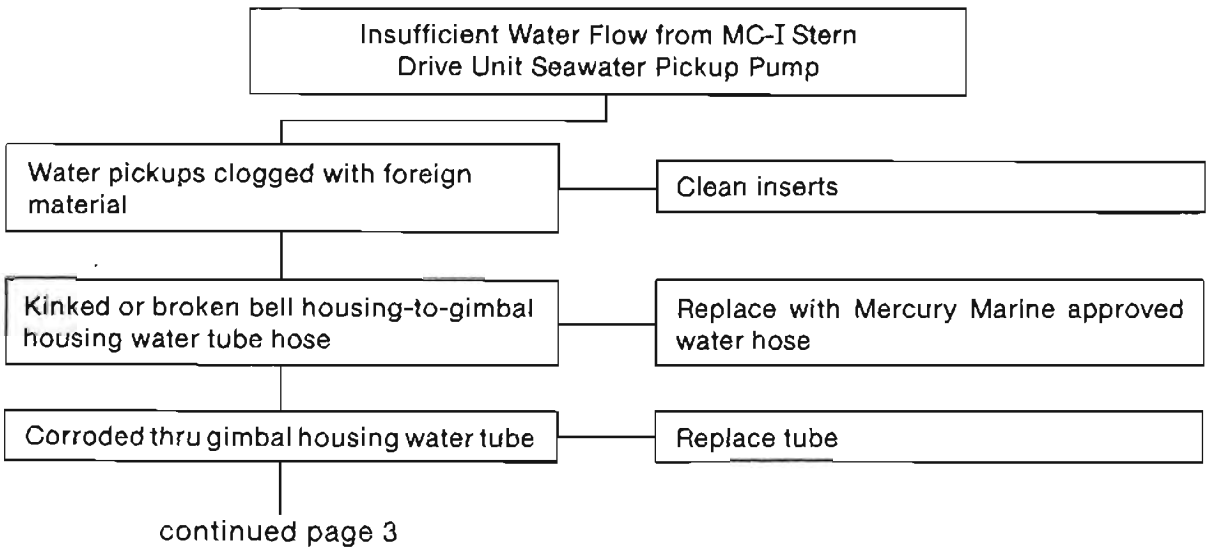
3. With the assistance of another person, start engine and adjust speed to exactly 1000 RPM, while holding unclamped end of hose on connection on engine. Remove hose from connection on engine and direct water flow into container for EXACTLY 15 seconds. At the end of 15 seconds, direct the water flow overboard, return engine to idle and stop engine. Reconnect hose to engine.
4. Measure quantity of water discharged into container and compare with specifications given in chart below.

MINIMUM PUMP OUTPUT FOR 15 SECOND PERIOD	
Drive Unit Gear Ratio	**Minimum Quantity**
1.98:1	3.0 Qts. (2.8 liters)
1.84:1	3.3 Qts. (3.1 liters)
1.65:1	3.6 Qts. (3.4 liters)
1.50:1	4.0 Qts. (3.8 liters)
1.32:1	4.5 Qts. (4.3 liters)

5. Repeat test 4 times to check repeatability of results.
6. If output is insufficient, refer to troubleshooting chart, following.

B. INSUFFICIENT WATER FLOW FROM MC-I STERN DRIVE UNIT SEAWATER PICKUP PUMP TROUBLESHOOTING CHART

The following troubleshooting chart should be of assistance when troubleshooting an overheating condition due to insufficient water flow from seawater pickup pump in drive unit. Possible causes are arranged by those which are easiest to check to those which are most difficult.



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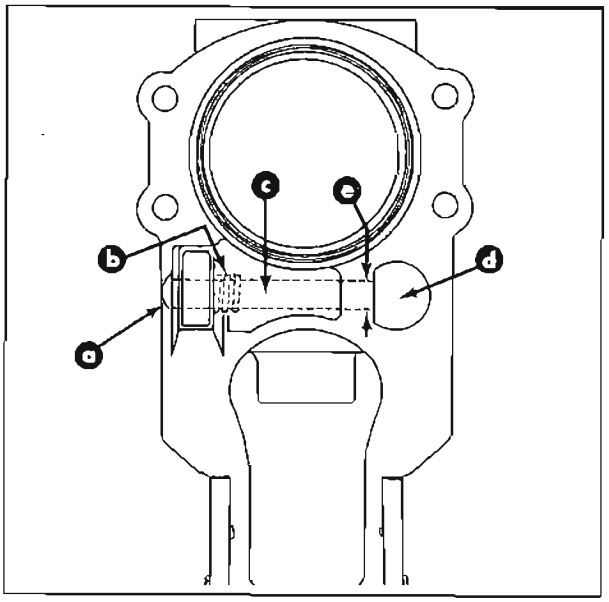
Water pickup inserts warped. (Engine will overheat while boat is underway only.)	Repair as necessary. (Refer to Service Bulletin 77-5.)
	NOTE: Pickup inserts must not protrude above gear housing surface or inserts will create an irregular or turbulent water flow over the water pickup holes. Consequently, this may cause loss of cooling water and subsequent engine overheating. This condition also can be identified by cavitation burn (pitting, erosion) on the gear housing in the area aft of the water pickup inserts.
Damaged gear housing or accessories improperly installed on boat bottom or transom (speedometer pickup, depth sounder transducer, etc.). Substantial amount of barnacles or other marine growth on gear housing or boat bottom. (Engine will overheat while underway only.)	Repair or clean as necessary.
	NOTE: An object or an irregularity on boat or gear housing in area close to water pickups could create turbulence in water flow going to water pickups. This could aerate the water flow and cause engine to overheat.
Stern drive installed too high on transom or drive unit trimmed too far out allowing air to be drawin into pump. (Engine will overheat while underway only.)	Contact boat company if stern drive is installed too high. Instruct operator on proper trimming technique if unit is trimmed out too far.
Bell housing-to-drive shaft housing "O" ring missing or damaged	Replace "O" ring.
Faulty seawater pickup pump	Repair pump as required.
Seawater pickup pump water tube corroded thru	Replace tube.
Drive shaft housing water pocket cover cracked	Replace cover.
Broken-off impeller blade or other obstruction in water passages (usually lodges in drive shaft housing water pocket cover or cross-drilled water passage).	Remove obstruction.
	NOTE: To check cross-drilled water passage in drive shaft housing, remove welch plug and pipe plug located under decal on starboard side of housing. Drive unit must be shifted into reverse to remove pipe plug.
Water passage in drive shaft housing improperly drilled	Check passage and redrill, if necessary, as explained following.

C. MC-I DRIVE SHAFT HOUSING WATER PASSAGE IMPROPERLY DRILLED

If troubleshooting an otherwise unexplainable overheating condition, problem may be due to an improperly cross-drilled water passage in drive shaft housing. (Figure 2) A few cases have been reported where the drill was not run far enough into the water passage during the machining operation at the factory. Only the tip of the drill penetrated thru the casting at the end of the water passage, leaving a ¼" to ⅜" (6.4mm to 9.5mm) diameter hole [instead of a .580" (14.7mm) diameter hole] at end of passage. This restricted water flow sufficiently to cause engine to overheat.

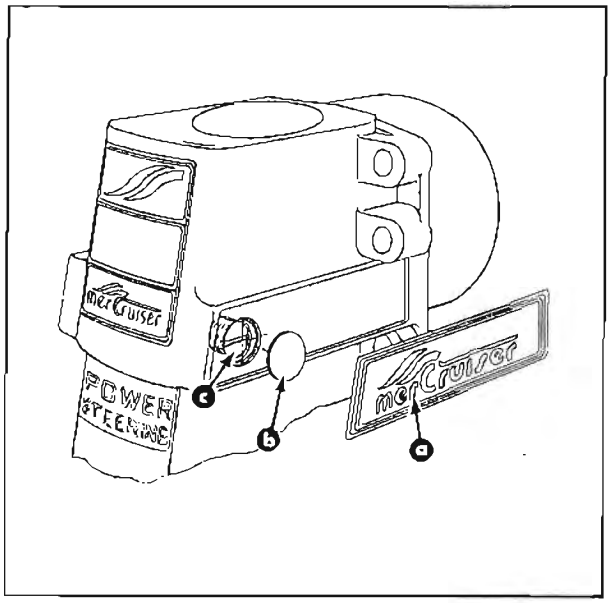
To check cross-drilled water passage, remove stern drive unit and inspect passage thru water cavity on port (left) side of drive shaft housing (Figure 2), using a flashlight. Water passage should be approximately ½" (12.7mm) in diameter. If not, proceed as follows:

1. Remove decal from starboard (right) side of drive shaft housing and remove welch plug (under decal). (Figure 3)
2. Apply heat to water passage pipe plug (Figure 3) and remove plug with a large blade screwdriver.
3. Drill out material at end of water passage, using a 9/16" (14mm) diameter drill bit.
4. Clean threads in drive shaft housing with a ⅜" x 18 NPTF tap. Clean old sealer from pipe plug with a wire brush.
5. Apply Perfect Seal (92-34227) to threads of pipe plug and thread into drive shaft housing. PIPE PLUG MUST BE INSTALLED FLUSH OR SLIGHTLY INDENTED INTO INNER SURFACE OF DRIVE SHAFT HOUSING TO PREVENT INTERFERENCE WITH SHIFTING SLIDE ASSEMBLY.
6. Apply Loctite "A" (92-32609) to outer diameter of NEW welch plug (19-32562). Place plug in drive shaft housing and flatten, using a hammer and suitable driver.
7. Install a new decal.
8. Reinstall stern drive unit.



a - Welch Plug
b - Pipe Plug
c - Water Passage
d - Inspect Water Passage Thru This Cavity
e - Passage MUST BE .580" (14.7mm) In Diameter

Figure 2. Drive Shaft Housing Cross-Drilled Water Passage



a - Decal
b - Welch Plug
c - Pipe Plug

Figure 3. Cross-Drilled Water Passage Pipe Plug