Fig. 26 Latches on E-Tec cases such as this pop out slightly, then rotate

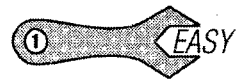
Fig. 27 Locate and remove the external cover bolts. . .

disconnected in order to remove the lower case(s) completely from the outboard. But, most models are equipped with removable panels or covers that allow most lines and wiring to remain connected and intact. Many lower cover designs utilize cutouts at the cover split-lines through which cables are passed.

⁂ WARNING

It is especially important that you take note how each hose and wire is routed before disconnecting or moving them during service. Unless the person who worked on the motor previously made a mistake (which could cause damage and the need for repairs), all hoses and wires should already be routed in a manner that will prevent interference with and damage from moving components. Unless there are signs of damage from contact with components wires and hoses should be returned to the exact same positions as noted during disassembly. Don't be afraid to grab a digital camera and take pictures as you're disassembling. If you are unsure how a wire or hose was routed, work slowly, checking the positioning as the covers are installed to prevent damage.

40-90 Hp E-Tec Motors



◆ See Figures 26 thru 30

1. Disconnect the negative battery cable for safety.
2. Release the top cover latches, then carefully lift the cover from the outboard. If equipped, make sure the top cover seal remains in the groove.

■ **When the top cover is removed, be sure to perform a quick visual check of the seal and replace the seal if it is damaged or worn beyond use.**

3. If necessary on 75-90 hp motors, loosen the thumbscrews and remove the air intake silencer assembly for access.
4. Locate and remove the 6-7 bolts from the perimeter of the port side cover, as well as the single bolt in the top side, aft portion of the cover.

■ **There are usually 3 external bolts (on the outside of each cover) at the front, and three more at the rear securing the lower cover halves, but, check the covers carefully before attempting to separate them. Some covers may have 4 external bolts at the front of the cover. If the covers seem unwilling to separate, make sure that there are no additional fasteners either around the perimeter or inside the cover.**

5. Carefully pull the port cover outward JUST barely free of the mounting grommets for access to the PTT wiring.
6. Note the wire positioning/routing, then tag and disconnect the power trim/tilt wiring connector, then completely remove the port and starboard covers from the motor.

■ **The lower covers contain various flange seals. Make sure all seals are in good condition or replace them before reinstallation.**

7. Installation is essentially the reverse of the removal, but positioning the covers with the wiring, hoses and cables can sometimes be a bit of a bugger. If you follow this sequence closely you shouldn't have too much trouble

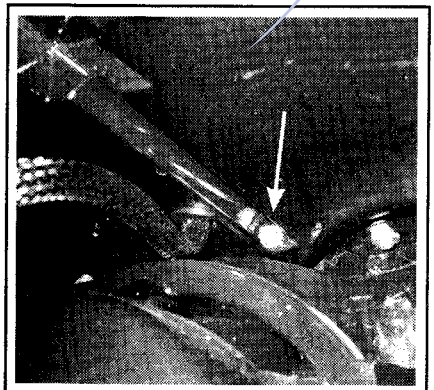


Fig. 28 . . .some are tucked underneath the front of the motor. . .

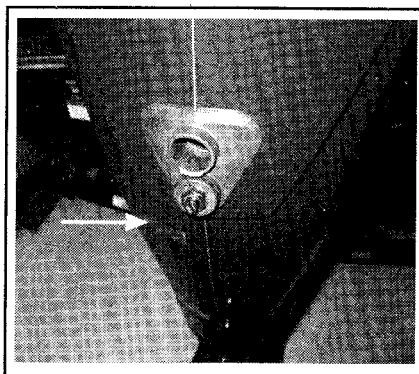


Fig. 29 . . .while others are in a groove at the rear

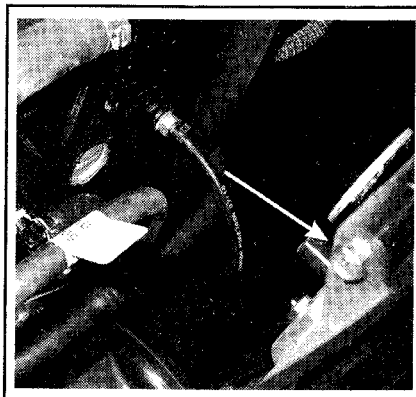


Fig. 30 Don't forget the bolt in inside the covers, at the top rear

■ **During installation, make sure all hoses and wiring are positioned as noted during removal to prevent any pinching or damage by the covers themselves or by other moving parts once the motor is returned to service.**

8. Position the starboard cover to the motor, routing the fuel hose and batter cable through the grommet notch. This will help position the cover and hold it in place as you work.
9. Inert the trim cable grommet into the port side cover.
10. Engage the PTT connector, the tuck the wires.

■ **It is sometimes easier to tuck bundle the wiring harness together RIGHT below the starter and in front of the capacitor.**

11. Place the port side cover in position on the outboard, then start the retaining screw JUST above the exhaust relief grommet. Tighten it ONLY enough to hold the grommet in place.
12. Move to the top front screw and thread it in position, tightening it ONLY enough to draw the cover halves together in front of the motor.
13. Install the remaining cover screws finger-tight, then tighten all of the screws to 24-36 inch lbs. (3-4 Nm).

✳✳ CAUTION

Always tighten the retaining bolts securely, but be careful not to over-tighten and crack the delicate covers.

14. On 75-90 hp motors, if removed, install the air intake silencer assembly.
15. Reconnect the negative battery cable.

75-175 Hp DI V4/V6 Motors

EASY

◆ **See Figures 23, 24, 25 and 31 thru 40**

1. Disconnect the negative battery cable for safety.
2. Release the top cover latches, then carefully lift the cover from the outboard. Make sure the top cover seal remains in the groove on the top cover.

■ **Whenever the top cover is removed, be sure to perform a quick visual check of the seal and replace the seal if it is damaged or worn beyond use.**

3. Loosen and remove the 3 screws fastening the cable entry cover to the front corner of the starboard side lower cover. Remove the cover for access to the fuel and oil hoses.

■ **Be sure to take note of the fuel and oil hose positioning before removing them from the bracket.**

4. Remove the fuel and oil [illegible]es from the rubber grommet.
5. Note the harness pos[illegible]n, then disengage the power trim/tilt wiring connector.

■ **The cover bolts [illegible] different lengths, keep the bolts sorted as they are [illegible] order to prevent difficulty during installation. Al[illegible]y[illegible]nt smaller, thin walled sockets for access to most of the b[illegible]. T[illegible]olts found inside the cover can be turned using a wrenc[illegible]U-joint and wobble adaptor on a normal 3/8 or 1/4 in. dri[illegible]chet.**

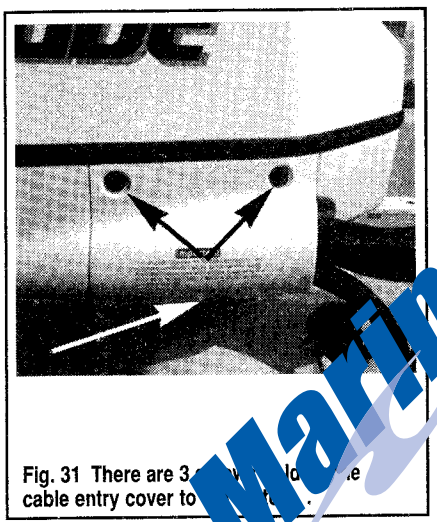


Fig. 31 There are 3 [illegible] cable entry cover to [illegible]

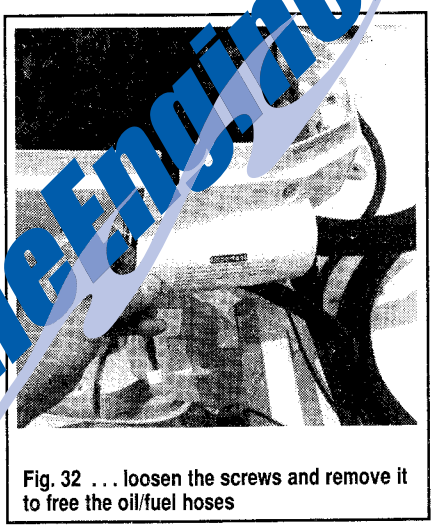


Fig. 32 . . . loosen the screws and remove it to free the oil/fuel hoses

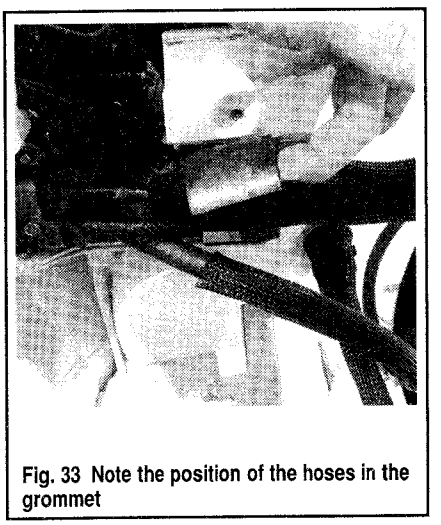


Fig. 33 Note the position of the hoses in the grommet

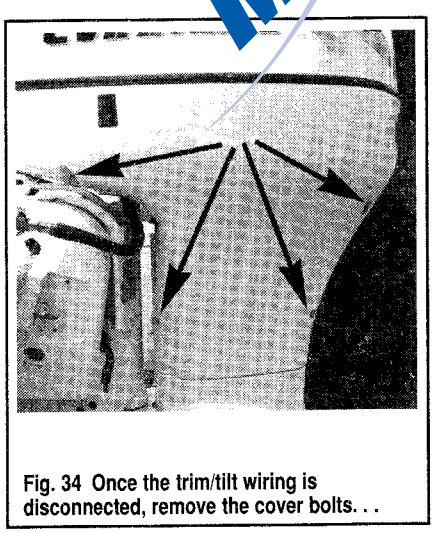


Fig. 34 Once the trim/tilt wiring is disconnected, remove the cover bolts. . .

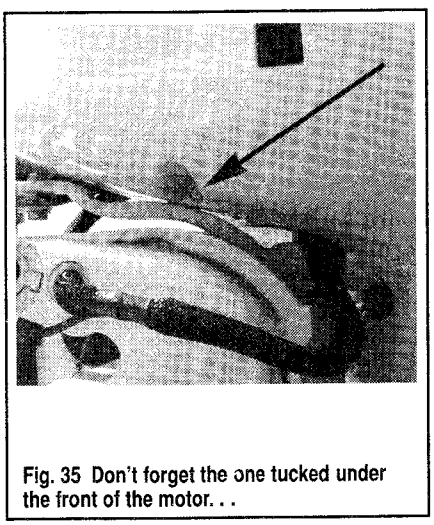


Fig. 35 Don't forget the one tucked under the front of the motor. . .

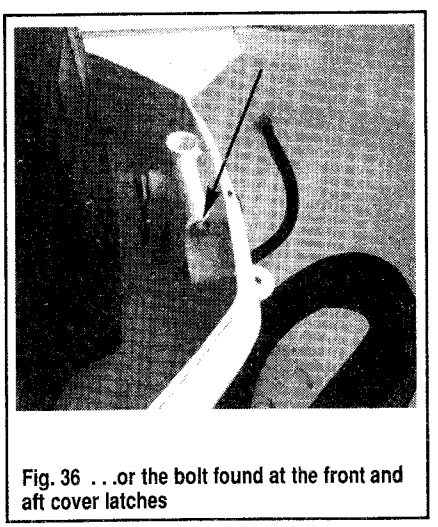


Fig. 36 . . .or the bolt found at the front and aft cover latches

will absorb water. The water/alcohol settles to the bottom of the tank, promoting rust (in metal tanks) and leaving a non-combustible mixture at the bottom of a tank that could leave a boater stranded.

One of the first steps to fuel system troubleshooting is to make sure the fuel source is not at fault for engine performance problems. Check the fuel if the engine will not start and there is no ignition problem or Check Engine light indicating a possible control system problem. Stale or contaminated fuels will often exhibit an unusual or even unpleasant unusual odor.

■ **The best method of disposing stale fuel is through a local waste pickup service, automotive repair facility or marine dealership. But, this can be a hassle. If fuel is not too stale or too badly contaminated, it may be mixed with greater amounts of fresh fuel and used to power lawn/yard equipment or even an automobile (if greatly diluted so as to prevent misfiring, unstable idle or damage to the automotive engine). But we feel that it is much less of a risk to have a lawn mower stop running because of the fuel problem than it is to have your boat motor quit or refuse to start.**

Unfortunately, on DI (FICHT) or E-Tec motors, there is not usually a dedicated drain for the high-pressure system. However, some V4 and V6 motors may be equipped with a high-pressure fuel circuit test ports (found on top of the vapor separator and/or inline on the high-pressure fuel lines). To obtain a sample of fuel from the high-pressure circuit, attach a fuel pressure gauge (equipped with a pressure bleed line) to the test fitting, then use the pressure bleed to drain a small amount of the fuel from the lines. If necessary, cycle the ignition key to run the fuel pump (with the pressure bleed closed) in order to rebuild system pressure and obtain a larger sample. Of course, if the test fitting is not present, you'll have to disconnect a high-pressure fuel line (such as the one coming from the fuel pump to the fuel manifold/injectors), then with this line directed into a suitable container (a large one with a splash guard, and perhaps while wearing safety glasses) you can cycle the ignition key to the **ON** (but not **START**) position in order to momentarily energize the fuel pump and get some fuel spray into the container.

Of course, on all motors, fuel samples can be taken from the low-pressure circuit, by simply disconnecting the fuel pump inlet hose and using the prime bulb to push out a sample.

Lastly, for some motors, it may be easier to drain a fuel sample from the hoses leading to or from the low-pressure fuel filter or fuel pump. Or, you can remove the powerhead mounted water-separating fuel filter for a sample. Removal and installation instructions for the fuel filters are located in the Maintenance Section, while fuel pump procedures are found in this section. To check for stale or contaminated fuel:

1. Disconnect the negative battery cable from the battery. Cover the end of the cable tape over the end so that it cannot accidentally contact the terminal and complete the circuit.

CAUTION

Throughout this procedure, keep sparks and flames away from the fuel to prevent a fire hazard.

2. If a fuel sample is desired from the high-pressure circuit, there are a couple of ways to go about it:

■ **Refer to Relieving Fuel System Pressure, later in this section for more details on the high-pressure circuit and use of a test port or fuel gauge.**

a. If equipped with a pressure test fitting, attach a fuel pressure gauge (equipped with a bleed hose) to the pressure test fitting, then use the pressure bleed to drain a small fuel sample.

■ **If there is insufficient fuel/pressure present to obtain the sample, close the pressure bleed and cycle the ignition switch to ON, wait for 10 seconds and turn the switch OFF again. Repeat as necessary to build system pressure and obtain a sufficient sample.**

b. If not equipped with a pressure test fitting you can disconnect the fuel outlet line somewhere between the pump and injectors/fuel manifold and either install a pressure test fitting or simply direct the open line into a shielded container, then cycle the keyswitch to run the pump and spray some fuel into the container.

3. To obtain a sample from the low pressure circuit, disconnect the fuel supply hose from the pump or low pressure fuel filter (as desired), then squeezing the fuel primer bulb to obtain a small sample of fuel. Place the sample in a clear glass container and reconnect the hose.

■ **If a sample cannot be obtained from the fuel filter or pump supply hose, there is a problem with the fuel tank-to-motor fuel circuit. Check the tank, primer bulb, fuel hose, fuel pump, fitting or inlet needle on carbureted models.**

4. Check the appearance and odor of the fuel. An unusual smell, signs of visible debris or a cloudy appearance (or even the obvious presence of water) points to a fuel that should be replaced.

5. If contaminated fuel is found, drain the fuel system and dispose of the fuel in a responsible manner, then clean the entire fuel system. To drain the high-pressure circuit it's probably best to attach a pressure gauge with a bleed hose, then cycle the keyswitch using the high-pressure pump to empty the vapor separator tank through the open bleed hose.

■ **If debris is found in the fuel system, clean and/or replace all fuel filters.**

6. When finished, reconnect the negative battery cable, then properly pressurize the fuel system and check for leaks.

Fig. 2 Commercial additives, such as Sta-bil®, may be used to help prevent "sourin

Fuel System Pressurization

GENERAL

When it comes to safety and outboards, the condition of the fuel system is of the utmost importance. The system must be checked for signs of damage or leakage with every use and checked, especially carefully when portions of the system have been opened for service.

The best method to check the fuel system is to visually inspect the lines, hoses and fittings once the system has been properly pressurized.

Furthermore, injected motors are equipped with two inter-related fuel circuits, a low-pressure circuit that is similar to the circuit that feeds carburetors on other motors and a high-pressure circuit that feeds the fuel injection system. As its name implies, the high-pressure circuit contains fuel under pressure that, if given the chance, will spray from a damaged/loose hose or fitting. When servicing components of the high pressure system, the fuel pressure must first be relieved in a safe and controlled manner to help avoid the potential explosive and dangerous conditions that would result from simply opening a fitting and allowing fuel to spray uncontrolled into the work area.

RELIEVING FUEL SYSTEM PRESSURE

OEM ② MODERATE

◆ **See Figures 3 and 4**

Before servicing the high-pressure fuel circuit or related components, including the vapor separator tank, high-pressure fuel pump, fuel injectors and/or related high-pressure lines, the pressure must be released. Failure to do so in a proper manner could lead to high pressure fuel spray, excessive concentrations of vapors and an extremely dangerous, potentially explosive condition.

Here is where we run into one of those quandaries. Prior to Bombardier we believe that ALL injected motors (FICHT) were equipped with a fuel pressure test port. However, for 2002 or later motors, it seems that it has become hit and miss. Here's what we can tell:

- 40-90 hp E-Tec motors - are not equipped with a fuel pressure test port.
- 75-175 hp DI (FICHT) and E-Tec motors - MAY or MAY NOT be equipped with a pressure test port, on the line coming out of the high-pressure fuel pump.
- 200-250 hp DI (FICHT) motors - MAY or MAY NOT be equipped with a pressure test port, again on the line coming out of the high-pressure fuel pump.
- 200-250 hp E-Tec motors - appear to contain a pressure test port, guess where? Yup, on the line coming out of the high-pressure fuel pump (port side of the motor, just above the pump, next to the separator tank).

Generally speaking, if a motor is equipped with a test port, pressure relief involves attaching a fuel gauge with a bleed line, then using the bleed line to direct fuel spray into a shielded container in order to release the pressure. IF HOWEVER there is no installed port, you've basically got to wrap a fuel line (usually the pump output line) with a rag to catch the fuel spray and carefully disconnect it.

One other trick that Bombardier mentions in only their E-Tec manuals, though we can't see why it wouldn't work on DI (FICHT) models too, is to pinch off or disconnect the low-pressure fuel supply line, then start and run the outboard for about 5 seconds (or crank it for 10 seconds if it won't start) and this should help dissipate at least some of the fuel pressure. Either way, we don't suggest running the outboard completely out of fuel, since it will still receive a portion of it's oiling from the fuel/oil mixture.

To relieve pressure from the high-pressure fuel circuit, proceed as follows:

1. If the motor has not been run in a while and the primer bulb is soft, allow it to soften, DO NOT PRIME IT.
2. For E-Tec motors (or DI/FICHT motors if you have installed a fuel pressure test port), disconnect the fuel supply line, or use a hose pinch clamp to partially restrict it (and attach a flush fitting). Crank and start the outboard and allow it to run for about 5 seconds. If it will not start, then crank the motor for about 10 seconds. This should at least lower the pressure in the high-pressure circuit.
3. Disconnect the negative battery cable for safety during service.

✳✳ WARNING

Disconnecting the negative battery cable serves 2 important safety purposes. The first is that it prevents the electric fuel pump from activating during service. This could occur is someone was to turn the ignition keyswitch to the ON position for any reason (which would result in the pump running for a few seconds, possibly spewing high-pressure fuel spray from any open fittings). The second is to prevent an accidental grounding of a hot lead during service (which would result in sparks that could ignite fuel vapors in the work area). It only takes a couple of seconds to protect yourself and your boat, so always disconnect the negative battery cable when working on fuel system components.

4. Check the top of the vapor separator tank/high-pressure fuel pump and specifically the fuel lines running either from the pump to the injectors or the return line from the injectors to the pressure tank.
   - If no fuel pressure test port is present, wrap the fuel outlet line (from the high-pressure pump) with a shop rag, then carefully press the fuel pump connector release button and slowly pull the connector off the fuel pump. Allow the shop towel to absorb and fuel spray or remaining fuel that leaks from the fitting.
   - If the motor already contains a pressure test port, connect a fuel pressure gauge (equipped with a pressure bleed valve and a drain hose) to the high-pressure fuel circuit test port. Place the drain hose into a suitable container and slowly open the bleed valve to release system pressure.

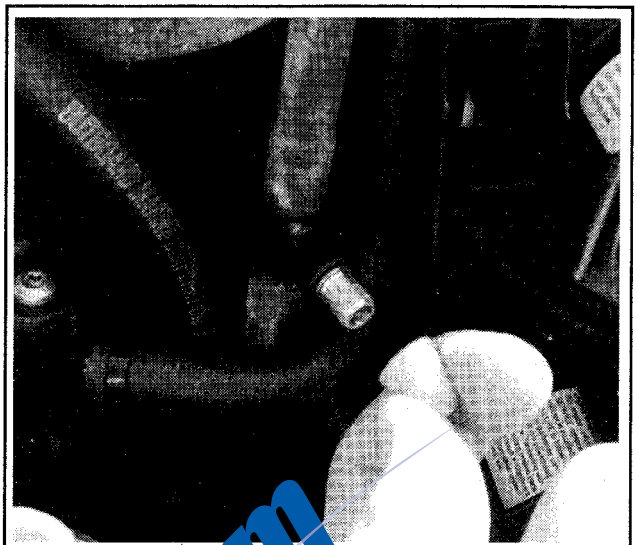


Fig. 3 When equipped, the fuel pressure test port can be used to release system pressure (or to connect a pressure gauge)

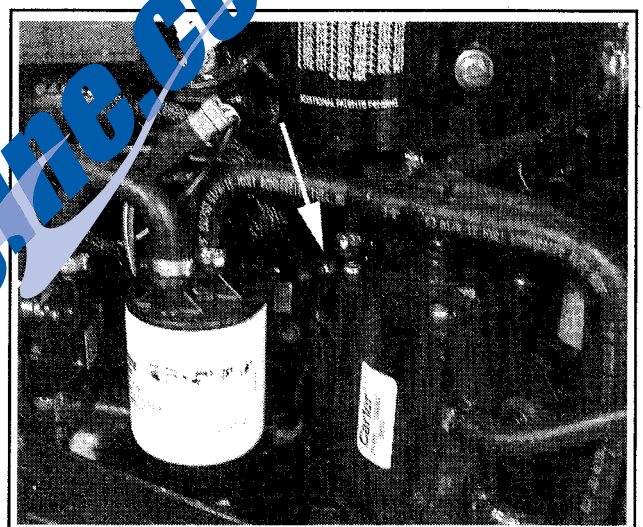


Fig. 4 Example of test port location on a big E-Tec

■ **Even after most or all of the pressure has been dissipated, there may still be some liquid fuel left in the lines. Always wrap a shop rag around fittings before they are disconnected to catch any escaping fuel.**

5. After maintenance or repairs are finished, fully pressurize the high- and low-pressure fuel circuits, then thoroughly check the system for leakage.

PRESSURIZING THE FUEL SYSTEM - CHECKING FOR LEAKS

① EASY

✳✳ CAUTION

Fuel leaking from a loose, damaged or incorrectly installed hose or fitting may cause a fire or an explosion. ALWAYS pressurize the fuel system and run the motor while inspecting for leaks after servicing any component of the fuel system.

The direct injector models (DI/FICHT and E-Tec) covered by this guide utilize 2 fuel circuits. A low-pressure circuit consisting of a fuel tank, primer bulb, mechanical fuel pump (also known as the lift pump), one or more low-pressure filters and the low-pressure fuel line to the vapor separator tank all

12. The manufacturer recommends replacing the inner exhaust housing seals regardless of condition. Apply a light coating of Evinrude Adhesive 847 or an equivalent sealant/adhesive to the top and bottom sealing surfaces of the inner exhaust housing. Then position 2 new seals on the housing. Apply a thin coating of Evinrude Triple Guard grease to the outer surface of the seals to lubricate them and help them seat easier. Position the housing onto the gearcase.

■ **If the shift rod height was changed (if the rod was threaded inward or outward) or the gearcase was overhauled or replaced, be sure to check the Shift Rod Height Adjustment, as detailed later in this section, before proceeding.**

13. Check to be sure that the water tubes are clean, smooth, and free of any corrosion. Coat the water pickup tubes and grommets with a light coating of marine grease as an aid to installation.

14. Dip all the attaching bolts in Evinrude Gasket Sealing Compound, or an equivalent product and put them on a clean surface to be used in the next step.

15. Apply a light coating of Gel-Seal II or equivalent to the gearcase mating surface pads on the exhaust housing.

■ **This gearcase is big enough to make holding it while aligning everything a bit of a pain. As we mentioned earlier, we've found that if you get one or two bolts of the same thread as the gearcase retainers, BUT which are significantly longer, you can use them to hold the case in position as you align the driveshaft, water tube, shifter etc. A couple of nuts and washers threaded onto those bolts before inserting them up from under the gearcase will allow you to slowly raise the case into position as it is aligned and hold it there while you thread some of the actual gearcase bolts.**

16. Align the driveshaft and shift rod with the intermediate housing. Now, three things are to be done at the same time. Bring the two units together, while guiding the water pickup tube into the rubber grommet of the water pump, and simultaneously rotating the flywheel slowly to permit the splines of the driveshaft to index with the splines of the crankshaft all the while making sure the inner exhaust housing seats properly.

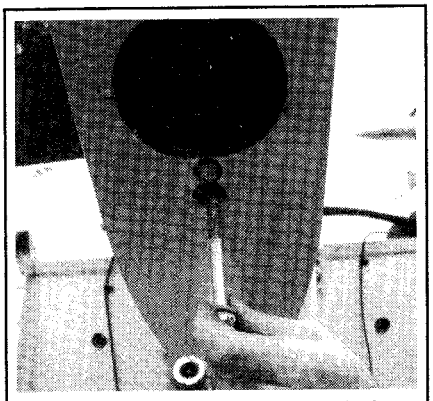


Fig. 71 . . .located under the anti-cavitation plate NOTE: do not disturb the anode retainer

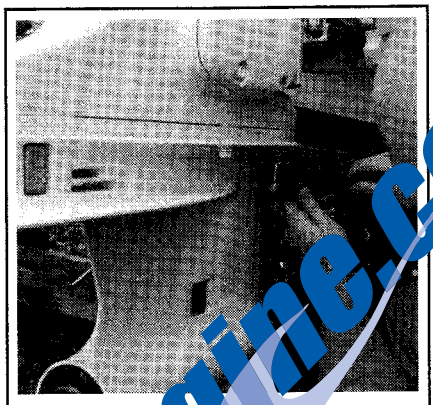


Fig. 72 Fina[illegible] 4 [illegible]ning bolts on the [illegible]

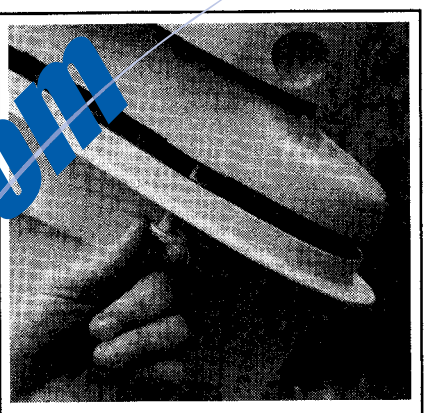


Fig. 73 . . .turn them out just enough to hold the case. . .

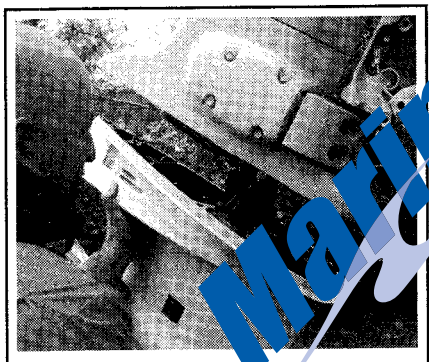


Fig. 74 . . .until you are ready to lower it straight out from the exhaust housing

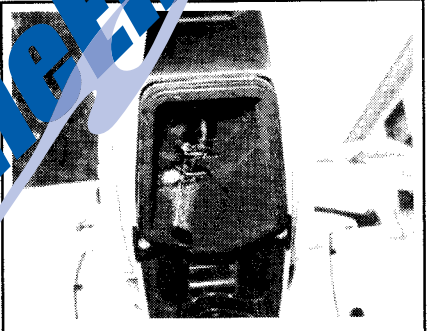


Fig. 75 If the inner exhaust housing remained behind, remove it. . .

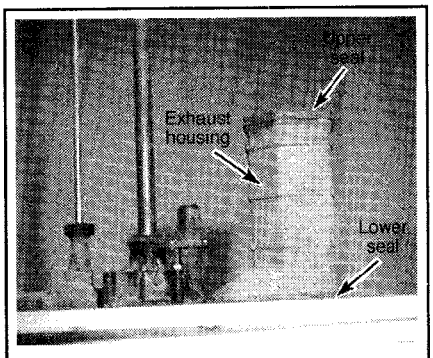


Fig. 76 . . .the inner exhaust housing must be properly resealed during installation

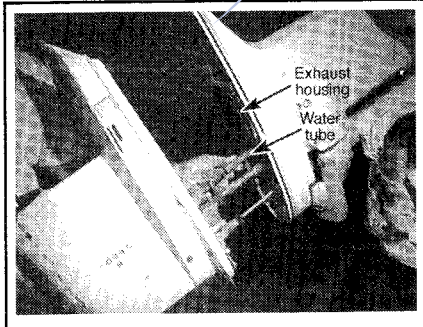


Fig. 77 Install the gearcase, carefully aligning the driveshaft, water tube and shifter rod

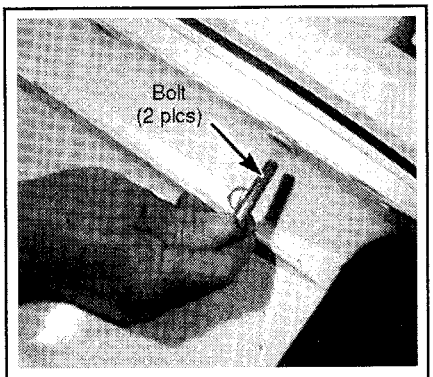


Fig. 78 With the gearcase almost flush, thread and slowly tighten the bolts

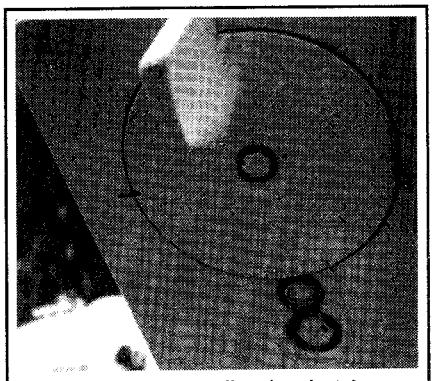


Fig. 79 Remember to align the trim tab matchmark during installation

■ **If water is discovered in the lower unit and the propeller shaft seal is damaged and requires replacement, the lower unit does not have to be removed to accomplish the work. The bearing carrier can be removed and the seal replaced without disassembling the lower unit. However, such a procedure is not considered good shop practice, but merely a "quick-fix". If water has entered the lower unit, the unit should be disassembled and a detailed check made to determine if any other seals, bearings, bearing races, O-rings or other parts have been rendered unfit for further service by the water.**

4. Tilt the outboard to the full up or trailering position and engage the tilt-up lock.

5. On 75-175 hp DI/FICHT motors, and on other models as necessary to access the shift linkage, remove the air intake silencer for access.

■ **Removing the lower engine cowling can make access to the gearcase shift rod much easier.**

6. Locate the shift rod (which comes up from the gearcase) and connects to the shift rod lever at the front of the powerhead, just below the throttle body assembly. Disconnect the shift linkage, depending upon the model, as follows:

- On 75/90 hp inline E-Tecs, when looking from the port side of the powerhead you should see a single screw that secures the rod to the lever (it's normally a slotted, hex head screw). Loosen and remove the screw to release the gearcase shift rod.
- On 75-175 hp DI/FICHT models, remove the retaining pin (it's usually easier to access this from the front, starboard side of the motor on these models) and disconnect the shift rod (at the lower front of the motor) by carefully pushing the rod link toward the powerhead (disengaging it from the shift rod). This pushes a shift linkage pin out of the hole in the top of the shift rod.
- On all 200-250 hp (both DI/FICHT and E-Tec) models, unthread and remove the retaining pin (usually a slotted and/or hex head bolt which is facing horizontally out to the port side of these motors) and then disconnect the shift rod.

7. Scribe a matchmark on the trim tab and lower unit to ensure the trim tab will be installed back in the same position from which it is removed. Remove the bolt and lift off the trim tab.

■ **There are normally 3-4 bolts on the underside of the ventilation plate. One secures the trim tab, another secures the anode and 2 more (one that is usually not visible or partially obscured because it is under the trim tab) secure the gearcase.**

8. Use a suitable (usually 9/16 in.) thin-walled socket with a short extension to remove the rearmost gearcase retaining bolt (usually found in the trim tab cavity). Failure to remove this bolt may result in the housing being damaged beyond repair during the attempt to separate the lower unit from the exhaust housing.

9. Use a suitable (usually 5/8 in.) thin-walled socket to remove the bolt recessed in the counter-bore just ahead of the trim tab. Some units may have both a 9/16 in. and a 5/8 in. bolt forward of the trim tab, but the second 9/16 in. bolt is **normally** for the anode.

10. Using a suitable (usually 9/16 in.) socket or wrench, remove the 4 bolts, two on each side, securing the lower unit to the exhaust housing. Carefully pull and work the lower unit free of the exhaust housing. Support both ends of the lower unit, and at the same time, guide the shift rod and driveshaft out of the exhaust housing, prevent bending them until free of the exhaust housing. Some ... exhaust housing may come out with the lower unit. If it ... ool because you need to replace the upper and lower seals ... both a coating of adhesive to the seal's inner surfaces an... e seal's outer surfaces during installation. If the housing ren... remove it from the mid-section, making sure the upper and lower ... come out with it.

To in...:

11. ...ides of the driveshaft splines only with Evinrude Moly ... ...valent grease. DO NOT coat the top of the driveshaft ... grease on the end of the driveshaft may cause a hydrolock ... in the crankshaft, prevent the driveshaft splines from completely ... into the powerhead.

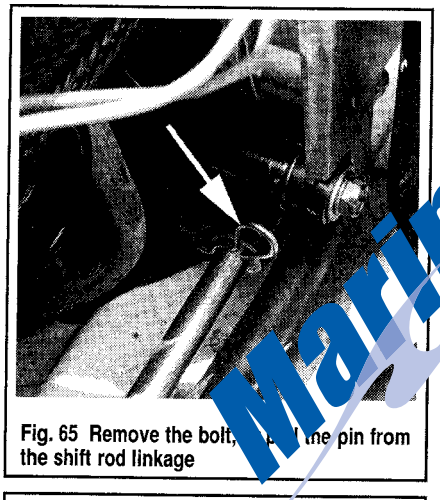


Fig. 65 Remove the bolt, ... the pin from the shift rod linkage

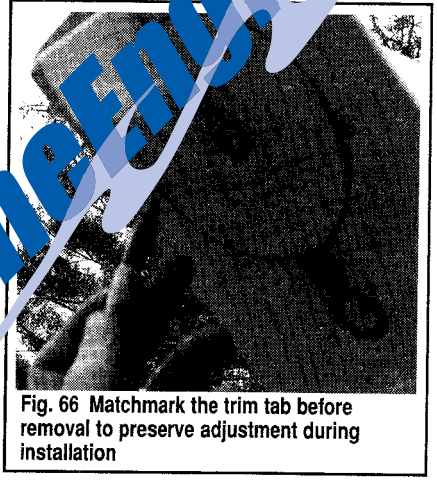


Fig. 66 Matchmark the trim tab before removal to preserve adjustment during installation

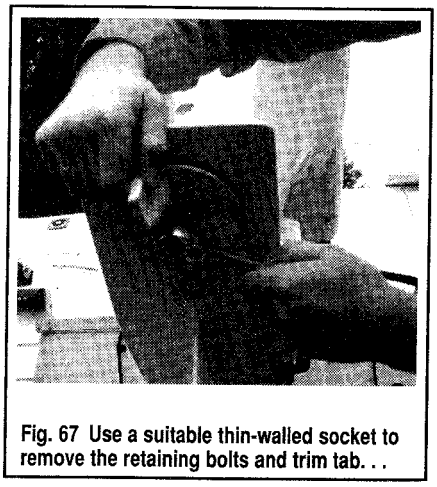


Fig. 67 Use a suitable thin-walled socket to remove the retaining bolts and trim tab. . .

Fig. 68 . . .then use a thin-walled socket (it's a tight fit). . .

Fig. 69 . . .to remove the gearcase retainer underneath

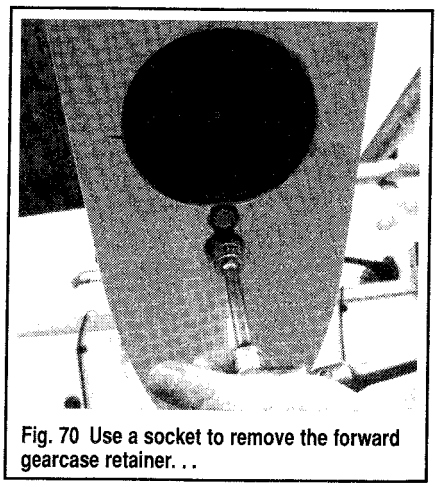


Fig. 70 Use a socket to remove the forward gearcase retainer. . .

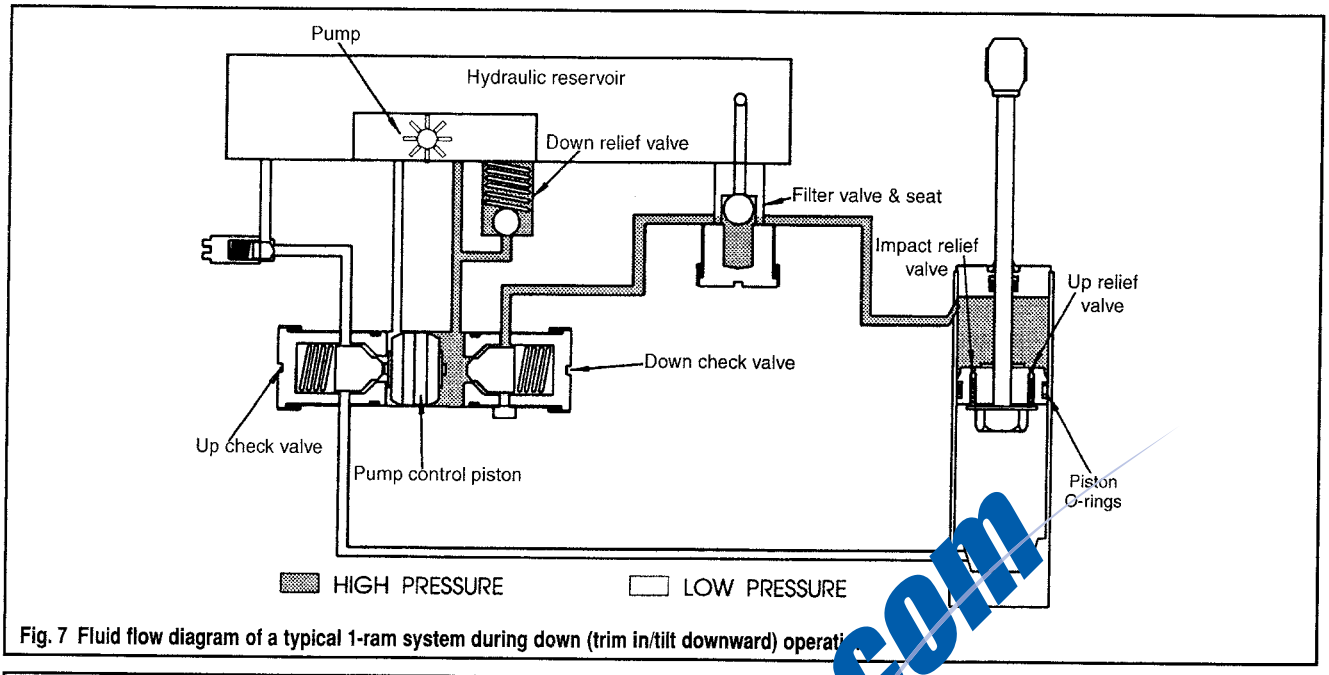


Fig. 7 Fluid flow diagram of a typical 1-ram system during down (trim in/tilt downward) operati

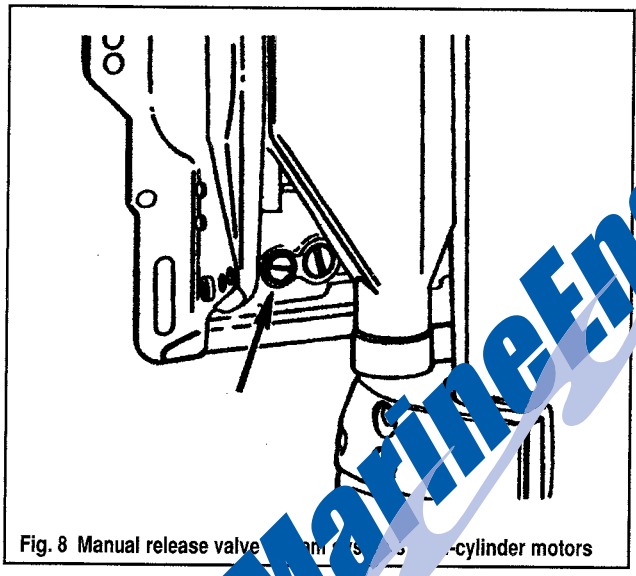


Fig. 8 Manual release valve [illegible] -cylinder motors

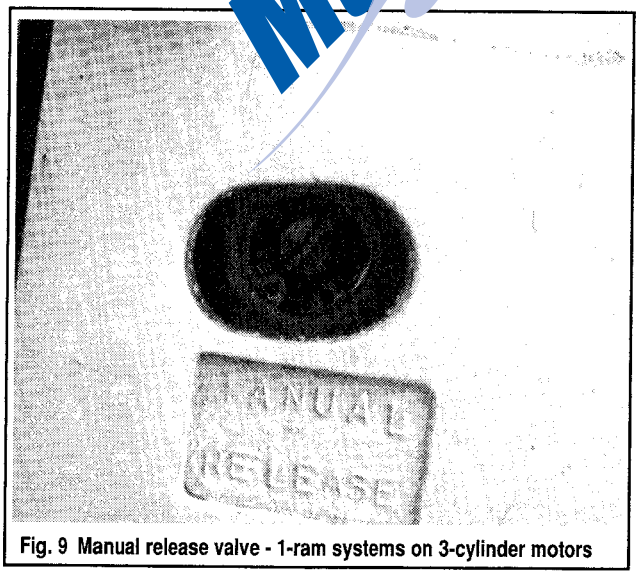


Fig. 9 Manual release valve - 1-ram systems on 3-cylinder motors

A manual release [illegible] is provided on the assembly in order to provide tilt/trim fu[illegible] in the [illegible]ent of certain electrical or mechanical system failures. [illegible] to [illegible]ove the engine by hand, loosen the manual release valve [illegible] [illegible]o 3 turns. Once the engine is positioned as desired, the v[illegible] [illegible] and tightened to 45-55 inch lbs. (5-6 Nm). The electro-[illegible] [illegible]ste[illegible] will not work again until the valve is closed and tightened. [illegible] ga[illegible]e can be added to this system. When equipped, the sending [illegible]ed on the port side of the swivel bracket.

[illegible] equipped with this system are normally equipped with integral [illegible] locks to protect the system from stress and shock. The locks MUST be used whenever the boat is towed or in storage. When setting the locks, be sure to retract the cylinder until the locks are fully engaged. In addition, on some motors a mooring or storage bracket is also supplied to support the motor at a 50° or 73° angle. When equipped though, the mooring tilt support must NOT be used to support the motor while trailering.

3-RAM SYSTEM

◆ **See Figures 10, 11 and 12**

The 3-ram system is completely self-contained in an assembly that is mounted to the engine stern bracket. The main system components include an electric motor, a fluid reservoir and pump/valve manifold assembly and a cylinder body.

The 3-ram system utilizes a cylinder body with 2 trim cylinder rams and one combination tilt cylinder/shock absorber. Whenever the trim button is pressed upward the electric motor rotates clockwise, (as viewed from the pump end) pumping hydraulic fluid to force the cylinders upward. Because of a mechanical advantage, the trim cylinders perform **most**, but not all, of the work. Once the motor is raised 21° (to the end of the trim cylinder travel), the tilt cylinder moves the engine through the remaining 54° of the tilt range.

■ **While in the tilt range (above the trim range) the engine will only operate at idle/low throttle.**

When the down switch is activated, fluid is pumped only to the top of the tilt cylinder whose piston moves the engine downward (pushing fluid from underneath the tilt piston as it travels downward). The force of the engine moving down pushes against the trim cylinder rams, forcing fluid out from underneath the trim cylinder pistons as they return to the bottom of their travel.

A manual release valve is provided in order to provide tilt/trim function in the event of certain electrical or mechanical system failures. The valve is normally located on the port side of the trim/tilt bracket assembly and is accessed with a screwdriver through a hole on the outside of the stern bracket.

An integral trailering bracket is provided to protect the system from stress and shock. The bracket should be used whenever the boat is towed or in

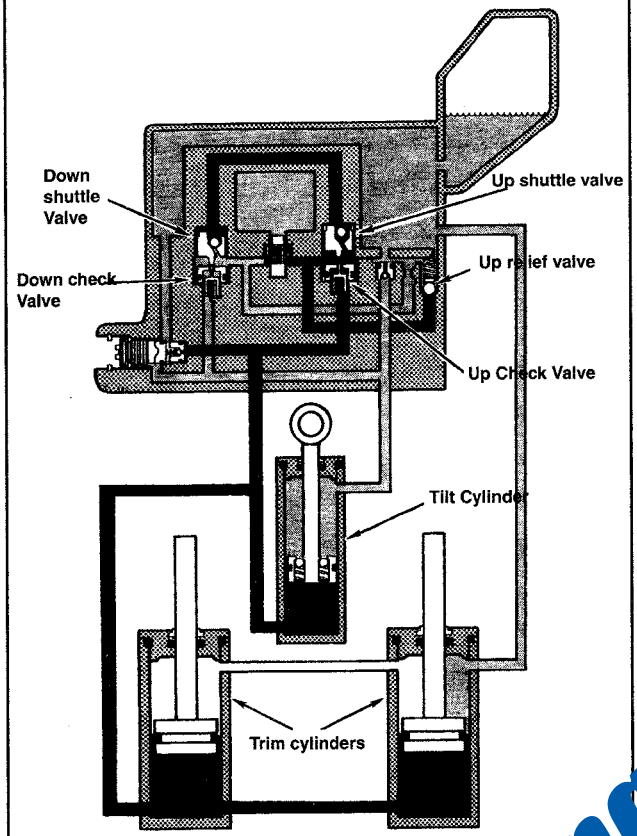


Fig. 10 Fluid flow diagram of 3-ram system during up (t… up) operation - darkest passages represent pressur… fl… w

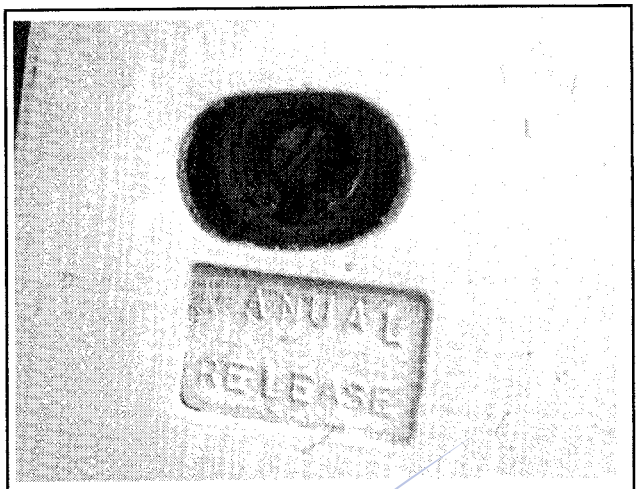


Fig. 11 A manual release valv… is located on the port side of the 3-ram system

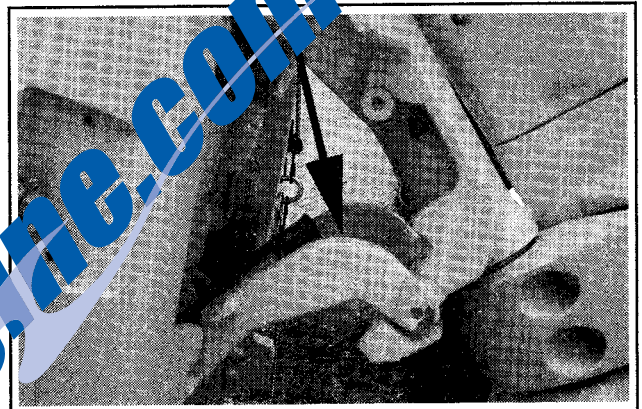


Fig. 12 An integral trailering bracket provides support when the engine is raised

storage. In addition, a mooring or storage bracket is … support the motor at a 50° or 73° angle.

✳✳ CAUTION

The mooring tilt support must NOT … d … pp…rt the motor while trailering.

A tilt limit switch can h… …ev… …e …ne from contacting the boat's motor well during … …tion. However, setting the trim limit switch will not prevent the … …rom striking the motor well if moved manually or due to a severe …act.

Manually Tilting A 3-Ram Engine

EASY

◆ **See Figure 12**

To manually tilt a 3-ram engine, open the manual release valve by rotating it about 3 1/2 turns **counterclockwise** using a screwdriver inserted through the access hole on the outside of the stern bracket. Turn lightly until the valve **just** contacts the retaining ring.

With the valve open you can manually raise the engine (which will allow fluid to flow from the top of the tilt cylinder to the reservoir and to the underside of the tilt cylinder).

✳✳ WARNING

Once the release valve is opened, the engine must be supported when it is lifted, either using a hoist or the trailering bracket. DO NOT attempt to hold the engine up, above the trim range using the tilt cylinder and manual release valve. Similarly, do not allow the engine to drop suddenly once the support is removed.

To trim the engine out; start by releasing the valve and raising the motor further than the final desired trim position. Close the release valve and gently allow the tilt cylinder to take the motor's weight; then slowly open the release valve, bleeding off pressure using the weight of the engine. Close the valve again once the desired trim level has been reached.

■ **Remember that the manual release valve must be closed (turned gently inward) in order for the 3-ram system to operate properly.**

Troubleshooting

1-RAM SYSTEM

If problems are encountered with a single ram system, use the following list of symptoms and possible causes to help determine the problem. Before starting the troubleshooting procedure, make sure all basic system checks are completed as follows:

- If the system does not work **and** the motor does not run or make any noise, then refer to the Power Supply procedure in this section.
- If the engine tilts part of the way upward, but does not move smoothly or with a constant sound, there is probably air in the system (usually caused by low fluid level). Check and refill the reservoir (as detailed in the Maintenance and Tune-Up section). Bleed air from the system by running the engine fully up and down with the trim/tilt motor for at least 5 complete cycles, pausing between each cycle to recheck fluid level and top-off, as necessary. When running the motor upward or downward to bleed the system, hold the switch (with the motor running) for an additional 5-10 seconds after the unit reaches the top or bottom of it's travel, and then activate the switch in the opposite direction.
- If the motor seems to be binding mechanically, open the manual release valve and tilt the motor manually up and downward to check for smooth operation or binding.