

UNIVERSAL MOTORS

MARINE DIESEL OWNER'S MANUAL

MODELS

12, 15, 18, 20, 25, 30, 40, 50

Engine #

D850-388422

WARNING

Raw Cooling Water
Has Been Drained From
Engine. Drain Cocks Are Open
And/Or Drain Plugs Removed.
Water Pump Hoses Is Disconnected.
Connect Hoses And Close Drains
And Plugs Before Operating Engine.

1984 → BOAT MODEL C-36
HULL NO. 336
ENGINE TYPE DIESEL
ENGINE NO. 411901
IGNITION KEY NO. CK-137

medalist **Universal Motors**

CROSS REFERENCE MODEL GUIDE

<u>OLD</u>	<u>NEW</u>
-	M-12
5411	M-15
-	M-18
5416	M-20
5421	M-25
5424	M-30
5432	M-40
5444	M-50

CONGRATULATIONS!

The Medalist Universal Diesel engine you have selected is backed by more than 85 years of experience in the design, development and manufacture of marine engines for auxiliary power.

An extensive Universal service network is available to you should your engine require service. Always CONTACT THE NEAREST dealer for fast service. If you call Universal Motors direct, you will be directed to the nearest service center in your area.

Please read the Owner's manual and warranty thoroughly to familiarize yourself with the engine and its components. Observe the various CAUTION AND WARNINGS in this manual for your safety and to prevent damage to the engine.

FILL OUT AND MAIL YOUR WARRANTY CARD NOW!!

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MODEL (OLD)	M-12	M-15 (5411)	M-18	M-20 (5416)	M-25 (5421)	M-30 (5424)	M-40 (5432)	M-50 (5444)
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ENGINE OPERATING TEMPERATURE °F
 Model 15 135° to 155°F (SWC)
 Models 12, 18, 20, 25, 30, 40, 50 165° to 190°F (FWC)

MAX. OPERATING ANGLE OF ENGINE 15° ALL MODELS

ENGINE ROTATION Clockwise when viewed from V-belt end

PROPELLER ROTATION (W/Hurth gear) Right Hand (BOTH STD. AND V-DRIVE)

ENGINE WEIGHT (Lbs.)	170	245	255	365	285	425	490	545
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LENGTH (Overall)	23.0	25.6"	24.8	28.0"	28.1"	32.5"	36.2"	36.0"
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HEIGHT (Overall)	20.0"	21.2"	20.0"	24.1"	22.6"	24.6"	26.0"	26.0"
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WIDTH (Overall)	19.3"	20.7"	20.7"	20.7"	21.9"	21.4"	20.7"	22.9"
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INJECTION NOZZLE	299517	299517	299517	298787	299517	299787	299567	299567
		299518	299518	299788	299518	298788		298788

INJECTION TIMING 20° before top dead center - all models

It is recommended to carry an extra V-Belt, Sea Water Pump Impeller, Fuel and Lube Oil Filter, and a quart of lube and transmission oil on board at all times to be available should the need arise.

HAVE YOU MAILED IN YOUR WARRANTY CARD?

-CAUTION-

Your Universal Diesel engine is supplied with top quality, factory tested components. These will not, however, replace safe practices in the handling of fuel and the use of your engine. The following procedures, if observed, will help insure safe operation and prevent damage to your engine and its components.

SAFETY PROCEDURES:

KEEP THE ENGINE AND ENGINE COMPARTMENT CLEAN AND FREE FROM OILY WASTE AND CLOTHS.

KEEP FUEL AND OIL OUT OF BILGE.

PERIODICALLY INSPECT THE ENGINE, FUEL LINES AND CONNECTIONS FOR LEAKS.

DO NOT OVERFILL THE FUEL SUPPLY TANK, THIS MAY CAUSE RAW FUEL TO ACCUMULATE IN THE BILGE.

THE BLOWER SHOULD ALWAYS BE OPERATED FOR APPROXIMATELY FOUR (4) MINUTES PRIOR TO STARTING THE ENGINE SO THAT THE ENGINE COMPARTMENT WILL BE COMPLETELY VENTILATED, IF BLOWER IS INSTALLED.

LUBRICATION:

THE ENGINE IS SHIPPED FROM THE FACTORY WITH THE CRANKCASE EMPTY. THE CORRECT GRADE AND AMOUNT OF OIL MUST BE ADDED BEFORE OPERATION, SEE SPECIFICATIONS AND FILL TO FULL MARK ON DIPSTICK.

THE TRANSMISSION IS FILLED BEFORE SHIPMENT BUT THE OIL LEVEL SHOULD BE CHECKED BEFORE OPERATION, SEE SPECIFICATIONS.

ALTERNATOR:

TO PREVENT ALTERNATOR DAMAGE, DO NOT OPEN OR SWITCH BATTERY CIRCUITS WHILE THE ENGINE IS RUNNING.

RACING THE ENGINE:

DO NOT RACE THE ENGINE. THIS PRACTICE MAY CAUSE SERIOUS DAMAGE.

DECOMPRESSION LEVER:

DO NOT USE THE DECOMPRESSION LEVER TO STOP THE ENGINE. THIS WILL CAUSE SERIOUS DAMAGE TO THE EXHAUST VALVES.

-CAUTION-

MAINTENANCE AND UPKEEP:

IT IS THE OWNER'S OR OPERATOR'S RESPONSIBILITY TO PERFORM ALL NECESSARY PREVENTIVE MAINTENANCE AND UPKEEP.

FRESH WATER COOLING SYSTEM: Models 12, 18, 20, 25, 30, 40 & 50

THIS SYSTEM MUST BE FILLED SLOWLY WITH A 50/50 BLEND OF WATER AND A GOOD GRADE OF PERMANENT ANTIFREEZE. (THE COOLANT BLEND MAY CHANGE, BASED ON CLIMATIC CONDITION IN YOUR AREA.) OR YOU MAY ALSO USE CLEAN FRESH WATER WITH AN ANTI RUST INHIBITOR. DO NOT USE PURE ANTIFREEZE. AFTER ENGINE HAS REACHED OPERATING TEMPERATURE IT MAY REQUIRE ADDING MORE COOLANT AS THE AIR IS PURGED FROM THE SYSTEM. IF ENGINE OVERHEATS, RECHECK LEVEL. IF HOT WATER HEATER IS INSTALLED, ALL AIR MUST BE REMOVED FROM THE LINES AND SYSTEM TO PREVENT OVERHEATING USUALLY BY MEANS OF AN ADDED BLEED VALVE IN HEATER LINE OR EXPANSION TANK IN THE SYSTEM.

COOLING SYSTEM: Model 15

THE M-15 WHICH IS COOLED DIRECTLY BY SEA WATER, USES A RECIRCULATING SYSTEM WHICH DISCHARGES THE WATER AND VAPOR OVERBOARD WITH THE EXHAUST GASES.

EXHAUST SYSTEM:

IT SHOULD BE INSTALLED WITHOUT SHARP BENDS AND SHOULD BE DESIGNED TO DRAIN ANY WATER AWAY FROM THE ENGINE. THE WATER INLET TO EXHAUST LINE MUST BE LOCATED TO PREVENT WATER FROM BACKING UP INTO THE ENGINE. IF A WATER-LIFT "CAN" TYPE MUFFLET IS USED, BE SURE IT IS LARGE ENOUGH TO HOLD APPROXIMATELY 3 TIMES THE AMOUNT OF WATER THAT MAY BE IN THE LINES WHEN THE ENGINE IS SHUT DOWN SO THAT WATER WON'T BACK UP INTO THE ENGINE.

CAUTION

PROLONGED CRANKING OF THE ENGINE WITH FAILURE TO START CAN FILL THE EXHAUST SYSTEM WITH SEA WATER CAUSING IT TO BACK UP INTO THE ENGINE CAUSING SERIOUS DAMAGE TO THE ENGINE WHEN CRANKING IS STOPPED.

STARTING & STOPPING ENGINE:

BE SURE TO CAREFULLY READ INSTRUCTIONS ON HOW TO START AND STOP YOUR ENGINE BEFORE STARTING ENGINE.

FUEL SUPPLY:

DO NOT RUN ENGINE OUT OF FUEL OR RE-BLEEDING OF YOUR FUEL SYSTEM WILL BE REQUIRED.
FUEL MUST BE FREE OF ANY MOISTURE OR IMPURITIES. CHECK CAREFULLY.
MOISTURE CAN SERIOUSLY DAMAGE PUMP AND NOZZLES.

AN ADDITIVE SHOULD BE USED AS BACTERIA GROWTH CAN PREVENT GOOD RUNNING CONDITIONS CAUSING THE ENGINE TO RUN ERRATIC OR LOOSE POWER.

STARTER MOTOR:

CRANK THE ENGINE FOR ONLY 10 SECONDS AND PAUSE FOR 10 SECONDS. REPEAT UNTIL ENGINE STARTS. NEVER CRANK ENGINE LONGER THAN 20 SECONDS WITHOUT A PAUSE TO PERMIT STARTER TO COOL DOWN. USE OF GLOW PLUGS WILL AID IN STARTING, REDUCE CRANKING TIME AND INCREASE BATTERY LIFE. ENGINE SOLD AFTER EARLY 1983 REQUIRES GLOW PLUG BUTTON TO BE ENGAGED IN ORDER FOR STARTER BUTTON TO ENERGIZE STARTER.

GENERAL INFORMATION

ENGINE:

Universal Diesel engines are four stroke direct injection engines. They are designed with special swirl combustion chambers, balanced crankshaft system and three or four point mounting for minimum vibration and noise levels. Models 15, 18 & 25 are available with 4 point mounting to match our Atomic-4 engine bed.

COOLING SYSTEM: Models 12, 18, 20, 25, 30, 40 & 50

Engines are fresh water cooled, employing a rubber impeller sea water pump moving sea water through a heat exchanger thereby lowering the temperature of the fresh water coolant. A fresh water coolant supply is maintained in the expansion tank which is an integral part of the exhaust manifold. Coolant level should be checked at regular intervals and at least once each season for leakage, deposits and general condition. Always close the sea water cock before attempting any work on the coolant system. (Note the make of sea water pump for service parts under general information.)

COOLING SYSTEM: Model 15

Engine is sea water cooled, having a rubber impeller sea water pump, with a recirculating temperature control thermostat. The mixing tee is to be located below the engine and sea water level to prevent air from entering the system causing overheating.

LUBRICATION SYSTEM:

Engines are pressure lubricated and use replaceable oil filters which should be changed regularly.

FUEL SYSTEM:

The fuel system utilizes either an electric or mechanical fuel pump, fuel filter, fuel injection pump with injectors and necessary fuel lines. Unused fuel coming from the injector nozzles is returned to the top of the fuel supply tank through a fuel return line.

ELECTRICAL SYSTEM:

All models are equipped with a 12 volt starter and a 55 amp alternator. Battery cable connections as well as all other electrical connections should be checked regularly. The V-belt driving the alternator and water pump should have a finger pressure deflection of approximately 1/2".

1. Battery ground cable (-) should be connected to a component or cylinder block which is constructed of cast iron or steel.
2. Do not connect to the transmission, bell housing or front timing cover case.
3. It is recommended all ground connections are secure and properly coated to prevent corrosion or improper grounding. Check connection semi-annually.

GENERAL CARE:

If the boat is left afloat for periods of a month or more, the engine should be started at least every 14 days to prevent internal corrosion.

Regularly spray external unpainted surfaces and exposed, unpainted electrical equipment with a corrosion and moisture protective coating.

ENGINE ALIGNMENT TO SHAFT COUPLING:

It is the responsibility of the dealer or yard to properly align the engine and shaft to within .002" to .004" inches. The boat must be in the water when this is done. Alignment is not the responsibility of Universal Motors. If not done properly damage to shaft and engine can occur, usually vibration is present if alignment is off.

HAVE YOU MAILED IN YOUR WARRANTY CARD?

PREPARATIONS FOR STARTING YOUR NEW DIESEL ENGINE

For long dependable service, become familiar with the operating requirements of your engine.

All Universal Diesel engines are completely factory tested under load conditions before shipment.

In preparation for starting engine, oil must be added to the crankcase. Refer to specifications for lubrication, oil type and capacity. Recheck oil level on dipstick, it should be to full mark.

The oil level should be checked before the first start-up each day. Dipstick has high and low markings. Oil levels either above or below these marks, should never be allowed. Oil is put into the engine by removing the screw cap on the top of the rocker arm cover. Fill the crankcase with oil to the upper mark on the dipstick and securely replace the filler cap.

The transmission is shipped with oil but should be checked prior to operation. Refer to specification of oil type and capacity. Recheck oil level on dipstick. (DIPSTICK TO BE INSERTED ONLY. DO NOT SCREW IN). See transmission instructions for additional information.

An unrestricted water supply must be provided to the engine. Use a minimum of 1/2" through hull fitting. Locate the scoop where it will have a full supply of water at all times regardless of running position or rough seas. A sea cock or gate valve is necessary at the water inlet point. The water pump has a 3/8" N.P.T. suction inlet and the heat exchanger has a 3/8" N.P.T. water outlet. Use a non-collapsible hose for the suction side. A water strainer installed in the line ahead of the water pump aids in preventing clogging of the cooling system. The exhaust pipe is 1-1/4" N.P.T. on Models 12, 15, 18, 20, 25, and 30, and 1-1/2" N.P.T. on Models 40 and 50.

The fresh water manifold on models 12, 18, 20, 25, 30, 40 & 50 should be filled slowly to the bottom of the filler cap. A 50/50 mixture of fresh water and antifreeze solution is acceptable as an all weather coolant., eliminating the need to drain the fresh water system for cold weather operation or storage. A coolant mixture may change based on climatic conditions in your area. The rust preventive will aid in reducing rust formation if no antifreeze is used.

Model 15, being sea water cooled, draws its water directly from the sea, filling the engine system and discharging the hot water overboard into the exhaust line.

Be sure water pump is lubricated by turning grease cup (if provided on your engine) clockwise 1/2 turn at 30 hour intervals. Pumps with no grease cup do not require lubrications.

Transmission shifting controls must allow the clutch to engage in the full forward and reverse positions. Restricted or partial engagement will cause undue wear. The transmission should always be in the neutral position before starting the engine. Also, the transmission shifter arm must be at a 90° angle to the transmission bracket cable when in neutral.

DO NOT LEAVE GEAR IN FORWARD DURING SAILING WITH ENGINE OFF.

On Models 12, 18, 20, 25, 30, & 50, the fuel line must be connected from the fuel tank to the electric fuel pump, then to the fuel filter. On Models 15 and 40, connect directly to the fuel supply line. A fuel return line must be connected from the injector nozzles to the top of the fuel tank so that the unused fuel can flow back into the fuel tank. IT IS VERY IMPORTANT TO KEEP ALL FUEL LINES FREE OF DUST AND IMPURITIES. THEREFORE, BLOW OUT LINES BEFORE CONNECTING.

Check fuel supply and make sure fuel lines are tight. Any fuel leakage must be corrected before any attempt to start the engine. If fuel line leaks are discovered or any work is done on the fuel system, it may be necessary to bleed the fuel system before the engine will start. (Refer to bleeding instructions in this manual if that procedure becomes necessary.)

Check all electrical connections. A wiring diagram is included in this manual. GROUND IS NEGATIVE and the ground terminal should be connected to the engine block. Make sure it is metal to metal contact, and securely tightened. Also, check the battery to be sure all cells are covered with electrolyte. Do not allow flames or sparks near battery openings. Gases produced during normal battery charging are EXPLOSIVE.

BEFORE STARTING THE ENGINE

1. Have safety equipment on board and know how to use it.
2. Ventilate engine compartment by opening hatches, or blower if installed.
3. Check crankcase oil level on dipstick, should be at full mark.
4. Check transmission oil level. (Refer to transmission servicing.)
5. Check fresh water level in manifold or expansion tank if installed. (Models 12, 18, 20, 25, 30, 40 & 50)
6. Check fuel supply.
7. Fuel shut-off valve should be OPEN.
8. Sea water valve to water pump must be OPEN.
9. Exhaust shut-off valve must be OPEN or end-plug removed if installed.
10. Remove any obstruction caught in air intake screen.

11. Turn main battery switch "ON".
12. Turn ignition key to "ON" position, to energize fuel pump on Models 18, 20, 25, 30 & 50 bleed fuel line at fuel filter. (This is usually completed by the boatbuilder at the time the engine is tested and should not be required by customer.)

STARTING THE ENGINE

1. Have safety equipment on board and know how to use it.
2. Ventilate engine compartment by opening hatches.
3. Be sure engine compartment is thoroughly ventilated.
(Run blowers for 4 minutes before starting engine, if installed.)
4. Turn blowers off after starting or before starting to eliminate excessive battery drain, if preferred.
5. Transmission lever should be in neutral. (Center Position)
6. Place throttle lever at 1/3 open position.
7. Turn key to "ON" position to energize fuel pump, glow plug and oil pressure light. If your panel uses a key switch start, go to 9.
8. Press "Glow Plug" button for 30 to 60 seconds, depending on the outside temperature. Continue to hold glow plug button while pressing "Start" button to crank engine. Release both buttons immediately after engine starts. Go to 11.
NOTE: You must hold glow plug button in to energize the starter button for cranking engine.

PANELS WITH KEY SWITCH START

9. Activate "Glow Plug" switch for 30 seconds to 1 minute, depending on the outside air temperature. It may be necessary to hold the glow plugs on during the time the engine is cranked in very cold outside temperatures.
10. Turn key to full "right" position to crank engine. Release key immediately after start. Key will return to the "ON" position.

NOTE: When cranking engine, only crank engine for 10 seconds and pause for 10 seconds. Repeat until engine starts. (See Caution printed on Starter Motor.)
11. Check oil pressure light. (Should go out after engine starts.)
12. Ammeter should indicate "Charge", depending on battery condition.

13. Check cooling system. (Make sure water pump is operating by checking for water coming out of exhaust pipe with exhaust gases.) Temperature on gauge should gradually increase to 165°F to 190°F on Model 12, 18, 20, 25, 30, 40 & 50. Temperature on Model 15 should be between 135°F and 155°F.
14. If oil pressure light does not go out or no water overboard or temperature is not normal, STOP ENGINE AT ONCE! Recheck all items listed to correct problem.
15. If all indications are normal after start-up, continue to run engine for about 10 minutes to be sure all systems remain normal and operating temperature is maintained.
16. With boat still SECURED to mooring and throttle reduce to idle, check transmission operation by shifting from neutral to forward, to neutral, to reverse to neutral. Make sure no lines or obstructions are near the propeller.
17. Stop engine after above check out has been accomplished and recheck oil and water levels.

-CAUTION-

COOLING SYSTEM IS UNDER PRESSURE AFTER OPERATION. REMOVE CAP SLOWLY. COOLANT WILL BE VERY HOT, USE A RAG.

ENGINE BREAK-IN AND GENERAL RUNNING

1. Engine break-in period should be approximately 10 hours of operation at 75% of normal cruising speed.
2. On your trail cruise, check the propeller shaft for abnormal vibration and engine mounts for tightness. Realignment of the propeller shaft may be required if noticeable vibration is present. Boat should be in the water when checking alignment. Universal is not responsible for shaft alignment.
3. After the break-in period, an average cruising speed for a sail boat installation is about 80% of the maximum engine speed obtainable, to achieve hull speed. 200KIN
4. Periodically check light indicators, ammeter, temperature and exhaust water for normal operation, this is the operators responsibility.
5. When shifting transmission, engine R.P.M. should be reduced to idle, then shift transmission firmly from one direction to another. A slight pause in neutral will allow propeller to slow and add life to transmission.

STOPPING THE ENGINE

1. Place throttle in the idle position.

2. Place transmission shift lever in neutral. (Center position.)
3. Leave engine idle for approximately 1 to 2 minutes for it to cool down.
4. To stop engine on Models 15, 18, 20, 30 & 40, hold throttle lever in the back position against the spring loading until the engine stops. Then release the throttle from the stop position and throttle will return to the idle position. Repeat if engine does not stop the first time. Models 12, 25 & 50 have a separate stop lever for shutting the engine down.
5. Turn key to the "OFF" position to shut off the electric fuel pump and accessories.
6. Open battery master switch ONLY AFTER ENGINE HAS COME TO A COMPLETE STOP! This will prevent alternator and regulator damage.
7. DO NOT USE THE DECOMPRESSION LEVER TO STOP THE ENGINE! This practice could seriously damage the exhaust valves.
8. You may want to close the fuel and sea water valves after stopping the engine. If so, BE SURE TO RE-OPEN THEM BEFORE RESTARTING. FAILURE TO DO SO COULD CAUSE ENGINE TO OVERHEAT AND DAMAGE TO THE PUMP IMPELLER OR FUEL LINES TO BECOME AIR LOCKED. THIS SITUATION WOULD THEN REQUIRE BLEEDING OF THE FUEL SYSTEM BEFORE RESTARTING AND/OR REPLACING THE PUMP IMPELLER.

DECOMPRESSION LEVER

A decompression lever fitted to the engine enables the user to start the engine easier when it is extremely cold, when the battery is low or when bleeding the fuel system.

-CAUTION-

THE DECOMPRESSION LEVER MUST NOT BE USED TO STOP THE ENGINE EXCEPT IN EMERGENCY SITUATIONS SUCH AS, RUN AWAY ENGINE OR THROTTLE DAMAGE, AS SERIOUS DAMAGE CAN BE DONE TO THE EXHAUST VALVES.

When the battery is weak or starting in extremely cold weather:

Models with Glow and Start Buttons:

1. Pull decompression lever to release position.
2. Turn ignition switch to ON position.
3. Hold Glow Plug Button in for 30 to 60 seconds then press Start Button to crank engine (Models after early 1983).
4. After 3 to 5 seconds, when the engine has gained momentum, return decompression lever to its original position. Engine should now start.

Models With Start On Key Switch:

1. Pull decompression lever to release position.
2. Turn key to on position.
3. Energize glow plugs for 30 to 60 seconds.
4. Turn key to start position to crank engine.
5. After 3 to 5 seconds, when the engine has gained momentum, return decompression lever to its original position. Engine should now start.

INSTRUMENT PANEL

Refer to the instrument panel drawing when becoming familiar with the start up procedure or any general operating requirements of the engine.

The "Blower" switch (if equipped with engine) will remain in the "ON" position until it is turned off.

The "Glow Plug" or pre-heat switch requires continuous pressure for whatever time it is necessary to activate the glow plug.

The "Oil Pressure" light will come on when starting the engine but should go out after the engine starts. A low oil level in the engine crankcase or a serious oil leakage should be suspected if the light comes on at any other time during engine operation.

Old style key switch is a four position selector type. Far left, "ACCESSORY"--- "OFF"---"ON"---"START" at the far right moving clockwise. The key will spring return to the "ON" position when released after start up.

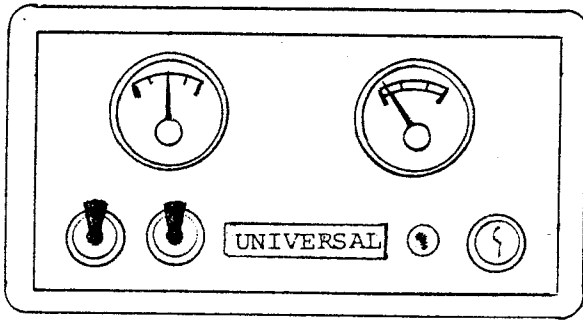
New style key switch is on-off only glow and start switches are push button type both must be engaged to start engine.

Operating temperature is approximately 165°F to 190°F on Model 12, 18, 20, 25, 30, 40 & 50. Operating temperature is approximately 135°F to 155°F on Model 15. The ammeter should indicate the charge required based on equipment and battery condition.

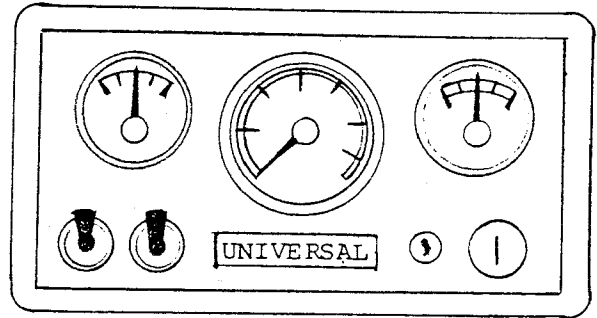
There are three (3) New style "Universal" panels.

1. Standard: Includes temp. and AMP gauges, oil light, on-off key switch, glow plug and start buttons.
2. Deluxe: Same as Standard plus a tachometer with 4 selection stations on the back. To be set to correct Model for accurate readings.
3. Custom: Same as Standard plus a tachometer/hour meter with Model selection station on back and a low-oil high-temp audio alarm with red light.

KEY START PANELS

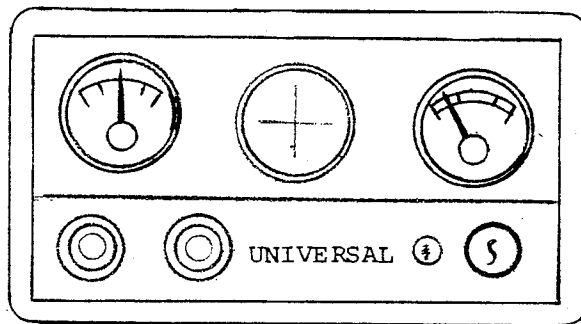


STANDARD

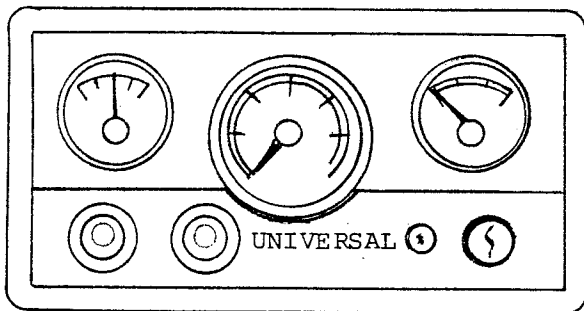


DELUXE

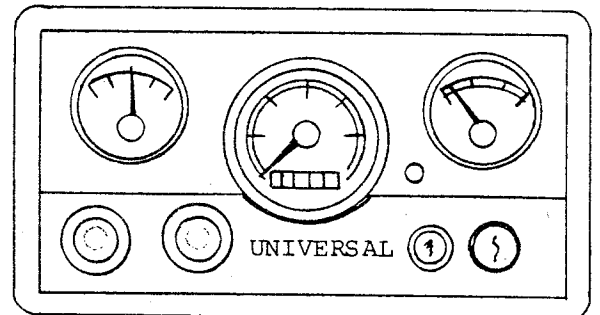
BUTTON START PANELS (1983)



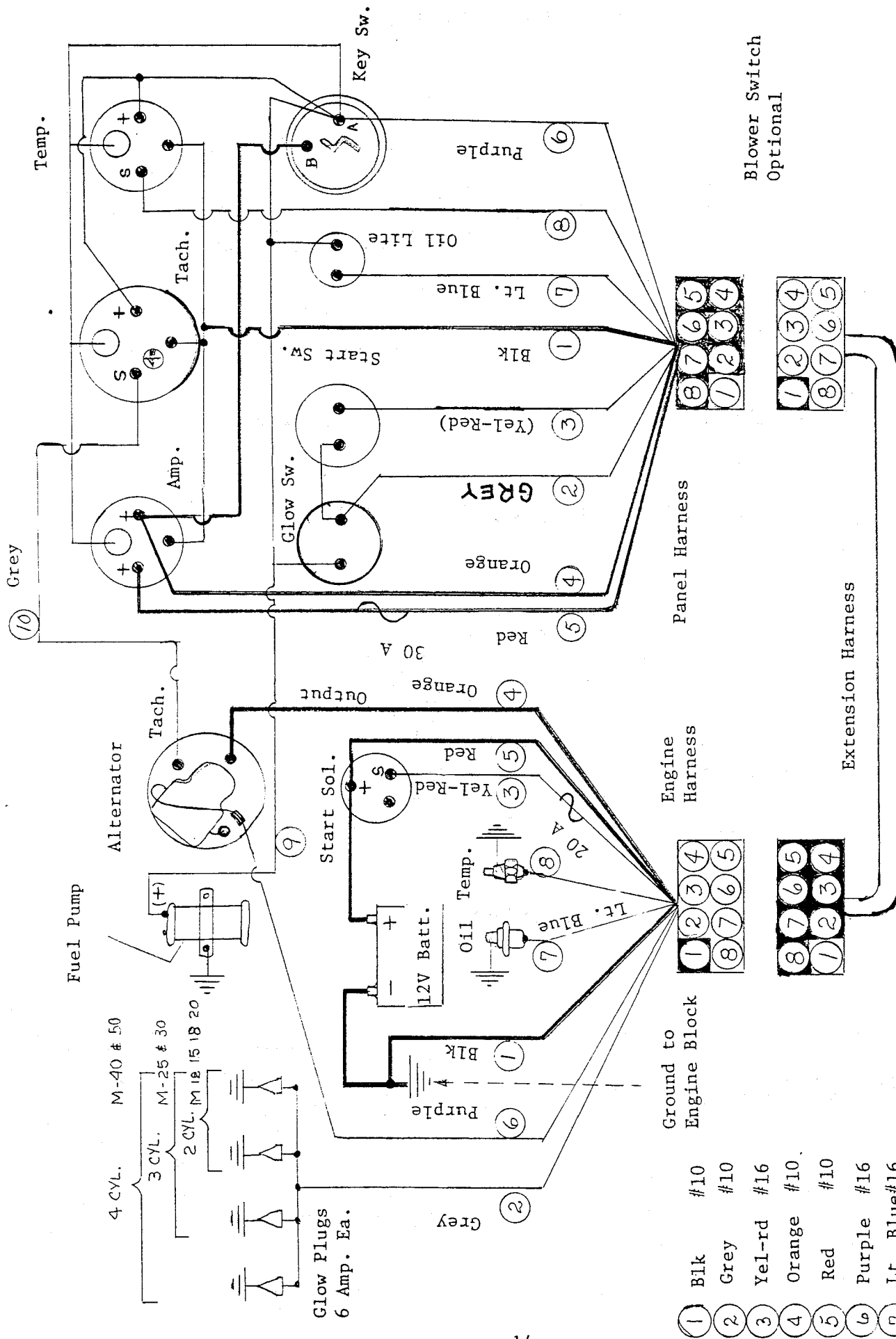
STANDARD



DELUXE



CUSTOM



Electric Fuel Pump on M-12-18-20-25-30 & 50

PREPARING THE ENGINE FOR WINTER STORAGE OR LAYUPS

Proper preparation of your engine for storage will avoid damage and minimize expense when again placing your engine in service.

NOTE: It is recommended that your engine be winterized by an authorized Universal mechanic or at least, a trained mechanic familiar with the engine and its options.

LUBRICATION SYSTEM:

1. Before boat is lifted out of the water, run the engine until operating temperature is attained.
2. Stop engine after warm up and remove crankcase oil through the dipstick hole using hand sump pump designed for that purpose. Replace dipstick after oil has been removed or through oil drain hose if one is provided.
3. Refill crankcase with new oil and replace filler cap.
4. Run engine again for about 5 minutes to distribute a protective film of clean oil to act as a rust preventive during storage.

TRANSMISSION: (See transmission instructions)

1. Fill transmission completely with type "A" transmission oil. (You may just add to the existing oil or drain the old oil and completely refill with new transmission oil.)
2. Be sure both drain and filler plugs are tight after draining or adding to the oil in the transmission.
3. Transmission is now ready for storage.

SEA WATER COOLING SYSTEM: Models 12, 18, 20, 25, 30, 40 & 50

OPTION #1

1. To drain sea water system, disconnect hose end at sea water pump that comes from heat exchanger.

Lower free end of hose to a point approximately level with the front engine mount. This will allow the sea water to drain from heat exchanger and hoses.

2. Loosen the 4 or 6 screws on the sea water pump cover plate. Tap the plate lightly to loosen it, this will allow pump to drain.

3. After pump has drained, apply a light coat of lubrication to protect pump and impeller during storage and replace cover.
4. Drain exhaust muffler and system separately.

OPTION #2 USED IN PLACE OF DRAINING SEA WATER

1. Disconnect sea water inlet hose at sea cock shut off valve. BE SURE SEA INLET VALVE IS CLOSED FIRST.
2. Place this inlet hose into a container of antifreeze, after it has stopped draining, and crank engine over (with decompression lever on), at 10 second intervals, until antifreeze comes out of exhaust outlet, see item 4.
3. You should now have antifreeze in sea water pump, hoses, heat exchanger and exhaust system.
4. If aqua-lift or pot type muffler is used, it is recommended to drain prior to pumping antifreeze thru system and afterwards to prevent coolant from backing up into the engine.

SEA WATER COOLING SYSTEM: Model M-15

OPTION #1

1. Open the cylinder block drain cock on the side of the block where hose from water pump enters, and drain.
2. Loosen water pump cover plate, allowing pump to drain, lubricate and replace cover.
3. Remove drain plug or rear bottom of exhaust manifold, and drain.
4. When boat is out of water, inlet lines to pump and thermostat will drain. Close sea cock valve when completed for storage.
5. If aqua-lift or can type muffler is used, it is recommended to drain muffler and lines of water.

OPTION #2 (With engine at operating temperature and stopped)

1. Shut off sea cock valve.
2. Remove hose at sea cock. Let water drain from hose. Place inlet hose into container of antifreeze (with decompression lever on). Crank engine over at 10 second intervals until antifreeze comes out exhaust outlet.
3. If aqua-lift or can type muffler is used, drain prior to pumping antifreeze thru system and afterwards to prevent coolant from backing up into the engine.

4. You may wish to do option #1 prior to #2 to insure all water is out of engine and exhaust system.
5. Replace hose to sea cock when complete. Be sure sea valve is closed.
6. Antifreeze will aid in coating inside of the engine, reducing rusting.

TO DRAIN FRESH WATER COOLING SYSTEM: Models 12, 18, 20, 25, 30, 40 & 50

1. Remove pressure cap from manifold.
2. Open drain cock located above oil filter to drain engine block and head cylinder.
3. Open the in-line drain petcock located below the alternator. This will drain the manifold, heat exchanger and engine fresh water pump.
4. Remove 1/8" pipe plug at lower rear of manifold, to drain manifold separately.
5. Close all drain valves and petcocks when draining has been completed.
6. If antifreeze solution is used, it is not necessary to drain the system each year, providing you have the correct mixture to prevent freezing during winter storage.

EXHAUST SYSTEM:

1. Exhaust pipes and muffler should be drained of sea water. Allow the exhaust pipes to dry out. Seal exhaust pipe end to prevent entrance of moisture into the engine through exhaust valves that are open.
2. See Option #2 under Sea Water Cooling System appropriate for your model.
3. All can type mufflers should be drained. After any long periods of cranking. As Sea Water pump will fill the muffler causing water to backup and enter the engine.

ELECTRICAL SYSTEM:

1. Remove battery and store it in a warm dry area.
2. Protect other electrical parts against moisture.

FUEL TANK:

1. To protect against corrosion or moisture in the fuel supply tank, either fill the tank with fuel or drain completely and seal top securely for storage.
2. A diesel additive is recommended to prevent bacterial growth in the fuel.

GENERAL:

You may want to completely cover the engine to provide additional protection. Care should be taken when covering so that electrical connections are not loosened and that fuel lines are not bent or broken.

HAVE YOU MAILED IN YOUR WARRANTY CARD?

PREPARING ENGINE FOR SPRING SERVICE

Preparation of the engine should include all those items of maintenance necessary to permit satisfactory operation of the engine. A properly serviced engine will give a full season of carefree pleasure. The amount of service needed will be determined by the storage procedure of the previous fall. Refer to the section of the manual covering initial start up of the engine.

LUBRICATION SYSTEM:

1. Drain oil from crankcase using hand sump pump through the dipstick hole or oil drain hose if installed.
2. Install new oil filter.
3. Refill crankcase with recommended grade and amount of engine oil. (Fill to upper or full mark on dipstick).
4. Be sure filler cap is secure after filling crankcase and that no oil leaks are apparent.

TRANSMISSION:

1. If transmission was completely filled for winter storage, some oil will have to be removed to attain the correct level in the transmission.
2. Check transmission oil level according to specifications found in this manual.
3. Be sure all plugs are secure and that no leaks are apparent. The drain plug should be checked regularly.

SEA WATER COOLING SYSTEM:

1. Remove front cover of pump if system was drained for storage. Inspect rubber impeller, lightly lubricate pump impeller, replace gasket and cover securely when inspection and lubrication have been completed. Turn grease cup 1/2 turn to lubricate shaft.
2. If impeller is not serviceable, see instructions covering the replacement of the sea water pump impeller in the maintenance section of this manual.

COOLING SYSTEM: Model M-15

On Model 15, make sure all plugs and hoses are replaced and secure. Remove inlet hose on pump and add about 3/4 oz. of lube oil. This will lubricate impeller when engine first starts until it picks up sea water.

FRESH WATER COOLING SYSTEM: Models 12, 18, 20, 25, 30, 40 & 50

1. Inspect the heat exchanger and exhaust manifold for secure mounting and interior cleanliness. If system was filled with a 50/50 water and antifreeze mixture for storage, leaks will be easier to detect than if the system was drained. The coolant should be relatively clear and should be free of scale or other foreign particles.
2. If system was drained and inspection is satisfactory, fill slowly with coolant and replace pressure cap. Recheck coolant level after engine has run and reached operating temperature. Use caution when removing cap when engine is hot.
3. Use antifreeze or rust preventative in system to prevent rust.

EXHAUST SYSTEM:

1. Check all hoses and hose clamps for serviceability and security. Any worn or damaged hoses or clamps must be replaced before operation.
2. Check all valves and remove all plugs before operation.

ELECTRICAL SYSTEM:

1. Inspect all wiring, terminals, controls and switches for damage or corrosion.
2. Install a fully charged batter and connect it correctly. (NEGATIVE GROUND.) Be careful to not short across negative and positive terminals.

FUEL SYSTEM:

1. Fuel tank must be clean, free of water and securely mounted. If it was filled with fuel for storage, FUEL MUST BE CLEAN.
2. Check fuel cap vent hose. It must be open for unrestricted air venting.
3. Fuel lines must be secure and all clamps and nuts tight. Lines must not be bent or leaking. Fuel system will require bleeding before operation, if tank has been drained or filter has been replaced. (See instructions covering fuel system bleeding).

GENERAL:

All of the above items must be carefully checked if satisfactory operation is to be expected, good common service will aid during servicing.

Refer to the start up check list in this manual after above items have been checked and before attempting to start the engine so that the proper procedure may be followed in some cases other add ons may require servicing.

WITH THE BOAT IN THE WATER, check freedom of the propeller shaft in the bearings and alignment of the propeller shaft with the engine. Shaft alignment should not be more than .002" to .004" out at four points in one position at coupling flange and the same four points in the same position when shaft and coupling is rotated 180° from first check. If propeller shaft is out of alignment, we strongly recommend that re-alignment be performed by a qualified mechanic familiar with the installation.

Also, it may be necessary to tighten the stuffing gland just enough to stop excessive leakage along the shaft. Excessive tightening will cause power loss and burned stuffing material. A slight seepage is necessary to lubricate the stuffing gland.

Any problems arising from this pre-use inspection requiring special tools or attention should be referred to the boat dealer, a Universal Dealer service center, or a qualified diesel engine service center.

MAINTENANCE OF YOUR ENGINE

Unless major repair work is done on the engine, timing should not be required.

FUEL INJECTION TIMING:

Basic tools required: (A) - 10 MM Socket wrench
(B) - 13 MM Socket wrench
(C) - 17 MM Open end wrench
(D) - 12 MM Box end wrench
(E) - 27 MM Socket (1-1/16")

Engine firing order --- Two cylinder ----- 1 - 2
(Front V belt end)

Three cylinder --- 1 - 2 - 3

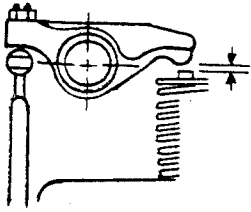
Four cylinder ----- 1 - 3 - 4 - 2

1. Remove fuel lines from injector pump fittings on injector pump (Tool C).
2. Pull decompression lever so that it will remain in the decompression position.
3. Open throttle fully.
4. Energize electric fuel pump and turn engine over with starter to ensure that fuel is coming out of each injector pump opening. Have clean rags around opening to soak up fuel.
5. Wipe off any fuel on injector pump body and the top of each injector opening.
6. Turn crankshaft over by hand being careful not to damage spline on end of crankshaft. Engine rotation will be clockwise. STOP IMMEDIATELY at the first sign of fuel movement in the injector pump fuel fitting, for whichever injector pump is being checked. (No. 1 injector pump is the closest to the V-belt end of the engine).
7. Remove cover from flywheel timing mark inspection hold. Located inside of left engine mount (Tool B).
8. Check alignment of mark on flywheel with the timing pointer on the wall of the inspection hole. The 1-FI mark on the flywheel represents fuel injection of NO. 1 cylinder. 2-FI represents No. 2 cylinder, etc.
9. If timing pointer and the flywheel marking 1-FI is aligned then No. 1 cylinder is properly timed for fuel injection and should require no adjustment. The same will be true for No. 2, No. 3 and No. 4 cylinders if the above steps are followed.

10. In order to determine if timing is off, or if the injection pump is faulty, it is necessary to recheck the timing for each cylinder two or three times.
11. If there are variations in repeatability in the alignment of pointer and timing mark, a faulty fuel injector pump may be suspected.
12. If timing marks repeat to same location but are off $3/16''$ or more above or below the pointer, this indicates that the engine must be retimed.

If alignment of the timing mark is not within $3/16''$ above or below the pointer, the above steps must be taken to time the engine. If the timing is found to be satisfactory, then reconnect all fuel lines and fittings and tighten. The fuel system must be bled before the engine will operate properly. (See fuel bleeding instructions on page 28).

DIESEL VALVE ADJUSTMENT



*Valve clearance
0.007-0.009 in. (0.18 - 0.22 mm)
**Valve clearance
0.0075-0.0072 in. (0.145 - 0.185 mm)
(with engine cold.)

Intake valve opens 20° B TDC
Intake valve closes 45° A BDC

Exhaust valve opens 50° B BDC
Exhaust valve closes 15° A TDC

* Models 20, 30, 40 & 50

** Models 15 & 25

FIGURE 3: ADJUSTMENT OF VALVE CLEARANCE

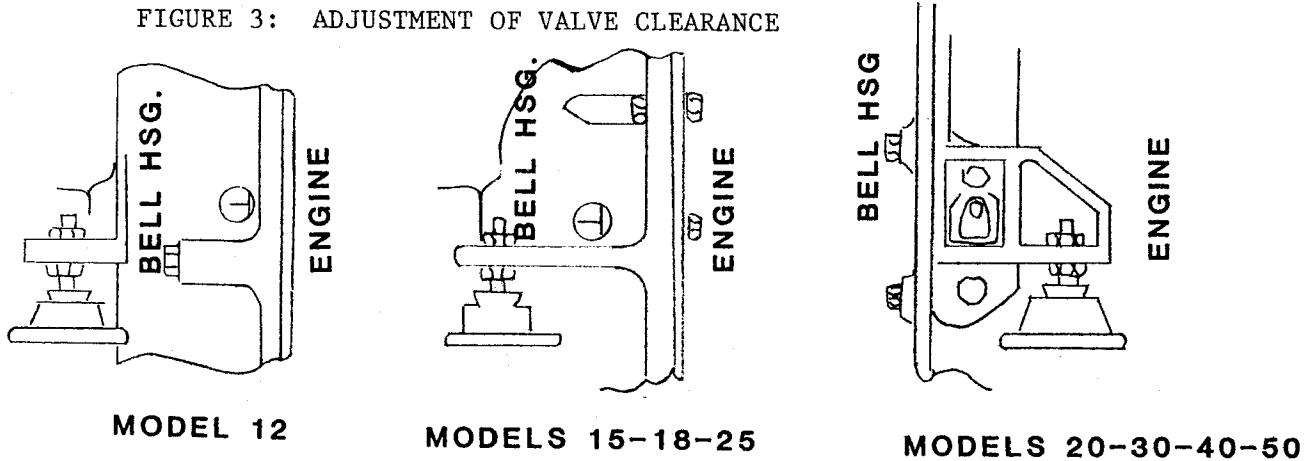


FIGURE 4

TIMING MARK LOCATIONS

INJECTOR PUMP SIDE

Turn crankshaft over by hand (Clockwise) being careful not to damage the spline on the end of the shaft. Turn until pointer aligns with timing mark 1TC on flywheel (Figure 4A). Check to make sure both intake and exhaust valves on No. 1 cylinder are loose. If not, turn crankshaft one more complete revolution to bring No. 1 cylinder onto compression. Valves can now be set on No. 1 cylinder. This procedure is true for No. 1 cylinder on all models. To set the valves on the remaining cylinders, follow the matching diagrams above being sure that both intake and exhaust valves are loose at the corresponding cylinder before adjusting.

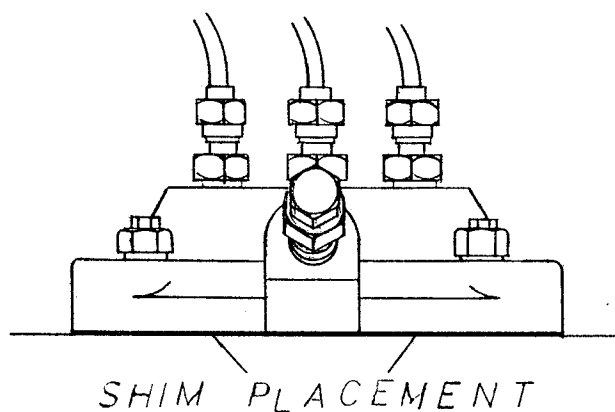
CAUTION: DO NOT use the timing marks 1-FI, 2-FI, etc. These marks are used for timing fuel injector pumps only.

ADJUSTING FUEL TIMING

Steps necessary for fuel timing:

1. Remove air intake manifold so that the fuel injector pump can be removed without interference.
2. Set throttle lever at full speed.
3. Remove injector pump side cover. This will enable you to visually check to insure that the fuel rack pin inside the pump properly aligns with the opening in the top of pump housing when being removed to prevent binding or shearing of the pin. This pin is critical to proper pump operation and if damaged will require replacement of the complete pump.
4. The injector pump internal unit can now be loosened and removed. It may be necessary to remove fuel lines from injector nozzles to aid in pump removal.
5. There are several shims located just below the pump top plate which will be used to adjust the timing. These shims are .006 inch thick and are equal to $1-1/2^{\circ}$ or approximately $3/16''$ of distance on the circumference of the flywheel. Addition of shims will retard the timing and removing shims will advance the timing.
6. If the mark on the flywheel is below the pointer, the fuel is being injected sooner than required and the fuel timing must be retarded. Shims must be added until the timing marks are aligned. The opposite is true if the flywheel mark is above the pointer. See figure 5.
7. If at all possible, it is better to operate the engine with the timing advanced rather than retarded.
8. Replace fuel injector pump, making sure the fuel rack pin aligns with the housing opening and is properly inserted into the slotted arm. Tighten injector pump cover in place. Reconnect fuel line from fuel filter to pump. Repeat steps 2 thru 12 on engine timing.
9. If timing is satisfactory, then reassemble. Be certain that all plates, covers, fuel lines and connections are tight and free of leaks so that safe operation may be expected when the engine is started. Clean engine thoroughly.
10. Caution: Be sure all fuel lines and connections are kept clean during adjusting, to prevent fouling of nozzles when reassembled.

FIGURE 5

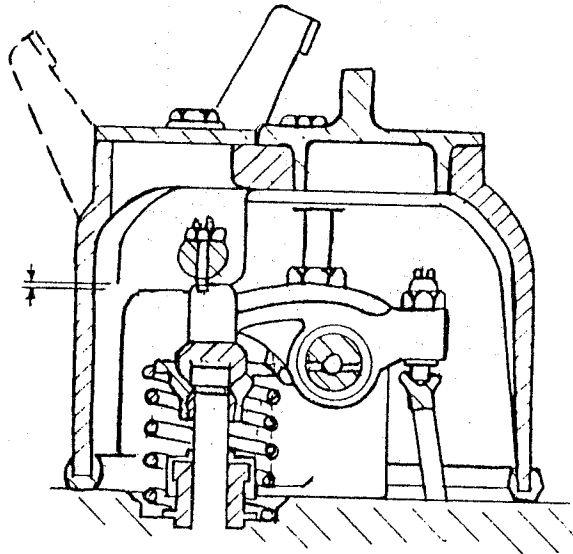


DECOMPRESSION DEVICE ADJUSTMENT:

The decompression device must be adjusted every time the rocker arm cover is removed or tightened.

1. Remove cover over flywheel timing mark inspection hole. (Tool B).
2. Turn crankshaft over by hand being careful not to damage the spline on end of crankshaft, until flywheel mark 1-TC is aligned with the pointer on the wall of the inspection hole.
3. Remove decompression covers from top of rocker arm cover over number 1 cylinder. (Tool A).
4. With the alignment of the pointer and flywheel mark 1-TC the no. 1 cylinder decompression adjustment can now be accomplished.
5. Pull and hold lever to full decompression position.
6. Working through the access hole, loosen the lock nut with a wrench (tool A) and back the adjusting screw off until no contact is made on the rocker arm (Using screw driver).
7. Now turn adjusting screw in until first contact is made, continue to turn screw in (1) turn.

8. Lock the screw in this position with the lock nut. Observe the position of slot in screw prior to locking nut, recheck after tightening lock nut.
9. The above steps are to be followed to adjust the decompression for all remaining cylinders. After aligning the respective flywheel marks (2-TC, 3-TC, etc.), Adjustments can be made as described in steps 3 thru 7 above.
10. After all necessary adjustments have been made, be sure to replace and secure all access hole covers and the flywheel inspection hole cover.



DECOMPRESSION DEVICE

FUEL SYSTEM:

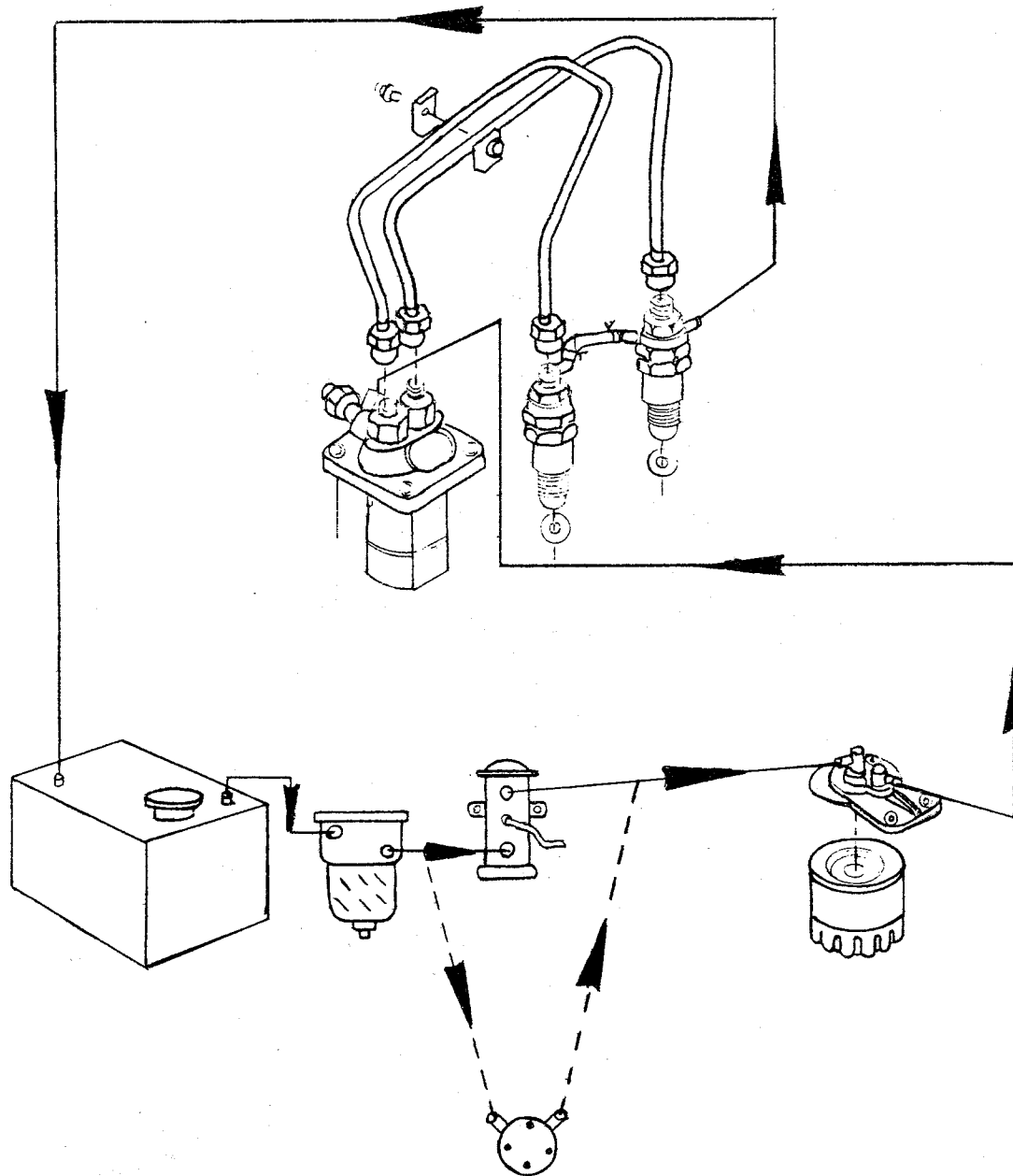
The fuel system utilizes either an electric or mechanical fuel pump, fuel filter, fuel injection pump with injectors and fuel lines. Any fuel not used by the injectors is returned through fuel return lines from the rear most nozzle to the top of the fuel supply tank.

The canister type fuel filter should be changed each season before the engine is placed back in service or more often based on engine usage.

The engine operates on No. 2 diesel fuel only and care should be taken to see that no water or dirt enters the fuel system.

Clean fuel is very important to a smooth, trouble free running engine.

PLEASE MAIL IN YOUR WARRANTY NOW!



BLEEDING THE FUEL SYSTEM:

It will be necessary to bleed the fuel system to achieve a steady air free flow of fuel if any of the following have occurred:

1. Running out of fuel.
2. If fuel shut off valve is left closed and engine runs out of fuel.
3. Replacing fuel filter.
4. Fuel injector nozzle or injector pump repair.
5. After repairing or replacing any fuel line.
6. Before putting engine back into service in the spring, if fuel system has been drained.
7. Replacement of electric or mechanical fuel pump.
8. Any time air is permitted to enter the fuel system.

BLEEDING PROCEDURE:

Be sure to have some means available to catch or absorb any fuel escaping during the bleeding process so that it will not accumulate in the engine compartment of bilge.

1. Be sure there is a sufficient supply of fuel in the fuel tank.
2. Open the fuel shut-off valve at the tank.
3. Start the electric fuel pump by turning the ignition key to the "ON" position on models 18, 20, 25, 30, 50.
4. Models 15 and 40 have mechanical fuel pumps. Therefore with decompression on, turn engine over with starter. Crank at 10 second intervals while doing steps #5 and 7.
5. Slowly loosen the air bleed plug on the fuel filter, letting air escape until an air free flow of fuel is evident.
6. At this time, tighten the air bleed plug on the filter.
7. Slowly loosen the air bleed plug on the injector pump, letting air escape until an air free flow of fuel is evident. Unit with a self bleed return valve open for a short period then close.
8. At this time, tighten the air bleed plug or knurled knob on the injector pump.
9. The fuel system should now be properly bled and ready for operation.

Refer to starting instructions before attempting to start the engine after bleeding the fuel system.

CAUTION: Excessive cranking with sea cock valve open can cause water accumulation in the muffler and possibly back up into the engine. Drain muffler as needed.

FUEL INJECTORS:

Fuel injectors should be removed and taken to a qualified diesel engine repair center to be tested for leakage and spray pattern, if poor engine performance such as, loss of power, rough or uneven running, sudden notice of dark exhaust, or engine becomes hard to start.

REMOVING INJECTORS:

1. Clean the area around the injectors before removing.
2. Loosen nuts holding fuel lines to injector pump and injector nozzles and remove fuel lines (Tool C).
3. Loosen nuts on return line adaptors and remove adaptors (Tool C).
4. Loosen injectors using (Tool E) and remove injectors.

REPLACING INJECTORS:

1. Check to be sure contact surfaces and area around injectors is clean.
2. Replace injectors in the same cylinder from which they were removed.
3. Torque required to properly seat the injectors will be between 43 and 58 ft./lbs.
4. Replace fuel return lines and secure nuts.
5. Replace all fuel lines and secure all nuts.
6. After all injectors, fuel lines and hoses have been replaced and are secured, the fuel system will have to be bled. (Refer to bleeding instructions in this manual. (P-28)

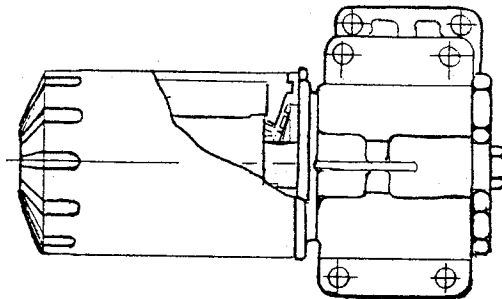
The fuel injection pump has been set at the factory and should need no adjustment. Any apparent problem with the pump should be referred to a qualified diesel mechanic or to a Universal Diesel dealer as advised.

NOTE: NO WARRANTY COVERAGE WILL BE GRANTED IF ANY OF THE FACTORY SET AND SEALED FUEL AND MAXIMUM R.P.M. ADJUSTMENTS ARE ALTERED.

OIL FILTER CHANGE:

After draining engine oil and before refilling with new oil, the oil filter should be changed.

1. Unscrew old filter. If it will not loosen, use a special oil filter removal tool.
2. Take care to catch any escaping oil so that it will not accumulate in the engine compartment.
3. When installing new filter, moisten the rubber seal with oil, screw new oil filter onto the threaded shaft and tighten it. Hand pressure is sufficient to tighten the filter.
4. Refill the crankcase with the correct grade and amount of oil as indicated by the full mark on dipstick.
5. Start the engine according to the starting procedure in this manual. Run only long enough to check for any oil leaks and stop engine.
6. The oil level will have dropped by the amount of oil which enters the oil filter and by the amount which has distributed around the engine.
7. After engine has stopped and the oil level allowed to settle, recheck the oil level and fill as required.



SEA WATER PUMP:

Your engine is equipped with a rubber impeller type sea water pump.

CAUTION: DO NOT RUN PUMP DRY AT ANY TIME OR YOU WILL DAMAGE THE IMPELLER, CAUSING ENGINE TO OVERHEAT.

You can use methyl alcohol based anti-freeze compounds such as Zerex, Shell Zone, Pyro Permanent, Permagard and Dowgard.

REPLACEMENT OF SEA WATER PUMP IMPELLER:

1. Be sure engine is stopped. Turn off sea water inlet valve.
2. Loosen and remove the pump cover screws.
3. Tap cover on side to loosen, being careful not to damage cover gasket and remove cover.
4. At this time, be careful not to pull the pump shaft forward or out of its present position. If the shaft does come forward during the changing of impeller, it will be necessary to remove complete pump.
5. Remove the snap ring located on the end of shaft in center of impeller, with shaft held in place.
6. The impeller can now be pulled off the pump shaft. Be sure to hold shaft in place with a screwdriver or etc., when removing the impeller.
7. Replace with the new impeller by rotating. (You can lubricate impeller with vasoline or oil prior to installing.) This will also prevent burning of new impeller when first starting engine.
8. Replace snap ring, being sure it is in the groove all the way around.
9. Replace gasket and cover (oil inside of cover).
10. Replace the cover screws and tighten evenly.
11. Open sea water inlet valve, check for leaks.
12. Engine can now be started, check engine temperature.

NOTE: IF DURING IMPELLER REPLACEMENT THE PUMP SHAFT CAME FORWARD, IT COULD HAVE COME OUT OF THE GROOVE AND DRIVE ADAPTOR. IF SO, YOU MUST COMPLETE THE FOLLOWING.

1. Loosen and remove the two capscrews holding the pump body to engine.

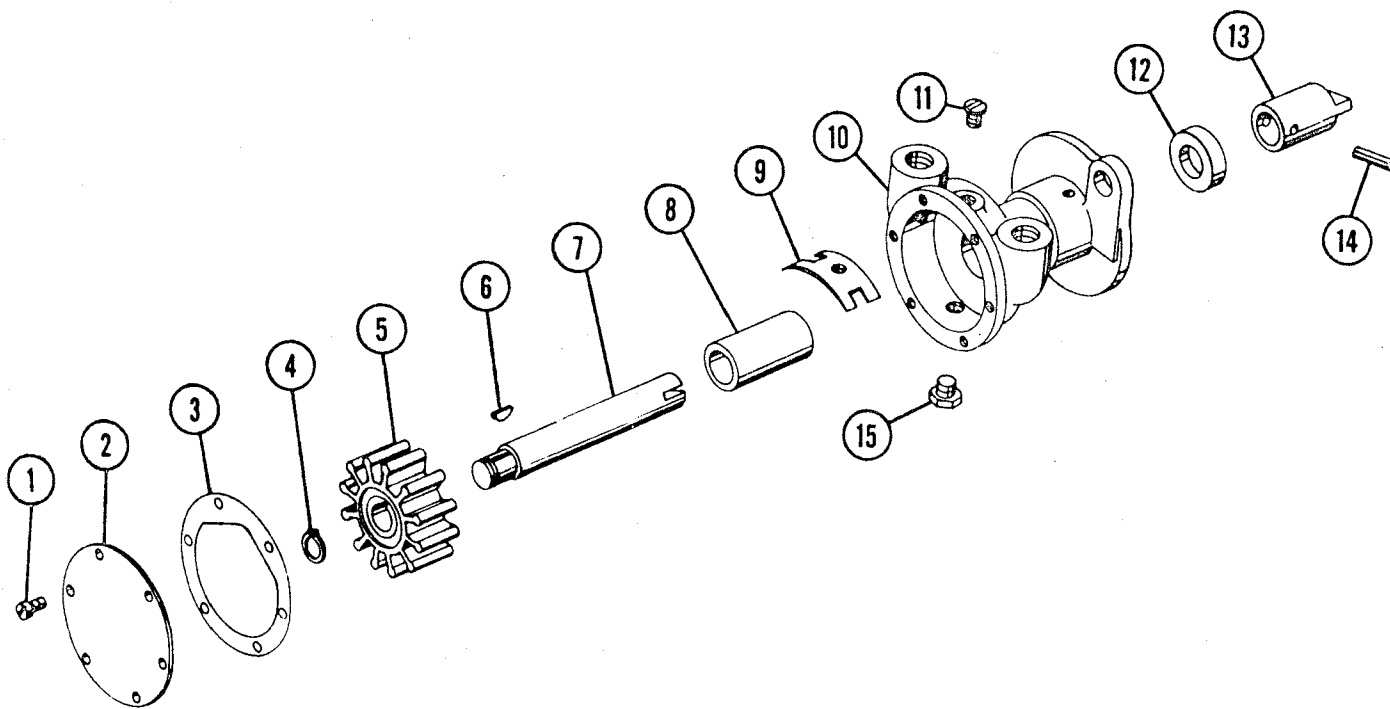
2. Slowly move pump away from engine as the adaptor will come out.
 3. Complete the replacement of impeller as noted above.
 4. The pump shaft will now be protruding through the body mounting flange.
 5. Place the adaptor on to the pump shaft aligning the pin on the groove.
 6. Align the slot on the other side of adaptor with the drive shaft in engine and place pump on engine.
 7. Hold in place and start the two mounting capscrews. TIGHTEN FINGER TIGHT SO PUMP IS FREE TO MOVE AND ALIGN ITSELF.
 8. Open sea water valve and start engine at idle. This will align pump to the drive and adaptor.
 9. Now tighten capscrews carefully while engine is running.
- CAUTION: BE VERY CAREFUL DUE TO V-BELT MOVING ON FRONT OF ENGINE.
10. Feel the bearings to make sure they are not hot; they are located in the center of pump body.

NOTE: THERE ARE TWO TYPES OF SEA WATER-RUBBER IMPELLER PUMPS USED. ORBERDORFER PUMP HAS 4 SCREWS SECURING COVER TO PUMP BODY AND SHERWOOD PUMP WHICH HAS 6 SCREWS SECURING COVER TO PUMP BODY. NOTE WHICH PUMP YOU HAVE ON COVER OF THIS MANUAL. IT IS RECOMMENDED TO HAVE A SPARE IMPELLER AND COVER GASKET ON BOARD AT ALL TIMES.

ORBERDORFER IMPELLER NO. 295628	COVER GASKET NO. 295626
SHERWOOD IMPELLER NO. 287439	COVER GASKET NO. 295745

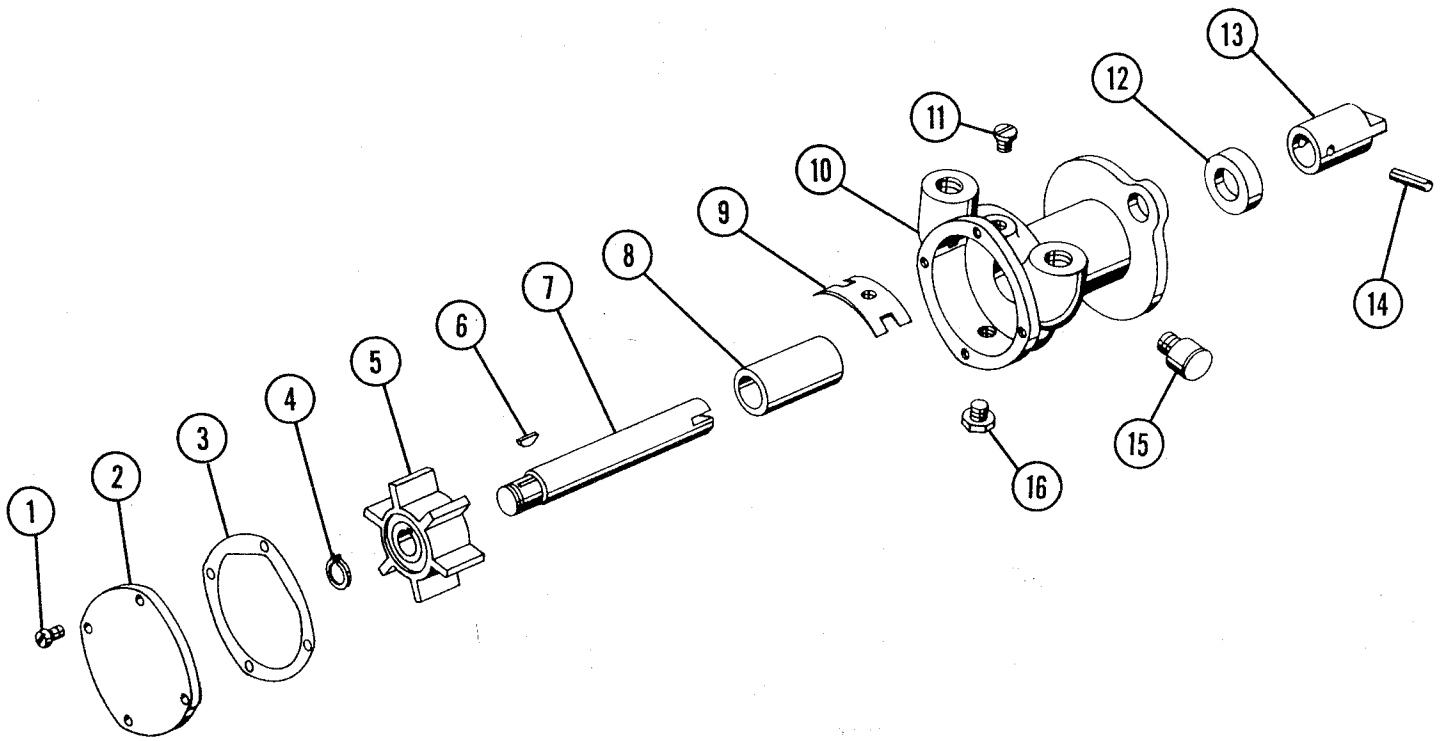
CAUTION: DO NOT RUN PUMPS DRY OR WITH SEA INLET VALVE CLOSED. LACK OF WATER WILL CAUSE EXCESSIVE HEAT BUILD UP DAMAGING OR DESTROYING THE RUBBER IMPELLER, AND ENGINE WILL OVERHEAT.

IF VANES COME OFF IMPELLER THEY MUST BE LOCATED AND REMOVED TO INSURE THEY ARE NOT BLOCKING OR RESTRICTING THE COOLING WATER FLOW IN THE ENGINE, HOSES, OR FITTINGS.



1. Cover Screws (6)
2. Pump Cover
3. Cover Gasket
4. Impeller Snap Ring
5. Impeller
6. Key
7. Pump Shaft
8. Water Seal
9. Cam
10. Pump Body
11. Cam Locking Screw
12. Oil Seal
13. Drive Adaptor
14. Roll Pin
15. Drain Plug

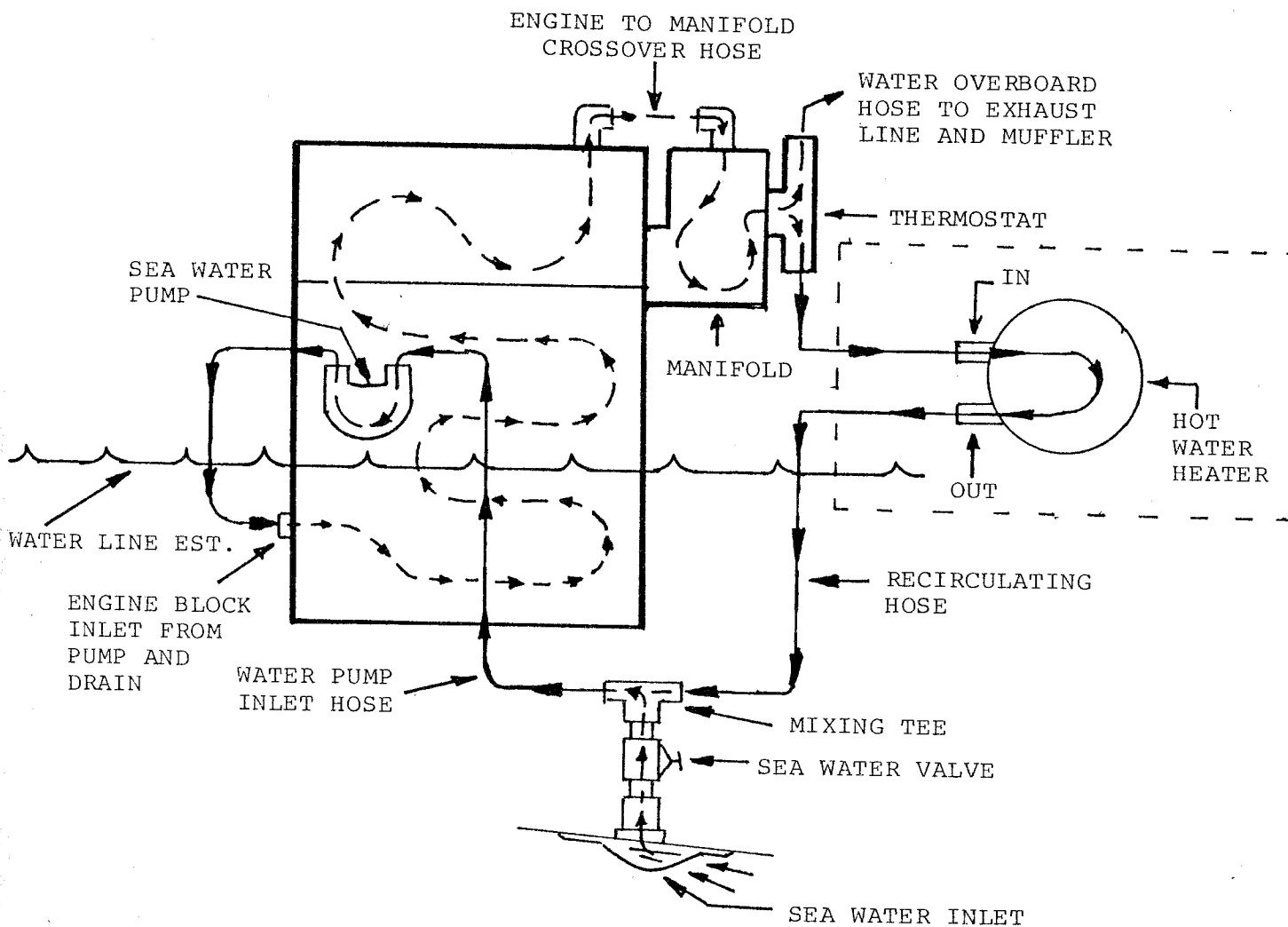
SHERWOOD RUBBER IMPELLER



1. Cover Screws (4)
2. Pump Cover
3. Cover Gasket
4. Impeller Snap Ring
5. Impeller
6. Key
7. Pump Shaft
8. Water Seal
9. Cam
10. Pump Body
11. Cam Locking Screw
12. Oil Seal
13. Drive Adaptor
14. Roll Pin
15. Grease Cup
16. Drain Plug

ORBERDORFER RUBBER IMPELLER PUMP

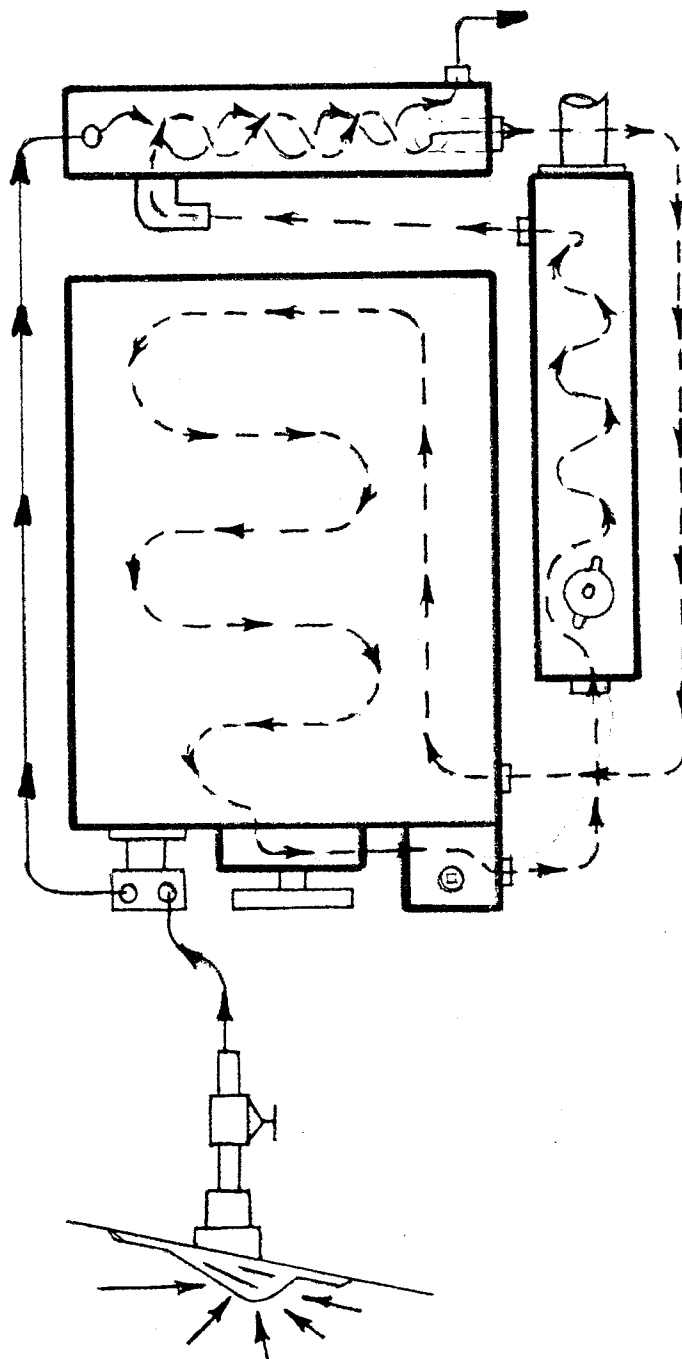
MODEL 15 SEA WATER CIRCULATION
 Normal Range 135° to 155° F



1. Sea water enters thru sea water inlet,
2. Through sea water valve when open,
3. Into mixing tee to suction side of pump, located below water line.
4. Out of pump by hose to inlet on side of block.
5. Circulates through block into cylinder head,
6. Leaves head on top front to exhaust manifold,
7. Circulates through manifold to thermostat,

8. Enters thermostat which remains closed during warm up, permitting a small amount of water to enter exhaust system for cooling and overboards.
9. As engine temperature rises the thermostat starts to open, permitting hot water enter exhaust line. At the same time the same amount of cool sea water is drawn in by the pump to replace the discharged hot water. This is done through the mixing tee which is located below engine (or water line) to prevent air from entering the system.
10. There may be some fluctuation in engine temperature until engine stabilizes.
11. In areas of cold inlet say 50° , you may notice some movement from 136° to 155° as engine R.P.M. are changed. This is less noticeable with warmer inlet waters. The reason being that the colder water causes thermostat to react faster than engine temperature stabilizes.
12. It may appear at first that no water is being pumped overboard with the exhaust gases. However, as long as water temperature is within operating range ($136^{\circ} - 155^{\circ}$), there is a flow of water being pumped overboard which may be noticed only as a fine mist. This will continue until the thermostat directs the water flow overboard to allow for greater intake of cooler sea water.

MODEL 12, 18, 20, 25, 30, 40 & 50 SEA WATER AND
FRESH WATER CIRCULATION DIAGRAM
Normal Range 160°F to 190°F



SEA WATER:

1. Sea water enter through sea water inlet,
2. Through sea water valve when open,
3. Through sea water pump into heat exchanger to cool fresh water system,
4. From heat exchanger to sea water overboard through exhaust port.

FRESH WATER:

1. Coolant (fresh water with antifreeze) is introduced into the system from the coolant section of exhaust manifold by removing pressure cap and filling manifold tank to within one inch of lower rim of fill port.
2. Fresh water engine driven circulating pump moves coolant from heat exchanger through engine block circulating pump and thermostat back through exhaust manifold into heat exchanger to be cooled.

The manifold serves as the engine expansion tank to allow for expansion of coolant as it heated. You also fill the system at this point. In some cases when hot water heaters are installed an expansion or surge tank may be required to prevent air from entering the system.

Should your engine overheat, first check coolant level to make sure it is not low which would cause air locks to develop. If air does enter the system, it may require a couple of fillings to remove the air pocket. A momentary increase of engine R.P.M. to approximately 2800 to 3000 R.P.M. may aid in moving the air from the system. In some cases it may require doing this 2 or 3 times. Do this just as you notice the temperature starting to rise above normal.

UNIVERSAL DIESEL WITH HURTH TRANSMISSION

Model HBW-50 (2:1)

Used on Models 12, 15, 18, 20 and 25

Model HBW-100 (2:1)

Used on Models 30 and 40

Model HBW-150 (2:1)

Used on Model 50

Model HBW-150 V-Drive (2:1)

Used on All of our V-Drive Models

TABLE OF CONTENTS

- A. Description
- B. Servicing
- C. Maintenance
- D. General Information
- E. Illustrations

CAUTION

DO NOT LEAVE GEAR IN FORWARD WHEN SAILING. GEAR MUST BE IN NEUTRAL FOR FREE WHEELING OR SHIFTED INTO REVERSE TO LOCK PROPELLER WHILE SAILING.

A. DESCRIPTION:

The Hurth transmission housing is made of a high strength aluminum alloy that is resistant to sea water. The transmission is equipped with shaved and case hardened helical gears and with shafts mounted in heavy-duty roller bearings. Forward and reverse is accomplished by a mechanical friction clutch.

Gear shifting is mechanical and requires only a minimum effort on the gear lever. Precision setting or readjustment of the shifting control (Morse or Teleflex) is not required.

The transmission is designed to permit reversing at full engine speed.
TO BE USED ONLY IN THE EVENT OF AN EMERGENCY!

B. SERVICING:

The transmission is filled with Type "A" transmission fluid at the factory during the engine load test.

Recheck and fill the gear box with the prescribed oil up to the top mark on the dipstick (approximately 1/4" up from bottom of stick).

When checking the oil level, DIPSTICK TO BE INSERTED ONLY - DO NOT SCREW IN.

Tighten the dipstick after adding oil or checking the oil level.

1. Placing in service after storage.

If the transmission was completely filled with oil for storage and preservation, make sure to drain the excess oil to the proper level. Use new oil if necessary.

2. Oil quantity.

Approximately 1.3 pints (.55 liter) - see servicing.

3. Oil grade.

Automatic Transmission Fluid, "AFT Type A oil only" according to specification Destron II D (General Motors) and M2 C33 G (Ford).

ALWAYS USE THE SAME GRADE AND TYPE OF OIL WHEN ADDING OR CHANGING OIL.

WARNING: ADDITIVES SUCH AS MOYBDENUM SULPHITE OR THE LIKE MUST NOT BE CONTAINED IN THE OIL UNDER ANY CIRCUMSTANCES.

C. MAINTENANCE:

1. Oil level in the transmission should be checked weekly.
Oil level: See Servicing.

2. Changing oil.

Change oil after first 25 hours of operation. Then change every 300 hours of operation, or at least at intervals of once a year or season.

3. Placing transmission in storage.

If the transmission is put out of operation for long periods of time under unfavorable environmental conditions, it should be protected against corrosion by filling it completely with oil of the same grade and type. Otherwise, it should be operated briefly with a good oxidation inhibiting oil to allow the agent to contact all parts of the gearbox.

D. GENERAL INFORMATION:

1. General

If the transmission is being painted, care should be taken to protect the oil seals at the output shaft in back of the coupling. Make sure the venting hole on the oil filter screw is not covered with paint.

The assembly - (engine/transmission) should be flex mounted in the boat to avoid distortion of the transmission housing.

2. Angle of installation

The angle of installation must not exceed 15° in relation to the water line in operation. (See illustration Fig. 1)

3. Operating temperature

Proper ventilation of the engine and transmission compartment should be insured. The operating temperature of the transmission oil should not exceed 250° F. (130° C)

4. Flexible couplings (Optional)

The flex coupling between engine coupling and propeller shaft should be designed to absorb bending stresses to compensate for minor angular deviations after installation.

Coupling alignment must be checked with the boat in the water, both rigid and flexible.

5. Gear shifting

Shifting requires little effort, therefore, both the single and dual lever control lever works well on this transmission. Dual lever is considered the standard in most cases.

Shift lever: Upon loosening the retaining screw, the shifting lever can be rotated as required to meet the control cable connection. The operating cable or rod assembly should be positioned perpendicular to the shifting lever in its neutral position (Fig. 2).

The shifting travel, measured at the pivot point of the shifting lever, must be at least 1-3/8" (35mm) from neutral to forward and neutral to reverse position. Longer shifting movements have no detrimental effect on the transmission (Fig. 2), however, insure lever travels beyond the detent in both directions when shifting.

When shifting transmission, engine R.P.M. should be returned to idle, then shift transmission firmly from one direction to another. A slight pause in neutral will allow propeller to slow and add life to transmission.

When running the engine to charge batteries in neutral, engage transmission for 1 or 2 minutes every 2 or 3 hours to lubricate all internal parts.

To lock the propeller vertically in line with the keel, mark the coupling and POSITION GEAR IN REVERSE. This will prevent slippage and damage to the clutch.

CAUTION: THE CABLE MUST BE MOUNTED TO THE SHIFT LEVER AT A 90° ANGLE TO INSURE EQUAL TRAVEL FROM NEUTRAL TO FORWARD AND NEUTRAL TO REVERSE (See Fig. 2).

CAUTION: TRANSMISSION MUST BE LEFT IN NEUTRAL WHEN SAILING, DO NOT LEAVE IN FORWARD GEAR WHEN SAILING WITHOUT POWER AS IT WILL DAMAGE GEAR.

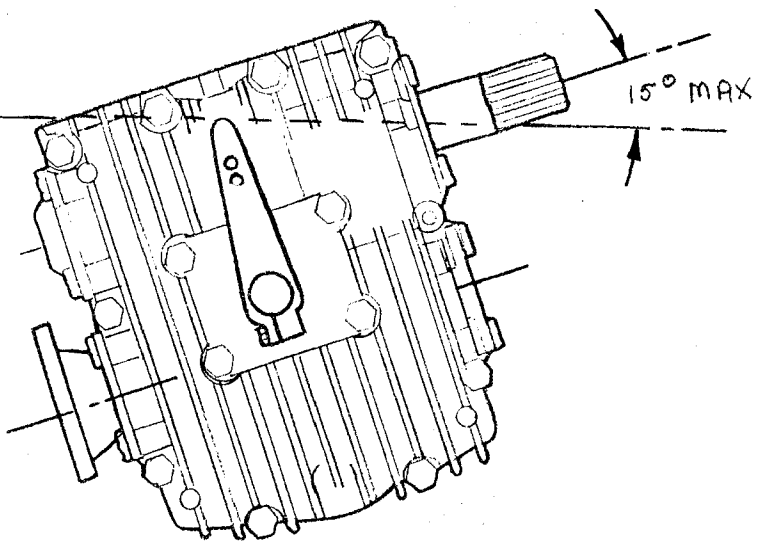


FIGURE 1

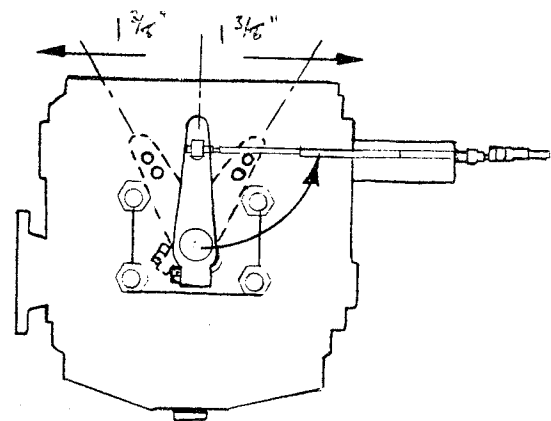
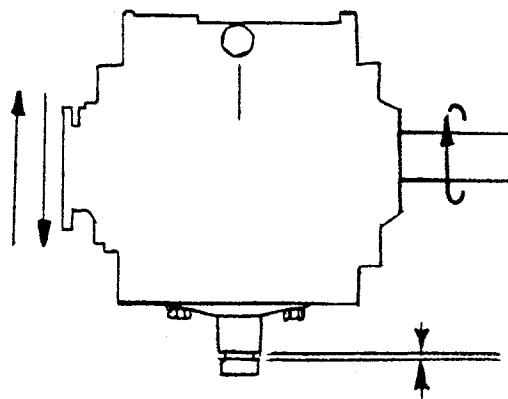
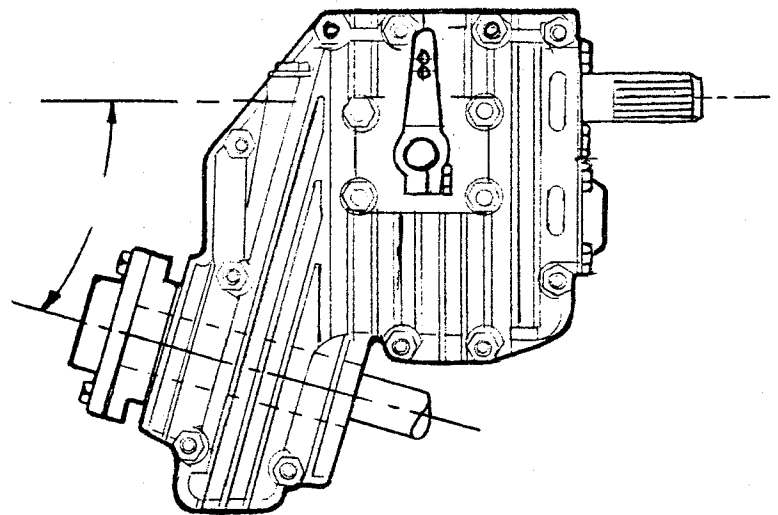
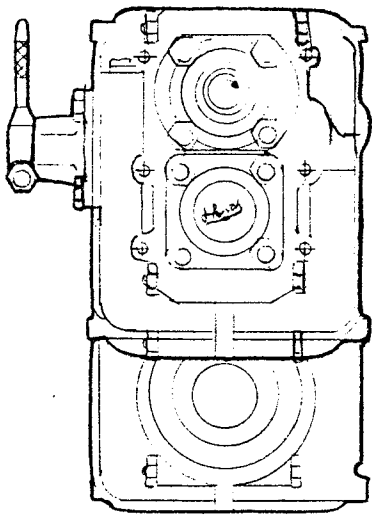
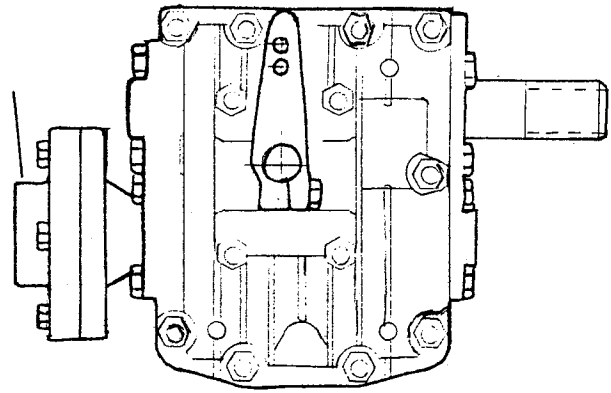
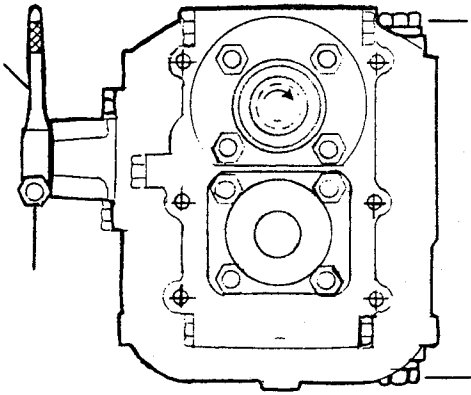


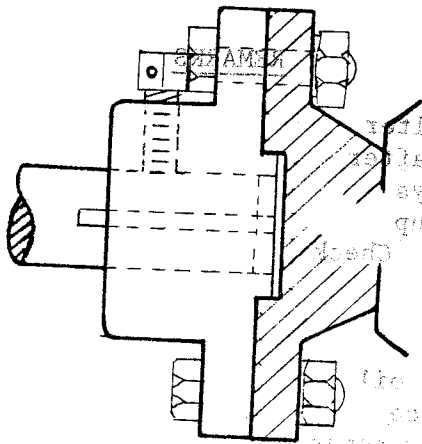
FIGURE 2

FIGURE 2



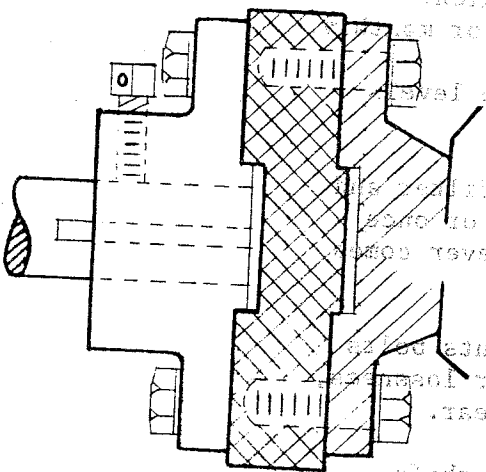
PERIODS OF OPERATION CHART

Always be sure engine is stopped and cool and that your personal safety is considered before making any repair work.



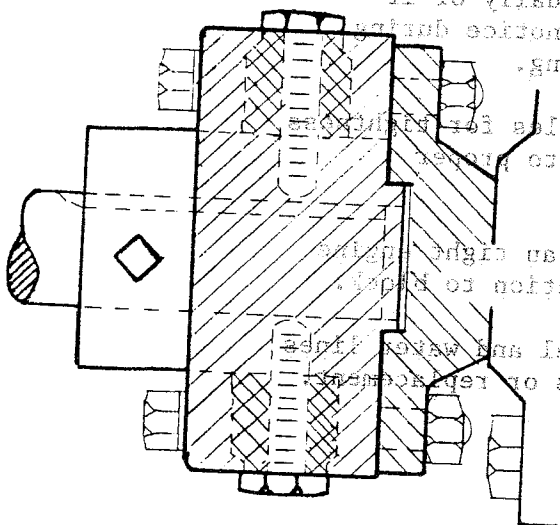
PERIOD OF OPERATION
 THINGS TO DO
 2. Drivesaver Flex Coupling

1" Thick
 Requires (1) rigid coupling (2A) & (2B) mounting screws and bolts
 Flex Coupling (Deluxe)
 2" Thick
 Specify Bore Size
 (3A) Mounting capscrews, locks, and nuts.



5. Point at which you check shaft coupling to gear coupling. See coupling alignment for details.
 6. Transmission or Gear Coupling

Mounted on engine. V-Drive is threaded and requires capscrew MM diameter.



Double check clearance between coupling nut or bolt and bearing cover capscrew on transmission. Must not hit or it will cause serious transmission failure. Rotate coupling and shaft to check.

PERIODIC SERVICE CHART

Always be sure engine is stopped and cool and that your personal safety is considered before making checks or doing any repair work.

<u>PERIOD OF OPERATION</u>	<u>THINGS TO DO</u>	<u>REMARKS</u>
Break-in period (Approx. 25 hours at 75% cruise speed).	Change engine oil, filter and transmission oil after first 25 hours. Always allow engine to warm up before applying load. Check V-belt tension. 1/2" deflection.	
Every 75 hours.	Change engine oil and oil filter or at least once each season which ever comes first.	
Every 100 hours.	Check V-belt tension. 1/2" deflection, or monthly. Check electrolyte levels in battery. Change fuel oil filter and transmission oil or once each year which ever comes first. Check engine mounts bolts and lock nuts for lossness, and rubber for wear. Check engine and shaft alignment annually or if vibration is notice during engine powering. Check all cables for tightness and location to proper positioning. Check for clean tight engine ground connection to block. Check all fuel and water lines for tightness or replacement.	

MARINE ENGINE WARRANTY - LIMITED

PRODUCT WARRANTY

Seller warrants all products and parts of its own manufacture against defects in material or workmanship for a period of one (1) year from date of shipment when given normal and proper usage as determined by seller upon examinations, and when owned by the original purchaser. Components purchased by seller as complete units and used as an integral part of sellers equipment will be covered by the standard warranty of the manufacture thereof. Seller will repair or replace F.O.B. original shipping point (but not install) any part or parts of its manufacture which in its judgment, shall disclose defects in either material or workmanship. If requested by seller, parts for which a warranty claim is made are to be returned transportation prepaid to our factory. This warranty becomes void if article claimed to be defective has been repaired or altered in any way or when the article has been subject to misuse, negligence or accident, or when instructions for installing or operating has been disregards. WE MAKE NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKE NO WARRANT OR MERCHANTABILITY OR OF FITNESS FOR BEYOND THE DESCRIPTION ON THE FACE HEREOF. NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY. THE REMEDIES HEREIN ABOVE AFFORDED TO THE PURCHASER ARE EXCLUSIVE OF ALL OTHER REMEDIES PROVIDED BY LAW. SELLER SHALL NOT BE LIABLE FOR INDIRECT OR CONSEQUENTIAL DAMAGES WHERE THE LOSS SUSTAINED IF OF A COMMERCIAL NATURE.

PRODUCT IMPROVEMENTS

The Manufacturer reserves the right to make product improvements at any time without responsibility or obligation to make similar changes or add similar improvements on engines delivered prior to those changes.

WARRANTY REGISTRATION

Enclosed with each engine is a warranty registration card. This card must contain the owner's name, address, serial number and model number of the engine and be returned to Medalist before the warranty becomes effective. Warranty registration will assist in identifying components required for your engine.

WARRANTY EXCLUSIONS

The following services or expenses will not be reimbursed under the warranty:

1. Tune up of the engine.
2. Repairs as a result of neglect, misuse, improper application, accident, racing of the engine and installations that do not meet minimum standards as set forth in the instruction manual.

3. Adjustments needed for cleaning of fuel system and components due to contamination.
4. Standard reverse gear adjustments from normal usage or wear.
5. Moisture in engine from exhaust systems which permit condensation or back flow of moisture into the engine.
6. Damage or loss of personal property, loss of revenue, towing charges, storage fees, fuel and telephone calls.
7. Damages or losses related to handling and shipping.
8. Expenses related to replacement of lubricants, anti-freeze or special additives.
9. Failure due to not following recommended maintenance schedules.
10. All transportation charges will be the obligation of the owner, such as freight, travel, time and tolls.
11. Warranty items returned to the factory collect will be billed to the shipper.

WARRANTY AUTHORIZATION

All repairs and/or claims must be approved by Medalist Universal Motors prior to performance of work.

RETURN OF MATERIAL TO THE FACTORY

All material to be returned must be authorized in advance by Medalist Universal Motors. Contact the service department for assignment of a return goods number. Ship material on a prepaid basis, after receiving the return goods form.

PLEASE NOTE

ENGINE WARRANTY REGISTRATION CARD MUST BE RETURNED TO MEDALIST UNIVERSAL MOTORS IMMEDIATELY.

GENERAL

Medalist Universal distributors and dealers are located throughout the United States and Canada. Distributors and dealers have an ample inventory of parts and can provide prompt, expert service in the maintenance and repair of your engine.

Medalist Universal Service Department will also provide assistance, within the limits of our specifications.

Welcome to the Medalist Universal Diesel powered sailing fleet.

medalist 

Universal Motors

1552 HARRISON ST. • P.O. BOX 3008 • OSHKOSH, WI 54903

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