

OPERATOR'S MANUAL

WESTERBEKE

WMF 25-32 KW

**Marine Diesel
Generator Sets**

Publication # 36250

Edition One

August 1986



AVON INDUSTRIAL PARK, AVON, MA 02322 • TEL: (617) 588-7700
TELEX: 92-4444 • FAX: (617) 559-9323 • CABLE: WESTCORP

FOREWORD

Thank you for having selected a Westerbeke Diesel Generator Set for your use.

This manual describes the procedures for proper handling and routine maintenance of:

Models WTF 25 KW and WTF 32 KW

Marine Diesel Generator Sets

To obtain best operating condition and longest life, it is important to use it sensibly and carry out operation and maintenance according to this manual.

If you have questions about your equipment or in the event of a failure, please contact your nearest distributor or dealer.

If, within 60 days of submitting your completed warranty registration card, you have not received a Customer Identification Card (see below) registering your warranty, please contact the factory in writing.

We look forward to your continued patronage.

from: J.H. Westerbeke Corp.
Avon Industrial Park
Avon, MA 02322

Mail To:

	J. H. WESTERBEKE CORP. <small>AVON INDUSTRIAL PARK, AVON, MASS. 02322</small>
CUSTOMER IDENTIFICATION	
32KW Gen. SN 44356 Eng. SN 1234C205	
Pleasure Craft expires 9/1/84	
Adam Smith	
85 Maple Street	
Alden, IN 14223	

PN

TABLE OF CONTENTS

	PAGE
GENERAL SPECIFICATIONS.....	3-4
CAUTIONS IN HANDLING ENGINE.....	5
BREAKING-IN.....	6
PREPARATIONS.....	7
INSTRUMENT PANEL, USE OF.....	8
STARTING PROCEDURES.....	9
STOPPING PROCEDURES.....	10
CAUTIONS ON STARTING AND OPERATION.....	11
REQUIREMENTS FOR PROPER OPERATION	
Lubrication System.....	13
Fuel System.....	14
Cooling System.....	18
Wiring diagram.....	20
Belt Tension.....	20
Domestic Hot Water.....	20
RECOMMENDED MAINTENANCE SERVICE...	22
TROUBLESHOOTING.....	24
TORQUE SPECIFICATIONS.....	25
COMMON PARTS BY NUMBER.....	26
SOUND GUARD INSTRUCTIONS.....	27
DESCRIPTION & RATING, GENERATOR...	28
INITIAL STARTUP.....	29
FIELD FLASHING, MAINTENANCE.....	30
TROUBLESHOOTING.....	31
RECTIFIER CHECKING.....	33
DISASSEMBLY & ASSEMBLY.....	34
GENERATOR & REGULATOR DIAGRAMS.	36-37
VOLTAGE REGULATOR.....	38
LIMITED WARRANTY.....	39

GENERAL SPECIFICATIONS

GENERATOR WTF 25KW

SPECIFICATIONS	WTF 25 KW
Number of Cylinders	4
Bore & Stroke	3.74 x 4.13 inches (95mm x 105mm)
Displacement	181.7 C.I. (2977 cc)
Compression Ratio	21:1
Combustion Chamber	Swirl Type
Injection Pump	Bosch Model VE Distributor
Lubrication	Pressure Feed
Cooling	Fresh Water with Exchanger System
Cold Starting Aid	Glow Plugs
Electric System	12 Volt DC Neg. Ground
Valve Mechanism	Rotating Type (Solid lifter)
Fuel System	See Page 14 of this manual.
Engine Start/stop	See Page 9 of this manual.
Maximum Torque	148 ft/lbs @ 1800
Horsepower Rating	50 HP @ 1800
Fuel Consumption	2.92 gal/hr. at rate output
Lube Oil Capacity (Sump Only)	6.5 qts. plus Filter/Cooler Assembly
Coolant Capacity	11.5 qts.
Cooling Air Requirements (Generator)	WTF 25KW - 450 C.F.M.
Starter Amperage Draw (Cranking cold)	375 - 425 Amps DC

GENERAL SPECIFICATIONS

GENERATOR WTF 32KW

SPECIFICATIONS	WTF 32 KW
Number of Cylinders	6
Bore & Stroke	3.62" X 4.00"
Displacement	247 CID
Compression Ratio	21:1
Combustion Chamber	Swirl Type
Injection Pump	Bosch Distributor Type
Lubrication	Pressure feed
Cooling	Fresh Water Cooled
Cold Starting Aid	Glow Plugs
Electric System	12 Volt DC Neg. Ground
Valve Mechanism	Rotating Type
Fuel System	See Page 14 of this manual.
Engine Start/Stop	See Page 9 of this manual.
Maximum Torque	195 ft/lbs @ 1800
Horsepower Rating	63 HP @ 1800
Spec Fuel Consumption	3.1 gal/hr.at Full Rated Load
Lube Oil Capacity	11 qts. plus Filter/Cooler Assembly
Coolant capacity	11.5 qts.
Cooling Air Requirement (Generator)	WTF 32KW-1.0 PF-480 C.F.M. WTF 32KW- .8 PF-530 C.F.M.
Starter Amperage Draw (Cranking cold)	375 - 425 Amps DC

INSTALLATION AND SUPPLY CAUTIONS

- * Check important aspects of installation before operating engine.
 - (1) Place generator set in engine room so that its own heated air is not recirculated through the AC alternator.
 - (2) Provide adequate ventilation. Sometimes, because of engine room geometry and the conflicting space requirements of other equipment, ambient temperature may exceed the allowable maximum of 104°C. In all such cases additional fresh air must be supplied to the AC alternator for proper cooling. (See page 27.)
 - (3) Provide adequate service room around engine. (All mechanical equipment will require service.)
- * Fill fuel tank with CLEAN #2 diesel from a reputable manufacturer.
- * Fill lubricating oil to full mark on dipstick (Select readily available lubricating oil of grade CC or CD). Check specifications for correct quantity of oil to place in oil sump.

Note: Filter quantity is in addition.
- * Fill freshwater cooling system with suitable mixture of water and antifreeze to suit your temperature zone. See page 16.
- * Plug-in Panel Harness Connection. After assembly, joint should be taped to prevent corrosion or, preferably, assembled using a silicon grease which can be obtained at an electronic store such as Radio Shack.

SAFETY PRECAUTIONS

- * Never operate engine with inadequate ventilation. Make certain there are no exhaust leaks inside engine compartment.
- * Do not touch moving parts during operation.
- * Do not touch hot parts, such as exhaust pipe, and do not place combustible materials near.
- * Inspect and adjust parts of the engine only after it is stopped.
- * Check and refill engine oil, cooling water and fuel after the engine is brought to a stop.
- * Add freshwater coolant via the coolant recovery tank. This is supplied with each unit and must be installed. Reference Service Bulletin #147.
- * Always use tools that fit correctly and use caution during servicing.
- * Be sure that current carrying wires are protected from abrasion and that all connections are correct and tight.

BREAKING-IN YOUR NEW GENERATOR SET

While your set has had individual test operations sufficient to demonstrate accurate assembly and correct operation of all systems, it still requires break-in time.

Service life of your engine is dependent on how it is operated and serviced during initial hours of operation.

Your new engine needs approximately fifty hours of conditioning operation for breaking in each moving part, thus maximizing performance and service life of the engine. Perform this conditioning carefully, keeping the following points in mind.

1. Start engine, run no load only while checking that all systems are functioning - sea water pump, oil pressure, battery charge.
2. Warm engine, preferably by running at medium load (50%+), until water temperature gauge moves into the 130 - 140 degree range.
3. Then use engine at varying loads (50 - 80%) for first twenty five hours.
4. Use caution not to overload engine. Loss of engine speed (Hertz) below acceptable minimums is an indication of an overload.
5. Next twenty-five hours may be run at 50 - 100% load.

Explanation:

"Breaking-in" a new engine is basically a seating of the piston rings to the cylinder walls. This is not accomplished by long periods of running no load or by early running under full load.

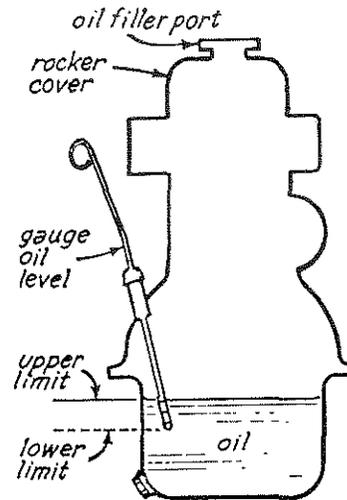
No load running may glaze the cylinder walls causing oil consumption and smoky operation. Excessive loads may score cylinder walls with similar results.

As indicated above, start the engine and check all operating functions at no load. Do not start engine with a load on the generator or transfer heavy loads from shore power to generator. Allow engine to reach operating temperature with moderate load on generator (25 - 50%) vary the loads during break in. This is most beneficial to the engine in helping to properly seat piston rings. Conscientious operation of your engine, following the above breaking-in procedure, will assure the best results.

PREPARATIONS

Take steps, as shown below, in starting your generator set for the first time or after a prolonged shut-down.

1. Fill your engine with oil up to or near the upper limit on the dipstick. Use a good grade of oil with API specification of CC or better. For correct quantity of oil, you may refer to the General Specifications page.



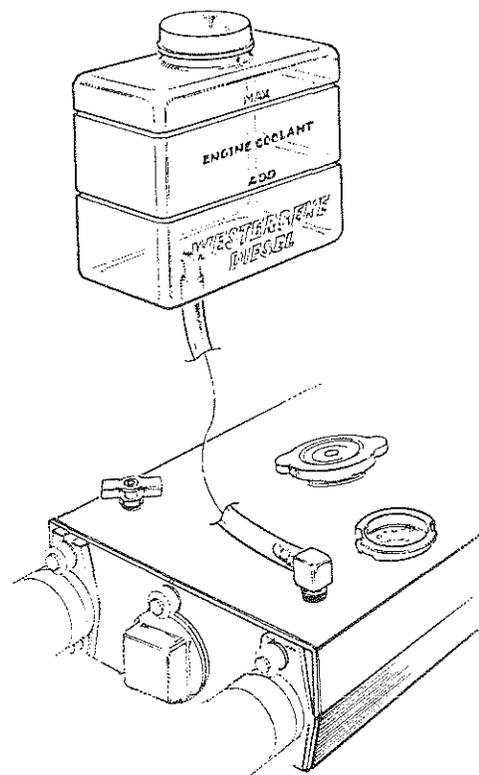
2. a) Fill the fuel tank with diesel fuel. The interior of the fuel tank must be kept clean. Be careful not to allow introduction of dirt or water when adding fuel.

b) Prime the fuel system up to the engine.

c) Prime the engine fuel system and bleed air from the on-engine fuel filter. Use the aid of the electric fuel pump by simply depressing the pre-heat switch. (Note: close the bleed screw on the engine filter once all the air is expelled.) Release the preheat.

d) Prime the injection pump by depressing the manual primer on the engine fuel filter with a steady, slow pumping action until a resistance is felt indicating the injection pump is primed.

3. Your engine is supplied with a coolant recovery system to which the following instructions apply:



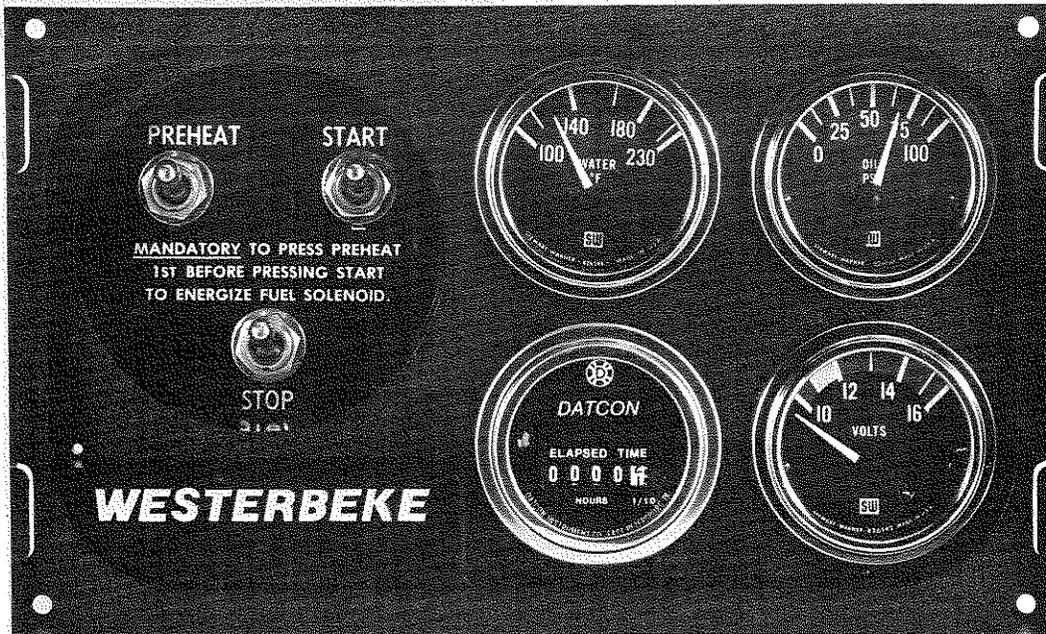
a) Fill engine completely to the neck of the manifold cap. Run the engine and insure all air is expelled before installing pressure cap.

b) Fill the recovery tank to the bottom level line. Need for adding coolant is indicated when a cold engine has coolant level below the bottom level line.

c) In winter add antifreeze as described on page 18. Antifreeze may be used year round.

4. Engine oil, and coolant levels should be checked at least once a day prior to engine use.

INSTRUMENT PANEL Description and use of:



Note 1: When engine is stopped after use, the water temperature and oil pressure gauges may stay at their running readings.

Note 2: When engine is next to be used, depress PREHEAT toggle switch. The temperature and pressure gauges will "ZERO" and the voltmeter will register battery voltage. The electric fuel lift pump, mounted on the engine, will also begin to operate, purging any air accumulated in the system. Excessive amounts of air found in the engine fuel system is an indication of a leak or improperly plumbed fuel system.

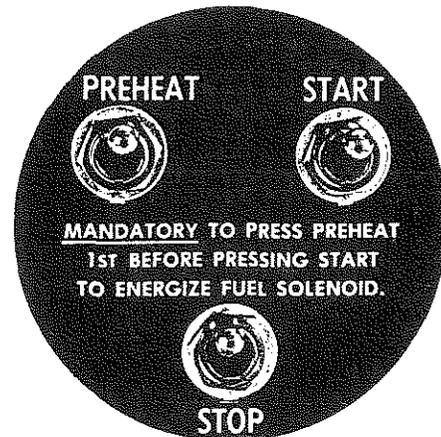
Note 3: The engine is now prepared for starting.

Note 4: It is best to disconnect all load from the generator set when starting or stopping. For example, if converting from on-shore power to on-ships power, start generator set (and before transferring to generator), remove heavy loads. Then transfer to the generator power. Allow the generator to stabilize then add the heavy loads. In opposite sequence, transfer to shore power before stopping the generator.

STARTING PROCEDURES

1. If making an initial start after lay-up, fuel filter servicing or repairs, depress the Preheat Switch for 15 to 25 seconds. This will energize the fuel pump allowing it to purge the system of any accumulated air, also manually bleed the on engine fuel filter.

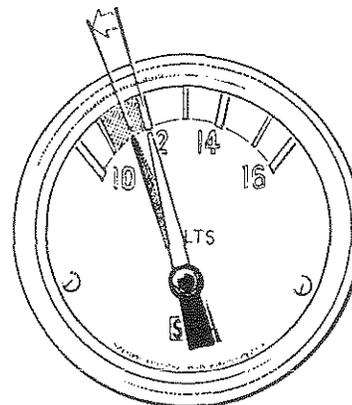
When depressing the Preheat the glow plugs are activated also, so use caution and refer to the chart below.



Glow Plug Use Data

Atmospheric temperature	Preheating time
+5°C (+41°F) or higher	Approx. 10 sec.
+5°C (+41°F) to -5°C (+23°F)	Approx. 20 sec.
-5°C (+23°F) or lower	Approx. 30 sec.
Limit of continuous use	1 minute

2. Proper glow plug function is indicated by voltmeter drop when key is depressed. This drop will be slight but discernible. If no voltage drop is noted, it may indicate defective glow plugs or a faulty preheat circuit (check for loose connection).



3. The Start Switch wiring is designed so that the Preheat Switch must be depressed before the Start Switch will function.

4. Starting

While still holding Preheat Switch depressed, also depress the Start Switch. The starter motor will run thereby cranking the engine. As soon as the engine runs, release the Start Switch which will return to its normally open position. Continue holding the Preheat Switch depressed for 2 or 3 seconds. This defeats the low oil pressure shutdown until the engine oil pressure rises to normal running pressure. Now release the Preheat Switch.



Should the engine not start when Start Switch is depressed for 10 to 12 seconds, wait 30 seconds and repeat Step 3 with adequate preheat time. Never run the starter motor for more than 30 seconds at a time.

5. Operation

With the engine running, check to make certain both oil pressure and battery charge voltage are registering and that raw water is discharging with the exhaust. During engine operation, do not depress Start Switch as this will damage starter motor. Check that AC voltage is being produced by the generator.

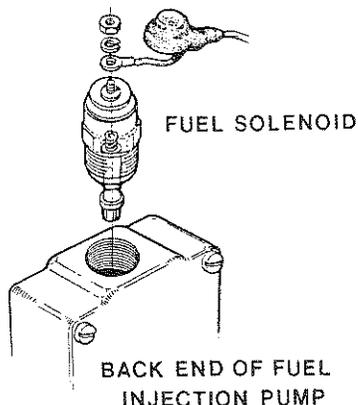
6. Warm-up operation

Operate at reduced generator loads until water temperature rises to the 130 to 140 degree range.

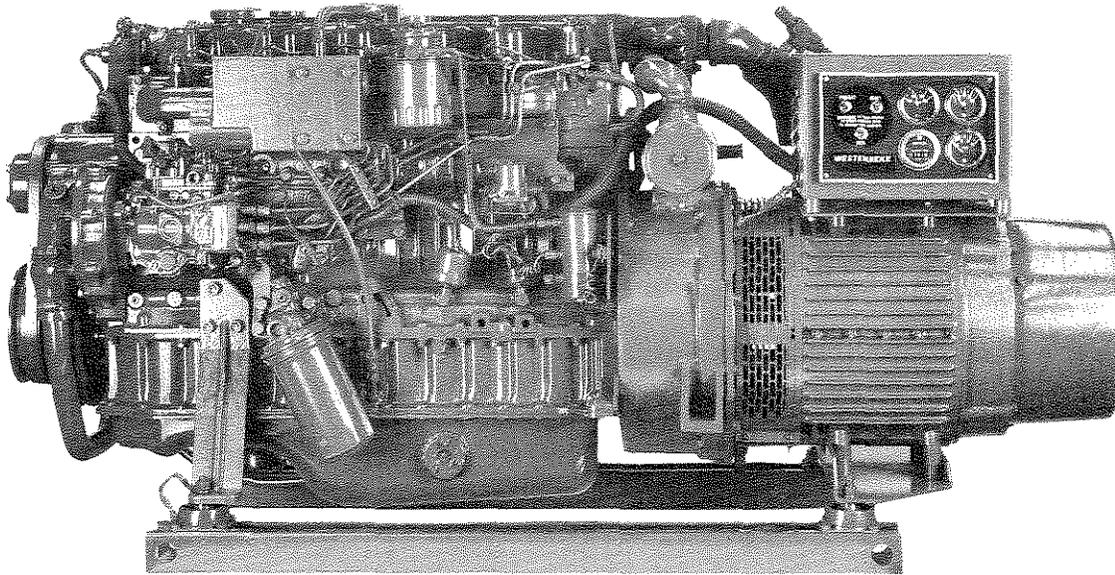
STOPPING PROCEDURE

1. Stop

To stop the generator, remove all AC loads and allow a few minutes to stabilize operating temperature, then depress the Stop Switch until engine stops completely and then release.



Each of the engines covered by this manual has an electric solenoid mounted on the injection pump which, when de-energized, will stop the flow of fuel. Therefore, to stop your generator, depress the Stop Switch until generator set stops rotating.



WTF 32 KW Shown Above

CAUTIONS ON STARTING AND OPERATION

1. Normal Starting

Follow the procedures below for routine starting of your engine.

- a. Check the engine oil level and add to full mark as necessary.
- b. Insure that you have sufficient fuel. Keep tank as full as possible.
- c. Check cooling water level, and refill if necessary.
Note: Check for leaks of water or oil, particularly when signs of such leaks are found on the bottom of the engine or in the drip tray.
- d. Start the engine in accordance with the procedures given on the preceding pages.
- e. Allow the engine to warm up to 140°-150° F before placing the engine under heavy load.

2. Starting Under Cold Conditions

The following three adverse conditions concur as the atmospheric temperature drops exceedingly, and the engine must, under such conditions, be started by taking steps described below:

LUBRICATING OIL TURNS VISCOUS - Make certain that viscosity is proper for the prevailing atmospheric temperature. Check the oil also for deterioration. (Study page 13.)

VOLTAGE ACROSS BATTERY TERMINALS DROPS _ Check that the battery is fully charged.

THE TEMPERATURE OF INTAKE AIR IS LOW AND COMPRESSION TEMPERATURE DOES NOT RISE ENOUGH - Allow the glow plug to operate sufficiently to aid starting. See table on page 9.

3. Cautions During Operation

Confirm that oil pressure is normal during normal operation.

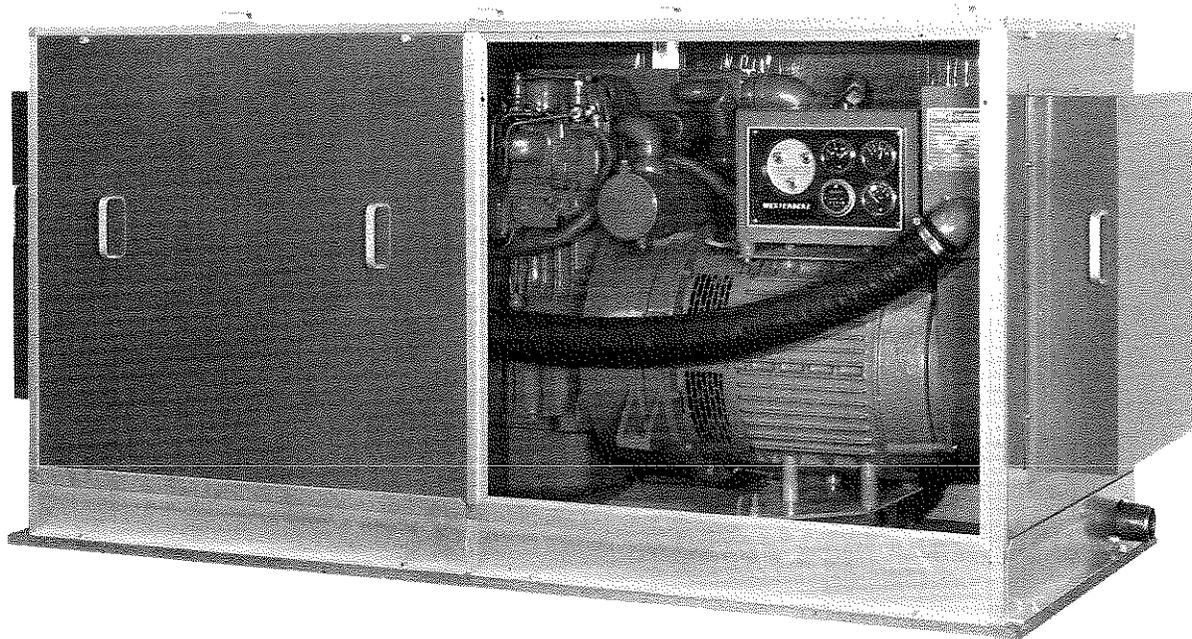
Confirm that exhaust gas is as follows:

- * While engine is cold.....White smoke
- * When the engine grows warm.....Almost smokeless
- * When the engine is overloaded.....Some black smoke

Check for abnormal noise such as knocking, friction or leaking sounds, vibration and blow-back sounds.

Check for leaks of fuel and engine oil.

A knocking sound is normal while the engine is cold. This is due to the combustion of the diesel fuel in a cold cylinder. Confirm that no knocking sound is heard in other cases.



WTF 32 KW Enclosed in SOUNDGUARD

REQUIREMENTS FOR PROPER OPERATION

LUBRICATION SYSTEM

1. Engine Oil

For engine lubrication, use diesel engine oil. Diesel engine oils are classified according to the API Specifications into grades CA, CB, CC and CD. Any one of them is suitable, but use of CC or higher grades prepared by well-known manufacturers is recommended.

2. Engine Oil Viscosity

Use oil having viscosity best suited to the atmospheric temperature. Use of an all-season oil SAE10W-30 with minimum viscosity change under different temperatures is suggested.

Atmospheric Temperature	Viscosity
20°C (68°F) or higher	SAE 30 or 10W-30
5°C (41°F) - 20°C (68°F)	SAE 20 or 10W-30
5°C (41°F) or lower	SAE 10W-30

3. Oil Pressure

The oil pressure during operation of the engine is indicated by the oil pressure gauge.

During normal operation.....Oil pressure will range between 40 and 70 PSI.

At the time of cranking.....Pressure will rise proportionately with speed.

4. Engine Oil Change and Oil Filter. (Step #5)

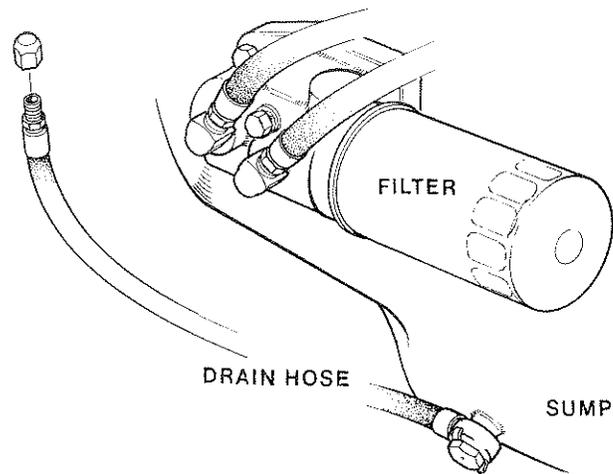
To renew engine oil, discharge old oil through the sump drain hose, attached at front of engine, while engine is still warm. Drain old oil completely, replace the hose, plug the end securely and add fresh oil through the oil inlet port on the valve cover. After refilling oil, run the engine for several minutes and stop. Then check the quantity of oil by the oil level gauge. Fill to but not over the high mark on the dipstick. Always observe old oil as it is removed. A yellow/grey emulsion indicates presence of water in the oil. While this condition is rare, it does require prompt attention to prevent serious damage.

5. Replacement Of Oil Filter

Being a replaceable spin-on cartridge type, the oil filter requires no cleaning inside. When installing the oil filter, apply engine oil thinly on to the gasket, and then tighten it firmly by hand.

When removing the used filter, cover over with a plastic bag. This will allow both filter element and spilled oil to be collected cleanly without spilling oil in the bilge.

- Note A: Generic market filters are not recommended since the material standard or diameters of important items might be entirely different from genuine parts.
- Note B: Immediately after filter change and oil fill, run engine to ensure that oil pressure is normal and that there are no oil leaks.
- Note C: Remote oil filter mounting kits are available for all generator models. Consult your dealer.



FUEL SYSTEM

1. Diesel Fuel

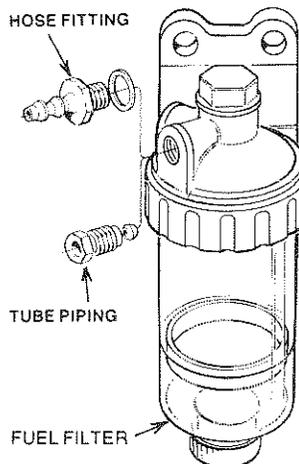
USE #2 DIESEL FUEL. NEVER USE KEROSENE OR HEAVY OIL.

In cold weather particularly, water vapor is produced by condensation when air is present in the fuel tank. The tank, therefore, should be kept full as much as possible.

The fuel tank, furthermore, needs to be kept completely free of dirt and water.

2. Water Trap Fuel Filter

It is required that a primary fuel filter of the water entrapment type be installed between the fuel tank and the engine. Such a filter, shown here, is available under Part #32974 from your local Westerbeke representative or your boat builder. This filter, adapted for boat builder use, comes complete with fittings for either hose or metal tubing. Mount in an accessible place, inspect often and drain off water accumulation frequently.



INSTR. #33009

SEDIMENT/WATER TRAP #32974

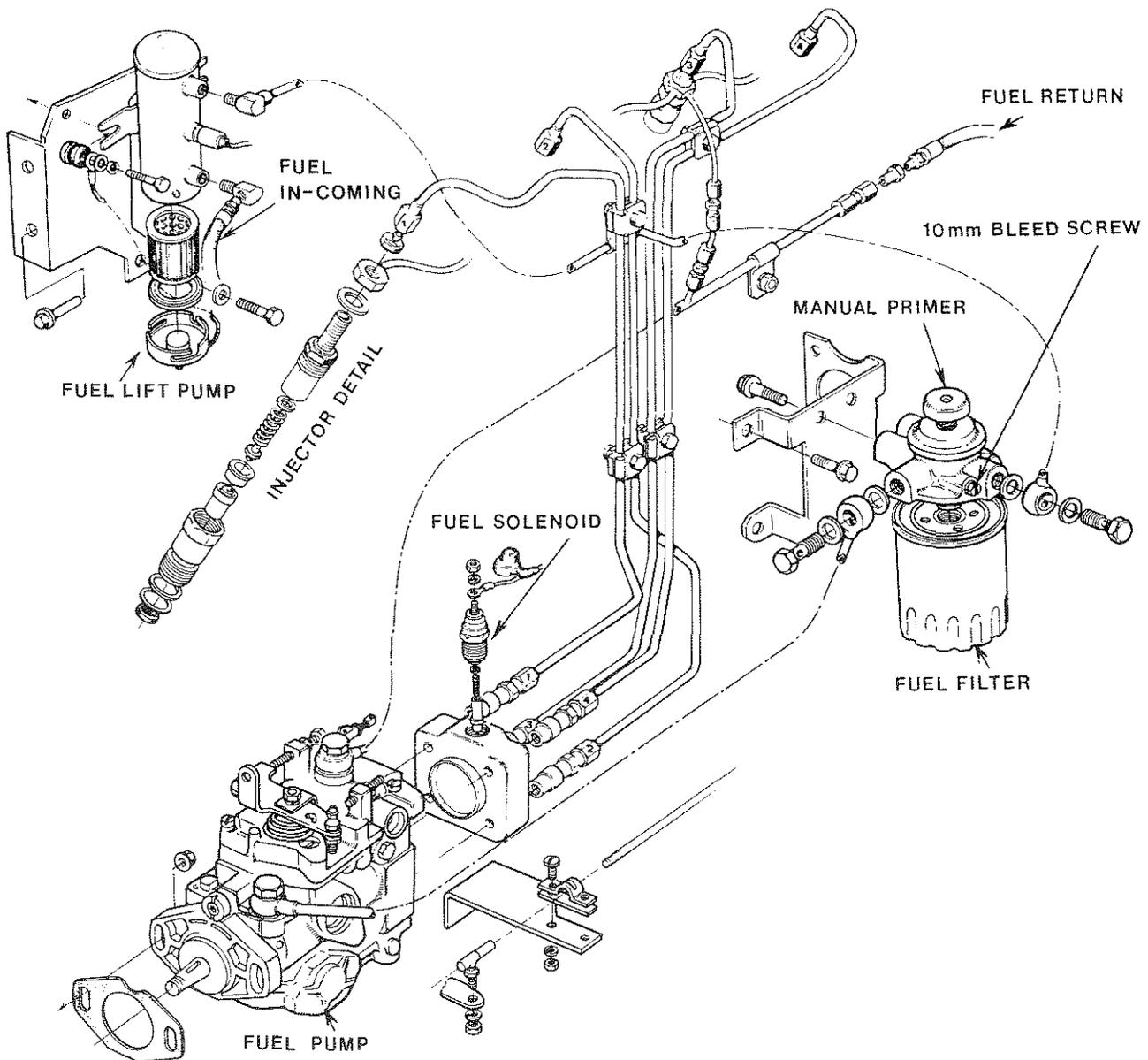
Installation Instructions

1. Bolt Sediment/Water Trap securely to an accessible structure so positioned that a receptacle to catch drainage can be placed under.
2. If fuel is to be piped with copper or bundy tubing, use nuts and ferrules provided. Be sure the tubing projects 1/4 inch through the ferrule before tightening the nut.
3. If fuel is to be piped with hose, use the two brass barbed fittings and washers supplied. Be certain that the hose selected has diagonal braid inserted (to cling on the barb), that it is neoprene lined and that it is USCG approved.
4. If water is present in the fuel, it will collect slowly in the bottom of the Sediment. When the red float ring reaches the bottom of the plastic bowl, loosen the bottom drain plug until all water runs out.
5. Tighten drain plug securely so no air can enter system.
6. Energize fuel pump to refill bowl.

If a water trap type filter (see page 14) is not interposed between the fuel tank and engine lift pump, any entrained water will tend to lay in the bottom of the electric lift pump. Internal metal parts of the lift pump will rust. Particles will pass on to filters and eventually to injection pump and injectors with damaging and expensive results. It is well to remember that water damage to the fuel system is not covered by warranty!

While many boat builders do supply a water trap filter, there are some who do not. It is to prevent such omission that Westerbeke offers a sedimenter/water trap filter as a desirable optional extra at moderate cost. It is supplied with fittings for either hose piping or metal tube piping.

Priming and self bleeding. All engines covered by this manual have a fuel filter with hand priming pump in the head casting for emergency use. The main priming source is the electric lift pump mounted on the engine.



3. Notes On Fuel System

See on facing page a typical exploded view of a fuel system for these generator engines. It is also illustrative of the self-bleeding and priming system used by Westerbeke.

The Westerbeke self-bleeding fuel system is automatic in operation. While it is unlikely that the operator will be forced to service the system at sea, the possibility does exist. Therefore, it is recommended that banjo washers, injector seat washers, lift pump filter and gasket, fuel filter and gasket be carried on board at all times. Select the column for your engine on page 25 and purchase spares from your local Westerbeke Dealer or Distributor. For example, hardware kit #33094 will supply fuel system washers for Model 25 KW.

If a leak should develop at a banjo or washer that cannot be remedied by a simple tightening of the screw, replace the washers.

The engine can be started by taking the steps described on pages 9 and 10. In cases where there is excessive amounts of air in the engine fuel system additional bleeding of the high pressure injector lines may be needed to start the engine. Loosen all these lines at the injectors and crank the engine with the starter until fuel spurts from between the nut and line then tighten the nuts.

4. Replacing Filter Elements

After the first 50 hours of operation, unscrew and discard fuel filter element. Re-install new filter. This same treatment is required of the filter element in the fuel lift pump. Similarly, replace new filter element using new gasket.

Note: Do not overlook this filter replacement as the fuel passes through this filter element before reaching the second filter.

After the first 50 hour change, the change period may be increased to 200 hours or once per season.

5. Fuel Injection Pump

The fuel injection pump is one of the most important components of the diesel engine and thus it calls for the utmost caution in handling. Furthermore, the fuel injection pump has been thoroughly shop-adjusted and should never be readjusted carelessly.

Such adjustment, whenever necessary, should be performed at an authorized service station, as a precision pump tester and skills are required.

To obtain long and satisfactory use of your injection pump:

- a. Always use #2 Diesel fuel which is free from impurities.
- b. Clean and renew the fuel filters periodically.
- c. Inspect water entrapment filter regularly and drain.
- d. Do not allow water to reach injection equipment.

6. Fuel Pressure Gauge

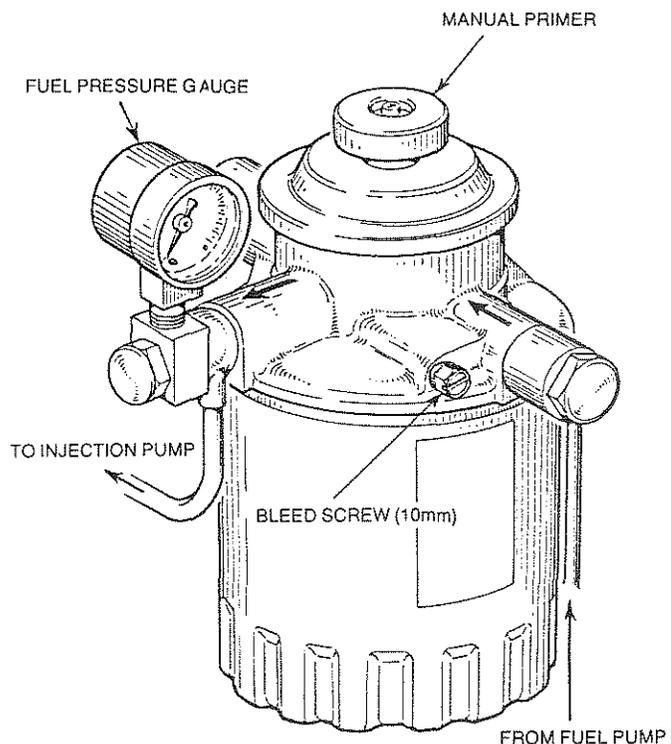
A fuel pressure gauge is incorporated in the ON engine fuel system. It is located on the outlet side of the engine mounted fuel filter. The primary purpose of this fuel pressure gauge is to help the installer insure that the fuel system, supplying the engine's fuel injection pump, will maintain a positive inlet pressure (1.5 psi minimum) to the injection pump under all conditions of generator load and fuel filter cleanliness.

NOTE: 1.5 psi is minimum, an ideal installation's fuel supply preferably should allow 2.5 - 3.5 psi to be present.

The absence of positive pressure usually indicates excessive fuel flow restriction in the fuel piping from the fuel tank to the engine. This can frequently be cured with larger lines and fewer and larger fittings. When the combination of distance, lifting, height and primary filter is too great for the fuel lift pump to overcome and maintain positive pressure, then an auxiliary boost fuel pump and/or fuel day tank is required.

Typical symptoms of generator engines running without positive fuel pressure at the inlet of the injection pump are:

- a. White smoke and fuel-laden exhaust.
- b. Rough running engine.
- c. Skipping/backfire noises from exhaust.
- d. Loss of engine power and R.P.M.
- e. Inability of engine to carry generator load.



FUEL PRESSURE GAUGE AND FUEL FILTER

COOLING SYSTEM

1. Cooling Water

For cooling water, always use soft water with least impurity content such as tap water (potable water) or rainwater, never use hard water or foul water. Use of hard water or water containing much impurity will lead to collection of scale in the engine and heat exchanger with resultant decline in cooling efficiency.

2. Antifreeze

In cold districts, care should be taken to prevent cooling water from freezing. Cooling water, when frozen, will expand, breaking the heat exchanger and the cylinder block. It is essential that antifreeze be added to cooling water in a quantity proportional to the lowest temperature of the district. It is recommended that the antifreeze mixture be used throughout the year.

*Antifreeze of poor quality or without rust inhibitor will cause corrosion of the cooling system. Always use antifreeze prepared by a reliable maker, and never use it mixed with antifreeze of a different brand.

*Make sure that the cooling system of the engine is cleaned well before adding antifreeze.

*Recommended antifreeze for year round use is ZEREX or PRESTONE with rust inhibitor.

*Insure that the antifreeze used is compatible with aluminum engine components and mix the antifreeze with water thoroughly before adding to the cooling system.

ANTIFREEZE ADDITION DATA

Antifreeze Concentration %	13	23	30	35	45	50	60
Freezing temperature °C	-5	-10	-15	-20	-30	-40	-50
temperature (°F)	(23)	(14)	(5)	(-4)	(-22)	(-40)	(-58)

Note: It is advisable that antifreeze concentration be selected on the basis of a temperature which is about 5°C (10°F) lower than the actual atmospheric temperature expected.

3. Fresh Water Cooling System

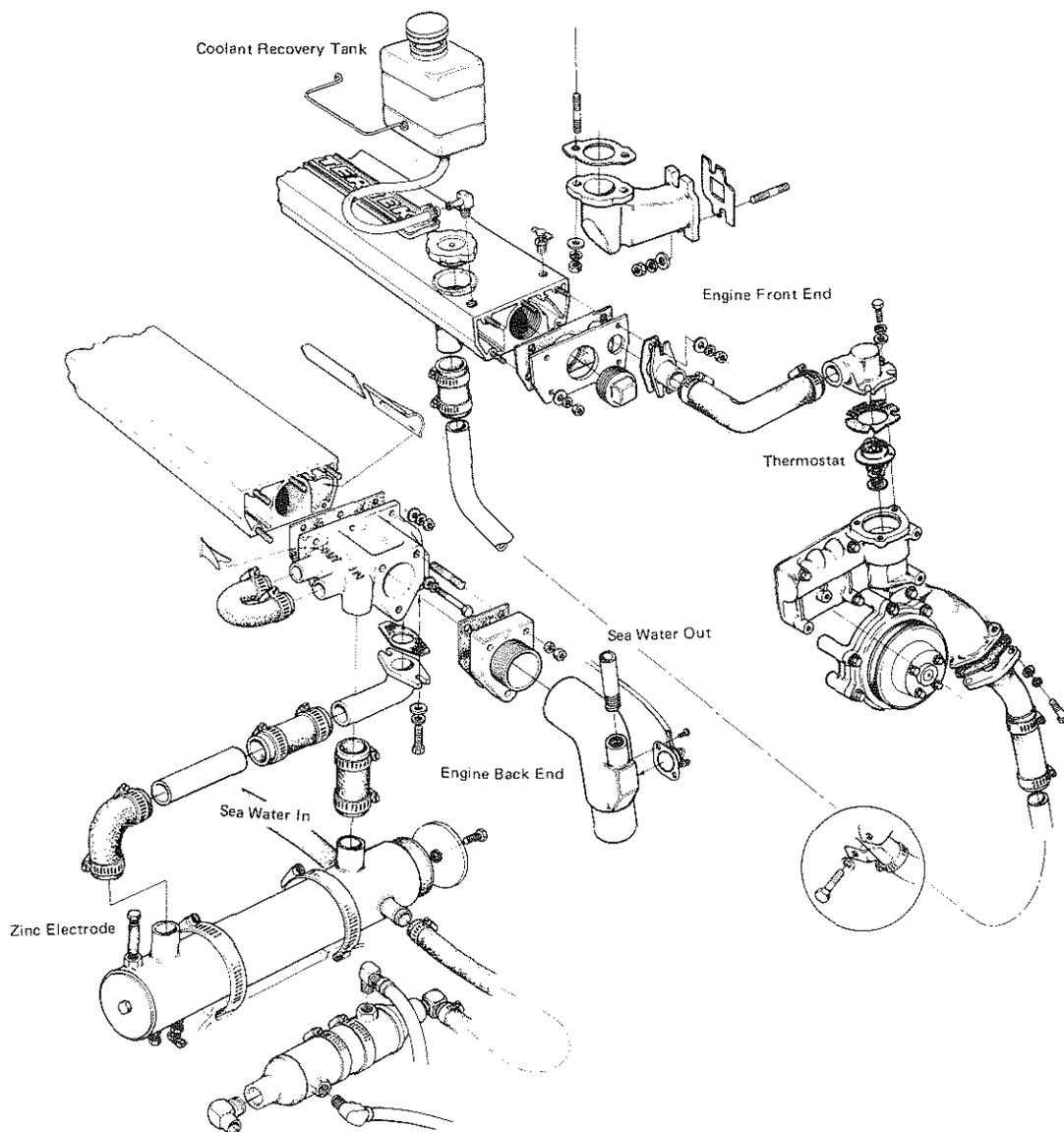
The system consists of a sea water pump which pumps raw sea water through a heat exchanger to remove heat from the fresh water coolant. The raw water is discharged overboard through the exhaust line.

The engine coolant (fresh water with or without antifreeze) is circulated by the fresh water pump in continuous circuit, pumped through the cylinder block, cylinder head, exhaust manifold heat exchanger and back to the fresh water pump.

The total system is very reliable and requires only a daily check of the water level in the system plus routine check of hose clamps and fittings.

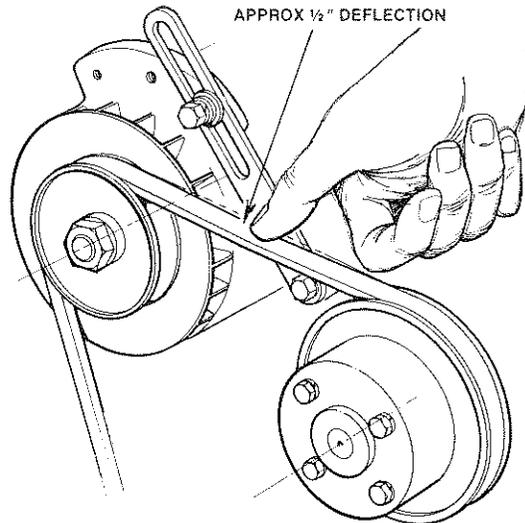
It is likely that the zinc anode in the primary heatexchanger will waste away from electrolysis action from the flow of seawater through the raw water circuit. It is also possible for the raw water pump impeller to fail due to lack of sea water or deterioration. An early sign of impeller failure is less water and more steam at the exhaust through hull fitting with a higher engine operating temperature.

It is recommended, therefore, that zinc electrodes, water pump belt, alternator belt, sea water pump assembly and sea water impeller kit be carried onboard at all times. These parts should be ordered from your nearest stocking dealer and used as inspection dictates. The part numbers for these may be taken from the parts list on page 25.



4. Alternator Belt And Water Pump Tension

The belts are properly tense if they deflect 10 to 12 mm (3/8 to 1/2 in.) as they are depressed with a finger between the pulley and pulley of the long distance side. Excessive tension can cause quick wear of the belt and bearings of the water pump and the alternator. Excessive slackness or presence of oil on the belt, on the other hand, can lead to engine overheating and insufficient charging due to a slipping belt.



CAUTION:

Never attempt to adjust tension of the fan belt while the engine is in operation.

DC WIRING DIAGRAM

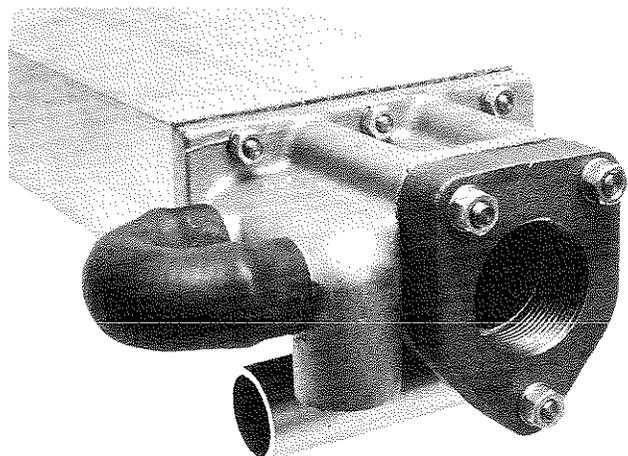
Your engine has a DC electrical 12V system and this electric circuit is as shown in diagram #24666 shipped loose with this manual.

For installing electrical parts, connect them correctly by referring to the diagram and at the same time check for damaged wire sheathing and confirm that grounding is provided properly. Care must always be taken while working on the electrical system.

Never shut the engine battery switch off while the engine is running. Damage to the battery charging alternator will result should this be done.

DOMESTIC HOT WATER

Photo at right shows FLOW-CONTROLLER mounted on end of two pass exhaust manifold. This device is standard equipment on all 25 KW and 32 KW generator sets. To use FLOW-CONTROLLER remove the hose u-bend bypass and connect your water heater as described on the following page. Study the instructions carefully.



Principle: There are two 7/8" hose connections at the end of the exhaust manifold which provide a parallel flow of engine cooling water to and from the heater. These connections are part of the FLOWCONTROLLER which assures a flow of hot water through the heater at all times and yet precludes excessive restriction of engine cooling water flow caused by the heater - all simply and automatically.

Installation: Remove the hose connecting the 7/8" spuds on manifold as shipped from the factory (see illustration preceding page). Connect these spuds to the heater with 7/8" ID wire inserted hose. One spud on manifold is the flow FROM the engine and should connect to lower fitting on the water heater. The other spud on manifold indicates flow RETURNING to the engine and should connect to the upper connection on the water heater.

Hoses should rise continuously from their low point at the heater to the engine so that trapped air will rise naturally from the heater to the engine. If trapped air can rise to the heater, then an air bleed petcock must be installed at the higher fitting on the heater for bleeding air while filling the system. Avoid loops in hose runs which will trap air.

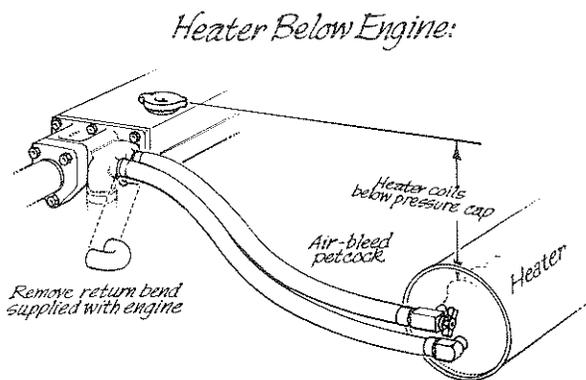
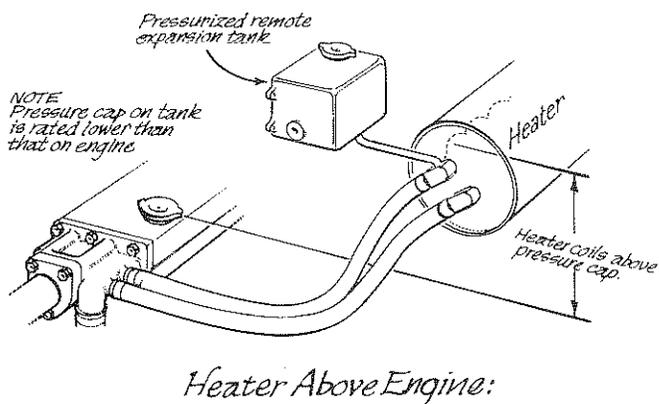
Note: Air pockets are a blockage to water flow.

If any portion of the plumbing from the flow control to the domestic hot water heater and particularly if the heater coil in the domestic water heater is higher then the filler cap on the engine exhaust manifold, then the pressurized remote expansion tank must be installed in the circuit to become the highest point. The tank kit Part Number is 24177. Install the remote expansion tank in a convenient location such as a sail locker for ease of checking fresh water coolant level. Connect the remote expansion tank with a single run of 7/8 I.D. wire reinforced hose to a tee connection directly off the highest of the two connections of the domestic water heater.

The cap on the engine mounted expansion tank/manifold should not be opened once the remote system is installed and filled.

The hose connection from the heater to the remote expansion tank should be routed and supported so as to rise continuously from the heater to the tank enabling any air in the system to rise up and out.

Illustrations below are of FLOWCONTROLLER adapted to our two pass manifolds.



RECOMMENDED MAINTENANCE SERVICE

Check and service your engine at specified intervals to maintain it in its best conditions and permit it to perform as it should. As for those asterisked items, it is suggested that you have this maintenance performed by an authorized distributor or dealer.

1. Daily inspection before use

- A. Check engine oil level and maintain at the dipstick full mark.
- B. Check engine coolant level via the remote recovery tank. Reference Service Bulletin #147.
- C. Check your fuel supply.
- D. Check for proper operation of engine gauges and generator AC meters (when installed).

After starting your engine, check oil pressure, water temperature, DC voltage reading and AC voltage output meters.

- E. Check for loose parts (fan belt or bolt, etc.), damage and leaks, correct or adjust as needed.
- F. Check for abnormality with exhaust gas, noise and vibration.

2. Servicing following initial 50 hours of operation

- A. Change lube oil and lube oil filter.
- B. Replace fuel filters. Two fuel filters are on the engine.
 - 1. Secondary (spin-on) fuel filter.
 - 2. Filter cartridge in the base of the electric fuel pump.
- C. Tightening of bolts and nuts. Torque cylinder head. Hold down bolts. Adjust belt tensions.
- D. Adjust valve clearance. (See SERVICE DATA)
- E. Check all electrical connections for tightness. Pay particular attention to AC electrical connections from the generator.
- F. Adjust No Load AC voltage and Hertz output as needed.

3. Servicing at every 100 hours of operation

- A. Renewal of engine lube oil.
- B. Replacement of lube oil filter.
- C. Check zinc anode in primary heat exchanger. Replace as needed.

4. Servicing at every 200 hours of operation

- A. Replacement of two engine mounted fuel filter elements.

5. Servicing at every 400 hours of operation

- A. Adjust AC No Load Voltage and Hertz output as needed.
- *B. Torque cylinder head hold down bolts and adjust valve clearance.
- *C. Checkup of starter motor, alternator and regulator.

Check the brush and surface of commutator for the degree of wear. Replace the brush if it is worn beyond the limits of wear.

- *D. Check glow plug operation. Do resistance check of each plug individually.
- E. Renew fresh water coolant and flushing is suggested.

6. Servicing at every 800 hours of operation

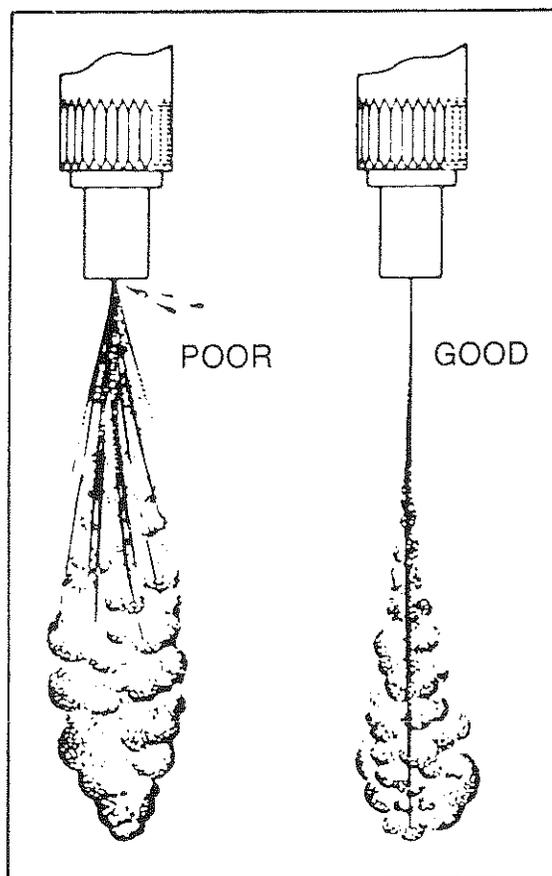
- *A. Check injector nozzles for spray pattern and popping pressure.

Set the injection starting pressure to 1920⁺³¹ -0 psi and eliminate undesirable injection conditions including "after dripping".

- *B. Check compression pressure

Remove each glow plug and check cylinders, one by one, using a compression pressure gauge. If the pressure differs by more than 3.0 kg/cm² (42.7 psi) between cylinders or if the cylinder pressure is less than 30 kg/cm² (427.0 psi) at 200 RPM, correct it.

- *C. Fuel injection adjustment.



In cases of severe vibrations and detonation noise, have the injectors overhauled by an authorized fuel injection service center.

- *D. Check tightness of nuts and bolts.

TROUBLESHOOTING

PROBLEM	REMEDY
1. ENGINE DOES NOT START	
a. Starting switch is defective	Correct connections and contacts
b. Deficient drive torque of the starter motor	The battery is exhausted, trouble with the starter motor, or dirty or loose wiring
c. Improper viscosity of engine oil	Check the viscosity and renew oil if necessary
d. Engine too cold	Use glowplug starting aid
e. Seizure of moving parts	Rectify
f. Air present in fuel system	Purge thoroughly with electric fuel pump
g. No fuel in fuel tank	Refill
h. Fuel filter clogged	Clean or renew
2. ENGINE STALLS WHILE IN OPERATION	
a. Fuel tank is empty	Refill
b. Fuel filter clogged	Clean or renew
c. Air present in fuel system	Retighten fuel line connections and allow electric fuel pump to run long enough to purge air thoroughly
3. IMPROPER OIL PRESSURE	
a. Oil shortage	Refill
b. Oil leak through connections	Repair
c. Oil pressure sender guage defective	Replace
4. ENGINE OVERHEATING	
a. Cooling water shortage	Refill and check for leaks and repair.
b. Belt loose or smeared with oil	Clean or renew
c. Raw water pump defective	Repair or renew
d. Heat exchanger clogged	Remove and clean.
5. BATTERY IS UNDERCHARGED	
a. Belt tension improper	Adjust/replace alternator belt
b. Faulty wiring circuit	Rectify
c. Alternator not functioning (observe voltmeter)	Check excitation circuit repair or replace
d. Battery faulty	Replace
e. Faulty voltage regulator	Repair or renew

TORQUE SPECIFICATIONS
(IN LB/FT)

	WTF 25KW	WTF 32KW
Cylinder head	85 - 90	80 - 85
Cylinder head cover	2 - 3	2 - 3
Connecting rod cap	59 - 65	55 - 60
Main bearing cap	80 - 85	80 - 85
Camshaft thrust plate	12 - 17	12 - 17
Camshaft gear	46 - 69	45 - 51
Idler gear	17 - 23	17 - 23
Injection pump drive gear	29 - 51	29 - 51
Rocker arm assembly	80 - 85	80 - 85
Timing gear case	12 - 17	12 - 17
Timing gear cover	12 - 17	12 - 17
Rear oil seal cap	11 - 15	11 - 15
Oil pan	12 - 17	12 - 17
Oil pump cover	6 - 9	6 - 9
Oil pump pipe	6 - 9	6 - 9
Fresh water pump	12 - 17	12 - 17
Crankshaft pulley	253 -289	282 -304
Glow plug	7 - 11	7 - 11
Injector to head	See explanation below	
Injection nozzle to body	58 - 72	29 - 36
Injection pipe flare nut	18 - 22	18 - 22
Intake manifold	12 - 17	18 - 22
Exhaust manifold	12 - 17	12 - 17
Back plate	24 - 35	24 - 35
Flywheel	95 -137	95 -137
Damper	14 - 20	14 - 20

WTF 25 KW use an injector screwed into the head for which the torque value is 42 - 51 lb/ft.

WTF 32 KW uses an injector bolted to the head for which the torque value is 12 - 17 lb/ft. per bolt, tightened evenly.

Certain parts should be carried on board at all times. These include consumable items like filter elements and zinc electrodes. There are other items whose life is indeterminate such as alternator and pump belts, thermostats, raw water pump impeller kits, injectors, injector hardware kits, etc. on which the owner must make his own decisions based on use and local supply of parts. Page 25 contains a list of common parts from which a practical replacement selection can be made.

COMMON PARTS BY NUMBER

	WTF 25 KW	WTF 32 KW
Alternator	24684	24684
Belt, Alternator Std.	32877	32544
Sea Water Pump	16446	11400
Filter, Lube Oil	32874	32874
Fuel Oil	24363	24363
Elec. Lift Pump	30548	30548
Gasket Set, Top	32555	32559
Complete	32556	32560
Glow Plug	24353	32899
Injector	32743	24563
Hardware Kit (1)	33094	33095
Nozzle	32744	24565
Pump, Fresh Water	32711	32895
Mounting Gasket	32712	32855
Rebuilding Kit	---	---
Pump, Sea Water	11353	11353
Mounting Gasket	---	---
Repair Kit	33329	33329
Impeller Kit	11907	11907
Impeller	11418	11418
Cover Gasket	11419	11419
Seal	14774	14774
Pump Fuel Lift (2)	24831	24831
Solenoid, Fuel Shut-Off	24338 (7)	24338 (7)
Pre-Heat	24639	24639
Spare Parts Kit A (3)	32557	32561
B (4)	32558	32562
Starter, Propulsion	31227	31227
Generator Set	23953	31226
Solenoid	33328	33328
Thermostat	24690	32872
Mounting Gasket	33373	32153
Valve Cover Gasket	32639	32755
Voltage Regulator (5)	24579	24579
Zinc	11885	11885

NOTES

- (1) Engine Set of Banjo and Injector Washers
- (2) Electric Fuel Pump with Filter
- (3) Minor Kit
- (4) Extended Cruising Kit
- (5) Integral Part of Alternator
- (6) Excludes Body
- (7) O-Ring 24339

TO INSTALL 25 KW, 32 KW and 45 KW GEN SETS

These generator sets also have the air intake plenum mounted directly on the back end of the alternator (see Figure 11). Attach plenum #35250 before mounting the generator set on the Sound Guard base, as follows:

1. Remove and discard protective cover over exciter.
2. Remove four $\frac{3}{8}$ bolts that secure rear bearing bracket to generator frame.
3. Place front plenum (Part #35250) against back end of alternator and secure by the same four bolts.
4. Place rear half plenum (Part #35750) in position and secure by four spring latches.
5. Screw air-to-engine elbow #32590 to appropriate side of plenum and blank off the opposite side (left side for 25 KW and 32 KW, right side for 45 KW).

The next operation is to mount Sound Guard base to generator set and set the assembly in place. Make certain there is working room around the set and that there is unrestricted air flow to air intake and outlet ducts.

Now complete fuel, water, battery and power connections through the skirts as best suits the installation. Note that it is easier to remove a skirt section for drilling in the shop than to drill in place (see Figure 12).

On the 32 KW plant, sea water flow from the heat exchanger should be divided by a $\frac{1}{2}$ " or larger tee at the inlet to the injected exhaust elbow so that only the necessary portion flows through the exhaust and so that the remaining portion has an unrestricted run back to the ocean. It is the installer's responsibility to balance these two flows so that adequate cooling water flows through the exhaust to cool it at full load and speed (see Figure 13).

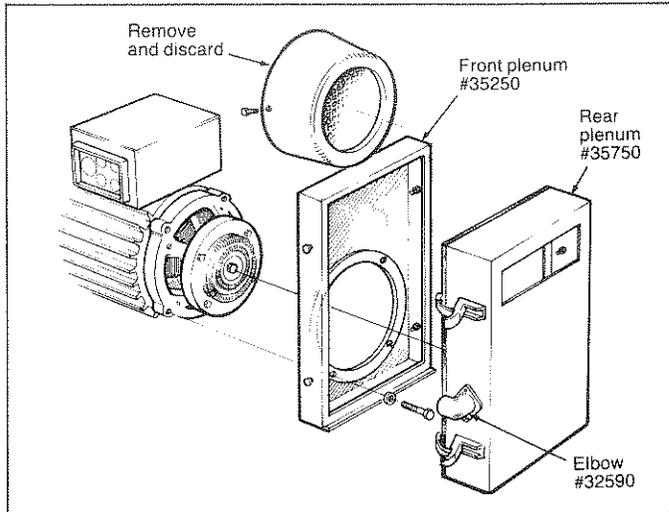


Figure 11. Plenum Mounting (25 KW, 32 KW and 45 KW)

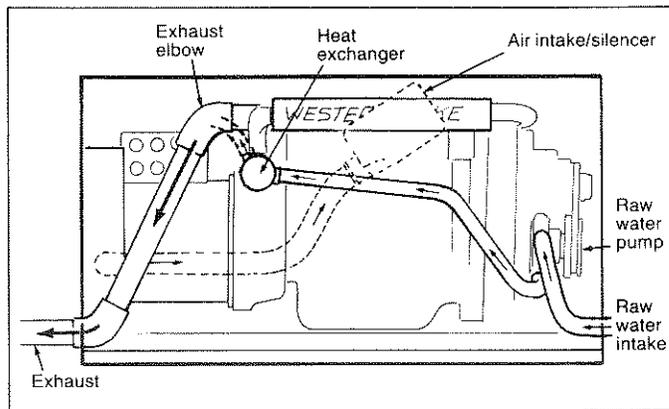


Figure 12. 25 KW Gen Set

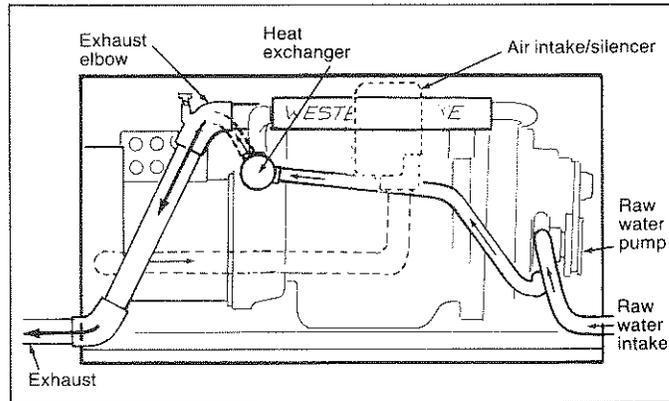


Figure 13. 32 KW Gen Set

WLF 30KW AND WTF 32KW GENERATORS

DESCRIPTION SUMMARY

Construction type	Rotating Field Brushless, Single Bearing
Speed: 60Hz	1800 RPM
50Hz	1500 RPM*
Phase	1 or 3
Ventilation	Self-ventilated (fan cooled)
Cooling Air Requirement:	
25KW and 32KW	500 - 550 C.F.M.
32KW .8 PF	550 - 600 C.F.M.
Ambient Temp., Max.	40°C
Insulation	Class F
Number of poles	4
Stator Leads: 3-phase	4 or 12
1-phase	3 or 4 leads

*Voltage and KW are 5/6 of rating at 1800 RPM.

At 1500 RPM, any given generator will provide a voltage and KW rating equal to 5/6 the rating at 1800 RPM. Consult manufacturer if a higher voltage or KW rating is needed at 50 Hz (1500 RPM).

RATINGS AND OVERLOAD PROTECTION

Generators are designed to provide the rated KW under specified operating conditions, but the ratings change with type of load; i.e., motor loads, resistive loads. If power demand exceeds ratings, the temperature increases significantly and may seriously shorten the life of the generator. The table below will help the user select the proper power for his application. Note that the 0.8 power factor load (motors) lowers the power and the load current capability of the generator.

MODEL WLF-30KW

MODEL WTF-25KW				
RATINGS	KW	KVA	VOLTS	AMP
RESISTIVE	25	25	120/240	104
LOAD (1.0PF)			120	208
MOTOR			120	177
LOAD (0.8PF)	17	22	120/240	177/88

MODEL WLF-30KW				
RATINGS:	KW	KVA	VOLTS	AMP
RESISTIVE	30	30	120/240	125
LOAD (1.0PF)			120	250
MOTOR			120/240	112
LOAD (0.8PF)	22	27	120	225

MODEL WTF-32W

MODEL WTF-32W				
RATING:	KW	KVA	VOLTS	AMP
RESISTIVE	32	32	120/240	135
LOAD (1.0PF)			120	270
MOTOR				
LOAD (0.8PF)	24	30	120	200

MODEL WTF-32KW 0.8PF

MODEL WTF-32KW 0.8PF				
RATINGS:	KW	KVA	VOLTS	AMP
MOTOR			120/240	135
LOAD (0.8PF)	32	40	120	270

PRESTART INSPECTION

1. Check for tightness of all threaded connections.
2. Check load leads for correct connection as specified in diagram.
3. Examine air inlet and outlet for air flow obstructions.
4. Examine generator armature and fan. Are they tight on shaft? Is there clearance around entire circumference of each?
5. Be sure no other generator or utility power is connected to load lines.
6. Be sure that in power systems with a neutral line that the neutral is properly grounded (or ungrounded) as the system requires, and that generator neutral is properly connected to the load neutral. In single phase and some 3-phase systems an incomplete or open neutral can supply the wrong line-to-neutral voltage on unbalanced loads.
7. Make sure mounting is secure.

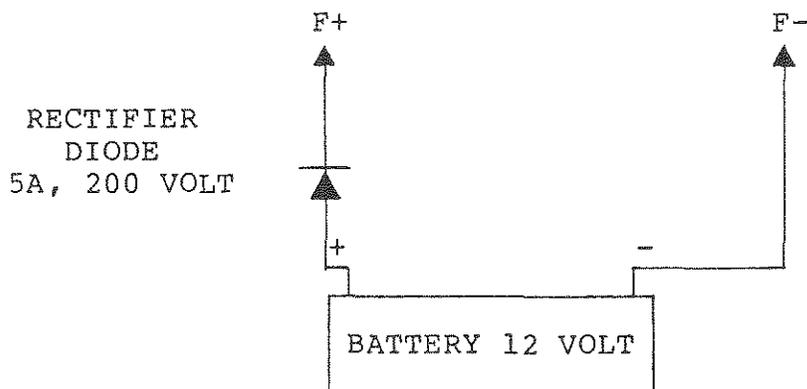
INITIAL STARTUP

1. After the prestart inspection has been performed, the unit is ready for startup. When driving the generator, observe vibration. If excessive, study possible procedures for correction.
2. The speed of the generator set is adjusted at the factory; however, it is advisable to verify upon installation. To supply 60Hz, the speed should be 1800 to 1860 RPM at no load, and should not fall below 1800 RPM by more than 1 percent at full load. To supply 50Hz, speed should be 1500 to 1550 RPM at no load, and 1500 RPM at full load. Generator voltage should build to its rated value within 5 seconds after rated speed is attained. If voltage does not build, the cause may be loss of residual magnetism in the exciter field, as a result of generator disassembly and reassembly or some other cause. In such a case (if generator is not defective) voltage build can be achieved by flashing the field as described below. To be assured that a reassembled generator will always build a voltage when placed in service, it should be operated at full rated load before installing in the boat.
3. Record or observe voltage of generator at no load and at full load. Observe voltage immediately after initial startup (cold) and desirably after 30 minutes of operation at full load (hot). The voltages are easily adjusted to optimum values at no load and full load (refer to Regulator section). If possible, apply actual service load or test load of same power factor as load to be used in service.
4. If voltage cannot be adjusted to suitable values and some fault seems evident, follow the troubleshooting procedure.

5. After running the generator for 30 minutes at full load, observe temperature rise. If smell, touch or temperature measurements indicate excessive temperature rise, examine the generator for obstructed air flow, hot air feeding into cold air inlet of generator or bypassed air (air not pulled through generator) because of air opening into unbaffled fan at engine side of generator fan. Also, carefully examine ratings and actual load applied to determine if generator rating may be too low for the load which is applied. Also, be sure ambient temperature is not over 40°C (104°F). FOR OPERATION AT AMBIENT TEMPERATURES ABOVE 40°C, DERATE KW RATING 1 PERCENT FOR EACH °C ABOVE 40°C. FOR OPERATION AT HIGH ALTITUDES ABOVE SEA LEVEL, RATINGS MUST BE DEGRADED 2 PERCENT FOR EACH 1000 FEET ABOVE SEA LEVEL. Frame temperatures above 60°C (140°F) are too high and indicate a temperature rise in the copper windings of 105°C (221°F) or higher.

FLASHING THE FIELD - VOLTAGE REGULATORS 32012 AND 34615 (see page 37)

With electronic voltage regulation, a 12 volt battery across F (+) and C (-) behaves as a short across the DC output of the regulator. If the generator is spinning at or near rated speed and the regulator starts to deliver a DC current to the field, the current passing through the battery will be so high that the electronic regulator will probably be damaged. Flash field either by disconnecting F and C from regulator when generator is not turning or flash (while turning) only if rectified diode is in the battery circuit. (See Regulator section or figure below.)



To flash the field while spinning at 1800 RPM, diode must be in + lead of battery as shown here.

NOTE: The DC battery used MUST BE totally separate from the engine and/or boat's DC system.

MAINTENANCE

1. Maintaining reasonable cleanliness is important. Connections of terminal boards and rectifiers may become corroded, and insulation surfaces may start conducting if salts, dust, engine exhaust, carbon, etc., are allowed to build up. Clogged ventilation openings may cause excessive heating and reduced life of windings.

2. For unusually severe conditions, thin rust-inhibiting petroleum-base coatings should be sprayed or brushed over all surfaces to reduce rusting and corrosion. Typical materials suggested are Ashland "Tectyle 506" and Daubert Chemical Co. "Nox-Rust AC-410".
3. In addition to periodic cleaning, the generator should be inspected for (a) tightness of all connections, (b) evidence of overheated terminals and (c) loose or damaged wires.
4. The drive discs on single bearing generators should be checked periodically if possible for tightness of screws and for any evidence of incipient cracking failure. Discs should not be allowed to become rusty because rust may accelerate cracking. The bolts which fasten the drive disc to the generator shaft must be hardened steel SAE grade 8, identified by 6 radial marks, one at each of the 6 corners of the head.
5. Examine bearings at periodic intervals. No side movement of shaft should be detected when force is applied. If side motion is detectable, bearings are wearing or wear on shaft of bearing socket outside bearing has occurred. Repair must be made quickly or major components will rub and cause major damage to generator.
6. Examine control box at periodic intervals to detect cracks from engine and generator vibration. If cracks in box are seen, engine vibration may be severe and require bracing in box for additional strength to resist vibration.

TROUBLESHOOTING

This section is intended to give helpful hints on finding the cause of any malfunction of the generator, exciter or regulator by doing basic testing and checking. Follow troubleshooting procedures with the aid of the proper generator diagram.

1. VISUAL EXAMINATION

The first step in investigating any generator failure or trouble should be to look for obvious evidence: burned areas, loose or open connections, wrong speed, incorrect reassembly and reconnection, etc.

2. OBSERVE VOLTAGE OF DEFECTIVE GENERATOR

The next step is to carefully measure line-to-line voltage. A voltage at about 10 percent of rated voltage (at rated RPM) is probably the residual voltage (determined by residual magnetism in exciter field). A normal residual voltage indicates exciter armature, rotor and stator are all good and that the trouble is probably in the excitation circuit. A very low voltage, or no voltage, indicates a more serious generator defect (voltage less than 10 volts across a normal 240 volt line).

3. BATTERY EXCITATION

The behavior of the generator, when the exciter field is connected to a 12 volt battery for excitation current, is a useful guide for locating the generator fault. Disconnect F(+) from all other generator connections and connect F(+) to (+) of battery. Connect (-) of battery to C(-). Spin generator at 1800 RPM.

- (a) If residual voltage is normal, 12 volts across the leads F+ and C- should cause the generator to deliver a voltage near rated voltage with no load. If 12 volt excitation produces near normal voltage, failure of voltage regulator to provide voltage could mean a defective voltage regulator, or an open circuit in leads to terminals 3 or 4 of electronic regulator. Check switch or circuit breaker in these leads. With 12 volt excitation connect voltmeter across terminals 3 and 4. Voltage should be the same as generator line-to-line voltage across normal 240 volt lines.
- (b) If 12 volt excitation produces no voltage, check exciter field resistance. It should normally be 25 - 28 ohms at 77°F. If field is open or shorted, then the exciter field is defective. An open or short in the main rotor behaves similarly, but is also accompanied by a very low line-to-line voltage (residual voltage) without 12 volt battery excitation.
- (c) If 12 volt excitation causes the engine to growl and load the engine with no or very low generator output voltage, the stator could be grounded or shorted. Or, a short or ground in the wiring of the generator power circuit could be the main fault. In either case, the stator will develop hot spots or could even smoke after running a few minutes. Run generator until a hot smell is detected, or stop in 5 minutes (whichever occurs first). Feel the stator winding. If it is hot, the stator or power wiring contains a short circuit. Examine the stator for burned (black) insulation which indicates a defective or damaged stator. Measure stator resistance T1 to T2 and T3 to T4 (half the value listed in 6). Measure stator resistance to ground or hi-pot test at 1500 volts.
- (d) If 12 volt excitation causes an increase in voltage but the output voltage is less than 60 percent of rated voltage, the rectifier (see 4) in the exciter armature could be defective, the exciter armature could be shorted to ground or one phase of the armature winding could have an open circuit. Also, one pole of the main field (rotor) could be shorted or grounded. If any of these defects exist, failure of the electronic regulator will occur. Replacement of regulator alone will be followed by failure of the new regulator. If electronic regulator has failed, it is wise to check exciter current by placing a DC ammeter in the F(+) lead to field. Normal exciter current at no-load rated voltage is 0.65 to 0.95 ampere. A higher current is another indication of a generator defect (described above), which could cause a new voltage regulator to fail.

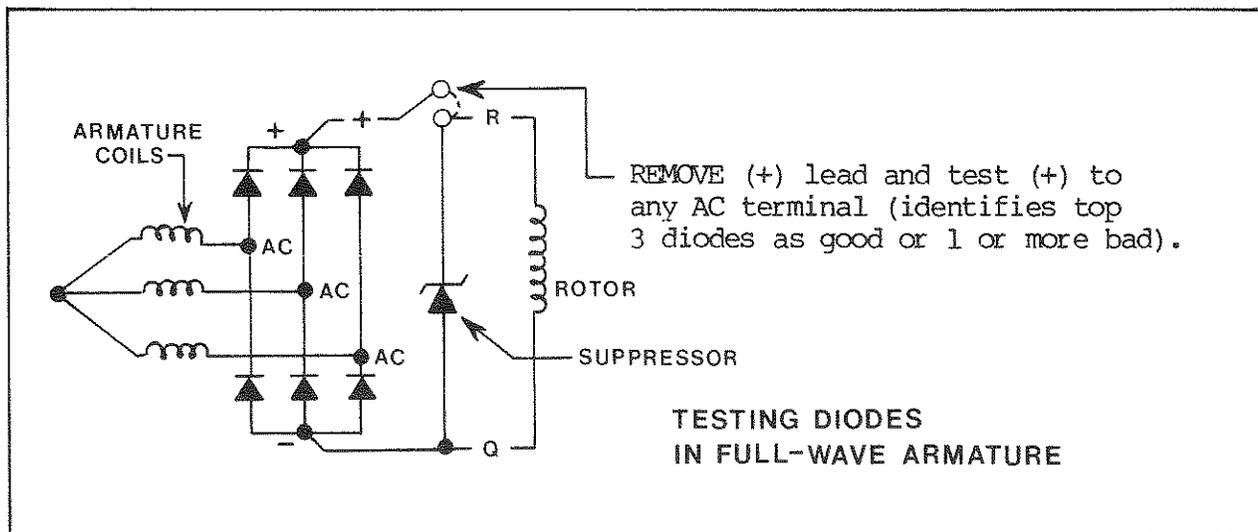
Note: Never open the exciter field circuit during generator operation when this circuit is connected to the voltage regulator board. High voltage arcing may occur damaging the regulator board and exciter circuit.

4. RECTIFIER CHECKING

(a) Each armature full-wave bridge rectifier has 5 terminals and 6 rectifying junctions. Rectifiers may be readily checked on the low range of an ohmmeter. From the "+" tab to "AC" tab, the ohmmeter should show a high resistance with one polarity of the ohmmeter leads and a low (about half scale deflection) resistance when polarity of the ohmmeter leads is reversed. The same conditions should be found from the "+" tab to any other "AC" tab and from "-" to "AC" tabs. If a zero resistance reading is found, this junction of the rectifier is shorted and the rectifier must be replaced. If a high resistance is found with both polarities of the ohmmeter, this junction of the rectifier is "open" and the rectifier must be replaced.

(b) Armatures with 3-phase full-wave bridge rectifier

The three phase full-wave rectifier is now standard on most armatures used in generators. This 3-phase (full-wave rectifier) is a single unit with 6 diodes in a special case. The (+) terminal is identified by a red dot on the case and is connected by a short lead to the "+" terminal of armature to which the (+) rotor lead and suppressor lead are connected. The other 3 terminals at the top of the rectifier are AC connections to each of the armature phase leads. The case is the (grounded) (-) lead to the rotor. To test the diodes disconnect the rectifier positive lead at the armature (+) terminal. Test between rectifier (+) lead and any AC terminal. Make the test also between rectifier (-) lead (ground or case) to any AC lead. The tests determine that all diodes are good or that one or more is defective. Since a grounded armature winding gives the same test results as a bad diode, it is necessary to disconnect all AC rectifier connections and test armature winding for a short to ground before a fault can be positively identified. Also test each diode separately (+) to each AC terminal, and case to each AC terminal to positively identify which diode is bad. (See figure below.)



5. VOLTAGE SUPPRESSORS

Voltage suppressors are similar to rectifiers in that they contain in effect a single semiconductor one-way junction. A suppressor should have a high resistance with one polarity of test leads and low but not zero resistance in the opposite direction. Resistance measurements sometimes fail to identify a defective suppressor. The best test is to remove suppressor from circuit. If an obvious improvement in generator is observed, suppressor is bad.

6. RESISTANCE OF WINDINGS

Frequently in troubleshooting a generator, a defective component can be identified by measuring the resistance of a winding.

Resistance values are as follows:

Exciter field F to C (F- to F+)	25 to 28 ohms
Armature AC lead to AC lead	.500 to .550 ohms
Stator Windings	Varies with KW
(T1 - T2) (T3 - T4) 4 wire	rating but far
(T1 - T2) (T2 - T3) 3 wire	less than 1 ohm.
Rotor (R & Q)	2.5 - 2.8 ohms

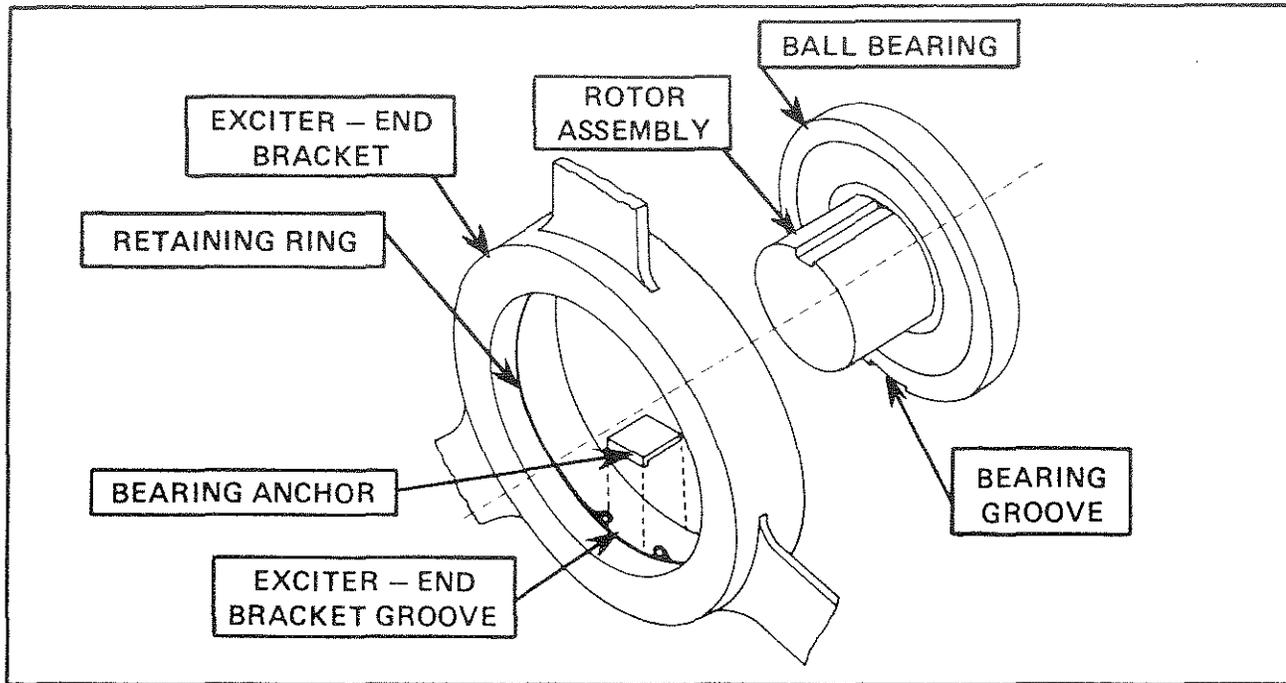
Exciter field, armature, rotor and stator should withstand 1500 volts between winding and ground with less than 0.002 ampere of current between winding and ground. All electronic components such as rectifiers, suppressors and resistors must be disconnected.

DISASSEMBLY AND ASSEMBLY

To remove the rotating field, it is necessary to remove the end cover by unscrewing the sheet metal screws. Remove the armature fastening bolt at the center of the shaft and detach ground lead "Q" and + lead "R" of the rotor. Mark position of armature so it can be replaced in the same position (armature rotation of 180° is the only other possible position to replace armature). Remove armature from shaft. If a puller is used, pull only on hub. Do not exert excessive force on laminations, since they are soft and easily bent. After armature is removed, rotor and drive disc assembly may be pulled out of generator frame at open end. Do not lose bearing anchor when bearing is removed from exciter end bracket.

As rotor is removed, be careful not to allow rotor to scratch or cut stator copper winding. The rotor and drive disc may now be bolted to engine flywheel.

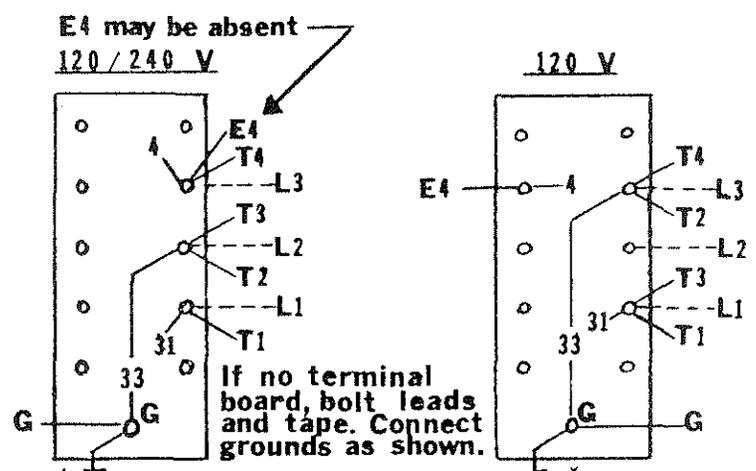
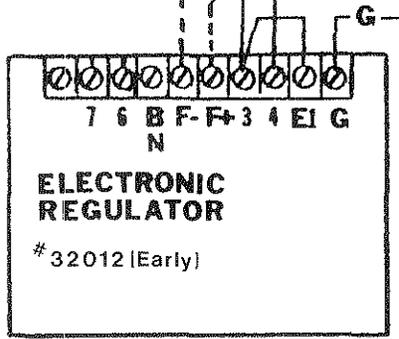
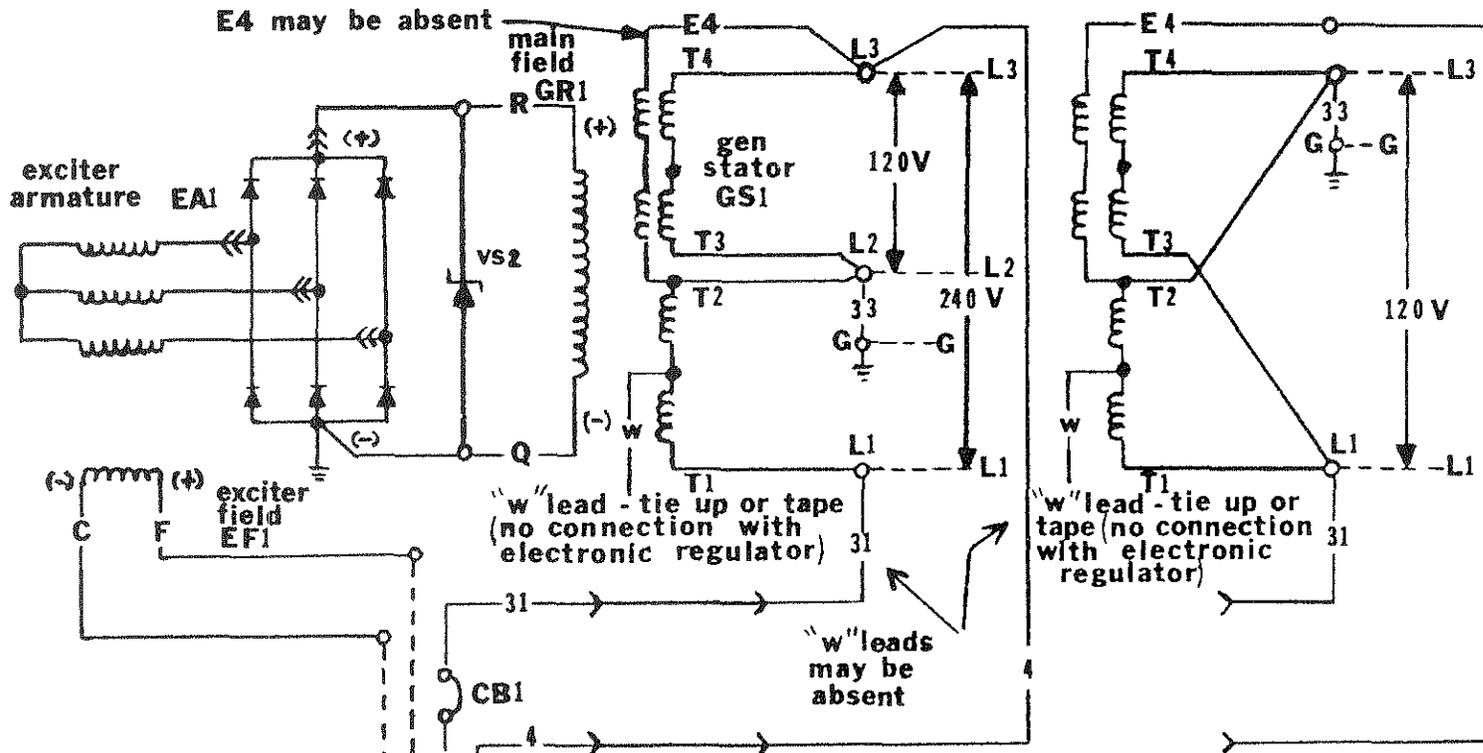
Make sure the right type lockwasher is used and tighten the bolts (SAE grade 8) well. Locate the bearing anchor and move the generator frame assembly carefully over the rotor. Carefully align the groove in the bearing with the bearing anchor before the bearing enters the bearing bracket. (See figure for clarification.) Fasten the frame assembly to the engine flywheel housing with the proper hardware.



EXCITER - END BRACKET, BEARING AND BEARING ANCHOR ASSEMBLY

With two screws, lockwashers and nuts reassemble the drive-end cover and hood, using a large screwdriver and a 7/16 wrench.

To reassemble the exciter armature, first pull the two rotor leads through the opening in the armature spider nearest the two terminal points. Turn the armature until it slips over the two pins in the shaft, making sure that the rotor leads are not stretched or bent sharply. Assemble the armature to the shaft with the mounting screw and lockwasher using thread-locking compound. Use a 9/16 socket on the torque wrench and torque the mounting screw to 25 lb-ft. Connect the two rotor leads, one to each terminal (polarity is unimportant).



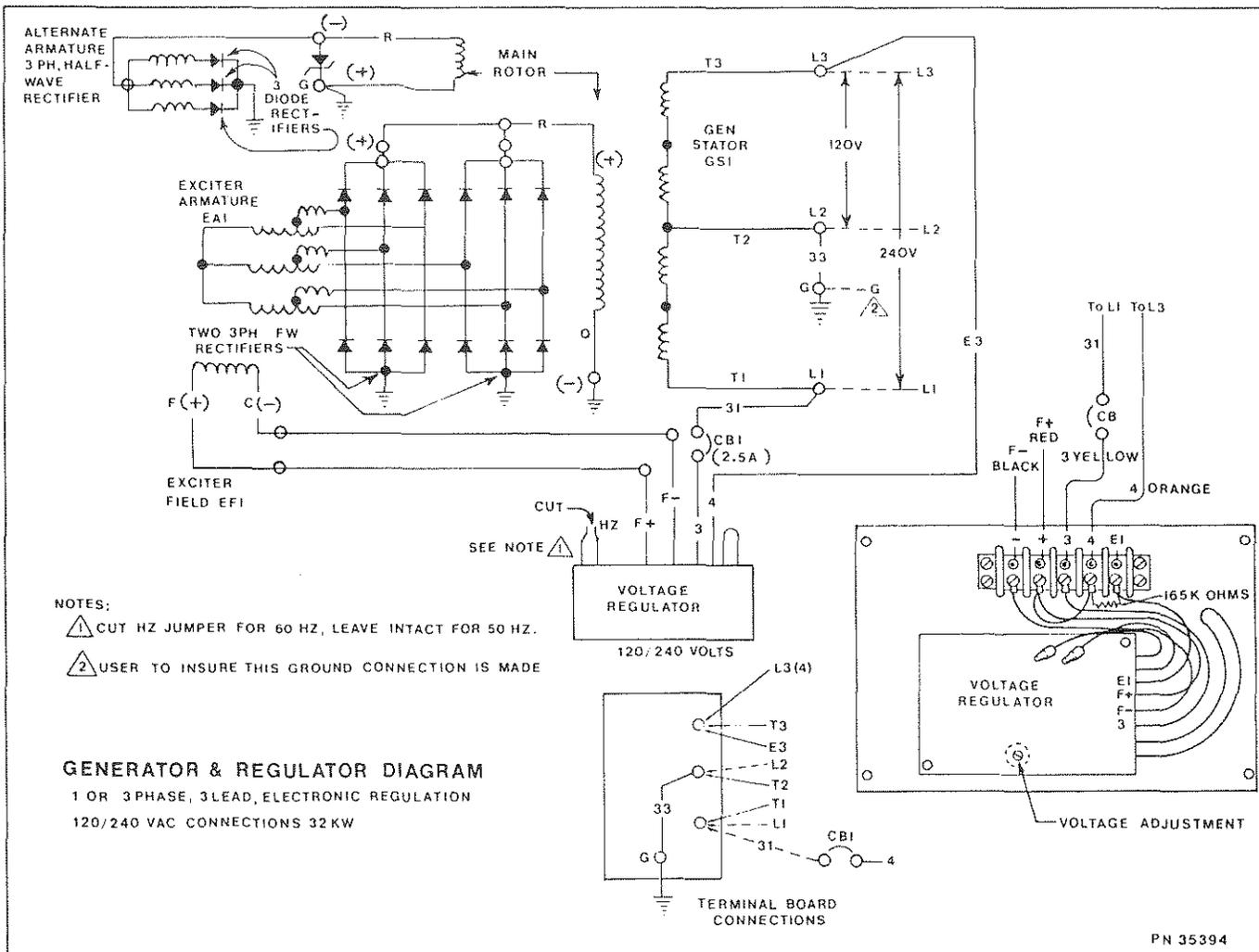
GENERATOR & REGULATOR DIAGRAM
 1 phase, 4 lead, electronic regulation
 120/240V & 120V connections
 30 & 32 KW's

TERMINAL BOARD CONNECTION

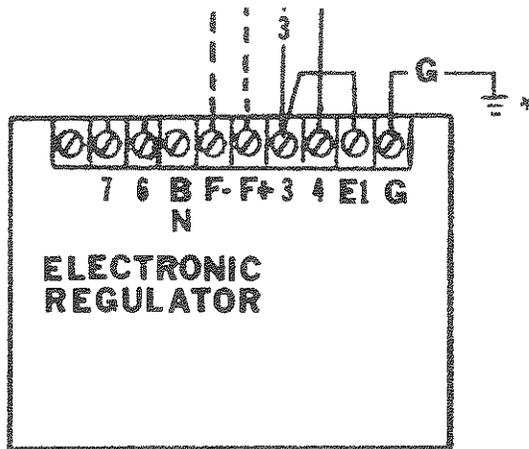
*Note: Ground Connection
 User to insure this ground connection is made.

GENERATOR & REGULATOR DIAGRAM
 1-PHASE, 4-LEAD, ELECTRONIC REGULATION
 120/240 V & 120 CONNECTIONS

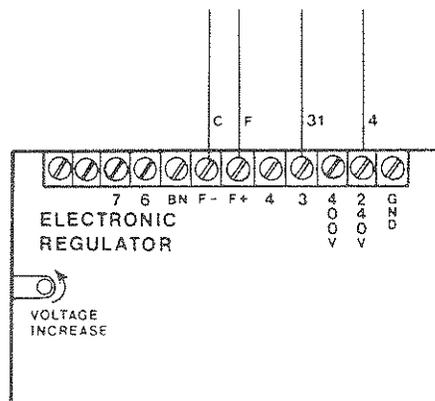
GENERATOR & REGULATOR DIAGRAM
1 OR 3 PHASE, 3 LEAD, ELECTRONIC REGULATION
120/240 VAC CONNECTIONS WTF 25KW AND WTF 32KW



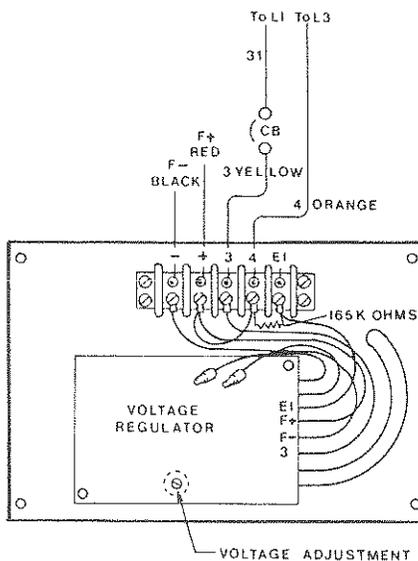
Note: Never connect terminal E1 to terminal 4.
 Loss of sensing voltage and maximum generator voltage would result.



#32012 (Early) SOLID STATE VOLTAGE REGULATOR



#32012 (later) SOLID STATE VOLTAGE REGULATOR



#34615 SOLID STATE VOLTAGE REGULATOR
(Encapsulated)

(Replaces both early and later voltage regulators #32012)

WESTERBEKE LIMITED WARRANTY

1. Warranty Obligation and Duration

Westerbeke warrants to the original consumer purchaser that all standard Westerbeke marine engines and generator sets manufactured or supplied by us will be free from defects in material and workmanship for a period of one year: from date of commission, or date of purchase on repower, OR fifteen hundred (1500) hours on Commercial Generators, only (whichever occurs first).

2. Remedy

Westerbeke will elect to repair or replace free of charge to you any product or part returned to our factory transportation costs prepaid which we adjudge defective in materials or workmanship. Alternatively, we may reimburse at our discretion a portion of labor costs incurred to repair defective parts or products on site. If you request shipment of replacement parts to you prior to our determination of cause of failure, such shipment will be sent C.O.D.

3. Notification

If you encounter a problem with your Westerbeke engine or generator set within the warranty period as stated above, contact your nearest authorized Westerbeke Master Distributor directly, by telephone or letter.

Be prepared to furnish the following information:

- a. number of hours on unit
- b. date of commission, date of purchase
- c. owner's office and home telephone
- d. model number, serial number
- e. name of vessel
- f. present location of vessel or product
- g. name and address of builder
- h. boat model name
- i. who performed prior servicing, installation
- j. description of current problem
- k. any service outlet consulted and their diagnosis

4. Exclusions

This warranty shall not apply to:

- a) failures due to wear and tear, misuse, accident or negligence, including but not limited to improper storage or installation, inadequate maintenance, overloading and insufficient lubrication;
- b) consequential harm caused by overheating of engine cooling water or loss of engine lubricating pressure (these conditions should be constantly monitored by engine instruments and/or alarms);
- c) consequential harm caused by improper installation or failure of accessories attached to our product, such as water heaters and refrigeration compressors;
- d) products altered or modified in a manner not authorized in writing by Westerbeke;
- e) products damaged in transit;
- f) replacement of engine fluids, filter elements or vee belts, engine tune-up, valve adjustment, oil and water leaks, or any other normal service items;
- g) specially manufactured products provided to customer specifications;
- h) fuel systems, cooling systems, exhaust systems, electrical systems and cable control systems beyond the connection points on the product.

5. Application of Warranty

THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS, IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET FORTH IN THE FIRST PARAGRAPH ABOVE. NO REPRESENTATIVE OR PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME FOR WESTERBEKE ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS. WESTERBEKE WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OR INSTALLATION OF ITS PRODUCTS.

SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS OR THE EXCLUSIONS OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS AND EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

P/N 21479

6/1/83



J. H. WESTERBEKE CORP.

AVON INDUSTRIAL PARK, AVON, MASS. 02322 (617) 588 7700
CABLE: WESTCORP, AVON · TELEX: 92 4444

