OPERATORS MANUAL

FOR THE

25KW-60Hz AND 20KW-50Hz BEG

20KW-60Hz AND 16KW-50Hz BEG

MARINE GASOLINE GENERATORS

SINGLE AND THREE PHASE

PUBLICATION NO.041302
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WESTERBEKE

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⚠ WARNING

Exhaust gasses contain Carbon Monoxide, an odorless and colorless gas. Carbon Monoxide is poisonous and can cause unconsciousness and death. Symptoms of Carbon Monoxide exposure can include:

- ***Dizziness***
- ***Nausea***
- ***Headache***
- ***Weakness and Sleepiness***
- ***Throbbing in Temples***
- ***Muscular Twitching***
- ***Vomiting***
- ***Inability to Think Coherently***

IF YOU OR ANYONE ELSE EXPERIENCE ANY OF THESE SYMPTOMS, GET OUT INTO THE FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the unit and do not restart until it has been inspected and repaired.

CALIFORNIA

Proposition 65 Warning

Diesel and gasoline engine exhaust and some of their constituents contain chemicals known to the State of California to cause cancer, birth defects and other reproductive harm.

SAFETY INSTRUCTIONS

INTRODUCTION

Read this safety manual carefully. Most accidents are caused by failure to follow fundamental rules and precautions. Know when dangerous conditions exist and take the necessary precautions to protect yourself, your personnel, and your machinery.
The following safety instructions are in compliance with the American Boat and Yacht Council (ABYC) standards.

PREVENT ELECTRIC SHOCK

⚠ WARNING: ***Do not touch AC electrical connections while engine is running, or when connected to shore power. Lethal voltage is present at these connections!***

- Do not operate this machinery without electrical enclosures and covers in place.
- Shut off electrical power before accessing electrical equipment.
- Use insulated mats whenever working on electrical equipment.
- Make sure your clothing and skin are dry, not damp (particularly shoes) when handling electrical equipment.
- Remove wristwatch and all jewelry when working on electrical equipment.
- Do not connect utility shore power to vessel's AC circuits, except through a ship-to-shore double throw transfer switch. Damage to vessel's AC generator may result if this procedure is not followed.
- Electrical shock results from handling a charged capacitor. Discharge capacitor by shorting terminals together.

PREVENT BURNS — HOT ENGINE

⚠ WARNING: ***Do not touch hot engine parts or exhaust system components. A running engine gets very hot!***

- Always check the engine coolant level at the coolant recovery tank.

⚠ WARNING: ***Steam can cause injury or death!***

- In case of an engine overheat, allow the engine to cool before touching the engine or checking the coolant.

PREVENT BURNS — FIRE

⚠ WARNING: ***Fire can cause injury or death!***

- Prevent flash fires. Do not smoke or permit flames or sparks to occur near the carburetor, fuel line, filter, fuel pump, or other potential sources of spilled fuel or fuel vapors. Use a suitable container to catch all fuel when removing the fuel line, carburetor, or fuel filters.
- Do not operate with a Coast Guard Approved flame arrester removed. Backfire can cause severe injury or death.
- Do not operate with the air cleaner/silencer removed. Backfire can cause severe injury or death.
- Do not smoke or permit flames or sparks to occur near the fuel system. Keep the compartment and the engine/generator clean and free of debris to minimize the chances of fire. Wipe up all spilled fuel and engine oil.
- Be aware — diesel fuel will burn.

PREVENT BURNS — EXPLOSION

⚠ WARNING: ***Explosions from fuel vapors can cause injury or death!***

- Follow re-fueling safety instructions. Keep the vessel's hatches closed when fueling. Open and ventilate cabin after fueling. Check below for fumes/vapor before running the blower. Run the blower for four minutes before starting your engine.
- All fuel vapors are highly explosive. Use extreme care when handling and storing fuels. Store fuel in a well-ventilated area away from spark-producing equipment and out of the reach of children.
- Do not fill the fuel tank(s) while the engine is running.
- Shut off the fuel service valve at the engine when servicing the fuel system. Take care in catching any fuel that might spill. DO NOT allow any smoking, open flames, or other sources of fire near the fuel system or engine when servicing. Ensure proper ventilation exists when servicing the fuel system.
- Do not alter or modify the fuel system.
- Be sure all fuel supplies have a positive shutoff valve.
- Be certain fuel line fittings are adequately tightened and free of leaks.
- Make sure a fire extinguisher is installed nearby and is properly maintained. Be familiar with its proper use. Extinguishers rated ABC by the NFPA are appropriate for all applications encountered in this environment.

SAFETY INSTRUCTIONS

ACCIDENTAL STARTING

⚠ WARNING: ***Accidental starting can cause injury or death!***

- Disconnect the battery cables before servicing the engine/generator. Remove the negative lead first and reconnect it last.
- Make certain all personnel are clear of the engine before starting.
- Make certain all covers, guards, and hatches are re-installed before starting the engine.

BATTERY EXPLOSION

⚠ WARNING: ***Battery explosion can cause injury or death!***

- Do not smoke or allow an open flame near the battery being serviced. Lead acid batteries emit hydrogen, a highly explosive gas, which can be ignited by electrical arcing or by lit tobacco products. Shut off all electrical equipment in the vicinity to prevent electrical arcing during servicing.
- Never connect the negative (–) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together. Sparks could ignite battery gases or fuel vapors. Ventilate any compartment containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb the battery charger connections while the battery is being charged.
- Avoid contacting the terminals with tools, etc., to prevent burns or sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling the battery.
- Always turn the battery charger off before disconnecting the battery connections. Remove the negative lead first and reconnect it last when disconnecting the battery.

BATTERY ACID

⚠ WARNING: ***Sulfuric acid in batteries can cause severe injury or death!***

- When servicing the battery or checking the electrolyte level, wear rubber gloves, a rubber apron, and eye protection. Batteries contain sulfuric acid which is destructive. If it comes in contact with your skin, wash it off at once with water. Acid may splash on the skin or into the eyes inadvertently when removing electrolyte caps.

TOXIC EXHAUST GASES

⚠ WARNING: ***Carbon monoxide (CO) is a deadly gas!***

- Ensure that the exhaust system is adequate to expel gases discharged from the engine. Check the exhaust system regularly for leaks and make sure the exhaust manifolds are securely attached and no warping exists. Pay close attention to the manifold, water injection elbow, and exhaust pipe nipple.
- Be sure the unit and its surroundings are well ventilated.
- In addition to routine inspection of the exhaust system, install a carbon monoxide detector. Consult your boat builder or dealer for installation of approved detectors.
- For additional information refer to ABYC T-22 (educational information on Carbon Monoxide).

⚠ WARNING: ***Carbon monoxide (CO) is an invisible odorless gas. Inhalation produces flu-like symptoms, nausea or death!***

- Do not use copper tubing in diesel exhaust systems. Diesel fumes can rapidly destroy copper tubing in exhaust systems. Exhaust sulfur causes rapid deterioration of copper tubing resulting in exhaust/water leakage.
- Do not install exhaust outlet where exhaust can be drawn through portholes, vents, or air conditioners. If the engine exhaust discharge outlet is near the waterline, water could enter the exhaust discharge outlet and close or restrict the flow of exhaust. Avoid overloading the craft.
- Although diesel engine exhaust gases are not as toxic as exhaust fumes from gasoline engines, carbon monoxide gas is present in diesel exhaust fumes. Some of the symptoms or signs of carbon monoxide inhalation or poisoning are:

  Vomiting
  Dizziness
  Throbbing in temples
  Muscular twitching
  Intense headache
  Weakness and sleepiness

AVOID MOVING PARTS

⚠ WARNING: ***Rotating parts can cause injury or death!***

- Do not service the engine while it is running. If a situation arises in which it is absolutely necessary to make operating adjustments, use extreme care to avoid touching moving parts and hot exhaust system components.

SAFETY INSTRUCTIONS

- Do not wear loose clothing or jewelry when servicing equipment; tie back long hair and avoid wearing loose jackets, shirts, sleeves, rings, necklaces or bracelets that could be caught in moving parts.
- Make sure all attaching hardware is properly tightened. Keep protective shields and guards in their respective places at all times.
- Do not check fluid levels or the drive belt's tension while the engine is operating.
- Stay clear of the drive shaft and the transmission coupling when the engine is running; hair and clothing can easily be caught in these rotating parts.

HAZARDOUS NOISE

⚠ WARNING: ***High noise levels can cause hearing loss!***

- Never operate an engine without its muffler installed.
- Do not run an engine with the air intake (silencer) removed.
- Do not run engines for long periods with their enclosures open.

⚠ WARNING: ***Do not work on machinery when you are mentally or physically incapacitated by fatigue!***

OPERATORS MANUAL

Many of the preceding safety tips and warnings are repeated in your Operators Manual along with other cautions and notes to highlight critical information. Read your manual carefully, maintain your equipment, and follow all safety procedures.

GASOLINE ENGINE AND GENERATOR INSTALLATIONS

Preparations to install a gasoline engine or generator should begin with a thorough examination of the American Boat and Yacht Council's (ABYC) standards. These standards are from a combination of sources including the USCG and the NFPA.

Sections of the ABYC standards of particular interest are:

H-2 Ventilation
H-24 Gasoline fuel systems
P-1 Exhaust systems
P-4 Inboard engines
E-9 DC Electrical systems

All installations must comply with the Federal Code of Regulations (FCR).

ABYC, NFPA AND USCG PUBLICATIONS FOR INSTALLING DIESEL ENGINES

Read the following ABYC, NFPA and USCG publications for safety codes and standards. Follow their recommendations when installing your engine.

ABYC (American Boat and Yacht Council)
"Safety Standards for Small Craft"

Order from:

ABYC
15 East 26th Street
New York, NY 10010

NFPA (National Fire Protection Association)
"Fire Protection Standard for Motor Craft"

Order from:

National Fire Protection Association
11 Tracy Drive
Avon Industrial Park
Avon, MA 02322

USCG (United States Coast Guard)
"USCG 33CFR183"

Order from:

U.S. Government Printing Office
Washington, D.C. 20404

INSTALLATION

When installing WESTERBEKE engines and generators it is important that strict attention be paid to the following information:

CODES AND REGULATIONS

Strict federal regulations, ABYC guidelines, and safety codes must be complied with when installing engines and generators in a marine environment.

SIPHON-BREAK

For installations where the exhaust manifold/water injected exhaust elbow is close to or will be below the vessel's waterline, provisions must be made to install a siphon-break in the raw water supply hose to the exhaust elbow. This hose must be looped a minimum of 20" above the vessel's waterline. ***Failure to use a siphon-break when the exhaust manifold injection port is at or below the load waterline will result in raw water damage to the engine and possible flooding of the boat.***

If you have any doubt about the position of the water-injected exhaust elbow relative to the vessel's waterline under the vessel's various operating conditions, ***install a siphon-break.***

NOTE: *A siphon-break requires periodic inspection and cleaning to ensure proper operation. Failure to properly maintain a siphon-break can result in catastrophic engine damage. Consult the siphon-break manufacturer for proper maintenance.*

EXHAUST SYSTEM

The exhaust hose must be certified for marine use. The system must be designed to prevent water from entering the exhaust under any sea conditions and at any angle of the vessels hull.

A detailed 40 page Marine Installation Manual covering gasoline and diesel, engines and generators, is available from your WESTERBEKE dealer.

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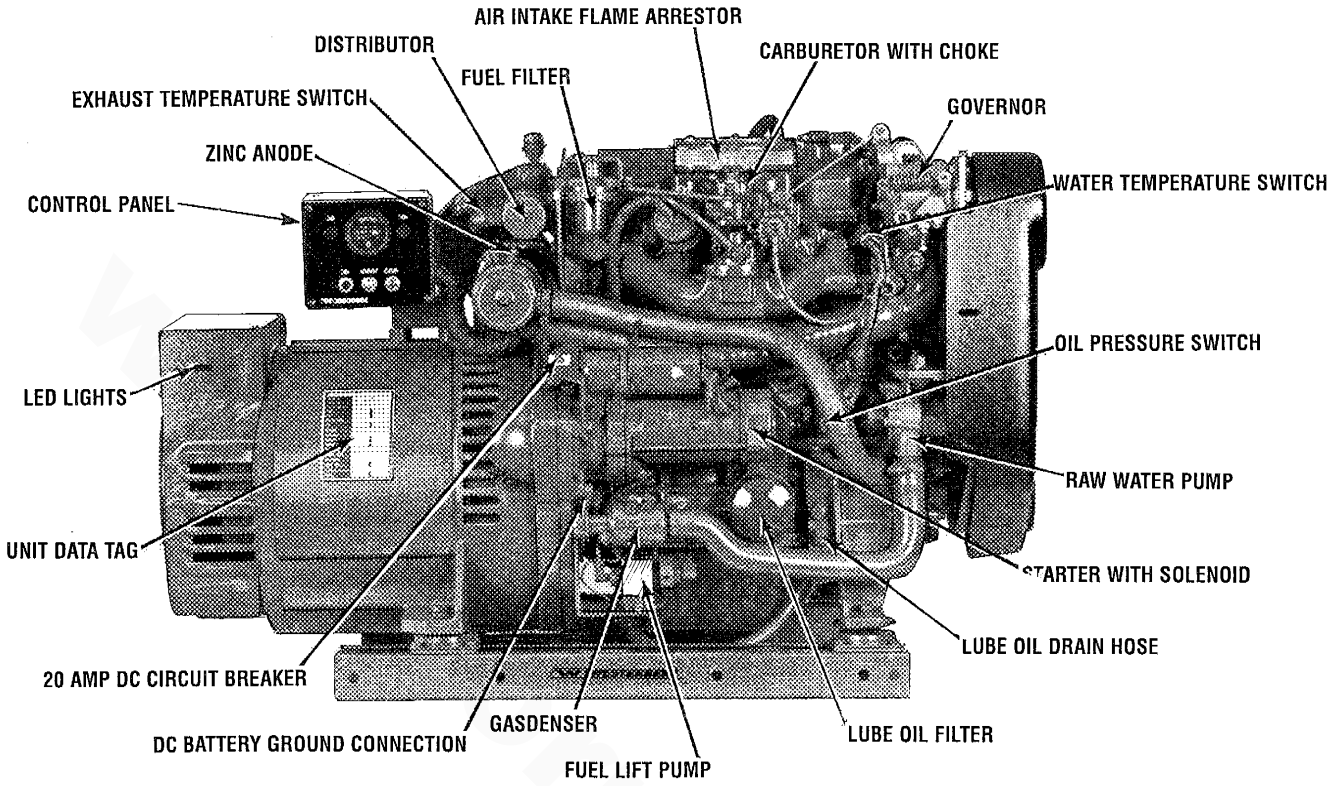
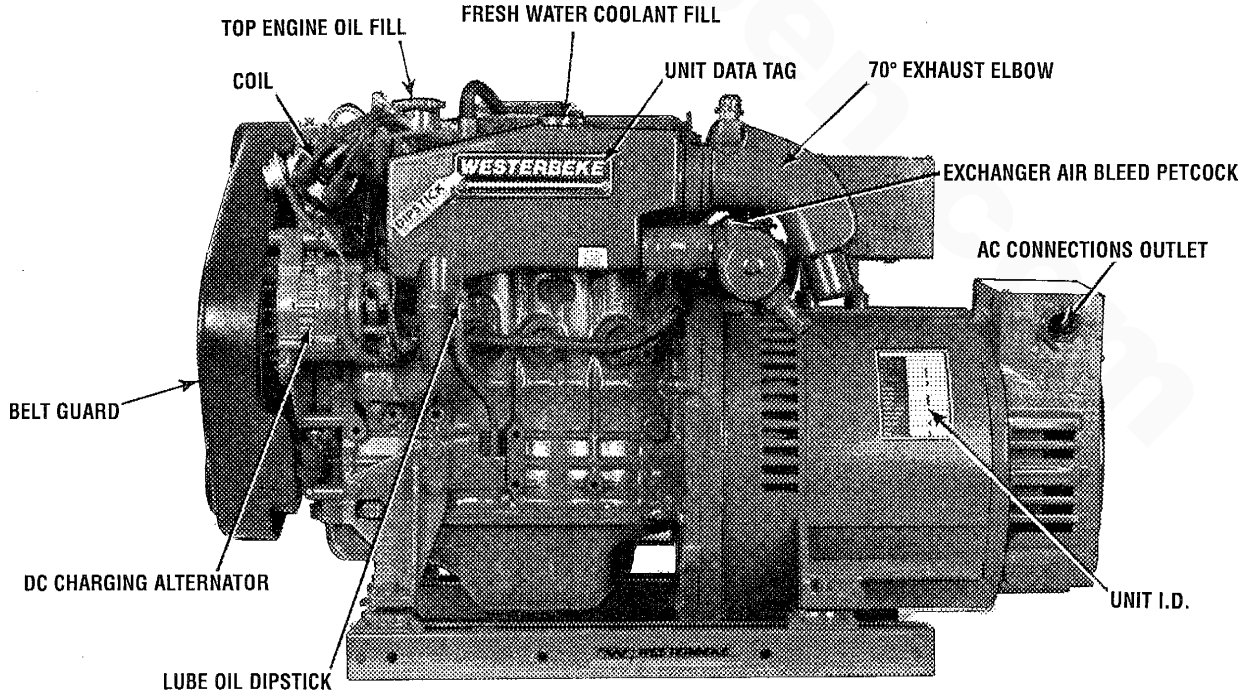
25KW AND 20KW BEG GENERATOR PARTS IDENTIFICATION

RIGHT SIDE



LEFT SIDE



WESTERBEKE
Engines & Generators

INTRODUCTION

This WESTERBEKE Generator is a product of WESTERBEKE'S long years of experience and advanced technology. We take great pride in the superior durability and dependable performance of our engines and generators. Thank you for selecting WESTERBEKE.

In order to get the full use and benefit from your generator, it is important that you operate and maintain it correctly. This manual is designed to help you do this. Please read this manual carefully and observe all the safety precautions throughout. Should your generator require servicing, contact your nearest WESTERBEKE dealer for assistance.

This is your Operators Manual. A Parts Catalog is also provided and a Technical Manual is available from your WESTERBEKE dealer. If you are planning to install this equipment yourself, contact your WESTERBEKE dealer for WESTERBEKE'S Installation Manual.

WARRANTY PROCEDURES

Your WESTERBEKE Warranty is included in a separate folder. If you have not received a customer identification card registering your warranty 60 days after submitting the warranty registration form, , please contact the factory in writing with model information, including the unit's serial number and commission date

WESTERBEKE
Engines & Generators

Customer Identification

WESTERBEKE OWNER
MAIN STREET
HOMETOWN, USA

Model BEG Ser. #D703XXXX
Expires 9/20/02

PRODUCT SOFTWARE

Product software (tech data, parts lists, manuals, brochures and catalogs) provided from sources other than WESTERBEKE are not within WESTERBEKE'S CONTROL.

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WESTERBEKE customers should also keep in mind the time span between printings of WESTERBEKE product software and the unavoidable existence of earlier WESTERBEKE manuals. In summation, product software provided with WESTERBEKE products, whether from WESTERBEKE or other suppliers, must not and cannot be relied upon exclusively as the definitive authority on the respective product. It not only makes good sense but is imperative that appropriate representatives of WESTERBEKE or the supplier in question be consulted to determine the accuracy and currentness of the product software being consulted by the customer.

SERIAL NUMBER LOCATION

The generator serial number and model number are located on a decal on the generator housing. Take the time to enter the information on the blank decal provided. This will provide a quick reference when seeking technical information and/or ordering repair parts.

SPECIFICATION	50 HZ.	60 HZ.
MODEL		
RPM		
KW		
KVA		
VOLTS		
AMPS		
ENG. HP		
ENG. SER. NO.		
GEN. SER. NO.		
PF/PHASE	/	
WIRES		
RATING		
INSUL. CLASS		
TEMP. RISE		
BATTERY		
C.I.D.		

Fill in the information for your reference.

Engine I.D. Plate

INTRODUCTION

The *engine* model number and serial number are located on a plate mounted on the engine's valve cover.

UNDERSTANDING THE GASOLINE GENERATOR

The gasoline engine driving an AC generator is in many ways similar to a gasoline automobile engine. The cylinders are verticle in-line, and the engine's cylinder head has an overhead camshaft which is chain-driven. The engine utilizes a solid-state distributor which is horizontally mounted and camshaft-driven. The engine incorporates a pressure type lubrication system, and a fresh water-cooled engine block which is thermostatically-controlled. To a large degree, the generator's engine requires the same preventive maintenance that is required of a gasoline automobile engine. The most important factors to the generator's longevity are proper ventilation, maintenance of the fuel system, ignition system, cooling system and the generator back end.

ORDERING PARTS

Whenever replacement parts are needed, always provide the generator and engine model and serial numbers. In addition, include a complete part description and part number for each part needed (see the separately furnished Parts Catalog). Also insist upon WESTERBEKE packaged parts because *will fit* or generic parts are frequently not made to the same specifications as original equipment.

NOTES, CAUTIONS AND WARNINGS

As this manual takes you through the operating procedures, maintenance schedules, and troubleshooting of your generator, critical information will be highlighted by NOTES, CAUTIONS, and WARNINGS. An explanation follows:

NOTE: *An operating procedure essential to note.*

⚠ CAUTION: ***Procedures, which if not strictly observed, can result in the damage or destruction of the engine or generator.***

⚠ WARNING: ***Procedures, which if not properly followed, can result in personal injury or loss of life.***

PROTECTING YOUR INVESTMENT

Care at the factory during assembly and thorough testing have resulted in a WESTERBEKE generator capable of many thousands of hours of dependable service. However the manufacturer cannot control how or where the generator is installed in the vessel or the manner in which the unit is operated and serviced in the field. This is up to the buyer/owner-operator.

NOTE: *Six important steps to ensure long generator life:*

- ***Proper engine and generator installation and alignment.***
- ***An efficient well-designed exhaust system that includes an anti-siphon break to prevent water from entering the engine.***
- ***Changing the engine oil and oil filters every 100 operating hours.***
- ***Proper maintenance of all engine and generator components according to the maintenance schedule in this manual.***
- ***Use clean, filtered unleaded fuel.***
- ***Winterize your engine according to the "Lay-up and Recommissioning" section in this manual.***

SPARES AND ACCESSORIES

Certain spare parts will be needed to support and maintain your WESTERBEKE generator or engine when cruising (see *SUGGESTED SPARE PARTS*). Often even simple items such as proper fuel and oil filters can be difficult to obtain along the way. WESTERBEKE will provide you with a suggested spares and accessories brochure to assist you in preparing an on-board inventory of the proper WESTERBEKE parts.

FUEL, ENGINE OIL AND ENGINE COOLANT

GASOLINE

> ⚠ **CAUTION:** ***Only use unleaded fuel with an octane rating of 89 or higher. Leaded fuel will cause serious harm to your engine and violate your warranty.***

Care Of The Fuel Supply

Use only clean fuel! The clearance of the components in your fuel injection pump is very critical; invisible dirt particles which might pass through the filter can damage these finely finished parts. It is important to buy clean fuel, and keep it clean. The best fuel can be rendered unsatisfactory by careless handling or improper storage facilities. To assure that the fuel going into the tank for your engine's daily use is clean and pure, the following practice is advisable:

Purchase a well-known brand of fuel.

Install and regularly service a good, Coast Guard approved metal bowl type filter/water separator between the fuel tank and the engine.

ENGINE OIL

Use a heavy duty engine oil with an API classification of SJ. Change the engine oil and filter after an initial 50 hours of break-in operation, and every 100 hours of operation thereafter.An oil viscosity of SAE 15W-40 is recommended for this engine in all conditions.

> ⚠ **CAUTION:** ***Do not allow two or more brands of engine oil to mix. Each brand contains its own additives; additives of different brands could react in the mixture to produce properties harmful to your engine.***

ENGINE COOLANT

WESTERBEKE recommends a mixture of 50% antifreeze and 50% distilled water. Distilled water is free from the chemicals that can corrode internal engine surfaces.

The antifreeze performs double duty. It allows the engine to run at proper temperatures by transferring heat away from the engine to the coolant. It also lubricates and protects the cooling circuit from rust and corrosion. Use a good quality antifreeze that contains supplemental cooling additives (SCAs) that keep the antifreeze chemically balanced, crucial to long term protection.

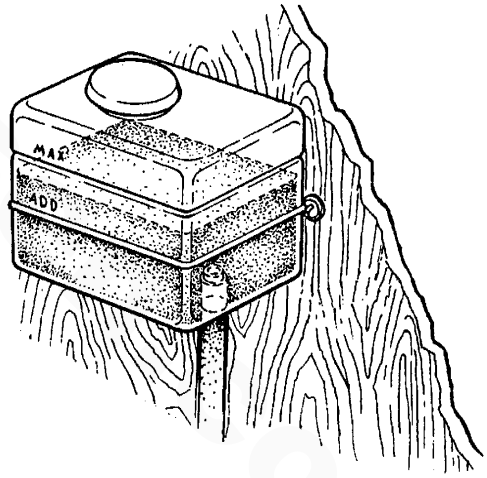
The water and antifreeze should be premixed before being poured into the cooling circuit.

NOTE: *Use the new environmentally-friendly, long lasting, antifreeze that is now available.*

A proper 50/50 mixture as recommended will protect the engine coolant to temperatures of -40°F

COOLANT RECOVERY TANK

A coolant recovery tank kit is supplied with each generator. The purpose of this recovery tank is to allow for engine coolant expansion and contraction during engine operation, without the loss of coolant and without introducing air into the cooling system.



CONTROL PANELS

DESCRIPTION

The generator mounted control panel is equipped with an **ON** switch (black), a **START** switch(white) and a **STOP** switch (red).

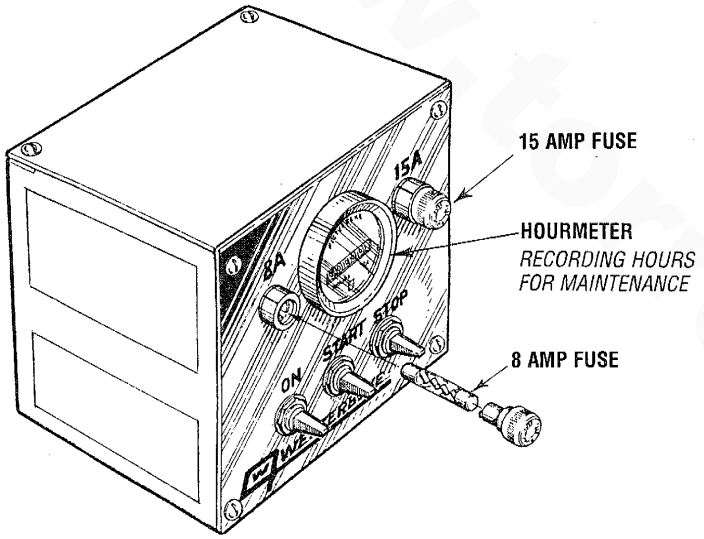
The *ON* switch provides power to the start circuit. This switch by-passes the protective oil pressure shutdown switch until the oil pressure reaches 5 - 10 psi.

The *START* switch energizes the start solenoid/starter which cranks the engine. This switch will **not** operate unless the **on** switch is depressed and held at the same time.

The *STOP* switch will turn off the engine/generator. This switch must be depressed until the stop sequence is complete.

The panel also has two fuses to protect the DC circuit:

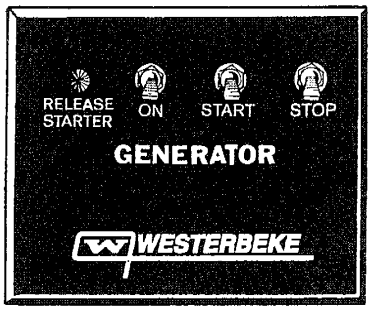
- *A 15 amp slow bluw fuse protects the start circuit.*
- *An 8 amp fuse protects the engine operating circuit and any optional remote start/stop or instrument panel.*



REMOTE START/STOP PANEL (OPTIONAL)

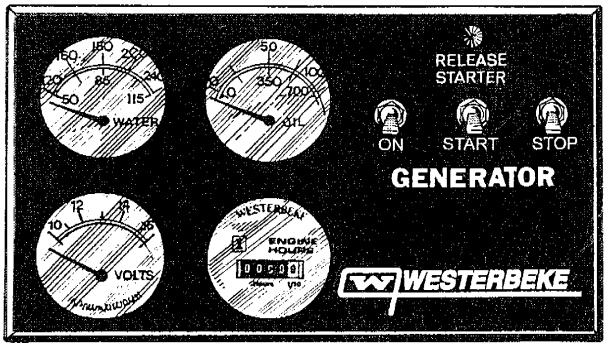
An optional remote start/stop panel is available for controlling the generator from a remote location.

This panel has the same **ON**, **START**, and **STOP** functions previously described. Also included is a green LED light which glows once the engine/generator has reached 600 rpm's. The purpose of the LED is to alert the operator to release the **START** switch. It is also an indication that the engine/generator is running.



REMOTE INSTRUMENT PANEL (OPTIONAL)

An optional remote instrument panel is available which includes a water temperature gauge, oil pressure gauge, DC charging voltmeter, operating hourmeter, and start/stop switches.



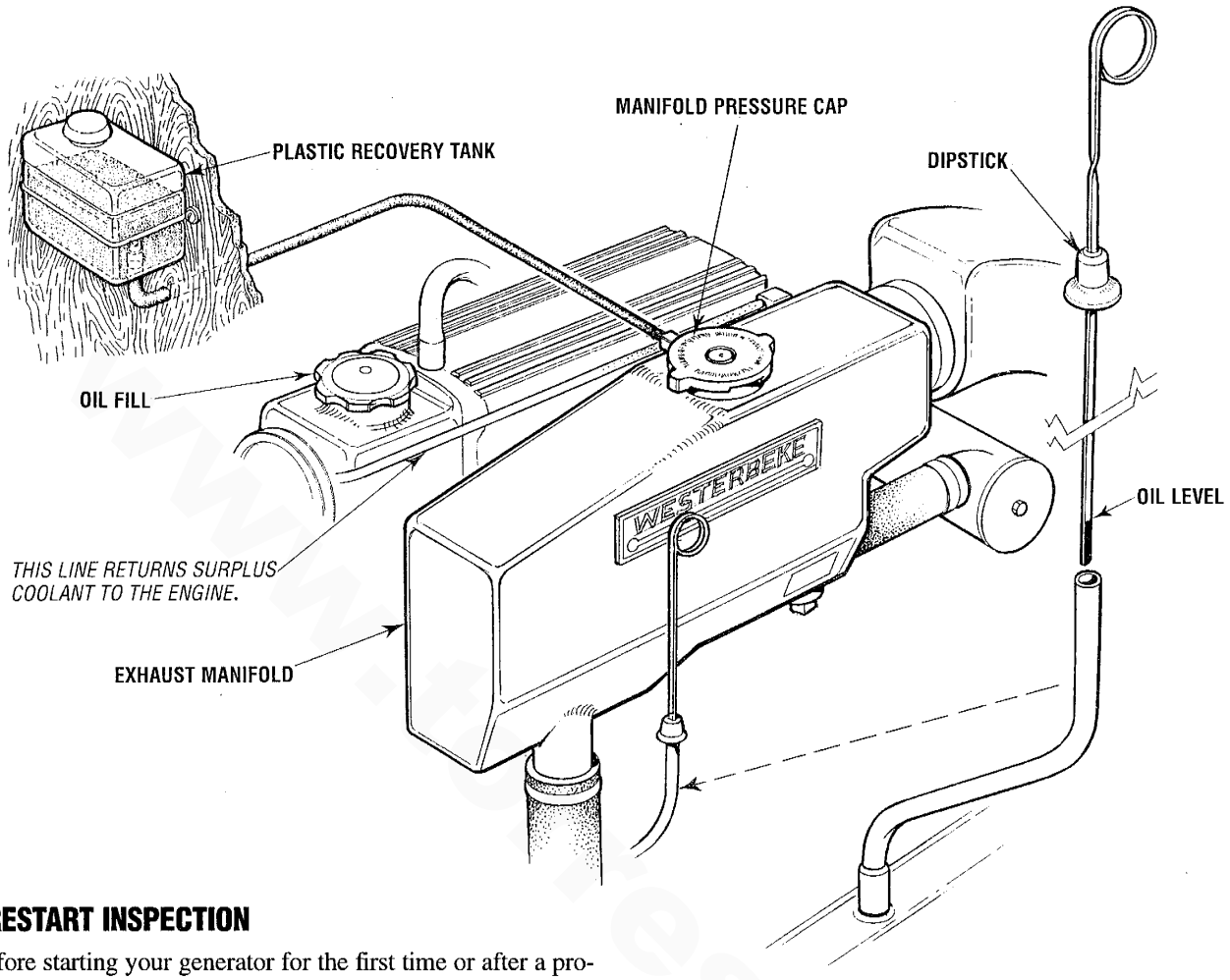
REMOTE INSTRUMENT PANEL INSTALLATION

The remote instrument panel has two sending units to be installed on the engine block, a *water temperature sender* and an *oil pressure gauge sender*. Plugged ports for each are located on the engine. The water temperature sender is installed in the thermostat housing and the oil pressure sender is adjacent to the oil pressure switch. Use sealing compound on the threads of both senders. Electrical connections for each sender are tied off next to the senders location (in the wiring harness).

The blue wire is for the oil pressure sender and the tan wire is for the water temperature sender. If there is a jumper between terminal board connections T-1 and T-2, it should be removed. Refer to the *REMOTE INSTRUMENT WIRING DIAGRAM* in this manual.

NOTE: *When installing the optional remote panels, it is the installers responsibility to comply with the U.S. Coast Guard standards 33 CFR part 183.*

PREPARATIONS FOR INITIAL START-UP



PRESTART INSPECTION

Before starting your generator for the first time or after a prolonged layoff, check the following items:

- Check the engine oil level: add oil to maintain the level at the full mark on the dipstick.
- Check the fuel supply and examine the fuel filter/separator bowls for contaminants.
- Check the DC electrical system. Inspect wire connections and battery cable connections.
- Check the coolant level in both the plastic recovery tank and at the manifold.

  NOTE: *After the initial running of the generator, the air in the engine's cooling system will be purged to the coolant recovery tank. Open the air bleed petcock to ensure that the cooling system is purged of air. After shutdown and after the engine has cooled, the coolant from the recovery tank will be drawn into the engine's cooling system to replace the purged air.*

  Before subsequent operation of the generator, the engine's manifold should be topped off, and the coolant recovery tank may need to be filled to the MAX level.
- Visually examine the unit. Look for loose or missing parts, disconnected wires, unattached hoses, and check threaded connections. Search for any gasoline leaks.
- Check load leads for correct connections as specified in the wiring diagrams.
- Examine the air inlet and outlet for air flow obstructions.
- Be sure no other generator or utility power is connected to the load lines.
- 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 systems an incomplete or open neutral can supply the wrong line-to-neutral voltage on unbalanced loads.

> ⚠ **CAUTION:** ***When starting the generator, it is recommended that all AC loads, especially large motors, be switched OFF until the engine has come up to speed and, in cold climates, starts to warm up. This precaution will prevent damage caused by unanticipated operation of the AC machinery and will prevent a cold engine from stalling.***

OPERATING INSTRUCTIONS

STARTING THE GENERATOR

> ⚠ **WARNING:** ***Ventilate the generator compartment for a minimum of five minutes prior to starting. The ventilating blowers remove any explosive gasoline fumes from the generator compartment and bilges.***

1. Depress the **ON** switch and hold it down (5-15 seconds), this primes carburetor. Continue to depress **ON**.
2. Depress the **START** (white), when the generator starts, release the **START** switch. Continue to engage the **ON** switch a few seconds longer.

NOTE: *Keeping the ON switch depressed by-passes the oil pressure shutdown circuit allowing the oil pressure to rise enough to close the switch and maintain the ignition circuit*

3. Release the **ON** switch.

> ⚠ **CAUTION:** ***All AC loads must be switched off when starting. This precaution will prevent damage caused by unanticipated operation of AC machinery and will prevent a cold engine from stalling.***

Once The engine is running apply a light load to the generator and allow the engine to warm up to operating temperature (130°-150° F/ 55°-56°C) before applying heavy loads.

If an optional instrument panel is installed, monitor the gauges for normal readings.

NOTE: *Some unstable running may occur in a cold engine. This condition should smooth out as the engine warms up and when the generator loads are applied.*

> ⚠ **CAUTION:** ***Prolonged cranking intervals without the engine starting can result in filling the engine exhaust with raw water. This may happen because the pump is pumping raw water through the raw water cooling system during cranking. This raw water can enter the engine's cylinders by way of the exhaust manifold once the exhaust system fills. Prevent this from happening by closing the raw water supply through-hull shutoff, draining the exhaust muffler, and correcting the cause of the excessive engine cranking. Engine damage resulting from raw water entry is not a warrantable issue: the owner/operator should keep this in mind.***

STOPPING THE GENERATOR

1. Remove the AC loads from the generator and allow the generator to run for an added 3 to 5 minutes (this stabilizes its operating temperature).
2. Depress the **STOP** (red) switch.
3. When the generator stops, release the **STOP** switch.

NOTE: *In an emergency, if the generator will not stop using the stop switch, remove the 8 amp fuse in the control panel.*

ABNORMAL STOP

An abnormal stop is one in which the generator ceases to run and comes to a stop as a result of an operating fault which may cause damage to the engine, the generator, or create an unsafe operating condition. The fault stop conditions are:

1. Overspeed condition.
2. High engine temperature.
3. Low oil pressure.
4. High exhaust temperature.

Should a fault condition occur, the engine will shut down and the green LED light on the remote panel will go off indicating that a fault has occured. Once detected, the fault should be located (see *ENGINE TROUBLESHOOTING*).

OVERSPEED SHUTDOWN

In the case of an overspeed shutdown, the overspeed circuit must be reset before restarting the generator. Simply depress the STOP switch momentarily then proceed with the normal start sequence.

If the overspeed switch is faulty (resetting with the Stop switch fails to reset the circuit), lift the black/white wire off the T5 terminal and connect it with the red/purple wire on the T4 terminal. Now restart the generator.

If this by-pass is successful, replace the faulty overspeed switch

Refer to the *CONTROL PANEL WIRING DIAGRAMS* in this manual.

> ⚠ **WARNING:** ***Do not operate the generator with the overspeed switch by-passed.***

NOTE: *Overspeed switches draw a small amount of amperage (25 milliamps) at all times once the generator is connected to its starting battery. This amounts to approximately 18 amp-hours in a month. It is not necessary to be concerned with this slight amperage draw during normal seasonal operation. However, if the generator set is to be unused for many months, it is best to either remove the 8 amp ignition fuse from the control panel on the generator or turn off the generator's starting battery switch..*

> ⚠ **CAUTION:** ***It is very important that the overspeed shutdown always be installed and functioning. Any tampering with the overspeed shutdown module, which would cause it to malfunction, could be a cause of injury should the generator's belt-driven governor fail and cause the generator to run away.***

REMOTE PANELS

The ***remote start panel*** and ***the remote instrument panel*** operate the same as the ***generator mounted control panel*** except that they have green LED lights for starting at a remote location (where the sound of the generator may not be audible). The green LED lights indicate when the generator is running at about 600 rpms. That is when the start switch should be released. For the remote start/stop sequence refer to *STARTING THE GENERATOR* on the previous page.

BREAK-IN PROCEDURE/DAILY OPERATION

BREAK-IN PROCEDURE

After the generator has been started, check for proper operation and then encourage a fast warm-up. Run the generator between 20% to 60% of full load for the first 10 hours.

> ⚠ **CAUTION:** ***Do not attempt to break-in your generator by running without a load.***

After the first 10 hours of the generators' operation, the load can be increased to the full-load rated output; then periodically vary the load.

Avoid overload at all times. An overload is signaled by a smoky exhaust with reduced output voltage and frequency. Monitor the current being drawn from the generator and keep it within the generators' rating. Since the generator operates at 1800 rpm to produce 60 hertz, or at 1500 to produce 50 hertz, control of the generator's engine break-in is governed by the current drawn from the generator.

To protect against unintentional overloading of the generator, the generator's output leads should be routed through a circuit breaker that is rated at the rated output of the generator.

NOTE: *Be aware of motor starting loads and the high current drawn required for starting motors. This starting amperage drawn can be 3 to 5 times normal running amperage. See GENERATOR INFORMATION in this manual.*

CHECK LIST

Follow this checklist each day before starting your generator.

- Record the hourmeter reading in your log (engine hours relate to the maintenance schedule).
- Visually inspect the engine for fuel, oil, or water leaks.
- Check the oil level (dipstick).
- Check the coolant level in the coolant recovery tank.
- Check your fuel supply.
- Check the starting batteries (weekly).
- Check the drive belts for wear and proper tension (weekly).
- Check for abnormal noise such as knocking, vibration and blow-by sounds.
- Confirm exhaust smoke:
  When the engine is cold – White Smoke.
  When the engine is warm – almost Smokeless.
  When the engine is overloaded – some Black Smoke.

NOTE: *Some unstable running may occur in a cold engine. This condition should abate as normal operating temperature is reached and loads are applied.*

> ⚠ **CAUTION:** ***Do not operate the generator for long periods of time without a load being placed on the generator.***

STOPPING THE GENERATOR

Remove the major AC loads from the generator one at a time. Allow the generator to run for a few minutes to stabilize the operating temperature and press the STOP switch down, (see *CONTROL PANELS*).

NOTE: *After the first 50 hours of generator operation check the maintenance schedule for the 50 hour service check.*

GENERATOR ADJUSTMENTS

Once the generator has been placed in operation, there may be governor adjustments required for engine speed (hertz) during the engine's break-in period (first 50 hours) or after this period (see *ENGINE SPEED (HERTZ) ADJUSTMENT* under *ENGINE ADJUSTMENTS*. A no-load voltage adjustment may also be required in conjunction with the engine's speed adjustment (see *GENERATIOR INFORMATION*).

SAFETY SHUTDOWN SWITCHES

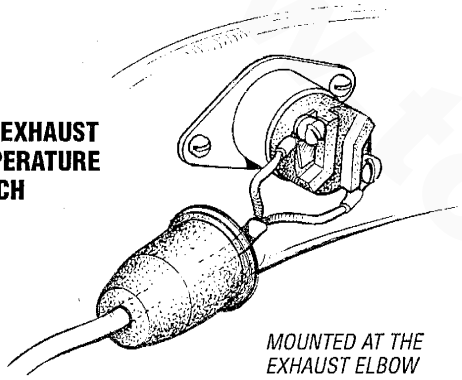
SAFETY SHUTDOWN SWITCHES

The engine is protected by three automatic shutdown switches. Should a shutdown occur, ***do not attempt to restart without finding and correcting the cause***. Refer to the heading *Engine starts, runs and then shuts down* in the *ENGINE TROUBLESHOOTING* section of this manual.

The following is a description of these automatic shutdown switches:

High Exhaust Temperature Switch

An exhaust temperature switch is located on the exhaust elbow. Normally closed, this switch will open and interrupt the DC voltage (shutting off the engine) should the switch's sensor indicate an excessive exhaust temperature (an inadequate supply of raw water causes high exhaust temperatures). This switch opens at 260-270°F (127-132°C). This switch resets at approximately 225°F (107°C).

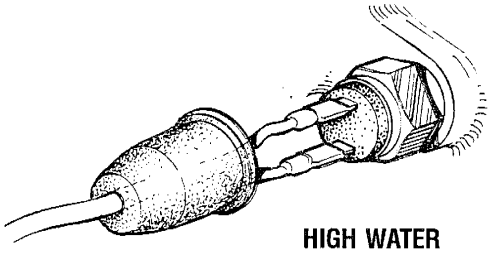


HIGH EXHAUST TEMPERATURE SWITCH

MOUNTED AT THE EXHAUST ELBOW

High Water Temperature Switch

A high water temperature switch is located at the thermostat housing. Normally closed, this switch, should the fresh water coolant's operating temperature reach approximately 210°F (99°C), will open and interrupt the DC voltage thereby shutting off the engine. This switch resets at 195°F (107°C).



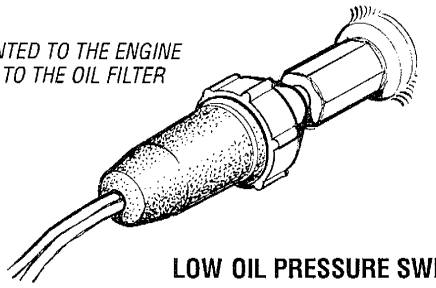
HIGH WATER TEMPERATURE SWITCH

LOCATED AT THE THERMOSTAT HOUSING UNDER THE GOVERNOR

Low Oil Pressure Switch

A low oil pressure shutdown switch is located off the engine's oil gallery. Normally open in a static state, this switch's sensor monitors the engine's oil pressure. Should the engine's oil pressure fall to 5-10 psi, this switch will open interrupting the DC voltage thereby shutting off the engine.

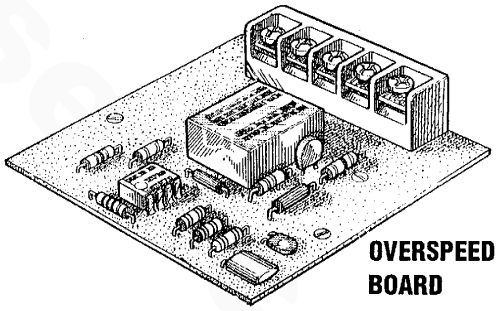
MOUNTED TO THE ENGINE NEXT TO THE OIL FILTER



LOW OIL PRESSURE SWITCH

Engine Circuit Breaker

The generator's engine is protected by an engine mounted manual reset circuit breaker (20 amps DC). Excessive current draw or electrical overload anywhere in the instrument panel wiring or engine wiring will cause the breaker to trip. In this event the generator will shut down because the opened breaker interrupts the DC circuit. If this should occur, check and repair the source of the problem. After repairing the fault, reset the breaker and restart the generator.



OVERSPEED TERMINAL BOARD

High RPM Shutdown Switch

An overspeed switch in the DC circuit shuts off the generators engine by grounding out the ignition system if the engine's speed reaches 2175 rpm(approximately). After correcting the problem, this switch can be reset by momentarily depressing the stop switch. Refer to the *WIRING DIAGRAMS* in this manual.

NOTE: *When troubleshooting an engine shutdown, to by-pass the overspeed lift T-5 connection and connect it onto and with T-4.*

By-pass overspeed ONLY for troubleshooting purposes.

MAINTENANCE SCHEDULE

> ⚠ **WARNING:** ***Never attempt to perform any service while the engine is running. Wear the proper safety equipment such as goggles and gloves, and use the correct tools for each job. Disconnect the battery terminals when servicing any of the engine's DC electrical equipment.***

NOTE: *Many of the following maintenance procedures are simple but others are more difficult and may require the expert knowledge of a service mechanic.*

SCHEDULED MAINTENANCE	CHECK EACH DAY	HOURS OF OPERATION 50	100	250	500	750	1000	1250	EXPLANATION OF SCHEDULED MAINTENANCE
Fuel Supply	☐								Unleaded gasoline with octane rating of 89 or higher.
Fuel/Water Separator	☐								Check for water and dirt in fuel (drain/replace filter if necessary).
Engine Oil Level	☐								Oil level should indicate between FULL and LOW on dipstick.
Coolant Level	☐								Check at recovery tank; if empty, check at manifold. Add coolant if needed.
Drive Belt	☐ weekly								Inspect for proper tension (3/8" to 1/2" deflection) and adjust if needed. Check belt edges for wear.
Visual Inspection of Engine	☐	**NOTE:** *Keep engine surface clean. Dirt and oil will inhibit the engine's ability to remain cool.*							Check for fuel, oil and water leaks. Inspect wiring and electrical connections. Keep bolts & nuts tight. Check for loose belt tension.
Spark Plugs		☐		☐	☐	☐	☐	☐	Check gap; inspect for burning and corrosion.
Generator		☐	☐	☐	☐	☐	☐	☐	Check that AC connections are clean and secure with no chafing – see *GENERATOR INFORMATION* for additional information.
Fuel Filter		☐		☐	☐	☐	☐	☐	Initial change at 50 hrs, then change every 250 hrs.
Starting Batteries (and House Batteries)	☐ weekly	☐							Every 50 operating hours check electrolyte levels and make sure connections are very tight. Clean off excessive corrosion.
Engine Oil		☐	☐	☐	☐	☐	☐	☐	Initial engine oil & filter change at 50 hrs., then change both every **100** hours.
***Adjust the Valve Clearances**		☐			☐		☐		Initial adjustment at 50 hrs., then every 500 hrs.
Air Screen (Flame Arrester)		☐							Clean at 50 hours, then every 100 hours.
Exhaust System		☐		☐		☐		☐	Initial check at 50 hrs., then every 250 hrs. Inspect for leaks. Check siphon brake operation. Check the exhaust elbow for carbon and/or corrosion buildup on inside passages; clean and replace as necessary. Check that all connections are tight.
Engine Hoses			☐	☐	☐	☐	☐	☐	Hose should be hard & tight. Replace if soft or spongy. Check and tighten all hose clamps.

*WESTERBEKE recommends this service be performed by an authorized mechanic.

(continued) →

WESTERBEKE Engines & Generators

MAINTENANCE SCHEDULE

NOTE: *Use the generator and hourmeter gauge to log your engine hours or record your engine hours by running time.*

SCHEDULED MAINTENANCE	CHECK EACH DAY	HOURS OF OPERATION							EXPLANATION OF SCHEDULED MAINTENANCE
		50	100	250	500	750	1000	1250	
Governor				☐	☐	☐	☐	☐	Change oil every 250 hours. Lubricate linkage arm periodically.
Heat Exchanger		☐	☐	☐	☐	☐	☐	☐	Clean or replace anode. Open heat exchanger end cap and clean out debris. Remove every 1000 hours for professional cleaning and pressure testing.
Raw Water Pump				☐		☐		☐	Remove pump cover and inspect impeller for wear; replace if needed. Also replace gasket. Lubricate both when reassembling.
Coolant System						☐			Drain, flush, and refill cooling system with appropriate antifreeze mix.
*Starter Motor					☐			☐	Check solenoid and motor for corrosion. Remove and lubricate. Clean and lubricate the Start motor pinion drive.
Distributor		☐			☐				Check ignition timing. Check condition of distributor cap and rotor.
Carburetor Filter Screen		☐		☐	☐	☐	☐	☐	Clean at 50 hours. Inspect and clean every 250 hours.
Ignition Wires					☐		☐		Inspect wires, check resistance.
*Engine Cylinder Compression and Valve Clearance					☐			☐	Incorrect valve clearance will result in poor engine performance; check compression pressure and timing, and adjust valve clearances.
*Engine Timing Belt							☐		Remove and replace at 10,000 operating hours. **NOTE:** Failure to replace the timing belt at the recommended interval could result in timing belt failure resulting in major damage to the engine.
*Exhaust Elbow					☐				Test exhaust elbow for casting integrity. Replace if casting is corroded or deteriorated. **WARNING:** *A defective exhaust elbow can cause carbon monoxide leakage!*

*WESTERBEKE recommends this service be performed by an authorized mechanic.

COOLING SYSTEM

DESCRIPTION

Westerbeke marine engines are designed and equipped for fresh water cooling. Heat produced in the engine by combustion and friction is transferred to fresh water coolant which circulates throughout the engine. This circulating fresh water coolant cools the engine block, its internal moving parts, and the engine oil. The heat is transferred externally from the fresh water coolant to raw water by means of a heat exchanger, similar in function to an automotive radiator. Raw water flows through the tubes of the heat exchanger while fresh water coolant flows around the tubes; engine heat transferred to the fresh water coolant is conducted through the tube walls to the raw water which is then pumped into the exhaust system where finally it is discharged overboard. In other words, the engine is cooled by fresh water coolant, this coolant is cooled by raw water, and the raw water carries the transferred heat overboard through the exhaust system. The fresh water coolant and raw water circuits are independent of each other. Using only fresh water coolant within the engine allows the cooling water passages to stay clean and free from harmful deposits.

FRESH WATER COOLING CIRCUIT

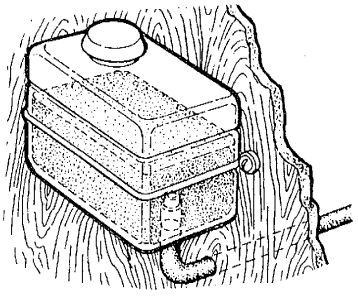
NOTE: *Refer to the ENGINE COOLANT section for the recommended antifreeze and water mixture to be used as the fresh water coolant.*

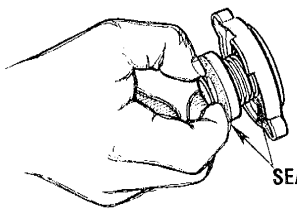
Fresh water coolant is pumped through the engine by a circulating pump, absorbing heat from the engine. The coolant then passes through the thermostat into the manifold, to the heat exchanger where it is cooled, and returned to the engine block via the suction side of the circulating pump.When the engine is started cold, external coolant flow is prevented by the closed thermostat (although some coolant flow is bypassed around the thermostat to prevent the exhaust manifold from overheating). As the engine warms up, the thermostat gradually opens, allowing full flow of the engine's coolant to flow unrestricted to the external portion of the cooling system.

Coolant Recovery Tank

A coolant recovery tank allows for engine coolant expansion and contraction during engine operation, without any significant loss of coolant and without introducing air into the cooling system. This tank should be located at or above the engine manifold level and should be easily accessible.

NOTE: *Periodically check the condition of the manifold pressure cap. Ensure that the upper and lower rubber seals are in good condition and check that the vacuum valve opens and closes tightly. Carry a spare cap.*





CHANGING COOLANT

The engine's coolant must be changed according to the *MAINTENANCE SCHEDULE*. If the coolant is allowed to become contaminated, it can lead to overheating problems.

> ⚠ **CAUTION:** ***Proper cooling system maintenance is critical; a substantial number of engine failures can be traced back to cooling system corrosion.***

Drain the engine coolant by loosening the drain plug on the engine block and opening the manifold pressure cap. Flush the system with fresh water, then start the refill process.

NOTE: *The drain petcock on the heat exchanger should also be used to help drain engine coolant.*

> ⚠ **WARNING:** ***Beware of the hot engine coolant. Wear protective gloves.***

Refilling the Coolant

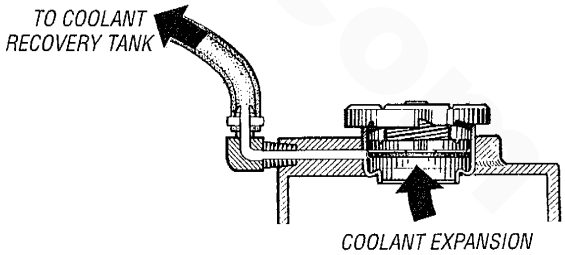
After replacing the engine block drain plug, close the heat exchanger's coolant petcock. Then run the engine at idle and slowly pour clean, premixed coolant into the manifold.

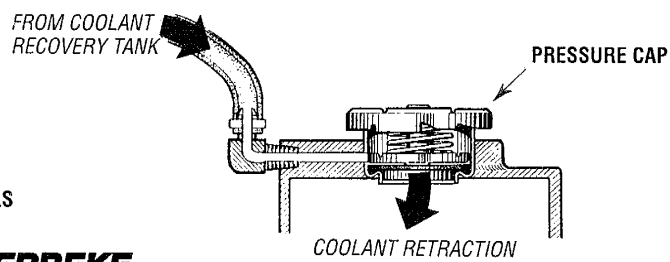
NOTE: *Open the air-bleed petcock on the heat exchanger. When a steady flow of coolant appears at the petcock, close the petcock and fill the system until the manifold remains full.*

Monitor the coolant in the manifold and add as needed. Fill the manifold to the filler neck and install the manifold pressure cap.

Remove the cap on the coolant recovery tank and fill with coolant mix to halfway between LOW and MAX and replace the cap. Run the engine and observe the coolant expansion flow into the recovery tank.

After checking for leaks, stop the engine and allow it to cool. Coolant should draw back into the cooling system as the engine cools down. Add coolant to the recovery tank if needed. Clean up any spilled coolant.





WESTERBEKE
Engines & Generators

Raw Water Intake Strainer

NOTE: *Always install the strainer at or below the waterline so the strainer will always be self-priming.*

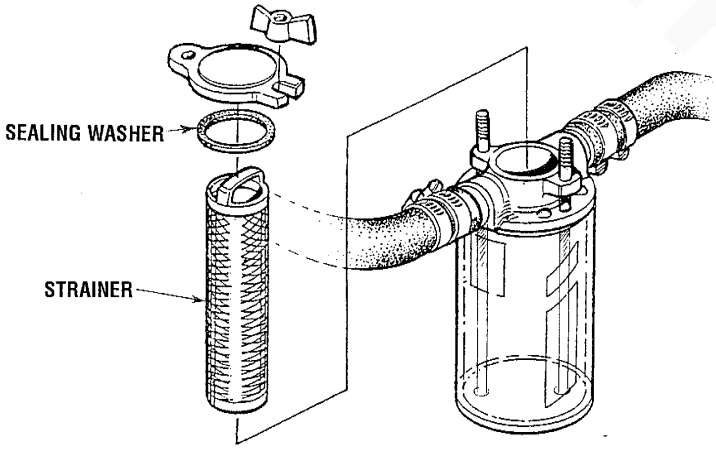
A clean raw water intake strainer is a vital component of the engine's cooling system. Include a visual inspection of this strainer when making your periodic engine check. The water in the glass should be clear.

Perform the following maintenance after every 100 hours of operation:

1. Close the raw water seacock.
2. Remove and clean the strainer filter.
3. Clean the glass.
4. Replace the sealing washer if necessary.
5. Reassemble and install the strainer.
6. Open the seacock.
7. Run the engine and check for leaks.

NOTE: *Also follow the above procedure after having run hard aground.*

If the engine temperature gauge ever shows a higher than normal reading, the cause may be that silt, leaves or grass may have been caught up in the strainer, slowing the flow of raw water through the cooling system



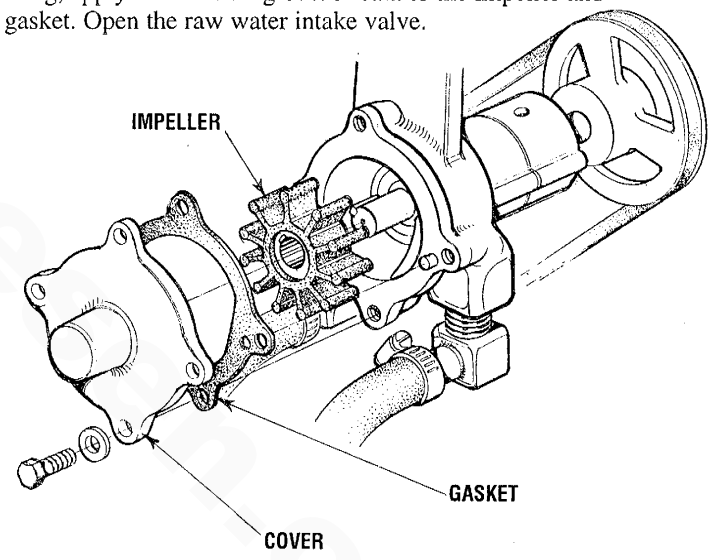
RAW WATER INTAKE STRAINER OWNER INSTALLED (TYPICAL)

Raw Water Pump

The raw water pump is a self-priming, rotary pump with a non-ferrous housing and a Neoprene impeller. The impeller has flexible blades which wipe against a curved cam plate within the impeller housing, producing the pumping action. *On no account should this pump be run dry.* There should always be a spare impeller and impeller cover gasket aboard (an impeller kit). Raw water pump impeller failures occur when lubricant (raw water) is not present during engine operation. Such failures are not warrantable, and operators are cautioned to make sure raw water flow is present at start-up. The raw water pump should be inspected periodically for broken or torn impeller blades. See *MAINTENANCE SCHEDULE.*

Changing the Raw Water Pump Impeller

Close the raw water intake valve. Remove the pump cover and, with the aid of two small screwdrivers, carefully pry the impeller out of the pump. Install the new impeller and gasket. Move the blades to conform to the curved cam plate and push the impeller into the pump's housing. When assembling, apply a thin coating of lubricant to the impeller and gasket. Open the raw water intake valve.

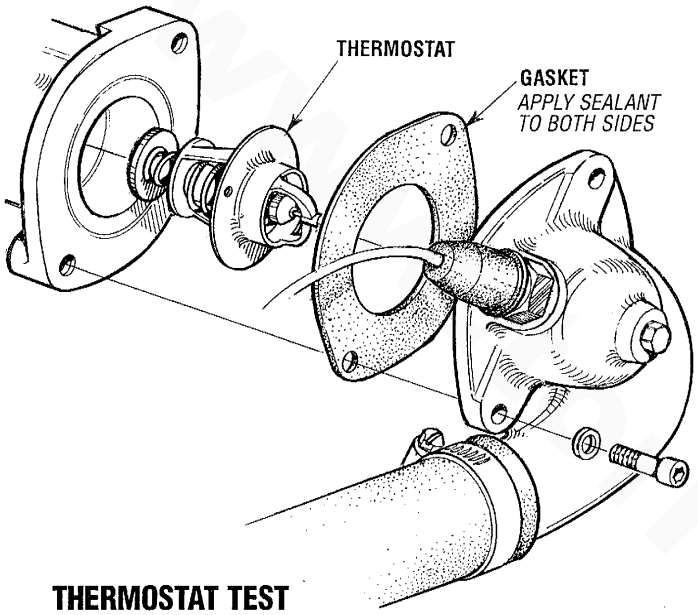


⚠ CAUTION: ***If any of the vanes have broken off the impeller, they must be found to prevent blockage in the cooling circuit. They often can be found in the heat exchanger.***

COOLING SYSTEM

THERMOSTAT

A thermostat controls the coolant temperature as the coolant continuously flows through the closed cooling circuit. When the engine is first started the closed thermostat prevents coolant from flowing (some coolant is by-passed through the thermostat to prevent the exhaust manifold from overheating). As the engine warms up, the thermostat gradually opens. The thermostat is accessible and can be checked, cleaned, or replaced easily. Carry a spare thermostat and gasket.

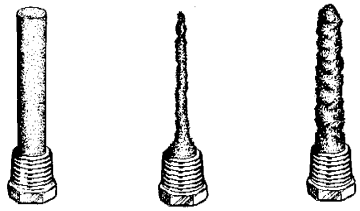


THERMOSTAT TEST

If you suspect a faulty thermostat, place it in a pan of water and bring to a boil. A working thermostat should open about 1/2".

ZINC ANODE

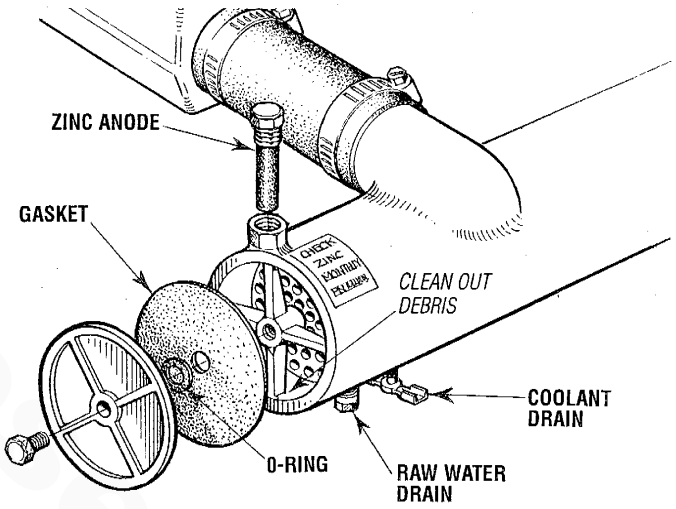
A zinc anode (or pencil) is located in the raw water cooling circuit within the heat exchanger. The purpose of the zinc anode is to sacrifice itself to electrolysis action taking place in the raw water cooling circuit, thereby reducing the effects of electrolysis on other components of the system. The condition of the zinc anode should be checked monthly and the anode cleaned or replaced, as required. Spare anodes should be carried onboard.



NOTE: *Electrolysis is the result of each particular installation and vessel location, not that of the engine.*

If the zinc anodes need replacement, hold the hex boss into which the zinc anode is threaded with a wrench while loosening the anode with another wrench. This prevents the hex boss from possibly tearing off the exchanger shell. After removing the zinc, note the condition. If the zinc is in poor condition, there are probably a lot of zinc flakes within the exchanger. Remove the end of the heat exchanger and clean the inside of all zinc debris. Always have a spare heat exchanger end gasket in case the present one becomes damaged when removing the end cover. Replace the sealing gasket (refer to your engine model's heat exchanger end gasket part number), O-ring and cover, and install a new zinc anode.

NOTE: *The threads of the zinc anodes are pipe threads and do not require sealant. Sealant should not be used as it may insulate the zinc from the metal of the heat exchanger housing preventing electrolysis action on the zinc.*



HEAT EXCHANGER

Cool raw water flows through the inner tubes of the heat exchanger. As the engine coolant passes around these tubes the heat of the internal engine is conducted to the raw water which is then pumped into the exhaust system and discharged. The engine coolant (now cooled) flows back though the engine and the circuit repeats itself.

The engine coolant and raw water are independent of each other; this keeps the engine's water passages clean from the harmful deposits found in raw water.

Heat Exchanger Service

After approximately 1000 hours of operation, remove, clean and pressure test the engine's heat exchanger. (A local automotive radiator shop should be able to clean and test the heat exchanger).

NOTE: *Operating in silty and/or tropical waters may require that a heat exchanger cleaning be performed more often then every 1000 hours.*

ENGINE LUBRICATING OIL

DESCRIPTION

Use a heavy duty engine oil with an API classification of SJ. Change the engine oil after an initial 50 hours of break-in operation and every 100 hours of operation thereafter. For recommended oil viscosity see the following chart:

Operating Temperature	Oil Viscosity
Above 68° F (20° C)	SAE 30, 10W-30 or 15W-40
41° - 68° F (5°-20° C)	SAE 20 or 10W-30
Below 41° F (5° C)	SAE 10W-30

⚠ CAUTION: ***Do not allow two or more brands of engine oil to mix. Each brand contains its own additives; additives of different brands could react in the mixture to produce properties harmful to your engine.***

CHANGING THE ENGINE OIL

The engine oil should be warm. Remove the oil drain hose from its attachment bracket and lower it into a container and allow the oil to drain, or attach a pump to the end of the drain hose and pump the old oil out. Make sure the oil drain hose is properly secured in its holder after all of the old oil has been drained.

Always observe the old oil as it is removed. A yellow/gray emulsion indicates the presence of water in the oil. Although this condition is rare, it does require prompt attention to prevent serious damage. Call a competent mechanic if water is present in the oil. Raw water present in the oil can be the result of a fault in the exhaust system attached to the engine and/or a siphoning through the raw water cooling circuit into the exhaust, filling into the engine.

⚠ WARNING: ***Used engine oil contains harmful contaminants. Avoid prolonged skin contact. Clean skin and nails thoroughly using soap and water. Launder or discard clothing or rags containing used oil. Discard used oil properly.***

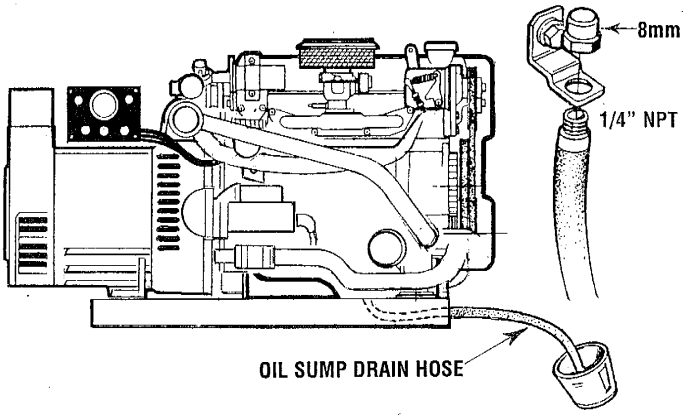
REPLACING THE OIL FILTER

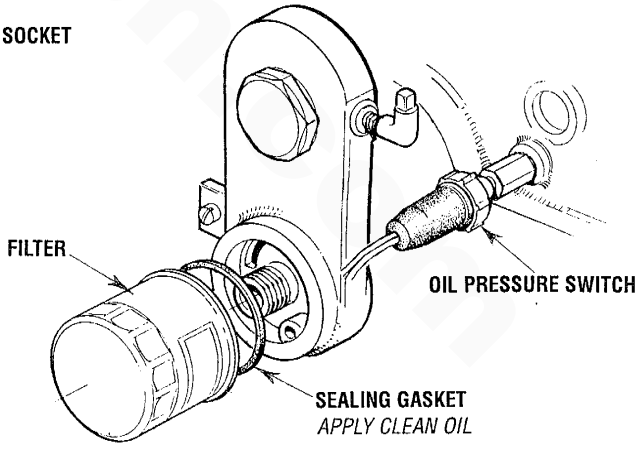
When removing the used oil filter, you may find it helpful to punch a hole in the upper and lower portion of the old filter to drain the oil into a container before removing it. This helps to lessen spillage. An automotive filter wrench should be helpful in removing the old oil filter. Place some paper towels and a plastic bag around the filter when unscrewing it to catch any oil that's in the filter. Inspect the old oil filter as it is removed to make sure that the rubber sealing gasket comes off with the old oil filter. If this rubber sealing gasket remains sealed against the oil filter adapter, gently remove it. When installing the new oil filter element, wipe the filter gasket's sealing surface on the oil filter adapter free of oil and apply a thin coat of clean engine oil to the rubber sealing gasket on the oil filter. Screw the filter onto the threaded oil filter stub, and tighten the filter firmly by hand.

NOTE: *Use genuine WESTERBEKE oil filters. Generic filters are not recommended.*

REFILLING THE OIL SUMP

Add fresh oil through the valve cover. After refilling the oil, run the engine for a few moments while checking the engine's oil pressure. Make sure there is no leakage around the new oil filter or from the oil drain system, and then stop the engine. Then check the quantity of oil with the lube oil dipstick. Fill to, but not over, the FULL mark on the dipstick.





OIL PRESSURE

NOTE: *WESTERBEKE recommends that the following engine adjustments be performed by a competent engine mechanic. The information below is provided to assist the mechanic.*

DESCRIPTION

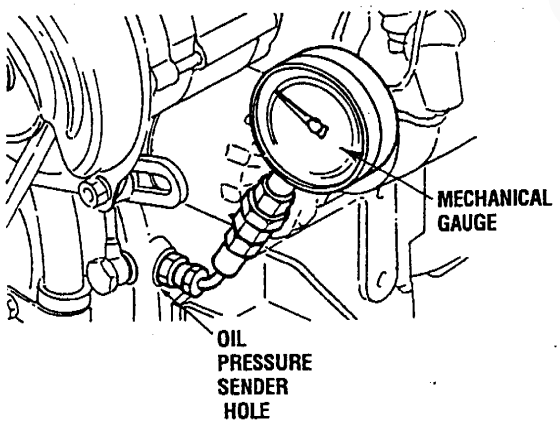
The lubricating system is a pressure feeding system using an oil pump. The engine oil is drawn from the oil sump by the oil pump, which drives the oil, under pressure, through the oil filter and various lubricating points in the engine. The oil then returns to the oil sump to repeat the continuous cycle. When the oil pressure exceeds the specified pressure, the oil pushes open the relief valve in the oil pump and returns to the oil sump, keeping the oil pressure within its specified range.

TESTING OIL PRESSURE

To test the oil pressure, remove the oil pressure sender, then install a mechanical oil pressure gauge in it's place. After warming up the engine, set the engine speed at 1800 rpm and read the oil pressure gauge.

Oil Pressure **Between 55 and 75 psi at 1800 rpm.**

Note: A newly started (cold) engine may have an oil pressure up to 70 or 80 psi. A warmed engine can have an oil pressure as low as 40 psi. Oil pressure will vary depending on the load placed on the generator.



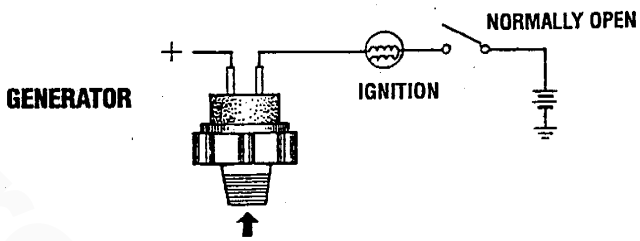
LOW OIL PRESSURE

The specified safe minimum oil pressure is 4.3 + 1.4 psi (0.3 + 0.1 kg/cm²). A gradual loss of oil pressure usually indicates worn bearings. For additional information on low oil pressure readings, see the *ENGINE TROUBLESHOOTING* chart.

OIL PRESSURE SWITCH/SENDER

The generator is fitted with an oil pressure shutdown switch. Should the engine's oil pressure drop below the safe minimum, the switch will shut the engine down to prevent damage by interrupting the DC voltage to the ignition coil.

> ⚠ **CAUTION:** ***Oil Pressure Switch - Do not use lock pliers, vise grips or pipe wrenches on the oil pressure switch. Use the correct socket which is available from Snap-On, Proto, New Britain and others. Damage to the switch will cause oil leaks and/or switch failure.***



REMOTE OIL FILTER (OPTIONAL)

INSTALLATION

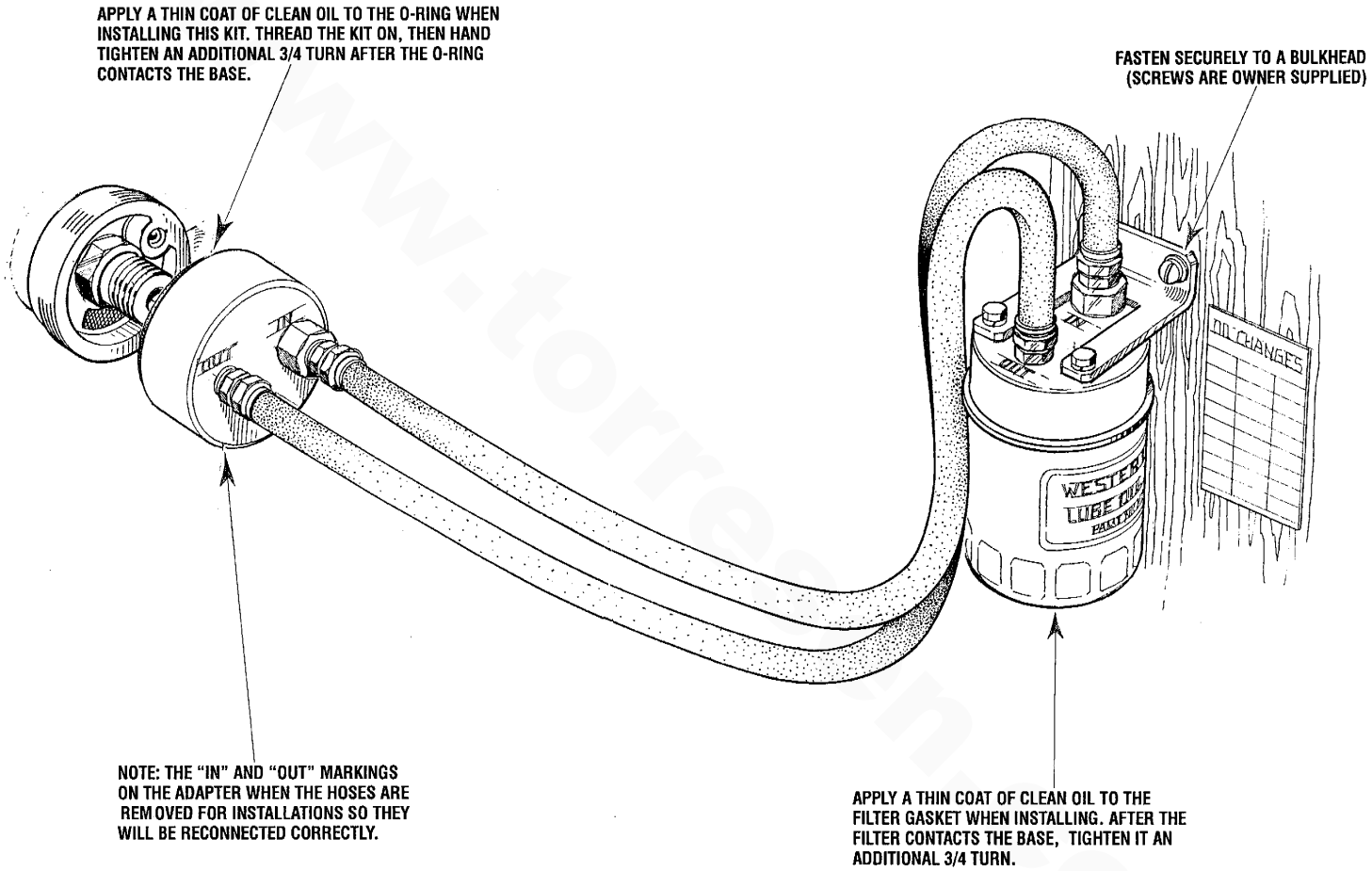
This popular accessory is used to relocate the engine's oil filter from the engine to a more convenient location such as an engine room bulkhead.

NOTE: *Refer to ENGINE OIL CHANGE in this manual for instructions on changing the oil filter.*

To install, simply remove the engine oil filter and thread on WESTERBEKE's remote oil filter kit as shown. Always install this kit with the oil filter facing down as illustrated.

Contact your WESTERBEKE dealer for more information.

NOTE: *Westerbeke is not responsible for engine failure due to incorrect installation of the Remote Oil Filter.*



FUEL SYSTEM

GASOLINE

Use ***unleaded*** 89 octane or higher gasoline. When fueling, follow U.S. Coast Guard regulations, close off all hatches and companionways to prevent fumes from entering the boat, and ventilate after fueling.

NOTE: *The generator compartment should have a gasoline fume detector/alarm properly installed and working.*

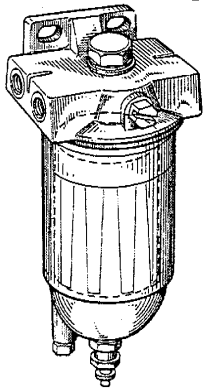
> **⚠WARNING:** ***Shut off the fuel valve at the tank when servicing the fuel system. Take care in catching any fuel that may spill. DO NOT allow any smoking, open flames or other sources of fire near the fuel system when servicing. Ensure proper ventilation exists when servicing the fuel system.***

GASOLINE/WATER SEPARATOR AND FILTER

A primary fuel filter of the water separating type must be installed between the fuel tank and the engine to remove water and other contaminants from the fuel before they can be carried to the fuel system on the engine.

Most installers include a type of filter/water separator with the generator installation package as they are well aware of the problems that contaminants in the fuel can cause.

These gasoline filters must have *metal* bowls (not "see-through") to meet U.S. Coast Guard requirements. The metal bowls have drain valves to use when checking for water and impurities.



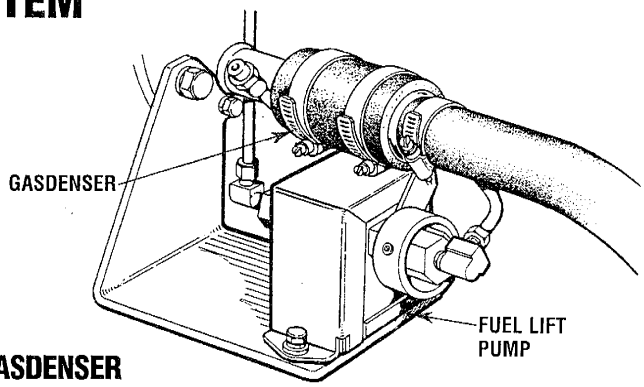
GASOLINE/WATER SEPERATOR & FILTER

FUEL LIFT PUMP

Periodically check the fuel connections to and out of the pump and make sure that no leakeage is present and that the fittings are tight and secure. The DC ground connection at one of the pump's mounting bolts should be clean and well secured by the mounting bolt to ensure proper pump operation.

The engine mounted fuel lift pump is maintenance free.

> **⚠WARNING:** ***Fuel leakage at the fuel pump or its connections is a fire hazard and should be corrected. Make sure proper ventilation exists whenever servicing fuel system components.***



GASDENSER

The gasdenser consists of a portion of the fuel line that is coiled around the raw water intake line and insulated. It is located between the raw water intake and the raw water pump. The gasdenser cools the fuel to prevent vapor lock.

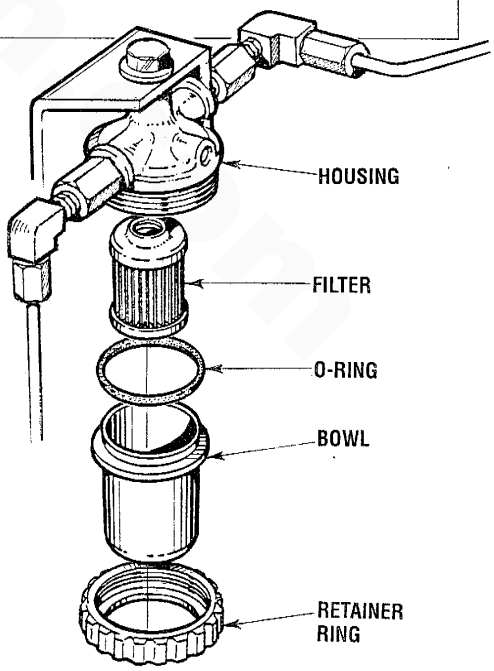
ENGINE FUEL FILTER

Periodically check the fuel connections and the filter bowl for leakage. Change the filter element after the first 50 hours. See *MAINTENACE SCHEDULE.*

Changing the Filter Element

1. Shut off fuel supply.
2. Unscrew the retainer ring that holds the filter bowl to the housing and allow bowl to come away from the housing.
3. Remove and replace the filter element and clean the bowl.
4. Replace the sealing "O" ring and reassemble the bowl to the housing. Thread the retainer ring on carefully so as not to cross thread. When retainer contacts the "O" ring, tighten 1/4 - 1/2 turnes by hand. Open the fuel supply and run the engine to inspect for leaks.

> **⚠WARNING:** ***Fuel is present in the housing and lines. Use extreme care to prevent spillage.***



CARBURETOR ADJUSTMENTS

CARBURETOR

The carburetor is a single barrel, down-draft type with a cleanable metal screen air intake filter/spark arrester.

The electric choke uses a 12-volt heating element which opens the choke automatically once the engine starts and remains running. Some hunting will occur when the generator is started, is on choke, and is running without a load on the generator. (The choke is factory set).

Air Screen/Flame Arrester

The air screen/flame arrester can easily be removed by releasing the hold-down clamp. Clean after the first 50 hours of operation, every 100 hours from then on. Clean the air screen in a water soluble cleaner such as GUNK.

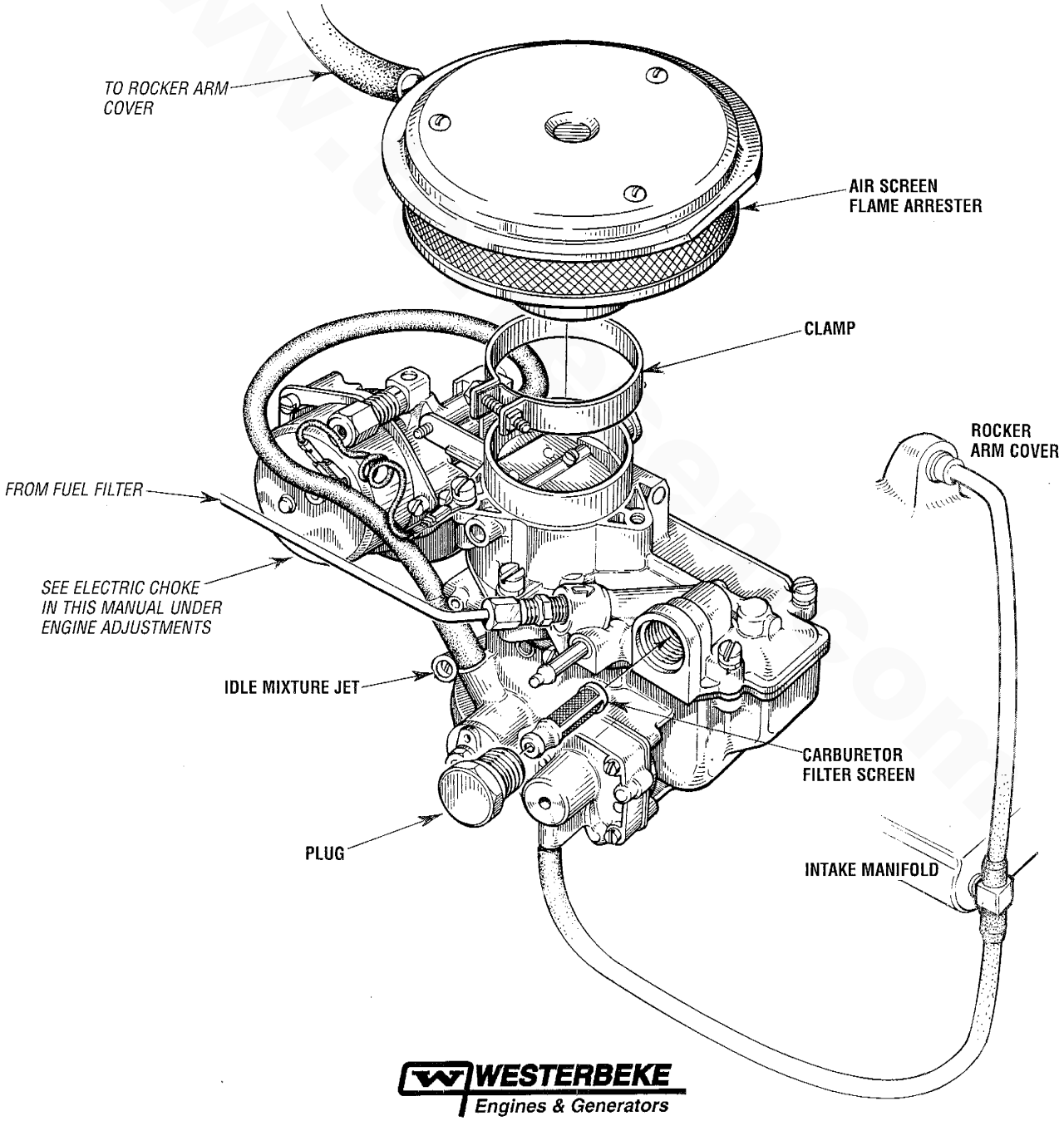
Carburetor Filter Screen

Clean this filter element after the first 50 hours of operation, then clean and inspect every 250 operating hours. Replace the screen if necessary. Tighten the plug and make certain there are no leaks.

Idle Mixture Jet

Adjustment is performed with the generator operating. Screw the jet slowly in until it seats, then back it out 1-1/2 to 2 turns.

Note: *An idle mixture jet adjusted too far off its seat can induce a sooty exhaust discharge at engine start-up and shut-down.*



WESTERBEKE
Engines & Generators

ENGINE ADJUSTMENTS

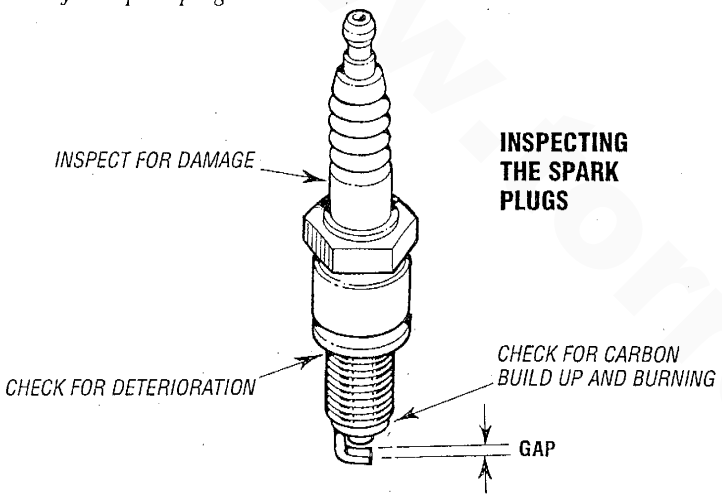
SPARK PLUGS

The spark plugs should be cleaned and regapped after the first 50 hour break-in period, then inspected every 250 hours thereafter and replaced as needed.

> ⚠ **WARNING:** ***Do not remove the spark plugs while the engine is hot. Allow the engine to cool before removing them.***

SPARK PLUG GAP: 0.027 - 0.031in (0.7 - 0.8mm)
SPARK PLUG TORQUE: 10 - 15 lb-ft (1.5 - 2.31 kg-m)

NOTE: *Loctite Anti-Seize applied to the threaded portion of the spark plugs will retard corrosion, making future removal of the spark plugs easier.*



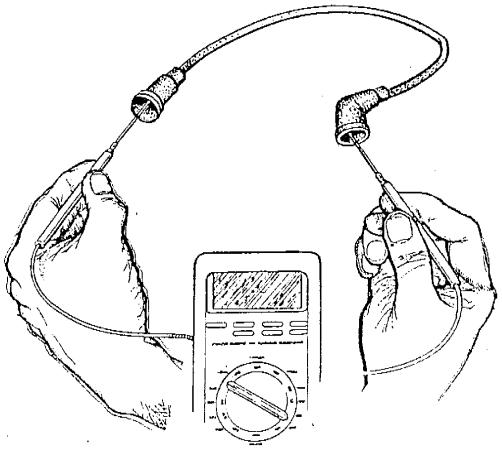
INSPECTING THE SPARK PLUGS

HIGH TENSION CORDS (IGNITION WIRES)

Check the ignition wires every 500 operating hours as engine compartment heat can deteriorate the wires.

Check the resistance of each wire. Do not pull on the wire because the wire connection inside the cap may become seperated or the insulator may be damaged. When removing the wires from the spark plugs, grasp and twist the moulded cap, then pull the cap off the spark plug.

The resistance value is 410 ohm per inch of wire.



CHECKING RESISTANCE

DRIVE BELT ADJUSTMENT

The drive belt must be properly tensioned. Excessive drive belt tension can cause rapid wear of the belt and reduce the service life of the fresh water pump's bearing. A slack belt or the presence of oil on the belt can cause belt slipping, resulting in high operating temperatures.

The 25 and 20 BEG generators have two drive belts, one drives the governor and alternator and the other drives the raw water pump. The tension adjustment procedure for both belts is as follows:

1. Remove the belt guard.
2. To adjust the governor drive belt, loosen the two governor mounting bolts.

   To adjust the raw water pump/fresh water pump drive belt, loosen the two raw water pump mounting bolts.
3. With the belt(s) loose, inspect for wear, cracks and frayed edges, and replace if necessary.
4. To loosen or tighten the governor drive belt, slide the governor in or out as required, then retighten its mounting bolts.

   To loosen or tighten the raw water pump/fresh water pump drive belt, slide the raw water pump in or out as required, then retighten its mounting bolts.
5. The drive belts are properly adjusted if it can be deflected no less than 3/8 inch (10mm) and no more than 1/2 inch (12mm) as the belt is depressed with the thumb at the midpoint between the two pulleys on the longest span of the belt.

   NOTE: *Maintain a 22 lb pressure to the belt's outer face for proper belt operation. Spare belts should always be carried on board.*

> ⚠ **WARNING:** ***Never attempt to check or adjust a drive belt's tension while the engine is in operation.***

6. Operate the generator for about 5 minutes, then shut down the generator and recheck the belt(s) tension.
7. Replace the belt guard.

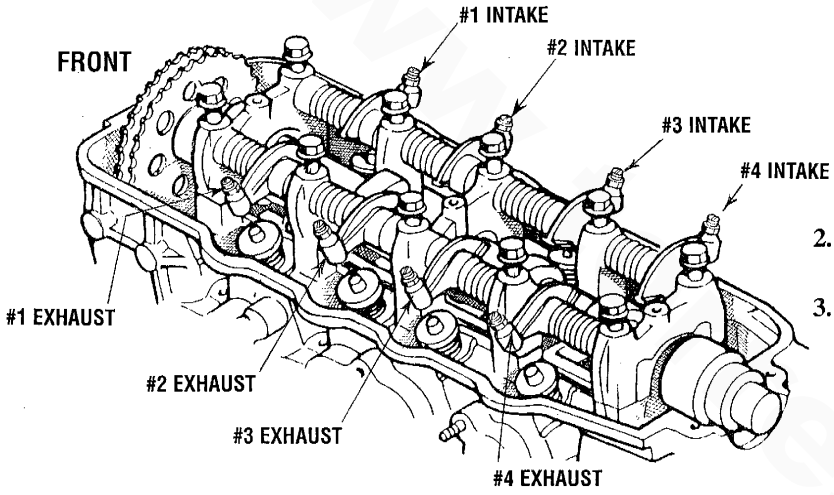
ENGINE ADJUSTMENTS

NOTE: *WESTERBEKE recommends that the following engine adjustments be performed by a competent engine mechanic. The information below is provided to assist the mechanic.*

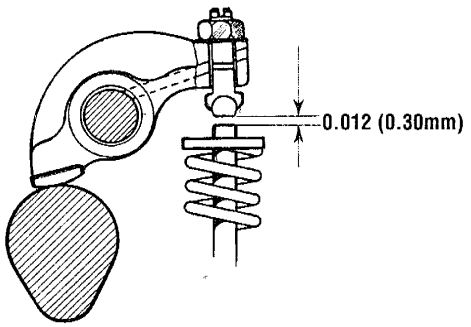
VALVE CLEARANCE ADJUSTMENT

NOTE: *Retorque the cylinder head bolts before adjusting the engine's valves (see TORQUING THE CYLINDER HEAD BOLTS).*

1. Remove the rocker cover and gasket.
2. Position the No.1 piston at Top Dead Center (TDC) of its compression stroke and adjust the #1 and #3 exhaust No.1 and No.2 valves on the intake side of the cylinder head and the No.1 and No.3 on the exhaust side. Rotate the crankshaft 360° in a clockwise direction and adjust the remaining four valves.



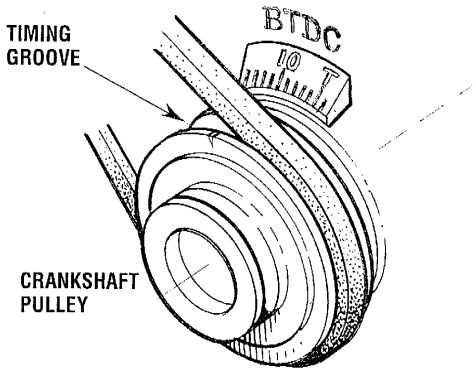
3. Replace the rocker cover and the rocker cover gasket..
   Rocker cover torque: 2.9–5.1 lb-ft (0.4–0.7 kg-m)
4. Adjust all values to 0.012 (0.30mm) with the engine hot.



IGNITION TIMING

1. Attach a timing light to the #1 spark plug and mark the front crankshaft timing groove and the timing mark on the scale embossed on the engine's front cover.

   Each timing mark represents 2°.



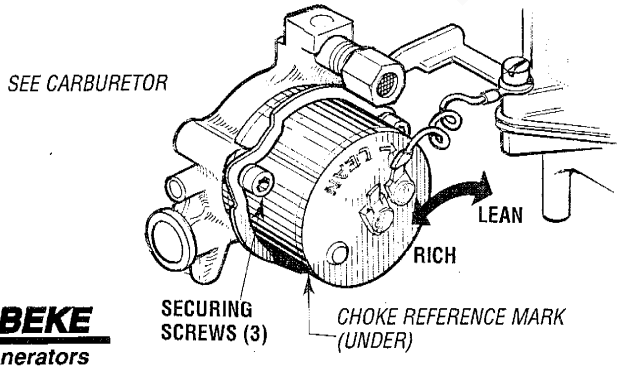
2. Start the engine and warm the engine to its normal operating temperature.
3. Using the timing light, align the timing groove in the front crankshaft pulley with the proper timing mark on the ignition timing scale embossed on the engine's front cover. Do this by loosening and slowly rotating the distributor body. Refer to the timing specifications:

Timing Specifications	**12° BTDC at 1800 rpm ± 1° (20 BEG) °.**
	(20° BTDC at 1800 rpm ± 1° (25 BEG)

ELECTRIC CHOKE

The electric choke uses a 12 volt heating element which opens the choke automatically when the engine starts and is running. Some hunting may occur when the generator is first started, when the choke is on, and when the generator has no-load on it.

The choke is adjusted with the engine off and cooled. Adjust the choke by loosening the three cover-securing screws and rotating the cover clockwise to **LEAN** the choke and counterclockwise to **RICH** the choke. The choke is initially set at the factory for an average of 70° F (21° C) room temperature. The choke may need readjustment at engine commissioning for the ambient temperature of the area the engine is operating in. The choke reference mark is located on the underside of the choke cover.



ENGINE ADJUSTMENTS

NOTE: *WESTERBEKE recommends that the following engine adjustments be performed by a competent engine mechanic. The information below is provided to assist the*

ENGINE SPEED (HERTZ) ADJUSTMENT

Governor

The belt-driven, mechanically operated governor maintains the engine's rpm under various load conditions. Engine speed determines the hertz and voltage output of the generator.

Governor Adjustments

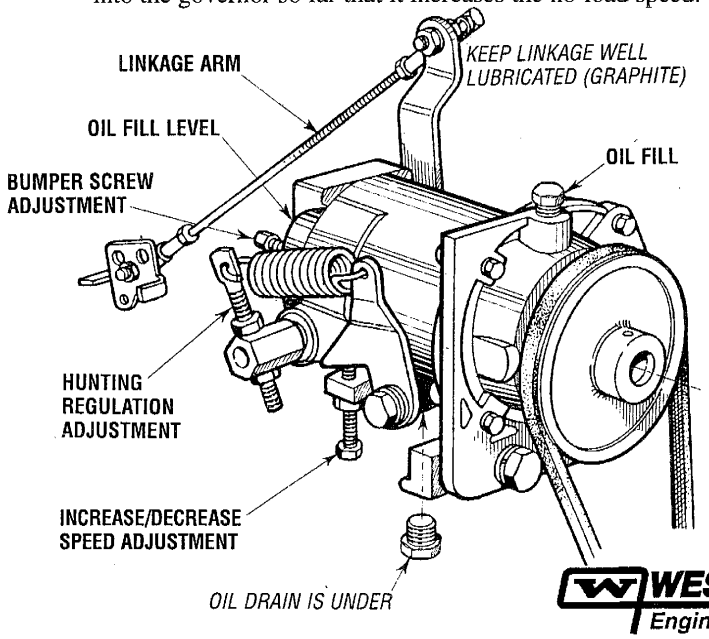
Operate the generator to bring the unit up to operating temperature before adjusting the governor.

NOTE: *If the governor is severely out of adjustment, manually adjust the linkage at no-load to obtain a safe output voltage before proceeding with the adjustment.*

There are three adjusting points on the governor (see illustration).

1. ***Increase/Decrease Speed Adjustment.*** This adjusting bolt sets the no-load speed of the engine. The linkage between the governor and the throttle lever should be adjusted to hold the throttle just slightly closed; about the width of the ball joint at the linkage arms end towards the closed position (when the engine is not running). Make sure this linkage moves freely and that the ball joint connectors are properly lubricated. Use graphite lube for this purpose. Disconnect the ball joint and apply graphite lube to the inside of the joint.
2. ***Hunting/Regulation Adjustment.*** If the variation in engine speed between no-load and full-load is too great, adjust this eye bolt to draw the spring closer to the lever hub. The increase/decrease speed bolt may need to be adjusted as well.

   If the governor surges under load, adjust this eye bolt to move the spring away from the lever hub (check speed adjustment).
3. ***Bumper Screw Adjustment.*** This screw is used to remove a no-load surge ONLY. ***NEVER*** turn the bumper screw into the governor so far that it increases the no-load speed.



Governor Maintenance

1. Periodically lubricate the linkage arm attaching points at the governor arm and throttle lever. Use a graphite lubricant or equivalent.

   NOTE: *Free movement of this linkage arm is important for proper governor/throttle operation.*
2. Governor oil capacity – 3 ounces 10/30 engine oil.

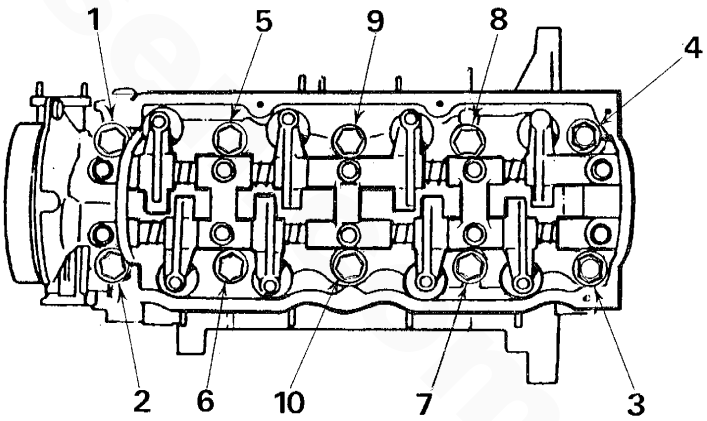
   NOTE: *Do not overfill the governor.*
3. Change the governor oil every 250 hours of operation.

   To change the oil, remove the governor from the engine, remove the oil fill and the fill level plug, and drain all the oil. Reinstall on the engine and fill with 3 ounces of 10/30 engine oil. Replace the plugs.
4. Periodically adjust the governor belt tension (see *DRIVE BELTS ADJUSTMENT*). Since belts stretch slightly, this stretching will, to some degree, affect the govenor's action.

TORQUING THE CYLINDER HEAD BOLTS

After the initial break-in period (approximately 50 hours), the cylinder head bolts should be re-torqued.

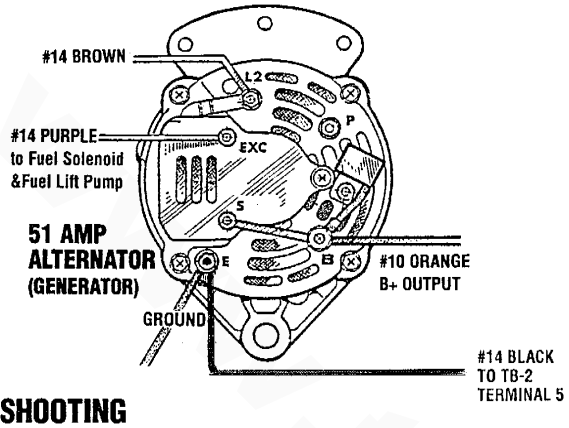
Tighten the cylinder head bolts according to the sequence shown. Make sure the engine is cold when this is done, and loosen one head bolt one-half turn and then tighten it between 55 - 59 lb-ft (8.2 - 8.8 Kg-m). Then proceed to the next head bolt in the sequence. Tighten the RS (rocker cover stud) securely.



ALTERNATOR TESTING

DESCRIPTION

The charging system consists of an alternator with a voltage regulator, an engine DC wiring harness, a mounted DC circuit breaker and a battery with connecting cables. Because of the use of integrated circuits (IC's), the electronic voltage regulator is very compact and is mounted internally or on the back of the alternator.



TROUBLESHOOTING

> ⚠ **WARNING:** ***A failed alternator can become very hot. Do not touch until the alternator has cooled down.***

This troubleshooting section is to determine if a problem exists with the charging circuit or with the alternator. If it is determined that the alternator or voltage regulator is bad, it is best to have a qualified technician check it out.

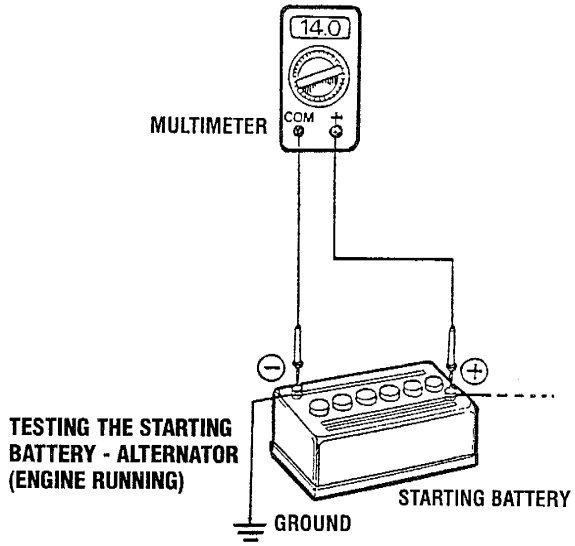
The alternator charging circuit charges the starting battery and the service battery. An isolator with a diode, a solenoid, or a battery selector switch is usually mounted in the circuit to isolate the batteries so the service battery is not discharged along with the service battery. If the alternator is charging the starting battery but not the service battery, the problem is in the service battery charging circuit and not with the alternator.

Testing the Alternator

> ⚠ **WARNING:** ***Before starting the engine make certain that everyone is clear of moving parts! Keep away from sheaves and belts during test procedures.***

> ⚠ **WARNING:** ***MULTIMETERS AND DC CIRCUITS: DC and AC circuits are often mixed together in marine applications. Always disconnect shore power cords, isolate DC and AC converters and shut down generators before performing DC testing. No AC tests should be made without proper knowledge of AC circuits.***

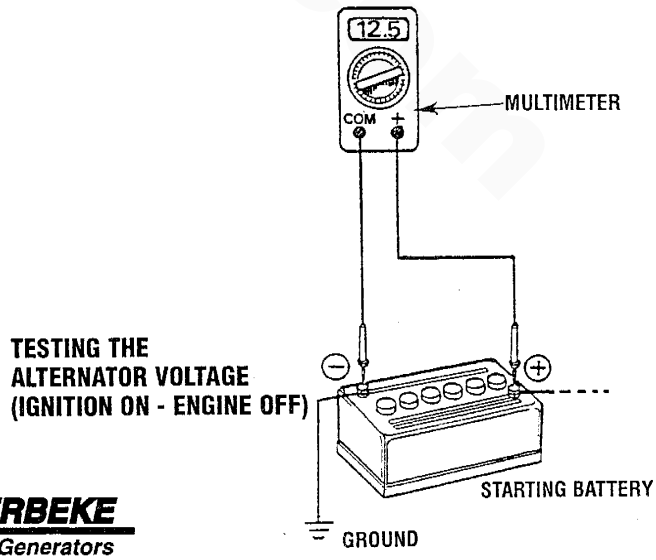
1. **Start the Engine.**
2. After a few minutes of running measure the starting battery voltage at the battery terminals using a multi-meter set on DC volts.
   The voltage should be increasing toward 14 volts. If it is, **the alternator is working**. Turn to Step 4 .



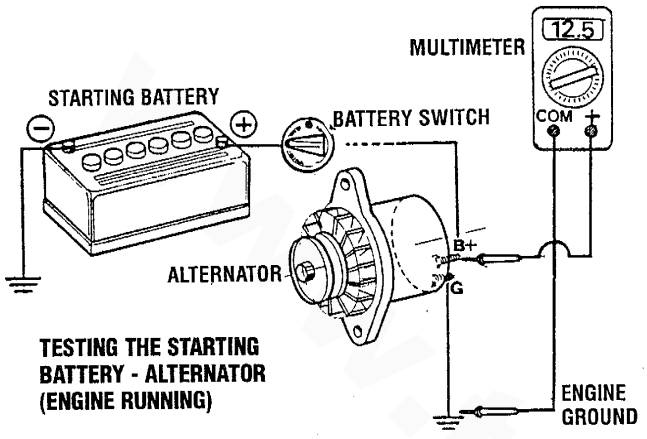
3. If the starting battery voltage remains around 12 volts after the engine is started and run for a few minutes, a problem exists with the alternator or the charging circuit.
   a. Turn off the engine. Inspect all wiring and connections. Ensure that the battery terminals and the engine ground connections are tight and clean.

> ⚠ **CAUTION:** ***To avoid damage to the battery charging circuit, never shut off the engine battery switch when the engine is running!***

   b. If a battery selector switch is in the charging circuit, ensure that it is on the correct setting.
   c. Turn on the ignition switch, but do not start the engine.
   d. Check the battery voltage. If your battery is in good condition the reading should be 12 to 13 volts.



e. Now check the voltage between the alternator output terminal (B+) and ground. If the circuit is good, the voltage at the alternator should be the same as the battery, or if an isolator is in the circuit the alternator voltage will be zero. If not, a problem exists in the circuit between the alternator and the battery. Check all the connections - look for an opening in the charging circuit.



TESTING THE STARTING BATTERY - ALTERNATOR (ENGINE RUNNING)

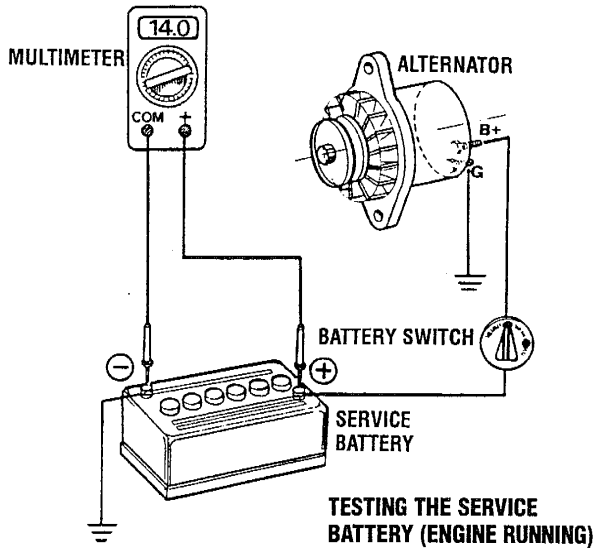
f. Start the engine again. Check the voltage between the alternator output and ground.
The voltage reading for a properly operating alternator should be between 13.5 and 14.5 volts. If your alternator is over- or under-charging, have it repaired at a reliable service shop.

NOTE: *Before removing the alternator for repair, use a voltmeter to ensure that 12 volts DC excitation is present at the EXC terminal if the previous test showed only battery voltage at the B output terminal.*
If 12 volts are not present at the EXC terminal, trace the wiring looking for breaks and poor connections.

Jump 12 V to the Exc. terminal from a known 12V source and operate the alternator. If the voltage output is 13-14 volts, the alternator is o.k. Trace the cause for 12 volts not being present at the Exc. terminal.

Alternator is Working

4. Check the voltage of the service battery. This battery should have a voltage between 13 and 14 volts when the engine is running. If not, there is a problem in the service battery charging circuit. Troubleshoot the service battery charging circuit by checking the wiring and connections, the solenoid, isolator, battery switch and the battery itself.



TESTING THE SERVICE BATTERY (ENGINE RUNNING)

⚠ CAUTION: ***When performing tests on the alternator charging circuit do not use a high voltage tester (i.e. Megger). You can damage the alternator diodes***

ALTERNATOR INSPECTION

When rebuilding the engine, the alternator should be cleaned and inspected. The housing can be wiped off with a solvent and the alternator terminal studs should be cleaned with a wire brush. Make certain the studs are tight and clean the wiring connections that connect to the wiring harness.

Turn the rotor pulley by hand. It should turn smoothly.

Depending on when the alternator was last serviced, the brushes may need replacing. If the alternator is at all suspect, send it to a service shop for testing and overhaul.

ENGINE TROUBLESHOOTING

The following troubleshooting tables are based upon certain engine problem indicators and the most likely causes of the problems.
When troubleshooting indicates an electrical problem, see the *GENERATOR WIRING DIAGRAMS*, as these may reveal other possible causes of the problem which are not listed below.

NOTE: *The engine's control system (electrical system) is protected by a 20-Ampere manual reset circuit breaker located next to the starter motor and the (-) ground terminal. Refer to the model photographs at the beginning of this manual for a photograph showing the exact position of this reset circuit breaker.*

PROBLEM	PROBABLE CAUSE
Engine does not crank.	1. Voltage drop at starter solenoid terminal. 2. Engine 20A circuit breaker has tripped. 3. Battery is low or dead. 4. Loose battery connections. 5. Faulty wire connection. 6. Faulty start switch. 7. Faulty starter solenoid. 8. Raw water filled cylinders. 9. Filters are clogged by contaminated fuel. 10. Voltage drop at (+) at overspeed switch. 11. Faulty overspeed switch (reset & start).
Engine cranks but fails to start.	1. Out of fuel. 2. Filters are clogged by contaminated fuel. 3. Voltage drop at (+) at overspeed switch. 4. Carburetor filter screen is clogged. 5. Automatic shutdown switch is faulty. 6. Engine is flooded. a. Carburetor float needle valve open or damaged. Clean or replace the needle valve b. Float in carburetor is leaking. Repair or replace float. c. Float chamber gasket damaged or securing screws are loose. Replace gasket and/or tighten screws. 7. Fuel lift pump inoperative. 8. Worn or faulty spark plugs. 9. High tension wires grounding. 10. Faulty ignition coil. 11. Faulty distributor. 12. Faulty wire connection. 13. No engine compression.

PROBLEM	PROBABLE CAUSE
Engine starts, runs and then shuts down.	1. Faulty shutdown switch, (oil pressure, water, exhaust temperature or overspeed). 2. High engine water or exhaust temperature. 3. Dirty fuel/water seperator filters. 4. Mechanical check valve at the fuel supply faulty. 5. Low oil level in sump. 6. Faulty fuel lift pump. 7. Faulty engine temperature sensor. 8. Faulty fuel pump. 9. Faulty stop switch. 10. Circuit breaker is tripping. 11. Check the valve in the fuel supply line, lift pump is not drawing fuel.
Engine starts, runs but does not come up to speed.	1. Fuel line restriction. 2. Mechanical check valve at the fuel supply is faulty. 3. Throttle plate binding. 4. Faulty fuel lift pump. 5. Faulty wire connection. 6. Faulty engine temperature sensor. 7. AC generator overload. 8. High exhaust pressure.
Engine hunts.	1. Governor is out of adjustment. 2. Generator is overloaded. 3. Cracked distributor cap 4. Faulty high tension wires. 5. Faulty fuel pump. 6. High exhaust back-pressure. 7. Valves are out of adjustment. 8. Dirty fuel filters. 9. Throttle linkage is binding.

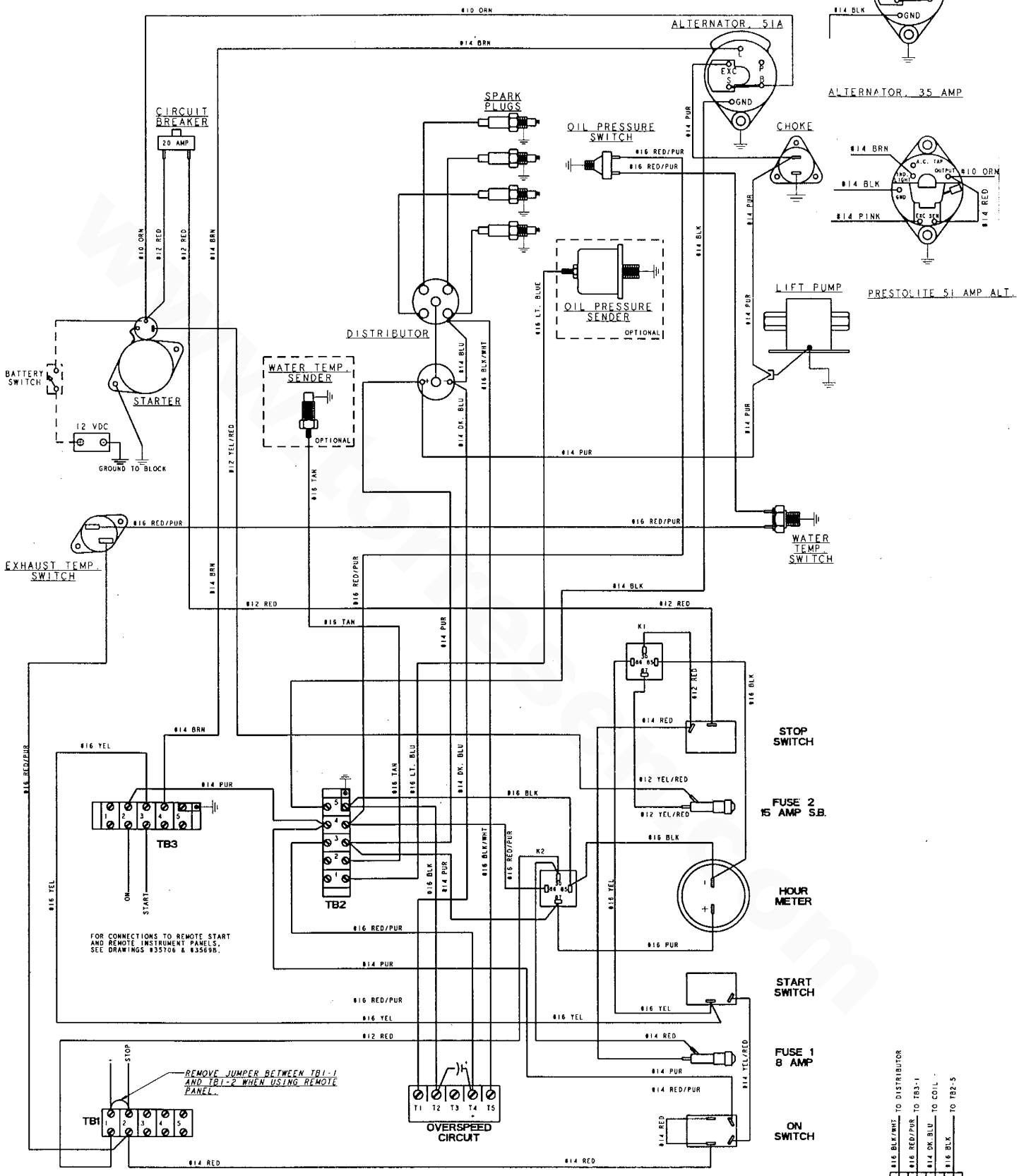
(continued)
→

ENGINE TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE
Engine misfires.	1. Poor quality fuel. 2. Incorrect timing. 3. Dirty flame arrester. 4. Cracked distributor cap. 5. Faulty ignition wires. 6. Spark plugs are worn. 7. High exhaust back-pressure. 8. Valve clearances are incorrect.
Engine backfires.	1. Spark plug wires are connected wrong. 2. Incorrect timing. 3. Engine is flooded. See *Engine is flooded* under *Engine cranks but fails to start.* 4. Dirty flame arrester. 5. Cracked distributor cap. 6. High exhaust back-pressure. 7. Choke is stuck closed.
Engine overheats.	1. Coolant loss. Pressure test cooling system. 2. Faulty raw water pump impeller. 3. Belts are loose or broken. 4. Raw water pump worn. 5. Faulty thermostat. 6. Heat exchanger is clogged. 7. Collasped hose.
Low oil pressure.	1. Low oil level. 2. Wrong SAE type oil in the engine. 3. Wrong type oil filter. 4. Relief valve is stuck. 5. Faulty oil pump. 6. Faulty engine bearings. 7. Faulty oil filter.

PROBLEM	PROBABLE CAUSE
High oil pressure.	1. Dirty oil or wrong SAE type oil in the engine. 2. Relief valve is stuck.
No DC charge to the starting battery.	1. Faulty connections to battery voltage regulator. 2. Faulty battery voltage regulator. 3. Faulty bridge rectifier. 4. Faulty generator charger windings. 5. Connections to the alternator are loose or faulty. 6. Faulty alternator. 7. No excitation to the regulator's yellow lead.
Blue exhaust smoke discharge from the engine.	1. Lube oil is diluted. 2. High lube oil level. 3. Crankcase breather hose is clogged. 4. Valves are worn or adjusted incorrectly. 5. Piston rings are worn or unseated.
Black exhaust smoke discharge from the engine.	1. Dirty flame arrester. 2. Faulty carburetor. 3. Idle mixture jet too rich. 4. Accelerator diaphram leaking. 5. Valves are worn or incorrectly adjusted. 6. Lube oil is diluted. 7. Piston rings are worn or unseated. 8. Crankcase breather hose is clogged.

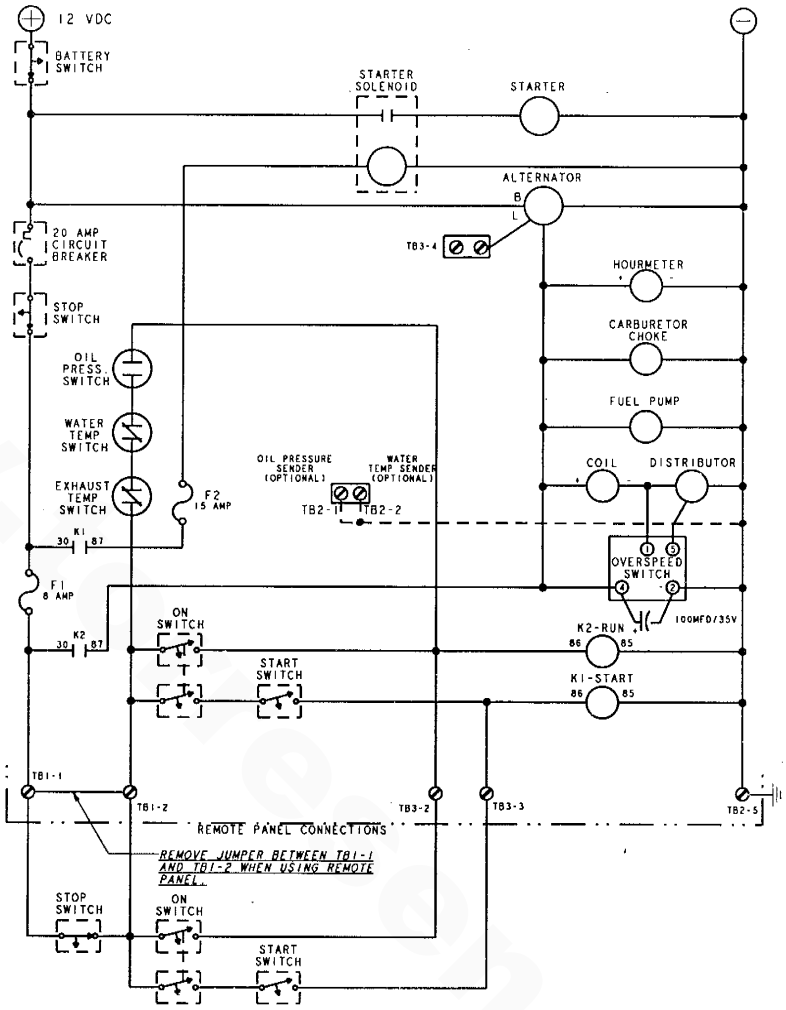
20KW and 25KW BE GENERATOR
WIRING DIAGRAM #044580 [TWO RELAYS]



WESTERBEKE
Engines & Generators

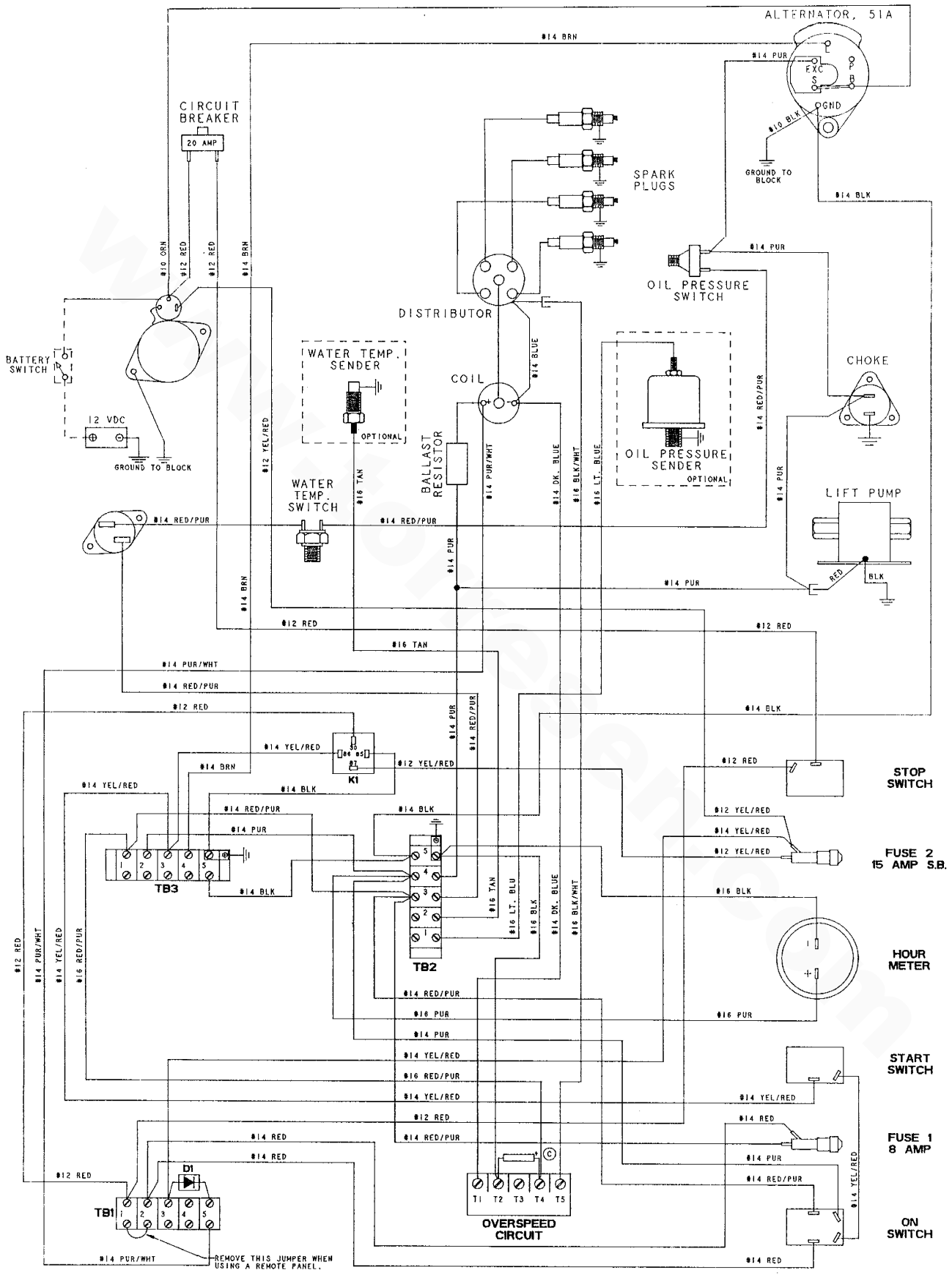
20KW and 25KW BE GENERATOR
WIRING SCHEMATIC #044580 [TWO RELAYS]

NOTE: *An on-off switch should be installed in this circuit to disconnect the starter from the battery in an emergency and when leaving the boat. Twelve volt engine starters typically draw 200 to 300 amps when cranking. A switch with a continuous rating of 175 amps at 12 VDC will normally serve this function, but a switch must never be used to "make" the starter circuit.*



25KW AND 20KW BE GENERATOR

WIRING DIAGRAM #040620

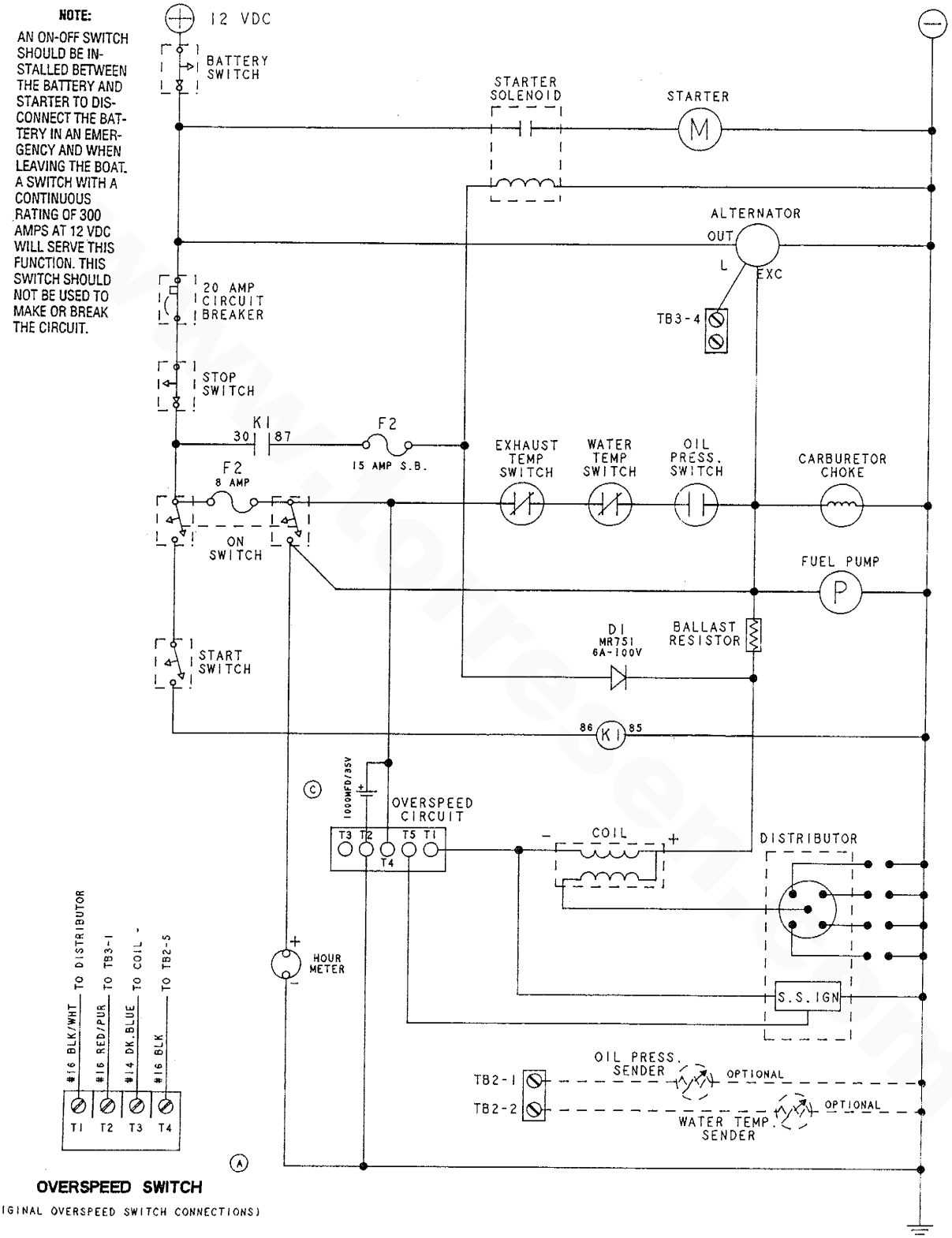


WESTERBEKE
Engines & Generators

REV.12/98

25KW AND 20KW BE GENERATOR

WIRING DIAGRAM #040620



OVERSPEED SWITCH

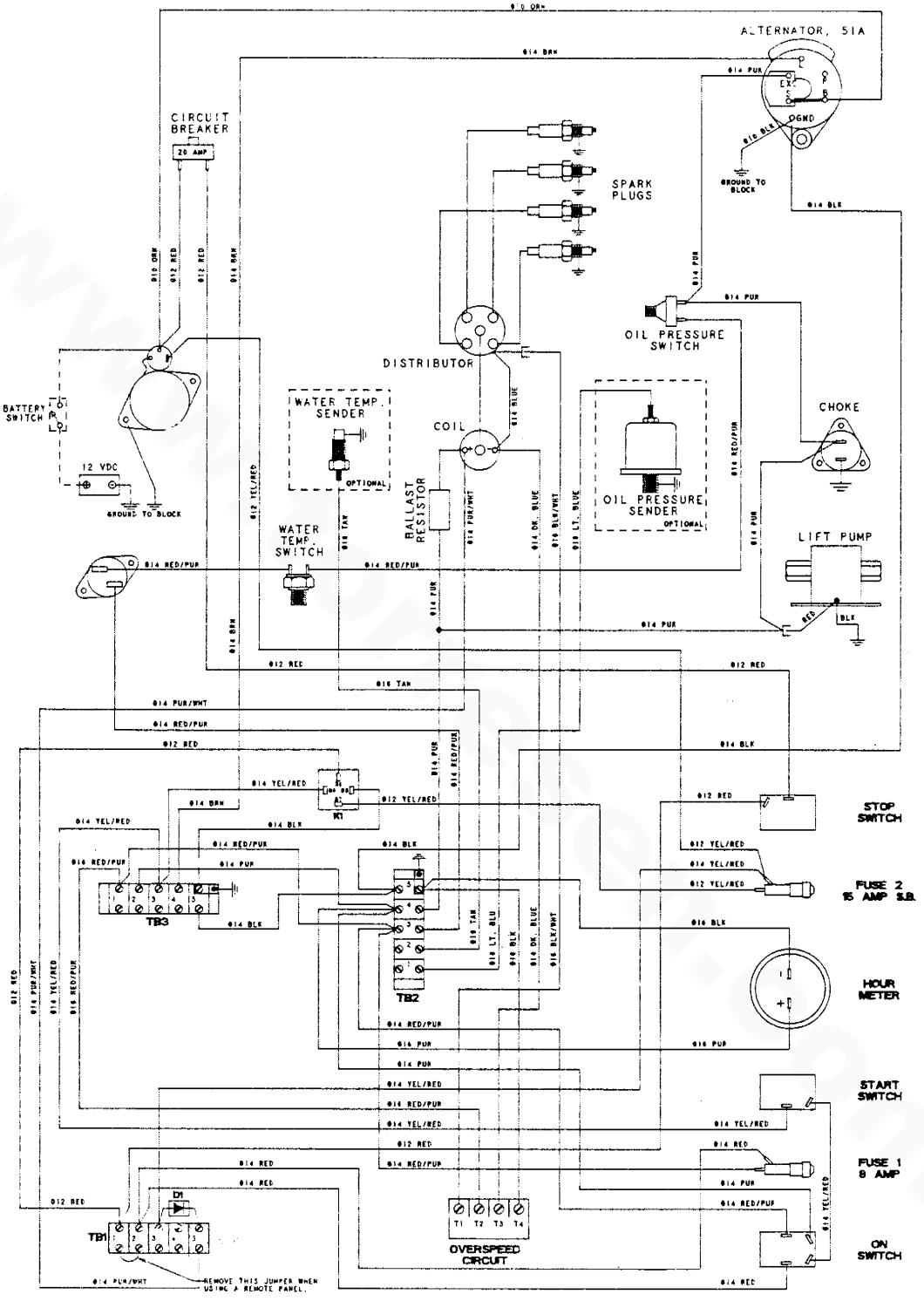
(ORIGINAL OVERSPEED SWITCH CONNECTIONS)

REV.12/98

WESTERBEKE
Engines & Generators

25KW AND 20KW BE GENERATOR

WIRING DIAGRAM #040620



NOTE: *The only difference between the diagrams on the two previous pages [new generators] and these diagrams occurs at the overspeed switch [T5 to ignition].*

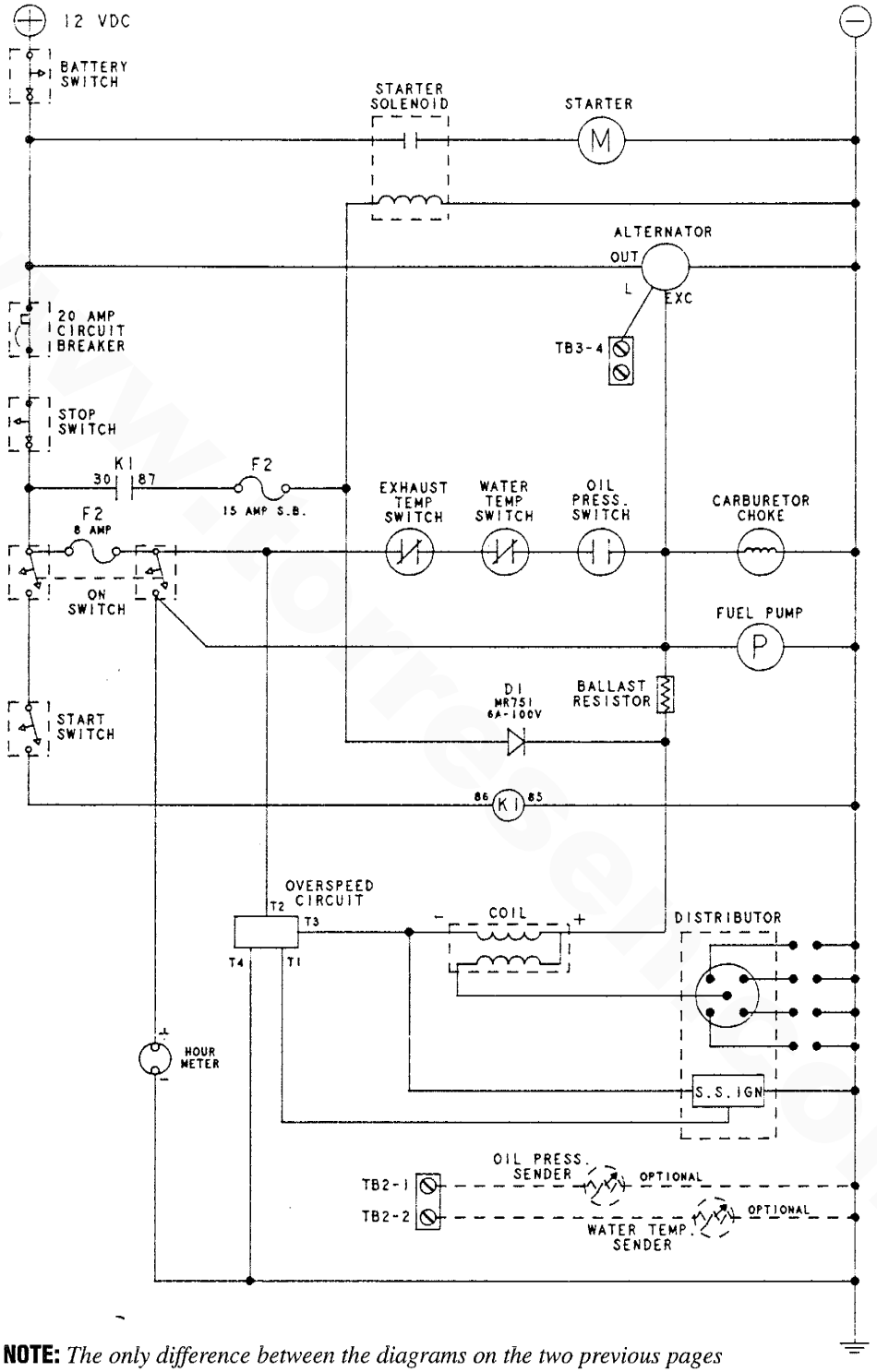
WESTERBEKE
Engines & Generators

25KW AND 20KW BE GENERATOR

WIRING SCHEMATIC #040620

NOTE:

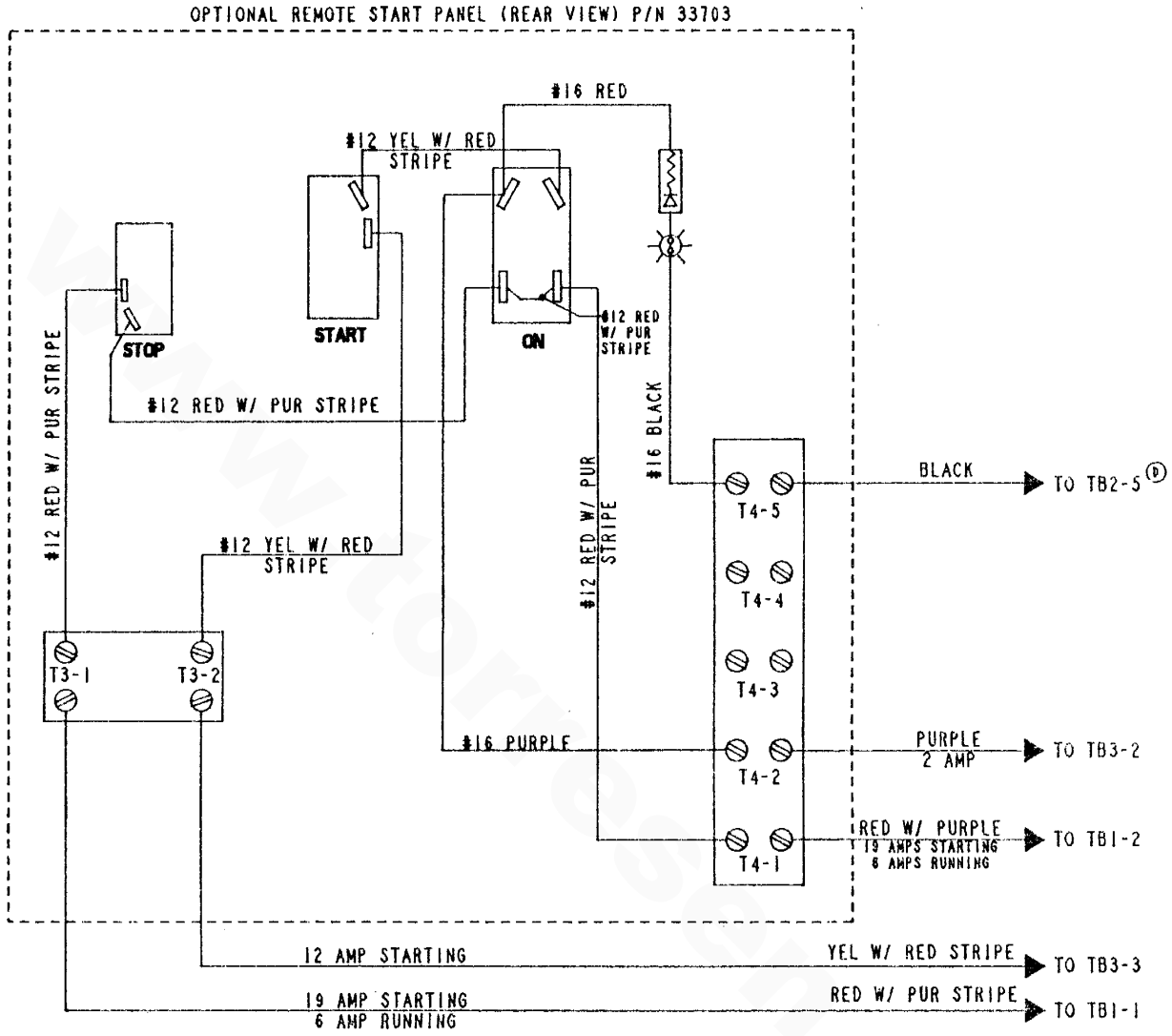
AN ON-OFF SWITCH SHOULD BE INSTALLED BETWEEN THE BATTERY AND STARTER TO DISCONNECT THE BATTERY IN AN EMERGENCY AND WHEN LEAVING THE BOAT. A SWITCH WITH A CONTINUOUS RATING OF 300 AMPS AT 12 VDC WILL SERVE THIS FUNCTION. THIS SWITCH SHOULD NOT BE USED TO MAKE OR BREAK THE CIRCUIT.



NOTE: *The only difference between the diagrams on the two previous pages [New Generators] and these diagrams occurs at the overspeed switch [T5 to ignition].*

OPTIONAL REMOTE START PANEL

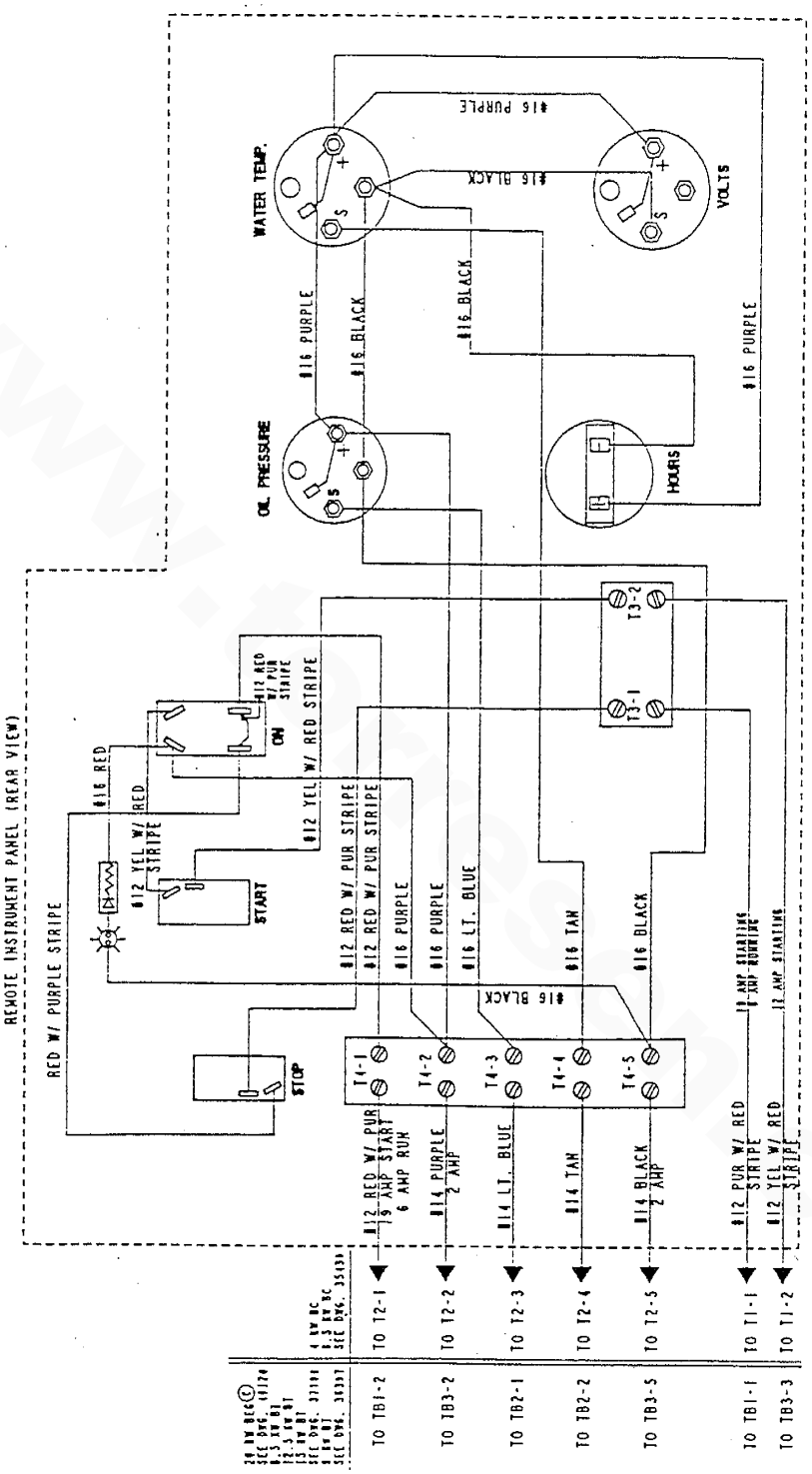
WIRING DIAGRAM #035706



WESTERBEKE
Engines & Generators

OPTIONAL REMOTE INSTRUMENT PANEL

WIRING DIAGRAM #035698



GENERATOR INFORMATION

USE OF ELECTRIC MOTORS

The power required to start an electric motor is considerably more than is required to keep it running after it is started. Some motors require much more current to start them than others. Split-phase (AC) motors require more current to start, under similar circumstances, than other types. They are commonly used on easy-starting loads, such as washing machines, or where loads are applied after the motor is started, such as small power tools. Because they require 5 to 7 times as much current to start as to run, their use should be avoided, whenever possible, if the electric motor is to be driven by a small generator. Capacitor and repulsion-induction motors require from 2 to 4 times as much current to start as to run. The current required to start any motor varies with the load connected to it. An electric motor connected to an air compressor, for example, will require more current than a motor to which no load is connected.

In general, the current required to start 115-Volt motors connected to medium starting loads will be approximately as follows:

MOTOR SIZE (HP)	AMPS FOR RUNNING (AMPERES)	AMPS FOR STARTING (AMPERES)
1/6	3.2	6.4 to 22.4*
1/4	4.6	9.2 to 32.2*
1/3	5.2	10.4 to 72.8*
1/2	7.2	14.4 to 29.2*
3/4	10.2	20.4 to 40.8*
1	13	26 to 52

***NOTE:** *In the above table the maximum* Amps for Starting *is more for some small motors than for larger ones. The reason for this is that the hardest starting types (split-phase) are not made in larger sizes.*

Because the heavy surge of current needed for starting motors is required for only an instant, the generator will not be damaged if it can bring the motor up to speed in a few seconds. If difficulty is experienced in starting motors, turn off all other electrical loads and, if possible, reduce the load on the electric motor.

Required Operating Speed

Run the generator first with no load applied, then at half the generator's capacity, and finally loaded to its full capacity as indicted on the generator's data plate. The output voltage should be checked periodically to ensure proper operation of the generating plant and the appliances it supplies. If an AC voltmeter or ampmeter is not installed to monitor voltage and load, check it with a portable meter and ampprobe.

NOTE: *When the vessel in which the generator is installed contains AC equipment of 120 volts only, it is recommended that the generator's AC terminal block be configured to provide one 120 volt AC hot leg for the vessel's distribution panel. This will ensure good motor starting response from the generator.*

Generator Frequency Adjustment

Frequency is a direct result of engine/generator speed, as indicated by the following:

- When the generator is run at 1800 rpm, the AC voltage output frequency is 60 Hertz.
- When the generator is run at 1500 rpm, the AC voltage output frequency is 50 Hertz.

Therefore, to change the generator's frequency, the generator's drive engine's speed must be changed. Along with a reconfiguring of the AC output connections at the generator, a regulator board voltage output adjustment must also be made. See *ELECTRONIC GOVERNOR* in this manual.

Generator Maintenance

- 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.
- For unusually severe conditions, thin rust-inhibiting petroleum-base coatings, should be sprayed or brushed over all surfaces to reduce rusting and corrosion.
- In addition to periodic cleaning, the generator should be inspected for tightness of all connections, evidence of overheated terminals and loose or damaged wires.
- 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.
- The rear armature bearing is lubricated and sealed; no maintenance is required. However, if the bearing becomes noisy or rough-sounding, have it replaced.
- Examine bearing 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.

Carbon Monoxide Detector

WESTERBEKE recommends mounting a carbon monoxide detector in the vessels living quarters. **Carbon monoxide, even in small amounts is deadly**.

The presence of carbon monoxide indicates an exhaust leak from the engine or generator, from the exhaust elbow/exhaust hose, or that fumes from a nearby vessel are entering your boat.

If carbon monoxide is present ventilate the area with clean air and correct the problem immediately!

THE BE GENERATOR
SINGLE AND THREE PHASE

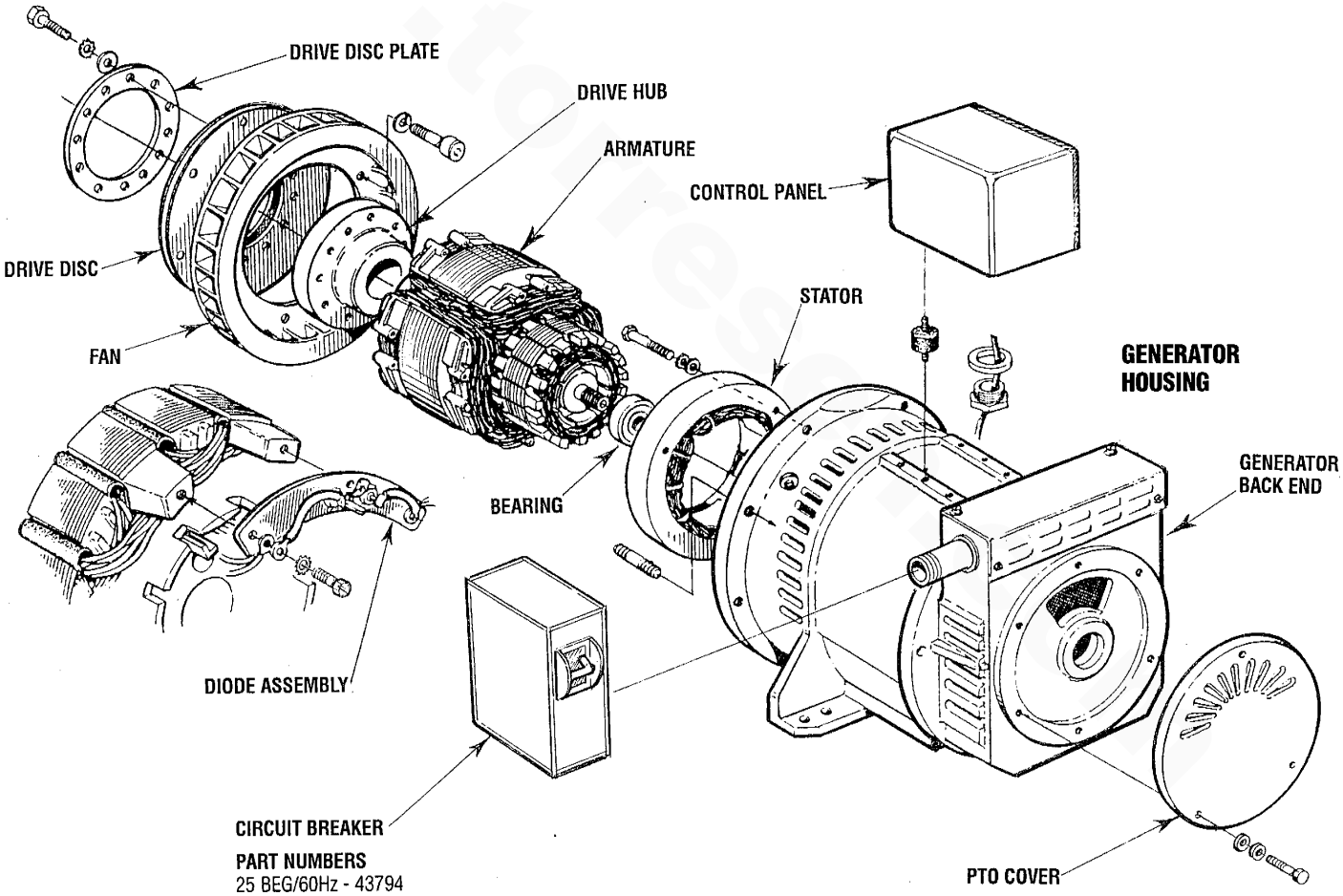
DESCRIPTION

This generator is a four-pole, brushless, self-excited generator which requires only the driving force of the engine to produce AC output. The copper and laminated iron in the exciter stator are responsible for the self-exciting feature of this generator. The magnetic field produced causes an AC voltage to be induced into the related exciter rotor windings during rotation. Diodes located in the exciter rotor rectify this voltage to DC and supply it to the windings of the rotating field. This creates an electromagnetic field which rotates through the windings of the main stator, inducing an AC voltage which is supplied to a load. An AC voltage is produced in the auxiliary windings of the main stator and is, in turn, supplied to a voltage regulator. The regulator produces a DC voltage to further excite the exciter stator windings, enabling the generator to produce a rated AC output. The voltage regulator senses AC voltage output and adjusts DC excitation to the exciter stator winding according to amperage load the generator is furnishing to mainatin a constant voltage output.

CIRCUIT BREAKER

A circuit breaker is installed on all WESTERBEKE generators. This circuit breaker will automatically disconnect generator power in case of an electrical overload. The circuit breaker can be manually shut off when servicing the generator to ensure no power is coming into the boat.

NOTE: *This circuit breaker is available as a WESTERBEKE add-on kit for earlier model generations; contact your WESTERBEKE dealer.*

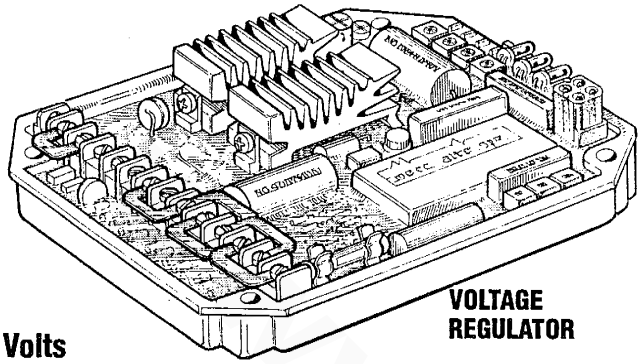


PART NUMBERS
25 BEG/60Hz - 43794
20 BEG/50Hz - 42696
20 BEG/60Hz - 42696
16 BEG/50Hz - 42718

VOLTAGE REGULATOR ADJUSTMENTS

Description

The voltage regulator is an advanced design which ensures optimum AC alternator performance. It is equipped with complete protection circuitry to guard against operating conditions that could be detrimental to the AC alternator.



VOLTAGE REGULATOR

Volts

This potentiometer is used to adjust output voltage. At proper engine operating speed the output voltage should be held at ±1% from a no-load condition to a full rated generator output and from power factor 1.0 - 0.8 with engine drive speed variations up to -6%.

Prior to starting the engine, turn the VOLT and STAB trimmers (using a mini phillips screwdriver) fully in a counter clockwise (Minimum) direction until you feel them hit their stops.

Turn the AMP and HERTZ trimmers completely clockwise (Maximum) in the same manner.

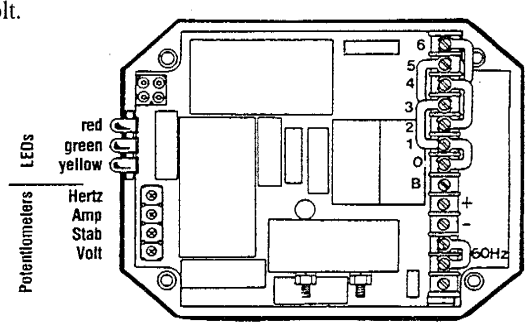
With the alternator running at no-load, at normal speed, and with VOLT adjust at minimum, it is possible that output voltage will oscillate. Slowly rotate the VOLT adjust clockwise. The voltage output of the alternator will increase and stabilize. Increase the voltage to the desired value. In this situation, only the green LED will stay lit.

Stability

This potentiometer permits variation of the regulator's response to generator load changes so as to limit overcompensation and obtain a minimum recovery time to the normal voltage output.

In order to adjust the regulator stability the alternator must be running at no-load and the output must be monitored.

Turn the STAB adjust slowly clockwise until the voltage starts to fluctuate. At this point rotate the STAB adjust counterclockwise until the voltage is stable within 1 or 2 tenths of a volt.



VOLTAGE REGULATOR DIAGRAM

Amp-Hertz

These two adjustments are used in conjunction with the two protection circuits in the voltage regulator that are indicated by the illumination of a colored LED lights.

1. Delayed overload protection (yellow LED).
2. Low speed protection (red LED).

Both systems have an intervention threshold which can be adjusted using the respective potentiometer. Each of the two circuits are able to cause an adequate reduction in excitor voltage to safeguard the excitor windings and prevent their overheating.

The overload protection system has a delay which permits temporary overloading of the generator during times such as motor start-up or other similar load surge demands. The regulator also has a third LED (green), that glows during generator operation to indicate correct operation of the regulator with the generator.

Setting the Overload Protection

In order to set the AMP overload protection, the alternator must be loaded to its full output rating.

1. Load the alternator to its rating, then decrease the speed of the engine by 10.10% (54 Hertz on 60 hertz units, 45 hertz on 50 hertz units).
2. Rotate the AMP adjustment counterclockwise until it hits its stop. Wait about 15-20 seconds after which the AC output of the alternator should drop and the yellow LED light should come on.
3. Slowly rotate the AMP adjustment clockwise until the output voltage increases to approximately 97% of the voltage output at the start of the adjustment. At this point the yellow LED light should come on.
4. Return to nominal speed, the yellow LED will turn off and the alternator voltage will rise to its normal value. Should this not happen, repeat the adjustment.

NOTE: *When changing from 60 hertz to 50 hertz operation, remove the 60 hertz jumper bar from the regulator board.*

Setting the Underspeed Protection

NOTE: *If the unit is operating at 60 Hertz ensure that the jumper strap is in place on the regulator board between the two 60 Hertz terminals. In order to adjust the underspeed setting, the alternator should be running at no-load.*

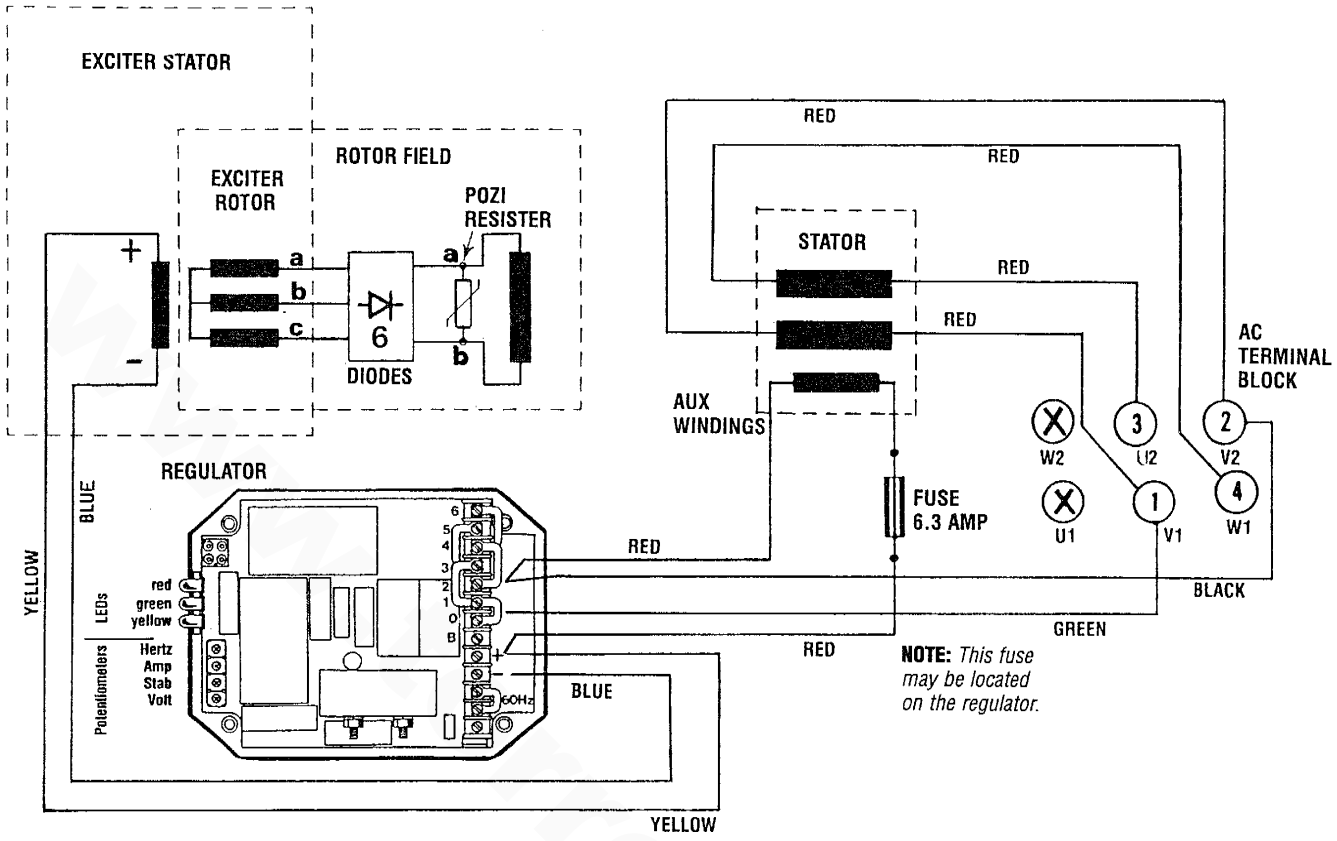
1. To adjust the underspeed (low frequency) protection circuit, lower the engine speed at 90% of its normal running speed (54 hertz on 60 hertz units, 45 hertz on 50 hertz units.
2. Rotate the Hertz adjustment counterclockwise slowly until the alternator's AC output voltage starts to decrease and at the same time the red "LED" light comes on.
3. Increase the engine speed to its normal speed (frequency). The red "LED" light will go out and the AC voltage output will return to normal.

With the above adjustments made, the regulator should function normally.

WESTERBEKE
Engines & Generators

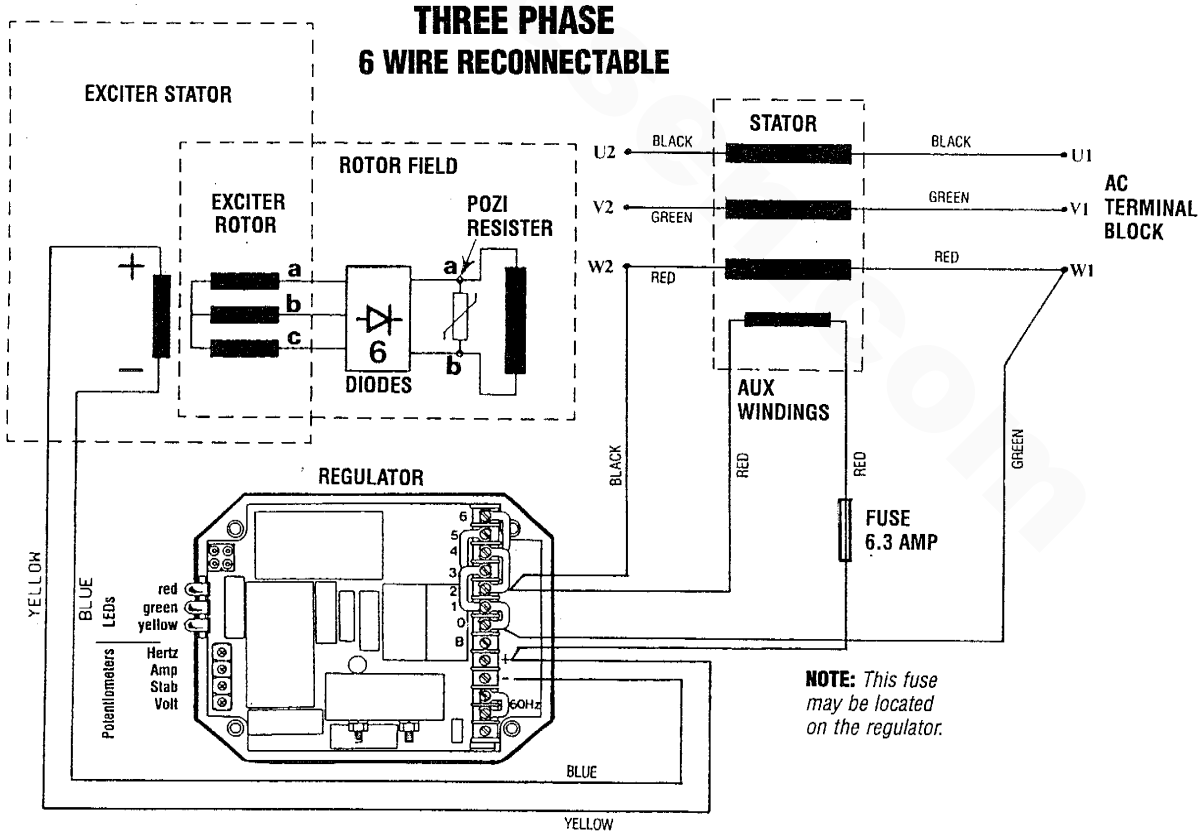
INTERNAL WIRING SCHEMATICS

SINGLE PHASE



THREE PHASE

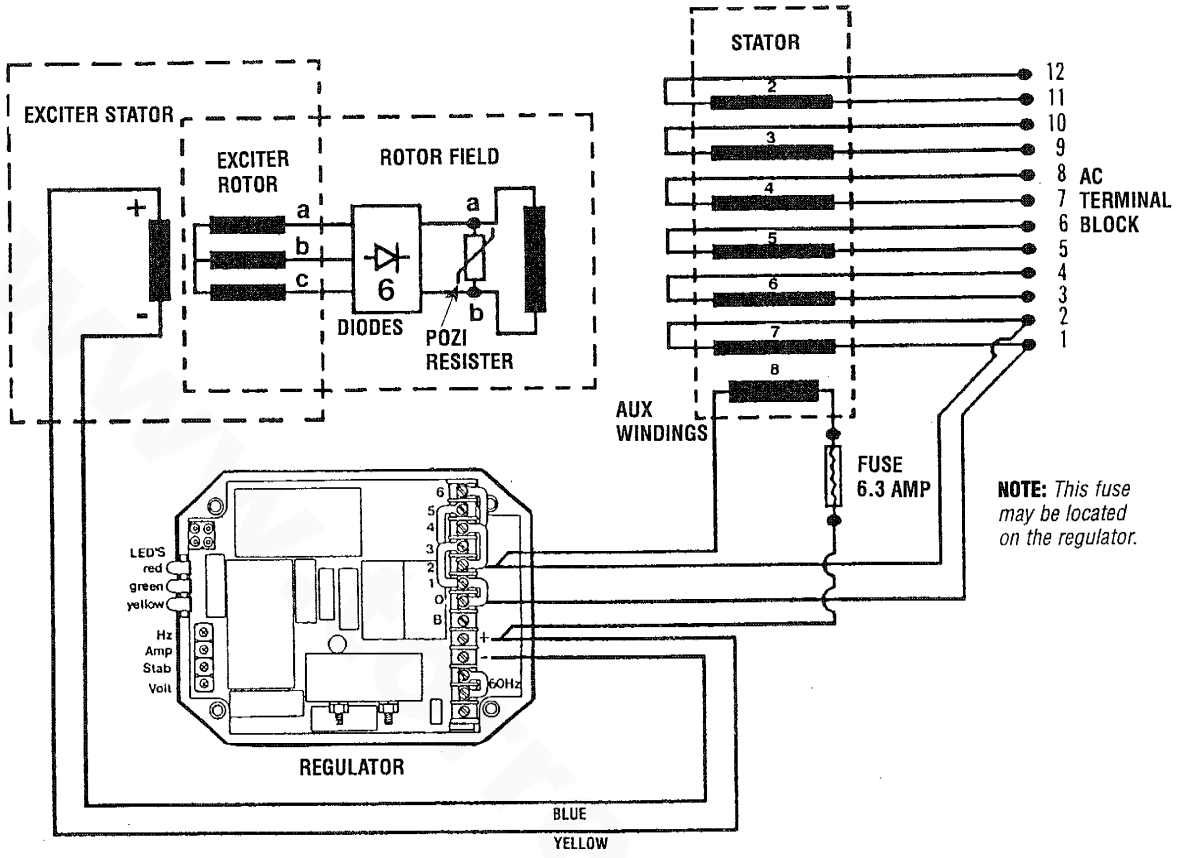
6 WIRE RECONNECTABLE



WESTERBEKE
Engines & Generators

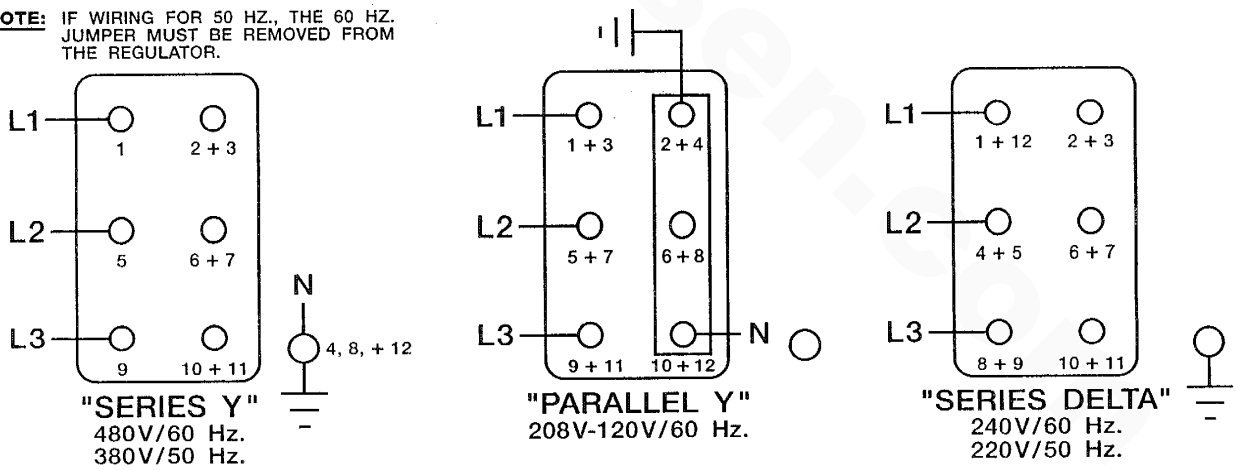
INTERNAL WIRING SCHEMATICS

3 PHASE TWELVE WIRE RECONNECTABLE



AC VOLTAGE CONNECTIONS

NOTE: IF WIRING FOR 50 HZ., THE 60 HZ. JUMPER MUST BE REMOVED FROM THE REGULATOR.



BE TROUBLESHOOTING/3 PHASE

NOTE: *AC GENERATOR TROUBLESHOOTING MUST BE PERFORMED WITH ENGINE OPERATING AT 60 HERTZ.*

PROBLEM	PROBABLE CAUSE	
No AC voltage output at no load.	**1.** Short or open in the main stator winding. **2.** Shorted pozi-resistor on exciter rotor. **3.** Four or more shorted or open diodes on exciter rotor.	**4.** Short or open in exciter stator winding. **5.** Short or open in rotating field winding.
Residual voltage produced at no load 15 - 20 volts AC.	**1.** Blown 6 AMP buse fuse auxiliary circuit feed to AVR. **2.** Faulty voltage regulator.	**3.** Shorted or open main stator auxiliary winding.
Low AC voltage output at no load 60 - 100 VAC.	**1.** Open or shorted diodes in exciter rotor 1 to 3 diodes. **2.** Open or shorted exciter rotor winding.	**3.** Faulty voltage regulator.
High AC output voltage 150 VAC or higher.	**1.** Faulty voltage regulator.	
Unstable voltage output.	**1.** STB pod on regulator needs adjustment.	**2.** Faulty voltage regulator.
AC voltage drop under load 60 - 100 volts AC.	**1.** Diode(s) on exciter rotor breaking down when load is applied (inductive) 1-3 diodes.	

BE GENERATOR WINDING RESISTANCE VALUES *(IN OHMS)*

SINGLE PHASE		20 & 25 BE	32 BE
EXCITER STATOR		*18.06*	*18.20*
EXCITER ROTOR	a - b	*0.68*	*0.72*
	b - c	*0.68*	*0.72*
ROTATING FIELD		*1.75*	*2.01*
MAIN STATOR	1 - 2	*0.05*	*0.05*
	3 - 4	*0.05*	*0.05*
AUXILLARY WINDING		*1.19*	*0.98*

THREE PHASE		20, 25, & 32 BE
EXCITER STATOR		*18.20*
EXCITER ROTOR	a - b	*0.7*
	b - c	*0.7*
ROTATING FIELD		*2.01*
MAIN STATOR		*0.06 (each winding)*
AUXILLARY WINDING		*0.98*

GENERATOR AC VOLTAGE CONNECTIONS

AC VOLTAGE CONNECTIONS

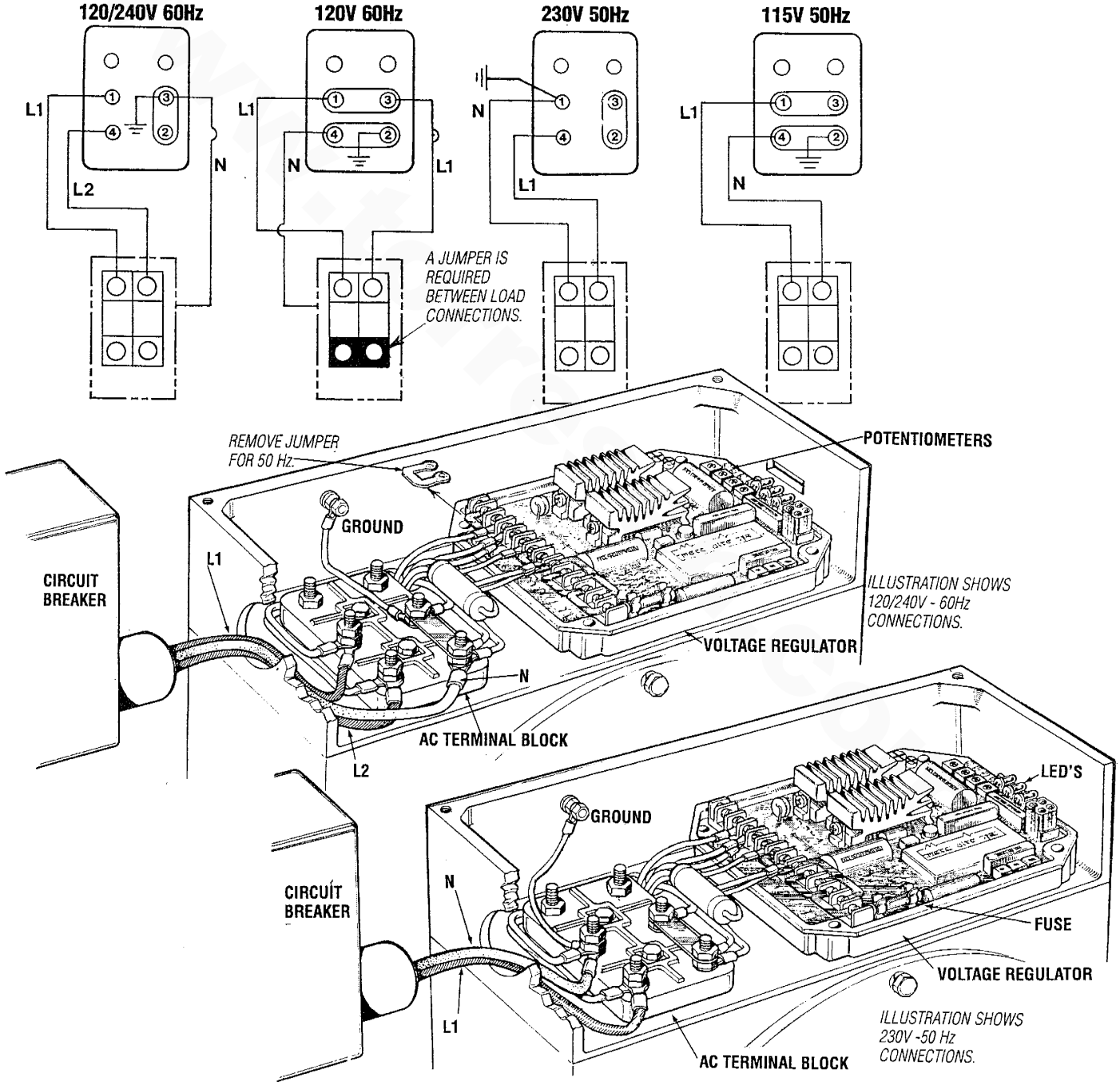
NOTE: The frame ground wire (white/green) must be properly positioned when changing the AC output configuration of the AC terminal block. For making connections to the AC terminal block, use terminal ends for 1/4 inch studs that will accept multi strand copper wire sized for the amperage rating from the hot lead connection. The frame ground wire is white or white with a green strip. It connects between the neutral stud and the generator frame.

Generator Frequency

1. Frequency is a direct result of engine/generator speed: 1800 rpm = 60 hertz; 1500 rmp = 50 hertz.
2. To change generator frequency, follow the steps below:

   Configure the AC terminal block for the desired voltage frequency as shown. Ensure that the case ground wire is connected to the correct terminal block neutral ground stud.

NOTE: *The white/green ground wire may be removed in those installations where the AC circuit has a separate neutral and ground circuit. This will prevent the unit from being a ground source in the vessel.*

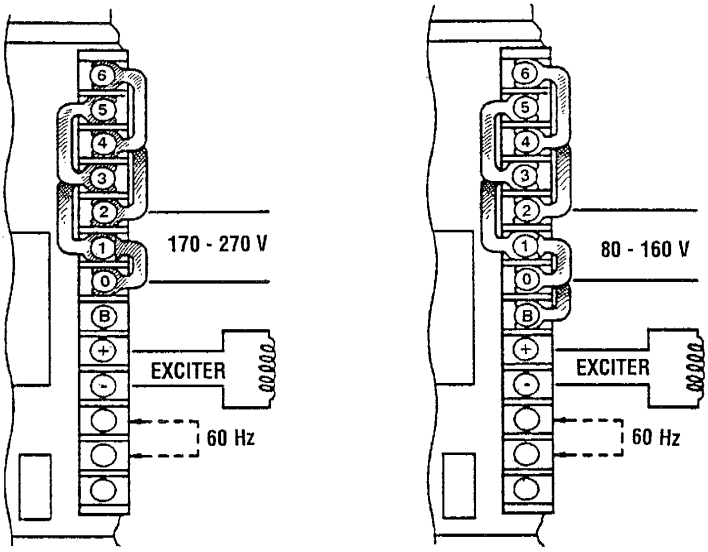


GENERATOR AC VOLTAGE CONNECTIONS

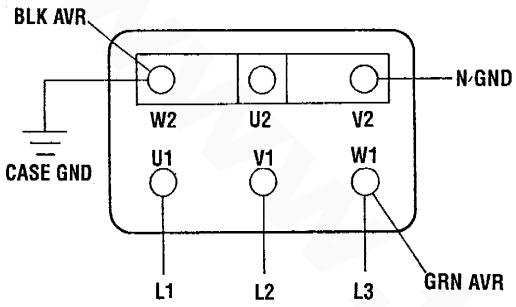
DESCRIPTION

The regulator is equipped with seven numbered terminals (0 to 6) and their related brass jumpers. The illustrations show connection points and jumpers for the 3 phase configuration of the generator. The sensing leads connect between pin #1 and pin #2 on the AC terminal block and connection #2 and #0 on the voltage regulator board.

NOTE: *Series Delta requires the installation of a jumper on the regulator board between terminal B and 10.*

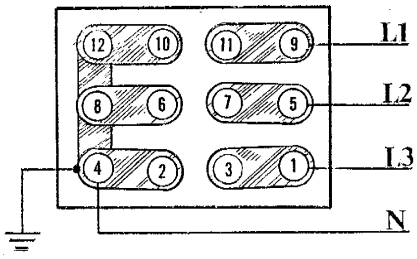


3 PHASE VOLTAGE REGULATOR



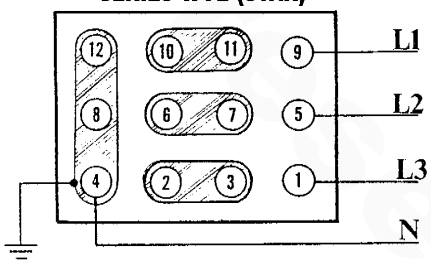
BE THREE PHASE (SIX WIRE)
CONNECTIONS FOR BOTH 60 & 50 HERTZ

PARALLEL WYE (STAR)



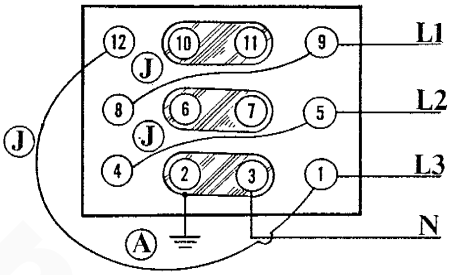
L - L - 208 VAC 3Ø 50 Hz
L - N - 120 VAC 1Ø 60 Hz
L - L - 190 VAC 3Ø 50 Hz
L - N - 110 VAC 1Ø 60 Hz

SERIES WYE (STAR)



L - L - 450 VAC 3Ø 60Hz
L - N - 265 VAC 1Ø 60 Hz
L - L- 380 VAC 3Ø 50Hz
L - N - 230 VAC 1Ø 50Hz

SERIES DELTA



L - L - 240 VAC 2Ø 60Hz
L2, L3-N - 120 VAC 1Ø 60Hz
L - L - 230 VAC 3Ø 50Hz
L2, L3-N - 110 VAC 1Ø 50Hz

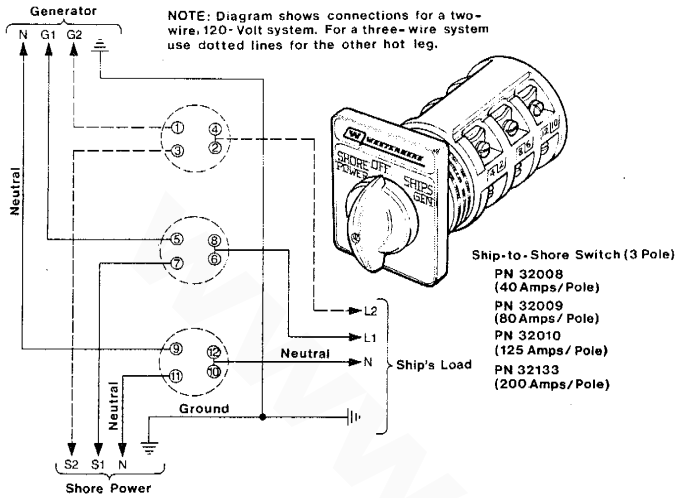
BE THREE PHASE (TWELVE WIRE)

A. SERIES DELTA-Note the repositioning of the ground lead from neutral to generator housing.

J. Jumper using #10 AWG wire.

SHORE POWER TRANSFER SWITCH

SHORE POWER CONNECTIONS (60 HERTZ)

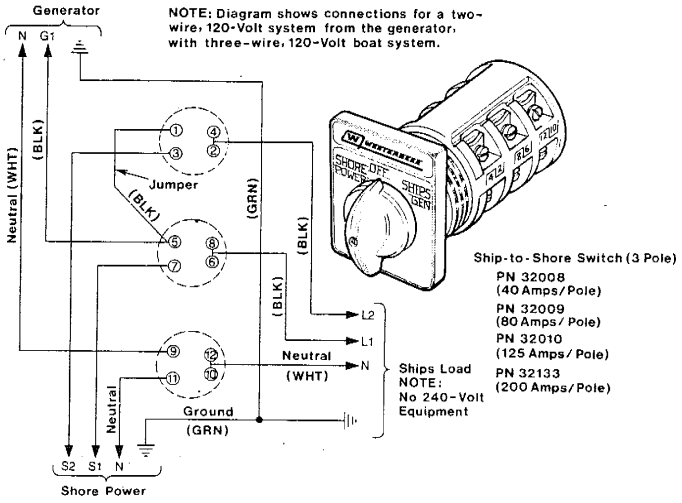


If the installer connects shore power to the vessel's AC circuit, this must be done by means of the Shore Power Transfer Switch. Set the transfer switch shown in the diagrams to the OFF position. This switch prevents simultaneous connection of shore power to generator output.

⚠ CAUTION: ***Damage to the generator can result if utility shore power and generator output are connected at the same time. This type of generator damage is not covered under the warranty; it is the installer's responsibility to make sure all AC connections are correct.***

120 VOLT/60 HZ THREE WIRE CONFIGURATION

Notice the repositioning of the white wire ground load on the terminal block to the generator case.

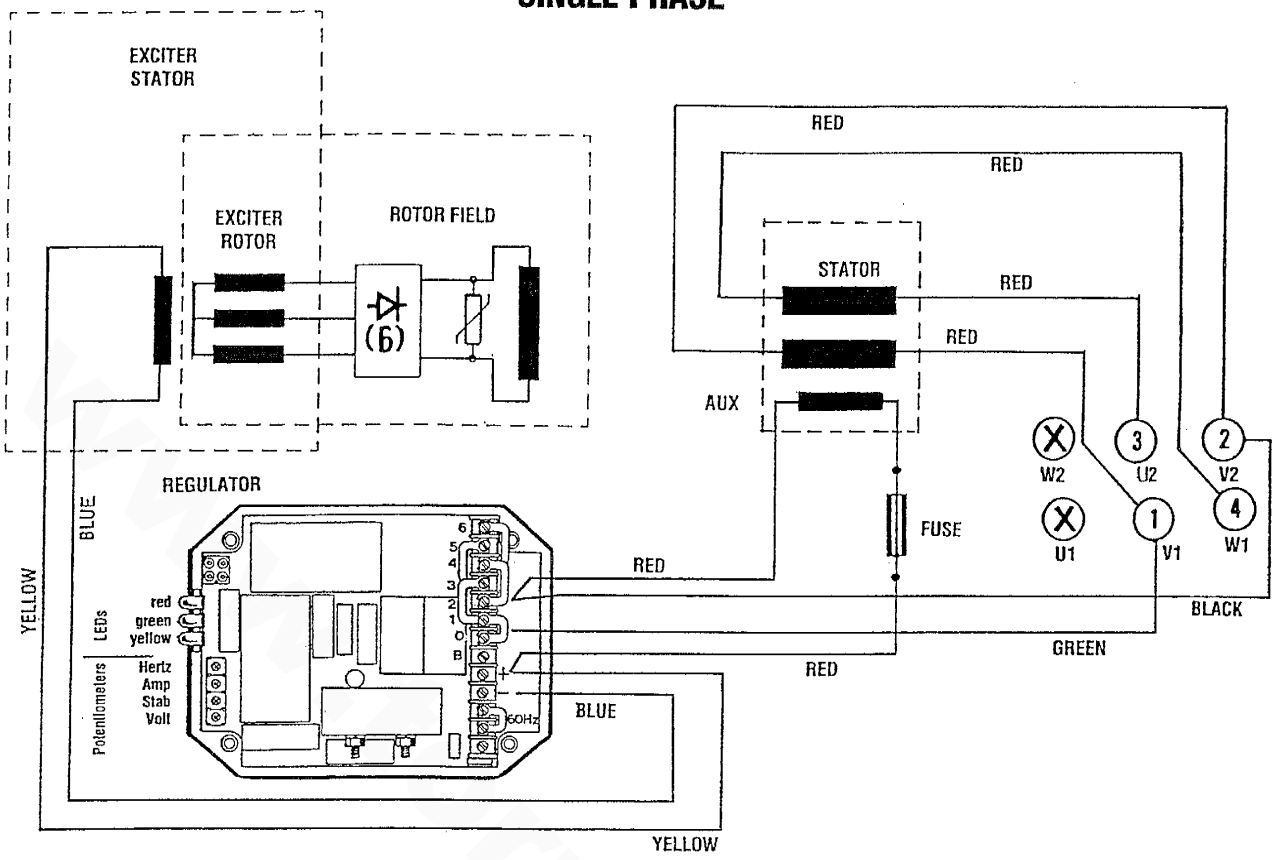


Switching Shore Power to Generator Power

⚠ CAUTION: ***Heavy motor leads should be shut off before switching shore power to generator power or vice-versa because voltage surges induced by switching with heavy AC loads on the vessel being operated may cause damage to the exciter circuit components in the generator.***

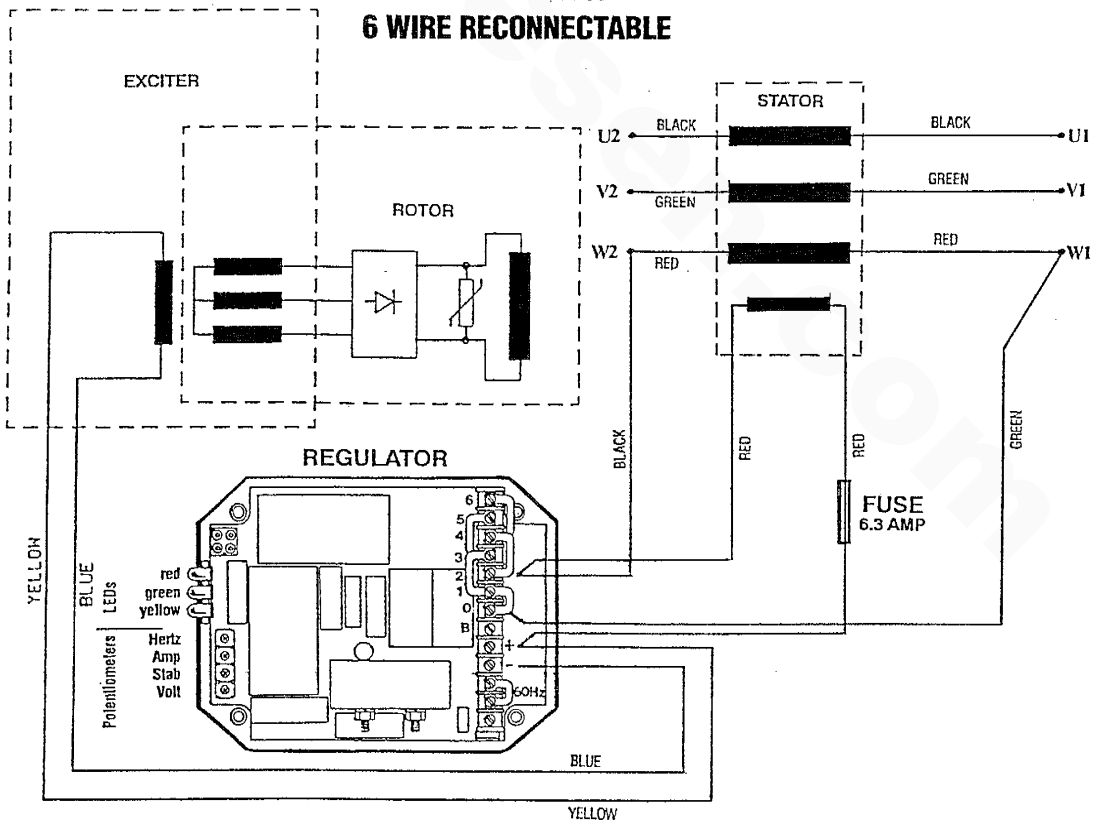
INTERNAL WIRING SCHEMATICS

SINGLE PHASE



THREE PHASE

6 WIRE RECONNECTABLE



WESTERBEKE
Engines & Generators

GENERATOR AC VOLTAGE CONNECTIONS

AC VOLTAGE CONNECTIONS

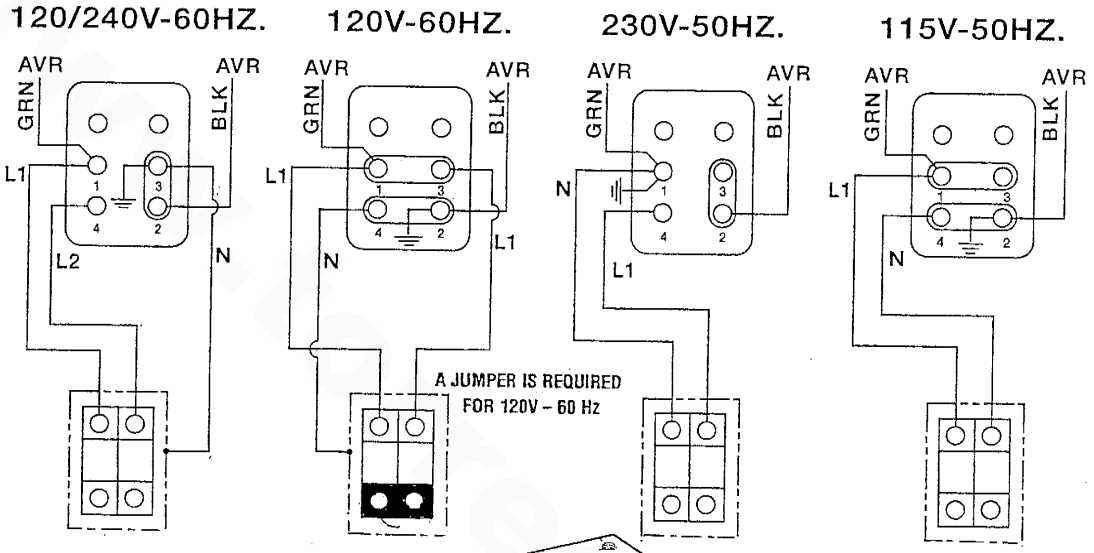
NOTE: The frame ground wire (white/green) must be properly positioned when changing the AC output configuration of the AC terminal block. For making connections to the AC terminal block, use terminal ends for 1/4 inch studs that will accept multi strand copper wire sized for the amperage rating from the hot lead connection. The frame ground wire is white or white with a green strip. It connects between the neutral stud and the generator frame.

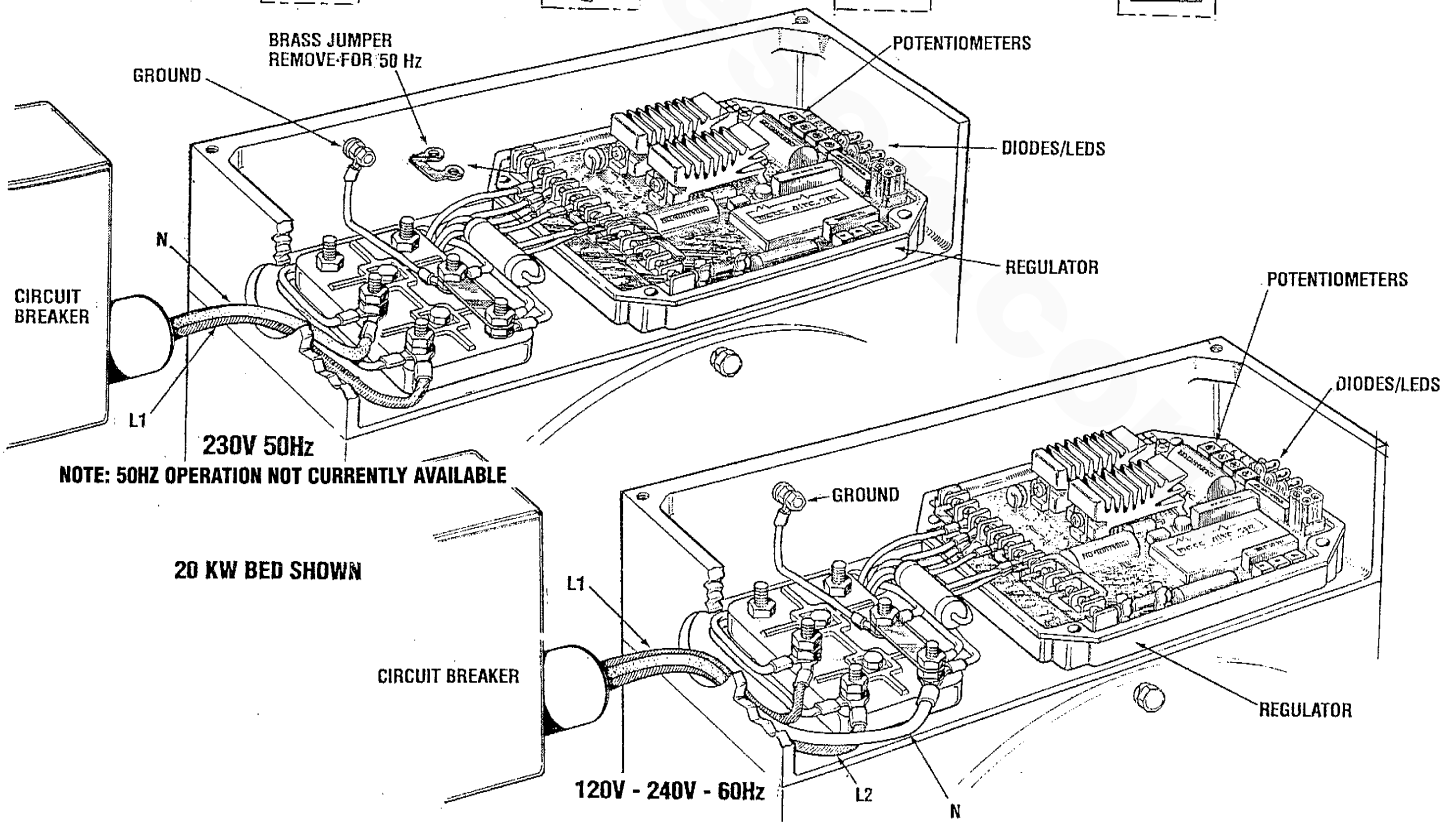
Generator Frequency

1. Frequency is a direct result of engine/generator speed: 1800 rpm = 60 hertz; 1500 rmp = 50 hertz.
2. To change generator frequency, follow the steps below:
   Configure the AC terminal block for the desired voltage frequency as shown. Ensure that the case ground wire is connected to the correct terminal block neutral ground stud.

NOTE: *The white/green ground wire may be removed in those installations where the AC circuit has a separate neutral and ground circuit. This will prevent the unit from being a ground source in the vessel.*

BE SINGLE PHASE





WESTERBEKE
Engines & Generators

WESTERBEKE 25KW AND 20KW BEG GENERATOR SPECIFICATIONS

ENGINE SPECIFICATIONS

Engine Type	Gasoline, four-cycle, four-cylinder, fresh water-cooled, Vertical, in-line overhead mechanism
Governor	Hoof, flyball type. 5% speed regulation.
Combustion Chamber	Multi-sphere type.
Bore & Stroke	3.38 x 3.70 inches (86.0 x 94.0 mm).
Piston Displacement	133.26 cubic inches (2184 cubic centimeters)
Firing Order	1 - 3 - 4 - 2
Direction of Rotation	Clockwise, when viewed from the front
Compression Ratio	8.6:1
Dimensions	Height: 42.2 inches (1071.9 mm) Width: 22.4 inches (568.9 mm) Length: 28.2 inches (716.3 mm)
Weight **25KW** **20KW**	968 lbs (439.5 kgs) 940 lbs (426.7 kgs)
Inclination	Continuous 26° Temporary 30°

TUNE-UP SPECIFICATIONS

Compression Pressure (Limit of difference between cylinders)	198.1 psi (14 kg/cm²) at 400 rpm 28.0 psi (2.0 kg/cm²).
Valve Timing	Intake Opens 2° BTDC Intake Closes 53° ABDC Exhaust Opens 57° BBDC Exhaust Closes -2° ATDC
Valve Seat Angle	Intake 45°.. Exhaust 45°.
Valve Clearance (engine warm)	Intake 0.012 inches (0.3 mm) Exhaust 0.012 inches (0.3 mm)..
Engine Timing	**20 BEG** 12° BTDC at 1800 rpm ± 1° **25 BEG** 20° BTDC at 1800 rpm ± 1°

EXHAUST SYSTEM

Emission Control	Meets U.S.C.G. Regulations 33 CFR 183 Systems

IGNITION SYSTEM

General	Battery ignition 12V negative ground. Distributor with ignition module and ignitor. Ignition coil and spark plugs.
Distributor	Solid state type with signal generator and ignitor.
Spark Plug Thread Size	14mm X 1.25 pitch
Carburetor (STD Type)	Down draft type, single barrel. USCG approved flame arrester
Spark Plug Gap	.030 inches (0.8 mm)
Dwell	63° at 1800 rpm.

FUEL SYSTEM

General	Conventional carburetor type with electric fuel pump.
Fuel	Regular or unleaded gasoline with an octane rating of 89 or better.
Fuel Lift Pump	Electric-lift capability of 6ft. (18mm)
Fuel consumption	2.5 U.S. GPH (9.4 LPH) at full output.
Fuel Filter (on engine)	Replaceable cartridge-screw on.
Air Cleaner (flame arrester)	Metal screen type - cleanable.
Air Flow (engine combustion)	69.5 cfm (1.9 cmm)

COOLING SYSTEM

General	Fresh water-cooled block, thermostatically-controlled with heat exchanger.
Operating Temperature	130 - 150° F (55 - 66° C)
Fresh Water Pump	Centrifugal type, metal impeller, belt-driven
Raw Water Pump	Positive displacement, rubber impeller, belt driven.
Raw Water Flow, at 1800 rpm	6.7 gpm (25.3 lpm)
System Capacity (coolant)	9.0 qts (8.5 liters)

(continued) →

WESTERBEKE 25KW AND 20KW BEG GENERATOR SPECIFICATIONS

LUBRICATION SYSTEM

General	Pressure fed system
Oil Filter	Full flow, paper element, spin-on type
Sump Capacity (not including filter)	4.0 U.S. qts (3.7 liters) plus filter/cooler assembly
Operating Oil Pressure (engine hot)	55-75 psi (3.8 - 5.2 kg/cm²)
Oil Grade	API Specification of SJ.

ELECTRICAL SYSTEM

Starting Battery	12-Volt, (-) negative ground
Battery Capacity	300 - 600 Cold Cranking Amps(CCA)
Starter	12-Volt, reduction - solenoid mounted.
DC Charging	12 VDC belt driven alternator.
DC Charging Cranking Current	.175 - 200 amps (cold engine).

AC GENERATOR (SINGLE PHASE)

General-Single Phase	Brushless six pole, revolving field. Sealed lubricated single bearing design. Reconnectable single phase for 120/240 volts with solid state voltage regulator	
Voltage - Single Phase	120 0r 120/240 volts - 60 hertz 230 volts - 50 hertz	
Voltage Regulation	±2% no load to full load.	
Frequency Regulation	±5% no load to full load.	
Rating (Volts AC)		
20KW - 60 Hz	120 volts 102/240 volts	166 amps 166/183 amps
16KW - 50 Hz	230 volts	72.7 amps
25KW - 60 Hz	120 volts 120/240 volts	208 amps 208/104 amps
20KW - 50 Hz	230 volts	91 amps

AC GENERATOR (THREE PHASE)

General-3 Phase	Brushless six pole, revolving field. Sealed lubricated single bearing design. 12 lead reconnectable for low voltage WYE and for Delta. Solid state voltage regulator with protection circuitry.	
Voltage - 3 Phase (60 Hertz)	Low voltage WYE High voltage WYE Delta	208 volts 480 volts 240 volts
Voltage - 3 Phase (50 Hertz)	High voltage WYE Delta	380 volts 230 volts
20KW - 60 Hz Amperage 3 Phase	Low voltage WYE High voltage WYE Delta	70 amps 35 amps 60 amps
16KW - 50 Hz Amperage 3 Phase	High voltage WYE Delta	30.4 amps 52.5 amps
25KW - 60 Hz Amperage 3 Phase	Low voltage WYE High voltage WYE Delta	86.7 amps 37.6 amps 75.2 amps
20KW - 50 Hz Amperage 3 Phase	High voltage WYE Delta	38 amps 65.6 amps

GENERATOR COOLING

Air Requirements (60 Hertz at 1800 RPM)	450 cfm (12.74 cmm)
Note: Increase air supply 15% for Hertz operation 1500 rpm.	
Engine combustion Air Requirements (60 Hertz at 1800 RPM)	69.5 cfm (1.9 cmm)
Engine Cooling Air	100 cfm (2.83 cmm)

WESTERBEKE
Engines & Generators

TORQUE SPECIFICATIONS - 25 KW AND 20 KW BEG GENERATORS

COMPONENT	FT-LB (M-KG)
Air Cleaner Bracket	12.7 - 17.4 (1.9 - 2.6)
Alternator Bracket	25.5 - 35.6 (3.8 - 5.3)
Alternator Flange Bolt	12.7 - 20.8 (1.9 - 3.1)
Alternator Strap	12.7 - 17.4 (1.9 - 2.6)
Camshaft Pully Lock Bolt	32.2 - 44.3 (4.8 - 6.6)
Carburetor	8.0 - 11.4 (1.2 - 1.7)
Connecting Rod Cap	44.3 - 47.0 (6.6 - 7.0)
Coolant Pump	12 - 17 (1.6 - 2.4)
Coolant Pump Pulley	12 - 17 (1.6 - 2.4)
Coolant Temperature Sender	9 - 13 (1.2 - 1.8)
Coolant Temperature Switch	9 - 13 (1.2 - 1.8)
Crank Shaft Pulley	22.1 - 25.5 (3.3 - 3.8)
Cylinder Head	
Cold	55 - 59 (8.2 - 8.8)
Hot	63 - 67 (9.5 - 10.0)
Cylinder Head Cover	2.6 - 4.0 (4.0 - 6.0)
Drive Plate	16.1 - 18.1 (2.4 - 2.7)
Exhaust Manifold	12 - 17 (1.6 - 2.4)
Front Housing Assembly	12.7 - 17.4 (1.9 - 2.6)
Intake Manifold	12 - 17 (1.6 - 2.4)

COMPONENT	FT-LB (M-KG)
Main Bearing Cap	56.4 - 60.4 (8.4 - 9.0)
Oil Pan	4.7 - 8.0 (7.0 - 12.0)
Oil Pressure Sender	9 - 13 (1.2 - 1.8)
Oil Pressure Switch	9 - 13 (1.2 - 1.8)
Oil Pump	
M8	12.7 - 17.4 (1.9 - 2.6)
M10	25.5 - 35.6 (3.8 - 5.3)
Oil Strainer	
M6	5.3 - 8.0 (8.0 - 12.0)
M8	10.7 - 15.4 (1.6 -2.3)
Rear Cover Assembly	5.3 - 8.0 (8.0 - 12.0)
Rocker Shaft Assembly	12.0 - 18.1 (1.8 -2.7)
Spark Plug	10.0 - 15.4 (1.5 - 2.3)
Timing Belt Crank Pulley Bolt	120.9 - 134.4 (18.0 - 20.0)
Timing Belt Cover	
Upper	4.7 - 6.7 (7.0 - 10.0)
Lower	4.7 - 6.7 (7.0 - 10.0)
Timing Tension Lock Bolt	25.5 - 35.6 (3.8 - 5.3)
Thermostat Cover	12.7 - 20.8 (1.9 - 3.1)
Water Pump	12 7 - 17.4 (1.9 - 2.6)

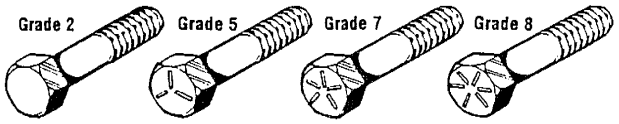
NOTE: *Formula to convert Ft-Lbs to Nm (Newton Meters) multiply Ft-Lb x 1.356.*

STANDARD HARDWARE

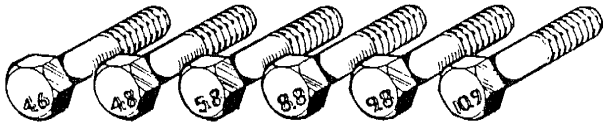
BOLT HEAD MARKINGS

Bolt strength classes are embossed on the head of each bolt.

Customary (inch) bolts are identifed by markings two to grade eight (strongest). The marks correspond to two marks less than the actual grade, i.e.; a grade seven bolt will display five embossed marks.



Metric bolt class numbers identify bolts by their strength with 10.9 the strongest.



NOTES: 1. *Use the torque values listed below when specific torque values are not available.*
2. *These torques are based on clean, dry threads. Reduce torque by 10% when engine oil is used.*
3. *Reduce torques by 30% or more, when threading capscrews into aluminum.*

STANDARD BOLT & NUT TORQUE SPECIFICATIONS

Capsrew Body Size (Inches) - (Thread)	SAE Grade 5 Torque Ft-Lb (Nm)	SAE Grade 6-7 Torque Ft-Lb (Nm)	SAE Grade 8 Torque Ft-Lb (Nm)
1/4 - 20	8 (11)	10 (14)	12 (16)
- 28	10 (14)		14 (19)
5/16 - 18	17 (23)	19 (26)	24 (33)
- 24	19 (26)		27 (37)
3/8 - 16	31 (42)	34 (46)	44 (60)
- 24	35 (47)		49 (66)
7/16 - 14	49 (66)	55 (75)	70 (95)
- 20	55 (75)		78 (106)
1/2 - 13	75 (102)	85 (115)	105 (142)
- 20	85 (115)		120 (163)
9/16 - 12	110 (149)	120 (163)	155 (210)
- 18	120 (163)		170 (231)
5/8 - 11	150 (203)	167 (226)	210 (285)
- 18	170 (231)		240 (325)
3/4 - 10	270 (366)	280 (380)	375 (508)
- 16	295 (400)		420 (569)
7/8 - 9	395 (536)	440 (597)	605 (820)
- 14	435 (590)		675 (915)
1 - 8	590 (800)	660 (895)	910 (1234)
- 14	660 (895)		990 (1342)

METRIC BOLT & NUT TORQUE SPECIFICATIONS

Bolt Dia.	Wrench Size	Grade 4.6 Ft-Lb (Nm)	Grade 4.8 Ft-Lb (Nm)	Grade 8.8 - 9.8 Ft-Lb (Nm)	Grade 10.9 Ft-Lb (Nm)
M3	5.5 mm	0.3 (0.5)	0.5 (0.7)	1 (1.3)	1.5 (2)
M4	7 mm	0.8 (1.1)	1 (1.5)	2 (3)	3 (4.5)
M5	8 mm	1.5 (2.5	2 (3)	4.5 (6)	6.5 (9)
M8	10 mm	3 (4)	4 (5.5)	7.5 (10)	11 (15)
M9	13 mm	7 (9.5)	10 (13)	18 (25)	35 (26)
M10	16 mm	14 (19)	18 (25)	37 (50)	55 (75)
M12	18 mm	26 (35)	33 (45)	63 (85)	97 (130)
M14	21 mm	37 (50)	55 (75)	103 (140)	151 (205)
M16	24 mm	59 (80)	85 (115)	159 (215)	232 (315)
M18	27 mm	81 (110)	118 (160)	225 (305)	321 (435)
M20	30 mm	118 (160)	166 (225)	321 (435)	457 (620)
M22	33 mm	159 (215)	225 (305)	435 (590)	620 (840)
M24	36 mm	203 (275)	288 (390)	553 (750)	789 (1070)
M27	41 mm	295 (400)	417 (565)	811 (1100)	1154 (1565)
M30	46 mm	402 (545)	568 (770)	1103 (1495)	1571 (2130)
M33	51 mm	546 (740)	774 (1050)	1500 (2035)	2139 (2900)
M36	55 mm	700 (950)	992 (1345)	1925 (2610)	2744 (3720)

NOTE: *Formula to convert Ft-Lbs to Nm (Newton Meters) multiply Ft-Lb x 1.356.*

SEALANTS & LUBRICANTS

GASKETS/SEALANTS

Oil based PERMATEX #2 and it's HIGH TACK equivalent are excellent all purpose sealers. They are effective in just about any joint in contact with coolant, raw water, oil or fuel.

A light coating of OIL or LIQUID TEFLON can be used on rubber gaskets and O-rings.

LOCTITE hydraulic red sealant should be used on oil adapter hoses and the oil filter assembly.

Coat both surfaces of the oil pan gasket with high temp RED SILICONE sealer.

When installing gaskets that seal around water (coolant) passages, coat both sides with WHITE SILICONE grease.

High-copper ADHESIVE SPRAYS are useful for holding gaskets in position during assembly.

Specialized gasket sealers such as HYLOMAR work well in applications requiring non-hardening properties. HYLOMAR is particlarly effective on copper cylinder-head gaskets as it resists fuel, oil and water.

Use LIQUID TEFLON for sealing pipe plugs and fillings that connect coolant passages. **Do not use tape sealants!**

BOLTS & FASTENERS/ASSEMBLIES

Lightly oil head bolts and other fasteners as you assemble them. Bolts and plugs that penetrate the water jacket should be sealed with PERMATEX #2 or HIGH TACK.

When assembling the flywheel, coat the bolt threads with LOCTITE blue.

Anti-seize compounds and thread locking adhesives such as LOCTITE protect threaded components yet allows them to came apart when necessary. LOCTITE offers levels of locking according to the job.

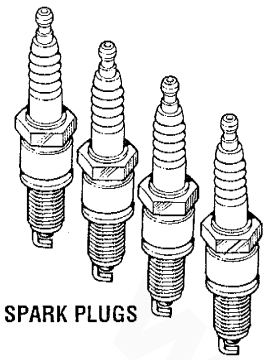
LITHIUM based grease is waterproof, ideal for water pump bearings and stuffing boxes.

Heavily oil all sliding and reciprocating components when assembling. **Always use clean engine oil!**

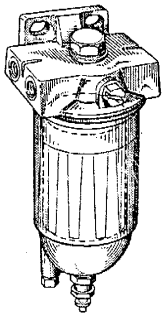
SUGGESTED SPARE PARTS

WESTERBEKE MARINE GASOLINE GENERATORS

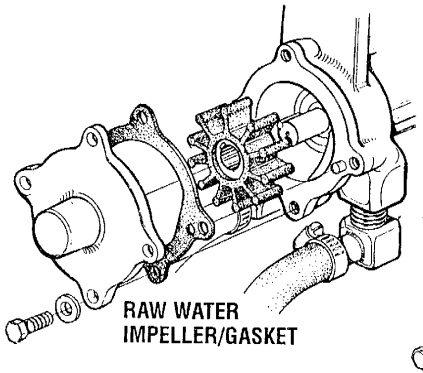
CONTACT YOUR WESTERBEKE DEALER FOR SUGGESTIONS AND ADDITIONAL INFORMATION



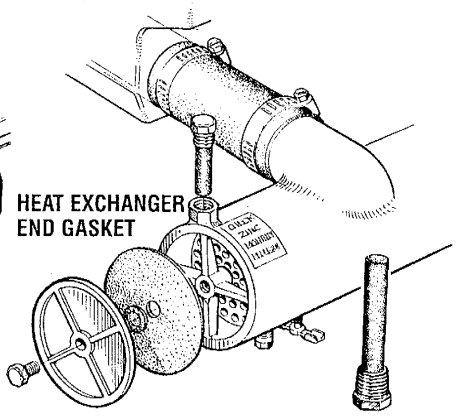
SPARK PLUGS



FUEL/WATER SEPARATOR FILTER ELEMENT

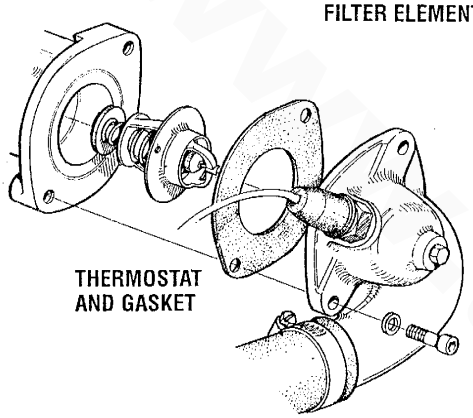


RAW WATER IMPELLER/GASKET

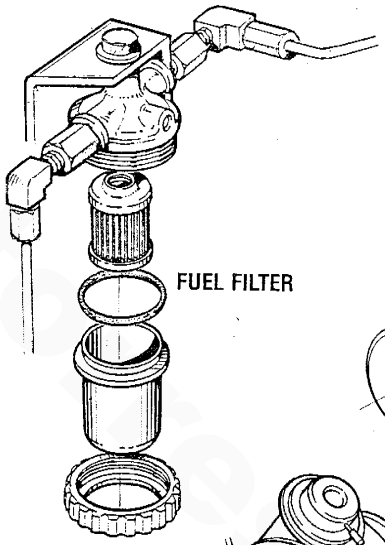


HEAT EXCHANGER END GASKET

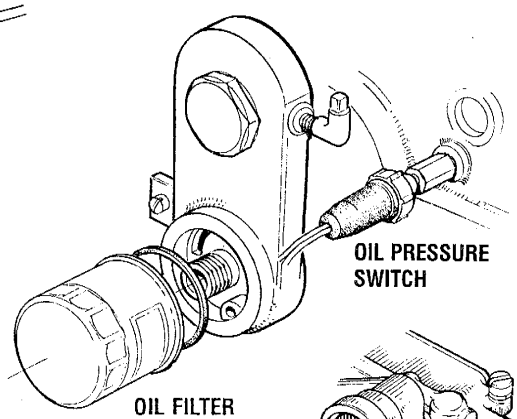
ZINC ANODES



THERMOSTAT AND GASKET

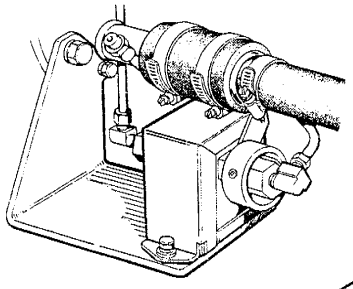


FUEL FILTER

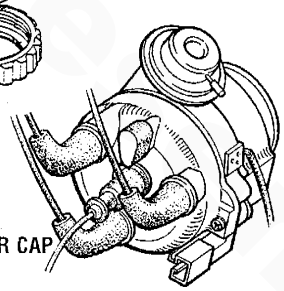


OIL PRESSURE SWITCH

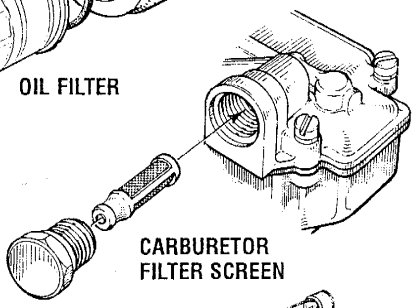
OIL FILTER



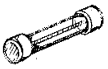
FUEL LIFT PUMP



DISTRIBUTER CAP AND WIRES

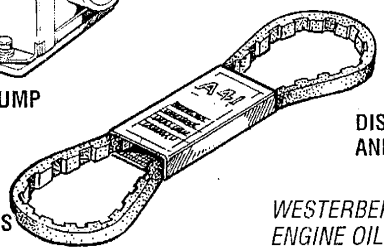


CARBURETOR FILTER SCREEN



SPARE FUSES

CONTROL PANEL AND BE REGULATOR



DRIVE BELTS

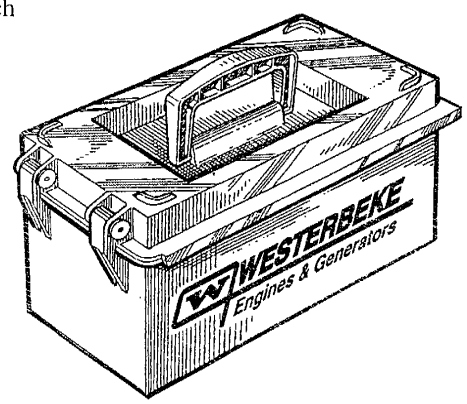
WESTERBEKE RECOMMENDS CARRYING ENOUGH SPARE ENGINE OIL (YOUR BRAND) FOR AN OIL CHANGE (5 QTS.) AND A GALLON OF PREMIXED COOLANT.

SPARE PARTS KIT

WESTERBEKE offers two Spare Parts Kits, each packaged in a rugged toolbox.
Kit A includes the basic spares.
Kit B is for more extensive off-shore cruising.

KIT A

Impeller Kit
Heat Exchanger Gasket
Oil Filter
Drive Belt
Zinc Anodes
Spark Plugs



KIT B

Impeller Kit
Water Pump Repair Kit
Thermostat Kit
Zinc Anodes
Complete Gasket Kit
Heat Exchanger Gasket
Oil Filter
Drive Belt
Spark Plugs

WESTERBEKE
Engines & Generators

1013 WM/DW 6/99

Engine parts from Torrsen Marine - www.torresen.com - 231-759-8596