



# **OPERATORS MANUAL**

**5.0KW BCG-60Hz / 4.2KW BCG-50Hz**

**5.0KW BCGA-60Hz / 4.2KW BCGA-50Hz**

**7.0KW BCGC-60Hz / 5.9KW BCGC-50Hz**

**7.0KW BCGD-60Hz / 5.9KW BCGD-50Hz**

## **GASOLINE GENERATORS**

### **Single Phase**

**PUBLICATION NO. 46983**

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*Member National Marine Manufacturers Association*

**CALIFORNIA PROPOSITION 65  
WARNING**

Exhaust gas from diesel and gasoline engines (and some of its constituents) are known to the State of California to cause cancer, birth defects, and other reproductive harm.

**⚠ 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.***

***A WARNING DECAL is provided by WESTERBEKE and should be fixed to a bulkhead near your engine or generator.***

***WESTERBEKE also recommends installing CARBON MONOXIDE DETECTORS in the living/sleeping quarters of your vessel. They are inexpensive and easily obtainable at your local marine store.***



## 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 servicing 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 manifold/water-injected elbow is securely attached.
- Be sure the unit and its surroundings are well ventilated. Run blowers when running the generator set or engine.
- Don't run the generator set or engine unless the boat is equipped with a functioning marine carbon monoxide detector that complies with ABYCA-24. 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	Inability to think coherently
Dizziness	Throbbing in temples
Headache	Muscular twitching
Nausea	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.

### ENGINE INSTALLATIONS

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

Sections of the ABYC standards of particular interest are:

- H-2 Ventilation
- 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  
3069 Solomon's Island Rd.  
Edgewater, MD 21037

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

Order from:

NFPA  
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.



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# 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 engine 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. Also, if you are planning to install this equipment yourself, contact your WESTERBEKE dealer for WESTERBEKE'S Installation Manual.

## WARRANTY PROCEDURES

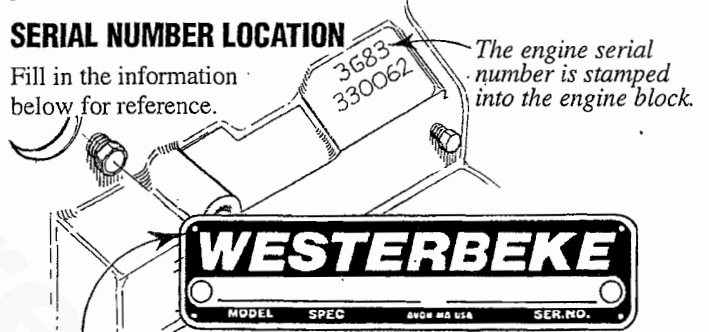
Your WESTERBEKE Warranty is included in a separate folder. If you have not received a customer identification card registering your warranty 60 days after submitting the warranty registration form, please contact the factory in writing with model information, including the unit's serial number and commission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

**WESTERBEKE CANNOT BE RESPONSIBLE FOR THE CONTENT OF SUCH SOFTWARE, MAKES NO WARRANTIES OR REPRESENTATIONS WITH RESPECT THERETO, INCLUDING ACCURACY, TIMELINESS OR COMPLETENESS THEREOF AND WILL IN NO EVENT BE LIABLE FOR ANY TYPE OF DAMAGE OR INJURY INCURRED IN CONNECTION WITH OR ARISING OUT OF THE FURNISHING OR USE OF SUCH SOFTWARE.**

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

Fill in the information below for reference.




The engine serial number is stamped into the engine block.

The engine model number and serial number are printed on a decal on the engine manifold.

The generator serial number is stamped on the top of the generator housing.

The generator specifications are printed on a decal on the side of the generator.

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. ....		



**Customer Identification**

WESTERBEKE OWNER  
MAIN STREET  
HOMETOWN, USA

Model                      Ser. #  
Expires

## Customer Identification Card (Typical)

The WESTERBEKE serial number is an alphanumeric number that can assist in determining the date of manufacture of your WESTERBEKE engine/generator. The first character indicates the decade (A=1960s, B=1970s, C=1980s, D=1990s E=2000s), the first number represents the year in the decade, and the second and third numbers represent the month of manufacture.

## PRODUCT SOFTWARE

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





## INTRODUCTION

### 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.*

**NOTE:** *A carbon monoxide warning decal has been provided by WESTERBEKE. Affix this decal in a visible location in the engine room.*

### 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 filter 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.

### 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.*

### 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 backend.



## FUEL, ENGINE OIL AND ENGINE COOLANT

### CARE OF THE FUEL SUPPLY

**⚠ 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.*

Use only clean fuel! 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 good well known brand of oil and try to stay with the brand you select.

Use "ONLY" SAE 40W oil with an API code of SJ or better in this engine. Do Not use any multi grade oils.

Change the engine's lube oil and oil filter after the initial 50 hours of break-in operation and then every 100 hours of operation there after.

**⚠ 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, when possible. Distilled water is free from the chemicals that can corrode internal engine surfaces.

The antifreeze performs double duty, as 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 pre-mixed before being poured into the cooling circuit.

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

#### ANTIFREEZE PROTECTION CHART

Antifreeze concentration	23%	30%	35%	50%
Freezing Temperature	14° F	8° F	-4° F	-40° F
	(-10°C)	(-13°C)	(-20°C)	(-40°C)

### 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

### GENERATOR CONTROL PANEL

The ON and START/STOP switches are the only functional components to operate the generator at the engine. Both switches are used to start the generator - see *Starting the Generator* under *OPERATING INSTRUCTIONS*.

The ON switch is a two-position switch with momentary contacts in the up (*on*) position and a stationary contact function in the center position. This switch energizes the fuel pump.

The START/STOP switch is a three-position switch with momentary contacts in the up (*start*) position and a stationary contact function in the center and down (*stop*) positions. The center (*normal*) position allows the generator to be run, once started, and also enables the remote panel(s) to control the start/stop functions. The up (*start*) position starts the generator and once released, reverts to the center position. The down (*stop*) position stops the engine in normal operation as well as in an emergency situation, as it opens the K2 relay which de-energizes the run circuit and shuts down the engine (unlike the remote panel stop switch) controls power to the starter, fuel pump, and ignition relay coils, thus stopping the engine should a malfunction occur. During times when maintenance is being performed on the generator, the START/OFF switch should be placed in the stationary (*off*) position. This will disable the remote control panel(s), preventing attempts to start the generator from their locations. However, it is always best to remove the F1 fuse to prevent accidental starting .

### REMOTE PANEL

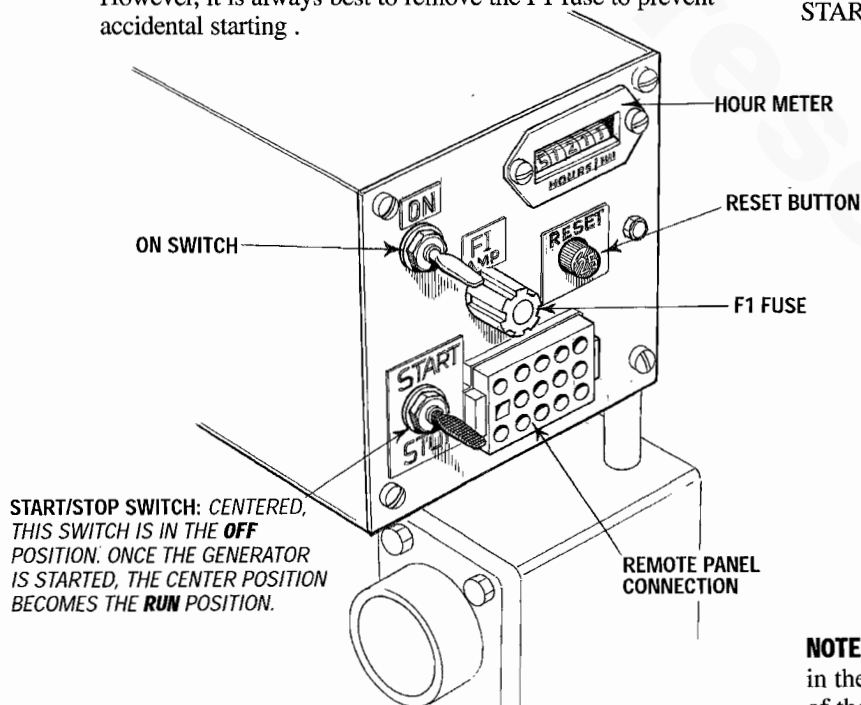
There are three functional components on the remote panel for generator operation:

1. ON switch
1. START/STOP switch
2. Green LED indicator light

The ON switch is a two-position switch with momentary contacts in the up (*on*) position and a stationary contact function in the center position. This switch energizes the fuel pump.

The START/STOP switch is a three-position switch with momentary contact functions in the up (*start*) and down (*stop*) positions, and a stationary contact function in the center position. The center position is a dual OFF/RUN mode position and is normally in the *off* mode. When in the *start* (up) position, this switch starts the generator (together with the ON switch in the up position) and once released, reverts to the center position, *run* mode. When in the *stop* (down) position, this switch stops the generator, and once released, reverts to the center position, *off* mode.

The Green LED indicator light indicates the engine running condition. It lights when the ON switch is moved to the *start* position, dims when the engine is cranking, and brightens when the engine starts, notifying the operator to release the START switch.



REMOTE PANEL

**NOTE:** Refer to *OPERATING INSTRUCTIONS* in the following pages for the operation of these panels.

## 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.

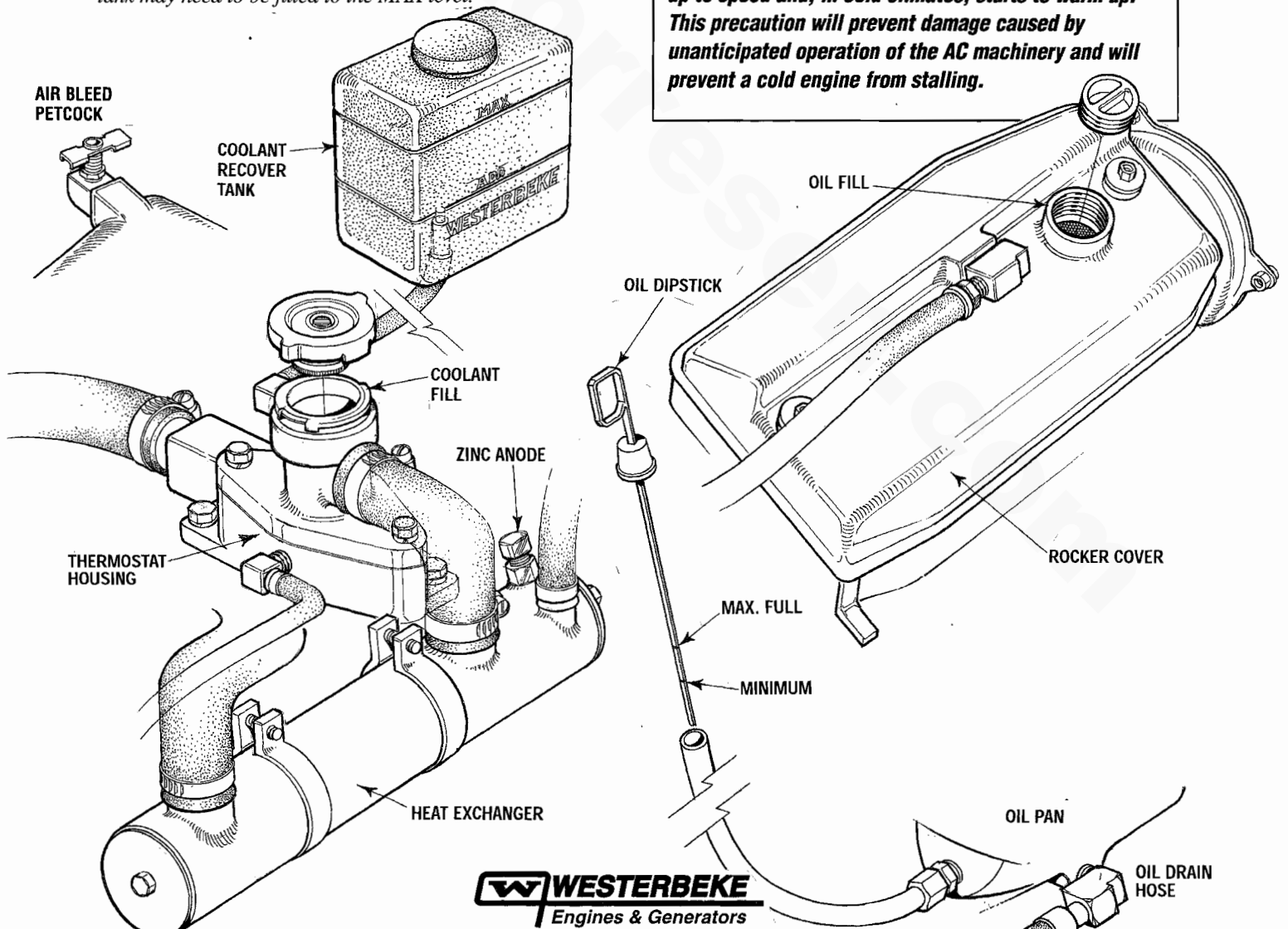
**NOTE:** During the initial filling of the cooling system, the air bleed petcock on the manifold should be opened to purge air from the engine block. Once coolant, free of air bubbles, flows from the petcock - close the petcock.

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.
- Make certain the raw water thru-hull is open.

**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.



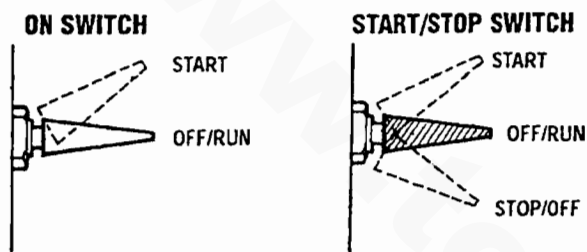
## OPERATING INSTRUCTIONS

### GENERATOR CONTROL PANEL

#### Starting the Generator

To start the generator, hold the momentary ON switch in the up (on) position, then hold the momentary START/STOP switch in the up (start) position (both switches are held up together). After approximately one second, the starter will engage and the engine will crank. Once the engine is running, the starter will disengage, and the START/STOP switch may then be released to return to its center (run mode) position. Continue holding the ON switch until the engine has sufficient oil pressure, then release it to its center position.

**NOTE:** Should the engine fail to start, release both switches, wait 20 seconds, and try again. Never run the starter more than 20 seconds at a time.



#### Starting Under Cold Conditions

Make certain the lubricating oil conforms with the ratings for the prevailing temperature. Check the table under *ENGINE LUBRICATING OIL*. The battery should be fully charged to minimize voltage drop.

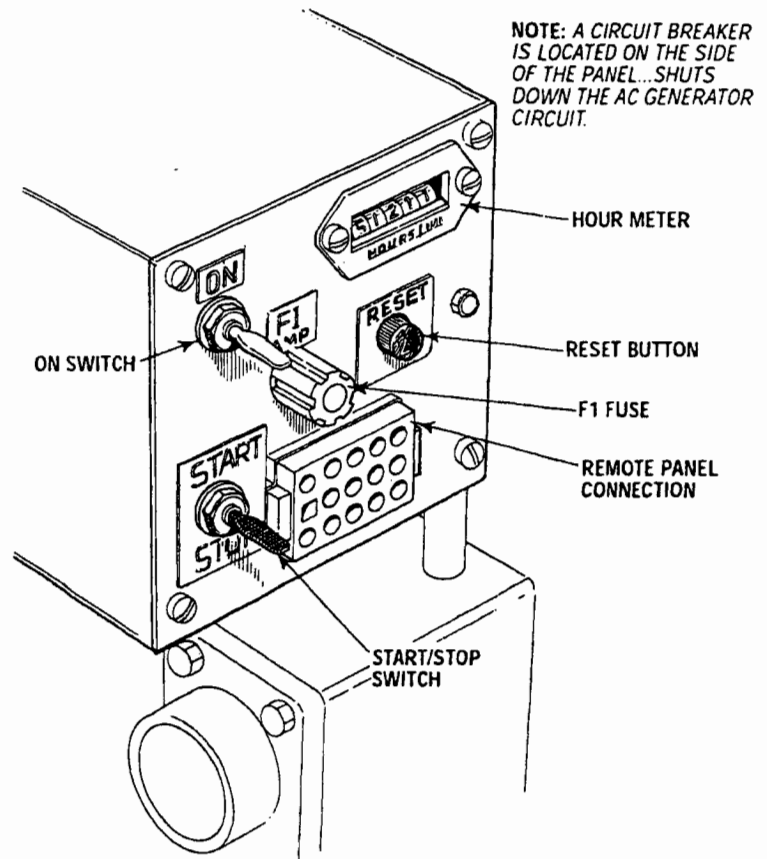
#### Stopping the Generator

To stop the generator, move the momentary START/STOP switch to the down (stop) position then release it to the center (off/run mode) position. This will de-energize the K2 run relay in the generators control panel and stop the generator.

#### EMERGENCY STOPPING

If the generator does not stop using the START/STOP switch, remove the F1 fuse or disconnect the battery.

**CAUTION:** Prolonged cranking intervals without the engine starting can result in the engine exhaust system filling 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.



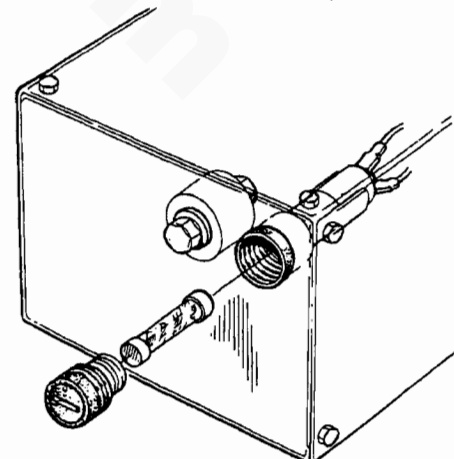
#### Abnormal Stop

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. Over speed condition.
2. High engine temperature.
3. Low oil pressure.
4. High exhaust temperature.

Should a fault condition occur, the engine will shutdown. On the remote panel, the green LED light will turn off indicating an engine shutdown. Once detected, the fault should be located and corrected (see *ENGINE TROUBLESHOOTING*).

**NOTE:** A 30 amp fuse is located at the rear of the control box. This fuse provides protection for the battery charging circuit.



## OPERATING INSTRUCTIONS

### REMOTE PANEL

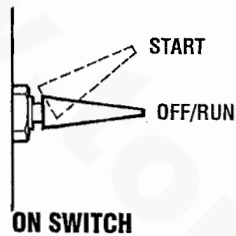
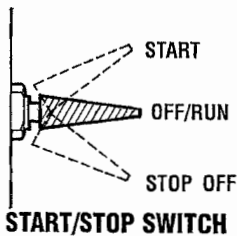
#### Starting the Generator

To start the generator, hold the momentary ON switch in the up (*on*) position (the green light will come on), then hold the momentary START/STOP switch in the up (*start*) position (both switches are held up together). After approximately one second, the starter will engage and the engine will crank (the green light will dim). Once the engine is running (the green light will brighten), the starter will disengage, and the START/STOP switch may then be released to return to its center (*run* mode) position. Continue holding the ON switch until the engine has sufficient oil pressure, then release it to its center position.

**NOTE:** Should the engine fail to start, release both switches, wait 20 seconds, and try again. Never run the starter more than 20 seconds at a time.



REMOTE PANEL



#### Stopping the Generator

To stop the generator, move the momentary START/STOP switch to the down (*stop*) position then release it to the center (*off/run* mode) position. This will de-energize the K2 run relay in the generator's control panel and stop the generator.

## 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 rpm 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 belt for wear and proper tension (weekly).
- Check for abnormal noise such as knocking, vibration and blow-back 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 GENERATOR INFORMATION).

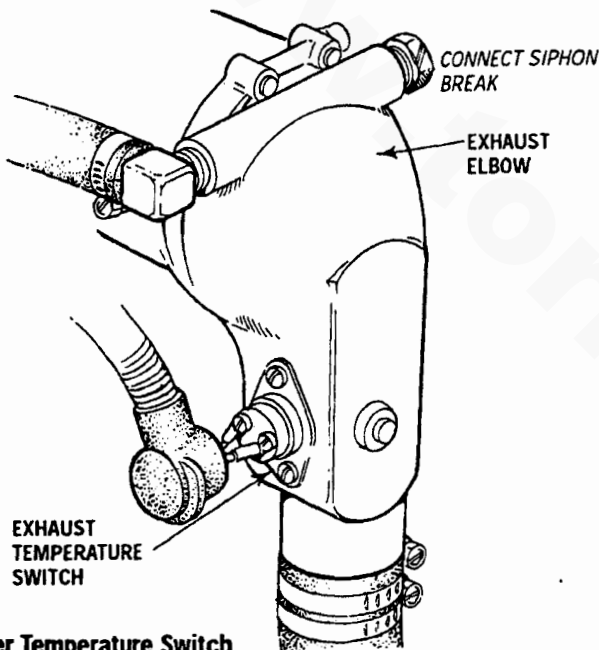
**SAFETY SHUTDOWN SWITCHES**

The engine is protected by a variety of 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:

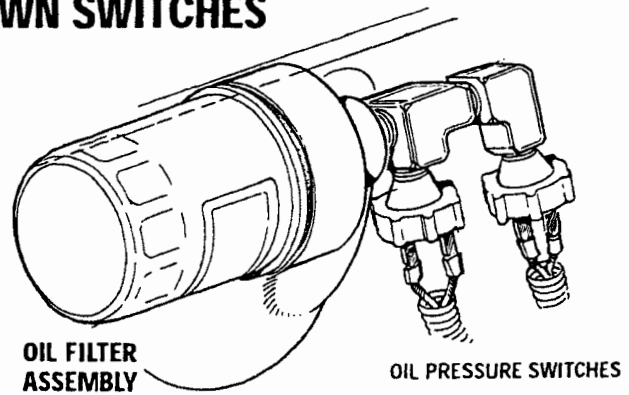
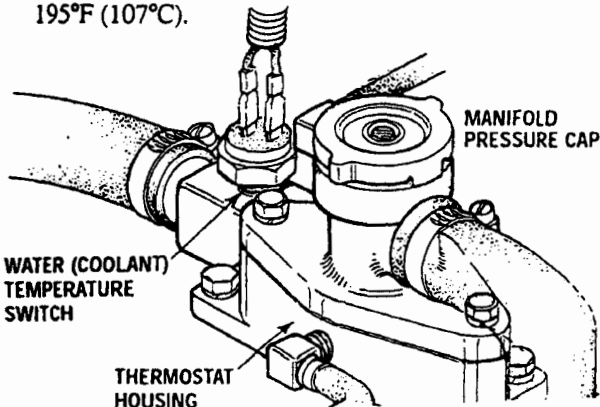
**Exhaust Temperature Switch**

An exhaust temperature switch is located on the exhaust elbow. Normally closed, this switch will open and interrupt the DC voltage to the K2-run relay (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).



**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 to the K2 run relay thereby shutting off the engine. This switch resets at 195°F (107°C).



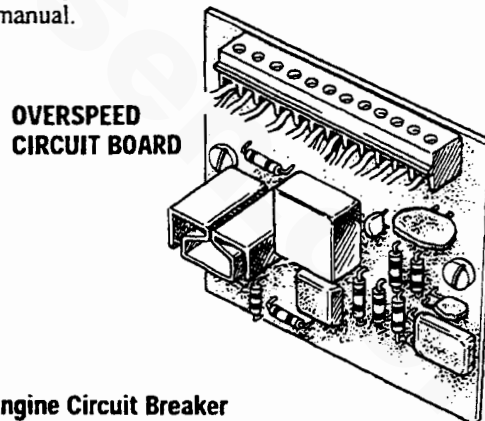
**Low Oil Pressure Switch**

Dual low oil pressure switches are located off the engine's oil gallery manifold. One is normally open when the engine is in a static state. This switch functions in the automatic shutdown circuit when the unit is operating (5 psi rating). The second oil pressure switch is installed *only* on SEA RAY spec. generators. This switch is normally closed and functions in their low oil pressure alarm system (10 psi rating).

Should the oil pressure drop to 10 psi while the generator is operating, the SEA RAY spec. switch will close activating their low oil pressure alarm. Should the oil pressure drop further to 5 psi, the automatic shutdown circuit switch will open interrupting DC voltage to the K2 run relay thereby shutting off the generator.

**High RPM Shutdown Switch**

An overspeed switch in the DC circuit shuts off the generator's engine by interrupting DC voltage to the K2 run relay if the engine's speed runs to high. After correcting the problem, this switch can be reset by momentarily depressing the stop switch. Refer to the *WIRING DIAGRAMS* in this manual.



**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 to the K2-run relay. If this should occur, check and repair the source of the problem. After repairing the fault, reset the breaker and restart the generator.





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



## MAINTENANCE SCHEDULE

**NOTE:** Use the engine 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	
Heat Exchanger		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	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				<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	Remove pump cover and inspect impeller for wear; replace if needed. Also replace gasket. Lubricate both when reassembling.
Coolant System						<input type="checkbox"/>			Drain, flush, and refill cooling system with appropriate antifreeze mix.
*Starter Motor					<input type="checkbox"/>			<input type="checkbox"/>	Check solenoid and motor for corrosion. Remove and lubricate. Clean and lubricate the start motor pinion drive.
Distributor		<input type="checkbox"/>			<input type="checkbox"/>				Check ignition timing. Check condition of distributor cap and rotor.
*Engine Cylinder Compression and Valve Clearance					<input type="checkbox"/>			<input type="checkbox"/>	Incorrect valve clearance will result in poor engine performance; check compression pressure and timing, and adjust valve clearances.
*Engine Timing Belt					<input type="checkbox"/>				Remove and replace every 1000 hours. <b>Note:</b> Failure to replace the timing belt at the recommended interval could result in timing chain failure resulting in major damage to the engine.
*Exhaust Elbow					<input type="checkbox"/>				Test exhaust elbow for casting integrity. Replace if casting is corroded or deteriorated. <b>WARNING:</b> A defective exhaust elbow can cause carbon monoxide leakage!
Carburetor Drip Tray									Inspect and drain at regular intervals. Do not allow fuel to collect in drain.

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



## COOLING SYSTEM

### FRESH WATER COOLING CIRCUIT

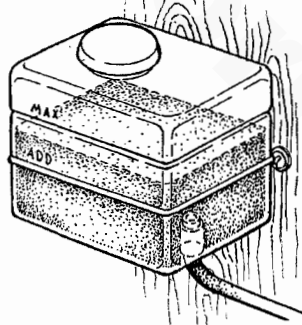
**NOTE:** Refer to the *ENGINE COOLANT* section for the recommended antifreeze and water mixture to be used as the fresh water coolant.

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.

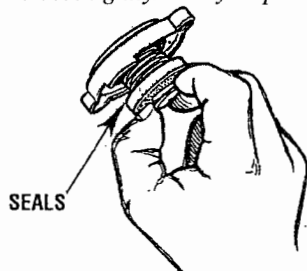
### Coolant Recovery Tank

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.

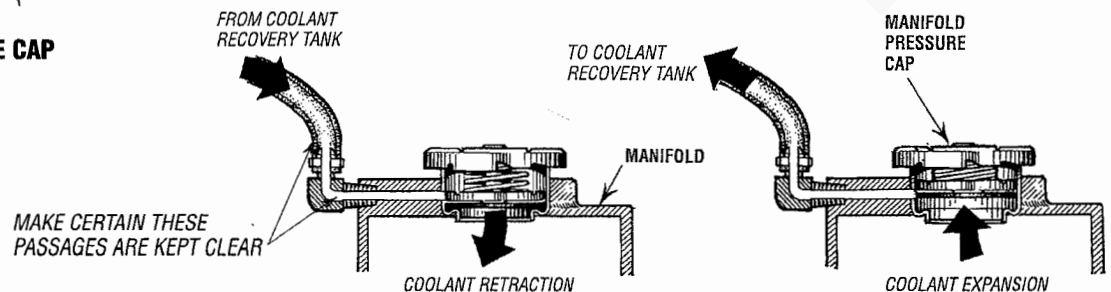
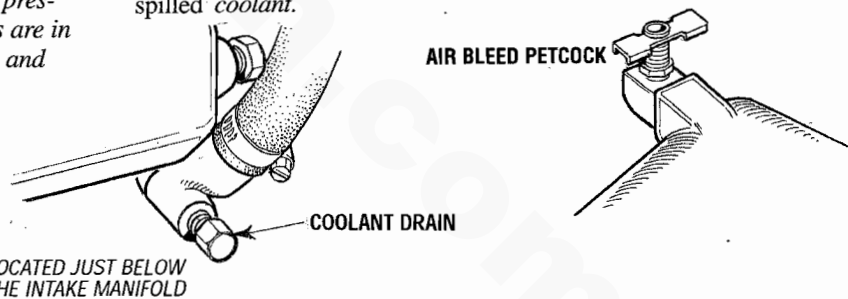
**COOLANT RECOVERY TANK**



**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.



**CHECKING THE PRESSURE 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 removing the drain plug and opening the manifold pressure cap. Flush the system with fresh water, then reinstall the drain and start the refill process.

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

### Refilling the Coolant

After replacing the engine drain plug, open the air bleed petcock on the exhaust manifold and slowly pour clean, premixed coolant into the manifold.

Monitor the coolant in the manifold and add as needed. Fill the manifold neck. Once coolant begins flowing from the air bleed petcock free of air bubbles, close the petcock 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.

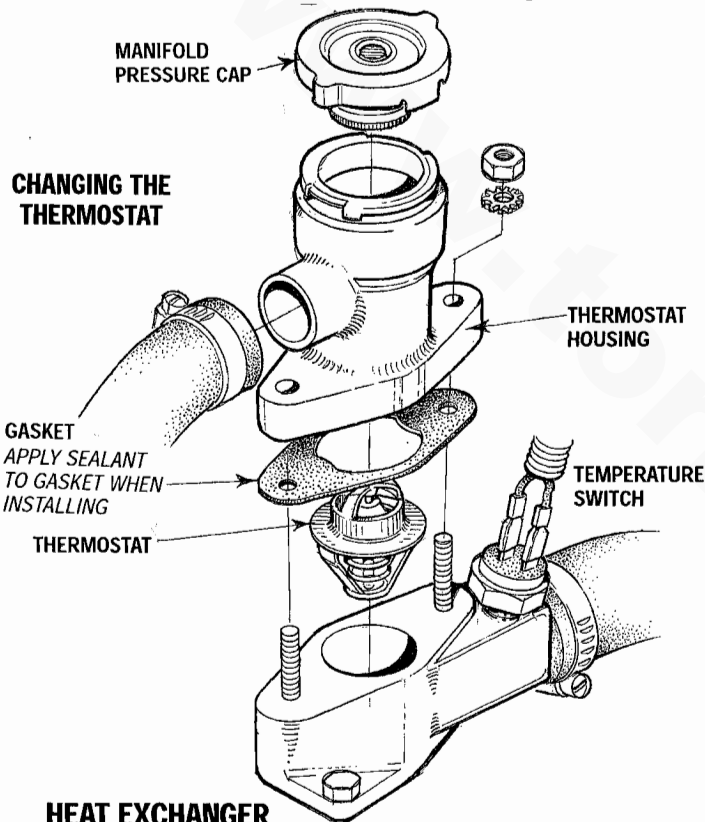
After checking for leaks, stop the engine and allow it to cool. Coolant should draw back into the cooling system as the engine cools down. Add coolant to the recovery tank if needed and check the coolant in the manifold. Clean up any spilled coolant.

## 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 around 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.

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"



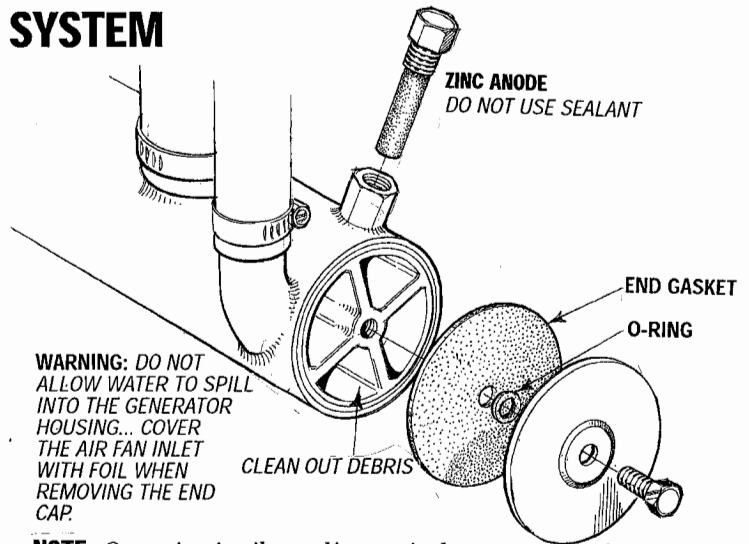
### HEAT EXCHANGER

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 through 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 than every 1000 hours.

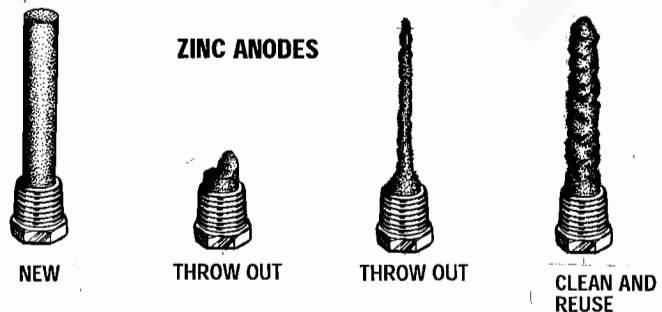
### ZINC ANODE

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 of it. 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 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.



## COOLING SYSTEM

### RAW WATER INTAKE STRAINER

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

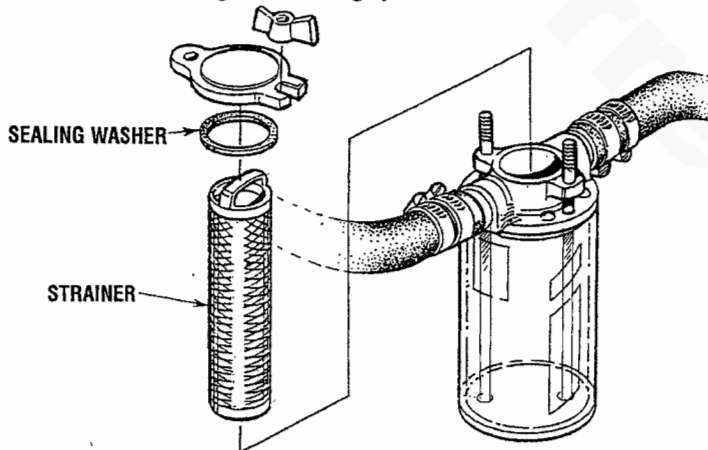
A clean raw water intake strainer is a vital component of the engine's cooling system. Include a visual inspection of this strainer when making your periodic engine check. The water in the glass should be clear.

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 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 COOLING CIRCUIT

The raw water flow is created by a positive displacement impeller pump. This pump draws water directly from the raw water source (ocean, lake, or river) through a hose to the water strainer. The raw water passes from the strainer through the raw water pump to the heat exchanger (through the heat exchanger tubes) where it cools the engine circulating fresh water coolant. The raw water is then discharged into the water-injected exhaust elbow, mixing with and cooling the exhaust gasses. This mixture of exhaust gas and raw water is discharged overboard by the engine's exhaust gas discharge pressure.

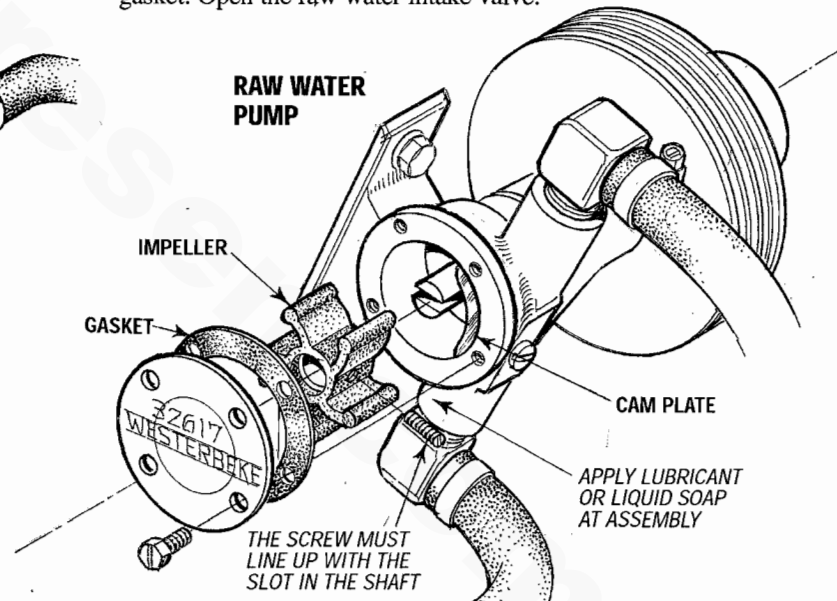
### RAW WATER PUMP

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*.

**NOTE:** Should a failure occur with the pump's internal parts (seals and bearings), it may be more cost efficient to purchase a new pump and rebuild the original pump as a spare.

### 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 located to prevent blockage in the cooling circuit. They often can be found in the heat exchanger.

## 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.*

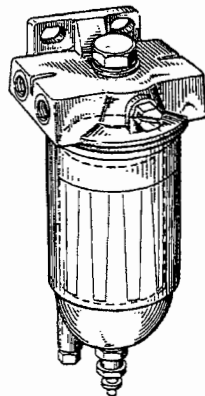
**⚠ WARNING:** *Shut off the fuel valve at the tank when servicing the fuel system. Take care in catching any fuel that may spill. DO NOT allow any smoking, open flames or other sources of fire near the fuel system when servicing. Ensure proper ventilation exists when servicing the fuel system.*

### 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 contaminant's 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 contaminant's 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.



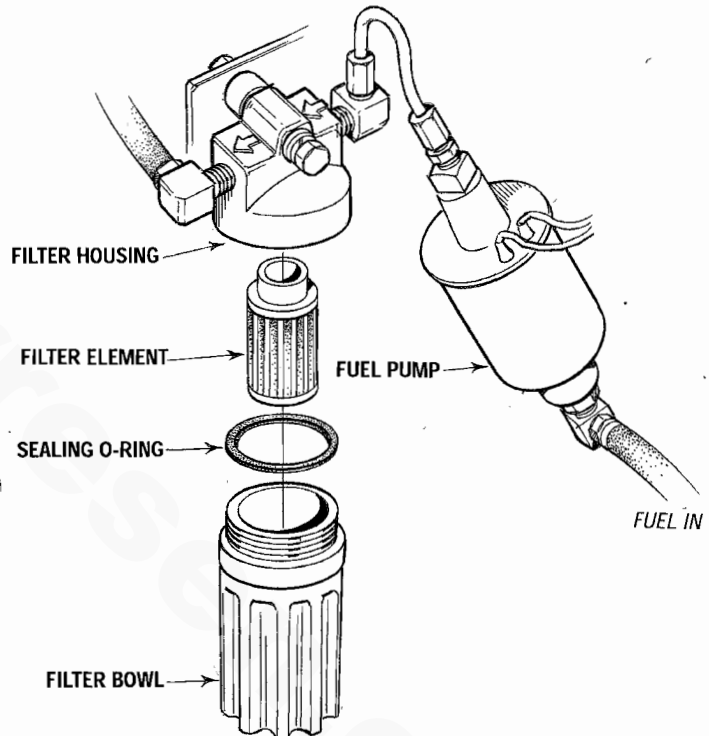
**GASOLINE/WATER SEPERATOR & FILTER**  
OWNER INSTALLED

### ENGINE FUEL FILTER

Periodically check the fuel connections and the bowl for leakage. Replace the filter element after the first 50 hours then follow the *MAINTENANCE SCHEDULE*.

#### Changing/cleaning the filter element.

1. Shut the fuel supply off.
2. Unscrew the filter bowl from the housing.
3. Pull the fuel element down and off.
4. Inspect the sealing O-ring and replace if necessary.
5. Install a new filter element and reassemble the bowl.
6. Screw the bowl on tightly 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.*

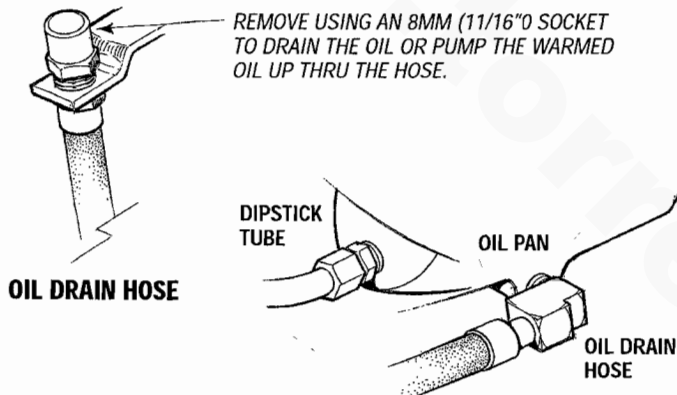
## ENGINE OIL

### ENGINE OIL CHANGE

1. **Draining the Oil Sump.** Discharge the used oil through the sump drain hose (attached to the front of the engine) while the engine is warm. Drain the used oil completely, replace the hose in its bracket, and replace the end cap securely.

**NOTE:** Thread size for the lube oil drain hose capped end is 1/4 NPT.

Always observe the used 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 qualified mechanic should water be 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 of raw water through the raw water cooling circuit into the exhaust, filling the engine. This problem is often caused by the absence of an anti-siphon valve, its poor location or lack of maintenance.

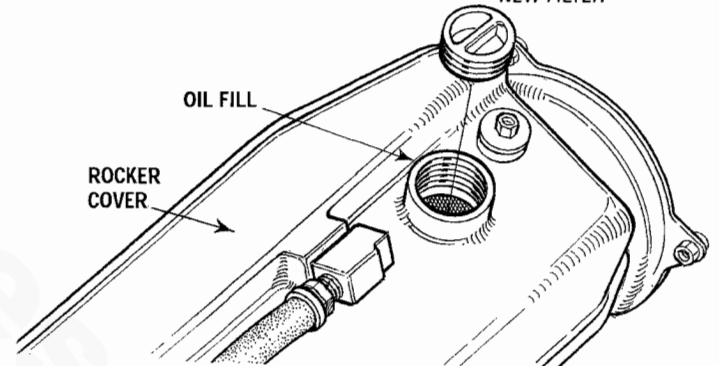
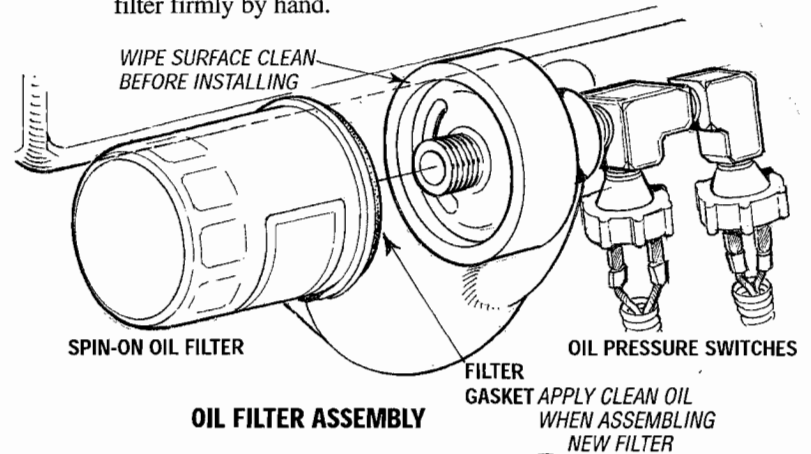


2. **Replacing the Oil Filter.** When removing the used oil filter, you may find it helpful and cleaner to punch a hole in the upper and lower portion of the old filter to drain the oil from it into a container before removing it. This helps to lessen spillage. A small automotive filter wrench should be helpful in removing the old oil filter.

**NOTE:** Do not punch this hole without first loosening the filter to make certain it can be removed.

Place some paper towels and a plastic bag around the filter when unscrewing it to catch any oil left in the filter. (Oil or any other fluid on the engine reduces the engine's cooling ability. Keep your engine clean.) 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 filter bracket, gently remove it.

When installing the new oil filter element, wipe the filter gasket's sealing surface on the bracket free of oil and apply a thin coat of clean engine oil to the rubber gasket on the new oil filter. Screw the filter onto the threaded oil filter nipple on the oil filter bracket, and then tighten the filter firmly by hand.



**NOTE:** Generic filters are not recommended, as the material standards or diameters of important items on generic parts might be entirely different from genuine parts. Immediately after an oil filter change and oil fill, run the engine to make sure the oil pressure is normal and that there are no oil leaks around the new oil filter.

3. **Filling the Oil Sump.** After refilling, run the engine for a few moments while checking the oil pressure. Make sure there is no leakage around the new oil filter or from the oil drain system, and stop the engine. Then check the quantity of oil with the lube oil dipstick. Fill to, but not over the high mark on the dipstick, should the engine require additional oil.

**CAUTION:** 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.

The DC Circuit on the BCGB functions to start, operate and stop the generator's engine. The circuit is best understood by reviewing the DC Wiring Diagram and Wiring Schematic. The engine's DC wiring is designed with three simple basic circuits: start, run and stop.

The engine has a 12 volt DC electrical control circuit that is shown on the Wiring Diagrams. Refer to these diagrams when troubleshooting or when servicing the DC electrical system or the engine.

**BATTERIES**

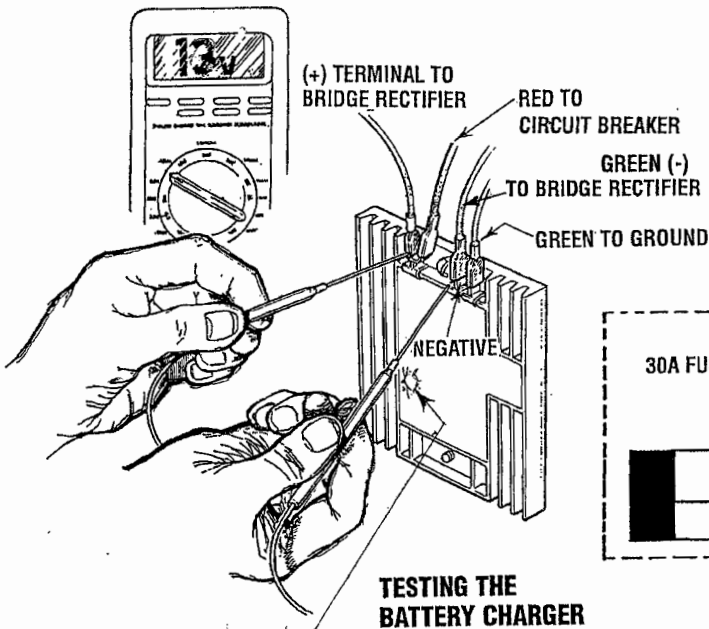
**CAUTION:** To avoid damage to the battery charging circuit, never shut off the engine battery switch while the engine is running. Shut off the engine battery switch, however, to avoid electrical shorts when working on the engine's electrical circuit.

**Specifications**

The recommended capacity of the "dedicated" starting battery used for the engine's 12VDC circuit is 600-800 C.C.A.

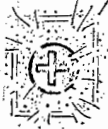
**BATTERY CHARGER**

The generator supplies a continuous 17 amp charge from its battery charger to the starting battery. To test the battery charger, put a multimeter between the positive (+) and negative (-) leads to the battery. It should indicate 13.0V to 13.4V with the engine running. If only the battery voltage is indicated, check that the battery charger terminal connections are tight. With the unit running, test between the (+) and (-) terminals for 13.0V to 13.4V. If no charge is indicated, replace the charger.



DEVIATION OUTPUT ADJUSTMENT POT

C.W TO INCREASE  
 C.C.W TO DECREASE

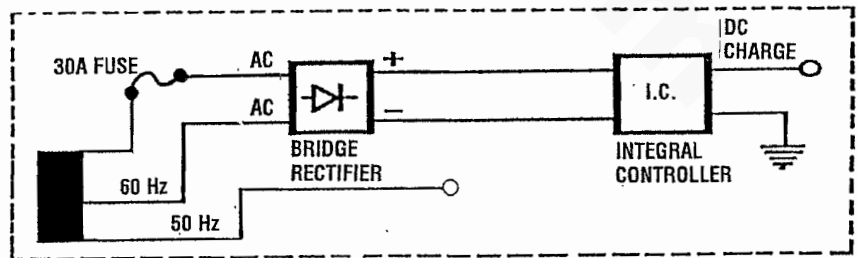
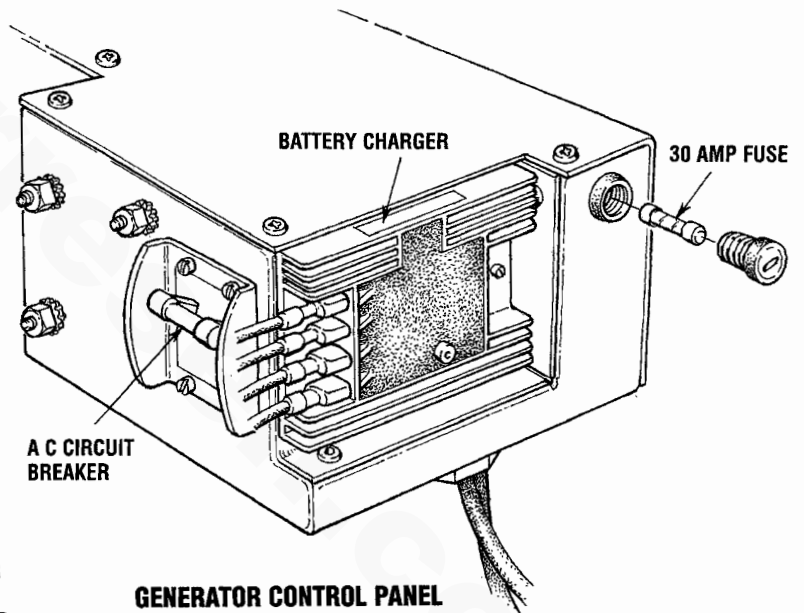


**Battery Maintenance**

Review the manufacturer's recommendations and then establish a systematic maintenance schedule for your engine's starting batteries and house batteries.

- Monitor your voltmeter for proper charging during engine operation.
- Check the electrolyte level and specific gravity with a hydrometer.
- Use only distilled water to bring electrolytes to a proper level.
- Make certain that battery cable connections are clean and tight to the battery posts (and to your engine).
- Keep your batteries clean and free of corrosion.

**WARNING:** Sulfuric acid in lead batteries can cause severe burns on skin and damage clothing. Wear protective gear.





# ELECTRONIC GOVERNOR

## Electronic Governor System

The system is composed of three basic components:

1. **Controller:** Mounted in the instrument panel.
2. **Sensor:** Installed on the bellhousing over the flywheel ring gear.
3. **Actuator:** Mounted at the front of the engine and attached with linkage to the throttle arm of the injection pump.

## Controller Adjustment

1. **Speed.** This adjustment is used to raise or lower the engine's speed to the desired hertz.
2. **Gain.** This adjustment affects the reaction time of the actuator to the generator/engine load changes.

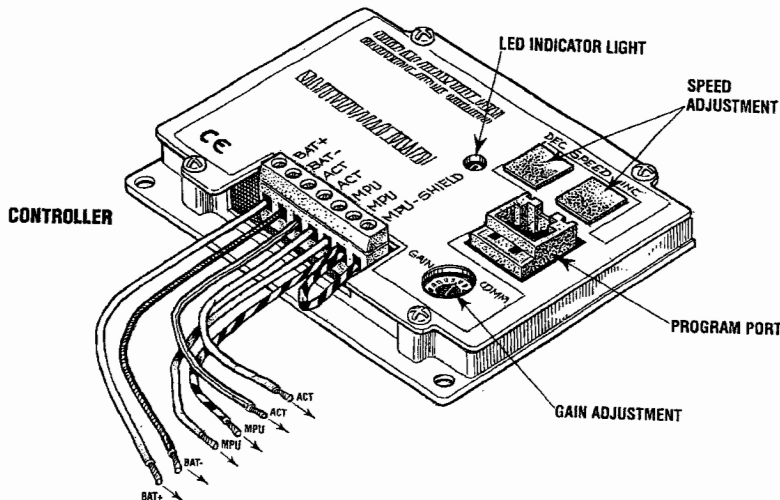
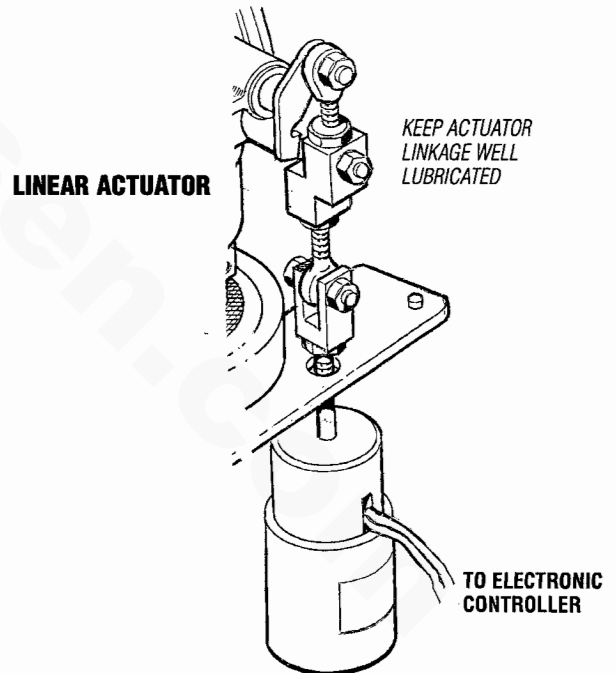
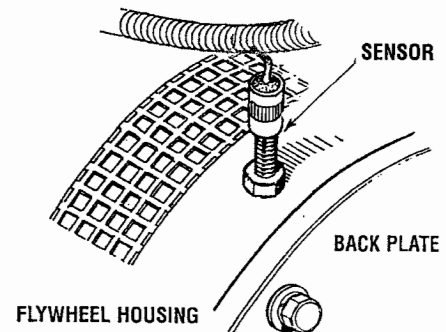
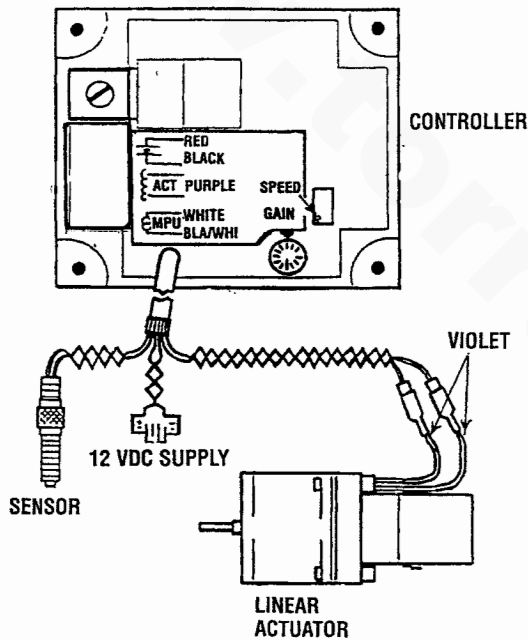
**NOTE:** A high gain adjustment can induce an oscillating of the actuator producing a hunting mode. In such cases, lessen the gain adjustment.

## Calibration

1. With no power to the governor, adjust the GAIN to 9:00 o'clock.
2. Start the engine and adjust the speed by turning the speed pot clockwise to desired speed.

**NOTE:** Controllers are factory adjusted to minimum rpm. However, for safety, one should be capable of disabling the engine if an overspeed should exist.

3. At no-load, turn the GAIN potentiometer clockwise until the engine begins to hunt. If the engine does not hunt, physically upset the governor linkage.
4. Turn the GAIN potentiometer counterclockwise until stable.



## TROUBLESHOOTING THE ELECTRONIC GOVERNOR

PROBLEM	TEST/CHECK	CORRECTION
<p>Unit starts, then overspeeds and shuts down.</p> <p><b>NOTE:</b> When troubleshooting, manually operate the throttle to prevent an overspeed or disconnect the throttle from the actuator and operate manually.</p>	<ol style="list-style-type: none"> <li>1. Check DC voltage between terminal #12 and + connection on hourmeter when ON switch is depressed.</li> <li>2. Check the AC signal from the MPU while cranking, voltage should be 1.5 - 2.5 VAC.</li> <li>3. Check the actuator.</li> <li>4. Check the controller.</li> </ol>	<ol style="list-style-type: none"> <li>1. Charge starting battery. Start unit, troubleshoot battery, charge circuit.</li> <li>2. Check the MPU resistance value and positioning. Adjust and replace as needed.</li> <li>3. Check the resistance value. Apply 12VDC across leds. Should fully retract. Replace as needed.</li> <li>4. Manually control unit. Start and check DC voltage between #9 and #8, between #11 and #10. Replace controller or OS board as needed.</li> </ol>
<p>Unit starts, runs at idle.</p> <p><b>NOTE:</b> Less than one volt DC found between terminals #9 and #8 and high DC voltage-10 volts or higher between terminals #11 and #10 indicated a faulty controller.</p>	<ol style="list-style-type: none"> <li>1. Incorrect speed adjustments..</li> <li>2. Faulty governor controller..</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and adjust speed adjustment.</li> <li>2. Check DC voltages from controller to O/S board and O/S board to actuator.</li> </ol>
<p>Actuator hunts during operation.</p> <p><b>NOTE:</b> Check carburetor adjustments before proceeding.</p>	<ol style="list-style-type: none"> <li>1. Improper controller adjustment.</li> <li>2. Linkage or rod end bearings are sticking or binding.</li> <li>3. Inadequate DC supply voltage.</li> <li>4. MPU positioned marginally too far away from the flywheel teeth, giving an erratic AC input signal to the controller.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lessen GAIN adjustment.</li> <li>2. Lubricate and replace as needed.</li> <li>3. Manually stabilize the unit. Check the DC voltage to the controller. Correct as needed.</li> <li>4. Check the MPU signal. Adjust positioning as needed.</li> </ol>



## CARBURETOR ADJUSTMENTS

### CARBURETOR

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

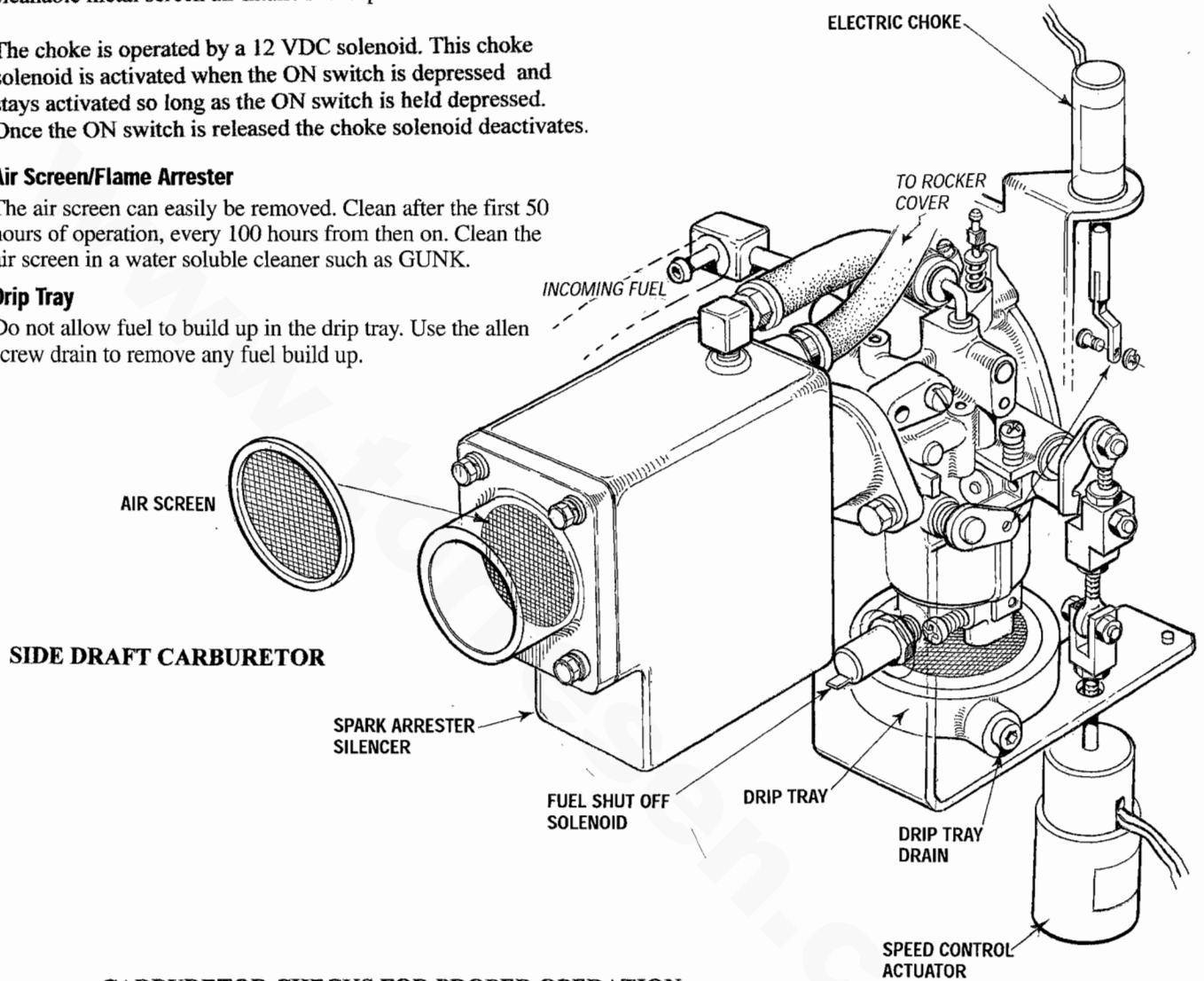
The choke is operated by a 12 VDC solenoid. This choke solenoid is activated when the ON switch is depressed and stays activated so long as the ON switch is held depressed. Once the ON switch is released the choke solenoid deactivates.

#### Air Screen/Flame Arrester

The air screen can easily be removed. 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.

#### Drip Tray

Do not allow fuel to build up in the drip tray. Use the allen screw drain to remove any fuel build up.



### CARBURETOR CHECKS FOR PROPER OPERATION

1. The idle mixture screw adjustment. Remove the plastic limiter. Turn the mixture screw in till it seats. Then back it out 3 ½ turns. Once running adjust the screw no more than ½ turn in or out to further stabilize engine operation.
2. Verify that the choke mechanism flutters when the engine is cranking on a start. The choke return spring should rest against the actuator mounting bracket.
3. The throttle linkage's eye bolts need to be 2 5/8" apart (center to center). This should place the throttle full open when the unit is shut down.
4. Throttle actuator should move freely. Lubricate with Teflon or Graphite lubricant "only".
5. Carburetor inlet screen must be clean for good air flow into the engine.



## 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.

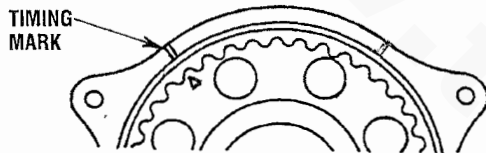
### TIMING BELT INSPECTION AND REPLACEMENT

#### Timing Belt Removal

**CAUTION:** Water or oil on the timing belt severely reduces the service life of the belt. Keep the timing belt sprocket and tensioner free of oil and grease. These parts should never be cleaned. Replace if seriously contaminated with dirt or oil. If oil is evident on these parts, check the front case, oil pump oil seals, and camshaft oil seals for a possible oil leak.

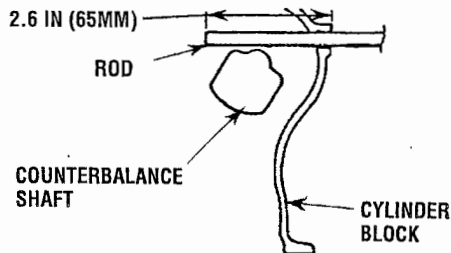
1. Turn the crankshaft clockwise to align the timing mark on the camshaft sprocket and timing belt rear cover.

**NOTE:** always turn the crankshaft clockwise.

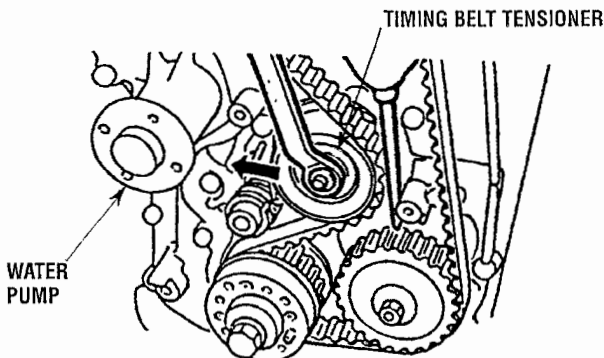


2. Remove the plug on the left surface of the cylinder block and insert a rod with a diameter of 8mm (0.31 in.) to lock the counterbalance shaft.

**NOTE:** Be sure to use an inserting rod with a diameter of 8mm (0.31 in.).

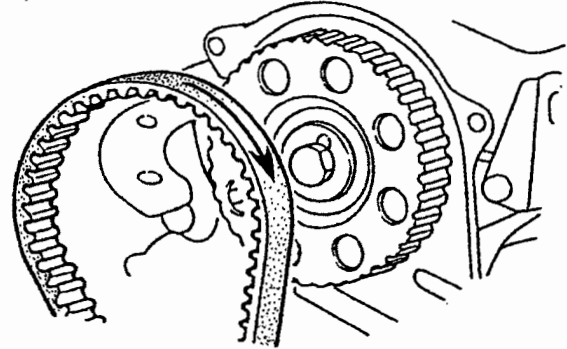


3. Loosen the timing belt tensioner nut.
4. Move the timing belt tensioner toward the water pump, and temporarily tighten the nut to hold the tensioner in that position.



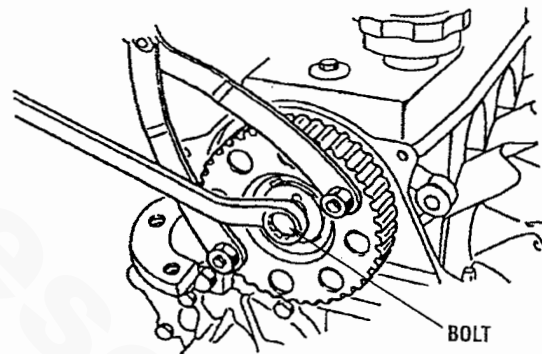
5. Remove the timing belt.

**NOTE:** If the timing belt is to be reused, draw an arrow on the belt back to indicate the direction of rotation (clockwise).



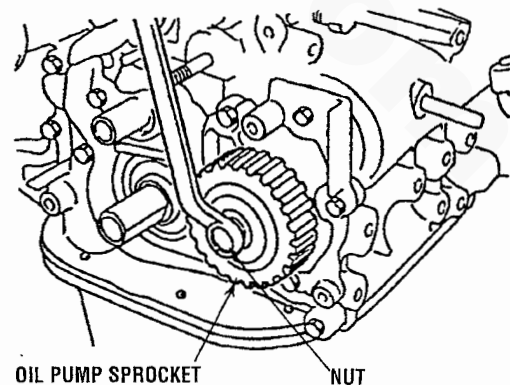
#### Camshaft Sprocket Removal

1. Remove the bolt without turning the camshaft.



#### Oil Pump Sprocket Flange Nut Removal.

1. Remove the plug from the left side of the cylinder block.
2. Insert an 8 mm (0.31 in.) diameter round bar to lock the counterbalance shaft.
3. Remove the nut.



## 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.

### Crankshaft Bolt Removal

1. Lock the crankshaft in position.

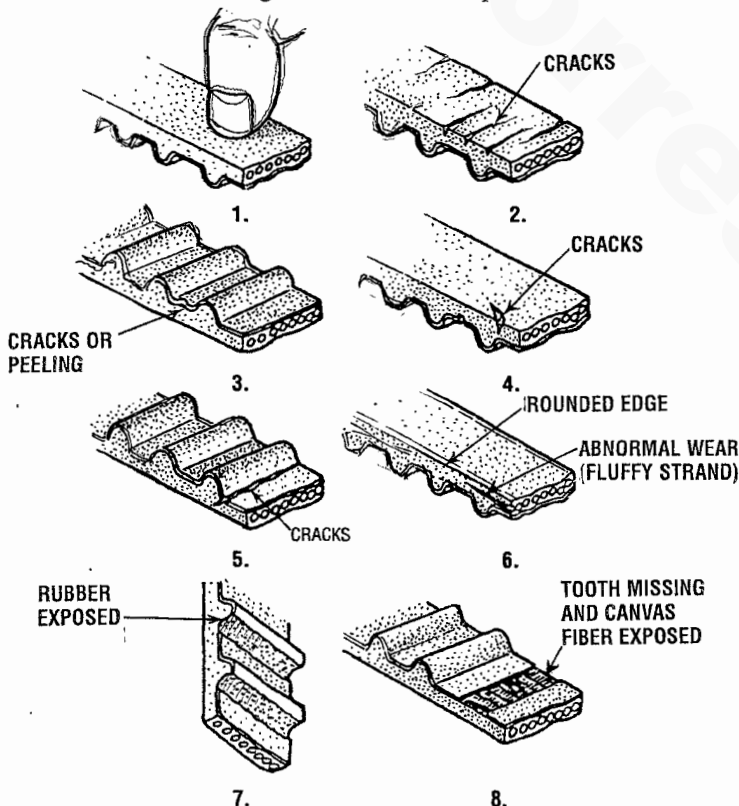
**NOTE:** Do not turn the crankshaft.

2. Remove the crankshaft bolt.

### Timing Belt Inspection

Replace the belt if any of the following conditions exist:

1. Hardening of back rubber-back side is glossy, without resilience, and leaves no indent when pressed with fingernail.
2. Cracks on rubber back.
3. Cracks or peeling of canvas.
4. Cracks on tooth bottom.
5. Cracks on belt.
6. Abnormal wear of belt sides. The sides are normal if they are sharp as if cut by a knife.
7. Abnormal wear on teeth.
8. Tooth missing and canvas fiber exposed.

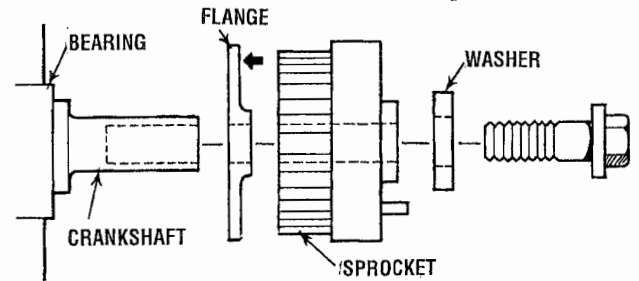


### Tensioner Inspection

1. Replace the tensioner if the pulley binds, rattles or is noisy when turned.

### Flange Installation

1. Mount the flange so that its side shown by the heavy arrow in the illustration faces toward the sprocket.



### Crankshaft Bolt Installation

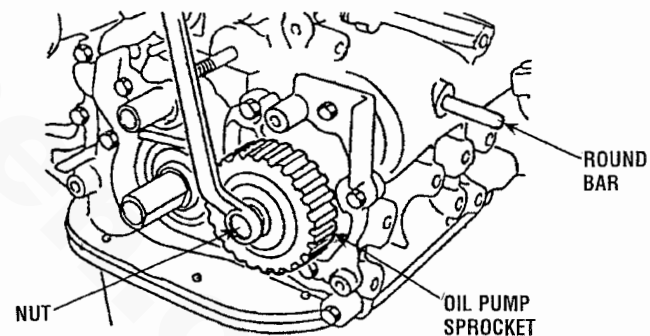
1. Lock the crankshaft.

**NOTE:** Do not turn the crankshaft.

2. Tighten the crankshaft bolt to the specified torque.

### Oil Pump Sprocket Flange Nut Installation

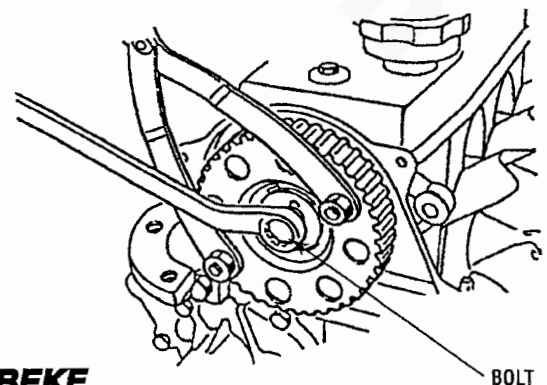
1. Insert a round bar into the plug hole in the left side of the cylinder block to keep the counterbalance shaft from turning.
2. Install the oil pump sprocket.
3. Tighten the nut to the specified torque.



### Camshaft Sprocket Bolt Installation

1. Tighten the bolt to the specified torque.

Bearing Cap Bolt Torque 36 40 ftlbs (50 -55 Nm)

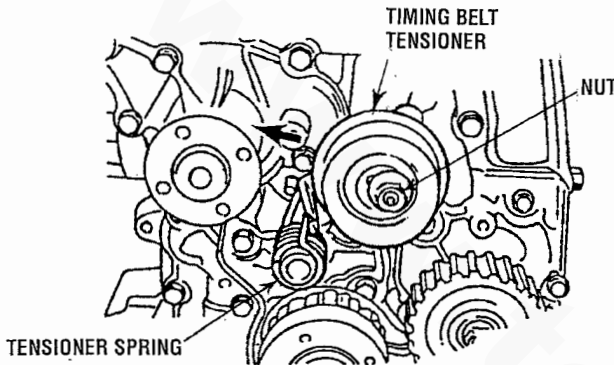


## ENGINE ADJUSTMENTS

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

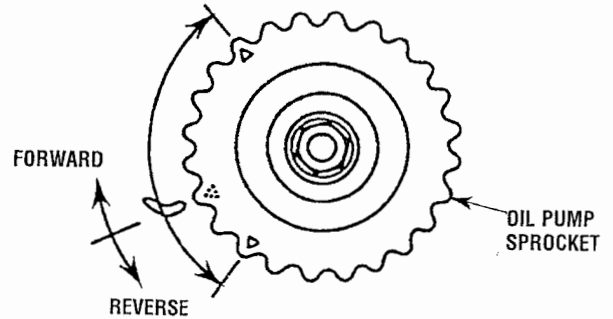
### Tensioner Spring/Timing Tensioner Installation

1. Install the tensioner spring and timing belt tensioner.
2. Hook the tensioner spring onto the bend of the timing belt tensioner bracket and the stopper pin on the cylinder block.
3. Move the timing belt tensioner as close as possible to the water pump; temporarily tighten the tensioner nut.



At this time, check that the moveable range of teeth on the oil pump sprocket is according to specifications.

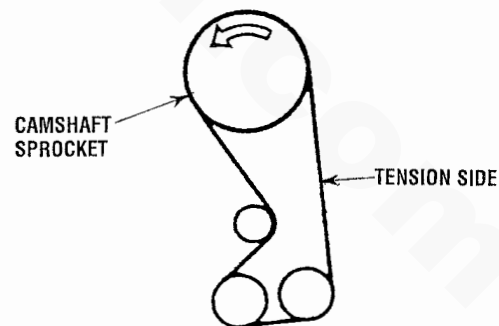
Standard value: 4 to 5 teeth in forward direction.  
1 to 2 teeth in reverse direction.



4. If the movable range of the oil pump sprocket exceeds the specified range, correct as follows:
  - a. Pull out the round bar from the plug hole in the left side of the cylinder block.
  - b. Turn the oil pump sprocket one turn at a time until the round bar can again be inserted.
  - c. Check that the movable range of the oil pump sprocket is in the specified value.
5. Set the timing belt over the crankshaft sprocket and then over the oil pump sprocket and camshaft sprocket, in that order.

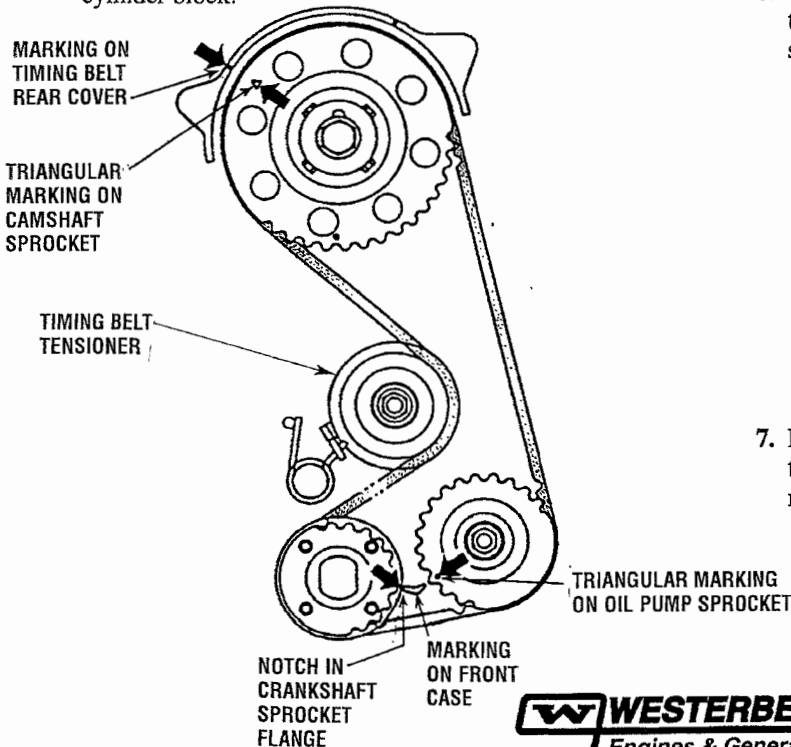
**NOTE:** Ensure that the tension side of the timing belt is not slack. Keep the round bar inserted until the timing belt has been placed. After this step, be sure to remove the round bar.

6. Apply counterclockwise force to the camshaft sprocket to make the belt taut on the tension side, and make sure that all timing marks are lined up.



### Timing Belt Installation

1. Align the triangular marking on the camshaft sprocket with a marking on the timing belt rear cover.
2. Align the notch in the crankshaft sprocket flange with the marking on the front case.
3. Align the triangular marking on the oil pump sprocket with the marking on the front case, and then insert a 65 mm (2.56 in.) or longer, 8 mm (0.31 in.) diameter round bar into the plug hole in the left side of the cylinder block.



7. Loosen the temporarily tightened tensioner nut on the water pump side 1 or 2 turns, and tension the belt making use of spring force.

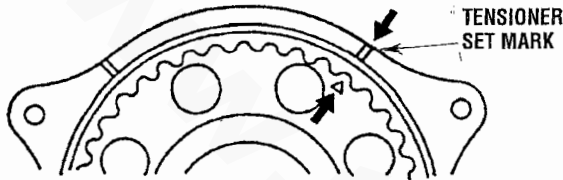


## ENGINE ADJUSTMENTS

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

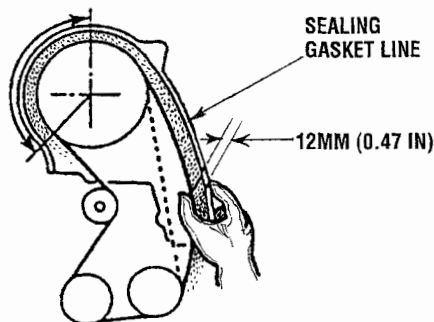
- Turn the crankshaft *clockwise* by nine camshaft sprocket teeth (817) to align the timing mark on the camshaft sprocket with the tensioner set mark on the timing belt rear cover.

**CAUTION:** This operation is performed to give a proper tension to the timing belt, so do not turn the crankshaft counterclockwise and push the belt to check the tension.



- Make sure that the timing belt teeth are engaged with the camshaft sprocket teeth along the portion of the sprocket shown by the curved arrow in the illustration below. Then tighten the tensioner nut.
- Pull the timing belt in the center of the tension side toward the sealing gasket line for the belt cover, as illustrated. Make sure that the clearance between the back of the belt and the sealing line is the standard value.

Standard Value: 12mm (0.47in.)



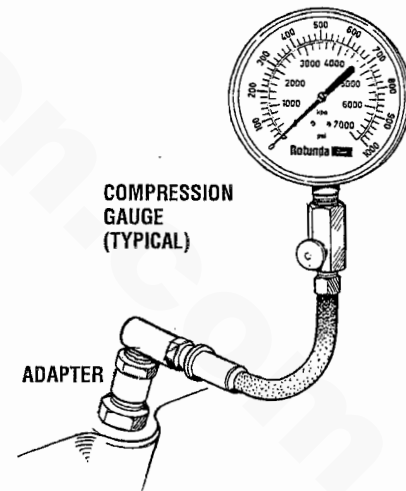
- Pull out a rod from the plug hole on the left surface of the cylinder block and apply the specified sealant. Then tighten the plug to the specified torque.

Specified sealant value: 3M ATD Part No. 8660 or equivalent

Tightening torque: 15-22 Nm (11-16 ft.lbs.)

### ENGINE COMPRESSION TEST

- To check the engine's compression pressure, warm up the engine then shut it down.
- Remove the three spark plug caps and remove the three spark plugs.
- Install a compression adapter and gauge in the spark plug hole.
- Close off the raw water intake seacock.
- Crank the engine with the start motor and unplug the ignition coil and allow the compression gauge to reach a maximum reading and record.
- Measure the compression pressure for all the cylinders. Ensure that compression pressure differential for each cylinder is within the specified unit.  
 Compression pressure should not differ by more than 14 psi (100 Kpa).
- If a cylinder's compression or pressure differential is below the limit, add a small amount of engine oil through the spark plug hole and repeat steps 4 and 5.
  - If additional of oil causes an increase of pressure, the piston ring and/or cylinder wall may be worn or damaged.
  - If additional oil does not increase compression pressure suspect poor valve contact, valve seizure, or valve wear.
- Reinstall three plugs and ignition wires.
- Open the raw water thru seacock.



## 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**).

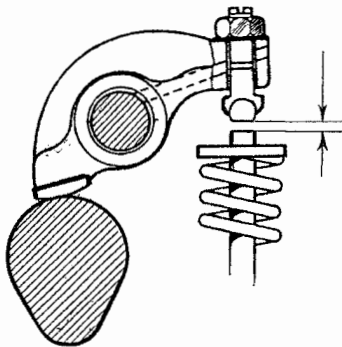
1. Remove the rocker cover and gasket.
2. Rotate the crankshaft in the normal direction of rotation, placing the No. 1 piston at the top of its compression stroke with the exhaust and intake valves completely closed. Adjust the intake and exhaust valves for No. 1 cylinder, the exhaust valve for No. 2 cylinder, and the intake valve for No. 3 cylinder (see chart).
3. Rotate the crankshaft 180° in its normal direction of rotation. Locate the piston in No. 1 cylinder at the top of its exhaust stroke. Adjust the intake valve for No. 2 cylinder and the exhaust valve for No. 3 cylinder (see chart).

CRANK ANGLE		CYLINDER #		
		1	2	3
When No. 1 piston is set at top of compression stroke	IN	●		●
	EX	●	●	
When No. 1 piston is positioned at top of exhaust stroke	IN		●	
	EX			●

4. Replace the rocker cover along with a new rocker cover gasket..

Rocker cover torque: 2.9-5.1 lb-ft (4 - 7 Nm)

### VALVE CLEARANCE

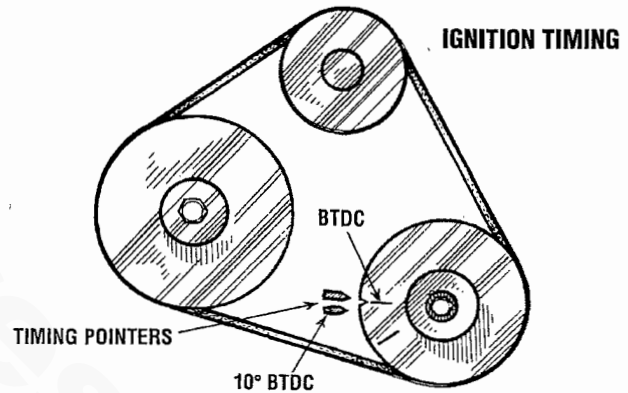


Valve Clearance: Intake 0.20mm (.008 inches)  
Exhaust 0.30mm (.012 inches)

### IGNITION TIMING

1. Attach a timing light to the #1 spark plug and mark the front timing pointer to indicate 15°. Locate the timing mark on the crankshaft pulley and mark it with white chalk or a crayon.
2. Start the engine and warm it up to its normal operating temperature. Make sure the generator is operating *without a load on it*.
3. Using the timing light, align the timing mark in the front crankshaft pulley so it is just slightly before the first timing pointer. Do this by loosening and slowly rotating the distributor body. Use the following timing specifications:

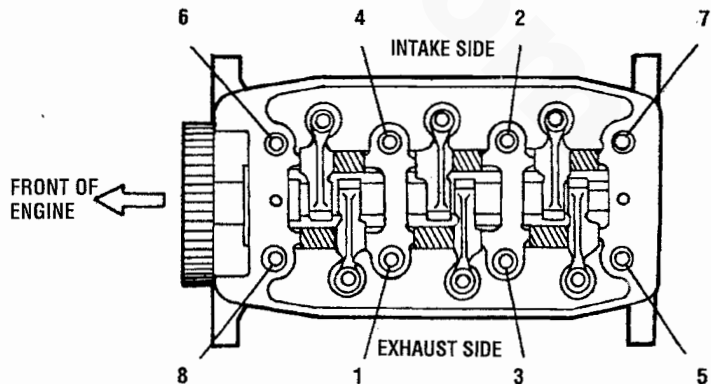
Timing Specifications: 15° ± .5° BTDC at 1800 rpm  
(no load on generator)



### 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 43 - 51 lb-ft (60 - 70 Nm). Then proceed to the next head bolt in the sequence. Tighten the RS (rocker cover stud) securely.





## ENGINE ADJUSTMENTS

### SPARK PLUGS

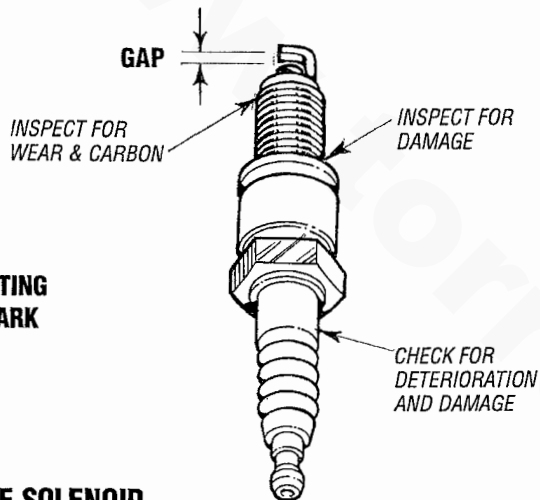
The spark plugs should be cleaned and regapped after the first 50 hour break-in period, then inspected every 250 hours thereafter and replaced as needed.

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

Spark plug gap: 0.031 – ± 0.0002 in. (0.8 – 0.05 mm).

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.

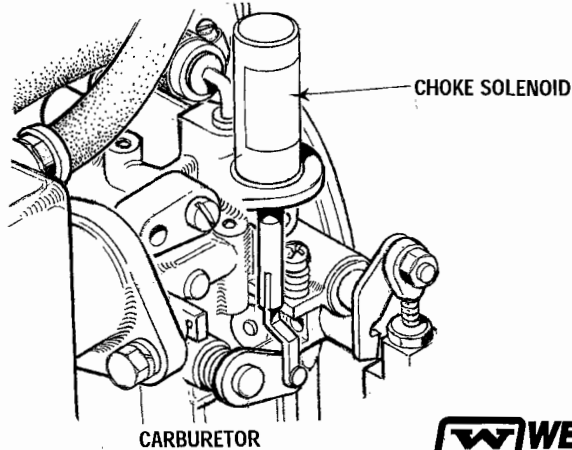


### INSPECTING THE SPARK PLUGS

### CHOKE SOLENOID

The choke solenoid is a 12 volt DC operated unit that functions to close the choke plate in the carburetor when the ON switch is depressed during engine start-up.

The choke solenoid de-energises once the engine starts and the ON switch is released. Some unstable running may be present when the engine starts cold, but should smooth out as the engine reaches normal operating temperature. Keep this solenoid dry and periodically lubricate the linkage, plunger and choke shaft with graphite lube.



### 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 pumps bearing. A slack belt or the presence of oil on the belt can cause belt slipping.

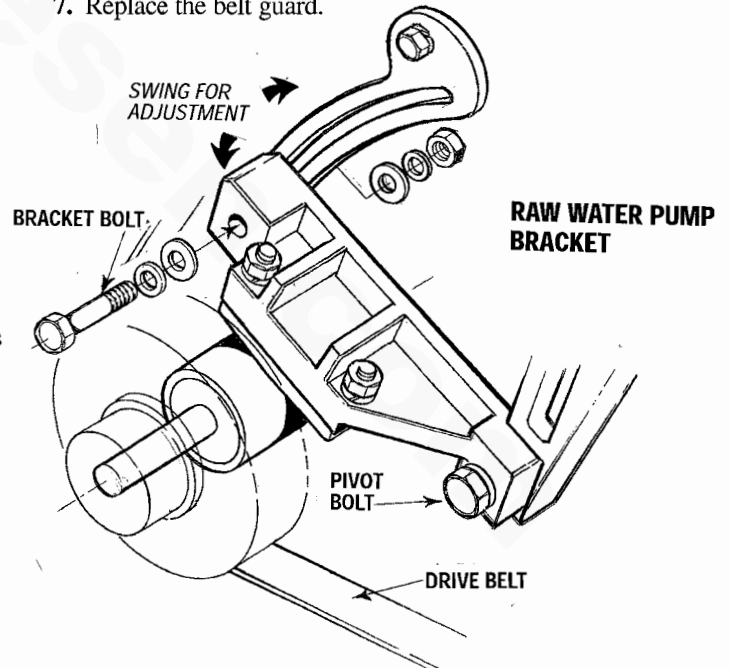
1. Remove the belt guard.
2. To release the belt, back off the pivot bolt and loosen the bracket bolt.
3. Swing the bracket to loosen for removal.
4. Inspect the belt for frayed edges and excessive wear.
5. Re-install or replace the belt and re-tighten the bolts.

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 belts 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.



## 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 indicated 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 ammeter is not installed to monitor voltage and load, check it with a portable meter and amprobe.

**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.

### 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 reduce life of windings.
- For unusually severe conditions, thin rust-inhibiting petroleum based 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 generator's 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 the bearing at periodic intervals. No side movement of the shaft should be detected when force is applied. If side motion is detectable, inspect the bearing and shaft for wear. Repair must be made quickly or major components will rub and cause major damage to the generator.

### Carbon Monoxide Detector

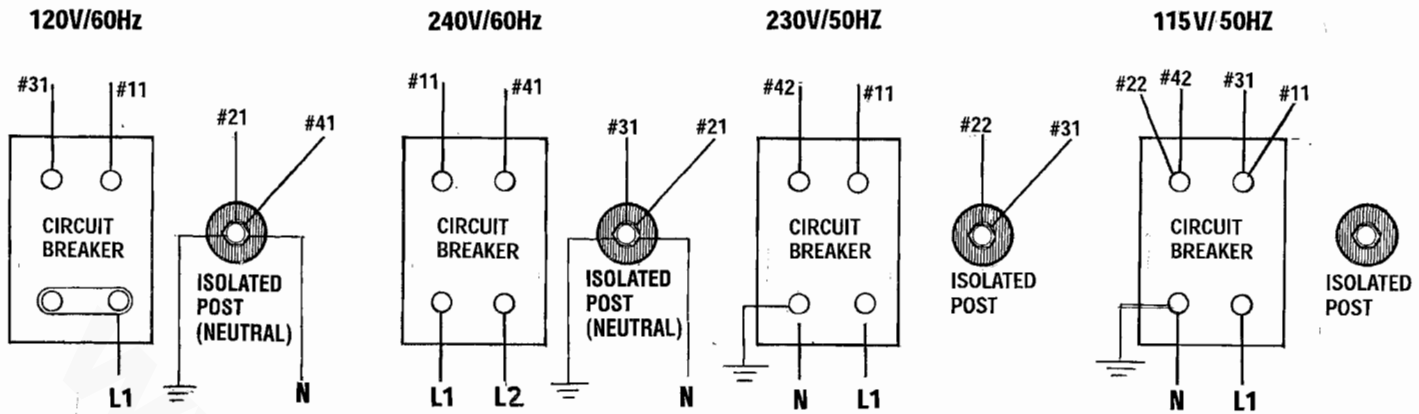
WESTERBEKE recommends mounting a carbon monoxide detector in the vessel's living quarters. **Carbon monoxide, even in small amounts, is deadly.**

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

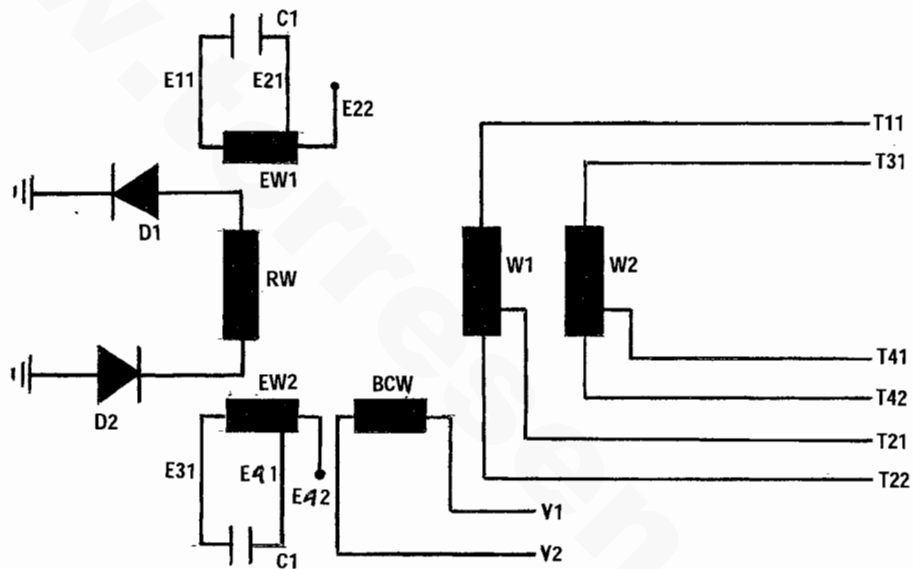
If carbon monoxide is present, ventilate the area with clean air and correct the problem immediately!



## BCGA & C AC TERMINAL CONNECTIONS

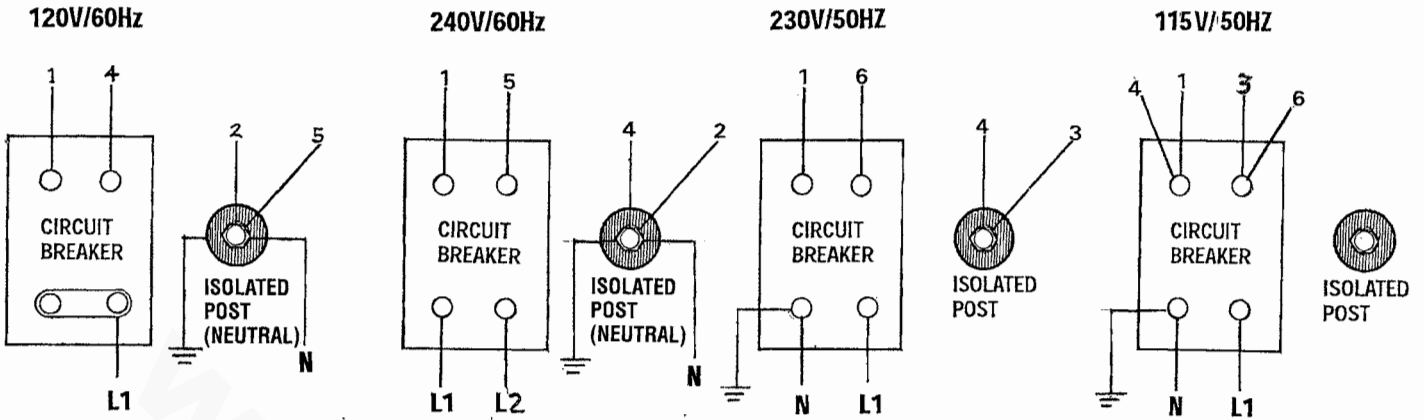


## BCGA & C GENERATOR WINDINGS SCHEMATIC

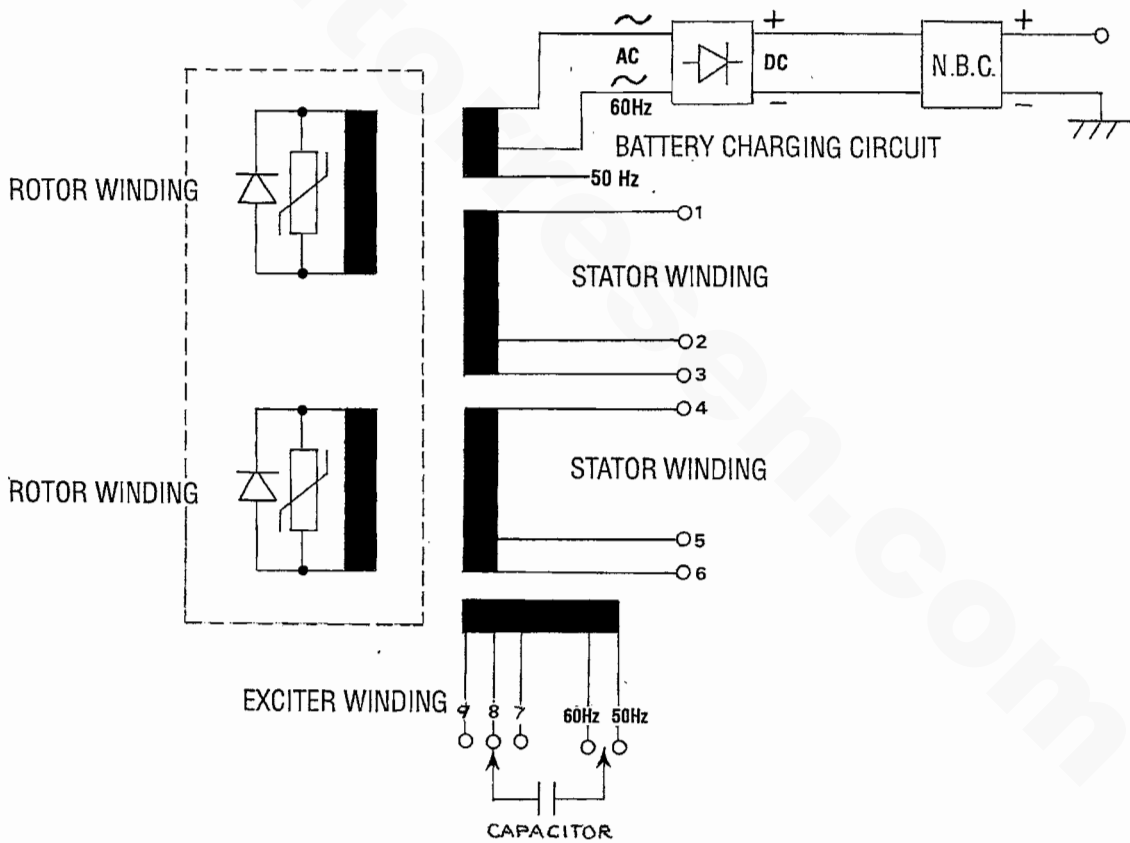


EW1 - EXCITER WINDING 1  
 EW2 - EXCITER WINDING 2  
 BCW - BATTERY CHARGER WINDING  
 RW - ROTOR WINDING  
 W1 - STATOR WINDING 1  
 W2 - STATOR WINDING 2  
 C1 - CAPACITOR  
 D1/D2 - DIODES

60Hz OPERATION: CONNECT CAPACITORS TO E31-E41/E11-E21  
 50Hz OPERATION: CONNECT CAPACITORS TO E31-E42/E11-E22

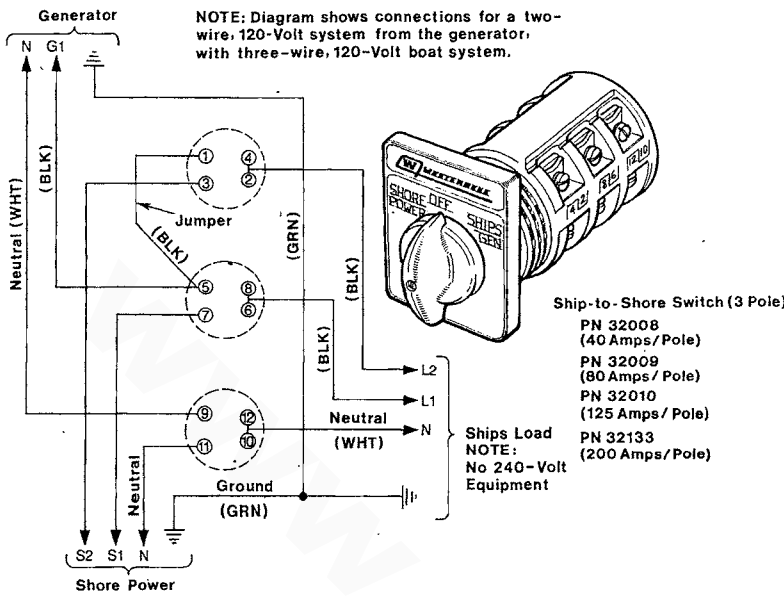


**BCG & D GENERATOR WINDINGS SCHEMATIC**



# SHORE POWER TRANSFER SWITCH

## 120 VOLT/60 HERTZ TWO WIRE CONFIGURATION

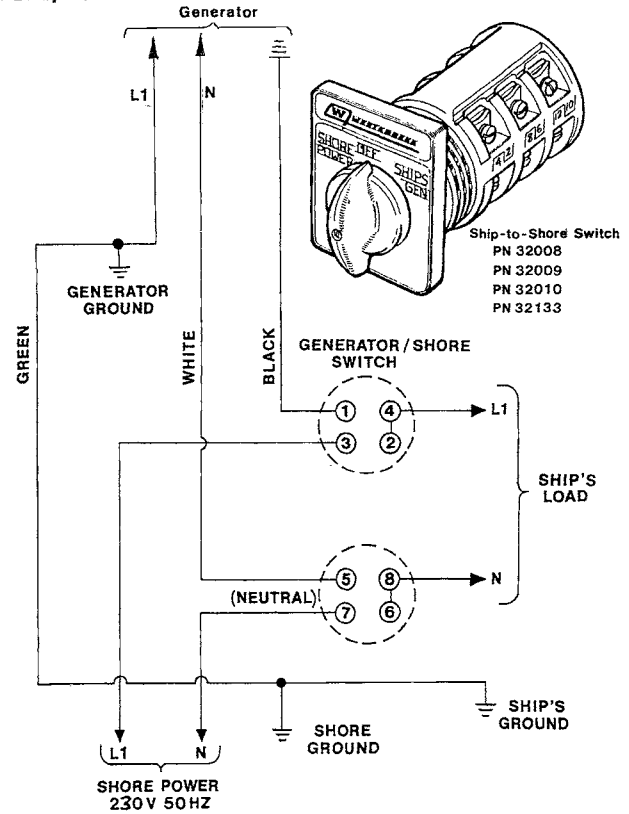


NOTE: Diagram shows connections for a two-wire, 120-Volt system from the generator, with three-wire, 120-Volt boat system.

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.

## 230 VOLT/50 HERTZ TWO WIRE CONFIGURATION



### Switching Shore Power to Generator Power

**CAUTION:** Heavy motor loads 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.

## BC GENERATOR SINGLE PHASE

### INTEGRAL CONTROLLER (I.C.)

The Integral Controller (I.C.) is an encapsulated, solid-state unit that supplies a DC charging voltage to the generator's starting battery while the generator is opening.

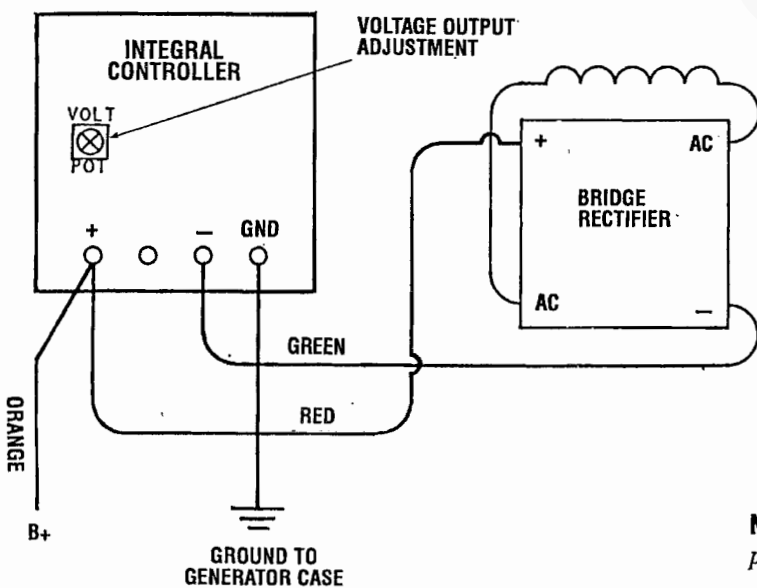
**Charging Voltage: 13.1 - 13.4 volts DC**  
**Charging Amperage: 0 - 17.0 amps DC**

A separate group of stator windings supplies AC voltage to a bridge rectifier which converts the AC current to supply the I.C. unit. The I.C. unit senses the needs of the starting battery and supplies a DC charge when one is needed. If you suspect that the I.C. unit is faulty (that is, if the battery's charge is low), check the charging circuit and its components as described in the following steps. Check all connections for cleanliness and tightness including the ground before replacing the I.C. unit.

**NOTE:** When the generator is first started, the I.C. unit will produce a low charging rate. This charging rate will rise as the generator is operated.

The Integral Controller is mounted inside the generator housing in the 12:00 position. There is a voltage output adjustment on the controller that will allow a DC voltage output adjustment of  $\pm 2$  volts.

**NOTE:** New four wire controllers eliminate the ballast resistor circuit since the ballast resistor's function is now handled internally. Whenever replacing an early stylr controller with the newer four wire model, remove the ballast resistor and its wiring.



### Testing the Battery Charging Circuit

#### 1. Bridge Rectifier

Normal AC voltage running to the rectifier (while the engine is operating at 1800 rpm) is measured across the two AC connections on the bridge rectifier. (As illustrated).

AC voltage running to the bridge rectifier (approximate):

**No-load off the generator 16.0 volts AC**  
**Full-load off the generator 17.5 volts AC**

Normal DC voltage running out of the rectifier (in volts DC) is measured across the two DC connections of the bridge rectifier; that is + and -.

DC voltage running from the bridge rectifier (approximate):

**No-load off the generator 17.0 volts DC**  
**Full-load off the generator 18.5 volts DC**

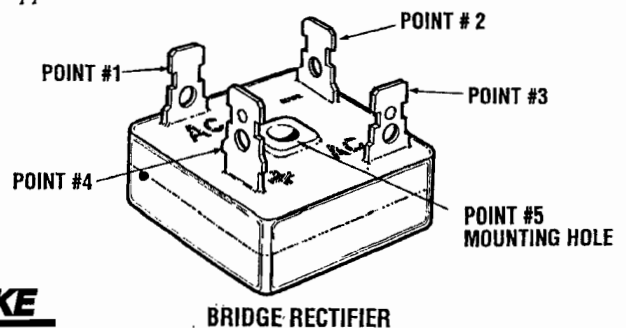
#### 2. AC winding: 0.10 ohm

Lift the two AC wire leads off the bridge rectifier and measure, the resistance between these two leads with an ohmmeter. It should measure 0.10 ohm. No continuity should exist between these two leads and the ground or the main AC stator windings.

#### 3. Testing the Bridge Rectifier (meter used - Simpson 260)

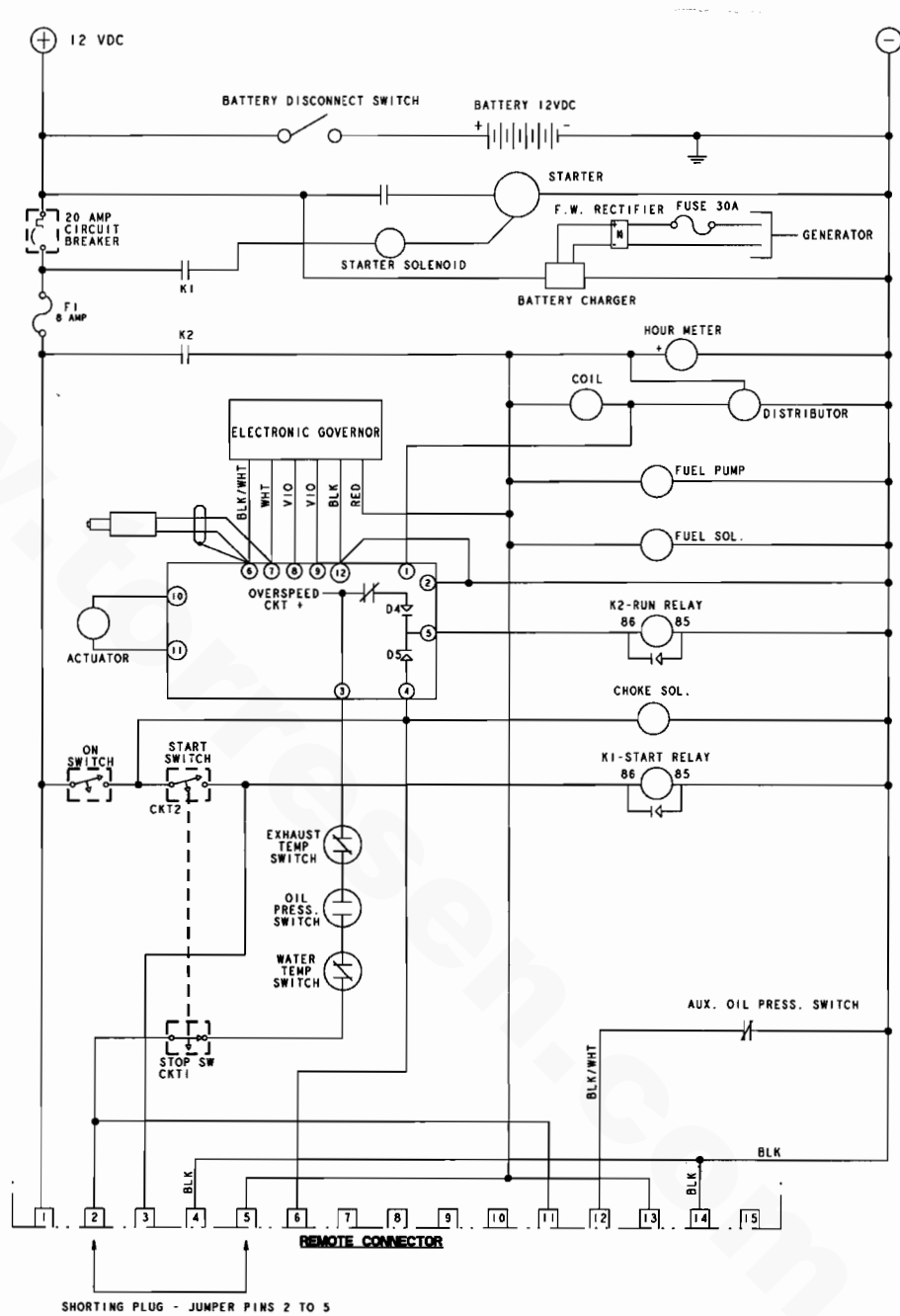
- Set your ohmmeter's scale on RX1 (+ DC) and set the needle to zero.
- Connect the (+) positive lead from the ohmmeter to point #4. Taking the ohmmeter's negative (-) lead, momentarily touch points #1, #2, #3, and #5. The ohmmeter should register no deflection for any of the points touched.
- Remove the positive (+) lead from point #4 and connect the negative (-) lead; momentarily touch points #1, #2, and #3. The ohmmeter's needle should deflect when each point is touched.
- Leaving the negative ohmmeter (-) lead on point #4, touch point #5 with the positive lead. No deflection should take place.
- Place the positive (+) lead on point #1 and the negative (-) lead on point #3. The ohmmeter again should not register any deflection (no deflection indicated infinite resistance). Reverse these connections and the ohmmeter should again register no deflection. If the rectifier fails any of the previous tests (A-E), replace the rectifier because it is defective.

**NOTE:** Different types and/or brands of test meters may produce opposite test results.



# WIRING SCHEMATIC #46876

**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.

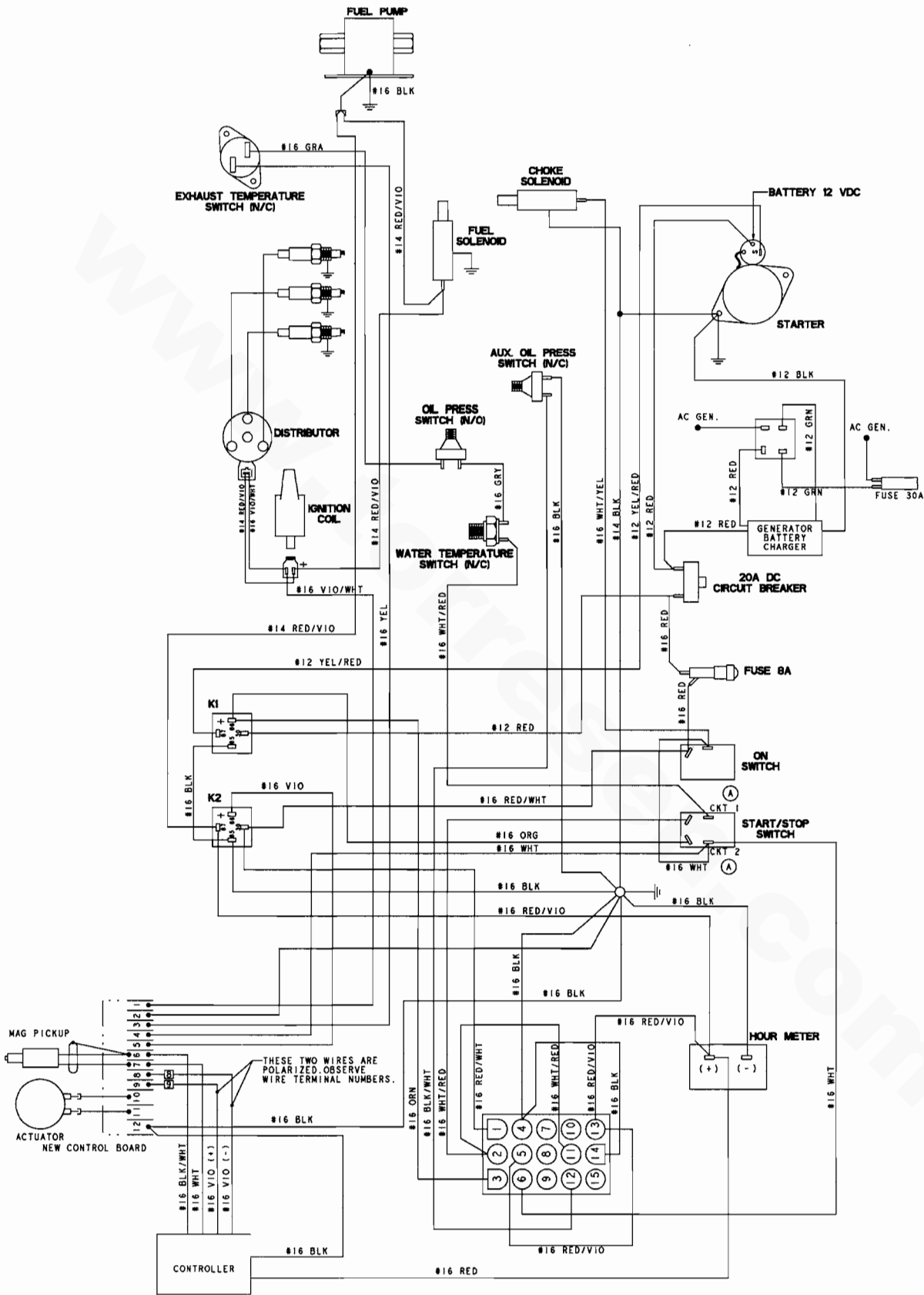


**TROUBLESHOOTING** - WHEN TROUBLESHOOTING THE DC CIRCUIT: TO BY PASS THE OVERSPEED TO DETERMINE IF IT IS FAULTY. MOVE CONNECTION #3 TO CONNECTION #5.  
**NOTE** - DO NOT OPERATE THE UNIT WITH THE OVERSPEED BY PASSED.

**NOTES:**  
 1. ALL WIRE #16AWG(105DEG C 600V-ALPHA 1858/18-MIL-B-16878D TYPE B1 UNLESS SPECIFIED OTHERWISE.  
 2. WARNING - RELAYS K1, K2 HAVE INTERNAL DIODES ACROSS THE IR COILS. POLARITY AS INDICATED MUST BE MAINTAINED TO AVOID DAMAGE TO THE RELAYS.



# WIRING DIAGRAM #46876

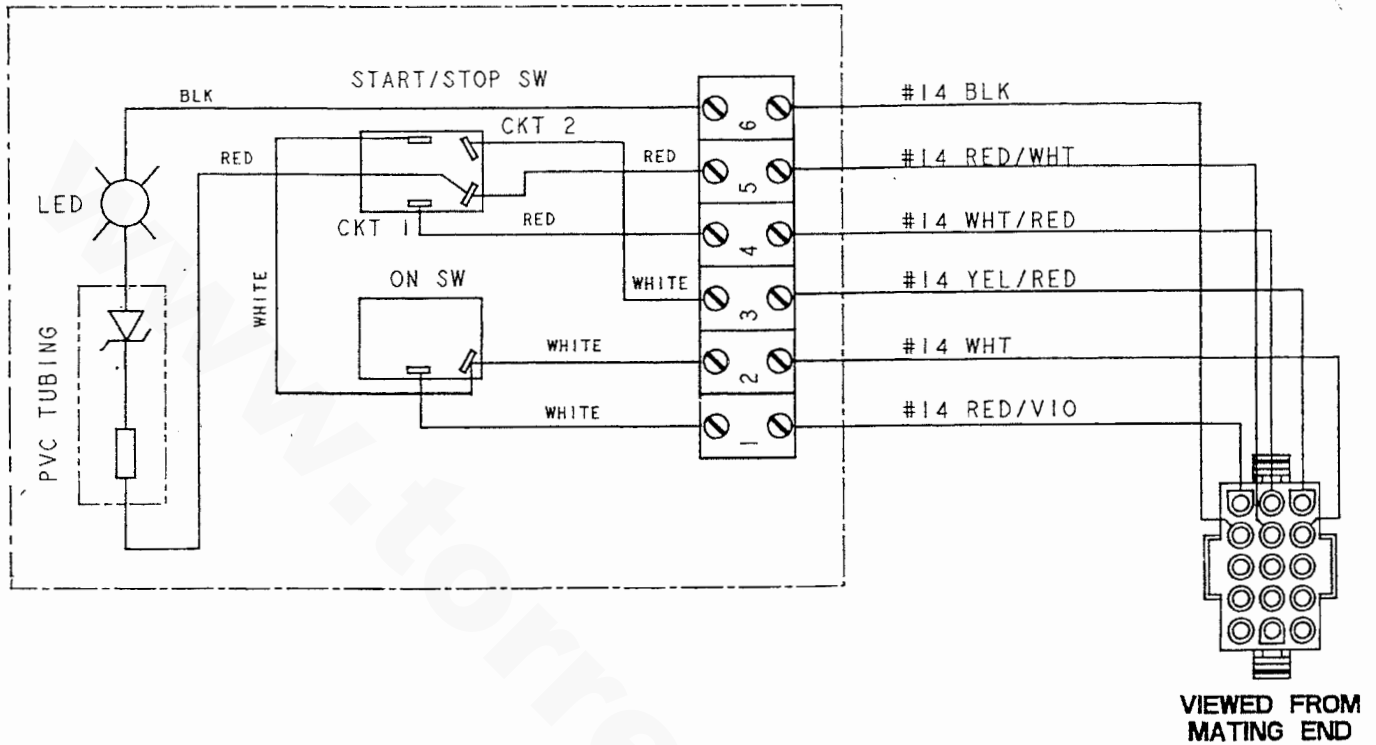




## REMOTE PANEL WIRING

### SCHEMATIC

REMOTE PANEL #043912 WITH 1 FOOT HARNESS



### EXTENSION HARNESS

15 Feet PN# 043914

30 Feet PN# 043860

## 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 ELECTRICAL SYSTEM WIRING DIAGRAM, as these may reveal other possible causes of the problem which are not listed below.

**NOTE:** *The engines control system (electrical system) is protected by a 20 Ampere manual reset circuit breaker located on the control panel.*

PROBLEM	PROBABLE CAUSE
Engine does not crank.	<ol style="list-style-type: none"> <li>1. Voltage drop at starter solenoid terminal.</li> <li>2. Engine circuit breaker has tripped.</li> <li>3. 8 amp fuse/holder is faulty.</li> <li>4. Battery is low or dead.</li> <li>5. Loose battery connections.</li> <li>6. Faulty wire connection.</li> <li>7. Faulty start switch.</li> <li>8. Faulty start relay (K1).</li> <li>9. Faulty starter solenoid</li> <li>10. Raw water filled cylinders.</li> </ol>
Engine starts, runs and then shuts down.	<ol style="list-style-type: none"> <li>1. Faulty shutdown switch, (oil pressure, water or exhaust temperature).</li> <li>2. Faulty overspeed switch (See note below).</li> <li>3. Dirty fuel/water separator filter.</li> <li>4. Mechanical check valve at the fuel supply faulty (if installed).</li> <li>5. Low oil level in sump.</li> <li>6. Faulty fuel pump.</li> <li>7. High engine water or exhaust temperature.</li> </ol>
Engine starts, runs but does not come up to speed.	<ol style="list-style-type: none"> <li>1. Faulty mag-pickup sensor.</li> <li>2. Electronic governor controller faulty,</li> <li>3. Fuel pump.</li> <li>4. Fuel supply to engine restricted.</li> <li>5. Throttle linkage binding.</li> <li>6. Actuator or electrical connections faulty.</li> <li>7. AC generator overload./short.</li> <li>8. Air intake restricted.</li> <li>9. Exhaust restricted.</li> </ol>

PROBLEM	PROBABLE CAUSE
Engine cranks but fails to start.	<ol style="list-style-type: none"> <li>1. Out of fuel.</li> <li>2. Engine is flooded.</li> <li>3. Faulty carburetor.</li> <li>4. Faulty choke solenoid.</li> </ol>
Engine hunts.	<ol style="list-style-type: none"> <li>1. Controller gain adjustment needed.</li> <li>2. Faulty fuel pump.</li> <li>3. Mag pick-up sensor needs adjustment.</li> <li>4. Low DC battery voltage.</li> <li>5. Generator overload.</li> <li>6. Valves need adjustment.</li> </ol>
Engine misfires.	<ol style="list-style-type: none"> <li>1. Poor quality fuel.</li> <li>2. Incorrect timing.</li> <li>3. Dirty flame arrester.</li> <li>4. Cracked distributor cap.</li> <li>5. Faulty ignition wires.</li> <li>6. Spark plugs are worn.</li> <li>7. High exhaust back-pressure.</li> <li>8. Valve clearances are incorrect.</li> </ol>
Engine backfires.	<ol style="list-style-type: none"> <li>1. Spark plug wires are connected wrong.</li> <li>2. Incorrect timing.</li> <li>3. Engine is flooded. See <i>Engine is flooded under Engine cranks but fails to start.</i></li> <li>4. Dirty flame arrester.</li> <li>5. Cracked distributor cap.</li> <li>6. High exhaust back-pressure.</li> </ol>
Engine overheats.	<ol style="list-style-type: none"> <li>1. Coolant loss. Pressure test cooling system.</li> <li>2. Faulty raw water pump impeller.</li> <li>3. Belts are loose or broken.</li> <li>4. Raw water pump worn.</li> <li>5. Faulty thermostat.</li> </ol>

**NOTE:** OVERSPEED SWITCH: TO BY-PASS THE OVERSPEED SWITCH WHEN TROUBLESHOOTING MOVE CONNECTION #3 AND CONNECT IT ONTO AND WITH #5. REFER TO WIRING DIAGRAM #46876.



## ENGINE TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE
Low oil pressure.	<ol style="list-style-type: none"> <li>1. Low oil level.</li> <li>2. Wrong SAE type oil in the engine.</li> <li>3. Faulty or wrong type oil filter.</li> <li>4. Relief valve is stuck.</li> <li>5. Faulty oil pump.</li> <li>6. Faulty engine bearings.</li> <li>7. Faulty oil filter.</li> </ol>
High oil pressure.	<ol style="list-style-type: none"> <li>1. Dirty oil or wrong SAE type oil in the engine.</li> <li>2. Relief valve is stuck.</li> </ol>
No DC charge to the starting battery.	<ol style="list-style-type: none"> <li>1. Faulty connections to battery charging control.</li> <li>2. 30 amp fuse blown/faulty.</li> <li>3. Faulty battery charging control.</li> <li>4. Faulty bridge rectifier.</li> <li>5. Faulty generator charger windings.</li> </ol>
Blue exhaust smoke discharge from the engine.	<ol style="list-style-type: none"> <li>1. Lube oil is diluted.</li> <li>2. High lube oil level.</li> <li>3. Crankcase breather hose is clogged.</li> <li>4. Valves are worn or adjusted incorrectly.</li> <li>5. Piston rings are worn or unseated.</li> </ol>

PROBLEM	PROBABLE CAUSE
Black exhaust smoke discharge from the engine.	<ol style="list-style-type: none"> <li>1. Dirty flame arrester.</li> <li>2. Faulty carburetor.</li> <li>3. Idle mixture jet too rich.</li> <li>4. Faulty choke/solenoid.</li> <li>5. Valves are worn or incorrectly adjusted.</li> <li>6. Piston rings are worn or unseated.</li> </ol>
Poor performance at generator speed.	<ol style="list-style-type: none"> <li>1. Contaminates in carburetor.</li> <li>2. Faulty fuel pump/contaminated.</li> <li>3. Electronic governor controller needs adjustment.</li> </ol>

## LAY-UP & RECOMMISSIONING

### GENERAL

Many owners rely on their boatyards to prepare their craft, including engines and generators, for lay-up during the off-season or for long periods of inactivity. Others prefer to accomplish lay-up preparation themselves.

The procedures which follow will allow you to perform your own lay-up and recommissioning, or you may use them as a check list if others do the procedures.

These procedures should afford your engine protection during a lay-up and also help familiarize you with the maintenance needs of your engine.

If you have any questions regarding lay-up procedures, call your local servicing dealer; he will be more than willing to provide assistance.

### Propeller Shaft Coupling [Propulsion Engine]

The transmission and propeller half couplings should always be opened up and the bolts removed when the boat is hauled out of the water or moved from land to water, and during storage in the cradle. The flexibility of the boat often puts a severe strain on the propeller shaft or coupling or both, while the boat is taken out or put in the water. In some cases, the shaft has actually been bent by these strains. This does not apply to small boats that are hauled out of the water when not in use, unless they have been dry for a considerable period of time.

### Fresh Water Cooling Circuit

A 50-50 solution of antifreeze and distilled water is recommended for use in the coolant system at all times. This solution may require a higher concentration of antifreeze, depending on the area's winter climate. Check the solution to make sure the antifreeze protection is adequate. Should more antifreeze be needed, drain an appropriate amount from the engine block and add a more concentrated mixture. Operate the engine to ensure a complete circulation and mixture of the antifreeze concentration throughout the cooling system. Now recheck the antifreeze solution's strength.

### Lubrication System

With the engine warm, drain all the engine oil from the oil sump. Remove and replace the oil filter and fill the sump with new oil. Use the correct grade of oil. Refer to the *ENGINE LUBRICATING OIL* pages in this manual for the oil changing procedure. Run the engine and check for proper oil pressure and make sure there are no leaks.

**CAUTION:** Do not leave the engine's old engine oil in the sump over the lay-up period. Engine oil and combustion deposits combine to produce harmful chemicals which can reduce the life of your engine's internal parts.

### Fuel System [Gasoline]

Top off your fuel tanks with *unleaded* gasoline of 89 octane or higher. A fuel conditioner such as *STABIL* gasoline stabilizer should be added. Change the element in your gasoline/water separator and clean the metal bowl. Re-install and make certain there are no leaks. Clean up any spilled fuel.

### Fuel System [Diesel]

Top off your fuel tanks with No. 2 diesel fuel. Fuel additives such as *BIOBOR* and *STABIL* should be added at this time to control algae and condition the fuel. Care should be taken that the additives used are compatible with the primary fuel filter/water separator used in the system. Change the element in your primary fuel filter/water separator, if the fuel system has one, and clean the separator sediment bowl.

Change the fuel filter elements on the engine and bleed the fuel system, as needed. Start the engine and allow it to run for 5 – 10 minutes to make sure no air is left in the fuel system. Check for any leaks that may have been created in the fuel system during this servicing, correcting them as needed. Operating the engine for 5 – 10 minutes will help allow movement of the treated fuel through the injection equipment on the engine.

### Raw Water Cooling Circuit

Close the through-hull seacock. Remove the raw water intake hose from the seacock. Place the end of this hose into a five gallon bucket of clean fresh water. Before starting the engine, check the zinc anode found in the primary heat exchanger on the engine and clean or replace it as required, and also clean any zinc debris from inside the heat exchanger where the zinc anode is located. Clean the raw water strainer.

Start the engine and allow the raw water pump to draw the fresh water through the system. When the bucket is empty, stop the engine and refill the bucket with an antifreeze solution slightly stronger than needed for winter freeze protection in your area.

Start the engine and allow all of this mixture to be drawn through the raw water system. Once the bucket is empty, stop the engine. This antifreeze mixture should protect the raw water circuit from freezing during the winter lay-up, as well as providing corrosion protection.

Remove the impeller from your raw water pump (some antifreeze mixture will accompany it, so catch it in a bucket). Examine the impeller. Acquire a replacement, if needed, and a cover gasket. Do not replace the impeller (into the pump) until recommissioning, but replace the cover and gasket.

### Cylinder Lubrication [Gasoline]

With the engine running, remove the flame arrester and spray fogging oil into the open air intake. The fogging oil will stall out the engine as it coats the valves, cylinders and spark plugs for winter protection.

## LAY-UP & RECOMMISSIONING

### Starter Motor

Lubrication and cleaning of the starter drive pinion is advisable, if access to the starter permits its easy removal. Make sure the battery connections are shut off before attempting to remove the starter. Take care in properly replacing any electrical connections removed from the starter.

### Cylinder Lubrication *[Diesel]*

If you anticipate a long lay-up period (12 months or more) WESTERBEKE recommends removing the glow plugs or fuel injectors for access to the cylinders. Squirt light lubricating oil into the cylinders to prevent the piston rings from sticking to the cylinder walls. Rotate the engine by hand two revolutions then replace the glow plugs or injectors.

Make sure you have a replacement if removing the injector sealing washer for the injector and fuel line return.

**NOTE:** *If engine storage is going to be a lengthy one, 12 months or beyond, it is wise to rotate the engine by hand two complete turns every additional 4 months to allow the injection pump components to move. This will help prevent their sticking during extended storage periods.*

### Intake Manifold and Thru-Hull Exhaust *[Diesel]*

Place a clean cloth, lightly soaked in lubricating oil, in the opening of the intake manifold to block the opening. Do not shove the cloth out of sight. (If it is not visible at recommissioning, and an attempt is made to start the engine, you may need the assistance of a servicing dealer.) Make a note to remove the cloth prior to start-up. The through-hull exhaust port can be blocked in the same manner.

### Intake Manifold *[Gasoline]*

Clean the filter screen in the flame arrester, and place a clean cloth lightly soaked in lube oil around the flame arrester to block any opening. Also place an oil-soaked cloth in the through-hull exhaust port, Make a note to remove cloths prior to start-up!

### Transmission *[Propulsion Engine]*

Check or change fluid in the transmission as required. If the engine is to be layed up 12 months or more, fill the transmission to the very top to prevent corrosion. **Lower the fluid to its normal at recommissioning.** Wipe off grime and grease and touch up unpainted areas. Protect coupling and output flange with an anticorrosion coating, Refer to the *TRANSMISSION SECTION* in this manual for additional information.

### Batteries

If batteries are to be left on board during the lay-up period, make sure they are fully charged, and will remain that way, to prevent them from freezing. If there exists any doubt that the batteries will not remain fully charged, or that they will be subjected to severe environmental conditions, remove the batteries and store them in a warmer, more compatible environment.

### SPARE PARTS

Lay-up time provides a good opportunity to inspect your WESTERBEKE engine to see if external items such as drive belts or coolant hoses need replacement. Check your basic spares kit and order items not on hand, or replace those items used during the lay-up, such as filters and zinc anodes. Refer to the *SPARE PARTS* section of this manual.

### RECOMMISSIONING

The recommissioning of your WESTERBEKE engine after a seasonal lay-up generally follows the same procedures as those described in the *PREPARATIONS FOR STARTING* section regarding preparation for starting and normal starts. However, some of the lay-up procedures will need to be counteracted before starting the engine.

1. Remove any rags that were placed in the exhaust, intake manifold, or flame arrester.
2. Remove the raw water pump cover and gasket and discard the old gasket. Install the raw water pump impeller removed during lay-up (or a replacement, if required). Install the raw water pump cover with a new cover gasket.
3. Reinstall the batteries that were removed during the lay-up, and reconnect the battery cables, making sure the terminals are clean and that the connections are tight. Check to make sure that the batteries are fully charged.
4. Remove the spark plugs, wipe clean, re-gap, and install to proper tightness. *[Gasoline]*
5. Check the condition of the zinc anode in the raw water circuit and clean or replace the anode as needed. Note that it is not necessary to flush the antifreeze/fresh water solution from the raw water coolant system. When the engine is put into operation, the system will self-flush in a short period of time with no adverse affects. Also open up the heat exchanger ends and clear out any accumulated debris.
6. Check the transmission fluid, if it had been topped off during the lay-up, lower the level of the fluid to normal. *[Propulsion Engine]*
7. Make certain all electrical connections and switches are in the correct position and there are no-loads on the generator at start up. *[Generator]*
8. Start the engine in accordance with the procedures described in the *PREPARATIONS FOR STARTING* section of this manual.

## 5.0KW BCG/BCGA GENERATOR SPECIFICATIONS

### ENGINE SPECIFICATIONS

Engine Type	3-cylinder, 4-cycle, , overhead camshaft w/counterbalance shaft, water cooled gasoline engine
Bore & Stroke	2.56 x 2.61 inches (65.0 x 66.3 mm)
Total Displacement	40.3 cubic inches (0.66 liters)
Bearings	Four main bearings
Compression Chamber	Semi-spherical
Compression Ratio	9.8:1
Hp@1800/1500 rpm	8.0/6.5
Firing Order	1 - 3 - 2
Aspiration	Naturally aspirated
Direction of Rotation	Counterclockwise viewed from the back end
Inclination	25° continuous, all directions
Dry weight	307 lbs (139.3 Kg)
Governor	Electronic

### FUEL SYSTEM

Fuel Pump	Electric fuel pump
Fuel	Unleaded 89 octane or higher gasoline
Distributor	Breakerless distributor
Spark Plugs	14mm
Ignition Coil	12 volt
Flame Arrester	Metal screen type
Carburetor	Single draft type
Fuel Consumption (Full Load)	.8 GPH @ 1800 rpm

### ELECTRICAL SYSTEM

Start Motor	12-Volt reduction gear with solenoid
Starting Battery	12-Volt, (-) negative ground
Battery Capacity	600-800 Cold Cranking Amps (CCA)(min))
Battery Charging	Integral electric, 17 amps

### EXHAUST EMISSIONS SYSTEMS

EM	Engine Modification
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### COOLING SYSTEM

General	Fresh water-cooled block through raw water-cooled heat exchanger circuit
Fresh Water Pump	Centrifugal type, metal impeller, belt-driven.
Raw Water Pump	Positive displacement, rubber impeller, belt-driven.
Raw Water Flow,	4.9 US gpm @ 1800 rpm (439 gmp @ 1500 rpm) (approx. measure before discharging into exhaust elbow).
Cooling Water Capacity	3 qts (2.8 liters).
Operating Temperature	150° - 170° F (65 - 77° C)

### LUBRICATION SYSTEM

Type	Forced lubrication by gear pump
Oil Filter	Full flow, paper element. spin-on disposals
Oil Capacity	2.5 qts. (2.4 liters).
Operating Oil Pressure	40 - 60 psi (2.8 - 4.2 kg/cm <sup>2</sup> ).
Oil Grade	API Specification SJ class

### AC GENERATOR (Single Phase)

Type	Brushless, four-pole capacitor, regulated. 1800 rpm/60Hz, 1500 rpm/50Hz
Ratings:	
<b>5.0KW</b>	120 volts, 41.6 amps, 60Hz single phase, 4 wire, 1.0 power factor
<b>4.2KW</b>	230 volts, 18.2 amps, 50Hz single phase, 4 wire, 1.0 power factor

### TUNE-UP SPECIFICATIONS

Spark plug Gap	0.031 ± .002 inches (0.8 ± 0.05mm)
Spark Plug Torque	10.8 - 15.2 lb-ft
Cylinder Head Torque	60-70 Nm (43-51 ft-lbs)
Ignition Timing	15° ± 5° BTDC at 1800 rpm
Bolt Torque	See <i>TORQUING THE CYLINDER HEAD</i>

## 7.0KW BCGC/BCGD GENERATOR SPECIFICATIONS

ENGINE SPECIFICATIONS	
Engine Type	3-cylinder, 4-cycle, , overhead camshaft w/counterbalance shaft, water cooled gasoline engine
Bore & Stroke	2.56 x 2.61 inches (65.0 x 66.3 mm)
Total Displacement	40.3 cubic inches (0.66 liters)
Bearings	Four main bearings
Compression Chamber	Semi-spherical
Compression Ratio	9.8:1
Hp@1800/1500 rpm	8.0/6.5
Firing Order	1 - 3 - 2
Aspiration	Naturally aspirated
Direction of Rotation	Counterclockwise viewed from the back end
Inclination	25° continuous, all directions
Dry weight	307 lbs (139.3 Kg)
Governor	Electronic
FUEL SYSTEM	
Fuel Pump	Electric fuel pump
Fuel	Unleaded 89 octane or higher gasoline
Distributor	Breakerless distributor
Spark Plugs	14mm
Ignition Coil	12 volt
Flame Arrester	Metal screen type
Carburetor	Single draft type
Fuel Consumption (Full Load)	.8 GPH @ 1800 rpm
ELECTRICAL SYSTEM	
Start Motor	12-Volt reduction gear with solenoid
Starting Battery	12-Volt, (-) negative ground
Battery Capacity	600-800 Cold Cranking Amps (CCA)(min))
Battery Charging	Integral electric, 17 amps

EXHAUST EMISSIONS SYSTEMS	
EM	Engine Modification
COOLING SYSTEM	
General	Fresh water-cooled block through raw water-cooled heat exchanger circuit
Fresh Water Pump	Centrifugal type, metal impeller, belt-driven.
Raw Water Pump	Positive displacement, rubber impeller, belt-driven.
Raw Water Flow,	4.9 US gpm @ 1800 rpm (439 gmp @ 1500 rpm) (approx. measure before discharging into exhaust elbow).
Cooling Water Capacity	3 qts (2.8 liters).
Operating Temperature	150° - 170° F (65 - 77° C)
LUBRICATION SYSTEM	
Type	Forced lubrication by gear pump
Oil Filter	Full flow, paper element. spin-on disposals
Oil Capacity	2.5 qts. (2.4 liters).
Operating Oil Pressure	40 - 60 psi (2.8 - 4.2 kg/cm <sup>2</sup> ).
Oil Grade	API Specification SJ class
AC GENERATOR (Single Phase)	
Type	Brushless, four-pole capacitor, regulated. 1800 rpm/60Hz, 1500 rpm/50Hz
Ratings: <b>7.0KW</b>	120 volts, 58.3 amps, 60Hz single phase, 4 wire, 1.0 power factor
<b>5.9KW</b>	230 volts, 25.6 amps, 50Hz single phase, 4 wire, 1.0 power factor
TUNE-UP SPECIFICATIONS	
Spark plug Gap	0.031 ± .002 inches (0.8, ± 0.05mm)
Spark Plug Torque	10.8 - 15.2 lb-ft
Cylinder Head Torque	60-70 Nm (43-51 ft-lbs)
Ignition Timing	15° ± 5° BTDC at 1800 rpm
Bolt Torque	See <i>TORQUING THE CYLINDER HEAD</i>

## GENERATOR HARDWARE TORQUES

Timing Belt	Nm	ft. lbs.
Crankshaft bolt	135-145	98-105
Timing belt cover bolts	10-12	7-9
Camshaft sprocket bolts	80-100	58-72
Oil pump sprocket nuts	50-57	36-41
Timing tensioner nuts	22-30	16-22
Timing belt rear cover bolts	10-12	7-9
<b>Rocker Arms and Rocker Shaft</b>		
Rocker cover shaft	29-35	21-25
Camshaft thrust plate bolt	10-12	7-9
Rocker arm adjust nut	8-10	6-7
<b>Cylinder Head, Valve</b>		
Cylinder head bolt (cold engine)	60-70	43-51
Spark plug	15.2	10.8
Rocket cover	12-13	9-10
<b>Miscellaneous</b>		
Coolant temperature sender	12-18	9-13
Coolant temperature switch	12-18	9-13
Generator mounts	34-47	23-34
Exhaust manifold	16-23	12-17
Thermostat housing	8-11	6-8

Front Case, Counterbalance Shaft	Nm	ft. lbs.
Front case bolts	8-10	6-7
Oil pump cover bolts	8-10	6-7
Oil pan bolts	10-12	7-9
Oil drain plug	35-45	25-33
Oil screen bolts	15-22	11-16
Oil pump driven gear bolt	34-40	25-29
Rear cover bolts	10-12	7-9
<b>Piston and Connecting Rod</b>		
Connecting rod cap nut	15 + 90° turn	11 + 90° turn
<b>Crankshaft, Bearing</b>		
Oil seal case bolts	10-12	7-9
Bearing cap bolts	50-55	36-40
<b>Cylinder Block</b>		
Taper plug 1/16	8-12	6-9
Taper plug 1/8	15-22	11-16
Water drain plug	35-45	25-33
Taper plug 1/4 NPT	35-45	25-33
Oil pressure switch	12-18	9-13
Oil pressure sender	12-18	9-13
<b>Water Pump</b>		
Water pump	8-10	6-7



## STANDARD AND METRIC CONVERSION DATA

### LENGTH-DISTANCE

Inches (in) x 25.4 = Millimeters (mm) x .0394 = Inches  
Feet (ft) x .305 = Meters (m) x 3.281 = Feet  
Miles x 1.609 = Kilometers (km) x .0621 = Miles

### DISTANCE EQUIVALENTS

1 Degree of Latitude = 60 Nm = 111.120 km  
1 Minute of Latitude = 1 Nm = 1.852 km

### VOLUME

Cubic Inches (in<sup>3</sup>) x 16.387 = Cubic Centimeters x .061 = in<sup>3</sup>  
Imperial Pints (IMP pt) x .568 = Liters (L) x 1.76 = IMP pt  
Imperial Quarts (IMP qt) x 1.137 = Liters (L) x .88 = IMP qt  
Imperial Gallons (IMP gal) x 4.546 = Liters (L) x .22 = IMP gal  
Imperial Quarts (IMP qt) x 1.201 = US Quarts (US qt) x .833 = IMP qt  
Imperial Gallons (IMP gal) x 1.201 = US Gallons (US gal) x .833 = IMP gal  
Fluid Ounces x 29.573 = Milliliters x .034 = Ounces  
US Pints (US pt) x .473 = Liters(L) x 2.113 = Pints  
US Quarts (US qt) x .946 = Liters (L) x 1.057 = Quarts  
US Gallons (US gal) x 3.785 = Liters (L) x .264 = Gallons

### MASS-WEIGHT

Ounces (oz) x 28.35 = Grams (g) x .035 = Ounces  
Pounds (lb) x .454 = Kilograms (kg) x 2.205 = Pounds

### PRESSURE

Pounds Per Sq In (psi) x 6.895 = Kilopascals (kPa) x .145 = psi  
Inches of Mercury (Hg) x .4912 = psi x 2.036 = Hg  
Inches of Mercury (Hg) x 3.377 = Kilopascals (kPa) x .2961 = Hg  
Inches of Water (H<sub>2</sub>O) x .07355 = Inches of Mercury x 13.783 = H<sub>2</sub>O  
Inches of Water (H<sub>2</sub>O) x .03613 = psi x 27.684 = H<sub>2</sub>O  
Inches of Water (H<sub>2</sub>O) x .248 = Kilopascals (kPa) x 4.026 = H<sub>2</sub>O

### TORQUE

Pounds-Force Inches (in-lb) x .113 = Newton Meters (Nm) x 8.85 = in-lb  
Pounds-Force Feet (ft-lb) x 1.356 = Newton Meters (Nm) x .738 = ft-lb

### VELOCITY

Miles Per Hour (MPH) x 1.609 = Kilometers Per Hour (KPH) x .621 = MPH

### POWER

Horsepower (Hp) x .745 = Kilowatts (Kw) x 1.34 = MPH

### FUEL CONSUMPTION

Miles Per Hour IMP (MPG) x .354 = Kilometers Per Liter (Km/L)  
Kilometers Per Liter (Km/L) x 2.352 = IMP MPG  
Miles Per Gallons US (MPG) x .425 = Kilometers Per Liter (Km/L)  
Kilometers Per Liter (Km/L) x 2.352 = US MPG

### TEMPERATURE

Degree Fahrenheit (°F) = (°C X 1.8) + 32  
Degree Celsius (°C) = (°F - 32) x .56

### LIQUID WEIGHTS

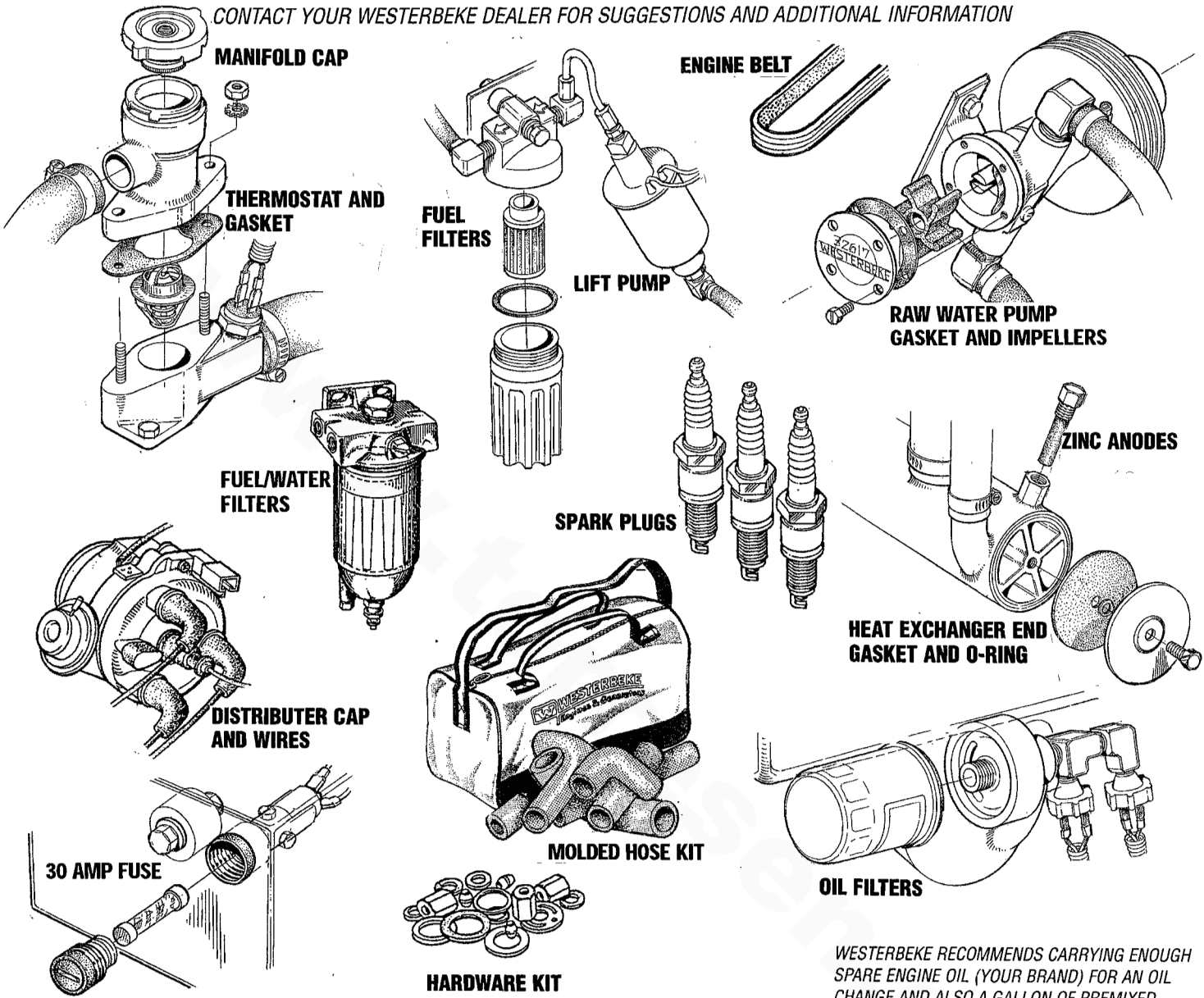
Diesel Oil = 1 US gallon = 7.13 lbs  
Fresh Water = 1 US gallon = 8.33 lbs  
Gasoline = 1 US gallon = 6.1 lbs  
Salt Water = 1 US gallon = 8.56 lbs



## SUGGESTED SPARE PARTS

### WESTERBEKE MARINE GASOLINE GENERATORS

CONTACT YOUR WESTERBEKE DEALER FOR SUGGESTIONS AND ADDITIONAL INFORMATION



WESTERBEKE RECOMMENDS CARRYING ENOUGH SPARE ENGINE OIL (YOUR BRAND) FOR AN OIL CHANGE AND ALSO A GALLON OF PREMIXED COOLANT FOR THE COOLING SYSTEM.

## SPARE PARTS KITS

WESTERBEKE also offers two Spare Parts Kits, each packaged in a rugged, rust free toolbox.

**KIT A** includes the basic spares.

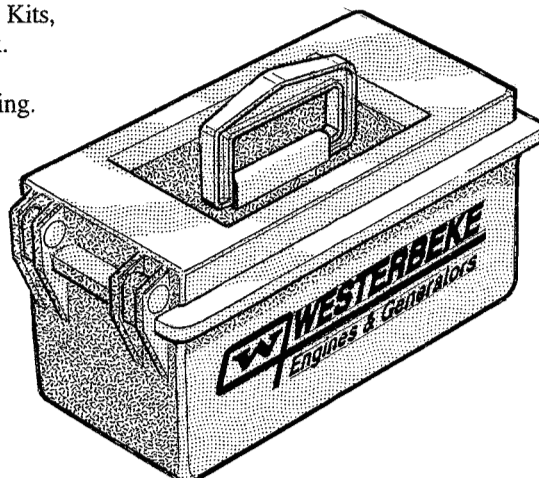
**KIT B** is for more extensive off-shore cruising.

### 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



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