

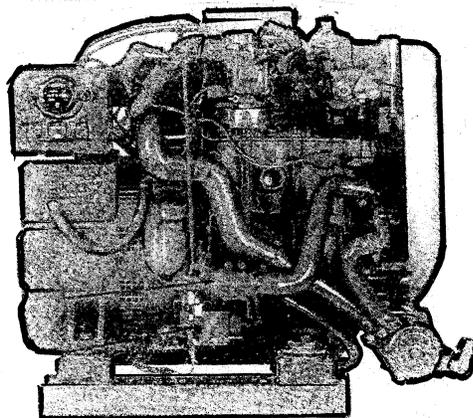
OPERATORS MANUAL

4.5 BCG(A) - 60Hz

3.5 BCG(A) - 50Hz

MARINE GASOLINE GENERATOR

SINGLE PHASE



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REVISION 3



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! WARNING:

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

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

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



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.

**CALIFORNIA
PROPOSITION 65 WARNING**

Marine diesel and gasoline engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

SAFETY INSTRUCTIONS

INTRODUCTION

Read this safety manual carefully. Most accidents are caused by failure to follow fundamental rules and precautions. Know when dangerous conditions exist and take the necessary precautions to protect yourself, your personnel, and your machinery.

As the owner or operator, always observe the following safety rules and advisories provided for your convenience. This safety information is in alignment with the American Boat and Yacht Council (ABYC) standards; however safety risks are not limited to the information in the following pages. The responsibility for the identification of potential and actual risks for compliance with all safety advisories, maintenance activities, and other conditions belong exclusively to the owner/operator.

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.

PREVENT BURNS — HOT ENGINE

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

- Monitor engine antifreeze coolant level at the plastic coolant recovery tank and periodically at the filler cap location on the water jacketed exhaust manifold, but only when the engine is COLD.

 **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 the air cleaner/silencer removed. Backfire can cause severe injury or death.
- Do not smoke or permit flames or sparks to occur near the fuel system. Keep the compartment and the engine/generator clean and free of debris to minimize the chances of fire. Wipe up all spilled fuel and engine oil.
- Be aware — diesel fuel will burn.

PREVENT BURNS — EXPLOSION

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

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

SAFETY INSTRUCTIONS

ACCIDENTAL STARTING

⚠ WARNING: Accidental starting can cause injury or death!

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

BATTERY EXPLOSION

⚠ WARNING: Battery explosion can cause injury or death!

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

BATTERY ACID

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

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

TOXIC EXHAUST GASES

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

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

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

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

AVOID MOVING PARTS

⚠ WARNING: Rotating parts can cause injury or death!

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

SAFETY INSTRUCTIONS

- Do not wear loose clothing or jewelry when servicing equipment; 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.
- Do not allow any swimming or activity around or near the exhaust discharge opening for the generator while the generator is operating. Carbon Monoxide poisoning or death can occur.

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) or flame arrested removed.
- Do not run engines for long periods with their enclosures open (when installed).



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

OPERATORS MANUAL

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

GASOLINE ENGINE AND GENERATOR INSTALLATIONS

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

Sections of the ABYC standards of particular interest are:

H-2 Ventilation for Boats using Gasoline

H-24 Gasoline Fuel Systems

P-1 Installation of Exhaust systems

for Propulsion and Auxiliary Engines

P-4 Marine Inboard engines and Transmissions

E-11 AC and DC Electrical systems On Boats

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

www.abycinc.org

ABYC, NFPA AND USCG PUBLICATIONS FOR INSTALLING ENGINES AND GENERATORS

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

613 Third Street, Suite 10

Annapolis, MD 21403

www.abycinc.org

NFPA - (National Fire Protection Association)
"Pleasure and Commercial Motor Craft"

Order From:

National Fire Protection Association

Battery March Park

Quincy, MA 02269

USCG (United States Coast Guard)

Regulations are under titles CFR33 and CFR46 of the "Code of Regulations"

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 system's hose **MUST** be certified for marine use. Corrugated Marine Exhaust Hose is recommended. The use of this type of hose allows for extreme bends and turns without the need of additional fitting and clamps to accomplish these bends and turns. In this regard, a single length of corrugated exhaust hose can be used. The system **MUST** be designed to prevent the entry of water into the exhaust system under any sea conditions and at any angle of vessels heel.



AVAILABLE FROM
YOUR WESTERBEKE
DEALER

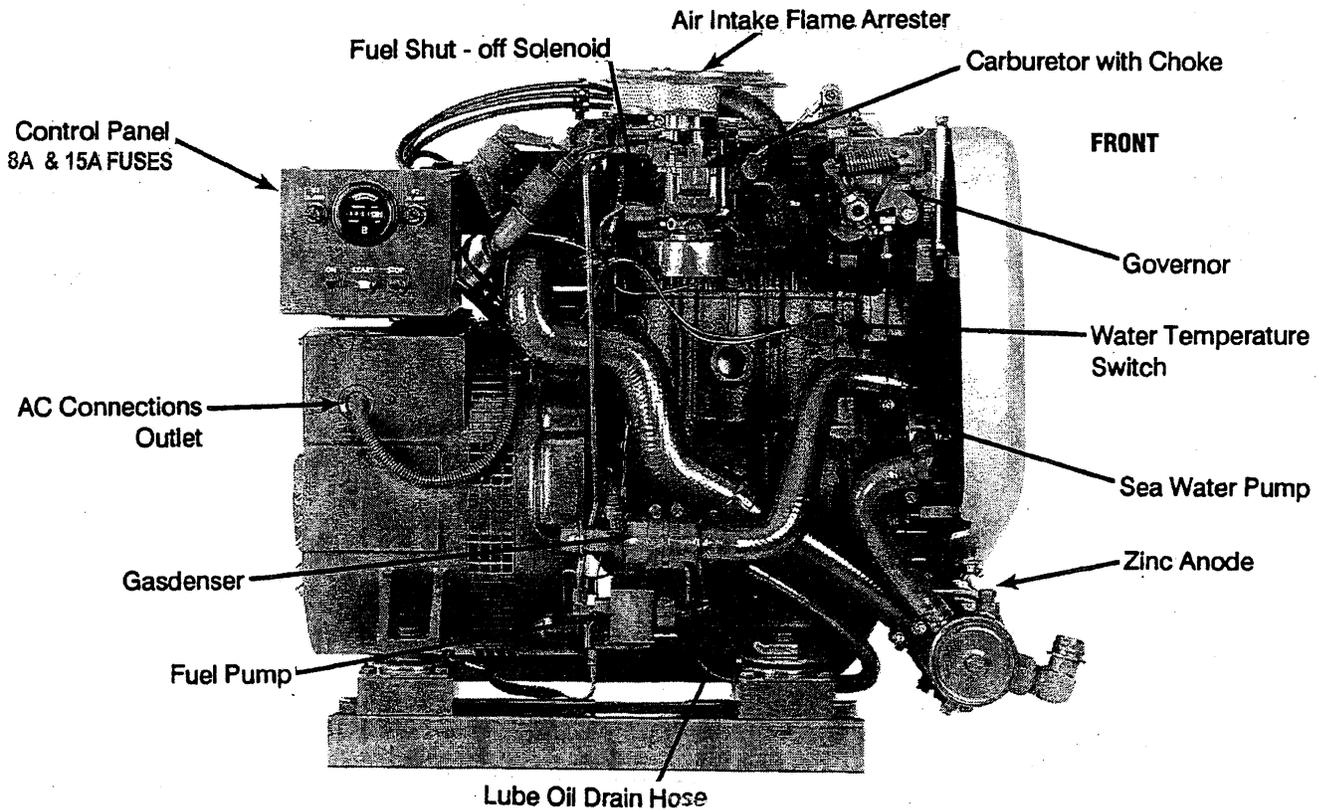
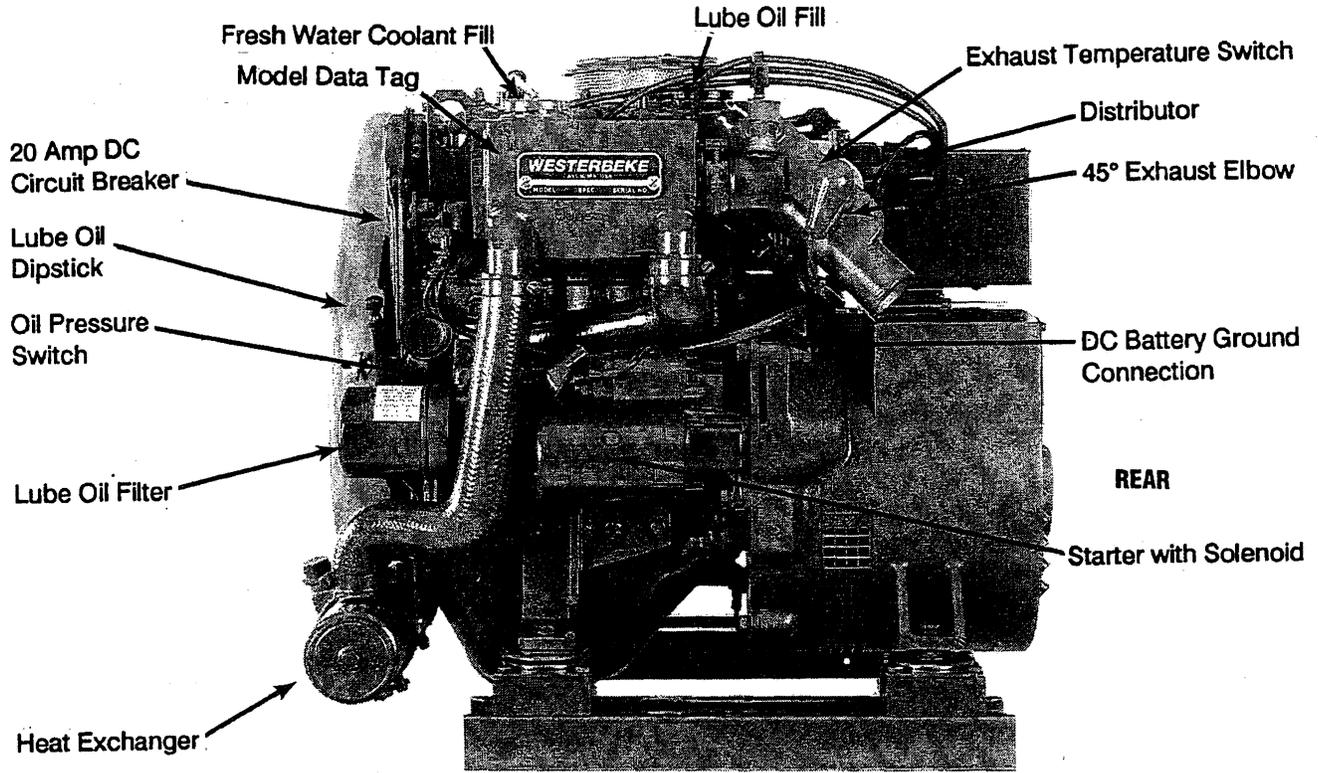
SIPHON-BREAK WITH STAINLESS
LOOP

A detailed Marine Installation Manual covering gasoline and diesel, engines and generators, is supplied with each unit. A pdf is available to download from our website at www.westerbeke.com.

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PARTS IDENTIFICATION



INTRODUCTION

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

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

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

WARRANTY PROCEDURES

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



Customer Identification

WESTERBEKE OWNER
 MAIN STREET
 HOMETOWN, USA

Model BCG — Ser. # _____
 Expires _____

PRODUCT SOFTWARE

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

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

The engine's model and serial number can be found on I.D. stickers affixed to either side of the generator housing. The engine's serial number can also be found stamped into the engine block on a flat surface just above and inboard of the lube oil filter. Take the time to enter this information on the illustration of the I.D. sticker below, as this will provide a quick reference when seeking technical information and/or ordering service/repair parts.

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

Fill in the information for your reference.



Engine I.D. Plate

INTRODUCTION

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 your engine.*

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

NOTE: *Also available are Spare Parts Kits (last page in this manual). These provide basic service spares needed in maintaining the drive engine. Visit our website: www.westerbeke.com to learn about these kits.*

CARBON MONOXIDE DETECTOR

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

The presence of carbon monoxide could indicate an exhaust leak from the main engine or the generator's engine or from the exhaust elbow/exhaust hose system the engine is connected to. Even possibly from a neighboring vessel's exhaust.

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

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.*
- *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 ENGINE

The gasoline engine driving an AC generator is in many ways similar to a gasoline automobile engine. The cylinders are vertical 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 preventative maintenance that is required of a gasoline automobile engine. The most important factors to the generator's longevity are proper ventilation, maintenance of the fuel system, ignition system, cooling system and the generator back-end.

FUEL, ENGINE OIL AND ENGINE COOLANT

GASOLINE

CAUTION: Use unleaded 89 Octane gasoline or higher. Ethanol gasoline must not exceed E10 (10%). Gasoline with higher percentages of Ethanol are not acceptable for use in these models and can void the warranty.

Gasoline with an ETHANOL content higher than 10% (E10) is not allowed and may void warranty.



Care Of The Fuel Supply

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

Purchase a well-known brand of fuel.

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

ENGINE OIL

Use a good brand of engine oil with an API and SAE designations as listed in the SPECIFICATION Section of this manual.

Change the engine oil and filter after an initial 50 hours of engine break-in operation. Then follow the oil and filter change intervals as specified in the MAINTENANCE SCHEDULE in this manual.

Westerbeke Corporation does not approve or disapprove the use of synthetic oils. If synthetic oils are used, engine break-in **MUST** be performed using conventional oil. Oil change intervals must be as listed in the MAINTENANCE SCHEDULE section in this manual and not to be extended if synthetic oils are used.

NOTE: The information above supercedes all previous statements regarding synthetic oil usage.

ENGINE COOLANT

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

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

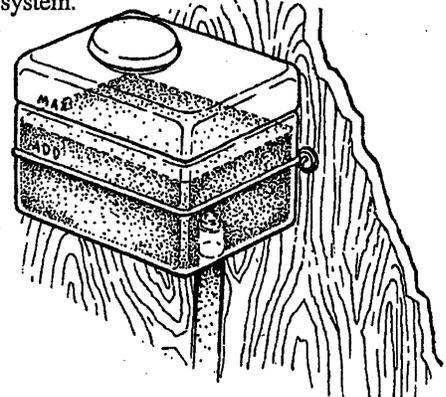
The distilled water and antifreeze should be premixed before being poured into the cooling circuit.

NOTE: Look for the new environmentally-friendly long lasting antifreeze that is now available.

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

COOLANT RECOVERY TANK

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



NOTE: This tank, with its short run of plastic hose, is best located at or above the level of the engine's exhaust manifold.

CONTROL PANELS

DESCRIPTION

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

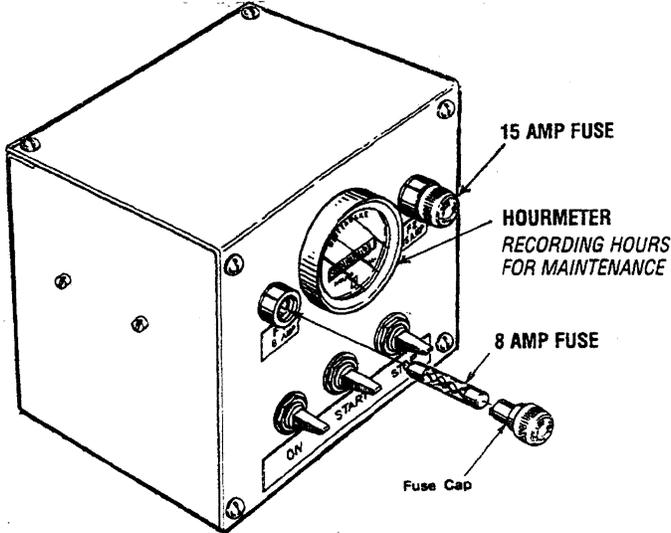
The **ON** switch provides power to the start circuit. This switch by-passes the protective oil pressure shutdown switch until the oil pressure reaches 5 - 10 psi.

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

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

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

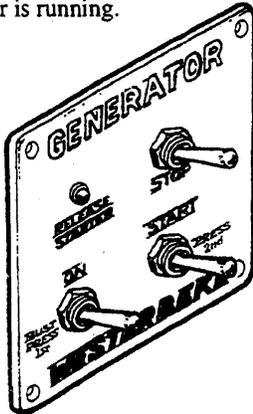
- A Slow-blo 15Amp Fuse to protect the start circuit.
- An 8 Amp Fuse to protect the engine operating circuit and any optional remote panels.



REMOTE START/STOP PANEL (OPTIONAL)

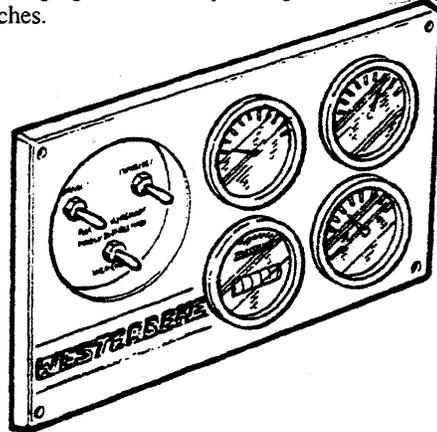
An optional remote start/stop panel is available for controlling the generator from a remote location.

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



REMOTE INSTRUMENT PANEL (OPTIONAL)

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



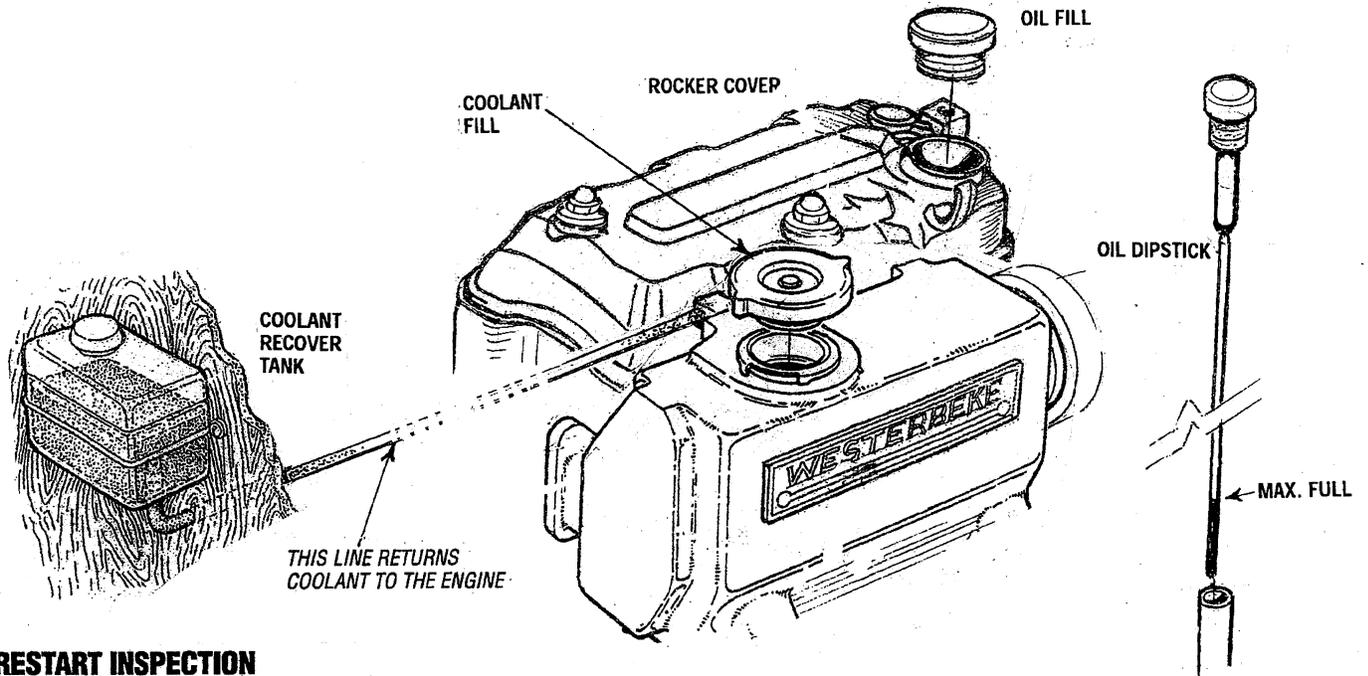
REMOTE INSTRUMENT PANEL INSTALLATION

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

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

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

PREPARATIONS FOR INITIAL START-UP



PRESTART INSPECTION

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

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

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

Before subsequent operation of the generator, the engine's manifold should be topped off, and the coolant recovery tank may need to be filled to the MAX level.

- Visually examine the unit. Look for loose or missing parts, disconnected wires, unattached hoses, and check threaded connections. Search for any gasoline leaks.

- Check load leads for correct connections as specified in the wiring diagrams.
- Examine the air inlet and outlet for air flow obstructions.
- Be sure no other generator or utility power is connected to the load lines.
- Be sure that in power systems with a neutral line that the neutral is properly grounded (or ungrounded) as the system requires, and that generator neutral is properly connected to the load neutral. In single phase systems an incomplete or open neutral can supply the wrong line-to-neutral voltage on unbalanced loads.

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

OPERATING INSTRUCTIONS

STARTING THE GENERATOR

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

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

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

3. Release the **ON** switch.

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

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

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

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

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

STOPPING THE GENERATOR

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

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

OPERATING INSTRUCTIONS

ABNORMAL STOP

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

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

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

OVERSPEED SHUTDOWN

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

If the overspeed switch itself is faulty and re-setting it by depressing the STOP switch will not reset the circuit, lift the T-1 coil connection from the overspeed switch and tape the end of the T-1 wire with electrical tape. By-pass this circuit only as a test. Re-start the generator, if this by-pass is successful, replace the faulty overspeed switch.

Do not run the generator without replacing the overspeed switch.

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

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

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

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

REMOTE PANELS

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

BREAK-IN PROCEDURE/DAILY OPERATION

BREAK-IN PROCEDURE

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

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

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

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

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

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

CHECK LIST

Follow this checklist each day before starting your generator.

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

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

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

STOPPING THE GENERATOR

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

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

GENERATOR ADJUSTMENTS

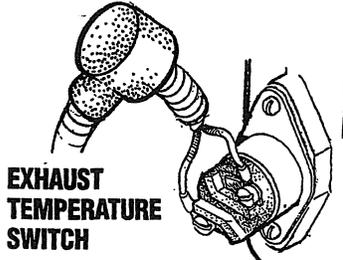
Once the generator has been placed in operation, there may be governor adjustments required for engine speed (hertz) during the engine's break-in period (first 50 hours) or after this period (see *ENGINE SPEED (HERTZ) ADJUSTMENT* under *ENGINE ADJUSTMENTS*). A no-load voltage adjustment may also be required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

SAFETY SHUTDOWN SWITCHES

SAFETY SHUTDOWN SWITCHES

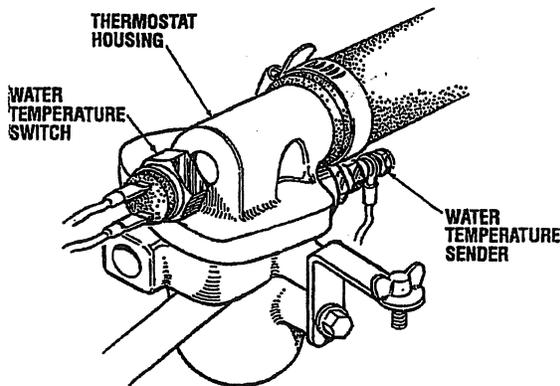
The engine is protected by a variety of shutdown switches. Should a shutdown occur, **do not attempt to restart without finding and correcting the cause**. Refer to the heading *Engine starts, runs and then shuts down* in the **ENGINE TROUBLESHOOTING** section of this manual.

The following is a description of these automatic shutdown switches:



Exhaust Temperature Switch

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



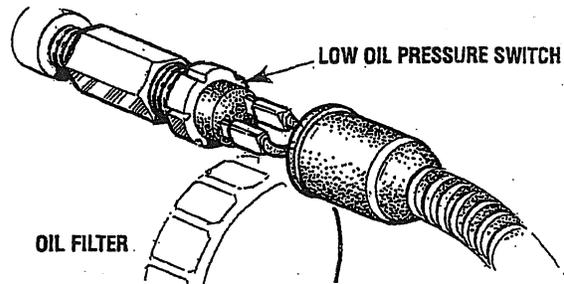
High Water Temperature Switch

A high water temperature switch is located on the thermostat housing. This switch will open and interrupt the DC voltage to the ignition coil (which turns OFF the engine), should the fresh water coolant's operating temperature reach approximately 205° F (96° C).

This switch resets at 195° F (107° C).

Low Oil Pressure Switch

A low oil pressure shutdown switch is located off the engine's oil gallery. The switch is kept closed by engine oil pressure. Should the engine's oil pressure fall to 10 - 15 psi, the switch will open interrupting the DC voltage to the ignition coil (which turns OFF the engine).

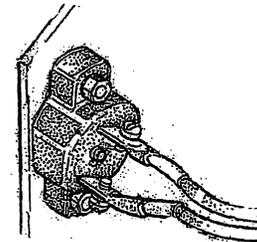


High RPM Shutdown Switch

An overspeed shutdown switch shuts OFF the generator set by grounding out the ignition system should the engine's speed reach approximately 2175 rpm. Reset the switch by momentarily depressing the STOP switch. (Make sure the cause of the engine overspeed shutdown is corrected).

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.



Overspeed PC Board

Inside the Control Box on the generator is a solid state Overspeed PC Board. It monitors engine rpm via ignition coil pulses. If these pulses reach a preset point. The PC Board grounds the ignition and shuts the generator down. Press the STOP switch to re-set the PC Board. (For test purpose ONLY to determine a faulty PC Board that will not re-set. Lift the T1 connection off the board and attempt to start 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. When servicing/replacing DC components, turn off the DC circuit breaker on the control panel or turn off the battery switch.

SCHEDULED MAINTENANCE

EXPLANATION OF SCHEDULED MAINTENANCE

Maintenance procedures are all detailed in this manual.

DAILY CHECK BEFORE START-UP	
Coolant Level	Check at recovery tank, if empty, check at manifold. Add coolant if needed.
Engine Oil Level	Oil level should indicate between MAX and LOW on dipstick. Do not overfill!
Fuel/Water Separator (owner installed)	Check for water and dirt in fuel. Drain filter if necessary. Replace filter every 250 operating hours or once a year.
Fuel Supply	Fresh unleaded gasoline with an octane rating of 89 or higher. Lower octane will affect engine performance. 10% ethanol maximum.
Visual Inspection of Engine	Check for fuel, oil and water and exhaust leaks. Check that the water injected exhaust elbow securing v-clamp is tight. No exhaust leaks around the elbow. Inspect wiring and electrical connections. Look for loose bolts/hardware and correct as needed.

INITIAL 50 HOURS OF OPERATION	
*Spark Plugs	Clean/regap.
Engine Oil and Filter	Initial engine oil and filter change at 50 hours, then change both every 100 hours.
*Exhaust System	Initial check at 50 hours, then every 250 hours or once a year. Carefully inspect for leaks. Check that the exhaust hoses are properly attached and that the securing clams are tight. Check the integrity/mounting security of the water injected exhaust elbow.
*Valve Adjustment	Check adjustment of valve. Check again at 500 hours. Torque head bolts first.
Air Screen/Flame Arrester	Remove, clean and re-install screen pack. Inspect rubber sealing ring and replace if necessary, then every once a year.
Carburetor Filter Screen	Clean screen at 50 hours then every 250 hours.
Mechanical Governor	Initial oil change, then every 250 hours or once a year.

EVERY 50 OPERATING HOURS OR MONTHLY	
Drive Belt (water pump)	Inspect for proper tension (3/8" to 1/2" deflection) and adjust if needed. Check belt for slipping, cracking and wear. Adjust tension or replace as needed. Replace cover.
Starting Batteries	Check electrolyte levels. Make sure cables and connections are in good order. Clean off corrosion if needed. Apply petroleum jelly to terminals for corrosion protection.
Electric Fuel Pump and Gasdenser	Inspect for leaks, ensure fuel and electrical connections are clean and tight.
Zinc Anode	Inspect and clean zinc anode. Replace if necessary. Note the condition, then determine your own inspection schedule.

EVERY 100 OPERATING HOURS OR YEARLY	
Engine Oil and Filter	Change engine oil and filter.
Air Screen/Flame Arrester	Remove, clean and re-install screen pack. Inspect rubber sealing ring and replace if necessary.

EVERY 250 OPERATING HOURS OR YEARLY	
*Exhaust Elbow/Exhaust System NOTE: Some models have catalytic converters <i>See data below.</i>	Check the structural integrity of the water injected exhaust elbow casting. Check the integrity of the exhaust system attached to the elbow. All hose connections should be secure. No chaffing. No exhaust leaks. Hoses and muffler are in good serviceable condition. NOTE: An exhaust leak will cause exposure to diesel exhaust!
Carburetor Filter Screen	Clean, replace fuel inlet screen.
*Generator	Check that AC connections are clean and secure. Ensure wires have no chafing. <i>See GENERATOR INFORMATION.</i>

MAINTENANCE SCHEDULE

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

SCHEDULED MAINTENANCE

EXPLANATION OF SCHEDULED MAINTENANCE

EVERY 250 OPERATING HOURS OR YEARLY	
Hoses	Engine hoses should be firm and tight. Replace if hoses become spongy, brittle or delaminated. Check and tighten all hose clamps as needed.
*Ignition Timing	Check timing and adjust as needed.
*Spark Plugs	Inspect, clean, re-gap or replace.
*Vibration Isolators/Engine Mounts	Check vibration isolators, brackets and mounting hardware. Replace as needed.
Heat Exchanger	Open heat exchanger and cap(s) and clean out debris. Replace gasket and O-rings if needed.
Mechanical Governor	Change governor oil.
EVERY 500 OPERATING HOURS OR YEARLY	
Raw Water Pump	Remove the pump cover and inspect the pump assembly for wear, especially cam and wear plates. Replace the impeller and gasket. Lubricate the impeller at re-assembly.
*Exhaust System Catalyst	Inspect and/or replace. See Data below. *
EVERY 500 OPERATING HOURS OR EVERY TWO YEARS	
Ignition Wires	Inspect for deterioration. Inspect resistance.
*Coolant System	Drain, flush and re-fill the cooling system with appropriate antifreeze mix. Replace the thermostat and coolant pressure cap.
*Valve Clearances	Adjust valves. (Incorrect valve clearance will result in poor engine performance.)
*Starter Motor	Check solenoid and motor for corrosion. Remove and lubricate. Clean and lubricate the starter motor pinion drive.
EVERY 1000 OPERATING HOURS OR OR EVERY FIVE YEARS	
*Engine Timing Belt	Inspect timing belt. Replace as needed. Failure to replace belt can result in severe engine damage.
Heat Exchanger	Remove the heat exchanger for professional cleaning and pressure testing.
Cylinder Head Bolts	Re-torque bolts (engine cold). Adjust valves after re-torque.

(CONT.)

NOTE: Keep the engine surface clean. Dirt and oil will inhibit the engine's ability to remain cool.

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

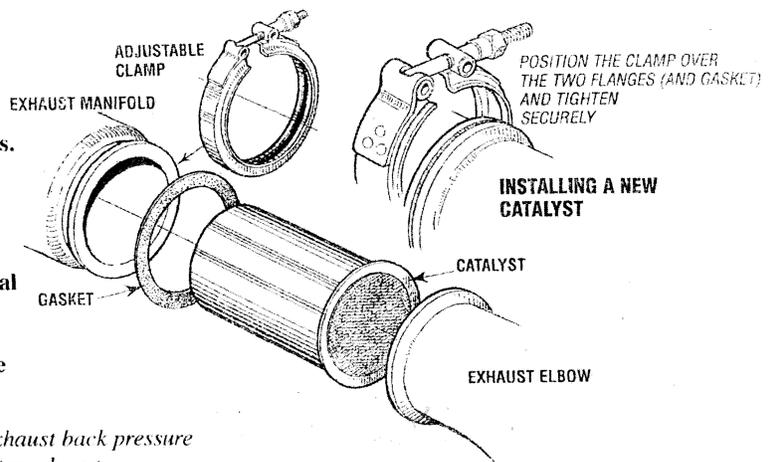
*CATALYTIC CONVERTER

ADDED TO PRODUCTION MODELS...(Date Code D608)

A Catalytic Converter has been installed on the engine's exhaust to reduce exhaust emissions and to conform with the current U.S. Environmental Protection Agency and the California Air Resources Board exhaust emission standards. Do not operate the engine without the Catalyst assembly installed.

Every 500 operating hours a visual inspection of the converter should be performed. Remove the converter assembly from the exhaust manifold and inspect the internal part for damage, carbon build-up, or soot deposits. If light is not visible through the element, replace the converter. The complete assembly with housing must be replaced. The internal part is not available separately.

NOTE: Signs that the Catalyst may need replacing are high exhaust back pressure and a sooty exhaust. Do not allow sea water to contact the internal part.



COOLING SYSTEM

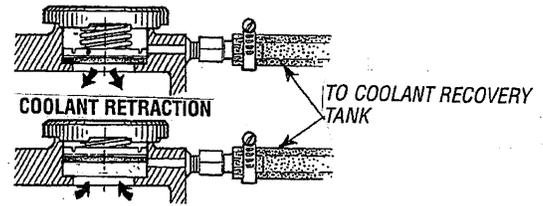
DESCRIPTION

Westerbeke marine engines are designed and equipped for fresh water cooling. Heat produced in the engine by combustion and friction is transferred to fresh water coolant which circulates throughout the engine. This circulating fresh water coolant cools the engine block, its internal moving parts, and the engine oil. The heat is transferred externally from the fresh water coolant to raw water by means of a heat exchanger, similar in function to an automotive radiator. Raw water flows through the tubes of the heat exchanger while fresh water coolant flows around the tubes; engine heat transferred to the fresh water coolant is conducted through the tube walls to the raw water which is then pumped into the exhaust system where finally it is discharged overboard.

In other words, the engine is cooled by fresh water coolant, this coolant is cooled by raw water, and the raw water carries the transferred heat overboard through the exhaust system. The fresh water coolant and raw water circuits are independent of each other. Using only fresh water coolant within the engine allows the cooling water passages to stay clean and free from harmful deposits.

Coolant Recovery Tank

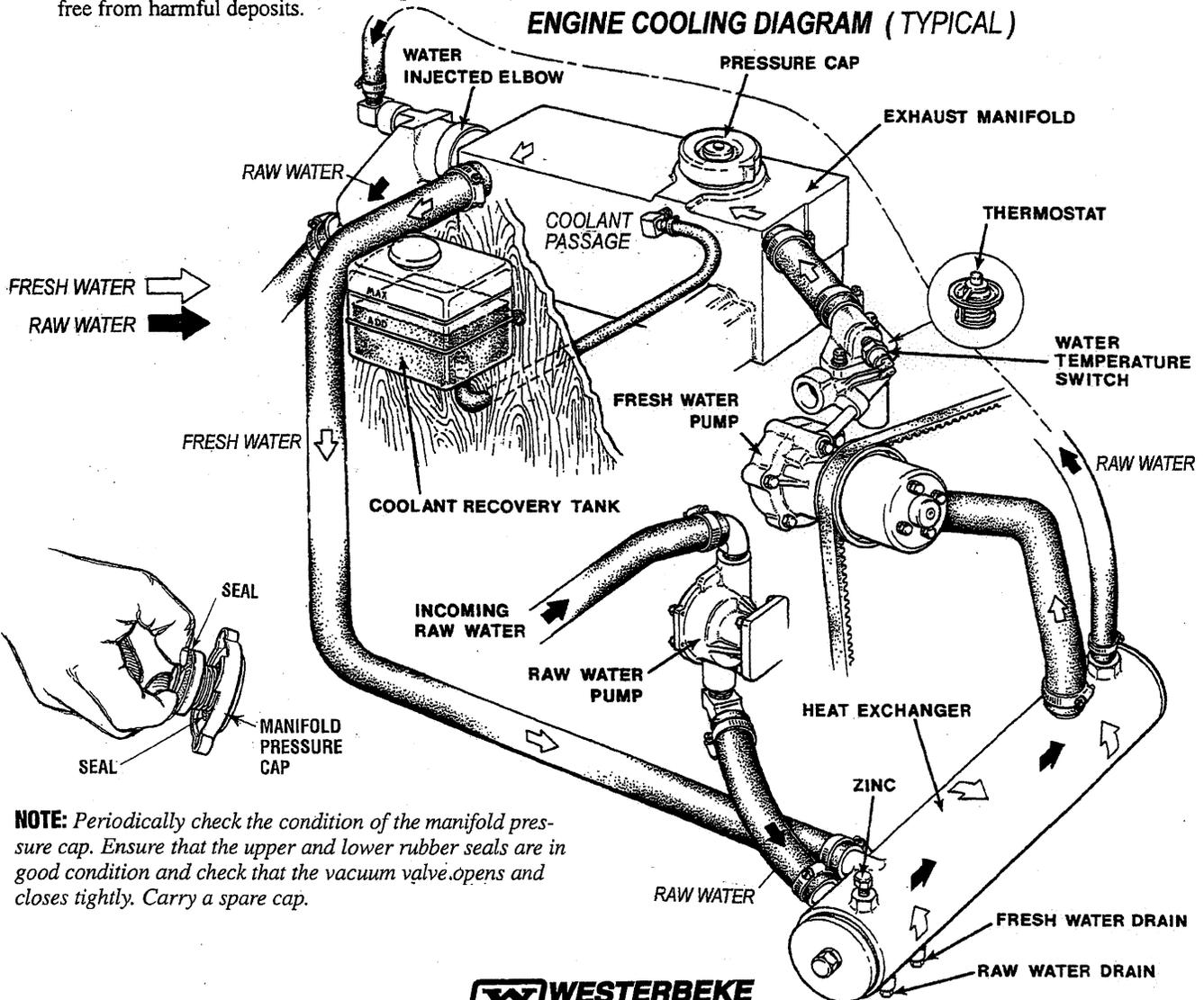
A coolant recovery tank allows for engine coolant expansion and contraction during engine operation, without any significant loss of coolant and without introducing air into the cooling system. This tank should be located at or above the engine manifold level and should be easily accessible.



COOLANT EXPANSION

KEEP THESE PASSAGES CLEAR TO ENSURE A FULL FLOW OF COOLANT TO AND FROM THE COOLANT RECOVERY TANK (A PIPE CLEANER WORKS WELL)

ENGINE COOLING DIAGRAM (TYPICAL)



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.

COOLING SYSTEM

RAW WATER INTAKE STRAINER

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

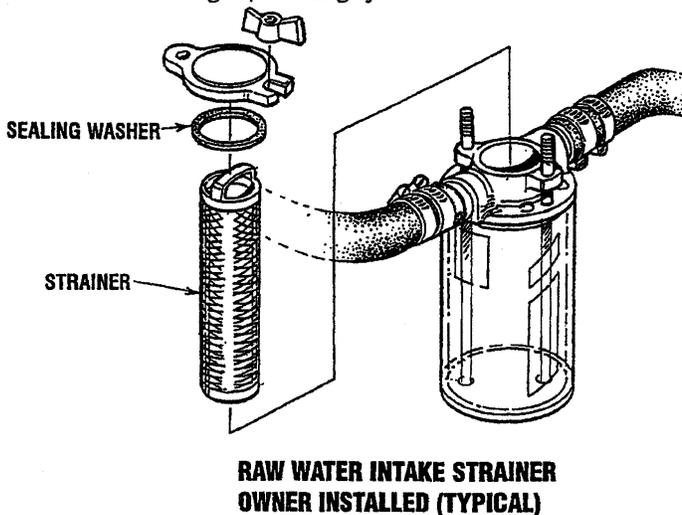
A clean raw water intake strainer is a vital component of the engine's cooling system. Include a visual inspection of this strainer when making your periodic engine check. The water in the glass should be clear.

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 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.

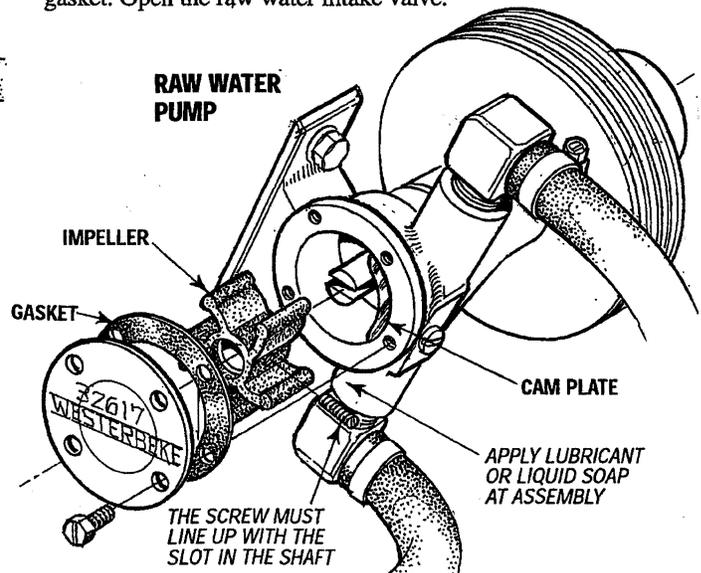
RAW WATER PUMP

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.

COOLING SYSTEM

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 on the engine block and opening the manifold pressure cap. Flush the system with fresh water, then reinstall the drain and start the refill process.

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

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

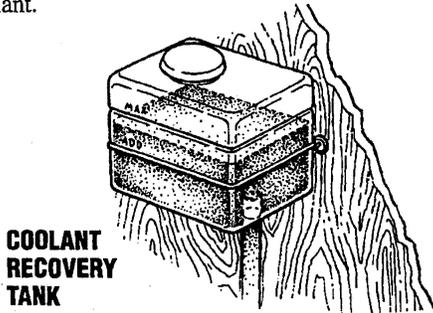
Refilling the Coolant

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

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

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

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



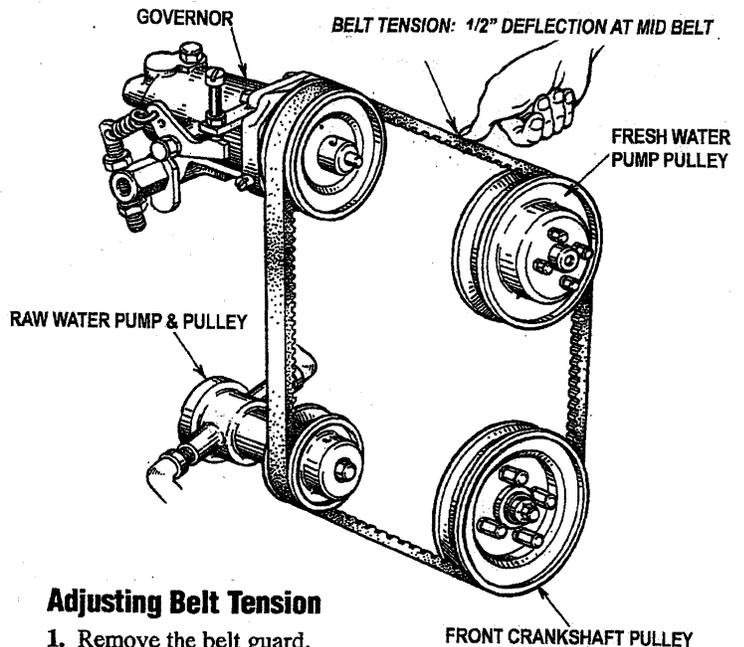
DRIVE BELT ADJUSTMENT

For your safety, Westerbeke generator models come equipped with belt guards that cover over the belt(s) on the front of the engine. ("Out of sight - out of mind." The belt guard is NOT installed for that purpose.) Operators are advised that proper inspection, service, and maintenance is required.

Drive belts must be properly tensioned. Loose drive belts will not provide proper alternator charging and will eventually damage the alternator. Drive belts that are too tight will pull the alternator out of alignment and/or cause the alternator to wear out prematurely. Excessive drive belt tension can also cause rapid wear of the belt and reduce the service life of the fresh water pump's bearing. A slack belt or the presence of oil on the belt can cause belt slipping, resulting in high operating temperatures.

The drive belt is properly adjusted if the belt 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. A spare belt or belts should always be carried on board.

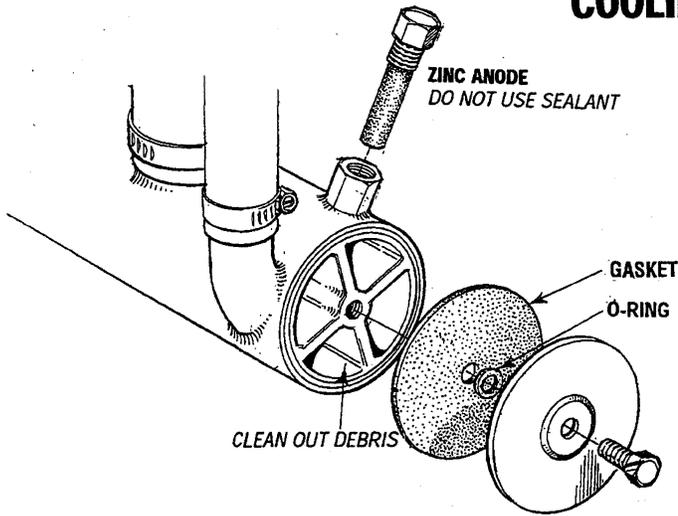
WARNING: *Never attempt to check or adjust the drive belt's tension while the engine is in operation.*



Adjusting Belt Tension

1. Remove the belt guard.
2. Loosen the alternator adjusting strap bolt and the base mounting bolt.
3. With the belt loose, inspect for wear, cracks, and frayed edges.
4. Pivot the alternator on the base mounting bolt to the left or right as required, to loosen or tighten.
5. Tighten the base mounting bolt and the adjusting strap bolt.
6. Operate the generator for about 5 minutes then shut down and recheck the belt tension.
7. Replace the guard.

COOLING SYSTEM



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.

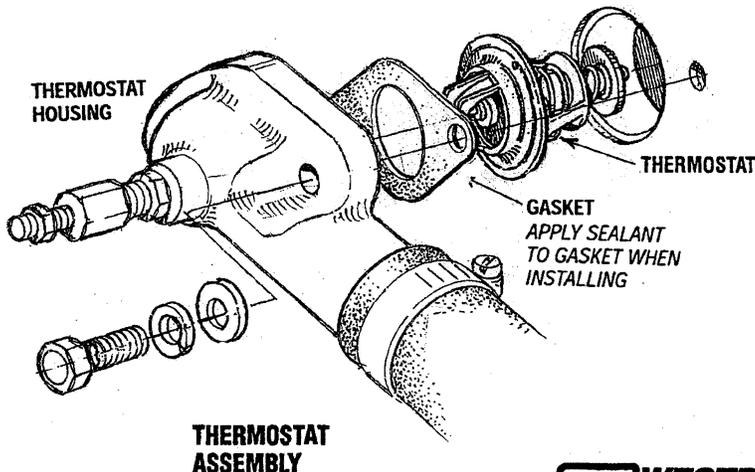
The engine coolant and raw water are independent of each other; this keeps the engine's water passages clean from the harmful deposits found in raw water.

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

THERMOSTAT

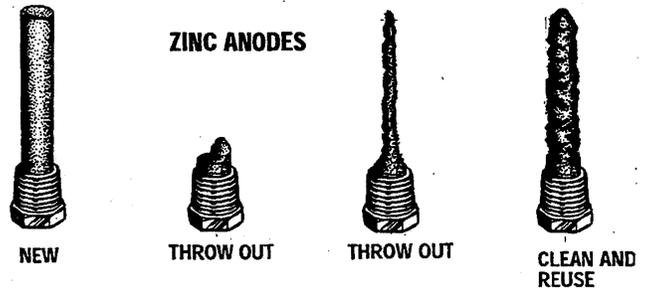
A thermostat controls the coolant temperature as the coolant continuously flows through the closed cooling circuit. When the engine is first started the closed thermostat prevents coolant from flowing (some coolant is by-passed around the thermostat to prevent the exhaust manifold from overheating). 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 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).



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.

FUEL SYSTEM

GASOLINE

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

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

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

GASOLINE/WATER SEPARATOR AND FILTER

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

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

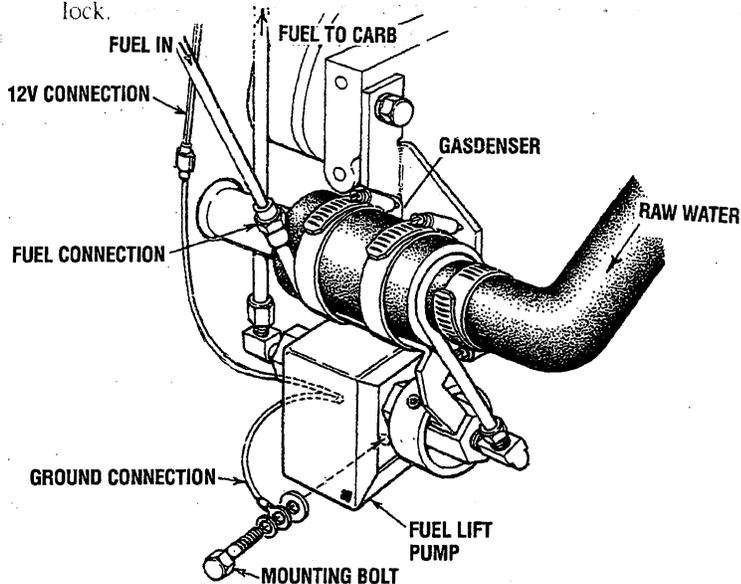
These gasoline filters must have *metal* bowls (not "see-through") to meet U.S. Coast Guard requirements. The metal bowls have drain valves to use when checking for water and impurities.



GASOLINE/WATER SEPERATOR & FILTER

GASDENSER

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

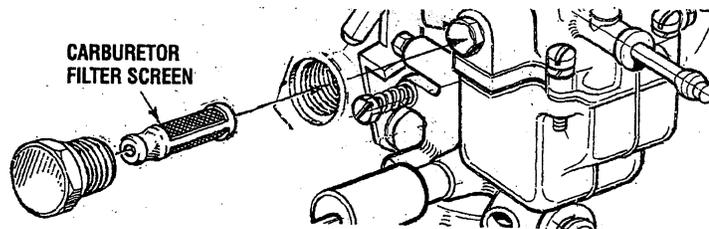


FUEL LIFT PUMP

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

The engine mounted fuel lift pump is maintenance free.

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



CARBURETOR FILTER SCREEN

This generator has just one filter screen that is located in the carburetor. To remove the filter screen, unscrew the plug as shown. Clean the filter screen or, if needed, replace it. This screen should be cleaned periodically.

FUEL SYSTEM

CARBURETOR

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

On early models, the choke was electric using a 12-volt heating element which opens the choke automatically once the engine starts. Later models the choke was operated by a 12-volt solenoid. It activates the choke when the ON switch was depressed. It could be kept on in this manner to assist in a cold start.

Air Screen/Flame Arrester

The air screen/flame arrester can easily be removed by releasing the hold-down clamp. Clean after the first 50 hours of operation, every 1 hours from then on. Clean the air screen in a water soluble cleaner such as GUNK.

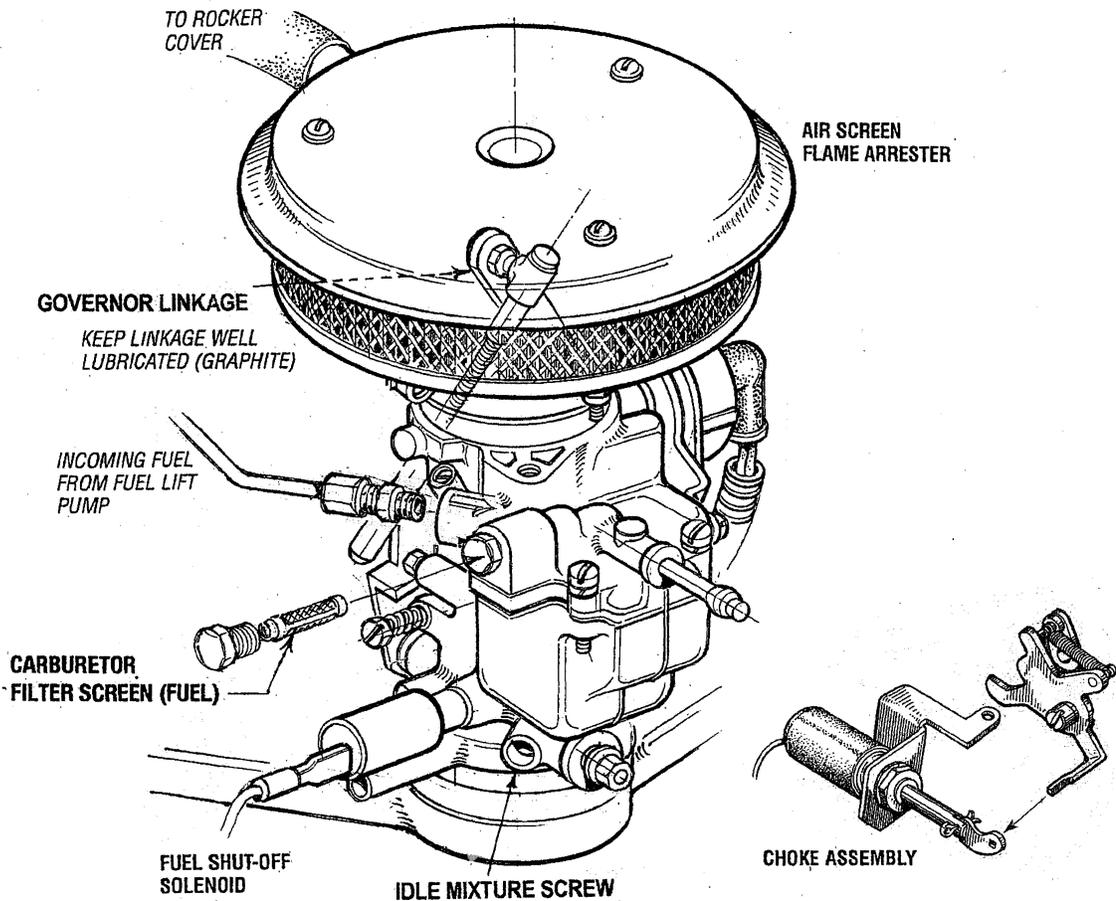
Carburetor Filter Screen

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

Idle Mixture Jet

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

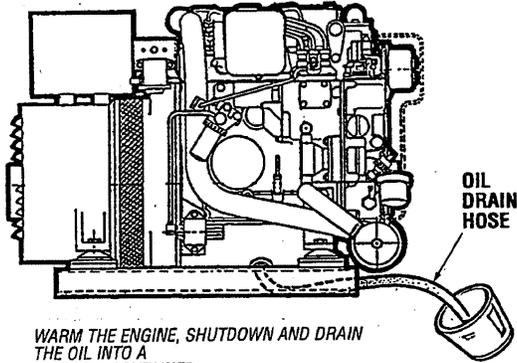
Note: An idle mixture jet adjusted too far off its seat can induce a sooty exhaust discharge at engine start-up and shut-down.



ENGINE OIL CHANGE

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.



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 competent 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 poor location of or the lack of an anti-siphon valve.

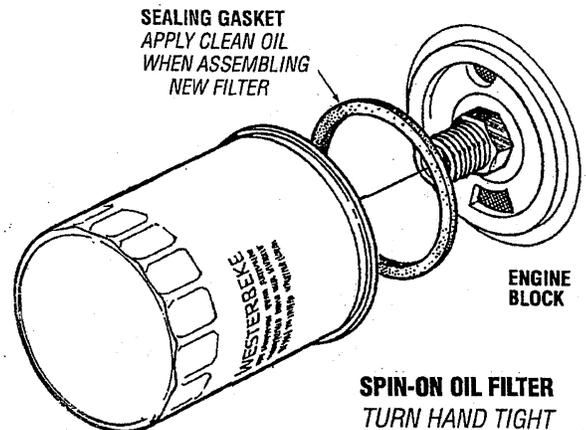
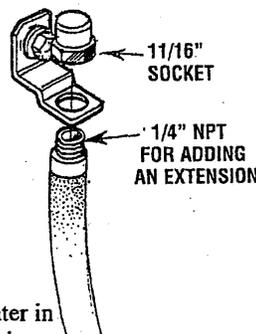
2. **Replacement of the Oil Filter.** When removing the used oil filter, you may find it helpful and cleaner to punch a hole in the upper and lower portion of the old filter to drain the oil from it into a container before removing it. This helps to lessen spillage. A small style automotive filter wrench 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. Please keep your engine clean.) Inspect the old oil filter as it is removed to make sure that the rubber sealing gasket came off with the old oil filter. If this rubber sealing gasket remains sealed against the engine block, gently remove it.

When installing the new oil filter element, wipe the filter gasket's sealing surface on the engine block 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, and then tighten the filter firmly by hand.

3. **Filling the Oil Sump.** Add new oil through the oil filler cap on the top of the engine or through the side oil fill. After refilling, run the generator for a few moments while checking the engine's oil pressure. Make sure there is no leakage around the new oil filter or from the oil drain system, and stop the generator. 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.



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.

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

Oil Pressure

The engine's oil pressure, during operation, is indicated by the oil pressure gauge on the instrument panel. During normal operation, the oil pressure will range between 35 and 55 psi.

NOTE: A newly started, cold engine can have an oil pressure reading upwards of 60 psi. A warmed engine can have an oil pressure reading as low as 35 psi. These readings will vary depending upon the temperature of the engine and the load placed on the generator.

REMOTE OIL FILTER (OPTIONAL)

PN. 040078

INSTALLATION

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

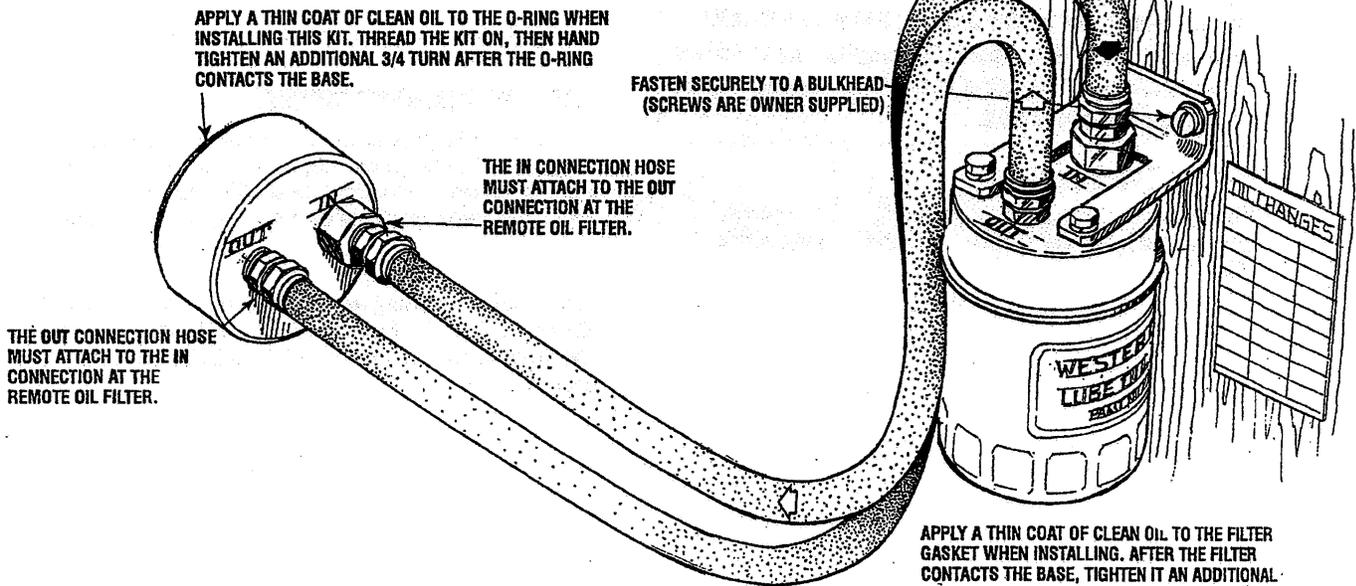
NOTE: Refer to *ENGINE OIL CHANGE* in this manual for instructions on removing the oil filter.

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

Contact your WESTERBEKE dealer for more information.

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

CAUTION: It is vital to install the oil lines correctly. If the oil flows in the reverse direction, the by-pass valve in the filter assembly will prevent the oil from reaching the engine causing an internal engine failure. If there is no oil pressure reading, shutdown immediately and check the hose connections.



STARTER MOTOR

DESCRIPTION

The starter can be roughly divided into the following sections:

- A motor section which generates a drive power.
- An overrunning clutch section which transmits an armature torque, preventing motor overrun after starting.
- A switch section (solenoid) which is operated when actuating the overrunning clutch through a lever and which supplies load current to the motor.

The starter is a new type, small, light-weight and is called a high-speed internal-reduction starter. The pinion shaft is separate from the motor shaft; the pinion slides only on the pinion shaft. A reduction gear is installed between the motor shaft and a pinion shaft. The pinion sliding part is not exposed outside the starter so that the pinion may slide smoothly without becoming fouled with dust and grease. The motor shaft is supported at both ends on ball bearings. The lever mechanism, switch and overrunning clutch inner circuit are identical to conventional ones.

ADJUSTMENT AND REPAIR

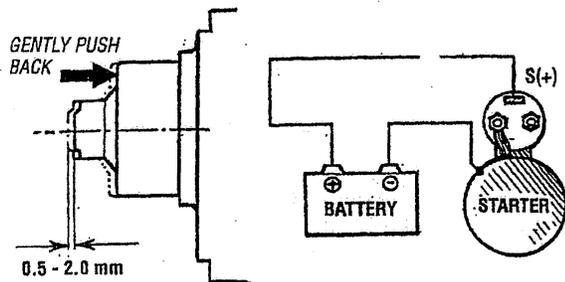
If any abnormality is found by the following tests, the starter should be disassembled and repaired.

Pinion Gap Inspection

1. Connect a battery (12V) between the starter terminal S and the starter body, and the pinion drive should rotate out and stop.

CAUTION: Never apply battery voltage for over 10 seconds continuously.

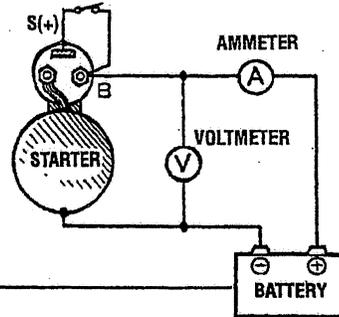
2. Lightly push the pinion back and measure the return stroke (called pinion gap).
3. If the pinion gap is not within the standard range, (0.5 to 2.0 mm), adjust it by increasing or decreasing the number of shims on the solenoid. The gap is decreased as the number of shims increases.



PINION GAP

No-Load Test

1. Connect the ammeter, voltmeter, and battery to the starter as illustrated.
2. When the switch is closed, the pinion must protrude and the starter must run smoothly (at 3000 rpm or more). If the current or starter speed is out of specification, disassemble the starter and repair it.

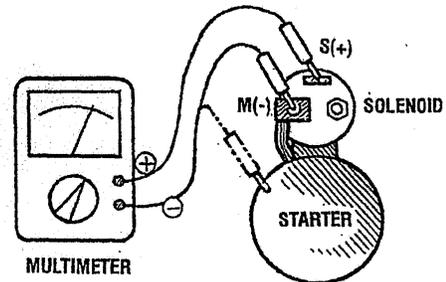


CAUTION: Use thick wires as much as possible and tighten every terminal securely. This is a solenoid shift-type starter which makes a rotating sound louder than that of a direct-drive type starter. When detecting starter rotation at the pinion tip, be careful not to come in contact with the pinion gear when it protrudes.

SOLENOID

Perform the following tests. If any test result is not satisfactory, replace the solenoid assembly.

1. Inspect the solenoid for continuity between terminals (+) and (-) and between terminals S and the body and M and the body. There should be no continuity found between terminals S and M. Continuity will be found between terminals S and the body and terminal M and the body.

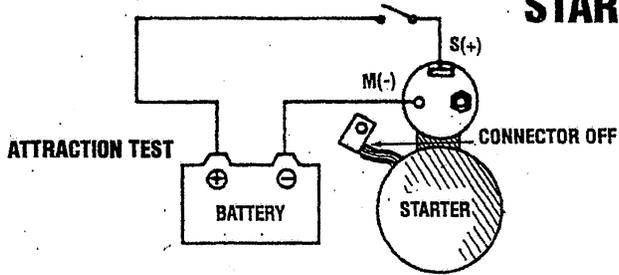


NOTE: Disconnect the wire from terminal M.

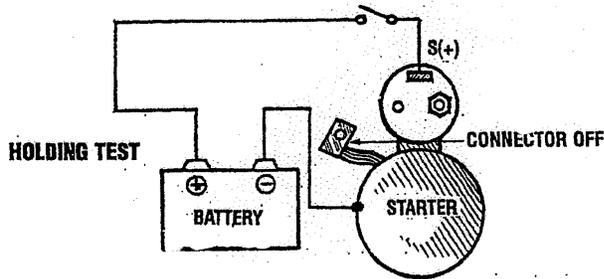
2. Connect a battery to the solenoid's terminal S for (+) and M for (-). Have a switch in the + lead and close it. The pinion drive should extend fully out.

CAUTION: Do not apply battery current for more than 10 seconds when testing the solenoid.

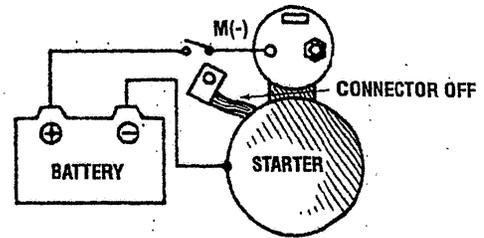
STARTER MOTOR



3. *Holding test.* With a battery connected to the solenoid terminal S (+) and to the starter body, manually pull out the pinion fully. The pinion must remain at that position even when released from holding with your hand.

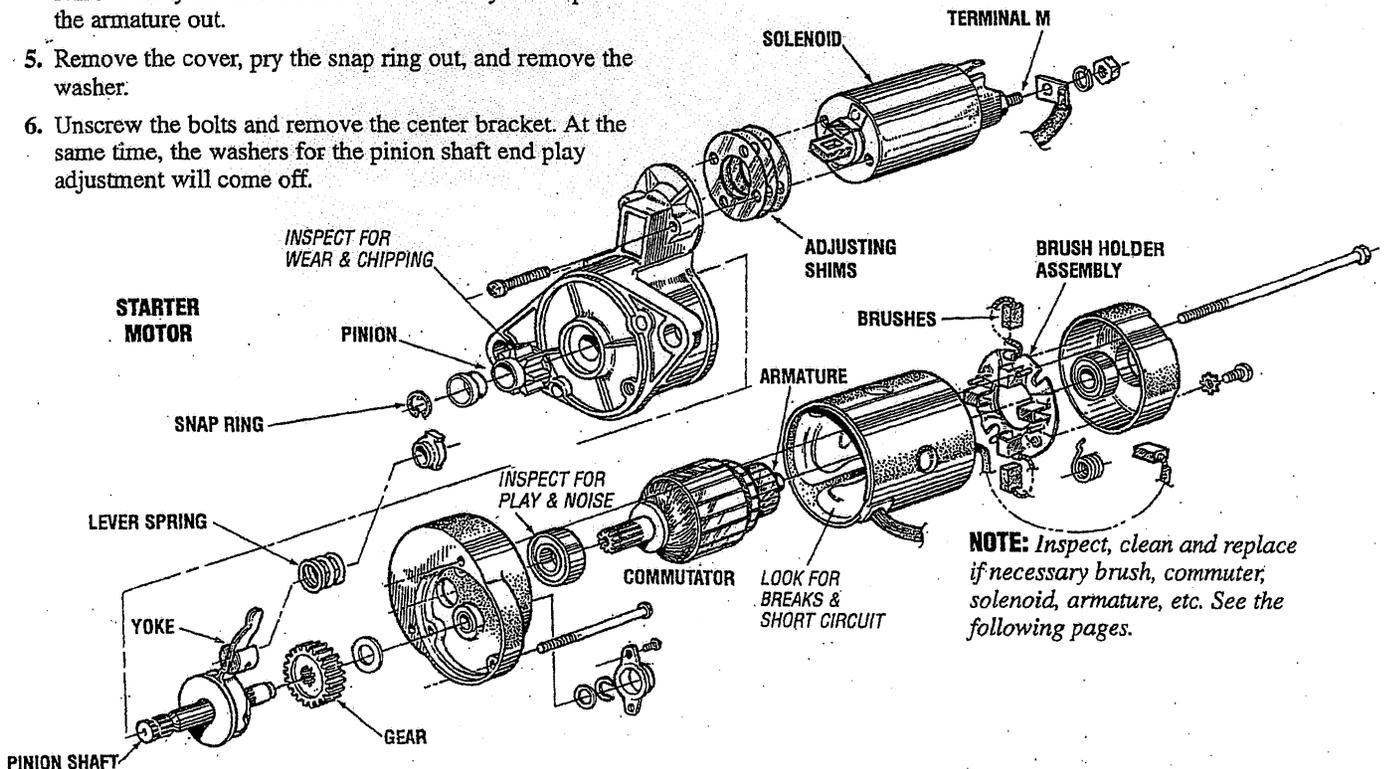


4. *Return test.* With a battery connected to the solenoid terminal M (-) and to the starter body, manually pull out the pinion fully. The pinion must return to its original position when released from holding by hand.



STARTER DISASSEMBLY

1. Disconnect the wire from the solenoid terminal M (-).
2. Loosen the two screws fastening the solenoid. Remove the solenoid assembly.
3. Remove the two long through bolts and two screws fastening the brush holder. Remove the rear bracket.
4. With the brushes pulled away from the armature, remove the yoke and brush holder assembly. Then pull the armature out.
5. Remove the cover, pry the snap ring out, and remove the washer.
6. Unscrew the bolts and remove the center bracket. At the same time, the washers for the pinion shaft end play adjustment will come off.
7. Pull out the reduction gear lever and lever spring from the front bracket.
8. On the pinion side, pry the snap ring out, and pull out the pinion and pinion shaft.
9. At each end of the armature, remove the ball bearing with a bearing puller. It is impossible to replace the ball bearing press-fitted in the front bracket. If that bearing has worn off, replace the front bracket assembly.



BATTERY CHARGING CIRCUIT

The DC Circuit on the BCG 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 minimum recommended capacity of the battery used in the engine's 12-volt DC control circuit is 400 CCA.

BATTERY CHARGER

The generator supplies a continuous 10 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 13.5V to 14V 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 13.5V to 14V. If no charge is indicated, replace the charger.

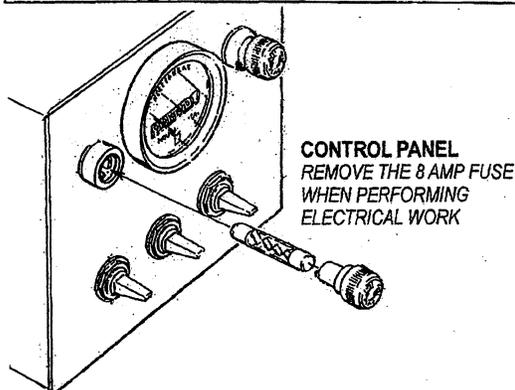
NOTE: FOR THE DESCRIPTION AND TESTING OF THE BATTERY CHARGER (INTEGRAL CONTROLLER), REFER TO THE FOLLOWING PAGE.

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.



BATTERY CHARGING CIRCUIT

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.

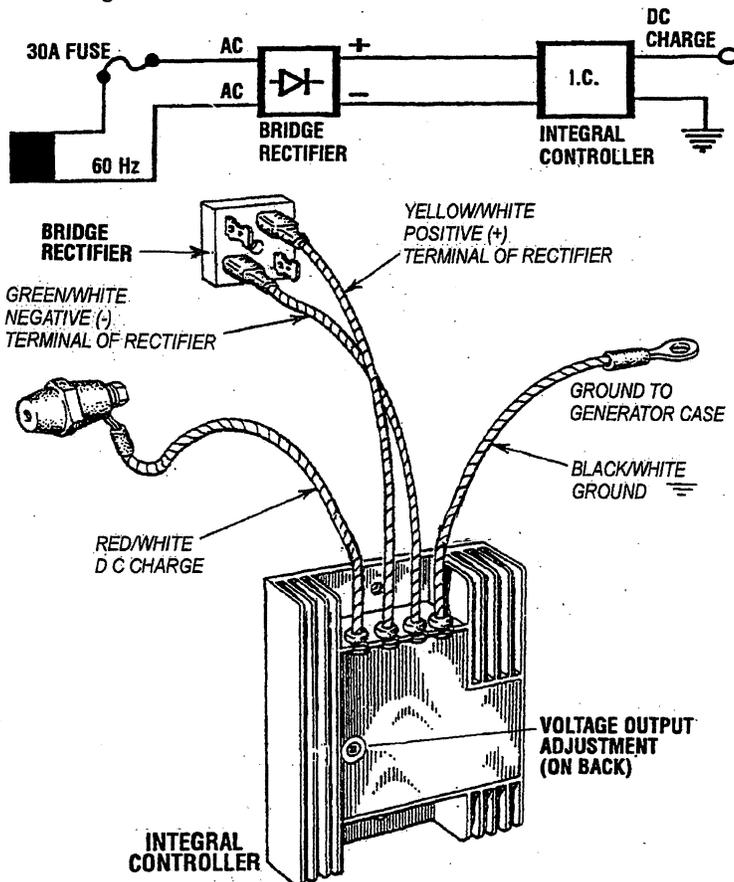
Charging Voltage: 13.0 - 14.0 volts DC
Charging Amperage: 0 - 10.0 amps DC

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 ± 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

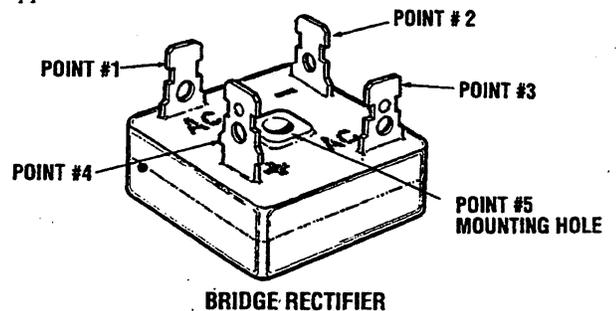
2. AC winding: 0.10 ohm

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.



ENGINE TROUBLESHOOTING

The following troubleshooting tables are based upon certain engine problem indicators and the most likely causes of the problems.

When troubleshooting indicates an electrical problem, see the *GENERATOR WIRING DIAGRAMS*, as these may reveal other possible causes of the problem which are not listed below.

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

PROBLEM	PROBABLE CAUSE
Engine does not crank.	<ol style="list-style-type: none"> 1. Voltage drop at starter solenoid terminal. 2. Engine 20A circuit breaker has tripped. 3. Battery is low or dead. 4. Loose battery connections. 5. Faulty wire connection. 6. Faulty start switch. 7. Faulty starter solenoid. 8. Raw water filled cylinders.
Engine cranks but fails to start.	<ol style="list-style-type: none"> 1. Out of fuel. 2. Filters are clogged by contaminated fuel. 3. Voltage drop at (+) at overspeed switch. 4. Carburetor filter screen is clogged. 5. Faulty ballast resistor. 6. Engine is flooded. <ol style="list-style-type: none"> a. Carburetor float needle valve open or damaged. Clean or replace the needle valve b. Float in carburetor is leaking. Repair or replace float. c. Float chamber gasket damaged or securing screws are loose. Replace gasket and/or tighten screws. 7. Fuel lift pump inoperative. 8. Worn or faulty spark plugs. 9. High tension wires grounding. 10. Faulty ignition coil. 11. Faulty distributor. 12. Faulty wire connection. 13. No engine compression.

PROBLEM	PROBABLE CAUSE
Engine starts, runs and then shuts down.	<ol style="list-style-type: none"> 1. Faulty shutdown switch, (oil pressure, water, exhaust temperature or overspeed). 2. High engine water or exhaust temperature. 3. Dirty fuel/water separator filters. 4. Low oil level in sump. 5. Faulty fuel lift pump. 6. Faulty engine temperature sensor. 7. Faulty stop switch. 8. Circuit breaker is tripping. 9. Check the valve in the fuel supply line, lift pump is not drawing fuel.
Engine starts, runs but does not come up to speed.	<ol style="list-style-type: none"> 1. Fuel line restriction. 2. Mechanical check valve at the fuel supply is faulty. 3. Throttle plate binding. 4. Faulty fuel lift pump. 5. Faulty wire connection. 6. AC generator overload. 7. High exhaust pressure.
Engine hunts.	<ol style="list-style-type: none"> 1. Governor is out of adjustment. 2. Generator is overloaded. 3. Cracked distributor cap 4. Faulty high tension wires. 5. Faulty fuel pump. 6. High exhaust back-pressure. 7. Valves are out of adjustment. 8. Dirty fuel filters. 9. Throttle linkage is binding.

(continued)

ENGINE TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE
Engine misfires.	<ol style="list-style-type: none"> 1. Poor quality fuel. 2. Incorrect timing. 3. Dirty flame arrester. 4. Cracked distributor cap. 5. Faulty ignition wires. 6. Spark plugs are worn. 7. High exhaust back-pressure. 8. Valve clearances are incorrect.
Engine backfires.	<ol style="list-style-type: none"> 1. Spark plug wires are connected wrong. 2. Incorrect timing. 3. Engine is flooded. <i>See Engine is flooded under Engine cranks but fails to start.</i> 4. Dirty flame arrester. 5. Cracked distributor cap. 6. High exhaust back-pressure. 7. Choke is stuck closed.
Engine overheats.	<ol style="list-style-type: none"> 1. Coolant loss. Pressure test cooling system. 2. Faulty raw water pump impeller. 3. Belts are loose or broken. 4. Raw water pump worn. 5. Faulty thermostat. 6. Heat exchanger is clogged. 7. Collapsed hose.
Low oil pressure.	<ol style="list-style-type: none"> 1. Low oil level. 2. Wrong SAE type oil in the engine. 3. Wrong type oil filter. 4. Relief valve is stuck. 5. Faulty oil pump. 6. Faulty engine bearings. 7. Faulty oil filter.

PROBLEM	PROBABLE CAUSE
High oil pressure.	<ol style="list-style-type: none"> 1. Dirty oil or wrong SAE type oil in the engine. 2. Relief valve is stuck.
No DC charge to the starting battery.	<ol style="list-style-type: none"> 1. Faulty connections. 2. Faulty bridge rectifier. 3. Faulty generator charger windings. 4. Connections to the controller are loose or faulty. 5. Faulty controller.
Blue exhaust smoke discharge from the engine.	<ol style="list-style-type: none"> 1. Lube oil is diluted. 2. High lube oil level. 3. Crankcase breather hose is clogged. 4. Valves are worn or adjusted incorrectly. 5. Piston rings are worn or unseated.
Black exhaust smoke discharge from the engine.	<ol style="list-style-type: none"> 1. Dirty flame arrester. 2. Faulty carburetor. 3. Idle mixture jet too rich. 4. Valves are worn or incorrectly adjusted. 5. Lube oil is diluted. 6. Piston rings are worn or unseated. 7. Crankcase breather hose is clogged.

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.

ENGINE SPEED (HERTZ) ADJUSTMENT

Governor

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

Governor Adjustments

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

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

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

1. **Increase/Decrease Speed Adjustment.** This adjusting bolt sets the no-load speed of the engine. (The linkage arm between the governor arm and throttle lever should be adjusted to hold the throttle full open when the engine is not running.) Make sure this linkage moves freely and that the ball joint connectors are properly lubricated. Use graphite lube for this purpose. Disconnect the ball joint and apply graphite lube to the inside of the joint.

2. **Hunting/Regulation Adjustment.** If the variation in engine speed between no-load and full-load is too great, adjust this eye bolt to draw the spring closer to the lever hub. The increase/decrease speed bolt may need to be adjusted as well.

If the governor surges under load, adjust this eye bolt to move the spring away from the lever hub (check speed adjustment).

3. **Bumper Screw Adjustment.** This screw is used to remove a no-load surge ONLY. NEVER turn the bumper screw into the governor so far that it increases the no-load speed.

Governor Maintenance

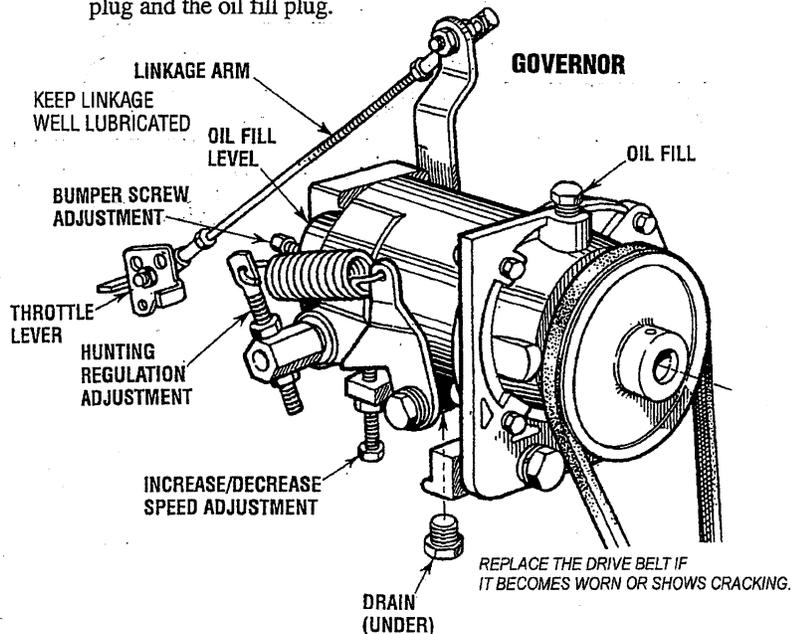
1. Periodically lubricate the linkage arm attaching points at the governor arm and throttle lever. Use a graphite lubricant or equivalent.

NOTE: Free movement of this linkage arm is important for proper governor/throttle operation.

2. Governor Oil Capacity: 3 ounces SAE 10W/30 oil. (Synthetic oil is recommended) Change the oil every 250 operating hours. **NOTE:** Do not overfill the governor.

3. To change the oil, remove the oil fill plug. Place a small container under the governor and remove the governor drain plug.

Allow the oil to completely drain. Replace the governor drain plug. Then remove the allen head oil fill level plug located on the back of the governor. Fill the governor with three ounces of oil or more until oil starts to flow out of the oil fill level opening. Replace the allen head plug and the oil fill plug.



4. Periodically adjust the governor belt tension (see *DRIVE BELT ADJUSTMENTS*). Since belts stretch slightly, this stretching will, to some degree, affect the governor's action.

ENGINE ADJUSTMENTS

SPARK PLUGS

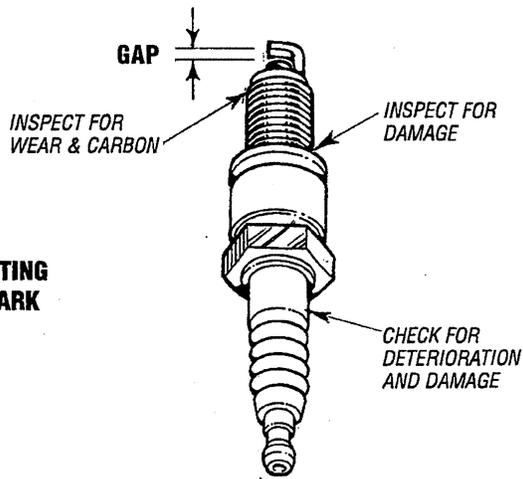
The spark plugs should be cleaned and regapped after the first 50 hour break-in period, then inspected every 250 hours thereafter and replaced as needed.

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.



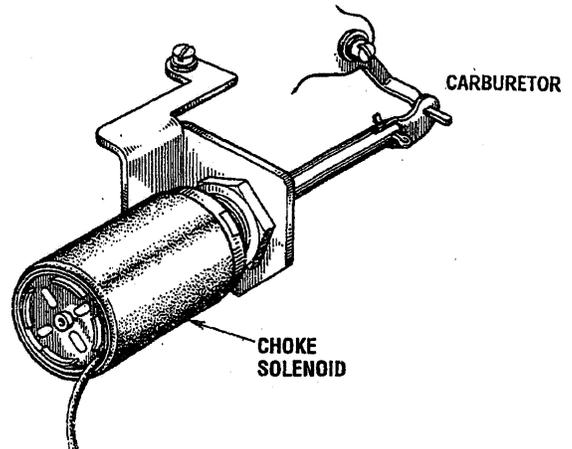
INSPECTING THE SPARK PLUGS

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 operating temperature.

Keep this solenoid dry and periodically lubricate the linkage between the solenoid and the choke lever.

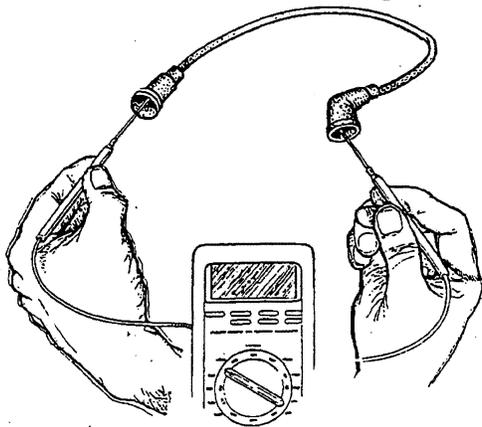


HIGH TENSION CORDS (IGNITION WIRES)

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

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

The resistance value is 410 ohm per inch of wire.



CHECKING RESISTANCE

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

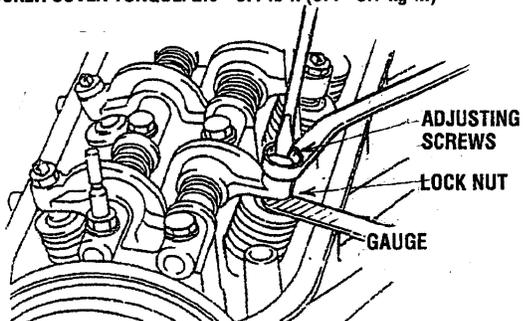
NOTE: Retorque the cylinder head bolts before adjusting the engine's valves (see **TORQUING THE CYLINDER HEAD BOLTS**).

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 (0.4 - 0.7 kg-m)



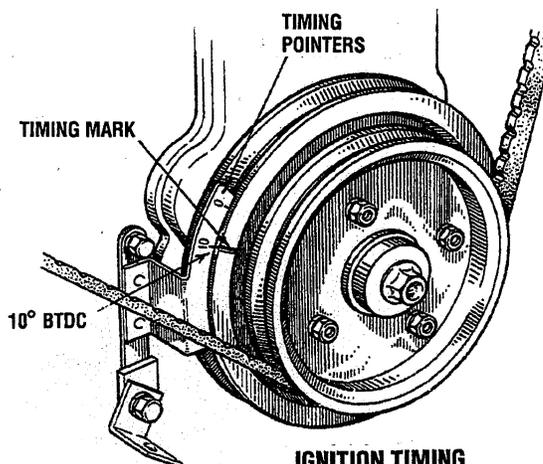
VALVE CLEARANCE

HOT: IN 0.25mm (0.0098 in)
EX 0.30mm (0.0118 in)

IGNITION TIMING

1. Attach a timing light to the #1 spark plug and mark the front timing pointer to indicate 10°. Locate the timing mark on the crankshaft pulley and mark it with white chalk or 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: 10° ± 5° BTDC at 1800 rpm
(no load on generator)

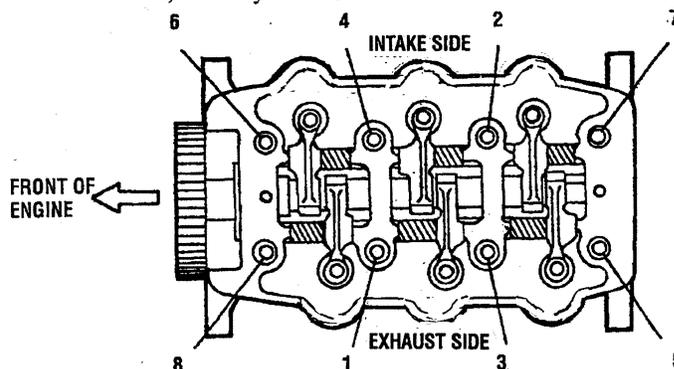


IGNITION TIMING

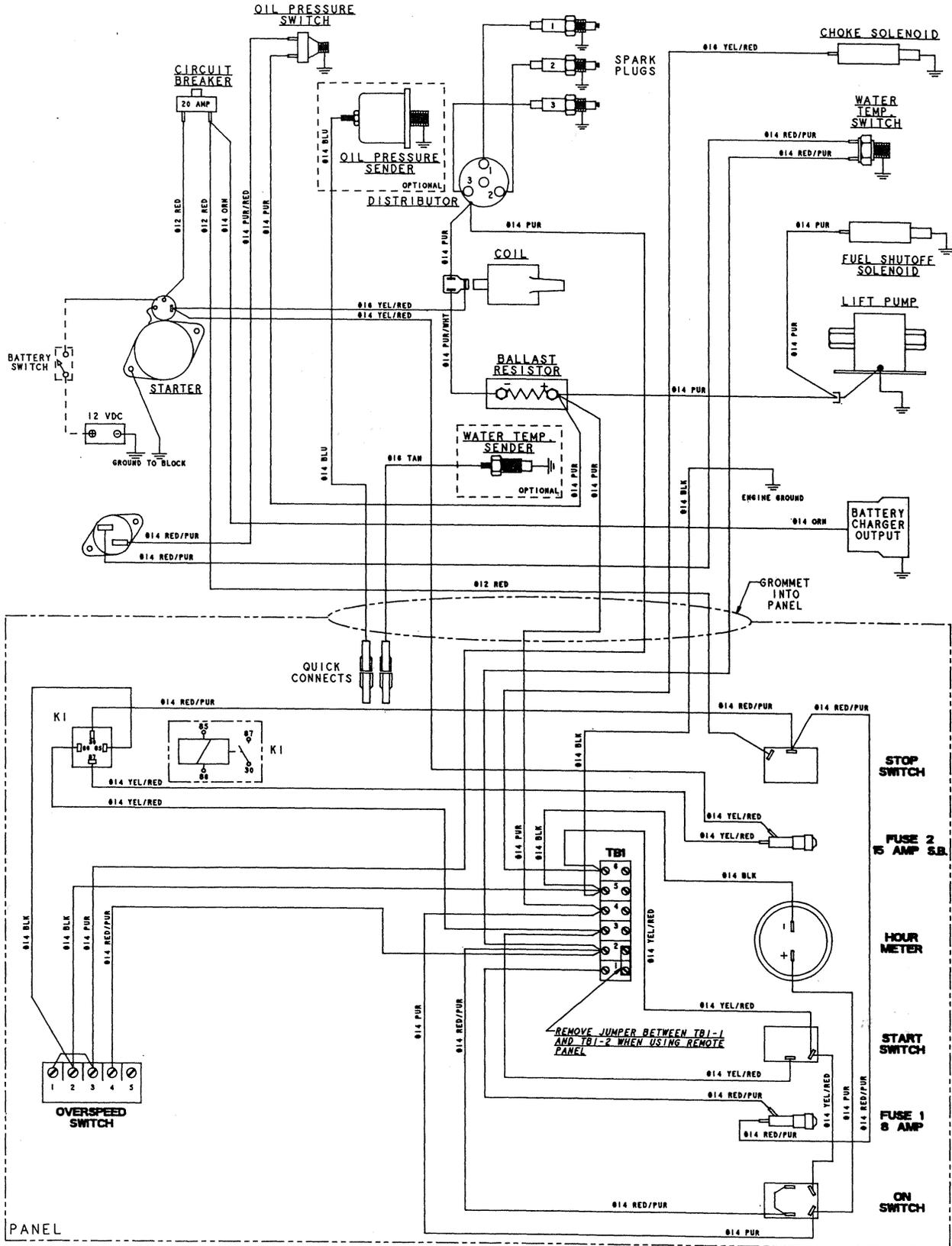
TORQUING THE CYLINDER HEAD BOLTS

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

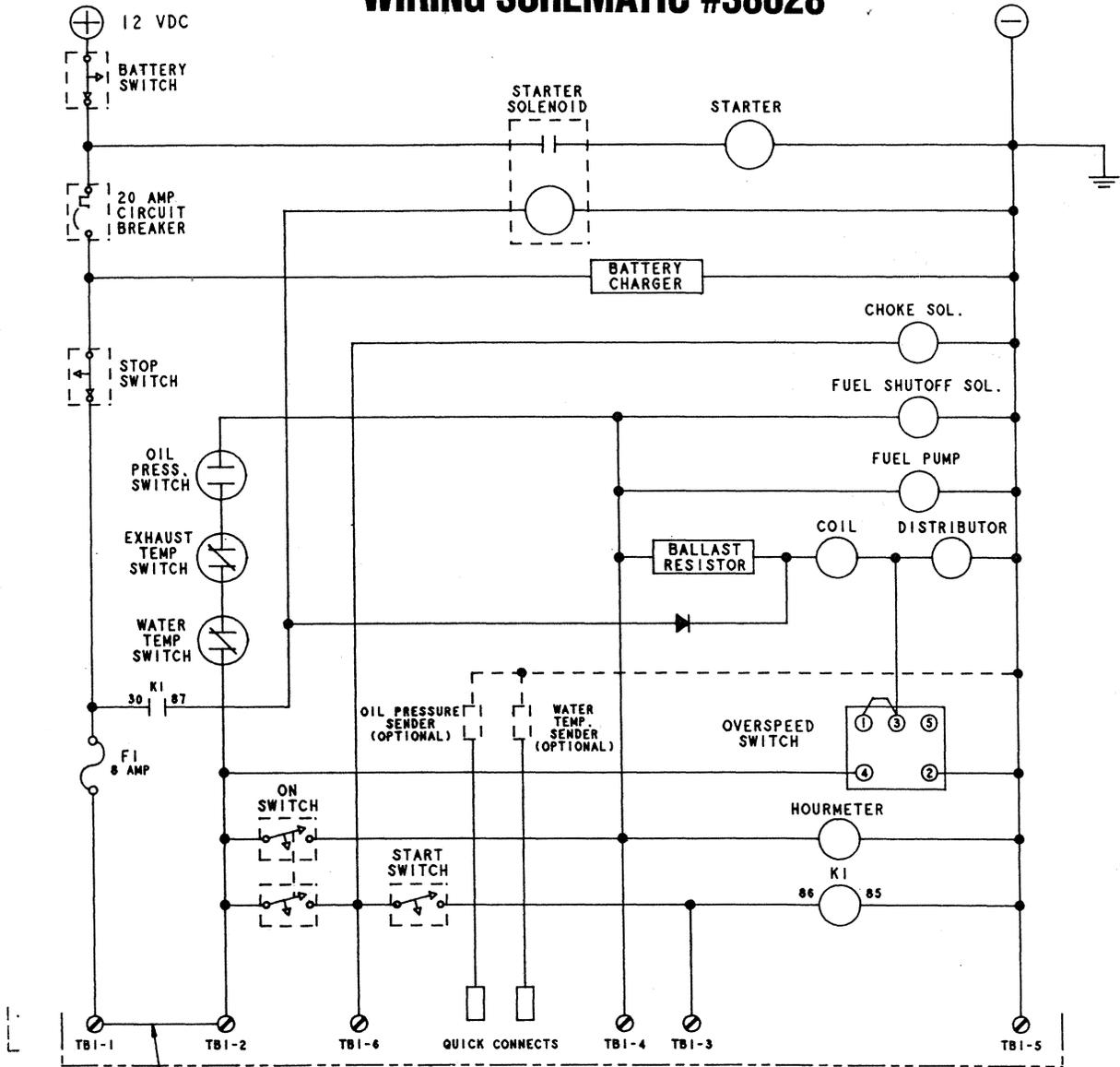
Tighten the cylinder head bolts according to the sequence shown. Make sure the engine is cold when this is done, and loosen one head bolt one-half turn and then tighten it between 36.2 - 43.4 lb-ft (5.0 - 6.0 Kg-m). Then proceed to the next head bolt in the sequence. Tighten the RS (rocker cover stud) securely.



WIRING DIAGRAM #38028



WIRING SCHEMATIC #38028



REMOVE JUMPER BETWEEN TB1-1 AND TB1-2 WHEN USING REMOTE PANEL.

RESPONSIBILITY FOR SAFETY REGULATIONS

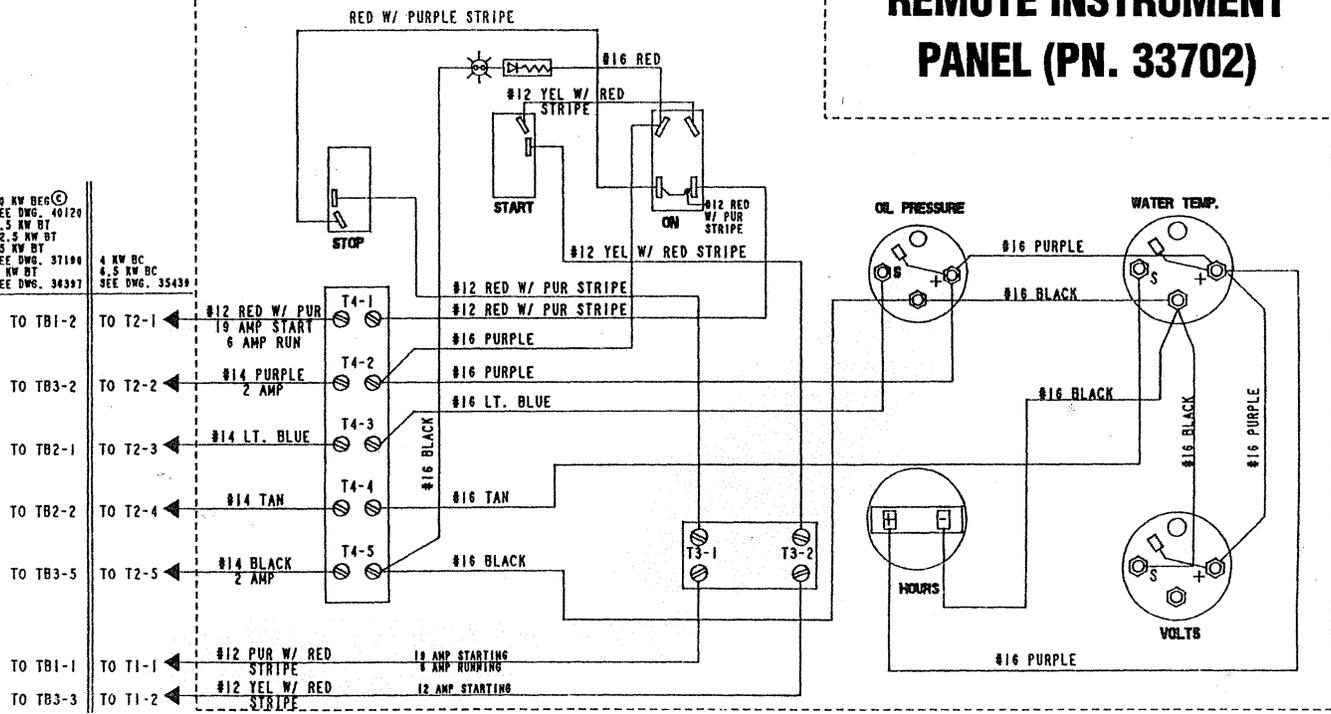
1. BATTERY CHARGER CAUSES A 9^{ma} DRAIN AND OVERSPEED MODULE CAUSES A 15^{ma} DRAIN WHEN GENERATOR IS NOT OPERATING. THEREFORE, WHEN LEAVING BOAT FOR AN EXTENDED PERIOD, DISCONNECT THE BATTERY.
2. WESTERBEKE GASOLINE MARINE GENERATORS, AS SHIPPED FROM THE FACTORY AND EXCLUSIVE OF OPTIONAL REMOTE INSTRUMENT OR CONTROL PANELS, COMPLY WITH U.S. COAST GUARD 33CFR-183. ACCESSORY INSTRUMENT AND CONTROL PANELS DO NOT NECESSARILY SO COMPLY AND ARE INTENDED TO BE INSTALLED ABOVE DECK AND "ISOLATED FROM GASOLINE SOURCES" IN ACCORDANCE WITH 33CFR-183.410(b). IT IS THE RESPONSIBILITY OF THE BOAT MANUFACTURER TO INSURE THAT THE INSTALLATION OF THESE GENERATORS AND OPTIONALLY, THEIR REMOTE INSTRUMENT OR CONTROL PANELS, COMPLY WITH 33CFR-183.
3. SENDERS SUPPLIED WITH OPTIONAL INSTRUMENT PANEL.
4. MINIMUM RECOMMENDED WIRE GAUGE TO REMOTE PANEL IS No. 14 AWG.
5. REMOVE JUMPER BETWEEN TB1-1 AND TB1-2 WHEN USING REMOTE PANEL.

20 KW REG. ©
 SEE DWG. 40120
 8.5 KW BT
 12.5 KW BT
 15 KW BT
 SEE DWG. 37100
 9 KW BT
 SEE DWG. 36397

4 KW BC
 8.5 KW BC
 SEE DWG. 35439

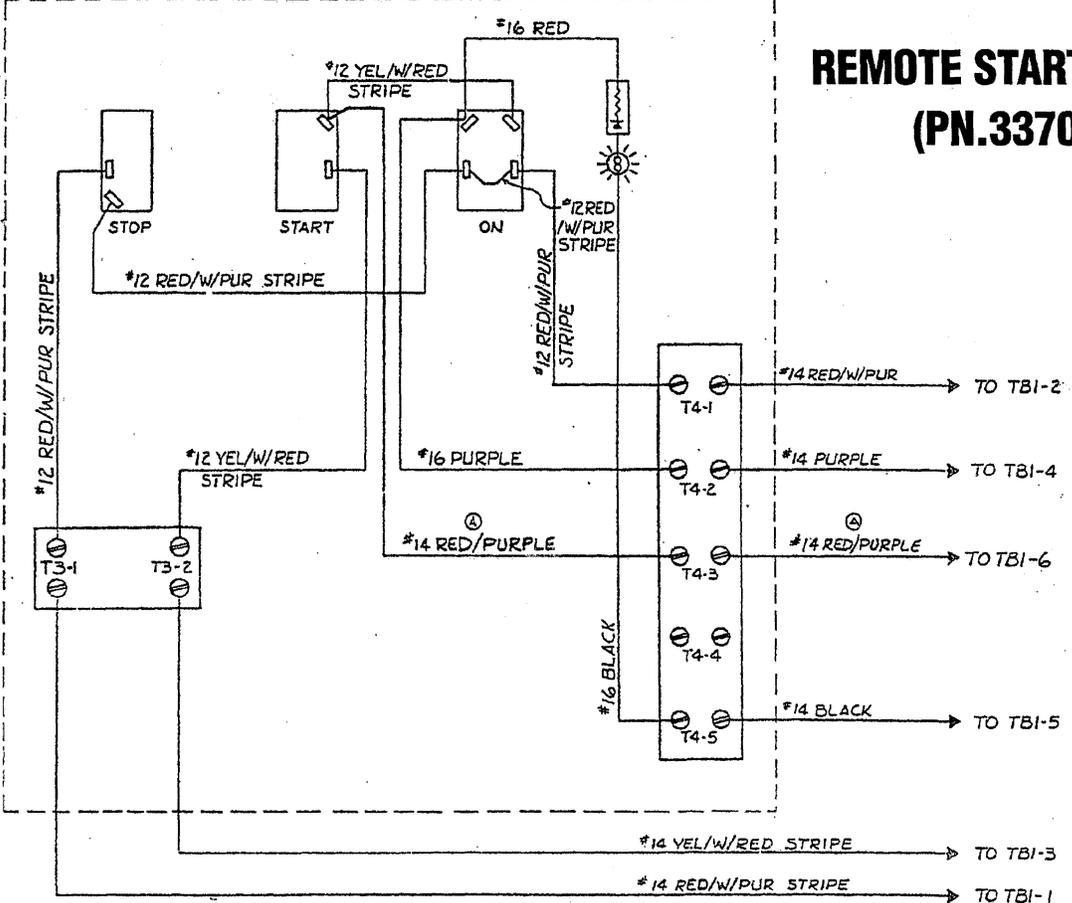
REMOTE INSTRUMENT PANEL (REAR VIEW)

**REMOTE INSTRUMENT
 PANEL (PN. 33702)**



OPTIONAL REMOTE START PANEL (REAR VIEW) P.N. 33703

**REMOTE START PANEL
 (PN.33703)**



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!

BC GENERATOR SINGLE PHASE

NOTE: WESTERBEKE recommends that the following generator tests and adjustments be performed by a qualified technician.

DESCRIPTION

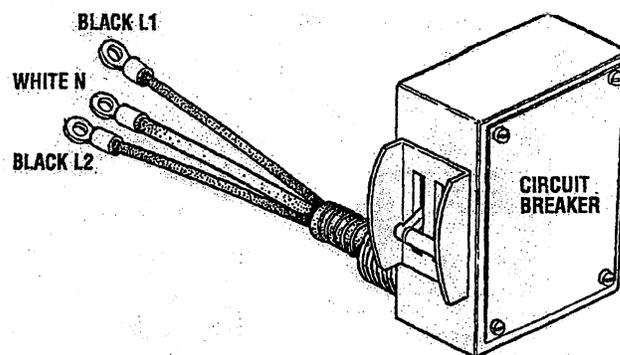
The BC generator is a brushless, self-excited generator which requires only the driving force of the engine to produce an AC output. The stator houses two sets of windings; the main stator windings and the exciter windings. When the generator is started, residual magnetism in the four rotating poles induces a current in the stator which then generates an even larger current in the exciter windings. This mutual build up of current in the four rotating poles and in the exciter windings quickly reaches the saturation point of the capacitor(s) and a regulated energy field is then maintained in the stator. At the same time, this regulated field produces a steady voltage in the stator windings which can then be drawn off the generator's AC terminals to operate AC equipment. The generator is a single-phase, reconnectable 120 volt AC two-wire or 110 volt AC two-wire or 220 volt AC two-wire, at 50 hertz. Refer to the *SPECIFICATIONS* section of this manual for generator ratings. The generator's data plate gives the voltage, current and frequency rating of the generator. An AC wiring decal is affixed to the inside of the louvered cover at the generator end. A diagram of the various AC voltage connections is provided on the decal. An Integral Controller (IC) is mounted inside the generator and supplies a continuous DC charge to the generators starting battery when the generator is running. For more information see the *INTEGRAL CONTROLLER DC CHARGER* section in this manual

Circuit Breaker

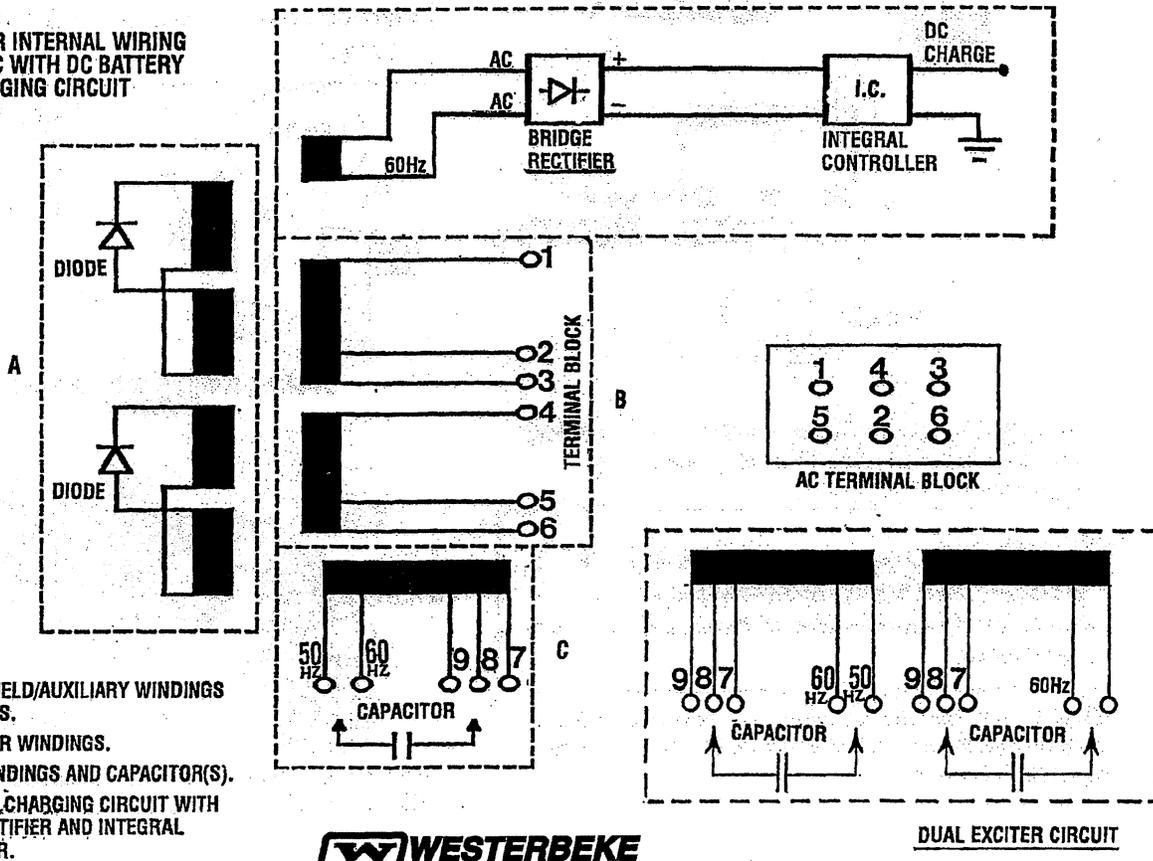
A circuit breaker is installed on all single phase WESTERBEKE generators. This circuit breaker will automatically disconnect generator power in case of an electrical overload. The circuit breaker can be manually shut off when servicing the generator to ensure that no power is coming into the boat.

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

60 Hz - 4.5 Kw Circuit Breaker Part Number 42232
50 Hz - 3.7 Kw Circuit Breaker Part Number 42712

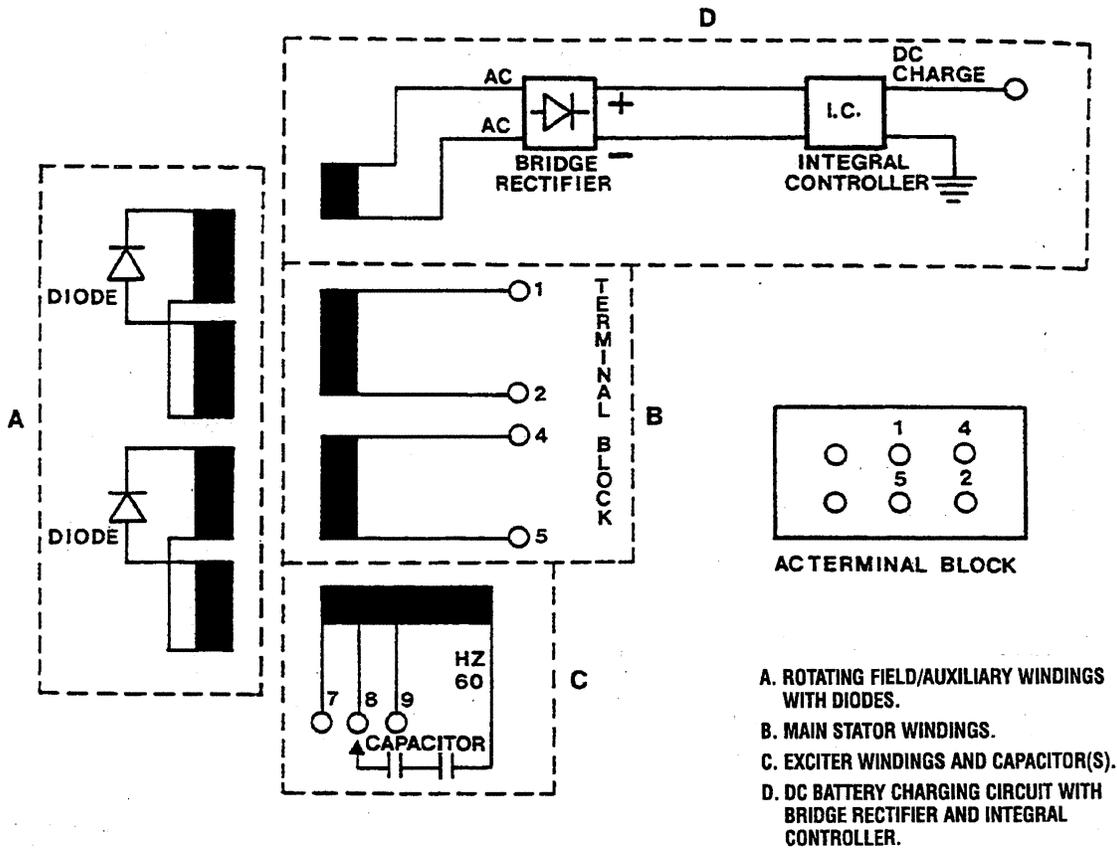


GENERATOR INTERNAL WIRING SCHEMATIC WITH DC BATTERY CHARGING CIRCUIT



- A. ROTATING FIELD/AUXILIARY WINDINGS WITH DIODES.
- B. MAIN STATOR WINDINGS.
- C. EXCITER WINDINGS AND CAPACITOR(S).
- D. DC BATTERY CHARGING CIRCUIT WITH BRIDGE RECTIFIER AND INTEGRAL CONTROLLER.

BCA GENERATOR (60 HERTZ ONLY)



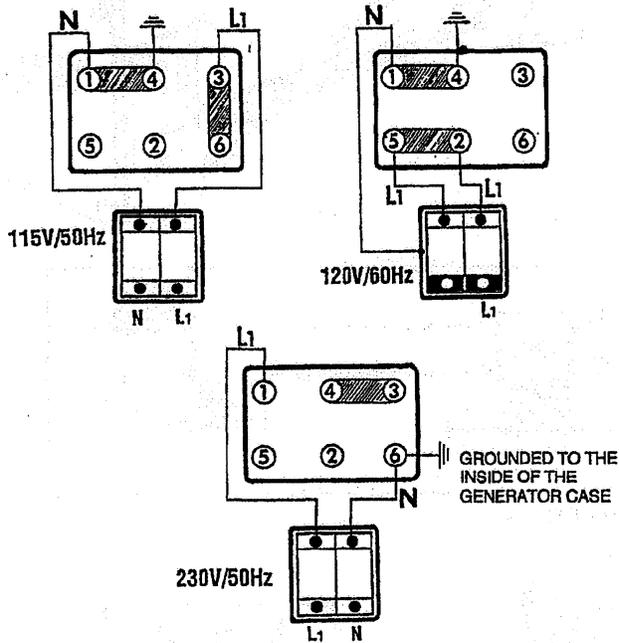
**GENERATOR INTERNAL WIRING SCHEMATIC
WITH DC BATTERY CHARGING CIRCUIT**

BC GENERATOR SINGLE PHASE

NOTE: WESTERBEKE recommends that the following generator tests and adjustments be performed by a qualified technician.

SINGLE EXCITER NO-LOAD VOLTAGE ADJUSTMENT

1. Remove the louvered metal plate, at the back of the generator, covering the AC terminal connections and the capacitor(s).
2. Start the generator and allow it to run for approximately five minutes so the engine can warm up. Make sure the generator is operating without any equipment drawing AC current from the generator (that is, shut off all electrical appliances). Make sure the engine's speed (Hertz) is correct. Adjust the fuel throttle/speed linkage as needed to obtain the correct engine speed before proceeding.
3. Referring to the AC load connections diagram below, check the generator's no-load voltage by measuring the voltage across the neutral lead and the hot lead with a volt meter. Make sure you record this reading. The generator's no-load voltage is 115 - 124 volts at 60.5 - 61.5 Hertz. If the voltage output is higher or lower than specified, proceed.



4. Shut off the generator. Make sure the correct Hertz lead (60 Hertz #6, or 50 Hertz #5) is plugged into the capacitor(s).

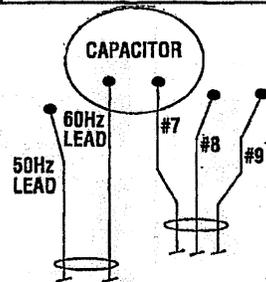
WARNING: Capacitors must be discharged before handling as they store electricity and can pack a potentially lethal charge even when disconnected from their power source.

NOTE: Simply cross the capacitor's two terminals with an insulated (plastic handle) screwdriver. This will discharge any excess electricity.

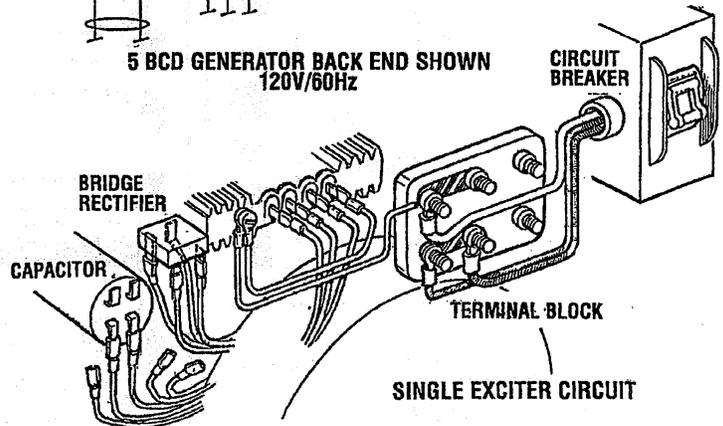
WARNING: Do not attempt to make a no-load voltage adjustment while the generator is operating. The capacitor can produce a 400-500 volt charge. Touching any wiring can produce a severe electrical shock. In addition, attempting to make a no-load voltage adjustment while the generator is operating could cause your fingers to be caught in the generator's rotor.

5. There are three plugs grouped for the right capacitor terminal, #7, #8, and #9. If the generator's no-load voltage is low, then disconnect the lower numbered plug and connect the plug with the next higher number. If the generator's no-load voltage is high, then disconnect the higher numbered plug and connect the plug with the next lower number. Note that the plug presently connected to this terminal may be any one of the three plugs available.
6. If the generator's no-load voltage cannot be adjusted because the voltage needs to be increased and the highest numbered plug is already connected to the right terminal, or the voltage needs to be lowered and the lowest numbered plug is connected, refer to the WESTERBEKE BC Generator Troubleshooting Guide).

WARNING: Make certain the insulating covers on the unused leads are in place and are NOT in contact with each other or in contact with the generator's housing.

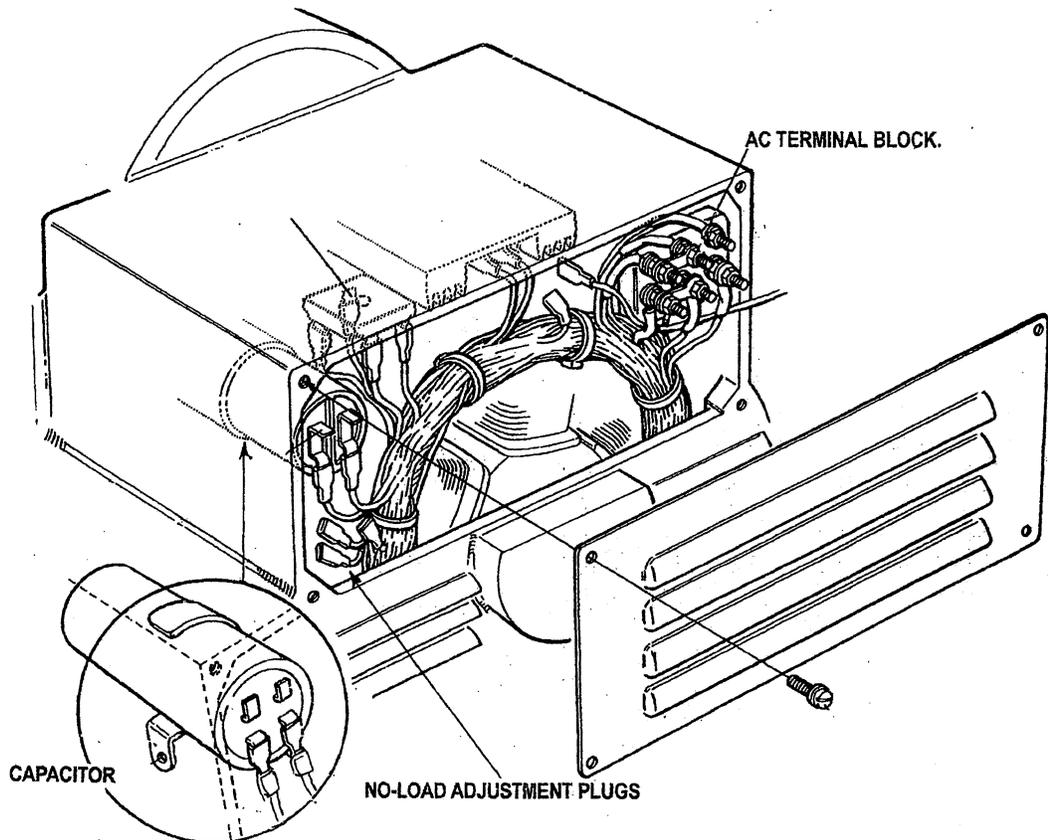


NOTE: THE #7 WIRE IS SHOWN CONNECTED AS A DEMONSTRATION OF HOW THESE CONNECTIONS CAN BE MADE.



See the ENGINE ADJUSTMENT section in this manual for ADJUSTING THE ENGINE SPEED.

BC GENERATOR



CAUTION: DO NOT ALLOW ANY OF THESE PLUGS (CONNECTIONS), TO TOUCH THE GENERATORS HOUSING OR OTHER WIRES AS THAT COULD BURN THE WINDINGS.

RESISTANCE FIGURES

CHECK THE RESISTANCE OF THE EXCITER WINDINGS

SINGLE EXCITER CIRCUIT

4.5 BCG & BCGA.....1.9 OHM

CHECK THE CAPACITOR

SINGLE EXCITER CIRCUIT

4.5 BCG & BCGA.....31.5 $\mu\text{F} \pm 5^\circ$

CHECK THE ENGINES SPEED

60 Hz 60.5 - 61.5

50 Hz 50.5 - 51.5

WESTERBEKE'S "AC Electrical Testing & Troubleshooting Guide" for BC Generators is available in pdf form. Download from our website: www.westerbeke.com.

LOAD APPLIED	4-POLE SPEED. (RPM)	FREQUENCY (HERTZ).	GENERATOR. 120V (110)	VOLTAGE 230V
NONE	1830. (1530)	62 (52)	122 (112)	235
HALF	1800 (1500)	60. (50)	120. (110)	230
FULL	1755 (1455)	59. (49)	110 (100)	225

NOTE: Adjust the engines speed by using the governors speed adjustment to obtain the correct hertz.

NOTE: The output should be checked periodically to ensure proper operation of the generator and the appliances it supplies. If an AC Voltmeter or Ampmeter is not installed to monitor the voltage and load, check it with a portable meter and amp-probe.

SHORE POWER TRANSFER SWITCH

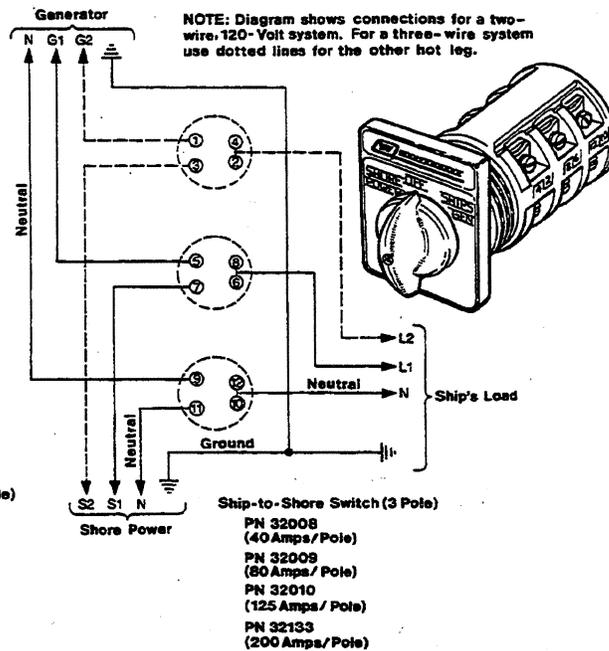
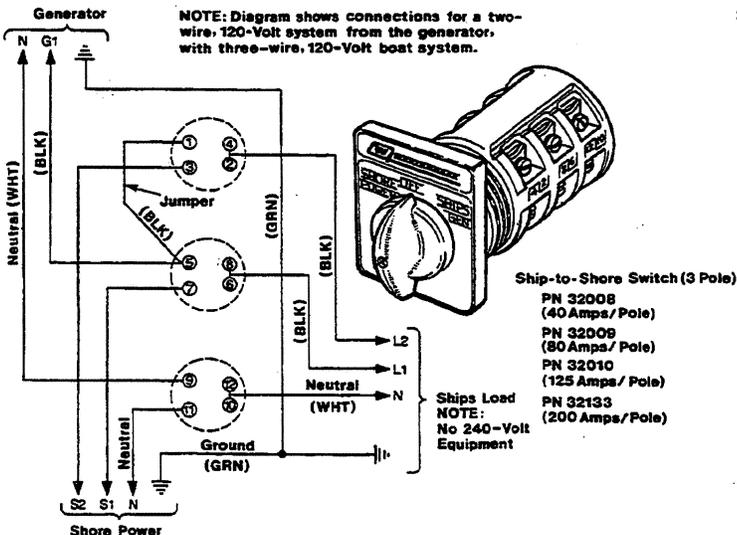
120 VOLT/60 HERTZ TWO WIRE CONFIGURATION

Switching Shore Power to Generator Power

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.

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



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 will serve as a checklist if others do the procedures.

These procedures should provide protection for your engine/generator during a lay-up and also help familiarize you with its maintenance needs.

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 fresh water cooling 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. Then 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 "engine oil change".

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 *MARINE STABIL* 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 DIESEL KLEEN 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 fitting. Remove the raw water intake hose from the fitting. 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. Get a replacement, if needed, and a cover gasket. Do not replace the impeller (into the pump) until recommissioning, but replace the cover and gasket.

Intake Manifold and Thru-Hull Exhaust

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 assistance of the servicing dealer). Make a note to remove the cloth prior to start-up. The thru-hull exhaust port can be blocked in the same manner.

CONTINUED

LAY-UP & RECOMMISSIONING

Starter Motor

Lubrication and cleaning of the starter drive pinion is advisable, if access to the starter permits its 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 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.

Make sure you have replacements for the injector and return line sealing washers.

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!

Cylinder Lubrication [Gasoline]

Spray fogging oil into the open air intake, with the flame arrester removed, while the generator is running. The fogging oil will stall out the engine and coat the valves, cylinders and spark plugs for winter protection.

NOTE: *The spark plugs will need to be removed for cleaning and regapping at spring commissioning.*

Batteries

If batteries are to be left on board during the lay-up period, make sure that they are fully charged, and will remain that way, to prevent them from freezing. If there is 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.

⚠ WARNING: *Lead acid batteries emit hydrogen, a highly-explosive gas, which can be ignited by electrical arcing or a lighted cigarette, cigar, or pipe. Do not smoke or allow an open flame near the battery being serviced. Shut off all electrical equipment in the vicinity to prevent electrical arcing during servicing.*

Transmission [Propulsion Engine]

Check or change the fluid in the transmission as required. Wipe off grime and grease and touch up any unpainted areas. Protect the coupling and the output flange with an anti-corrosion coating. Check that the transmission vent is open.

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 *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 presented 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 the oil-soaked cloths from the intake manifold
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.

⚠ CAUTION: *Wear rubber gloves, a rubber apron, and eye protection when servicing batteries. Lead acid batteries emit hydrogen, a highly explosive gas, which can be ignited by electrical arcing or a lighted cigarette, cigar, or pipe. Do not smoke or allow an open flame near the battery being serviced. Shut off all electrical equipment in the vicinity to prevent electrical arcing during servicing.*

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. It is advisable, as either an end of season or recommissioning service, to inspect the area where the zinc is located in the heat exchanger and clear any and all zinc debris from that area.
6. Start the engine in accordance with procedures described in the *PREPARATIONS FOR INITIAL START-UP* section of this manual.

BCG GENERATOR SPECIFICATIONS

Engine Type	Gasoline, four-cycle, three-cylinder, fresh water-cooled Vertical, in-line overhead valve mechanism (8 bhp at 1800 rpm, maximum).	FUEL SYSTEM	Conventional carburetor type with fuel pump.
Governor	Hoof, flyball type, 5% speed regulation.	General	Regular or unleaded gasoline with an octane rating of 89 or higher.
Combustion Chamber	Multi-sphere type.	Fuel	12-volt DC; lift capacity 5 ft (1.5 m)
Bore & Stroke	2.44 x 2.38 inches (62.0 x 60.5 mm) 2.62 x 3.19" (66.6 x 81mm) A-MODEL.	Fuel Pump	Reusable screen type (located at inlet to carburetor).
Piston Displacement	33.4 cubic inches (.547 liter) 51.6 cubic inches (0.846 liter) A-MODEL	Fuel Screens (on engine)	Metal screen type - cleanable.
Firing Order	1-2-3	Air cleaner	18 cfm (0.509 cmm) at 1800 rpm.
Direction of Rotation	Clockwise, when viewed from the front.	Air Flow (engine combustion)	
Maximum Torque (at 1800 rpm)	13.5 lbf-ft	COOLING SYSTEM	Fresh water-cooled block, thermostatically-controlled with a heat exchanger.
Compression Ratio	10.0:1 9.5:1 (A-MODEL)	General	130 - 150°F (55 - 66°C)
Compression Pressure (Limit of difference between cylinders)	198.1 psi (14.0 kg/cm ²) at 400 rpm (213.3 psi / 15.0 kg / cm ²) (21 psi (1.5kg/cm ²)) (A-MODEL)	Operating Temperature	Centrifugal type, belt-driven, 1.13:1.
Valve Timing	Intake Opens 32° BTDC (28° A-MODEL) Intake Closes 52° ABDC (62° A-MODEL) Exhaust Opens 56° BBDC (62° A-MODEL) Exhaust Closes 28° ATDC (28° A-MODEL)	Fresh Water Pump	Positive displacement, rubber impeller, belt-driven.
Valve Seat Angle	Intake 45° Exhaust 45°	Sea Water Pump	
Valve Clearance (engine warm)	Intake 0.010 inches (0.25 mm) Exhaust 0.012 inches (0.30 mm)	Sea Water Flow, at 1800 rpm (measured before discharging into exhaust elbow)	3.75 - 4.0 U.S. gpm (14.19 - 15.14 lpm)
Engine Speed	1800 rpm 60 hertz. 1500 rpm 50 hertz.	System Capacity (fresh water)	4.2 U.S. qts (3.9 liters)
Dimensions	Length: 26.50 inches (673.1 mm) Width: 18.34 inches (465.8 mm) Height: 23.44 inches (595.4mm)	LUBRICATION SYSTEM	
Dry Weight	Approx. 309 lbs (140.1 kgs)	General	Fully - Force fed type by Trochoid pump, crankshaft-driven.
Fuel Consumption	0.8 U.S. gph (3.02 lph) at full rated output (approximate).	Oil Filter	Full flow, paper element, spin-on type.
Inclination	Continuous 14° Temporary 20° (not to exceed 20 min.)	Sump Capacity (not including filter)	3.0 qts (2.8 liters)
INTAKE SYSTEM		Operating Oil Pressure (engine hot)	50 - 70 psi (3.5 - 4.9 kg/cm ²)
Carburetor (STD type)	Manual with butterfly shaped valve, single barrel with U.S.C.G. approved flame arrester.	Oil Grade	API category SJ, SN, SL, SM, or better. SAE 30W or 10W-30
IGNITION SYSTEM		ELECTRICAL SYSTEM	
General	Battery ignition, 12-volts (negative ground), distributor with points, ignition coil and spark plugs.	Starting Battery	12-volt, 24 A-H, (-) negative ground (recommended) (28 A-H in cold areas).
Distributor	Conventional, contact-point type.	Battery Capacity	400 to 600 CCA RATED.
Spark Plug Thread Size	14 x 1.25 mm pitch (0.55 x 0.05 in.)	DC Battery Charger	Integral controller 13-volt, 10 amp (located in the AC alternator).
Spark Plug Type	Westerbeke part number 33805 (Always identify the generator model when ordering parts. See page 5.)	Starter	12-volt, 1.2 KW, Magneto engaging type.
		DC No-Load Current	90 amp (max.) at 11.5 volts.
		DC Cranking Current	100 - 125 amps (engine cold).

BCG GENERATOR SPECIFICATIONS

AC GENERATOR

General-3 Phase	Brushless, four-pole, revolving field. Self exciting. Capacitor saturated field excitation. Pre-lubricated, single bearing design. Reconnectable 120 volts or 120/240 volts, single phase
Voltage	120 or 120/240 Volts - 60 Hertz 220 Volts - 50 Hertz
Voltage Regulation:	± 5% no load to full load.
Frequency Regulation:	± 3 Hertz (5%) no load to full load
Rating (Volts AC)	
60 Hertz (1800 rpm)	120 Volts 37.5 Amps
50 Hertz (1500 rpm)	230 Volts 16 Amps
AC Circuit Breaker	To be rated at 120% of the generator's rated amperage and voltage output
Generator Cooling Air Requirements, (60 hertz) at 1800 rpm	225 - 240 cfm (6.4 - 6.6 cmm)
Note: Increase air supply 15% for 50 Hertz operation 1500 rpm	
Engine Combustion Air Requirements (60 Hertz at 1800 RPM)	18 cfm (0.509 cmm)

TUNE-UP SPECIFICATIONS

Spark Plug gap	0.028 - 0.031 inches (0.70 - 0.80 mm)
Contact Point Clearance	0.017 - 0.018 inches (0.4 - 0.5 mm)
Timing	11° ± 5° BTDC at 1800 rpm
Dwell Angle	58 - 66°
Emissions Control System (Models August 1996 on)	Three way catalyst

TORQUE SPECIFICATIONS

	lb-ft	kg-m
Cylinder Head Bolts*	36.2 - 43.4	5.0 - 6.0
(*See the Torquing Cylinder Head Bolts section.)		
Crankshaft pulley to crankshaft	36.2 - 43.4	5.0 - 6.0
Rocker cover to cylinder block	2.9 - 5.1	0.4 - 0.7
Spark plug to cylinder head	10.8 - 15.2	1.5 - 2.1
Timing belt cover #1	3.2 - 4.8	0.44 - 0.66
Timing belt cover #2	5.2 - 7.8	0.72 - 1.08
Timing belt tensioner	23.1 - 34.7	3.2 - 4.8
Valve adjusting screws	9.4 - 13.0	1.3 - 1.8
Oil pan drain plug and oil pan	25.3 - 32.5	3.5 - 4.5
Flywheel bolts	28.9 - 36.2	4.0 - 5.0
Exhaust manifold	8.4 - 12.6	1.16 - 1.74
Intake manifold	7.5 - 10.8	1.04 - 1.56

TABLE OF STANDARD HARDWARE TIGHTENING TORQUES

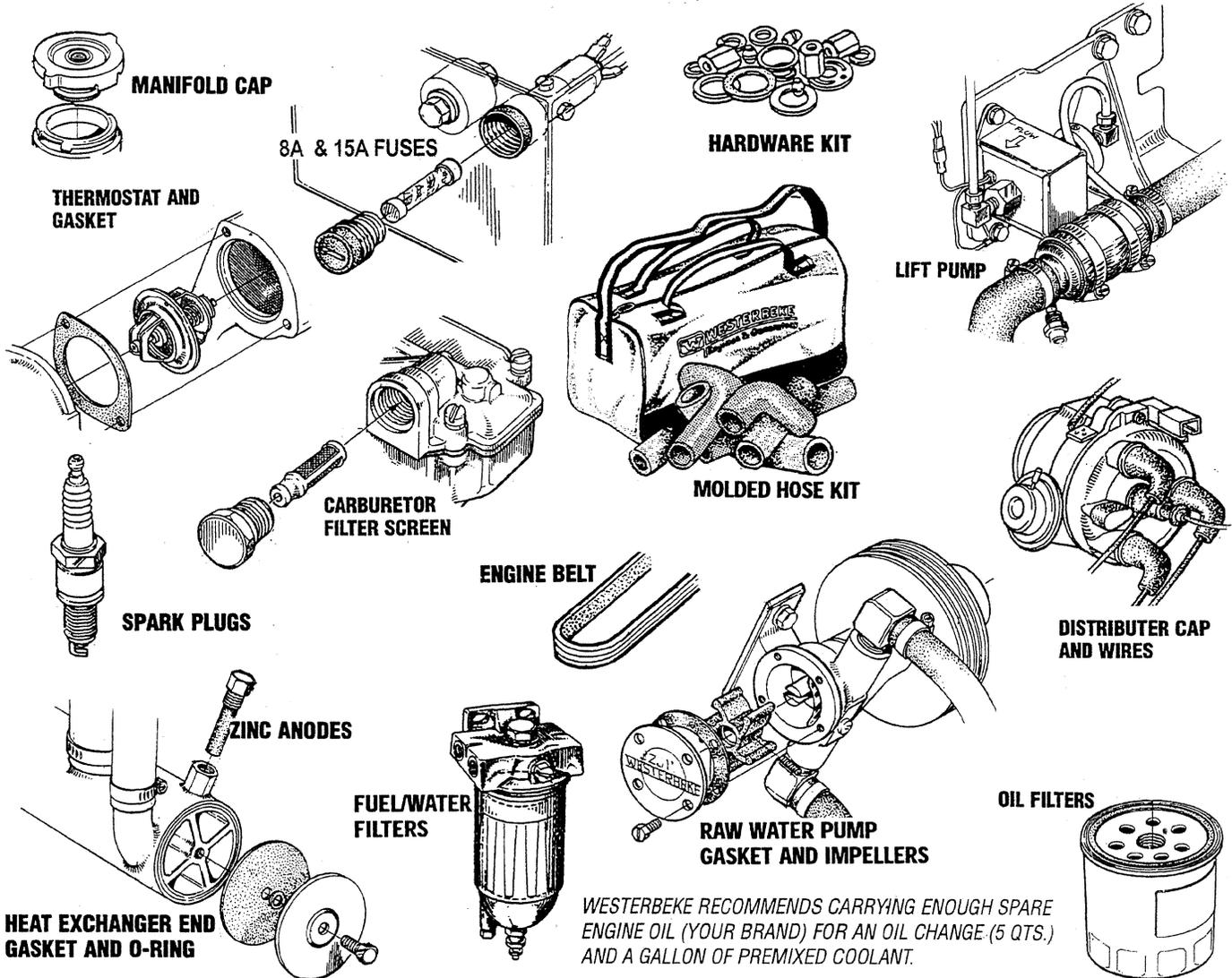
Unless stated otherwise for a specific assembly, use the following torque values when tightening standard hardware.

	Pitch	lb-ft	kg-m				
<u>Grade 4T</u>				<u>Grade 7T, 8T and 8.8</u>			
6mm bolt head/nut	1	2.9 - 5.1	0.4 - 0.7	6mm bolt head/nut	1	5.8 - 8.7	0.8 - 1.2
8mm bolt head/nut	1.25	7.2 - 11.6	1.0 - 1.6	8mm bolt head/nut	1.25	14.5 - 21.7	2.0 - 3.0
10mm bolt head/nut	1.25	13.7 - 22.4	1.9 - 3.1	10mm bolt head/nut	1.25	28.9 - 39.8	4.0 - 5.5
10mm bolt head/nut	1.5	13.0 - 21.7	1.8 - 3.0	10mm bolt head/nut	1.5	26.8 - 37.6	3.7 - 5.2
12mm bolt head/nut	1.25 (ISO)	25.3 - 39.8	3.5 - 5.5	12mm bolt head/nut	1.25 (ISO)	54.2 - 75.9	7.5 - 10.5
12mm bolt head/nut	1.5	25.3 - 39.8	3.5 - 5.5	12mm bolt head/nut	1.5	50.6 - 65.1	7.0 - 9.0
12mm bolt head/nut	1.75	21.7 - 36.2	3.0 - 5.0	12mm bolt head/nut	1.75	43.4 - 61.5	6.0 - 8.5
13mm bolt head/nut	1.5	32.5 - 50.6	4.5 - 7.0	13mm bolt head/nut	1.5	57.9 - 86.8	8.0 - 12.0
14mm bolt head/nut	1.5	36.2 - 57.9	5.0 - 8.0	14mm bolt head/nut	1.5	72.3 - 108.5	10.0 - 15.0
14mm bolt head/nut	2	34.0 - 55.7	4.7 - 7.7	14mm bolt head/nut	2	68.7 - 101.3	9.5 - 14.0
16mm bolt head/nut	1.5	54.2 - 79.6	7.5 - 11.0	16mm bolt head/nut	1.5	108.5 - 166.4	15.0 - 23.0
16mm bolt head/nut	2	51.4 - 76.7	7.1 - 10.6	16mm bolt head/nut	2	101.3 - 159.1	14.0 - 22.0
<u>Grade 6T</u>				<u>Grade 5 capscrew</u>			
6mm bolt head/nut	1	4.3 - 6.5	0.6 - 0.9	1/4 UNC		9 - 11	1.2 - 1.5
8mm bolt head/nut	1.25	10.8 - 15.9	1.5 - 2.2	1/4 UNF		11 - 13	1.5 - 1.8
10mm bolt head/nut	1.25	21.7 - 32.5	3.0 - 4.5	5/16 UNC		18 - 20	2.5 - 2.8
10mm bolt head/nut	1.5	19.5 - 30.4	2.7 - 4.2	5/16 UNF		21 - 23	2.9 - 3.2
12mm bolt head/nut	1.25 (ISO)	36.2 - 57.9	5.0 - 8.0	3/8 UNC		28 - 33	3.7 - 4.6
12mm bolt head/nut	1.5	36.2 - 50.6	5.0 - 7.0	3/8 UNF		30 - 35	4.1 - 4.8
12mm bolt head/nut	1.75	34.7 - 49.2	4.8 - 6.8	7/16 UNC		44 - 49	6.1 - 6.8
				7/16 UNF		50 - 55	6.9 - 7.6
				1/2 UNC		68 - 73	9.4 - 10.1
				1/2 UNF		73 - 80	10.1 - 11.1

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 (5 QTS.) AND A GALLON OF PREMIXED COOLANT.

SPARE PARTS KITS

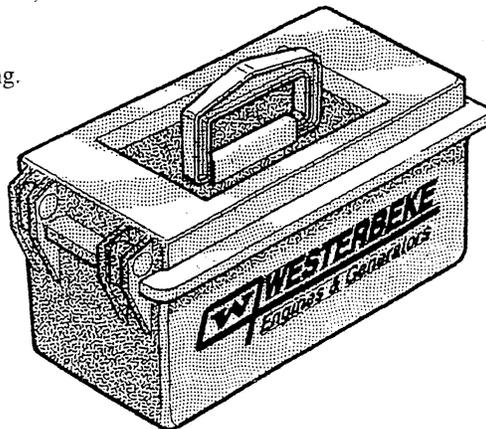
WESTERBEKE also offers two Spare Parts Kits, each packaged in a rugged, rust free toolbox.

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

WESTERBEKE
Engines & Generators

