



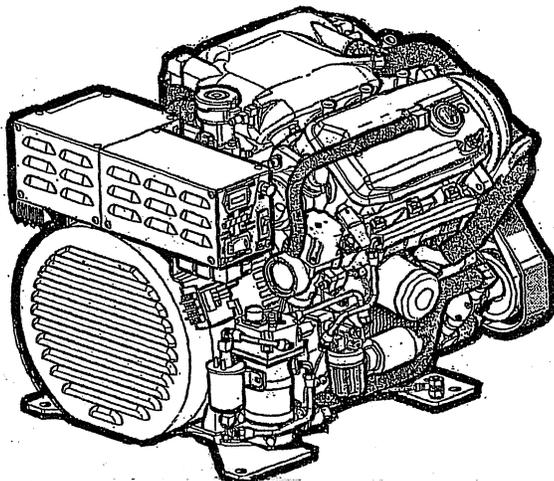
OPERATORS MANUAL

6.5 MCG 60HZ | 5.2 MCG 50HZ

5.0 MCG 60HZ | 4.2 MCG 50HZ

Multi-port MARINE GASOLINE GENERATOR

SINGLE PHASE



PUBLICATION NO. 055570

REVISION 3

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Low Carbon Monoxide Emissions

**CALIFORNIA PROPOSITION 65
WARNING**

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

⚠ WARNING:

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

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

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

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

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



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



WESTERBEKE™
Engines & Generators

SAFETY INSTRUCTIONS

INTRODUCTION

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

The following safety instructions are in compliance with the American Boat and Yacht Council (ABYC) standards.

PREVENT ELECTRIC SHOCK

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

- Do not operate this machinery without electrical enclosures and covers in place.
- Shut off electrical power before accessing electrical equipment.
- Use insulated mats whenever working on electrical equipment.
- Make sure your clothing and skin are dry, not damp (particularly shoes) when handling electrical equipment.
- Remove wristwatch and all jewelry when working on electrical equipment.

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!

- Turn OFF the DC breaker on the control panel or turn the unit's battery selector switch to OFF before servicing the engine.
- Make certain all personnel are clear of the engine before starting.
- Make certain all covers, guards, and hatches are re-installed before starting the engine.

BATTERY EXPLOSION

⚠ WARNING: Battery explosion can cause injury or death!

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

BATTERY ACID

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

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

TOXIC EXHAUST GASES

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

- Ensure that the exhaust system is adequate to expel gases discharged from the engine. Check the exhaust system regularly for leaks and make sure the exhaust manifold/water-injected elbow is securely attached.
- Be sure the unit and its surroundings are well ventilated. Run blowers when running the generator set or engine.
- Do not run the generator set or engine unless the boat is equipped with a functioning marine carbon monoxide detector that complies with ABYC A-24. Consult your boat builder or dealer for installation of approved detectors.
- For additional information, refer to ABYC TH-22 (educational information on Carbon Monoxide).

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

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

Vomiting	Inability to think coherently
Dizziness	Throbbing in temples
Headache	Muscular twitching
Nausea	Weakness and sleepiness

AVOID MOVING PARTS

⚠ WARNING: Rotating parts can cause injury or death!

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

SAFETY INSTRUCTIONS

- Do not wear loose clothing or jewelry when servicing equipment; tie back long hair and avoid wearing loose jackets, shirts, sleeves, rings, necklaces or bracelets that could be caught in moving parts.
- Make sure all attaching hardware is properly tightened. Keep protective shields and guards in their respective places at all times.
- Do not check fluid levels or the drive belt's tension while the engine is operating.
- 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 the engine with the air intake (silencer) or flame arrester 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 from 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

E11AC and DC Electrical Systems on Boats

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

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)

"Standards and Technical Information Reports for Small Craft"

Order from:

ABYC

613 Third Street, Suite 10

Annapolis, MD 21403

www.abycinc.org

NFPA (National Fire Protection Association)

"Fire Protection Standard for Motor Craft"

Order from:

NFPA

11 Tracy Drive

Avon Industrial Park

Avon, MA 02322

USCG (United States Coast Guard)

"USCG 33CFR183"

Order from:

U.S. Government Printing Office

Washington, D.C. 20404

INSTALLATION

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

CODES AND REGULATIONS

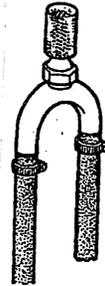
Strict federal regulations, ABYC guidelines, and safety codes must be complied with when installing engines and generators in a marine environment.

SIPHON-BREAK

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

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

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



AVAILABLE FROM
YOUR WESTERBEKE
DEALER

SIPHON-BREAK WITH STAINLESS
LOOP

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.

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.

CARBON MONOXIDE “CO”/LOW-CO GENERATORS

IMPORTANT INFORMATION

DESCRIPTION

Carbon monoxide “CO” is a component of engine exhaust. It is a colorless, tasteless, odorless, lighter than air poisonous gas that can kill you without any warning. CO poisoning is one of the major safety risks associated with boating. It is a threat that must not be underestimated.

Westerbeke Low-CO generators are designed to dramatically reduce normal levels of CO in the engine exhaust.

Several standards for CO have been published, expressed in parts per million “ppm” and hours of exposure:

Regulator	CO ppm	Exposure Hours
EPA	9	8
ACGIH	25	8
EPA	35	1
NIOSH	35	8
OSHA	50	8
ACGIH	125	0.5
NIOSH	200	0.0
NIOSH (IDLH)	1200	0.0

1200 ppm is the so-called IDLH concentration - IMMEDIATELY DANGEROUS TO LIFE AND HEALTH.

A city in California characterizes the effect of CO concentration this way:

Parts per Million	Responses
25	Permissible exposure level, no apparent toxic symptoms.
100	No poisoning for long period. Allowable for several hours.
200	Should not be exposed above this level for any period of time. A possible mild frontal headache in two to three hours.

Even though the generator normally produces very low levels of CO, an exhaust leak of untreated exhaust would be extremely dangerous. For this reason it is extremely important to install a CO detector near the generator and to be sure it is always turned on and functioning properly. If this detector sounds, do not turn it off, assuming it is a false signal. You can not taste, smell, or otherwise detect CO. Leave the detector on, turn off all engines and generators, evacuate the boat leaving ports and hatches open, and seek professional help.

As soon as CO leaves the exhaust outlet, the level is subject to dilution in the open air. The closer a person is to the exhaust outlet, the higher the concentration of CO.

In a closed space, such as the engine compartment, the boat, or underneath a stern swim platform, concentrations will potentially rise to the undiluted level emanating from the exhaust system due to a lack of fresh air to dilute the exhaust gas. Therefore, one should never rely on dilution of the exhaust to provide a margin of safety.

Westerbeke Low-CO generators achieve reduction of CO by precise control of the engine’s air/fuel ration coupled with after treatment in a special catalyst. CO emissions are not the same for every model because each engine is different. Also, certain fuel system components are commonized across several engine models being adequate for some and extra-adequate for others, thus producing different CO levels for different models.

The fuel system which accomplishes the required precise air/fuel ratio control is comprised of many different components: purchased sub-assemblies, machined castings, sensors, electronics and others. Because of the extreme level of CO reduction, any variability in the functioning of any these components can and will cause variability of the CO output.

CO concentration also varies with load. Usually, but not always, the worst case CO concentration occurs at maximum load.

INSPECTION

The catalyst is critical to optimizing CO levels. Any water intrusion into the exhaust system will likely quickly compromise the proper operation of the catalyst.

Westerbeke’s exhaust system installation instructions must be adhered to.

NOTE: *Water intrusion is not a product defect and is not covered under warranty, neither Westerbeke’s normal product warranty nor the emissions specific warranty mandated by various regulating authorities such as EPA and CARB.*

Maintenance of any components affecting the flow of air or the flow of fuel to the engine is critically important, such as fuel filters and air filters (if any).

Inspection of the catalyst at the prescribed intervals is critically important. The exhaust elbow is removed by loosening the metal clamp to provide a view of the output surface of the catalyst. Any visual irregularity of the normal flush, honeycomb appearance is most likely a result of water intrusion. The cause of the irregularity must be identified and addressed. If there is irregularity, the catalyst and gasket must be replaced. Upon careful reassembly of the catalyst, exhaust elbow gasket, and exhaust elbow, check for the presence of CO while the engine is running. This must be performed with a CO analyzer.

CARBON MONOXIDE "CO"/ LOW-CO GENERATORS

IMPORTANT INFORMATION

Catalyst performance will degrade over time. As the generator accumulates operating hours, CO concentrations will increase. **The catalyst must be replaced every 2,000 hours of engine operation.**

Verification of satisfactory CO levels must be done seasonally or each 1,000 hours (whichever occurs first). Verification involves actual sampling of exhaust gas with an appropriate CO analyzer.

There are two locations where exhaust gas can be sampled. Dry, but hot, exhaust can be sampled at the plugged tapped hole in the exhaust elbow intended for back pressure measurements. Measurements at this location may not be practical in all instances due to the high exhaust temperature, temperature limits of the analyzer, safety concerns over temperatures involved or the possibility of high levels of CO. The other location is the boat's exhaust outlet, which contains entrained cooling water (except dry stack exhaust systems). Only analyzers with probes should be used at this location and it is critical that the probe not ingest water. Probe-type analyzers have an air pump drawing a gas sample through the probe. As a result, they tend to ingest water when it is present. Be sure to aim the probe downwards with the opening pointed in the direction of the water flow and just out of the flow. Position the analyzer as high as possible with the tubing leading to the probe running continuously downhill. Observe the usually translucent tubing between the probe and the analyzer and be sure no water is being ingested. If any water is ingested into the analyzer, it must be repaired or replaced and recalibrated.

When measuring CO at the exhaust outlet be aware of the ambient CO level by also measuring CO away from and upwind of the exhaust outlet, especially in marinas. The CO level at the exhaust will be influenced upwards by the ambient level.

Whenever taking the time to verify proper CO concentration from the exhaust with a CO analyzer, always take the opportunity to use the analyzer to "sniff" around the engine looking for CO from exhaust leaks. Pay close attention to the connection of the cylinder head to the exhaust manifold, the exhaust manifold to the water injected exhaust elbow, and all subsequent downstream exhaust components and hoses. Remember, exhaust gas that has not yet passed through the catalyst is raw, untreated exhaust and is very high in CO content.

Analyzers usually require periodic calibration. Follow the instructions that come with the analyzer very carefully regarding calibration.

The following are manufacturers that offer CO analyzers: Extech, TIF, Testo, TSI, Bacharach, Fluke, Monoxor, Fyrite, Zellweger Analytics, Industrial Scientific Corp, GFG, TPI, Teledyne and others. Westerbeke recommends analyzers with a probe connected to the analyzer by a length of transparent tubing. They are slightly more expensive than those with the sensor built into one end of the analyzer, but they allow you to sample the exhaust coming out of the boat's exhaust outlet.

EMISSIONS

This genset meets the requirements of California's Exhaust Emissions Standards as stated on the nameplate.

California users of this genset should be aware that unauthorized modifications or replacement of fuel, exhaust, air intake, or speed control system components that affect engine emissions are prohibited. Unauthorized modification, removal or replacement of the engine label is prohibited.

Federal Emissions Compliance Period: The Federal Emissions Compliance Period referred to on the nameplate indicates the number of operating hours for which the engine has been shown to meet Federal Emissions requirements.

Category C= 250 hrs, B=500 hrs, A =1000 hrs.

You should carefully review operator (Owner Installation and other manuals and information you receive with your genset. If you are unsure that the installation, use, maintenance or service of your genset is authorized, you should seek assistance from an approved WESTERBEKE dealer.

California genset users may use the table below as an aid in locating information related to the California Air Resources Board requirements for emissions control.

EMISSIONS CONTROL INFORMATION TABLE

Emissions Warranty Information	The California emissions control warranty statement is located in the same packet, if information as this manual when the genset is shipped from the factory.
Engine Fuel Requirements	The engine is certified to operate on unleaded gasoline. See <i>FUEL RECOMMENDATIONS</i> .
Engine Valve Adjustment	See <i>MAINTENANCE SCHEDULE</i> .
Engine Ignition Timing	See <i>MAINTENANCE SCHEDULE</i> .
Engine Lubricating Oil Requirements	See <i>ENGINE OIL RECOMMENDATIONS</i> .
Engine Adjustments	ECU.
Engine Emission Control System	The engine emission control system consists of engine design and precision manufacture.
Catalyst	See <i>MAINTENANCE SCHEDULE</i> .
Oxygen Sensor	See <i>MAINTENANCE SCHEDULE</i> .
Back Pressure	See <i>MAINTENANCE SCHEDULE</i> .

EXHAUST SYSTEM MAINTENANCE

DESCRIPTION

The catalyst is critical to minimizing exhaust emissions like CO. Any water intrusion into the engine's exhaust system will likely quickly compromise the proper operation of the catalyst.

Inspection of the catalyst at the prescribed intervals is critically important. The exhaust elbow is removed by loosening the metal clamp to provide a view of the output surface of the catalyst. Any visual irregularity of the normal flush, honeycomb appearance is most likely a result of water intrusion. The cause of the irregularity must be identified and addressed. If there is irregularity, the catalyst and sealing gasket must be replaced. The water injected exhaust elbow casting must be inspected also for corrosion and replaced as needed. Upon careful reassembly of the catalyst, new sealing gasket, and exhaust elbow, check for the presence of CO while the engine is running. This must be performed with a CO analyzer.

NOTE: For information on installing Exhaust Systems, refer to *WESTERBEKE'S INSTALLATION MANUAL* available at www.westerbeke.com.

Refer also to *TESTING THE BACK PRESURE* in this manual.

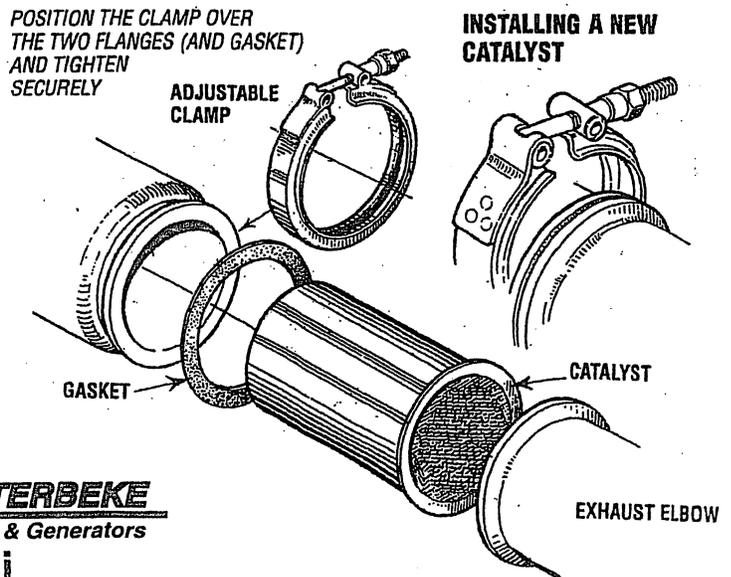


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INTRODUCTION

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

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

This is your Operators Manual. Along with this manual there is an Installation Manual and Parts Information. A service Manual is available and can be ordered from your local WESTERBEKE/UNIVERSAL dealer.

WARRANTY PROCEDURES

Your WESTERBEKE Warranty Statement is included in the product documentation package. There is a warranty registration card you can fill out and mail to Westerbeke Corporation or go to our website www.westerbeke.com and register your product's warranty on line. You should receive a customer warranty identification card in the mail within 60 days of registering. If you do not, please contact the factory and have your product model number, serial number and in service date available.

Customer Identification Card

 WESTERBEKE Engines & Generators	
Customer Identification	
WESTERBEKE OWNER	
MAIN STREET	
HOMETOWN, USA	
Model	Ser. #
Expires	

NOTES, CAUTIONS AND WARNINGS

As this manual takes you through the operating procedures, maintenance schedules, and troubleshooting. 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.

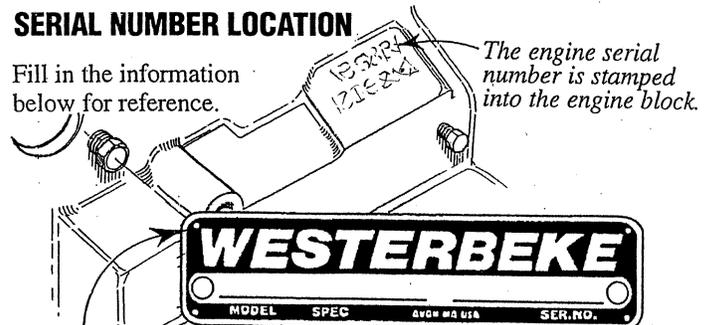
WARNING: Procedures, which if not properly followed, can result in personal injury or loss of life.

MANUALS/SOFTWARE

Westerbeke frequently updates manuals and software. Please insure that you will have the latest information by consulting your WESTERBEKE representative or visit our website at www.westerbeke.com

SERIAL NUMBER LOCATION

Fill in the information below for reference.



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

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

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

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

Fill in the information for your own reference.

NOTE: Technical information is provided in our Manuals for your reference and convenience. Westerbeke recommends that your engine, generator or climate control system is serviced and/or installed only by a qualified Westerbeke distributor or dealer.

The 6.5/5.0 MCG Service Manual (#055743) is available as a pdf download at www.westerbeke.com. This Service Manual can also be purchased in hard copy from your Westerbeke Dealer.

INTRODUCTION

PROTECTING YOUR INVESTMENT

Care at the factory during assembly and thorough testing have resulted in a WESTERBEKE generator capable of many 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 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 as outlined in the Maintenance Schedule.**
- **Proper maintenance of all engine and generator components according to the Maintenance Schedule in this manual.**
- **Use clean, filtered unleaded fuel, maximum 10% ethanol.**
- **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 belt 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.

ORDERING PARTS

Whenever replacement/service parts are needed, always provide the generator model number, engine serial number, and generator serial number as they appear on the silver and black name plate located on the generator end. You must provide us with this information so we may properly identify your generator set. In addition, include a complete part description and part number for each part needed (see the separately furnished Parts Catalog). Also insist upon WESTERBEKE genuine parts because *will fit* or generic parts are frequently not made to the same specifications as original equipment.

SPARES AND ACCESSORIES

Certain spares will be needed to support and maintain your WESTERBEKE generator. Your local WESTERBEKE dealer will assist you in preparing an inventory of spare parts. Suggested Spares are shown in the last page of this manual. For additional parts and accessories, contact your WESTERBEKE DEALER.

INSTALLATION MANUAL

Publication #043268 provides detailed information for installing generators.

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 engine or generator or from the exhaust elbow/exhaust hose or exhaust system.

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

AMPERAGE DRAIN

There is a very small amount of amperage being drawn from the unit's starting battery by the electronics on the unit when the generator is not in use. To prevent this and draw down of the starting battery charge. Turn **OFF** either the panel DC breaker or the starting battery switch when the unit will not be operated for a period of time.

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 may void the warranty.



Care Of The Fuel Supply

Use only clean properly filtered fuel! The fit and tolerance 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.

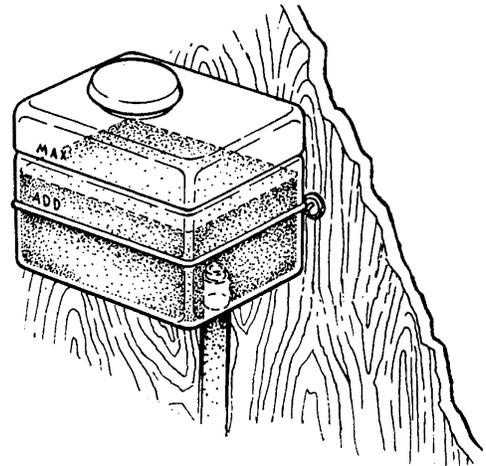
The distilled water and antifreeze should be pre-mixed before being poured into the cooling circuit.

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

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

COOLANT RECOVERY TANK

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



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

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.

NOTE: The starting battery *must* be totally dedicated to the generator and maintained by the generator's DC charging alternator and no other source.

- Check the coolant level in both the plastic recovery tank and at the manifold.

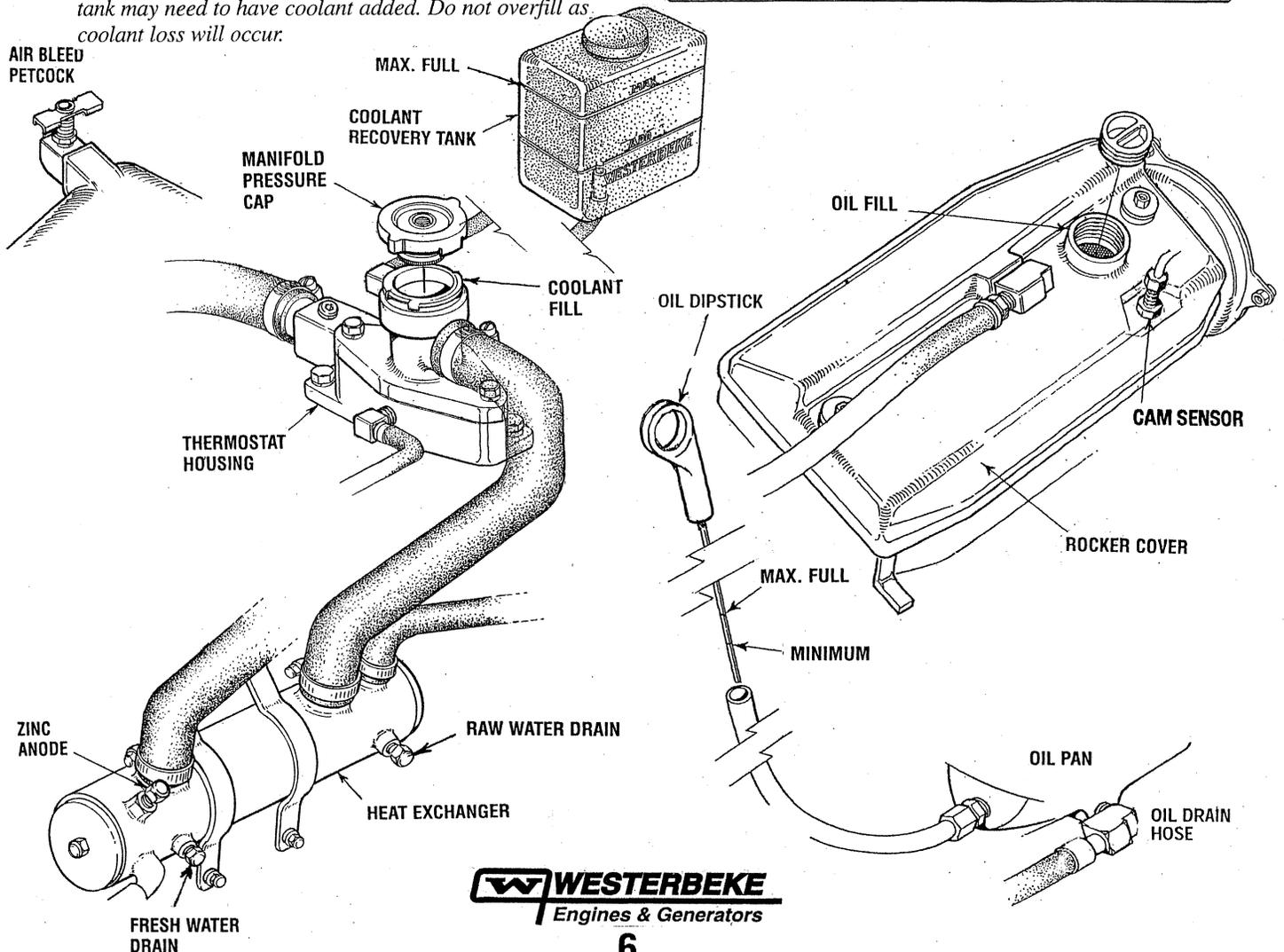
NOTE: During the initial filling of the cooling system, the air bleed petcock on the manifold should be opened to purge air from the engine block. Once cooled, free of air bubbles, flows from the petcock - close the petcock.

After shutdown and after the engine has cooled, the coolant from the recovery tank will be drawn into the engine's cooling system to replace the purged air.

Before subsequent operation of the generator, the engine's manifold should be topped off, and the coolant recovery tank may need to have coolant added. Do not overfill as coolant loss will occur.

- Visually examine the unit. Look for loose or missing parts, disconnected wires, unattached hoses, and check threaded connections. Search for any gasoline leaks.
- Check AC wiring for correct connections as specified in the wiring diagrams.
- Inspect exhaust system connections.
- Be sure no other generator or utility power is connected to the load lines.
- Confirm that systems with a neutral line are properly grounded (or ungrounded) as the system requires, and that generator neutral is properly connected to the load neutral. In single phase systems an incomplete or open neutral can supply the wrong line-to-neutral voltage on unbalanced loads.
- Make certain the raw water thru-hull is open.

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



BLEEDING THE FUEL SYSTEM

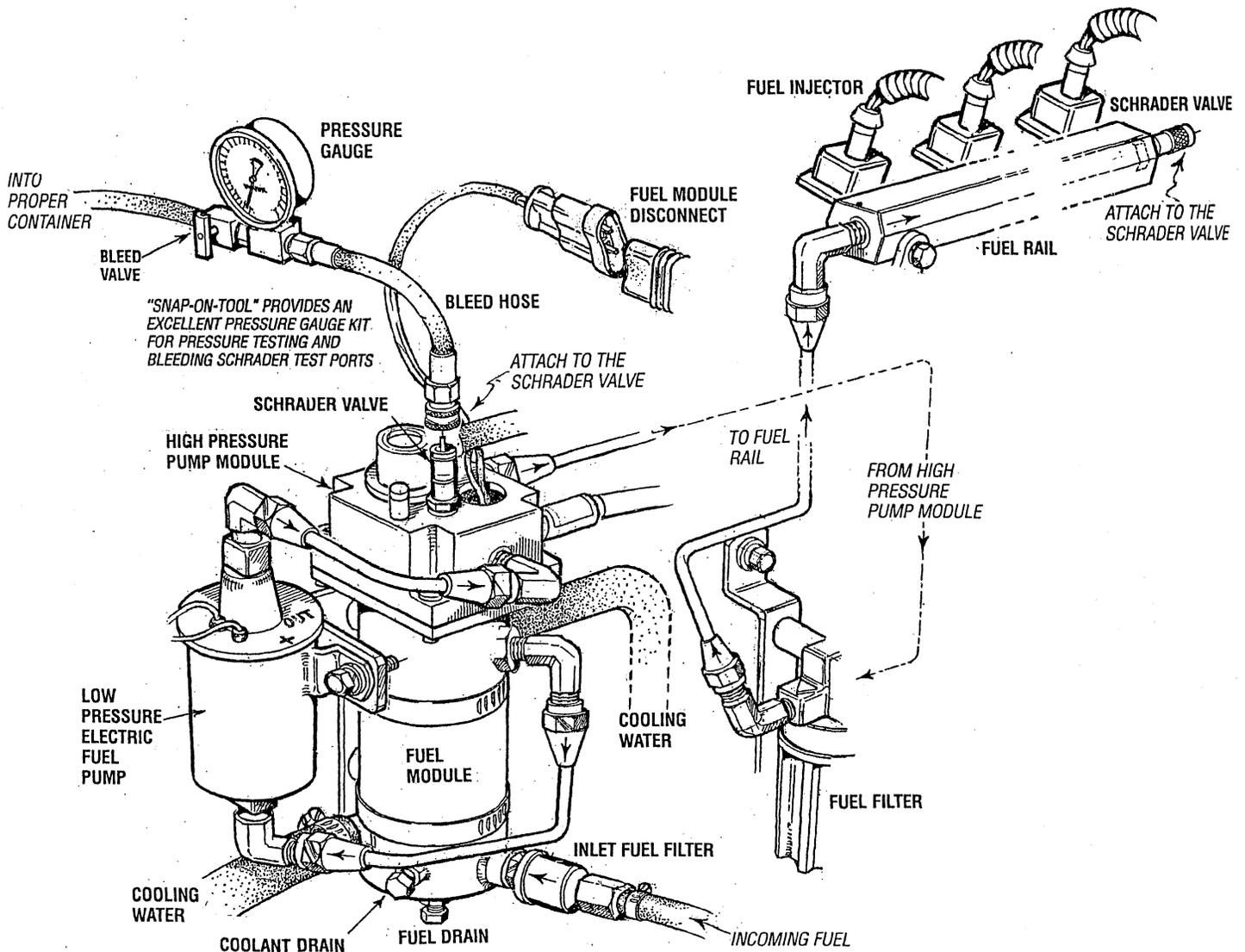
DESCRIPTION

1. Disconnect the fuel module from the engine wiring harness.
2. Attach your fuel pressure gauge set (Snap On #MT337B, OTC 7211) or equivalent to the Schrader valve on the fuel module. Direct the bleed hose from the pressure gauge into a proper container.
3. Open the bleed valve on the pressure gauge, Depress the **STOP** switch and hold it depressed. This activates the low pressure fuel pump. Observe the fuel flow through the bleed hose and when no air bubbles are seen, close the bleed valve and observe the fuel pressure. Typically about 3-5 psi
4. Remove the pressure gauge from the fuel module and connect it to the Schrader valve on the fuel rail.
5. Re-connect the fuel module to the engine harness.

6. Open the bleed valve on the fuel pressure gauge. Depress the **STOP** switch and hold it depressed. This activates both the low pressure and high pressure fuel pumps. Observe the fuel flow through the bleed hose and when no air bubbles are seen, close the bleed valve and observe the fuel pressure. The pressure should be in the 40 psi range.
7. Remove the pressure gauge set and replace the caps on the two Schrader valves.
8. Insure that all harness connections are secure, operate the generator and check that there are no fuel leaks.

NOTE: The fuel system will need to be bled any time the fuel filters are serviced.

⚠ WARNING: The fuel is under extreme pressure! No smoking and no open flames! Clean up spilled fuel and properly discard of cloths and towels.



CONTROL PANEL - START/STOP PROCEDURE

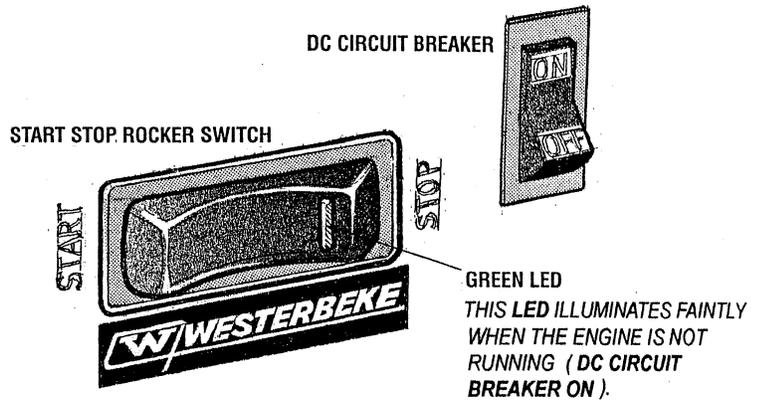
TO START (DC CIRCUIT BREAKER ON)

Simply press the rocker switch to the start position and release (the switch will revert to its center position) the engine will START electronically. A GREEN LED on the switch will indicate the engine is running.

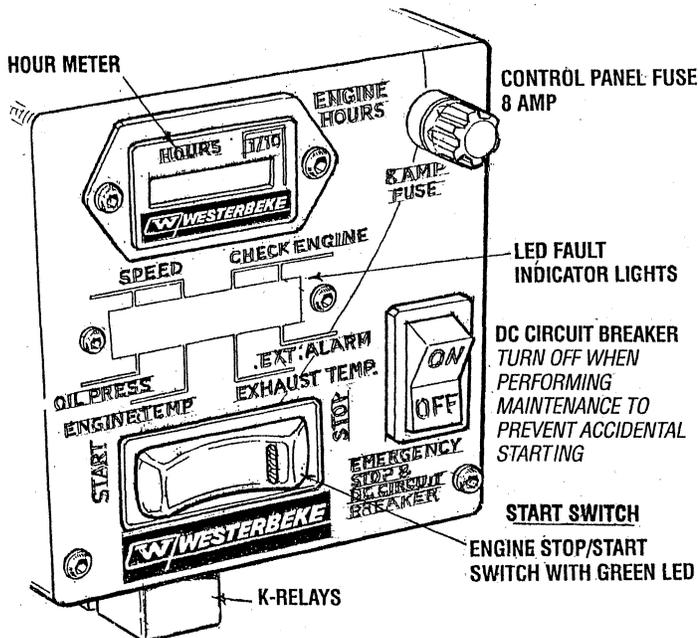
NOTE: There is a few second delay while the ECU self-tests before the start switch responds.

TO STOP

Press the rocker switch to the STOP position and release. The GREEN LED will go out indicating the engine has shut down.



CONTROL PANEL - OPERATING INSTRUCTIONS



Failure to Start

The start cycle will automatically terminate after 6-8 seconds of cranking. Three crank cycles can be attempted before the ECU initiates a SPEED fault and prevents further crank cycle attempts. Investigate the cause of this no-start, correct it and reset the ECU.

CAUTION: Prolonged cranking can result in the exhaust filling with water and the water backing into the engine. This could cause catastrophic damage to your generator/engine.

The LED fault shut-down display has six LED light combinations that indicate to the operator the cause of the engines automatic shut-down. The LED displays are: CHECK ENGINE, OIL PRESSURE, ENGINE TEMPERATURE, EXTERNAL ALARM, EXHAUST TEMPERATURE and SPEED (flashes).

Should the generator shut down from one of these faults, the fault LED will remain illuminated. To reset the LED, the DC breaker on the control box **must** be turned OFF and then back ON.

NOTE: The CHECK ENGINE LIGHT indicates a possible emissions control problem. Immediate action should be taken to troubleshoot and correct this problem.

The Ext. Alarm indicates a faulty fire suppression circuit. By-pass the circuit to determine the fault (the fire suppression circuit must be closed when the circuit is running).

The 8 Amp Fuse protects the Control Panel from High Amperage or Short Circuit.

The 15 Amp DC Circuit Breaker protects the K1, K2, K3 relays (closed circuit) from high amperage or short circuit.

BLEEDING THE FUEL SYSTEM

NOTE: Bleeding of air from the fuel system is required at the initial commissioning of the generator. Refer to the previous page.

GENERATOR CONTROL PANEL

The start/stop rocker switch is the only functional component on the generator control panel used to start and stop the generator.

The start/stop rocker switch is a three position switch with momentary contacts in the (START) and (STOP) position and a stationary contact in the center (NORMAL). This position allows the generator to run once started and also enables the remote start/stop panel(s) to control the start/stop functions of the generator.

The (START) position starts the generator and once released reverts to the center position. The (STOP) position stops the engine in normal operation as well as in an emergency situation. This position is also used to prime the fuel system when necessary.

REMOTE STOP/START PANELS

DESCRIPTION

Two remote start/stop panels are available that allow for the engine/generator to be controlled from any location on the boat.

The remote panels connect to the main panel using a 15' or 30' wiring harness (or a combined length of 45'). Once installed, the engine/generator can be started and stopped from either the remote or the main panel.

REMOTE START/STOP PANEL (with LED Fault Display)

The components on the panel are:

1. A three position start/stop rocker switch.
2. A green LED run indicator light on the rocker switch.
3. A four position LED fault shutdown display.

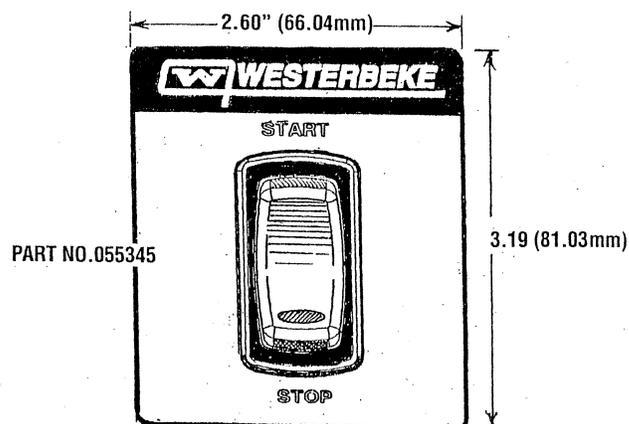
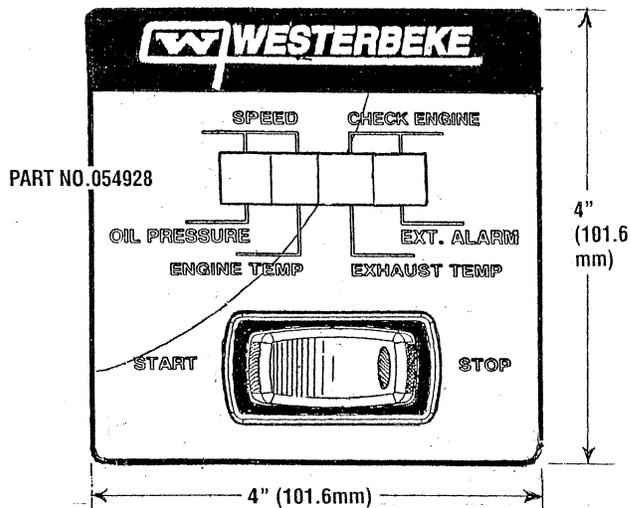
The start/stop rocker switch functions the same as the start/stop rocker switch on the generator's control panel as previously explained.

The green LED run indicator light on the rocker switch will illuminate when the start circuit is energized. It will go dim as the engine cranks and will brighten as the engine starts, indicating the generator is running.

The LED fault shutdown display has six separate LED combinations that indicate to the operator the cause of the engine's automatic shutdown. The LED displays are: Check Engine, Oil Pressure, Engine Temperature, External Alarm, Exhaust Temperature, and Speed (Overspeed -LEDs and Underspeed-LEDs) flashing.

Should the generator shutdown from one of these faults, the fault LED will remain illuminated. To reset the LED, the panel DC breaker must be cycled OFF then ON.

NOTE: For connecting these remote panels, refer to the Wiring Diagram section in this manual.



BREAK-IN PROCEDURE/THE DAILY OPERATION

BREAK-IN PROCEDURE

After the generator has been started, check for proper operation and then allow the generator to warm up a few minutes before applying a load.. Run the generator between 20% and 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 reduced output voltage and/or frequency. MCG models will illuminate a warning LED when the generator is overloaded. Monitor the current being drawn from the generator and keep it within the generators rating.

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

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

CHECK LIST

Follow this check list each day before starting your generator.

- Record the hourmeter reading in your log (engine hours relate to the maintenance schedule).
- Visually inspect the generator 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 drive belts for proper tension.
- Check for abnormal noise such as knocking, vibration and blow-back sounds.
- Inspect the exhaust system.

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

SAFETY SHUTDOWN SWITCHES SENSORS AND SENDERS

DESCRIPTION

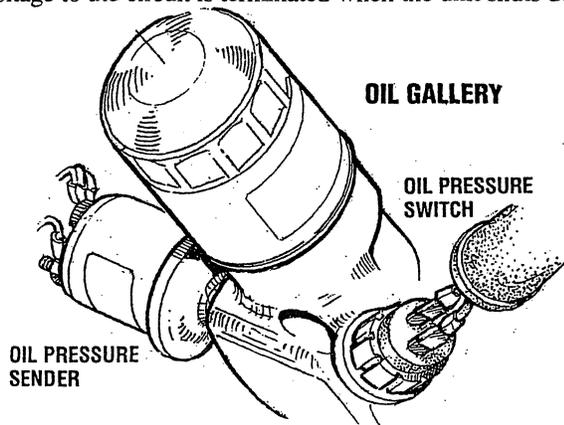
The engine/generator is protected by switches and sensors that send signals to the ECU that it interprets as a fault and automatically shuts down the generator's engine. When an automatic shutdown occurs, one of the control panel fault LED lights will illuminate indicating what fault caused the engine to shutdown. This LED will stay illuminated. To correct the fault, refer to *ENGINE TROUBLESHOOTING* in this manual. **Do not attempt to re-start the generator before correcting the fault.**

SPEED SENSOR (Hall Effect)

A speed sensor is mounted on a bracket adjacent to the front crank shaft pulley. It monitors pulley rotation and sends a voltage signal to the ECU that interprets it as crankshaft speed. If a speed threshold is reached, either overspeed or underspeed. The ECU will shut the unit down. If both speed LEDs are illuminated, it indicates an overspeed. If both are flashing it is an underspeed.

OIL PRESSURE SWITCH

An oil pressure switch is located on the right side of the oil filter mounting bracket. This is a normally open contact switch. It functions with the time relay circuit to ensure DC voltage to the circuit is terminated when the unit shuts down.

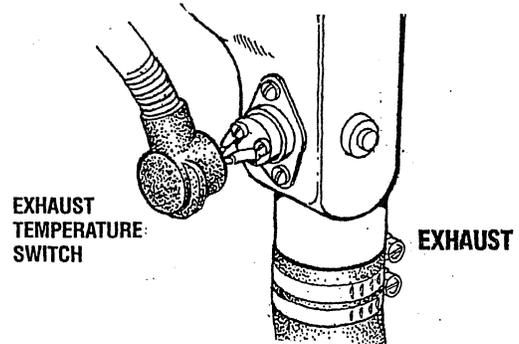


OIL PRESSURE SENDER

An oil pressure sender (to the left of the oil filter) sends DC voltage to the ECU that it interprets as oil pressure. Should this voltage fall below a certain level, the ECU will shut the generator down and illuminate the low oil pressure LED. Should this occur, refer to *ENGINE TROUBLESHOOTING* in this manual.

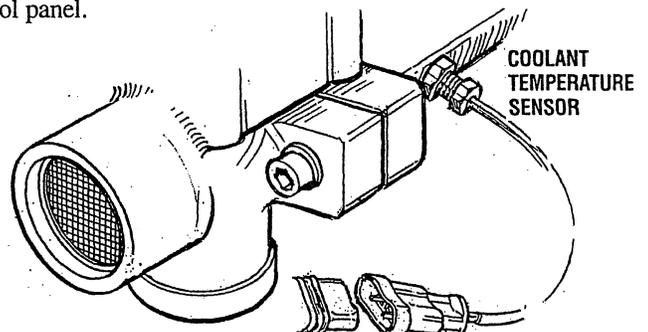
EXHAUST TEMPERATURE SWITCH

A temperature switch is mounted on the exhaust elbow to monitor the temperature of the exhaust coolant and gases. Should the switch sense an excessive exhaust temperature, the ECU will shut the generator down and the exhaust temperature LED will illuminate on the control panel.



COOLANT TEMPERATURE SENSOR

This sensor is located on the underside of the intake manifold to monitor the engines coolant temperature. The sensor is sending DC voltage to the ECU that interprets this as engine coolant temperature. Should the temperature reach an over-heat threshold, the ECU will shut the engine down and will illuminate the engine temperature fault LED light on the control panel.



DC CIRCUIT BREAKER

The engines electrical system is protected by a 15 amp manual reset circuit breaker. An electrical overload in the wiring harness or the instrument panel will trip the breaker and shut down the engine/generator. Should this occur, inspect and repair the problem. Then reset the breaker and re-start the engine.



FUSE PROTECTION

Four DC circuit protectors are found in the engines electrical circuit. A 15 amp DC breaker and an 8 amp buss fuse on the control panel. A 30 amp buss fuse in the control panel and a 30 amp spade fuse by the starter motor for the battery charge circuit.

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

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. Insure there are no exhaust leaks around the elbow. Inspect wiring and electrical connections. Look for loose bolts/hardware and possible corrosion.

INITIAL 50 HOURS OF OPERATION

*Spark Plugs	Clean/re-gap.
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 clamps are tight. Check the integrity/mounting security of the water injected exhaust elbow.
*Air Screen/Flame Arrestor	Remove, clean and re-install screen pack. Inspect rubber sealing ring and replace if necessary, then once a year.
*Valve Adjustment	Check adjustment of valves. Check again at 500 hours.
*Inlet Fuel Filter	Initial change, then every 250 hours or once a year.
*Fuel Filter and "O" Rings	Initial change, then every 250 hours or once a year.

EVERY 50 OPERATING HOURS OR MONTHLY

*Drive Belts (Fresh Water/Raw Water Pumps)	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	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 Arrestor	Remove, clean and re-install screen pack. Inspect rubber sealing ring and replace if necessary.

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

AMPERAGE DRAIN

There is a very small amount of amperage being drawn from the unit's starting battery by the electronics on the unit when the generator is not in use. To prevent this and draw down of the starting battery charge. Turn **OFF** either the panel DC breaker or the starting battery switch when the unit will not be operated for a period of time.

MAINTENANCE SCHEDULE

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

SCHEDULED MAINTENANCE

EXPLANATION OF SCHEDULED MAINTENANCE

EVERY 250 OPERATING HOURS OR YEARLY

*Exhaust Elbow/Exhaust System	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 chafing. No exhaust leaks. Hoses and muffler are in good serviceable condition. NOTE: An exhaust leak will cause exposure to carbon monoxide!
*Fuel Filter and O-Rings	Remove and replace fuel filter and all sealing O-rings.
*Inlet Fuel Filter	Remove and replace inlet fuel filter.
*Generator	Check that AC connections are clean and secure. Ensure wires have no chafing. See <i>GENERATOR INFORMATION</i> .
*Hoses	Engine hoses should be firm and tight. Replace if hoses become spongy, brittle or delaminated. Check and tighten all hose clamps as needed.
Vibration Isolators/Engine Mounts	Check vibration isolators, brackets and mounting hardware. Replace as needed.
*Heat Exchanger	Open heat exchanger end cap(s) and clean out debris. Replace gasket and O-rings if needed.

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 when re-assembling.
*Exhaust System Catalyst	Inspect for proper operation. Replace at 2000 operating hours.

EVERY 500 OPERATING HOURS OR EVERY TWO YEARS

*Ignition System	Inspect for deterioration. Test 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	Remove and replace the timing belt. NOTE: Failure to replace the timing belt at the recommended interval could result in timing belt failure resulting in major damage to the engine.
*Heat Exchanger	Remove the heat exchanger for professional cleaning and pressure testing.
*Diverter Valve PN#054500	Remove and replace.

EVERY 2000 OPERATING HOURS

*Oxygen Sensor	Remove and replace exhaust oxygen sensor.
*Catalyst	Remove and replace exhaust catalyst.

⚠ 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.

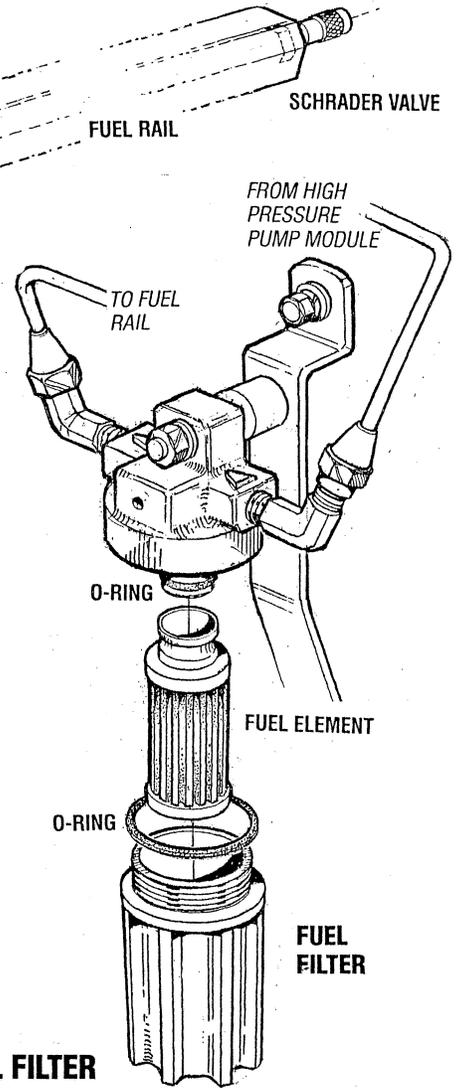
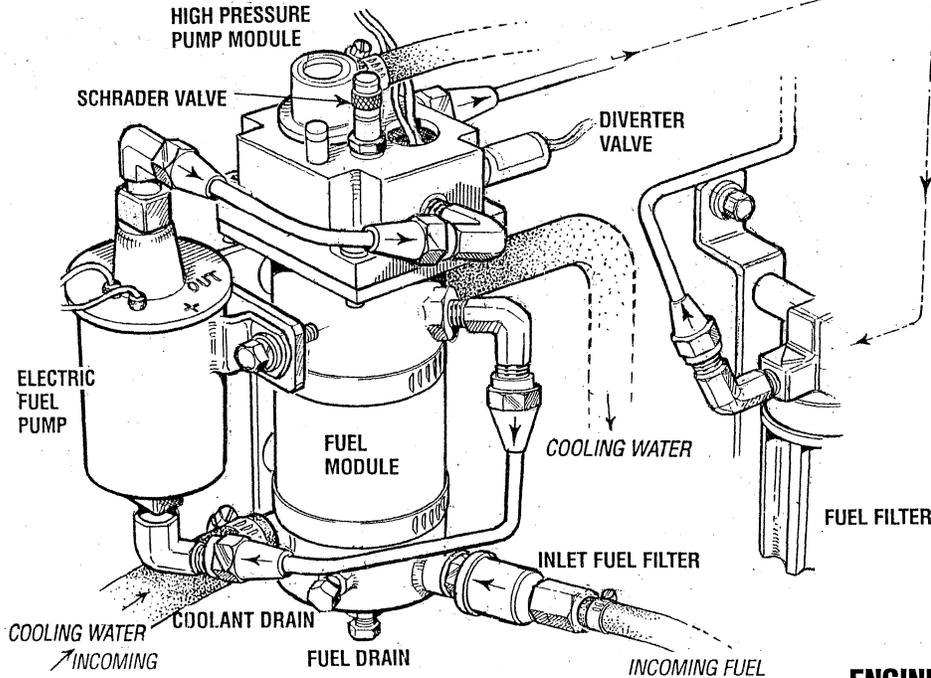
*WESTERBEKE recommends this service be performed by a knowledgeable mechanic.

The 6.5/5.0 MCG Service Manual (#055743) is available as a pdf download at www.westerbeke.com. This Service Manual can also be purchased in hard copy from your Westerbeke Dealer.

FUEL SYSTEM

FUEL SYSTEM COMPONENTS

Incoming fuel (from the owner installed *Gasoline Water Separator/Filter*) is pumped thru the *Inlet Fuel Filter* into the *Fuel Module* by the *Electric Fuel Pump*. The fuel is cooled as it circulates through the *Fuel Module* and then is pumped by the *Electric Fuel Pump* to the *High Pressure Pump Module* and to the *Secondary Fuel Filter*. The fuel passes to the *Fuel Rail* and is delivered (under pressure) to the *Fuel Injectors*.



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 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 the water and contaminants.

OWNER INSTALLED
FUEL WATER
SEPARATOR
PN.049602



FUEL 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 engine mounted fuel pump is maintenance free.

ENGINE FUEL FILTER

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

Changing the Engine Mounted Filter Element

1. Shut the fuel supply to the generator off.
2. Bleed the fuel system to reduce the fuel pressure to zero. Refer to *BLEEDING THE FUEL SYSTEM*.
3. Unscrew the fuel bowl from the housing and pull the filter element down and off. Use care to catch any fuel that may be present.
4. Replace the two sealing "O" rings. Install the new filter element and thread on the fuel bowl then tighten by hand.
5. Open the fuel supply to the generator and start the unit. Ensure that there are no leaks.
6. Bleed the fuel system again to remove trapped air from the system. Refer to *BLEEDING THE FUEL SYSTEM*.

BLEEDING THE FUEL SYSTEM

The engine's fuel system should be bled of air at the initial commissioning of the unit, each time the fuel system is serviced and once a season to ensure any air that may have accumulated in the system is removed. Bleeding instructions are found in the model's *SERVICE MANUAL*.

COOLING SYSTEM

FRESH WATER COOLING CIRCUIT

An antifreeze mixture is pumped through the engine by a belt driven circulating pump, absorbing heat from the engine. The coolant then passes through the thermostat, into the heat exchanger, then into the jacketed exhaust manifold into the suction side of the circulating pump and then through the engine.

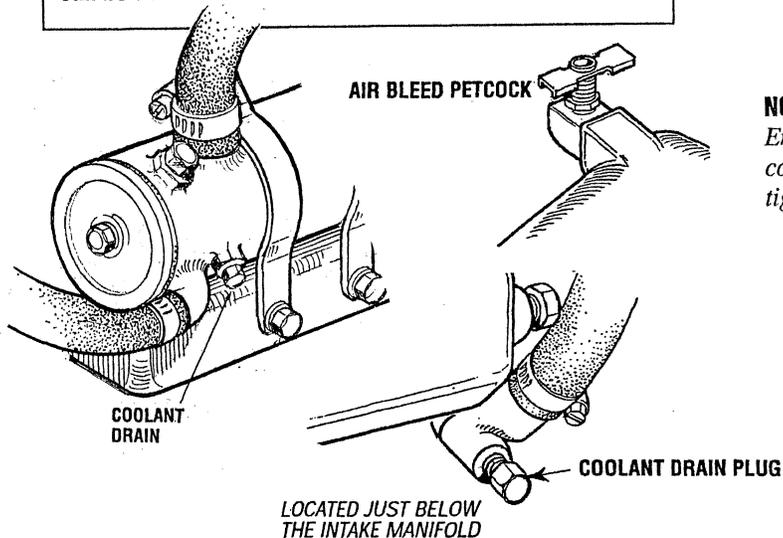
When the engine is started cold, external coolant flow is prevented by the closed thermostat (although some coolant flow is bypassed around the thermostat to prevent the exhaust manifold from overheating). As the engine warms up, the thermostat gradually opens, allowing full flow of the engine's coolant to flow unrestricted to the external portion of the cooling system.

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

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. Drain the engine coolant by removing the block drain adjacent to the oil filter, remove the in-board drain plug on the heat exchanger and remove the pressure cap from the water jacketed exhaust manifold.

CAUTION: *The engine must be allowed to cool down before attempting these procedures. Not only is the surface of the engine hot but coolant temperatures can be at 190° F.*



Refilling the Coolant

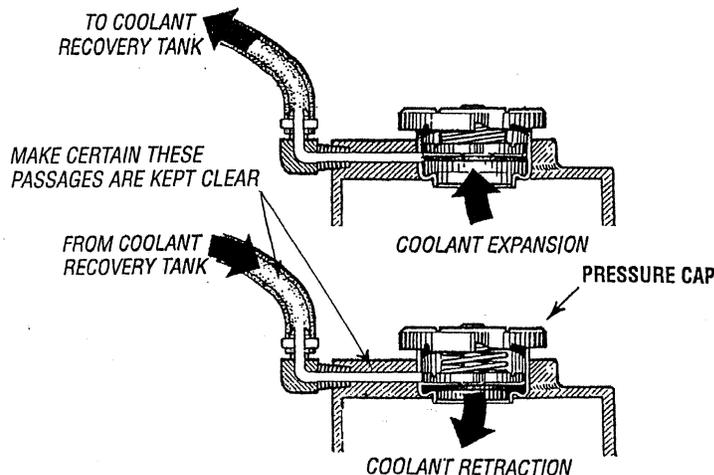
After re-installing the coolant drain plugs, open the air bleed petcock on the water jacketed exhaust manifold and slowly pour new pre-mixed coolant into the open filler neck until coolant is visible in the filler neck.

Start the engine and monitor coolant in the filler neck and add as needed. Check the air bleed petcock and when coolant flows from the petcock, close it.

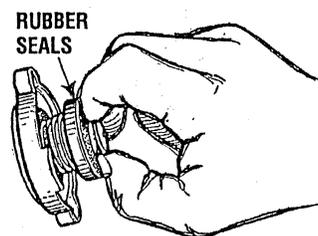
Allow the engine to run and monitor coolant in the filler neck and add as needed. When the coolant level is stable, fill to the brim and install the pressure cap.

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 make certain the coolant is topped off at the pressure cap. Clean up any spilled coolant.



NOTE: *Periodically check the condition of the 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.*

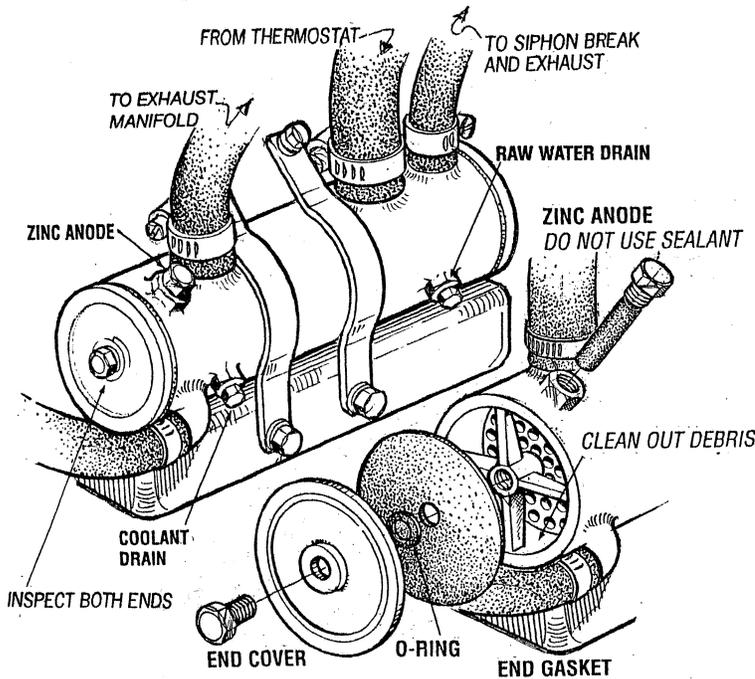


COOLING SYSTEM

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 cycle repeats itself.

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



Heat Exchanger Service

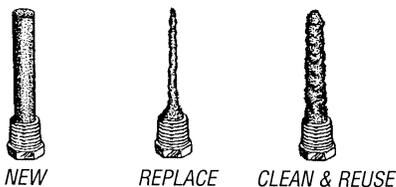
Remove, clean and pressure test the engine's heat exchanger according to the interval listed in the Maintenance Schedule. (A local automotive radiator shop should be able to clean and test the heat exchanger.)

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

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 on board.

ZINC ANODES



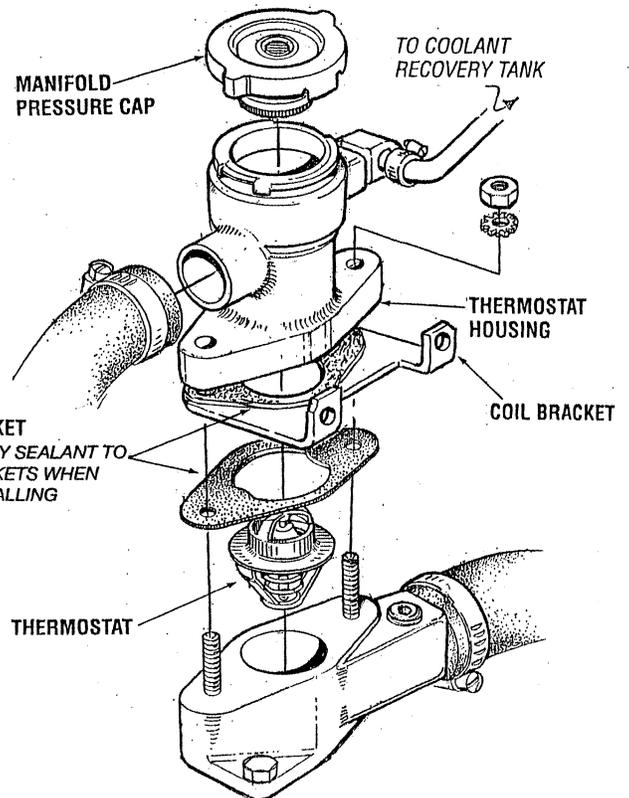
If the zinc pencil needs replacement, hold the hex boss into which the zinc pencil is threaded with a wrench while loosening the anode with another wrench. This prevents the hex boss from possibly tearing off the exchanger shell. After removing the zinc, note the condition of it. If the zinc is in poor condition, there are probably 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, 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.

THERMOSTAT

The thermostate 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".



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.

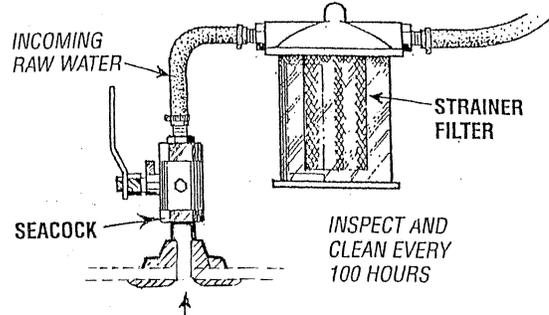
Perform the following maintenance after every 100 hours of operation:

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 warning light LED illuminates, 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.

TYPICAL RAW WATER INTAKE STRAINER (OWNER INSTALLED)



NOTE: The external thru-hull opening should be of the flush type with a clear opening. No perforated or slot type external opening. Let all the filtering be accomplished on the inside of the hull where there is easy access to the strainer.

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.

Never allow the pump to run dry. There should always be a spare impeller and impeller cover gasket aboard (an impeller kit). Raw water pump impeller failures occur when 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 pumps internal parts (seals and bearings), it may be more cost efficient to purchase a new pump and rebuild the original pump as a spare.

NOTE: Never allow the pump to run dry. Even a short period of dry running may destroy the impeller.

Changing the Raw Water Pump Impeller

Close the raw water intake valve. Remove the pump cover and, using an impeller puller, screw drivers, or pliers, 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 pumps housing. When assembling, apply a thin coating of lubricant to the impeller and gasket. **Open the raw water intake valve.**

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

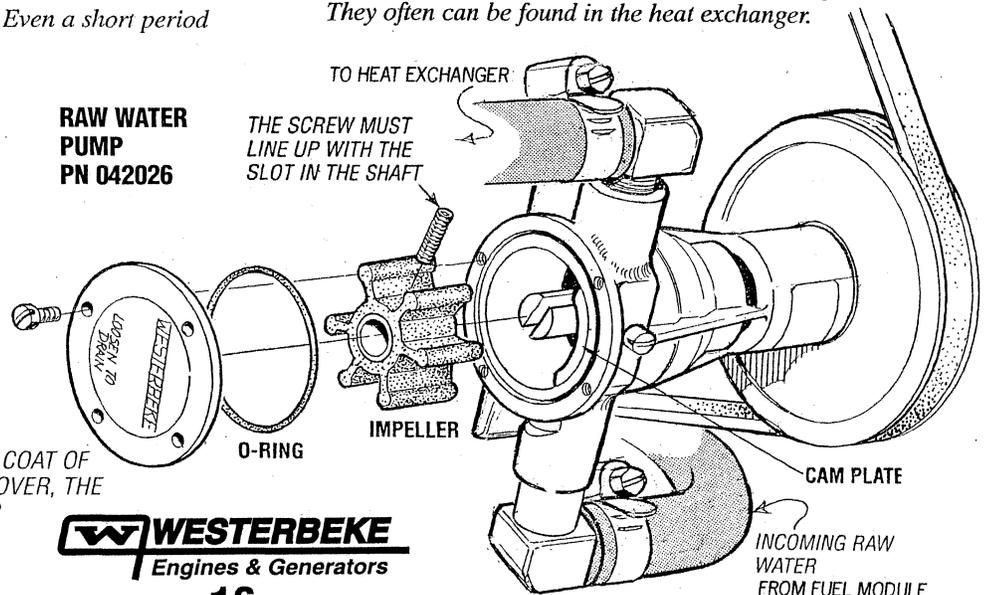
NOTE: If any of the vanes have broken off the impeller they must be found to prevent blockage in the cooling circuit. They often can be found in the heat exchanger.

IMPELLER

INSPECTION: CHECK AT THE BASE OF EACH BLADE BY BENDING VIGOROUSLY. REPLACE THE IMPELLER IF THERE ARE ANY CRACKS.

WHEN INSTALLING: TAKE CARE TO ALIGN THE IMPELLER KEYWAY WITH THE SHAFT KEY. FOLD THE IMPELLER BLADES IN EITHER DIRECTION (THEY WILL TURN IN THE CORRECT POSITION WHEN THE IMPELLER STARTS TO ROTATE).

WHEN ASSEMBLING: APPLY A THIN COAT OF GLYCERIN TO THE INSIDE OF THE COVER, THE COVER O-RING, AND THE IMPELLER



WESTERBEKE
Engines & Generators

ENGINE LUBRICATING OIL

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 interval as specified in the MAINTENANCE SCHEDULE in this manual.

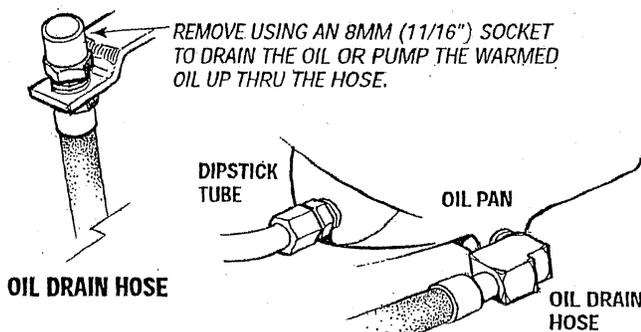
Westerbeke Corporation does not approve or disapprove the use of synthetic oils. If synthetic oils are used, engine break-in must be performed using conventional oil. Oil change intervals must be as listed in the MAINTENANCE SCHEDULE section of this manual and not be extended if synthetic oils are used.

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

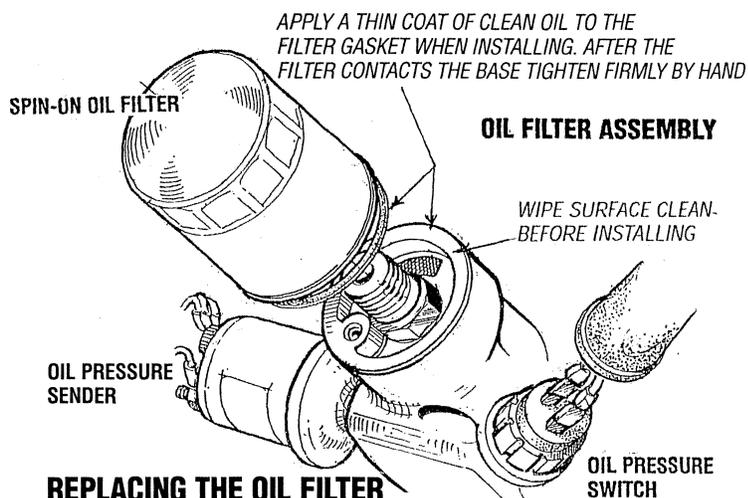
CHANGING THE ENGINE OIL

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

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



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



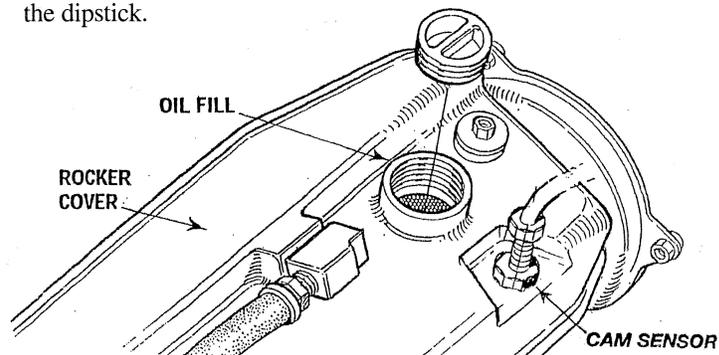
REPLACING THE OIL FILTER

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

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

REFILLING THE OIL SUMP

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



ENGINE ADJUSTMENTS

SPARK PLUGS

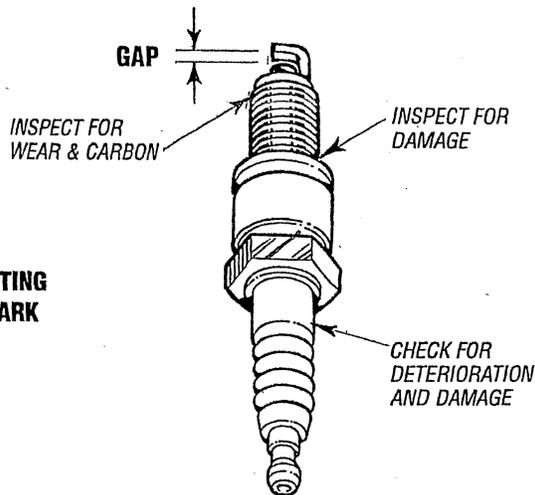
The spark plugs should be cleaned and re-gapped after the first 50 hour break-in period, then follow the maintenance schedule in this manual.

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

SPARK PLUG GAP: 0.028-0.031 in (0.7-0.08 mm)

SPARK PLUG TORQUE: 11-15 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.



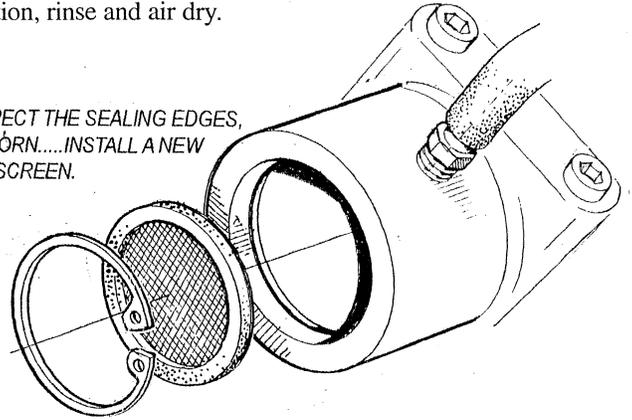
INSPECTING THE SPARK PLUGS

NOTE: It is important to maintain spark plugs in a proper operating condition. They are an important component in the ignition system in lowering carbon monoxide levels.

AIR SCREEN/FLAME ARRESTER

The air screen/ flame arrester should be cleaned after the first 50 hours of operation. Then refer to the Maintenance Schedule in this manual. Clean using a good dish washing solution, rinse and air dry.

INSPECT THE SEALING EDGES, IF WORN.....INSTALL A NEW AIR SCREEN.



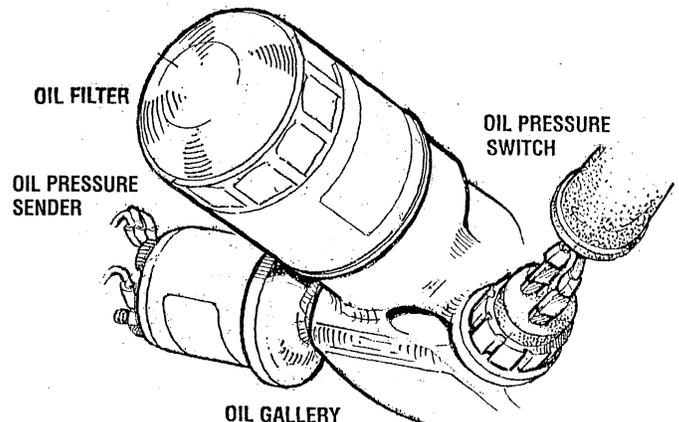
WARNING: The generator should never be started/operated without the air screen/flame arrester properly installed.

OIL PRESSURE

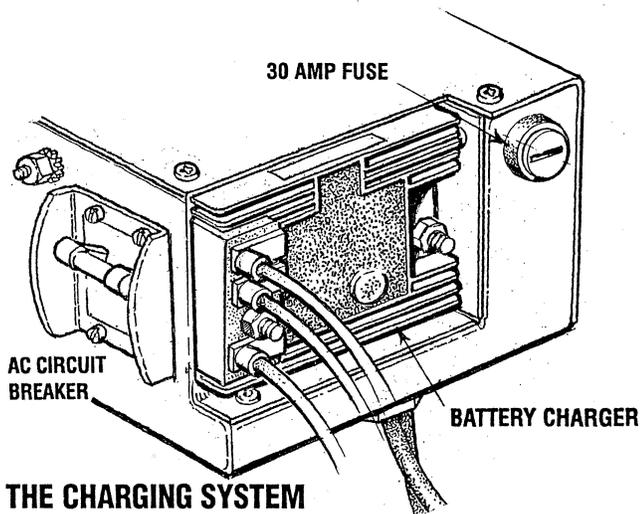
OIL PRESSURE

The engine oil pressure is continually monitored by the ECU in the generator control panel when the engine is running. Should the oil pressure fall below a safe operating level, the generator will shut-down and the control panel's low oil pressure fault LED will illuminate. Should this occur, **do not** attempt to re-start the generator. Check the oil level and the condition of the oil. If there is a loss of oil, inspect the engine for leaks. Inspect the wire connections at the oil gallery (pressure sender).

WARNING: If the oil pressure light illuminates but the engine does not shut down, this is a low oil pressure warning.



BATTERY CHARGING CIRCUIT

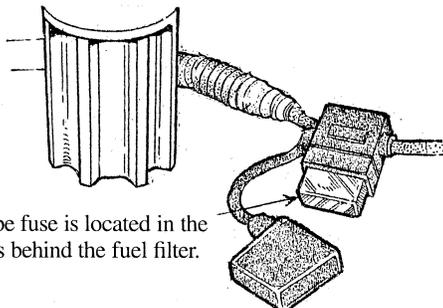


THE CHARGING SYSTEM

The battery charger is an encapsulated, solid-state unit that supplies a DC charging voltage to the generator's starting battery while the generator is operating.

NOTE: *The battery charging circuit is totally separate from the AC output of the generator. The generator output affects the circuits output, but not the reverse.*

A separate group of stator windings supplies AC voltage to a bridge rectifier which converts the AC current to supply the charging unit. The unit senses the needs of the starting battery and supplies a DC charge when one is needed.



30A FUSE

This spade type fuse is located in the wiring harness behind the fuel filter.

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

BATTERY

The minimum recommended capacity of the battery used in the engine's 12 volt DC control circuit is 800-1000 CCA. This **MUST** be a dedicated battery.

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.

There is a small DC amperage drain from the starting battery when the generator is not in use. To prevent this draw, turn off the DC breaker on the generators control panel (or turn off the DC battery switch to the generator).

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.*

ENGINE TROUBLESHOOTING

The following troubleshooting chart describes certain problems and causes relating to engine service. Also note there is a Diagnostic Troubleshooting section that follows.

Note: When servicing the engine/generator, the main circuit breaker (control panel) disconnects all AC power and can be switched off and reset manually.

Problem	Possible Cause
Engine does not crank.	<ol style="list-style-type: none"> 1.DC panel breaker OFF. 2.DC battery OFF. 3.K2 relay faulty. 4.Starter solenoid faulty. 5.DC battery low/dead. 6.Water filled cylinder. 7.DC panel 8 amp buss fuse is faulty.
Engine cranks, does not start (engine will crank 8 seconds) (3 crank cycles before underspeed fault occurs)	<ol style="list-style-type: none"> 1.Fuel starvation. 2.Air in fuel system. 3.Fouled spark plugs. 4.Faulty ignition coil.
Engine starts, runs and the shuts down.	<ol style="list-style-type: none"> 1.Fuel starvation. 2.Air in fuel system. 3.Faulty shutdown switch/sensor. 4.Faulty fuel pump.
Engine hunts.	<ol style="list-style-type: none"> 1.Air in fuel system. 2.Faulty fuel pump. 3.Low octane fuel (lower than 89). 4.Faulty speed sensor (crankshaft).
Engine misfires/back firing.	<ol style="list-style-type: none"> 1.Low octane fuel (lower than 89). 2.Dirty air intake screen screen. 3.High tension ignition wires. 4.Exhaust restriction. 5.Worn/fouled spark plug. 6.Faulty ignition coil. 7.Low or no fuel pressure. Poor quality fuel.
Engine overheats/engine temp LED is illuminated.	<ol style="list-style-type: none"> 1.Raw water coolant flow obstruction. 2.Coolant level low. 3.Faulty impeller. 4.Pump belt loose/broken. 5.Stuck thermostat. 6.Air in cooling system (fresh water).
Exhaust temp LED is illuminated.	<ol style="list-style-type: none"> 1.Loss of coolant flow/faulty pump. 2.Faulty exhaust temperature switch.
Low oil pressure/oil pressure LED is illuminated.	<ol style="list-style-type: none"> 1.Oil level low. 2.Faulty oil pressure sensor. 3.Oil viscosity incorrect.

ENGINE TROUBLESHOOTING

Problem	Possible Cause
No DC charge to starting battery.	<ol style="list-style-type: none"> 1.Circuit fuse faulty/blown (two fuses). 2.Faulty circuit connection. 3.Faulty regulator/battery charger. 4.Bridge rectifier.
High DC Charge to battery.	<ol style="list-style-type: none"> 1.Battery charger misadjusted. 2.Faulty starter solenoid.
Starter stays energized after start.	<ol style="list-style-type: none"> 1.Faulty K1 relay. 2.Faulty starter solenoid.
Poor performance at generator speed.	<ol style="list-style-type: none"> 1.Low octane fuel. 2.Incorrect ignition timing. 3.Fuel supply issue. 4.High engine compartment temperature.
Black exhaust smoke.	<ol style="list-style-type: none"> 1.Dirty air screen. 2.Faulty injector.
Blue exhaust smoke.	<ol style="list-style-type: none"> 1.Lube oil is diluted. 2.Crankcase breather tube is clogged. 3.High lube oil level.
Check engine LED's are illuminated.	<ol style="list-style-type: none"> 1.Diagnostic software required.
Speed LED's are illuminated-no flashing.	<ol style="list-style-type: none"> 1.Faulty speed sensor. 2.Intake manifold vacuum leak.
Pair of Speed LED's are illuminated-flashing.	<ol style="list-style-type: none"> 1.AC generator overload. 2.Fuel starvation.
External alarm LED is illuminated.	<ol style="list-style-type: none"> 1.Loose connection. 2.Faulty fire suppression shutdown devise.

The **6.5/5.0 MCG Service Manual** (#055743) is available as a pdf download at www.westerbeke.com. This Service Manual can also be purchased in hard copy from your **Westerbeke Dealer**.

SOFTWARE DIAGNOSTICS

PC INTERFACE SOFTWARE

Diagnostic Software Kit #055410 is available for purchase through your Westerbeke Dealer or Distributor.

It contains a PC Interface Software CD for your laptop and a Programmed USB Interconnect Cable to connect between your laptop and the unit's Electronic Control Board (ECU).

CABLE AND DIAGNOSTIC SOFTWARE KIT PART #055410 (USB to ECU) SEE BELOW.

Your areas distributor can be found on our website:
www.westerbeke.com

The Diagnostic Software (EC11) is designed to aide the technician in monitoring the engine's operation and the ECU (Electronic Control Unit) functions.

Once downloaded, this software provides IDLE Mode diagnostics, FAILURE Record and Run Time Data Logging to EXCEL.

The Diagnostic Software will run on Windows 98, XP, Vista and Windows 7. These MUST have a minimum of 128 megabytes of RAM (Random Access Memory). The communications cable plugs into a USB port. When using serial to USB adapters, the communication port that the adapter is using MUST be known in order to configure the Diagnostic Software.

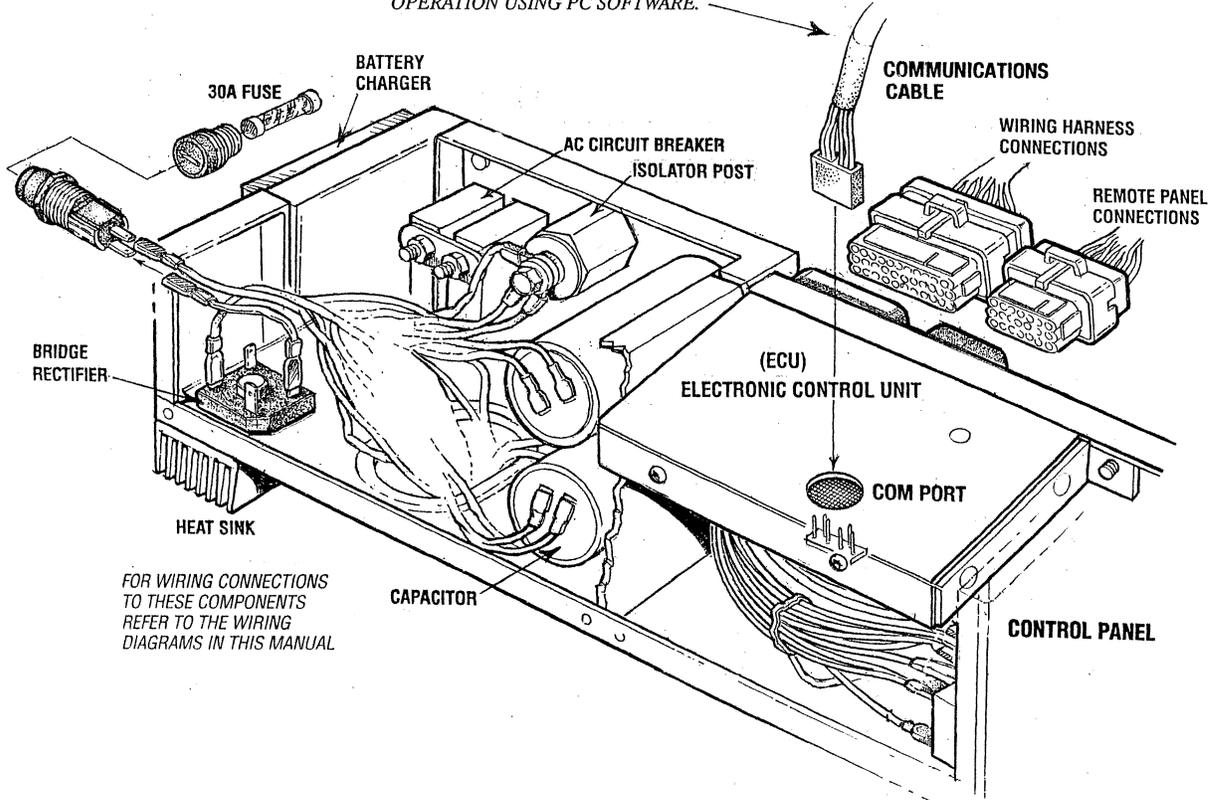
The Westerbeke communication cable is unique to this Diagnostic Software and MUST be used or otherwise damage to the ECU will occur if any communications cable is substituted. The Diagnostic Software is designed with multiple screens, tabs and pull down menus to aid the user in the diagnostic process.

The Diagnostic Software is for monitoring the operation of the engine/generator and is also used to change the ECU target frequency between 50Hz and 60Hz.

Refer to WESTERBEKE'S MCG Service Manual for the Software Diagnostic Monitoring and Troubleshooting Data.

CONTROL BOX INTERNAL COMPONENTS TYPICAL ASSEMBLY

THE COMMUNICATIONS CABLE IS AVAILABLE FOR DIAGNOSTIC MONITORING OF THE ENGINES OPERATION USING PC SOFTWARE.



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 a brief period, the generator will not be damaged if it can bring the motor up to speed quickly. If difficulty is experienced in starting motors, turn off all other electrical loads and, if possible, reduce the load on the electric motor. Some motor controllers can be configured to reduce the peak starting current. These are called *Soft-Start* controls.

LOAD TEST

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. To monitor voltage and load, check it with a portable meter and amp probe.

Generator Maintenance

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

In addition to periodic cleaning, the generator should be inspected for tightness of all connections, evidence of overheated terminals and loose or damaged wires.

BC GENERATOR SINGLE PHASE

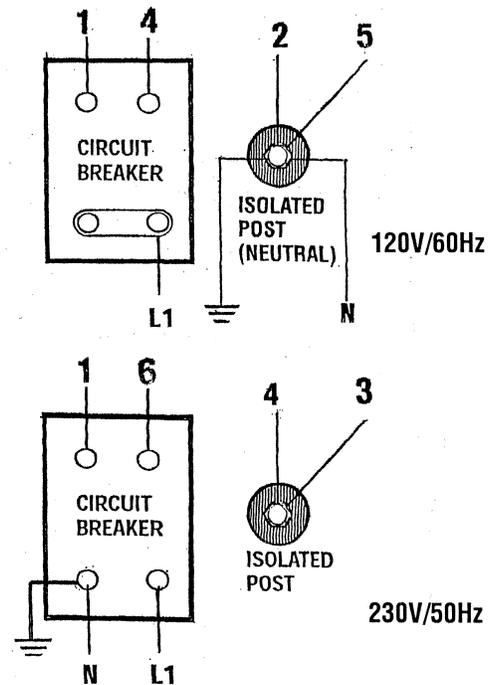
DESCRIPTION

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 at 60 hertz or 115 volt AC two-wire or 230 volt or 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.

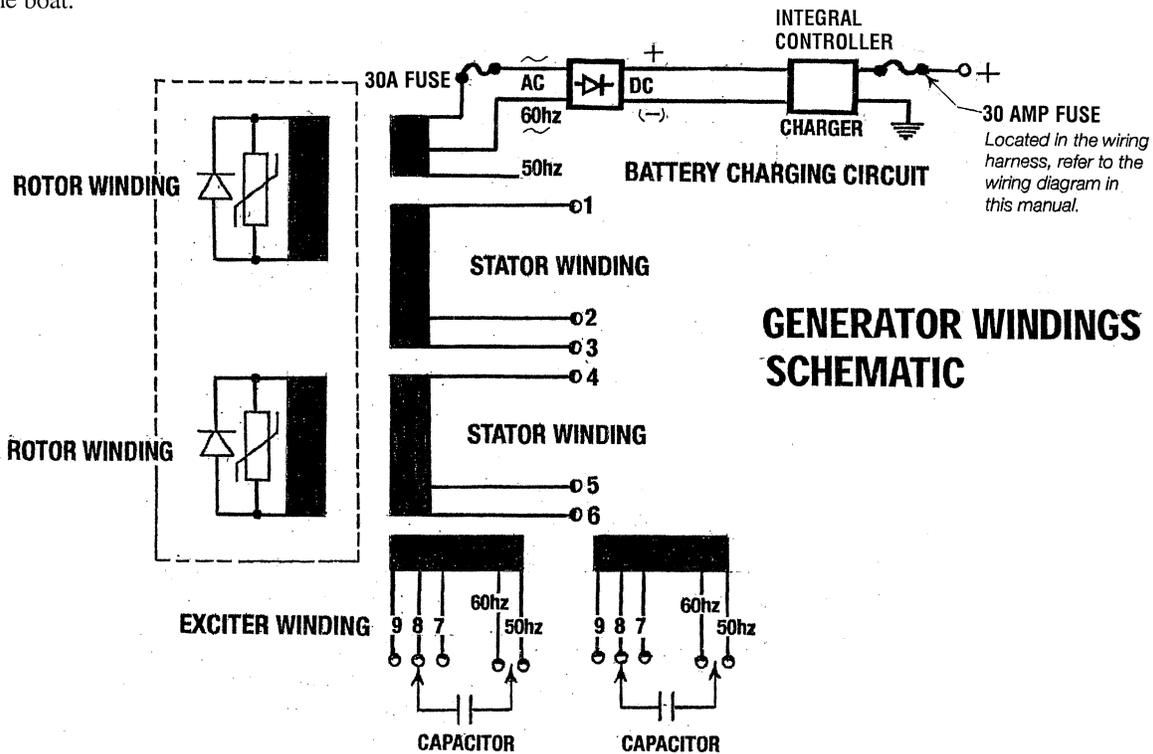
Circuit Breaker (AC)

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.

AC TERMINAL CONNECTIONS

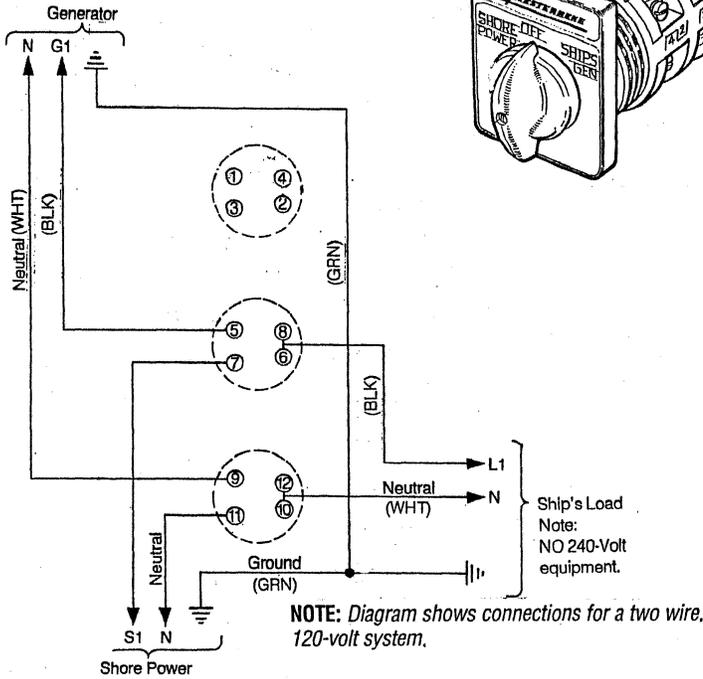


NOTE: Correctly position the case ground wire (white/green) onto the neutral/ground terminal.



SHORE POWER TRANSFER SWITCH

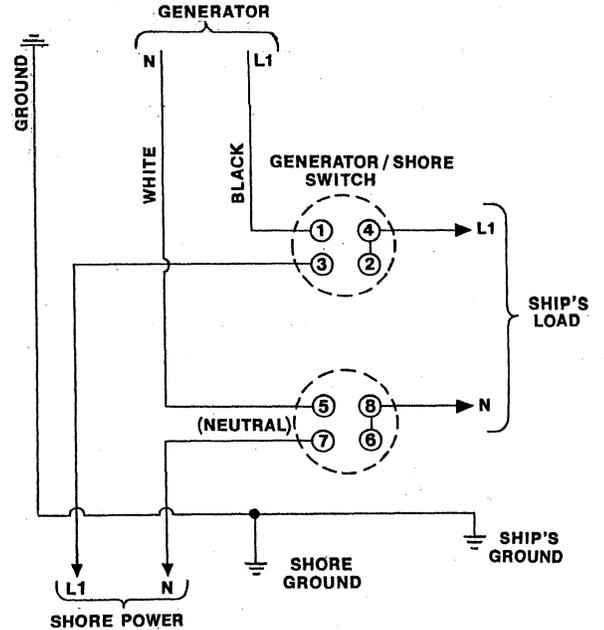
SINGLE LINE 120 VOLT SYSTEM



NOTE: Ship to shore switches are available at your WESTERBEKE dealer.

230 VOLT/50 HERTZ TWO WIRE CONFIGURATION

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

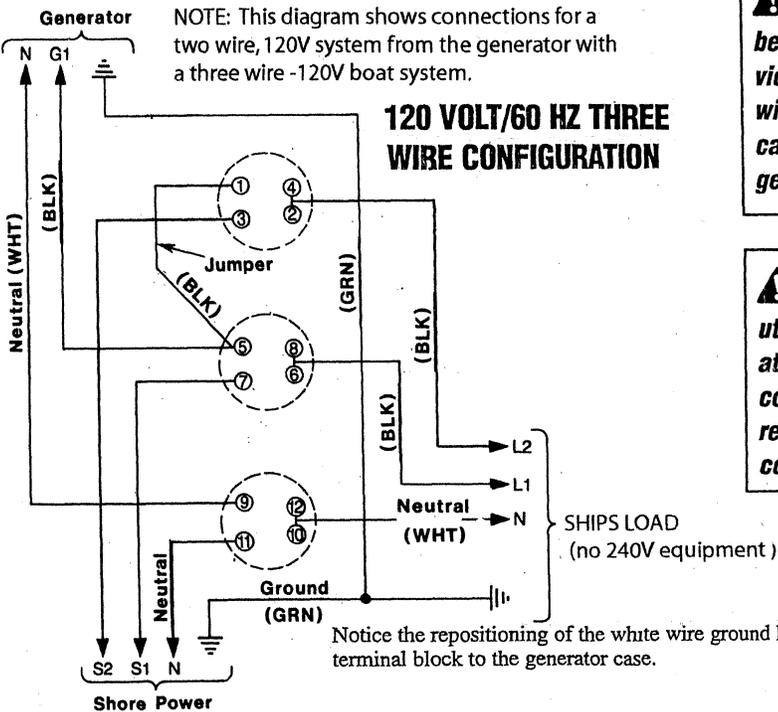


If the installer connects shore power to the vessel's AC circuit, this must be done by means of the Shore Power Transfer Switch. Set the transfer switch shown in the diagrams to the OFF position. This switch prevents simultaneous connection of shore power to generator output.

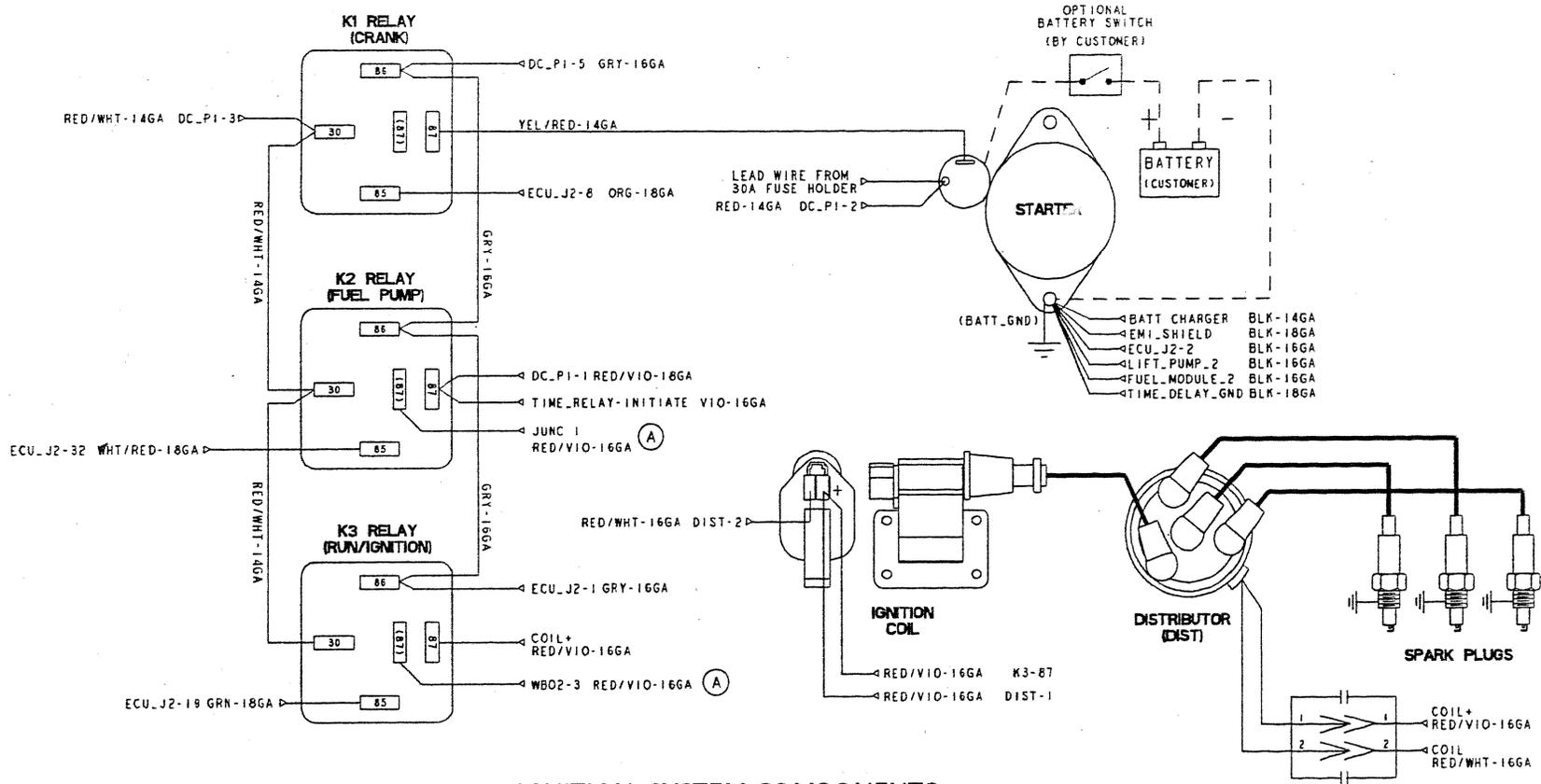
Switching Shore Power to Generator Power

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

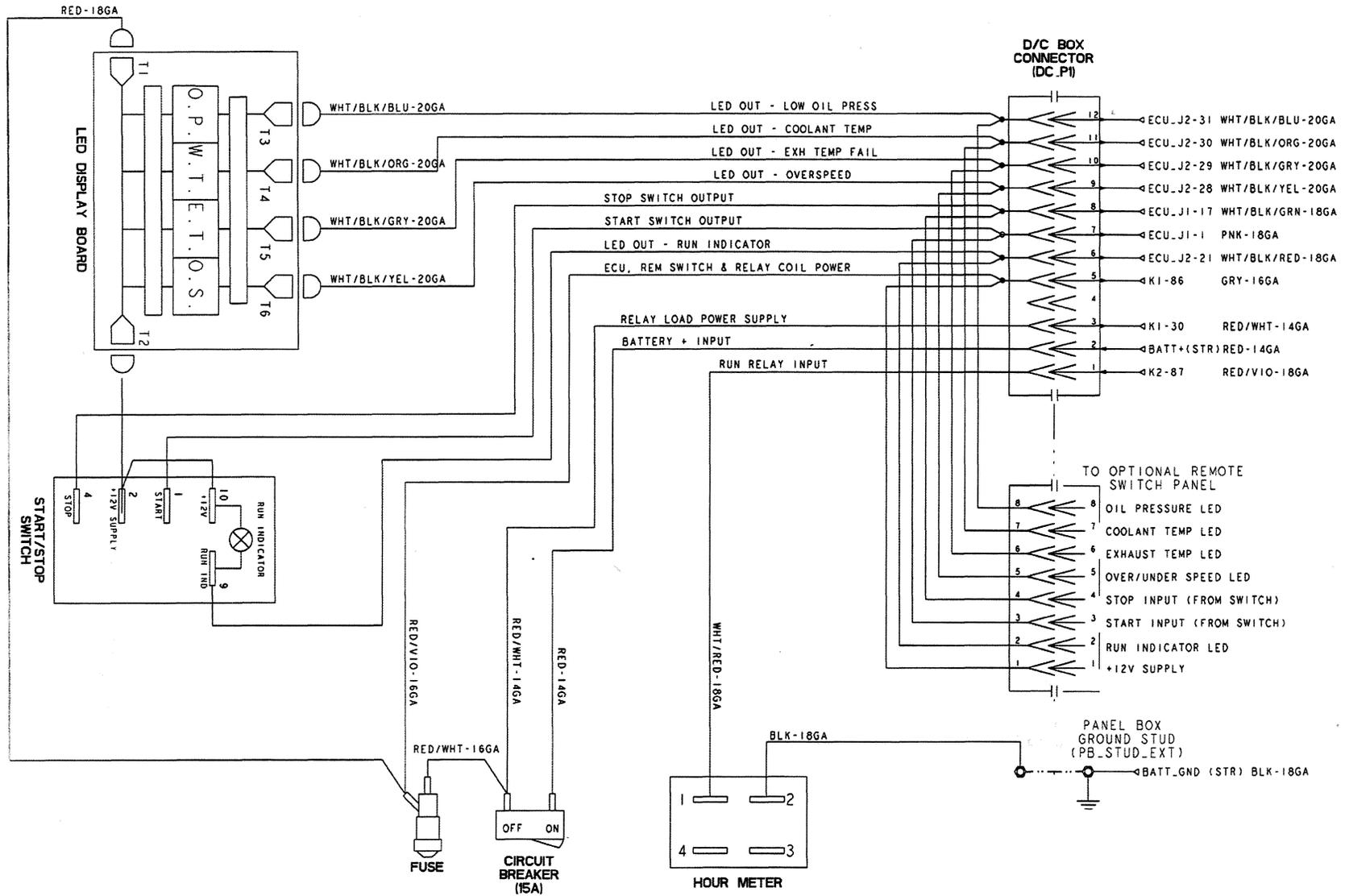
CAUTION: Damage to the generator can result if utility shore power and generator output are connected at the same time. This type of generator damage is not covered under the warranty; it is the installer's responsibility to make sure all AC connections are correct.



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



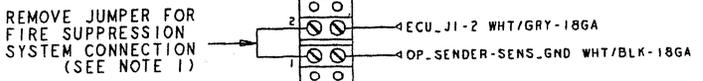
IGNITION SYSTEM COMPONENTS



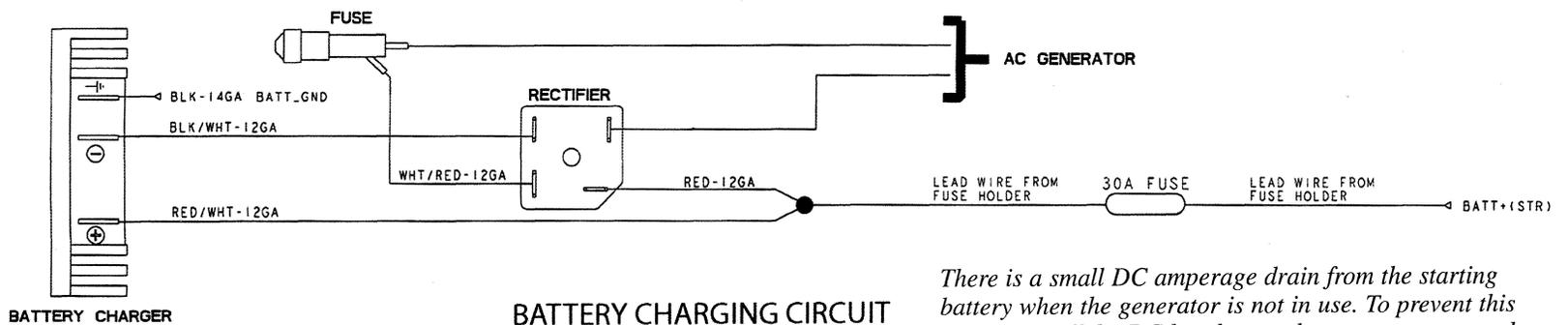
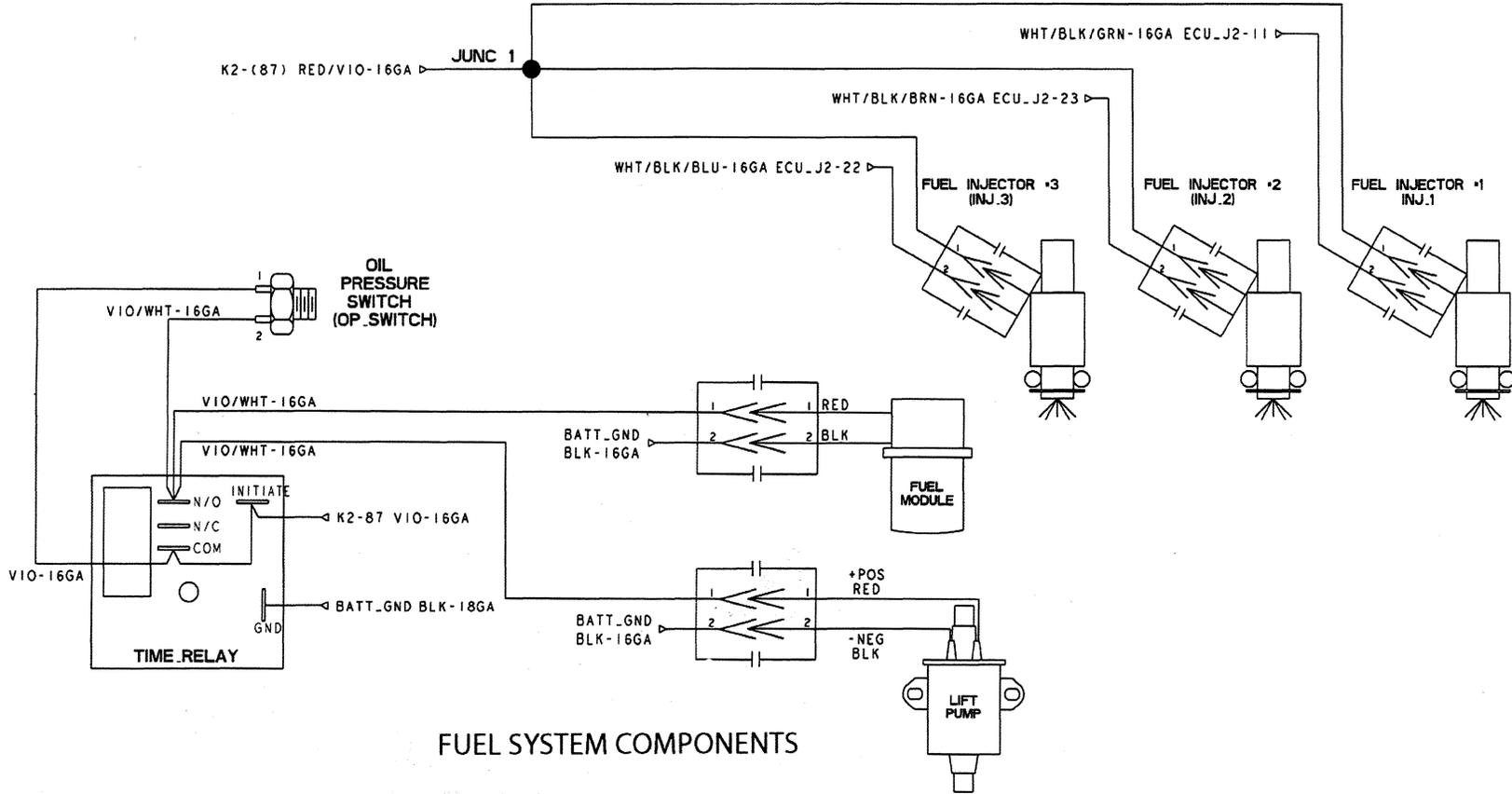
WIRING DIAGRAM #55536

DC CONTROL PANEL BOX COMPONENTS

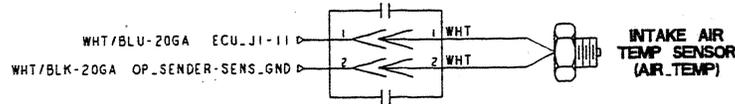
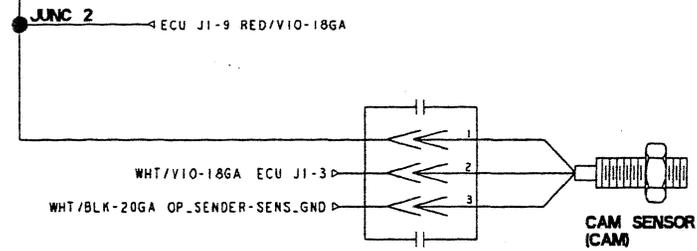
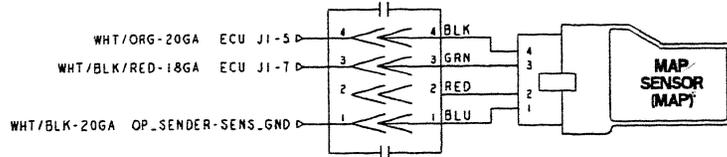
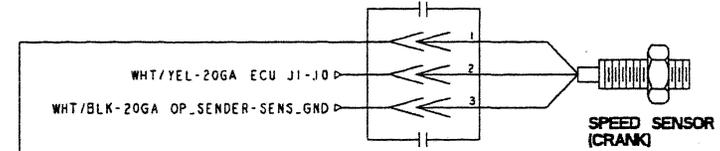
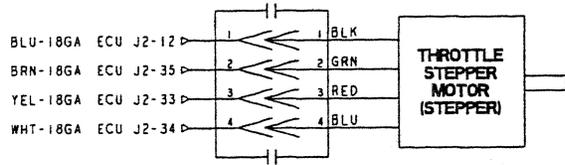
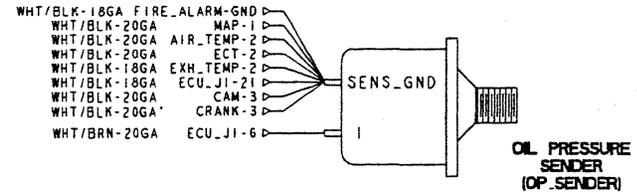
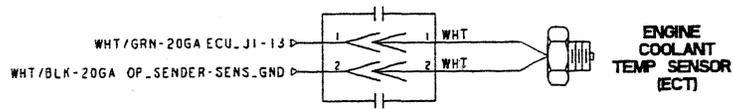
FIRE ALARM



NOTES:
1. FIRE SUPPRESSION SYSTEM CONNECTION IS NOT A POWER SOURCE. THIS CIRCUIT MUST BE CLOSED TO RUN. AN OPEN CIRCUIT WILL STOP THE GENSET.

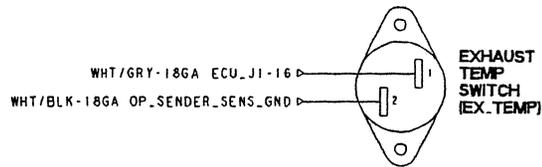


There is a small DC amperage drain from the starting battery when the generator is not in use. To prevent this draw, turn off the DC breaker on the generators control panel (or turn off the DC battery switch to the generator).

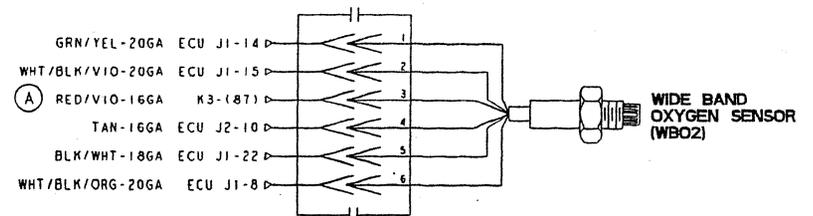


ENGINE BLOCK COMPONENTS

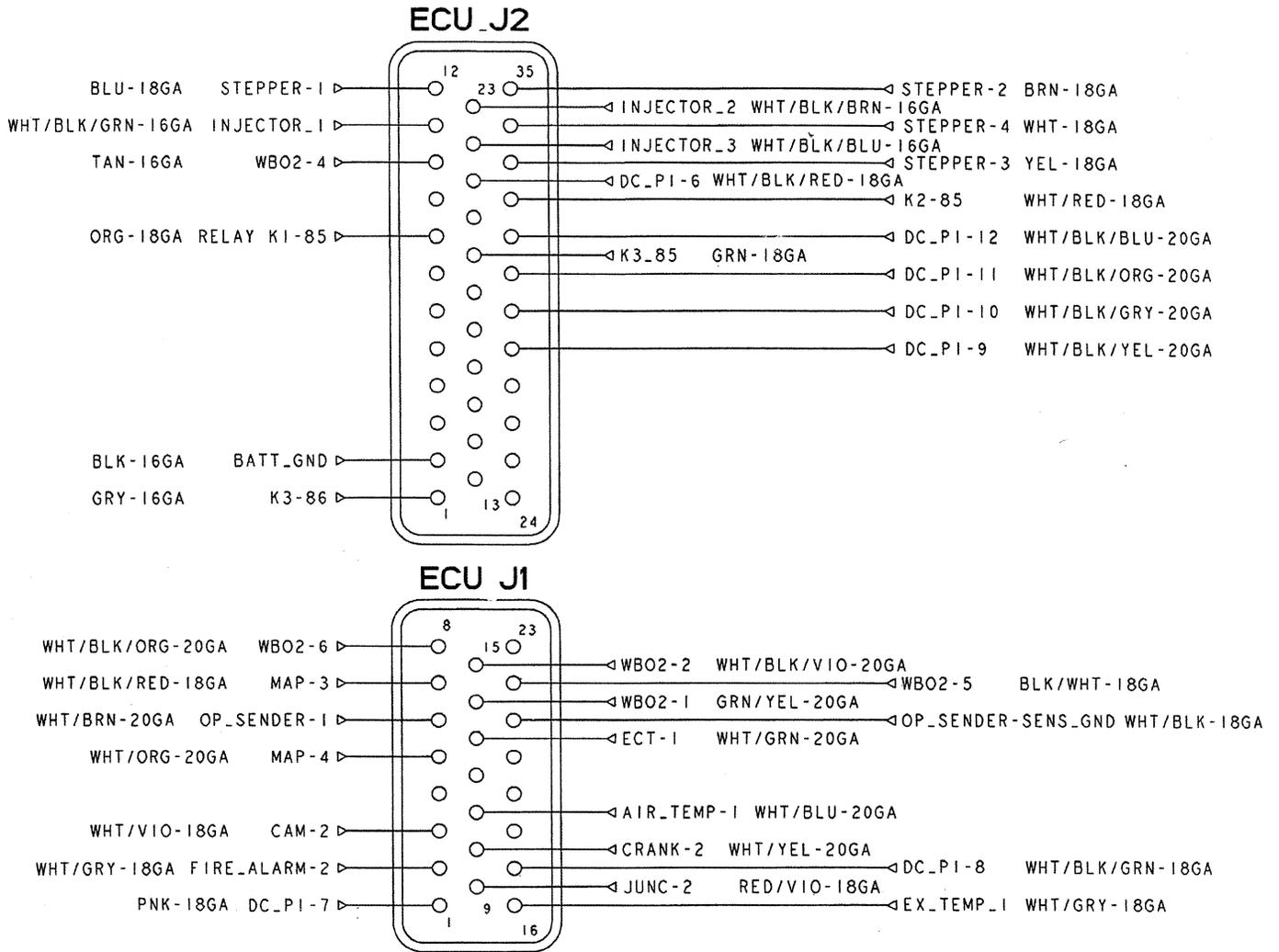
COMPONENTS LOCATED ON THE INTAKE THROTTLE BODY



EXHAUST SYSTEM COMPONENTS



WIRING DIAGRAM #55536



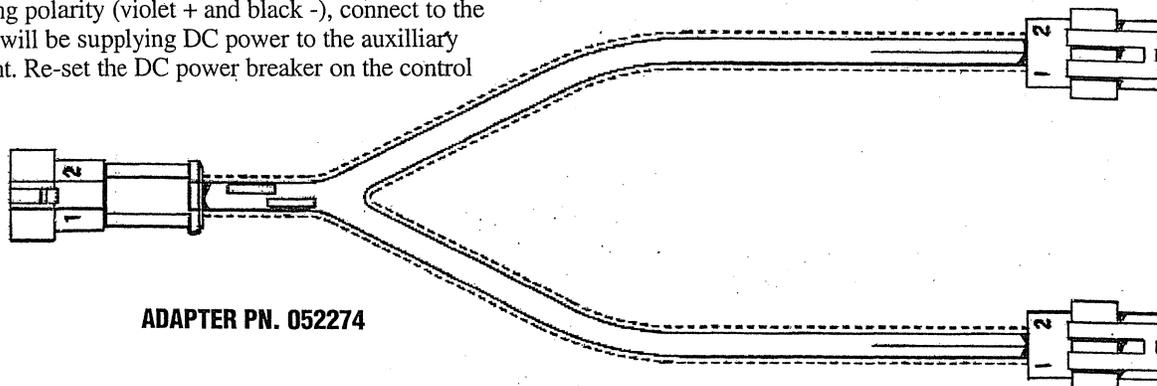
ECU CONNECTIONS

DC AUXILLIARY POWER ADAPTER

DESCRIPTION

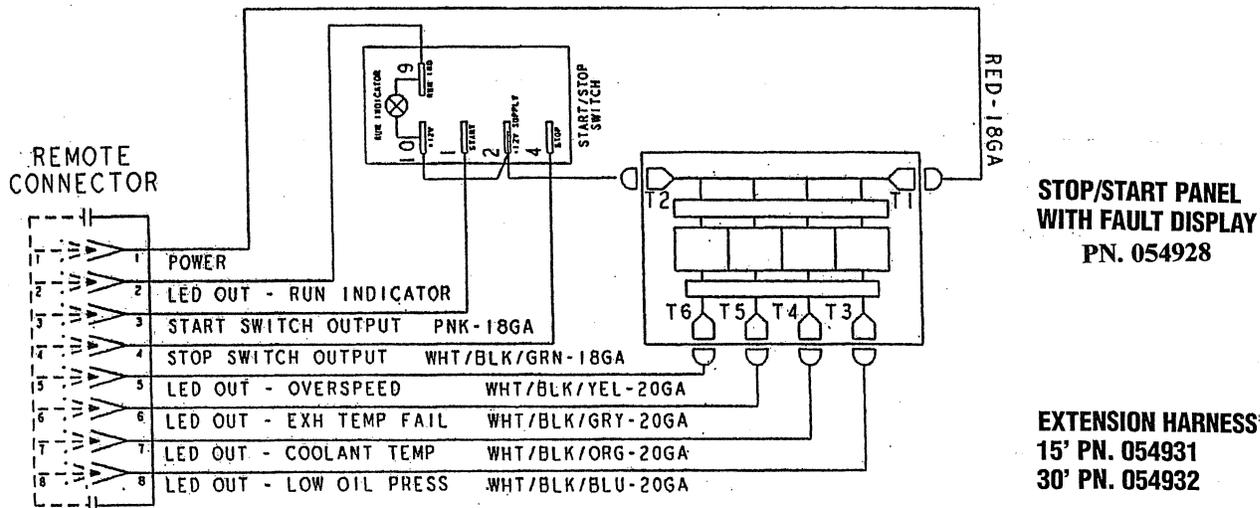
This auxilliary power adapter is designed to plug-in the engine wiring harness where the electric fuel pump is connected. Simply turn off the DC power using the breaker on the control panel. Unplug the electric fuel pump, connect the adapter and connect the fuel pump to one of the adapter plugs. Cut off the other plug and strip back the wires and maintaining polarity (violet + and black -), connect to the relay that will be supplying DC power to the auxilliary component. Re-set the DC power breaker on the control panel.

NOTE: This auxilliary connection provides DC power only when the engine is running or the fuel system is being primed. The maximum DC power available is 400 milliamps.



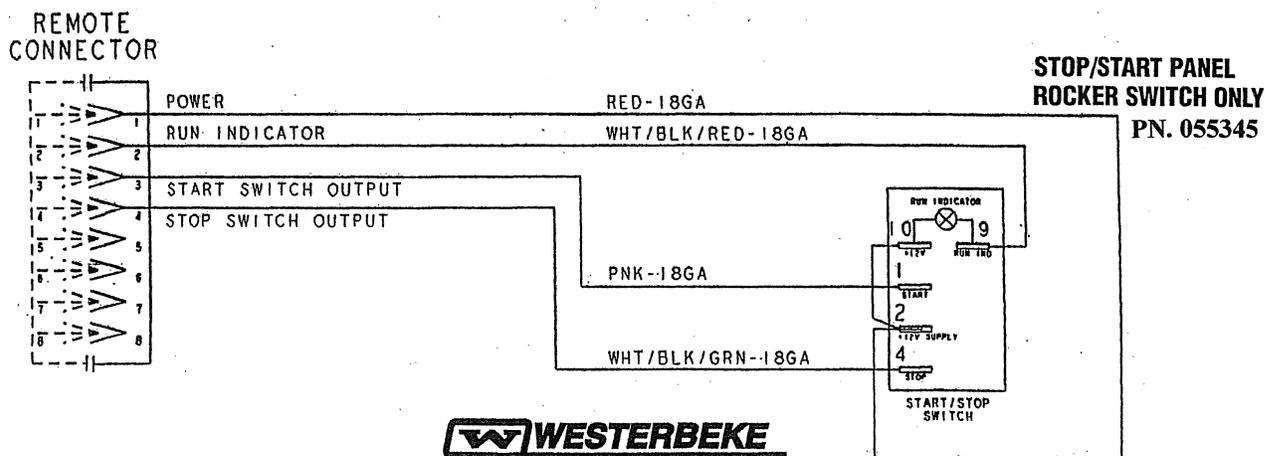
ADAPTER PN. 052274

REMOTE PANELS WIRING



STOP/START PANEL WITH FAULT DISPLAY
PN. 054928

EXTENSION HARNESS
15' PN. 054931
30' PN. 054932



STOP/START PANEL
ROCKER SWITCH ONLY
PN. 055345

MCG GENERATOR SPECIFICATIONS

ENGINE SPECIFICATIONS

Engine Type	3-cylinder, 4-cycle, , overhead camshaft w/counterbalance shaft, water cooled gasoline engine
Bore & Stroke	2.56 x 2.61 inches (65.0 x 66.3 mm)
Total Displacement	40.3 cubic inches (0.66 liters)
Bearings	Four main bearings
Compression Chamber	Semi-spherical
Compression Ratio	9.8:1
Hp@1800/1500 rpm	10.0
Firing Order	1 - 3 - 2
Aspiration	Naturally aspirated
Direction of Rotation	Counterclockwise viewed from the back end
Inclination	25° continuous, all directions
Dry weight	<i>Refer to the sales brochure</i>
Governor	Electronic

FUEL SYSTEM

General	Multi-port fuel injection
Fuel	Unleaded gasoline with an octane rating of 89 or higher
Fuel Consumption (full load) approx.	5.0 MCG (.74 gph) 4.2 MCD (.63 gph) 6.5 MCG (.76 gph) 5.2 MCG (.71 gph)
Fuel Hose Size (supply and return)	1/4" I.D. minimum - 3/8" I.D. maximum
Fuel Pump	12 volt electric (high/low pressure)
Fuel Filter (on engine)	Replaceable cartridge-canister type
Air Cleaner (flame arrester)	Metal screen type - cleanable

ELECTRICAL SYSTEM

Start Battery	12-Volt, (-) negative ground Battery must be totally dedicated to the generator and maintained only by the DC charge controller system in the AC generator
Battery Capacity	800 - 1000 Cold Cranking Amps rated (CCA) (minimum)
Starter	120 Volt, reduction-solenoid mounted
DC Charging	Solid state controller, 12 Amp rated
DC Cold Cranking Amps	150 - 176 Amps

AIR REQUIREMENTS

Generator Cooling	225 -2 50 CFM (6.3 - 7.0 cmm)
Engine Combustion (all models)	21 CFM (0.6 cmm)
Engine Cooling	100 CFM (2.8 cmm)

Note: Forced ventilation should be provided to maintain generators compartment temperature below 122°F (50°C).

COOLING SYSTEM

General	Fresh water-cooled block through raw water-cooled heat exchanger circuit
Fresh Water Pump	Centrifugal type, metal impeller, belt-driven.
Raw Water Pump	Positive displacement, rubber impeller, belt-driven.
Raw Water Flow,	4.9 US gpm (18.5 liters) @ 1800 rpm (approx. measure before discharging into exhaust elbow).
Cooling Water Capacity	3.5 qts (3.3 liters).
Operating Temperature	170° - 190° F (77° - 88° C)

LUBRICATION SYSTEM

General	Forced lubrication by gear pump.
Oil Filter	Full flow, paper element. spin-on disposals.
Oil Capacity	3.0 qts. (2.8 liters).
Operating Oil Pressure	30 - 45 psi (2.1 - 3.1 kg/cm ²).
Oil Grade	API Service Catagory SJ, SL, SM or SN SAE 40. ONLY (No Multi-Weight Oils).

AC GENERATOR (Single Phase)

Single Phase	Brushless, four-pole capacitor, regulated. 1800 rpm/60Hz, 1500 rpm/50Hz
Ratings:	
4.2KW	230 volts, 18.2 amps, 50Hz single phase, 4 wire, 1.0 power factor
5.0KW	120 volts, 41.6 amps, 60Hz single phase, 4 wire, 1.0 power factor
5.2KW	230 volts, 22.6 amps, 50Hz single phase, 4 wire, 1.0 power factor
6.5KW	120 volts, 54 amps, 60Hz single phase, 4 wire, 1.0 power factor

IGNITION SYSTEM

General	Battery ignition 12 volts negative ground. Distributor with ignition module and ignitor. Ignition coil and spark plugs.
Distributor	Solid state type with signal generator and ignitor.
Spark Plug Thread Gap	11mm x 1.25 pitch
Spark Plug Gap	0.028 - 0.031 inches (0.7 - 0.8mm)
Ignition Timing	15° BTDC at 1800 RPM ± 1° (Vacuum advance hose disconnected)
Spark Plugs	14mm
Ignition Coil	12 volt
Distributor	Breakerless with ignitor and pick up assembly

LAY-UP & RECOMMISSIONING

GENERAL

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

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

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

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

Lubrication System

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

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

Intake Manifold

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

After engine shutdown, remove the spark plugs and spray a small amount of fogging oil into each cylinder. Rotate the crankshaft manually two complete revolutions. Re-install the spark plugs loosely for winter lay-up.

NOTE: At spring commissioning, remove the plugs and rotate the crankshaft two full revolutions. Re-install the spark plugs, tighten each properly and connect the high tension leads fully onto each spark plug.

Fuel System

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



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

STARTER MOTOR

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

Raw Water Cooling Circuit

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

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

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

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

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.

LAY-UP & RECOMMISSIONING

Spare Parts

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

Recommissioning

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

1. Remove 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.
4. Remove the spark plugs, wipe clean, re-gap, and install to proper tightness [*gasoline*].
5. Start the engine in accordance with procedures described in the *PREPARATIONS FOR STARTING* section of this manual.

REMOTE OIL FILTER (OPTIONAL)

PN: 040078

APPLY A THIN COAT OF CLEAN OIL TO THE O-RING WHEN INSTALLING THIS KIT. THREAD THE KIT ON, THEN HAND TIGHTEN AN ADDITIONAL 3/4 TURN AFTER THE O-RING CONTACTS THE BASE.

THE "IN" CONNECTION HOSE MUST ATTACH TO THE "OUT" CONNECTION AT THE REMOTE OIL FILTER.

THE "OUT" CONNECTION HOSE MUST ATTACH TO THE "IN" CONNECTION AT THE REMOTE OIL FILTER.

NOTE: The "in" and "out" markings on the kit (if the hoses are removed for installation) so they can be reconnected correctly.

FASTEN SECURELY TO A BULKHEAD (SCREWS ARE OWNER SUPPLIED)

APPLY A THIN COAT OF CLEAN OIL TO THE FILTER GASKET WHEN INSTALLING. AFTER THE FILTER CONTACTS THE BASE, tighten it firmly by hand

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.

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.

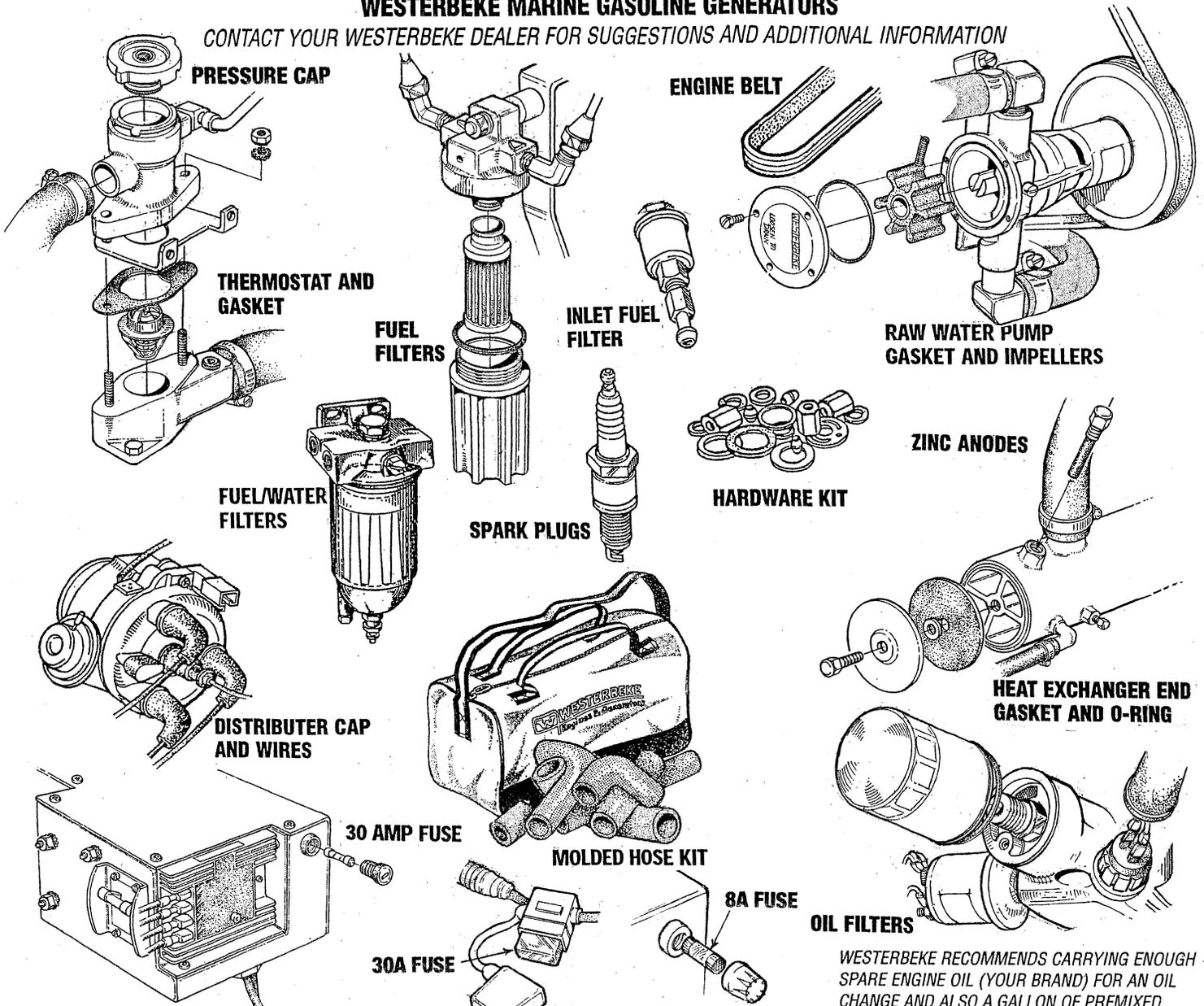
TIGHTENING TORQUE SPECIFICATIONS

Timing Belt	Nm	ft. lbs.	Front Case, Counterbalance Shaft	Nm	ft. lbs.
Flywheel bolt	135-145	98-105	Front case bolts	8-10	6-7
Timing belt cover bolts	10-12	7-9	Oil pump cover bolts	8-10	6-7
Camshaft sprocket bolts	80-100	58-72	Oil pan bolts	10-12	7-9
Oil pump sprocket nuts	50-57	36-41	Oil drain plug	35-45	25-33
Timing tensioner nuts	22-30	16-22	Oil screen bolts	15-22	11-16
Timing belt rear cover bolts	10-12	7-9	Oil pump driven gear bolt	34-40	25-29
Rocker Arms and Rocker Shaft			Rear cover bolts	10-12	7-9
Rocker cover shaft	29-35	21-25	Piston and Connecting Rod		
Camshaft thrust plate bolt	10-12	7-9	Connecting rod cap nut	15 + 90° turn	11 + 90° turn
Rocker arm adjust nut	8-10	6-7	Crankshaft, Bearing		
Cylinder Head, Valve			Oil seal case bolts	10-12	7-9
Cylinder head bolt (cold engine)	60-70	43-51	Bearing cap bolts	50-55	36-40
Spark plug	15.2	11 - 15 lb-ft	Cylinder Block		
Rocket cover	12-13	9-10	Taper plug 1/16 NPT	8-12	6-9
Miscellaneous			Taper plug 1/8 NPT	15-22	11-16
Coolant temperature sender	12-18	9-13	Water drain plug	35-45	25-33
Coolant temperature switch	12-18	9-13	Taper plug 1/4 NPT	35-45	25-33
Generator mounts	34-47	23-34	Oil pressure switch	12-18	9-13
Exhaust manifold	16-23	12-17	Oil pressure sender	12-18	9-13
Thermostat housing	8-11	6-8	Water Pump		
Front Crankshaft bolt	135-145	98-105	Water pump	8-10	6-7

SUGGESTED SPARE PARTS

WESTERBEKE MARINE GASOLINE GENERATORS

CONTACT YOUR WESTERBEKE DEALER FOR SUGGESTIONS AND ADDITIONAL INFORMATION



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

SPARE PARTS KITS

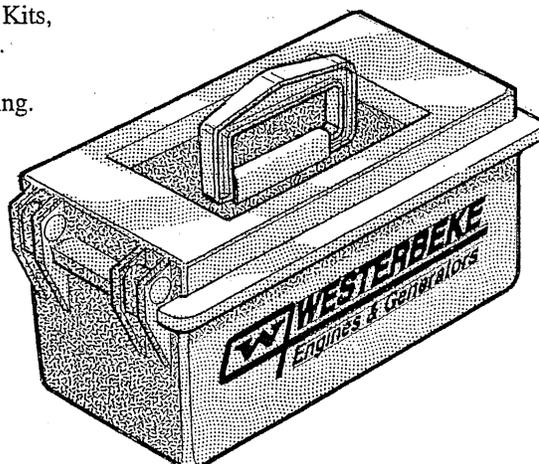
WESTERBEKE also offers two Spare Parts Kits, each packaged in a rugged, rust free toolbox.

KIT A includes the basic spares.

KIT B is for more extensive off-shore cruising.

Kit A

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



Kit B

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

WESTERBEKE GASOLINE GENERATOR



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