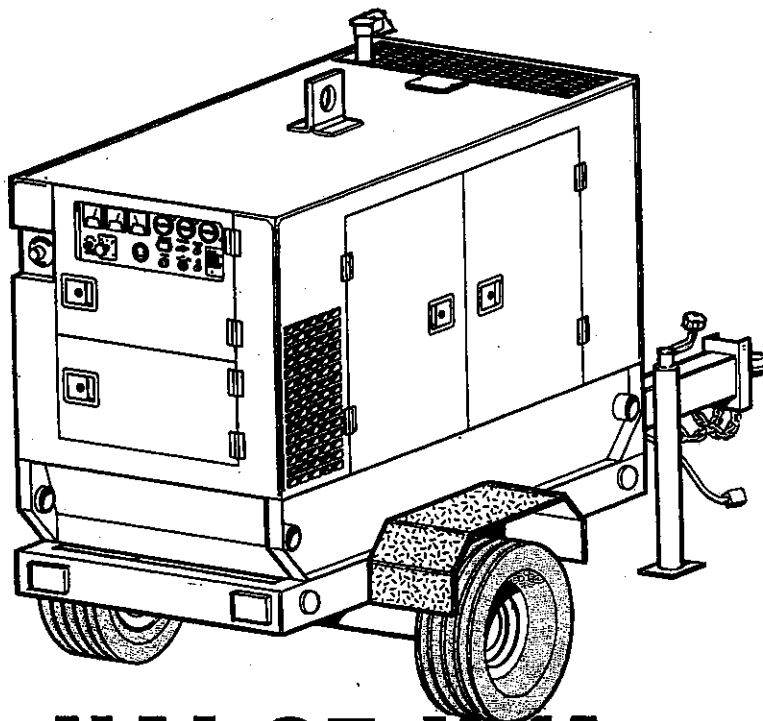


# **OWNERS MANUAL**

## **MOBILE DIESEL GENERATOR**



### **NAI 25 KVA**

**NICHIMEN AMERICA INC.  
222 N. La Salle Street Suite 999  
Chicago, IL 60601**



**CALIFORNIA  
PROPOSITION 65 WARNING**

**Diesel engine exhaust 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.***

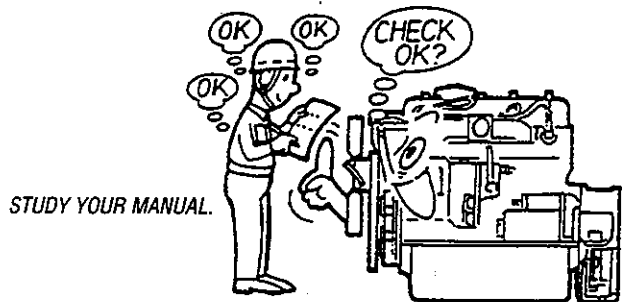
# TABLE OF CONTENTS

<b>Safety Instructions</b> .....	1
<b>Required Decals and Location</b> .....	5
<b>Parts Identification</b> .....	6
<b>Introduction</b> .....	7
<b>Control Panel</b> .....	9
<b>Power Panel</b> .....	11
<b>AC Voltage Connections</b> .....	12
<b>Preparations for Initial Start-Up</b> .....	14
<b>Diesel Fuel, Engine Oil and Engine Coolant</b> ....	15
<b>Starting/Stopping Procedure</b> .....	16
<b>Safety Shutdown Switches</b> .....	16
<b>Generator Break-In Procedure</b> .....	17
<b>The Daily Routine</b> .....	17
<b>Maintenance Schedule</b> .....	18
<b>Trailer Maintenance/Parking</b> .....	20
<b>Engine Cooling System</b> .....	21
<b>Air Intake/Silencer</b> .....	22
<b>Fuel System</b> .....	23
<b>Engine Oil Change</b> .....	24
<b>Battery</b> .....	25
<b>Glow Plugs</b> .....	26
<b>Engine Adjustments</b> .....	27
Drive Belt Adjustment.....	27
Fuel Injectors .....	27
Valve Clearance Adjustment .....	28
Testing Engine Compression.....	29
Oil Pressure .....	29
<b>Generator Information</b> .....	30
<b>Engine Troubleshooting</b> .....	31
<b>Wiring Diagram and Schematics</b> .....	33
<b>Wiring Sizes and Colors</b> .....	37
<b>Standard and Metric Conversions Data</b> .....	38
<b>NAI 25 kVA Generator Specifications</b> .....	40

# SAFETY INSTRUCTIONS

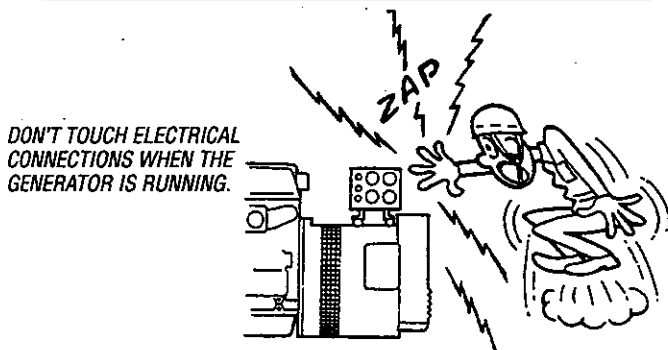
## INTRODUCTION

Read this safety section 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.



## PREVENT ELECTRIC SHOCK

**⚠ WARNING:** Do not touch AC electrical connections while engine is running. Lethal voltage is present at these connections!



- Make sure your clothing and skin are dry, not damp (particularly shoes) when handling electrical equipment.
- Remove wristwatch and all jewelry when working on electrical equipment.
- Do not come in contact with or allow anything else to come in contact with the output terminals during operation.
- Do not operate this machinery without electrical enclosures and covers in place.
- Do not insert metal objects (such as pins or wires) into plug-in receptacles.
- Do not touch the wiring or any electrical parts inside the equipment during operation.
- There is always a danger of being electrocuted by a short-circuit to ground. Be sure to test the generators insulation resistance to ground periodically.
- Before connecting or disconnecting load cables from the output terminals, always turn the output circuit breaker to the *OFF* position, stop the engine, and remove the engine key. The person performing the cable disconnect should always keep the key.

- Before performing any equipment check or maintenance, stop the engine, and remove the engine key. The person performing the check or maintenance should always keep the key.
- Backfeed to a utility system can cause electrocution and or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is opened.
- When starting the engine, disconnect the supplied load and set the output circuit breaker to the *OFF* position..
- Do not connect the AC output to any indoor wiring without an approved disconnecting device between the generator and the building's electrical service.
- Never use damaged or worn cables when connecting power tools or equipment to the generator. Make sure power connecting cables are securely connected to the generators output terminals, insufficient tightening of the terminal connections may cause damage to the generator and electrical shock.
- Never operate the generator in standing water.
- Always make certain the generators well-grounded and securely fastened to a good earthen ground per national and local regulations.

## PREVENT BURNS — HOT ENGINE

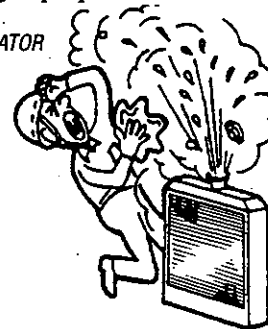
**⚠ WARNING:** Do not touch hot engine parts or exhaust system components. A running engine gets very hot!

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

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

- In case of an engine overheat, allow the engine to cool before touching the engine or checking the coolant.
- Do not remove the radiator cap when the engine is hot! High pressure boiling water will gush out of the radiator causing severe scalding to people in the area.

DON'T REMOVE THE RADIATOR CAP UNTIL THE ENGINE COOLS DOWN.

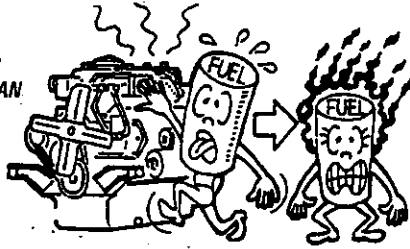


# SAFETY INSTRUCTIONS

## PREVENT BURNS — FIRE

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

BEWARE OF FUEL LEAKS AND SPILLED FUEL. CLEAN UP AND CORRECT THE PROBLEM.



- Prevent flash fires. Do not smoke or permit flames or sparks to occur near the 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 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!**

- 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.

## ACCIDENTAL STARTING

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

- Disconnect the battery cables before servicing the engine/ generator. Remove the negative lead first and reconnect it last.

- Make certain all personnel are clear of the engine before starting.
- Make certain all covers, guards, and hatches are re-installed before starting the engine.

## BATTERY EXPLOSION

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

DON'T SMOKE NEAR THE BATTERY...AND NO OPEN FLAMES. BATTERY GAS IS EXPLOSIVE!



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

## BATTERY ACID

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

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

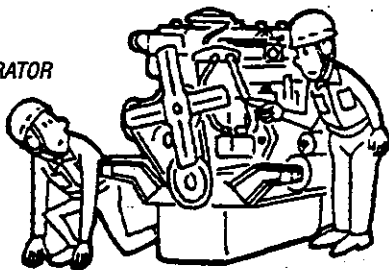
# SAFETY INSTRUCTIONS

## GENERAL SAFETY

*Failure to follow instructions in this manual may lead to serious injury or even death! This equipment is to be operated by trained and qualified personnel only! This equipment is for industrial use only.*

- This equipment should not be operated by persons under 18 years of age.
- Never operate this equipment without proper protective clothing, shatterproof glasses, steel toed boots and other protective devices required by the job.
- Do not allow unauthorized people to operate this equipment.
- Do not leave the generator running unattended.
- Use the emergency stop button only in an actual emergency. Do not restart the engine until the cause of the trouble has been determined and fixed.
- Never overload the generator. The total amperage of the tools and equipment attached to the generator must not exceed the load rating of the generator.
- Never operate this equipment when not feeling well due to fatigue, illness or taking medicine. Do not operate this equipment under the influence of drugs or alcohol.
- Make a walk-around inspection of the generator set before starting it. Open side doors and visually inspect the engine compartment for obvious damage or the presence of foreign objects which might affect operation

INSPECT THE GENERATOR BEFORE STARTING.



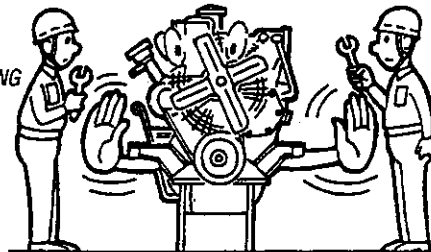
- Keep the area immediately surrounding the generator clean, neat and free of debris. Make sure that the area overhead is clear of debris that could fall onto or into the generator.

## 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.

BEWARE OF ALL MOVING PARTS.



- 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 belts tension while the engine is operating.

WHEN THE ENGINE IS RUNNING, KEEP CLEAR OF THE FAN AND ENGINE BELT.



## HAZARDOUS NOISE

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

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

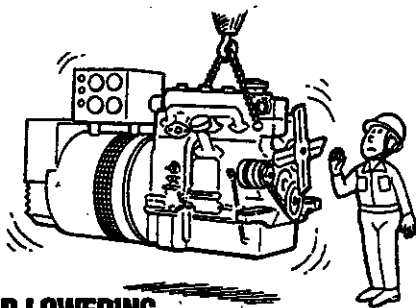
# SAFETY INSTRUCTIONS

## TOXIC EXHAUST GASES

- Ensure that the exhaust system is adequate to expel gases discharged from the engine. Check the exhaust system regularly for leaks and make sure the exhaust manifolds are securely attached and no warping exists.

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

- Keep the generator at least three feet (one meter) away from structures, buildings and other equipment during use.
- Do not discharge exhaust gases under a vehicle. Direct exhaust gases away from vehicle windows, doors and any other openings. Close any openings that are above or to the rear of the exhaust pipe(s) when the generator is operating.



## LIFTING AND LOWERING

When lifting the equipment, always use the installed lifting hook. *The lifting hooks are designed to lift only the generator. Do not lift any additional added weight such as fuel tanks and/or trailers.*

- Before lifting, make sure the generator's lifting hooks are secure and there is no apparent damage to the generator itself (loose screws, nuts and bolts). If any part is loose or damaged, please take corrective action before lifting.
- Always drain the fuel prior to lifting.
- Always make sure crane or lifting device has been properly secured to the lifting hook.
- Never lift the machine while the engine is running.
- Use adequate lifting cable (wire or rope) of sufficient strength.
- When lifting the generator, always use a balanced center-point suspension and lift straight upwards.
- Never allow any person or animal to stand underneath the machine while lifting.
- When loading the generator on a truck, be sure to use the front and back frame bars as a means to secure the generator during transport.

## TOWING SAFETY

- Always shutdown the engine before transporting.
- Tighten the fuel tank cap securely.
- Drain the fuel when transporting generator over long distances or bad roads.
- Make sure the hitch and coupling of the towing vehicle are rated equal to, or greater than the trailer "gross vehicle weight rating" (GVWR).
- Always inspect the hitch and coupling for wear. Never tow a trailer with defective hitches, couplings, chains, etc.
- Check the tire air pressure on both the towing vehicle and the trailer. Also check the tire tread wear on both vehicles.
- Always make sure the trailer is equipped with a **Safety Chain**.
- Always check that lug nuts holding the wheels are tight and none are missing.
- Always attach the trailers safety chain to the bumper of the towing vehicle.
- Always make sure the vehicle and trailer directional, backup, brake, and trailer lights are connected and working properly.
- The maximum speed for highway towing is **45 MPH** unless posted otherwise. Recommended off-road towing is not to exceed **10 MPH** or less depending on type of terrain.
- Place *choked blocks* underneath wheel to prevent rolling while parked.
- Place *support blocks* underneath the trailers bumper to prevent tipping while parked.
- Use the trailers hand winch to adjust the height of the trailer, then insert the locking pin to lock the wheel stand in place while parked.
- Avoid sudden stops and starts. This can cause skidding or jack-knifing. Smooth, gradual starts and stops will improve gas mileage.
- Avoid sharp turns to prevent rolling.
- Check with your county or state safety towing regulations department before towing your generator.

## 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.



# REQUIRED DECALS AND LOCATION

**NOTE:** Missing or unreadable decals should be replaced immediately. Contact your dealer.

⚠ WARNING ⚠	OPERATION INSTRUCTIONS
<ul style="list-style-type: none"> <li>• READ OPERATORS MANUAL STORED ON UNIT CAREFULLY BEFORE STARTING. SERIOUS INJURY OR DEATH COULD OCCUR IF USED IMPROPERLY.</li> <li>• OPERATE ONLY IN WELL VENTILATED AREAS. ENGINE EXHAUST IS DEADLY.</li> <li>• CHECK ALL FLUID LEVELS PRIOR TO STARTING AND AT SERVICE INTERVALS. ENGINE DAMAGE CAN OCCUR.</li> <li>• TO AVOID ACCIDENTAL CONTACT WITH MOVING OR HOT PARTS, CLOSE AND LOCK SERVICE DOORS WHILE OPERATING.</li> <li>• DO NOT REACH INTO RUNNING EQUIPMENT. SERIOUS INJURY OR DEATH MAY OCCUR.</li> <li>• DO NOT TOUCH OUTPUT TERMINALS WHILE THE ENGINE IS OPERATING. TURN POWER OFF BEFORE SERVICING.</li> <li>• DISCONNECT BATTERY BEFORE SERVICE.</li> <li>• NEVER REMOVE ENVIRONMENTAL OR FUEL TANK DRAIN PLUGS WITHOUT PROPER CONTAINMENT AND DISPOSAL METHODS.</li> <li>• BACKFEED TO A UTILITY SYSTEM CAN CAUSE ELECTRIC SHOCK AND/OR PROPERTY DAMAGE. DO NOT CONNECT TO BUILDING ELECTRICAL SYSTEMS EXCEPT THROUGH AN APPROVED DEVICE BY A QUALIFIED ELECTRICIAN.</li> <li>• CALIFORNIA PROPOSITION 65 WARNING - ENGINE EXHAUST AND SOME OF ITS CONSTITUENTS ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS AND OTHER REPRODUCTIVE HARM.</li> </ul>	<ol style="list-style-type: none"> <li>1. CONNECT LOAD VIA RECEPTACLES OR HARD WIRE TO TERMINALS PROVIDED IN THE CONNECTION BOX (SEE VOLTAGE CONNECTION DIAGRAM INSIDE THE CONNECTION BOX OR OPERATORS MANUAL).</li> <li>2. TURN MAIN CIRCUIT BREAKER TO THE 'OFF' 'O' POSITION. THIS WILL DISCONNECT ALL LOADS FROM THE GENERATOR.</li> <li>3. SELECT DESIRED VOLTAGE OUTPUT VIA ROTARY VOLTAGE SELECTOR SWITCH: 277/480, 120/208, OR 120/240. RECEPTACLES WILL NOT WORK IN THE 277/480 POSITION. PADLOCK THE SWITCH IN PLACE TO PREVENT TAMPERING.</li> <li>4. TURN IGNITION KEY SWITCH TO THE 'ON' POSITION. IF THE ENGINE IS COLD, PRESS AND HOLD THE PREHEAT BUTTON FOR UP TO 10 SECONDS.</li> <li>5. TURN THE IGNITION SWITCH TO THE START POSITION WHILE HOLDING THE PREHEAT BUTTON. NEVER CRANK THE STARTER MOTOR FOR MORE THAN 10 SECONDS AT A TIME.  AS SOON AS THE ENGINE STARTS, RELEASE THE KEY SWITCH. RELEASE THE PREHEAT BUTTON AFTER THE ENGINE HAS SUFFICIENT OIL PRESSURE. IF THE ENGINE DOES NOT START, WAIT 30 SECONDS BEFORE RETRYING.</li> <li>6. RESET MAIN CIRCUIT BREAKER. (BREAKER WILL NOT RESET IF THE LOAD CONNECTION BOX DOOR IS OPEN.)</li> <li>7. TURN THE IGNITION KEY SWITCH TO THE 'OFF' POSITION TO STOP. PRESSING THE EMERGENCY STOP BUTTON WILL SHUT DOWN THE ENGINE AND TRIP THE MAIN CIRCUIT BREAKER.</li> </ol> <p style="text-align: center;"><b>FAULT SHUTDOWNS</b></p> <p>THIS GENERATOR IS EQUIPPED WITH THE FOLLOWING AUTOMATIC SHUTDOWNS:</p> <ul style="list-style-type: none"> <li>• LOW ENGINE OIL PRESSURE</li> <li>• HIGH ENGINE WATER TEMPERATURE</li> <li>• GENERATOR OVERLOAD (MAIN CIRCUIT BREAKER WILL ALSO TRIP)</li> </ul> <p>ALL FAULTS SHOULD BE IDENTIFIED AND CORRECTED PRIOR TO RESTARTING.</p>

INSIDE THE CONTROL PANEL SERVICE DOOR

## DANGER

### HIGH VOLTAGE

**TURN POWER OFF BEFORE SERVICING**

#47045

INSIDE THE CONTROL PANEL SERVICE DOOR

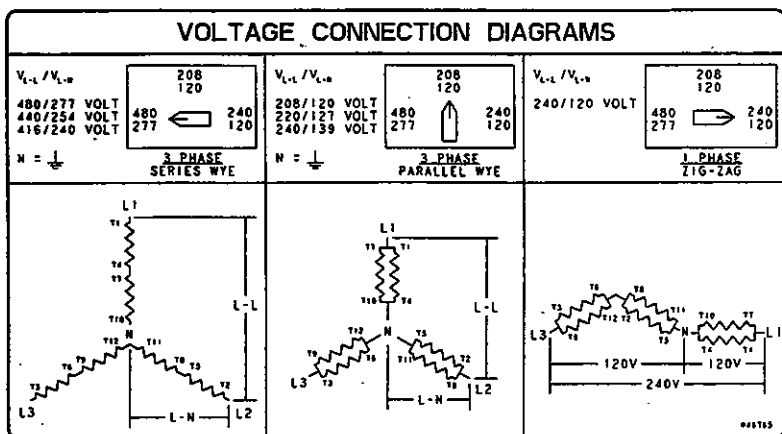
⚠ CAUTION ⚠

UNIT IS EQUIPPED WITH AN AUTOMATIC SAFETY DICONNECT

OPENING THIS DOOR WILL TRIP MAINLINE CIRCUIT BREAKER(S)

#00101

ON THE TERMINAL LUG DOOR



INSIDE THE TERMINAL LUG DOOR

## DANGER

### ROTATING MACHINERY

**DO NOT OPERATE WITHOUT ALL GUARDS IN PLACE**

PN. 39900

INSIDE GENERATOR ENCLOSURE

⚠ RECEPTACLE VOLTAGE ⚠		
$3\phi$ 208/120 480/277 ← 240/120	$3\phi$ 208/120 480/277 ↑ 240/120	208/120 1∅ 480/277 → 240/120
50 AMP N/A	50 AMP 208/120 / 240/139	50 AMP 240/120
20 AMP DUPLEX N/A	20 AMP DUPLEX 120 / 139	20 AMP DUPLEX 120

ON THE CONTROL PANEL

⚠ CAUTION ⚠

HOT PARTS CAN BURN SKIN DO NOT TOUCH

#7086

INSIDE THE ENGINE ENCLOSURE AT MULTIPLE LOCATIONS

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		
CID		

⚠ DIESEL FUEL ONLY ⚠

- STOP ENGINE AND ALLOW TO COOL
- KEEP AWAY FROM FLAMES OR SPARKS
- DO NOT OVERFILL, HOT FUEL EXPANDS
- FIRE OR EXPLOSION MAY RESULT

#47001

AT THE FUEL FILL

## DANGER

### HIGH VOLTAGE

#47004

ON THE TERMINAL LUG DOOR

⚠ CAUTION ⚠

$208/120$   
 480/277 ↑ 240/120

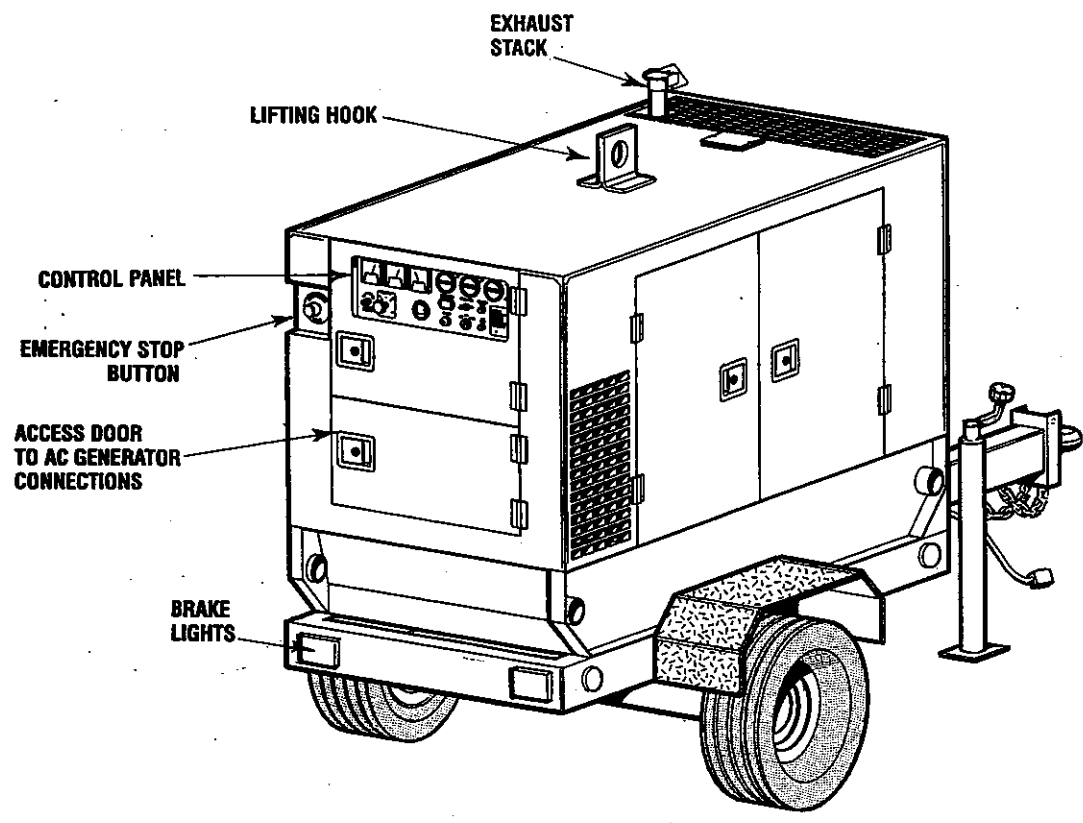
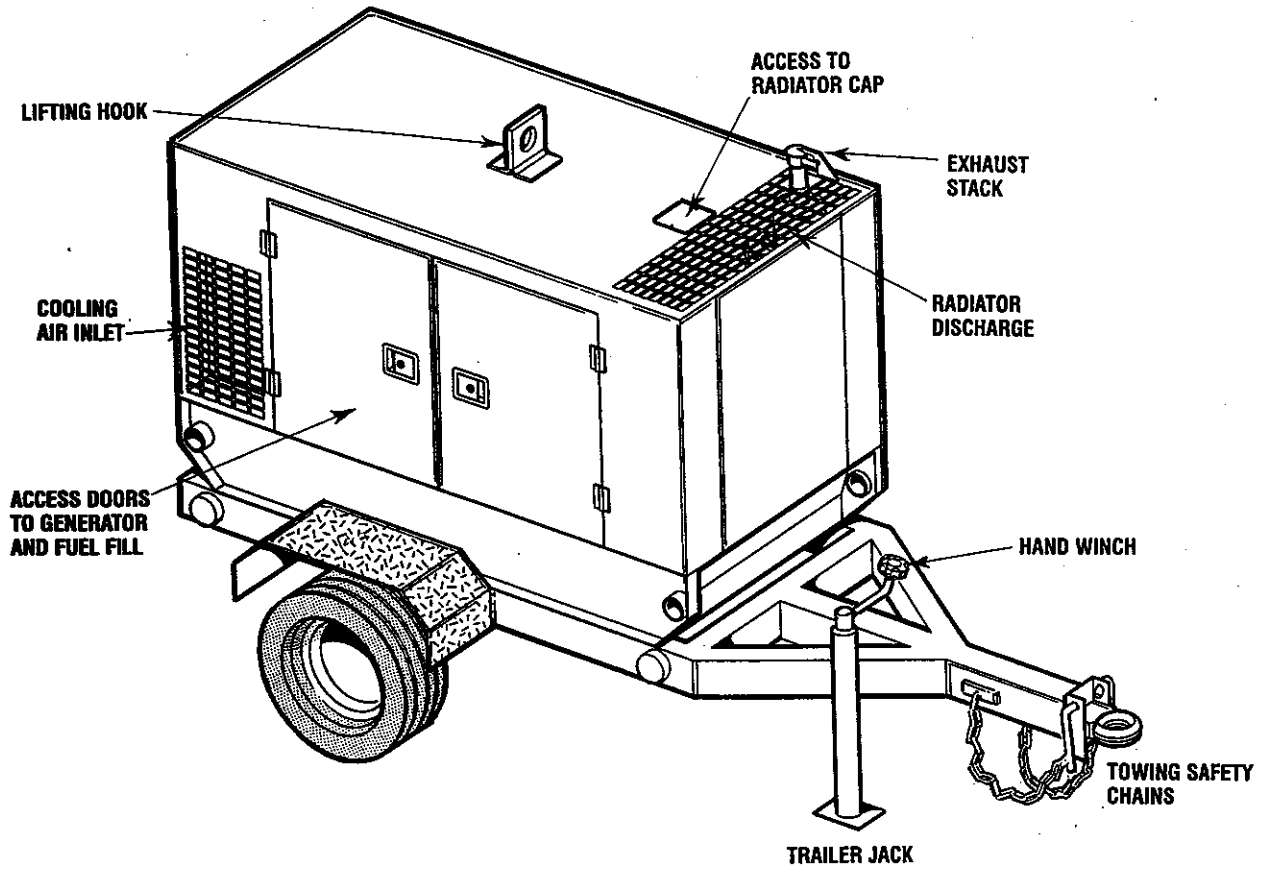
- NEVER CHANGE SWITCH POSITION WHILE ENGINE IS RUNNING
- RESULTS IN ELECTRIC SHOCK AND DAMAGE TO MACHINE
- ALWAYS PADLOCK SWITCH POSITION

#47079

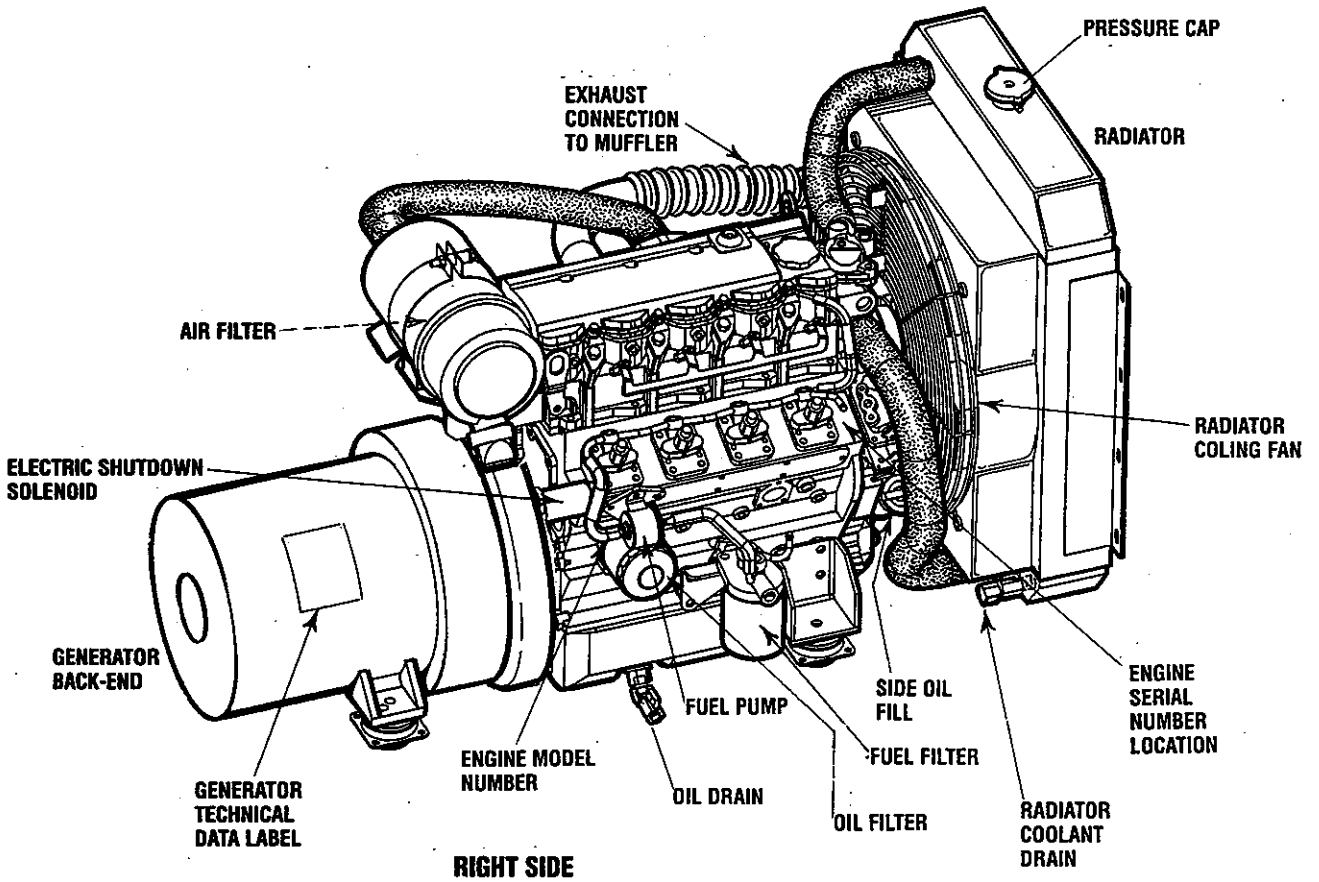
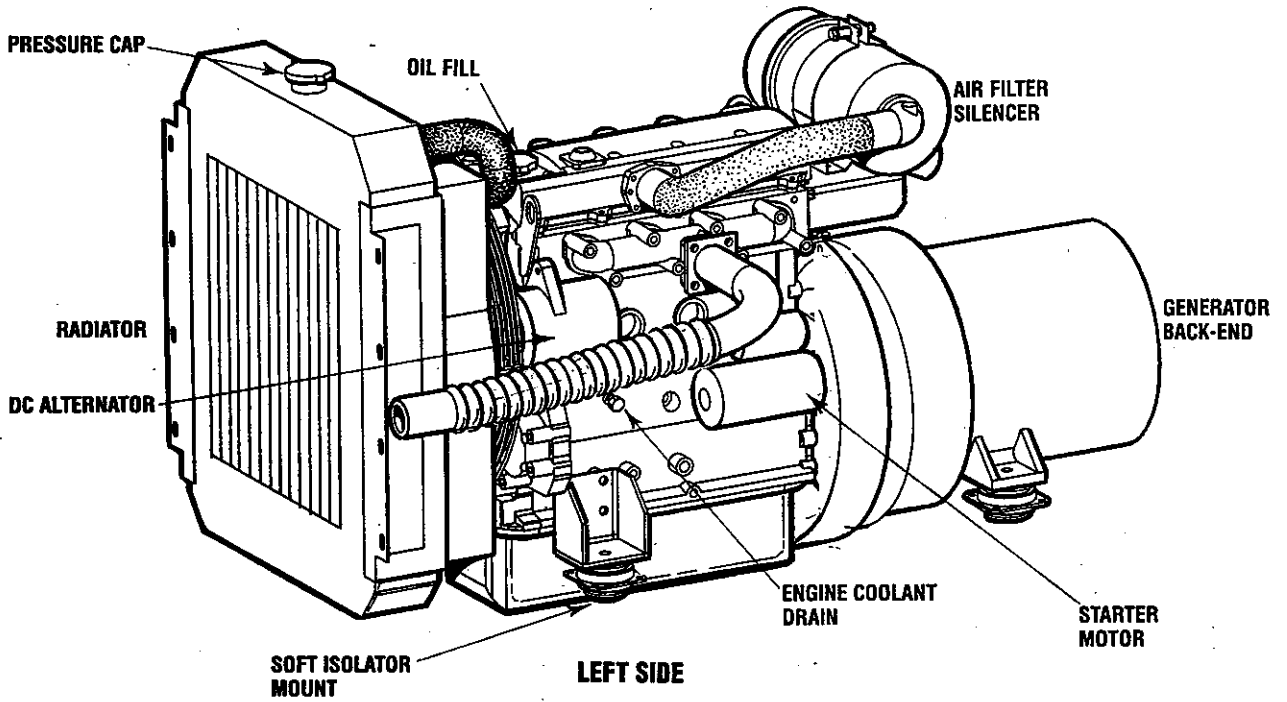
NEXT TO THE VOLTAGE SELECTOR SWITCH

GROUND STUD AT THE GENERATOR MOUNT

# PARTS IDENTIFICATION



# PARTS IDENTIFICATION



# INTRODUCTION

## PRODUCT SOFTWARE

Product software, (technical data, parts lists, manuals, brochures and catalogs), provided from sources other than the manufacturers are not within the manufacturers control.

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

Customers should keep in mind the time span between printings of product software and the unavoidable existence of earlier product software. The product software provided with this product must not and cannot be relied upon exclusively as the definitive authority on the respective product. It not only makes good sense but is imperative that appropriate representatives of the manufacturer or the supplier in question be consulted to determine the accuracy and currentness of the product software being consulted by the customer.

## NOTES, CAUTIONS AND WARNINGS

As this manual takes you through the operating procedures, maintenance schedules, and troubleshooting of your marine engine, 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 generator.*

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

## ORDERING PARTS

Whenever replacement parts are needed, always provide the engine model number and serial number. You must provide us with this information so we may properly identify your engine. In addition, include a complete part description and part number for each part needed (see the separately furnished Parts List).

## SERIAL AND MODEL NUMBERS

The engine's serial number is stamped in the engine block to the right of the four injection pumps next to the radiator fan assembly. The model number is stamped on the block just above the oil filter. The generator data is stamped on an I.D. plate that is fastened on the generators right side.

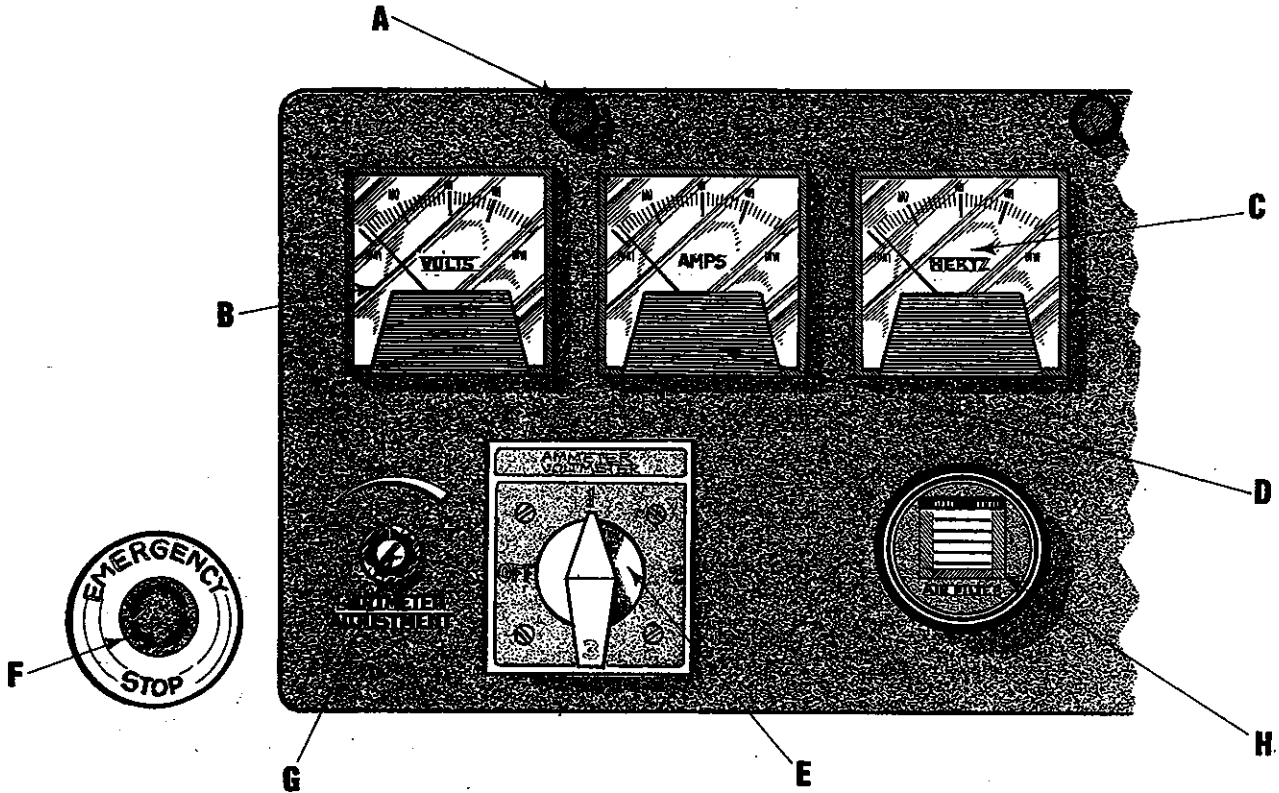
## UNDERSTANDING THE DIESEL ENGINE

The diesel engine closely resembles the gasoline engine, since the mechanism is essentially the same. The cylinders are arranged above a closed crankcase, the crankshaft is of the same general type as that of a gasoline engine, and the diesel engine has the same type of valves, camshaft, pistons, connecting rods and lubricating system.

To a great extent, a diesel engine requires the same preventive maintenance as a gasoline engine. The most important are proper ventilation and proper maintenance of the fuel, lubricating and cooling systems. Replacement of fuel and lubricating filter elements at the time periods specified, and frequent checking for contamination (water, sediment, etc.) in the fuel system are essential. Also important is the consistent use of the same brand of high detergent diesel lubrication oil designed specifically for diesel engines.

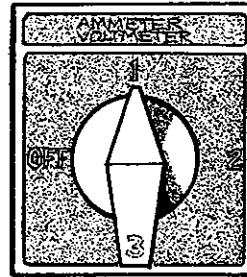
The diesel engine does differ from the gasoline engine, however, in its method of handling and firing of fuel. The carburetor and ignition systems are done away with and in their place is a single component (the fuel injection pump) which performs the function of both.

# CONTROL PANEL



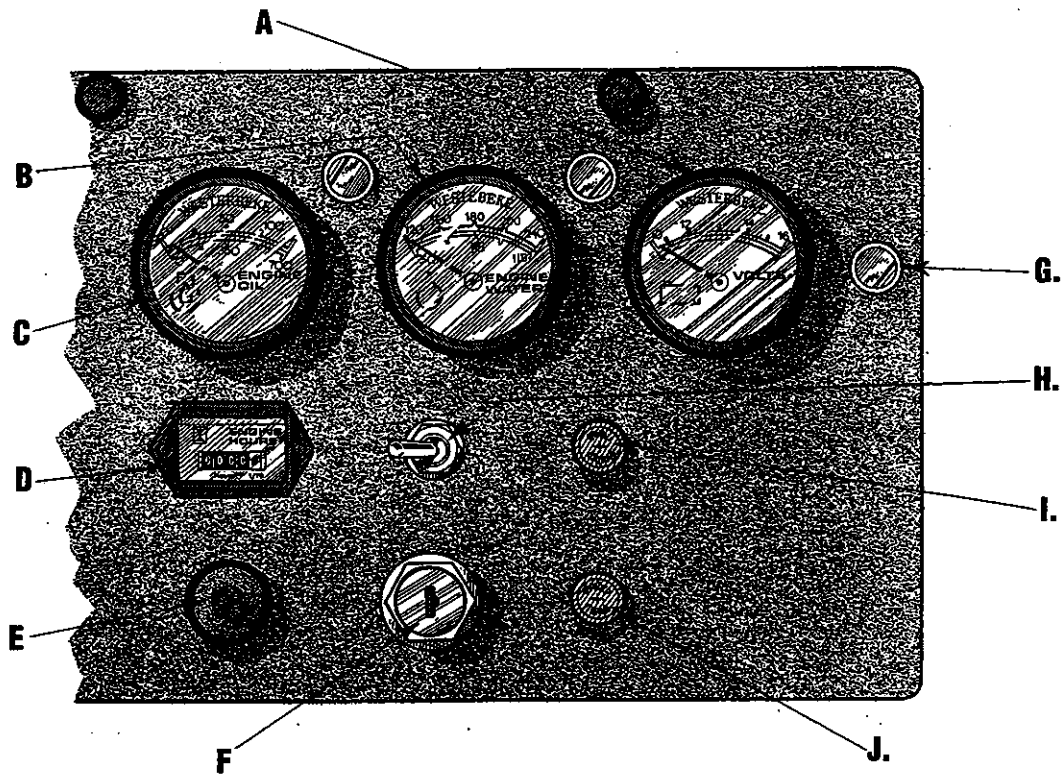
## DESCRIPTION / FUNCTION

- A. PANEL LIGHTS** - Illuminate with the Panel Toggle Switch. To replace the bulb, pull off the cover and push the bulb in.
- B. VOLTMETER** - Displays the output voltage of the generator. Voltage depends on the position of the Selector Switch.
- C. FREQUENCY METER** - Indicates the generator output in hertz (Hz), normally 60Hz (59 to 62Hz depending on the load).
- D. AMMETER** - Indicates the amount of current (load) drawing from the generator thru leg 1, 2, or 3 from the position of the Selector Switch.
- E. SELECTOR SWITCH** - Controls the volts and amp gauges above. Positions 1, 2, & 3 refer to incoming power leads L1, L2, & L3.
- F. EMERGENCY STOP BUTTON** - Pressing the Emergency Stop Button will shutdown the engine and trip the main circuit breaker. The Emergency Stop Light will illuminate. To reset the Emergency Stop Button, turn in the direction of the arrows and the button will release.
- G. VOLTAGE ADJUSTMENT DIAL** - To fine tune the output voltage.
- H. FILTER MONITOR** - Displays the condition of the air filter element.



Switch Positions	Volts	Amps
Off	-----	-----
1	L1 - L3	L1
2	L2 - L3	L2
3	L1 - L2	L3

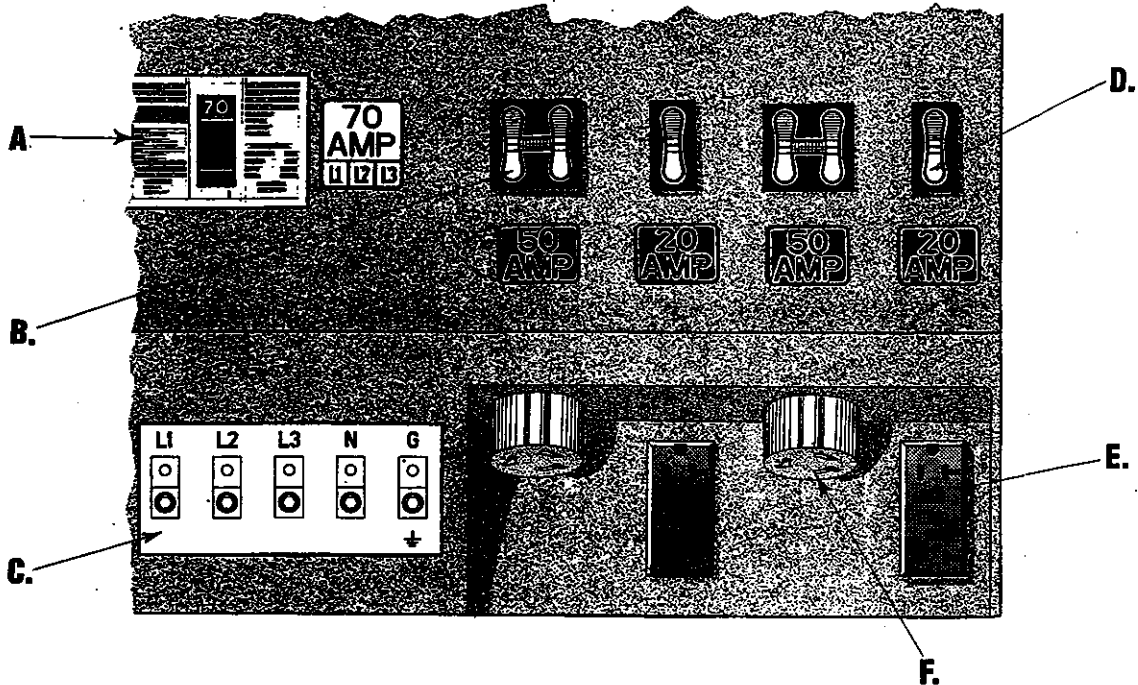
# CONTROL PANEL



## DESCRIPTION / FUNCTION

- A. DC VOLTMETER** - This gauge indicates the condition of the battery (normally 12 Volts when the engine is not operating, 14 Volts with the engine running).
- B. WATER TEMPERATURE GAUGE** - This gauge is graduated in degrees fahrenheit and is activated when the keyswitch is turned on. The normal operating temperature is 170° to 200° depending on the conditions.
- C. OIL PRESSURE GAUGE** - This gauge is graduated in pounds per square inch (PSI) and activates when the keyswitch is turned on. The normal operating pressure can vary from 20 to 80 PSI depending on the load and temperature.
- D. HOURMETER** - Registers elapsed engine running time and is used to schedule maintenance.
- E. PREHEAT BUTTON** - With the keyswitch in the "ON" position, this button is pressed to activate the glow plugs that preheat the combustion chamber.
- F. KEYSWITCH** - This three position switch STARTS and STOPS the engine.
- G. EMERGENCY STOP LIGHT**- Indicates the emergency stop button has been pressed, the generator is shut down and will not re-start.
- H. PANEL LIGHT SWITCH**- This toggle switch controls all panel lights and gauge lights.
- I. DC CIRCUIT FUSE 8A**- Protects the generators DC electrical system.
- J. FIELD FUSE 4A**- Protects against overload at the automatic voltage regulator.

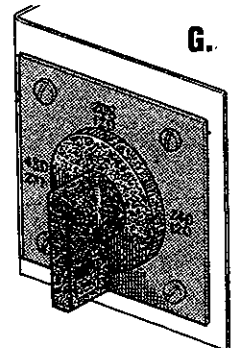
# POWER PANEL



## DESCRIPTION / FUNCTION

- A. 70A CIRCUIT BREAKER** - The main circuit breaker protects the generator from overload. The breaker will trip to the middle position. To reset, switch the breaker down (off) and then switch back to the top (on) position. This circuit breaker automatically trips off if the terminal lug door is opened and cannot be reset until the door is closed.
- B. 50A CIRCUIT BREAKER** - Protects the generator from overload thru the 120/240V-50A receptacles and also serves as an on/off switch for the 50A receptacles below.
- C. TERMINAL LUG PANEL** - For connecting loads to the generator. The door latch will automatically trip the 70A circuit breaker if the door is not closed.
- D. 20A CIRCUIT BREAKER** - Protects the generator from overload thru the 120V-20A receptacles and also serves as an on/off switch for the 20A receptacles below.
- E. 120V-20A RECEPTACLES** - These two receptacles can be used when the generator is in operation (depending on the position of the voltage selector switch). They are controlled by the circuit breakers above. In the center of the receptacle is a reset button should the receptacle trip off and a test button to check the receptacle.
- F. 120/240V-50A RECEPTACLES** - These two twist-lock receptacles can be used when the generator is in operation (depending on the position of the voltage selector switch). They are controlled by the circuit breakers above.
- G. VOLTAGE SELECTOR SWITCH-** This switch provides a convenient way of changing the generator output voltage. Never operate while the engine is running. Once selected, padlock in place. (Note: The 20A and 50A receptacles will not work when the switch is in the 277/480V position).

THE VOLTAGE SELECTOR SWITCH IS LOCATED INSIDE THE ENCLOSURE BEHIND THE GENERATOR.



# AC VOLTAGE CONNECTIONS

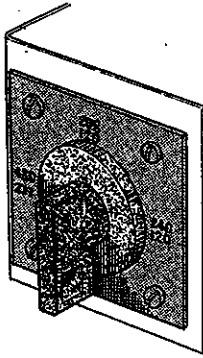
## VOLTAGE SELECTOR SWITCH

For setting the desired generator output voltage. Do not operate when the engine is running. Once selected, padlock in place.

The following text on AC Voltage Connections relates directly to the settings of this switch.

## VOLTAGE ADJUSTMENT DIAL

Refer to in the following text, this dial fine tunes the generators output voltage.



**⚠ WARNING: DANGER OF ELECTROCUTION**  
 Stop the engine and open the main circuit breaker before attempting any connections to the terminal block.

**⚠ WARNING: DANGER OF ELECTROCUTION**  
 Before attempting any connections to the output terminals, always turn off the associated circuit breaker, stop the engine and remove the key. The person performing the connections or disconnection, should always keep the key.

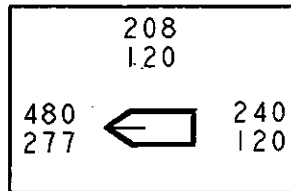
## SELECTOR SWITCH AT 480/277V POSITION

**NOTE:** When the selector switch is in the 480/277V position, the 20A and 50A receptacles will not work!

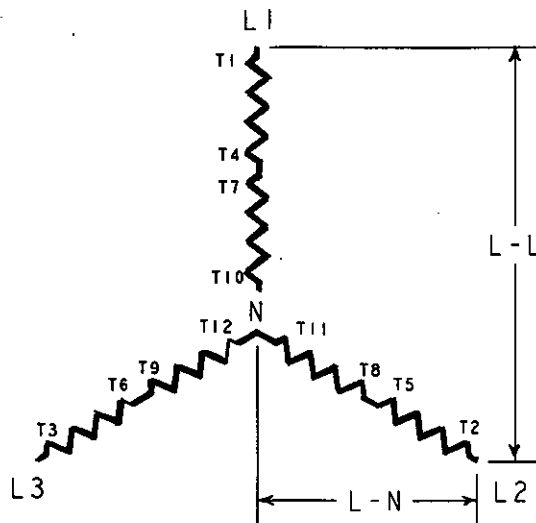
$V_{L-L} / V_{L-N}$

480/277 VOLT  
 440/254 VOLT  
 416/240 VOLT

$N = \perp$



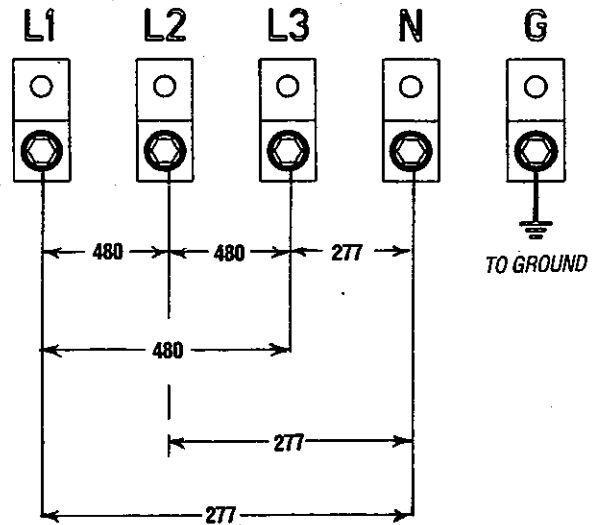
3 PHASE  
 SERIES WYE



**SCHEMATIC**

## HARD WIRE CONNECTION FOR 480/440 OR 416V THREE PHASE

This setting can provide 3-phase power of 480, 440, or 416 volts. After hooking up the hard wires to the lugs as shown, 480 volts can be obtained by turning the voltage adjustment dial toward maximum, 440 volts can be obtained with the voltage adjustment dial turned down, and 416 volts can be obtained with the voltage adjustment dial at its lowest setting.





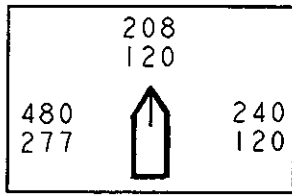
# AC VOLTAGE CONNECTIONS

## SELECTOR SWITCH AT 208/120V POSITION

$V_{L-L} / V_{L-N}$

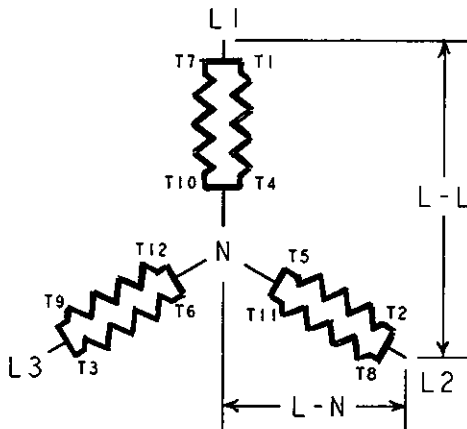
208 / 120 VOLT  
220 / 127 VOLT  
240 / 139 VOLT

$N = \perp$



3 PHASE  
PARALLEL WYE

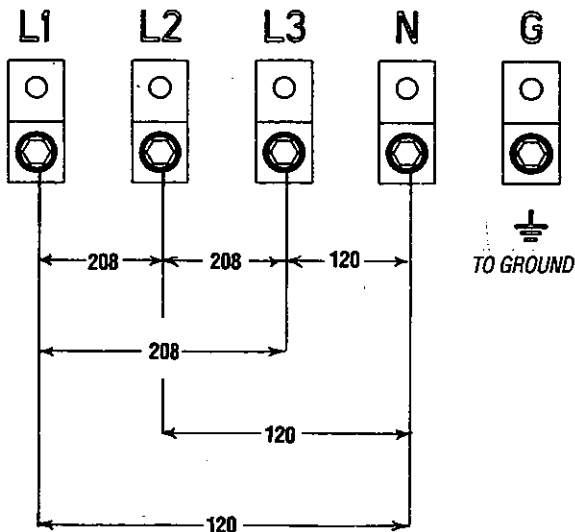
### SCHEMATIC



## HARD WIRE CONNECTION FOR 208/120V

### THREE PHASE

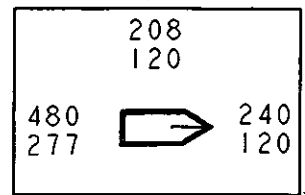
This setting can provide 3-phase power at 240, 220, or 208 volts. After hooking up the hard wires to the lugs as shown, 240 volts can be obtained by the voltage adjustment dial turned toward maximum, 220 volts can be obtained when the voltage adjustment dial is turned down, and 208 volts can be obtained with the voltage adjustment dial at its lowest setting.



## SELECTOR SWITCH AT 240/120V POSITION

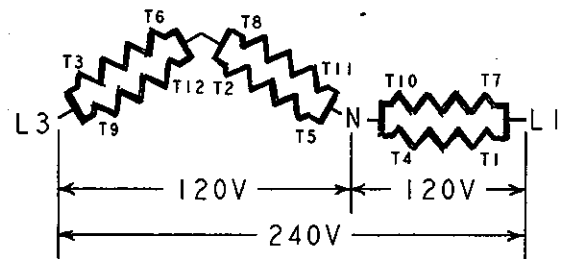
$V_{L-L} / V_{L-N}$

240 / 120 VOLT

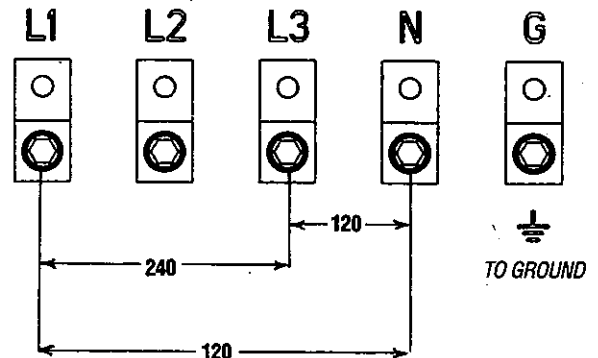


1 PHASE  
ZIG-ZAG

### SCHEMATIC



## HARD WIRE CONNECTION FOR 240/120V SINGLE PHASE



# PREPARATIONS FOR INITIAL START-UP

## PRESTART INSPECTION

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

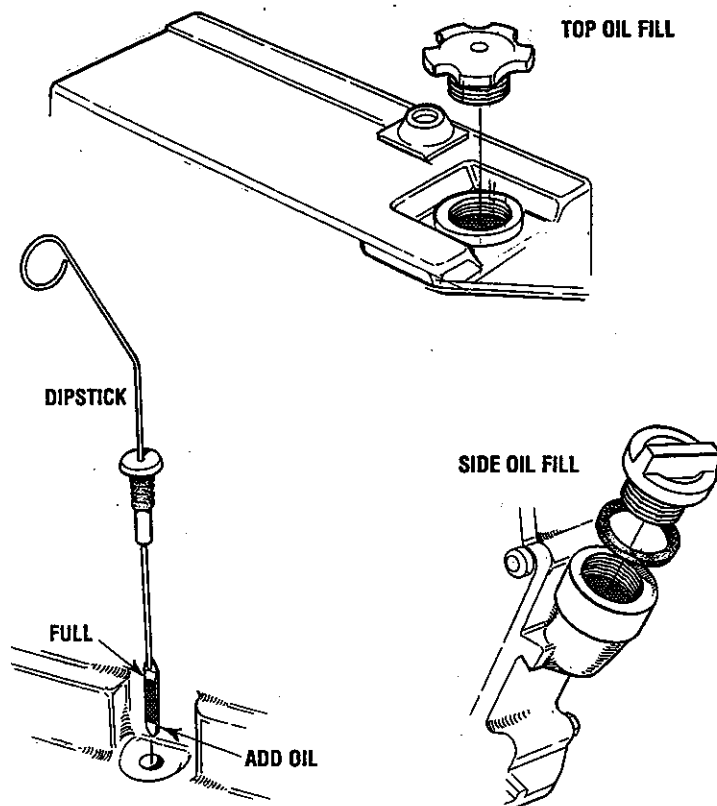
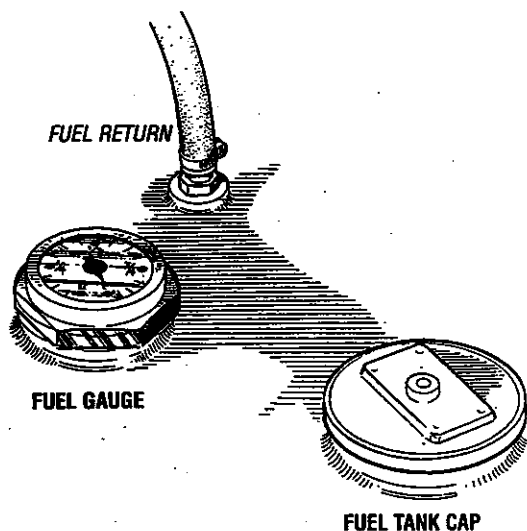
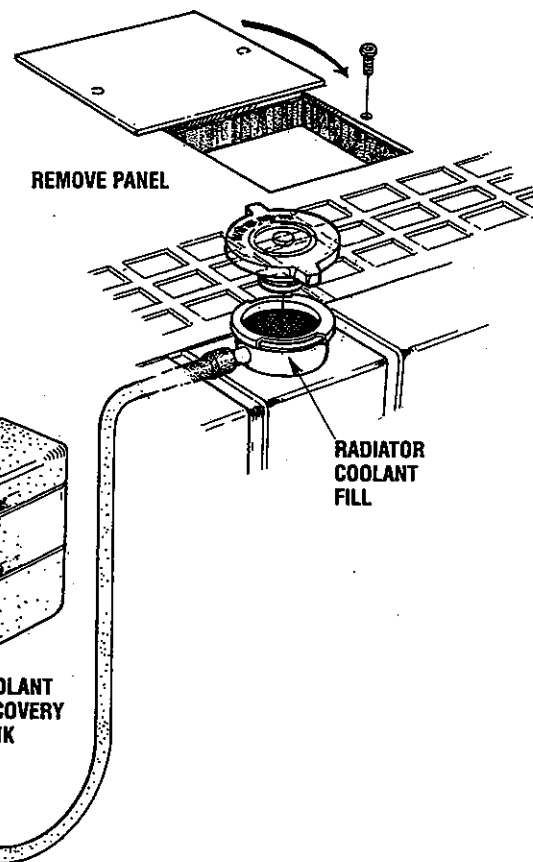
- Make sure the trailer is as level as possible and that the wheels are properly chocked.
- Check the engine oil level. Add oil to maintain the level at the high mark on the dipstick.

**NOTE:** Refer to the specifications pages in this manual for fuel, oil and coolant types and quantities.

- Check the DC electrical system. Inspect wire connections and battery cable connections. Make certain the positive (+) battery cable is connected to the starter solenoid and the negative (-) cable is connected to the engine ground.
- Check the coolant level in both the plastic recovery tank and at the radiator.

**NOTE:** If the engine has not yet been filled with coolant, refer to the COOLING SYSTEM section of this manual.

- Visually examine the engine. Look for loose or missing parts, disconnected wires, and unattached hoses. Check the threaded connections and engine attachments.
- Examine the air inlet and outlet for air flow obstructions. Good ventilation and an ample air supply are necessary for proper engine performance.
- Check that all the power panel circuit breakers are in the off position.



# DIESEL FUEL, ENGINE OIL AND ENGINE COOLANT

## DIESEL FUEL

Use fuel that meets the requirements or specification of Class 2-D (ASTM), and has a cetane rating of #45 or better.

### Care Of The Fuel Supply

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

## ENGINE OIL

Use a heavy duty engine oil with an API classification of CF or CG-4 or better. Change the engine oil after an initial 50 hours of break-in operation, and every 100 hours of operation thereafter. For recommended oil viscosity, see the following chart:

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

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

## ENGINE COOLANT

A mixture of 50% antifreeze and 50% distilled water is recommended. 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, and lubricates and protects the cooling circuit from rust and corrosion. Look for a good quality antifreeze that contains Supplemental Cooling Additives (SCAs) that keep the antifreeze chemically balanced, crucial to long term protection.

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

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

Antifreeze mixtures will protect against an unexpected freeze and they are beneficial to the engine's cooling system. They retard rust and add to the life of the circulating pump seal.

### ANTIFREEZE PROTECTION

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

## COOLANT RECOVERY TANK

The purpose of the coolant 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. This kit is provided and must be installed before operating the generator.

**NOTE:** This tank, with its short run of plastic hose, is best located at or above the level of the engine's manifold, but it can be located below the level of the engine's manifold if the particular installation makes this necessary.

# STARTING/STOPPING PROCEDURE

## OPERATING INSTRUCTIONS - STARTING

1. Connect up the equipment, tools, or wiring desired using the receptacles or by wiring directly to the main terminal lugs. (Refer to the voltage connection diagram inside the panel cover or in this manual).
2. Turn the main circuit breaker (70A) off. (This disconnects all loads from the generator).
3. Select the desired voltage output via the rotary voltage selector switch: 277/480, 120/208, or 120/240. Receptacles will not work in the 277/480 position. Padlock the switch in place to prevent tampering.  
Turn the ignition key switch to the "ON" position, if the engine is cold, press and hold the preheat button for up to 10 seconds.
4. Turn the ignition switch to the start position while holding the preheat button. Never crank the starter motor for more than 10 seconds at a time.

As soon as the engine starts, release the key switch. Release the preheat button after the engine has sufficient oil pressure. If the engine does not start, wait 30 seconds before retrying.

5. Reset main circuit breaker. (Breaker will not reset if the panel load connection box door is open).

Also make certain the required receptacle circuit breakers are reset on.

## STOPPING

1. Turn the ignition keyswitch to the off position.

**NOTE:** Pressing the emergency stop button will shutdown the engine and trip the main circuit breaker.

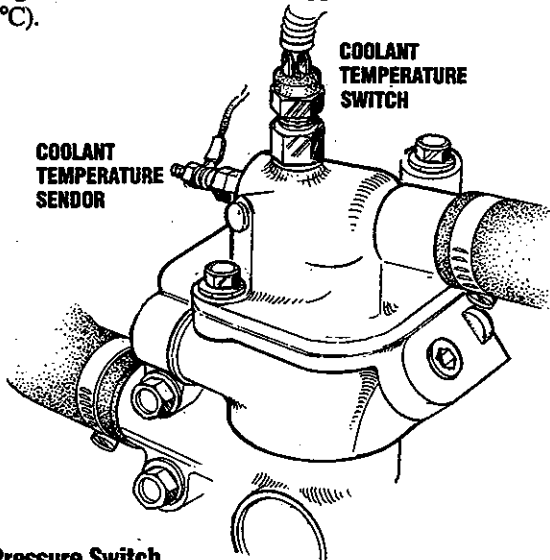
## SAFETY SHUTDOWN SWITCHES

### DESCRIPTION

The engine is protected by four automatic shutdown switches. Should a shutdown occur, *do not attempt to restart without finding and correcting the cause. Refer to the heading "Engine Stops" in the TROUBLESHOOTING section of this manual.*

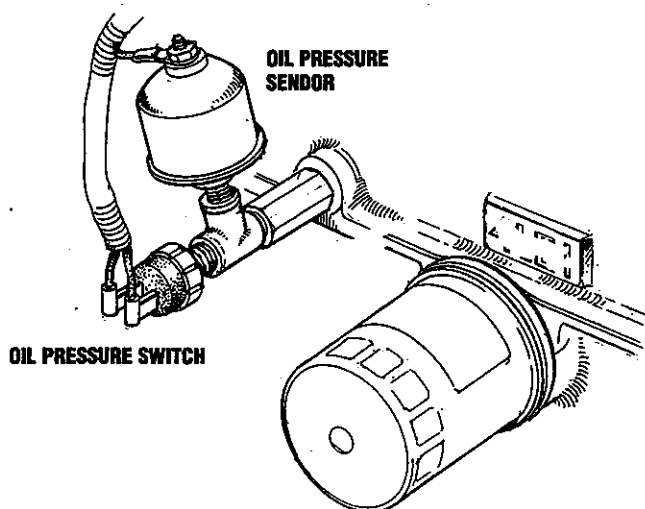
### Coolant Temperature Switch

A high coolant temperature switch is located on the thermostat housing. Should the fresh water coolant's temperature reach approximately 210°F (99°C), the switch will open and interrupt the DC voltage to the K2 relay, thereby shutting off the engine. This switch resets at approximately 195°F (107°C).



### Oil Pressure Switch

A low oil pressure shutdown switch is located off the engine's oil gallery. Normally open in a static state, this switch's sensor monitors the engine's oil pressure. Should the engine's oil pressure fall to 5 psi, this switch will open interrupting the DC voltage to the K2 relay, thereby shutting off the engine.



### Engine Circuit Breaker

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

**NOTE:** The generator will also shut down if excessive current breaks the 8A fuse at the control panel.

### Overcurrent Relay

If there is excessive current being drawn thru the AC generator (overload or short circuit), the overcurrent relay will trip. The main 70A circuit breaker will also trip and the engine will shut down. The overcurrent relay is located behind the power panel and will reset automatically.

# GENERATOR BREAK-IN PROCEDURE

## DESCRIPTION

Although your engine has experienced a minimum of one hour of test operations at the factory to make sure accurate assembly procedures were followed and that the engine operated properly, a break-in time is required. The service life of your engine is dependent upon how the engine is operated and serviced during its initial hours of use.

Breaking-in a new engine basically involves seating the piston rings to the cylinder walls. Excessive oil consumption and smoky operation indicate that the cylinder walls are scored, which is caused by overloading the engine during the break-in period.

Your new engine requires approximately 50 hours of initial conditioning operation to break in each moving part in order to maximize the performance and service life of the engine. Perform this conditioning carefully, keeping in mind the following:

Start the engine according to the *STARTING PROCEDURE* section. Run the engine while checking that all systems (raw water pump, oil pressure, battery charging) are functioning. reach its full rated speed are signs of an overload.

## AFTER START-UP

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

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

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

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

## GENERATOR ADJUSTMENTS

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

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## THE DAILY ROUTINE

### CHECK LIST


Follow this checklist each day before starting your generator.

- Check that all generator circuit breakers (power panel) are in the off position before starting.
- Record the hourmeter reading in your log (engine hours relate to the maintenance schedule).
- Visually inspect the engine for fuel, oil, or water leaks.
- Check the oil level (dipstick).
- Check the coolant level in the coolant recovery tank.
- Check your fuel supply.
- Check the starting batteries (weekly).
- Check the drive belt for wear and proper tension (weekly).

### CHECK WITH THE ENGINE RUNNING.

- Check for abnormal noise such as knocking, vibration and blow-back sounds.
- Confirm exhaust smoke:
  - When the engine is cold – White Smoke.
  - When the engine is warm – almost Smokeless.
  - When the engine is overloaded – some Black Smoke.

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

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

### STOPPING THE GENERATOR

Remove the AC loads from the generator one at a time. Allow the generator to run for 3-5 minutes to stabilize the operating temperature, then turn the key to the off position. Once the generator is shutdown, close down all circuit breakers as a safety precaution.

# MAINTENANCE SCHEDULE

In order to use this Maintenance Schedule, it will be necessary to log your engine hours. Use your engine hourmeter or record your engine hours by running time.

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

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

SCHEDULED MAINTENANCE	CHECK EACH DAY	HOURS OF OPERATION							MAINTENANCE DESCRIPTION
		50	100	250	500	750	1000	1250	
Fuel Supply	<input type="checkbox"/>								Diesel No. 2 rating of 45 cetane or higher.
Engine Oil Level	<input type="checkbox"/>								Oil level should indicate between MAX. and LOW on dipstick.
Coolant Level	<input type="checkbox"/>								Check at recovery tank; if empty, check at radiator. Add coolant if needed.
Drive Belts	<input type="checkbox"/> weekly								Inspect for proper tension (3/8" to 1/2" deflection) and adjust if needed. Check belt edges for wear.
Visual Inspection of Engine	<input type="checkbox"/>	<b>NOTE:</b> Keep engine surface clean. Dirt and oil will inhibit the engine's ability to remain cool.							Check for fuel, oil and water leaks. Inspect wiring and electrical connections. Keep bolts & nuts tight. Check for loose belt tension.
Fuel Filter		<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		Change at 50 hours then every 250 hours.
Starting Batteries	<input type="checkbox"/> weekly								Check electrolyte levels every 250 operating hours and make sure connections are very tight. Clean off excessive corrosion.
Engine Oil and Filter		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Initial engine oil & filter change at 50 hours, then change both every 250 hours.
Exhaust System							<input type="checkbox"/>		Initial check at 50 hours, then every 1000 hours. Inspect for leaks. Check the exhaust for carbon and/or corrosion buildup on inside passages; clean and replace as necessary. Check that all connections are tight. Check casting integrity.
Engine Hoses			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hose should be hard & tight. Replace if soft or spongy. Check and tighten all hose clamps.
Generator		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Check that AC connections are clean and secure with no chafing. See <i>GENERATOR SECTION</i> for additional information.
Radiator (External Face)							<input type="checkbox"/>		Clean with compressed air.
Air Intake Filter				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Inspect, clean or replace..

*(continued)*

# MAINTENANCE SCHEDULE

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

SCHEDULED MAINTENANCE	CHECK EACH DAY	HOURS OF OPERATION							MAINTENANCE DESCRIPTION
		50	100	250	500	750	1000	1250	
Coolant System					<input type="checkbox"/>			<input type="checkbox"/>	Drain, flush, and refill cooling system with appropriate antifreeze mix.
DC Alternator				<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	Check DC charge from alternator. Check mounting bracket; tighten electrical connections.
*Fuel Injectors					<input type="checkbox"/>		<input type="checkbox"/>		Check and adjust injection opening pressure and spray condition. (Refer to your service manual).
*Starter Motor					<input type="checkbox"/>			<input type="checkbox"/>	Check solenoid and motor for corrosion. Remove and lubricate. Clean and lubricate the starter motor pinion drive.
*Preheat Circuit					<input type="checkbox"/>			<input type="checkbox"/>	Check operation of preheat solenoid. Remove and clean glow plugs. Reinstall with anti-seize compound on threads.
*Engine Cylinder Compression							<input type="checkbox"/>		Check compression pressure and timing (see <i>Engine Adjustments</i> ).
*Adjust the Valve Clearances							<input type="checkbox"/>		Adjust Valve Clearances. (see <i>ENGINE ADJUSTMENTS</i> ).
Lubricate Panel Key Switch with "Lockeze"			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	At first 100 hours, then each year at winterizing.
Trailer - Wheel Hubs							<input type="checkbox"/>		Grease.
Trailer - Tires	monthly								Inspect tread wear, inflation and lug nuts.
Trailer - Fuel Tank and Environmental Tank			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Drain off accumulated fluid. <b>NOTE</b> The external (environmental tank) and the internal (fuel tank) have drains that are aligned and located under the tank beneath the trailer.

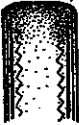





\*This service be performed by an authorized mechanic.

# TRAILER MAINTENANCE/PARKING

## TIRES

Tire inflation pressure is the most important factor in tire life. Pressure should be checked cold before operation. **DO NOT** bleed air from tires when they are hot. Check inflation pressure weekly during use to insure the maximum tire life and tread wear.

The following chart will help pinpoint the causes and solutions of tire wear problems.

WEAR PATTERN	CAUSE	SOLUTION
	Center Wear Over Inflation	Adjust pressure to particular load per tire manufacturer
	Edge Wear Under Inflation	Adjust pressure to particular load per tire manufacturer
	Side Wear Loss of camber or overloading	Make sure load does not exceed axle rating. Align wheels
	Toe Wear Incorrect toe-in	Align wheels
	Cupping Out-of-balance	Check bearing adjustment and balance tires
	Flat Spots Wheel lockup and tire skidding	Avoid sudden stops when possible and adjust breaks

## WHEELS

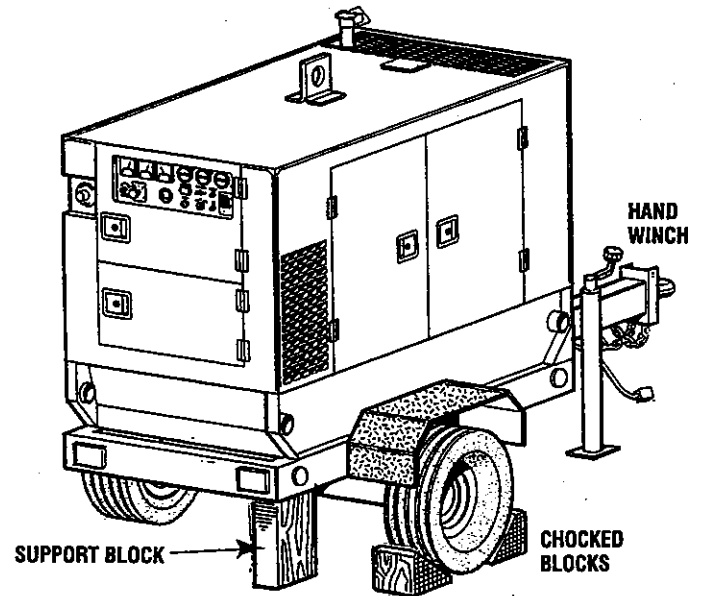
Check that lug nuts holding the wheels are tight. Replace any missing nuts immediately.

## AXEL HUBS

Grease axle hubs through grease fittings every 1000 miles using a good wheel bearing grease.

## PINTLE RING

The 3" pintle ring provided is maintenance free. If a coupler ball is added, apply grease each time the trailer is towed. The film of grease will eliminate squeaking and extend the life of the ball.



## PARKING

Place chocked blocks under the wheel to prevent rolling and put a support block under the bumper to prevent tipping. Use the hand winch to adjust the trailer to the proper height and then insert the locking pin.



# ENGINE COOLING SYSTEM

## FRESH WATER CIRCUIT

**NOTE:** Refer to the *ENGINE COOLANT* section in this manual for the recommended antifreeze and water mixture to be used as the fresh water coolant and for information on filling the fresh water system.

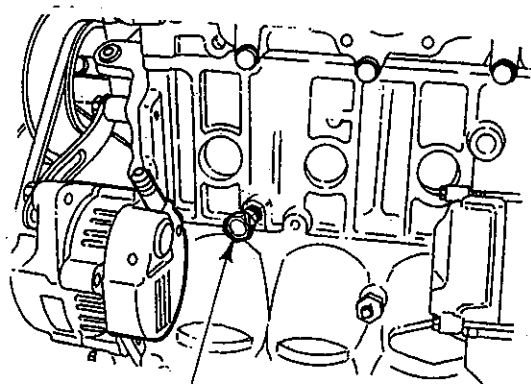
Fresh water coolant is pumped through the engine by a belt-driven circulating pump, absorbing heat from the engine. The fresh water coolant circulates through the engine's block absorbing heat, then passes through the thermostat to the radiator where it is cooled by a fan and then returned to the engine block through the suction side of the fresh water circulating pump. When the engine is started cold, external coolant flow is prevented by the closed thermostat. 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.

## Changing Coolant

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

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

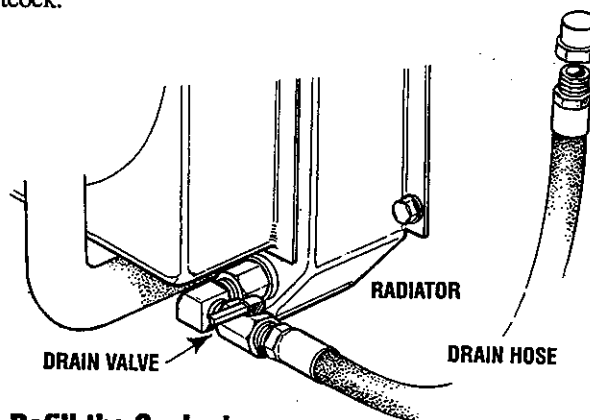
**WARNING:** Beware of the hot engine coolant. Perform coolant system maintenance with cold engine. Wear protective gloves, goggles and clothing.



ENGINE COOLANT DRAIN

## TO DRAIN THE COOLANT

While the engine is cold, open the filler cap on the top of the radiator. Open the drain petcock on the bottom rear of the radiator and open the engine block drain plug located above the lube oil filter. When the system has drained, flush the system with clean water. Once the system has been flushed and drained, close the engine block drain plug and radiator petcock.



## To Refill the Coolant

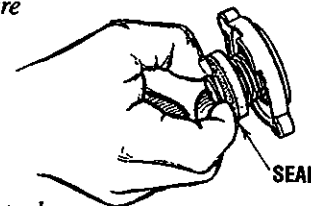
Fill the radiator with a 50/50 mixture of distilled water and antifreeze. Start the engine and observe the coolant level in the radiator. Add premixed coolant as air is expelled. Observe the engine operating temperature.

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

Run the engine and check for leaks.

After checking for leaks, stop the engine and allow it to cool. Check the coolant level at the radiator. Coolant should draw back to its original level as the engine cools down. Clean up any spilled coolant.

**NOTE:** Periodically check the condition of the radiator pressure cap. Ensure the upper and lower rubber seals are in good condition. Check to ensure the vacuum valve opens and closes tightly. Carry a spare cap. Check also to ensure the coolant passage is clear so coolant within the system is able to expand and contract to and from the coolant recovery tank.



## Cleaning The Radiator

The engine may overheat if the radiator fins become overloaded with dust or debris. Periodically clean the radiator fins with compressed air. Cleaning inside the radiator is dangerous, so clean only with the engine turned off and the battery disconnected.

# COOLING SYSTEM

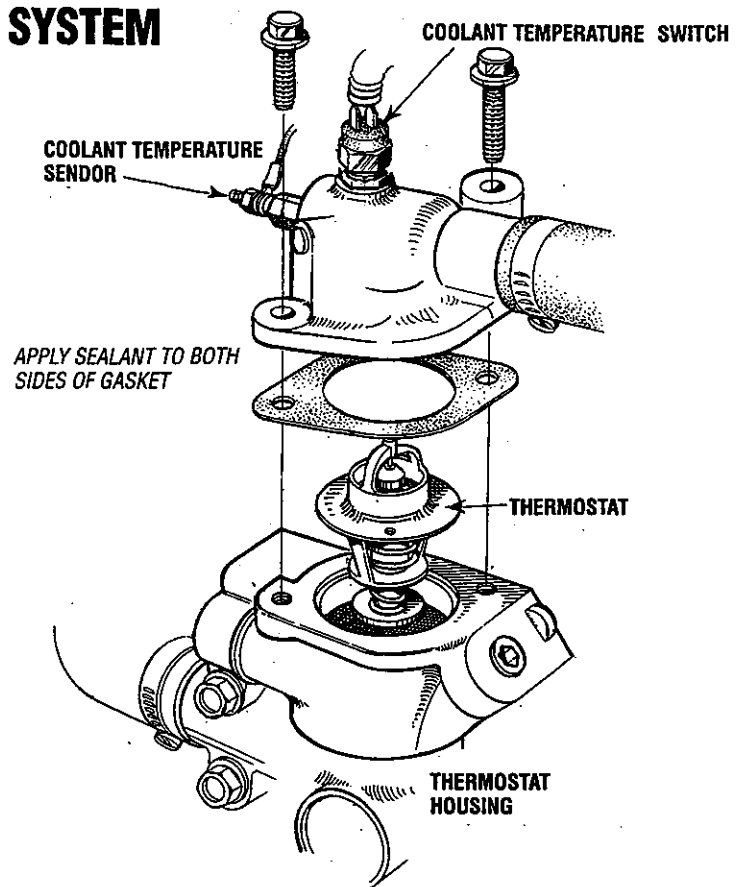
## THERMOSTAT

A thermostat, located at the front of the engine, 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 to the radiator. 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.

### Replacing the Thermostat

Remove the cap screws and disassemble the thermostat housing as shown. When installing the new thermostat and gasket, apply a thin coat of sealant on both sides of the gasket before pressing it into place. Do *not* over-tighten the cap screws.

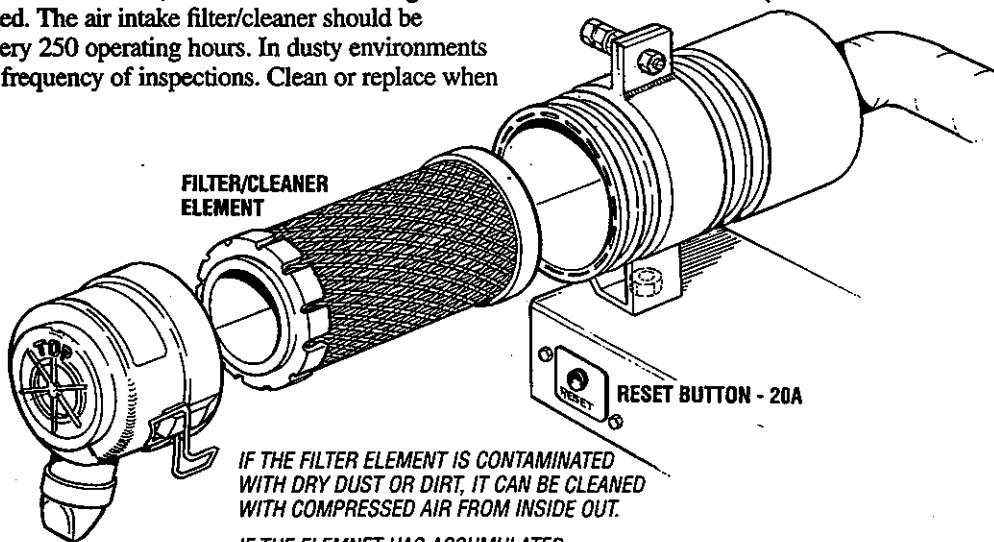
Run the engine and check for normal temperatures and that there are no leaks at the thermostat housing.



# AIR INTAKE / SILENCER

## DESCRIPTION

A diesel engine/generator will typically consume as much as 6,000 cubic feet of air per hour. Not only must the engine enclosure be well ventilated, the air flow into the engine must be unrestricted. The air intake filter/cleaner should be inspected every 250 operating hours. In dusty environments increase the frequency of inspections. Clean or replace when necessary.



IF THE FILTER ELEMENT IS CONTAMINATED WITH DRY DUST OR DIRT, IT CAN BE CLEANED WITH COMPRESSED AIR FROM INSIDE OUT.  
IF THE ELEMENT HAS ACCUMULATED CARBON OR GREASE, IT MUST BE REPLACED.

# FUEL SYSTEM

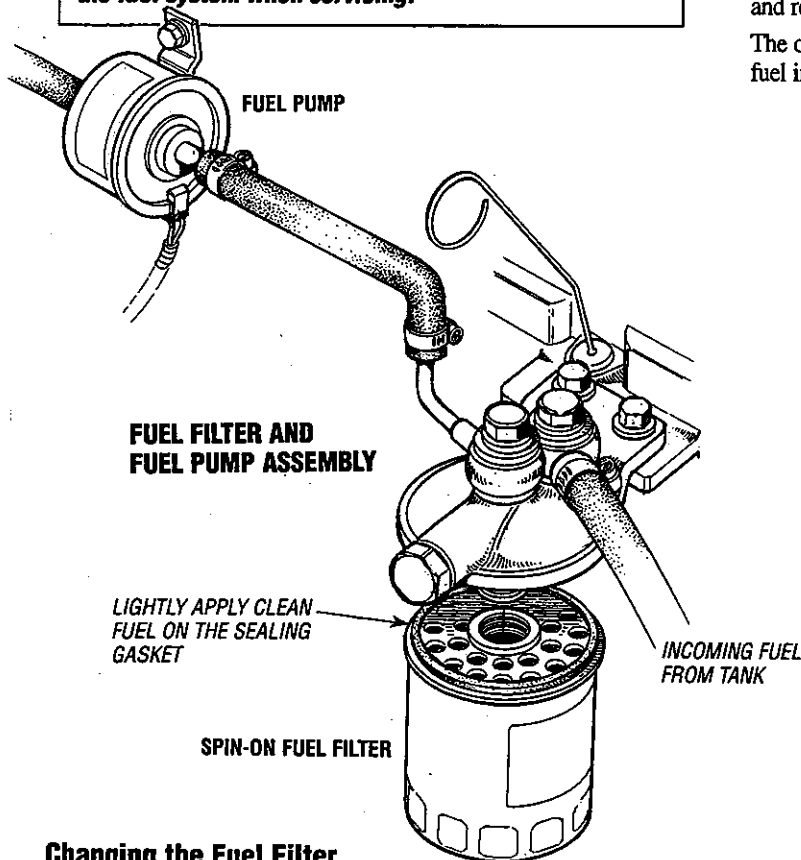
## DIESEL FUEL

Use No. 2 diesel fuel with a cetane rating of 45 or higher. Do not use kerosene or home heating fuel.

## FUEL FILTERS

The fuel injection pump and the fuel injectors are precisely manufactured and they must receive clean diesel fuel, free from water and dirt. To ensure this flow of clean fuel, the fuel passes through a fuel filter. This filter must be changed every 500 operating hours (immediately if dirty fuel is suspected).

**⚠ WARNING:** *When servicing the fuel system, take care in catching any fuel that may spill. DO NOT allow any smoking, open flames or other sources of fire near the fuel system when servicing.*



## Changing the Fuel Filter

1. Loosen the fuel filter, turning counterclockwise with a filter wrench. Place the used filter in a container for proper disposal.
2. Using a rag, wipe clean the sealing face on the housing bracket so the new filter can be seated properly.
3. Lightly oil the sealing O-ring on the new filter with clean fuel. To reinstall, turn the filter assembly counterclockwise carefully until the O-ring contacts the sealing surface of the housing bracket. Turn 2/3 further with the filter wrench.

**NOTE:** *The cartridge contains fuel. Take care not to spill it during disassembly.*

## 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.

When energized thru the preheat circuit, the fuel pump will purge air from the fuel system and provide a continuous flow of fuel as the engine running.

## FUEL INJECTION PUMP

The fuel injection pump is a very important component of the diesel engine, requiring the utmost care in handling. The fuel injection pump has been thoroughly bench-tested and the owner-operator is cautioned not to attempt to service it. If it requires servicing, remove it and take it to an authorized fuel injection pump service facility. Do not attempt to disassemble and repair it.

The only adjustment the servicing mechanic should make to the fuel injection pump is the adjustment for engine idle speed

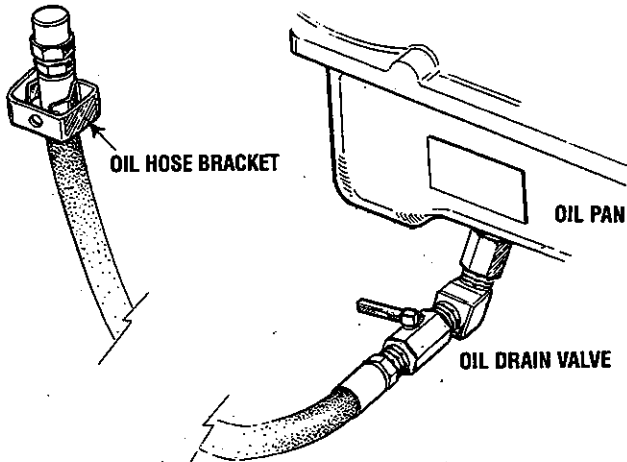
# ENGINE OIL CHANGE

## DESCRIPTION

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

**NOTE:** Thread size for the lube oil drain hose capped end is 3/8 NPT.

Always observe the used oil as it is removed. A yellow/gray emulsion indicates the presence of water in the oil. Although this condition is rare, it does require prompt attention to prevent serious damage. Call a qualified mechanic should water be present in the oil.

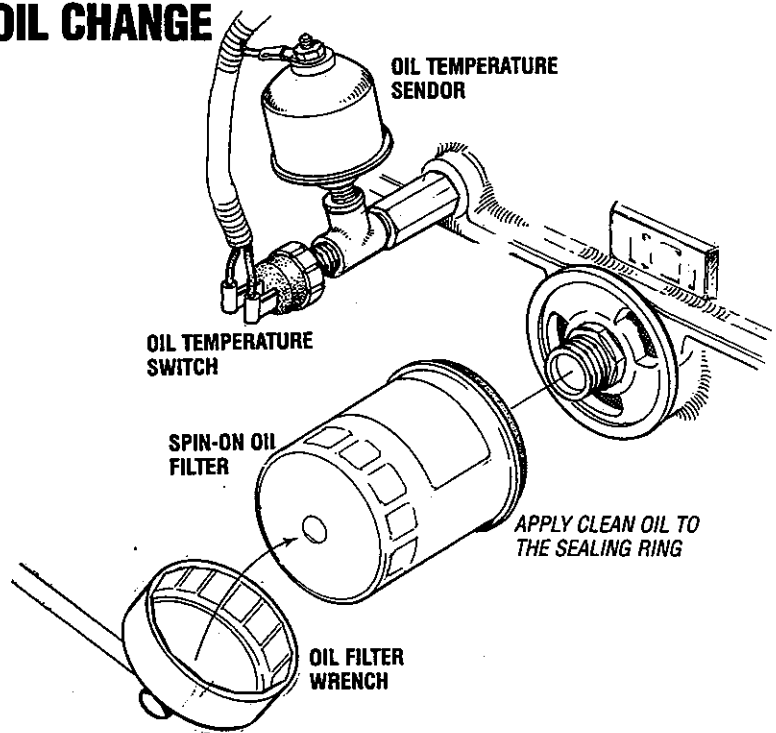


2. **Replacement of the Oil Filter.** When removing the used oil filter, you may find it helpful and cleaner to punch a hole in the upper and lower portion of the old filter to drain the oil from it into a container before removing it. This helps to lessen spillage. A small automotive filter wrench should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

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

Place some paper towels and a plastic bag around the filter when unscrewing it to catch any oil left in the filter. (Oil or any other fluid on the engine reduces the engine's cooling ability. Please keep your engine clean). Inspect the old oil filter as it is removed to make sure that the rubber sealing gasket comes off with the old filter. If this rubber sealing gasket remains sealed against the engine block, gently remove it.

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



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

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

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

# BATTERY

## BATTERY FLUID

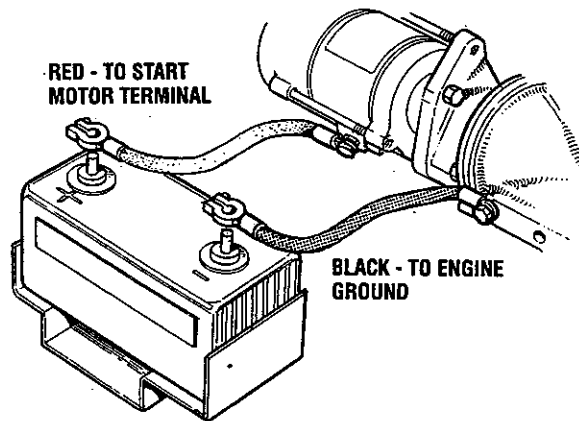
This unit is of negative ground. Do not connect in reverse. Always maintain battery fluid level between the specified marks. Battery life will be shortened if the fluid level is not properly maintained. Add only distilled water when replenishment is necessary. Do not over fill.

The battery is sufficiently charged if the specific gravity of the battery fluid is 1.28 (at 66LF). If the specific gravity should fall to 1.245 or lower, it indicates that the battery is dead and needs to be recharged or replaced.

**BATTERY RECOMENDATION      750 CCA (MINIMUM)**

## BATTERY CABLE INSTALLATION

Always be sure the battery cables are properly connected to the terminals as shown below. The **RED** cable is connected to the positive terminal of the battery and the **BLACK** cable is connected to the negative terminal of the battery.



**CAUTION:** *If the battery cable is connected incorrectly, damage to the generator will occur. Pay close attention to the polarity of the battery when connecting the battery.*

When connecting the battery do the following:

1. Do not connect the battery cables to the battery terminals when the key is in the ignition and is set in start mode. Always remove the key from the ignition and the ignition switch is in the off position when connecting the battery.
2. Place a small amount of grease around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.

**CAUTION:** *Inadequate battery connections may cause poor starting of the generator and create other malfunctions.*

# GLOW PLUGS

## DESCRIPTION

The glow plugs are wired through the preheat solenoid. When PREHEAT is pressed at the control panel this solenoid should "click" on and the glow plug should begin to get hot.

## INSPECTION

To inspect the plug, remove the electrical terminal connections, then unscrew or unclamp each plug from the cylinder head. Thoroughly clean each plug's tip and threads with a soft brush and cleaning solution to remove all the carbon and oil deposits. While cleaning, examine the tip for wear and burn erosion; if it has eroded too much, replace the plug.

## TESTING

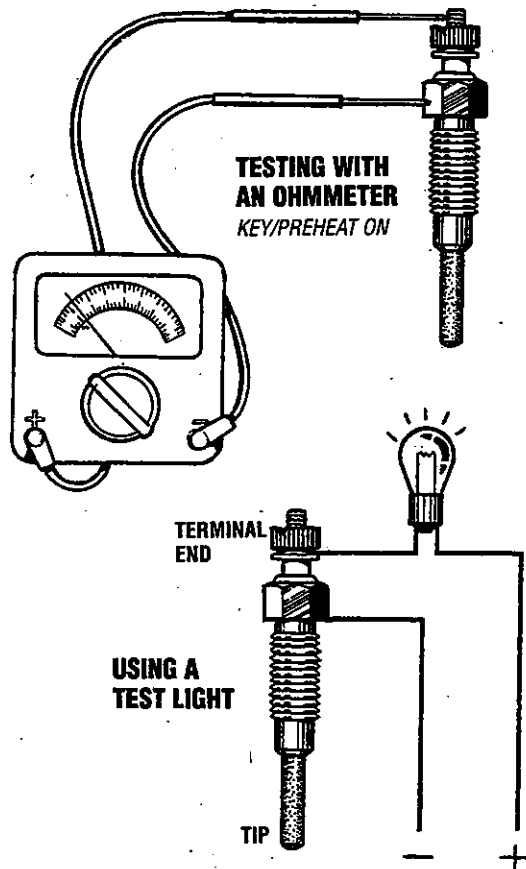
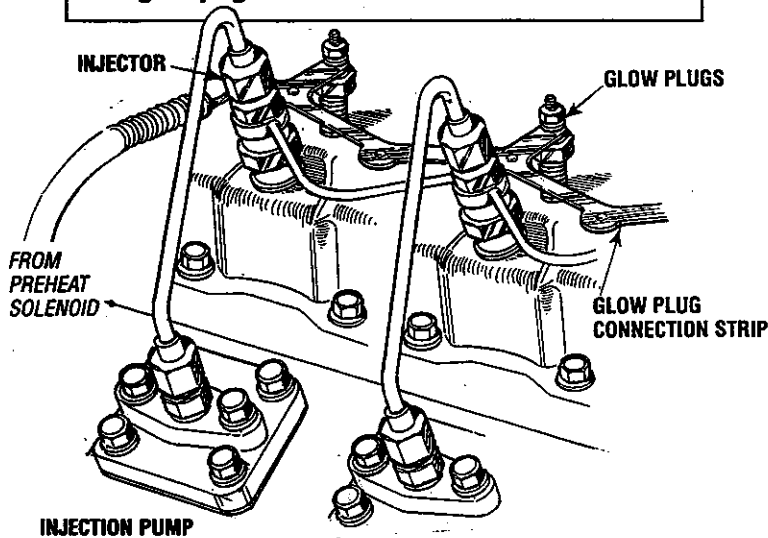
An accurate way to test glow plugs is with an ohmmeter. Touch one prod to the glow plug's wire connection, and the other to the body of the glow plug, as shown. A good glow plug will have a 0.4 - 0.6 ohm resistance. This method can be used with the plug in or out of the engine. You can also use an ammeter to test the power drain (5 - 6 amps per plug).

**WARNING:** These glow plugs will become very hot to the touch. Be careful not to burn your fingers when testing the plugs.

Re-install the plugs in the engine and test them again. The plugs should get very hot (at the terminal end) within 7 to 15 seconds. If the plugs don't heat up quickly, check for a short circuit. When reinstalling the glow plugs, use anti-seize compound on the threads.

**WARNING:** Do not keep a glow plug on for more than 30 seconds.

Glow Plug Tightening Torque 10.8 - 14.5 lb-ft (1.5 - 2.0 m-kg)



# ENGINE ADJUSTMENTS

## DRIVE BELT ADJUSTMENT

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

The drive belt is properly adjusted if the belt can be deflected no less than 3/8 inch (10mm) and no more than 1/2 inch (12mm) as the belt is depressed with the thumb at the mid-point between the two pulleys on the longest span of the belt.

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

## Adjusting Belt Tension

1. Loosen the alternator adjusting strap bolt and the base mounting bolt.
2. With the belt loose, inspect for wear, cracks and frayed edges.
3. Pivot the alternator on the base mounting bolt to the left or right as required, to loosen or tighten.
4. Tighten the base mounting bolt and the adjusting strap bolt.
5. Run the engine for about 5 minutes, then shut down and recheck the belt tensions.

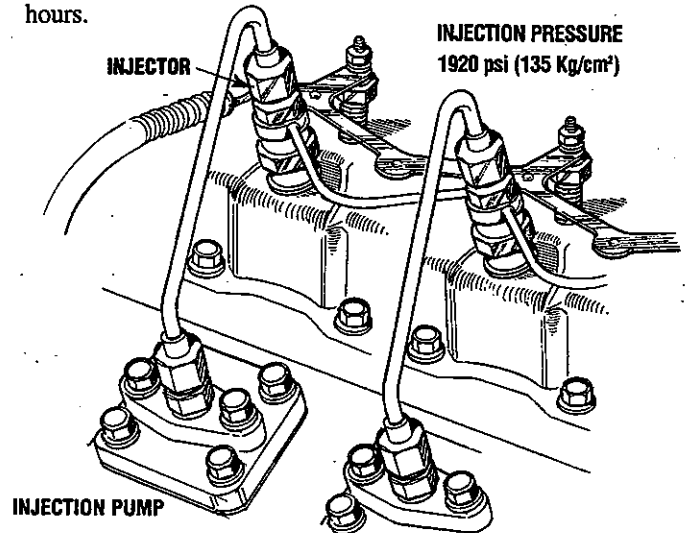
## FUEL INJECTORS

In case of severe vibrations and detonation noise, have the injectors checked and overhauled by an authorized fuel injection service center. Poor fuel quality, contaminants and loss of positive fuel pressure to the injection pump can result in injector faults. Since fuel injectors must be serviced in a clean room environment, it is best to carry at least one extra injector as a spare should a problem occur.

Before removing the old injector, clean the area around the base of the injector to help prevent any rust or debris from falling down into the injector hole. If the injector will not lift out easily and is held in by carbon build-up or the like, work the injector side-to-side with the aid of the socket wrench to free it, and then lift it out.

The injector seats in the cylinder head on a copper sealing washer. This washer should be removed with the injector and replaced with a new washer when the new injector is installed.

The fuel injectors should be pressure tested after 750 operating hours.

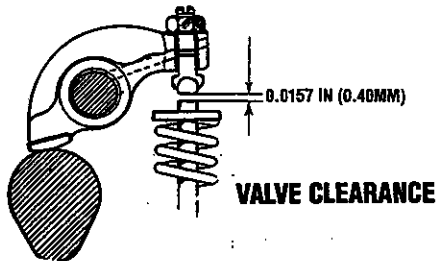


# ENGINE ADJUSTMENTS

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

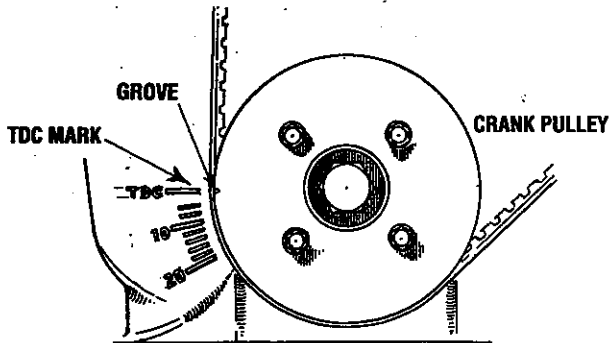
## VALVE CLEARANCE ADJUSTMENT

The valve clearance must be adjusted every 1000 operating hours, or whenever the valve rocker is abnormally noisy. Valve adjustment should only be done when engine is cold. Cold engine valve clearance is 0.0157 in (0.40 mm).

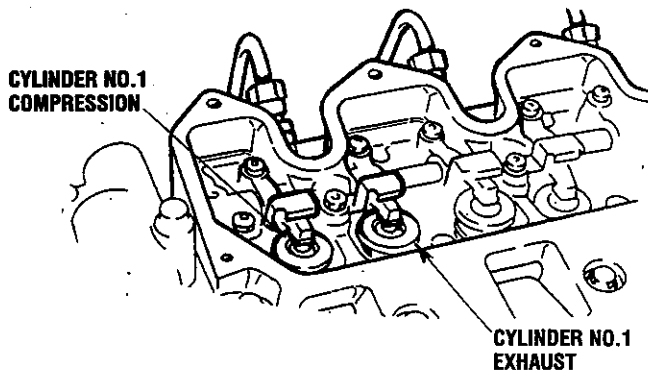


**NOTE:** The cylinder head bolts have been tightened with the "Angular Tightening Method". Therefore, it is not necessary to retighten the cylinder head bolts before adjusting the valve clearances.

## ADJUSTMENT PROCEDURE



1. Turn the crankshaft clockwise so that the mark groove on the crank pulley is aligned with the TDC mark (cast out) on the timing gear case cover.
2. Remove the cylinder head cover and check to see if cylinder No.1 is at TDC in the compression stroke or at TDC in the exhaust stroke. When the intake and exhaust valves are closed, the cylinder is at TDC in the compression stroke, and when only the exhaust valve is open, it is at TDC in the exhaust stroke.



3. In accordance with the conditions of cylinder No.1, measure and adjust if required the clearance of the valves marked with either ● or ○ in the table below.

Cylinder No.	1		2		3		4	
Valve arrangement	I	E	I	E	I	E	I	E
When No. 1 cylinder is at TDC in the compression stroke	●	●	●			●		
When No. 4 cylinder is at TDC in the compression stroke				○	○		○	○

I: Inlet E: Exhaust

4. On completion of the valve clearance alignment make a mark alignment as in 1 by giving a turn to the crankshaft in the normal direction. Then measure and adjust the clearance of the other valves.

**CAUTION:** The rocker arm is made of die-cast aluminum. Therefore, be careful not to tighten the adjusting screw to excess.

## Adjustment of Injection Timing

The injection timing may not be re-adjusted. Take care not to forget to insert a shim in the mounting surface when reassembling the injection pump after disassembly.

## Cylinder Compression Pressure Measurement

The cylinder compression measurement must be done every 1000 operation hours, or whenever the engine output is reduced.

## Starter and Alternator Servicing

Do the starter and the alternator servicing every 1000 operating hours on the following items:

- Starter commutator cleaning
- Alternator slip ring cleaning
- Carbon brushes and the brush contact check

## Radiator Pressurization Valve Check

A pressurization valve is incorporated in the radiator cap assembly. Check the valve actuating pressure with a radiator compression tester. For the pressurization valve actuating pressure and the check interval, follow the equipment manufacturer's standards.



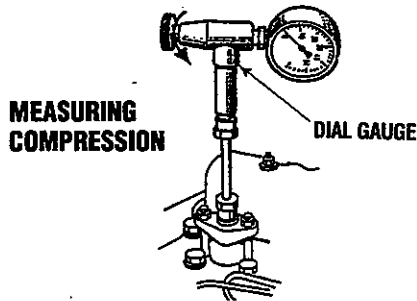
# ENGINE ADJUSTMENTS

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

## TESTING ENGINE COMPRESSION

Make certain the oil level (dipstick) is at the correct level and the air intake filter is clean. The battery and starter motor must also be in good condition.

1. Warm the engine to normal operating temperature.
2. Move the control lever to a position for shutting off the fuel. (Disconnect the wires if a fuel shutdown solenoid is used).
3. Remove all the glow plugs from the engine and install the compression gauge/adaptor combination to the cylinder on which the compression is to be measured.



4. Crank the engine and allow the gauge to reach a maximum reading, then record that reading.
5. Repeat this process for each cylinder.

**COMPRESSION PRESSURE** 441 psi (3.04 MPa) at 250 rpm.

**ALLOWABLE LIMIT** 370PSI (2.55 MPa).

**MAXIMUM PERMISSIBLE DIFFERENCE BETWEEN CYLINDERS**  
28.44 psi (196 Kpa)

**NOTE:** If the readings are below the limit, the engine needs an overhaul.

6. Re-install the glow plugs and reset the fuel shut-off to the run position.

## Low Compression

When low compression is found, determine the cause by applying a small amount of oil in the cylinder thru the glow plug hole. Allow the oil to settle.

Install the pressure gauge and repeat the above test. If the compression reading rises dramatically, the fault is with the rings. If the compression valve does not rise, the problem is with the valves.

A slight rise in compression would indicate a problem with both the rings and the valves.

## OIL PRESSURE

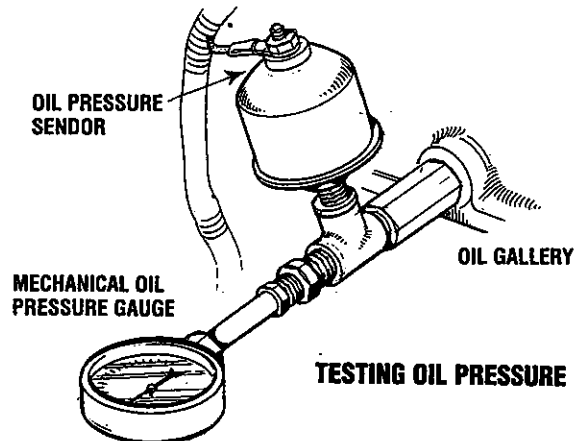
The engine's oil pressure, during operation, is indicated by the oil pressure gauge on the instrument panel. During normal operation, the oil pressure will range between 40 and 80 psi depending on the load.

**NOTE:** A newly started, cold engine can have an oil pressure reading up to 80 psi. A warmed engine can have an oil pressure reading as low as 20 psi. These readings will vary depending upon the temperature of the engine and the load placed on the generator.

## Testing Oil Pressure

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

**OIL PRESSURE** 20 - 80 psi at 1800 rpm.  
(depending on operating conditions)



# 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.

Capacitor and repulsion-induction motors require from 2 to 4 times as much current to start as to run. The current required to start any motor varies with the load connected to it. An electric motor connected to an air compressor, for example, will require more current than a motor to which no load is connected.

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

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

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

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

**CAUTION:** Prior to any cleaning or maintenance, make certain all switches and breakers are off and the generator is at room temperature.

## Generator Maintenance

- Maintaining reasonable cleanliness is important. Connections of terminal boards and rectifiers may become corroded, and insulation surfaces may start conducting if salts, dust, engine exhaust, carbon, etc. are allowed to build up. Clogged ventilation openings may cause excessive heating and reduced life of windings.
- For unusually severe conditions, thin rust-inhibiting petroleum-base coatings, should be sprayed or brushed over all surfaces to reduce rusting and corrosion. Typical materials suggested are Daubert Chemical Co. "Non-Rust AC-410" and Ashland "Tectyle 506" or equivalent.
- In addition to periodic cleaning, the generator should be inspected for (a) tightness of all connections, (b) evidence of overheated terminals and (c) loose or damaged wires.
- The drive discs on single bearing generators should be checked periodically if possible for tightness of screws and for any evidence of incipient cracking failure. Discs should not be allowed to become rusty because rust may accelerate cracking. The bolts which fasten the drive disc to the generator shaft must be hardened steel SAE grade 8, identified by 6 radial marks, one at each of the 6 corners of the head.
- The rear armature bearing is lubricated and sealed; no maintenance is required. However, if the bearing becomes noisy or rough-sounding, have it replaced.
- Examine bearing at periodic intervals. No side movement of shaft should be detected when force is applied. If side motion is detectable, bearings are wearing or wear on shaft of bearing socket outside bearing has occurred. Repair must be made quickly or major components will rub and cause major damage to generator.
- Compressed air can be used to clean the generator exterior. Do not use compressed air on internal components.

*Some of the above maintenance may require the services of a qualified technician.*

# ENGINE TROUBLESHOOTING

The following troubleshooting table describes certain problems relating to engine/generator service, the probable causes of these problems, and the recommendations to overcome these problems.

**NOTE:** *The engine's electrical system is protected by a 20 ampere manual reset circuit breaker located on a bracket at the back of the engine. The preheat solenoid is mounted on the same bracket.*

Problem	Probable Cause	Verification/Remedy
No panel indications; glow plugs fuel pump is not working (key switch is on and PREHEAT button is depressed).	<ol style="list-style-type: none"> <li>1. 20-amp circuit breaker tripped.</li> <li>2. 8-amp control panel fuse blown.</li> <li>3. Loose battery connections.</li> <li>4. Faulty K2 relay.</li> <li>5. Emergency stop button depressed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reset breaker; if breaker trips again, check preheat solenoid circuit and check circuit for shorts to ground.</li> <li>2. Determine cause of overload and replace fuse.</li> <li>3. Check (+) connection to starter solenoid and (-) connection to engine ground stud. Check battery cable connections.</li> <li>4. Check with ohmmeter, replace if faulty.</li> <li>5. Check indicator light on the control panel. Twist button to reset.</li> </ol>
START button is depressed, no starter engagement.	<ol style="list-style-type: none"> <li>1. Connection to solenoid faulty.</li> <li>2. Faulty switch.</li> <li>3. Faulty solenoid.</li> <li>4. Loose battery connections.</li> <li>5. Low battery.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check connection.</li> <li>2. Check switch with ohmmeter.</li> <li>3. Check that 12 volts are present at the solenoid connection.</li> <li>4. Check battery connections.</li> <li>5. Check battery charge state.</li> </ol>
START Button is depressed, panel indications OK, starter solenoid OK fuel solenoid not functioning.	<ol style="list-style-type: none"> <li>1. Poor connections to fuel solenoid.</li> <li>2. Defective fuel solenoid..</li> </ol>	<ol style="list-style-type: none"> <li>1. Check connections.</li> <li>2. Check that 12 volts are present at the (+) connection on the fuel run solenoid.</li> </ol>
Engine cranks, but does not start, fuel solenoid energized.	<ol style="list-style-type: none"> <li>1. Faulty fueling system.</li> <li>2. Preheat solenoid faulty.</li> <li>3. Low battery power.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check fuel supply/fuel pump.                             <ol style="list-style-type: none"> <li>1a. Check for air in fuel system. Bleed air from fuel system.</li> <li>1b. Fuel filter clogged. Replace filter and bleed air from fuel system.</li> </ol> </li> <li>2. Check solenoid.</li> <li>3. Replace batteries.</li> </ol>
Engine can't be stopped.	<ol style="list-style-type: none"> <li>1. Faulty DC alternator.</li> <li>2. Fuel run solenoid will not de-energize.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove Exc. connection at alternator, replace alternator.</li> <li>2. Manually disconnect the 12 volt connection to the fuel run solenoid at the injection pump.</li> </ol>
Battery runs down.	<ol style="list-style-type: none"> <li>1. Key left in "on" position.</li> <li>2. High resistance leak to ground.</li> <li>3. Low resistance leak.</li> <li>4. Poor battery connections.</li> <li>5. DC alternator not charging</li> </ol>	<ol style="list-style-type: none"> <li>1. Observe if gauges and panel lights are activated when engine is not running.</li> <li>2. Check wiring. Insert sensitive (0 – .25 amp) meter in battery lines. (Do not start engine.) Remove connections and replace after short is located.</li> <li>3. Check all wires for temperature rise to locate the fault.</li> <li>4. Check cable connections at battery for loose connections, corrosion</li> <li>5. Check connections, check belt tension, test alternator.</li> </ol>
Battery not charging	<ol style="list-style-type: none"> <li>1. DC charge circuit faulty.</li> <li>2. Alternator drive.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform DC voltage check.</li> <li>2. Check drive belt tension; alternator should turn freely. Check for loose connections. Check output with voltmeter. Ensure 12 volts are present at the Exc. terminal.</li> </ol>
Unstable engine running - poor engine output.	<ol style="list-style-type: none"> <li>1. Injection nozzle failure.</li> <li>2. Fuel supply.</li> <li>3. Incorrect valve clearance.</li> <li>4. Uneven compression pressure between cylinders.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test injectors - replace.</li> <li>2. Insufficient fuel supply - dirty fuel.</li> <li>3. Re-set valve clearance.</li> <li>4. Test engine compression pressure.</li> </ol>

*(continued)*

# ENGINE TROUBLESHOOTING

Problem	Probable Cause	Verification/Remedy
Generator engine overheats/shuts down.	<ol style="list-style-type: none"> <li>1. Coolant not circulating.</li> <li>2. Generator overloaded.</li> <li>3. Radiator clogged or damaged.</li> <li>4. High temperature switch opens at too low a temperature.</li> </ol>	<ol style="list-style-type: none"> <li>1. Obstruction at water pump.               <ol style="list-style-type: none"> <li>1a. Thermostat — remove and test in hot water. Replace thermostat.</li> <li>1b. Loss of coolant — check hoses, hose clamps, drain plug, etc. for leaks.</li> <li>1c. Broken or loose belts — tighten/replace.</li> <li>1d. Air leak in system; run engine and open the pressure cap to bleed air. Add coolant as needed.</li> </ol> </li> <li>2. Unload the generator, check load requirements.</li> <li>3. Clean/replace.</li> <li>4. Check for satisfactory operation with the switch bypassed. Check with ohmmeter, replace if faulty.</li> </ol>
Generator engine shuts down,	<ol style="list-style-type: none"> <li>1. Loss of oil.</li> <li>2. Pressure switch opens at too high a pressure.</li> <li>3. DC Electrical Overload.</li> <li>4. Overcurrent Relay tripped.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check dipstick, look for oil leaks at oil filter and at oil drain hose connection.</li> <li>2. Check for satisfactory operation with switch bypassed, check with ohmmeter, replace if faulty.</li> <li>3. 20A circuit breaker reset. 8A control panel fuse replace.</li> <li>4. Reduce load.</li> </ol>
Low Output Voltage	<ol style="list-style-type: none"> <li>1. Faulty or loose connections to voltage regulator.</li> <li>2. Faulty generator windings.</li> <li>3. 4A AVR fuse blown.</li> <li>4. Faulty voltage regulator.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check voltage regulator.</li> <li>2. Test windings.</li> <li>3. Determine cause of overload and replace fuse.</li> <li>4. Replace.</li> </ol>
Exhaust smoke problems	<ol style="list-style-type: none"> <li>1. Blue smoke.</li> <li>2. White smoke.</li> <li>3. Black smoke.</li> </ol>	<ol style="list-style-type: none"> <li>1. Incorrect grade of engine oil.               <ol style="list-style-type: none"> <li>1a. Crankcase is overfilled with engine oil (oil is blowing out through the exhaust).</li> </ol> </li> <li>2. Engine is running cold.               <ol style="list-style-type: none"> <li>2a. Faulty injector or incorrect injector timing.</li> </ol> </li> <li>3. Improper grade of fuel.               <ol style="list-style-type: none"> <li>3a. Fuel burn incomplete due to high back-pressure in exhaust or insufficient air for proper combustion (check for restrictions in exhaust system; check air intake).</li> <li>3b. Improperly timed injectors or valves, or poor compression.</li> <li>3c. Lack of air — check air intake and air filter. Check for proper ventilation.</li> <li>3d. Overload.</li> </ol> </li> </ol>

# WIRE SIZES AND COLORS

WIRE NO.	COLOR	AWG	WIRE NO.	COLOR	AWG
A01	BLK	#10	A45A	BLK	#16
A02	BLK	#10	A45B	BLK	#16
A03	BLK	#10	A46A	BLK	#16
A04	BLK	#10	A46B	BLK	#16
A05	BLK	#10	A47A	BLK	#16
A06	BLK	#10	A47B	BLK	#16
A07	BLK	#10	A48A	BLK	#16
A08	BLK	#10	A48B	BLK	#16
A09	BLK	#10	A49A	BLK	#16
A10	WHT	#10	A49B	BLK	#16
A11	WHT	#10	A50A	BLK	#16
A12	BLK	#10	A50B	BLK	#16
A13	BLK	#10	A51A	BLK	#16
A14	BLK	#10	A51B	BLK	#16
A15	BLK	#10	A52A	BLK	#16
A16	BLK	#10	A52B	BLK	#16
A17	BLK	#8	A53	BLK	#16
A18	BLK	#8	A54	BLK	#16
A19	BLK	#8	A55	BLK	#16
A20	BLK	#8	A56	BLK	#16
A21	BLK	#8	A57	BLK	#16
A22	WHT	#10	A58	BLK	#16
A23	WHT	#10	A59	BLK	#16
A24	BLK	#8	A60	BLK	#16
A25	BLK	#8	A61	BLK	#16
A26	BLK	#10	A62	BLK	#16
A27	BLK	#10	A63	BLK	#16
A28	BLK	#10			
A29	BLK	#10	N01	WHT	#8
A30	BLK	#10	N02	WHT	#8
A31	BLK	#12	N03	WHT	#10
A32	BLK	#10	N04	WHT	#10
A33	BLK	#10	N05	WHT	#10
A34	BLK	#10			
A35	BLK	#10	G00	BLK	#8
A36	BLK	#10	G01	GRN	#8
A37	BLK	#12	G02	GRN	#10
A38	BLK	#16	G03	GRN	#10
A39	BLK	#16	G04	GRN	#12
A40A	BLK	#16	G05	GRN	#8
A40B	BLK	#16			
A41A	BLK	#16			
A41B	BLK	#16			
A42A	BLK	#16			
A42B	BLK	#16			
A43A	BLK	#16			
A43B	BLK	#16			
A44A	BLK	#16			
A44B	BLK	#16			
A45	BLK	#16			

WIRE NO.	COLOR	AWG	WIRE NO.	COLOR	AWG
D00	BLK	#2	D33	RED/WHT	#16
D01	RED	#10	D34	RED/WHT	#16
D02	RED	#12	D35	RED/VIO	#16
D03	RED	#12	D36	RED/VIO	#16
D04	RED	#12	D37	RED/VIO	#16
D05	YEL/RED	#12	D38	RED/VIO	#16
D06	WHT	#12	D39	RED/VIO	#16
D07	RED	#10	D40	RED/VIO	#16
D08	ORG	#16	D41	RED	#16
D09	YEL	#16	D42	RED	#16
D10	GRY	#16	D43	RED/WHT	#16
D11	GRY	#16	D44	RED/WHT	#16
D12	VIO	#16	D45	VIO	#16
D13	VIO	#16			
D14	VIO	#14	G10	BLK	#2
D15A	RED	#14	G11	BLK	#16
D15B	RED	#14	G12	BLK	#16
D16A	RED/WHT	#14	G13	BLK	#12
D16B	RED/WHT	#14	G14	BLK	#16
D16C	RED/WHT	#14	G15A	BLK	#14
D17A	ORG	#16	G15B	BLK	#14
D17B	ORG	#16	G15C	BLK	#16
D17C	ORG	#16	G16	BLK	#16
D18A	YEL	#16	G17	BLK	#16
D18B	YEL	#16	G18	BLK	#16
D18C	YEL	#16	G19	BLK	#16
D19A	VIO	#16	G20	BLK	#16
D19B	VIO	#16	G21	BLK	#16
D19C	VIO	#16	G22	BLK	#16
D20A	BLU	#16	G23	BLK	#16
D21A	BRN	#16			
D22A	TAN	#16			
D22B	TAN	#16			
D22C	TAN	#16			
D23A	LT BLU	#16			
D23B	LT BLU	#16			
D23C	LT BLU	#16			
D24A	GRY	#16			
D24B	GRY	#16			
D25A	GRY	#16			
D25B	GRY	#16			
D26B	RED	#14			
D26C	RED	#14			
D27B	WHT	#16			
D27C	WHT	#16			
D28	WHT	#16			
D29	RED	#14			
D30	RED/WHT	#14			
D31	RED/WHT	#16			
D32	RED/WHT	#16			

# STANDARD AND METRIC CONVERSION DATA

## LENGTH-DISTANCE

Inches (in) x 25.4 = Millimeters (mm) x .0394 = Inches

Feet (ft) x .305 = Meters (m) x 3.281 = Feet

Miles x 1.609 = Kilometers (km) x .621 = Miles

## DISTANCE EQUIVALENTS

1 Degree of Latitude = 60 Nm = 111.120 km

1 Minute of Latitude = 1 Nm = 1.852 km

## VOLUME

Cubic Inches (in<sup>3</sup>) x 16.387 = Cubic Centimeters x .061 = in<sup>3</sup>

Imperial Pints (IMP pt) x .568 = Liters (L) x 1.76 = IMP pt

Imperial Quarts (IMP qt) x 1.137 = Liters (L) x .88 = IMP qt

Imperial Gallons (IMP gal) x 4.546 = Liters (L) x .22 = IMP gal

Imperial Quarts (IMP qt) x 1.201 = US Quarts (US qt) x .833 = IMP qt

Imperial Gallons (IMP gal) x 1.201 = US Gallons (US gal) x .833 = IMP gal

Fluid Ounces x 29.573 = Milliliters x .034 = Ounces

US Pints (US pt) x .473 = Liters(L) x 2.113 = Pints

US Quarts (US qt) x .946 = Liters (L) x 1.057 = Quarts

US Gallons (US gal) x 3.785 = Liters (L) x .264 = Gallons

## MASS-WEIGHT

Ounces (oz) x 28.35 = Grams (g) x .035 = Ounces

Pounds (lb) x .454 = Kilograms (kg) x 2.205 = Pounds

## PRESSURE

Pounds Per Sq In (psi) x 6.895 = Kilopascals (kPa) x .145 = psi

Inches of Mercury (Hg) x .4912 = psi x 2.036 = Hg

Inches of Mercury (Hg) x 3.377 = Kilopascals (kPa) x .2961 = Hg

Inches of Water (H<sub>2</sub>O) x .07355 = Inches of Mercury x 13.783 = H<sub>2</sub>O

Inches of Water (H<sub>2</sub>O) x .03613 = psi x 27.684 = H<sub>2</sub>O

Inches of Water (H<sub>2</sub>O) x .248 = Kilopascals (kPa) x 4.026 = H<sub>2</sub>O

## TORQUE

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

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

## VELOCITY

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

## POWER

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

## FUEL CONSUMPTION

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

Kilometers Per Liter (Km/L) x 2.352 = IMP MPG

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

Kilometers Per Liter (Km/L) x 2.352 = US MPG

## TEMPERATURE

Degree Fahrenheit (°F) = (°C X 1.8) + 32

Degree Celsius (°C) = (°F - 32) x .56

## LIQUID WEIGHTS

Diesel Oil = 1 US gallon = 7.13 lbs

Fresh Water = 1 US gallon = 8.33 lbs

Gasoline = 1 US gallon = 6.1 lbs

Salt Water = 1 US gallon = 8.56 lbs

# METRIC CONVERSIONS

## INCHES TO MILLIMETERS

## MILLIMETERS TO INCHES

Inches	mm	Inches	mm	mm	Inches	mm	Inches
1	25.40	15	381.00	1	0.0394	15	0.5906
2	50.80	20	508.00	2	0.0787	20	0.7874
3	76.20	25	635.00	3	0.1181	25	0.9843
4	101.60	30	762.00	4	0.1575	30	1.1811
5	127.00	35	889.00	5	0.1969	35	1.3780
10	254.00	40	1016.00	10	0.3937	40	1.5748

10 MILLIMETERS = 1 CENTIMETER, 100 CENTIMETERS = 1 METER = 39.37 INCHES (3.3 FEET)

## INCHES TO METERS

## METERS TO INCHES

Inches	Meters	Inches	Meters	Meters	Inches	Meters	Inches
1	0.0254	7	0.1778	0.1	3.937	0.7	27.559
2	0.0508	8	0.2032	0.2	7.874	0.8	31.496
3	0.0762	9	0.2286	0.3	11.811	0.9	35.433
4	0.1016	10	0.2540	0.4	15.748	1.0	39.370
5	0.1270	11	0.2794	0.5	19.685	1.1	43.307
6	0.1524	12	0.3048	0.6	23.622	1.2	47.244

TO CONVERT METERS TO CENTIMETERS, MOVE DECIMAL POINT TWO PLACES TO THE RIGHT

## YARDS TO METERS

## METERS TO YARDS

Yards	Meters	Yards	Meters	Meters	Yards	Meters	Yards
1	0.91440	6	5.48640	1	1.09361	6	6.56168
2	1.82880	7	6.40080	2	2.18723	7	7.65529
3	2.74320	8	7.31520	3	3.28084	8	8.74891
4	3.65760	9	8.22960	4	4.37445	9	9.84252
5	4.57200	10	9.14400	5	5.46807	10	10.93614

MOVE DECIMAL POINT FOR HIGHER VALUES — e.g. 6,000 METERS = 6,561.68 YARDS

## POUNDS TO KILOGRAMS

## KILOGRAMS TO POUNDS

lb	kg	lb	kg	kg	lb	kg	lb
1	0.454	6	2.722	1	2.205	6	13.228
2	0.907	7	3.175	2	4.409	7	15.432
3	1.361	8	3.629	3	6.614	8	17.637
4	1.814	9	4.082	4	8.818	9	19.842
5	2.268	10	4.536	5	11.023	10	22.046

## GALLONS TO LITERS

## LITERS TO GALLONS

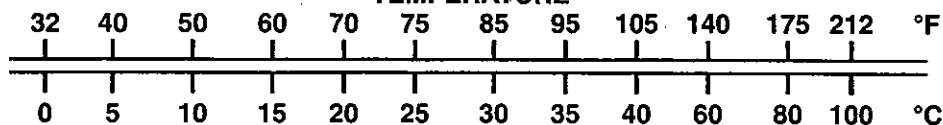
Gallons	Liters	Gallons	Liters	Liters	Gallons	Liters	Gallons
1	3.79	10	37.86	1	0.26	60	15.66
2	7.57	20	75.71	2	0.53	90	23.77
3	11.36	30	113.57	5	1.32	120	31.32
4	15.14	40	151.42	10	2.64	150	39.62
5	18.93	50	189.28	20	5.28	180	47.54

## PINTS TO LITERS

## LITERS TO PINTS

Pints	Liters	Pints	Liters	Liters	Pints	Liters	Pints
1	0.47	6	2.84	1	2.11	6	12.68
2	0.95	7	3.31	2	4.23	7	14.79
3	1.42	8	3.79	3	6.34	8	16.91
4	1.89	9	4.26	4	8.45	9	19.02
5	2.37	10	4.73	5	10.57	10	21.13

## TEMPERATURE



# NAI 25 kVA GENERATOR SPECIFICATIONS

## ENGINE

Make/Model	Isuzu 4LE1-PV02
Design	Water Cooled 4-Cycle Diesel
Combustion System	Swirl Chambered In-Direct Injection
Starting System	Electric - 12 Volt DC
Displacement	133 cu in (2.2 L)
Bore x Stroke	3.35 in x 3.78 in (85 mm x 96 mm)
Number of Cylinders	4
HP @ Rated Speed	34.5
RPM	1800
Governing	Mechanical
Coolant System Capacity	12 Qts.
Lube Oil Capacity	8 qts (8.1 L)
Fuel	Diesel (ASTM No. 2-D)
Fuel Capacity (Gallons)	50 (189.25 L)
Fuel Consumption @ 1/2 Load	1.0 gph
Fuel Consumption @ Full Load	1.7 gph
Battery Recommendation	12V 750 CCA
Fuel Injection Pump	Bosch PFR Type
Aspiration	Natural
Firing Order	1 - 3 - 4 - 2
Engine Torque	101 ft-lb @ 1800 RPM
Compression Ratio	21.5 to 1
Direction of Rotation	Clockwise When Viewed From Front
Fan Pulley	Groove Type A V Belt (110mm Diameter)
DC Charging Alternator	20A Belt Driven
Fuel Tank Capacity	50 Gallons
Sound Level db(A) @ 23 ft	65 @ full load

## GENERATOR

Standby Output - 150°C rise	20.0 kW (25.0 kVA)
Prime Output - 125°C Rise	18.7 kW (23.4 kVA)
Single Phase Output	18.0 kW Standby / 16.0 kW Prime
Power Factor - 3 Phase / 1 Phase	0.8 / 1.0
Generator Type	Brushless, Single Bearing
Frequency	60 Hertz - 1800 RPM
Insulation	Class H
Voltage - 3 Phase Adjustable	208, 220, 240, 416, 440, 480
Voltage - 1 Phase Adjustable	120, 127, 139, 240, 254, 277
Armature Connection	Star with Neutral/ Zig-Zag
Voltage Regulation	±1%
AC Receptacles	(2) 20A, 120V GFI Duplex (2) 50A, 120/240V Twistlock

## TUNE UP DATA

Valve Clearance	0.16 in (.40 mm) Cold
Injection Pressure	1920 Psi (13.2 MPa)
Valve Timing	
Intake	Open 15° BTDC - Close 29° ABDC
Exhaust	Open 40° BBDC - Close 16° ATDC
Injection Timing/Pressure	16° BTDC, 135 Kg/cm <sup>2</sup> (1920 PSI)
Cylinder Compression Pressure	441 psi (3.04 MPa)

## DIMENSIONS

Generator	74x38x51 in (1879x965x1295 mm)
Including Trailer	124x62x72 in (3149x1574x1828 mm)
Generator Weight w/o fuel	1740 lbs (790 Kg)
Weight including trailer w/o fuel	2330 lbs (1058 Kg)



# WIRING DIAGRAM 47292

