

# **OPERATIONS & MAINTENANCE**

## **MANUAL**

### **WESTERBEKE**

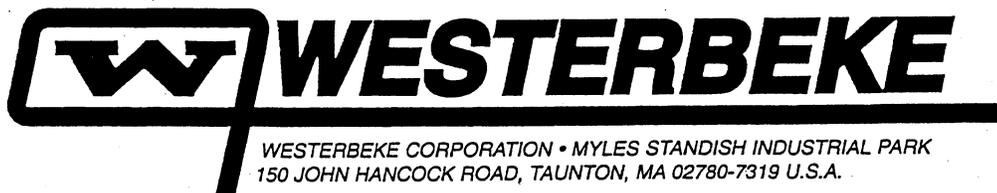
#### **DIESEL GENERATORS MOBILE & INDUSTRIAL**

**MODEL 8.0 BTDR, 10.0 BTDR, 11.0 BTDR  
AND 12.5 BTDAR**

**SINGLE & THREE PHASE GENERATORS**

Publication #039673

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October 1993



## IMPORTANT

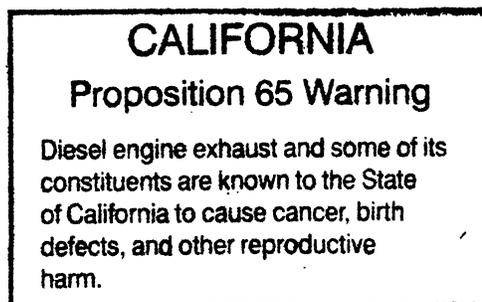
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# INTRODUCTION

Thank you for purchasing a Westerbeke diesel generator. With proper care on a routine basis, your Westerbeke generator is designed to provide you with reliable and economical power for many years.

This manual will help familiarize you with your engine. It covers initial service, operation, maintenance and troubleshooting in depth.

It also contains important safety information, key specifications, and a wiring diagram.

No manual can provide for every possible question or contingency. If you should need further assistance, please contact the Westerbeke Master Distributor located nearest you for technical advice.

Again, thank you for choosing a Westerbeke!

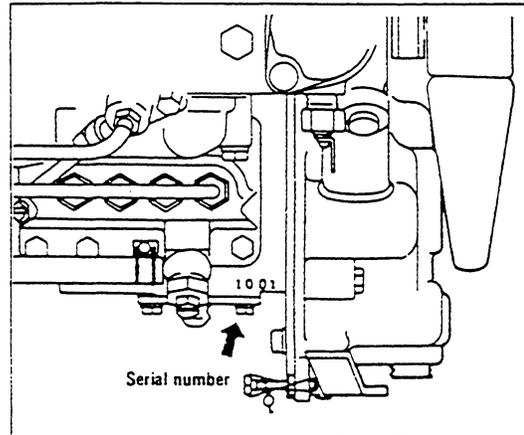
Sincerely,

WESTERBEKE CORPORATION

# ENGINE SERIAL NUMBER LOCATION

The engine serial number and model designation are found on an I.D. tag affixed to the generator's housing. An illustration of this I.D. tag is shown below. Take the time to fill in the model description, engine serial number and generator serial number in the appropriate blocks in the illustration below. These will provide quick reference when ordering spares, repair parts or when seeking technical information.

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



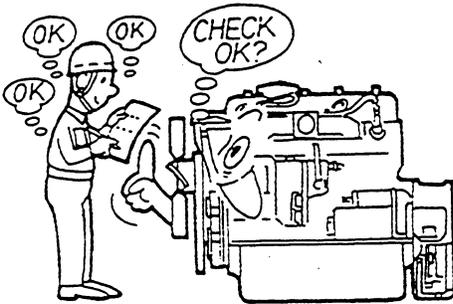
Engine Serial Number Stamp

The engine serial number can also be found stamped into the engine block on the flat outer surface where the injection pump is mounted. The generator serial number is stamped into the generator housing on the flat surface above the rear generator bearing.

# BE SAFETY CONSCIOUS

A careless moment can cause an accident or fire. Here are basic DO's and DON'TS:

## DO'S

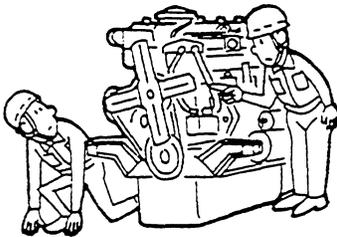


- DO visual inspections before starting your generator.

## DON'TS



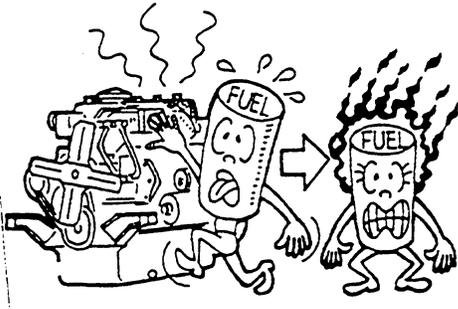
- DON'T touch any moving part on your engine during operation.



- DO check your engine once a day. Keep eyes open and be alert to people and obstacles.



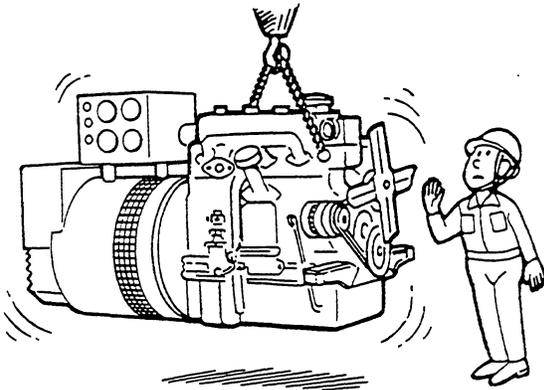
- DON'T touch hot engine parts such as exhaust manifolds.



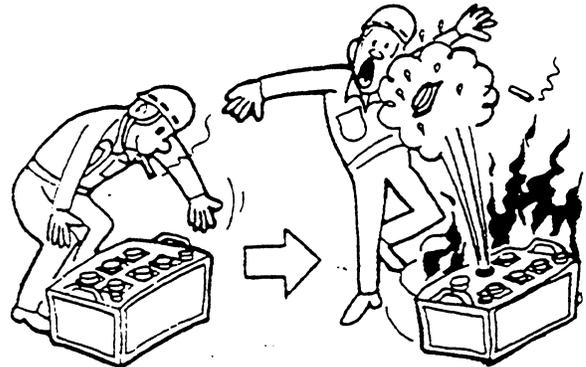
- DO keep fuel away from your engine at all times. Check for leaks regularly and correct them.



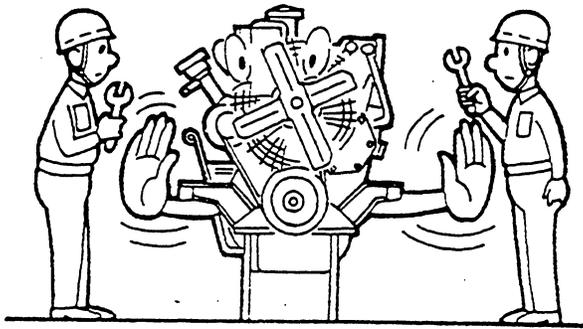
- DON'T remove radiator filler cap immediately after shutting down engine.



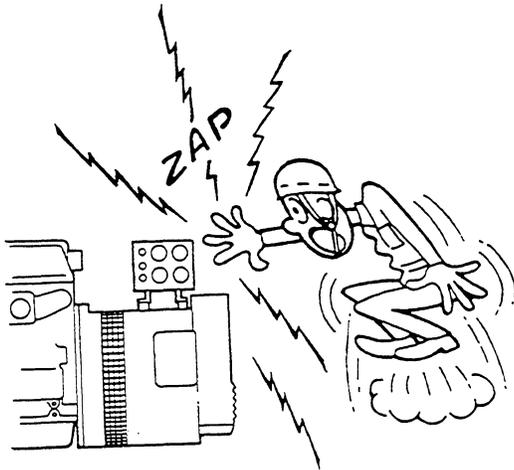
- DO check the capacity of sling hoist when lifting the unit. Use hangers and a wad of cloth in between sling and unit.



- DON'T smoke near the battery  
Never use an open flame as a light anywhere on or around the battery. Battery gas is highly flammable. Sulfuric acid is destructive. If it comes in contact with your skin, wash it off at once with water.



- DON'T work on an engine while it is running. If it is necessary to check the engine while running, use caution and beware of moving parts and the presence of AC voltage.



- DON'T touch AC electrical connections while the unit is running. Lethal voltage is present at these connections.

# NOTES, CAUTIONS AND WARNINGS

NOTES, CAUTIONS, AND WARNINGS are used in this manual to emphasize important and critical instructions. They are used for the following conditions:

## NOTE

An operating procedure, condition, etc. essential to notate.

## CAUTION

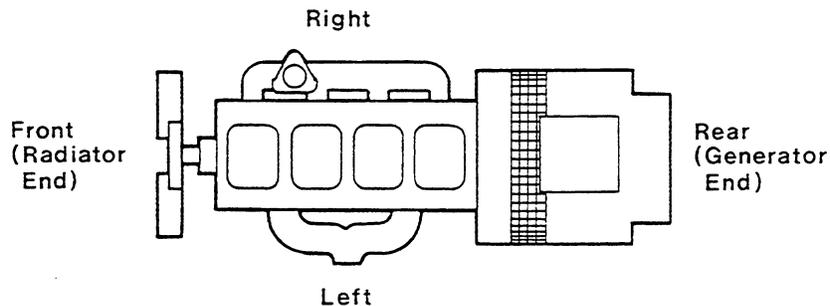
Operating procedures, practices, etc. which if not strictly observed, will result in damage or destruction to your engine.

## WARNING

Operating procedures, practices, etc. which if not correctly followed, will result in personal injury or loss of life.

## DEFINITION OF LOCAL TERMS

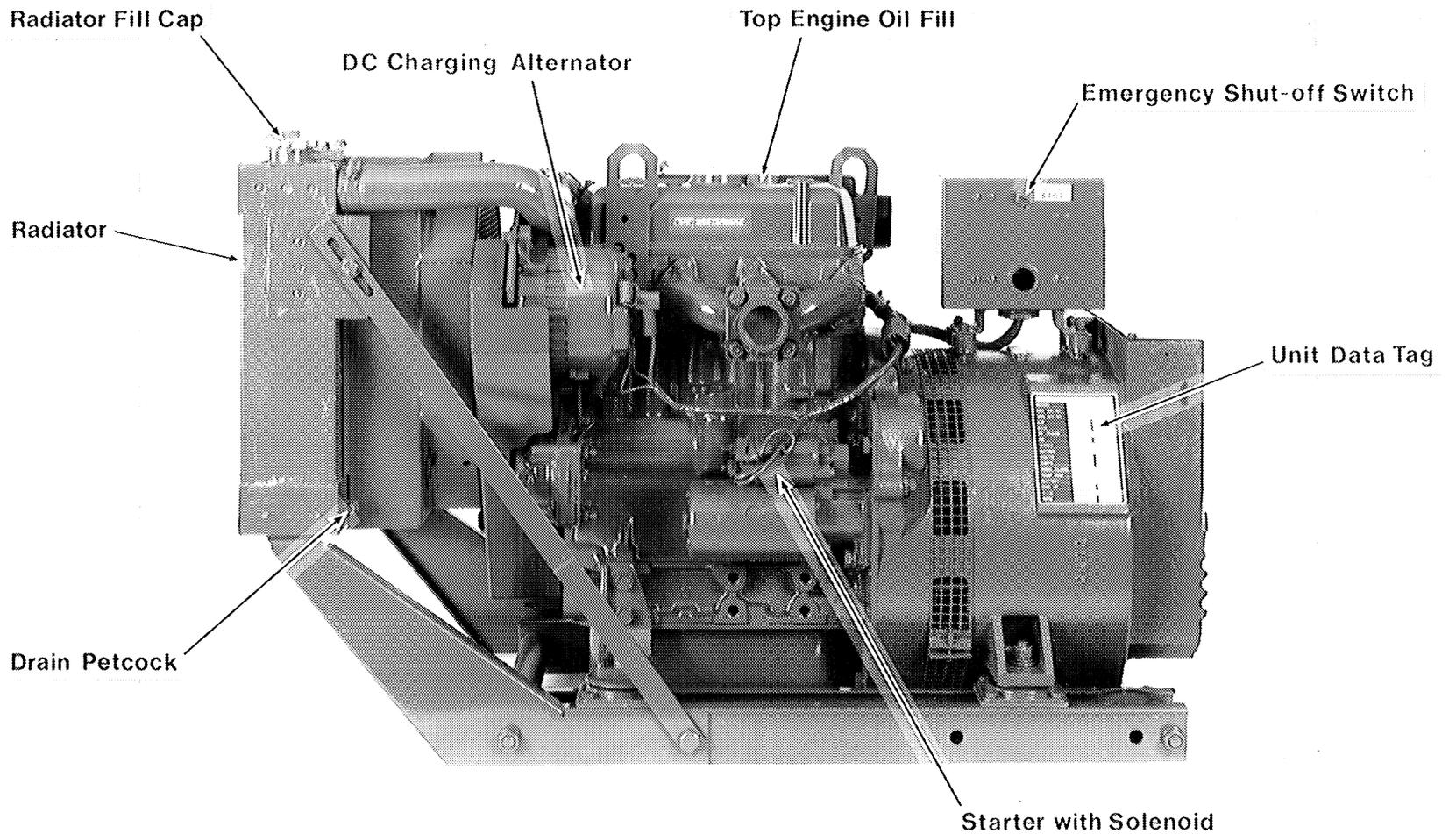
The words "leftside", "rightside", "front", and "rear" are used in the senses illustrated below:



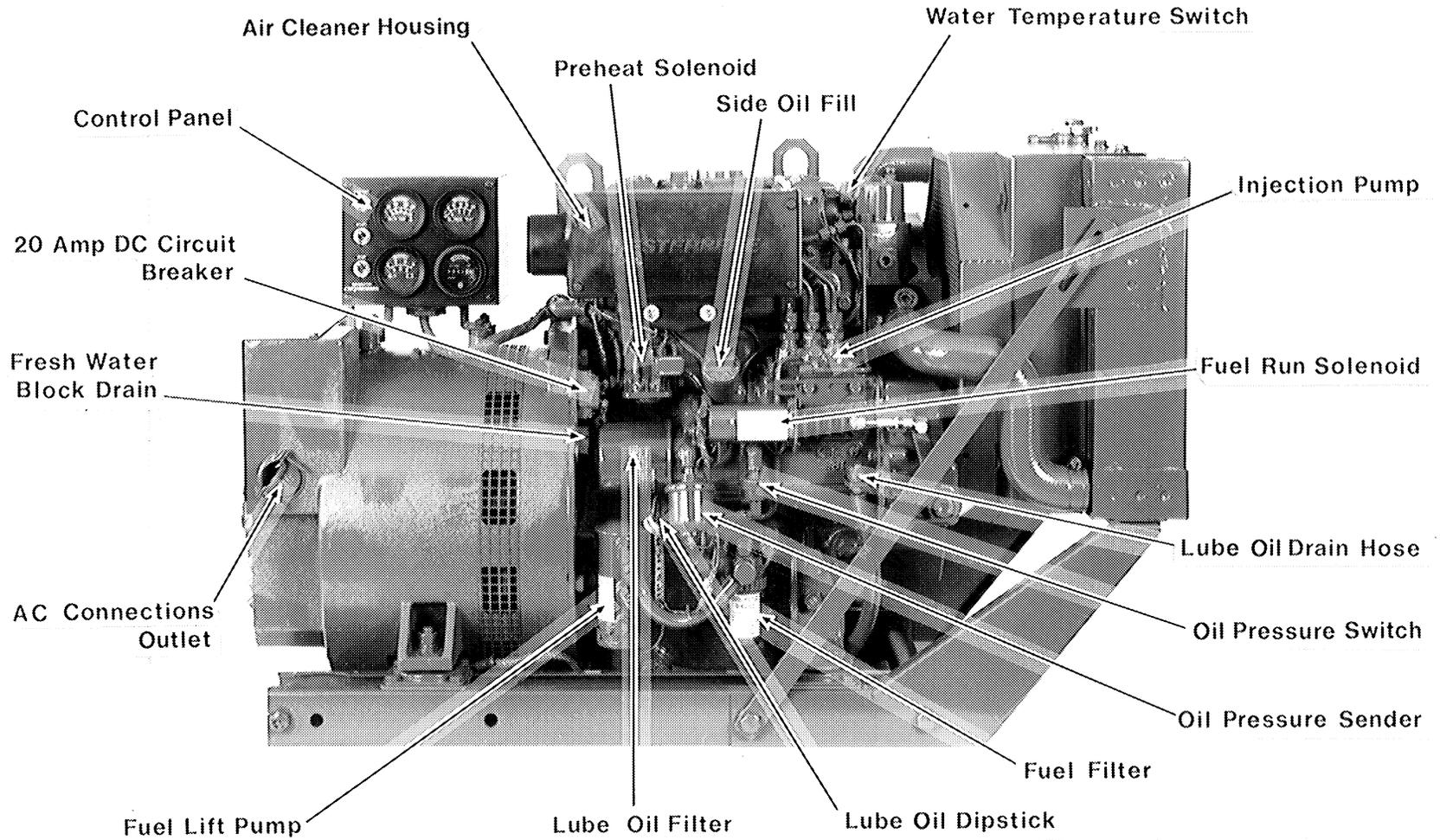
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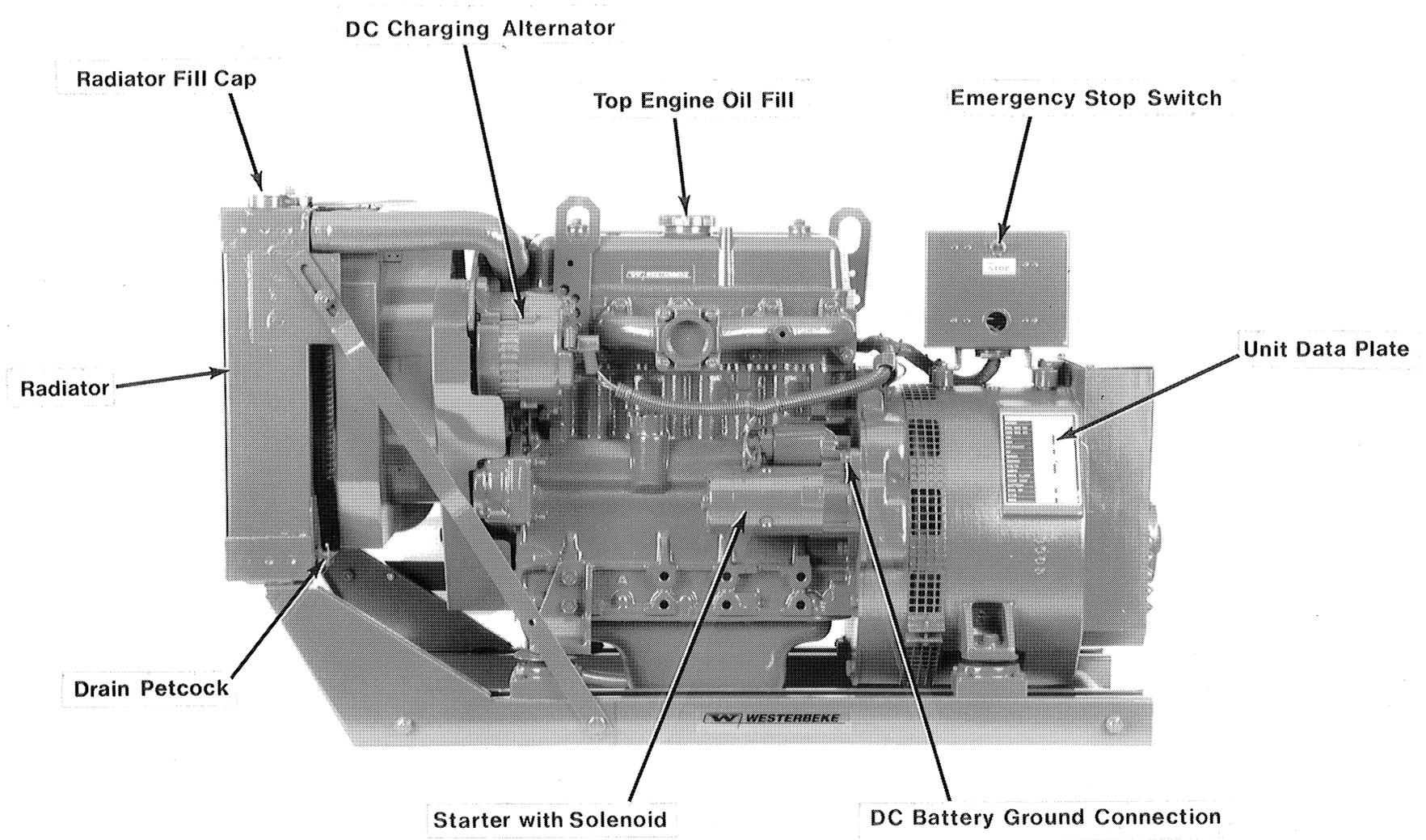


**8.0 & 10.0 BTDR GENERATOR**  
LEFT SIDE

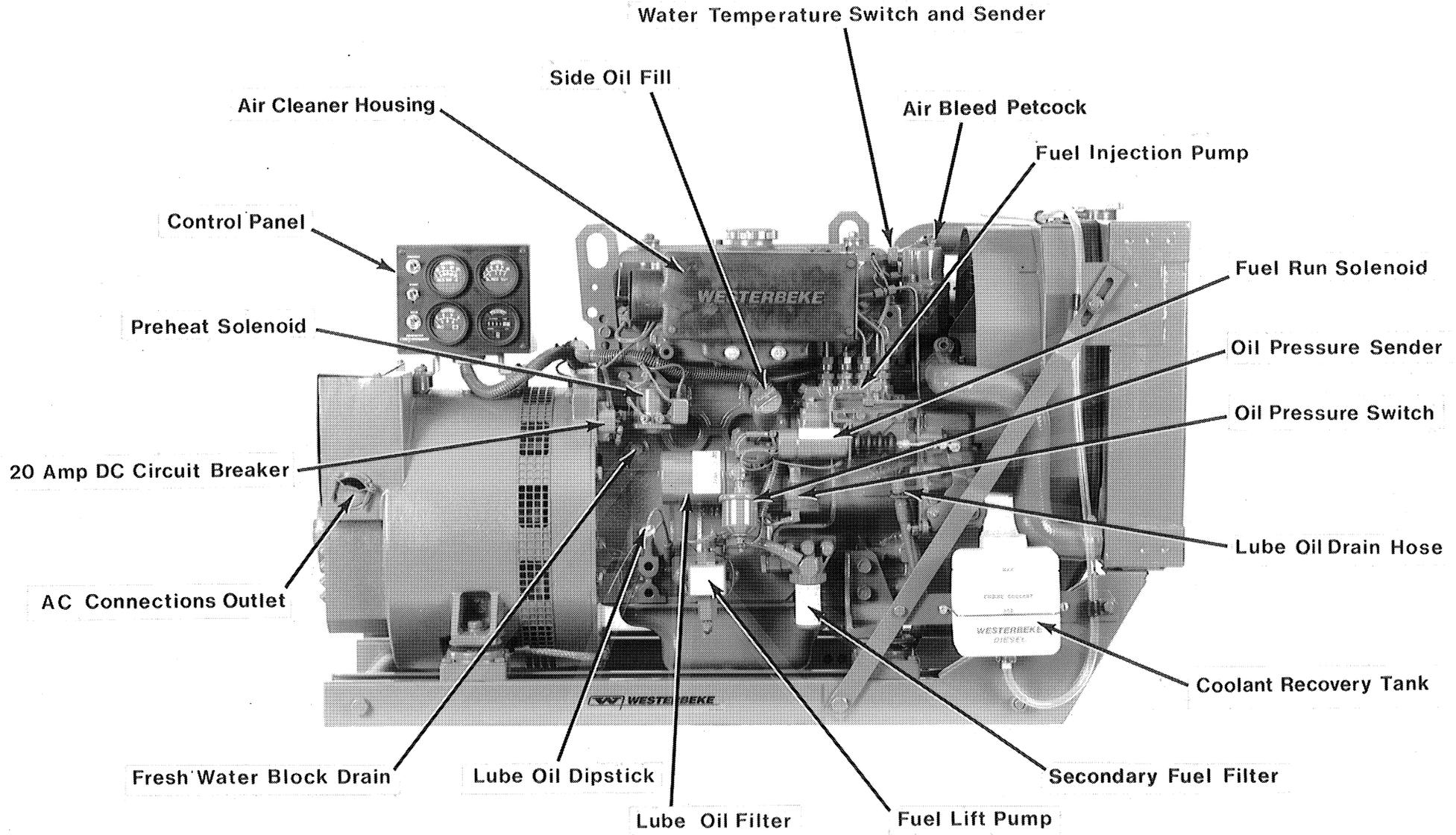


**8.0 & 10.0 BTDR GENERATOR**

RIGHT SIDE



**11.0 BTDR & 12.5 BT DAR**  
**LEFT SIDE**



**11.0 BTDR & 12.5 BTDR**  
**RIGHT SIDE**

## 8.0 BTDR DIESEL GENERATOR

### SINGLE PHASE

#### GENERAL SPECIFICATIONS

ENGINE TYPE	Diesel, 4 cycle, 3 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (14 hp at 1800 rpm maximum).
GOVERNOR	Mechanical, centrifugal weight type.
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	2.87 x 3.07 inches (73 x 78 mm)
PISTON DISPLACEMENT	60 cubic inches (0.979 liters)
FIRING ORDER	1-3-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	41.5 lb-ft (5.73 kg-m)
COMPRESSION RATIO	23:1
COMPRESSION PRESSURE	455.2 psi (32 kg/cm) at 280 rpm
VALVE TIMING	Intake Opens 18° BTDC Intake Closes 46° ABDC  Exhaust Opens 46° BBDC Exhaust Closes 18° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 45°
VALVE CLEARANCE (Engine Cold)	Intake 0.0098 inches (0.25 mm) Exhaust 0.0098 inches (0.25 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

**GENERAL SPECIFICATIONS CONTINUED.....**

**DIMENSIONS**

Height: 24.7 inches (627.3 mm)  
Width: 20.4 inches (518.1 mm)  
Length: 36.1 inches (916.9 mm)

**WEIGHT**

465 lbs. (211 kgs)

**FUEL CONSUMPTION**

0.9 gph (3.40 lph) at full rated output  
(approximate)

**8.0 BTDR DIESEL GENERATOR**  
**SINGLE PHASE**

**SYSTEM SPECIFICATIONS**

**FUEL SYSTEM:**

GENERAL	Open flow, totally self-bleeding
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Nippon Denso (Bosch M type)
FUEL INJECTION TIMING	19° BTDC ±0.5 (static timing)
NOZZLE	Throttle type
INJECTORS	Pintle type
FUEL PUMP	12-Volt DC
FUEL FILTER (on engine)	Canister type, with replaceable element
AIR CLEANER	Replaceable element
AIR FLOW ( engine combustion)	32 cfm (.906 cmm)

**COOLING SYSTEM:**

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	175° - 195° F (80° - 91° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	10 quarts approximately

**LUBRICATION SYSTEM:**

GENERAL	Pressure type by Trichoid pump, gear driven with external pressure relief valve
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## SYSTEM SPECIFICATIONS CONTINUED...

OIL FILTER	Full flow, paper element, spin-on type
SUMP CAPACITY (includes filter)	3.3 quarts (3.12 liters)
OPERATING OIL PRESSURE (engine hot)	40 - 50 psi (2.8 - 3.5 kg/cm)
OIL GRADE	<b>API SPECIFICATION CF OR CG-4</b> <b>SAE 30W, 10W-30 OR 15W-40</b>

### ELECTRICAL SYSTEM:

STARTING BATTERY	12 volt 30 A-H, (-) negative ground (recommended) (45 A-H in cold areas)
BATTERY CAPACITY	90 - 125 (Ampere - Hours)
DC CHARGING ALTERNATOR	12 volt DC, 50 amp
REGULATOR	Internal regulator built into the DC alternator
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, 1.2 KW, reduction type solenoid mounted
DC NO-LOAD CURRENT	90 amp (max.) at 11.5 volts
DC CRANKING CURRENT	175-200 amps ( engine cold)

### AC GENERATOR GENERAL:

SINGLE PHASE ONLY	Brushless, four pole, revolving field. Pre-lubricated single-bearing design. Reconnectable, single phase transformer regulated.
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## SYSTEM SPECIFICATIONS CONTINUED...

VOLTAGE (Single Phase)                      120 OR 120/240 volts- 60 Hertz  
220 volts - 50 Hertz  
Voltage regulation 5% no load to full load  
Frequency regulation: 3 Hertz (5%) no load  
to full load.

### RATING (Volts AC)

60 Hertz (1800 RPM) 8.0 KW	120 volts 66 amps 120/240 Volts 66/33 amps
50 Hertz (1500 RPM) 6.0 KW	220 volts 27 amps

### GENERATOR COOLING:

AIR REQUIREMENTS 60 Hertz at 1800 rpm	175 -200 cfm (4.95 - 5.66 cmm)
--	--------------------------------

NOTE: Increase air supply 15% for 50 hertz operation (1500 rpm)

### TUNE-UP SPECIFICATIONS:

INJECTOR PRESSURE	1707 psi (120 kg/cm + 10 kg/cm - 0 kg/cm)
ENGINE TIMING	19 BTDC (spill timing)

## 10.0 BTDR DIESEL GENERATOR

### SINGLE PHASE & THREE PHASE

#### GENERAL SPECIFICATIONS

ENGINE TYPE	Diesel, 4 cycle, 3 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (16.5 hp at 1800 rpm maximum).
GOVERNOR	Mechanical, centrifugal weight type.
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	3.07 x 3.07 inches (78 x 78 mm)
PISTON DISPLACEMENT	68 cubic inches (1.12l liters)
FIRING ORDER	1-3-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	47.7 lb-ft (6.6 kg-m)
COMPRESSION RATIO	23:1
COMPRESSION PRESSURE	455.2 psi (32 kg/cm) at 280 rpm
VALVE TIMING	Intake Opens 18° BTDC Intake Closes 46° ABDC Exhaust Opens 46° BBDC Exhaust Closes 18° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 45°
VALVE CLEARANCE (Engine Cold)	Intake 0.0098 inches (0.25 mm) Exhaust 0.0098 inches (0.25 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

## GENERAL SPECIFICATIONS CONTINUED....

### DIMENSIONS

Height: 24.7 inches(627.3 mm)  
Width: 20.4 inches (518.1 mm)  
Length: 39.3 inches (998.2 mm)

### WEIGHT

510 lbs. (231 kgs)

### FUEL CONSUMPTION

1.0 gph (3.78 lph) at full rated output  
(approximate)

**10.0 BTDR DIESEL GENERATOR**  
**SINGLE PHASE & THREE**

**SYSTEM SPECIFICATIONS**

**FUEL SYSTEM:**

GENERAL	Open flow, totally self-bleeding
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Nippon Denso (Bosch M type)
FUEL INJECTION TIMING	19° BTDC ± 0.5 (static timing)
NOZZLE	Throttle type
INJECTORS	Pintle type
FUEL PUMP	12-Volt DC
FUEL FILTER (on engine)	Canister type, with replaceable element
AIR CLEANER	Replaceable element
AIR FLOW ( engine combustion)	36 cfm (1.02.cmm)

**COOLING SYSTEM:**

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	175° - 195° F (80° - 91° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	10 quarts approximately

## SYSTEM SPECIFICATIONS CONTINUED...

### LUBRICATION SYSTEM:

GENERAL	Pressure type by Trichoid pump, gear driven with external pressure relief valve
OIL FILTER	Full flow, paper element, spin-on type
SUMP CAPACITY (includes filter)	3.3 quarts (3.12 liters)
OPERATING OIL PRESSURE (engine hot)	40 - 50 psi (2.8 - 3.5 kg/cm)
OIL GRADE	<b>API SPECIFICATION CF OR CG-4</b> <b>SAE 30W, 10W-30 OR 15W-40</b>

### ELECTRICAL SYSTEM:

STARTING BATTERY	12 volt 30 A-H, (-) negative ground (recommended) (45 A-H in cold areas)
BATTERY CAPACITY	90 - 125 (Ampere - Hours)
DC CHARGING ALTERNATOR	12 volt DC, 50 amp
REGULATOR	Internal regulator built into the DC alternator
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, 1.6KW, reduction type solenoid mounted
DC NO-LOAD CURRENT	90 amp (max.) at 11.5 volts
DC CRANKING CURRENT	225-250 amps (engine cold)

SYSTEM SPECIFICATIONS CONTINUED...

AC GENERATOR GENERAL:

SINGLE PHASE

Brushless, four pole, revolving field.  
Pre-lubricated single-bearing design.  
Reconnectable, single phase transformer  
regulation (optional solid-state voltage  
regulation).

VOLTAGE (Single Phase)

120 OR 120/240 volts- 60 Hertz  
220 volts - 50 Hertz  
Voltage regulation 5% no load to full load  
Frequency regulation: 3 Hertz (5%) no load  
to full load.

RATING (Volts AC)

60 Hertz (1800 RPM)  
10.0 KW

120 volts 83.3 amps  
120/240 83.3/41.6 amps

50 Hertz (1500 RPM)  
7.5 KW

220 volts 36.3amps

GENERAL THREE PHASE

Brushless, four-pole, revolving field.  
Pre-lubricated single bearing design.  
Reconnectable, three phase. Solid state  
voltage regulated.

Voltage - Parallel WYE 208 volts  
Series WYE 480 volts  
Series Delta 240 volts

Voltage regulation: 2% no load to full rated  
amperage output.  
Frequency regulation: 3 Hertz (5%) no load  
to full load.

RATING (Volts-Amps AC)

208 volts      34.7 amps  
480 volts      15.0 amps  
240 volts      30.1 amps

## SYSTEM SPECIFICATIONS CONTINUED...

### GENERATOR COOLING:

AIR REQUIREMENTS	200-225 cfm (5.66-6.37 cmm)
60 Hertz at 1800 rpm	

NOTE: Increase air supply 15% for 50 hertz operation (1500 rpm)

### TUNE-UP SPECIFICATIONS:

INJECTOR PRESSURE	1707 psi (120 kg/cm + 10 kg/cm - 0 kg/cm)
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ENGINE TIMING	19 BTDC (spill timing)
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## 11.0 BTDR DIESEL GENERATOR

### SINGLE PHASE & THREE PHASE

#### GENERAL SPECIFICATIONS

ENGINE TYPE	Diesel, 4 cycle, 4 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (16.5 hp at 1800 rpm maximum).
GOVERNOR	Mechanical, centrifugal weight type.
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	2.87 x 3.07 inches (73 x 78 mm)
PISTON DISPLACEMENT	80 cubic inches (1.305 liters)
FIRING ORDER	1-3-4-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	54 lb-ft (7.4 kg-m)
COMPRESSION RATIO	23:1
COMPRESSION PRESSURE	455.2 psi (32 kg/cm) at 280 rpm
VALVE TIMING	Intake Opens 18° BTDC Intake Closes 46° ABDC Exhaust Opens 46° BBDC Exhaust Closes 18° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 45°
VALVE CLEARANCE (Engine Cold)	Intake 0.0098 inches (0.25 mm) Exhaust 0.0098 inches (0.25 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

## GENERAL SPECIFICATIONS CONTINUED....

### DIMENSIONS

Height: 28.6 inches 726.4 mm  
Width: 20.0 inches 508.0 mm  
Length: 41.7inches 1059.2 mm

### WEIGHT

597 lbs. (271 kgs)

### FUEL CONSUMPTION

1.2 gph (4.54 lph) at full rated output  
(approximate)

**11.0 BTDR DIESEL GENERATOR**  
**SINGLE PHASE & THREE PHASE**

**SYSTEM SPECIFICATIONS**

**FUEL SYSTEM:**

GENERAL	Open flow, totally self-bleeding
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Nippon Denso (Bosch M type)
FUEL INJECTION TIMING	19° BTDC ± 0.5 (static timing)
NOZZLE	Throttle type
INJECTORS	Pintle type
FUEL PUMP	12-Volt DC
FUEL FILTER (on engine)	Canister type, with replaceable element
AIR CLEANER	Replaceable element
AIR FLOW ( engine combustion)	36 cfm (1.02.cmm)

**COOLING SYSTEM:**

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	175° - 195° F (80° - 91° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	12 quarts approximately

**LUBRICATION SYSTEM:**

GENERAL	Pressure type by Trichoid pump, gear driven with external pressure relief valve
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## SYSTEM SPECIFICATIONS CONTINUED...

OIL FILTER	Full flow, paper element, spin-on type
SUMP CAPACITY (includes filter)	4.23 quarts (4.0 liters)
OPERATING OIL PRESSURE (engine hot)	40 - 50 psi (2.8 - 3.5 kg/cm)
OIL GRADE	<b>API SPECIFICATION CF OR CG-4</b> <b>SAE 30W, 10W-30 OR 15W-40</b>
<b><u>ELECTRICAL SYSTEM:</u></b>	
STARTING BATTERY	12 volt 30 A-H, (-) negative ground (recommended) (45 A-H in cold areas)
BATTERY CAPACITY	90 - 125 (Ampere - Hours)
DC CHARGING ALTERNATOR	12 volt DC, 50 amp
REGULATOR	Internal regulator built into the DC alternator
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, 1.6KW, reduction type solenoid mounted
DC NO-LOAD CURRENT	90 amp (max.) at 11.5 volts
DC CRANKING CURRENT	175-200 amps (engine cold)
<b><u>AC GENERATOR GENERAL:</u></b>	
SINGLE PHASE	Brushless, four pole, revolving field. Pre-lubricated single-bearing design. Reconnectable, single phase transformer regulation (optional solid-state voltage regulation).
VOLTAGE (Single Phase)	120 OR 120/240 volts- 60 Hertz 220 volts - 50 Hertz Voltage regulation $\pm 5\%$ no load to full load Frequency regulation: $\pm 3$ Hertz (5%) no load to full load.

## SYSTEM SPECIFICATIONS CONTINUED...

### RATING (Volts AC)

60 Hertz (1800 RPM)  
11.0 KW

120 volts 92.0 amps  
120/240 92.0/46.0amps

50 Hertz (1500 RPM)  
8.3 KW

220 volts 37.7 amps

### GENERAL THREE PHASE

Brushless, four-pole, revolving field.  
Pre-lubricated single bearing design.  
Reconnectable, three phase. Solid state  
voltage regulated.

Voltage - Parallel WYE 208  
Series WYE 480  
Series Delta 240

Voltage regulation:  $\pm 2\%$  no load to full  
rated amperage output.  
Frequency regulation:  $\pm 3$  Hertz (5%) no  
load to full load.

### RATING (Volts-Amps AC)

208 volts	38.2 amps
480 volts	16.5 amps
240 volts	33.1 amps

### GENERATOR COOLING:

AIR REQUIREMENTS  
60 Hertz at 1800 rpm

200-255 cfm

NOTE: Increase air supply 15% for 50 hertz operation (1500 rpm)

### TUNE-UP SPECIFICATIONS:

INJECTOR PRESSURE

1707 psi (120 kg/cm + 10 kg/cm  
- 0 kg/cm)

ENGINE TIMING

19 BTDC (spill timing)

## 12.5 BTDR DIESEL GENERATOR

### SINGLE PHASE & THREE PHASE

#### GENERAL SPECIFICATIONS

ENGINE TYPE	Diesel, 4 cycle, 4 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (21 hp at 1800 rpm maximum).
GOVERNOR	Mechanical, centrifugal weight type.
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	2.87 x 3.07 inches (73 x 78 mm)
PISTON DISPLACEMENT	91 cubic inches (1.49 tiers)
FIRING ORDER	1-3-4-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	67 lb-ft (9.26 kg-m)
COMPRESSION RATIO	23:1
COMPRESSION PRESSURE	455.2 psi (32 kg/cm) at 280 rpm
VALVE TIMING	Intake Opens 18° BTDC Intake Closes 46° ABDC Exhaust Opens 46° BBDC Exhaust Closes 18° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 45°
VALVE CLEARANCE (Engine Cold)	Intake 0.0098 inches (0.25 mm) Exhaust 0.0098 inches (0.25 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

## GENERAL SPECIFICATIONS CONTINUED....

### DIMENSIONS

Height: 28.6 inches 726.4 mm  
Width: 20.0 inches 508.0 mm  
Length: 41.7 inches 1059.2 mm

### WEIGHT

645 lbs. (293 kgs)

### FUEL CONSUMPTION

1.4 gph (5.29 lph) at full rated output  
(approximate)

**12.5 BTDR DIESEL GENERATOR**  
**SINGLE PHASE & THREE PHASE**

**SYSTEM SPECIFICATIONS**

**FUEL SYSTEM:**

GENERAL	Open flow, totally self-bleeding
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Nippon Denso (Bosch M type)
FUEL INJECTION TIMING	19° BTDC ± 0.5 (static timing)
NOZZLE	Throttle type
INJECTORS	Pintle type
FUEL PUMP	12-Volt DC
FUEL FILTER (on engine)	Canister type, with replaceable element
AIR CLEANER	Replaceable element
AIR FLOW ( engine combustion)	36 cfm (1.02.cmm)

**COOLING SYSTEM:**

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	175° - 195° F (80° - 91° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	12 quarts approximately

## SYSTEM SPECIFICATIONS CONTINUED...

### LUBRICATION SYSTEM:

GENERAL	Pressure type by Trichoid pump, gear driven with external pressure relief valve
OIL FILTER	Full flow, paper element, spin-on type
SUMP CAPACITY (includes filter)	4.7 quarts (4.5 liters)
OPERATING OIL PRESSURE (engine hot)	40 - 50 psi (2.8 - 3.5 kg/cm)
OIL GRADE	<b>API SPECIFICATION CF OR CG-4</b> <b>SAE 30W, 10W-30 OR 15W-40</b>

### ELECTRICAL SYSTEM:

STARTING BATTERY	12 volt 30 A-H, (-) negative ground (recommended) (45 A-H in cold areas)
BATTERY CAPACITY	90 - 125 (Ampere - Hours)
DC CHARGING ALTERNATOR	12 volt DC, 50 amp
REGULATOR	Internal regulator built into the DC alternator
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, 1.6KW, reduction type solenoid mounted
DC NO-LOAD CURRENT	90 amp (max.) at 11.5 volts
DC CRANKING CURRENT	175-200 amps (engine cold)

SYSTEM SPECIFICATIONS CONTINUED...

AC GENERATOR GENERAL:

SINGLE PHASE

Brushless, four pole, revolving field.  
Pre-lubricated single-bearing design.  
Reconnectable, single phase transformer  
regulation (optional solid-state voltage  
regulation).

VOLTAGE (Single Phase)

120 OR 120/240 volts- 60 Hertz  
220 volts - 50 Hertz  
Voltage regulation  $\pm 5\%$  no load to full load  
Frequency regulation:  $\pm 3$  Hertz (5%) no  
load to full load.

RATING (Volts AC)

60 Hertz (1800 RPM)  
12.5 KW

120 volts 104 amps  
120/240 104/52 amps

50 Hertz (1500 RPM)  
9.4 KW

220 volts 42.7 amps

GENERAL THREE PHASE

Brushless, four-pole, revolving field.  
Pre-lubricated single bearing design.  
Reconnectable, three phase. Solid state  
voltage regulated.

Voltage - Parallel WYE 208  
Series WYE 480  
Series Delta 240

Voltage regulation:  $\pm 2\%$  no load to full  
rated amperage output.  
Frequency regulation:  $\pm 3$  Hertz (5%) no  
load to full load.

RATING (Volts-Amps AC)

208 volts      50 amps  
480 volts      20 amps  
240 volts      40 amps

**GENERATOR COOLING:**

AIR REQUIREMENTS	200-250 cfm
60 Hertz at 1800 rpm	

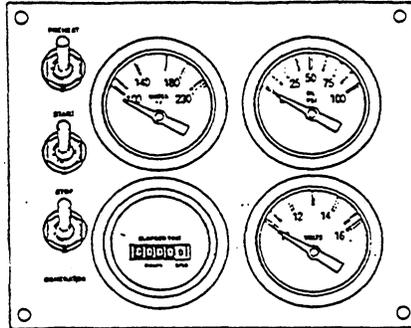
NOTE: Increase air supply 15% for 50 hertz operation (1500 rpm)

**TUNE-UP SPECIFICATIONS:**

INJECTOR PRESSURE	1707 psi (120 kg/cm + 10 kg/cm - 0 kg/cm)
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ENGINE TIMING	19 BTDC (spill timing)
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## CONTROLS AND INSTRUMENTS



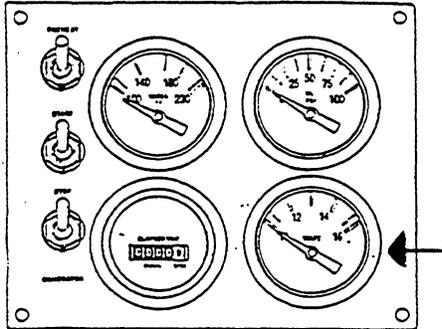
### INSTRUMENT PANEL

The manually-operated series of Westerbeke generators are equipped with toggle switches and optional remote panels. The Instrument Panel includes two gauges that indicate water temperature in degrees Fahrenheit (WATER °F) and oil pressure in pounds per square inch (OIL PSI). This panel is also equipped with two meters that indicate DC volts and hours of operations in 1/10ths. The water temperature, oil pressure gauge and DC voltmeter are illuminated; the ELAPSED TIME meter is not illuminated. The start/stop panel functions in the same manner as the instrument panel, but does not include gauges. Either panel can be engine or remote mounted.

1. **PREHEAT.** The **PREHEAT** switch energizes the engine's glow plugs, activates the electric fuel pump, bypasses the engine's oil pressure switch, and activates the fuel run solenoid. This switch also feeds power to the **START** switch.
2. **START.** The **START** switch, when pressed, energizes the starter's solenoids which cranks the engine. This switch will not operate electrically unless the **PREHEAT** switch is pressed and held at the same time.
3. **STOP.** Power is provided to the fuel solenoid through the **STOP** switch. Opening this switch deactivates the fuel solenoid and shuts off the fuel to the engine, causing the engine to stop.

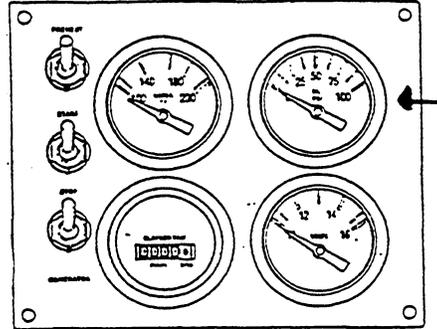
**NOTE:** When the engine is manually shut down, the water temperature gauge and the oil pressure gauge will continue to register the last temperature and oil pressure readings indicated before the electrical power was turned off. The temperature gauge and oil pressure gauge will return to zero once electrical power is restored.

**DC VOLTMETER  
GAUGE**



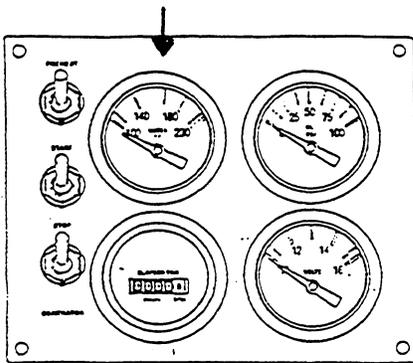
Shows the amount the battery is being charged.

**ENGINE OIL PRESSURE**



Indicates the pressure of lube oil.  
The needle should indicate: 40-50  
PSI (2.8-3.5 kg-cm)

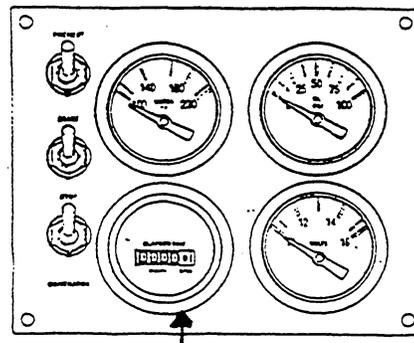
**WATER TEMPERATURE GAUGE**



Indicates the temperature of engine coolant.

During operation, it should be indicating  
175° F - 195°F (80° - 91°C).

**HOUR METER**



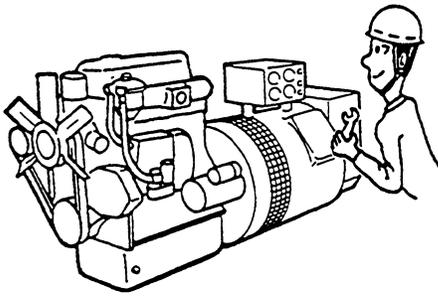
The hour meter registers elapsed  
time and should be used as a guide  
for scheduled maintenance.

## NEW GENERATOR INITIAL INSPECTION

Before starting your engine for the first time, check on the following items

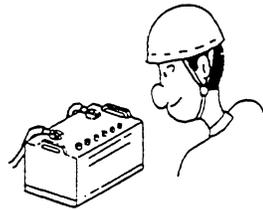
### Appearance

Check for any missing part, loose bolt or nut, or any sign of damage.



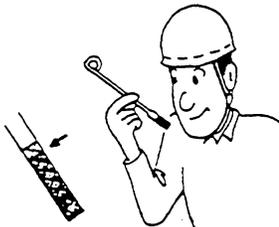
### Electrical System DC

Check battery electrolyte level. Check connections for tightness and instruments for operation.



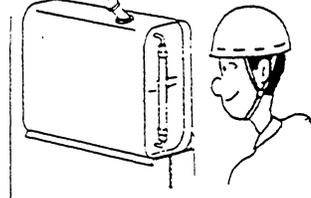
### Lubrication System

Check oil level in oil pan.  
Check for leaks.



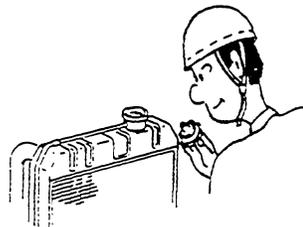
### Fuel System

Check fuel level in tank. Check piping for leaks. Prime fuel system.



### Cooling System

Check coolant level in radiator  
Vent air out of system.

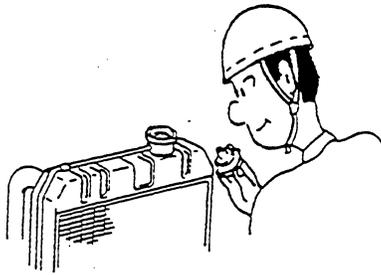


## DAILY WALK-AROUND CHECKS

For safety of operation and maximum service life of your engine, inspect the unit to make sure your answers to questions on these items are YES:

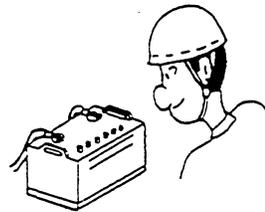
### Cooling System

Is coolant up to level in radiator filler? (Do not remove filler cap when engine is hot).



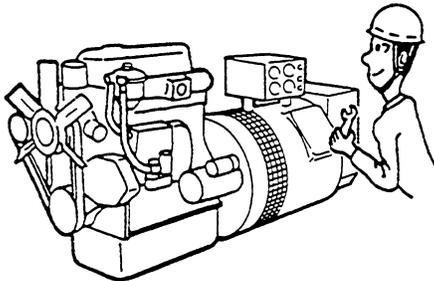
### Battery

Are cables tight on terminal posts?



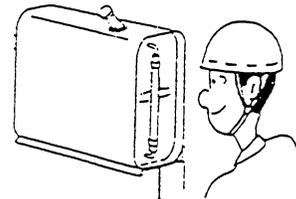
### Others

Are electrical connections OK? Are you sure there are no oil or water leaks? Are bolts and nuts tight?



### Fuel

Is there enough fuel for the day's operation?



### Engine Oil

Is the oil level up to the FULL mark on the dipstick?



## DIESEL FUEL, ENGINE OIL AND COOLING WATER

### **DIESEL FUEL:**

Use fuel that meets the requirements or specifications of Class 2-D (ASTM). Cetane rating of #45 or better.

### **CARE OF THE FUEL SUPPLY:**

Too much emphasis cannot be placed on the importance of using 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 fuel going into the tank for your engine's daily use is clean and pure, the following practice is advisable.

Purchase a well-known brand of fuel.

Install and regularly service a good, visual type, filter/water separator between the fuel tank and the generator drive engine. Raycor 220 or 225 is a good example of such a filter.

### **ENGINE LUBRICATING OIL:**

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

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

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

## COOLING WATER:

Use only water that is soft, or as free as possible from scale forming minerals.

The use of an antifreeze mixture of 50/50 is recommended for year round use.

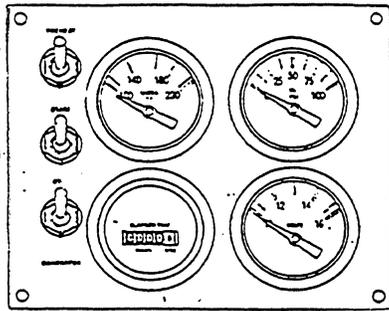
Use an antifreeze brand such as "Prestone" that is compatible with aluminum engine components.

An antifreeze mixture will aid in cooling and protect against unexpected freeze. Antifreeze mixtures are beneficial to the engine's cooling system in that they retard rust and scale formation and are beneficial to the service life of the freshwater circulating pump seal.

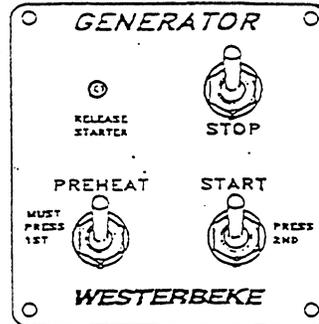
### ANTIFREEZE PROTECTION CHART

Antifreeze Concentration	%	13	23	30	35	45	50	60
Freezing Temperature	°F	23	14	5	-4	-22	-40	-58
	°C	(-5)	(-10)	(-15)	(-20)	(-30)	(-40)	(-58)

## OPERATING YOUR GENERATOR



Instrument Panel



Start/Stop Panel

1. *PREHEAT* - Depress the PREHEAT switch. The voltmeter, panel lights, gauges and meters and fuel solenoid will be activated. The PREHEAT switch should be depressed in accordance with the chart presented below.

Preheat according to the following chart:

Atmospheric Temperature	Preheating Time
+41°F (+5°C) or higher	Approx. 10 seconds
+41°F (+5°C) to +23°F (-5°C)	Approx. 20 seconds
+23°F (-5°C) or lower	Approx. 30 seconds
Limit of continuous use	One minute

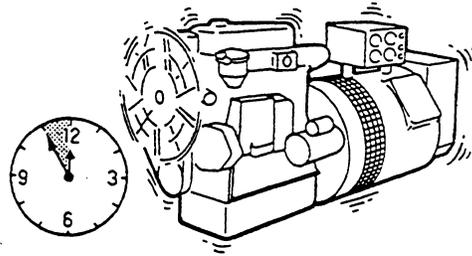
2. *STARTING:*

While still depressing the PREHEAT switch, depress the START switch. This will engage the start solenoid. Panel power and the fuel solenoid will be activated. Upon engine firing, release the START switch. Do not release the PREHEAT switch until the oil pressure reaches 15 psi. Then as long as the higher water temperature, low oil pressure and exhaust temperature protective circuits do not activate, the set will remain energized and continue to run.

Should the engine not start when the START switch is depressed for 10 to 20 seconds, release both switches and wait 30 seconds; repeat the procedure above. Never run the starter for more than 30 seconds.

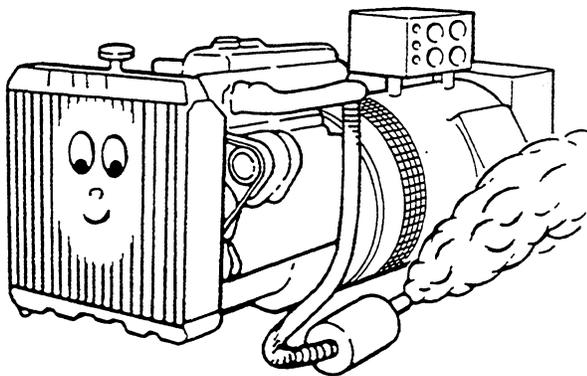
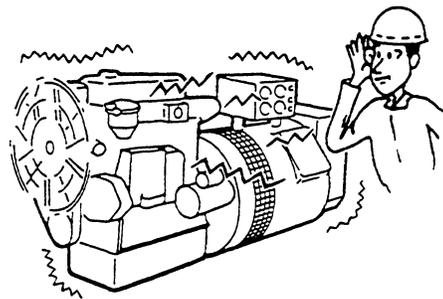
*WARMING UP:*

Once the engine starts, check instruments for proper oil pressure, DC battery charge and generator AC output.



Allow the engine to warm up for approximately 5 minutes before applying an amperage load. Note: There may be some unstable operation during warm up with a cold unit.

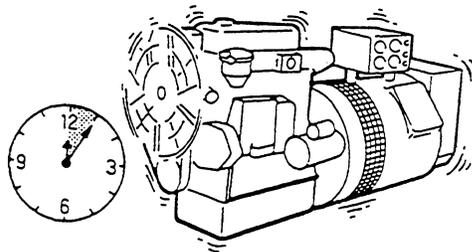
Check that the engine/generator are operating without any abnormal noise or vibration.



Apply a light amperage load to the generator and allow the engine operating temperature to come up to 140° - 150° F (60° - 65° C) before applying a heavy load.

*STOPPING:*

Remove the AC electrical load from the generator and allow the generator to run for 3 to 5 minutes to stabilize its operating temperatures. Depress the STOP switch and hold it until the generator is completely stopped. Now release the STOP switch.



## ROUTINE SERVICE

### **GENERAL RULES:**

1. Before starting the generator for the day's run, be sure to carry out "walk-around checks". (See page 38.)
2. Service intervals in hours refer to the hour meter reading. On a daily basis, read the hour meter and record the reading in your log book.
3. Before attempting to service the engine, read the instructions in this manual thoroughly to get a full understanding of the extent and nature of routine service. Some service jobs are simple while the others are not; for complicated or difficult kinds of service, rely on expert knowledge of service engineers, and service facilities at your local truck and generator service center.
4. Warm-Up. Once the unit has started on the initial cold start of the day, allow the engine to warm up for 5-10 minutes before applying any heavy loads.

Note: Some unstable running may occur in a cold engine. This condition should abate as normal operating temperature is reached and when a load is applied.

Note: DO NOT operate the generator unit for lengthy periods of time without a load being placed on the generator.

5. Loading. Apply loads systematically, not all at once. Allow the unit to adjust to each load before applying the next load.
6. Stopping. Remove major loads from the generator one at a time. Allow the unit to run loaded for approximately five minutes to stabilize engine temperatures. Depress the stop switch and hold it depressed until the engine comes to a complete stop, then release the switch.

### **SAFETY RULES:**

1. Never attempt to perform any service while the engine is running.
2. Wear the proper safety equipment such as goggles for example as called for by each special job. Use only the right kinds of hand tools.
3. When servicing DC electrical equipment, be sure to disconnect the battery.
4. Highly inflammable liquids are often used as cleaning fluids. When using such fluids, be sure to make necessary provisions for avoiding fire hazards. Good commercial, nonflammable solvents are preferred. Use with proper ventilation.
5. Do not attempt to service the AC generator with the engine running.

**ROUTINE SERVICE SCHEDULE**  
**Rely on hour meter to schedule maintenance**

**ITEM**

**SERVICE**

***EVERY 10 OPERATING HOURS OR DAILY***

- |                                |   |
|--------------------------------|---|
| 1. Walk-around inspection.     | See Page 38   |
| 2. Crankcase                   | Check oil level in the sump.  |
| 3. Fuel Tank                   | Check fuel level in the tank.   |
| 4. Radiator                    | Check coolant level in the radiator and expansion tank. (Cold Engine)       |
| 5. Fuel Filter/Water Separator | Check for any contaminants and clean as needed.                             |
| 6. Starting battery            | Check electrolyte level and make sure cables have tight, clean connections. |

***FIRST 50 OPERATING HOURS***

- |  |   |
|--|---|
| 1. Lube Oil                            | Initial lube oil change should be performed.  |
| 2. Lube oil filter                     | Initial oil filter change should be performed.  |
| 3. Fuel pump filter<br>(if applicable) | Initial fuel pump filter change should be performed.                                  |
| 4. Generator                           | Check that AC connections are clean and secure. Check that AC leads are not chaffing. |
| 5. Fuel filter element                 | Initial change of engine fuel filter element(s).                                      |
| 6. Engine no load speed                | Check engine no load speed and adjust if necessary. (61.5 - 62.0 Hertz)               |
| 7. Fan Belt                            | Adjust fan belt tension 1/2 - 3/8 inch deflection.                                    |
| 8. Air cleaner                         | Check and clean element.  |

## ROUTINE SERVICE SCHEDULE CONTINUED...

### **Servicing After Every 100 Hours of Operation**

1. Lube Oil Change engine lube oil.
2. Lube oil filter Change lube oil filter
3. Air Filter Check, clean or replace as needed.
4. Fan Belt Adjust fan belt tension as needed. Check condition of belt. Replace as needed.

### **Servicing After Every 200 Hours of Operation**

1. Fuel Filter(s) Replace fuel filter elements in electric fuel pump (if applicable) and in engine mounted cartridge filter.
2. Radiator Clean any obstructions from radiator fins. Check radiator hoses and tighten clamps.

### **Servicing After Every 500 Hours of Operation**

1. Cylinder Head Maintenance Retorque cylinder head and rocker shaft, hold down bolts and adjust valve clearances.
2. Cooling Systems Check antifreeze mixture. Restore additives or mixture strength as needed.
3. Starter Motor Remove and lubricate pinion drive.
4. Preheat circuit Check operation of preheat solenoid. Remove and clean glow plugs, check resistance (.4-.6 ohms).

## ROUTINE SERVICE SCHEDULE CONTINUED...

### **Servicing After Every 800 Hours of Operation**

- |                        |   |
|------------------------|---|
| 1. Fuel Injector(s)    | Remove, check and rebuild fuel injectors as needed.   |
| 2. Engine compression. | Check engine compression pressure.  |
| 3. DC Alternator       | Check DC charge from alternator.<br>Check pulley mounting and attachment of alternator to engine. |
| 4. Engine parts        | Check security and tightness of nuts, bolts and wire connections.                                 |

### **Servicing After Every 1000 Hours of Operation**

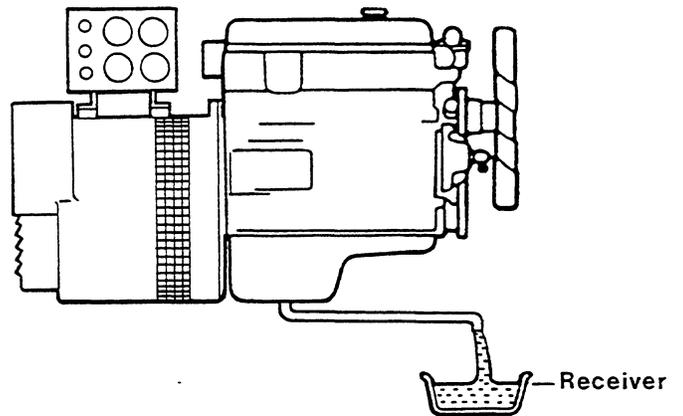
- |                   |  |
|-------------------|--|
| 1. Radiator       | Remove radiator, have professionally cleaned and pressure tested. Repair or replace as needed. |
| 2. Cooling System | Drain, flush and refill cooling system with antifreeze mixture.                                |

## SERVICE ITEMS

### 1. Engine Oil Change

Remove the lubricating oil through the sump oil drain hose (this is attached to a bracket on the right forward side of the engine). The lube oil should be removed while the engine is still warm so it will flow easily out through the drain hose.

When replacing the hose in its bracket be sure to securely reinstall the end cap.

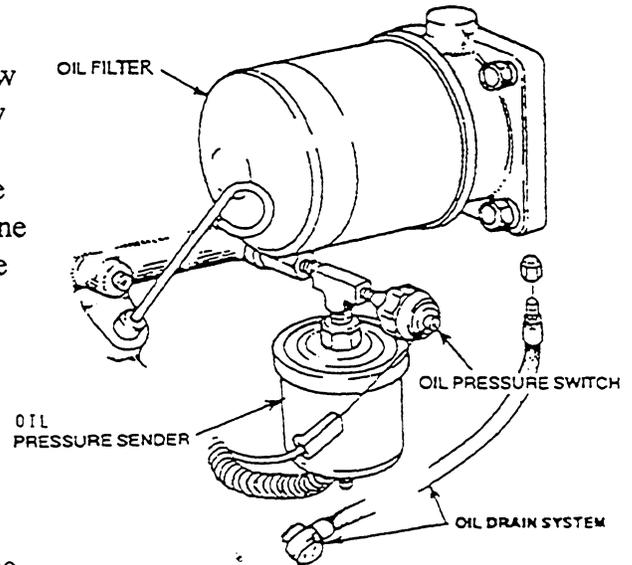


### 2. Replacement of the Oil Filter

When removing the used oil filter, cover the filter with a plastic bag containing a few cloth rags or paper towels. This will allow both the filter element and spilled oil to be collected cleanly without spilling oil on the engine. (Oil or any other fluid on the engine reduces the engine's cooling ability. Please keep your generator's engine clean.)

The replaceable cartridge-type oil filter requires no cleaning inside.

When installing the oil filter element, apply a thin coat of clean engine oil to the rubber gasket on the oil filter, screw the filter onto the threaded oil filter stub, and then tighten the filter firmly by hand.



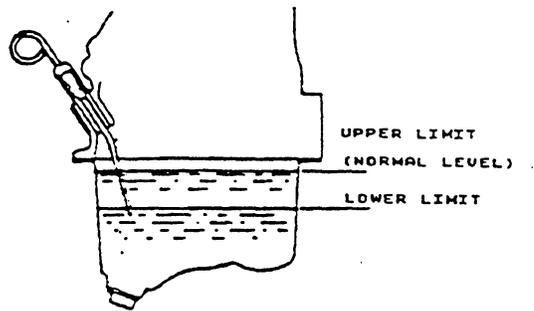
Oil Filter and Oil Drain System

**NOTE:** Generic filters are not recommended. The material standards or tolerances of important items on generic parts might be entirely different from genuine parts.

## SERVICE ITEMS CONTINUED....

### 3. Filling the Oil Sump

Add fresh oil through the oil filter cap on the valve cover. After refilling with oil, run the engine for a few moments while checking the engine's oil pressure. Make sure there is no leakage around the new oil filter or from the oil drain system. Stop the engine. Wait a minute to allow the oil to settle. Then check the quantity of oil with the dipstick. Fill to, (but not over), the high mark on the dipstick, if the engine requires additional oil.



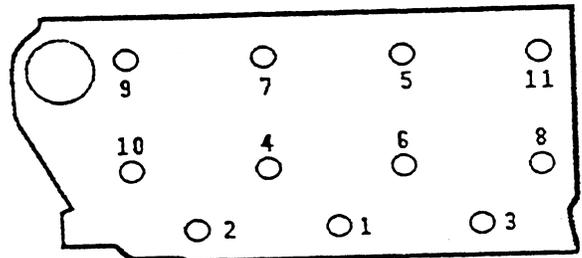
### 4. Torquing Cylinderhead Bolts 3 Cylinder Models 8, 10 KW

Torque the bolts in the sequence shown. The engine should be at ambient temperature.

Before applying torque to the bolt, loosen 1/2 turn and then apply the torque as specified for the bolt.

Bolts # 1,2, & 3 (14mm bolt heads)	47.0-57.9 ft. lbs. (6.5-8 kg-m)
Bolts # 4,5,6,7,8,9,10 &11 (17 mm bolt heads)	83.2-90.4 ft. lbs. (11.5-12.5 kg)

FRONT OF ENGINE  
←

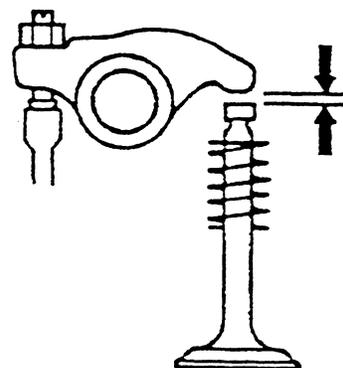


### 5. Valve Clearance Adjustment 3 Cylinder Models 8, 10 KW

Adjust the valve clearance when the engine is at ambient temperature.

- Remove the air breather pipe from the rocker cover, and take off the rocker cover bolts. Adjust the valve clearances at TDC (Top Dead Center) for each cylinder when they are on their compression stroke (see next page).

ADJUST VALVES TO 0.010 INCHES  
(0.25 MM)

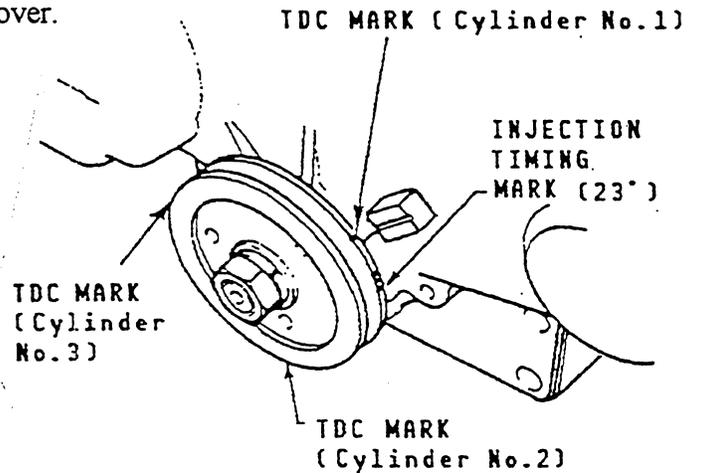


**SERVICE ITEMS CONTINUED....**

b. Rotate the engine crankshaft manually in a clockwise direction matching the valves on cylinder #1 so as to place the piston in #1 cylinder in its compression stroke. Rotate the crankshaft slowly to bring the piston to TDC and at the same time observe the TDC mark on the front of the crankshaft pulley and align it with the pointer on the front gear case cover.

c. Rotate the crankshaft in a clockwise direction 240° approximately. Adjust the valve clearances for the # 3 cylinder.

d. Rotate the crankshaft in a clockwise direction 240° approximately. Adjust the valve clearances for the #2 cylinder.



**6. Torquing Cylinder head Bolts  
4 Cylinder Models 11, 12.5 KW**

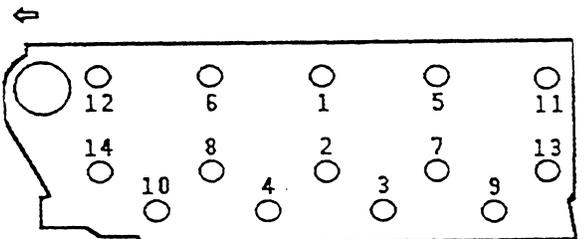
Torque the bolts in the sequence shown.

The engine should be at ambient temperature.

Before applying torque to the bolt, loosen 1/2 turn and then apply the torque as specified for the bolt.

Bolts # 1,2, 3 & 4 (14mm bolt heads)	47.0-57.9 ft. lbs. (6.5-8 kg-m)
Bolts # 5,6,7,8,9 10, 11, 12, 13, & 14 (17 mm bolt heads)	83.2-90.4 ft. lbs. (11.5-12.5 kg)

FRONT OF ENGINE



## SERVICE ITEMS CONTINUED....

### 7. Valve Clearance Adjustment 4 Cylinder Models 11, 12.5 KW

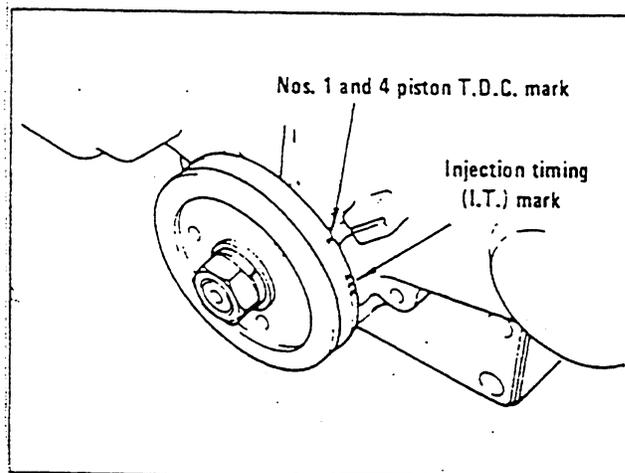
Adjust the valve clearance when the engine is at ambient temperature.

a. Pull off the air breather pipe from the rocker cover, and take off the rocker cover bolts. Adjust the valve clearances at TDC (Top Dead Center) for each cylinder when they are on their compression stroke. Remember, the engine's firing order is 1-3-4-2. The engine's valves must be adjusted in this order while the valves are closed. You may find that turning the engine's crankshaft is more easily accomplished when the engine's glow plugs are removed before the crankshaft is rotated.

b. Rotate the engine in the normal direction of rotation placing the No.1 cylinder at the top of its compression stroke. The TDC mark on the crankshaft pulley should be in line with the pointer on the front of the gear case cover, and the valves for the No. 1 cylinder should be closed. Now adjust the intake and exhaust valves for cylinder No. 1.

c. After adjusting the valves for cylinder No. 1, rotate the front crankshaft pulley clockwise 180° so the TDC mark on the pulley is positioned approximately in the position shown in the illustration shown above for cylinder No. 3. Now adjust the intake and exhaust valves for cylinder No. 3.

d. Rotate the crankshaft pulley clockwise another 180° and adjust the valve clearances for the intake and exhaust valves for cylinder No. 4.



Timing Mark

## SERVICE ITEMS CONTINUED ....

- e. Rotate the crankshaft pulley clockwise another 180° and adjust the valve clearances for the intake and exhaust valves for cylinder No. 2.

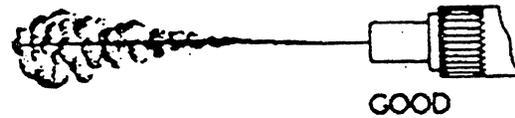
Adjust each valve's clearance by inserting a 0.010 inch (0.25 mm) feeler gauge between the rocker arm and the valve stem.

### 8. Injector Servicing

Injector spray pressure:  
1706 psi + 142 psi  
(120 kg/cm<sup>2</sup> + 10 kg/cm<sup>2</sup>)



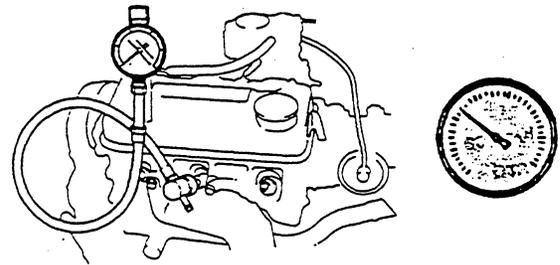
Eliminate undesirable injection conditions including after dripping.



Check compression pressure.  
Remove each glow plug and check each cylinder's compression pressure. The engine's cranking speed is at 250 RPM.

8.0 KW, 10.0 KW, 11.0 KW & 12.5 KW Standard	Minimum
455 psi (32 kg/cm <sup>2</sup> )	370 psi (26 kg/cm <sup>2</sup> )

Maximum difference between cylinders:  
35.5 psi (2.5 kg/cm<sup>2</sup>)



### 9. Air Cleaner Element

Remove the two wing nuts with their washers and remove the rectangular end cover from the intake housing. Pull the air cleaner element PN #039428 out of the housing. Wash this element in a safety klean solution or mild soapy solution. Squeeze out the solution, rinse and air dry.

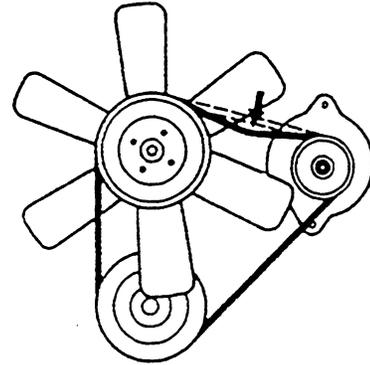
Reinstall the element into the housing. Note that the long thin end is down. Be careful not to cause this to fold and jam when inserting. Replace the rectangular end cover and secure with the wind nuts and their washers.

## SERVICE ITEMS CONTINUED...

NOTE: DO NOT OPERATE THE UNIT WITHOUT THE AIR CLEANER ELEMENT INSTALLED. INTERNAL ENGINE DAMAGE WILL RESULT FROM THE INGESTION OF ROAD DEBRIS.

### 10. Fan Belt Adjustment.

Check visual condition of the fan belt. Replace as needed. Correct tension is reached with  $3/8$  -  $1/2$  inch deflection of the belt with 20 pounds of force.



### 11. Engine Coolant Change

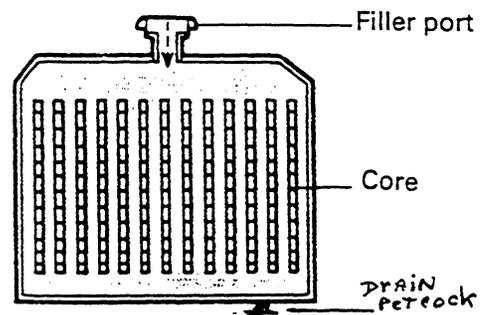
While the engine is cold, open the filler cap on the top of the radiator and then open drain petcock on the lower part of the radiator. (Drain and wash the plastic coolant recovery tank.)

Open the engine block drain petcock located behind the lube oil filter.

When the system is drained, flush with clean water. Once flushed and drained, close the two petcocks securely.

Fill the radiator with a 50/50 mixture of clean water and antifreeze. NOTE: Mix before adding.

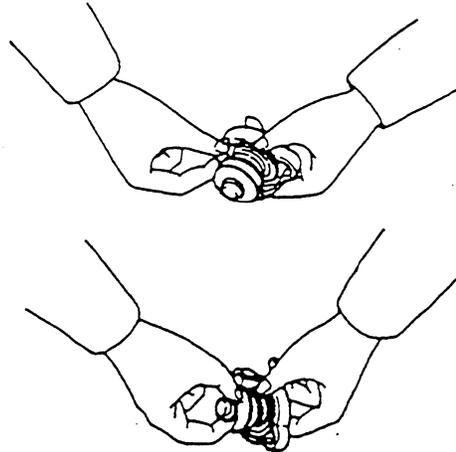
Start the engine and observe the coolant mixture in the radiator. Add coolant as air is expelled. Observe engine operating temperature. Once the system is purged of air, fill the radiator full and install the pressure cap. Fill the plastic coolant recovery tank  $1/2$  full.



## SERVICE ITEMS CONTINUED.....

### 12. Radiator Pressure Cap Maintenance

Periodically check the condition of the pressure cap. Ensure that the upper and lower rubber seals are in good condition. Check that the vacuum valve manually opens and closes tightly.



### 13. Generator Adjustments (Hertz/Speed)

Once the diesel generator set has been placed in operation, there may be adjustments required for engine speed (Hertz) during the engine's break-in period (first 50 hours) or after this period. A no-load voltage adjustment may also be required in conjunction with the engine's speed adjustment.

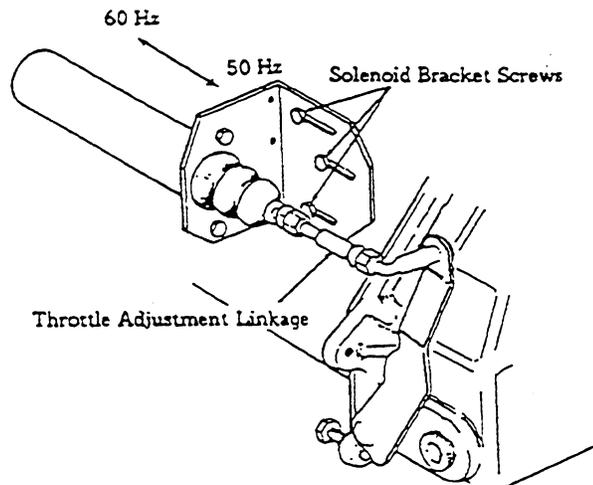
Frequency is a direct result of engine/generator speed, indicated as follows:

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

When the generator is run at 1500 rpm the AC voltage output frequency is 50 Hertz.

Therefore, to change the generator's frequency, the generator's speed must be changed.

Adjusting the length of the throttle linkage will effect the no load speed of the engine. Shortening the linkage will increase the speed (hertz) and lengthening the linkage will decrease the speed (Hertz).



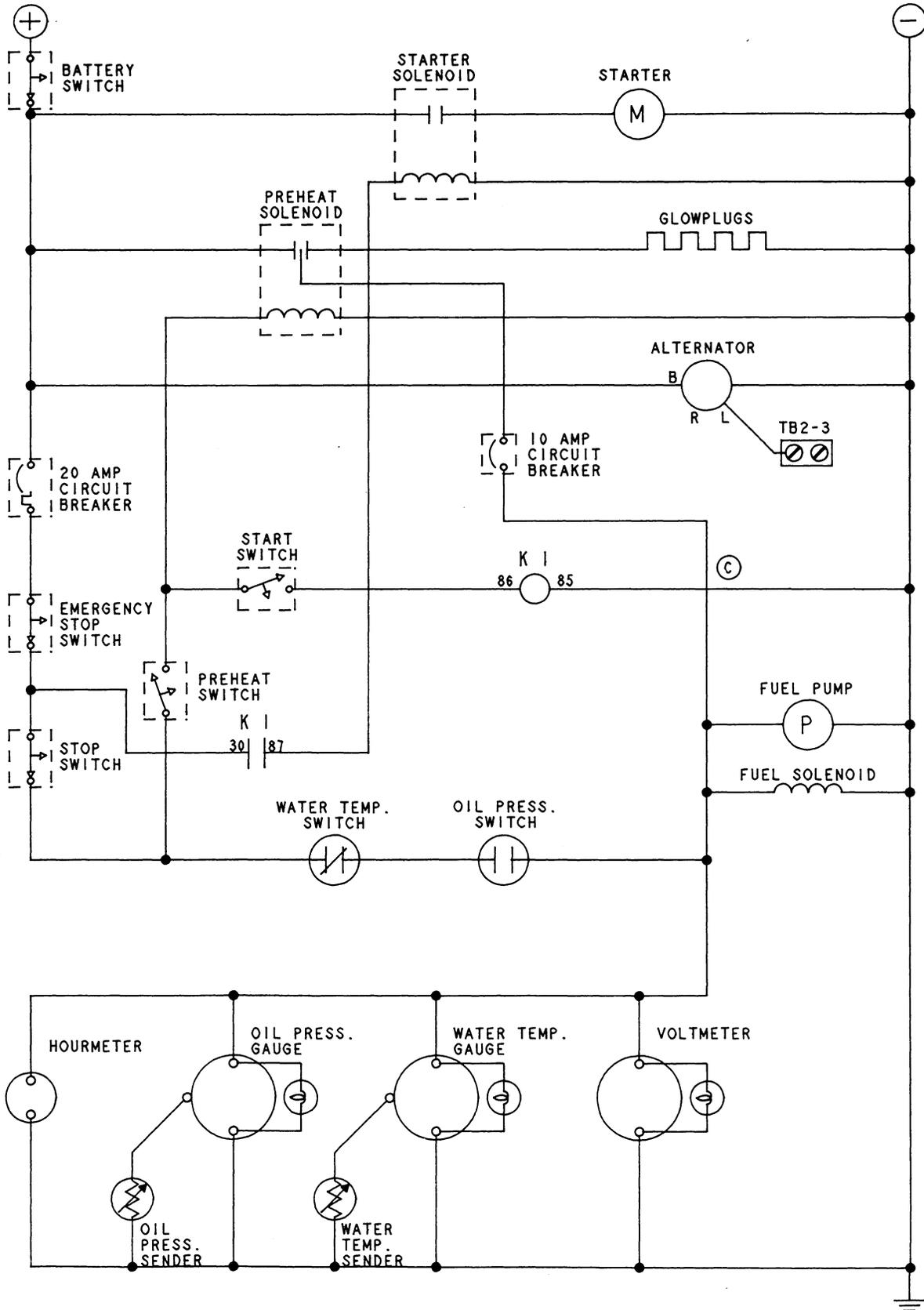
### 14. Generator Maintenance

Keep the generator clean, dry and well ventilated.

Ensure that all connections are clean and tight and that cables carrying AC voltage are properly supported and protected against chafing.

The rear rotor bearing is lubricated and sealed; no maintenance is required. However, if the bearing becomes noisy or rough-sounding, have it replaced.

# ENGINE DC WIRING SCHEMATIC





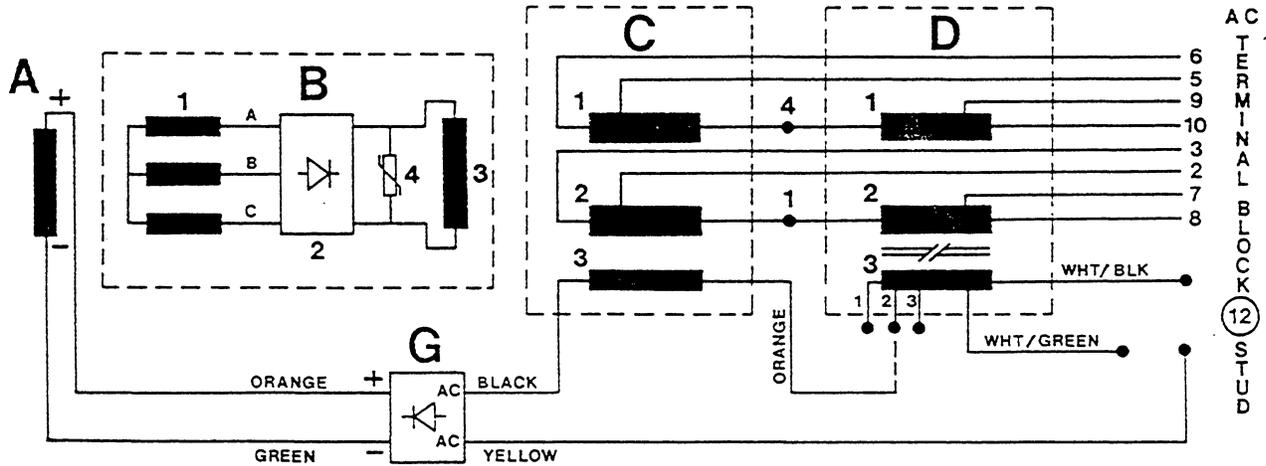
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## **BT GENERATOR**

This generator is a Brushless self-excited generator, which requires only the driving force of the engine to produce AC output. The copper and laminated iron in the exciter stator are responsible for the self-exciting feature of this generator. The magnetic field produced causes AC voltage to be induced into the related exciter rotor windings during rotation. Diodes located in the exciter rotor rectify this voltage to DC and supply it to the windings of the rotating field. This creates an electromagnetic field which rotates through the windings of the main stator, inducing an AC voltage which is supplied to a load. A transformer is connected in parallel to the AC output of the main stator. An AC voltage is produced in the auxiliary windings of the transformer and main stator and is, in turn, supplied to a full wave bridge rectifier. The rectifier produces a DC voltage to further excite the exciter stator windings, enabling the generator to produce a rated AC output.

## INTERNAL WIRING SCHEMATIC

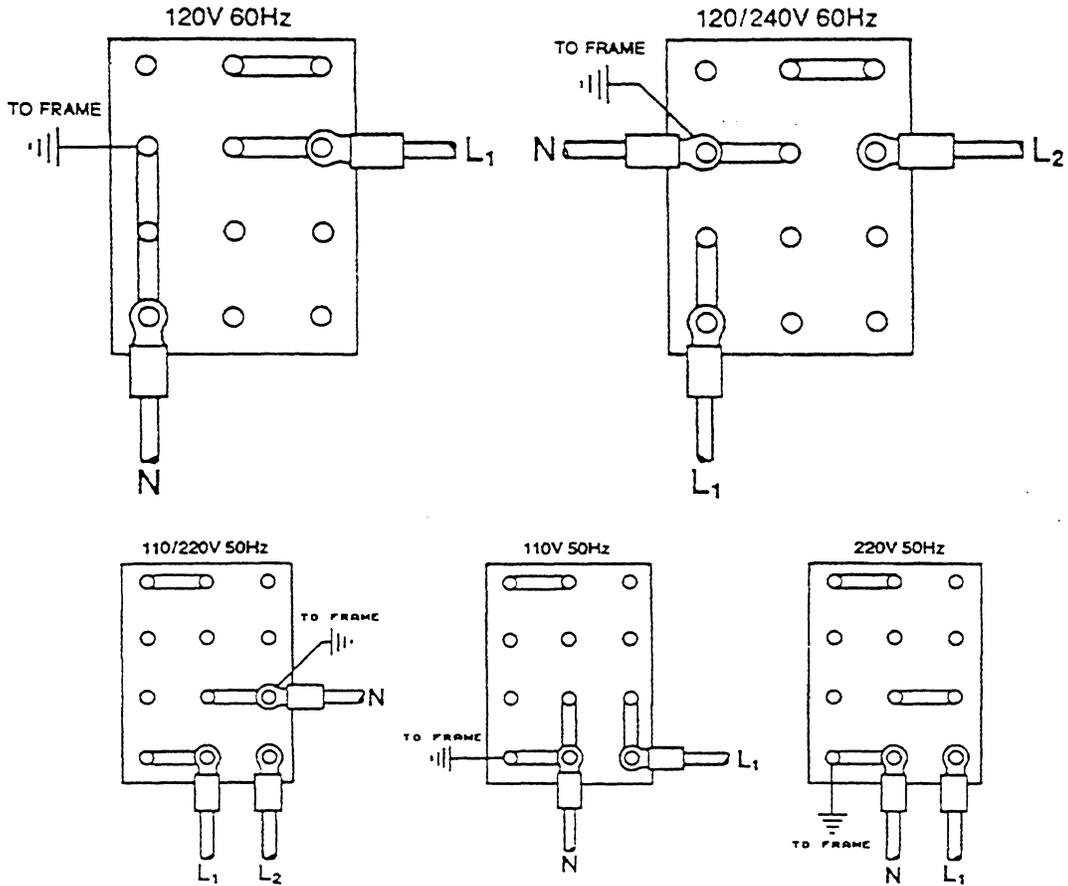
### MODEL 8.0 BTDR (SINGLE PHASE)



- A. Exciter Stator Winding  
Resistance Valve 10.0 Ohms
- B. Exciter Rotor & Field
  - 1. Auxiliary Windings (a-b-c)
  - 2. Diodes (6)
  - 3. Rotating Field Windings
  - 4. Pozi Resistor
- C. Main Stator
  - 1. Main Stator Windings
  - 2. Main Stator Windings
  - 3. Main Stator Auxiliary Windings
- D. Compound Transformer
  - 1. Compound Transformer Windings
  - 2. Compound Transformer Windings
  - 3. Compound Transformer Auxiliary Windings
- G. Bridge Rectifier

# AC TERMINAL BLOCK CONNECTIONS

## MODEL 8.0 BTDR (ONLY)



AC Voltage Connections (12 Stud Terminal Block)

For making connections to the AC terminal block, use terminal ends for #10 studs which will accept #6 or #8 multi-strand wire.

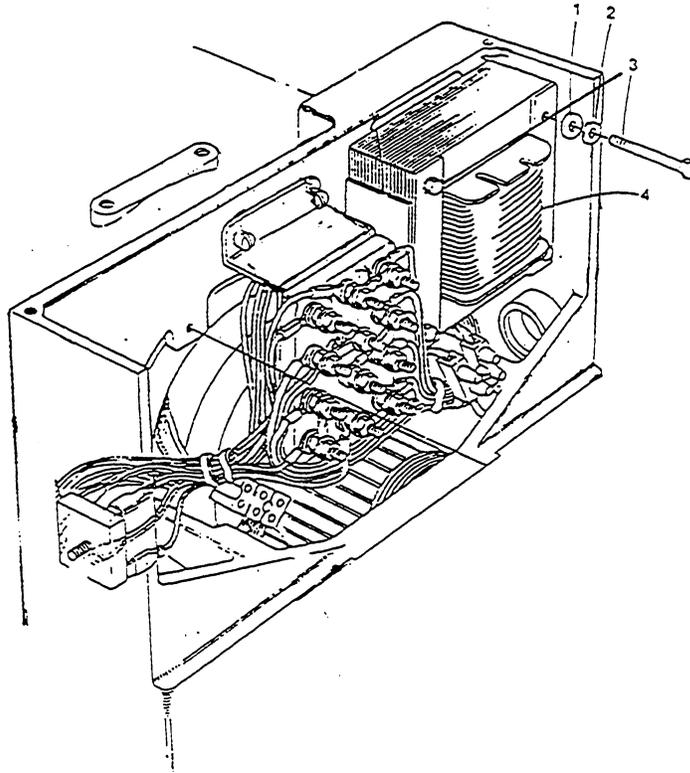
## No Load Voltage Adjustment

Voltage adjustment is made with the compound transformer governing generator regulation.

1. Operate the generator and apply a moderate load momentarily; then remove the load. Note the voltage output from the generator's 120 volt leg(s). The no-load voltage should be between 121-123 volts at 61.5-62 Hertz.

NOTE: The no load voltage should be adjusted when the generator is started, a momentary load is applied to excite the transformer, and then removed. The voltage produced by the generator after this momentary load is removed is the no-load voltage.

2. To raise or lower the voltage, non-conductive shims of varying thickness are inserted or removed from under the laminated steel bar that is situated on top of the compound transformer. The material used for shimming should not soften at temperatures in the 176°F (80°C) range. A small reduction in no-load voltage (1 to 3 Volts) sometimes can be accomplished by gently tapping the top of the laminated steel bar to reduce the air gap between the existing shims and the transformer core.



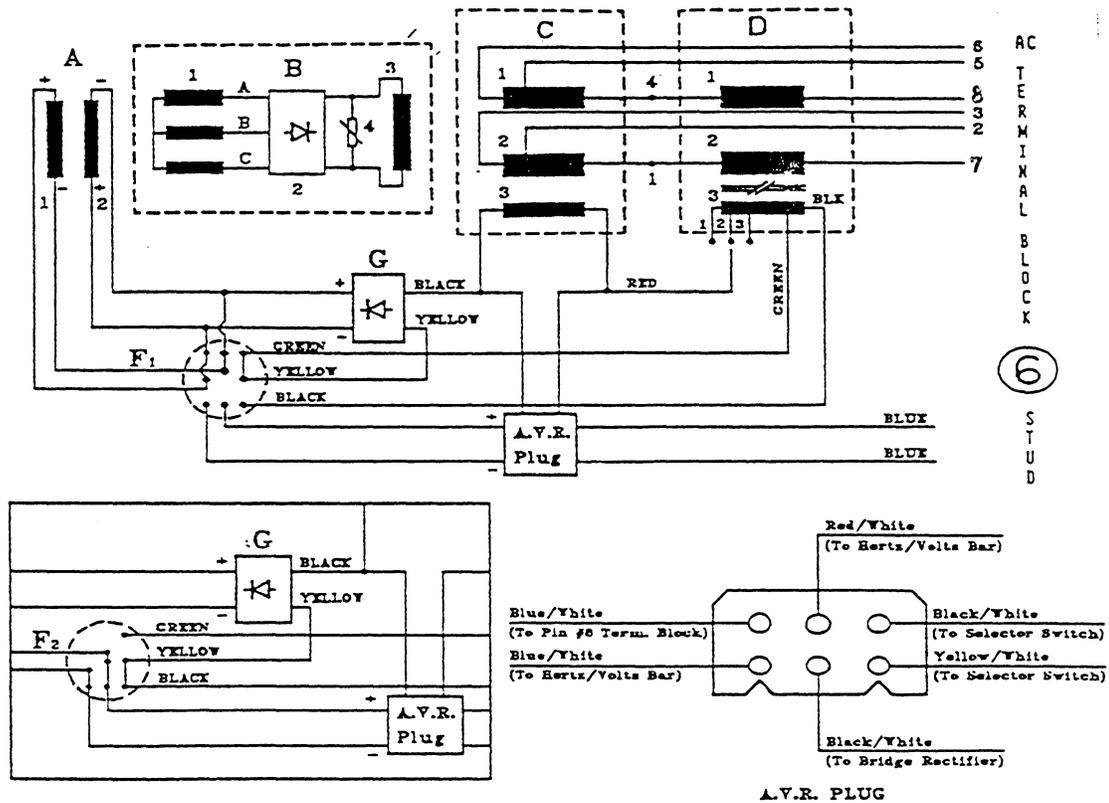
View of the 8.0 BTDR Generator showing AC terminal Block and compound transformer.

**CAUTION:** Under no circumstances attempt to increase the no-load voltage by increasing the gap between the laminated steel bar and the transformer core without the use of shims. Magnetic forces created within the transformer during the generator's operation may close the air gap and reduce the no-load voltage output.

3. To remove the laminated steel bar, remove the two upper securing bolts #3 with washer and locks from the compound transformer and lift the bar from the transformer. The addition of shim thickness will raise the no-load voltage and conversely, the removal of shim thickness will lower the no-load voltage.

Varying shim thickness by .001 inch (0.025 mm) will change the no-load voltage by 4 to 6 volts.

**INTERNAL WIRING SCHEMATIC  
SINGLE PHASE GENERATOR  
MODELS 10.0 BTDR, 11.0 BTDR AND 12.5 BTDR**



Internal Wiring Schematic

A. Exciter Stator Windings 1 & 2  
A -1 and A - 2 Exciter Stator Windings  
(Selector in COMP Position)

B. Exciter Rotor  
1. Auxiliary Windings (a-b-c)  
2. Diodes (6)  
3. Rotating Field Windings  
4. Pozi Resistor

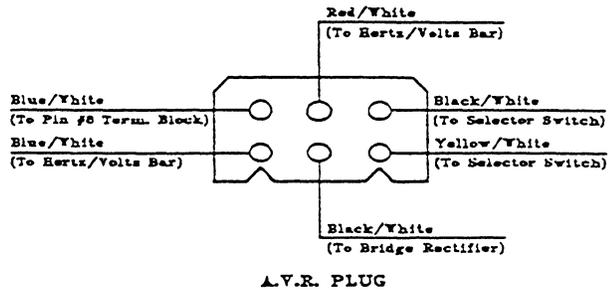
C. Main Stator  
1. Main Stator Windings  
2. Main Stator Windings  
3. Main Stator Auxiliary Windings

D. Compound Transformer

1. Compound Transformer Windings  
2. Compound Transformer Windings  
3. Compound Transformer Auxiliary Windings  
with Voltage/Hertz Connection Bar

F. Selector Switch  
F-1 Compound  
F-2 Electronic and Compound

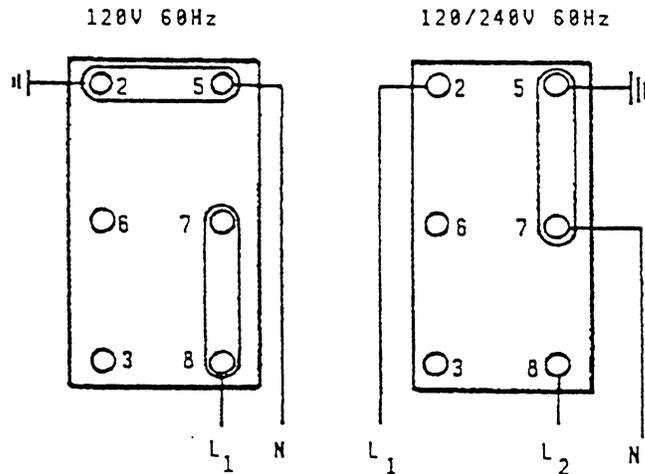
G. Bridge Rectifier Wiring



**AC TERMINAL BLOCK CONNECTIONS  
MODEL 10.0 BTDR, 11.0 BTDR AND 12.5 BTDR  
SINGLE PHASE MODELS**

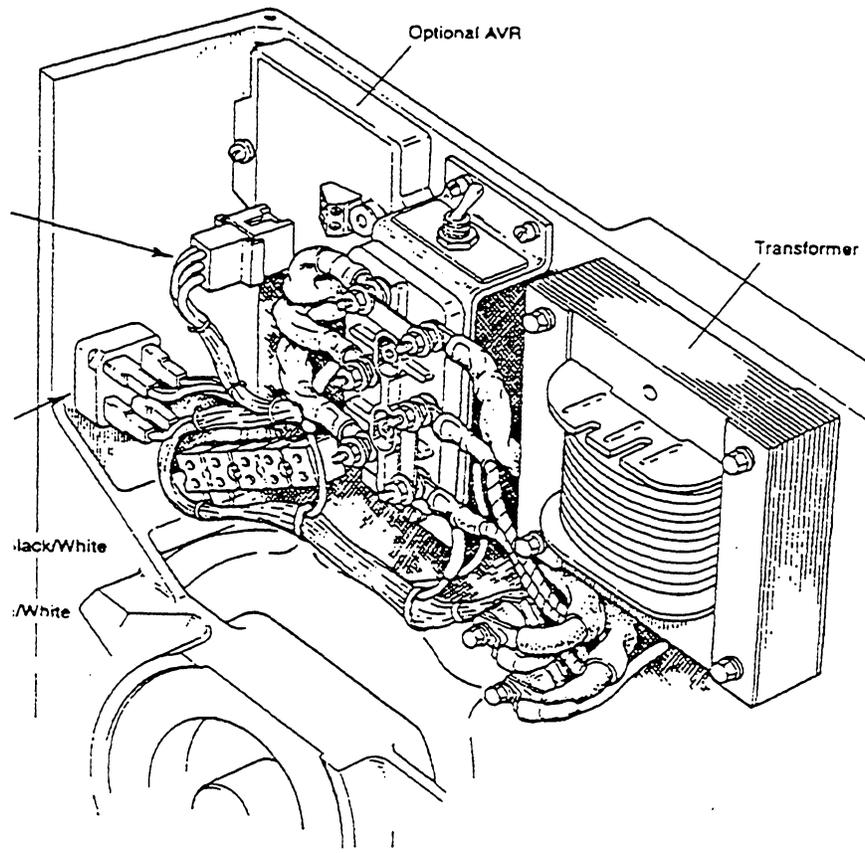
NOTE: We recommend that the installer provide AC ammeters (optional) so that the operator can observe the load being taken from each leg of the generator.

A circuit breaker should be installed between the generator and the AC load. This circuit breaker should be rated for the generator's AC output and be able to react quickly to overloads, subject to motor starting considerations:



For making connections to the AC terminal block, use 1/4 inch terminal ends that will accept multi-strand wire sized for the number of conductors in the bundle, the rating of the conductor's insulation, and amperage that will be drawn through the conductor(s). (Refer to the generator's data plate for generator amperage ratings).

**VIEW OF THE 10.0 BTDR, 11.0 BTDR AND 12.5 BTDR GENERATOR  
SHOWING THE AC TERMINAL BLOCK AND COMPOUND  
TRANSFORMER**



**No-Load Voltage Adjustment**

Voltage adjustment is made with the compound transformer governing generator regulation.

1. The selector switch must be in the COMP position.
2. Operate the generator and apply a moderate load momentarily; then remove the load. Note the voltage output from the generator's 120 Volt leg(s). The no-load voltage should be between 121-123 volts at 61.5-62 Hertz.

NOTE: The no-load voltage should be adjusted when: the generator is started, a momentary load is applied to excite the transformer, and then removed. The voltage reduced by the generator after this momentary load is removed, is the no-load voltage.

3. To raise or lower the voltage, non-conductive shims of varying thickness are inserted or removed from under the laminated steel bar that is situated on top of the compound transformer. The material used for shimming should not soften at temperatures in the 176°F (80°C) range. A small reduction in no-load voltage (1 to 3 Volts) sometimes can be accomplished by gently tapping the top of the laminated steel bar to reduce the air gap between the existing shims and the transformer core.

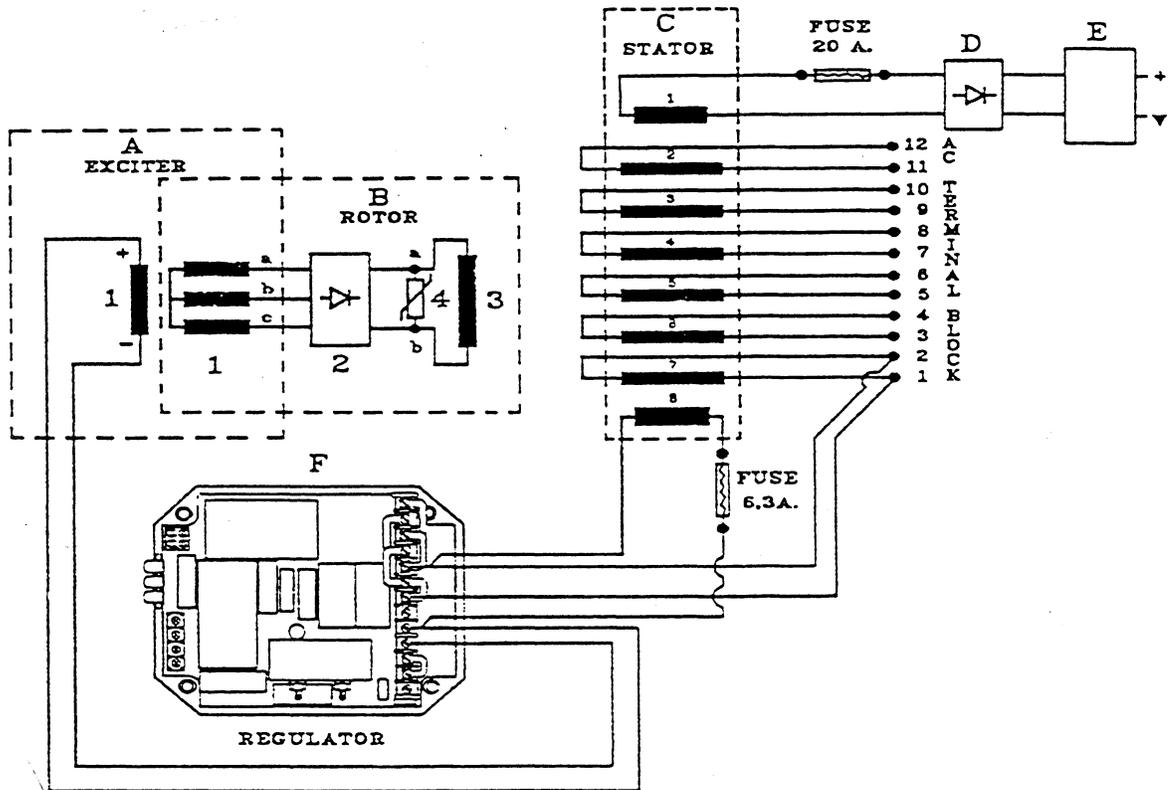
CAUTION: Under no circumstances attempt to increase the no-load voltage by increasing the gap between the laminated steel bar and the transformer core without the use of shims. Magnetic forces created within the transformer during the generator's operation may close the air gap and reduce the no-load voltage output.

4. To remove the laminated steel bar, remove the two upper securing bolts from the compound transformer and lift the bar from the transformer. The addition of shim thickness will raise the no-load voltage and conversely, the removal of shim thickness will lower the no-load voltage.

Varying shim thickness by .001 inch (0.025 mm) will change the no-load voltage by 4 to 6 volts.

# INTERNAL WIRING SCHEMATIC 3 PHASE GENERATOR

**MODELS 10.0 BTDR, 11.0 BTDR & 12.5 BTDR**



**A. Exciter**

- 1. Exciter Stator Windings

**B. Rotor**

- 1. Auxiliary Exciter Windings (a-b-c)
- 2. Diodes (6)
- 3. Main Rotor Windings
- 4. Pozi Resistor

**C. Main Stator**

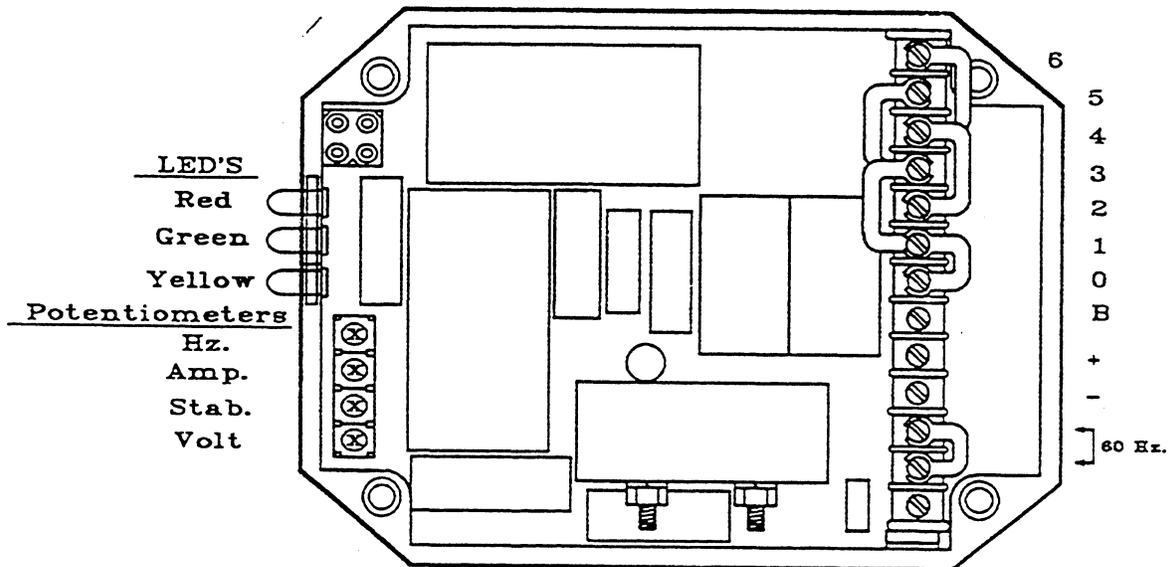
- 1. Auxiliary Windings (DC Charging Circuit) Special applications only.
- 2-7. Main Stator Windings
- 3. Auxiliary Windings (AC to Regulator)

**D. Bridge Rectifier**

**E. DC Controller**

**F. Voltage Regulator Board**

**VOLTAGE REGULATOR #038468**  
**Single & Three Phase**



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

**Adjustments:**

1. Volts - This potentiometer is used to adjust AC output voltage. It has an additional range of  $\pm 25$ -30 volts. At proper engine operating speed the output voltage should be held at  $\pm 1\%$  from a no-load condition to full rated generator output and from power factor 1.0-0.8 with engine drive speed variations of up to -6%.
  
2. Stability - This potentiometer permits variation of the regulators response to generator load changes so as to limit over-compensation and obtain a minimum recovery time to the normal voltage output.

3. Amp/Hertz - These two adjustments are used in conjunction with the two protection circuits in the voltage regulator that are indicated by illumination of a colored LED.

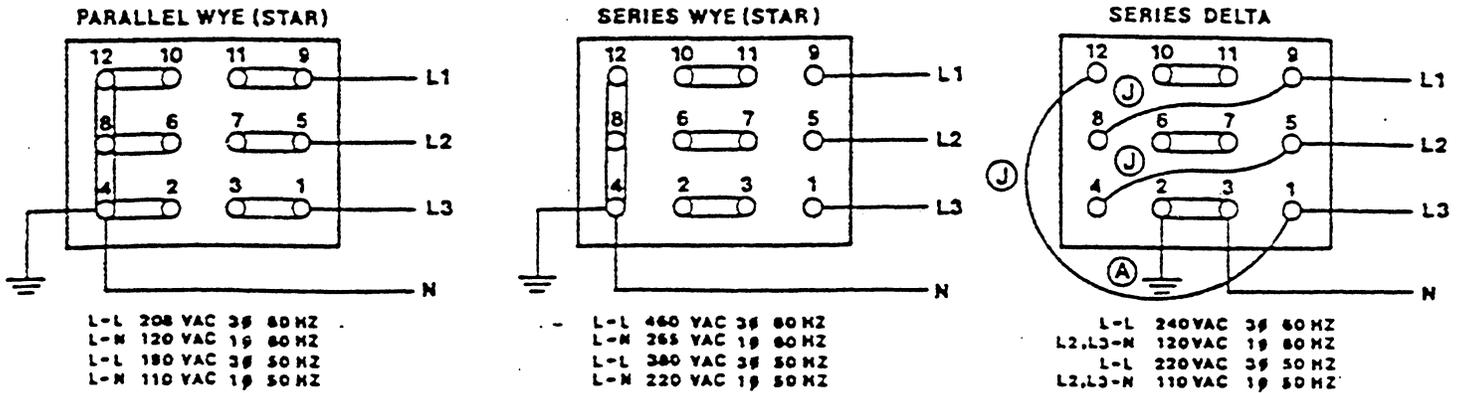
1) Delayed overload protection (YELLOW LED)

2) Low speed protection (RED LED)

Each of these two protection circuits reduces exciter voltage to safeguard the exciter windings and prevent overheating of the AC alternator. These two potentiometers are factory adjusted and sealed and should not be tampered with.

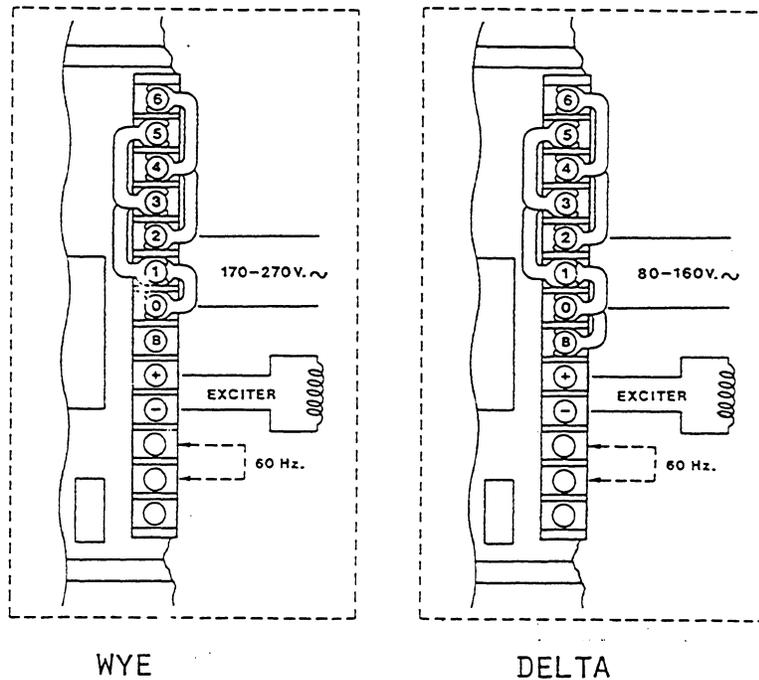
4. Proper Generator Operation (GREEN LED) - The overload protection system has a delay which permits temporary overloading of the generator during times such as motor start-up or other similar load surge demands.

### 3 PHASE AC TERMINAL BLOCK CONNECTIONS FOR WYE AND DELTA CONFIGURATION

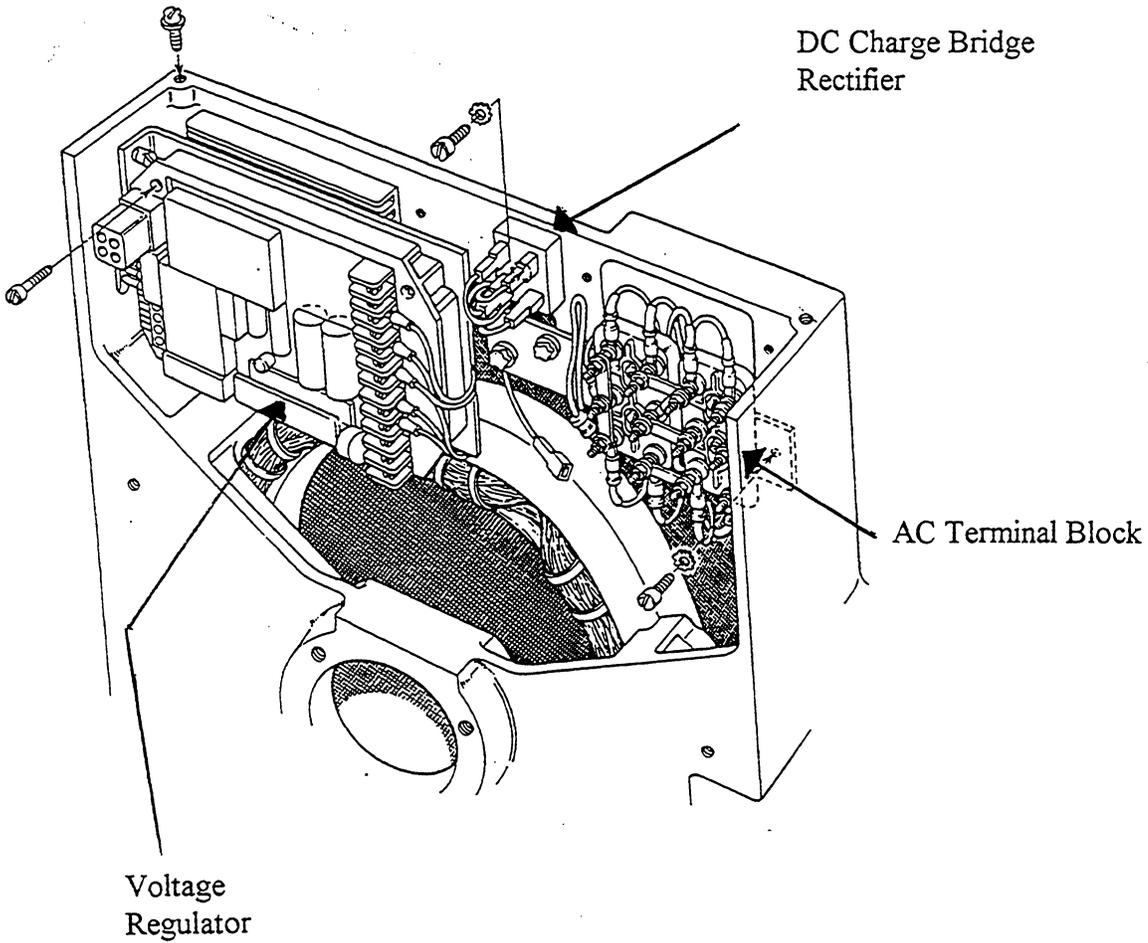


The regulator is equipped with 7 numbered terminals and related brass jumpers. The illustration below shows the connection points and jumpers for the 3 phase configuration of the generator. The sensing leads connect between pin #1 and pin #2 on the AC terminal block and connection #2 and #0 on the regulator board.

Note: Series DELTA requires the installation of a jumper on the regulator board between terminal B and O.



The illustration below shows the 3 phase AC generator backend with the louvered covers removed.



## TIGHTENING TORQUE CHART

DESCRIPTION	TIGHTENING TORQUE KG-M (FT. - LBS)																						
Crankshaft Pulley Nut M-18	15-20 (108 - 144.7)																						
Main Bearing Cap Bolts	5 - 5.5 (36.2 - 37.8)																						
Connecting Rod Cap Nuts	3.2 - 3.5 (23.1 - 25.3)																						
Flywheel Mounting Bolts	13-14 (94.0 - 101.3)																						
Oil Pan Banjo Drain Bolt	5-6 (36.2 - 43)																						
Injection Pump Delivery Valve Holder	4-5 (28.9 - 36.2)																						
Injector Hold Down Bolts	1.5 - 2 (10.8 - 14.5)																						
Glow Plug	1.5 - 2 (10.8 - 14.5)																						
<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">General Bolts (Bolt Diameter)</th> <th colspan="2" style="text-align: center;">Bolt Head Mark</th> </tr> <tr> <td></td> <th style="text-align: center;">4</th> <th style="text-align: center;">7</th> </tr> </thead> <tbody> <tr> <td>M6</td> <td style="text-align: center;">0.3 - 0.7 (2.2 - 5.1)</td> <td style="text-align: center;">0.8 - 1 (5.8 - 7.2)</td> </tr> <tr> <td>M8</td> <td style="text-align: center;">1 - 1.3 (7.2 - 9.4)</td> <td style="text-align: center;">1.5 - 2.2 (10.8 - 15.9)</td> </tr> <tr> <td>M10</td> <td style="text-align: center;">1.8 - 2.5 (13.0 - 18.1)</td> <td style="text-align: center;">3 - 4.2 (21.7 - 30.4)</td> </tr> <tr> <td>M12</td> <td style="text-align: center;">3 - 4.2 (21.7 - 30.4)</td> <td style="text-align: center;">5.5 - 7.5 (39.8 - 54.2)</td> </tr> <tr> <td>M14</td> <td style="text-align: center;">5 - 7 (36.2 - 50.6)</td> <td style="text-align: center;">8 - 11 (57.9 - 79.6)</td> </tr> </tbody> </table>			General Bolts (Bolt Diameter)	Bolt Head Mark			4	7	M6	0.3 - 0.7 (2.2 - 5.1)	0.8 - 1 (5.8 - 7.2)	M8	1 - 1.3 (7.2 - 9.4)	1.5 - 2.2 (10.8 - 15.9)	M10	1.8 - 2.5 (13.0 - 18.1)	3 - 4.2 (21.7 - 30.4)	M12	3 - 4.2 (21.7 - 30.4)	5.5 - 7.5 (39.8 - 54.2)	M14	5 - 7 (36.2 - 50.6)	8 - 11 (57.9 - 79.6)
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