

# **OPERATIONS & MAINTENANCE MANUAL**

**WESTERBEKE**

**DIESEL GENERATORS  
MOBILE & INDUSTRIAL**

**MODEL 15.0 BTDAR, 20.0 BEDR,  
25.0 BEDR & 32.0 BEDR  
60 HERTZ**

**MODEL 12.0 BTDAR, 16.0 BEDR,  
20.0 BEDR, 25.0 BEDR  
50 HERTZ**

**SINGLE & THREE PHASE GENERATORS**

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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.

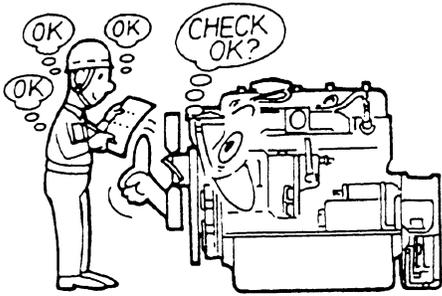
MODEL	16.0 BEI	20.0 BEI
ENG. SER. NO.	U1345-D301	
GEN. SER. NO.	47981	
KW	16.0	20.0
KVA	16.0	20.0
PF / PHASE	1.0 /	1
HZ	50	60
WIRES	4	
RATING	CONT.	
VOLTS	220	120/240
AMPS	72.7	166/837
INSUL. CLASS	F	
TEMP. RISE	105C AT 40C	
BATTERY	12VDC	
ENG. HP	32.0	40.0
C.I.D.	154.2	
RPM	1500	1800

The engine serial number can also be found stamped into the engine block on a smooth rectangular surface above the injection pump. 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

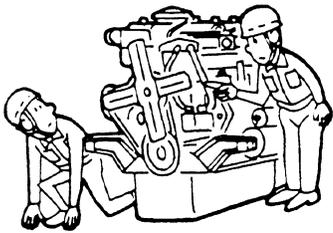


- DO visual inspections before starting your generator.

## DON'TS



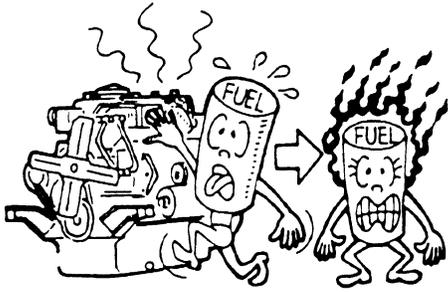
- DON'T touch any moving part on your engine during operation.



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



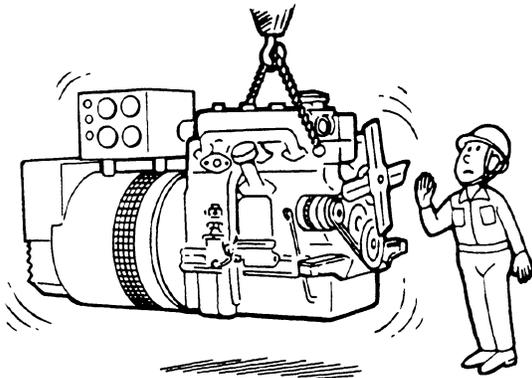
- DON'T touch hot engine parts such as exhaust manifolds.



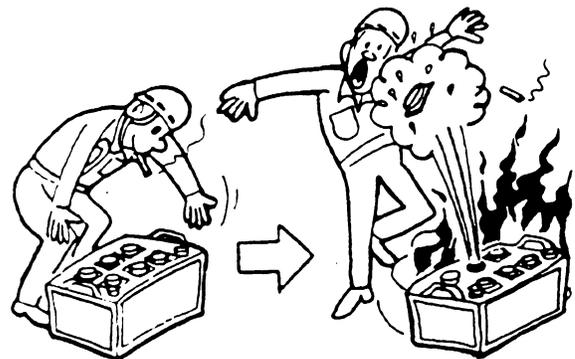
- **DO** keep fuel away from your engine at all times. Check for leaks regularly and correct them.



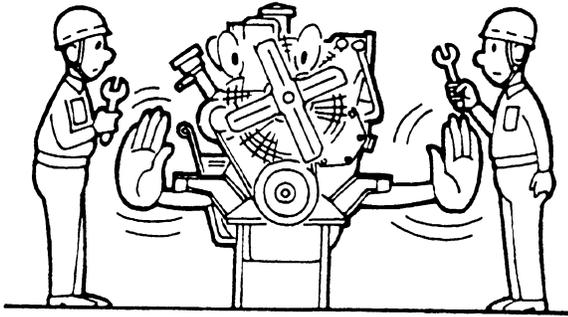
- **DON'T** remove radiator filler cap immediately after shutting down engine.



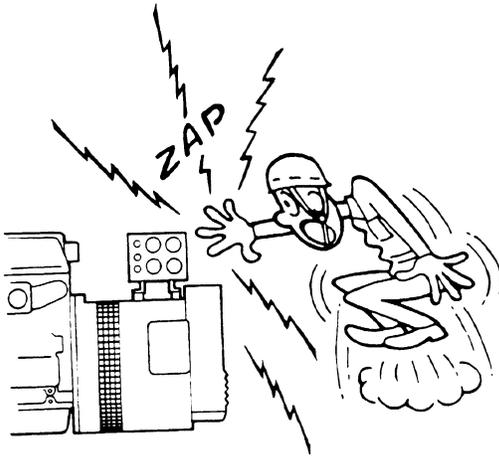
- **DO** check the capacity of sling hoist when lifting the unit. Use hangers and a wad of cloth in between sling and unit.



- **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

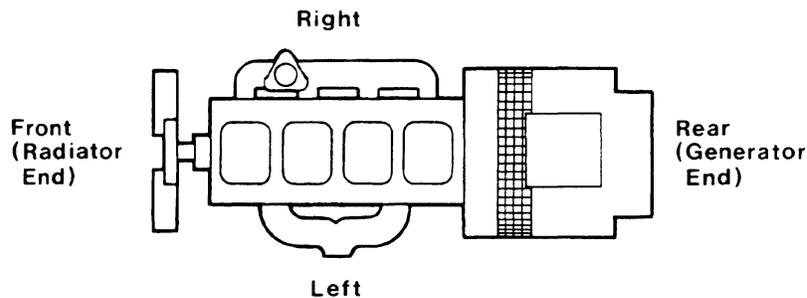
Operating procedures, practices, etc. which if not strictly observed, will result in damage or destruction to your engine.

### 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:

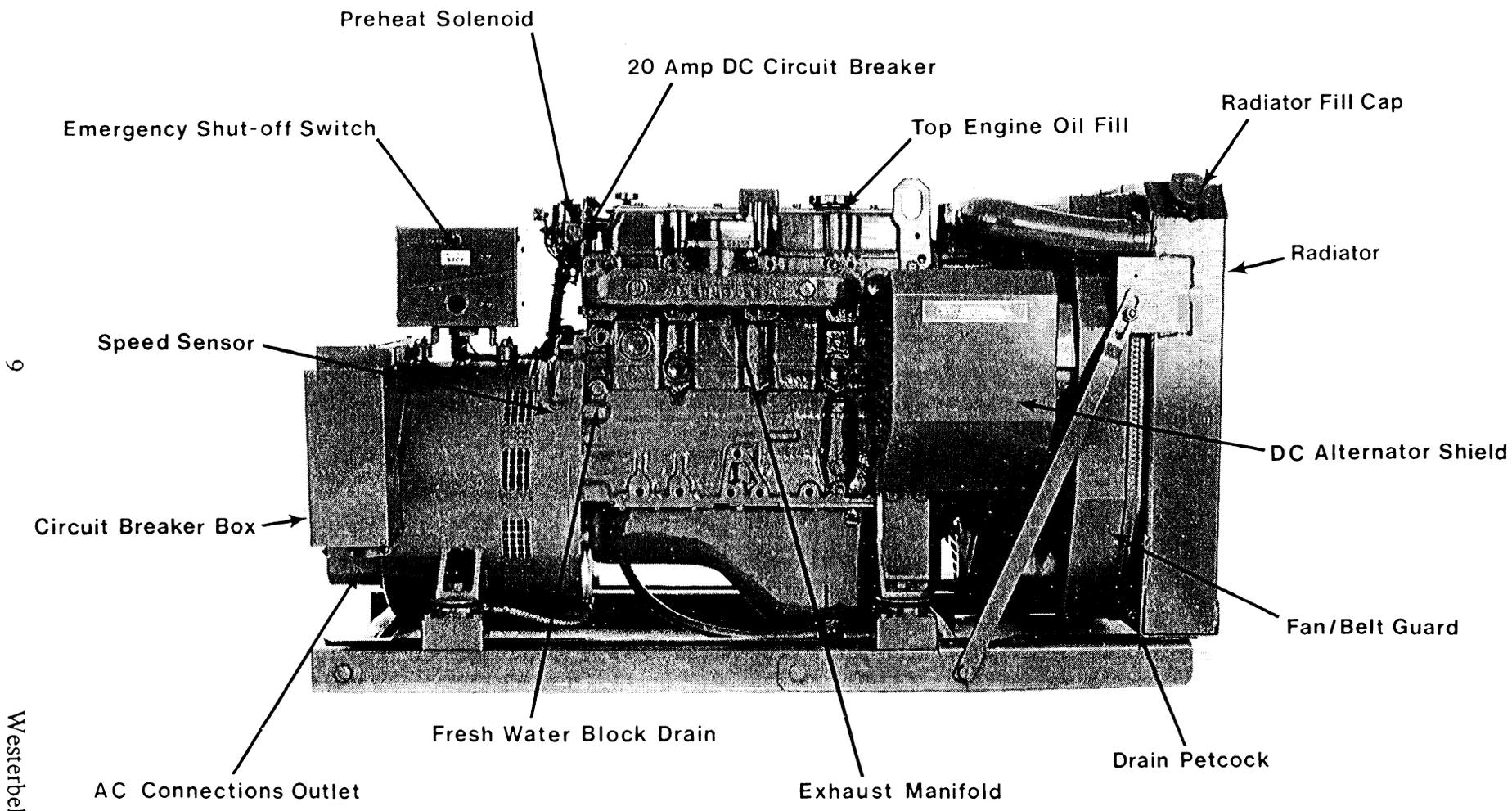


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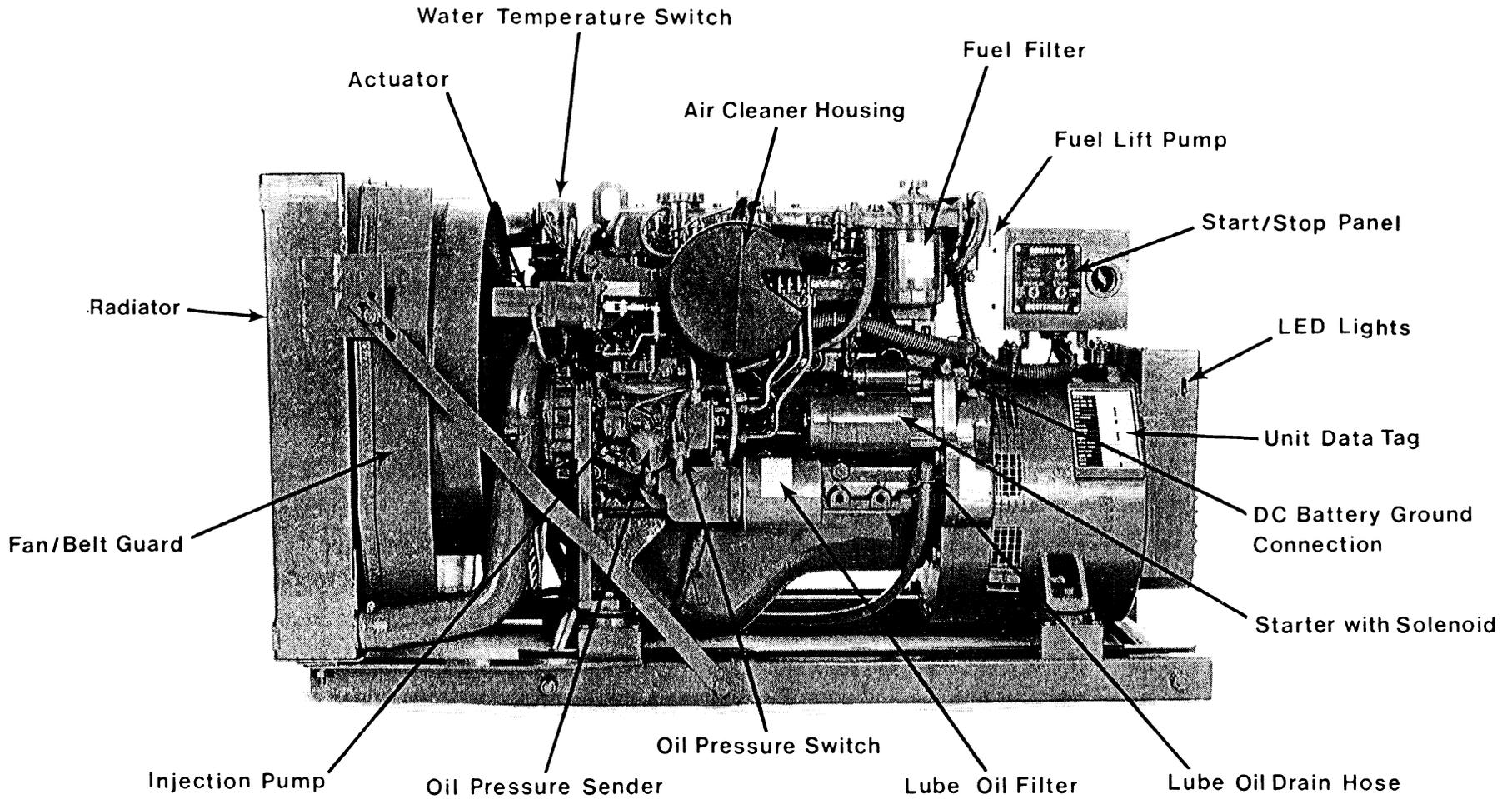


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Westerbeke Generators

**15.0 BTDAR GENERATOR**  
RIGHT SIDE

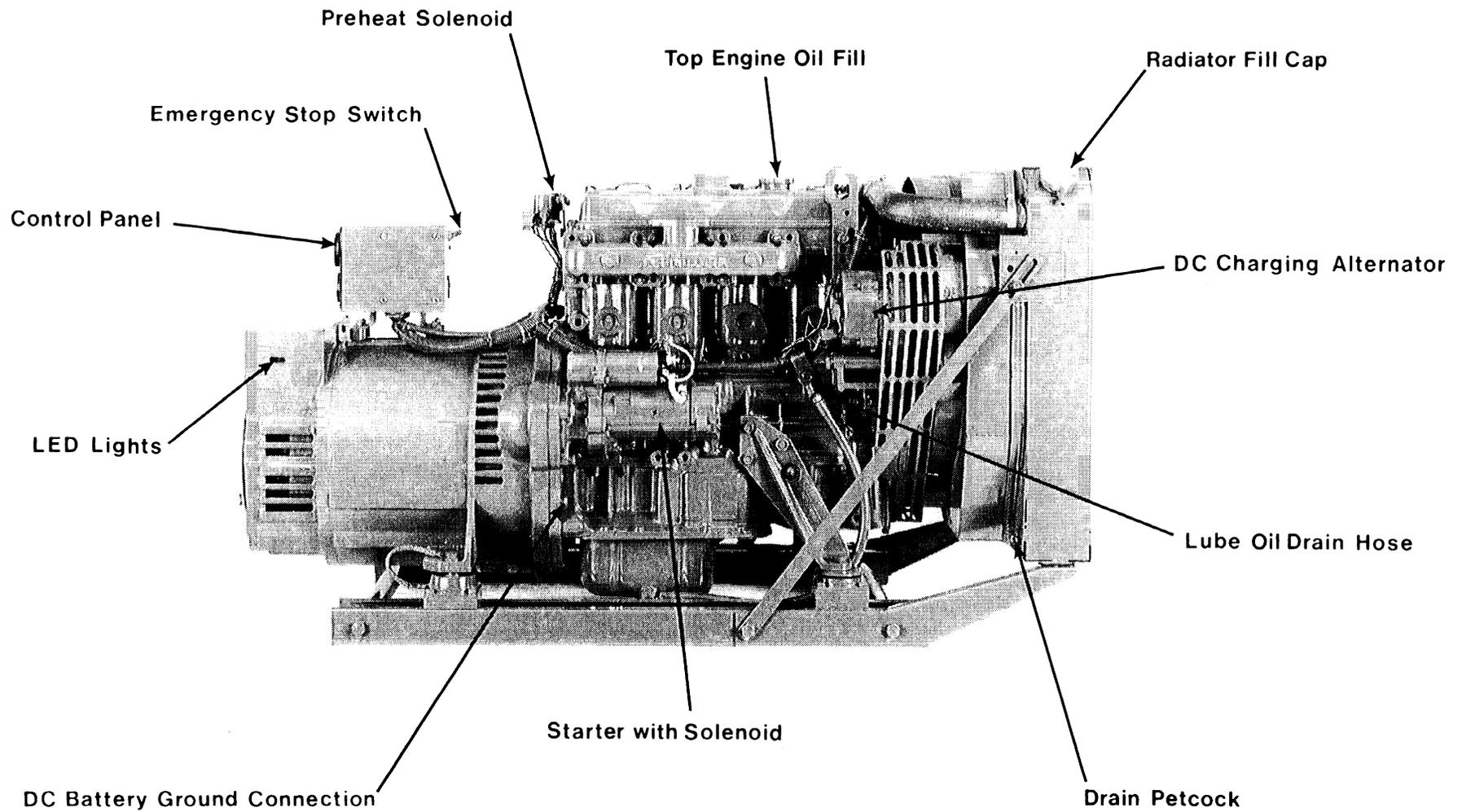




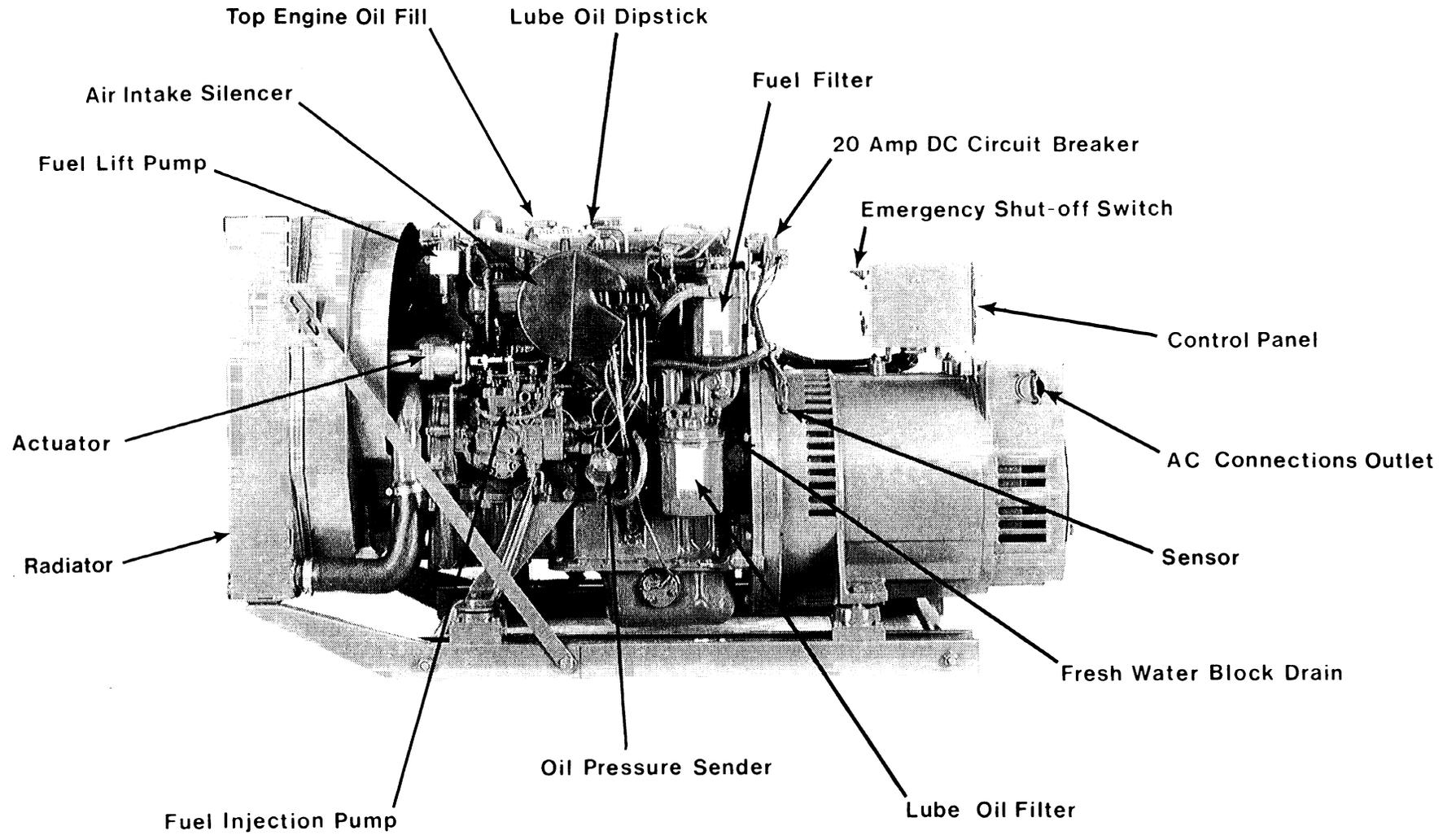
### 15.0 BTDAR GENERATOR

LEFT SIDE





**20.0 BEDR**  
RIGHT SIDE



**20.0 BEDR**  
LEFT SIDE









## 15.0 BTDAR DIESEL GENERATOR

### SINGLE PHASE & THREE PHASE

#### GENERAL SPECIFICATIONS

ENGINE TYPE	Diesel, 4 cycle, 4 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (30 hp at 1800 rpm maximum).
GOVERNOR	Electronic Governing
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	3.50 x 3.50 inches (88.9 x 88.9 mm)
PISTON DISPLACEMENT	134.8 cubic inches (2.2 liters)
FIRING ORDER	1-3-4-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	117 lb-ft (16.18 kg-m)
COMPRESSION RATIO	21:1
COMPRESSION PRESSURE (Limit of difference between cylinders)	427 psi (30 kg/cm <sup>2</sup> ) at 250 rpm 47.2 psi (3.0 kg/cm <sup>2</sup> )
VALVE TIMING	Intake Opens 17° BTDC Intake Closes 47° ABDC  Exhaust Opens 51° BBDC Exhaust Closes 13° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 30°
VALVE CLEARANCE (Engine Cold)	Intake 0.012 inches (0.3 mm) Exhaust 0.012 inches (0.3 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

## GENERAL SPECIFICATIONS CONTINUED.....

DIMENSIONS	Height: 28.50 inches (723 mm) Width: 24.8 inches (530 mm) Length: 49.6 inches (1260 mm)
WEIGHT	870 lbs. (395 kgs)
FUEL CONSUMPTION	2.0 gph (7.57 lph) at full rated output (approximate)
INCLINATION	Continuous 15° Temporary 20° (not to exceed 20 min)

**15.0 BTDAR DIESEL GENERATOR**  
**SINGLE PHASE & THREE PHASE**  
**SYSTEM SPECIFICATIONS**

**FUEL SYSTEM:**

GENERAL	Open flow, totally self-priming, 1 bleed point
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Bosch Model VE Distributor
FUEL INJECTION TIMING	0° TDC (Top Dead Center)
NOZZLE	Throttle type
FUEL FILTER (on engine)	Spin-on type, full flow
AIR CLEANER	Replaceable element
AIR FLOW ( engine combustion)	70.0 cfm (1.9 cmm)

**COOLING SYSTEM:**

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	170° - 190° F (77° - 88° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	11.5 quarts (10.88 liters) approximately

**LUBRICATION SYSTEM:**

GENERAL	Pressure fed system
OIL FILTER	Full flow, paper element, spin-on type

SUMP CAPACITY (not including filter)	5.3 quarts (5.0 liters) (plus filter/cooler assembly)
OPERATING OIL PRESSURE (engine hot)	50 - 65 psi (3.5 - 4.5 kg/cm)
OIL GRADE	API SPECIFICATION OF <b>CF</b> OR <b>CG-4</b> SAE 30, or 10W-30, 15W-40

**ELECTRICAL SYSTEM:**

STARTING BATTERY	12 volt 170 A-H, (-) negative ground (recommended) (200 A-H in cold areas)
BATTERY CAPACITY	400 - 600 cold cranking amps
DC CHARGING ALTERNATOR	51 amp rated, belt driven
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, 3 KW, reduction type
DC NO-LOAD CURRENT	± 2% of rated Amps
DC CRANKING CURRENT	250-300 amps ( engine cold)

**AC GENERATOR GENERAL:**

SINGLE PHASE ONLY	Brushless, four pole, revolving field. Sealed lubricated single-bearing design. Reconnectable, single phase for 120/240 volts with solid state voltage regulator.
VOLTAGE (Single Phase)	120 OR 120/240 volts- 60 Hertz 220 volts - 50 Hertz Voltage regulation ± 2% no load to full load Frequency regulation: .3 Hertz (.005%) no load to full load.
RATING (Volts AC)	
60 Hertz (1800 RPM) 15 KW	120 volts 125 amps 120/240 Volts 125/62.5 amps
50 Hertz (1500 RPM) 12 KW	220 volts 54.5 amps



**20.0 BEDR DIESEL GENERATOR**  
**SINGLE PHASE & THREE PHASE**  
**GENERAL SPECIFICATIONS**

ENGINE TYPE	Diesel, 4 cycle, 4 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (40 hp at 1800 rpm maximum).
GOVERNOR	Electronic Governing
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	3.50 x 4.0 inches (88.9 x 101.6mm)
PISTON DISPLACEMENT	154 cubic inches (2.5 liters)
FIRING ORDER	1-3-4-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	117 lb-ft (16.18 kg-m)
COMPRESSION RATIO	21:1
COMPRESSION PRESSURE (Limit of difference between cylinders)	427 psi (30 kg/cm <sup>2</sup> ) at 250 rpm 47.2 psi (3.0 kg/cm <sup>2</sup> )
VALVE TIMING	Intake Opens 17° BTDC Intake Closes 47° ABDC  Exhaust Opens 51° BBDC Exhaust Closes 13° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 30°
VALVE CLEARANCE (Engine Cold)	Intake 0.012 inches (0.3 mm) Exhaust 0.012 inches (0.3 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

## GENERAL SPECIFICATIONS CONTINUED.....

DIMENSIONS	Height: 28.50 inches (723.9 mm) Width: 22.0 inches (546.1 mm) Length: 45.79 inches (1163.3 mm)
WEIGHT	797 lbs. (361.5 kgs)
FUEL CONSUMPTION	2.0 gph (7.57 lph) at full rated output (approximate)
INCLINATION	Continuous 15° Temporary 20° (not to exceed 20 min)

**20.0 BEDR DIESEL GENERATOR**  
**SINGLE PHASE & THREE PHASE**  
**SYSTEM SPECIFICATIONS**

**FUEL SYSTEM:**

GENERAL	Open flow, totally self-priming, 1 bleed point
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Bosch Model VE Distributor
FUEL INJECTION TIMING	0° TDC (Top Dead Center)
NOZZLE	Throttle type
FUEL FILTER (on engine)	Spin-on type, full flow
AIR CLEANER	Replaceable element
AIR FLOW ( engine combustion)	81.0 cfm (2.29 cmm)

**COOLING SYSTEM:**

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	170° - 190° F (77° - 88° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	11.5 quarts (10.88 liters) approximately

**LUBRICATION SYSTEM:**

GENERAL	Pressure fed system
OIL FILTER	Full flow, paper element, spin-on type

SUMP CAPACITY (not including filter)	6.5 quarts (6.15 liters) (plus filter/cooler assembly)
OPERATING OIL PRESSURE (engine hot)	50 - 60 psi (3.5 - 4.2 kg/cm)
OIL GRADE	API SPECIFICATION OF <b>CF</b> OR <b>CG-4</b> SAE 30, or 10W-30, 15W-40

**ELECTRICAL SYSTEM:**

STARTING BATTERY	12 volt (-) negative ground
BATTERY CAPACITY	400 - 600 cold cranking amps
DC CHARGING ALTERNATOR	51 amp rated, belt driven
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, 3 KW, reduction type
DC NO-LOAD CURRENT	± 2% of rated Amps
DC CRANKING CURRENT	250-300 amps ( engine cold)

**AC GENERATOR GENERAL:**

SINGLE PHASE ONLY	Brushless, four pole, revolving field. Sealed lubricated single-bearing design. Reconnectable, single phase for 120/240 volts with solid state voltage regulator.
VOLTAGE (Single Phase)	120 OR 120/240 volts- 60 Hertz 220 volts - 50 Hertz Voltage regulation ± 2% no load to full load Frequency regulation: .3 Hertz (.005%) no load to full load.
RATING (Volts AC)	
60 Hertz (1800 RPM) 20 KW	120 volts 166 amps 120/240 Volts 166/83 amps
50 Hertz (1500 RPM) 16 KW	220 volts 72.7 amps



## 25.0 BEDR DIESEL GENERATOR

### SINGLE PHASE & THREE PHASE

#### GENERAL SPECIFICATIONS

ENGINE TYPE	Diesel, 4 cycle, 4 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (50 hp at 1800 rpm maximum).
GOVERNOR	Electronic Governing
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	3.74 x 4.13 inches (95 x 105 mm)
PISTON DISPLACEMENT	182 cubic inches (2.98 liters)
FIRING ORDER	1-3-4-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	148 lb-ft (20.46 kg-m)
COMPRESSION RATIO	21:1
COMPRESSION PRESSURE (Limit of difference between cylinders)	427 psi (30 kg/cm <sup>2</sup> ) at 250 rpm (47.2 psi (3.0 kg/cm <sup>2</sup> ))
VALVE TIMING	Intake Opens 17° BTDC Intake Closes 47° ABDC Exhaust Opens 51° BBDC Exhaust Closes 13° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 30°
VALVE CLEARANCE (Engine Cold)	Intake 0.012 inches (0.3 mm) Exhaust 0.012 inches (0.3 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

## GENERAL SPECIFICATIONS CONTINUED....

DIMENSIONS	Height: 28.6 inches(726.4 mm) Width: 23.3 inches (591.8 mm) Length: 49.9 inches (1140.5 mm)
WEIGHT	752 lbs. (345 kgs)
FUEL CONSUMPTION	2.9 gph (10.9 lph) at full rated output (approximate)
INCLINATION	Continuous 15° Temporary 20° (not to exceed 20 min)

## 25.0 BEDR DIESEL GENERATOR

### SINGLE PHASE & THREE PHASE

#### SYSTEM SPECIFICATIONS

##### FUEL SYSTEM:

GENERAL	Open flow, self priming - 1 bleed point
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Bosch Model VE Distributor
FUEL INJECTION TIMING	0° TDC (Top Dead Center)
NOZZLE	Throttle type
FUEL FILTER (on engine)	Spin on type, full flow.
AIR CLEANER	Metal screen type clean able
AIR FLOW ( engine combustion)	94.6 cfm (2.7 cmm)

##### COOLING SYSTEM:

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	170° - 190° F (77° - 88° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	11.5 quarts (10.88 liters) approximately

##### LUBRICATION SYSTEM:

GENERAL	Pressure fed system
OIL FILTER	Full flow, paper element, spin-on type

SUMP CAPACITY (not including filter)	6.5 quarts (6.15 liters) plus filter/cooler assembly
OPERATING OIL PRESSURE (engine hot)	50 - 60 psi (3.5 - 4.2 kg/cm)
OIL GRADE	API SPECIFICATION OF <b>CF OR CG-4</b> SAE 30W or 10W-30, 15W-40

**ELECTRICAL SYSTEM:**

STARTING BATTERY	12 volt (-) negative ground
BATTERY CAPACITY	400 - 600 cold cranking amps
DC CHARGING ALTERNATOR	51 Amp rated, belt-driven
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, reduction type
DC NO-LOAD CURRENT	± 2% of rated Amps
DC CRANKING CURRENT	250 - 300 amps (engine cold)

**AC GENERATOR GENERAL:**

SINGLE PHASE ONLY	Brushless, four pole, revolving field. Pre-lubricated single-bearing design. Reconnectable, single phase for 120/240 volts with solid state voltage regulation.
VOLTAGE (Single Phase)	120 OR 120/240 volts- 60 Hertz 220 volts - 50 Hertz Voltage regulation ± 2% no load to full load Frequency regulation: .3 Hertz (.005%) no load to full load.
RATING (Volts AC)	
60 Hertz (1800 RPM) 25.0 KW	120 volts 208 amps 120/240 208/104 amps
50 Hertz (1500 RPM) 20.0 KW	220 volts 91 amps

AC GENERATOR GENERAL:

GENERAL THREE PHASE ONLY

Brushless, six pole, revolving field. Sealed lubricated single bearing design. 12 lead reconnectable for low voltage and high voltage WYE and for DELTA. Solid state voltage regulation with protection circuitry.

Voltage - 3 Phase (60 Hertz)

Low voltage WYE	208 volts
High voltage WYE	480 volts
DELTA	240 volts

Voltage - 3 Phase (50 Hertz)

High voltage WYE	380 volts
DELTA	220 volts

Amperage - 3 Phase (60 Hertz)  
.8 Powerfactor

Low voltage WYE	86.6 amps
High voltage WYE	37.6 amps
DELTA	75.2 amps

Amperage - 3 Phase (50 Hertz)  
.8 Powerfactor

High voltage WYE	38.0 amps
DELTA	65.5 amps

GENERATOR COOLING:

AIR REQUIREMENTS  
60 Hertz at 1800 rpm

1.0 Power Factor 450 cfm (12.74 cmm)

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

TUNE-UP SPECIFICATIONS:

INJECTOR PRESSURE

1920 + 70 - 0 psi (135 + 5-0 kg/cm<sup>2</sup>)

ENGINE TIMING

Static timed - drop valve method  
0.180 ± .005 inches BTDC

## **32.0 BEDR DIESEL GENERATOR**

### **SINGLE PHASE & THREE PHASE**

#### **GENERAL SPECIFICATIONS**

ENGINE TYPE	Diesel, 4 cycle, 6 cylinder, fresh water cooled. Vertical, in-line overhead valve mechanism (67 hp at 1800 rpm maximum).
GOVERNOR	Electronic Governing
COMBUSTION CHAMBER	Swirl chamber type.
BORE & STROKE	3.62 x 4.00 inches (92 x 101.6 mm)
PISTON DISPLACEMENT	247.3 cubic inches (4.05 liters)
FIRING ORDER	1-5-3-6-4-2
DIRECTION OF ROTATION	Clockwise, when viewed from the front
MAXIMUM TORQUE (AT 1800 RPM)	195 lb-ft (26.97 kg-m)
COMPRESSION RATIO	21:1
COMPRESSION PRESSURE (Limit of difference between cylinders)	427 psi (30 kg/cm <sup>2</sup> ) at 250 rpm (47.2 psi (3.0 kg/cm <sup>2</sup> })
VALVE TIMING	Intake Opens 14° BTDC Intake Closes 44° ABDC Exhaust Opens 48° BBDC Exhaust Closes 10° ATDC
VALVE SEAT ANGLE	Intake 45° Exhaust 30°
VALVE CLEARANCE (Engine Cold)	Intake 0.012 inches (0.3 mm) Exhaust 0.012 inches (0.3 mm)
ENGINE SPEED	1800 rpm 60 Hertz 1500 rpm 50 Hertz

## GENERAL SPECIFICATIONS CONTINUED....

DIMENSIONS	Height: 31.0 inches(787.4 mm) Width: 25.2 inches (640.3 mm) Length: 57.5 inches (1460.5 mm)
WEIGHT	1250 lbs. (567 kgs)
FUEL CONSUMPTION	3.1 gph (11.73 lph) at full rated output (approximate)
INCLINATION	Continuous 15° Temporary 20° (not to exceed 20 min)

**32.0 BEDR DIESEL GENERATOR**  
**SINGLE PHASE & THREE PHASE**  
**SYSTEM SPECIFICATIONS**

**FUEL SYSTEM:**

GENERAL	Open flow, self priming - 1 bleed point
FUEL	No. 2 Diesel oil (cetane rating of 45 or higher)
FUEL INJECTION PUMP	Bosch Model VE Distributor
FUEL INJECTION TIMING	0° TDC (Top Dead Center)
NOZZLE	Throttle type
FUEL FILTER (on engine)	Spin on type, full flow.
AIR CLEANER	Metal screen type clean able
AIR FLOW ( engine combustion)	128.0 cfm (3.7 cmm)

**COOLING SYSTEM:**

GENERAL	Closed fresh water-cooled block, thermostatically controlled with radiator
OPERATING TEMPERATURE	170° - 190° F (77° - 88° C)
FRESH WATER PUMP	Centrifugal type, metal impeller, belt-driven.
SYSTEM CAPACITY (Fresh Water)	18.5 quarts (17.5 liters) approximately

**LUBRICATION SYSTEM:**

GENERAL	Pressure fed system
OIL FILTER	Full flow, paper element, spin-on type
SUMP CAPACITY (not including filter)	14.0 quarts (13.2 liters)

OPERATING OIL PRESSURE (engine hot)	50 - 60 psi (3.5 - 4.2 kg/cm)
OIL GRADE	API SPECIFICATION OF <b>CF</b> OR <b>CG-4</b> SAE 30W or 10W-30, 15W-40

**ELECTRICAL SYSTEM:**

STARTING BATTERY	12 volt (-) negative ground
BATTERY CAPACITY	900-1000 COLD CRANKING AMPS
DC CHARGING ALTERNATOR	51 Amp rated, belt-driven
STARTING AID	Glow plug, sheathed type.
STARTER	12 volt, reduction type
DC NO-LOAD CURRENT	± 2% of rated Amps
DC CRANKING CURRENT	350-400 AMPS (ENGINE COLD)

**AC GENERATOR GENERAL:**

SINGLE PHASE ONLY	Brushless, four pole, revolving field. Pre-lubricated single-bearing design. Reconnectable, single phase for 120/240 volts with solid state voltage regulation.
VOLTAGE (Single Phase)	120 OR 120/240 volts- 60 Hertz 220 volts - 50 Hertz Voltage regulation ± 2% no load to full load Frequency regulation: .3 Hertz .005% no load to full load.
RATING (Volts AC)	
60 Hertz (1800 RPM) 32.0 KW	120 volts 266 amps 120/240 266/133 amps
50 Hertz (1500 RPM) 25.0 KW	220 volts 113.6 amps

AC GENERATOR GENERAL:

GENERAL THREE PHASE ONLY

Brushless, six pole, revolving field. Sealed lubricated single bearing design. 12 lead reconnectable for low voltage and high voltage WYE and for DELTA. Solid state voltage regulation with protection circuitry.

Voltage - 3 Phase (60 Hertz)

Low voltage WYE 208 volts  
High voltage WYE 480 volts  
DELTA 240 volts

Voltage - 3 Phase (50 Hertz)

High voltage WYE 380 volts  
DELTA 220 volts

Amperage - 3 Phase (60 Hertz)  
.8 Powerfactor

Low voltage WYE 111.0 amps  
High voltage WYE 48.1 amps  
DELTA 96.2 amps

Amperage - 3 Phase (50 Hertz)  
.8 Powerfactor

High voltage WYE 47.5 amps  
DELTA 82.0 amps

GENERATOR COOLING:

AIR REQUIREMENTS  
60 Hertz at 1800 rpm

1.0 Power Factor 480 cfm (13.59 cmm)

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

TUNE-UP SPECIFICATIONS:

INJECTOR PRESSURE

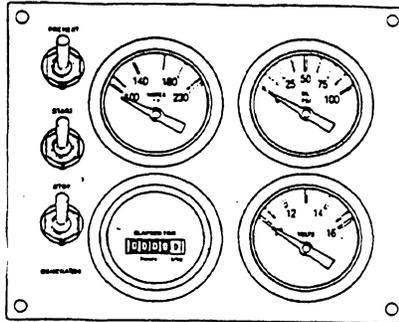
1920 + 70 - 0 psi (135 + 5-0 kg/cm<sup>2</sup>)

ENGINE TIMING

Static timed - drop valve method  
0.230 ± .005 inches BTDC

**YOUR NOTES**

## CONTROLS AND INSTRUMENTS



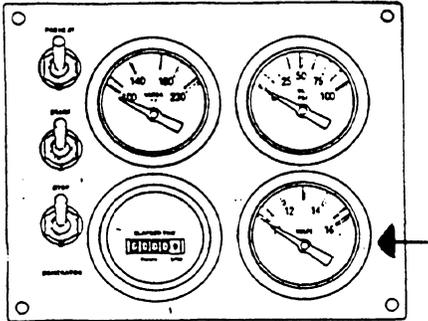
### INSTRUMENT PANEL

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.

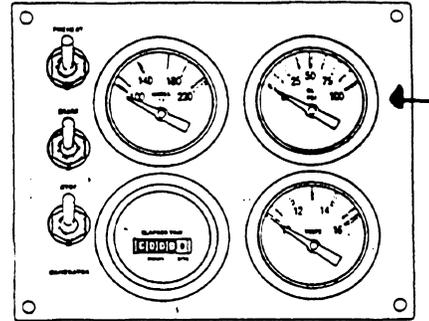
**NOTE:** When the engine is shut down, the water temperature gauge and the oil pressure gauge will continue to register the last temperature and oil pressure readings indicated before the electrical power was turned off. The temperature gauge and oil pressure gauge will return to zero once electrical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

**DC VOLTMETER  
GAUGE**



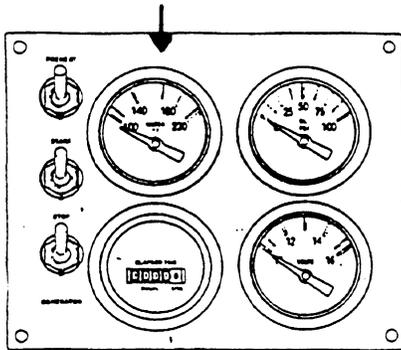
Shows the amount the battery is being charged.

**ENGINE OIL PRESSURE**



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

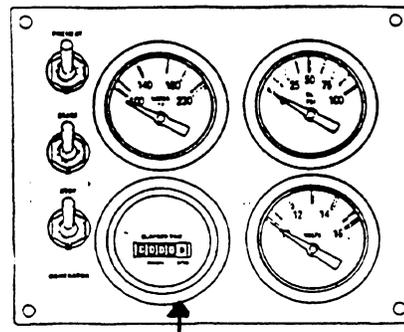
**WATER TEMPERATURE GAUGE**



Indicates the temperature of engine coolant.

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

**HOUR METER**



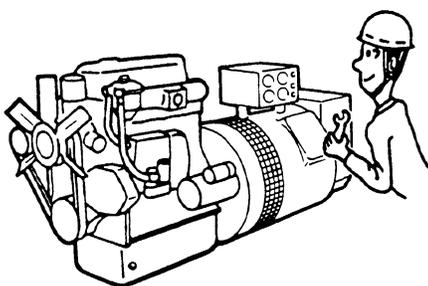
The hour meter registers elapsed  
time and should be used as a guide  
for scheduled maintenance.

## NEW GENERATOR INITIAL INSPECTION

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

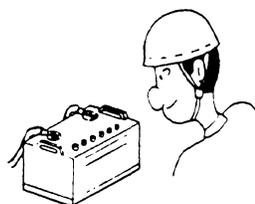
### Appearance

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.



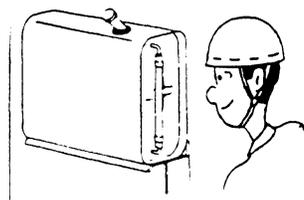
### Lubrication System

Check oil level in oil pan.  
Check for leaks.



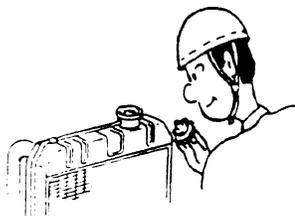
### Fuel System

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



### Cooling System

Check coolant level in radiator  
Vent air out of system.

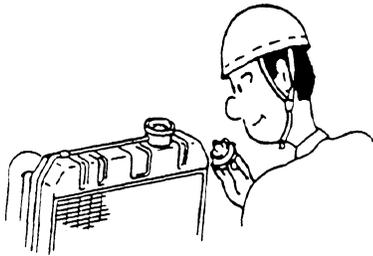


## DAILY WALK-AROUND CHECKS

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:

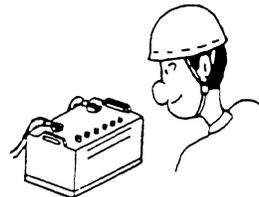
### Cooling System

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



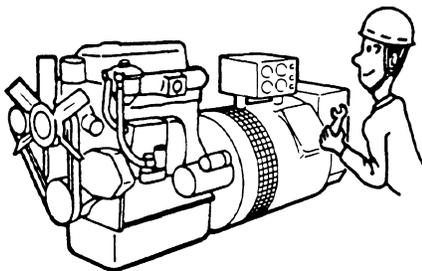
### Battery

Are cables tight on terminal posts?



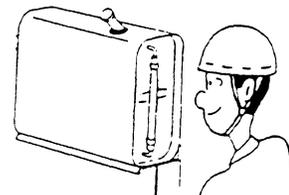
### Others

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 harmful 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.

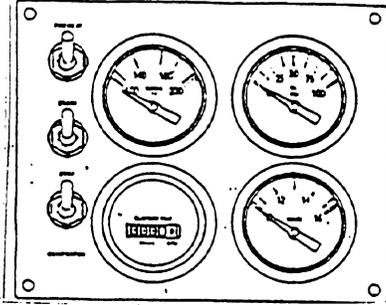
Use an antifreeze brand such as "Prestone" that is compatible with aluminum engine components. Do not use straight water this can be detrimental to the aluminum engine and cooling system components.

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.

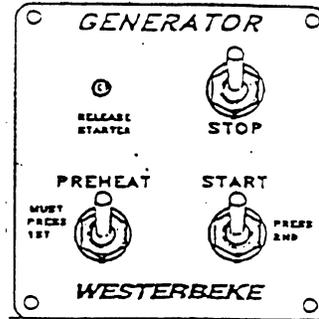
### ANTIFREEZE PROTECTION CHART

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

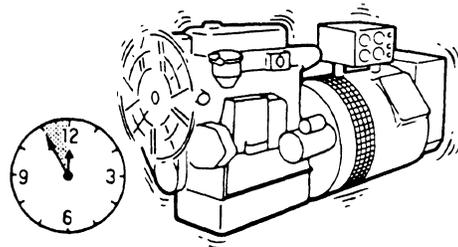
2. *STARTING:*

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 high water temperature and low oil pressure 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.

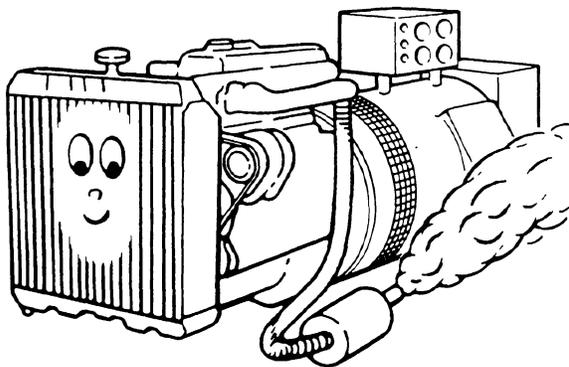
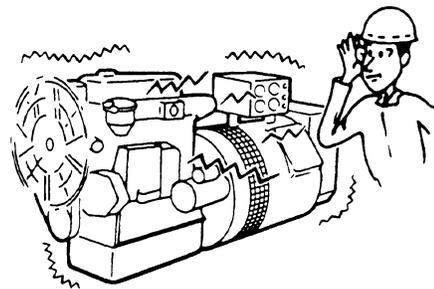
### *WARMING UP:*

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.

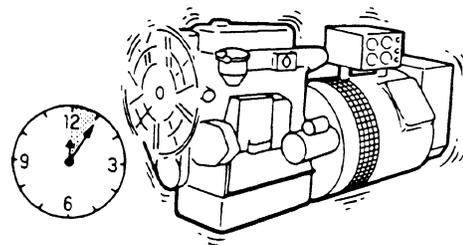
Check that the engine/generator are operating without any abnormal noise or vibration.



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 41.)
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**

<b>ITEM</b>	<b>SERVICE</b>
<b><i>EVERY 10 OPERATING HOURS OR DAILY</i></b>	
1. Walk-around inspection.	See Page 41
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. Generator	Check that AC connections are clean and secure. Check that AC leads are not chaffing.
4. Fuel filter element	Initial change of engine fuel filter element(s).
5. Engine no load speed	Check engine no load speed and adjust if necessary. (61.5 - 62.0 Hertz)
6. Fan Belt	Adjust fan belt tension 1/2 - 3/8 inch deflection.
7. Air cleaner	Check and clean element.

## ROUTINE SERVICE SCHEDULE CONTINUED...

### ITEM

### SERVICE

#### *EVERY 100 OPERATING HOURS*

- |                    |  |
|--------------------|--|
| 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. |

#### *EVERY 250 OPERATING HOURS*

- |                   |  |
|-------------------|--|
| 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.                        |

#### *EVERY 500 OPERATING HOURS*

- |                              |  |
|------------------------------|--|
| 1. Cylinder Head Maintenance | Retorque cylinder head and rocker shaft, hold down bolts and adjust valve clearances.              |
| 2. Cooling System            | Check antifreeze/water mixture. Add antifreeze as needed. Check condition of mixture.              |
| 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....**

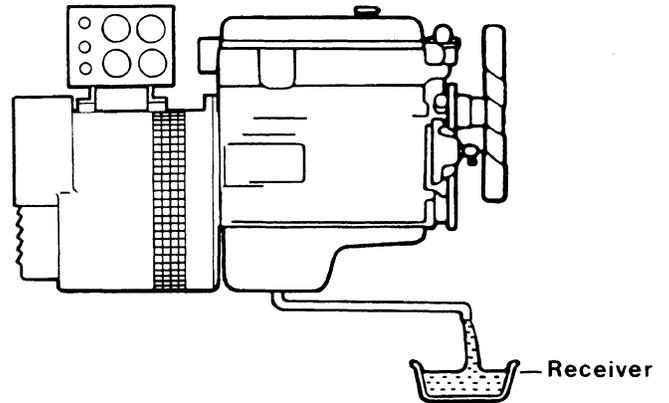
<b>ITEM</b>	<b>SERVICE</b>
<b><i>EVERY 800 OPERATING HOURS</i></b>	
1. Fuel injector(s)	Remove, check and rebuild fuel injectors as needed.
2. Engine compression	Check engine compression pressure.
3. DC alternator	Check DC charge from alternator. Check pulley mounting and attachment of alternator to engine.
4. Engine parts	Check security and tightness of nuts, bolts and wire connections.
<b><u><i>EVERY 1000 OPERATING HOURS</i></u></b>	
1. Radiator	Remove radiator, have professionally cleaned and pressure tested. Repair or replace as needed. Replace coolant mixture if needed.

## 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.

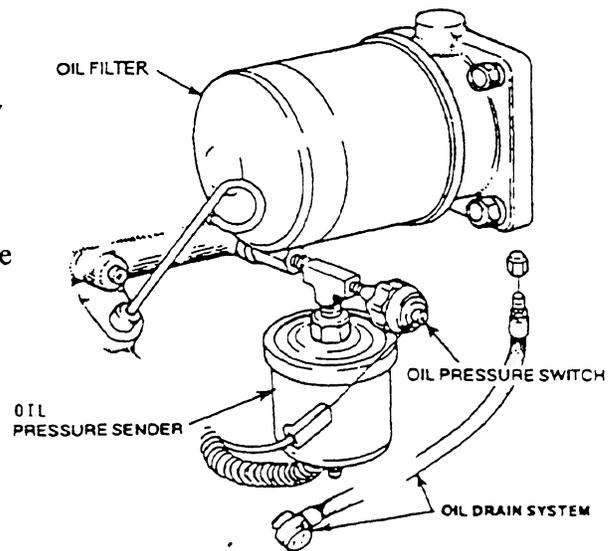


### 2. Replacement of the Oil Filter

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.



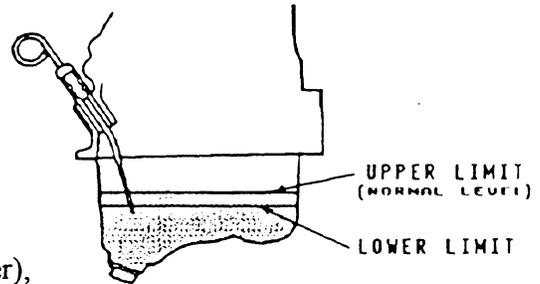
Oil Filter and Oil Drain System

**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...

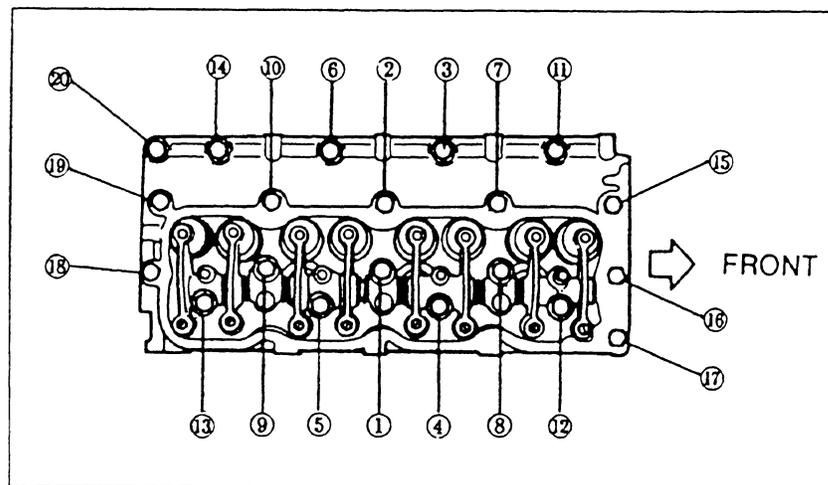
### 3. Filling the Oil Sump

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

Tighten the cylinder head bolts according to the sequence shown in the illustration below. Make sure the engine is cold when this is done, and loosen one head bolt one-half turn and then tighten it between 85 to 90 lb-ft. (11.8 to 12.5 kg/m) for the BED 20KW AND 25KW, or 80-85 lb-ft (11.0 to 11.8 kg/m) for the BTDAR 15 KW. Then proceed to the next head bolt in the sequence.



## SERVICE ITEMS CONTINUED....

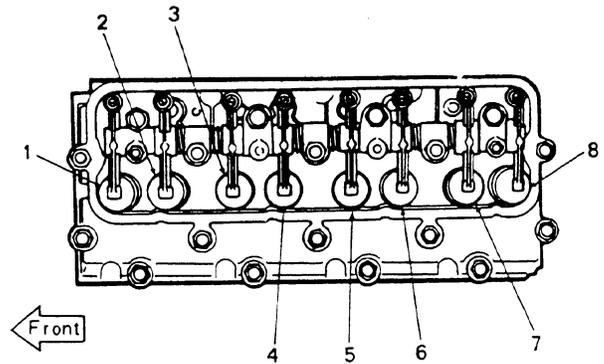
### 5. Valve Clearance Adjustment (.012 inches - .3 mm cold, intake and exhaust)

Note: Retorque the cylinder head bolts before adjusting the engine's valves.

For the BTDAR 15 KW, BEDR 20 KW and 25 KW Engines:

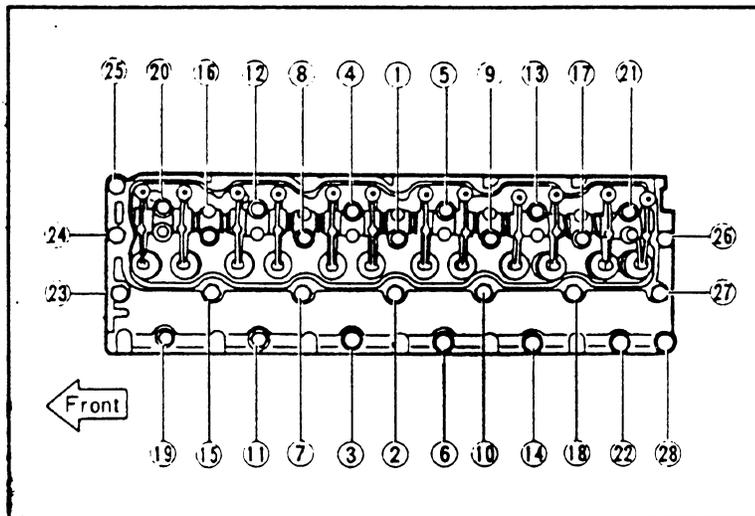
Position the No. 1 Piston at TOP DEAD CENTER (TDC) on its compression stroke and adjust the #1,2,3, and 6 valves (see the illustration to the right).

Position the No. 4 piston at TDC of its compression stroke and adjust the #4, 5, 7 and 8 valves. The valves are numbered 1 to 8 from the front of the engine to the back



### 6. Torquing Cylinderhead Bolts 32 BEDR

Tighten the cylinder head bolts according to the sequence shown in the illustration. Make sure the engine is cold when this is done. Loosen one bolt at a time one-half turn, then apply the torque. Tightening Torque: 80-85 lb-ft (11.0-11.7 kg-m)



## SERVICE ITEMS CONTINUED....

### 7. Valve Clearance Adjustment

Note: Retorque the cylinder head bolts before adjusting the engines valves.

For the 32 BEDR engine:

Position the No.1 piston at TOP DEAD CENTER (TDC) on its compression stroke and adjust the valve clearance:

Intake Valve Cylinder #1, #2 and #4  
Exhaust Valve Cylinder #1, #3 and #5

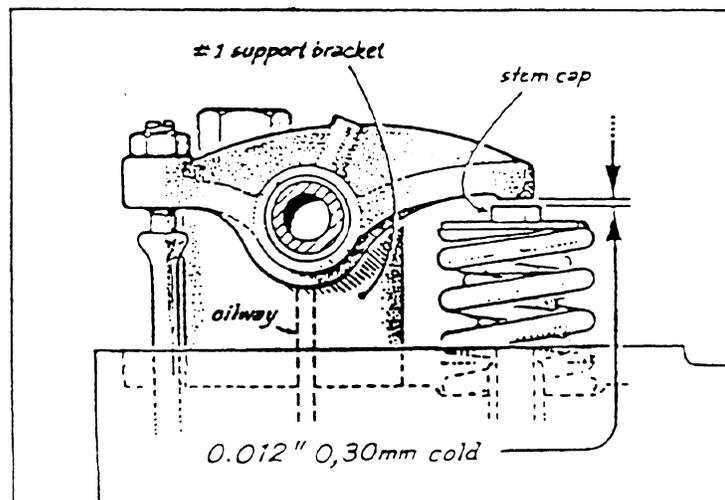
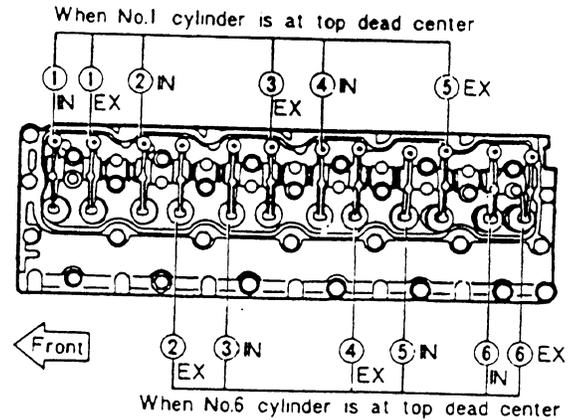
Position the No. 6 piston at the TOP DEAD CENTER (TDC) on its compression stroke and adjust the valve clearance:

Intake Valve - Cylinder # 3, #5 and #6  
Exhaust Valve Cylinder #2, #4 and #6

Valve Clearance:

15 BTDAR, 20 BEDR, 25 BEDR and 32 BEDR

Adjust all valves to .012 inches (0.3 mm)  
with the engine cold.



## SERVICE ITEMS CONTINUED ....

### 8. Injector Servicing

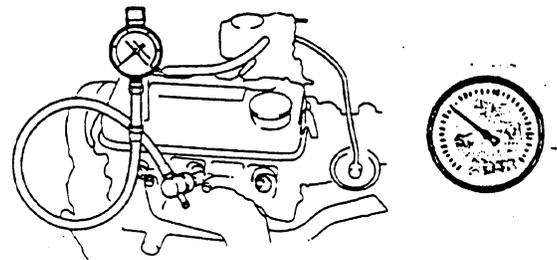
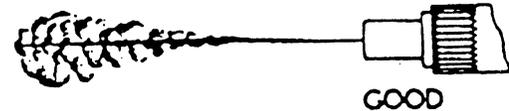
Injector spray pressure:  
1920 psi + 71 psi - 0  
(135 kg/cm<sup>2</sup> + 5 kg/cm<sup>2</sup> - 0)

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.

Standard	Minimum
427 psi (30 kg/cm <sup>2</sup> )	384 psi (27 kg/cm <sup>2</sup> )

Maximum difference between cylinders:  
42.7 psi (3.0 kg/cm<sup>2</sup>)



### 9. Air Cleaner Element

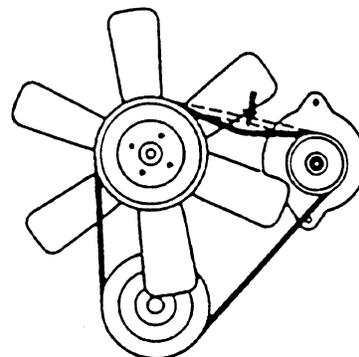
Various air filtration systems may be incorporated with your generator depending on the application. Proper servicing is imperative. Check the air filtration system frequently.

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

## SERVICE ITEMS CONTINUED...

### 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

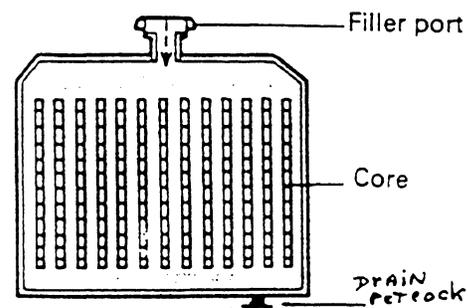
While the engine is cold, open the filler cap on the top of the radiator and then open drain petcock on the lower part of the radiator. (Drain and wash the plastic coolant recovery tank.)

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.

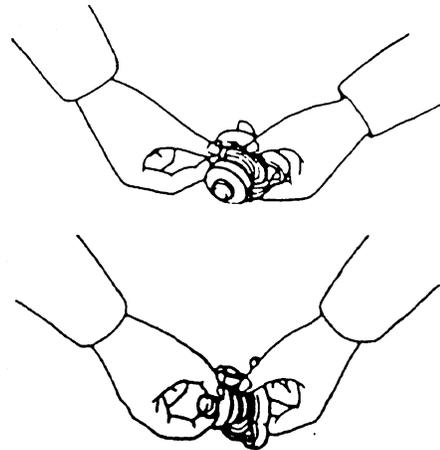
Start the engine and observe the coolant mixture in the radiator. Add coolant as air is expelled. Observe engine operating temperature. Once the system is purged of air, fill the radiator full and install the pressure cap. Fill the plastic coolant recovery tank 1/2 full.



## 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. Electronic Governing System

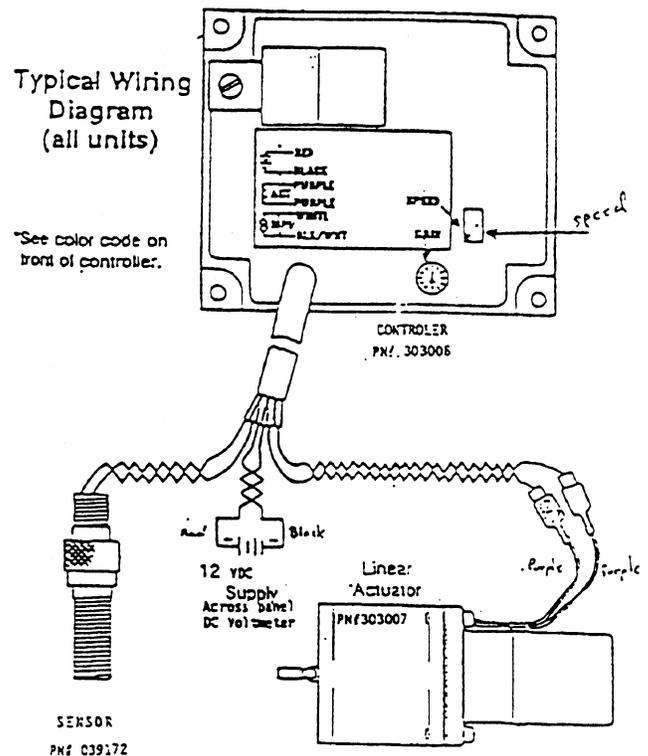
The system is composed of 3 basic components:

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

#### Controller Adjustments:

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

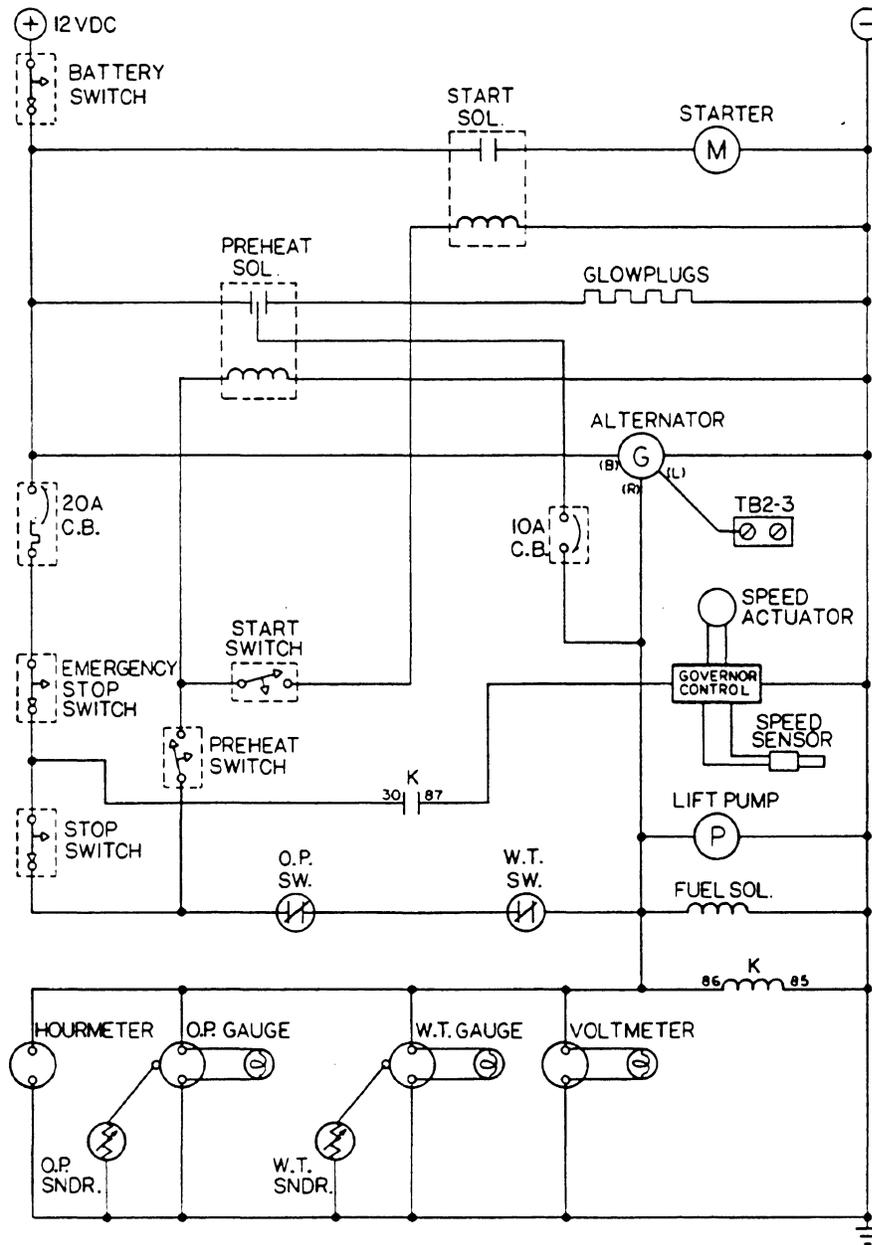
Note: A high gain adjustment can induce an oscillating of the actuator producing a hunting mode. In such cases, lessen the gain adjustment.



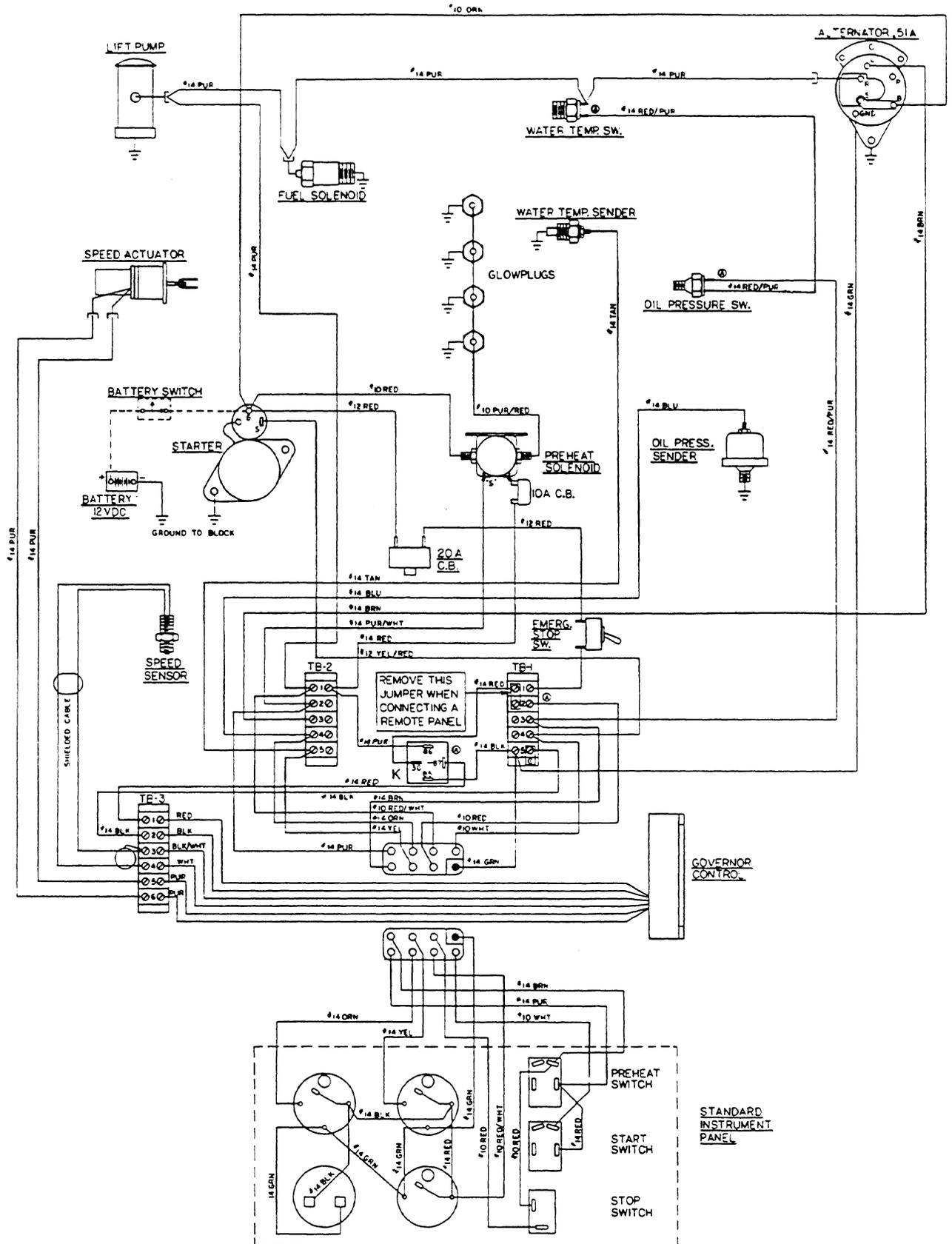
## 14. Generator Maintenance

1. 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.
2. 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 Ashland "Tectyle 506" and Daubert Chemical Co. "Nox-Rust AC-410."
3. 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.
4. 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.
5. Examine bearing at periodic intervals. No side movement of shaft should be detected when force is applied. If side motion is detectable, bearings area 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.
6. Examine control box at periodic intervals to detect cracks from engine and generator vibration. If cracks in box are seen, engine vibration may be severe and require bracing in box for additional strength to resist vibration.

# ENGINE DC WIRING DIAGRAM

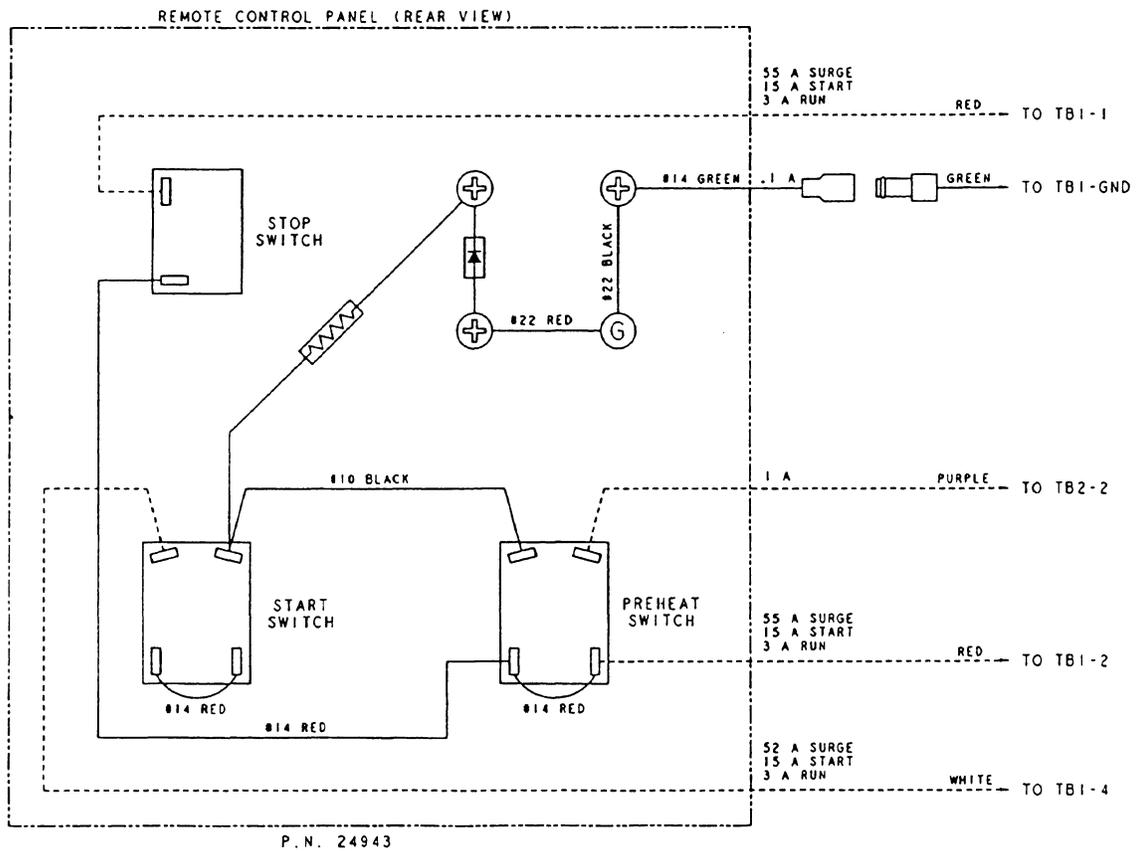


# DC Control Circuit Wiring Diagram



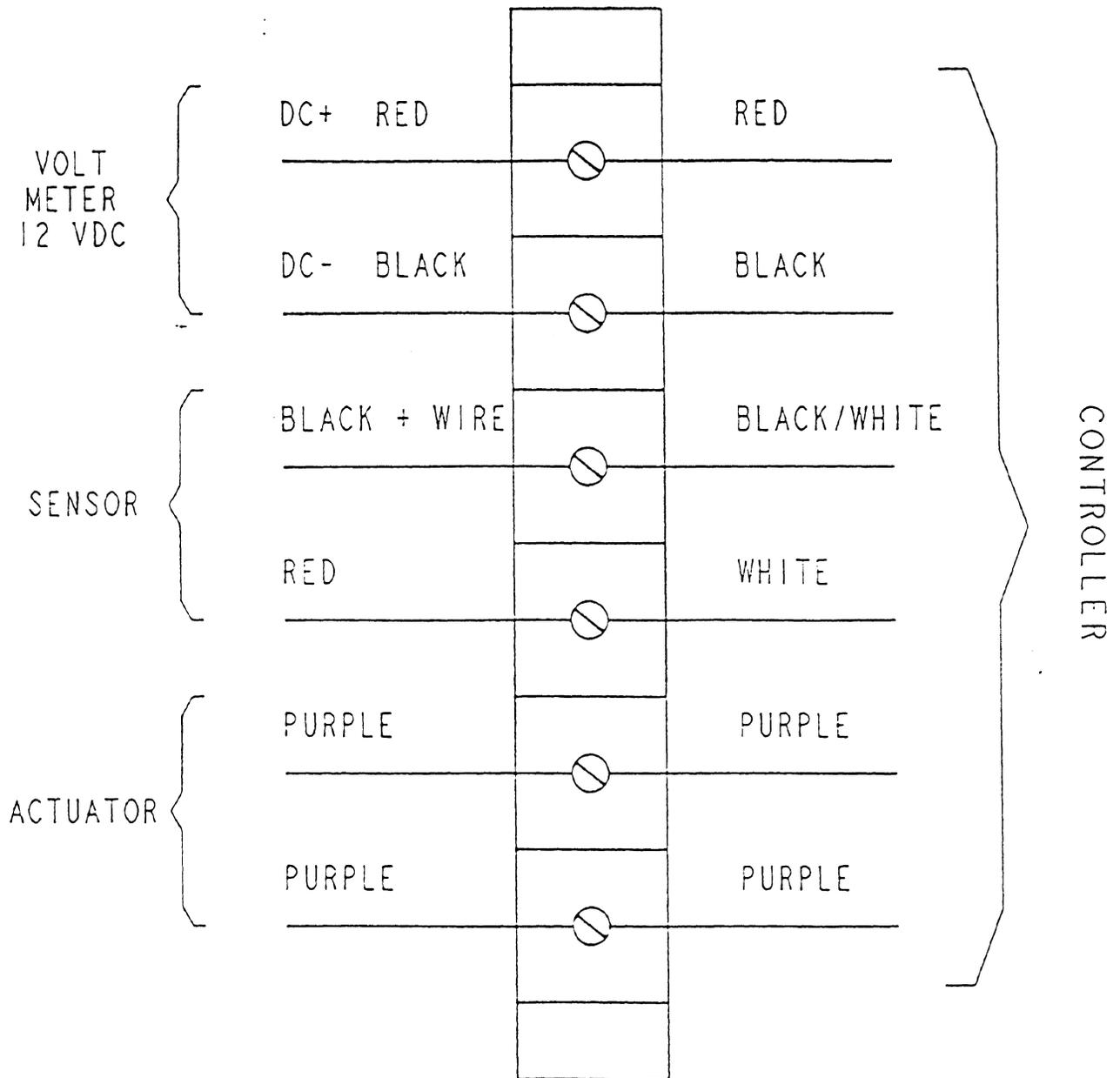
DC WIRING DIAGRAM  
FOR REMOTE  
START/STOP  
PANEL.

NOTE: For some applications, this panel may be mounted on the generator set and the instrument panel mounted at a remote location.



DC WIRING DIAGRAM CONTINUED...

ELECTRONIC GOVERNOR CIRCUIT TERMINAL BLOCK,  
MOUNTED INSIDE UNIT CONTROL PANEL.



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**GENERATOR DESCRIPTION SUMMARY  
BE-BRUSHLESS ELECTRONIC  
BT-BRUSHLESS TRANSFORMER**

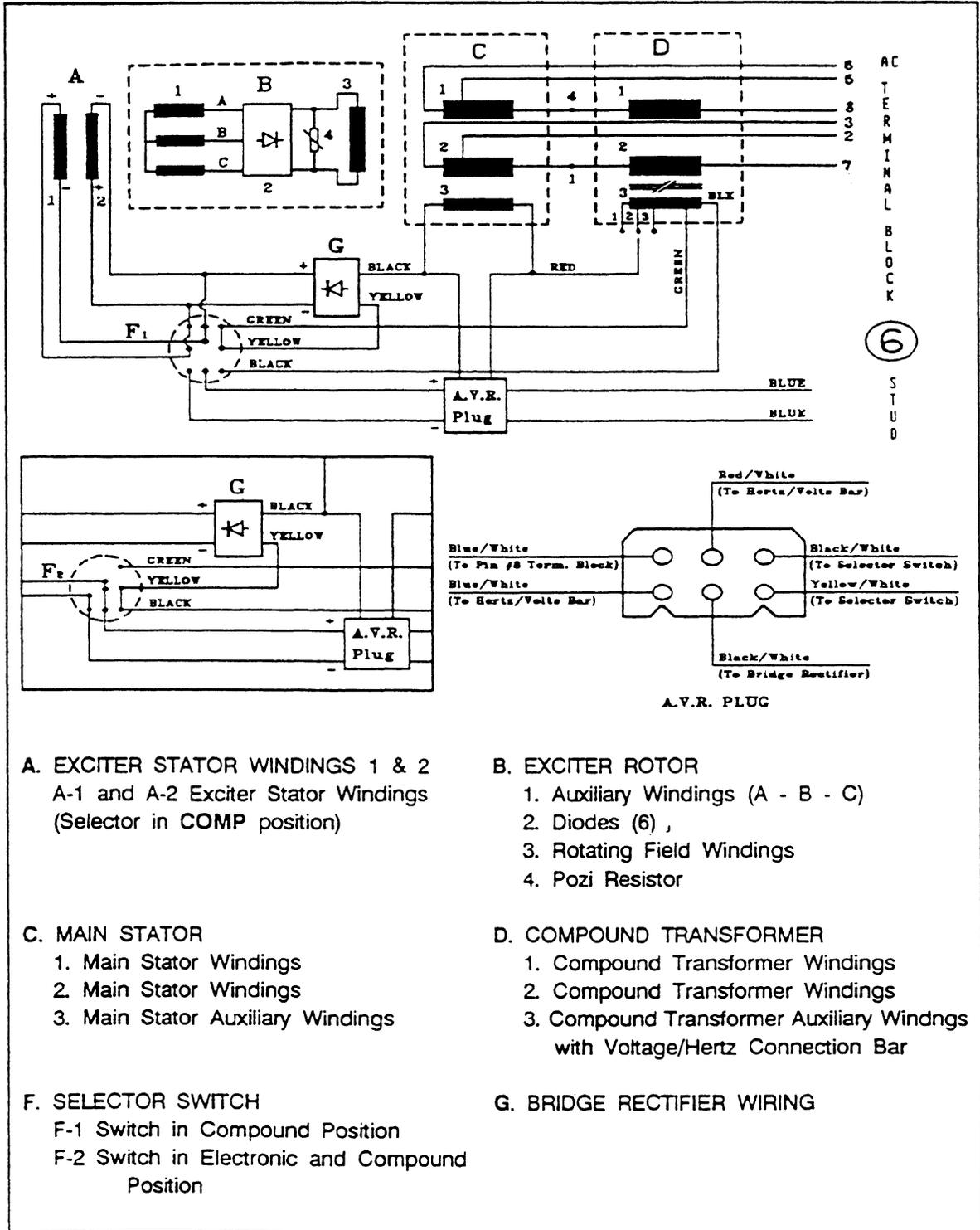
Construction Type	Brushless, four pole, revolving field, single bearing
Speed: 60 Hz	1800 RPM
50 HZ	1500 RPM*
Phase	1 or 3
Ventilation	Self - ventilated (fan cooled)
Cooling Air Requirements	
15 KW & 20 KW & 25 KW	450-500 CFM
32 KW	525-550 CFM
Ambient Temp., Max.	40° C
Insulation	Class F
Number of Poles	4 or 6
Stator Leads: 3 Phase	6 or 12
1 Phase	3 or 4

\*Voltage and KW are 5/6 of rating at 1800 RPM.

At 1500 RPM, any given generator will provide a voltage and KW rating equal to 5/6 the rating at 1800 RPM. Consult manufacturer if a higher voltage or KW rating is needed at 50 HZ (1500 RPM).

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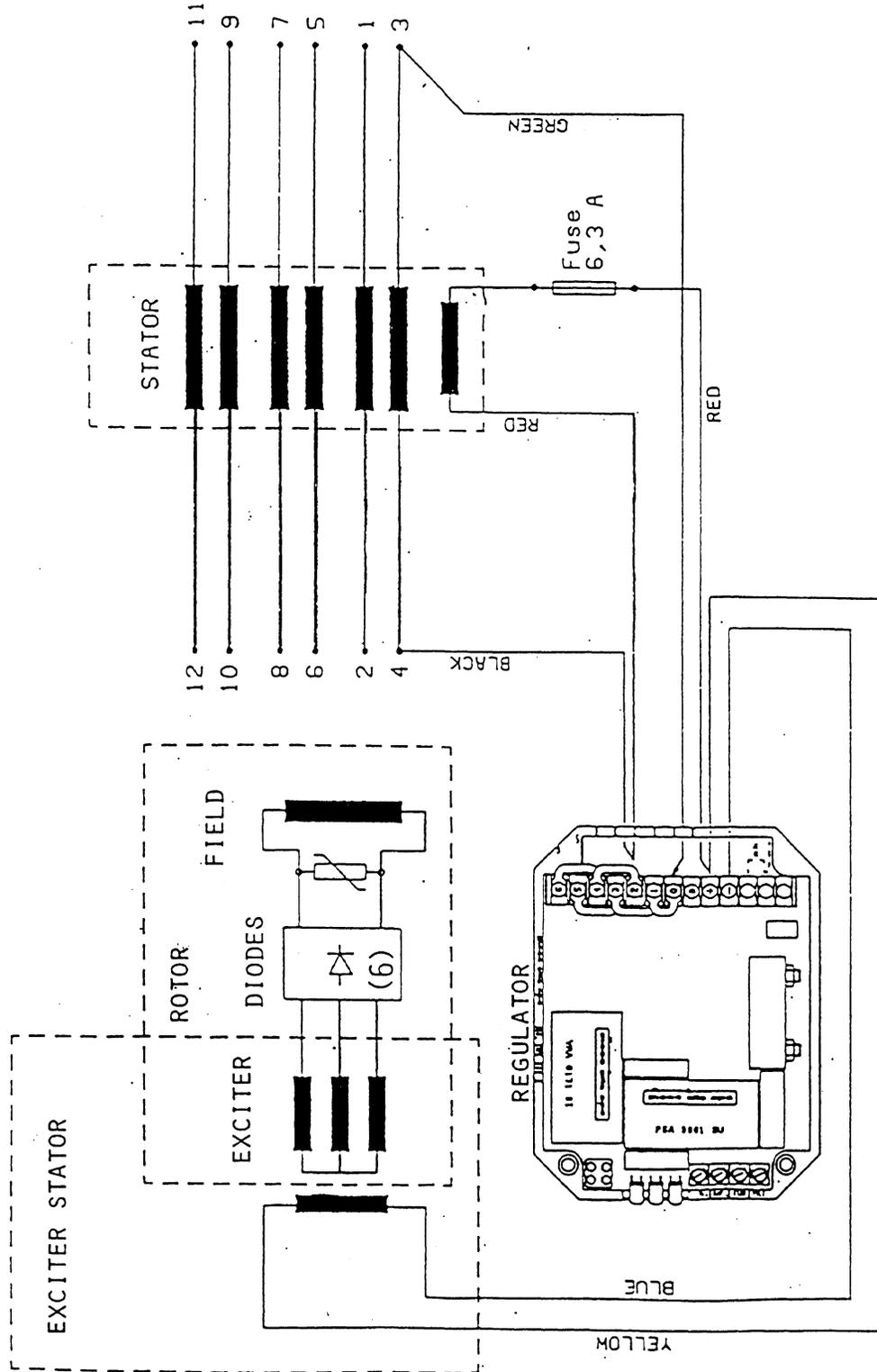
15.0 BTDAR GENERATOR  
INTERNAL WIRING SCHEMATIC  
SINGLE PHASE





15.0 BTDAR  
 20, 25, 32.0 BEDR GENERATOR  
 INTERNAL WIRING SCHEMATIC  
 THREE PHASE ONLY

BT & BE GENERATOR MODELS  
 GENERATOR INTERNAL WIRING SCHEMATIC  
 3 PHASE TWELVE WIRE RECONNECTABLE



## Regulator Adjustments

### Volts:

This potentiometer is used to adjust output voltage. At proper engine operating speed, the output voltage should be held at  $\pm 2\%$  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  $-6\%$ .

### Stability:

This potentiometer permits variation of the regulator's response to generator load changes so as to limit over compensation and obtain a minimum recovery time to the normal voltage output.

### Amp-Hertz: (Adjustment sealed)

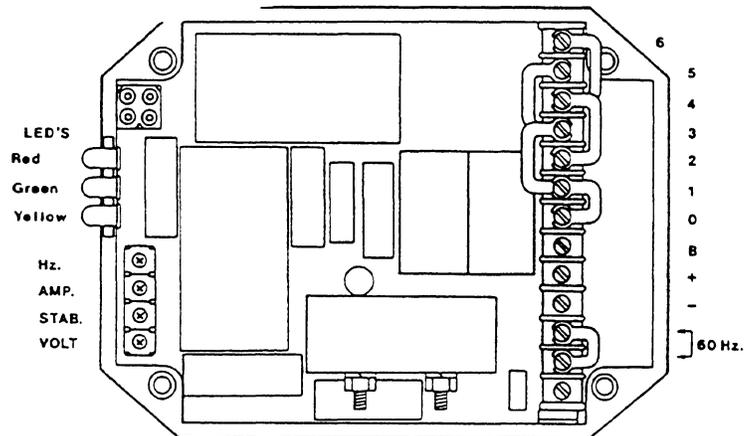
These two adjustments are used in conjunction with the two protection circuits in the voltage regulator that are indicated by the illumination of a colored LED.

1. Delayed overload protection (yellow LED)
2. Low speed protection (red LED)

Each system has an intervention threshold which can be adjusted using a potentiometer. Each of the two circuits reduces excitor voltage to safeguard the excitor windings and prevent overheating.

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. The regulator also has a third LED (green), that glows during operation to indicate correct operation of the regulator with the generator.

Note: When changing from 60 hertz to 50 hertz operation, remove the 60 hertz jumper bar from the regulator board. Regulator PN# 039640 is for the 20 BEDR, 25 BEDR and the 32 BEDR.



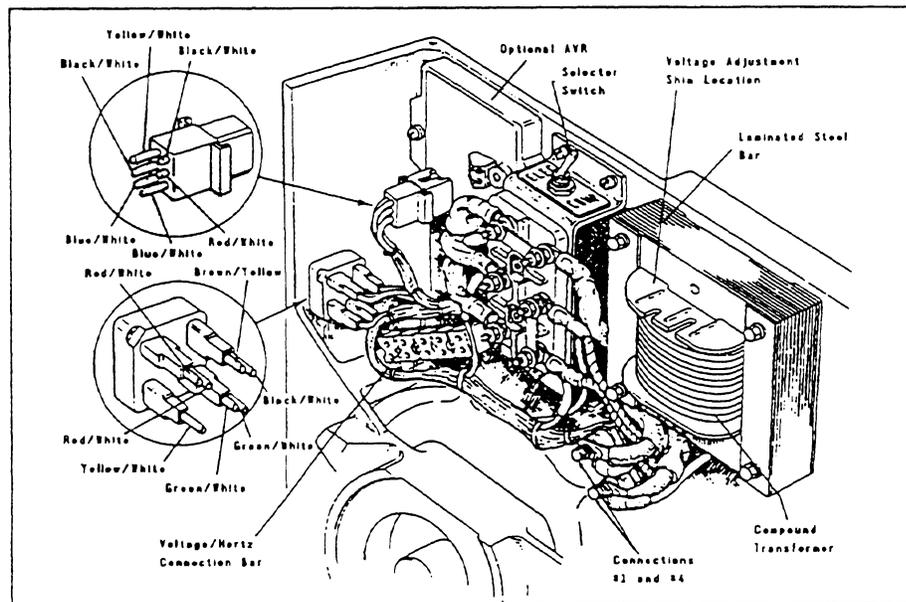
## BTDAR GENERATOR (Single Phase) NO LOAD VOLTAGE ADJUSTMENT

Voltage adjustment is made with the generator regulation being governed by the compound transformer.

1. The selector switch *must* be in the COMP position.
2. Operate the generator, apply a moderate load momentarily and remove it. Note the voltage output from the generator's 120 volt leg(s) (220 volt 50 hertz). The no-load voltage should be between 121-124 volts at 60.0 hertz (222-228 volts at 50.0 hertz).

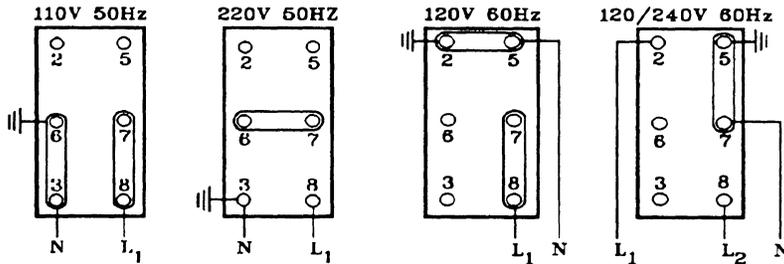
NOTE: The no-load voltage should be adjusted with the engine shut off. Measure the voltage after applying a momentary load to excite the transformer. The voltage produced by the generator after this momentary load is removed is no-load voltage. If this voltage does not fall within the specified range, shut down the engine and adjust the voltage.

3. To raise or lower the voltage, shims of varying thickness (nonconductive material) are placed or removed from under the steel laminated bar 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) can sometimes be accomplished by gently tapping the top of the laminated steel bar to reduce the gap between the existing shims and the transformer core. (.001 inch of shim thickness will vary voltage 4-6 volts AC.)

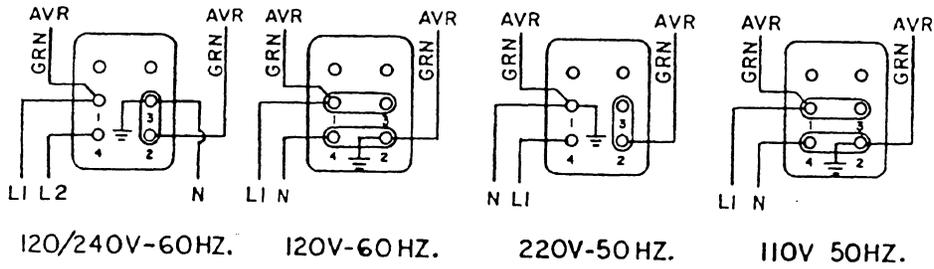


## AC OUTPUT CONNECTIONS Single & Three Phase

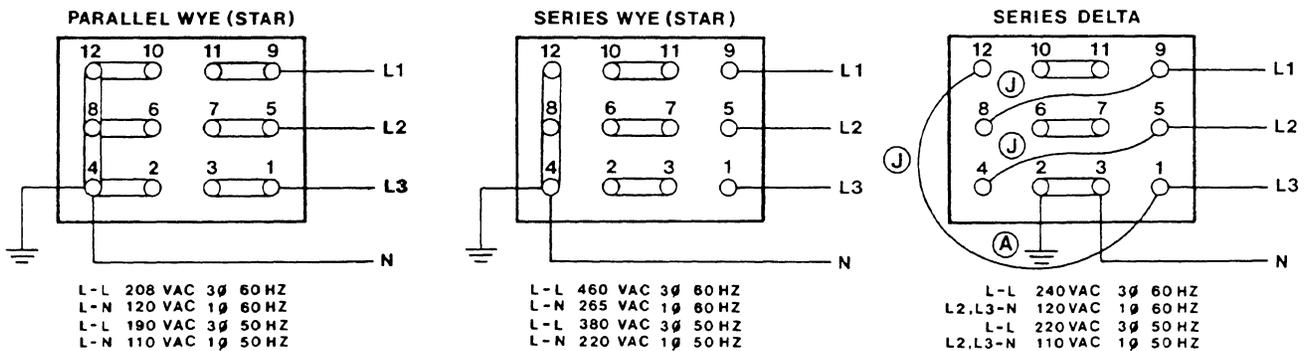
### AC CONNECTIONS FOR BT SINGLE PHASE



### AC CONNECTIONS FOR BE SINGLE PHASE



### AC CONNECTIONS FOR BT & BE THREE PHASE (12 WIRE)



**NOTE -** INSTALLER TO ENSURE THAT THE GROUND LEAD FROM THE NEUTRAL TERMINAL TO THE GENERATOR CASE IS PROPERLY INSTALLED.

## **BTDAR GENERATOR (Single Phase) OPTIONAL VOLTAGE REGULATOR**

An optional solid-state voltage regulator (board #34410) is available to use with the BT series generators. When installed, and the regulation switch is moved to the ELEC position, the regulator works together with the standard compound transformer regulator to regulate the generator's voltage output. In the ELEC mode, the regulator provides excitation to the group1 exciter windings, and the transformer provides excitation to the group 2 exciter windings.

### **Installation**

1. The regulator is mounted using existing tapped holes in the generator's case. Use two (2) M4 x 0.7 mm screws, each 15 mm long, with lock washers to mount the regulator board.

2. Connect the 6 prong generator plug to the receptacle on the regulator board.

**NOTE:** The plug is keyed to engage the regulator receptacle in one direction. Check this and insert it correctly.

3. Before moving the selector switch to the ELEC position the NO-LOAD voltage produced by the generator when in the COMP position will have to be adjusted. The NO-LOAD voltage should be adjusted down to between 114 -118 volts following the procedures for BTDAR Generator No Load Voltage Adjustment.

4. Move the selection switch into the ELEC position. Adjust the regulator board potentiometer to set No-load voltage at 120-122 volts at 60 hertz (220 - 224 volts at 50 hertz). The regulator board is operating in parallel with the compound transformer and should maintain voltage output within  $\pm 5$  percent from No-load to Full-rated.

## ENGINE TROUBLESHOOTING

### Introduction

The tables which follow indicate troubleshooting procedures based upon certain problem indicators, the probable causes of the problems, and the recommendations to overcome these problems.

Note that the engine's control system (electrical system) is protected by a 20-Ampere manual reset circuit breaker located on a bracket on the right side of the engine, just forward of the generator's end plate. The preheat solenoid is close by, as is the emergency STOP switch, which may be mounted on the same bracket or on the back of the standard instrument panel, depending upon the model.

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>VERIFICATION/ REMEDY</u>
PREHEAT switch is depressed: no panel indications, fuel solenoid electric fuel pump and preheat solenoid not energized.	Battery switch not on.	Check switch and/or battery connections.
	20-Amp circuit breaker tripped	Reset Breaker; if breaker trips again, check preheat solenoid circuit and run circuit for shorts to ground.
START switch is depressed: no starter engagement.	Connection to solenoid faulty.	Check connection.
	Faulty START switch.	Check switch with ohmmeter.
	Faulty solenoid.	Check that 12 Volts are present at starter solenoid connection.
	Loose battery connection.	Check battery connection.
	Low batteries.	Check battery charge state.

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>VERIFICATION/ REMEDY</u>
START switch is depressed:	Poor connections to fuel solenoid or no voltage	Check for 12 volts to fuel solenoid on injection pump and connection.
Engine cranks and does not start. No fuel to injectors.	Defective fuel solenoid.	Check that 12 Volts are present on the injection pump. Remove solenoid from the pump and test separately
No ignition: cranks but does not start; fuel solenoid energized.	Faulty fueling system.	<ol style="list-style-type: none"> <li>1. Check for fuel to generator engine.</li> <li>2. Check for air in fuel system. Allow system to self-bleed.</li> <li>3. Fuel lift pump faulty. Check for 12VDC at pump. Check ground connection.</li> <li>4. Filters clogged. (Replace filters and allow system to self-bleed by depressing only the PREHEAT switch).</li> </ol>
Failure to stop.	STOP switch failure.	Stop engine by depressing emergency STOP switch on engine or manually unplugging connection to fuel solenoid on injection pump.

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>VERIFICATION/ REMEDY</u>
Engine Stops.	Low oil pressure or overheated.	Check oil level; check fresh water coolant. Check gauge reading for indication of cause.
	Low oil pressure switch opens.	Check for satisfactory operation with switch bypassed. Check with ohmmeter.
	High water temperature switch opens at too low a temperature.	Check for satisfactory operation with switch bypassed. Check with an ohmmeter.
Engine stops.	20-Amp circuit breaker tripping.	Check for high DC amperage draw during operation. Ensure switch is not overly sensitive to heat which would cause tripping.
	Emergency STOP switch or STOP switch in panel defective, opening fuel run solenoid circuit.	Check operation of switch with an ohmmeter.
	Switches and/or wiring.	Inspect all wiring for loose connections and short circuits. Inspect switches for proper operation

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>VERIFICATION/ REMEDY</u>
Battery not charging.	Alternator drive.	Check drive belt tension. Be sure alternator turns freely. Check for loose connections. Check output with voltmeter. Ensure 12 Volts are present at EXC terminal.
Battery runs down.	Oil pressure switch.	Observe if gauges and panel lights are activated when engine is not running. Test the oil pressure switch.
Battery runs down.	High resistance leak to ground.	Check wiring. Insert sensitive (0-.25 Amp) meter in battery lines. (Do not start engine.) Remove connections and replace after short is located.
	Low resistance leak.	Check all wires for temperature rise to locate fault.
	Alternator	Disconnect alternator at output, after a good battery charging. If leakage stops, remove alternator and bench test. Repair or replace

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>VERIFICATION/ REMEDY</u>
Engine slows and stops	Fuel starvation	Check fuel filter for contamination. Check operation of fuel pump. Check fuel tank vent is clear.
Engine will not shut down when stop switch depressed.	DC Circuit Fault.	Check for DC feed through DC charging regulator. Disconnect exc. led. Then depress stop switch. Check for faulty stop switch.

## TORQUE SPECIFICATIONS

(lb-ft)

	BTDR 15.0KW	BEDR 20.0 KW	BEDR 25.0 KW	BEDR 32.0KW
<b>Cylinder Head</b>	80-85	85-90	85-90	80-85
<b>Cylinder Head Cover</b>	2-3	2-3	2-3	2-3
<b>Connecting Rod Cap</b>	50-54	59-65	59-65	55-60
<b>Main bearing Cap</b>	80-85	80-85	80-85	80-85
<b>Camshaft thrust plate</b>	12-17	12-17	12-17	12-17
<b>Camshaft gear</b>	45-51	46-69	46-69	45-51
<b>Idler Gear</b>	17-23	17-23	17-23	17-23
<b>Injection Pump Drive Gear Nut</b>	29-51	29-51	29-51	29-51
<b>Rocker Arm Assembly</b>	80-85	80-85	80-85	80-85
<b>Timing Gear Cover Bolts</b>	12-17	12-17	12-17	12-17
<b>Rear Oil Seal Cap</b>	11-15	11-15	11-15	11-15
<b>Oil Pan Bolts</b>	5-9	12-17	12-17	12-17
<b>Oil Pump Cover Bolts</b>	6-9	6-9	6-9	6-9
<b>Oil Pump Pipe</b>	6-9	6-9	6-9	6-9
<b>Fresh Water Pump Bolts</b>	12-17	12-17	12-17	12-17
<b>Crankshaft Pulley Nut</b>	145-181	253-289	253-289	282-304
<b>Glow Plug</b>	7-11	7-11	7-11	7-11
<b>Injector to Head</b>	*	*	**	**
<b>Injection Nozzle to Body</b>	58-72	29-36	58-72	29-36
<b>Injection Pipe Flare Nut</b>	18-22	18-22	18-22	18-22
<b>Intake Manifold Nuts</b>	12-17	12-17	12-17	18-22
<b>Exhaust Manifold Nuts</b>	12-17	12-17	20-24	20-24
<b>Back Plate Bolts</b>	24-35	24-35	24-35	24-35
<b>Flywheel Bolts</b>	95-137	80-85	95-137	95-137
<b>Damper Bolts</b>	14-20	14-20	14-20	14-20

\*BEDR 25KW and BTDR 15KW generator sets use injector **screwed** into the head for which the torque value is 42 to 51 lb-ft.

\*\*BEDR 20KW and 32KW generator sets use an injector **bolted** to the head for which the torque value is 12 to 17 lb-ft per bolt, tightened evenly.

## TABLE OF STANDARD HARDWARE TIGHTENING TORQUES

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

	Pitch	lb-ft	kg-m
<u>Grade 4</u>			
6mm bolt head/nut	1	2.9 - 5.1	0.4 - .07
8mm bolt head/nut	1.25	7.2 - 11.6	1.0 - 1.6
10 mm bolt head/nut	1.25	13.7 - 22.4	1.9 - 3.1
10 mm bolt head/nut	1.5	13.0 - 21.7	1.8 - 3.0
12 mm bolt head/nut	1.25 (ISO)	25.3 - 39.8	3.5 - 5.5
12 mm bolt head/nut	1.5	25.3 - 39.8	3.5 - 5.5
12 mm bolt head/nut	1.75	21.7 - 36.2	3.0 - 5.0
13 mm bolt head/nut	1.5	32.5 - 50.6	4.5 - 7.0
14 mm bolt head/nut	1.5	36.2 - 57.9	5.0 - 8.0
14 mm bolt head/nut	2	34.0 - 55.7	4.7 - 7.7
16 mm bolt head/nut	1.5	54.2 - 79.6	7.5 - 11.0
16 mm bolt head/nut	2	51.4 - 76.7	7.1 - 10.6
<u>Grade 6T</u>			
6mm bolt head/nut	1	4.3 - 6.5	0.6 - 0.9
8mm bolt head/nut	1.25	10.8 - 15.9	1.5 - 2.2
10 mm bolt head/nut	1.25	21.7 - 32.5	3.0 - 4.5
10 mm bolt head/nut	1.5	19.5 - 30.4	2.7 - 4.2
12 mm bolt head/nut	1.25 (ISO)	36.2 - 57.9	5.0 - 8.0
12 mm bolt head/nut	1.5	36.2 - 50.6	5.0 - 7.0
12 mm bolt head/nut	1.75	34.7 - 49.2	4.8 - 6.8
<u>Grade 7T, 8T and 8.8</u>			
6mm bolt head/nut	1	5.8 - 8.7	0.8 - 1.2
8mm bolt head/nut	1.25	14.5 - 21.7	2.0 - 3.0
10 mm bolt head/nut	1.25	28.9 - 39.8	4.0 - 5.5
10 mm bolt head/nut	1.5	26.8 - 37.6	3.7 - 5.2
12 mm bolt head/nut	1.25 (ISO)	54.2 - 75.9	7.5 - 10.5
12 mm bolt head/nut	1.5	50.6 - 65.1	7.0 - 9.0
12 mm bolt head/nut	1.75	43.4 - 61.5	6.0 - 8.5
13 mm bolt head/nut	1.5	57.9 - 86.8	8.0 - 12.0
14 mm bolt head/nut	1.5	72.3 - 108.5	10.0 - 15.0
14 mm bolt head/nut	2	68.7 - 101.3	9.5 - 14.0
16 mm bolt head/nut	1.5	108.5 - 166.4	15.0 - 23.0
16 mm bolt head/nut	2	101.3 - 159.1	14.0 - 22.0
<u>Grade 5 cap screw</u>			
1/4 UNC		9 - 11	1.2 - 1.5
1/4 UNF		11 - 13	1.5 - 1.8
5/16 UNC		18 - 20	2.5 - 2.8
5/16 UNF		21 - 23	2.9 - 3.2
3/8 UNC		28 - 33	3.7 - 4.6
3/8 UNF		30 - 35	4.1 - 4.8
7/16 UNC		44 - 49	6.1 - 6.8
7/16 UNF		50 - 55	6.9 - 7.6
1/2 UNC		68 - 73	9.4 - 10.1
1/2 UNF		73 - 80	10.1 - 11.1

