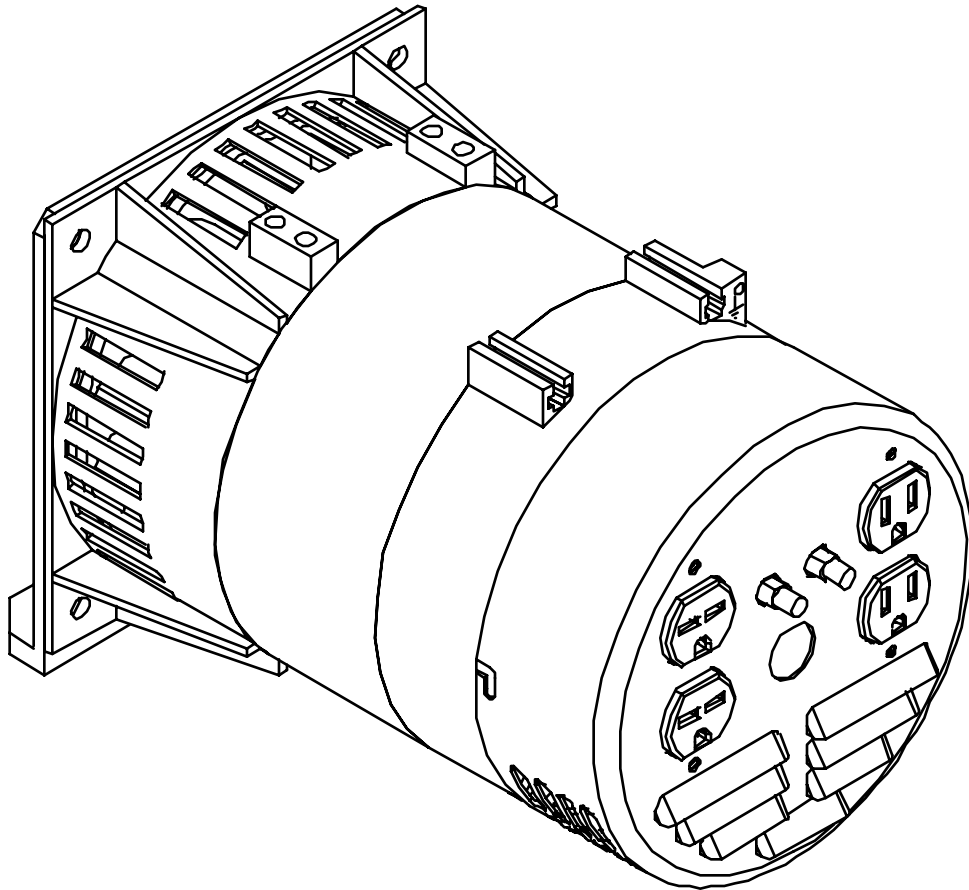




MODEL 2900 BDG, ITEM # 165915
Belt Driven Generator

M165915A

OWNER'S MANUAL



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2900 BDG

Questions or comments? Call 1-800-270-0810

THANK YOU

Thank you for purchasing a North Star Belt Driven Generator. Your machine is designed for long life, dependability, and the top performance you demand. Please take time now to read through this manual so you can better understand the machine's operation, maintenance and safety precautions. Everyone who operates this generator must read and understand this manual. The time you take now will prolong your generator's life and prepare you for its safe operation. Enjoy the exceptional performance of your North Star Belt Driven Generator.

IMPORTANT

If this machine is used by anyone who is not the owner or is loaned or rented, make certain the operator:

- Is instructed in safe and proper operation of this machine.
- Reads and understands the manuals pertaining to this machine.

NOTICE

K-BAR Industries Incorporated reserves the right to make improvements in design and/or changes in specifications at any time without incurring any obligation to install them on units previously sold.

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SPECIFICATIONS

Item Number	#165915
Maximum Output	2900 Watts (W)
Continuous Output	2600 Watts (W)
Voltage	120 / 240 Volt (V)
Phase	Single phase (4-wire)
Frequency	59.0-62.0 Hertz (Hz)
Power Factor	100 %
Engine	5 hp recommended
Engine Speed	3540-3720 RPM
120 V Receptacle	15 Amp (A) duplex (NEMA 5-15R)
240 V Receptacle	15 Amp (A) duplex (NEMA 6-15R)
Circuit Breaker	11 Amp (A) thermal, push to reset style
Dimensions	
Length	13.75" (413 cm)
Width	7.25" (184 cm)
Height	7.75" (197 cm)
Gross Weight	35 lb. (15.9 kg)

MACHINE COMPONENT IDENTIFICATION

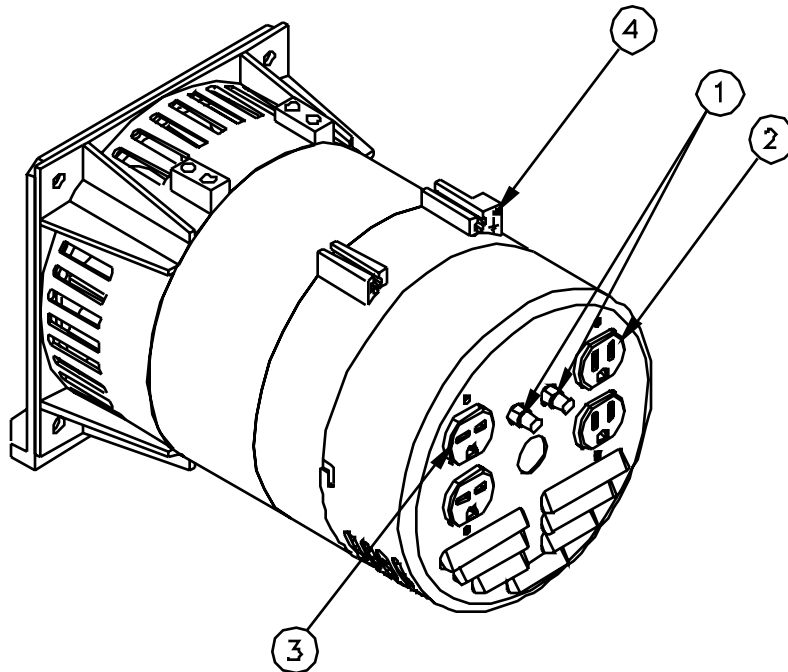


Figure 1 (Ref. 1-4)

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Ref.	Description	Ref.	Description
1	Circuit Breakers	5	7/8" shaft
2	120V 15A Duplex Receptade	6	Mounting feet
3	240V 15A Duplex Receptade	7	Fan vents
4	Grounding screw		

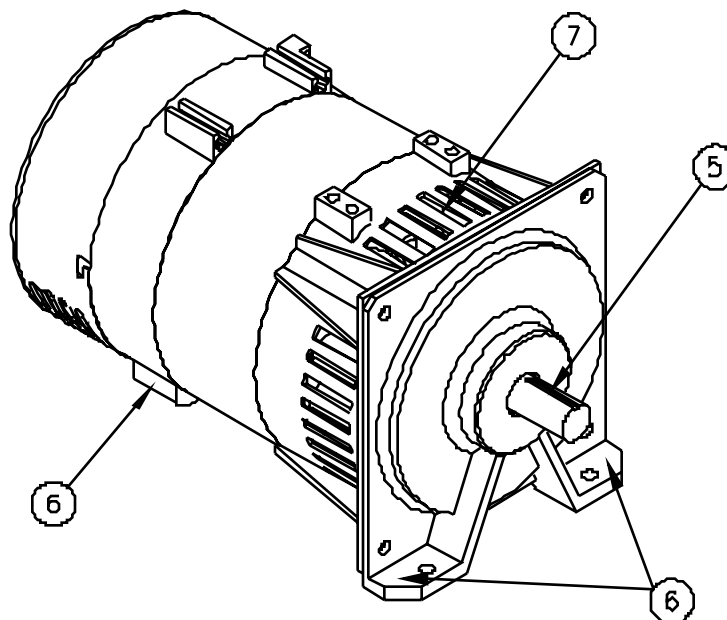


Figure 2 (Ref. 5-7)

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GENERATOR FEATURES

Reference 1 - Circuit Breakers. This belt driven single phase generator has 2, 11 amp (A) push to reset circuit breakers to protect against electrical overloads.

Receptacles

Reference 2 - 120V Receptacle. The generator has a end cover with two duplexes (two receptades in a common housing). The duplex on the right is a 120 volt (V) 15 amp (A) straight blade receptade, National Electrical Manufacturer's Association (NEMA) number 5-15R. This receptade accepts NEMA plug number 5-15P. Each receptade on the duplex is capable of drawing 11A.

Reference 3 - 240V Receptacle. The duplex on the left is a 240V 15A NEMA 6-15R receptade. This receptacle accepts a NEMA plug number 6-15P.

ALWAYS use grounded male plugs. The neutral line of the generator is mechanically grounded to the frame. Matching NEMA male plugs must always be used.

Reference 4 - Ground Screw. Ground the generator via the ground screw, to a copper pipe or rod that is driven into moist soil.

Reference 5 - 7/8" dia Shaft. The shaft is 1.50" long and has a 3/16" keyway.

Reference 6 - Mounting feet. Use these three locations to bolt the generator head in place.

Reference 7 - Fan Vents. Never block the vent slots or insert objects through the slots.

INTRODUCTION

Before attempting to mount your generator, thoroughly study the instructions and cautions in this manual to assure you are fully acquainted with the operation of all components of this generator. Proper preparation, operation and maintenance will result in operator safety, best performance and long life of the generator.

North Star is constantly improving its products. The specifications outlined herein are subject to change without prior notice or obligation. The purchaser and/or user assumes liability of any modification and/or alterations on this equipment from original design and manufacture.

Before using, the user shall determine the suitability of this product for its intended use and assumes liability therein.

ANSI SAFETY DEFINITIONS

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in a death or serious injury.

CAUTION indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

RULES FOR SAFE OPERATIONS

Safety precautions are essential when operating this generator. Respectful and cautious operation will considerably lessen the possibilities of a personal injury. This manual will warn of specific personal injury potential, and these will be designated by the symbol:



WARNING This generator is equipped with a grounding screw, located on the generator frame for your protection. Always complete the grounding path from the generator to a copper pipe/rod that is driven into moist earth, to prevent electrical shock.

ALWAYS use electrical cords that are in good condition. Worn, bare, frayed or otherwise damaged cords can cause electric shock.

NEVER operate the generator, or handle any electrical equipment while standing in water, while barefoot, while hands are wet or while in the rain or snow. Electric shock may result.

ALWAYS use a ground fault circuit interrupter (GFCI) in damp or highly electrical conductive areas and on construction job-sites to prevent electric shock.

ALWAYS remove the spark plug or spark plug wire before working on the engine or generator, to prevent accidental starting.

ALWAYS provide adequate ventilation. Do not operate generator in any enclosed or narrow space. Engines consume oxygen and give off deadly carbon monoxide poisonous gas. Improper ventilation will cause damage to generator and possible injury to people.

ALWAYS remove all oil or gasoline deposits and accumulated dirt from generator and immediate area. Keep generator head and engine clean.

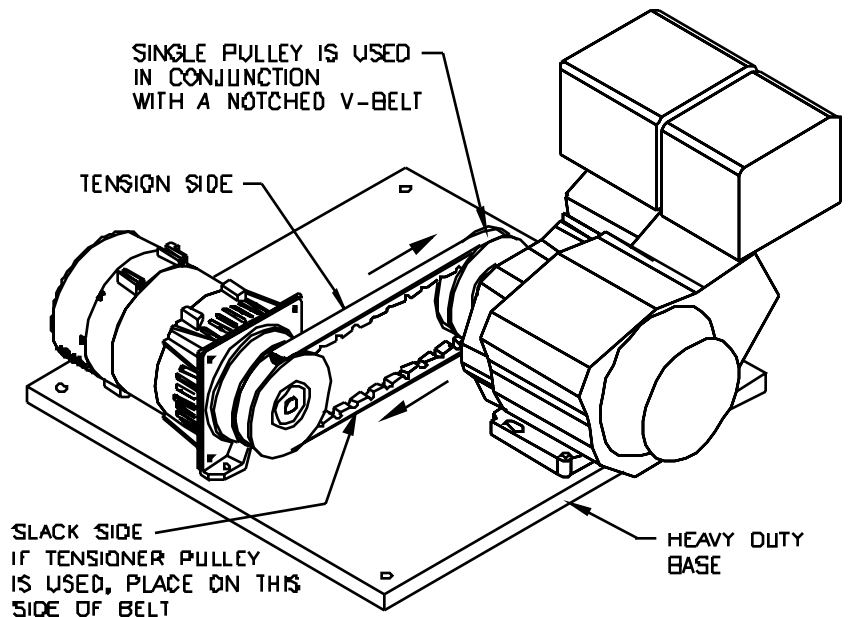
NEVER operate the generator under the following conditions:

- A. Excessive change in engine speed, slow or fast.
- B. Overheating in load connecting devices.
- C. Sparking or arcs from generator.
- D. Loss of electrical output.
- E. Damaged receptacles.
- F. Engine misfire.
- G. Excessive vibration.
- H. Enclosed compartments, or confined areas.
- I. Flame or smoke.
- J. Rain, snow or wet conditions.
- K. Operator non-attendance.



WARNING

Keep fire extinguisher close by your generator and be familiar on how to use it. Consult your local fire department for correct extinguisher type.



Note: Guards are removed to show details.

INSTALLATION

OUTDOORS: Choose a location where the generator will not be exposed to rain, snow or direct sunlight. Position the generator on secure, level ground so it will not tip or slide down a hill. Place the generator so that the exhaust fumes will not be directed towards people.

The installation site must be free from water, moisture, or dust. All electrical components should be protected from excessive moisture or the insulation system will deteriorate and result in grounding or shorting out the generating system.

Foreign matters, such as dust, dirt, sand, lint, or abrasive materials can cause damage to the generator head and engine if allowed into its cooling system.

POWER TRANSMISSION: The recommended method to transfer the power from the engine to the generator is by using sheaves (pulleys) and a V-belt. The generator shaft is 7/8" diameter X 1.50" long with a 3/16" keyway. Use the table below to select the correct diameter sheave. All V-belts have a B size cross section.

Engine hp	Single Sheave Dia. Belt Type - Qty.	Single Sheave Dia. Belt Type - Qty.
5 hp	3.60" Notched V-Belt - 1	4.80" V-Belt - 1

The shaft speed of the generator must be between 3540-3720 RPM. At no load the correct speed is 3720 RPM. If the engine is a 3600 RPM engine, than a sheave diameter ratio of 1:1 should be used. This means that the diameter of the sheave on the engine is the same as the diameter of the sheave on the generator. If smaller than recommended sheaves are used, the life of the belt will be shortened. The

Figure 3

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possibility of belt slippage also increases with a smaller sheave.

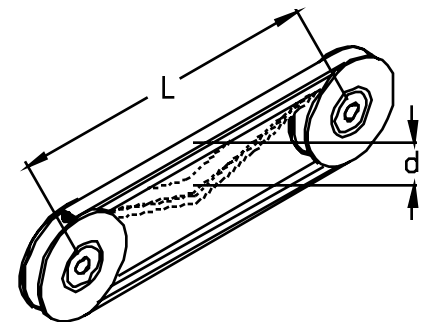
The engine and generator should be mounted to a plate or surface that can withstand the constant vibration and stresses that will be produced. See figure 3 for a possible mounting configuration.

The user shall determine the proper belt tensioning method for their specific use.

To determine belt tension:

Measure L - the center to center distance of the two sheaves

Measure d - the deflection of the belt.



Tighten or loosen belt until:

$$d = 0.016 \times L$$

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If you desire to direct couple the generator to the engine, great care must be taken to align the shaft of the generator and engine to within the specified tolerances of the chosen coupler.

NEVER install your generator inside confined areas. Inside installation can cause health hazards or death.



DANGER

Always have proper guarding on the V-belt and sheaves to prevent access to any pinch points. Failure to guard the power transmission mechanisms may result in serious injury or death.



DANGER

Remember, exhaust fumes are deadly carbon monoxide gas, and must be vented to the outside where there are no people. Cooling air of

sufficient amounts must be brought in and exhausted out to ensure proper cooling of the engine and generator.

LOAD APPLICATION

It is important to determine the total electrical load before it is connected to the generator. The two major factors in determining the life of a generator head are: heat build up, caused by overloading the generator and corrosive contaminants, that attack the wiring insulation. If the generator is overloaded, the wires become excessively hot and cause the insulation to break down, reducing its ability to resist corrosive contaminants. Over time the effectiveness of the insulation is eliminated and a dead short can result.

Always compare the generator nameplate data with that of the equipment to be used to ensure that watts, volts, amperage, and frequency requirements are suitable for operating equipment. The wattage listed on the equipment nameplate is its rated output. However, some equipment may require three to ten times more wattage than its rating on the nameplate, as the wattage is influenced by the equipment efficiency, power factor and starting system. NOTE: If wattage is not given on equipment nameplate, approximate wattage may be determined by multiplying nameplate voltage by nameplate amperage.

$$\text{VOLTS} \times \text{AMPS} = \text{WATTS}$$

$$\text{Example: } 120\text{V} \times 5\text{A} = 600\text{W}$$

When connecting a resistive load such as incandescent lights, heaters or common electric power tools, a capacity of up to the generator full rated wattage output can be used.

When connecting a resistive-inductive load such as a fluorescent or mercury light, transformers or inductive coils, a capacity of up to 0.6 times the generator's full rated output can be used.

Always allow the generator to reach operating speed before a load is applied.

STARTING ELECTRIC MOTORS

Electric motors require much more current (amps) to start than to run. Some motors, particularly low cost split-phase motors, are very hard to start and require 5 to 7 times more current to start than to run. Capacitor motors are easier to start and usually require 2 to 4 times as much current to start than to run. Repulsion Induction motors are the easiest to start and require 1.5 to 2.5 times as much to start than to run.

Most fractional motors take about the same amount of current to run them whether they are of Repulsion-Induction (RI), Capacitor (Cap), or Split-Phase (SP) type. The following chart shows the approximate current required to start and run various types and sizes of 120 volt 60 cycle electric motors under various conditions.

120V, 60 Hz Motors		Starting Amps		
Hp motor	Running Watts	RI type	Cap type	SP type
1/6	525	7-11	9-18	16-22
1/4	700	9-15	12-23	22-32
1/3	875	11-18	14-29	26-35
1/2	1175	15-25	20-40	NA
1	1925	24-40	32-64	NA
1 1/2	2400	30-50	40-80	NA
2	2900	36-60	48-96	NA
3	4075	51-85	68-136	NA
5	6750	84-140	112-224	NA

The figures given above are for an average load such as a blower or fan. If the electric motor is connected to a hard starting load such as an air compressor, it will require more starting current. If it is connected to a light load or no load such as a power saw, it will require less starting current. The exact requirement will also vary with the brand or design of the motor.

Generators respond to severe overloading differently than the power line. When overloaded, the engine is not able to supply enough power to bring the electric motor up to operating speed. The generator responds to the high initial starting current, but the engine speed drops sharply. The overload may stall the engine. If allowed to operate at very low speeds, the electric motor starting winding will burn out in a short time. The generator head winding might also be damaged.

Running the generator under these conditions may result in damage to the generator stator as well as the motor windings. Because the heavy surge of current is required for only an instant, the generator will not be damaged if it can bring the motor up to speed in a few seconds. If difficulties in starting a motor are experienced, turn off all other electrical loads and if possible reduce the load on the electric motor.

EXTENSION CORDS

When electric power is to be provided to various loads at some distance from the generator, extension cords can be used. These cords should be sized to allow for distance in length and amperage so that the voltage drop between the set and point of use is held to a minimum.

Current/Power		Maximum Extension Cord Length			
Amps at 240V	Load (watts)	#10 Ga. Cord	#12 Ga. Cord	#14 Ga. Cord	#16 Ga. Cord
10	2400	250'	150'	100'	75'
20	4800	125'	75'	50'	25'
30	7200	60'	35'	25'	10'
40	9600	30'	15'	10'	*
50	12000	15'	*	*	*

*Not recommended

CAUTION: Equipment damage can result from the low voltage caused by using an extension cord with a small wire size.

Use this chart to estimate the total load on your generator.

For Determining Generator Load Requirements	
Device	Running Watts
Air Conditioner (12,000 Btu)	1700 (b)
Battery Charger (20 Amp)	500
Belt Sander (3")	1000
Chain Saw	1200
Circular Saw (6-1/2")	900
Coffee Maker	1000
Compressor (1 HP)	2000 (b)
Compressor (3/4 HP)	1800 (b)
Compressor (1/2 HP)	1400 (b)
Curling Iron	700
Freezer	500 (b)
Dishwasher	1200
Edge Trimmer	500
Electric Nail Gun	1200
Electric Range (one element)	1500
Electric Skillet	1250
Furnace Fan (1/3 HP)	1200 (b)
Freezer	800 (c)
Hair Dryer	1200
Hand Drill (1")	1100
Hand Drill (1/2")	875
Hand Drill (3/8")	500
Hand Drill (1/4")	250
Hedge Trimmer	450
Home Computer	150 (a)
Impact Wrench	500
Jet Pump	800 (b)
Lawn Mower	1200
Light Bulb	100
Microwave Oven	700
Milk Cooler	1100 (b)
Oil Burner on Furnace	300
Oil Fired Space Htr (140,000 Btu)	400
Oil Fired Space Htr (85,000 Btu)	225
Oil Fired Space Htr (30,000 Btu)	150
Oven	4500
Paint Sprayer, Airless (1/3 HP)	600 (b)
Paint Sprayer, Airless (handheld)	150
Radio	200 (a)
Refrigerator	600 (c)
Slow Cooker	200
Submersible Pump (1-1/2 HP)	2800 (b)
Load Requirements Continued	
Submersible Pump (1 HP)	2000 (b)
Submersible Pump (1/2 HP)	1500 (b)
Sump Pump	600 (b)
Table Saw (10")	2000 (b)
Television	500 (a)
Toaster	1000
Vacuum cleaner	250
VCR	70 (a)
Water Heater	3000
Weed Trimmer	500

(a) Always use a voltage surge protector between the generator and these voltage sensitive loads. To order a surge protector call customer service at 1-800-270-0810 and ask for item # 30793.

(b) Hard-starting motors require 3 to 5 times the rated running watts.

(c) These loads may require up to 15 minutes to restart due to its normal build up of compressor head pressure.

NOTE: For extremely hard to start loads such as air conditioners and air compressors, consult the equipment dealer to determine the maximum wattage.

PRE-START PREPARATIONS

Your generator has been thoroughly tested prior to shipment from the factory. A factory test report has been included with this manual. However, damage can occur during shipping, so be sure to check for damaged parts, loose or missing nuts and bolts. If the aforementioned problems occur, call customer service at 1-800-270-0810.

GROUNDING - All units must be grounded. Drive a 3/4" or 1" copper pipe or rod into the ground close to the generator. The pipe/rod must penetrate moist earth. Connect an approved ground clamp to the pipe. Run a no. 12 Ga. wire from the clamp to the generator ground screw. Do not connect to a water pipe or a ground used by a radio system.

OPERATING SPEED

The generator must be run at the correct speed in order to produce the proper electrical voltage and frequency.

The output voltage should be checked to ensure the generator is working properly subsequent to connecting a load to the generator. Failure to do so could result in damage to equipment plugged into the unit and possible injury to the individual.

All engines have a tendency to slow down when a load is applied. When the electrical load is connected to the generator, the engine is more heavily loaded, and as a result the speed drops slightly. This slight decrease in speed, together with the voltage drop within the generator itself, results in a slightly lower voltage when the generator is loaded to its full capacity than when it is running with no load. The slight variation has no appreciable effect in the operation of motors, lights and most appliances. Electronic equipment and docks will be affected if correct RPM is not maintained. See Load vs. Output chart

Load	Output		
	Speed (RPM)	Frequency (Hz)	Generator voltage at 120V Receptacle
0 %	3720	62.0	129V
50 %	3600	60.0	120V
100 %	3540	59.0	115V

Output voltage should be checked periodically to ensure continued proper operation of the generating plant and appliances, it can be checked with a portable meter. Frequency can be checked by using an electric clock with a sweep second hand. Timed against a wrist watch or a stop watch the dock should be correct within +/- 2 seconds per minute. All speed setting adjustments should be done by a qualified technician.

GENERATOR CARE

The generator head is a two pole, 3600 RPM, 60 Hz, brushless, revolving field and synchronous type with two sealed radial roller bearings.

Proper care and maintenance are necessary to ensure a long trouble free life.

Exercising The Generator - The generator should be operated every three to four weeks. Warm the unit up by starting the engine and letting it run for 10 to 15 minutes. This will dry out any moisture that has accumulated in the windings. If left, this moisture can cause corrosion in the winding. Frequent operation of the engine generator will also ensure that the set is operating properly should it be needed in an emergency.

Generator Maintenance - The generator head is brushless and maintenance free. Any major generator service including the installation or replacement of parts should be performed only by a qualified electrical service technician. **USE ONLY FACTORY APPROVED REPAIR PARTS.**

A. Bearing - The bearings used in this generators are a heavy duty, sealed roller bearing. They require no maintenance or lubrication.

B. Receptacles - Quality receptacles have been utilized. If a receptacle should become cracked or otherwise damaged, replace it. Using cracked or damaged receptades can be both dangerous to the operator and destructive to the equipment.



WARNING, Stand-by Operation

If your generator is to be used as a standby electric power source in case of utility failure, it must be installed by a registered and licensed electrician and in compliance with all applicable state and local electrical codes. Also, local Fire Departments must be consulted concerning proper and safe handling procedures for gasoline. **NEVER** connect any generator to any existing electrical system without an isolating, UL approved transfer switch, installed by a licensed electrician.

TROUBLESHOOTING

Problem	Possible Causes	Possible Remedies
Voltage too low.	<ul style="list-style-type: none"> a) Engine speed too slow. b) Generator is overloaded. 	<ul style="list-style-type: none"> a) Bring generator to a qualified technician for adjustment. b) Reduce the load. (See Load Application section of this manual.)
Circuit breaker trips.	<ul style="list-style-type: none"> a) Defective load connected to generator. b) Defective receptade. c) Generator overloaded. 	<ul style="list-style-type: none"> a) Disconnect load. b) Replace receptade. c) Reduce the load. (See Load Application section of this manual.)
Voltage too high.	<ul style="list-style-type: none"> a) Engine speed too high. 	<ul style="list-style-type: none"> a) Bring generator to a qualified technician for adjustment.
Generator overheating.	<ul style="list-style-type: none"> a) Generator is overloaded. b) Insufficient ventilation. 	<ul style="list-style-type: none"> a) Reduce the load. (See Load Application section of this manual.) b) Make sure there is at least 3 feet of clearance on all sides of generator.
No output voltage.	<ul style="list-style-type: none"> a) Defective load connected to generator. b) Broken or loose wire. c) Defective receptade. d) Defective stator. e) Defective rotor. f) Defective capacitor. 	<ul style="list-style-type: none"> a) Disconnect load. b) Bring generator to a qualified technician for repair. c) Replace receptade. d) Bring generator to a qualified technician for repair. e) Bring generator to a qualified technician for repair. f) Bring generator to a qualified technician for repair.
Engine lacks power.	<ul style="list-style-type: none"> a) Generator is overloaded. b) Dirty air filter. 	<ul style="list-style-type: none"> a) Reduce the load. (See Load Application section of this manual.) b) Clean or replace air filter.