





MODEL 27500 PTOG
ITEM # 165937
Power Take-Off Generator

M165937D

OWNER'S MANUAL

	⚠ WARNING
	Read this manual. Serious injury or death can result if safety instructions are not followed.

	⚠ DANGER
	Fire hazard. Do not operate in an enclosure or building. Fire or explosion will result. Never place this product near combustible materials.

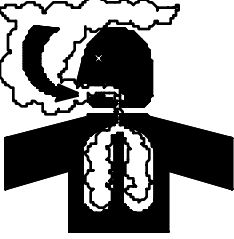
	⚠ DANGER
	Breathing hazard. Poisonous fumes from engine will kill you. Do not operate the generator in enclosed areas. Do not operate generator near building or inside of buildings.

FIG 1 8 00

Any Questions, Comments, or Problems?
Call Customer Service at 1-800-270-0810
Hours: Monday - Friday 7:30 AM to 5:30 PM
Saturday 7:30 to 11:30 AM CST

THANK YOU

Thank you for purchasing a NorthStar Power Take-Off Generator. Your machine is designed for long life, dependability, and the top performance you demand. Please take the 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 NorthStar PTO 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	#165937
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Maximum Output	27500 Watts (W)
Continuous Output	24000 W
Voltage	120 / 240 Volt (V)
Phase	Single phase (4-wire)
Frequency	59.0-63.0 Hertz (Hz)
Power Factor	1.0
Minimum PTO HP	48 HP at 540 RPM
Input Shaft	1 3/8" Diameter, 6 spline
120V Receptacle	(2) 20 Amp (A) duplex (NEMA 5-20R) 30A Twistlock (NEMA L5-30R)
120/240V Receptacle	60A Straight blade (NEMA 14-60R) 100A Pin and sleeve (4100R12W)
Circuit Breaker	(2) 20A thermal, push to reset style 30A thermal, push to reset style 60A thermal magnetic 100A thermal magnetic
Gear Box	
Gear Ratio	1:7
Gear Oil	SAE 80W-90
Oil Capacity	.53 Qt. (.5 L)
Dimensions	
Length	36.95" (93.9 cm)
Width	16.85" (42.8 cm)
Height	20.79" (52.8 cm)
Gross Weight	425 lb. (193.2 kg)

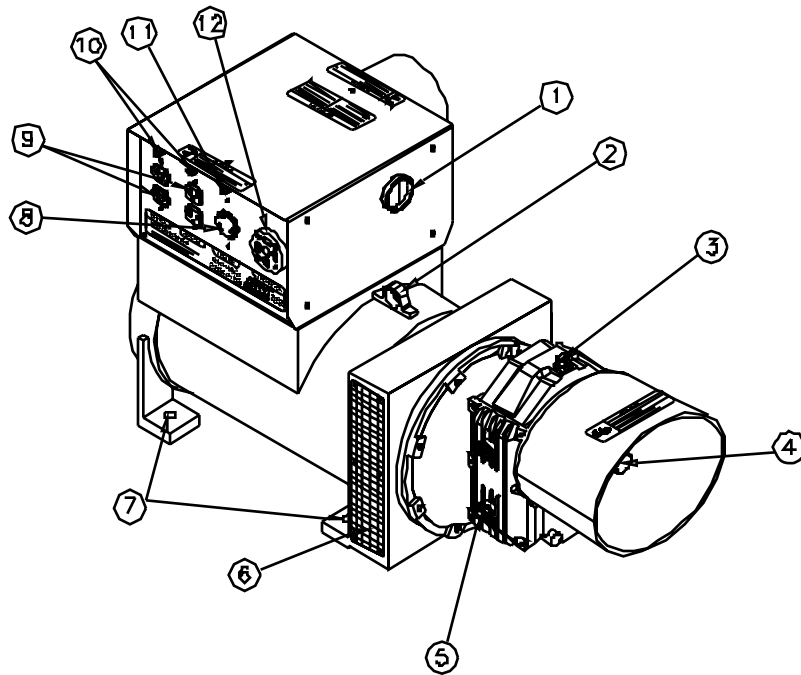
ANSI SAFETY DEFINITIONS

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.

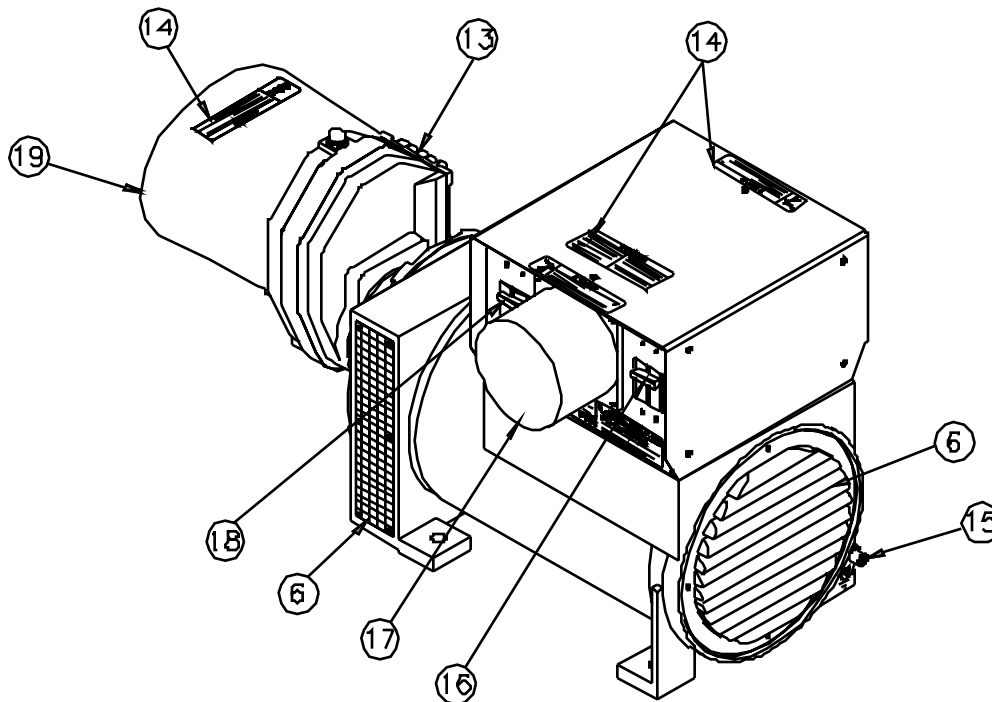
MACHINE COMPONENT IDENTIFICATION



00410

Figure 1 (Ref. 1-12)

Ref.	Description	Ref.	Description
1	Voltmeter	11	30A Circuit Breaker
2	Lifting Eye	12	120/240V 60A Receptacle
3	Breather/Oil Fill Plug	13	Gear Box
4	1 3/8", 6 Spline Input Shaft	14	Warning Decals
5	Sight Glass	15	Grounding Clamp
6	Fan Vents	16	100A Circuit Breaker
7	Mounting Holes	17	120/240V 100A Pin and Sleeve
8	120V 30A Twistlock Receptacle	18	60A Circuit Breaker
9	120V 20A Duplex Receptacles	19	Shield
10	20A Circuit Breakers		



GENERATOR FEATURES

References 1 - Voltmeter. Voltmeter needle should be in green area during all generator load conditions. The black line in the center on the green

Figure 2 (Ref. 13-19)

area indicates 120V. During no load conditions, the needle should be at or above the black line.

References 2 - Lifting Eye. Use when lifting or moving generator.

Reference 3 - Breather/Oil Fill Plug. Use SAE 90 gear oil. Maintain the correct oil level. Over filling can cause the oil to over heat and damage seals and bearings.

References 4 - 1 3/8" Diameter 6 Spline Input Shaft. 540 RPM. PTO driveline is available from Northern, Item #165936.

References 5 - Sight Glass. Fill gear box until oil is in the middle of the glass.

Reference 6 - Fan Vents. Never block the vent slots or insert objects through the slots. The closest object should be at least 3 feet away from the vents.

Reference 7 - Mounting Holes. Use these four locations to mount the generator head in place with four 5/8" grade 5 bolts/anchors (see Installation section).

Reference 8 - 120V Receptacle. This twistlock receptacle is a 120V 30A receptacle, National Electrical Manufacturer's Association (NEMA) number L5-30R. This receptacle accepts NEMA plug number L5-30P.

Reference 9 - 120V Receptacle. The generator has a control panel with two 120V 20A straight blade receptacle duplexes (two receptacles in a common housing). NEMA number is 5-20R.

Reference 10 - Circuit Breaker. Two 20A push-to-reset thermal circuit breakers.

Reference 11 - Circuit Breaker. One 30A push-to-reset thermal circuit breaker.

Reference 12 - 120/240V Receptacle. This straight blade receptacle is 120/240V 60A. This receptacle accepts a NEMA plug number 14-60P.

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 13 - Gear Box. Cast iron frame. 1:7 gear ratio.

References 14 - Warning Decals. Read and follow all warnings.

Reference 15 - Grounding Clamp. Ground the generator via the grounding clamp, to a copper pipe or rod that is driven into moist soil.

Reference 16 - 100A Circuit Breaker. One 100A thermal magnetic breaker.

Reference 17 - 120/240V 100A Pin and Sleeve. This extremely safe and durable receptacle can be used for all large loads, including transfer switches. IEC 309-1 number 4100R12W. A plug (part #32802) can be ordered from NorthStar at 1-800-270-0810.

Reference 18 60A Circuit Breaker. One 60A thermal magnetic breaker.

References 11 - Shield. Plastic implement shield. **NEVER** operate generator without shield in place.

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. NorthStar 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.

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 clamp, 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.

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 PTO driveline before working on the generator.

ALWAYS provide adequate ventilation. Do not operate generator in any enclosed or narrow space. Engines consume oxygen and give off deadly carbon monoxide, a 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.

ALWAYS wear ear protection while operating generator.

ALWAYS keep area around generator clean.

NEVER operate the generator without proper guarding.

NEVER operate the generator continuously when PTO driveline is at angle greater than 15° both horizontally and vertically.

INTRODUCTION

NEVER operate the generator while wearing loose fitting clothing such as neckties, scarves or untucked shirts.

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.

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.
- L. Without proper guarding in place.

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

DANGER Remember, exhaust fumes are deadly carbon monoxide, a poisonous 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.

INSTALLATION

Choose a location where the generator will not be exposed to rain, snow or direct sunlight. Common places for mounting your PTO generator are to a trailer or a cement slab. However you choose to mount the generator, make sure it can get as close to the load as possible. This will make using the generator more convenient and reduce voltage drop.

The installation site must be free from water, moisture, or dust. Foreign matters, such as dust, dirt, sand, lint, or abrasive materials can cause damage if allowed inside the generator. All electrical components should be protected from excessive moisture or the insulation system will deteriorate and result in grounding or shorting out of the generating system.

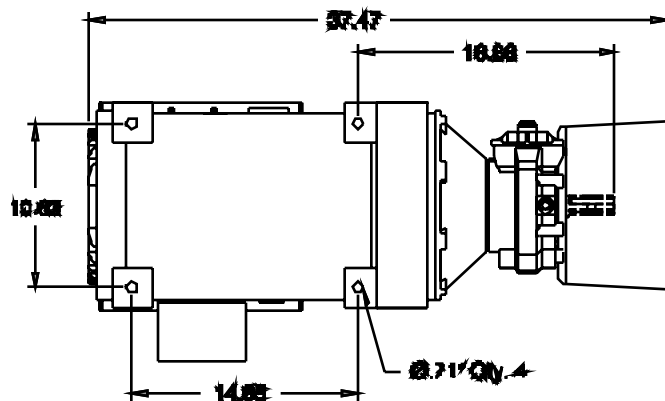
Design the application to minimize the angle of the driveline, 15° maximum. The smaller the angle of operation, the longer the driveline will last.

When trailer mounting the generator select a trailer that is wide enough to withstand the torque of start-up and loading torque. Wheels that are not spaced properly could cause the trailer to tip over. The constant vibration of the generator can cause metal

fatigue of the trailer base if the steel used is not thick enough.

DANGER Trailer may tip over and cause serious injury or death. Never stand near an operating PTO generator.

Use four, grade 5, 5/8" bolts to mount generator.



After the generator is firmly mounted, attach the PTO driveline to the generator then the tractor. Use a synchronized PTO driveline rated at 48 HP minimum.

DANGER Never attach PTO driveline while tractor is running.

DANGER Always have proper guarding of rotating parts. Failure to guard the power transmission mechanisms may result in serious injury or death.

While seated on the tractor and the engine at idle, engage the PTO. Slowly increase the throttle (00506) needle in the generator voltmeter is at or above the black line in the green area. A load can now be applied to the generator. Remember to stay clear of the rotating PTO driveline. From the tractor seat re-adjust the speed until the needle on the generator voltmeter is close to the black line in the green area. If the needle will not rise to the green area no matter what the engine speed, the generator is either overloaded or there is a problem. Use the troubleshooting guide at the end of the manual for assistance with possible problems.

Before each use check the gear box oil level. Use 80W-90 SAE synthetic gear oil and fill to the middle of the oil level sight plug.

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 starter 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 electric 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 (a)
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 (a)
Compressor (3/4 HP)	1800 (a)
Compressor (1/2 HP)	1400 (a)
Curling Iron	700
Dishwasher	1200
Edge Trimmer	500
Electric Nail Gun	1200
Electric Range (one element)	1500
Electric Skillet	1250
Freezer	800 (b)
Furnace Fan (1/3 HP)	1200 (a)
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
Impact Wrench	500
Jet Pump	800 (a)
Lawn Mower	1200
Light Bulb	100
Microwave Oven	700
Milk Cooler	1100 (a)
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 (a)
Paint Sprayer, Airless (handheld)	150
Radio	200
Refrigerator	600 (b)

Slow Cooker	200
Submersible Pump (1-1/2 HP)	2800 (a)
Submersible Pump (1 HP)	2000 (a)
Submersible Pump (1/2 HP)	1500 (a)
Sump Pump	600 (a)
Table Saw (10")	2000 (a)
Television	500
Toaster	1000
Vacuum cleaner	250
VCR	70
Water Heater	3000
Weed Trimmer	500

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

(b) 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 UP PREPARATIONS

Your generator has been thoroughly tested prior to shipment from the factory. However, damage can occur during shipping, so be sure to check for damaged parts, loose or missing nuts and bolts. If these 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 8 gauge 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 clocks will be effected if correct RPM is not maintained. See Load vs. Output chart

Load	Output			
	Percent of Generator Output	Speed (RPM)	Frequency (Hz)	Generator voltage at 120V Receptacle
	0 %	3780	63.0	125V
	50 %	3600	60.0	122V
	100 %	3480	58.0	118V

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 clock 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 bearings.

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

Exercising The Generator - The generator should be operated every four weeks. This is accomplished by starting the engine and applying a load for 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 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 NorthStar APPROVED REPAIR PARTS AVAILABLE AT 1-800-270-0810.**

A. Bearing - The bearings used in this generator are a heavy duty, sealed ball bearing type. 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 receptacles 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) Increase tractor RPMs. 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. d) Defective circuit breaker. 	<ul style="list-style-type: none"> a) Disconnect load. b) Replace receptade. c) Reduce the load. (See Load Application section of this manual.) d) Contact Customer Service for the nearest service center.
Voltage too high.	<ul style="list-style-type: none"> a) Engine speed too high. 	<ul style="list-style-type: none"> a) Contact Customer Service for the nearest service center.
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. g) Defective circuit breaker. h) Engine speed too slow. l) PTO not engaged. j) Gear box is malfunctioning. 	<ul style="list-style-type: none"> a) Disconnect load. b) Replace wire. c) Replace receptade. d) Contact Customer Service for the nearest service center. e) Contact Customer Service for the nearest service center. f) Contact Customer Service for the nearest service center. g) Contact Customer Service for the nearest service center. h) Increase tractor RPMs. l) Engage PTO. j) Contact Customer Service for the nearest service center.
Excessive gear box noise.	<ul style="list-style-type: none"> a) Defective bearing. b) Defective gear. c) No or low gear oil. d) PTO driveline is operating at an angle of greater than 15°. e) Unsynchronized PTO driveline. 	<ul style="list-style-type: none"> a) Contact Customer Service for the nearest service center. b) Contact Customer Service for the nearest service center. c) Fill gear box to oil level sight. d) Reposition the tractor or generator so the angle is reduced to less than 15° both vertically and horizontally. e) Disassemble PTO driveline and reassemble with CV joints synchronized.