



**MAINTENANCE AND OPERATING INSTRUCTIONS  
MODEL 39-002 MOTOR-GENERATOR  
"NOBRUSH" VOLTAGE REGULATED  
PERMANENT MAGNET FREQUENCY CONVERTER  
VERTICAL TYPE**

GEORATOR Corporation  
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USA  
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**GEORATOR CORPORATION**  
Manassas, Virginia

**NOTE**

Some instructions are general in nature. Some particular models may vary in size and precise locations for components. However, we believe that the user will be able to make those adjustment mentally. If you are at all concerned, please feel free to contact Georator Corporation with any questions you may have.



**SPECIFICATION**  
**GEORATOR CORPORATION**  
 MANASSAS, VIRGINIA 20110

Model No. 39-002  
 Type 22-A Vertical Converter & Back Iron Regulator

1.0 INPUT:

- 1.1 Motor, Rotor & Stator: Baldor, Frame 254T, Georator P/N 18-309; 7.5 H.P., 3 Phase, 60 Hz, 220/440V (+-10%), 1760 RPM F. L.
- 1.2 Input Current: 21.1/10.5 Amperes
- 1.3 Insulation: Class B
- 1.4 Max. Ambient Temperature: 40 Degrees C
- 1.5 Duty: Continuous

2.0 OUTPUT:

- 2.1 Rating: 5.0 KVA, 80% PF, 1 Phase, 400 Hz (Nom.), 115V +-1.5%
- 2.2 Output Voltage: No Load; AC values before regulation & rectification:
  - (A) Power Winding: 146V (+-1V)
  - (B) Control Winding: 57V (+-1V) L-L
- 2.3 Output Frequency Tolerances: 420 Hz N.L. to 408 Hz F.L.
- 2.4 Voltage Regulation: +-1.5% N. L. to F. L.
- 2.5 Voltage Adjustment: +-5%
- 2.6 Output Current Rating: 43.5 Amperes
- 2.7 Insulation: Class B
- 2.8 Max. Ambient Temperature: 40 Degrees C
- 2.9 Dielectric Strength, Winding to Frame: 1500V for 1 min.

3.0 VIBRATION: Within 0.0015

4.0 BEARINGS: Shielded Life Time Lubricated Motor Bearings

5.0 FINISH:

- 5.1 Primer: Alkyd, Red Iron Oxide Per Fed. Std. TT-P-664D
- 5.1 Paint: Silver-Blue Enamel

6.0 APPROX. WEIGHT:

- 6.1 Net: 300 Lbs.
- 6.2 Shipping: 360 Lbs.

Revision Letter	Date	Revision Description
ENGINEER	M.T.E.	
APPROVED BY		April 20, 1998

**GEORATOR CORPORATION**  
Manassas, Virginia

**MAINTENANCE AND OPERATING INSTRUCTIONS**  
**39-002 MOTOR-GENERATOR**  
**"NOBRUSH" VOLTAGE REGULATED**  
**PERMANENT MAGNET FREQUENCY CONVERTER**

**GENERAL**

The "NoBrush" vertical converter is a vertically mounted motor generator set used to convert 60 Hz frequency to 400 Hz frequency. The lower portion consists of the generator and the upper the motor.

The motor and generator, the control windings, and the control electronics are all packaged together in a single unit. The motor stator windings, the generator stator windings, and the control toroidal winding are mounted within the cast aluminum housing. The rotors for the motor and generator are mounted on a single common shaft with bearings at either end of the shaft. The electronic controls, consisting mainly of a single printed circuit board and heat sink, are mounted in an enclosure on the lower case of the motor-generator. An adjustment knob for setting the output voltage to a desired specific value (plus or minus 5% of rated regulated voltage at full load) is provided on the side of the control enclosure.

The drive motor is the induction type which means that it is very simple in construction and operation, and practically maintenance free. The rotor is the die cast aluminum squirrel cage type. The stator is wound for dual voltage input operation.

The Georator Corporation "NoBrush" alternator is probably the most reliable, rugged and trouble free generator built. The rotor consists of permanent magnets integrally cast in aluminum with the hub and pole pieces providing the field. Brushes, slip rings, etc. and their associated maintenance problems are eliminated. The stator is the armature.

The generator has internal protection against demagnetization from short circuit and will not be adversely affected by a short across its terminals for a short time duration.

**NOTE: DO NOT APPLY EITHER AC OR DC TO ANY OF THE  
WINDINGS OF THE GENERATOR**

A voltage applied to the generator leads may cause the rotor magnets to demagnetize or damage the stator.

A connection diagram will be found in the terminal box or on the connection diagram plate. Suitable overload protection should be provided, based on full load ampere rating shown on the

name plate. Protect wiring circuits with proper size fuses selected according to local code requirements.

## **DESCRIPTION OF REGULATION METHOD**

This regulated motor-generator utilizes the basic "NoBrush" generator with its permanent magnet rotor and normal stator windings. Supplementing these windings is a control toroidal winding, running from the bottom of the tooth slots to the back of the stator core. Through this toroidal winding is passed a direct current of sufficient magnitude to saturate the core to the degree required for attainment of a constant output voltage.

The output voltage is constantly sensed and any departure there from causes (via the control electronics) an increase or decrease in the direct current flowing through the toroidal winding. This, in turn, controls the amount of working flux passing through the stator core, which in turn determines the output voltage generated. The direct current necessary for energizing the toroidal winding is obtained from a separate control transformer feeding the regulator rectifier assembly. The power loss in the regulator circuitry is kept to a low figure.

Due to the design of the toroidal winding, the wave form of the machine is not impaired and approaches an ideal sine wave.

## **MAINTENANCE OF THE CONVERTER**

### Cleaning

It is most important that accumulations of oil, water, dirt, and dust are not permitted to cover the machine, enter it, or block ventilation. Remove any such accumulations from the machine and surrounding operating area.

Wipe the exterior of the machine to keep it clean. When necessary, use a suitable solvent to remove dirt accumulations from the machine surface.

Electrical machines should be protected from and kept free of acids, alkalines, chemical compounds and gas fumes that may cause insulation deterioration.

### Clean Windings

Accumulations of any foreign materials should be kept off the windings. Failure to keep the windings clean may result in short circuits, grounding of insulated surfaces, and in increased temperature rise.

The frequency of cleaning windings will have to be determined by operating conditions.

However, it is a good policy to clean the windings at least once a year. Greasy or oily deposits may be wiped off with a lint-free cloth dipped in a suitable solvent. Take care not to leave solvent deposits on the windings. Light accumulations of nonconductive dust may be removed by compressed air. Use a pressure range of 40 or 60 psi. Do not blow directly into the windings. When dirt and dust accumulations are heavy or of a highly conductive nature, it is best to use an especially built vacuum cleaner to clean the machine. Follow the cleaner instructions carefully.

### Solvents

When the parts of a motor and generator need cleaning, use a suitable petroleum solvent such as kerosene, petroleum spirits or Stoddard solvent. Care must be taken to utilize solvents in accordance with the solvent manufacturer's instructions. Protection in accordance with local laws regarding fire hazards must be provided. Gasoline containing lead compounds should not be used because of their toxic nature. Light petroleum solvents may be more effective but must be free of corrosive action and must be followed up with flushing oil.

### **BEARINGS**

Bearing life is estimated at more than 10,000 operating hours for normal operating conditions. Bearing replacement is required only when the bearings become noisy. This requires the disassembly of the unit.

### **CONVERTER DISASSEMBLY**

Disassemble converter for replacement of bearings. Use the following steps:

1. Remove 4 bolts, Item 2, from the top of the converter.
2. Remove 4 bolts, Item 5, from the motor flange.
3. Put a steel bar approximately 3/4" diameter through the eye bolts, and with a hoist slowly lift up motor housing, Item 7.
4. Screw into the end of the exposed shaft a 3/8-16 eye bolt and with a hoist slowly lift the shaft assembly, Item 1. The magnetic force will tend to hold the shaft assembly in place and it will be necessary to secure the generator housing, Item 1, to the work bench or floor.
5. Protect the generator rotor, Item 3, by wrapping it in heavy paper, and place it away from the iron or steel objects. If magnetic materials adhere to the rotor, this could cause partial demagnetization of the rotor. Iron and steel objects should be kept some distance from the rotor.

Removal of the shaft assembly will permit complete inspection of the generator and motor windings and removal of the bearings, Items 1, from the shaft assembly, using a proper size bearing puller. They should be removed in the same manner as when mounted; that is, from the shaft by force applied to the inner race only.

### **INSTALLATION OF THE BEARINGS**

The shaft bearing seat and bearing housing must be carefully cleaned to remove all traces of metal chips, filings, etc. To drive the inner ring of a bearing on a cylindrical shaft seat, a piece of tubing, squared on the ends should be used that will bear evenly against the face of the inner ring. Pressure should not be applied to the inner ring through the ball assembly by pushing against the outer ring. The bearing should be driven to a firm seat on the shaft shoulder.

Care must be taken that the bearing is started true and not cocked; otherwise, it is possible to roughen or burr the ground surface of the shaft. A light film of oil on the shaft and in the housing bore will prove an aid to mounting.

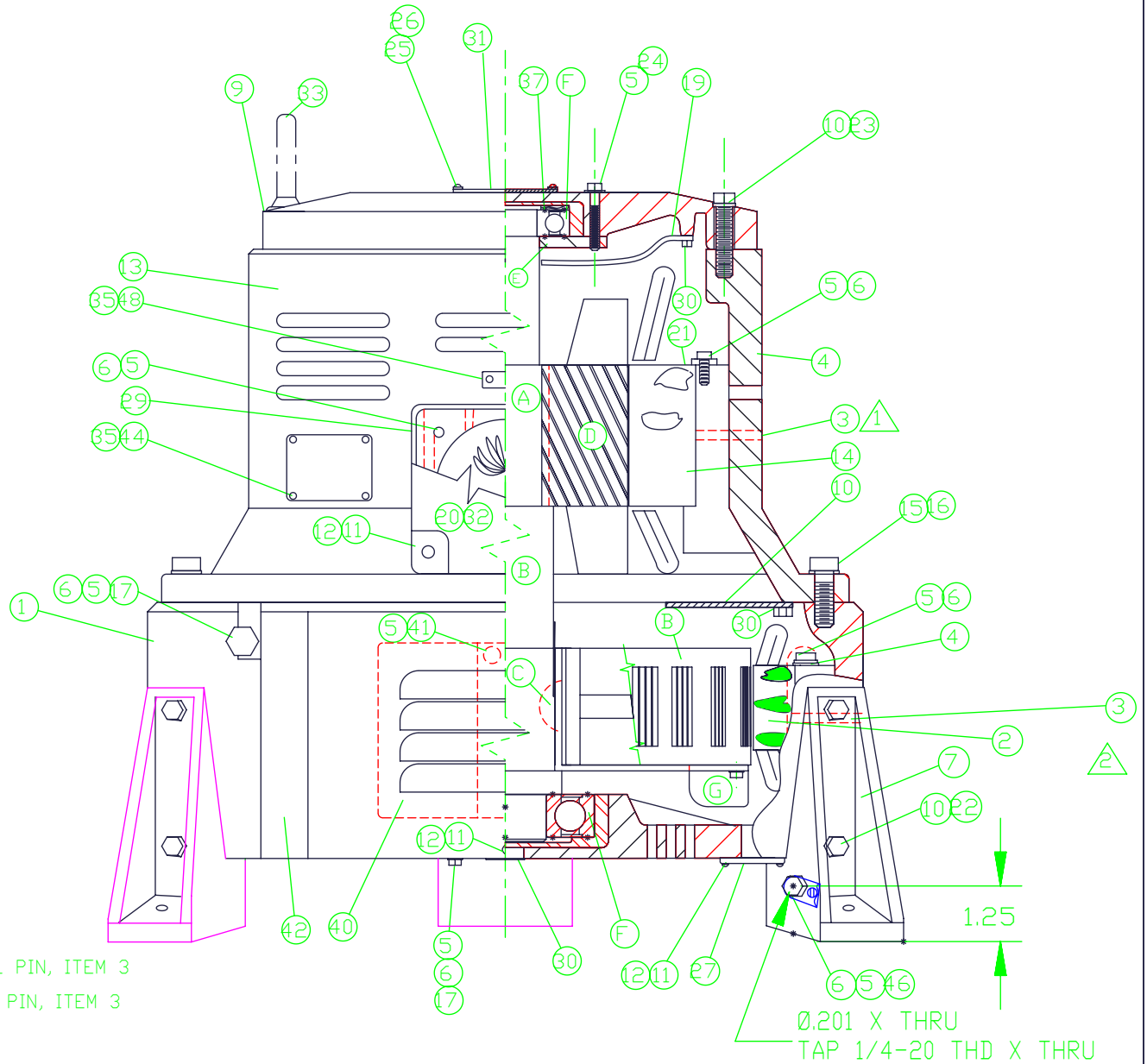
Do not force the bearing onto a shaft by blows applied to the outer race, nor into a housing by pounding upon the inner race.

To reassemble the converter reverse the order of the disassembly taking care not to damage the generator and motor windings. Clean any metal chips or particles from the rotors before installation. Check to see that the generator rotor turns freely and does not rub the stator. The generator leads should not be shorted when checking for a free turning rotor.

There should be a minimum air gap of at least 0.017 inches all around. This can be checked with a non-magnetic feeler gauge of the proper thickness and about 1/8 inch wide, through the inspection slots, located on the bottom of the generator housing. After inspection, be sure the inspection slots are closed with cover, Item 6.

LIST OF MATERIAL			LIST OF MATERIAL		
ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	Housing, Gen.	22	9	Bolt
2	1	Stator Assy. Gen.	23	4	Bolt
3	2	Spiral Pin	24	4	Bolt
4	16	Retaining Washer	25	2	Screw
5	34	Lockwasher	26	2	Lockwasher
6	24	Bolt	27	4	Cover, Inspection Slot
7	3	Feet	28	2	T. Box w/ Cover
8	1	Shaft Assy.	29	1	Gasket, Terminal Box Pad
A	1	Shaft	30	1	Plug, Generator Housing
B	1	Rotor, Gen.	31	1	Emblem
C	2	Woodruff Key	32	1	Gasket, Terminal Box Cover
D	1	Rotor, Motor	33	2	Eye Bolt
E	1	Cover, Motor Bearing	34	1	Name Plate
F	2	Ball Bearing	35	4	Screw
G	1	Fan, Generator	36	2	Screw
9	1	End Bell	37	1	Spring Washer
10	13	Lockwasher	38	24	Screw
11	20	Lockwasher	39		
			40	1	Voltage Regulator
12	20	Screw	41	6	Bolt
13	1	Housing, Motor	42	1	Regulator Box And Cover
14	1	Stator Assy. Motor	*	1	Connection Diag. Plate 3 Phase Input
15	4	Lockwasher	*44		Inductor, Mohawk Electro
16	4	Bolt			
17	8	Flatwasher			
18	1	Baffle, Generator			
19	1	Baffle, Motor End Bell			
20					
21	1	Baffle, Motor Stator			

\* NOT SHOWN



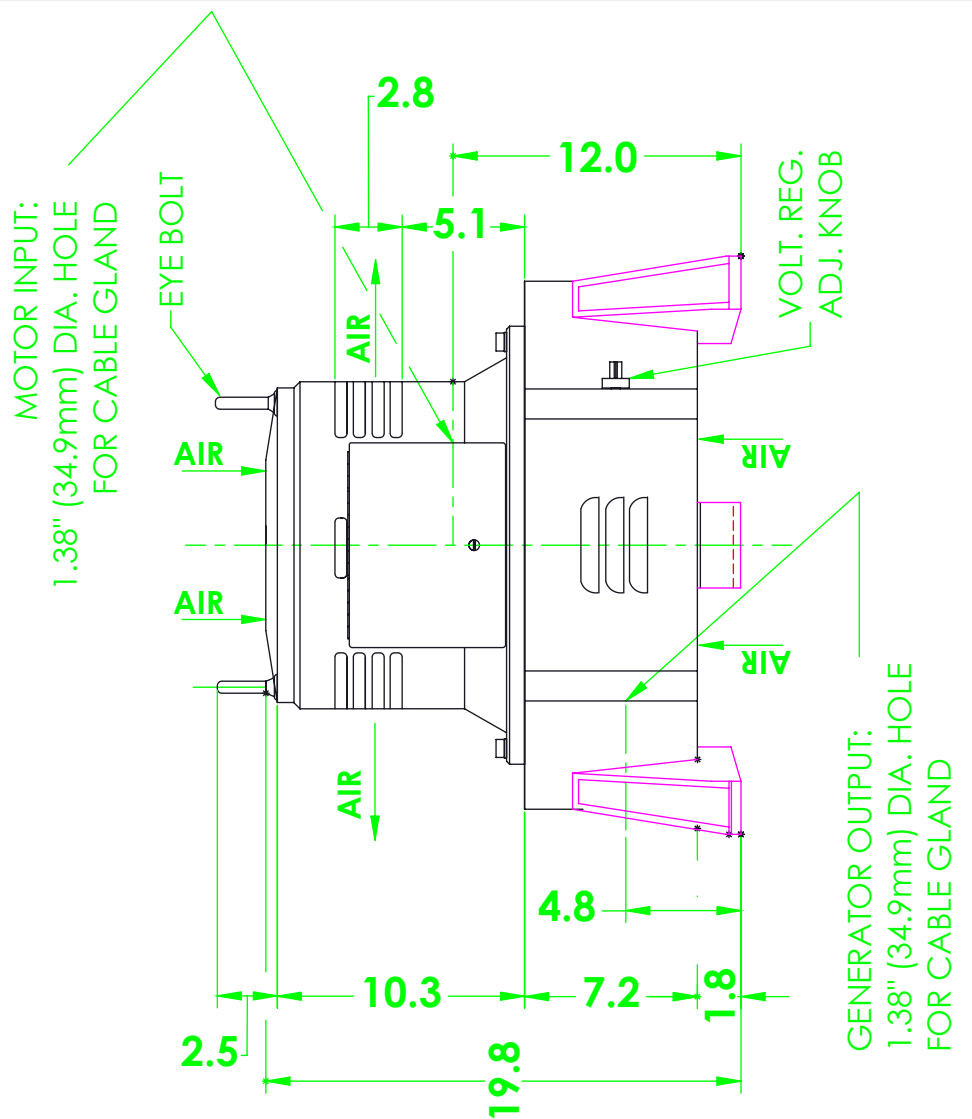
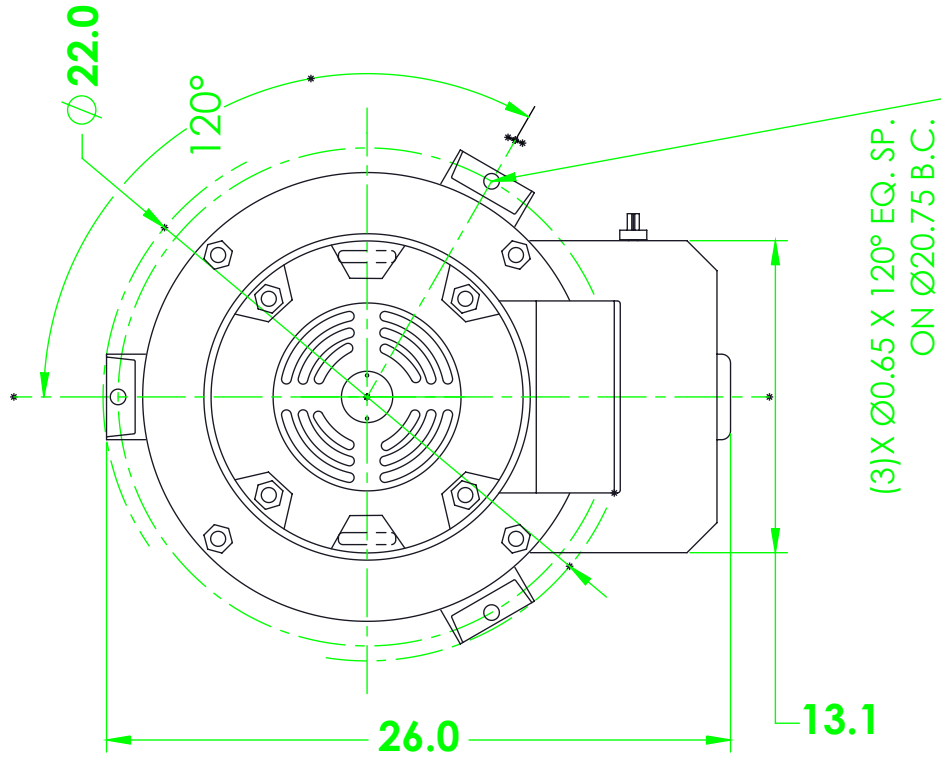
### NOTES:

- 1.) 1/4" (.250) DRILL X .09 DP. INTO MOTOR FOR 1/4" SPIRAL PIN, ITEM 3
- 2.) 1/4" (.250) DRILL X .09 DP. INTO GEN. FOR 1/4" SPIRAL PIN, ITEM 3
- 3.) VIBRATION WITHIN 0.0015
- 4.) MINIMUM AIR GAP 0.017
- 5.) FOR ASSEMBLY OF REGULATOR BOX COMPONENTS, SEE DWG. B22-345-1
- 6.) PRIMER: ZINC-CHROMATE
- 7.) PAINT: SILVER-BLUE ENAMEL
- 8.) FASTNERS: ZINC PLATED

REV.	DESCRIPTION	DATE	BY
A	REDRAWN IN AUTOCAD TO SHOW UL MODIFICATIONS	8/10/01	B.S.O.

UNSPECIFIED TOLERANCES FRACTIONAL: ±1/8 DECIMAL: ±0.030 2 PLACE: ±0.030 3 PLACE: .010 ANGULAR: ± 0°30'	USED ON: 39-002 39-004
PLOT @: FIT	DIMENSIONS ARE IN INCHES. DO NOT SCALE DRAWING
This drawing and any print thereof is the property of Georator Corporation and is not to be used or reproduced in any manner without the written consent of this company. The information shown is confidential and the recipient by accepting this drawing agrees not to use any information contained therein in any manner which will be detrimental to Georator Corporation.	DATE: 8/10/01 DRAWN: B.S.O. FILE: 22-369.dwg APP'D:
	SCALE: NONE

<b>Georator Corporation</b> 9617 Center Street Manassas, VA 20110-5521, USA Telephone (703)-368-2101 FAX (703) 368-1078	
NAME: ASSEMBLY DWG., VERTICAL CONVERTER, B.I.R., TYPE 20-A SER., MIL. DRIP PROOF	MATERIAL: PARTS LIST
DWG. NO. C 22-369	REV. A



**MODEL NO. 39-002-3**

**APPR. WEIGHT: 305 LBS.**

				UNSPECIFIED TOLERANCES FRACTIONAL ±1/8 DECIMAL ±0.030 2 PLACE ±0.030 3 PLACE N/A ANGULAR N/A		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.		<b>GEORATOR Corporation</b> 9617 Center Street Manassas, VA 20110-5521, USA Telephone (703)-368-2101 FAX (703) 368-1078	
				PLOT @: FIT		DO NOT SCALE DRAWING		NAME <b>OUTLINE DRAWING</b>	
				This drawing and any print thereof is the property of Georator Corporation and is subject to return on request by this company. The information shown is confidential and the recipient by accepting this drawing agrees not to use any information contained thereon in any manner which will be detrimental to Georator Corporation.		DATE 10/17/01		<b>VERTICAL CONVERTER TYPE 20-A SERIES</b>	
						DRAWN B.S.O.		<b>W/ VOLTAGE REGULATOR</b>	
						FILE: 23-1351.DWG		MATERIAL SEE BILL/LIST OF MATERIALS	
REV.	DESCRIPTION	DATE	BY			APP'D.	FINISH	DWG. NO.	REV.
						SCALE NONE	SHEET 1 OF 1	A 23-1351	

INPUT  
3 PH, 60 Hz

OUTPUT  
5.0kVA, 1 PH., 400Hz (NOM.)

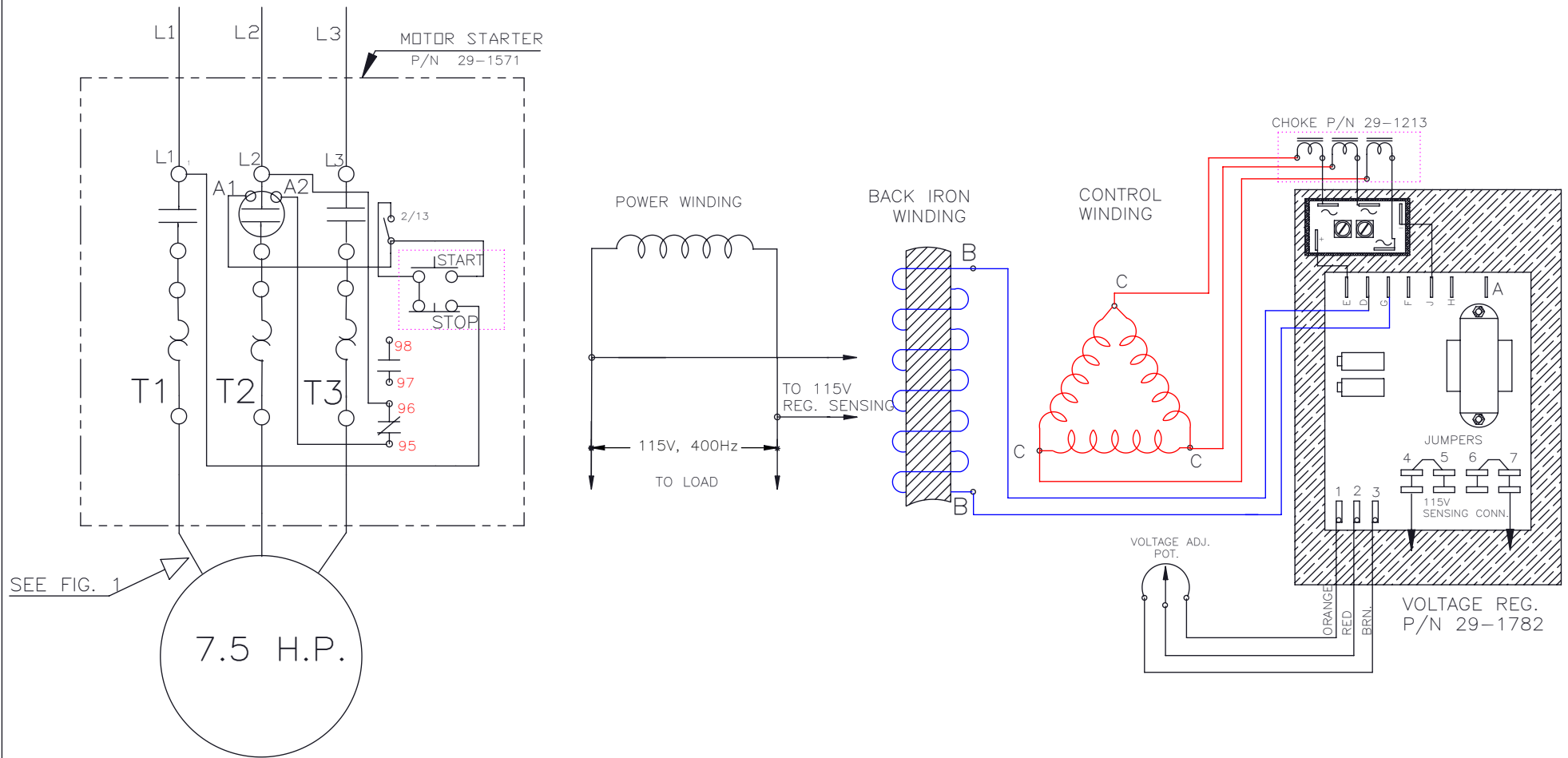


FIGURE 1

MOTOR CONNECTIONS					
LOW VOLTAGE			HIGH VOLTAGE		
T4	T5	T6	T4	T5	T6
T7	T8	T9	T7	T8	T9
T1	T2	T3	T1	T2	T3
L1	L2	L3	L1	L2	L3
220V			440V		

REV	DESCRIPTION	DATE	BY
A	REDRAWN	11/11/96	MTE

UNSPECIFIED TOLERANCES FRACTIONAL +L/32 DECIMAL 2 PLACE +0.00 3 PLACE -0.00 ANGULAR +L/2	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	Georator Corporation 9617 Center Street Manassas, VA 22110-5521, USA Telephone (703)-368-2101 FAX (703) 368-1078	
PLOT @ XXXXXX		DO NOT SCALE DRAWING	NAME
This drawing and any part thereof is the property of Georator Corporation and is subject to return on request by the company. The information shown is confidential and the recipient by accepting this drawing agrees not to use any information contained hereon in any manner which will be detrimental to Georator Corporation.		DATE 11-11-96	WIRING DIAGRAM
		DRAWN M.T.E.	MODEL NO. 39-002
		FILE 25-651A.DWG	MATERIAL
		APP'D.	FINISH
		SCALE NONE	DWG. NO.
		SHEET 1 OF 1	REV.
			25-651A