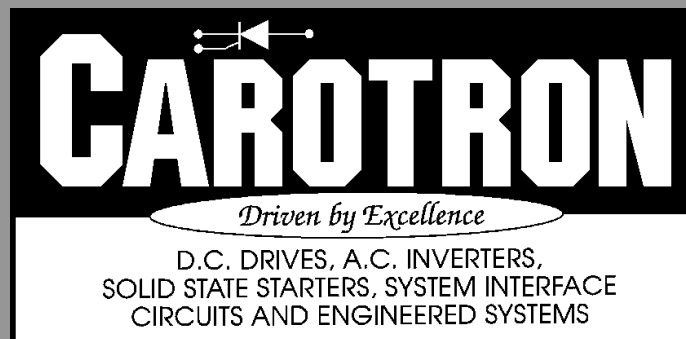


Frequency To Voltage Module

**Instruction Manual
FTV220-000**



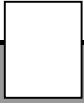


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General Description

Model FTV220-000 (Frequency to Voltage Module) is designed to provide a means of converting digital pulse frequency signals to an analog voltage or current. The frequency input signal is optically isolated from the analog output circuitry. The module also provides an isolated +15VDC power supply (rated at 100mA maximum) to power an external encoder. Calibration of the minimum and maximum input frequency is accomplished by a contact closure connected to the Teach input terminal.

The output signal is conditioned by scaling circuits which can be modified via multi-turn OFFSET, BIAS, and GAIN potentiometer adjustments. Terminal strip connections are provided for an optional external TRIM pot. A multi-turn TRIM RANGE adjustment is also supplied to limit the range of the external TRIM pot. The output circuit can be configured to source either a voltage or current. Typical output ranges are 0 to 10 VDC, 0 to 20 mADC, or 4 to 20 mADC.

2

Specifications

2.1 Electrical

D.C. Power Input

- 24 VDC $\pm 10\%$, 150mA max, internally fused

Isolation Voltage

- 500V (DC or AC Peak)

Linearity

- $\pm 0.5\%$ of 10 VDC span

Signal Input

- Square wave
- 2.5V (min) to 24V (max) peak
- 0 to 50kHz
- 10-90% Duty cycle

External Trim Potentiometer (Optional)

- 10k Ohms

Temperature Range

- 0-45°C

Signal Output

• Voltage Output

Selected by position V on J1. This circuit allows the output to source a voltage level of up to ± 12 VDC into a minimum resistance of 600 Ohms. If resistance is too low, output linearity may be affected.

• Current Output

Selected by position I on J1. This circuit allows the output to source a regulated current of up to ± 20 mA into a maximum resistance of 500 Ohms. Using the BIAS pot, the output can source a 4 to 20mA signal.

2.2 Physical

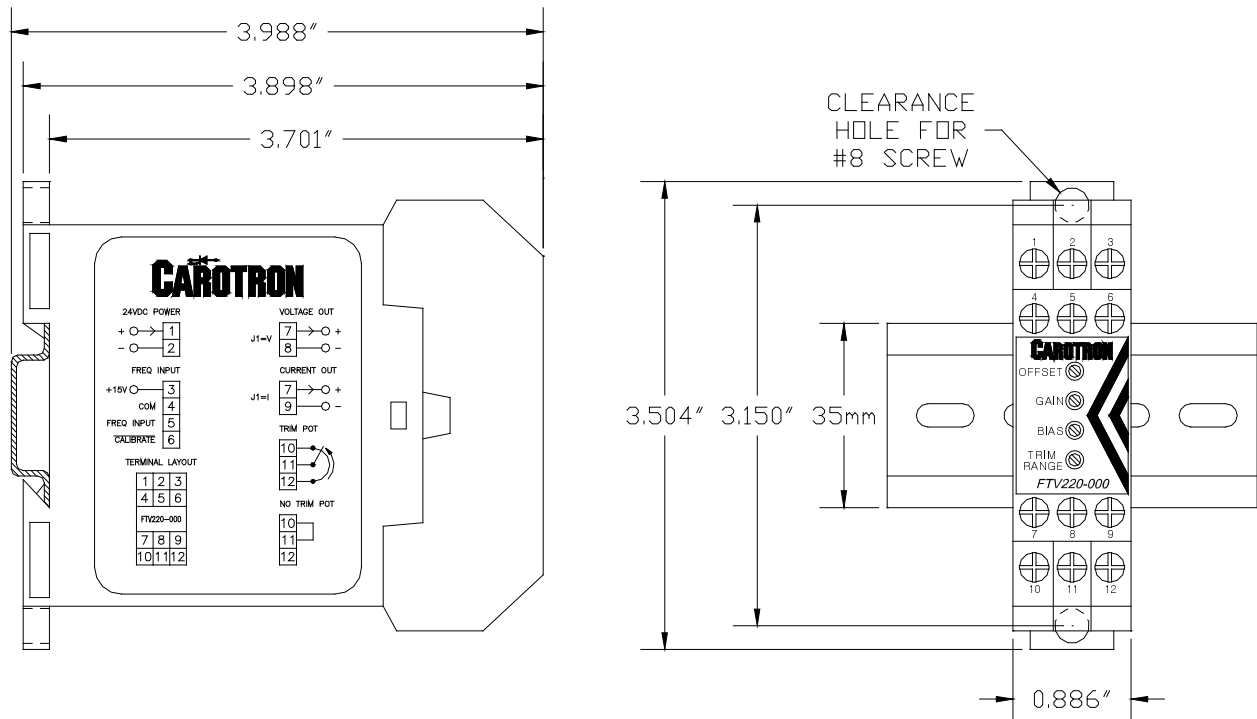


Figure 1: Physical Dimensions

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Installation

3.1 Wiring Guidelines

To prevent electrical interference and to minimize start-up problems, adhere to the following guidelines:

Use fully insulated and shielded cable for all signal wiring. The shield should be connected to circuit common at one end only. The other end of the shield should be clipped and insulated to prevent the possibility of accidental grounding.

Here are two examples:

- If an encoder is used to provide the frequency input signal to the FTV220-000 Module, the shield should be tied to terminal 4.
- If the output from this card is used as the speed feedback signal for a motor control, then the shield should be connected to the common terminal of the motor control.

Signal level wiring such as listed above should be routed separately from high level wiring such as armature, field, operator control and relay control wiring. When these two types of wire must cross, they should cross at right angles to each other.

Any relay, contactor, starter, solenoid or other electro-mechanical device located in close proximity to or on the same line supply as the FTV220-000 should have a transient

suppression device such as an MOV or R-C snubber connected in parallel with its coil. The suppressor should have short leads and be connected as close to the coil as possible.

3.2 Signal Connections

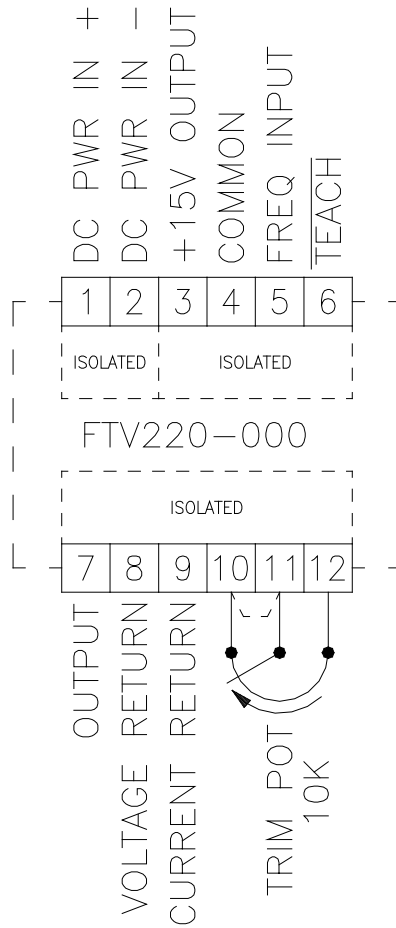


Figure 2: General Connections

4

Description of Jumpers & Adjustments

Jumpers are accessible by removing the cover assembly from the base. Squeeze the enclosure top on both sides and pull up to remove the base.

Jumper J1

Selects the Output Mode between Voltage or Current. Position V on J1 selects the Voltage Mode and the output is sourced from terminals 7 & 8. Position I on J1 selects the Current Mode and the output is sourced on terminals 7 & 9.

OFFSET Potentiometer

Used to null the first stage amplifier section to 0.0 VDC with minimum reference input.

GAIN Potentiometer

Used to set the maximum input level with maximum reference input.

BIAS Potentiometer

Used to set the desired output level with the minimum reference input.

TRIM RANGE Potentiometer

Used to set the range of the optional external trim potentiometer.

5

Adjustment Procedure

5.1 Select Output Type

- Select the type of output desired using Jumper J1. If a Voltage output is desired, select V on J1 and use output terminals 7 (OUTPUT) and 8 (VOLTAGE RETURN). If a Current output is desired, select I on J1 and use output terminals 7 (OUTPUT) and 9 (CURRENT RETURN).
- **If a TRIM potentiometer is not used, jumper terminals 10 to 11.** Otherwise, turn the external trim potentiometer to the full clockwise position.

5.2 Calibration

- Make connections per drawing C13689. Note that a temporary contact/switch connection is required between terminals 4 and 6 for teaching the min and max frequency input levels. The switch should initially be in the open position.
- Apply power to the FTV220-000 Module.
- The FTV220-000 is capable of producing an analog output with either a positive or negative slope (refer to Figure 3). A positive slope (solid line) is obtained by teaching the minimum frequency first, followed by the maximum frequency. A negative slope (dashed line) is obtained by teaching the maximum frequency first, followed by the minimum frequency.

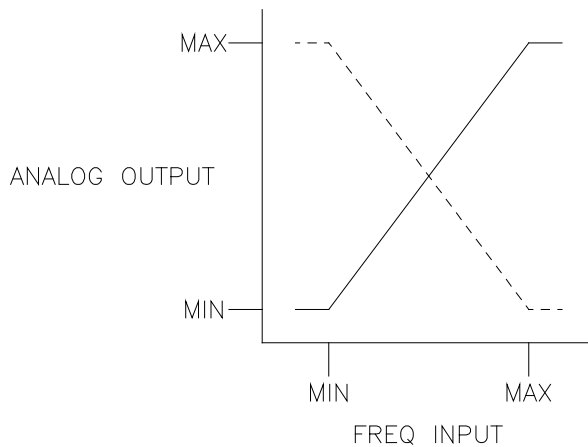


Figure 3: Analog Output Slope

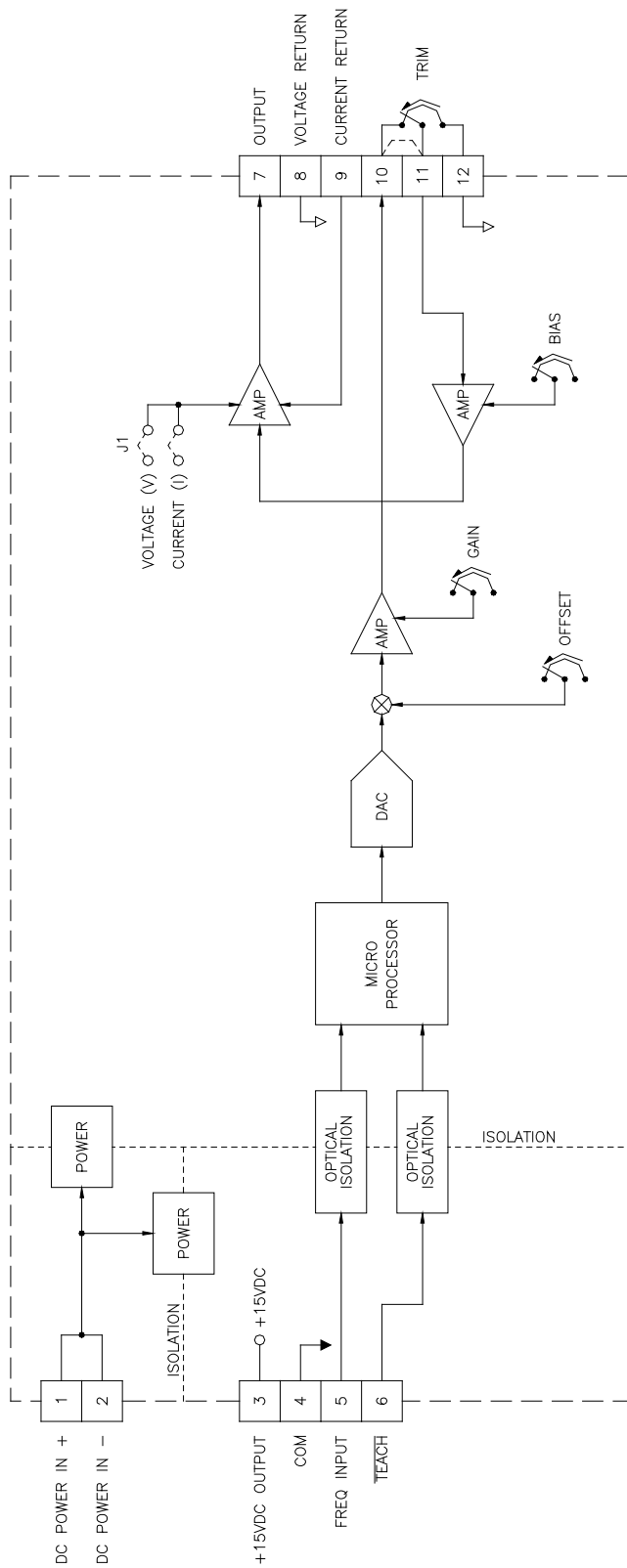
- Apply to terminal 5 the frequency level that corresponds to the minimum analog output level from the FTV220-000 module. Close the Teach switch between terminals 4 and 6 to capture this frequency level. The internal DAC (digital to analog converter) will also be forced to zero output (allowing proper adjustment of the OFFSET and BIAS settings).
- Turn the GAIN potentiometer fully clockwise (approximately 20 turns). Adjust the OFFSET potentiometer for 0.0 VDC between terminals 10 and 8. Turn the GAIN potentiometer fully counter clockwise (approximately 20 turns).
- Adjust the BIAS potentiometer for the minimum desired output level (at terminal 7).
- Apply to terminal 5 the frequency level that corresponds to the maximum analog output level from the FTV220-000 module. Open the Teach switch to capture this frequency level. The internal DAC will also be forced to its maximum output (allowing proper adjustment of the GAIN setting).
- Adjust the GAIN potentiometer for the maximum desired output (at terminal 7).
- The unit is now calibrated for operation. Refer to Section 5.3 for optional TRIM adjustment.


5.3 Trim Range (Optional)

If desired, the output level relative to the input signal may now be trimmed by an optional external 10K TRIM potentiometer. The Trim Range adjustment can be used to limit the range of the external trim potentiometer. A Trim Range setting of fully counter-clockwise gives the external trim potentiometer a full range of 0 to 100%. A Trim Range setting of fully clockwise gives an external 10K trim potentiometer a range of approximately 80 to 100%. Note that the value of the external trim potentiometer will have an affect on the range of the internal Trim Range potentiometer. If for example an external trim potentiometer of 50K is used, the minimum allowable external trim level will be approximately 40 to 100% (instead of the 80 to 100% with a 10K potentiometer).

5.4 Outputs Greater Than 12VDC up to 24VDC

When the BIAS and OFFSET potentiometers are both set at 0, the voltage at terminal 10 is opposite in polarity, but equal in magnitude to terminal 7. This can be used to achieve up to 24 VDC output signal as long as the load is no more than 5 mA. Refer to drawing C13689, 24 VDC OUTPUT. This is achieved by using terminal 11 as the common (instead of terminal 8) and using terminal 7 as the output.

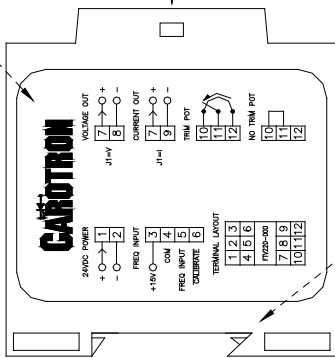
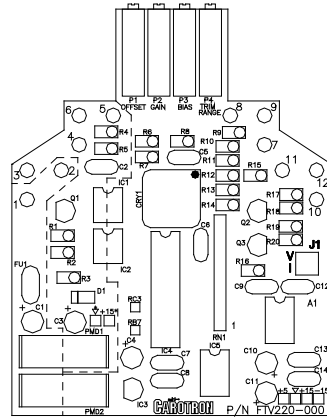
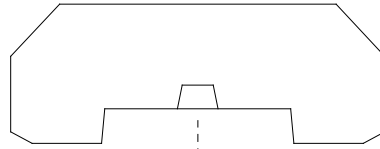
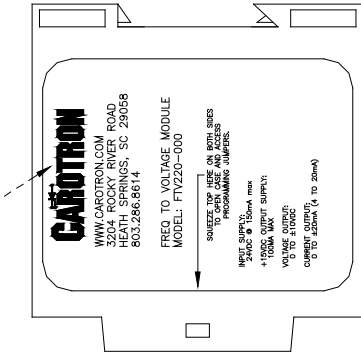


DRAWN BY: BKP	DATE: 4/28/10	APPROVED BY:	DATE:
 <i>Driven By Excellence</i>		HEATH SPAINING, SC 8 TEC. PL. = 21P* 3 TEC. PL. = 20P*	
TITLE: FTV220-000		BLOCK DIAGRAM	
DRAWING NUMBER: C13688		REV. A SH. 1 OF 1	

APPLY TOP LABEL. ENSURE POTENTIOMETER HOLES LINE UP.

APPLY MODEL NUM LABEL TO RIGHT SIDE

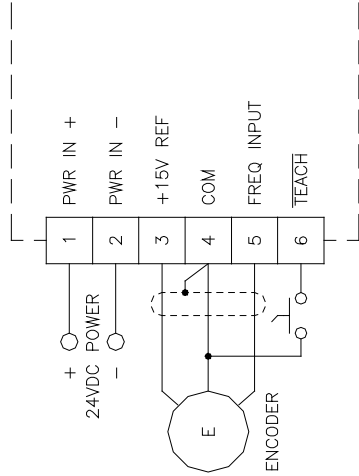
APPLY CONNECTION LABEL TO LEFT SIDE



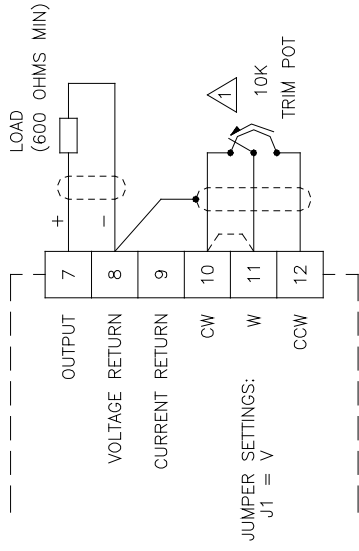
NOTE ORIENTATION OF ENCLOSURE BASE

DESIGNED BY: BKP	DATE: 3/18/10	APPROVED BY:	DATE:
TELEPHONE: +1 803 286 8614		HEATH SPRINGS, SC 29058	
FAX: 803 286 8615		Drivers by Excellence	
E-MAIL: carot@carot.com		TITLE: FREQUENCY TO VOLTAGE	
SCALE:		MODULE	
DRAWING NUMBER:		FTV220-000	
REV. A		ASSEMBLY	
C13675		SH. 1 OF 1	

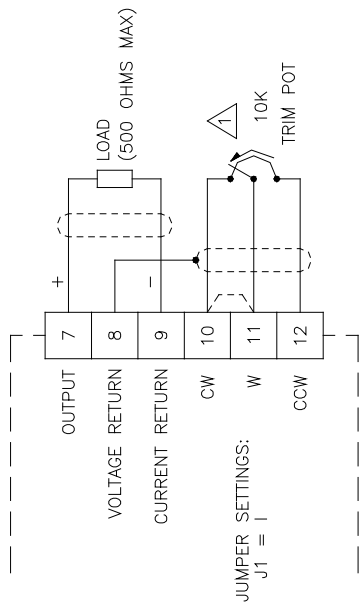
FREQUENCY INPUT



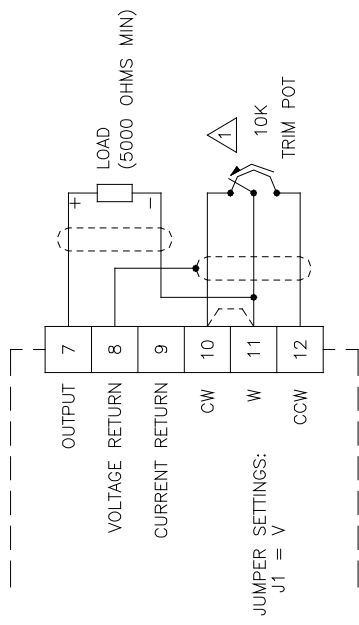
VOLTAGE OUTPUT



CURRENT OUTPUT



24VDC OUTPUT



⚠ JUMPER TERMINALS 10 TO 11 IF TRIM POT IS NOT USED.

DRAWN BY: BKP		DATE: 4/28/2010
APPROVED BY:		DATE:
GAROTRON <i>Driven by Excellence</i>		
HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-8063		
TOLERANCES: ±	TITLE: FTV220-000	
1 DEC. PL. = .001"	GENERAL CONNECTIONS	
3 DEC. PL. = .005"	SCALE:	
DRAWING NUMBER: C13689		
REV. A		SH. 1 OF 1

Standard Terms & Conditions of Sale

1. General

The Standard Terms and Conditions of Sale of Carotron, Inc. (hereinafter called "Company") are set forth as follows in order to give the Company and the Purchaser a clear understanding thereof. No additional or different terms and conditions of sale by the Company shall be binding upon the Company unless they are expressly consented to by the Company in writing. The acceptance by the Company of any order of the Purchaser is expressly conditioned upon the Purchaser's agreement to said Standard Terms and Conditions. The acceptance or acknowledgement, written, oral, by conduct or otherwise, by the Company of the Purchaser's order shall not constitute written consent by the Company to addition to or change in said Standard Terms and Conditions.

2. Prices

Prices, discounts, allowances, services and commissions are subject to change without notice. Prices shown on any Company published price list and other published literature issued by the Company are not offers to sell and are subject to express confirmation by written quotation and acknowledgement. All orders of the Purchaser are subject to acceptance, which shall not be effective unless made in writing by an authorized Company representative at its office in Heath Springs, S.C. The Company may refuse to accept any order for any reason whatsoever without incurring any liability to the Purchaser. The Company reserves the right to correct clerical and stenographic errors at any time.

3. Shipping dates

Quotation of a shipping date by the Company is based on conditions at the date upon which the quotation is made. Any such shipping date is subject to change occasioned by agreements entered into previous to the Company's acceptance of the Purchaser's order, governmental priorities, strikes, riots, fires, the elements, explosion, war, embargoes, epidemics, quarantines, acts of God, labor troubles, delays of vendors or of transportation, inability to obtain raw materials, containers or transportation or manufacturing facilities or any other cause beyond the reasonable control of the Company. In no event shall the Company be liable for consequential damages for failure to meet any shipping date resulting from any of the above causes or any other cause.

In the event of any delay in the Purchaser's accepting shipment of products or parts in accordance with scheduled shipping dates, which delay has been requested by the Purchaser, or any such delay which has been caused by lack of shipping instructions, the Company shall store all products and parts involved at the Purchaser's risk and expense and shall invoice the Purchaser for the full contract price of such products and parts on the date scheduled for shipment or on the date on which the same is ready for delivery, whichever occurs later.

4. Warranty

The Company warrants to the Purchaser that products manufactured or parts repaired by the Company, will be free, under normal use and maintenance, from defects in material and workmanship for a period of one (1) year after the shipment date from the Company's factory to the Purchaser. The Company makes no warranty concerning products manufactured by other parties.

As the Purchaser's sole and exclusive remedy under said warranty in regard to such products and parts, including but not limited to remedy for consequential damages, the Company will at its option, repair or replace without charge any product manufactured or part repaired by it, which is found to the Company's satisfaction to be so defective; provided, however, that (a) the product or part involved is returned to the Company at the location designated by the Company, transportation charges prepaid by the Purchaser; or (b) at the Company's option the product or part will be repaired or replaced in the Purchaser's plant; and also provided that (c) the Company is notified of the defect within one (1) year after the shipment date from the Company's factory of the product or part so involved.

The Company warrants to the Purchaser that any system engineered by it and started up under the supervision of an authorized Company representative will, if properly installed, operated and maintained, perform in compliance with such system's written specifications for a period of one (1) year from the date of shipment of such system.

As the Purchaser's sole and exclusive remedy under said warrant in regard to such systems, including but not limited to remedy for consequential damages, the Company will, at its option, cause, without charges any such system to so perform, which system is found to the Company's satisfaction to have failed to so perform, or refund to the Purchaser the purchase price paid by the Purchaser to the Company in regard thereto; provided, however, that (a) Company and its representatives are permitted to inspect and work upon the system involved during

reasonable hours, and (b) the Company is notified of the failure within one (1) year after date of shipment of the system so involved.

The warranties hereunder of the Company specifically exclude and do not apply to the following:

a. Products and parts damaged or abused in shipment without fault of the Company.

b. Defects and failures due to operation, either intentional or otherwise, (1) above or beyond rated capacities, (2) in connection with equipment not recommended by the Company, or (3) in an otherwise improper manner.

c. Defects and failures due to misapplication, abuse, improper installation or abnormal conditions of temperature, humidity, abrasives, dirt or corrosive matter.

d. Products, parts and systems which have been in any way tampered with or altered by any party other than an authorized Company representative.

e. Products, parts and systems designed by the Purchaser.

f. Any party other than the Purchaser.

The Company makes no other warranties or representation, expressed or implied, of merchantability and of fitness for a particular purpose, in regard to products manufactured, parts repaired and systems engineered by it.

5. Terms of payment

Standard terms of payment are net thirty (30) days from date of the Company invoice. For invoice purposed, delivery shall be deemed to be complete at the time the products, parts and systems are shipped from the Company and shall not be conditioned upon the start up thereof. Amounts past due are subject to a service charge of 1.5% per month or fraction thereof.

6. Order cancellation

Any cancellation by the Purchaser of any order or contract between the Company and the Purchaser must be made in writing and receive written approval of an authorized Company representative at its office in Heath Springs, S.C. In the event of any cancellation of an order by either party, the Purchaser shall pay to the Company the reasonable costs, expenses, damages and loss of profit of the Company incurred there by, including but not limited to engineering expenses and expenses caused by commitments to the suppliers of the Company's subcontractors, as determined by the Company.

7. Changes

The Purchaser may, from time to time, but only with the written consent of an authorized Company representative, make a change in specifications to products, parts or systems covered by a purchase order accepted by the company. In the event of any such changes, the Company shall be entitled to revise its price and delivery schedule under such order.

8. Returned material


If the Purchaser desires to return any product or part, written authorization thereof must first be obtained from the Company which will advise the Purchaser of the credit to be allowed and restocking charges to be paid in regard to such return. No product or part shall be returned to the Company without a "RETURN TAG" attached thereon which has been issued by the Company.

9. Packing

Published prices and quotations include the Company's standard packing for domestic shipment. Additional expenses for special packing or overseas shipments shall be paid by the Purchaser. If the Purchaser does not specify packing or accepts parts unpacked, no allowance will be made to the Purchaser in lieu of packing.

10. Standard transportation policy

Unless expressly provided in writing to the contrary, products, parts and systems are sold f.o.b. first point of shipment. Partial shipments shall be permitted, and the Company may invoice each shipment separately. Claims for non-delivery of products, parts and systems, and for damages thereto must be filed with the carrier by the Purchaser. The Company's responsibility therefor shall cease when the carrier signs for and accepts the shipment.



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SOLID STATE STARTERS, SYSTEM INTERFACE
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3204 Rocky River Road
Heath Springs, SC 29058

Phone: 803.286.8614

Fax: 803.286.6063

Email: saleserv@carotron.com

Web: www.carotron.com

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