Current Sensing Board

Instruction Manual
Model
C10748-000
C10748-001
C10748-002

CAROTRON

Driven by Excellence

D.C. DRIVES, A.C. INVERTERS,
SOLID STATE STARTERS, SYSTEM INTERFACE
CIRCUITS AND ENGINEERED SYSTEMS

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1 General Description

The model C10748-XXX Current Sensing Board is a means of sensing AC and DC Current while providing isolation. It makes it possible to measure current in a system conductor without breaking the wire. There is a minimum of 1500 Vrms isolation between the sensed conductor and the card output.

This unit is intended for use in systems to measure current in DC motors and line operated AC motors. It is not intended to measure output current from AC Variable Frequency Drives. It is able to measure motor current out of Electronic Soft Starters. In this case, the current range must be considered and the start current must stay in the range of this unit.

When the unit is used to measure DC, it's output can have the same polarity as the current or it can have positive only output to indicate absolute level. The scaling is adjustable up to 10 volts full scale. The Bipolar Output matches the waveform of an AC signal within it's rise time limitation. The Unipolar output is rectified and filtered so only a DC voltage is available indicating the level of the current.

When the unit is used for single phase applications, the bipolar output is to be 4 volts or less to avoid saturation of the current transducer or the amplifier stage after it due to the form factor of the current.

The current range can exceed 600 amps depending on the current waveform and can handle a maximum of less than 10 amps by using multiple turns through the sensor. Calibration of the unit is dependent on use of an accurate shunt and voltmeter or ammeter to set the scaling.

A screw type terminal strip and square pin MTA connector is available for connection to the 115VAC power and to connect to the output. The input connection is provided by passing the conductor to be measured through the hole in the current transducer. The sensitivity of the sensing is able to be increased by the number of times the wire passes through the hole. The polarity of the voltage output is dependent on the current direction through the hole of the current transducer.

2 Specifications

AC Input
115VAC +\-10%, 50, 60 Hz, 1.2VA max., 0.1A Fuse provided on power input.

Isolation
1500Vrms power input to signal output and sensed conductor.

Current Range
AC(50/60Hz):
- Model C10748-000: 200 Amps Max.
- Model C10748-001: 290 Amps Max.
- Model C10748-002: 570 Amps Max.

DC:
- Model C10748-000: 225 Amps Max.
- Model C10748-001: 330 Amps Max.
- Model C10748-002: 650 Amps Max.

Bipolar Output
- 0 to 8 VAC (AC input)
- 0 to +\-4 VDC (Single phase full wave DC drive input)
- 0 to +\-10 VDC (Three phase 3 or 6 Pulse DC drive input)

Unipolar Output
- 0 to 8 VAC (AC input)
- 0 to +\-4 VDC (Single phase full wave DC drive input)
- 0 to +\-10 VDC (Three phase 3 or 6 Pulse DC drive input)

Current Range and Accuracy

(Expressed in Max. Ampere Turns* and Percent deviation from nominal)
All signals have a 3µsec rise time limitation

Filtered DC			
	225 AT (-000)	325 AT (-001)	625 AT (-002)
± 2%	225 AT	330 AT	650 AT
± 1 %	150 AT	230 AT	485 AT

50, 60 Hz Sine Wave			
	225 AT (-000)	325 AT (-001)	625 AT (-002)
± 2%	200 AT	290 AT	570 AT
± 1 %	150 AT	230 AT	485 AT

SCR Phase Control DC Motor Armature Current:

Single Phase, Full Wave			
	225 AT (-000)	325 AT (-001)	625 AT (-002)
± 2%	50 AT	75 AT	210 AT
± 1 %	40 AT	60 AT	150 AT

3 Phase, 3 Pulse			
	225 AT (-000)	325 AT (-001)	625 AT (-002)
± 2%	200 AT	290 AT	600 AT
± 1 %	190 AT	265 AT	530 AT

3 Phase, 6 Pulse			
	225 AT (-000)	325 AT (-001)	625 AT (-002)
± 2%	225 AT	330 AT	650 AT
± 1 %	190 AT	290 AT	540 AT

* Ampere Turns (AT) is Amps X Turns through the hole of the transducer. 100A with 1 turn is 100 AT. 20A with 3 turns is 60 AT. The hole in the 225 and 325 AT unit is 5/8" and the 625 AT unit is 1 1/8". This should be kept in mind when planning on using multiple turns.

3 Description of Adjustment

CAL Pot P1
This pot sets the scaling of the Bipolar and Unipolar output.

ZERO Pot P2
This pot sets the bipolar output to zero volts when there is no current passing through the current transducer. This sets the unipolar output to zero also

4 Adjustment Procedure

Choose Range of Unit

There are three units that have ranges as indicated in the chart above. Pick the maximum level desired and use multiple turns if needed. Use multiple turns with the 225 AT unit to keep at AT level above 30% of the maximum single turn level recommended in the table above.

Set the Zero of the Output

When the unit has been powered for more than 5 minutes. The zero can be set. Use a digital voltmeter to measure the output, There is a hysteresis in the zero point. When current has been flowing in one polarity the zero setting will be biased in that polarity. When the polarity goes to zero from the opposite polarity, the zero will be biased 10 to 40 mV in the direction of the last following current. This represents less than 0.5% error when the scaling is above the 50% level of the unit. To keep this zero bias effect to a minimum, use as large an AT level as possible by the use of multiple turns.

Set the 100% Level

To set the scaling of the output, the level of the input needs to be known. Use a digital voltmeter with greater than 1% accuracy and in the case of AC, the ability to read RMS. Use a meter shunt to read levels that exceed the meter's range.

Read the level of the current at about the 75% level. This is necessary because the accuracy tends to droop above 50%, especially when used at highest AT levels. This helps to increase the accuracy, Example: For a calibration of 100 Amps to be 5 volts on the bipolar output, set the current at 75 amps and set the Cal pot to have 3.75 volts output.

If levels at the maximum level are the only readings of interest, set the calibration at that level. If the unipolar output is to be used, set the calibration reading that output. Remember to not exceed the levels on the bipolar output indicated above in the Output Specifications section.

Application Examples

1) 50HP AC motor with 0 to 10VDC signal output

This application needs a signal that indicates the load on the 50HP motor. In this case 10 VDC on the Unipolar output of the C10748-000 unit will indicate full load torque. The current at this torque is 65A in each lead of the motor. Since the current in each line is approximately equal, putting the sensor in one lead will provide the input needed. When setup correctly, 10 VDC indicates full torque and 4.6 VDC indicates zero torque. The 4.6 VDC is because the idle or magnetizing current is about 30A. Each motor type will have different maximum and minimum current values.

A) Connect 115 VAC to TB1,2. Keep power off.

B) Connect to output terminals TB4 (+) and TB5 (Common)

C) Put motor lead through hole in TDR1 current transducer. The direction is not important when AC is measured.

D) With the motor not powered, apply 115VAC and measure the TB3 to TB5. Adjust the ZERO pot to read 0 VDC ± .01 VDC. This voltage may drift for several minutes, but will stay near zero ultimately.

E) Measure TB4 to TB5 with a voltmeter and apply power to motor Apply full torque to motor. Adjust CAL pot to read 10 VDC on TB4 to TB5

F) The unit is now set to read correctly.

2) 1HP 90 Volt DC motor with 115 VAC 1 phase full wave SCR drive. 0 to 5 VDC output indicating Armature Current.

This application needs a signal that indicates the armature current of this 1 HP motor. The 100% current is approximately 10 ADC. This unit will be C10748-000. The 0 to 5 VDC is needed because it satisfies the need to not go over 4V on the Bipolar output. There is about a 2.1 times higher voltage on the Unipolar output than on the Bipolar output when sensing DC current.

A) Connect 115 VAC to TB1, 2. Keep power off.

B) Connect to output terminals TB4 (+) and TB (Common)

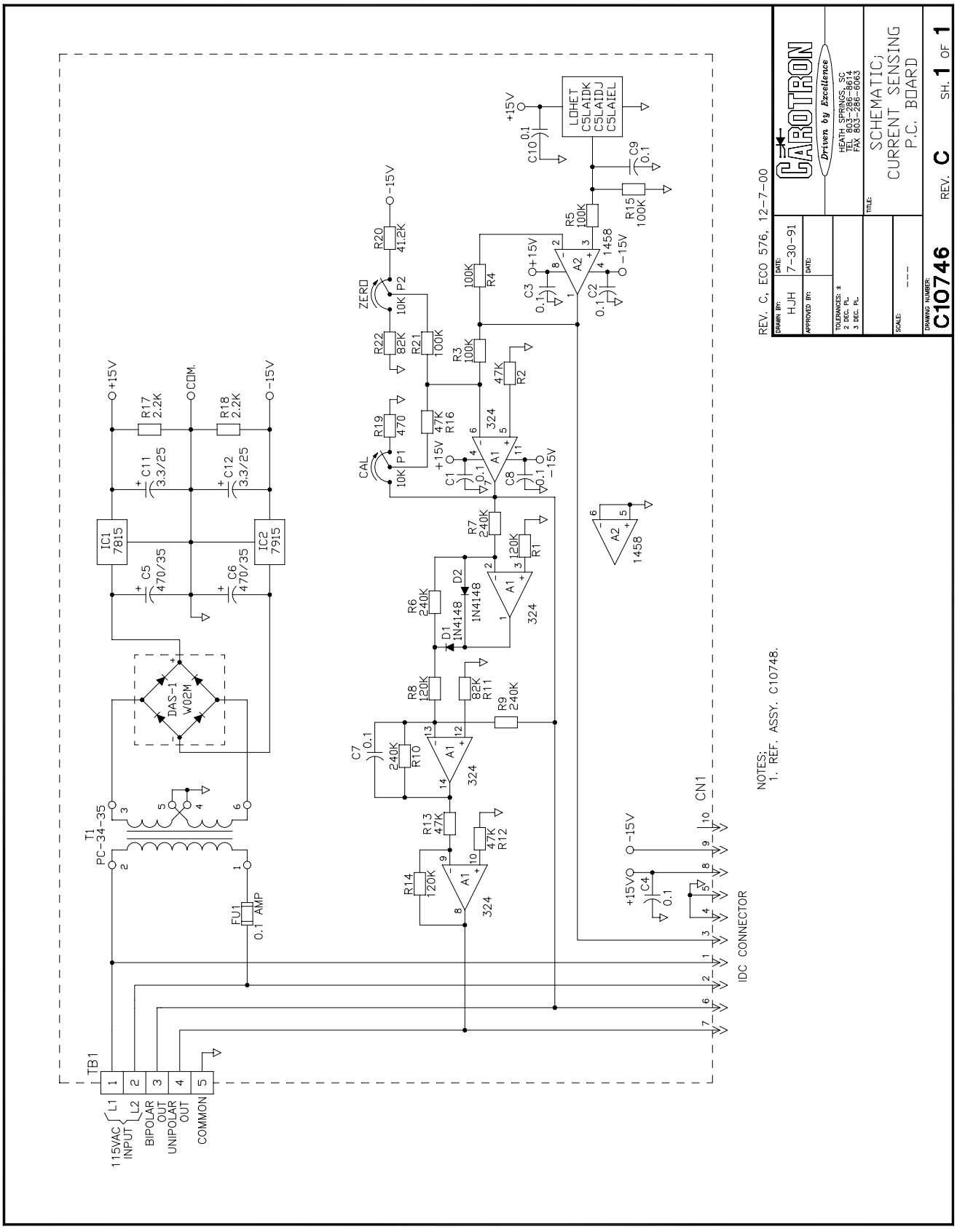
C) Put the Motor Armature lead through hole in TDR1 times. 3 times makes the ampere Turns 30 which makes it greater than 30% of Maximum AT and less than 40 AT which is the Maximum for this unit.

D) With the motor not powered, apply 115 VAC and measure TB to TB5 with a DC voltmeter. Adjust the ZERO pot to read 0 VDC ± .01 VDC. This voltage may drift for several minutes after power up, but will stay near zero ultimately.

E) Measure TB4 to TB5 and apply power to the motor. Apply speed and torque to get full current in armature. Adjust CAL pot to get 5 VDC to TB4 to TB5.

F) The unit is now calibrated to read 0 to 5 VDC for 0 full Armature Current.

Prints


REV. C, ECO 576, 12-7-00
CAROTRON
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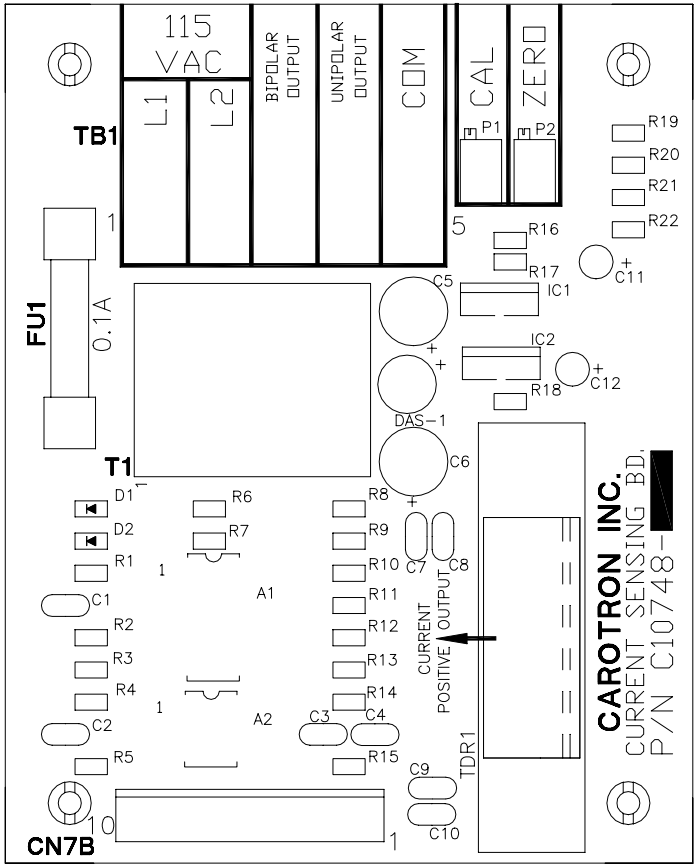
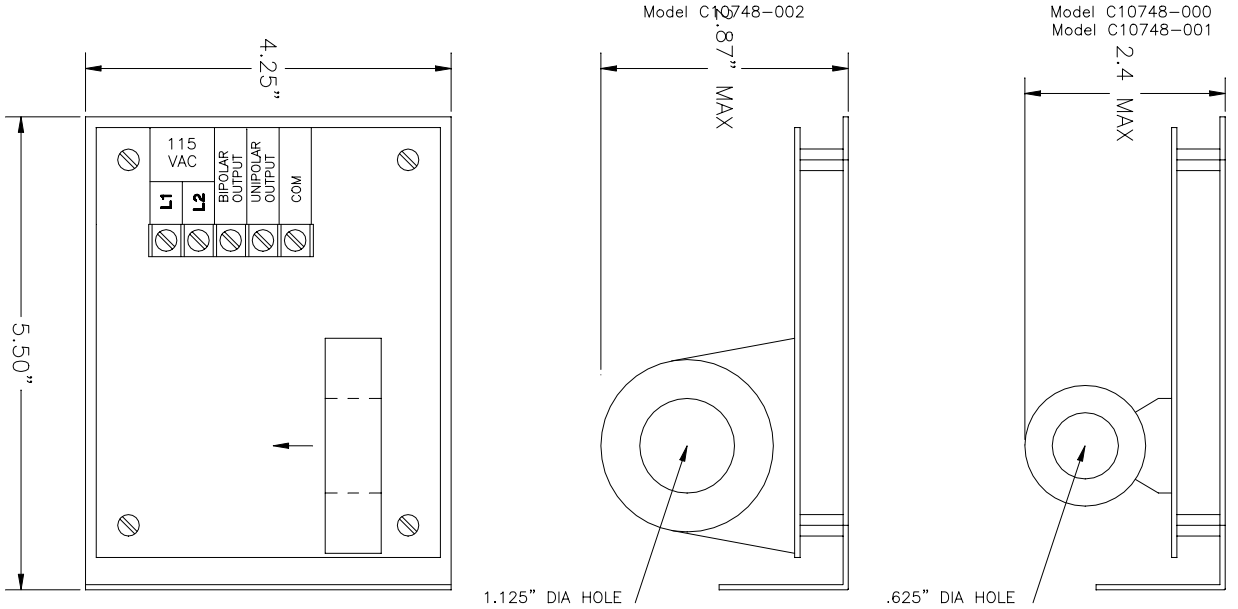
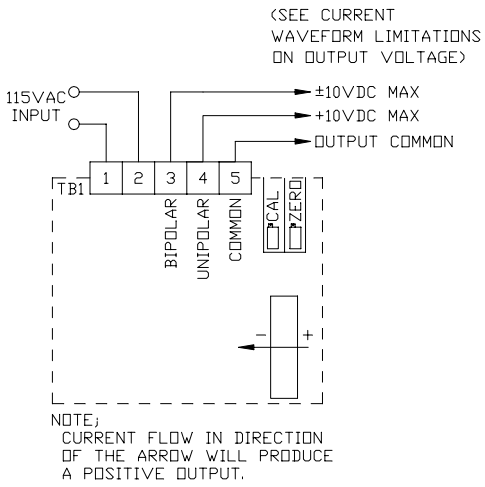
HEATH SPRINGS, SC
TEL 803-286-8614
FAX 803-286-6063
DRAWN BY: HJH
DATE: 7-30-91
APPROVED BY:
DATE:
TOLERANCES: ±
2 DEC. PL.
3 DEC. PL.
TITLE: SCHEMATIC; CURRENT SENSING P.C. BOARD
SCALE: ---
DRAWING NUMBER: C10746
REV. C
SH. 1 OF 1
NOTES;
1. REF. ASSY. C10748.
TB1
115VAC INPUT L1 L2
BIPOLAR OUT
UNIPOLAR OUT
COMMON
T1 PC-34-35
FU1 0.1 AMP
DAS-1 W02M
IC1 7815
IC2 7915
+15V
COM.
-15V
R17 2.2K
R18 2.2K
C5 470/35
C6 470/35
C11 3.3/25
C12 3.3/25
CAL P1 10K
ZERO P2 10K
R19 470
R20 41.2K
R22 82K
R21 100K
R16 47K
R3 100K
R2 47K
R4 100K
R5 100K
R15 100K
R7 240K
R1 120K
R6 240K
R8 120K
R11 82K
R9 240K
R10 240K
R13 47K
R12 47K
R14 120K
D1 1N4148
D2 1N4148
A1 324
A2 1458
C1 0.1
C2 0.1
C3 0.1
C4 0.1
C7 0.1
C8 0.1
C9 0.1
C10 0.1
LOHET C5LAIDK C5LAIDJ C5LAIEL
CN1
IDC CONNECTOR
+15VO



NOTES;
1. REF. SCHEMATIC C10746.
2. REF. B.O.M. A10748

DRAWN BY: HJH	DATE: 8-5-91	CAROTRON Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.		TITLE: ASSEMBLY CURRENT SENSING P.C. BOARD
SCALE:		
DRAWING NUMBER: C10748	REV. B	SH. 1 OF 1





DRAWN BY: HJH	DATE: 9-20-91	CAROTRON Driven by Excellence
APPROVED BY:	DATE:	HEATH SPRINGS, SC TEL 803-286-8614 FAX 803-286-6063
TOLERANCES: ± 2 DEC. PL. 3 DEC. PL.		TITLE: FIGURE DRAWING FOR CURRENT SENSING MANUAL
SCALE: ----		
DRAWING NUMBER: C10765	REV.	SH. 1 OF 1

NOTES:

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 Cc) 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, (l) 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

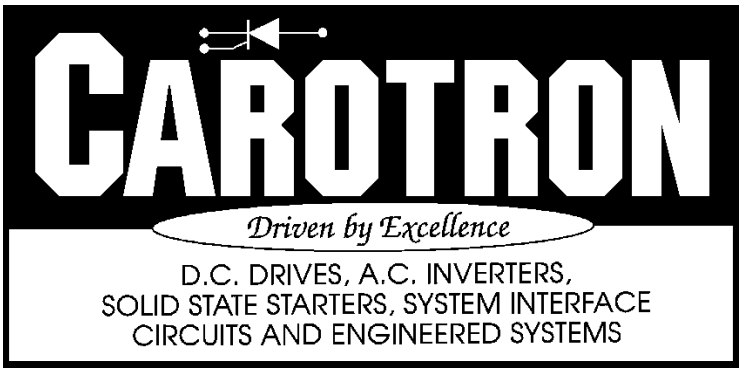
If the Purchaser desires to return any product or part, written authorization thereof must first be obtained from the Company which will advise the Purchaser of the credit to be allowed and restocking charges to be paid in regard to such return. No product or part shall be returned to the Company without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