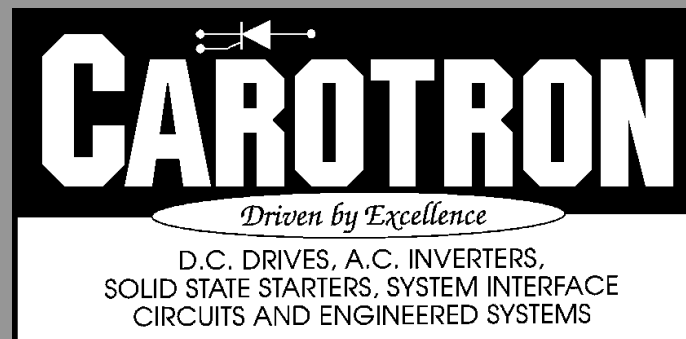


Trooper[®] Pro EtherNet/IP[®] Option Card

**Instruction Manual
C14757-001**



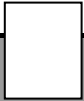


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1

General Description

Model C14757-001 provides the Trooper® Pro series of drives with an EtherNet/IP® interface. The card uses a Lantronix XPort gateway module to translate EtherNet/IP® to Modbus® RTU.



The C14757-001 option card is compatible with the Trooper Pro series of drives that have firmware version 1.02 or later installed.

2

Specifications

2.1 Electrical

Power Input

- Powered internally from Trooper® Pro drive

Network Interface

- RJ45
- 10/100M Ethernet

Temperature Range

- 0-55° C

2.2 Physical

(All dimensions are in inches)

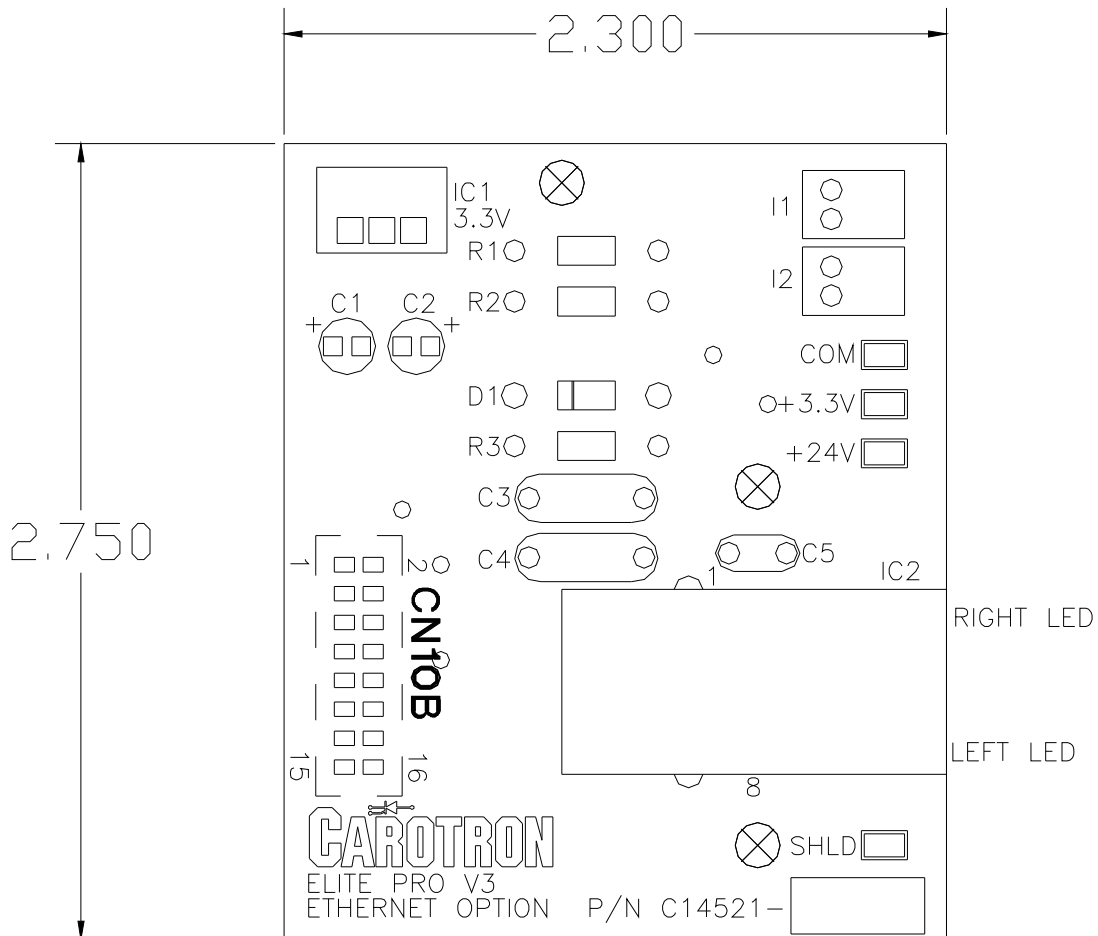


Figure 1: Dimensions

3.1 Physical Installation

The C14757-001 option card installs onto the control board of the Trooper[®] Pro drive.

1. Remove all power from the Trooper[®] Pro drive. This includes main and control power.
2. Align the option card connector CN3B with the control board connector CN3A. Ensure the 4 support standoffs are aligned with the holes on the control board.
3. Press down on the option card ensuring all 4 standoffs are seated fully.
4. Connect your Ethernet cable to the option card.

3.2 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.

Signal level wiring such as listed above should be routed separately from high level power wiring (such as the A.C. line, motor, 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 the C14757-001 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.

4.1 Module LEDs

<i>Right LED</i>	<i>State</i>
Solid Amber	10 Mbps
Solid Green	100 Mbps
Off	No Connection

Table 1: Connection LED

<i>Left LED</i>	<i>State</i>
Blinking Amber	Half Duplex Activity
Blinking Green	Full Duplex Activity
Off	No Activity

Table 2: Activity LED

4.2 Ethernet/IP[®] Input Assembly (T→O)

The table below lists the Input Assembly (Target to Originator) information. These values are read from the Trooper[®] Pro drive.

<i>Index</i>	<i>Tag</i>	<i>Address</i>	<i>Name</i>	<i>Notes</i>
1	-	-	Option Card Status	Refer to Table 4
2	H1.16	16528	Drive Running	0=Stopped, 1=Running
3	K2.08	22792	Fault Present	0=No fault, 1=Fault Present
4	G1.14	14478	Armature Current (A)	10=1.0A
5	G2.08	14600	Armature Voltage (V)	10=1.0V
6	U1.11	14730	Aux 11	10000=100.00%
7	U1.12	14734	Aux 12	10000=100.00%
8	K2.07	22791	Fault Code	Refer to Table 5
9	G2.18	14610	Actual Speed (%)	10000=100.00%
10	G1.13	14477	Actual Current (%)	10000=100.00%
11	U1.13	43149	Aux 13	10000=100.00%
12	U1.14	43150	Aux 14	10000=100.00%
13	U1.15	43151	Aux 15	10000=100.00%
14	U1.16	43152	Aux 16	10000=100.00%

Table 3: Input (T→O) Assembly

The Option Card Status item conveys the module status. Refer to the bitfield table below. During normal operation with no errors, the entire 16 bit word will be zero.

<i>Bit</i>	<i>Description (when bit is active, i.e. 1)</i>
15-10	Reserved
9	The module has a new configuration that will take affect on next power up
8	Factory defaults are loaded
7-3	Reserved
2	Communications between option card and drive cannot be established
1	Communications between option card and drive have timed out. Communications were previously active
0	Drive is responding with an error code to the option card

Table 4: Modbus Status

The Fault Code item contains a code that identifies the drive's fault (if any).

<i>Code</i>	<i>Description</i>
0	No Fault
201	Armature Over Current
202	Armature Over Voltage
301	Speed Feedback Loss
302	Motor Overspeed
503	Keypad Disconnect
504	EEPROM Read
505	EEPROM Write
601	External Fault
603	Communications Timeout
703	Invalid Motor Data

Table 5: Fault Codes

The default Input Assembly mapping is fixed and cannot be modified by the end user. This default mapping was created to handle the most common applications. However, there will certainly be applications that need access to parameters not included in the default mapping. For this reason, the default mapping includes six Auxiliary parameters (U1.11 - U1.16). By using these parameters, along with the drive's Internal Links, up to six additional parameters can essentially be added to the mapping. For example, if you wanted to access the actual Diameter value (parameter L2.14), you would simply use one of the drive's internal links (Q parameters) to link L2.14 to U1.13. The internal link continually updates the value of U1.13 with the value of L2.14. Refer to the Trooper[®] Pro drive manual for additional information on using the Internal Links. Carotron can also provide a customized mapping if needed for your application. Please consult Carotron for more info.

4.3 Ethernet/IP® Output Assembly (O→T)

The table below lists the Output Assembly (Originator to Target) information. These values are written to the Trooper® Pro drive.

<i>Index</i>	<i>Tag</i>	<i>Address</i>	<i>Name</i>	<i>Notes</i>
1	-	-	Write Control	0=Writes Disabled 1=Writes Enabled
2	H1.02-H1.05	16514-16517	Drive Control	Refer to Table 7
3	K1.16	22672	Fault Reset	0=No action, 1=Fault Reset
4	I1.04	18564	Reference	10000=100.00%
5	U1.17	43153	Aux 17	10000=100.00%
6	U1.18	43154	Aux 18	10000=100.00%
7	U1.19	43155	Aux 19	10000=100.00%
8	U1.20	43156	Aux 20	10000=100.00%

Table 6: Output (O→T) Assembly

The Write Control setting is used to control the writing of the Output Assembly from the Ethernet module on the option board to the Trooper® Pro drive. The output assembly is only written to the drive when this setting has a value of 1.

The Drive Control setting is used by the PLC to start, stop, jog, and reverse the drive.

<i>Bits 15-4</i>	<i>Bit 3</i>	<i>Bit 2</i>	<i>Bit 1</i>	<i>Bit 0</i>
Reserved	Reverse	Jog	Reserved	Run

Table 7: Drive Control

The Reference value controls the drive's speed reference in velocity mode and controls the drive's torque reference in torque mode. Refer to parameter A1.02 in the Trooper® Pro manual for more information. When the drive is operating in a velocity mode, the direction of rotation can also be controlled via the polarity of this value. Setting a negative reference is essentially the same as commanding the reverse direction via the Drive Control value.

The default Output Assembly mapping is fixed and cannot be modified by the end user. This default mapping was created to handle the most common applications. However, there will certainly be applications that need access to parameters not included in the default mapping. For this reason, the default mapping includes four Auxiliary parameters (U1.17 - U1.20). By using these parameters, along with the drive's Internal Links, up to four additional parameters can essentially be added to the mapping. For example, if you wanted to control the Tension Setpoint (parameter L4.01), you would simply use one of the drive's internal links (Q parameters) to link U1.17 to L4.01. When the PLC updates U1.17 in the output assembly, the internal link will write the value of U1.17 to L4.01. Refer to the Trooper® Pro drive manual for additional information on using the Internal Links. Carotron can also provide a customized mapping if needed for your application. Please consult Carotron for more info.

Step 1: Drive Programming

Verify the card is installed properly and recognized by the drive. Examine parameter T1.18. It should list the model number of the installed card: C14757-001 (ETH IP).

Certain parameters must be changed in the drive to allow the EtherNet/IP option card to communicate and function properly. The following list of parameters can be changed via the drive's keypad or by using the free CaroLink software available on our website. Also be aware that parameters U1.11-U1.20 are used in the preconfigured I/O objects and therefore should not be used for general purpose functions in the drive.

- Required
 - B2.01=00.00 (i.e. None)
 - B3.01=00.00 (i.e. None)
 - B4.01=00.00 (i.e. None)
 - B5.01=00.00 (i.e. None)
 - C1.01=00.00 (i.e. None)
 - H1.01="Maintained Run/Dir" (default)
 - R2.01=1 (default)
 - R2.02=115200
 - R2.03=None (default)
 - R2.04=1
 - R2.21-R2.24=Desired IP Address
 - R2.25-R2.28=Desired Subnet Mask
 - R2.29-R2.32=Desired Gateway Address
- Optional. The following parameters can be used to fault the drive if communications is lost for a given time period. Refer to the Trooper[®] Pro manual for more information.
 - R2.16
 - R2.17
 - R2.18

Note: After changing any of the above parameters, set R2.05 to On to apply the settings. Otherwise, control power on the drive must be cycled. Also remember that changes made via the drive's keypad are automatically saved. If changes are made via the CaroLink software, the changes must be manually saved.

Step 2: PLC Configuration

The following describes how to setup an Allen Bradley CompactLogix L16ER PLC using the Logix5000 software. Similar steps should be used for other devices and manufacturers.

1. Right click the Ethernet item under I/O Configuration in the Controller Organizer window and select New Module...

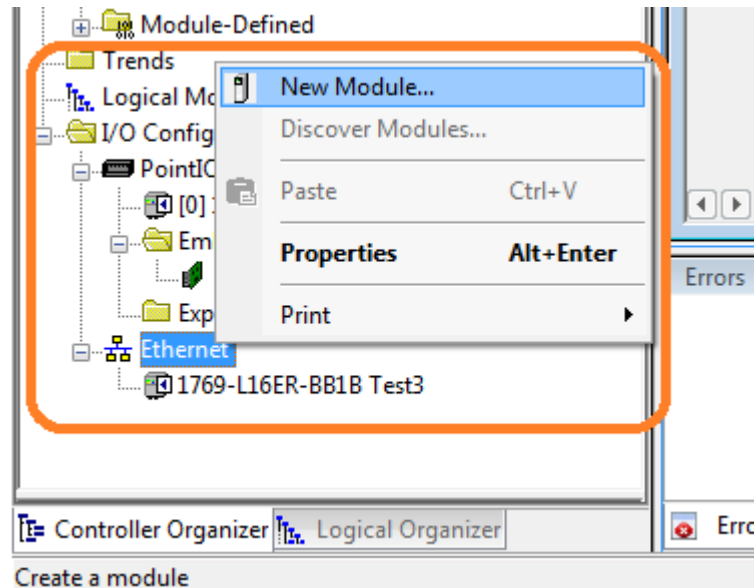


Figure 2: Logix 5000: Create New Module

2. Type "generic" in the search box to quickly display the ETHERNET-MODULE item. Select it and click Create.

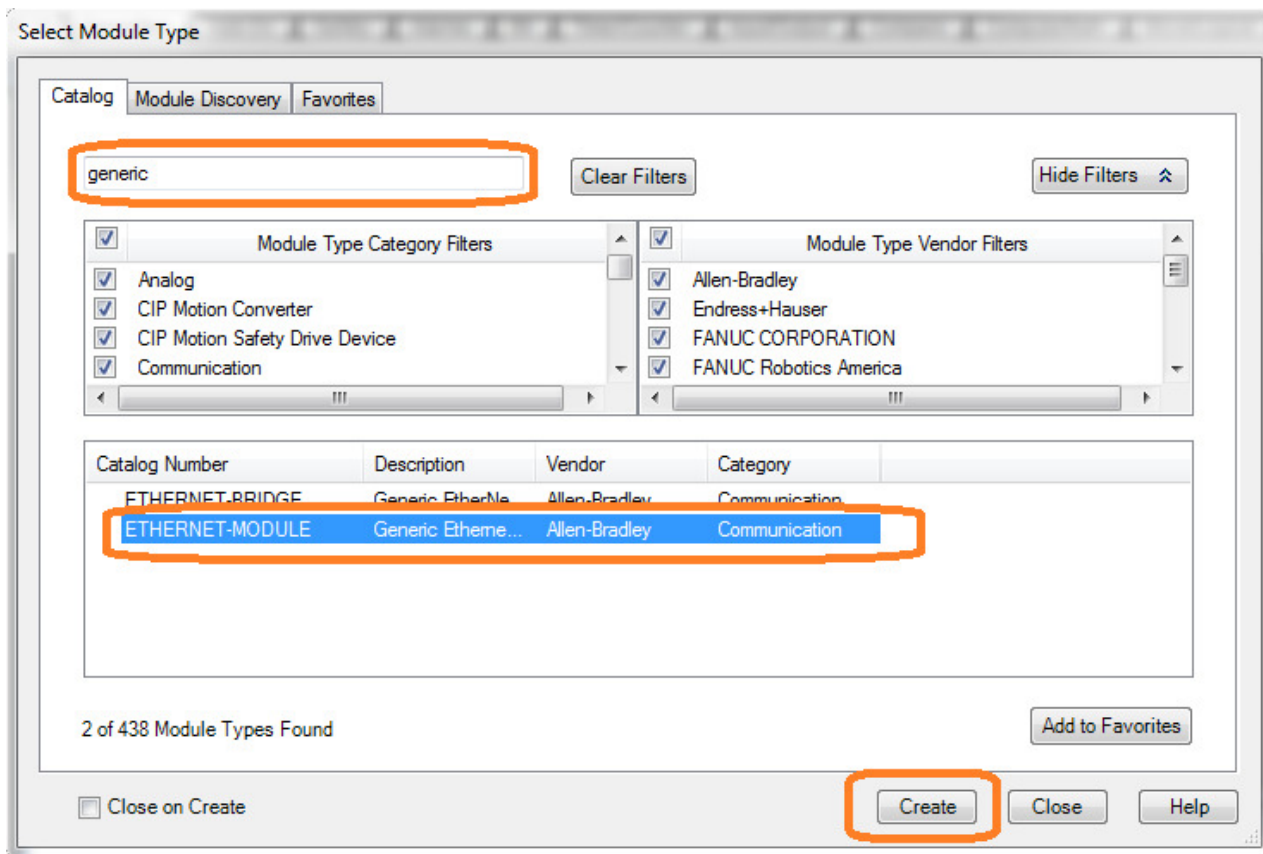


Figure 3: Logix 5000: Select Module Type

In the New Module window, fill in the following items below. Click OK when done.

- Name: We suggest using a descriptive name like "TrooperPro"
- Com Format: Data-INT (i.e. 16 bits)
- IP Address: Enter the IP address of the option module. In this example, we used 192.168.0.254.
- Input Assembly: Instance=101, Size=14
- Output Assembly: Instance=102, Size=8
- Configuration Assembly: Instance=128, Size=0

The screenshot shows the 'New Module' dialog box with the following settings:

- Type: ETHERNET-MODULE Generic Ethernet Module
- Vendor: Allen-Bradley
- Parent: Local
- Name: TrooperPro
- Description: (empty)
- Comm Format: Data - INT
- Address / Host Name: IP Address: 192 . 168 . 0 . 254
- Host Name: (empty)
- Open Module Properties: ☒
- Connection Parameters:
 - Input: Instance 101, Size 14 (16-bit)
 - Output: Instance 102, Size 8 (16-bit)
 - Configuration: Instance 128, Size 0 (8-bit)
 - Status Input: (empty)
 - Status Output: (empty)
- Buttons: OK, Cancel, Help

Figure 4: Logix 5000: Define Module Properties

3. Click the Connection Tab and set the Requested Packet Interval (RPI) to the desired value. Additional options can also be set here. Please refer to Rockwell Software for additional information. When finished click OK. The newly created module should be listed under the Ethernet item in the I/O Configuration.
4. When the new module is created, the Logix5000 software automatically creates Controller Tags for the I/O Assemblies. There will be a parameter group for each of the assemblies (Input, Output, & Configuration). Note that the Configuration assembly is not used. Refer to Figure 5 and Figure 6. In these examples, the Description column has been edited to reflect the mappings from Section 4.
5. When the PLC is programmed, it should begin reading the Inputs and writing the Outputs. Remember to set the Write Control Status register to 1 in order to enable writing of the outputs to the drive. Refer to Table 6.

Controller Tags - EIPTest(controller)

Scope: @EIPTest Show: All Tags Enter Name Filter...

Name	Value	Force Mask	Style	Data Type	Description
TrooperPro:I		(...)	(...)	AB:ETHERNET_M...	
TrooperPro:I.Data		(...)	(...)	Decimal	
TrooperPro:I.Data[0]		0	Decimal	INT	Option Status
TrooperPro:I.Data[1]		0	Decimal	INT	Drive Running
TrooperPro:I.Data[2]		0	Decimal	INT	Fault Present
TrooperPro:I.Data[3]		0	Decimal	INT	Arm Current (XXA)
TrooperPro:I.Data[4]		2	Decimal	INT	Arm Voltage (XXV)
TrooperPro:I.Data[5]		500	Decimal	INT	Aux 11
TrooperPro:I.Data[6]		600	Decimal	INT	Aux 12
TrooperPro:I.Data[7]		0	Decimal	INT	Fault Code
TrooperPro:I.Data[8]		28	Decimal	INT	Actual Speed (XXX%)
TrooperPro:I.Data[9]		37	Decimal	INT	Actual Current (XXX%)
TrooperPro:I.Data[10]		700	Decimal	INT	Aux 13
TrooperPro:I.Data[11]		800	Decimal	INT	Aux 14
TrooperPro:I.Data[12]		900	Decimal	INT	Aux 15
TrooperPro:I.Data[13]		1000	Decimal	INT	Aux 16

Monitor Tags (Edit Tags)

Figure 5: Logix 5000: Input Tags

Controller Tags - EIPTest(controller)

Scope: @EIPTest Show: All Tags Enter Name Filter...

Name	Value	Force Mask	Style	Data Type	Description
TrooperPro:O		(...)	(...)	AB:ETHERNET_M...	
TrooperPro:O.Data		(...)	(...)	Decimal	
TrooperPro:O.Data[0]		1	Decimal	INT	Write Control
TrooperPro:O.Data[1]		0	Decimal	INT	Drive Control
TrooperPro:O.Data[2]		0	Decimal	INT	Fault Reset
TrooperPro:O.Data[3]		2000	Decimal	INT	Reference A (XXX%)
TrooperPro:O.Data[4]		17	Decimal	INT	Aux 17
TrooperPro:O.Data[5]		18	Decimal	INT	Aux 18
TrooperPro:O.Data[6]		19	Decimal	INT	Aux 19
TrooperPro:O.Data[7]		25	Decimal	INT	Aux 20

Monitor Tags (Edit Tags)

Figure 6: Logix 5000: Output Tags

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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MAN1065-02 Rev. -
Issued 03-21-2023