

**CTI 2561 EIGHT CHANNEL
BIPOLAR ISOLATED ANALOG OUTPUT MODULE
INSTALLATION AND OPERATION GUIDE**

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CTI Part #062-00143**

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PREFACE

This *Installation and Operation Guide* provides installation and operation instructions for the CTI 2561 Eight Channel Bipolar Isolated Analog Output Module for SIMATIC TI Series 505 programmable controllers. We assume you are familiar with the operation of SIMATIC TI Series 505 programmable controllers. Refer to the appropriate SIMATIC TI user documentation for specific information on the SIMATIC TI Series 505 programmable controllers and I/O modules.

This *Installation and Operation Guide* is organized as follows:

Chapter 1 provides a description of the module.

Chapter 2 covers installation and wiring.

Chapter 3 is a guide to troubleshooting.



Figure 1 *The Model 2561 8-Channel Bipolar Isolated Analog Output Module*

USAGE CONVENTIONS

NOTE:

Notes alert the user to special features or procedures.

CAUTION:

Cautions alert the user to procedures which could damage equipment.

WARNING:

Warnings alert the user to procedures which could damage equipment and endanger the user.

TABLE OF CONTENTS

PREFACE	v
USAGE CONVENTIONS	vii
TABLE OF FIGURES	xi
CHAPTER 1. DESCRIPTION	1
1.1 Front Panel Description	1
1.1.1 Active LED	1
1.1.2 Input Connector	2
1.2 Asynchronous Operation	2
1.3 Immediate I/O	2
1.4 PLC Output Word	3
1.5 Module Output States	4
CHAPTER 2. INSTALLATION	5
2.1 Planning the Installation	5
2.1.1 Calculating the I/O Base Power Budget	5
2.1.2 Choosing a Power Supply	6
2.1.3 Wiring Consideration	6
2.1.4 Requirements for Signal Wire Providing Voltage	7
2.2 Unpacking the Module	8
2.3 Inserting the Module Into the I/O Base	8
2.4 Wiring the Output Connector Assembly	9
2.4.1 Connecting Voltage Output Wiring	9
2.4.2 Wiring the Shield	9
2.5 Inserting the Screw Terminal Connector	10
2.6 Connecting the Optional 24 VDC User Power Supply	10
2.7 Checking Module Operation	11
CHAPTER 3. TROUBLESHOOTING	13
SPECIFICATIONS	15
LIMITED PRODUCT WARRANTY	17
REPAIR POLICY	19

TABLE OF FIGURES

Figure 1	<i>The Model 2561 8-Channel Bipolar Isolated Analog Output Module</i>	v
Figure 2	<i>Front Panel Description</i>	1
Figure 3	<i>Relation of Update Time Change in Signal Output</i>	2
Figure 4	<i>Word Output from the PLC to the Module</i>	3
Figure 5	<i>Output Signal and Digital Word Relationship</i>	3
Figure 6	<i>Example of Change in Output Value</i>	4
Figure 7	<i>Voltage Output Circuit</i>	7
Figure 8	<i>Output Screw Terminal Wiring</i>	9
Figure 9	<i>Output Connector Assembly</i>	10
Figure 10	<i>Jumper Settings for Optional 24 VDC User Power Supply</i>	10
Figure 11	<i>Optional Power Supply Connections</i>	11
Figure 12	<i>I/O Configuration Chart</i>	12
Figure 13	<i>Troubleshooting Matrix</i>	13

CHAPTER 1. DESCRIPTION

The CTI Model 2561 Eight Channel Bipolar Isolated Analog Output Module is a member of the Control Technology Inc. (CTI) family of Input/Output (I/O) modules for SIMATIC TI Series 505 programmable controllers. The Model 2561 is designed to translate a digital word from the Programmable Controller (PLC) into an equivalent bipolar analog voltage. For external loads $\geq 10K \Omega$, no external supply is required. The Model 2561 derives all of its power supplies from the PLC supply. Applications that require load impedances $< 10K \Omega$ should use an optional external power supply.

1.1 Front Panel Description

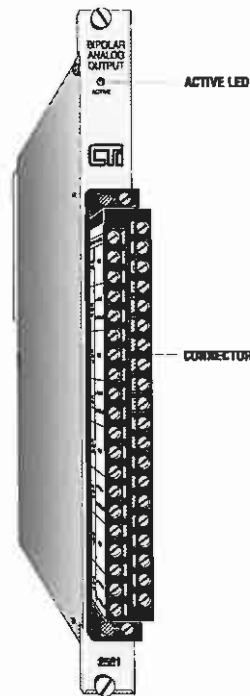


Figure 2 Front Panel Description

1.1.1 Active LED

The active LED will be illuminated when the module is functioning normally. The Active LED serves multiple functions in the Model 2561. When no external supply is used the LED indicates that the internally developed +24VDC supply is OK. When an external +24VDC supply is used the LED indicates that this external supply is OK. If the supply is removed the LED will turn off and an error will be reported to the PLC.

Flashing LED. The Model 2561 contains EEPROM technology to store all calibration parameters. In the event that there is a checksum failure the Active LED will flash at a 1 Hz rate. If the Active LED is not lit, refer to Chapter 3 for troubleshooting.

1.1.2 Input Connector

This connector provides wiring terminals for channels 1-8 and for the optional user supplied +24VDC power supply. This wiring connection supports field wiring from 14-22 AWG.

1.2 Asynchronous Operation

The module operates asynchronously with respect to the PLC so that a scan of the PLC and a module output scan cycle do not occur at the same time. Note also that how an output signal changes is dependent on the update time of the module. The following figure illustrates this relationship:

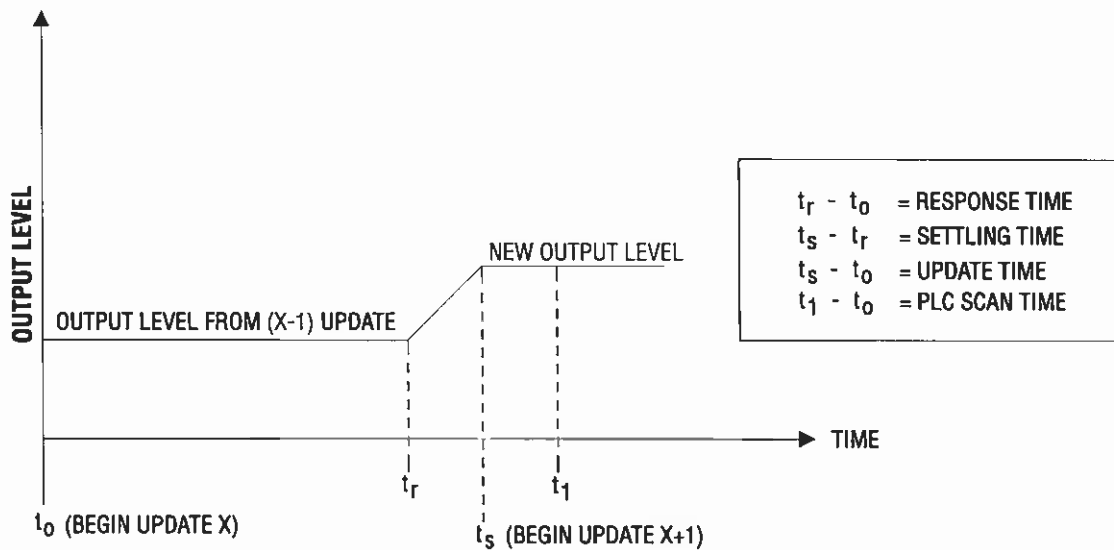


Figure 3 Relation of Update Time Change in Signal Output

1.3 Immediate I/O

The Model 2561 Bipolar Analog Output Module is fully compatible with the Immediate Output function in the SIMATIC TI545 and 555 PLC.

The following example illustrates the effects of a change in output level:

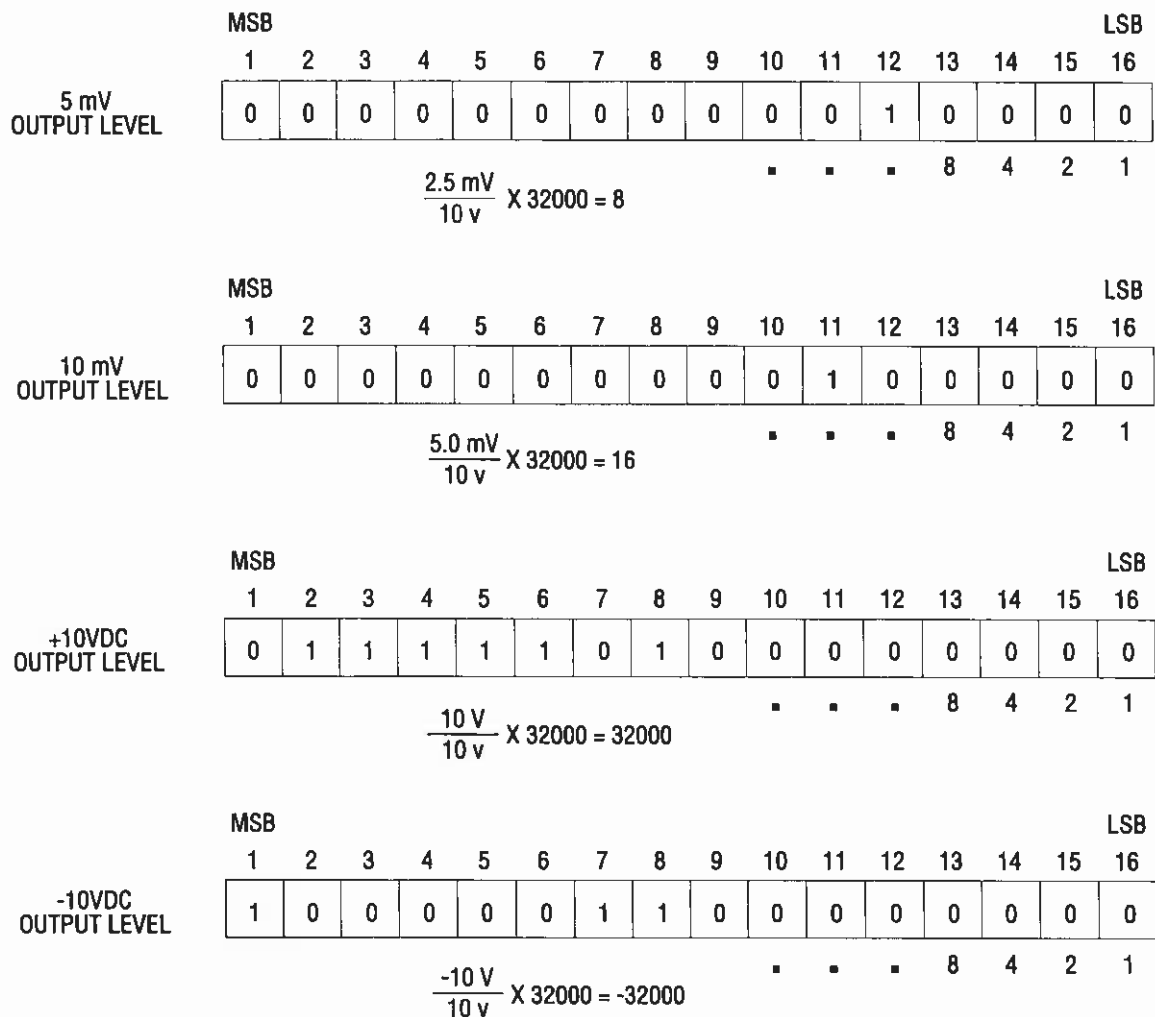


Figure 6 Example of Change in Output Value

1.5 Module Output States

Upon power up all outputs automatically output zero volts. In the event of an Early Power Failure signal from the PLC the Model 2561 will hold the outputs at the last state. In the event that the external supply is removed and then reapplied all of the outputs will return to the last state.

CHAPTER 2. INSTALLATION

The installation of the Eight Channel Analog Output Module involves the following steps:

1. Planning the installation
2. Inserting the module into the I/O base
3. Wiring the module output screw terminal plug
4. Plugging the screw terminal plug onto the module header
5. Connecting the optional 24 VDC user power supply
6. Checking module operation

These steps are explained in detail in the following pages.

2.1 Planning the Installation

Planning is the first step in the installation of the module. Planning the installation involves:

1. Calculating the I/O base power budget
2. Selecting a proper user power supply if required and wiring
3. Routing the wiring to minimize noise
4. Selecting the proper wiring method for the type of output you will use

The following sections discuss each of these aspects of the installation.

2.1.1 Calculating the I/O Base Power Budget

The Model 2561 requires 5.5 watts of power from the I/O base. Applications that require the Model 2561 to drive load impedances $\leq 10K$ should use an external +24VDC supply. Before inserting the module into the I/O base, ensure that the base power supply capacity is not exceeded.

2.1.2 Choosing a Power Supply

If an external power supply is used, the power supply should be a single voltage, 24 VDC nominal 0.5 amp, UL Class 2 device.

2.1.3 Wiring Consideration

The module requires separate wiring for the optional power supply and for the output signals. Power and signal wiring must be separated to prevent noise in the signal wiring. Output signal wiring should be shielded, twisted-pair cable, with 14 to 22 gauge stranded conductors. Use the following guidelines when wiring the module:

- Always use the shortest possible cables
- Avoid placing power supply wires and signal wires near sources of high energy
- Avoid placing low voltage wire parallel to high energy wire (if the two wires must meet, cross them at a right angle)
- Avoid bending the wire into sharp angles
- Use wireways for wire routing
- Avoid placing wires on any vibrating surfaces

2.1.4 Requirements for Signal Wire Providing Voltage

Applications using voltage signals require some special considerations to ensure the module's accuracy. Two additional parameters must be considered:

Resistive load of the field device

Capacitance of the cable wiring

The resistive load of the field device must be at least 1.0K ohms. The cable capacitance must be less than 0.01 microfarad.

The cable capacitance is a function of the cable length. To determine the maximum cable length allowed, find the nominal value of cable capacitance per unit length as given by the manufacturer. Use this value in the following equation to determine the maximum cable length:

$$\frac{0.01 \text{ microfarads}}{\text{Maximum Cable Length} = \text{Nominal Cable Capacitance (per unit length)}}$$

Maximum Cable Length = Nominal Cable Capacitance (per unit length)

NOTE:

Nominal capacitance is measured between the conductors. However, if one conductor is connected to the shield via a grounded power supply, then the nominal value will usually double in value.

The length of cable and the cable conductor resistance are used to find the fixed error which would appear at the field device. Use the following equation to determine the fixed error:

$$\text{Fixed Error (\%)} = \frac{[1 - R1] \times 100}{[(R1 + 2) \times CL \times RC]}$$

where:
 R1 is the field device resistive load
 CL is the cable length
 RC is the conductor resistance per unit length

The following figure provides a schematic for a voltage output circuit.

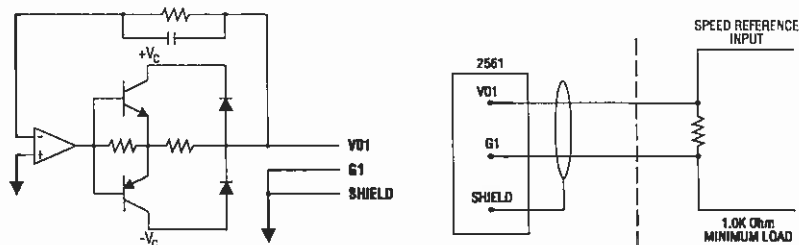


Figure 7 Voltage Output Circuit

2.2 Unpacking the Module

CAUTION:

HANDLING STATIC SENSITIVE DEVICES

The components on the Model 2561 module printed circuit card can be damaged by static electricity discharge. To prevent this damage, the module is shipped in a special anti-static bag. Static control precautions should be followed when removing the module from the bag, when opening the module, and when handling the printed circuit card during configuration.

Open the shipping carton and remove the special anti-static bag which contains the module.

After discharging any static build-up, remove the module from the static bag.

Do not discard the static bag. Always use this bag for protection against static damage when the module is not inserted into the I/O backplane.

WARNING:

Ensure that the power supply is turned off before connecting the wires to the I/O base.

2.3 Inserting the Module Into the I/O Base

Insert the module into the I/O base. When the module is fully seated in the slot, captive screws at the top and bottom will hold the module in place. To remove the module from the I/O base, loosen these captive screws, and then remove the module from the I/O base. Do not damage the edge card connector at the back of the module when inserting or removing the module.

2.4 Wiring the Output Connector Assembly

Output signals are provided through a connector assembly located on the front of the module. The connector assembly consists of a header attached to the printed circuit card (see Figure 9). Wiring is connected through the removable screw terminal plug.

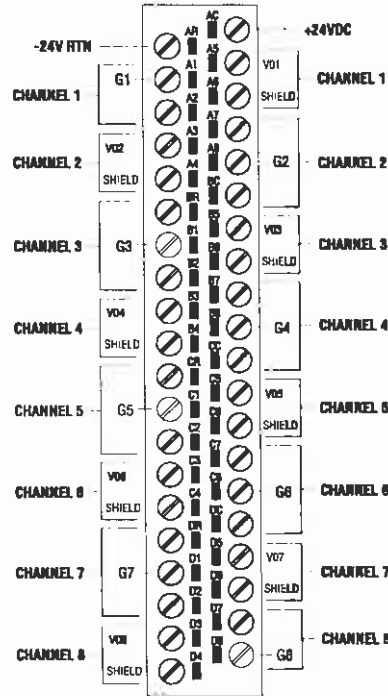


Figure 8 Output Screw Terminal Wiring

2.4.1 Connecting Voltage Output Wiring

First, loosen the wire locking screws on the output screw terminal plug. Connect the signal wire to the screw terminal, and the return wire to the G terminal. Insert the wires in the appropriate holes. When the wires are inserted, tighten the screws.

2.4.2 Wiring the Shield

In an isolated system each output channel has its own isolated ground G_n and Shield connection. The return and the shield should be terminated at the connector at the appropriate G_n and Shield connection for each separate channel. If the Shields are tied together and grounded at the chassis this will defeat the isolation between channels and impair the system performance.

NOTE:

Terminals labeled G1 through G8 are isolated grounds for each channel. These terminals are isolated from each other and from the backplane ground.

2.5 Inserting the Screw Terminal Connector

When all the output signal wires are connected to the screw terminal connector, carefully insert the Model 2561.

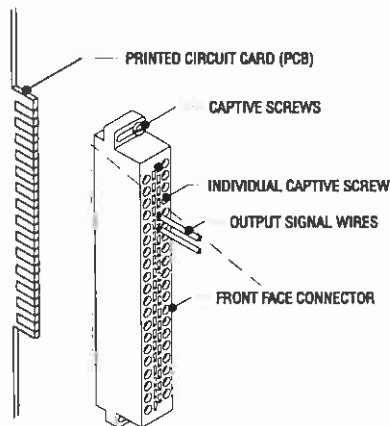


Figure 9 Output Connector Assembly

2.6 Connecting the Optional 24 VDC User Power Supply

WARNING:

Always remove power from the I/O base before inserting a module to minimize the risk of personal injury or damage to equipment. Never insert a module into a powered I/O base.

In order to use an external power supply, three internal jumpers, JP2, JP3, and JP4 must be moved to left positions as shown in the figure below.

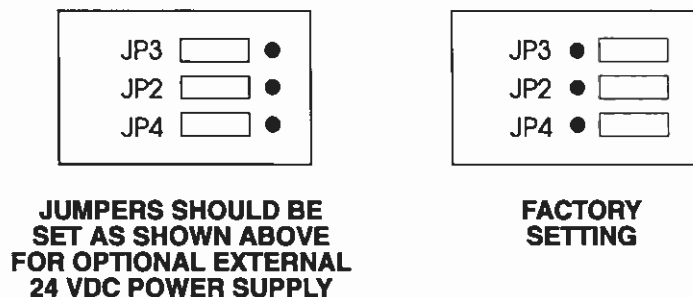


Figure 10 Jumper Settings for Optional 24 VDC User Power Supply

The power supply is connected to the module as shown in the figure below.

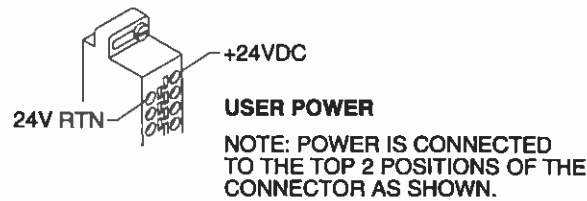


Figure 11 *Optional Power Supply Connections*

2.7 Checking Module Operation

First turn on the base supply power. If the diagnostics detect no problems, the front panel status indicator will light. If the indicator does not light, or begins flashing or goes out during operation, the module has detected a failure. For information on viewing failed module status, refer to your SIMATIC TISOFT Programming Manual. To diagnose and correct a module failure, refer to the next section on troubleshooting.

NOTE:

If the external 24VDC power fails or is removed and then later restored, the module will automatically resume normal operation. No external reset is required after power is restored.

You must also check that the module is configured in the memory of the PLC. This is important because the module will appear to be functioning regardless of whether it is communicating with the PLC. To view the PLC memory configuration chart listing all slots on the base and the inputs or outputs associated with each slot, refer to your SIMATIC TISOFT Programming Manual. An example chart is shown in the following figure.

In this example, the Model 2561 Module is inserted in slot 1 in I/O base 0. Data for channel 1 appears in word location WY1, data for channel 2 appears in word location WY2, etc. For your particular module, look in the chart for the number corresponding to the slot occupied by the module. If word memory locations appear on this line, then the module is registered in the PLC memory and the module is ready for operation.

I/O MODULE DEFINITION FOR CHANNEL ... 1 BASE 00

SLOT	ADDRESS	I/O NUMBER OF BIT AND WORD				I/O SPECIAL FUNCTION
		X	Y	WX	WY	
01	0001	00	00	00	08	NO
02	0000	00	00	00	00	NO
15	0000	00	00	00	00	NO
16	0000	00	00	00	00	NO

Figure 12 I/O Configuration Chart

If the line is blank or erroneous, re-check the module to ensure that it is firmly seated in the slots. Generate the PLC memory configuration chart again. If the line is still incorrect, contact your local distributor or CTI at 800-537-8398 for further assistance.

CHAPTER 3. TROUBLESHOOTING

If the module provides improper readings or the status indicator is not on, use the following chart to determine the appropriate action.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Indicator is not lit	Not receiving power Base or PC power is off External power supply is off	Check power supply and connections Turn base or PC on Turn on external power supply
Indicator is flashing	EEPROM Checksum failure	Return to CTI for calibration
Incorrect outputs	Wrong connections	Trace wiring to check connections
	Wrong addresses for word output	Check program for correct word output addresses
	Not logged-in	Read I/O configuration
	Incorrectly calibrated	Return the module to CTI for calibration
Incorrect output values	Output load <1.0K ohm voltage mode	Verify output load impedance is within specifications or install optional 24VDC supply
	Incorrect digital word from PLC	Verify that range of values from PLC is -32000 to +32000
No output	Blown fuse, or failed isolator	Contact CTI

Figure 13 *Troubleshooting Matrix*

When it is inconvenient to visually check the status indicator, use the TISOFT "Display Failed I/O" or "Show PLC Diagnostics" support functions. Note that if the module external power supply (user supply) fails, the module will still be logged into the PLC even though it is not operating. In this case, "Display Failed I/O" will not provide the information to accurately diagnose the problem.

CAUTION:

The module fuse component F1 is not user serviceable. If this fuse is blown, the module has a serious component failure and should be returned to CTI for repair.

If after consulting the chart above, you are unable to diagnose or solve the problem, contact your local distributor or CTI at 1-800-537-8398 for further assistance.

SPECIFICATIONS

Output Channels:	8 isolated bipolar output channels
Response Time:	2.2 msec total module (0.275 msec per channel) (includes settling time)
Output Range:	-10 to +10VDC
Resolution:	12 bit (5.0 mV per step)(11 bit plus sign)
Isolation:	1500 VDC channel-to-channel, 1500 VDC channel-to-PLC
Capacitance drive:	0.01 microfarads
Load Resistance:	Voltage: 1K Ω minimum, no maximum
Voltage Accuracy:	$\pm 0.1\%$ of full scale from 0° to 60°C over total load range
Optional User Supply:	20 to 28 VDC 0.5 amps (maximum ripple of ± 0.4 V) UL Class 2 power supply
Backplane Power Consumption:	5.5 Watts (minimum) 7.5 Watts (maximum) for loads $\geq 10K\Omega$ without external supply With external supply 2.5 Watts (minimum)
Module Size:	Single wide
Operating Temperature:	0° to 60°C (32° to 140°F)
Storage Temperature:	-40° to 85°C (-40° to 185°F)
Humidity, relative:	5% to 95% non-condensing
Agency Approvals Pending:	UL, UL Canada, FM

Specifications subject to change without notice.

LIMITED PRODUCT WARRANTY

CTI warrants that this CTI Industrial Product shall be free from defects in material and workmanship for a period of one (1) year after purchase from CTI or from an authorized CTI Industrial Distributor. This CTI Industrial Product will be newly manufactured from new and/or serviceable used parts which are equal to new in the Product.

Should this CTI Industrial Product fail to be free from defects in material and workmanship at any time during this one (1) year warranty period, CTI will repair or replace (at its option) parts or Products found to be defective and shipped prepaid by the customer to a designated CTI service location along with proof of purchase date and associated serial number. Repair parts and replacement Product furnished under this warranty will be on an exchange basis and will be either reconditioned or new. All exchanged parts or Products become the property of CTI. Should any Product or part returned to CTI hereunder be found by CTI to be without defect, CTI will return such Product or part to the customer.

This warranty does not include repair of damage to a part or the Product resulting from: failure to provide a suitable environment as specified in applicable Product specifications, or damage caused by an accident, disaster, acts of God, neglect, abuse, misuse, transportation, alterations, attachments, accessories, supplies, non-CTI parts, non-CTI repairs or activities, or to any damage whose proximate cause was utilities or utility like services, or faulty installation or maintenance done by someone other than CTI.

Control Technology Inc. reserves the right to make changes to the Product in order to improve reliability, function, or design in the pursuit of providing the best possible Product. CTI assumes no responsibility for indirect or consequential damages resulting from the use or application of this equipment.

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THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

REPAIR POLICY

In the event that the Product should fail during or after the warranty period, a Return Material Authorization number (RMA) can be requested verbally or in writing from CTI main offices. Whether this equipment is in or out of warranty, a Purchase Order number provided to CTI when requesting the RMA number will aid in expediting the repair process. The RMA number that is issued and your Purchase Order number should be referenced on the returning equipment's shipping documentation. Additionally, if under warranty, proof of purchase date and serial number must accompany the returned equipment. The current repair and/or exchange rates can be obtained by contacting CTI's main office at 1-800-537-8398.

When returning any module to CTI, follow proper static control precautions. Keep the module away from polyethylene products, polystyrene products and all other static producing materials. Packing the module in its original conductive bag is the preferred way to control static problems during shipment. **Failure to observe static control precautions may void the warranty.** For additional information on static control precautions, contact CTI's main office at 1-800-537-8398.