

**CTI 2560-A EIGHT CHANNEL
ISOLATED ANALOG OUTPUT MODULE
INSTALLATION AND OPERATION GUIDE**

CTI Part # 062-00198-013



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PREFACE

This *Installation and Operation Guide* provides installation and operation instructions for the CTI 2560-A Eight Channel Isolated Analog Output Module for SIMATIC® 505 programmable controllers. We assume you are familiar with the operation of SIMATIC® 505 series programmable controllers. Refer to the appropriate SIMATIC® user documentation for specific information on the SIMATIC® 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.

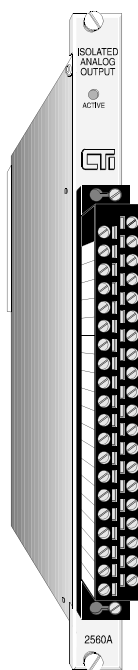


Figure 1 *The 2560-A 8-Channel Isolated Analog Output Module*

USAGE CONVENTIONS

NOTE:

Notes alert the user to special features or procedures.

CAUTION: *Cautions alert the user to procedures that could damage equipment.*

WARNING:

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

WARNING:

The outputs of the 2560 analog output module were negative with respect to the return. The outputs of the 2560-A are POSITIVE with respect to the return.

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CHAPTER 1. DESCRIPTION

The CTI 2560-A Eight Channel Isolated Analog Output Module is a member of the Control Technology Inc. (CTI) family of Input/Output (I/O) modules for SIMATIC® 505 Series programmable controllers. The Model 2560-A is designed to translate a digital word from the Programmable Controller (PLC) into an equivalent analog voltage and current signal.

1.1 Front Panel Description

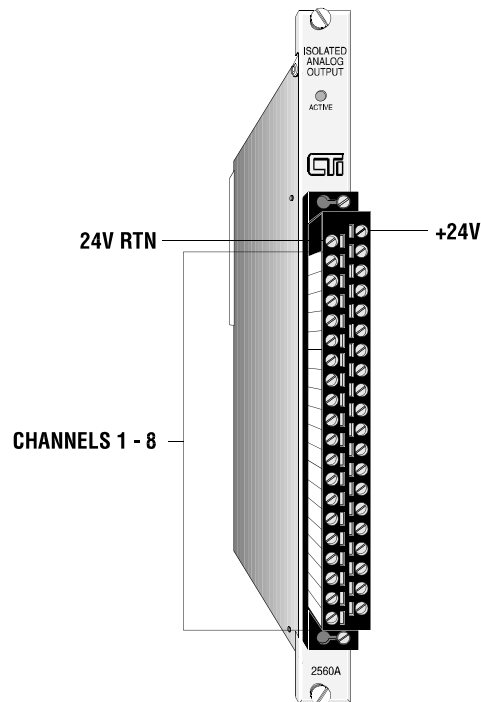


Figure 2 *Front Panel Description*

1.1.1 Active LED

The Active LED will be illuminated when the module is functioning normally. If the Active LED is not lit or is blinking, a serious problem exists with the module. If the LED is blinking the module requires calibration. Refer to Chapter 3 for troubleshooting.

1.1.2 Input Connector for Channels 1-8

This connector provides wiring terminals for channels 1-8 and for user supplied 24 VDC power supply. The wiring connector accepts 14-22 AWG wire.

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:

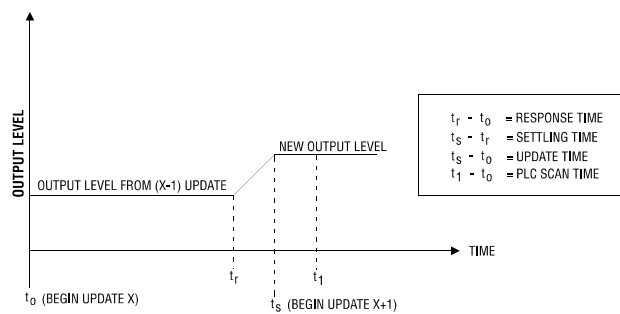


Figure 3 Relation of Update Time Change in Signal Output

1.3 Output Signal Description

Each of the eight channels provide output signals that are either Unipolar or Bipolar. Ranges supported include -5 to +5 VDC, -10 to +10 VDC, -20 to +20 mA, 0 to +5 VDC, 0 to +10 VDC, and 0 to 20 mA. Both voltage and current outputs are available simultaneously so that either may be used for a particular channel.

1.3.1 Unipolar Operation

In the Unipolar Mode the PLC sends a 16-bit word to the module for translation to an analog signal. Data to be translated occupies 12 bits. The four remaining bits are unused and set to zero. The following figure illustrates a 16-bit word sent from the PLC to the module.

1.3.2 Bipolar Operation

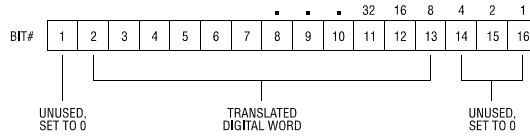


Figure 4 Word Output from the PLC to the Module

In the Bipolar Mode data to be translated occupies 11 bits plus a sign bit. The four remaining bits are unused and set to zero.

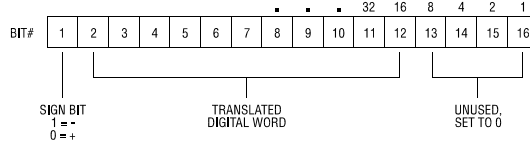


Figure 5 Bipolar Word Output from the PLC to the Module

1.4 Immediate I/O

The Model 2560-A Analog Output Module is fully compatible with the Immediate output instructions for the SIMATIC® 545 and 555 PLCs.

1.5 Unipolar or Bipolar Mode

Each output channel may be configured to provide either a bipolar or unipolar output signal.

1.6 Voltage or Current Output

Each of the modules eight output channels may be configured to provide either a voltage or current output signal. For Unipolar output signals the ranges supported are 0 to +5 VDC, 0 to +10 VDC, or 0 to 20 mA. For Bipolar outputs the ranges supported are -5 to +5 VDC, -10 to +10 VDC, and -20 to +20 mA. Selection of voltage ranges and Unipolar and Bipolar operation are made via internal jumpers and DIP switches. (See Figure 9).

1.7 Digital to Analog Conversion

1.7.1 Unipolar Mode Conversion

The following equations are used to calculate the digital word used to generate a Unipolar output signal:

$$\mathbf{WY = (Desired Output Voltage \times 32000) \div 5}$$

For example to generate an output voltage of 2.5 VDC the WY value output from the PLC is calculated as follows: $WY = (2.5 \times 32000) \div 5 = 16000$

$$0 \text{ to } +5 \text{ VDC range} \quad \text{Digital WY} = (\text{Output voltage} \times 32000) \div 5 \text{ volts}$$

$$0 \text{ to } +10 \text{ VDC range} \quad \text{Digital WY} = (\text{Output voltage} \times 32000) \div 10 \text{ volts}$$

$$0 \text{ to } 20 \text{ mA range} \quad \text{Digital WY} = (\text{Output current} \times 32000) \div 20 \text{ mA}$$

1.7.2 Bipolar Mode Conversion

The following equations are used to calculate the digital word used to generate a Bipolar output signal.

-5 to +5 VDC range

$$WY = (\text{Desired output voltage} \times 32000) \div 5 \text{ volts}$$

Example: -5 volts output

$$WY = (-5 \times 32000) \div 5 = -32000$$

-10 to +10 VDC range

$$WY = (\text{Desired output voltage} \times 32000) \div 10 \text{ volts}$$

Example: -5 volts output

$$WY = (-5 \times 32000) \div 10 = -16000$$

-20 to +20 mA range

$$WY = (\text{Desired output current} \times 32000) \div 20 \text{ mA}$$

Example: 4 mA

$$WY = (4 \times 32000) \div 20 = 6400$$

1.8 Output Resolution

1.8.1 Unipolar Mode

In Unipolar Mode the module has a resolution of 8 counts out of 32000, or 1 part out of 4000. For the voltage range 0 to +5 VDC the minimum step is 1.25 mV. For the range 0 to +10 VDC the minimum step is 2.5 mV and for 0 to 20 mA output the minimum step is 5 microamps.

1.8.2 Bipolar Mode

In Bipolar Mode the module has a resolution of 16 counts out of 32000 or 1 part out of 2000. For the voltage range -5 to +5 VDC the minimum step is 2.5 mV. For the range -10 to +10 VDC the minimum step is 5.0 mV and for -20 to +20 mA the minimum step is 10 microamps.

	RANGE CONFIGURATION	DIGITAL COUNTS / STEP	INPUT RESOLUTION PER STEP
UNIPOLAR	0 - 5 VDC	8	1.25 mV
	0 - 10 VDC	8	2.5 mV
	0 - 20 mA	8	5 μ A
BIPOLAR	-5 TO +5 VDC	16	2.5 mV
	-10 TO +10 VDC	16	5 mV
	-20 TO +20 mA	16	10 μ A

Figure 6 *Output Resolution*

1.9 Using the Module with a Built In 20% Offset Calculation (Not Supported in this release.)

If all 8 outputs are used in Offset Mode i.e. 4 to 20 mA or 1 to 5 VDC operation the 2560-A may be configured to automatically scale the digital word from the PLC. (See Figure 10). Jumper JP1 when enabled will configure all outputs for offset operation. No relay ladder logic is required for output processing.

NOTE:
Jumper JP1 is labeled on the printed circuit board as WY8 Scale (Enable/Disable) but is not supported in this release.

CHAPTER 2. INSTALLATION

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

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

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 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 2560-A requires 2.0 watts of +5 VDC power from the I/O base. 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

The power supply should be a single voltage, 20-28 VDC nominal 2.0 amp., UL Class 2 device. The compliance of the output circuits is directly related to the output voltage. The drive voltage and current are specified at 24 VDC.

2.1.3 Wiring Consideration

The module requires separate wiring for the power supply and for the output signals. Power and signal wiring must be separated to prevent noise in the signal wiring. Output signal wiring must be shielded, twisted-pair cable, with 14 to 22 gauge stranded conductors. The cable shield should always be terminated to earth ground at the I/O base. It should not be terminated at the output connector. 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
- Be sure to provide a proper earth ground for the cable shield at the I/O base
- Avoid placing wires on any vibrating surfaces

2.1.4 Requirements for Signal Wire Carrying Current

You must calculate the loop wiring resistance for any current output circuits. The loop resistance is determined by the length and type of wire, as well as the field device series resistance.

The circuit resistance must not exceed 1000 ohms. If a separate 10 volt power supply is used in the loop, the minimum resistance increases 1000 ohms, and the maximum resistance becomes 2000 ohms. The following figure provides a schematic for wiring a loop with a resistance of less than 1000 ohms. It also shows a schematic for adding a power supply to allow loop resistances up to 2000 ohms. Use the following equation to determine the resistance of an output loop for a channel:

$$\text{Resistance} = (2 \times \text{CL} \times \text{RFT}) + \text{TFL}$$

where: CL is the cable length

RFT is the conductor resistance (ohms/unit length)

TFL is the resistance of the field device

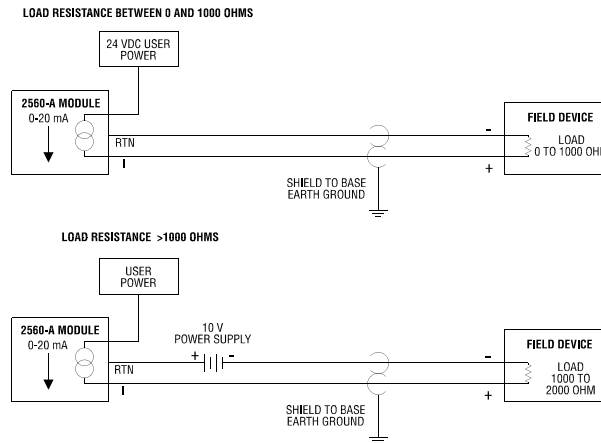


Figure 7 *Current Output Circuits*

2.1.5 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 1K 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:

Maximum Cable Length = 0.01 microfarads ÷ 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 a 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:

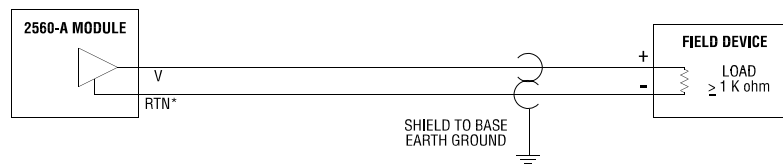
$$\text{Fixed Error (\%)} = (1 - R_1) 100 \div (R_1 + 2) CL \times RC$$

where: R_1 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.



***NOTE THAT THE VOLTAGE OUTPUT IS POSITIVE WITH RESPECT TO RTN**

Figure 8 *Voltage Output Circuit*

WARNING:

The outputs of the 2560 analog output module were negative with respect to the return. The outputs of the 2560-A are POSITIVE with respect to the return.

2.2 Unpacking the Module

CAUTION:

HANDLING STATIC SENSITIVE DEVICES

The components on the Model 2560-A 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 Configuring the Module for Operation

Configuring the Model 2560-A for operation consists of the following steps:

1. Selecting either 5 VDC or 10 VDC output range with hardware jumpers.
2. Selecting for each channel either Unipolar or Bipolar output configuration.
3. Setting DIP switches for each channel to match the hardware configuration.
4. Selecting 8 WY mode for log in to the PLC

2.3.1 Selecting Either 5 VDC or 10 VDC Range for Each Channel

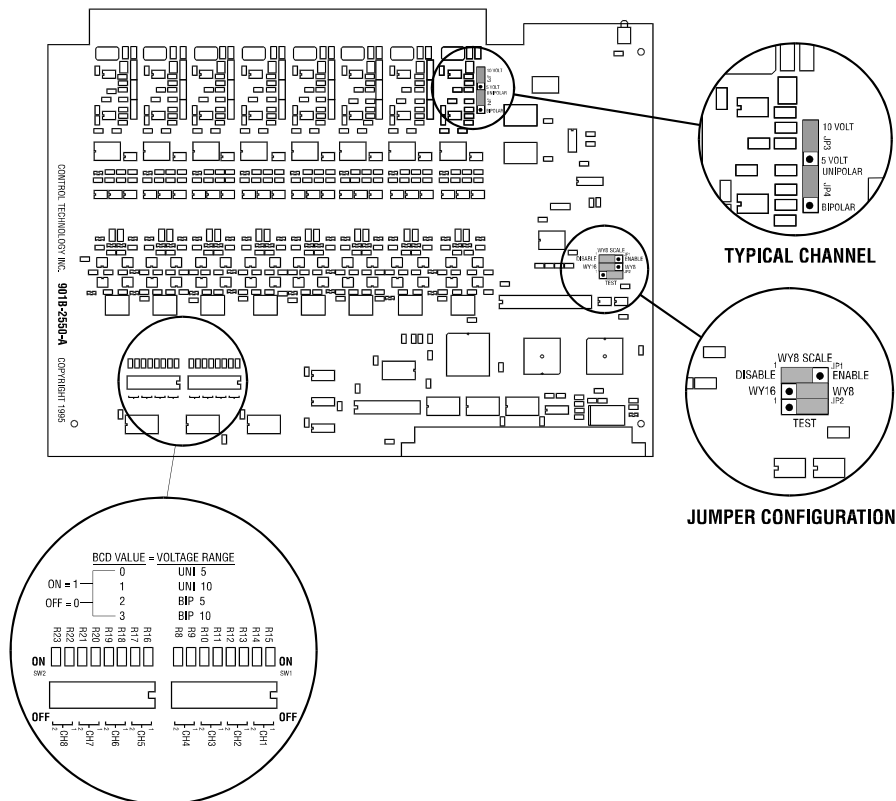


Figure 9 Configuring the Module

The Model 2560-A is capable of supporting Unipolar or Bipolar applications with an output range of -5 to +5 VDC or -10 to +10 VDC. For each channel a hardware jumper selects the range for that output circuit. (See Figure 10). Select 5 VDC range for all current applications.

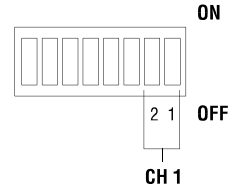
2.3.2 Selecting Unipolar or Bipolar Output

Each output channel on the Model 2560-A supports Unipolar or Bipolar output operation. Hardware jumpers select operation of the output. (See Figure 10). Select Bipolar for applications that drive the outputs from -5 to +5 VDC, -10 to +10 VDC, or -20 to +20 mA.

2.3.3 Setting DIP Switches to Match the Hardware Selections

Once the hardware jumpers are selected this information needs to be reported to the microcomputer. The information is reported via DIP switches SW1 and SW2. Each output channel uses 2 switches with a BCD code to indicate the state of the hardware jumpers.

2 (MSB)	1 (LSB)	Range
OFF	OFF	Unipolar 5VDC
OFF	ON	Unipolar 10 VDC
ON	OFF	Bipolar 5 VDC
ON	ON	Bipolar 10 VDC



NOTE:
For all current output applications select one of the 5 volt range selections.

2.3.4 Selecting Automatic SCALE 4-20 Offset Mode for the Entire Module

(Not supported in this release.) Some applications require an Offset Mode 4-20 mA or 1-5 VDC. The SIMATIC® PLC can adjust an output loop calculation to provide an offset output. If the application does not use the PID control block then the processing must be done in relay ladder logic. The Model 2560-A can perform this offset calculation and output an offset signal independent of the PLC. Selecting this function with JP1 causes all eight outputs to be scaled. Move the jumper to the ENABLED position to select this function. The normal shipping configuration is DISABLED.

NOTE:
The Model 2560-A only supports an 8 WY I/O configuration in this release. The advanced mode is not supported.

2.3.5 Selecting 8 WY Login Configuration

The Model 2560-A logs into the PLC I/O as 8 WY outputs. Hardware jumper JP2 selects between a 16 WY advanced mode (not supported in this release) and an 8 WY I/O configuration.

2.4 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 connector at the back of the module when inserting or removing the module.

2.5 Wiring the Output Connector

Output signals are provided through a connector assembly located on the front of the module.

2.5.1 Connecting Voltage Output Wiring

First, loosen the wire locking screws on the front of the connector. For voltage output circuits,

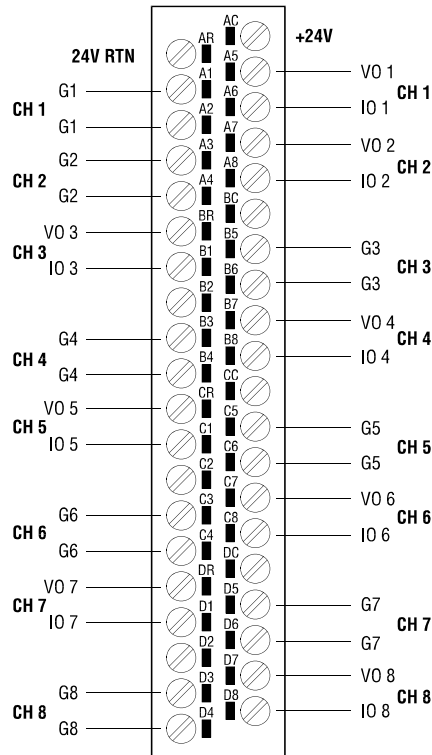


Figure 10 Output Screw Terminal Plug Wiring

connect the signal wire to the VO screw terminal, and the return wire to the G (channel ground) screw terminal. Insert the wires in the appropriate holes directly adjacent to the screws. When the wires are inserted, tighten the screws.

2.5.2 Connecting Current Output Wiring

For current output circuits, connect the signal wire to the IO screw terminal, and the return wire to the G (channel ground) screw terminal. When the wires are inserted, tighten the screws. Repeat this procedure for the remaining current output channels.

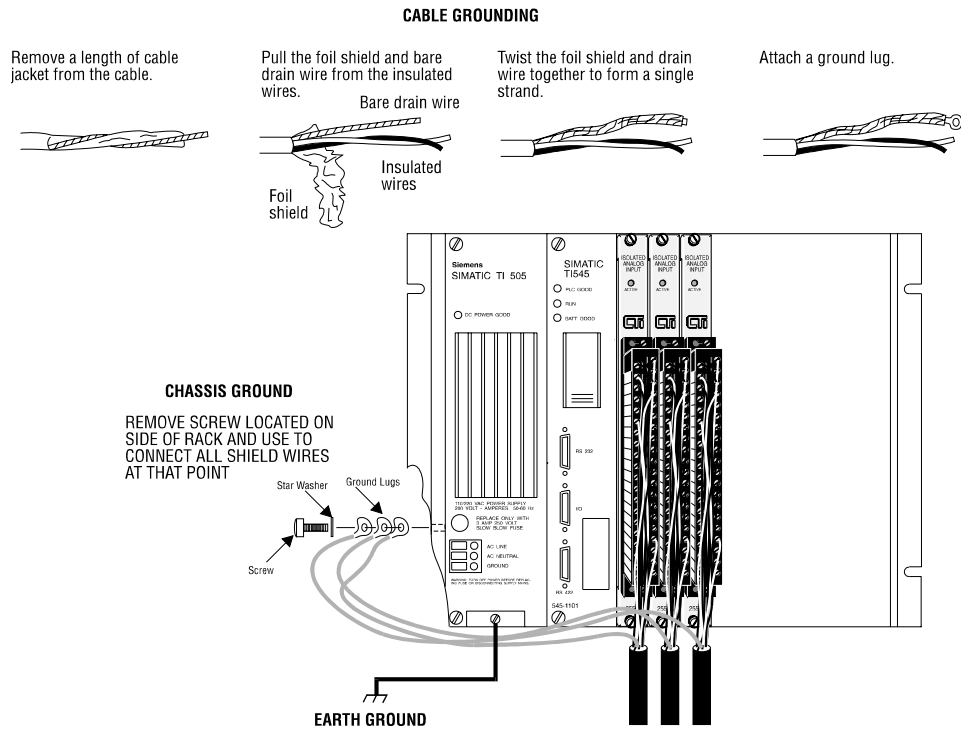


Figure 11 *Connecting the Shield Wiring*

2.5.3 Connecting the Shield Wiring

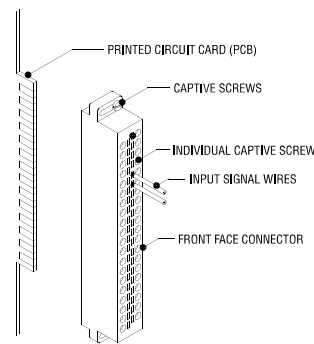


Figure 12 *Attaching the Front Wiring Connector*

NOTE:

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

2.6 Attaching the Front Wiring Connector

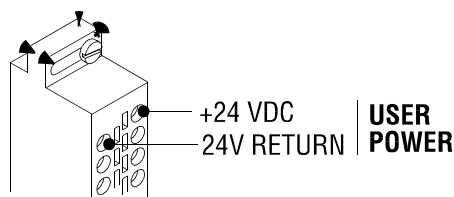
WARNING:

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

2.7 Connecting the 24 VDC User Power Supply

The power supply is connected to the top 2 positions of the top connector on the front of the module as shown in the figure below. Be sure to check that the 24V fuse is present and intact. See Specifications at the end of this manual for replacement fuses.

2.8 Checking Module Operation



NOTE: POWER IS CONNECTED TO THE TOP 2 POSITIONS OF THE CONNECTOR AS SHOWN

Figure 13 Power Supply Connections

First turn on the base supply power. If diagnostics detect no problems, the front panel status indicator will light. If the indicator does not light (or goes out during operation), the module has detected a

NOTE:

If 24 VDC 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.

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.

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 2560-A 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

```

I/O MODULE DEFINITION FOR CHANNEL ... 1  BASE ... 00
      I/O  NUMBER OF BIT AND WORD I/O SPECIAL
      SLOT ADDRESS      X  Y  WX WY  FUNCTION
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 14 I/O Configuration Chart

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.

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 1-800-537-8398 for further assistance.

NOTE:

*In the event a CTI analog detects an onboard module failure, the module will assert the module fail line and report the module failure in the I/O Status Word, which is reported to the PLC CPU. CTI strongly recommends the user application monitor the **I/O Module Status Words** which are Status Words 11-26 and apply to SIMATIC® Controllers /545, /555, /560 & 565 and the /575. The I/O Module Status Word can be used to report a module failure for an I/O Module in any of the 505 I/O slots. Please refer to Siemens® SIMATIC® 505 Programming Reference Manual for more information. If a module failure is reported by the status word, the module should be replaced with a working unit and the failed module sent infor repair.*

CHAPTER 3. TROUBLESHOOTING

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

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Indicator is not lit	Not receiving power	Check power supply and connections
	Base or PC power is off	Turn base or PC on
Indicator is blinking	No calibration data	Return 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	24 VDC user supply not within specification	Repair /replace user supply
	Output load < 1K ohm voltage mode or > 1000 ohm current mode	Verify output load impedance is within specifications Check 24 VDC supply
No output	Blown fuse, or failed isolator	Contact CTI

Figure 15 *Troubleshooting Matrix*

NOTE:
The module fuse is user serviceable. If this fuse continues to blow, the module has a serious component failure and should be returned to CTI for repair.

When it is inconvenient to visually check the status indicator, use the TISOFT "Display Failed I/O" or "Show PLC Diagnostics" support functions.

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 output channels
Response Time:	2 mSec total module (0.25 mSec per channel) (includes settling time)
Output Range:	Unipolar: 0 to +5 VDC 0 to +10 VDC 0 to +20 mA Bipolar: -5 to +5 VDC -10 to +10 VDC -20 to +20 mA
Resolution 12 bit:	0-20 mA range = 5 μ A/step 0-5 VDC range = 1.25 mV/step 0-10 VDC range = 2.5 mV/step -5 to +5 VDC range = 2.5 mV/step -10 to +10 VDC range = 5.0 mV/step -20 to +20 mA range = 0.5 μ A/step
Isolation:	1500 VDC channel-to-channel 1500 VDC channel-to-PLC
Capacitance Drive:	0.01 microfarads
Load Resistance:	Voltage: 1K Ω minimum, no maximum Current: 0 Ω to 1000 Ω max. or up to 2000 Ω max. with an external 10V power supply present in circuit
Voltage Accuracy:	\pm 0.1% of full scale from 0° to 60°C over total load range
Current Accuracy:	\pm 0.5% of full scale from 0° to 60°C over total load range
Repeatability:	.001%
User Supply:	20 to 28 VDC @ 0.5 amps (maximum ripple of \pm 0.4V) UL Class 2 power supply NOTE: Maximum load resistance for current output drops to 600 Ω at 20 VDC user supply.
24V Field Replaceable Fuse: Module Size:	5x20mm 1A fast blow Single wide

Backplane Power Consumption:	2.0 Watts
Operating Temperature:	0° to 60°C (32° to 140°F)
Storage Temperature:	-40° to 85°C (-40° to 185°F)
Humidity:	5% to 95%, noncondensing
Agency Approvals:	UL, UL for Canada FM (Class 1, Div 2) CE

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.

THE WARRANTY SET FORTH ABOVE IN THIS ARTICLE IS THE ONLY WARRANTY CTI GRANTS AND IT IS IN LIEU OF ANY OTHER IMPLIED OR EXPRESSED GUARANTY OR WARRANTY ON CTI PRODUCTS, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE AND IS IN LIEU OF ALL OBLIGATIONS OR LIABILITY OF CTI FOR DAMAGES IN CONNECTION WITH LOSS, DELIVERY, USE OR PERFORMANCE OF CTI PRODUCTS OR INTERRUPTION OF BUSINESS, LOSS OF USE, REVENUE OR PROFIT. IN NO EVENT WILL CTI BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

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.