2500 SERIES™

**CTI 2562 EIGHT CHANNEL
ANALOG OUTPUT MODULE
INSTALLATION AND OPERATION GUIDE
Version 2.3**

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REVISION HISTORY

Version 1.0	4/10/01	Original Release
Version 1.1	5/30/01	Update to reflect addition of 'last value' in power cycling, module configuration updates, miscellaneous typos corrected.
Version 1.2	03/12/09	Added note about zero/last value jumper in 2.3.5, 2.9
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Version 2.1	03/17/2021	Corrected Power Fail Table. Added references to CTI 2500 Series®. Added Chapter 3 on J-Soft.
Version 2.2	07/14/2021	Added pics and Power Fail info on new REV J PCB.
Version 2.3	02/14/2022	Corrected section 3.3.2 to correct number and corrected the Section label. PDB

PREFACE

This *Installation and Operation Guide* provides installation and operation instructions for the CTI 2562 8-Channel Analog Output Module for SIMATIC® 505 and CTI 2500 Series® programmable controllers. We assume you are familiar with the operation of the CTI 2500 Series® programmable controllers. Refer to the appropriate user documentation for specific information on the CTI 2500 Series® programmable controllers and I/O modules.

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

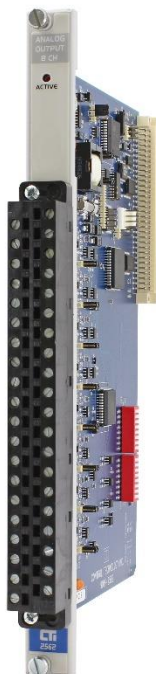Chapter 1 provides a description of the module.
Chapter 2 covers installation and wiring.
Chapter 3 discusses configuring IO using CTI's new Janus Workbench Software
Chapter 4 is a guide to troubleshooting.
Appendix A details compatibility between the 2562 and the Siemens® 505-6208-A and 505-6208-B.

The 2562 8-Channel 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 that could damage equipment and endanger the user.

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CHAPTER 1. OVERVIEW

1.0. Product Summary

The CTI 2562 Eight Channel Analog Output Module is a member of Control Technology's family of I/O modules compatible with the SIMATIC® 505 and CTI 2500 Series® programmable controllers. The 2562 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 1 2562 Front Panel

1.1.1. Active LED

The Active LED will be illuminated when the module is functioning normally. If the Active LED is not lit, the user 24V is not present or 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:

OUTPUT LEVEL

NEW OUTPUT LEVEL

OUTPUT LEVEL FROM (X-1) UPDATE

$t_r - t_o$ = RESPONSE TIME
$t_s - t_r$ = SETTLING TIME
$t_s - t_o$ = UPDATE TIME
$t_1 - t_o$ = PLC SCAN TIME

TIME

t_r t_1

t_o (BEGIN UPDATE X) t_s (BEGIN UPDATE X+1)
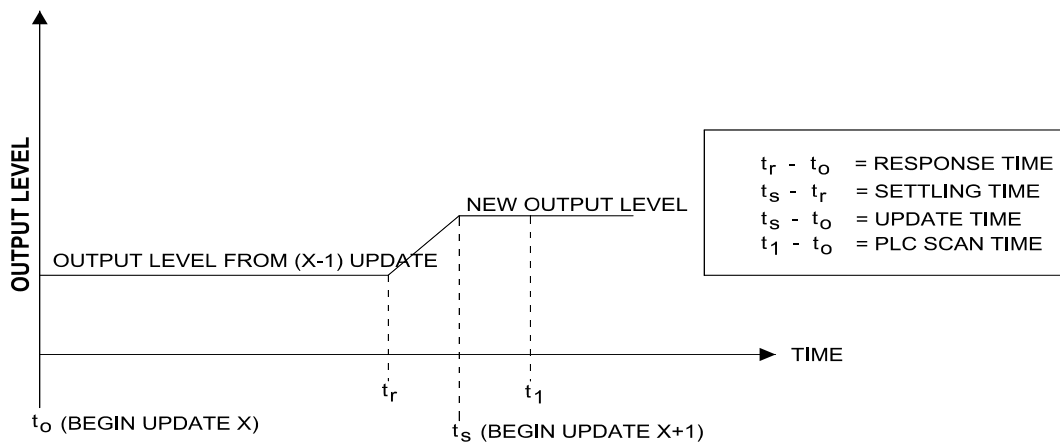
Figure 2 Relation of Update Time Change in Signal Output

1.3. Output Signal Description

Each of the eight channels independently provide output signals that are either Unipolar or Bipolar. Ranges supported include 0 to +5 VDC, 0 to +10 VDC, 0 to +20mA, -5 to +5 VDC, -10 to +10 VDC, and -20 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. The following figure illustrates a 16-bit word sent from the PLC to the module.
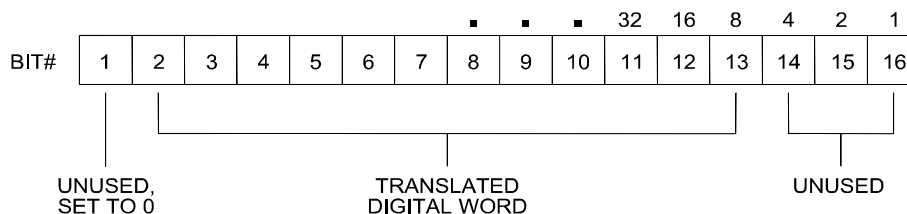
Figure 3 Word Output from the PLC to the Module

1.3.2. Bipolar Operation

In the Bipolar mode data to be translated occupies 11 bits plus a sign bit. The four remaining bits are unused.
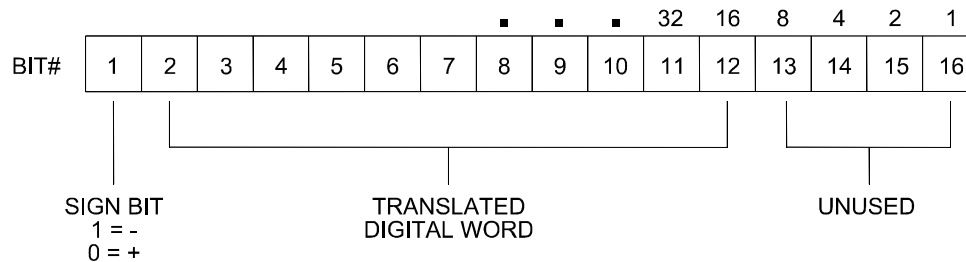
Figure 4 Bipolar Word Output from the PLC to the module

1.4. Immediate I/O

The 2562 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

Voltage and current output signals are both available simultaneously. For Unipolar output signals the ranges supported are 0 to +5 VDC, 0 to +10 VDC, and 0 to 20mA. 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 Section 2.3)

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:

0 to +5 VDC range   Digital WY = (Output voltage x 32000) ÷ 5 volts
WY = (Desired Output Voltage x 32000) ÷ 5
for example, to generate an output voltage of 2.5 VDC the WY value output
from the PLC is calculated as follows: WY= (2.5x32000) ÷ 5 = 16000

0 to +10 VDC range   Digital WY = (Output voltage x 32000) ÷ 10 volts

0 to +20 mA range   Digital WY = (Output current x 32000) ÷ 20 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 = (Desired output voltage x 32000) ÷ 5 volts
Example: -5 volts output
WY = (-5 x 32000) ÷ 5 = -32000

-10 to +10 VDC range   WY = (Desired output voltage x 32000) ÷ 10 volts
Example: -5 volts output
WY = (-5 x 32000) ÷ 10 = -16000

-20 to +20 mA range   WY = (Desired output current x 32000) ÷ 20 mA
Example: 4 mA output
WY = (4 x 32000) ÷ 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 output 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 µA
BIPOLAR	-5 TO +5 VDC	16	2.5 mV
	-10 TO +10 VDC	16	5 mV
	-20 TO +20 mA	16	10 µA

Figure 5 Output Resolution

1.9. Using the Module with a Built-In 20% Offset Calculation

If all 8 outputs are used in Offset Mode, i.e., 4 to 20 mA or 1 to 5 VDC operation, the 2562 may be configured to automatically scale the digital word from the PLC. This is to be used in Unipolar mode only. Jumper JP40, when enabled, will configure all eight outputs for offset operation. No relay ladder logic is required for output processing.

1 to 5 VDC range   Digital WY = ((Output voltage-1) x 32000) ÷ 4 volts
WY = ((Desired Output Voltage-1) x 32000) ÷ 4
for example, to generate an output voltage of 3.0 VDC the WY value output
from the PLC is calculated as follows: WY= ((3-1)x32000) ÷ 4 = 16000

4 to 20 mA range   Digital WY = ((Output current - 4) x 32000) ÷ 16 mA
WY = ((Desired Output Current - 4) x 32000) ÷ 16
for example, to generate an output voltage of 12 mA the WY value output
from the PLC is calculated as follows: WY= ((12-4)x32000) ÷ 16 = 16000

> *NOTE:*
> *Jumper JP40 is labeled on the printed circuit board as Offset (EN(able)/DIS(able)).*

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

The steps listed above are explained in detail in the following pages.

2.1. Planning the Installation

Planning is the first step in the installation of the module. This 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 these important considerations of the installation.

2.1.1. Calculating the I/O Base Power Budget

The 2562 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 wires 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 20 volt power supply is used in the loop, the minimum resistance increases 1000 ohms, and the maximum resistance becomes 2000 ohms. Any value over 1000 ohms prevents the module from operating accurately. 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:

Resistance = (2 x CL x RFT) + TFL

where: CL is the cable length
RFT is the conductor resistance (ohms/unit length)
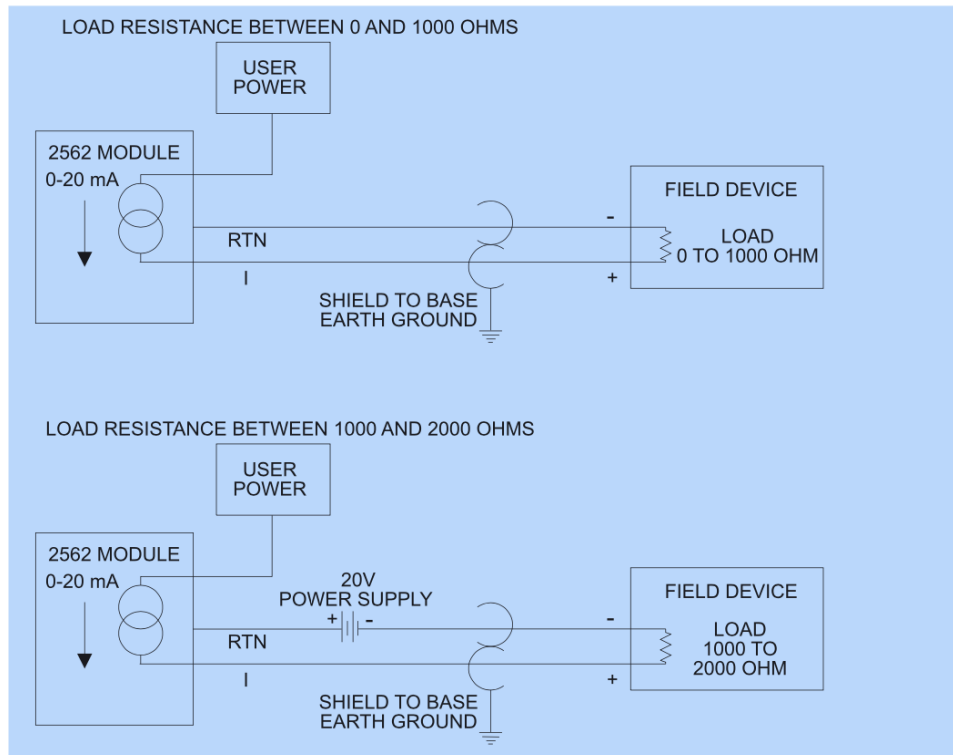TFL is the resistance of the field device

Figure 6 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 no lower than 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:

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

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:

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

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

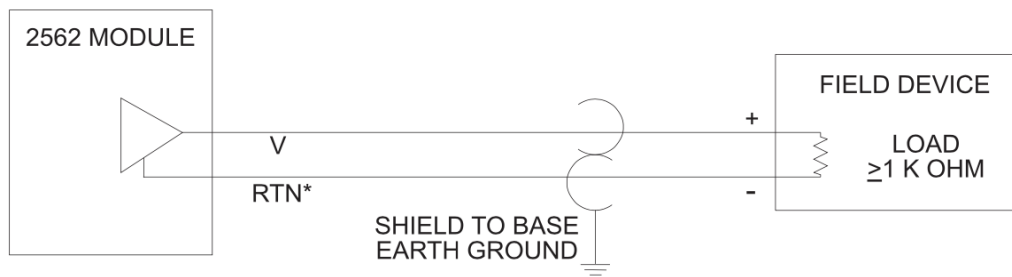The following figure provides a schematic for a voltage output circuit.

Figure 7 **Voltage Output Circuit**

CAUTION:
HANDLING STATIC SENSITIVE DEVICES
The components on the 2562 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

The 2562 must be configured for voltage output range, unipolar or bipolar mode, offset mode, and zero/last value mode before wiring the output connectors and inserting the module into the I/O base. As shipped, all output channels are configured for the 5V output range, unipolar outputs, disabled offset mode, and last value output at power up (see Error! Reference source not found.)**.**

Configuring the 2562 for operation consists of the following steps (notations in parenthesis are actual printed board titles):

1. Selecting 0-5V (5V) or 0-10V (10V) output voltage range for each channel.
2. Selecting unipolar (UNI) or bipolar (BI) mode for each output channel.
3. Setting DIP switches for each channel to match the hardware configuration.
4. Selecting offset scaling enabled (EN) or disabled (DIS) for the entire module.
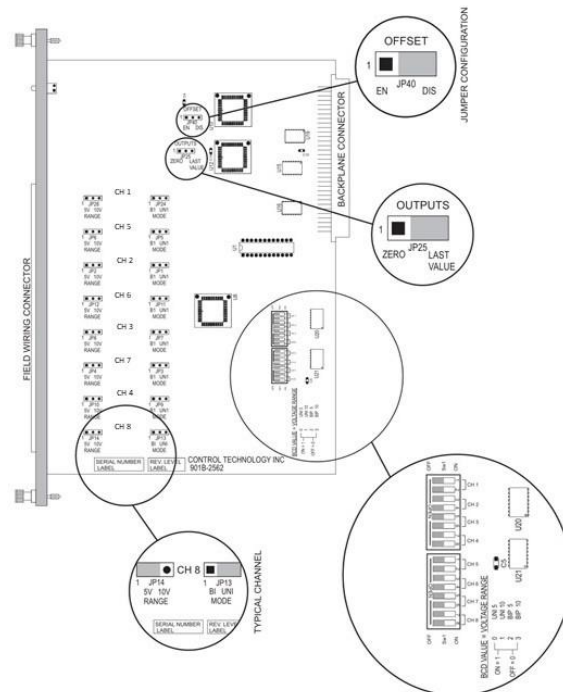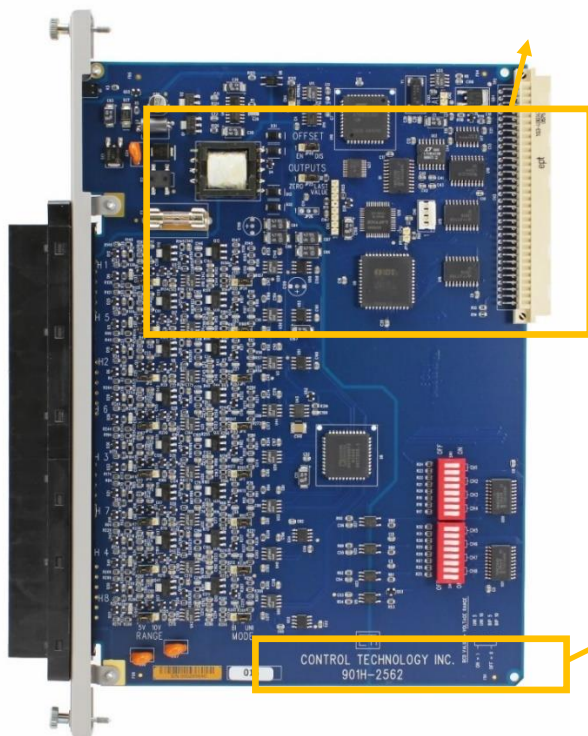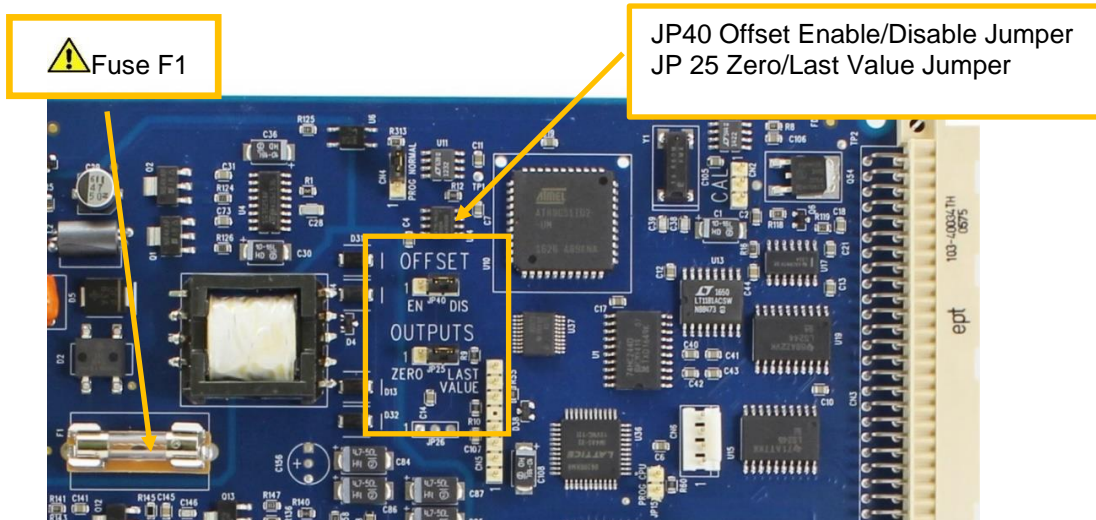5. Selecting either zero (ZERO) or last value (LAST VALUE) at power up for the module.

Figure 8 Configuring the Module
(Jumpers and DIP Switches shown in default shipping position.)

⚠️

Clause	English	French
9.7.1	WARNING – EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE WHILE CIRCUIT IS LIVE UNLESS THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.	AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS RETIRER NI REMPLACER PENDANT QUE LE CIRCUIT EST SOUS TENSION À MOINS QUE L'EMPLACEMENT NE SOIT EXEMPT DE CONCENTRATIONS INFLAMMABLES.
9.8.1	WARNING – EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED.	AVERTISSEMENT – RISQUE D'EXPLOSION. NE

⚠️ Fuse F1

JP40 Offset Enable/Disable Jumper
JP 25 Zero/Last Value Jumper

The letter "H" designates the printed circuit board Revision: 901H-2562
Board Revisions are done to improve product manufacturability and sometimes improve product functionality. Always check your board Rev and the manual for any differences.

Figure 9 **F1 and JP25 and JP40 Locations**
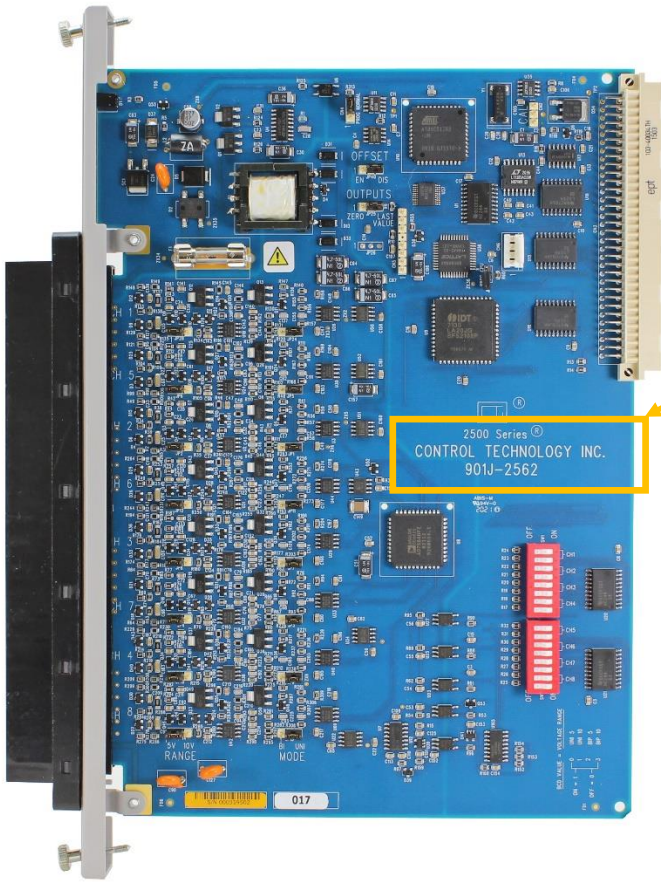
The letter "J" designates the printed circuit board Revision: `901J-2562` Board Revisions are done to improve product manufacturability and sometimes improve product functionality. Always check your board Rev and the manual for any differences.
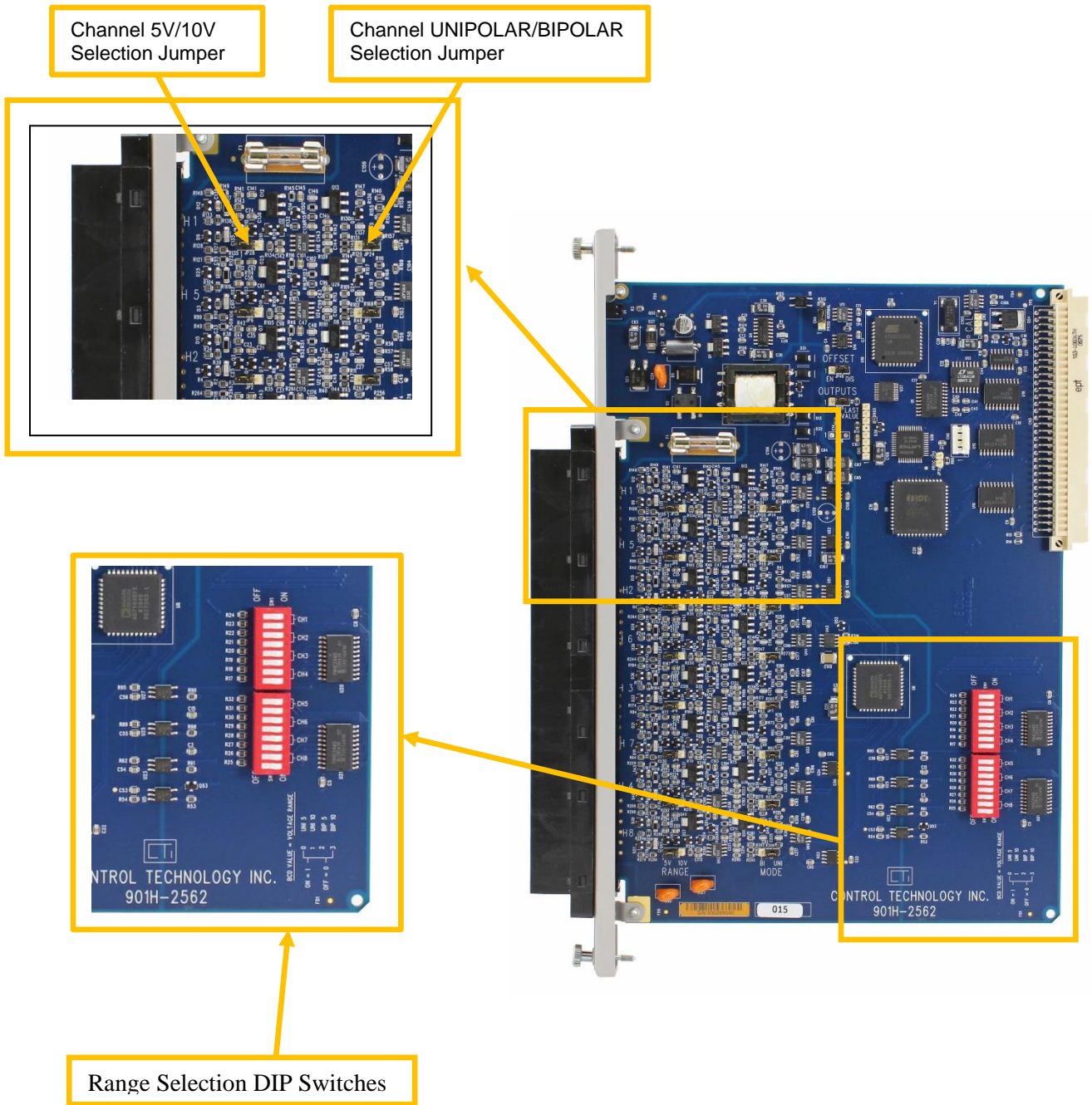
Figure 10 **Rev J Identifier Location**

Channel 5V/10V Selection Jumper

Channel UNIPOLAR/BIPOLAR Selection Jumper

Range Selection DIP Switches

Figure 11 Channel Voltage and Range Selection

Channel Number	Voltage Range Jumper	Jumper Position *5V or 10V*	Unipolar/Bipolar Jumper	Jumper Position *Uni or Bi*
1	JP28	5V	JP24	UNI
2	JP6	5V	JP5	UNI
3	JP2	5V	JP1	UNI
4	JP12	5V	JP11	UNI
5	JP8	5V	JP7	UNI
6	JP4	5V	JP3	UNI
7	JP10	5V	JP9	UNI
8	JP14	5V	JP13	UNI

All Channels	Offset Mode Jumper	Offset Mode Jumper Position	Outputs at Power Up Jumper	Outputs at Power Up Jumper Position
1-8	JP40	DISABLED	JP25	LAST VALUE

Figure 12 Jumper Configuration as Shipped

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

The 2562 is capable of supporting Unipolar or Bipolar applications with an output range of 0 to +5 VDC, 0 to +10 VDC, -5 to +5 VDC or -10 to +10 VDC. For each channel a hardware jumper selects the range for that output circuit. (See Error! Reference source not found..) Select 5 VDC range for all current a pplications. As shipped, the 5V range is selected.

2.3.2. Selecting Unipolar or Bipolar Output

Each output channel on the 2562 supports Unipolar or Bipolar output operation. Hardware jumpers select operation of the output. (See Error! Reference source not found.) Select Bipolar for applications that drive t he outputs from -5 to +5 VDC, -10 to +10 VDC, or -20 to +20 mA. As shipped, Unipolar range is selected.

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. As shipped, Unipolar 5VDC is selected.

2 (MSB)	1 (LSB)	Range
OFF	OFF	Unipolar 5VDC
OFF	ON	Unipolar 10VDC
ON	OFF	Bipolar 5VDC
ON	ON	Bipolar 10VDC
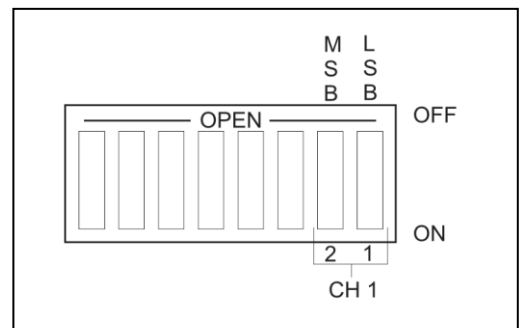
2.3.4. Selecting Automatic Offset Mode for the Entire Module

Some applications require an Offset mode of 4-20 mA or 1-5 VDC. The SIMATIC® TI 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 2562 can perform this offset calculation and output an offset signal independent of the PLC. Selecting this function with JP40 causes all eight outputs to be scaled. Move the jumper to the ENABLED position to select this function. As shipped the module offset is DISABLED.

2.3.5. Selecting Either Zero or Last Value Output at Power Up

Upon power up of the base power, the 2562 allows the user to choose between either a zero output value or last output value when transitioning to the next update. A hardware JP25 jumper setting sets the entire module for the mode chosen. Section 2.9. Power Cycling explains the details of each selection. As shipped the module power up mode is LAST VALUE.
 Note: this jumper only has effect when power is lost from the base.

2.3.6. Jumper Settings for Future Reference

See Appendix B. Jumper Settings Log Sheet to record any changes to the module's factory jumper settings.

2.4. Inserting 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. The connector assembly consists of a header attached to the printed circuit card and a mating removable screw terminal plug. Wiring is connected through the removable screw terminal plug.
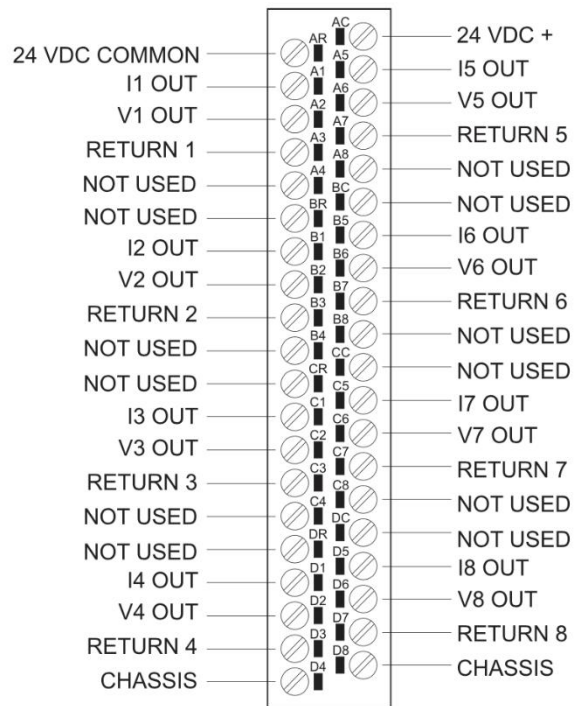

Figure 13 Output Screw Terminal Plug Wiring

2.5.1. Connecting Voltage Output Wiring

First, loosen the wire locking screws on the output screw terminal plug. For voltage output circuits, connect the signal wire to the VO screw terminal, and the return wire to the Return (channel ground) screw terminal. Insert the wires in the appropriate holes next to the screws. When the wires are inserted, tighten the screws. Repeat this procedure for the remaining voltage output channels.

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 Return (channel ground) screw terminal. Insert the wires in the appropriate holes next to the screws. When the wires are inserted, tighten the screws. Repeat this procedure for the remaining current output channels.

2.5.3. Connecting the Shield Wiring

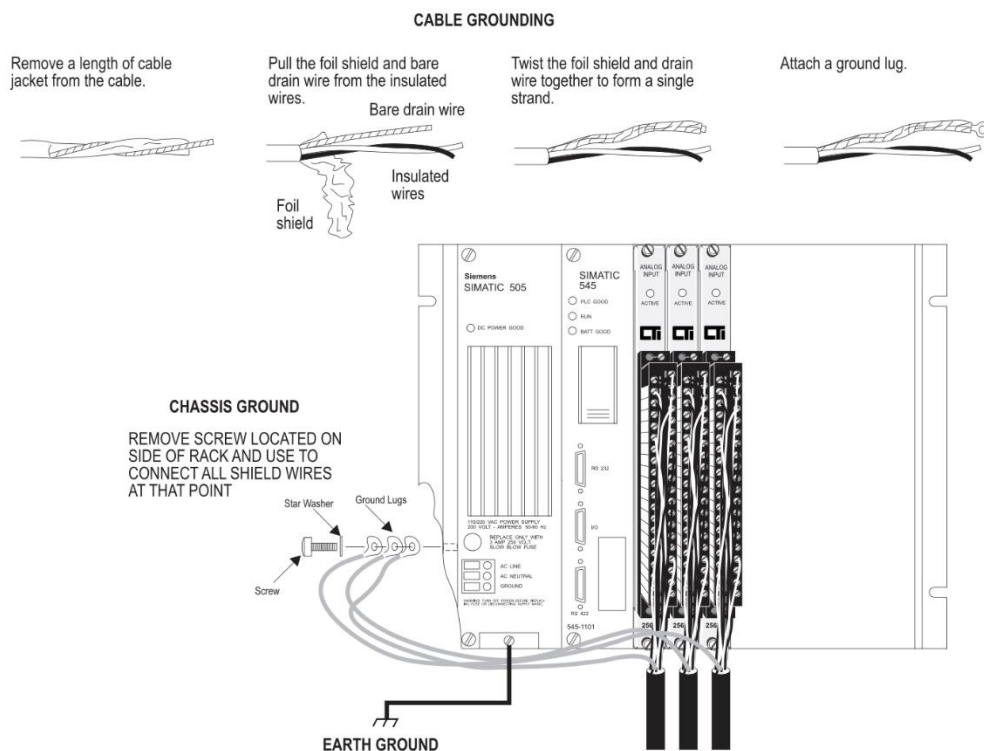See the diagram below that describes cable grounding and chassis ground.

Figure 14 Connecting the Shield Wiring

> *Note:*
> *A static drain is recommended on the 2562 to prevent a static charge buildup from occurring. A 10K to 1M resistor from any analog common to earth ground (chassis ground is front panel output connector pins D4 or D8) is sufficient for protection.*

2.6. Inserting the Screw Terminal Plug

When all the output signal wires are connected to the screw terminal plug, carefully insert the plug into its header. Both the plug and header are keyed to prevent reverse wiring. When the screw terminal is fully inserted onto the header, use the captive screws to secure the plug to the front panel.
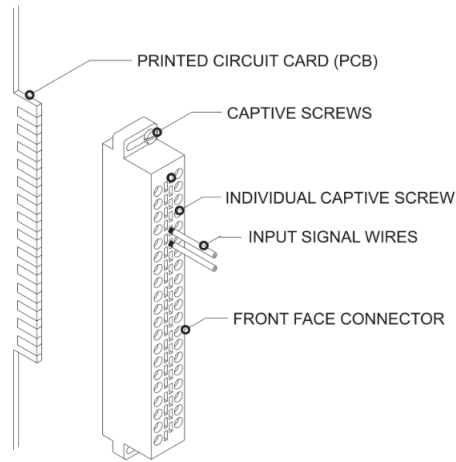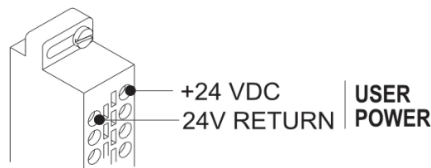

Figure 15 Attaching the Screw Terminal Plug

> **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 Figure 2.7 below. Be sure to check that the 24V fuse is present and intact. See Chapter 3 Troubleshooting recommendations for replacement fuses.

Figure 16 Power Supply Connection

2.8. Checking Module Operation

First turn on the base supply power. If diagnostics detects no problems, the front panel status indicator will light. If the indicator does not light (or goes out during operation), the user 24VDC is not present or the module has detected a different 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 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.

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 2562 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

                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 17 TISoft 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 1-800-537-8398 for further assistance.

NOTE:
In the event a CTI analog module detects no user 24VDC or 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 TI/545, TI/555, TI/560 & 565, and the TI/575. The I/O Module Status Word can be used to report a module failure for an I/O Module in any of the SIMATIC® 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 in for repair.

2.9 Product Board Rev "F" Power Cycling

The 2562 Board Rev "F" reacts the following ways upon various power cycling scenarios:

Base Power (5V)	User Power (24V)	2562 in Last Value Mode	
		Unipolar Mode*	Bipolar Mode*
On	Transition off	Output to zero.	Output to zero.
On	Transition on	Output from zero to PLC value.	Output from zero to full scale (+), then PLC value.
Transition off	On	Maintains last value.	Maintains last value.
Transition on	On	Maintains last value.	Maintains last value.

Figure 18 PCB REV F Last Value Mode Module Reactions

Base Power (5V)	User Power (24V)	2562 in Zero Mode	
		Unipolar Mode*	Bipolar Mode*
On	Transition off	Output to zero.	Output to zero.
On	Transition on	Output from zero to PLC value.	Output from zero to full scale (+), then to zero, then to PLC value.
Transition off	On	Maintains last value.	Maintains last value.
Transition on	On	Output to zero for several seconds, then to PLC value.	Output to zero, then to PLC value.
Off	Transition on	Output stays at zero.	Output from zero to full scale (+).

Figure 19 PCB REV F Zero Mode Module Reaction

2.10. Product Board Rev "H" Power Cycling

The 2562 reacts the following ways upon various power cycling scenarios:

Base Power (5V)	User Power (24V)	2562 in Last Value Mode	
		Unipolar Mode*	Bipolar Mode*
On	Transition off	Output to zero.	Output to zero.
On	Transition on	Output from zero to PLC value.	Output from zero to full scale (+), then PLC value.
Transition off	On	Maintains last value.	Maintains last value.
Transition on	On	Maintains last value.	Maintains last value.
Off	Transition on	Output goes to full scale	Output to full scale.

Figure 20 PCB Rev H Last Value Mode Module Reactions

Base Power (5V)	User Power (24V)	2562 in Zero Mode	
		Unipolar Mode*	Bipolar Mode*
On	Transition off	Output to zero.	Output to zero.
On	Transition on	Output from zero to PLC value.	Output from zero to full scale (+), then to zero, then to PLC value.
Transition off	On	Maintains last value.	Maintains last value.
Transition on	On	Output to zero for several seconds, then to PLC value.	Output to zero, then to PLC value.
Off	Transition on	Output goes to full scale	Output goes to full scale

Figure 21 PCB REV H Zero Mode Module Reactions

*see Section 2.3.5. Selecting Either Zero or Last Value Output at Power Up for further explanation.

2.11. Product Board Rev "J" Power Cycling

Base Power (5V)	User Power (24V)	2562 in Last Value Mode	
		Unipolar Mode*	Bipolar Mode*
On	Transition off	Output to zero.	Output to zero.
On	Transition on	Output from zero to PLC value.	Output from zero to full scale (+), then PLC value.
Transition off	On	Maintains last value.	Maintains last value.
Transition on	On	Maintains last value.	Maintains last value.
Off	Transition on	Output stays at zero	Output to full scale.

Figure 22 Rev J Last Value Mode Module Reactions

Base Power (5V)	User Power (24V)	2562 in Zero Mode	
		Unipolar Mode*	Bipolar Mode*
On	Transition off	Output to zero.	Output to zero.
On	Transition on	Output from zero to PLC value.	Output from zero to full scale (+), then to the PLC value.
Transition off	On	Output goes to zero	Output goes to (+) full scale
Transition on	On	Output to zero for several seconds, then to PLC value.	Output goes from (+) full scale to PLC value
Off	Transition on	Output stays at zero	Output goes to full scale

Figure 23 PCB REV J Zero Mode Module Reactions

Note: the zero/last value setting <u>only</u> has effect when power is lost from the base. It does not control what happens when the PLC is put in PROGRAM mode. The PLC always continues to update I/O modules when in PROGRAM mode.

CHAPTER 3 CONFIGURING LOCAL AND REMOTE I/O MODULES WITH JANUS WORKBENCH

3.0 Using Variables

This Chapter is intended to provide the user with a general concept of the steps involved in adding physical IO in the system whether it be in a Local Rack or a Remote Rack. The examples in the Chapter are not intended to match the exact module the manual is for but they are intended to provide the information and steps required in adding IO to the system. More information is available in the Janus Workbench help files or by contacting CTI Tech Support.

In Janus Workbench, all data elements are addressed indirectly by variable name as opposed to the direct (or absolute) addressing method used in the Siemens® 505 and CTI 2500 Series® controllers. The variable name itself identifies the data, and a data type is then assigned to the variable name so that the run-time can determine the data length and how to interpret the values stored at that memory location.

Most variables represent a single data element and are assigned a simple data type (i.e. BOOLEAN, INTEGER, or REAL). However, the user can create a custom type that combines various data types into a complex unit known as a Structure. The Structure can then be used to organize the information related to a device or machine into a data group represented by a single variable name.

Arrays of variables of all data types can be created so that common elements can be grouped together. One, two, and three-dimensional arrays may be used.

Variables are defined and edited in the variable editing pane.

Variable Editor

Name	Type	Dim.	Attrib.	Syb.	Init value
☐ 🄵🄱 TypeUDFB (*UDFB Example*)					
Input1	BOOL		IN	☐	
Input2	INT		IN	☐	
Output1	INT		OUT	☐	
Priv1	BOOL			☐	
Priv2	DINT			☐	
☐ 🏠 Global variables					
_CTI_PROD...	STRING(20)			☑	'2500P-ACP1'
_CTI_VERS...	STRING(10)			☑	'1.0'
_CTI_FLAGS	INT			☑	INT#0
💾 RETAIN variables					

3.1 Naming Conventions

- First character must be a letter ('A' to 'Z,' either upper or lower case) or an underscore
- Following characters must be letters, digits or underscores
- You cannot enter 2 consecutive underscore characters
- Names are case insensitive
- Maximum length is 255 characters

3.2 Variable Classes

Three classes of variables are supported:

- Global: Internal variable known to all programs in the project
- Local: Internal variable known only to the POU ("Program Organizational Unit (POU)") where it resides
- Retain: Non-volatile Global variable used to restore critical variables to previously store states. There is no limit to retained variables in 2500-Jxxx processors.

3.2.1 Variable Data Types

The variable data type can be assigned from the standard IEC data types from the list below, as well as the Standard Function Blocks (included with Workbench) and any User-Defined Function Blocks you have created.

No	Keyword	Data Type	Bits
1	BOOL	Boolean	1
2	SINT	Short integer	8
3	INT	Integer	16
4	DINT	Double integer	32
5	LINT	Long integer	64
6	USINT	Unsigned short integer	8
7	UINT	Unsigned integer	16
8	UDINT	Unsigned double integer	32
9	ULINT	Unsigned long integer	64
10	REAL	Real numbers	32
11	LREAL	Long reals	64
12	TIME	Duration	
13	DATE	Date	
14	TIME_OF_DAY	Time of day (only)	
15	DATE_AND_TIME	Date and time of day	
16	STRING	Character string	
17	BYTE	Bit string of length 8	8
18	WORD	Bit string of length 16	16
19	DWORD	Bit string of length 32	32
20	LWORD	Bit string of length 64	64

3.3 Configuring Local I/O

In this example, we will configure an I/O module in the local base. Note that this applies only for 2500P-Jxxx processors.

3.3.1 Open the Fieldbus Configuration

To open the Fieldbus Configurator, make sure you have selected the desired Startup Project, then click the "Open Fieldbus Configuration" icon.
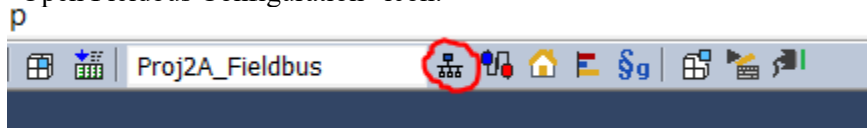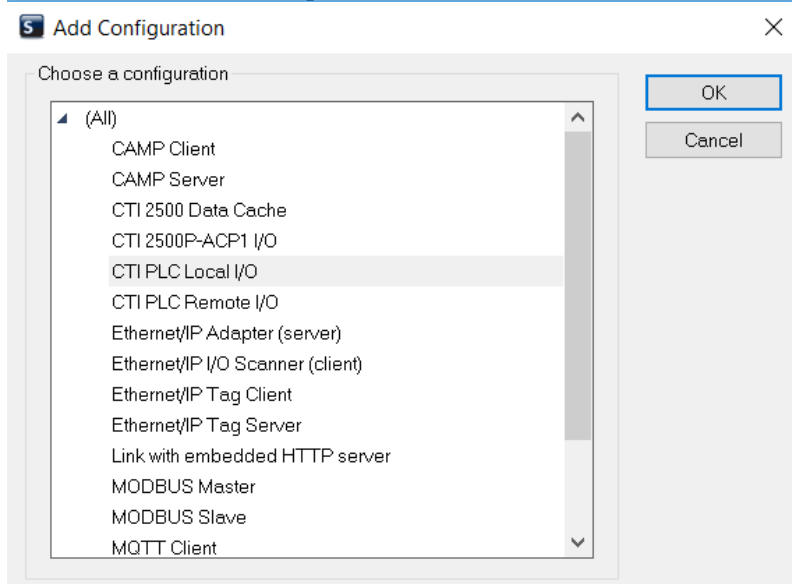
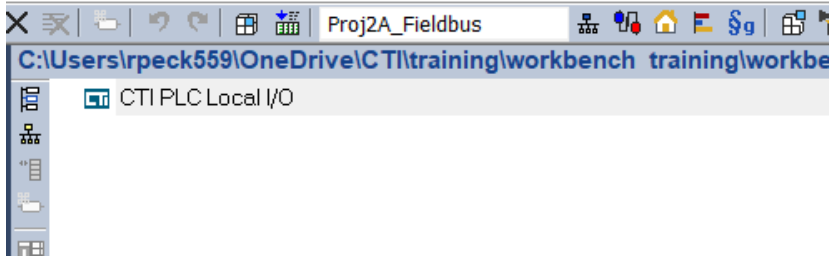### 3.3.2 Add the Local Base (if not already present)

Click the "Insert Configuration" icon on the Fieldbus Editor toolbar.
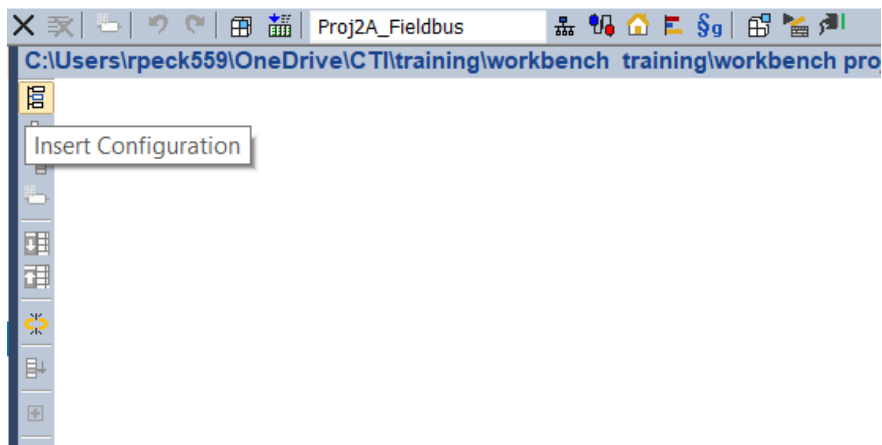
The "Add Configuration" dialog will come up. Expand the "All" selection and then click "CTI PLC Local I/O".

Click "OK" and the Local I/O base gets added in.

3.3.3 Add a Module

Click the "Insert Master/Port" icon on the editing toolbar.

The Select Module dialog will be displayed.
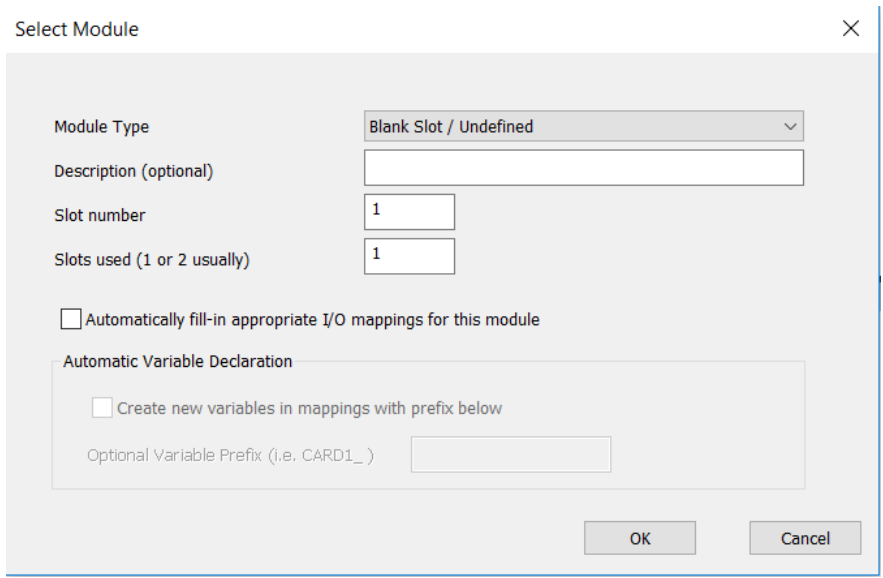
From the Module Type dropdown list, select "CTI 2558 8CH Analog Input". Enter a description, which slot, and how many slots the module takes. Check the boxes to fill in I/O mappings and create variables. Enter a prefix for the variables that will be created.

Click OK. The module will be added.

Now expand the "Local Base" and "Slot 1" to see the finished configuration.
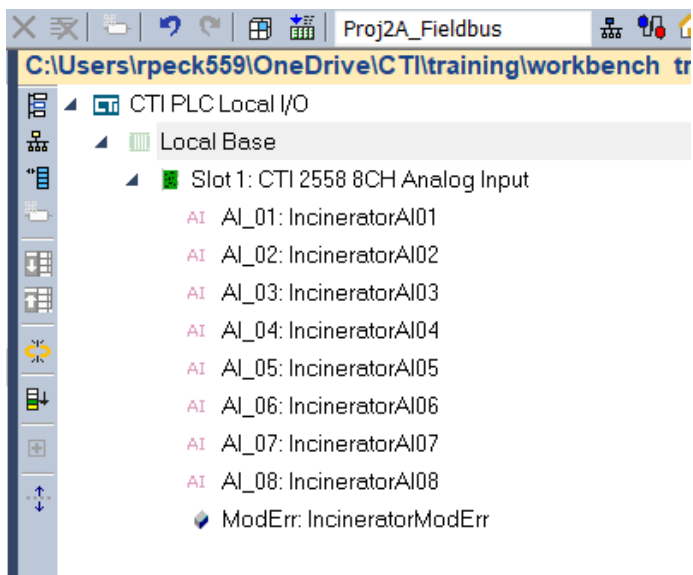
Note that channels AI_01 though AI_08 have been created and each has been tagged with a variable which will received the values of the input channel. The variable "ModErr" will be TRUE when there is a failure on the module. The variables IncineratorAI01 through IncineratorAI08 have been created and will appear in the "Global Variables" list.

Name	Type	Di...	A
⊿ ⌂ Global variables			
IncineratorAI01	INT		
IncineratorAI02	INT		
IncineratorAI03	INT		
IncineratorAI04	INT		
IncineratorAI05	INT		
IncineratorAI06	INT		
IncineratorAI07	INT		
IncineratorAI08	INT		
IncineratorModErr	INT		
💾 RETAIN variables			

3.4 Configuring RS-485 Remote I/O

3.4.1 Open the Fieldbus Configuration

To open the Fieldbus Configurator, make sure you have selected the desired Startup Project, then click the "Open Fieldbus Configuration" icon.

p

3.4.2 Add the Remote I/O Protocol

Click the "Insert Configuration" icon on the Fieldbus Editor toolbar.

C:\Users\rpeck559\OneDrive\CTI\training\workbench training\workbench pro

Insert Configuration
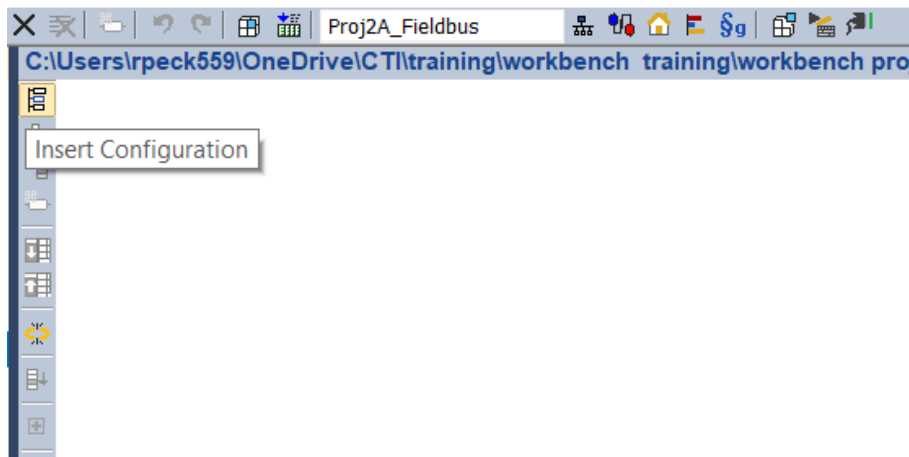
The "Add Configuration" dialog will come up. Expand the "All" selection and then click "CTI PLC Remote I/O".
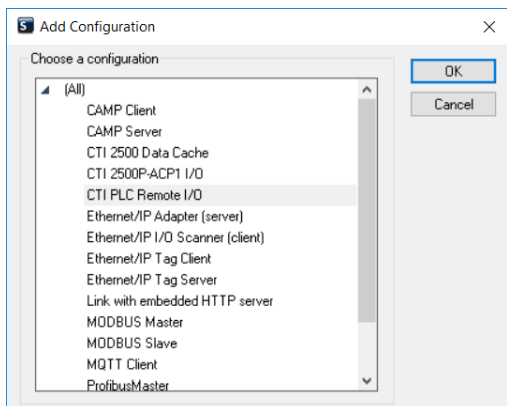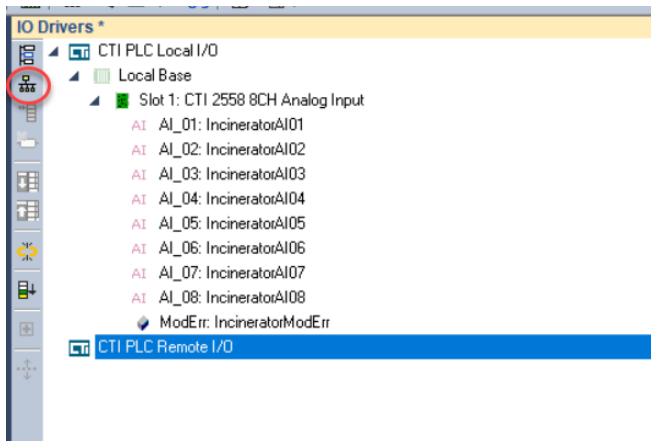

Click "OK" and the Remote I/O Protocol gets added in. If you already have Local I/O configured, the Remote I/O will be added below it.
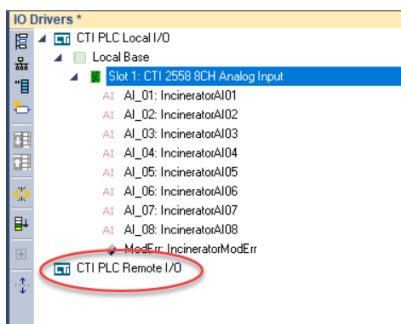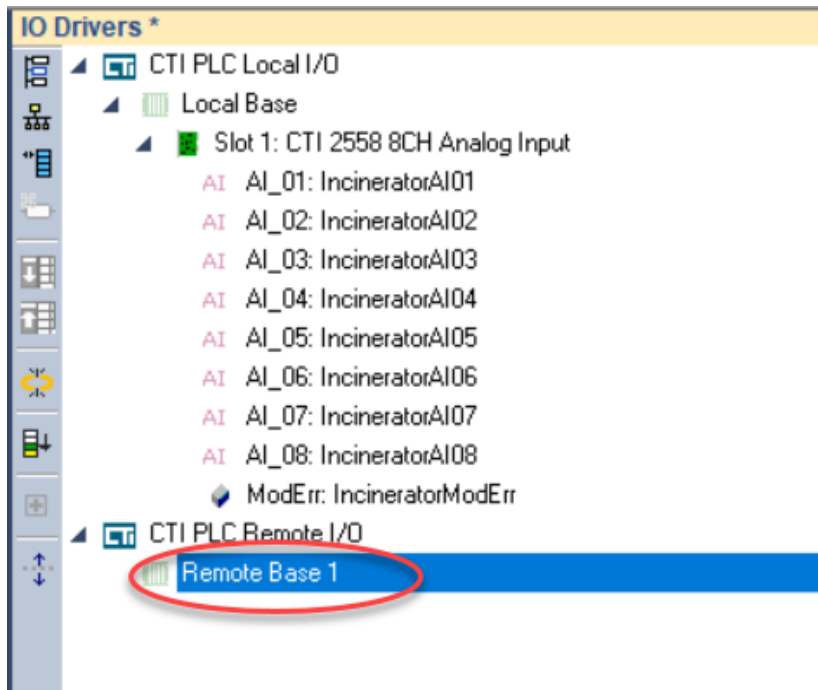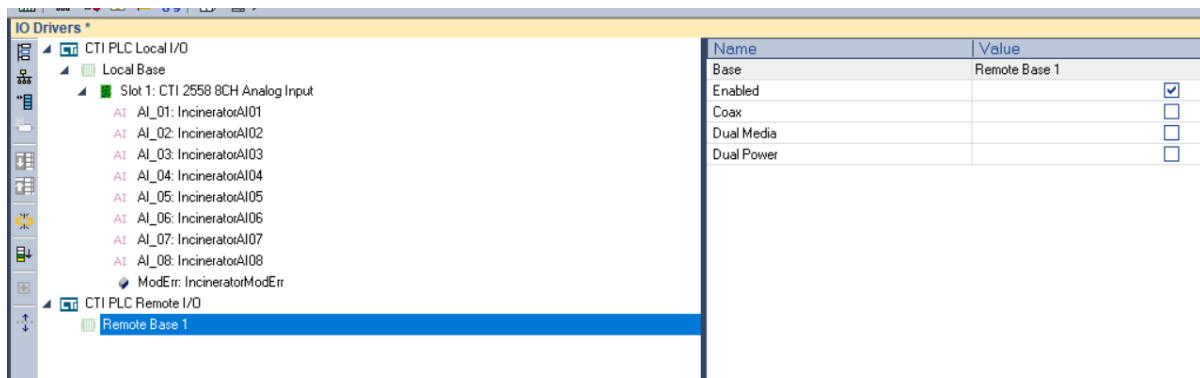

3.4.3 Add a Remote Base

Highlight the "CTI PLC Remote I/O" item you just created, and click the "Insert Master/Port" icon.
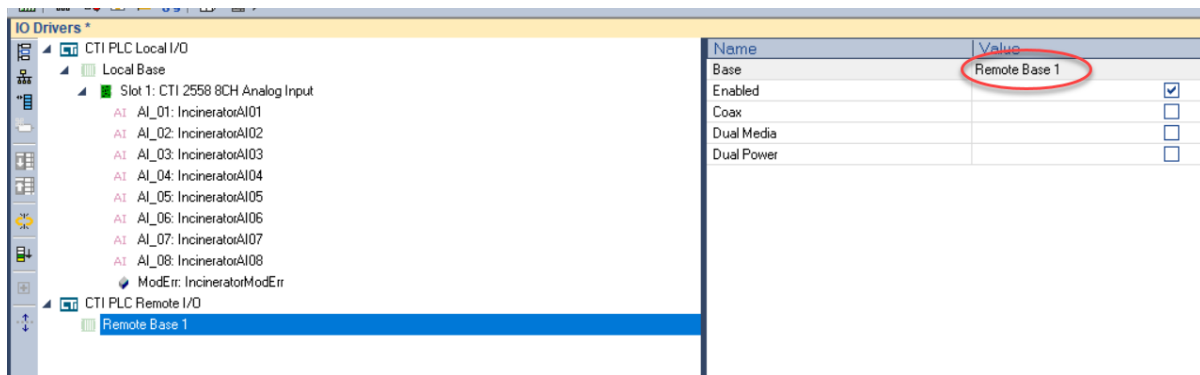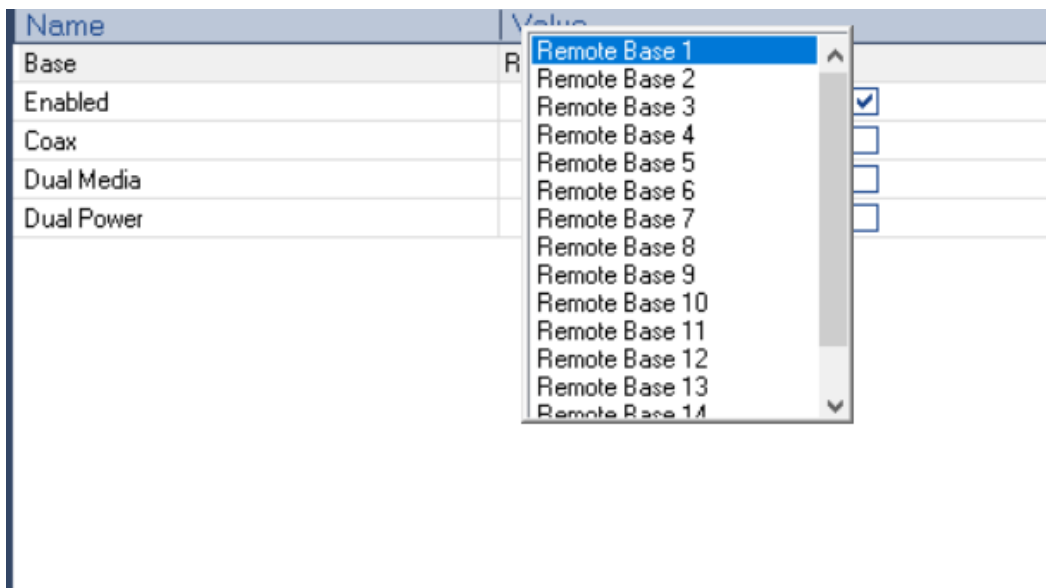

Remote Base 1 gets added in.

Highlight Remote Base 1. In the details pane to the right, tic the desired boxes to indicate whether this base is enabled, uses coaxial communications, has dual RBCs (dual media), and has dual power supplies.

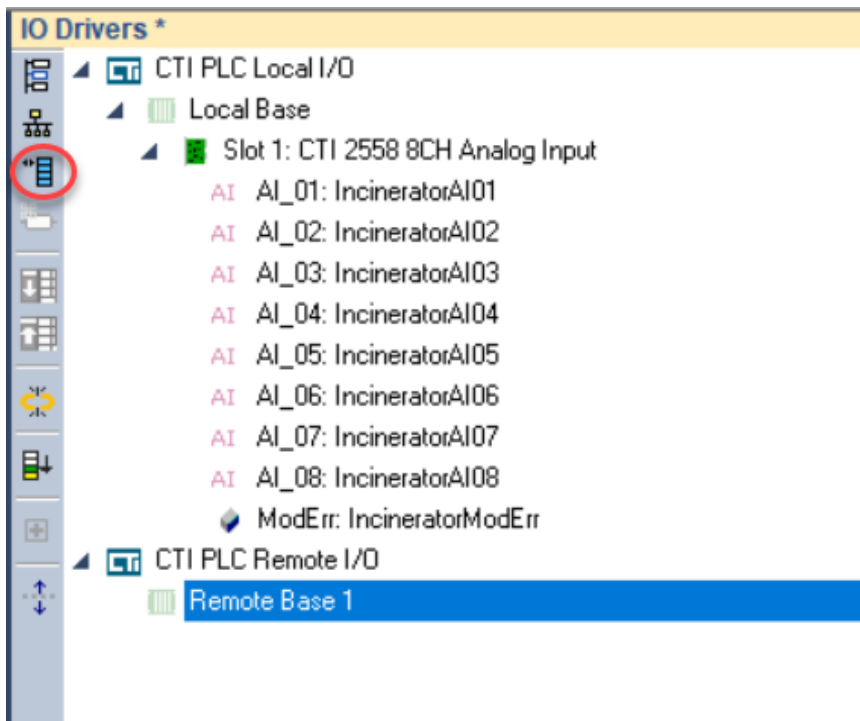Double click on the "Remote Base 1" value field, to edit the base number.

From the drop-down box, select your remote base address (1-15)

3.4.4 Add a Module

To add a module, highlight the Remote Base 1 we just added, and click "Insert Slave/Data Block" icon.

The Select Module dialog will be displayed.

From the Module Type dropdown list, select "CTI 2558 8CH Analog Input". Enter a description, which slot, and how many slots the module takes. Check the boxes to fill in I/O mappings and create variables. Enter a prefix for the variables that will be created.

Click OK. The module will be added. Note that channels AI_01 though AI_08 have been created and each has been tagged with a variable which will received the values of the input channel. Status variables "ModErr", "BaseOn", "DualMed", and "DualPow" are also added to indicate status of options and

module errors. The variables Incinerator2AI01 through Incinerator2AI08 have been created and will appear in the "Global Variables" list, along with variables created for error and options status.
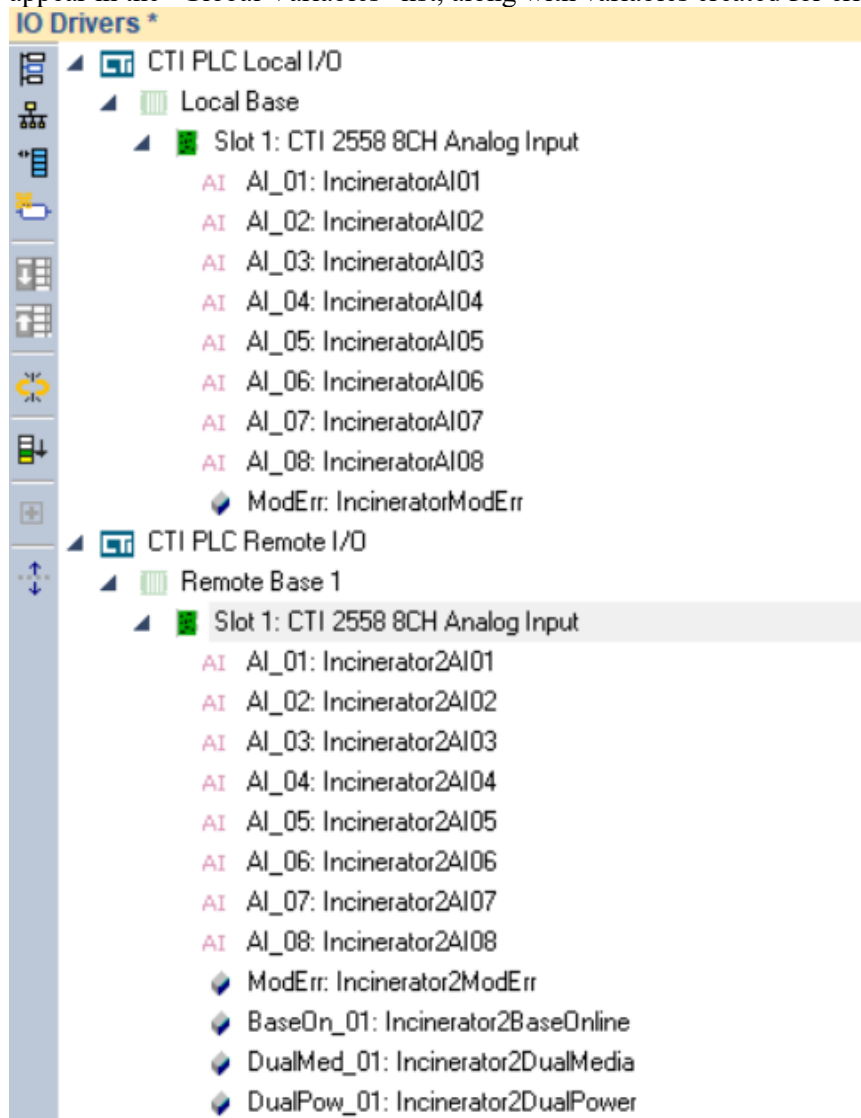
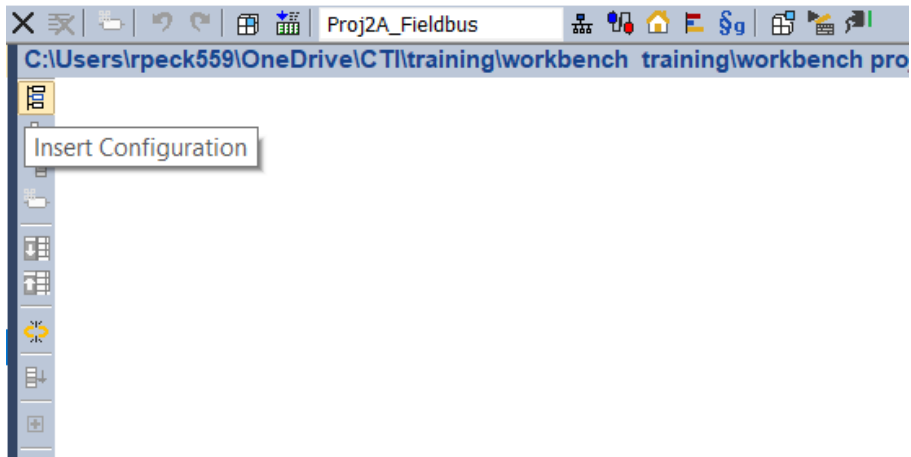## 3.5 Configuring Profibus I/O (Janus Processors)

3.5.1 Open the Fieldbus Configuration

To open the Fieldbus Configurator, make sure you have selected the desired Startup Project, then click the "Open Fieldbus Configuration" icon.
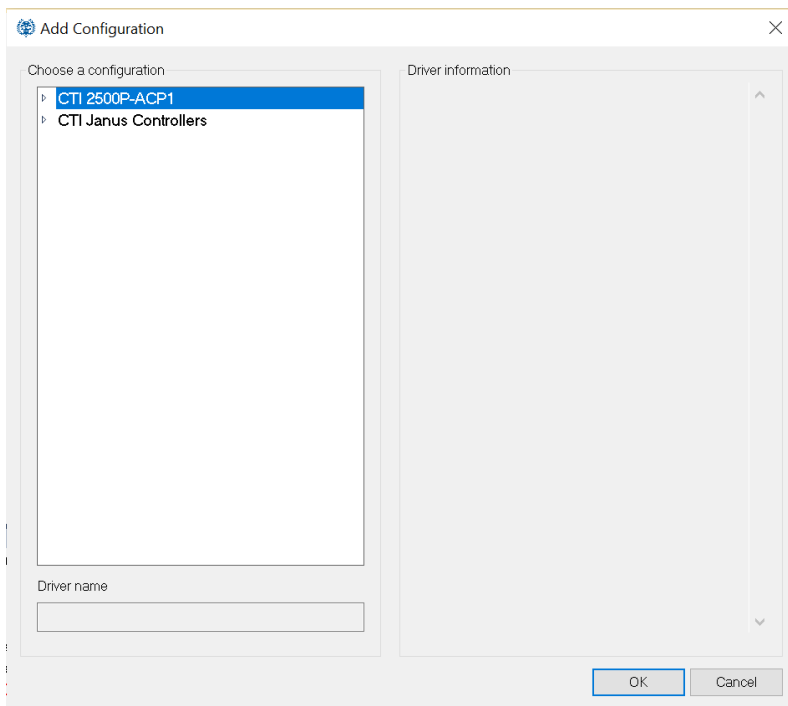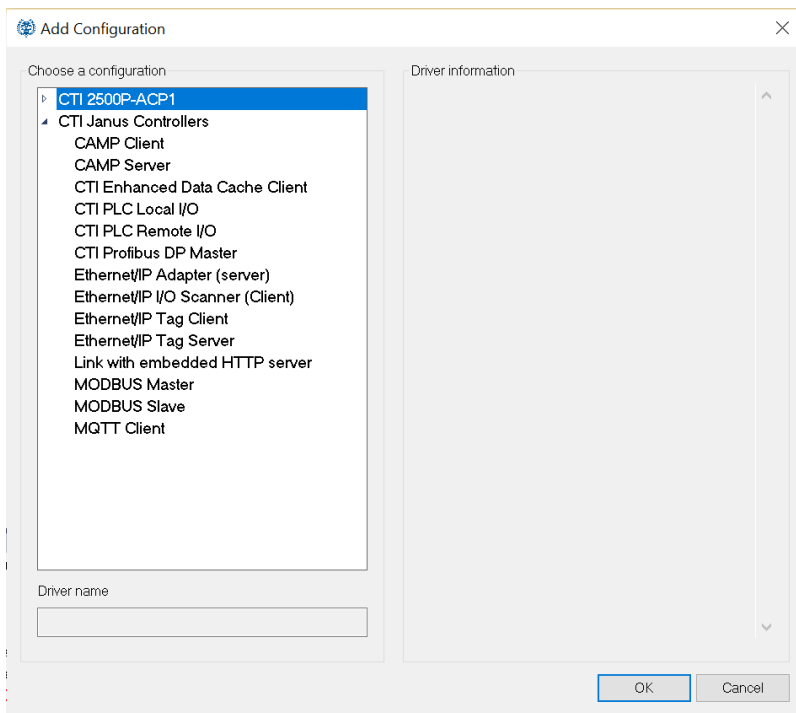
3.5.2 Add the Profibus Configuration

Click the "Insert Configuration" icon on the Fieldbus Editor toolbar.

The Add Configuration dialog box will come up.
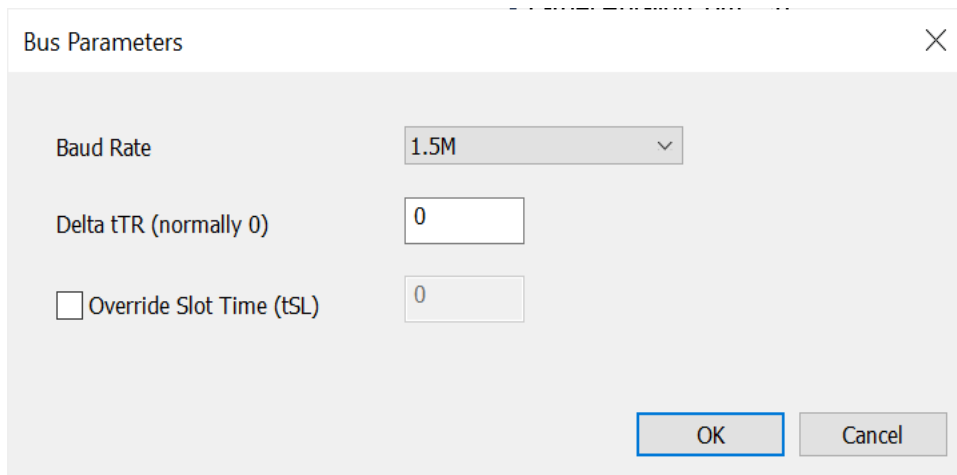

Expand the Janus Controllers entry.

Select "CTI Profibus Master" and click OK. The Profibus Master configuration will be added.

Double-click on the CTI Profibus Master configuration to bring up the Bus Parameter dialog box.

Baud Rate: If you want to change the default rate (1.5 Mb), click on the Baud Rate button and ou to select the desired baud rate from the drop-down list. Ensure that all slaves that you select will support the baud rate you selected.

Delta tTR: Allows you to extend the calculated Target Rotation Time to accommodate other masters on the Profibus DP network This value is measured in t-bits (time to transmit one bit at the selected baud rate) and should normally be 0.

Override Slot Time tSL: Checking the box allows you to manually enter the Slot Time, which is the maximum wait time for a station response. The default slot time is based on the baud rate and is measured in t-bits . You can enter a value within a range of 100-10,000 t-bits.

To accept the displayed values, click on the OK button.

3.5.3 Add the Master / Port (Profibus Remote Base)

Click the "Insert Master/Port" icon on the editing toolbar.
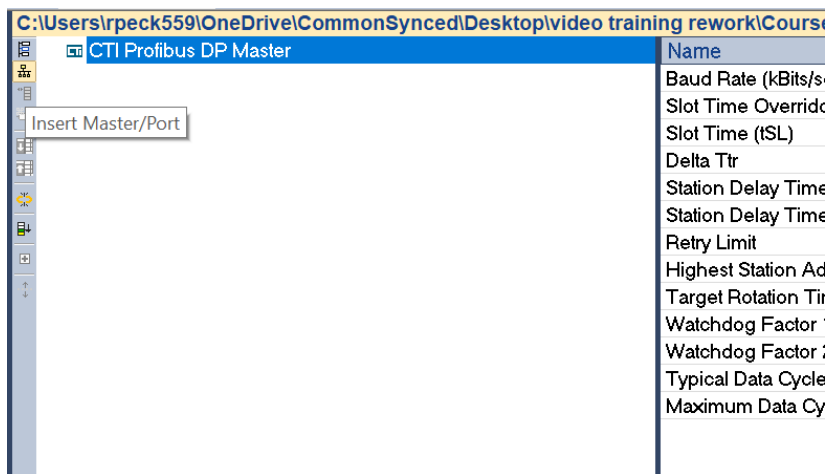
The Profibus DP Slave dialog will come up.

If you have not yet imported any GSD files to this project, the "GSD File" dropdown will be blank as shown. Click on "Import new GSD file to project". A Windows dialog will come up which allows you to browse to the desired GSD file. Here, we'll use the standard "CTI2500.GSD" file which works for all CTI Profibus RBCs. Once you selected the desired file, Click OK. The GSD file will be imported.

Enter the desired Station Address and Click OK.

Additional Profibus Remote Bases or other Profibus Slaves can be added by repeating the steps above.

3.5.4 Add the Profibus Slave / Data Block (Modules)

Once the remote base has been added, we can populate it with I/O modules. This is done by clicking the "Insert Slave / Data Block" icon on the editing toolbar.
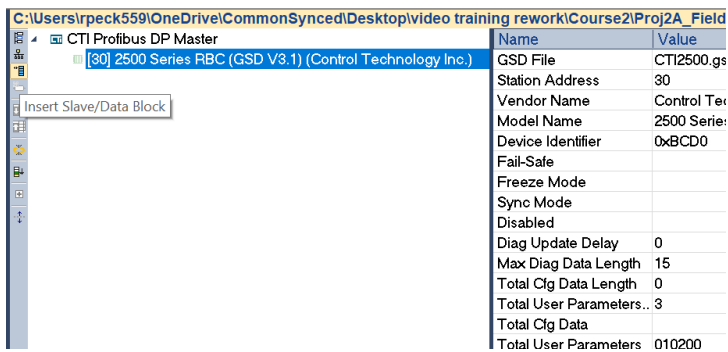
The Module Configuration dialog will come up. From this dialog, you can select the desired module from the dropdown list and (optionally) automatically fill in the I/O mapping for the module and create variables.
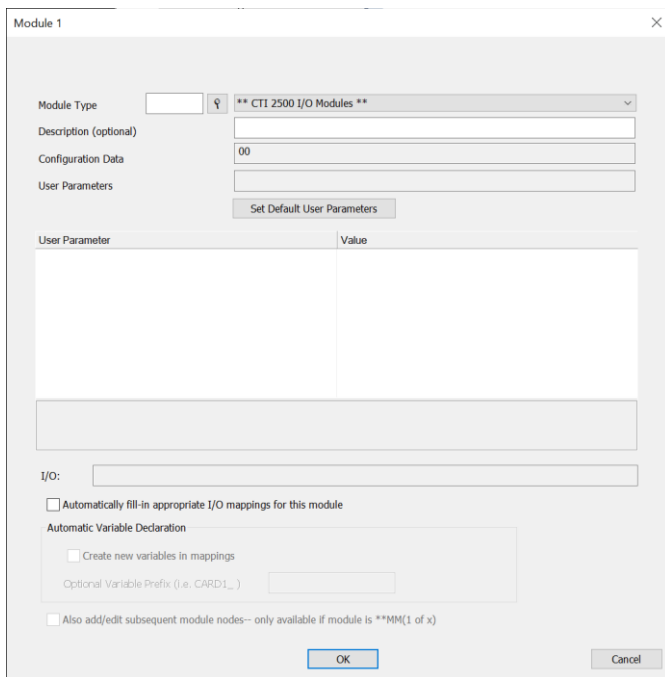
We'll select "2558" from the dropdown list.
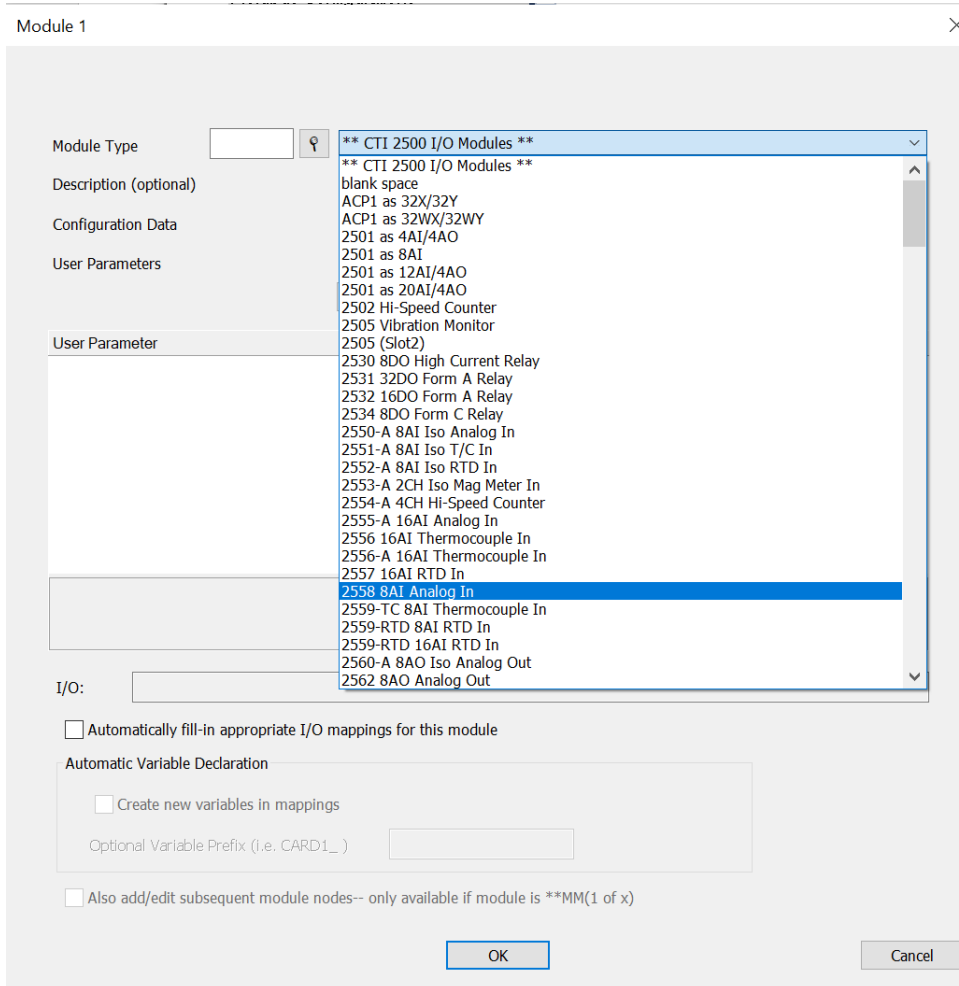
And select to automatically fill in I/O mapping and variable creation using the prefix "Unit_1_Pressure".
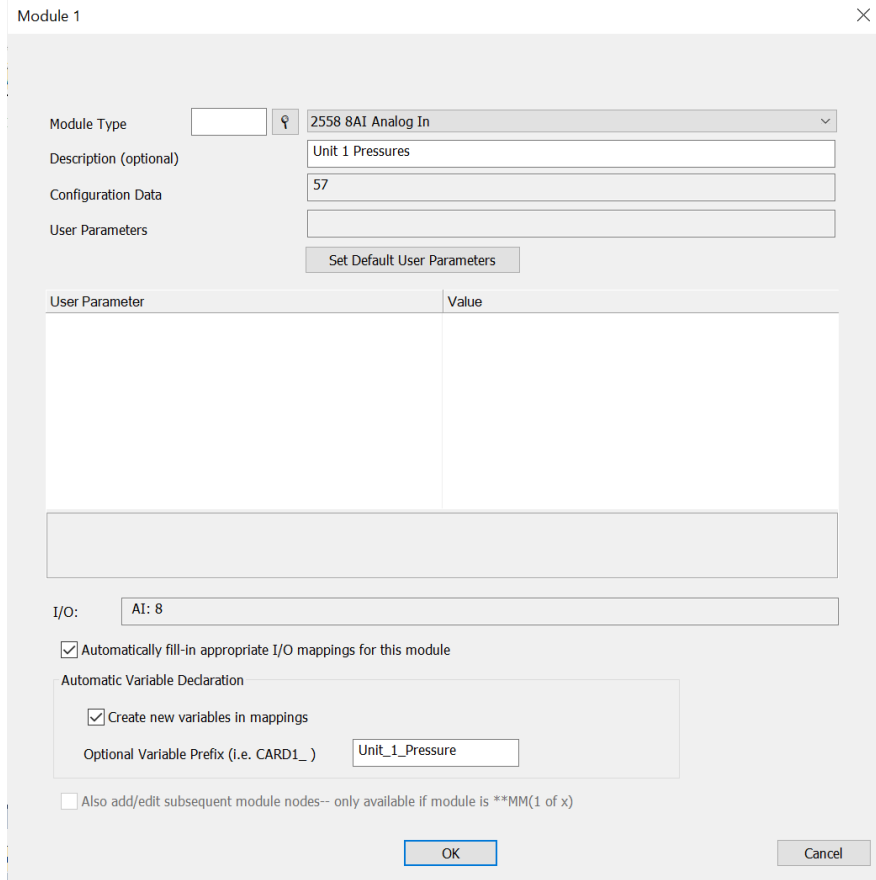
Click OK, and expand the module that is created, and we can see the mappings.
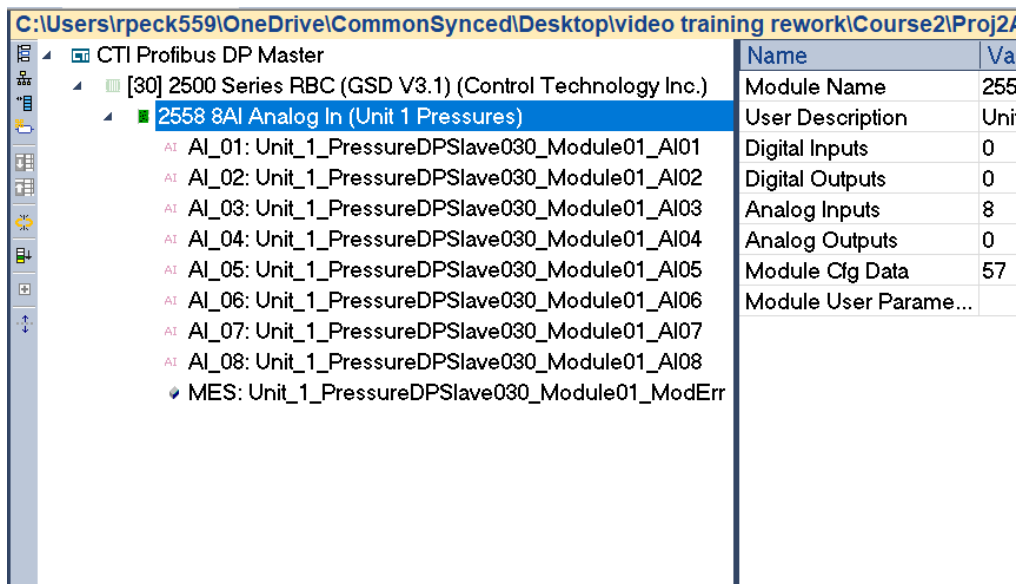
To add more modules to the base, simply repeat the steps above.

CHAPTER 4. TROUBLESHOOTING

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 power supply (user supply) fails, the module will still be logged into the PLC even though it is not operating.

In the event the user serviceable fuse blows, its replacement should be a 1 A, 250V Fast Blow 5x20mm fuse (Littlefuse 217-001 or equivalent).

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

| 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
	User 24 VDC not present	Check 24 VDC power
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
	24 VDC user supply not within specification	Repair /replace user supply
Incorrect output values	Output load < 1K ohm voltage mode or > 1000 ohm current mode	Verify output load impedance is within specifications
No output	Blown fuse, or failed isolator	Contact CTI

Figure 24 Trouble shooting Matrix

Clause	English	French
9.7.1	WARNING – EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE WHILE CIRCUIT IS LIVE UNLESS THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.	AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS RETIRER NI REMPLACER PENDANT QUE LE CIRCUIT EST SOUS TENSION À MOINS QUE L'EMPLACEMENT NE SOIT EXEMPT DE CONCENTRATIONS INFLAMMABLES.
9.8.1	WARNING – EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE FUSE WHEN ENERGIZED.	AVERTISSEMENT – RISQUE D'EXPLOSION. NE

SPECIFICATIONS

Output Channels:	8 analog output channels
Response Time:	4 mSec total module (includes settling time)

Output Range:

Unipolar:	0 to +5.12 VDC
	0 to +10.24 VDC
	0 to +20 mA
Bipolar:	-5.12 to +5.12 VDC
	-10.24 to +10.24 VDC
	-20 to +20 mA

Resolution 12 bits:

0-5 VDC range = 1.25 mV/step
0-10 VDC range = 2.5 mV/step
0-20 mA range = 5 μA/step
-5 to +5 VDC range = 2.5mV/step
-10 to +10 VDC range = 5.0 mV/step
-20 to +20 mA range = 10 μA/step

Isolation:	1500 VDC channel-to-PLC
Capacitance Drive:	0.01 microfarads
Load Resistance:	Voltage: 1KΩ minimum, no maximum
	Current: 0Ω to 1KΩ max. @ 24VDC or greater
Voltage Accuracy:	0.125% of full scale from 0° to 60°C over total load range
Current Accuracy:	0.225% of full scale from 0° to 60°C over total load range
User Supply:	20 to 30 VDC @ 0.50 Amps (maximum ripple of 0.4 V) UL Class 2 power supply
Backplane Power Consumption:	1.7 Watts
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:	UL, UL-C

Specifications subject to change without notice.

APPENDIX A. COMPATIBILITY WITH SIEMENS® 505-6208-A/B

Overview

The CTI 2562 Analog Output Module was designed to be a drop-in replacement for the Siemens® models 505-6208-A and 505-6208-B. From set up of the module to wiring and PLC reporting, the user will find many similarities between the CTI and Siemens® models.

Using the CTI 2562 in a 505-6208-A and/or 505-6208-B application

The CTI 2562 should fulfill all the following requirements for the 505-6208-A and 505-6208-B replacement(s), as outlined below:

Module setup

Since the CTI 2562 allows for both Unipolar and Bipolar setup, the module does have a slightly different module setup. See Chapter 2.3 Configuring the Module for Operation to determine the details in module setup.

Wiring

The wiring of the output connector is the same between the modules. See Chapter 2.5. Wiring the Output Connector for a detailed explanation of how this is accomplished.

If the module is used to supply voltage, the requirements of the input voltage to the module (20-30VDC) remains the same in order to supply the resistive load of the field device (>1000Ω). However, the maximum load resistance for current output drops to 600Ω at 20VDC and then climbs linearly to 1000Ω at 24-30VDC.

Also noteworthy is the isolation achieved module to module with the same power supply by using the CTI 2562 versus the Siemens® modules. With the 2562, each module is dielectrically isolated from a common 24V power supply.

PLC Reporting

The word format is the same between the modules. See Chapter 1.3 for a more detailed explanation on PLC reporting.

Power Cycling

When the user power is supplied and the base power is transitioning on, the 2562 has the option to either transition to hold the last output value until the next PLC update, as the Siemens® modules do, or to go to zero until the next PLC update. See section 2.3.5. Selecting Either Zero or Last Value Output at Power Up for further details.

APPENDIX B: JUMPER SETTINGS LOG SHEET

Channel Number	Voltage Range Jumper	Jumper Position 5V or 10V	Unipolar/Bipolar Jumper	Jumper Position Uni or Bi
1	JP28		JP24	
2	JP6		JP5	
3	JP2		JP1	
4	JP12		JP11	
5	JP8		JP7	
6	JP4		JP3	
7	JP10		JP9	
8	JP14		JP13	

All Channels	Offset Mode Jumper	Offset Mode Jumper Position	Outputs at Power Up Jumper	Outputs at Power Up Jumper Position
1-8	JP40		JP25	

Record the configuration jumper settings on this log for future reference. Make additional copies if necessary.

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 (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 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 (RMA) number can be requested orally 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 the product is 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 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 office at 1-800-537-8398.