2500 Series®

CTI 2500-RBC

PROFIBUS REMOTE BASE CONTROLLER

INSTALLATION AND OPERATION GUIDE

Version 1.9

2500RBCIOG

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V1.0	04/30/04	Original Issue
V1.1	08/25/04	Changed Profibus address switch open/close labeling
	05/03/07	Fixed Profibus connector diagram, added 2500 Series® processors
V1.2	06/22/09	Added reference to WorkShop Profibus configuration documentation
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PREFACE

This ***Installation and Operation Guide*** provides reference information for the CTI 2500-RBC Profibus Remote Base Controller. The information in this manual is directed to individuals who will be installing the module and configuring it for use with a Profibus Master.

We assume you are familiar with the installation and operation of:

1)   CTI 2500 Series® and Simatic® 505® programmable controllers,

2)   PLC WorkShop™ for Siemens 505™ or Com Profibus Configuration Software

Please refer to the appropriate user documentation for specific information on your programmable controllers and I/O modules.

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. DESCRIPTION

1.1. Introduction

The CTI 2500-RBC Profibus Remote Base Controller is a member of Control Technology's family of I/O modules compatible with the programmable controllers.

The 2500-RBC Profibus Remote Base Controller (RBC) allows a CTI 2500 Series® or Simatic® 505 I/O base to function as a slave node on a Profibus-DP I/O channel that complies with the PROFIBUS standard (DIN 19245, Part 3). The 2500-RBC is intended to be a replacement for the Siemens® 505-6870 RBC. It provides the following functions:

- Compatible with CTI 2500 Series®, Simatic® 505, Siemens® S5 and S7 masters
- Can be used in currently-available CTI and Siemens® 4-, 8-, and 16-slot bases
- Supports communication speeds from 9.6 Kbaud (maximum cable distance per segment: 1200 m) up to 12 Mbaud (maximum cable distance per segment: 100 m).
- Includes an LED display which shows error codes or current station address.
- Configurability using the Siemens® 505-6870 "gsd" file or the new CTI 2500-RBC "gsd" file which can be downloaded from our web site

The 2500-RBC resides in CTI 2500 Series® or Simatic® 505 base. It installs in the second slot from the left, adjacent to the power supply module.

Figure 1. 2500-RBC Front Panel

CHAPTER 2. INSTALLATION

The installation of the Model 2500-RBC Profibus Remote Base Controller consists of the following steps:

1)   Planning the installation,
2)   Verifying power requirements
3)   Unpacking and configuring the module,
4)   Physical installation,
5)   Connecting cables,
6)   Checking the module operation.

2.1. Installation Planning

Choosing Profibus Media

The 2500-RBC attaches directly to the Profibus-DP RS485 cable using a DB9 connector. The Profibus organization recommends using bus cable as specified in EN 50170 part 8-2 and "Cable Type A", and should comply with the parameters below. An example cable of this type would be Belden 3079A.

Cable Specification – Profibus DP	
Impedance	135 to 165Ω / 3 to 20 MHz
Capacitance	< 30 pf / m
Resistance	< 110 Ω / km
Wire gauge	> 0.64 mm
Conductor area	> 0.34 mm2

For more information on Profibus installation guidelines, see Appendix A.

Wiring the Profibus Connector

The Profibus connector should be wired as shown in Section 2.6. For more information, refer to Appendix A.

Selecting a Profibus Address

Before proceeding, you must determine what Profibus address you will assign to the module. Profibus addresses range from 0 to 127. In CTI 2500 Series® and Simatic® 505 systems, address 0 and addresses 113-127 are not valid. Therefore, any address between 1 and 112 is valid for the RBC when installed in these systems. Note that each slave node and the master must have a unique address on the bus.

Selecting a Profibus Speed

The 2500-RBC supports Profibus speed from 9.6K bits/s to 12M bits/s. For more information on selecting Profibus speed see Appendix A.

Selecting Slave Parameters

The 2500-RBC supports four parameterization options. These options are set using WorkShop, or using the "properties" screen for the remote base in Com Profibus. For more information about these settings, see "Setting Software Parameters in Com Profibus" in Section 2.4.

Setting Module Hardware Options

In addition to the Profibus address, the module includes a hardware setting for selecting the state of the base discrete outputs in the event of a communications loss. The module can be configured to set all outputs off, or to leave outputs at their last values.

2.2. Power Requirements

The CTI 2500-RBC module consumes 2.5 watts of +5 VDC power from the backplane. Before installing the RBC, verify that your mounting base power budget can accommodate the required power. A good tool for performing the verification is the CTI Replacement Guide and Power Calculator, available from our website at

www.controltechnology.com

On the main page you will find a selection for the "Selection to CTI Replacement Calculator". This is an excel file. Once downloaded you will open the file as a spread sheet. At the bottom of the spread sheet you will find tabs for Instructions, Replacement Calculator and Power Calculator. Click on the Power Calculator tab and follow the instructions.

2.3. Unpacking the Module

Open the shipping carton and remove the special anti-static bag that 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 base.

CAUTION:
The components on the 2500-RBC 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 and when handling the printed circuit card during configuration.

2.4. Configuring the Module

There are six steps to configuring the module and getting it operational on a Profibus network:

1. Setting the module option switches
2. Setting the output state on communication loss (freeze jumper)
3. Setting software parameters in WorkShop or Com Profibus
4. Configuring the remote base in in WorkShop or Com Profibus
5. Exporting a binary configuration file (Com Profibus only)
6. Merging the configuration file into the Profibus master (Com Profibus only)

For detailed information on using Com Profibus to configure a remote base with the 2500-RBC, refer to Chapter 3.

Setting the Module Option Switches

Switches on the 2500-RBC are used to select the following

- Serial Port Baud Rate
- Profibus Address
- Display mode

option switches   **freeze jumper setting**

Figure 2. Switch Locations

Figure 2 indicates the location of the option switches and freeze jumper.   The remainder of this section describes the function of the individual switches.

SW1 through SW3 – Serial Port Baud Rate.

Switches 1-3 are used for setting the baud rate of the serial port. Serial port operations are not currently implemented in the product.

Baud rate	SW1	SW2	SW3
38400	0	0	1
19200	1	1	1
9600	1	1	0
2400	1	0	0
1200	0	1	0
300	0	0	0
Invalid	0	1	1
Invalid	1	0	1

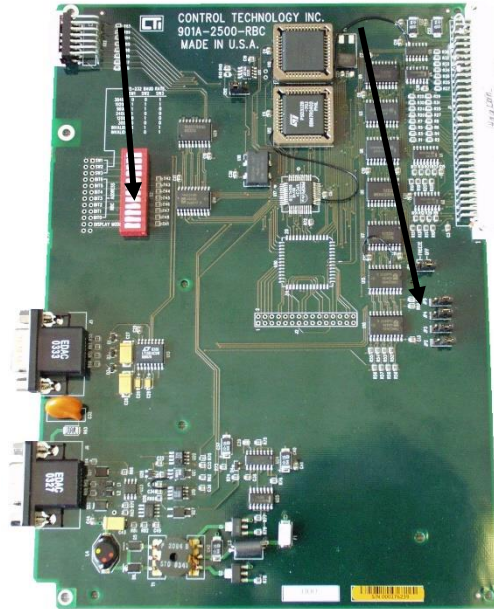*SW4 through SW10 - Profibus Address*

Switches 4 through 10 are used to assign a station address to the RBC for identification on the Profibus-DP I/O channel. Each station in the Profibus network must be uniquely numbered. The station address is assigned as a binary number, with SW4 and the most significant bit (MSB) and SW10 as the least significant (LSB). The table below shows how to set the dipswitch to a station address between 0 and 125. Note that a switch in the "open" position=1 and a switch in the "closed" position=0.

Table 1. Profibus Station Address Settings

Station Address	Switch Number / State							Station Address	Switch Number / State						
	4	5	6	7	8	9	10		4	5	6	7	8	9	10
0*(Master Address)	0	0	0	0	0	0	0	32	0	1	0	0	0	0	0
1	0	0	0	0	0	0	1	33	0	1	0	0	0	0	1
2	0	0	0	0	0	1	0	34	0	1	0	0	0	1	0
3	0	0	0	0	0	1	1	35	0	1	0	0	0	1	1
4	0	0	0	0	1	0	0	36	0	1	0	0	1	0	0
5	0	0	0	0	1	0	1	37	0	1	0	0	1	0	1
6	0	0	0	0	1	1	0	38	0	1	0	0	1	1	0
7	0	0	0	0	1	1	1	39	0	1	0	0	1	1	1
8	0	0	0	1	0	0	0	40	0	1	0	1	0	0	0
9	0	0	0	1	0	0	1	41	0	1	0	1	0	0	1
10	0	0	0	1	0	1	0	42	0	1	0	1	0	1	0
11	0	0	0	1	0	1	1	43	0	1	0	1	0	1	1
12	0	0	0	1	1	0	0	44	0	1	0	1	1	0	0
13	0	0	0	1	1	0	1	45	0	1	0	1	1	0	1
14	0	0	0	1	1	1	0	46	0	1	0	1	1	1	0
15	0	0	0	1	1	1	1	47	0	1	0	1	1	1	1
16	0	0	1	0	0	0	0	48	0	1	1	0	0	0	0
17	0	0	1	0	0	0	1	49	0	1	1	0	0	0	1
18	0	0	1	0	0	1	0	50	0	1	1	0	0	1	0
19	0	0	1	0	0	1	1	51	0	1	1	0	0	1	1
20	0	0	1	0	1	0	0	52	0	1	1	0	1	0	0
21	0	0	1	0	1	0	1	53	0	1	1	0	1	0	1
22	0	0	1	0	1	1	0	54	0	1	1	0	1	1	0
23	0	0	1	0	1	1	1	55	0	1	1	0	1	1	1
24	0	0	1	1	0	0	0	56	0	1	1	1	0	0	0
25	0	0	1	1	0	0	1	57	0	1	1	1	0	0	1
26	0	0	1	1	0	1	0	58	0	1	1	1	0	1	0
27	0	0	1	1	0	1	1	59	0	1	1	1	0	1	1
28	0	0	1	1	1	0	0	60	0	1	1	1	1	0	0
29	0	0	1	1	1	0	1	61	0	1	1	1	1	0	1
30	0	0	1	1	1	1	0	62	0	1	1	1	1	1	0
31	0	0	1	1	1	1	1	63	0	1	1	1	1	1	1

Table 1. Profibus Station Address Settings

Station Address	Switch Number / State							Station Address	Switch Number / State						
	4	5	6	7	8	9	10		4	5	6	7	8	9	10
64	1	0	0	0	0	0	0	95	1	0	1	1	1	1	1
65	1	0	0	0	0	0	1	96	1	1	0	0	0	0	0
66	1	0	0	0	0	1	0	97	1	1	0	0	0	0	1
67	1	0	0	0	0	1	1	98	1	1	0	0	0	1	0
68	1	0	0	0	1	0	0	99	1	1	0	0	0	1	1
69	1	0	0	0	1	0	1	100	1	1	0	0	1	0	0
70	1	0	0	0	1	1	0	101	1	1	0	0	1	0	1
71	1	0	0	0	1	1	1	102	1	1	0	0	1	1	0
72	1	0	0	1	0	0	0	103	1	1	0	0	1	1	1
73	1	0	0	1	0	0	1	104	1	1	0	1	0	0	0
74	1	0	0	1	0	1	0	105	1	1	0	1	0	0	1
75	1	0	0	1	0	1	1	106	1	1	0	1	0	1	0
76	1	0	0	1	1	0	0	107	1	1	0	1	0	1	1
77	1	0	0	1	1	0	1	108	1	1	0	1	1	0	0
78	1	0	0	1	1	1	0	109	1	1	0	1	1	0	1
79	1	0	0	1	1	1	1	110	1	1	0	1	1	1	0
80	1	0	1	0	0	0	0	111	1	1	0	1	1	1	1
81	1	0	1	0	0	0	1	112	1	1	1	0	0	0	0
82	1	0	1	0	0	1	0	113*							
83	1	0	1	0	0	1	1	114*							
84	1	0	1	0	1	0	0	115*							
85	1	0	1	0	1	0	1	116*							
86	1	0	1	0	1	1	0	117*							
87	1	0	1	0	1	1	1	118*							
88	1	0	1	1	0	0	0	119*			Invalid Addresses				
89	1	0	1	1	0	0	1	120*							
90	1	0	1	1	0	1	0	121*							
91	1	0	1	1	0	1	1	122*							
92	1	0	1	1	1	0	0	123*							
93	1	0	1	1	1	0	1	124*							
94	1	0	1	1	1	1	0	125*							

> *NOTE:*
> *The address setting on the 2500-RBC switches <u>must</u> match the address set for the base in WorkShop or Com Profibus for proper operation*

> *NOTE:*
> *When connecting the 2500-RBC to a CTI 2500 CPU or a 545/555/575 CPU, only addresses between 1 and 112 are valid.*

SW11 - Display Mode.   Switch 11 controls the display mode of the LED status display to show either the station address or the module status.

- When switch 11 is set to 1 (closed), the station address of the RBC is displayed as a three digit number, one digit at a time. There is a short pause after each digit, then a long pause after the last digit.

- When switch 11 is set to 0 (open), the status of the RBC is displayed according to the status codes below.

Display	Definition	Communications to RBC	Comment / Action
0	Module Ready	OK	Fully Operational and Online to Master.
1	Diagnostic Failure	None	Serious malfunction. Place system in safe state and consult CTI technical support
2	Module Mismatch	OK	I/O modules installed do not match the expected configuration in the master.
3	No Communications	None	There is no communication with the master. Place the system in a safe state. Check cabling and connection to the master.
7	No Configuration	OK	Enter a Profibus Configuration.
A	Diagnostic failure		Serious malfunction. Place system in safe state and consult CTI technical support.
b	RBC in wrong Slot (Rev 6.0 and >)	None	Insert RBC into Correct Slot.
E	Diagnostic failure	None	Serious malfunction. Place system in safe state and consult CTI technical support.
.	50X Ignore Mismatch is enabled	OK	The "." Character is turned on in conjunction with the other displayed number when the 50X Ignore Mismatch parameter is enabled.

SW12 – Reserved. This switch position is reserved for future use.

NOTE:
The Option switches are read only at module startup. If you change the switch position after startup, you must reset the module before the setting will take effect.

Setting the Output State on Communications Loss

When I/O channel communication to a remote base is lost, the state of the discrete outputs is determined by the selection made on the 2500-RBC jumper JP1 (Off/Freeze). Figure 2 shows the location of the jumper on the 2500-RBC.

> *NOTE:*
> *The 2500-RBC ships with the FREEZE jumper in the OFF setting.*

> *NOTE:*
> *If the jumper JP1 is missing from the board, the 2500-RBC defaults to the OFF setting.*

For discrete output modules, the state of the outputs is determined solely by the position of the Off/Freeze jumper JP1 on the 2500-RBC.

For analog/word output modules, the state of the outputs is influenced not only by the position of the Off/Freeze jumper but by the output module's (Zero/Hold Last Value) selection, if the module has that option. See the table below.

RBC Off/Freeze Selection	Analog/Word Module Zero/Hold Selection	Analog/Word Output State
Off	Zero	Zero*
Off	Hold Last Value	Last Value
Off	No selection	Last Value
Freeze	Zero	Last Value
Freeze	Hold Last Value	Last Value
Freeze	No selection	Last Value
*see the user manual of your analog/word output module for details		

Notice that the Freeze option on the RBC overrides the Zero selection on the analog/word output module; likewise, when Hold Last Value is selected on the analog/word output module, that selection overrides the "Off" option on the RBC jumper.

Setting Software Parameters in WorkShop or Com Profibus

The 2500-RBC has parameters that are specified using the Com Profibus configuration utility software. Refer to the Chapter 3 for information about using Com Profibus. The paragraphs below describe the parameters used to set up the 2500-RBC.

The **Discrete I/O Interval** parameter defines the rate in milliseconds at which the 2500-RBC updates I/O modules. This parameter specifies the minimum time between updates of the discrete I/O modules. Valid values are 1-255 and the default value is 1.

The **Word I/O Update Factor** controls how often the word I/O modules are updated. The Word I/O Factor is the number of discrete I/O updates performed per word update; for example, if the factor is 2, the word I/O modules are updated on every second discrete I/O update. Valid values are 1-255 and the default value is 2.

The **50X Ignore Mismatch Mode** parameter allows you to select the way I/O configuration mismatches are handled. With the default setting, "Disable," the 2500-RBC handles I/O configuration mismatches according to DP Standard mode, meaning that the configuration sent by the CPU to the RBC must match the actual base configuration exactly, or else no I/O updates are performed. If you enable 50X Ignore Mismatch Mode, the RBC performs updates with all modules whose configuration matches, omitting only those modules whose configuration does not match. This mode of operation does not conform to the DP Standard. For detailed information about how mismatches are indicated and handled, see Section 2.8.

Configuring the Remote Base in WorkShop or Com Profibus

The remote base must be configured in WorkShop or Com Profibus to describe to the Profibus Master which I/O modules are installed. In Com Profibus, this configuration is done using the "Properties" / "Configure" / "Module" dialog. For each slot in the base, simply select the installed CTI or Siemens® I/O module from the list. For more information or if you're using WorkShop, see Chapter 4.

Exporting a Binary Configuration File from Com Profibus

Once the RBC has been parameterized and configured in Com Profibus, a binary file is exported which contains the configuration information. This file is used for setup of the Profibus Master. For more information, see Chapter 3. This export step is not required when using WorkShop.

Merging the Configuration File into the Profibus Master

The exported binary file must be merged with the Profibus Master to bring in the I/O configuration of the remote base. For more information about Merging the configuration file in Workshop (when using the 2500-RBC with CTI 2500 Series® or Simatic® 505 PLC's), see Chapter 3. This merge step is not required when using WorkShop.
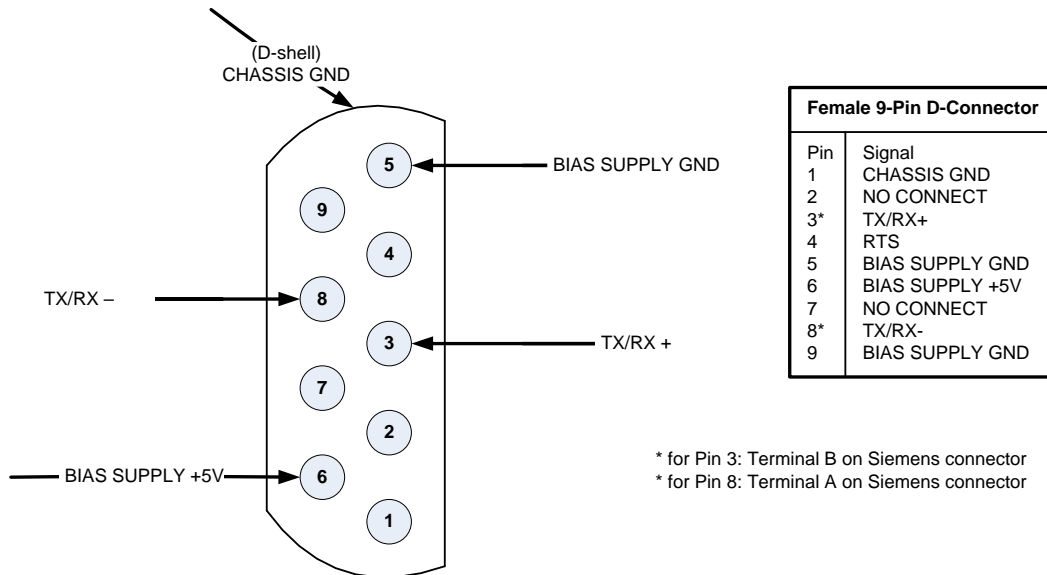
2.5. Physical Installation

To insert the module into the I/O base, hold the top and bottom of the bezel and slide the module carefully into the slot, pushing it all the way into the base. If you have inserted the module correctly, you will feel a slight increase in resistance as the module mates with the base backplane connector. Once the module is fully seated in the slot, tighten the captive screws at the top and bottom to hold the module in place. To remove the module from the I/O base, loosen the captive screws, then move the module. Take care not to damage the connector at the back of the module when inserting or removing the module.

2.6. Connecting the Profibus Cable

The Profibus port is used to connect the 2500-RBC to a Profibus DP network. Appendix A describes how to connect a 12 Mbaud RS-485 cable to the PROFIBUS-DP port. The figure below shows the required pinout for the DB9 Profibus port.

> *NOTE:*
> *NOTE: Pins 2 and 7 are "No Connect" for the RBC. For some PROFIBUS products, these pins are used to provide 24 VDC for powering a programming or configuration tool. Such tools are not powered by the RBC; however, it is acceptable for an externally-powered PROFIBUS programming or configuration tool to drive pins 2 and 7 to 24 VDC.*

(D-shell)
CHASSIS GND

BIAS SUPPLY GND

TX/RX –

TX/RX +

BIAS SUPPLY +5V

Female 9-Pin D-Connector

Pin	Signal
1	CHASSIS GND
2	NO CONNECT
3*	TX/RX+
4	RTS
5	BIAS SUPPLY GND
6	BIAS SUPPLY +5V
7	NO CONNECT
8*	TX/RX-
9	BIAS SUPPLY GND

* for Pin 3: Terminal B on Siemens connector
* for Pin 8: Terminal A on Siemens connector

> *CAUTION:*
> *Pin 5 (BIAS SUPPLY +5V) and Pin 6 (BIAS SUPPLY GND) on the Profibus-DP connector are designed to support termination of the Profibus-DP cable only. These pins have a limited output power capability of approximately 0.45W. Overloading these pins by using the voltage to drive other than the normal terminating resistors can cause internal component damage to the 2500-RBC.*

2.7. Diagnostics

The standard for PROFIBUS-DP I/O, DIN 19245, Part 3, stipulates the format that each DP slave shall use to report specific diagnostics to the DP master. The diagnostics used by the PROFIBUS-DP RBC are described below.

NOTE: Byte 1 through Byte 15, as described in this text, correspond to Octet 1 through Octet 15 in the PROFIBUS standard. For PROFIBUS-DP I/O, Bit 7 is the most significant bit (MSB), 0 is the least significant bit (LSB). This may or may not correspond to the bit numbering scheme used in your master system. For example, CTI 2500 Series® and Simatic® 505/500 controllers identify the MSB of a byte as Bit 1, and the LSB of a byte as Bit 8. A DP diagnostic consists of two parts. The first part (Bytes 1 through 6) is standardized for all DP slaves. The second, or extended, part (Bytes 7 through 15 in the case of the RBC) is slave-specific. In the description that follows, it is assumed that the diagnostic has been successfully read from an RBC that has been configured and activated: that is, that Bytes 5 and 6 equal 0xBC and 0xD0, respectively.

2.8. Base Mismatch Handling in the 2500-RBC

The 2500-RBC automatically detects mismatches between the Profibus configuration expected by the Profibus Master and the actual remote base configuration. Depending on the type of mismatch and the configuration settings, the 2500-RBC can operate normally or go offline and indicate a mismatch. The table below shows the response of the 2500-RBC under various conditions.

2500-RBC Mismatch Handling		
50X Ignore Mismatch Mode = disabled		
Action	*Display*	*Outputs*
Remove a module	2	Follow "freeze" jumper setting
Add a module to an open slot	0	Normal operation. The inserted module is ignored.
Replace a module with a different one	2	Follow "freeze" jumper setting
50X Ignore Mismatch Mode = enabled		
Action	*Display*	*Outputs*
Remove a module	2.	All other slots operate normally
Add a module to an open slot	0.	The inserted module is ignored, all other slots operate normally
Replace a module with a different one	2.	The inserted module is ignored, all other slots operate normally

2.9. Differences Between the 2500-RBC and the 505-6870

There are minor differences between the 2500-RBC and the 505-6870 which may affect some user applications. The differences are summarized below:

Display – Status Codes "4", "5", "6", "8", and "C" listed on the front panel of older 2500-RBC's are not used. Rev 6.0 and newer 2500-RBC's use codes "A" or "E For diagnostic failures, they also display a code "2" to indicate the user has an incorrect module inserted in a configured slot when 50X Ignore Mismatch is disabled. A "b" indicates the RBC is inserted into the wrong slot.

Reset switch – the 2500-RBC does not include a reset switch.

RS232 port – the 2500-RBC includes an RS232 port, but communication with the PLC using this port is not presently implemented. Future versions of the product may contain this feature.

Mismatch handling

When 50X Ignore Mismatch is disabled and a module is inserted into an empty slot, the 2500-RBC ignores the inserted module and continues normal operation. The 505-6870 considers this situation a mismatch and takes the base offline.

When 50X Ignore Mismatch is disabled and the wrong module is inserted into a configured slot, the 2500-RBC displays a "2", takes the base offline, and sets outputs based on the freeze jumper setting. The 505-6870 displays a "2" and takes the base offline.

When 50X Ignore Mismatch is enabled and a module is inserted into an empty slot, the 2500-RBC ignores the inserted module and continues normal operation. The 505-6870 displays a "2", ignores the inserted module, and continues normal operation.

When Profibus is stopped from the PLC, the 2500-RBC displays a "3", sets outputs based on the freeze jumper setting, and turns inputs off. The 505-6870 displays a "3", sets outputs based on the freeze jumper setting, and <u>leaves inputs at their last state</u>.

2.10. Diagnostics

The 2500-RBC provides diagnostic information in the PLC available in status words and through execution of the RSD instruction in the ladder logic.

PLC Status Words

NOTE: For more information on STW diagnostics, see the CTI 2500 Series® Programming Reference Manual, Appendix A.

STW147:
This PLC status word records the number of times, since the most recent start, that the Profibus-DP slaves have failed to respond to a request from the CPU. Each time communication is lost to the 2500-RBC, STW147 increments by 1. When there is a base mismatch detected by the 2500-RBC, STW147 increments continuously.

STW03-STW09
These 7 status words give the status for Profibus-DP slaves. Each bit corresponds to a particular Profibus address, with STW03 Bit 16 being address 1 and STW09 Bit 1 being address 112. Each bit = 0 if the address is present and operating. The bit = 1 if the address is not present or failed. When the 2500-RBC loses communication or goes offline due to a mismatch, the corresponding bit for that address is set = 1.

STW211-STW217

These 7 status words contains the "enable" status of each Profibus address. If the slave is enabled, the bit = 1. If the slave is disabled, the bit = 0.

STW231 bits 1,2, and 16 indicate the OPERATE, CLEAR, and CONFIGURED state of the Profibus-DP I/O system.

STW232-STW238 indicate the Profibus-DP slave that have signaled a diagnostic that has not been read by an RSD instruction. The slave's bit is a 1 if a diagnostic has been signaled and not yet read.

Diagnostic Bytes from the 2500-RBC

When an RSD instruction is executed, the 2500-RBC returns 15 bytes of information which is stored according to the settings in the RSD instruction. In each byte, bit 7 is the MSB and bit 0 is the LSB.

Byte 1: Station_Status_1
Bit 7 = RBC parameterized from another master (see description of byte 4)
Bit 6 = Parameterization error
Bit 5 = Invalid response from RBC (always set to 0)
Bit 4 = Unsupported function request from RBC
Bit 3 = Extended diagnostics (bytes 7-15) present
Bit 2 = Configuration error
Bit 1 = RBC not ready
Bit 0 = RBC did not respond

Byte 2: Station_Status_2
Bit 7 = RBC is configured but not active (RBC can only set this to 0)
Bit 6 = Reserved
Bit 5 = RBC is operating in SYNCHRONOUS mode
Bit 4 = RBC is operating in FREEZE mode
Bit 3 = Reserved
Bit 2 = Always set to 1
Bit 1 = Always set to 0
Bit 0 = RBC waiting for parameterization

Byte 3: Station_Status_3
Bit 7 = Always set to 0
Bit 6 = Reserved
Bit 5 = Reserved
Bit 4 = Reserved
Bit 3 = Reserved
Bit 2 = Reserved
Bit 1 = Reserved
Bit 0 = Reserved

Byte 4: Diag.Master_Add
Bits 7-0 contain the address of the master that has parameterized the RBC. If none of the masters has parameterized the RBC, then the RBC inserts the address 255 in this byte.

Bytes 5-6: Ident_Number
Manufacturer identifier for the RBC. The 2500-RBC reports BCD0 for this value.

Byte 7: Ext_Diag_Data
Device-related diagnostic header; value is 0x06.

Byte 8: Ext_Diag_Data
Bit 7 = Reserved
Bit 6 = Reserved
Bit 5 = Reserved
Bit 4 = Reserved
Bit 3 = Reserved
Bit 2 = Reserved
Bit 1 = Reserved
Bit 0 = Remote port request pending

Bytes 9-10: Ext_Diag_Data
Reserved

Byte 11: Ext_Diag_Data
Bit 7 = Slot 8 is mismatched type
Bit 6 = Slot 7 is mismatched type
Bit 5 = Slot 6 is mismatched type
Bit 4 = Slot 5 is mismatched type
Bit 3 = Slot 4 is mismatched type
Bit 2 = Slot 3 is mismatched type
Bit 1 = Slot 2 is mismatched type
Bit 0 = Slot 1 is mismatched type

Byte 12: Ext_Diag_Data
Bit 7 = Slot 16 is mismatched type
Bit 6 = Slot 15 is mismatched type
Bit 5 = Slot 14 is mismatched type
Bit 4 = Slot 13 is mismatched type
Bit 3 = Slot 12 is mismatched type
Bit 2 = Slot 11 is mismatched type
Bit 1 = Slot 10 is mismatched type
Bit 0 = Slot 9 is mismatched type

Byte 13: Ext_Diag_Data

Identifier-related diagnostic header; value is 0x43.

Byte 14: Ext_Diag_Data
Bit 7 = Slot 8 contains failed module or is mismatched type
Bit 6 = Slot 7 contains failed module or is mismatched type
Bit 5 = Slot 6 contains failed module or is mismatched type
Bit 4 = Slot 5 contains failed module or is mismatched type
Bit 3 = Slot 4 contains failed module or is mismatched type
Bit 2 = Slot 3 contains failed module or is mismatched type
Bit 1 = Slot 2 contains failed module or is mismatched type
Bit 0 = Slot 1 contains failed module or is mismatched type

Byte 15: Ext_Diag_Data
Bit 7 = Slot 16 contains failed module or is mismatched type
Bit 6 = Slot 15 contains failed module or is mismatched type
Bit 5 = Slot 14 contains failed module or is mismatched type
Bit 4 = Slot 13 contains failed module or is mismatched type
Bit 3 = Slot 12 contains failed module or is mismatched type
Bit 2 = Slot 11 contains failed module or is mismatched type
Bit 1 = Slot 10 contains failed module or is mismatched type
Bit 0 = Slot 9 contains failed module or is mismatched type

CHAPTER 3. SETTING UP THE 2500-RBC USING COM PROFIBUS

3.1. Overview

Configuration of the Profibus network can be accomplished using either PLC WorkShop™ for Siemens 505™ (version 4.32 or above) or the Com Profibus configuration utility.

If you're using PLC WorkShop™ for Siemens 505™, please refer to the "PLC Memory and I/O Configuration" of the WorkShop user manual for a complete discussion of Profibus network configuration.

If you're using Com Profibus, follow the procedure below:

The configuration utility Com Profibus is used to setup the 2500-RBC for operation with a CTI 2500 Series® or Simatic® 505 PLC or other Profibus master. Steps for configuration include.

1. Startup Com Profibus
2. Import 2500-RBC "gsd" file into Com Profibus
3. Set bus parameters
4. Add a master (CTI 2500-Cxxx or 505-CP1434-DP) to the system and set Profibus address
5. Add a 2500-RBC to the system
6. Configure the 2500-RBC
    a. Set address
    b. Set station name
    c. Parameterize
    d. Configure Slots
7. Save the Profibus configuration and Export the binary file
8. Merge the binary file in Workshop
9. Write the configuration to the bases
10. Set synchronous / asynchronous mode and Start Profibus

3.2. Startup Com Profibus

To begin configuration of the 2500-RBC, start the Com Profibus application. The window should look like this:
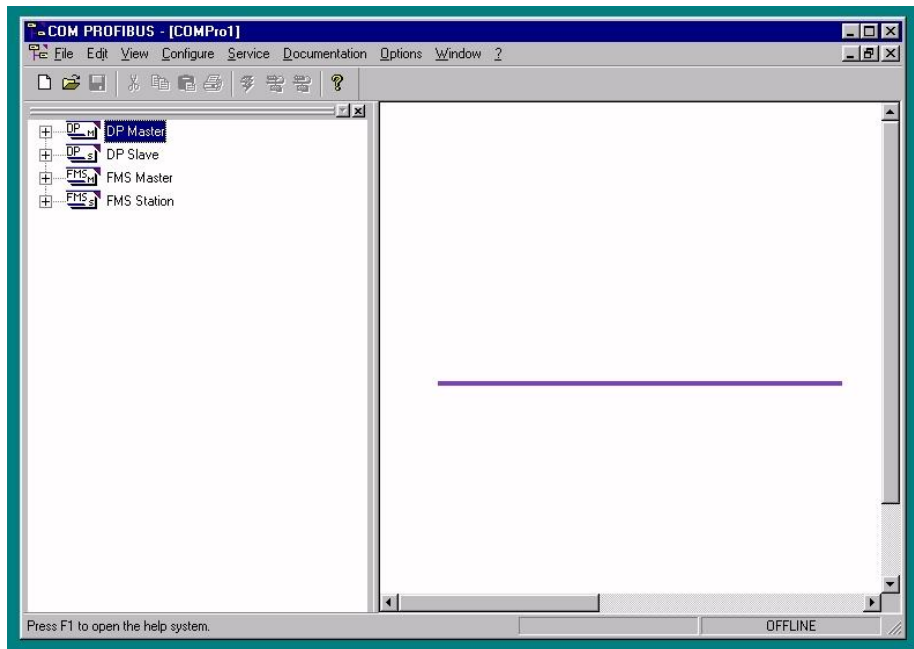
3.3. Import the 2500R.gsd file into Com Profibus

The next step is to copy the "2500.gsd" file into the Com Profibus directory. This file must be placed in the "gsd" subfolder where Com Profibus is installed on your hard drive. You can obtain the file from the CTI web site at:

www.controltechnology.com

On the main page go to the "Download" tab, once you have clicked on the tab scroll down the page and you will come to 2500-RBC (Classic) heading. Under this heading will be a list of .gsd files. Select the latest version to download.

Once the file is copied into the "gsd" subfolder, use "File / Read in GSD Files" to update Com Profibus with the new GSD file.
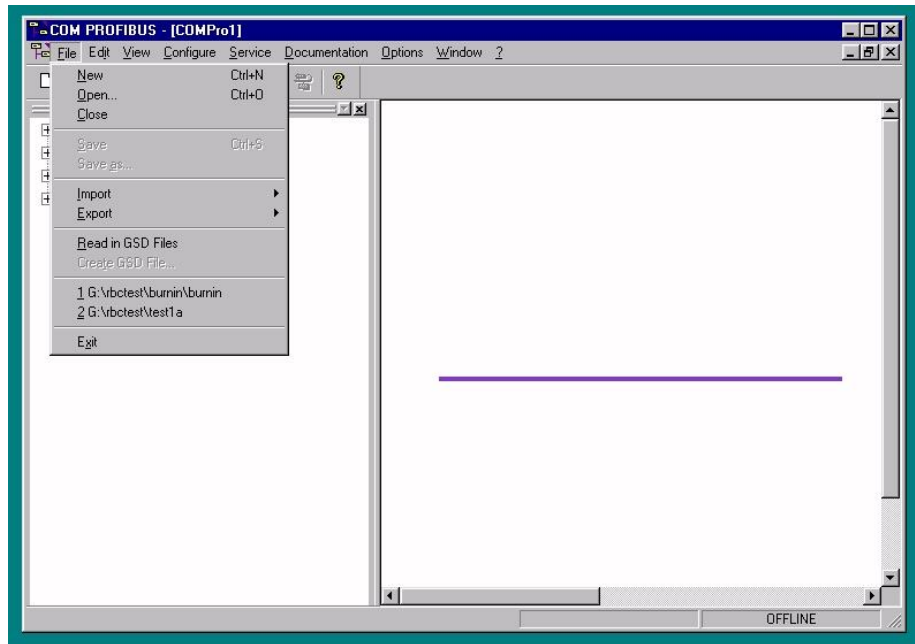
3.4. Set Bus Parameters

Next, set the Profibus speed for this installation using "Configure / Set Bus Parameters".
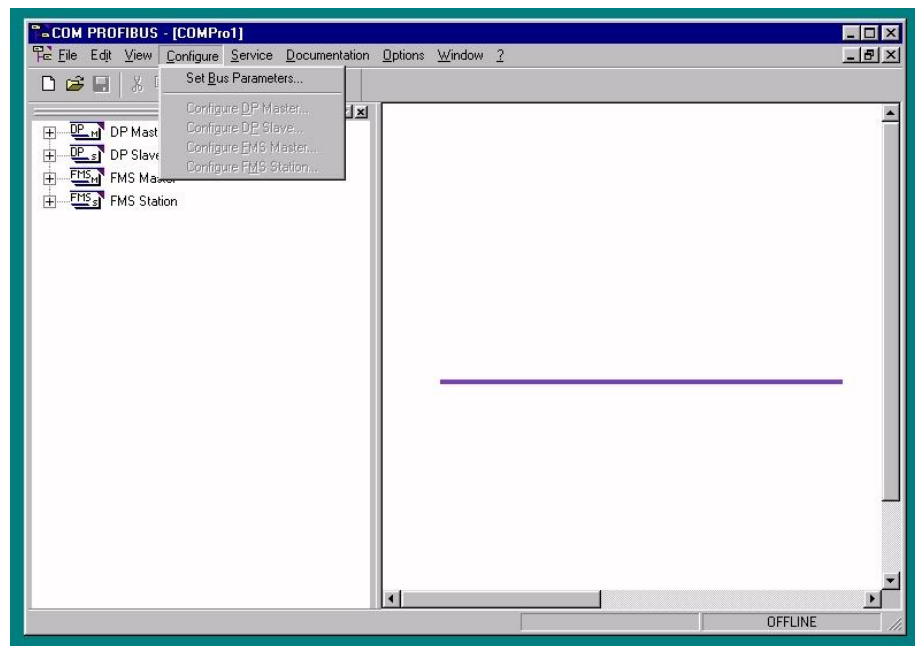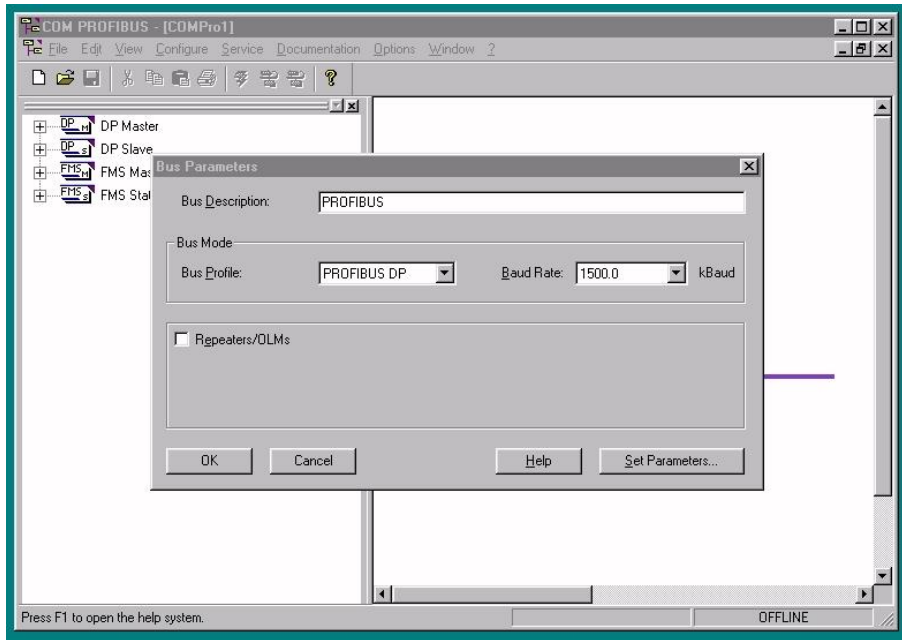
The "Bus Profile" setting should be "Profibus DP". Set the baud rate to your desired value.

3.5. Add a Master to the System and Set the Profibus Address.

Next, add a master (CTI 2500-Cxxx or 505-CP1434-DP) to the system and set Profibus address. Select the proper master from the list.
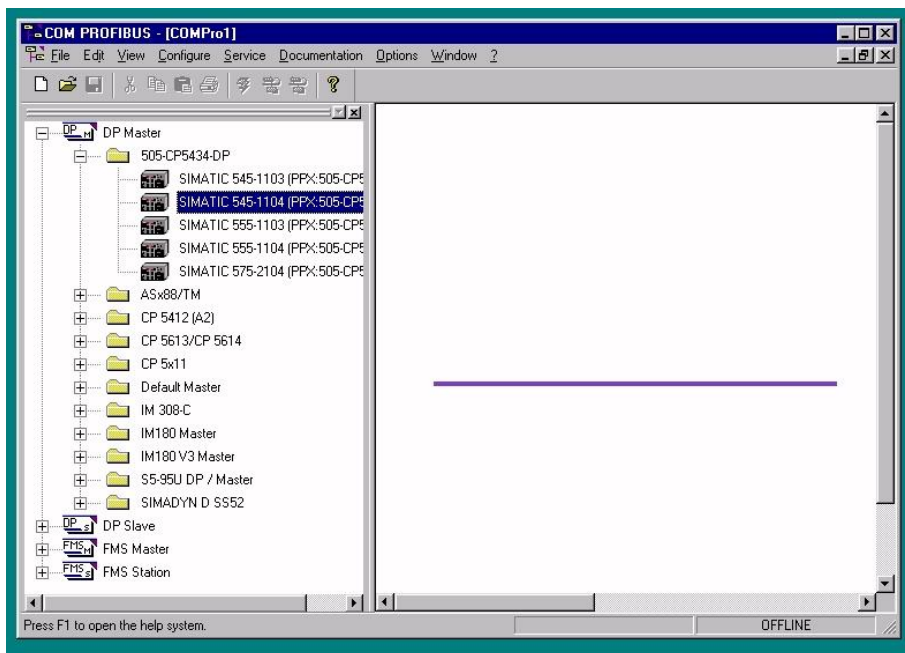
Click your selection and drag it over into the graphics window.
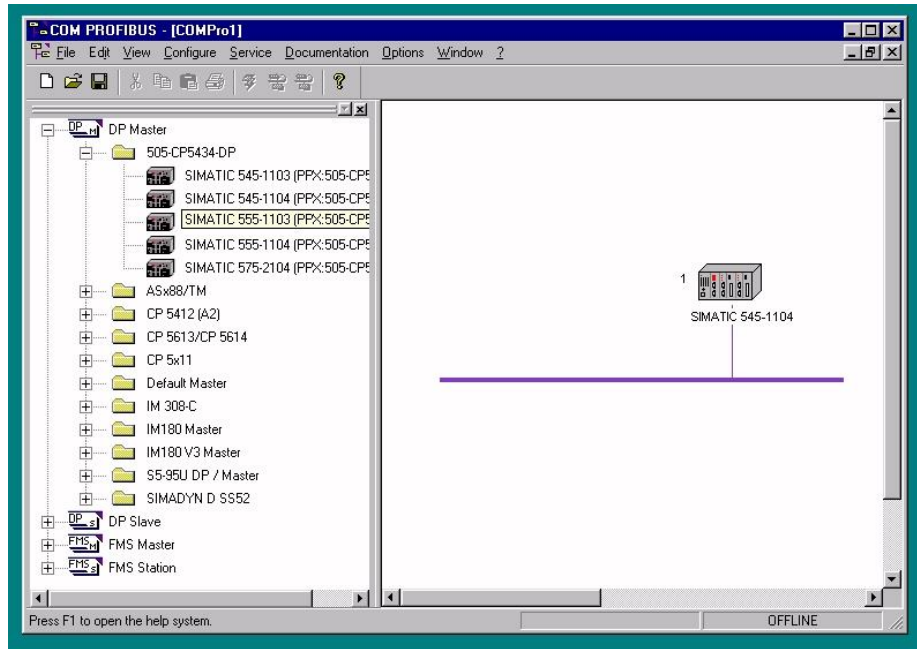
Next, highlight the PLC master and right click.
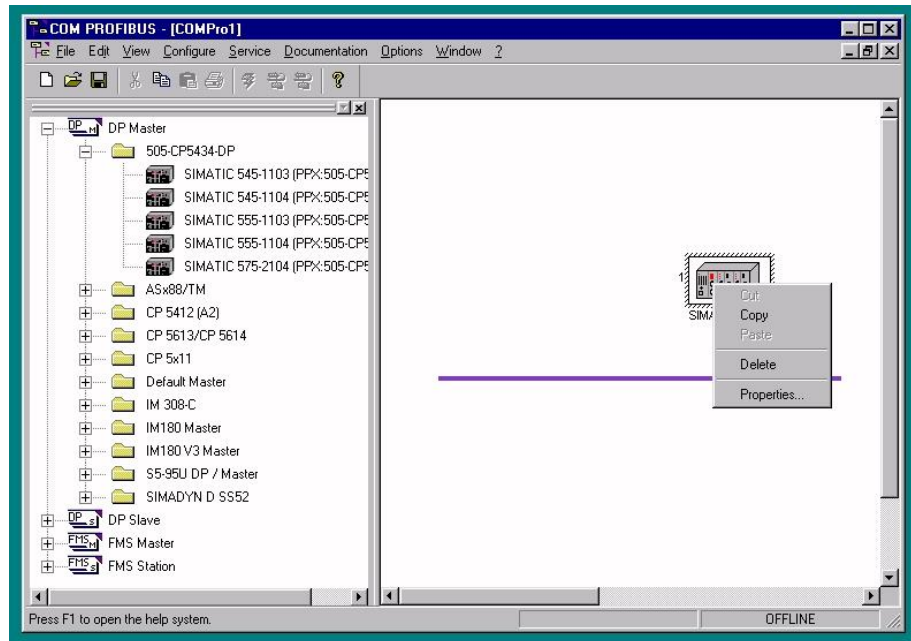
Then click "Properties" to set properties for this master.
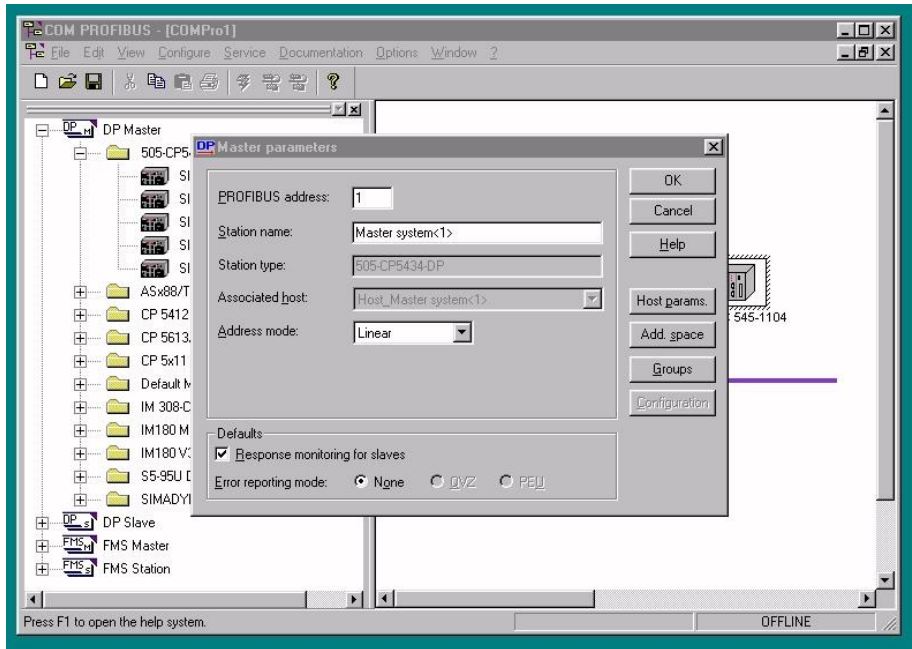
Now enter the Profibus address for this master and a station name. Press OK when finished.

Next, add the 2500-RBC to the system. Go to the "DP Slave – I/O – CTI" list and find the 2500-RBC.

CTI 2500-RBC Installation and Operation Guide V1.9
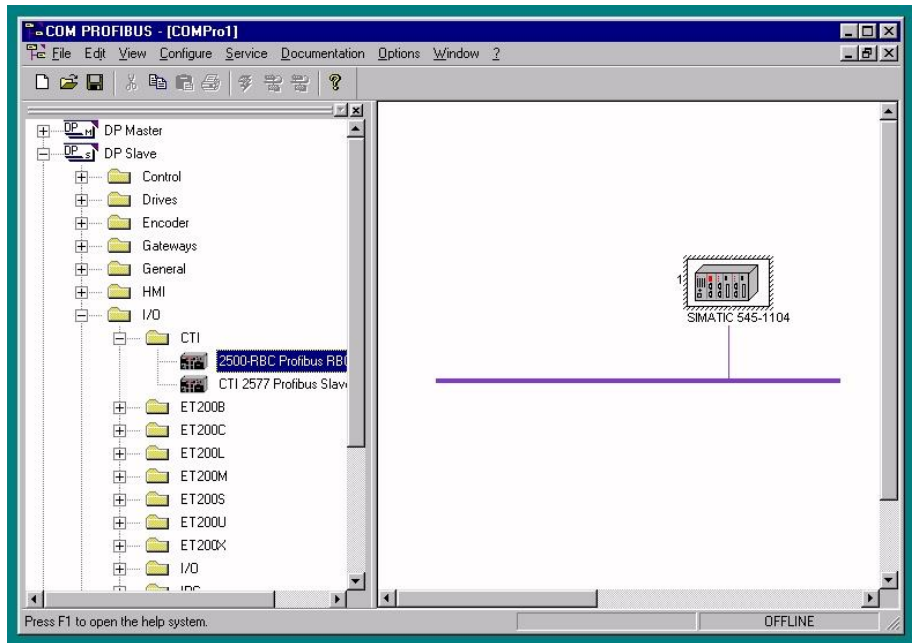
3.6. Add the 2500-RBC to the System

Click on the 2500-RBC and drag it into the graphics window.
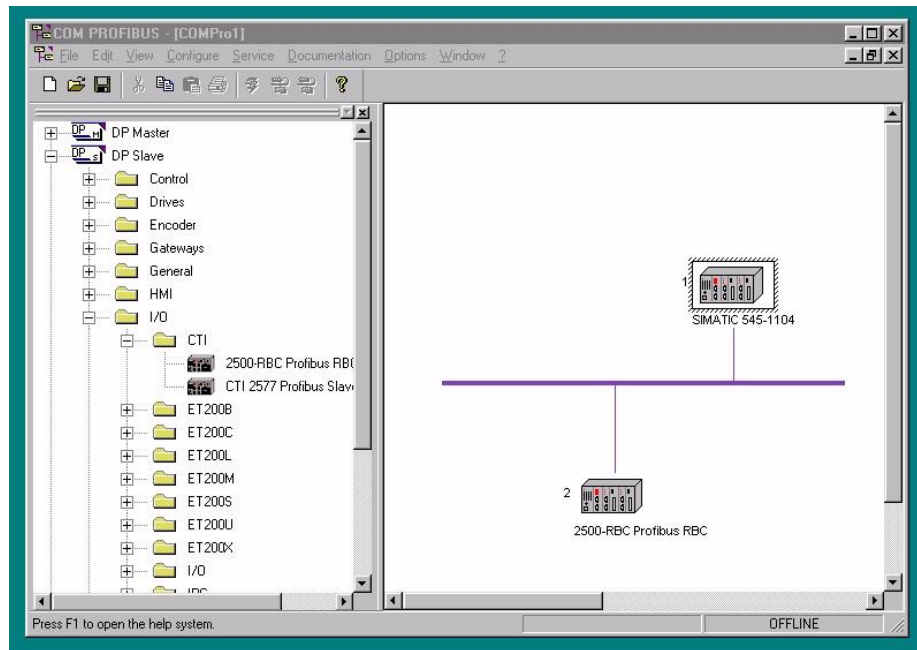
3.7. Configure the 2500-RBC

Now, configure the 2500-RBC. Highlight the RBC and right click.
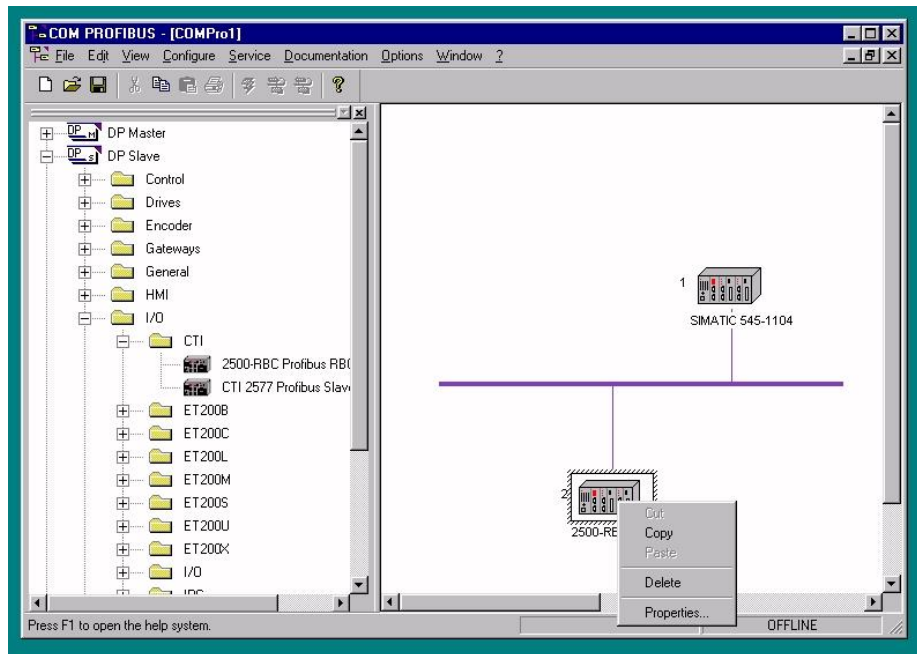
Then click on "Properties" to bring up the configuration dialog.
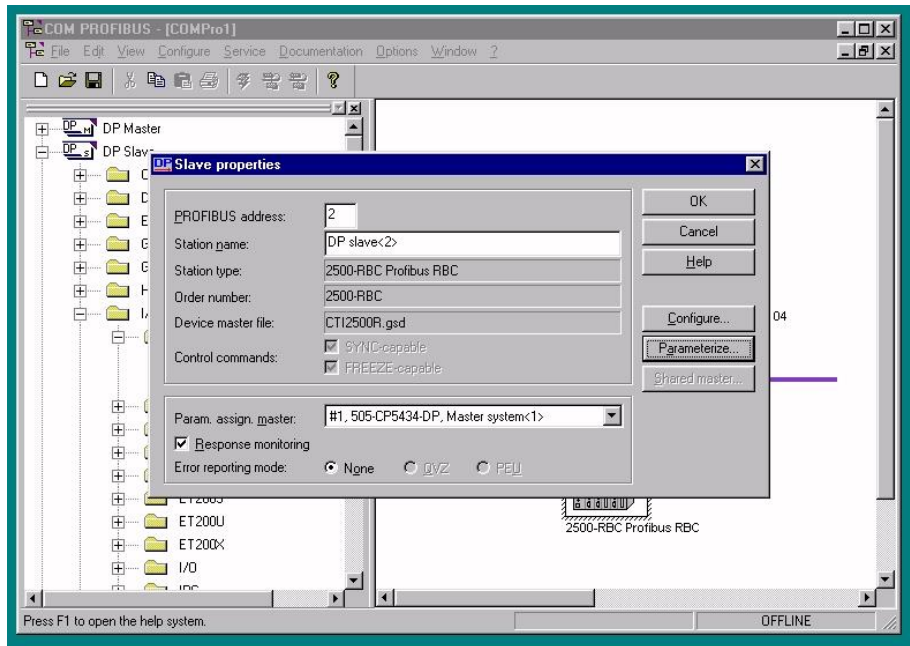
Enter the desired Profibus address and station name. Then click the "Parameterize" button.
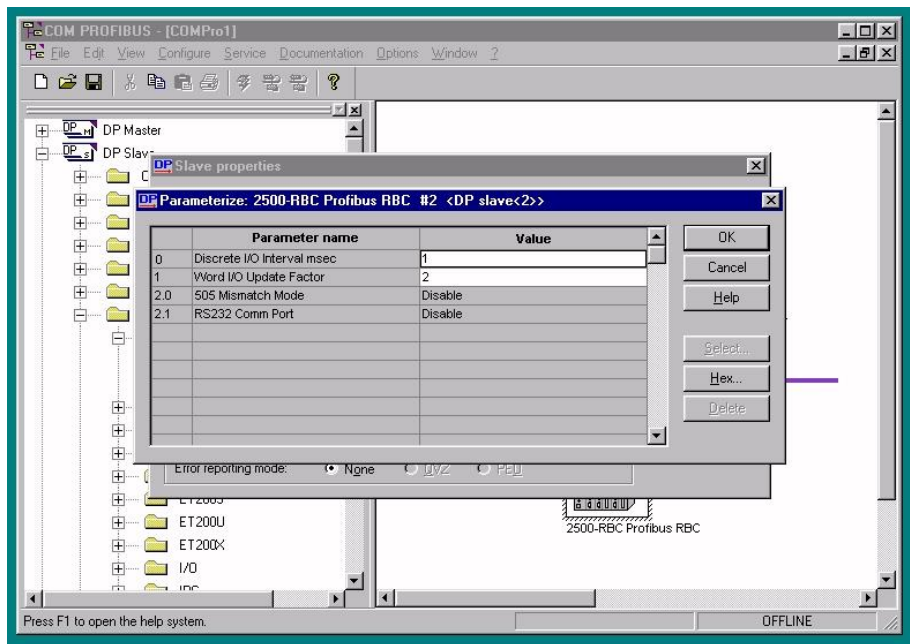
In the parameterize dialog box, enter your desired settings for the parameters. For more information, see "Setting Software Parameters in Com Profibus" in Chapter 2. Press OK when finished. Next press the "Configure" button to set up the I/O slots. For each slot, select the installed CTI or Siemens® module from the list. For blank slots, use the "blank panel" selection. Note that some CTI

discrete I/O modules support multiple login configurations for 32, 18, or 8 points. Be sure that you select the desired configuration if you're using these modules.
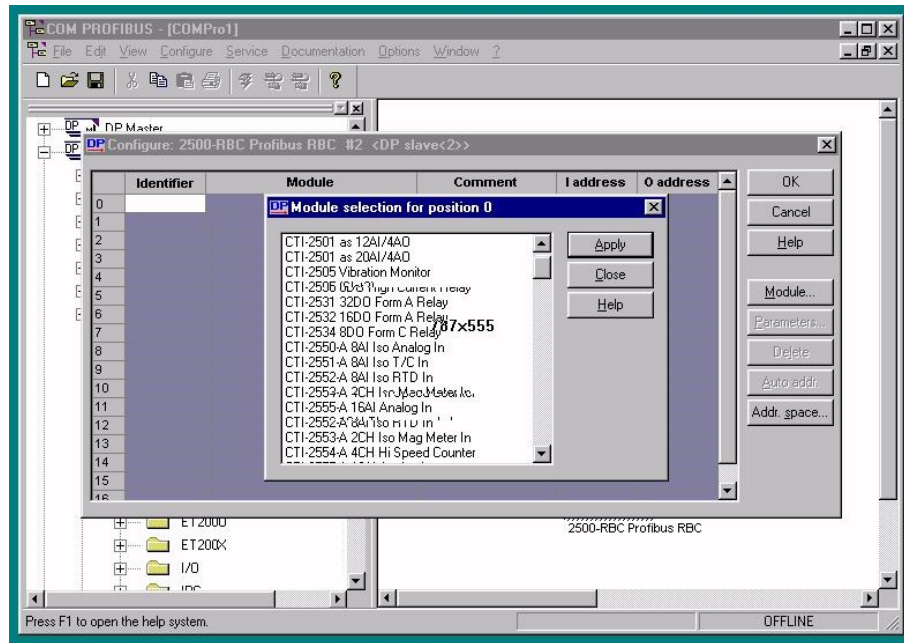
Next, press OK to exit the Configure screen and OK to exit the Slave Properties screen.

3.8. Save the Profibus Configuration and Export the Binary File

Make sure the Master is highlighted as show below by clicking on it, then use "File / Save" to save your project. Then use "Export / Binary File" to export a binary file for merging into the PLC. Save the file in a place where you can access it later with Workshop or TISOFT.
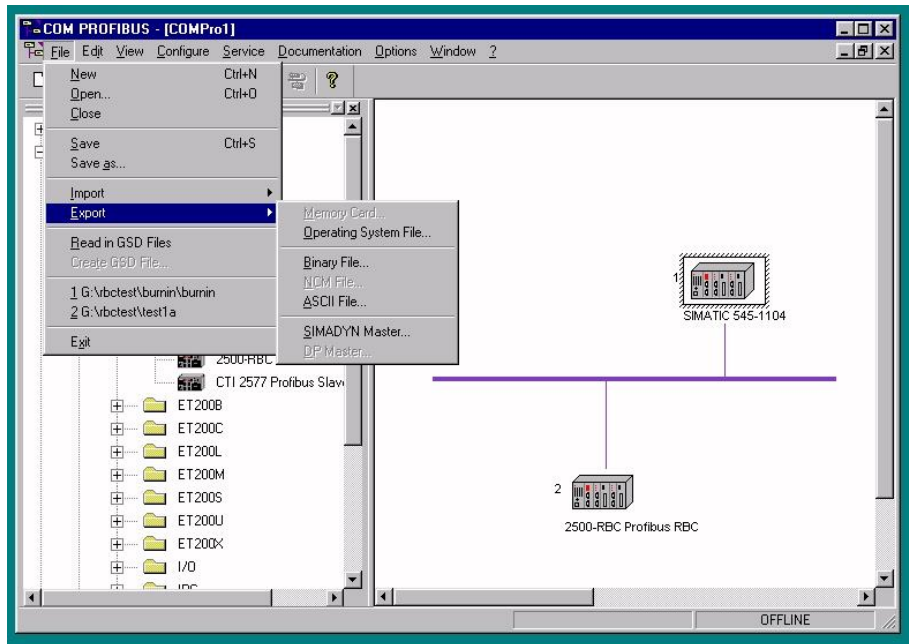
3.9. Merge the Binary File in Workshop

Next, start Workshop and go online with your PLC.
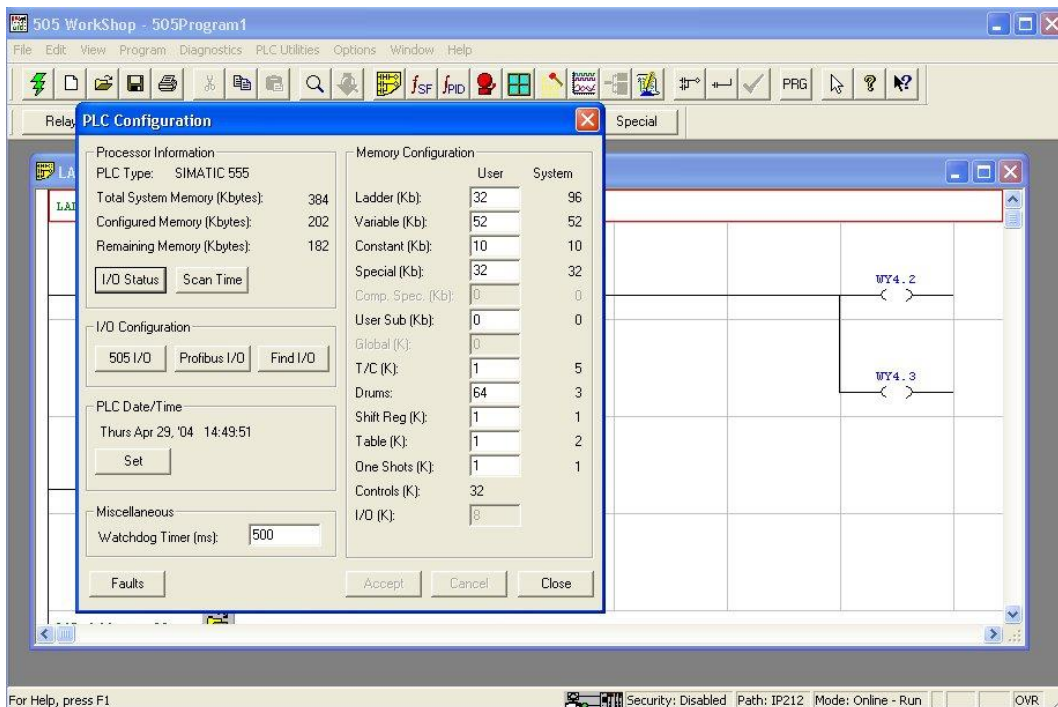
Use "PLC Utilities / PLC Configuration" to get to the configuration menu. Press the "Profibus I/O" button to configure Profibus.
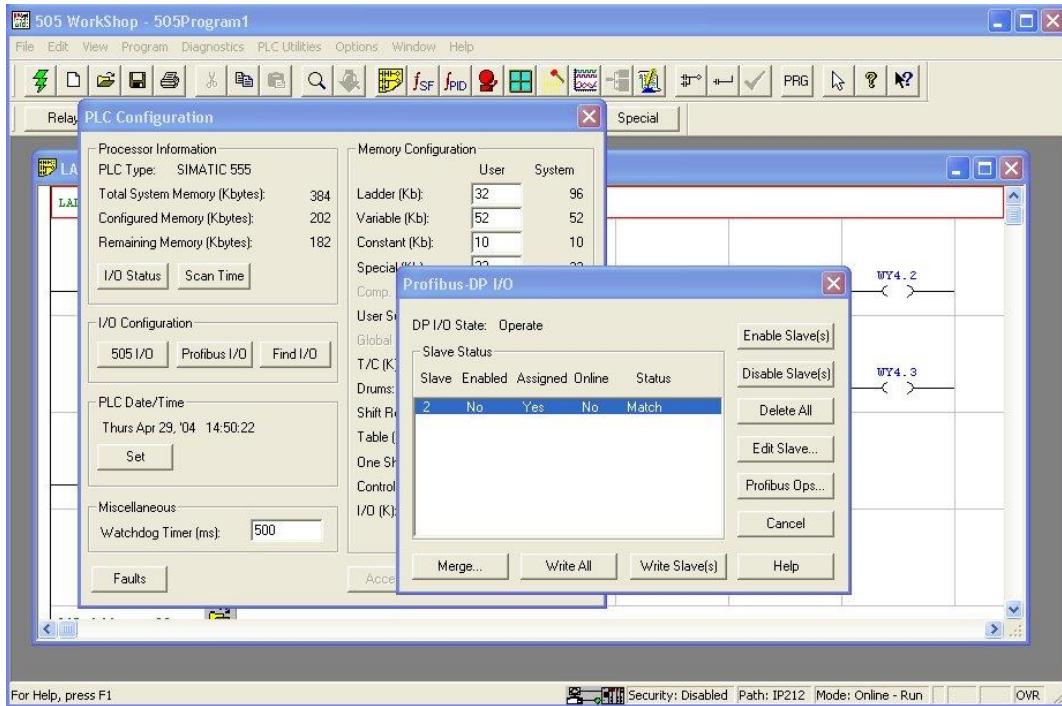
The system used in this example already has one Profibus slave installed. If you have no slaves installed yet, your "Slave Status" area will be blank. To merge in your binary file and add the base to your configuration, click the "Merge" button, then select the ".2bf" file that your created with Com Profibus "Export Binary File". Press OK and Workshop will read your file from disk and merge it into the PLC configuration.
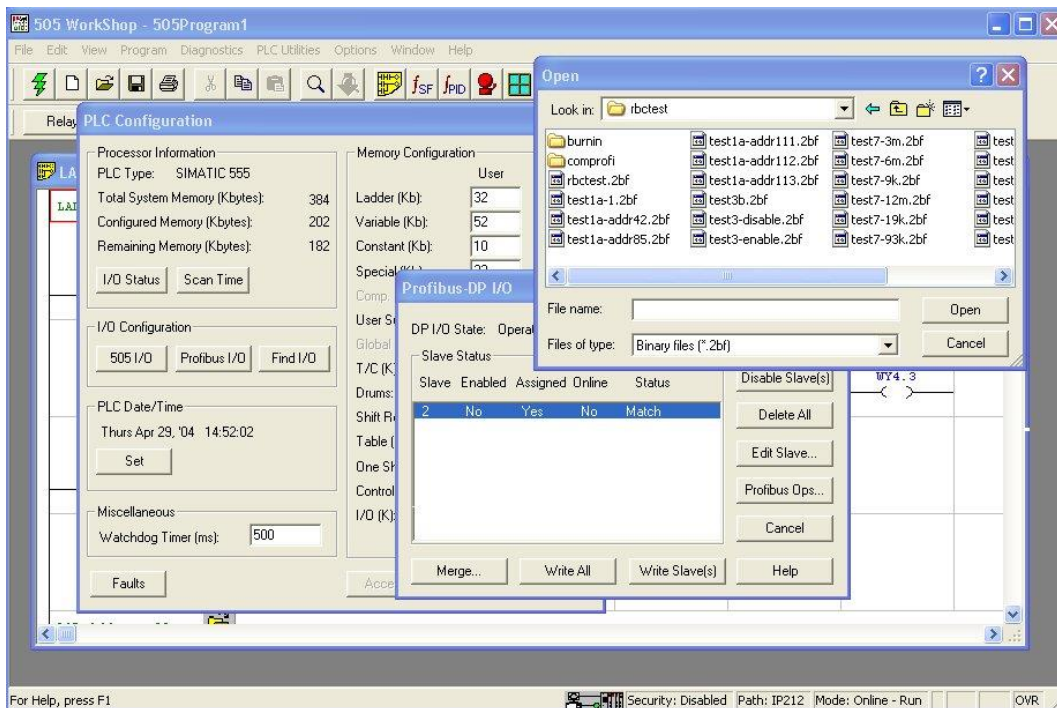
3.10. Write the Configuration to the Base(s)

You should already have installed the base and connected it to the Profibus.

Next, click the "Write All" button to write the configuration out to the RBC on Profibus. You may get a notification that the I/O is not configured. If so, use the "Edit Slave" button to set the starting addresses of the slots in the base. Once all the I/O is addressed, use the "Write All" button again. You may also need to Enable and Slaves that are showing "Disabled" in the status list.

3.11. Select Synchronous or Asynchronous and Start Profibus

Finally, use the "Profibus Ops" button to start Profibus ("Operate") and set Synchronous or Asynchronous mode as desired. When Profibus is set to Operate, the base should come online in the status screen. The display on the base should show "0".
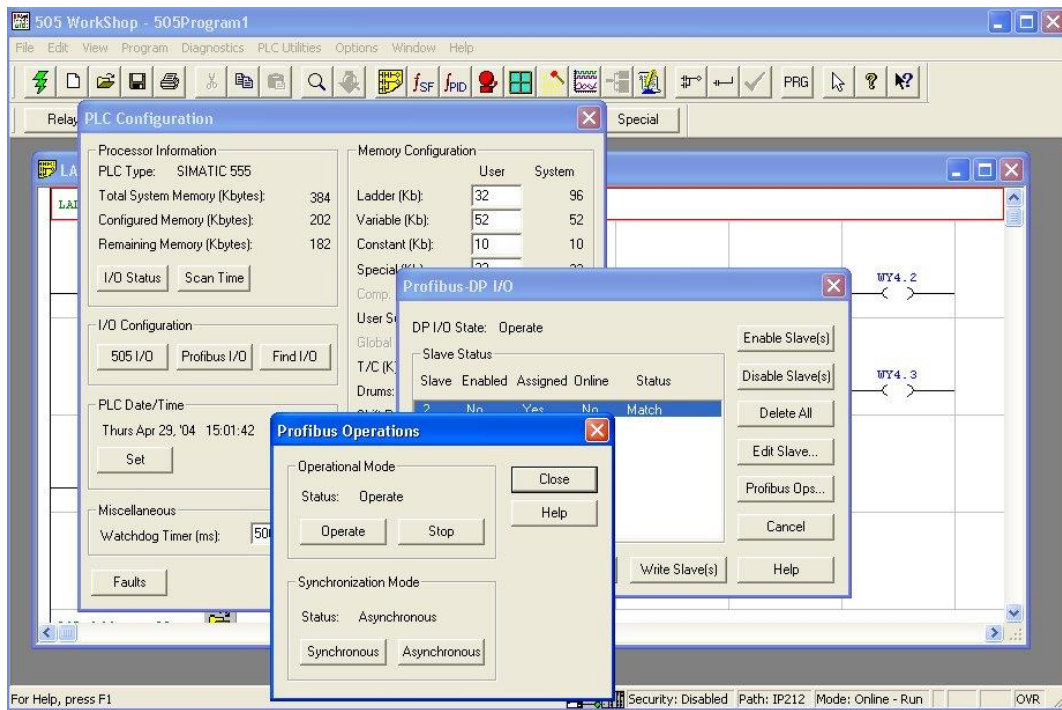
CHAPTER 4. SETTING UP THE 2500-RBC USING WORKSHOP 4.32 OR LATER

4.1 Overview

Configuration of the Profibus network can be accomplished using either PLC WorkShop™ for Siemens 505™ (version 4.32 or above) or 505 Workshop (version 4.32 or above).

If you're using PLC WorkShop™ for Siemens 505™, please refer to the "PLC Memory and I/O Configuration" of the WorkShop user manual for a complete discussion of Profibus network configuration.

If you're using 505 Workshop, follow the procedure below to configure your Profibus I/O:

1. Download GSD file for the 2500C series Profibus RBC from Control Technology Website. The file name is 'CTI2500.gsd'
2. Startup Workshop
3. Run the PLC configuration utility.
4. Add a 2500-RBC to the system.
5. Configure the 2500-RBC
   a. Set address
   b. Set station name
   c. Configure I/O Slots
   d. Set memory offsets for each slot

4.2 Download GSD file from the CTI Website

To begin configuration of the 2500-RBC, download the GSD file from the Control Technology Website. www.controltechnology.com

On the main page go to the "Download" tab, once you have clicked on the tab scroll down the page and you will come to the "2500-RBC (Classic)" heading. Under this heading will be a list of .gsd files. Select the latest version to download. Place this file in FasTrak Softworks, Inc/505 WorkShop/HDGSDBMP folder.

It will be necessary to log in on the Control Technology website in order to download this GSD file. If you are not currently a registered user on the CTI website, then you must first complete a new user registration before being able to download your file.

4.3 Start Workshop

Start Workshop and open your new or existing program. You will need to be using Workshop version 4.32 or higher in order to configure the Profibus I/O.

4.4 Profibus Configuration

To open the "PLC Configuration" screen click on the **PLC Utilities** Tab and then click on **PLC Configuration.** The following box should appear.
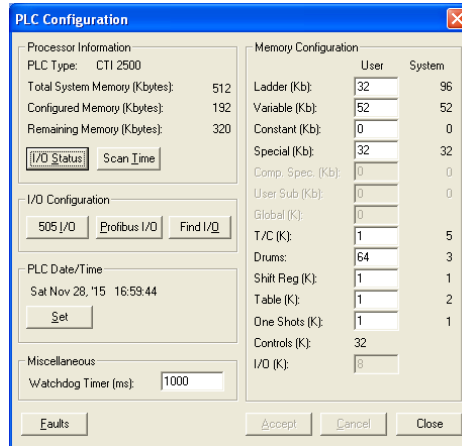

Click on the **Profibus I/O** button to get the following box.
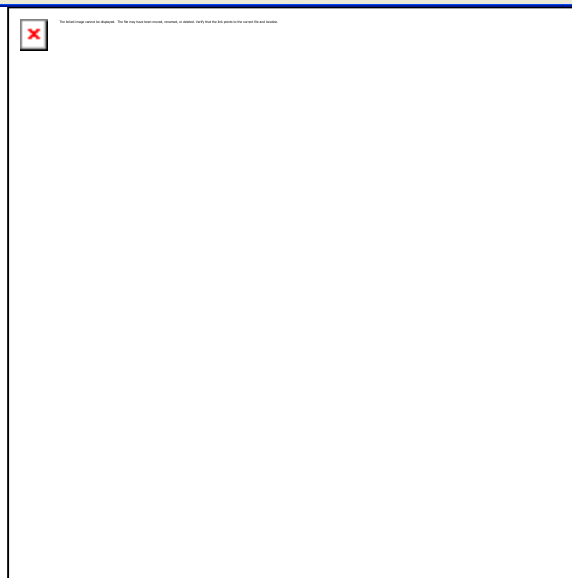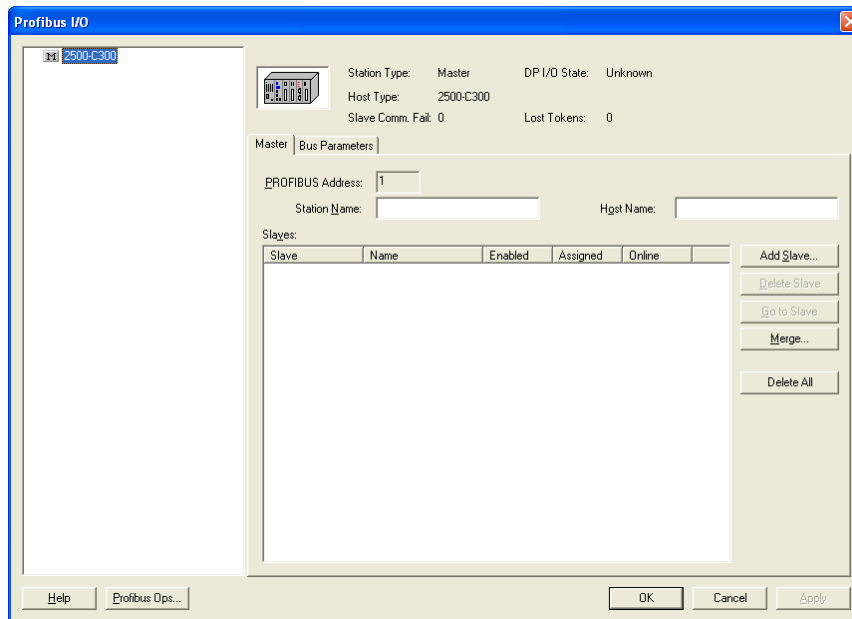
Click on the PROFIBUS address box and enter the PROFIBUS address of the slave you are adding.
You can also enter a Station Name and a Host Name at this time.
Click on the **Add Slave** Button to get the following box.
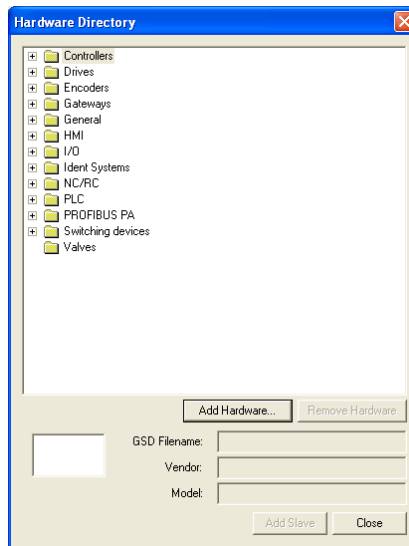
Open the I/O folder. If you do not have a CTI folder with the 2500 Series® RBC(GSD V…) File as shown below, Click on the **Add Hardware** Button. Go to the HDGSDBMP folder and select CTI2500.gsd file you down loaded from CTI. Then Click on the **Open** Button. The Box should now look like this. Click on 2500 Series® RBC (GSD V…) then Click on **Add Slave.**
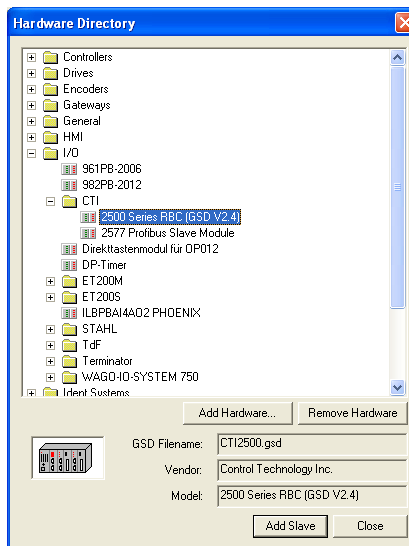

You should get the following box.
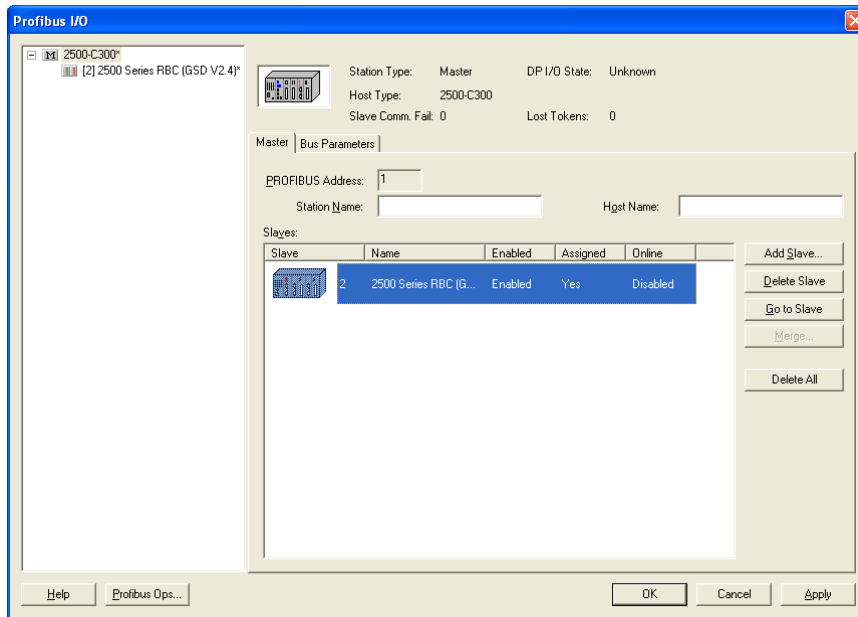
Select the Slave you just added by clicking on in it in the left hand box. The box should change to look like the box below.
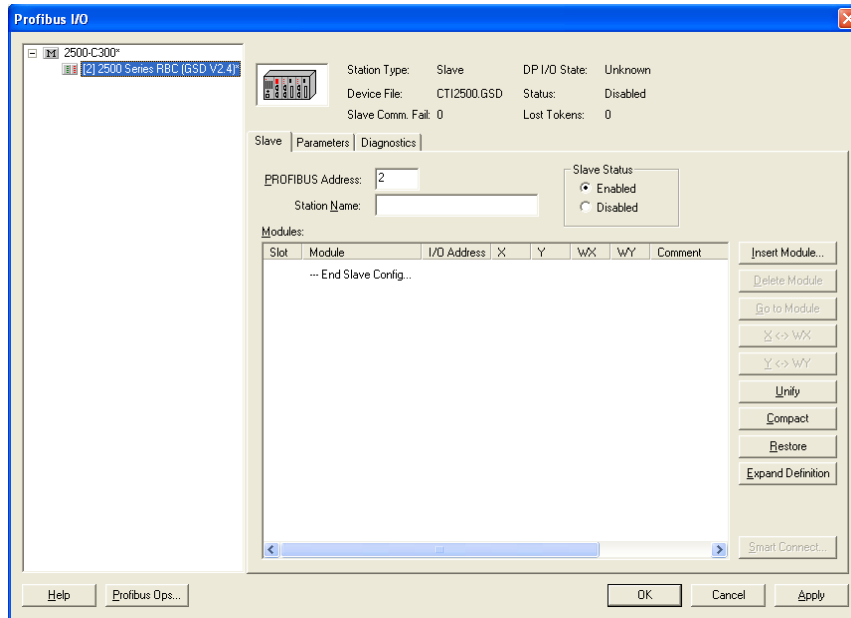

You are now ready to configure the I/O slots in your remote base. Click on **Insert Module**.
Scroll through the module list to find the 2500 or 505 series devices. Select the desired module for I/O slot #1 and then press the **Add Module** button. Then select the module for each of the remaining

slots and add them in like manner. Note: All empty slots before an occupied slot must be filled with a "Blank" entry. Any empty slots after the last occupied slot does not have to have a "Blank" entry.
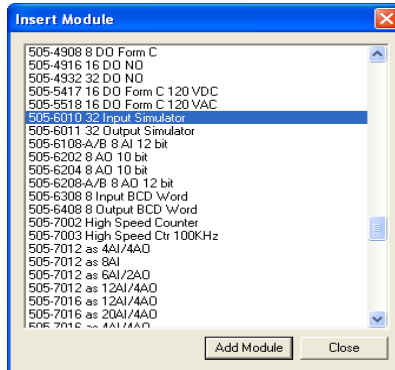
Each module in the remote base needs a unique starting I/O address. You can enter the starting I/O address of a module by clicking on the address field on the module row.
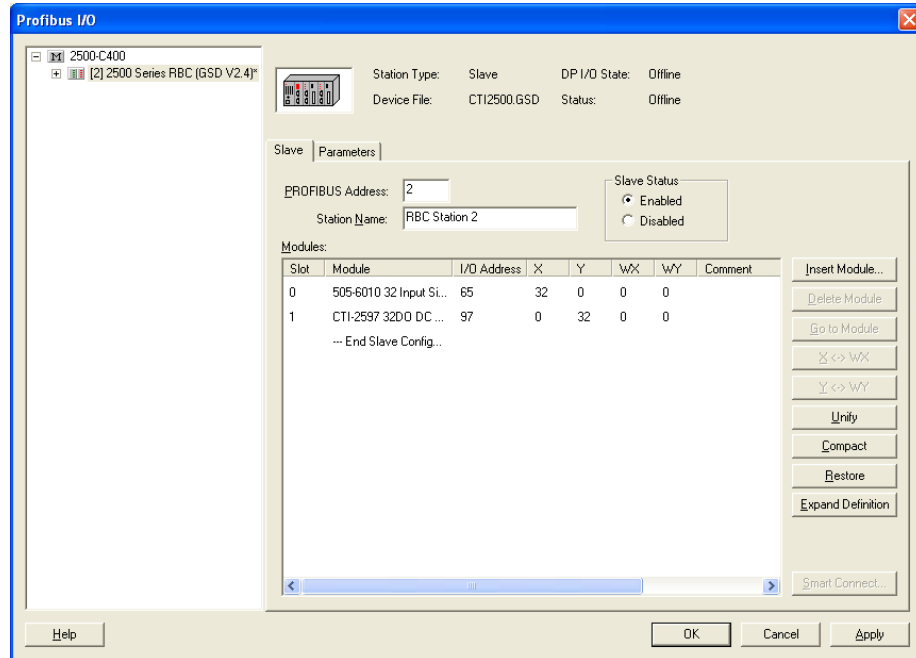
Modules that use X and Y memory must have unique addresses because X and Y variables share the same memory table on the CPU. An 'X32' and a 'Y32' cannot coexist in the same program. Likewise, modules that use WX and WY memory must have unique memory addresses assigned. However, because WX/WY memory is separate from X/Y memory, it is completely acceptable to have both a X32 and a WX32 in the same program.

NOTE:

Example: If the local base rack uses addresses 1-32 of X/Y memory, the 8pt digital input card in slot #1 of the first remote base must have a starting address of a least '33' and will use memory addresses 33through 40. The next 8pt digital card will need a starting address of 41.
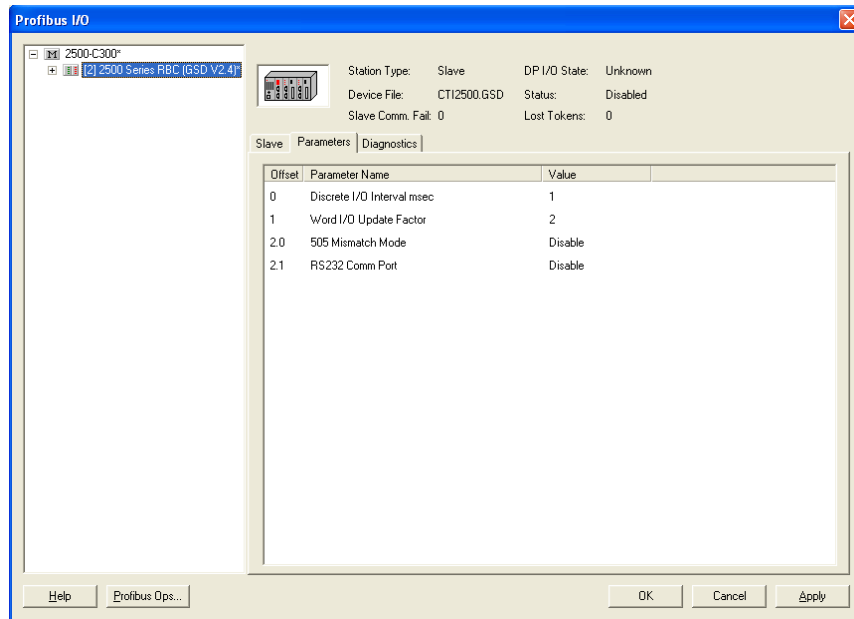
4.7 Setting Profibus Slave Parameters

The following Profibus parameters can be set for each profibus slave : *Discrete I/O Update Interval*, *Word I/O Update Factor*, and *505 Mismatch Mode*. These parameters are defined in section 2.4.

Click on the "Parameters" tab for the remote base.
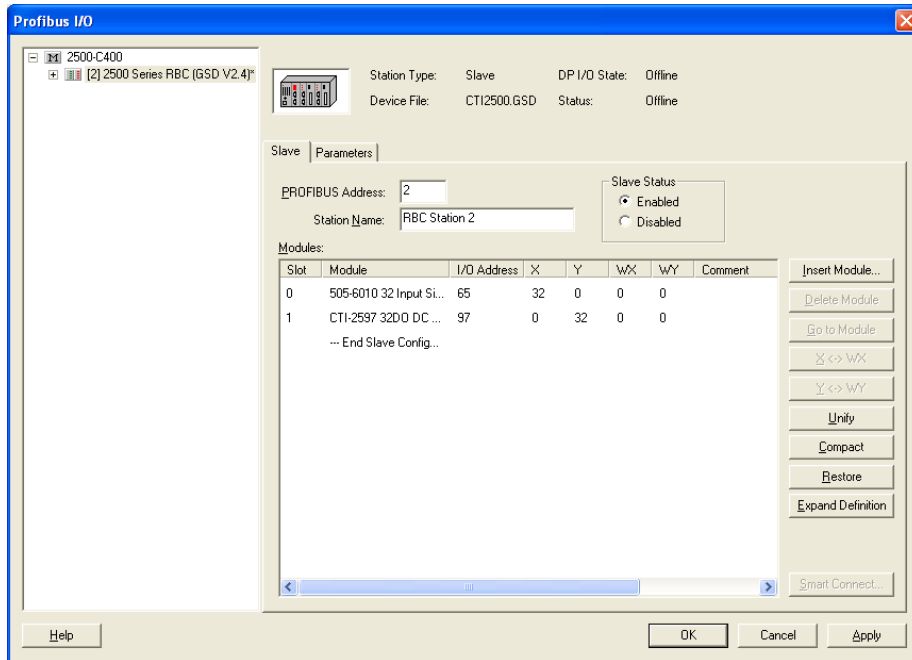
If you desire to change any of the parameters, click on the 'Value' field and type a new value.

After configuring each of your Profibus slaves, you may click 'OK' and then 'Close' to exit the Profibus and PLC configuration screens. The Profibus RBC's will be initialized when you download the program to the system CPU.

CHAPTER 5. USING THE 2500-RBC WITH JANUS PROCESSORS AND WORKBENCH

5.1 Starting the Fieldbus Editor

All communications between the Workbench program and external devices (including PLC I/O when the remote target is a 2500P-Jxxx CPU) is configured using the Fieldbus Editor. To start the editor, click the icon in the toolbar at the top of the Workbench window.
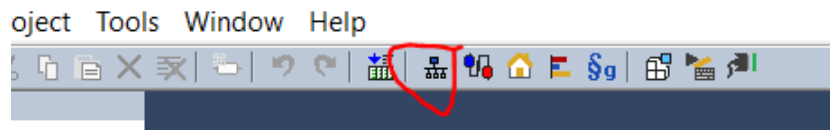
5.2 General Concepts

Communications are configured in the Fieldbus Editor using a tree-based structure. The sections below summarize the levels of hierarchy in the tree.

5.2.1 Configuration

A **Configuration** is the top-level fieldbus object, which refers to a communications channel employing a specific protocol. In CTI Janus products, the Profibus I/O Protocol is considered a Fieldbus Configuration.

5.2.2 Master / Port

The **master/port** is a child object of the **Configuration**. The Master/Port refers an individual connection to a target object. For example, for a "CAMP Client" Configuration, the Master/Port is the IP address of the target CAMP Server device. For a "Modbus Master" Configuration, the Master/Port is the IP address of the remote modbus device. Multiple Master/Port objects can be added to each Configuration, *except* in the case of Data Cache, which allows only once instance.

5.2.3 Slave / Data Block

The **Slave/Data Block** is a child object of the Master/Port, and is equivalent to a read/write (or allow a read/write, in the case of Modbus Slave) of a specific register type. For example, in the "CAMP Client" Configuration, the Slave/Data block is a command to read or write V-memory. Multiple Slave/Data blocks can be defined for each Master/Port.

5.2.4 Variable

The **Variable** is a child object of the Slave/Data Block, and ties a specific read or write operation to a variable in Workbench. Multiple Variables can be defined for each Slave/Data Block.

5.3 Fieldbus Configuration Window

The Fieldbus Configuration window is illustrated below:
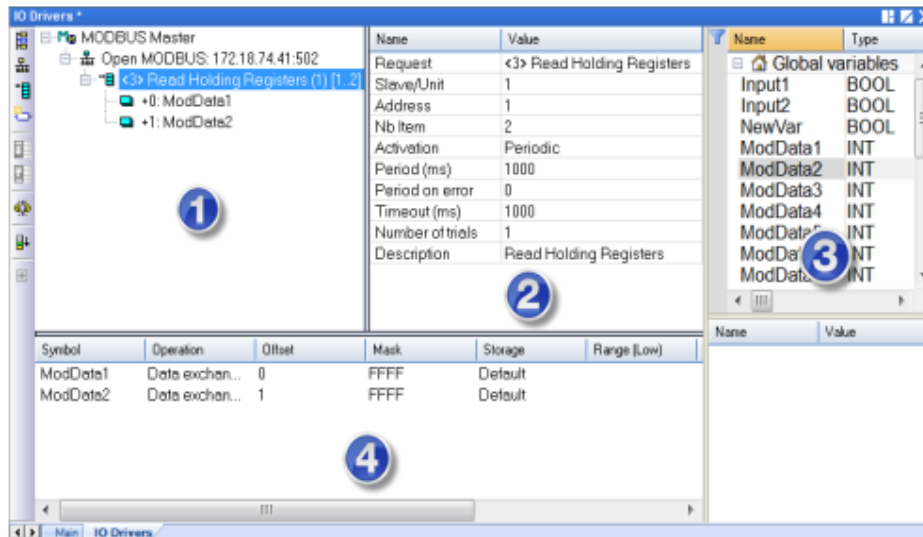
The Fieldbus Configuration window consists of the following panes:

1 - Configuration Tree

This pane displays the Fieldbus configuration objects in a tree structure, representing a parent/child relationship. The highest element in the tree is the fieldbus name. Child elements are added below the fieldbus name object using the local toolbar buttons on the right-hand margin of the pane.

The illustration above shows a Modbus Master fieldbus protocol, A child object of the Modbus Master object is the Master/Port object, which specifies a connection to a slave device. The Slave/Data block, which specifies a Modbus request that will be sent to the slave device, is shown as a child of the Master/Port object. Finally, the data associated with the request is shown as children of the Slave/Data block

NOTE: The structure of the configuration tree may vary with the fieldbus protocol being configured.
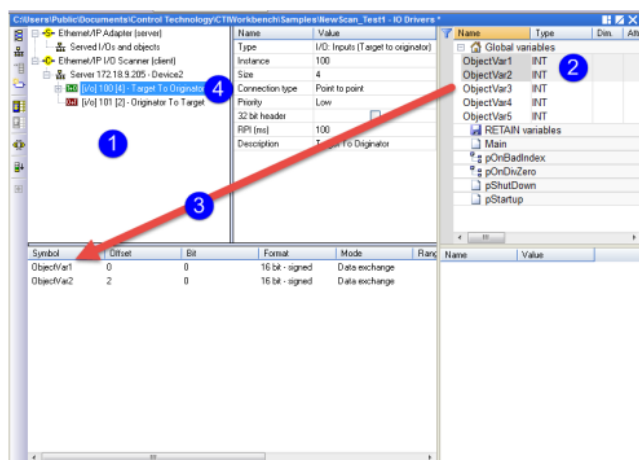
2 - Object Properties

This pane displays the properties of the object that you have selected. In the illustration above, the pane displays the properties of the Master/Port object. You can edit the values shown in the pane.

3 - Variable List

This pane contains the declared variables associated with the active project.

You can map a single variable to a fieldbus configuration object by selecting the variable from the Variable List (Pane 3) and dragging it to the appropriate fieldbus object (Pane 1).

A group of variables can be mapped to the same fieldbus configuration object by the following steps:

(1) Select the fieldbus object

(2) Select the appropriate variables from the Variable List (Pane 3)

(3) Drag/drop the variables into the Child Properties area (Pane 4)

(4) Right-click on fieldbus object and select Renumber offsets from the drop-down menu

4 - Child Properties

This pane displays the properties of the selected object's children. In the illustration above, the properties associated with the variable mapping is shown. You can edit the values shown this pane by selecting the desired value cell, entering a new value, and pressing the Enter key.

5.4 Toolbar Buttons

Use the following buttons on the local toolbar when building the configuration tree:

Icon	Description
	Inserts a new fieldbus (top level) object.
	Inserts a new master/port child object.
	Inserts a new slave/data block child object.
	Inserts a new variable child object.
	Moves the selected object down within a set of similar objects. All associated child objects are moved with the object.
	Moves the selected object down within a set of similar objects. All associated child objects are moved with the object.
	Disables the fieldbus execution.
	Sorts the symbols. This can be used to re-order the variables displayed in the Child Properties pane.

5.5 Configuration Example

In this example, we will add a Profibus Remote Base and configure an I/O module in the Remote Base. Note that this applies only for 2500P-Jxxx processors.
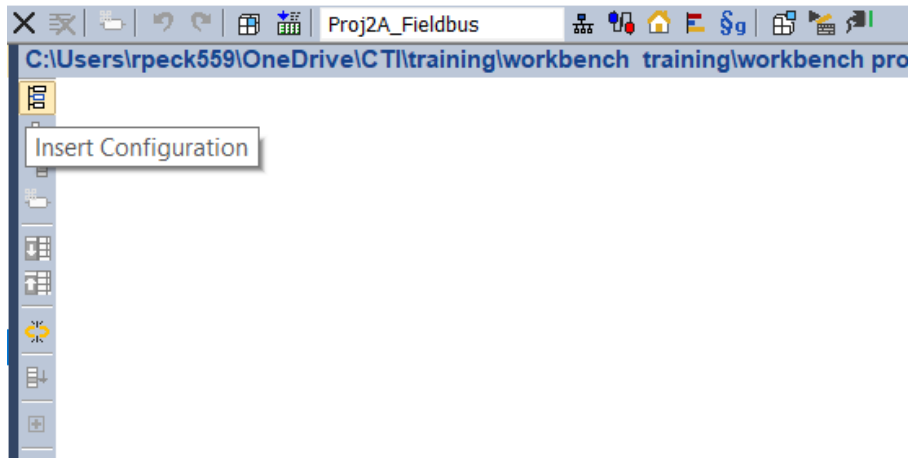
5.5.1 Open the Fieldbus Configuration

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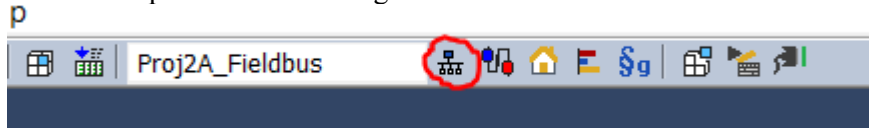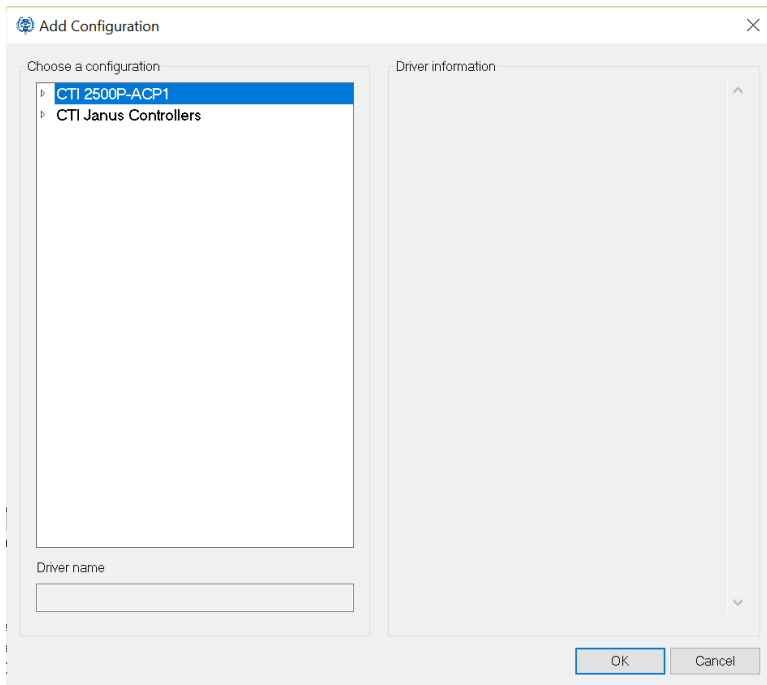

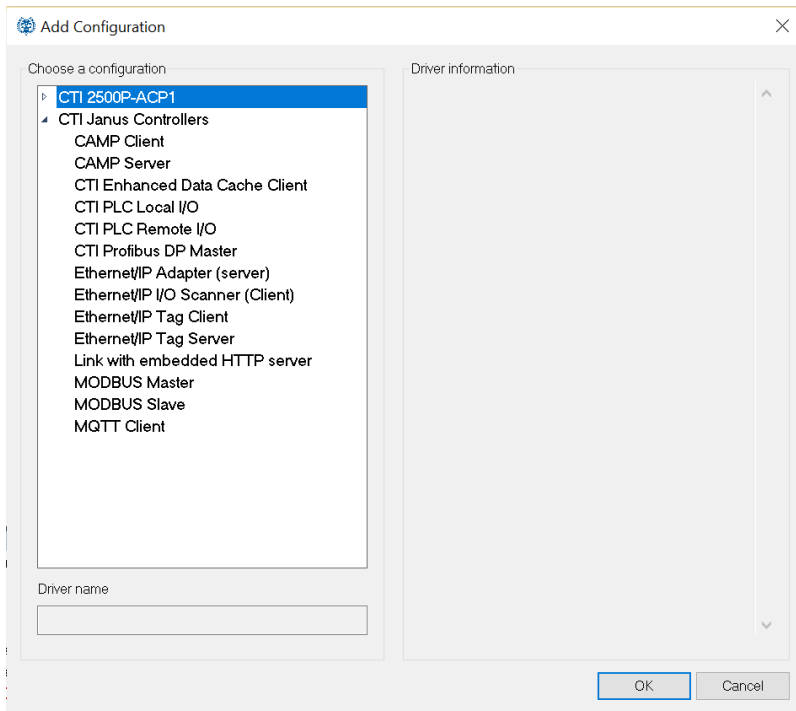### 5.5.2 Add the Profibus Configuration

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.

5.5.3 Add the Master / Port (Profibus Remote Base)

Click the "Insert Master/Port" icon on the editing toolbar.
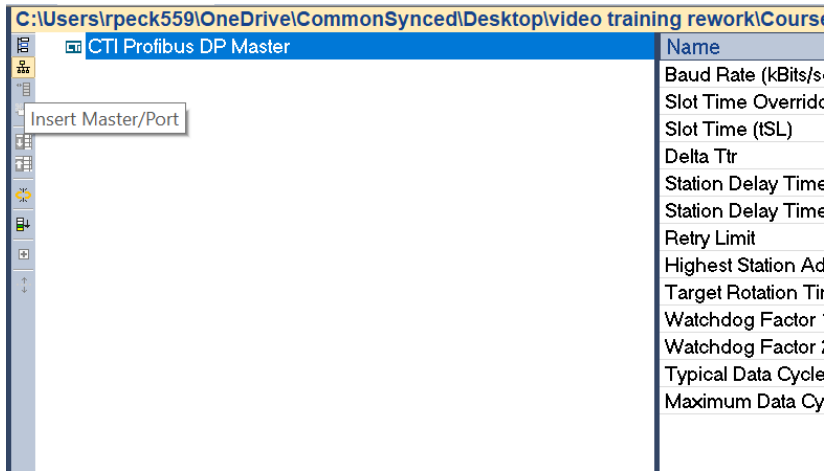
The Profibus DP Slave dialog will come up.
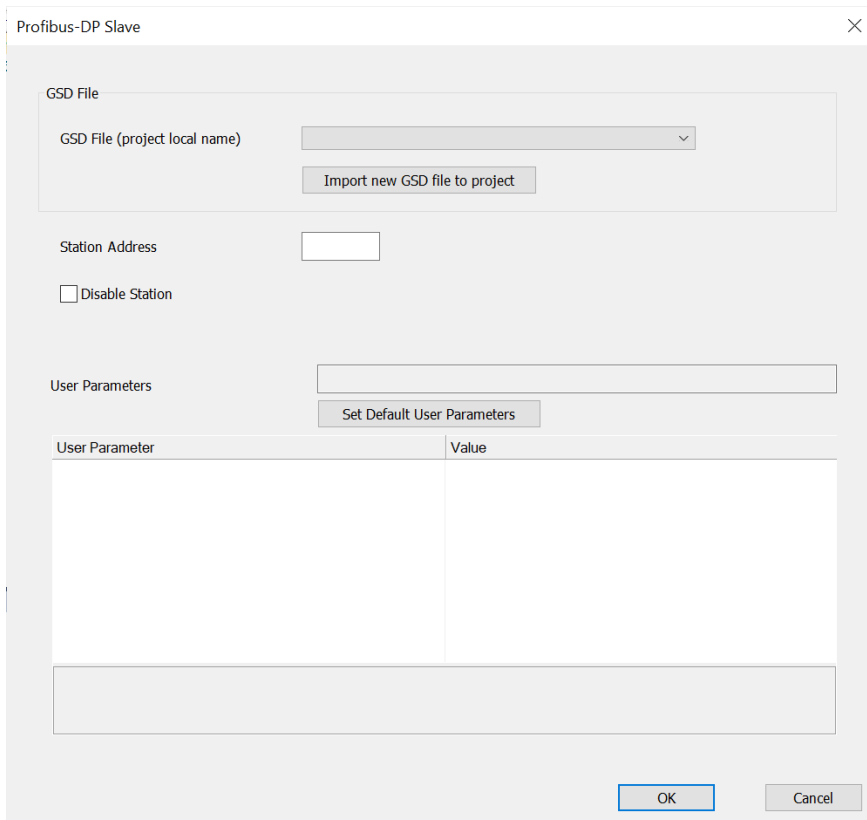
If you have not yet imported any GSD files to this project, the "GSD File" dropdown will be blank as shown. Click on "Import new GSD file to project". A Windows dialog will come up which allows

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.
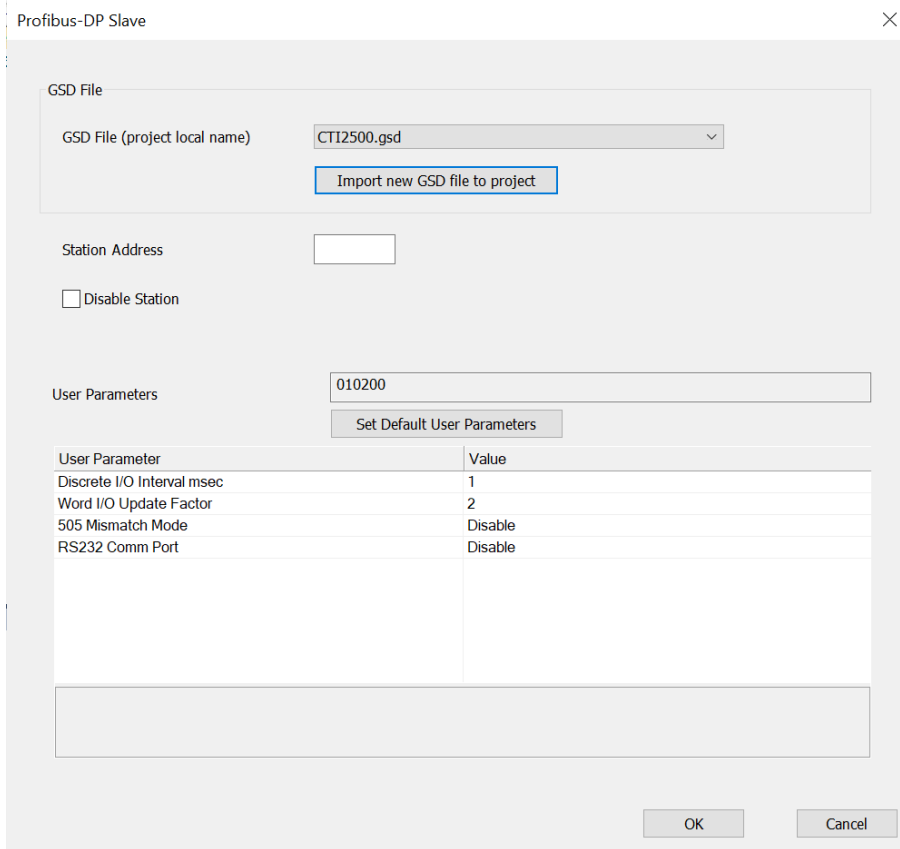
Enter the desired Station Address and Click OK.

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

5.5.4 Add the 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.
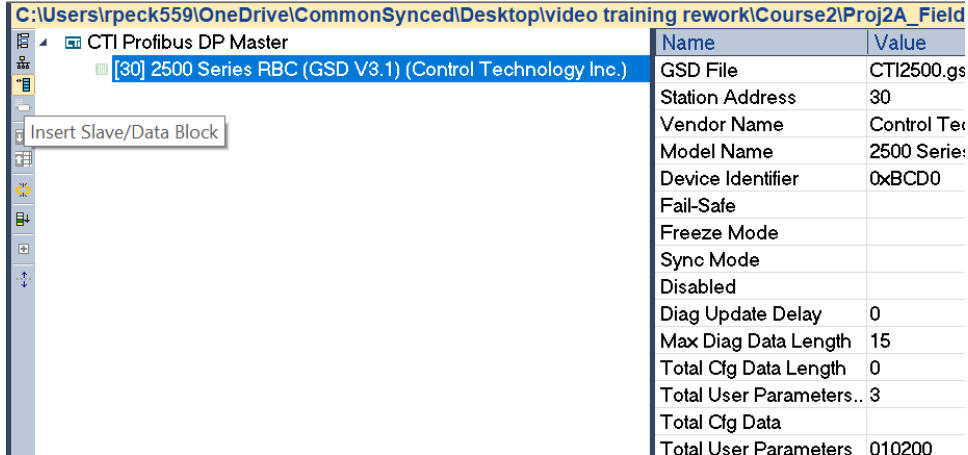
The Module Configuration dialog will come up. From this dialog, you can select the desired module from the dropdown list and (optionally) automatically fill in the I/O mapping for the module and create variables.
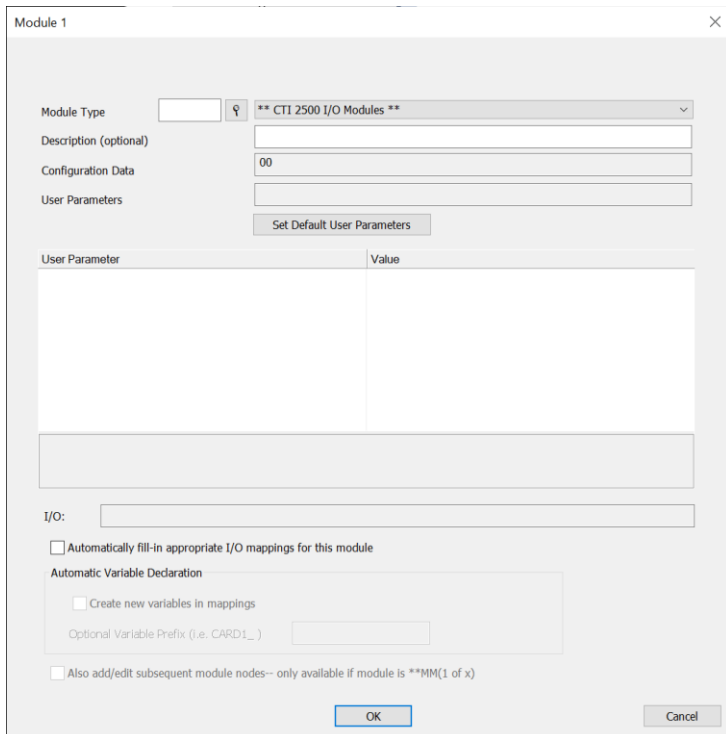
We'll select "2558" from the dropdown list.

And select to automatically fill in I/O mapping and veriable creation using the prefix "Unit_1_Pressure".

Click OK, and expand the module that is created, and we can see the mappings.

C:\Users\rpeck559\OneDrive\CommonSynced\Desktop\video training rework\Course2\Proj2/

Name	Va
Module Name	255
User Description	Uni
Digital Inputs	0
Digital Outputs	0
Analog Inputs	8
Analog Outputs	0
Module Cfg Data	57
Module User Parame...	

Tree view:
- CTI Profibus DP Master
  - [30] 2500 Series RBC (GSD V3.1) (Control Technology Inc.)
    - 2558 8AI Analog In (Unit 1 Pressures)
      - AI_01: Unit_1_PressureDPSlave030_Module01_AI01
      - AI_02: Unit_1_PressureDPSlave030_Module01_AI02
      - AI_03: Unit_1_PressureDPSlave030_Module01_AI03
      - AI_04: Unit_1_PressureDPSlave030_Module01_AI04
      - AI_05: Unit_1_PressureDPSlave030_Module01_AI05
      - AI_06: Unit_1_PressureDPSlave030_Module01_AI06
      - AI_07: Unit_1_PressureDPSlave030_Module01_AI07
      - AI_08: Unit_1_PressureDPSlave030_Module01_AI08
      - MES: Unit_1_PressureDPSlave030_Module01_ModErr

To add more modules to the base, simply repeat the steps above.

APPENDIX A. PROFIBUS INSTALLATION GUIDELINES

These Profibus Installation Guidelines are based on the PNO *Profibus Guideline*, September 1998.

General Installation Information

Maximum number of stations

Maximum number of stations participating in the exchange of user data	DP: 126 (addresses from 0 .. 125) FMS: 127 (addresses from 0 .. 126)
Maximum number of stations per segment including repeaters	32
Available data transfer rates in kbit/s Max. number of segments in series	9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000 According to EN 50170, a maximum of 4 repeaters are allowed between any two stations. Dependent on the repeater type and manufacturer, more than 4 repeaters are allowed in some cases. Refer to the manufacturer's technical specification for details.

Cable Type

The bus cable is specified in EN 50170 part 8-2 as "Cable Type A", and should comply with the parameters in the following table. Cable Type B, which is also described in EN 50170, is outdated and should no longer be used.

Parameter	Cable type A
Characteristic impedance	35 ... 165 ohms at a frequency of (3-20 MHz)
Operating capacity (pF/m)	< 30
Loop resistance (W/km)	< =110
Core diameter (mm)	> 0.64 *)
Core cross-section (mm²)	> 0.34 *)

Cable Lengths

Data transfer rate in kbit/s	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12 000

Max segment length in meters	1200	1200	1200	1200	1000	400	200	100	100	100

Important: In a PROFIBUS-DP/FMS installation, you must choose a data transfer rate which is supported by all devices connected to the bus. The chosen data transfer rate then determines the maximum segment lengths as shown above.

The maximum admissible distance between two bus stations in each PROFIBUS network can be calculated as follows:

(NO_REP + 1) * Segment length

NO_REP= The maximum number of repeaters connected in series (depends on repeater type).

Bus termination

In order to minimize cable reflections and ensure a defined noise level on the data lines, the data transfer cable must be terminated at both ends with a terminating resistor combination as follows.
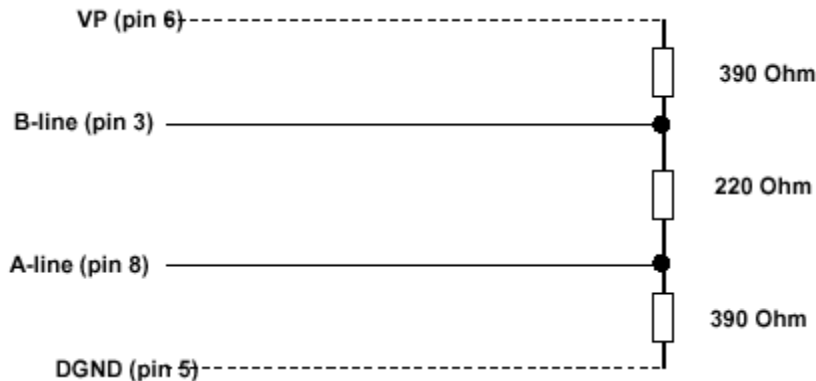
Bus connectors and PROFIBUS-DP/FMS interface

A bus connector is used to connect the bus cable to the PROFIBUS device. Bus connectors are available with a variety of protection classes and mechanical designs. The choice of connector is mainly determined by the space available in the vicinity of the PROFIBUS device (i.e. PC interface, PLC or special fieldbus device). EN 50170 Volume 2 recommends the use of a 9-pin Sub-D connector. Depending on the required protection class and the application of the fieldbus device, other connector designs are also allowed. The table below shows the pin assignment if a 9-pin Sub-D connector is used:

Pin no.	Signal	Significance
1	Shield	Shield/functional ground

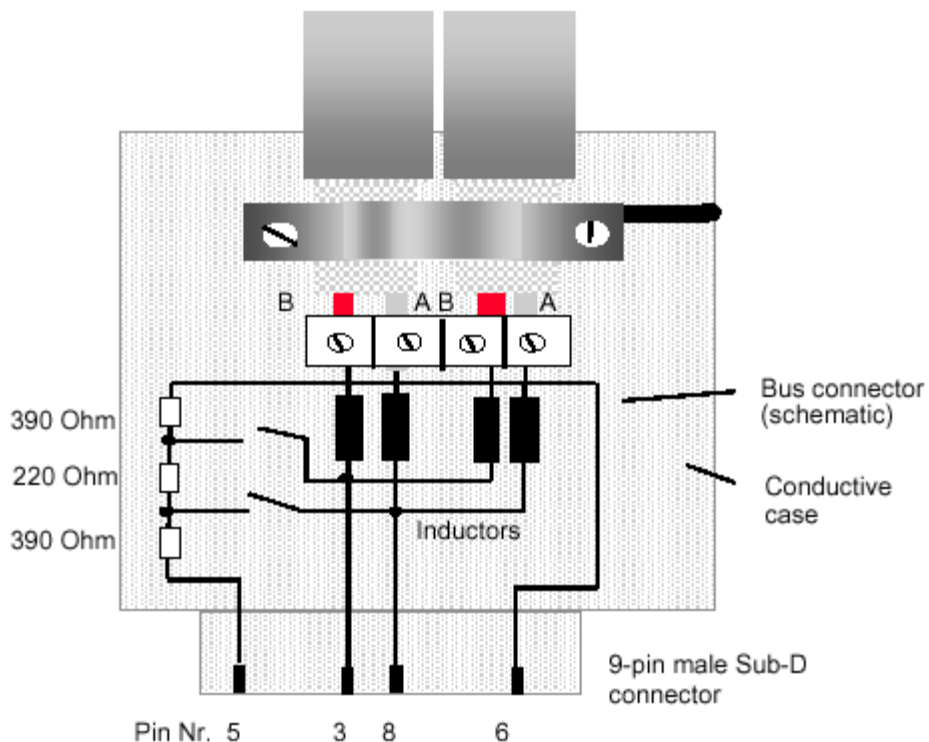| 2	M24	Ground for +24 V output voltage
3	**RxD/TxD-P *)**	**Receive/Transmit data – plus (B wire)**
4	CNTR-P	Repeater control signal (direction control), RTS signal
5	**DGND *)**	**Data ground (reference potential for VP)**
6	**VP *)**	**Supply voltage - plus (P5V)**
7	P24	Output voltage +24 V
8	**RxD/TxD-N *)**	**Receive/Transmit data – minus (A wire)**
9	CNTR-N	Repeater control signal (direction control)

Make sure that the connector type used is suitable for the selected baud rate.

To prevent EMC interference from entering the device, the cable shield should be connected to the functional ground of the device (generally the electrically conductive case). This is done by connecting the cable shield to the metal case of the Sub-D connector and the functional ground over a large area. The bus connector must have a low-impedance connection to the cable shield. The data transfer technology of the serial bus system, which uses a shielded twisted pair data cable, is described in the specification of the interference-immune RS 485 interface standard. To allow correct bus termination, each station must connect the signals DGND and VP (5 V) to pins 5 and 6 of the connector, respectively. The 5 V supply for the terminating resistors (VP) should have a minimum current rating of 10 mA (the current load can increase to 12 mA if a NULL signal is sent through the bus).The current rating should be increased to app. 90 mA if you need to be able to supply other types of devices on the bus such as bus terminals and optical fiber cable drivers.

Due to the capacitive load of the station and the resulting cable reflections, bus connectors should be provided with built-in series inductors as shown below. Due to the built-in series inductors in the bus connectors, all bus connectors in the network should be attached to fieldbus devices to ensure that the necessary capacitive load is provided by the device input capacitance.

Bus connector (schematic)

Conductive case

9-pin male Sub-D connector

390 Ohm
220 Ohm
390 Ohm

Inductors

Pin Nr. 5   3 8   6

Cable laying guidelines

Laying of copper cable

Data transfer in PROFIBUS systems is based on an interference-immune symmetrical bus system to the RS 485 specification using shielded twisted pair cable. With correct system installation, small external sources of interference are led to ground through the cable shield without causing interference in the data lines. Interference of this type can largely be avoided with appropriate EMC measures such as EMC-compliant system installation, EMC-compliant cable laying and measures that avoid large ground potential differences.

Electromagnetic interference from sources such as switching processes, rectifiers and circuit breakers can cause equipment faults to occur. In addition, overvoltage and lightning strikes can destroy electronic components in fieldbus devices. Correct operation of the plant can then no longer be guaranteed.

Particularly for equipment containing frequency inverters (variable speed drives), the manufacturer's regulations for EMC compliance must be observed for the following components:

Filters,
Chokes, and

Shielding.

In addition, electronic starters should be used if fluorescent lamps are installed within control cabinets.

The following cable laying instructions apply to shielded twisted pair cables. The cable shield is used to improve the immunity to electromagnetic interference. PROFIBUS cables should be shielded with a combination of both conductive braid and conductive foil. In the following, "shield" refers to both types of shields (braid **and** foil). A foil shield should not be used on its own, because it is very thin and can easily be damaged. The cable shield must be connected to the functional ground at both ends of the cable by making a large-area connection to a grounded conductive surface. When laying the bus cables, particular care should be taken to ensure that the cable shield (braid shield and foil shield, if available) is connected to the shield grounding clamp over a large area. The two PROFIBUS data lines are designated A and B. There are no regulations on which cable core color should be connected to which of the two data terminals on each fieldbus device; the sole requirement is to ensure that the same core color is connected to the same terminal (A or B) for all stations throughout the entire system **(across all stations and bus segments).** If the data transfer cable has data wires with red and green insulation, then the following assignment should be used:
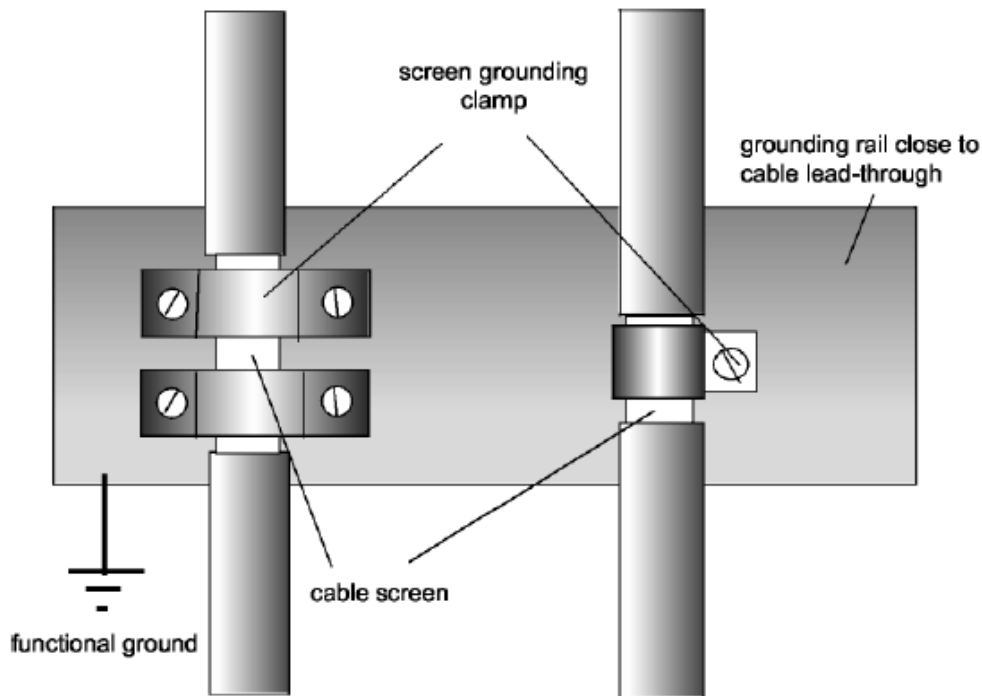
Data cable wire A - green
Data cable wire B – red

This rule applies to both the incoming and the outgoing data lines.

Laying cables within control cabinets

If a repeater or fieldbus device is installed within a control cabinet, the cable shield of the incoming bus cable should be electrically connected to a grounding rail as close as possible to the cable leadthrough using a shield grounding clamp or similar (see Figure 3-1). The cable shield should continue within the cabinet to the fieldbus device and be connected there in accordance with the manufacturer's instructions. The following installation guidelines should be observed. Ensure that the case of the device and also the control cabinet in which the fieldbus device is mounted have the same ground potential by providing a large-area metallic contact to ground (use e.g. galvanized steel to ensure a good connection). Grounding rails should not be attached to painted surfaces. If the above measures are observed, electromagnetic interference is diverted through the cable's shield.

screen grounding clamp

grounding rail close to cable lead-through

functional ground

cable screen

PROFIBUS cables ...

and cables for ...	must be laid ...
• Bus signals, e.g. PROFIBUS • Data signals for PC´s, programming devices, printers etc. • Screened analog inputs • Unscreened DC voltages (<= 60V) • Screened process signals (<= 25 V) • Unscreened AC voltages (<= 25V) • Coaxial cables for monitors	in the same cable loom or cable duct.
• DC voltages from 60 V ... 400 V (unscreened) • AC voltages from 25V ... 400 V (unscreened)	in separate cable looms or cable ducts without minimum spacing requirements
• DC and AC voltages > 400 V (unscreened) • Telephone cables • For areas with explosion hazard	in separate cable looms or cable ducts without minimum spacing requirements

Laying cables outside of control cabinets

All cable ducts should be constructed of electrically conducting material and connected to functional ground at regular intervals. Bus cables should not be subject to mechanical loads which exceed the manufacturer's specifications. If this cannot be avoided, additional protective measures should be taken, e.g. by laying the cables in a steel pipe or rugged metal duct. The pipe or duct should then be grounded at regular intervals and protected against corrosion.

SPECIFICATIONS

General

Module Size: Double-Wide CTI 2500 Series® or Simatic® 505 I/O

Backplane Power Consumption: 2.5 watts

Compatibility: CTI 2500 Series® , Simatic® 505, Siemens® S5 and S7 masters

Compatibility: all currently-available CTI and Siemens® 4-, 8-, and 16-slot bases

Display: shows errors codes and Profibus address

Output State Selection: Determines state of outputs when I/O channel communication is lost:
    off   all outputs are turned off
    freeze   all outputs hold their last value

Dipswitch Options:
    Serial port baud rate (future use)
    RBC station address
    Status display mode

Software-Set Parameters:
    Discrete I/O interval
    Word I/O update factor
    Ignore mismatch mode
    RS232 port enable/disable

Diagnostic Data:
    Station status (3 bytes)
    Master address (1 byte)
    Ident number (1 byte)
    Extended diagnostics (9 bytes)

Ports

Profibus: 9-pin female, pins 2,7 "no connect"

Communication Speeds Supported: 9600, 19.2K, 93.75K, 187.5K, 1.5M, 3.0M, 6.0M, 12M

RS232C: 9-pin male, future use

Profibus Port Isolation: 1500VDC

Environmental

Operating Temperature: 0º to 60º C (32º to 185º F)

Storage Temperature: -40º to 85º C (-40º to 185º F)

Humidity: 5% to 95%, non-condensing

Agency Approvals Pending: UL, ULC, CE

Shipping Weight: 1.5 lb. (0.68 Kg)

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.

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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 (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 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 at 1-800-537-8398.