CTI 2571-TCM1

TASK CODE MASTER FEATURE

REFERENCE MANUAL

Version 1.00

CTI Part # 062-00158

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PREFACE

This Reference Manual provides instructions for configuring and controlling the CTI Model 2571 Program Port Expander using the 2571-TCM1 Task Code Master feature. This manual supplements information found in the *CTI 2571 Program Port Expander Module Installation and Operation Guide (*2571 IOG*),* CTI Part Number 62-137. You should have the 2571 IOG available for reference, especially for information relating to the module hardware.

The 2571-TCM1 feature uses the standard CTI257x PLC Command Interface to implement the functions provided. This interface is fully described in the *CTI 257x PLC Command Interface Reference Manual* (CTI Part # 62-163). You should have this manual available for reference.

We assume you are familiar with the installation and operation of SIMATIC TI505 programmable controllers. Please refer to the appropriate SIMATIC user documentation for specific information on SIMATIC TI505 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 which could damage equipment.

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

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CHAPTER 1. DESCRIPTION

The 2571-TCM1 Task Code Master feature consists of firmware which enhances the function of a standard CTI Model 2571 Program Port Expander. The firmware is contained in Programmable Read Only Memory (PROM) chips which replace the standard Model 2571 PROMs. This feature allows you to operate any serial port on the Model 2571 as either a Task Code Slave or Task Code Master. In addition, the firmware allows you to use any serial port for simple ASCII input and output.

1.1 Task Code Slave Operation

When a Model 2571 serial port is configured for *Task Code Slave* mode, it emulates the program port of a SIMATIC TI505 series PLC. A device, such as an operator interface panel, can communicate with the PLC processor by sending an NITP (Non-Intelligent Terminal Protocol) message containing a task code to the 2571. The 2571 then routes the task code to the PLC processor. When the PLC processor replies to the task code, the 2571 sends an NITP message containing the response back to the device.

The 2571-TCM1 designates this mode of operation as Task Code Slave because the module responds to commands from an attached (master) device. No changes to the PLC logic are required to support this mode. Any serial port on the 2571 can be configured for Task Code Slave operation. This mode operates identically to the standard 2571 port.

1.2 Task Code Master Operation

The 2571-TCM1 firmware offers a new operational mode known as *Task Code Master.* In Task Code Master mode, the PLC logic can *initiate* task code messages. On command from the PLC, the 2571 builds the task code message and sends it to a designated serial port. The response to the task code message is processed by the 2571 and the result stored in PLC memory.

The 2571-TCM1 generates messages in the Non-Intelligent Terminal Protocol (NITP) message format, which can be processed directly by the program ports of both TI505 and TI500 series PLCs. Both the initiation and the content of the task code message can be controlled from the PLC logic.

1.3 Typical Configurations

Concurrent Task Code Slave and Master

As mentioned above, any port on the 2571 can be configured as a Task Code Slave or as a Task Code Master. NITP messages from the task code master port of a 2571 can be sent to the programming port of a TI505 or TI500 series PLC.

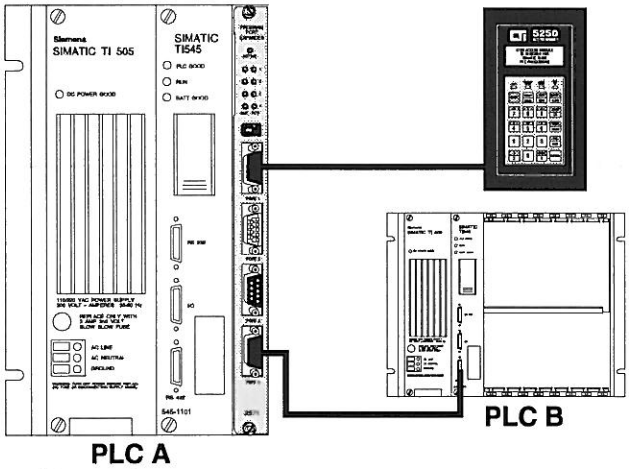


Figure 1. *Concurrent Master/Slave Operation*

Figure 1 illustrates a 2571 with Port 1 configured as a Task Code Slave and Port 4 configured as a Task Code Master. The Task Code Slave port is connected to a CTI 5250 Access Module. The Task Code Master port is connected to the programming port of a SIMATIC TI545 PLC. In this configuration, the 5250 can read and write memory in PLC A and PLC A can read and write memory in PLC B.

Both Port 1 and Port 4 can function concurrently. Ports 2 and 3 are not used in this example to simplify the illustration. However, in an actual application, all four ports could be used. Any port could be configured to operate as either a Task Code Slave or a Task Code Master.

2571 Master to 2571 Slave

Figure 2 illustrates two TI545 PLCs, each with a 2571 installed in the local rack. Port 1 of the 2571 in PLC A has been configured as a Task Code Master. Port 1 of the 2571 in PLC B has been configured as a Task Code Slave.

In this example, leased line (non dial-up) modems are used to interconnect the 2571 ports rather than serial cables to illustrate that the PLC's could be in completely different plant locations. In an actual application, you could use serial cables, modem eliminators, null modems, or any equivalent communications equipment.

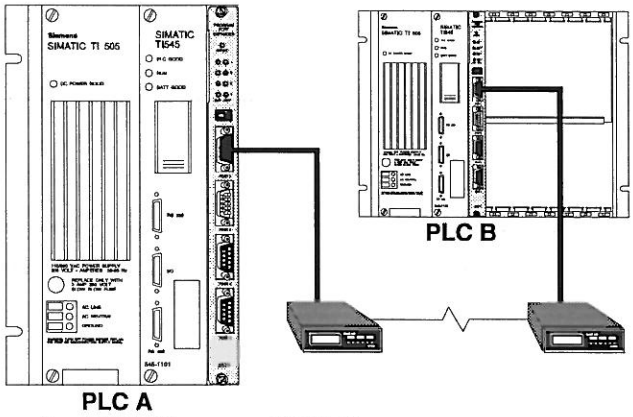


Figure 2. *2571 Master to 2571 Slave*

As in the first example, PLC A is the master and PLC B is the slave. PLC A can read or write memory in PLC B. Ports 2,3, and 4 are not used in this example. In an actual application, they could be connected to other PLCs, to operator interface devices, or to CTI 2571 modules located in other PLC racks.

NOTE:

Leased line modems are the functional equivalent of point to point cables.

The 2571-TCM1 does not support switched dial-up modems, which require control codes to be sent to the modem. Contact CTI if you have a requirement for dial-up modem support.

Full Duplex Master

In the previous example, one PLC acts as a slave while one PLC functions as a master. In some applications, it may be useful to have both PLC's capable of initiating a task code command.

Figure 3 shows a full duplex master configuration. Both PLC A and PLC B contain a 2571 equipped with the 2571-TCM1 feature. Port 3 of each 2571 is configured as a Task Code Master. Port 4 of each 2571 is configured as a Task Code Slave.

Port 3 of each 2571 is then connected to Port 4 of the other 2571. This connects a Task Code Master Port on each module with a Task Code Slave port on the other module.

In this configuration, PLC A can update memory in PLC B while PLC B can simultaneously update memory in PLC A.

Although the example uses Port 3 and Port 4, any combination of ports can be used. Ports not used in this example could be used for other purposes.

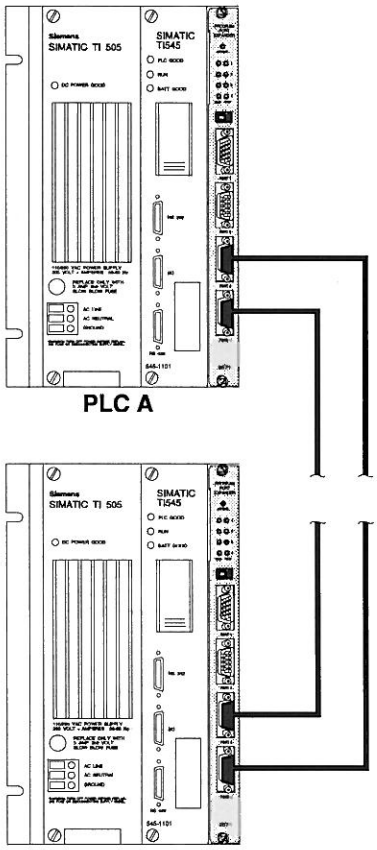


Figure 3. *Full Duplex Master*

1.4 Task Code Master Functions

When a 2571 port is configured as a task code master, PLC logic can be used to cause the 2571 to send a task code and to process the response. There are two commonly used Task Code Master functions: Write Remote PLC Memory and Read Remote PLC Memory.

Write Remote PLC Memory

This function reads the contents of a designated area of V memory in the local PLC and writes the values in a specified area of V memory in the other PLC. The application programmer can specify the starting V memory addresses on both the local and remote PLCs and the number of words to be transferred (up to 256 words). Based on the specification, the 2571 reads the local V memory, generates NITP messages containing the applicable task code and data, and sends the message via the designated port. When the response is returned from the remote PLC, the 2571 verifies that the task code was properly processed. If not, an error is posted which can be acted upon by PLC logic.

Read Remote PLC Memory

This function reads the contents of a designated area of V memory in the remote PLC and writes the values in a specified area of V memory in the local PLC. The application programmer can specify the starting V memory addresses on both the local and remote PLCs and the number of words to be transferred (up to 256 words). Based on the specification, the 2571 generates NITP messages containing the applicable task code, verifies the response, and writes the data in local V memory. If an error is encountered, the 2571 will post an error which may be processed by PLC logic.

1.5 Other Functions

In addition to the Task Code Slave and Task Code Master functions, the 2571-TCM1 firmware offers the capability to output a user defined string of ASCII characters under control of the PLC logic. The ASCII characters could be used for simple device control or for message output. Similarly, the 2571-TCM1 firmware will accept ASCII messages and will store them in PLC memory under control of PLC logic. See Chapter 4 for implementation details.

1.6 Programming Overview

All 2571 Task Code Master functions are initiated by PLC logic. The 2571-TCM1 feature provides a PLC logic interface for sending task code messages. The interface consists of two structures, the Command Block and the module WX/WY words, which can be manipulated by PLC logic.

Command Block

A Command Block is a group of V memory words is used to store command information. For example, in the Command Block for Read Remote PLC Memory:

- The command number
- The port to be used,
- The number of words to transfer,
- The beginning V memory address in the remote PLC
- The beginning V memory address in the local PLC where the answer will be stored.

The exact content of the Command Block will vary with the command being issued. The Command Block is typically created in programming software such as TISOFT, and stored permanently in V memory.

2571 WX and WY Words

The 2571 logs in as a Special Function module and is assigned two WX words and six WY words. PLC logic manipulates the contents of these words to cause the 2571 to execute a command. Using the WY word interface, the PLC logic can select which Command Block to execute and can trigger the command execution. The status of command execution can be monitored via the WX words.

Please refer to the CTI 257x Command Interface Reference Manual for a thorough description of the command block, WX/WY usage, and command timing diagrams.

CHAPTER 2. CONFIGURATION

2.1 Configuration Overview

Before you use the 2571-TCM1 firmware, you must configure the 2571 module and install it in the PLC rack. Module configuration consists of setting DIP switches on the module which control the baud rate, hardware handshake operation (RS-232 ports), and the port protocol. Port protocol selection includes Task Code Slave, Task Code Master, Loopback, and PLC Select.

NOTE:

This manual supplements information found in the *2571 Program Port Expander Module Installation and Operation Guide*. Please refer to the 2571 IOG for information regarding topics such as installation planning, module installation, module log-in and hardware check-out.

The *Task Code Slave* protocol emulates the programming port of a SIMATIC TI505 PLC. This protocol is used when attaching Operator Interface panels, computers running TISOFT, and other devices which send task codes to the PLC using NITP (Non-Intelligent Terminal Protocol). A port configured for the Task Code Slave protocol functions similarly to a standard 2571.

The *Task Code Master* protocol allows the 2571 to generate NITP messages which contain task codes and to process the task code responses. This protocol is typically used when you want to use PLC logic to read or write memory in another PLC. It may also be used to send other task code messages.

NOTE:

When you use the module switches to select the Task Code Slave protocol or Task Code Master protocol, the baud rate is also determined by switch settings and other parameters such as data bits, parity, and stop bits default to standards that match the SIMATIC TI505 program port. These defaults are: Data Bits =7, Parity =Odd, Stop Bits = 1.

The *Loopback* setting provides a means to test the operation of the serial port. The Loopback setting generates a series of ASCII characters.

The *PLC Select* setting allows you to use PLC logic to select the port protocol. This setting is required when choosing protocols other than Task Code Slave or Task Code Master. It is also used when you want to select communications parameters such as baud rate, parity, data bits, and stop bits that cannot be set by DIP switches.

NOTE:

When the switches are set to *PLC Select* you can choose any supported protocol using PLC logic, including Task Code Slave and Task Code Master. However, unless you have an overriding reason to do otherwise, it is easier to use the switches to select Task Code Master or Task Code Slave protocols.

2.2 Switch Locations

There are four sets of DIP switches on the 2571, one set for each serial port. Please refer to the following figure for the approximate location of these switches.

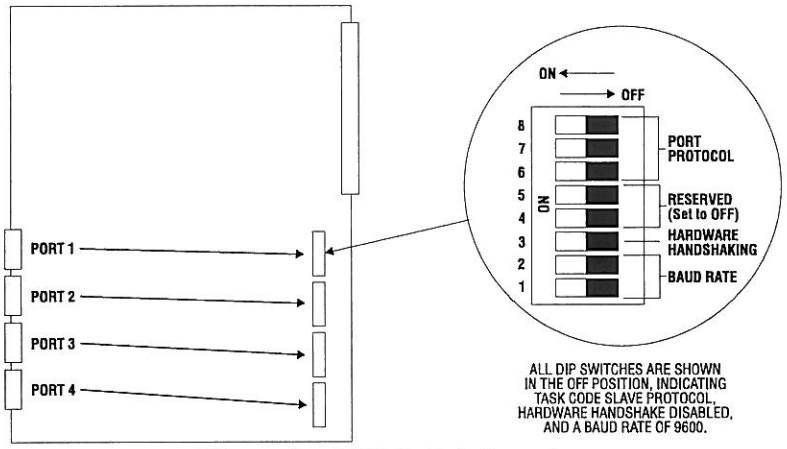


Figure 4. *DIP Switch Locations*

On each set of Switches:

Switch 1 and 2 control the baud rate,
Switch 3 selects hardware handshaking (Port 1 and Port 2 only), and
Switches 6, 7 and 8 determine the port protocol.

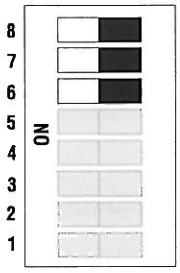
Switch 3 is unused on the RS-422 ports (Port 3 and Port 4). Switches 4 and 5 are reserved for future use and should be set to the OFF position.

NOTE:

The module is shipped from CTI with all DIP switches in the OFF position. This factory setting selects Task Code Slave protocol, no hardware handshaking, and a baud rate of 9600 baud.

2.3 Protocol Switch Settings

Refer to the table below for settings to select the port protocol



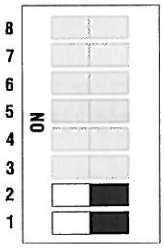
Port Protocol	Switch 6 Position	Switch 7 Position	Switch 8 Position
Task Code Slave	OFF	OFF	OFF
Reserved	OFF	OFF	ON
Task Code Master	OFF	ON	OFF
Loopback	ON	OFF	OFF
PLC Select	ON	ON	ON

Figure 5. *Port Protocol Switch Settings*

Settings for switches 6, 7, and 8 not shown above are reserved for future use. When using the 2571-TCM1 firmware, settings other than those shown will initiate the LOOPBACK protocol.

2.4 Baud Rate Switch Settings

Refer to the table below to set the port baud rates



Baud Rate	Switch 1 Position	Switch 2 Position
1200	ON	ON
2400	ON	OFF
9600	OFF	OFF
19200	OFF	ON

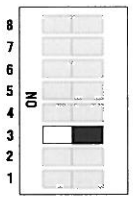
Figure 6. *Baud Rate Switch Settings*

NOTE:

The baud rate switch settings are ignored if the protocol switches (6,7, and 8) are set to *PLC Select.*

2.5 Hardware Handshaking Settings

Hardware handshaking can be set for the RS-232 ports (Port 1 and Port 2). Refer to the following table for settings.



Hardware Handshaking	Switch 3 Position
Disabled	OFF
Enabled	ON

Figure 7. *Hardware Handshake Switch Settings*

When hardware handshake is enabled, the 2571 uses the RTS and CTS lines for flow control on input and output respectively. This switch setting is ignored for ports 3 and 4.

Input Flow Control (RTS)

When hardware handshake is enabled, the 2571 controls the RTS control line. RTS is normally high unless the input buffer is almost full. If the number of characters in the input buffer exceeds a preset value (about 2/3 of the buffer size), the 2571 will pull the RTS line low. When the number of characters in the buffer goes below this value, the 2571 will drive RTS high.

Output Flow Control (CTS)

When hardware handshake is enabled, the 2571 senses the state of the CTS control line. When the state of the line is high, the 2571 will transmit if there are characters to be transmitted. If the state of the line is low, no output occurs.

NOTE:
Unless the device you are attaching explicitly requires hardware handshaking, you should set hardware handshaking to DISABLED.

CHAPTER 3. COMMAND BLOCKS - TASK CODE MASTER

3.1 Memory Transfer Command Blocks

General Issues

The following Command Blocks allow you to transfer the contents of V memory between two PLCs. When one of these command blocks is triggered by the PLC, the 2571 generates the applicable sequence of task codes required to read or write V memory in the remote PLC. The task codes are encoded in the Non-Intelligent Terminal Protocol (NITP) message format, which is supported by all SIMATIC TI505 and TI500 series PLCs.

The Command Blocks allow you to transfer up to 256 words with a single command trigger; however, the NITP message format supports only 15 words per message. The 2571-TCM1 firmware accomplishes the transfer of more than 15 words by generating multiple NITP messages. Although this operation is transparent to the local PLC logic, transferring a large number of words may require a multiple scans. At baud rates of 9600 or above, the primary determination of the command completion time is the transfer performance of the attached PLCs which, in turn, is determined by the scan time and other task code activity.

NOTE:

When designing applications that transfer large amounts of V memory, you should carefully evaluate the response time to ensure that it meets your requirements.

The Command Blocks allow you set a timeout value for executing the commands. This represents the number of seconds that can elapse from starting the command until the command is completed. If the command has not been completed within the elapsed time, the 2571 will halt command processing and set the CMD ERR bit. The 2571 has a default timeout built into every command of approximately 9 seconds. Except for unusual situations, you should use the default value.

NOTE:

In the Command Block Description, a boldface entry in the value column, designates a required value. Other entries are recommended values.

The following command blocks show the Command Number in both Hex and Decimal (integer) format. You can enter values in either format using TISOFT.

3.2 Create Connection Command

Normally, you will use the 2571 DIP switches to configure a serial port for the Task Code Master protocol . However, if you want to create a connection for the Task Code Master protocol manager using PLC logic, you can use this command block. To use this command, the serial port must have been configured as *PLC Select.*

Offset	Description	Hex Value	Decimal Value
0	Error Word	**0**	**0**
1	Command Code (Create Connection)	**01**	**01**
2	Connection Number (19201 - 19299)		
3	Protocol Manager Number	**20**	**32**
4	Physical Port Number (1, 2, 3, or 4)		
5	Port Baud Rate (300, 600, 1200, 2400, 4800, 9600, 19200)		
6	Bits per character (7 or 8)	**7**	**7**
7	Parity (0=none, 1=Odd, 2=Even)	**1**	**1**
8	Stop Bits (1 or 2)	**1**	**1**
9	Handshake (0=None, 1=Software, 2 = Hardware)	0	0
10 - 15	Unused (Set to 0)	**0**	**0**

Offset 0 Error Word - The command error word should be set to 0.

Offset 1 The Command Code of the Create Connection command is 01.

Offset 2 Connection Number - Any connection numbers within the valid range can be assigned, as long as the number is unique. Usually, it is simpler to set the lower digits equal to the physical port number (e.g. 19201 for serial port 1).

Offset 3 The Protocol Manager Number for the Task Code Master protocol manager is hex 20.

Offset 4 Physical Port Number - The number of the serial port you want to use.

Offset 5 Port Baud Rate - This must match your PLC port. The value entered here overrides any hardware baud rate setting.

Offsets 6-9 Communications Parameters. You must set these values as shown in bold to communicate with a SIMATIC TI505 or TI500 series PLC.

3.3 Write Remote PLC Memory

The following command block will cause the 2571 to write the contents of local V memory to V memory in a remote PLC attached to a 2571 serial port.

Offset	Description	Hex Value	Decimal Value
0	Command Error Word	**0**	**0**
1	Command Code (Write Remote Memory)	**0201**	**513**
2	Connection Number (19201 - 19299)		
3	Source: Starting V Memory Address in this PLC		
4	Number of Words to Transfer (1-256)		
5	Destination: Starting V Memory Address in Remote PLC		
6	Command Timeout in seconds (0=Use Default)	0	0
7-15	Unused (Set to 0)	**0**	**0**

Offset 0 — The Command Error Word should be set to 0. If a command execution error is encountered, the 2571 will use this word to store an error code. This word should always be cleared so that an error code from a previous error does not remain in the V memory location.

Offset 1 — The Command Code is 513 decimal (or 0201 hexadecimal).

Offset 2 — The Connection Number is established in the Create Connection command. If the serial port was *automatically connected* based on the module DIP switches, the connection number in offset 2 will correspond to the 2571 physical port number (e.g. Connection Number 19201 specifies the protocol manager connected to serial port 1, connection number 19202 specifies the protocol manager connected to serial port 2, etc.).

Offset 3 — The starting address of V memory which contains the values you want to transfer.

Offset 4 — This indicates the number of words you want to transfer. For large transfers see the caution on performance on page 11.

Offset 5 — The starting address of V memory in the remote PLC that you want to update.

Offset 6 — Command Timeout in seconds. Should normally be set to 0 (2571 default).

3.4 Read Remote PLC Memory

The following command block will cause the 2571 to read the designated V memory in the PLC attached to a 2571 serial port (remote PLC) and store result in local V memory.

Offset	Description	Hex Value	Decimal Value
0	Command Error Word	**0**	**0**
1	Command Code (Read Remote Memory)	**0202**	**514**
2	Connection Number (19201-19299)		
3	Source: Starting V Memory Address in Remote PLC		
4	Number of Words to Transfer (1-256)		
5	Destination: Starting V Memory Address in this PLC		
6	Command Timeout in seconds (0=Use Default)	0	0
7-15	Unused (Set to 0)	**0**	**0**

Offset 0 — The Command Error Word should be set to 0. If a command execution error is encountered, the 2571 will use this word to store an error code. This word should always be cleared so that an error code from a previous error does not remain in the V memory location.

Offset 1 — The Command Code is 514 decimal (or 0202 hexadecimal).

Offset 2 — The Connection Number is established in the Create Connection command. If the serial port was *automatically connected* based on the module DIP switches, the connection number in offset 2 will correspond to the 2571 physical port (e.g. Connection Number 19201 specifies the protocol manager connected to serial port 1, connection number 19202 specifies the protocol manager connected to serial port 2, etc.).

Offset 3 — The starting address of V memory in the remote PLC which contains the values you want to transfer.

Offset 4 — This indicates the number of words you want to transfer. For large transfers see caution on performance on page 11.

Offset 5 — The starting address of V memory in the local PLC that you want to update.

Offset 6 — Command Timeout in seconds. Should normally be set to 0 (2571 default).

CHAPTER 4. COMMAND BLOCKS - ASCII INPUT/OUTPUT

4.1 Overview

In addition to the Task Code Slaver and Task Code Master protocol managers, the 2571-TCM1 firmware also contains a simple ASCII protocol manager. This protocol manager allows to write ASCII message strings to a serial port and to read an ASCII message from a serial port. The ability to read and write simple ASCII strings under control of PLC logic can solve many simple device interfacing problems.

You must create a connection to the ASCII protocol manager using PLC logic. It cannot be automatically connected like the Task Code Slave and Task Code Master.

NOTE:
To use the ASCII Protocol Manager on a serial port, the port must be configured as PLC Select and PLC logic must create a connection to the ASCII Protocol Manager.

ASCII Output

When you trigger the *Send ASCII Text* command, the 2571 retrieves ASCII characters from a user-designated location in V memory and sends them to the serial port. The protocol manager will send message streams up to 1024 characters in length. Two ASCII characters are stored in each V memory word. You will typically store the ASCII characters in V memory using programming software such as TISOFT. You can create several different message streams and select which message stream is sent using the 2571 PLC command interface.

ASCII Input

When you trigger the *Read ASCII Text* command, the 2571will read characters from the serial port until a complete message has been received or a timeout occurs. When the complete message has been received, the 2571 will transfer the entire group of ASCII characters to a user-designated area of V memory.

The Create Connection command requires you to enter a maximum length. You may also specify a start-of-message character and/or an end-of-message character. The protocol manager will use these specifications to determine when a complete message is received. If a complete message is not received within a user-specified timeout period, the protocol manager will post a timeout error.

Take note that this ASCII protocol manager does not reformat the ASCII message in any way, it simply moves ASCII data strings between V memory and the serial port.

4.2 Create Connection Command

The following Command block is used to create a connection to the ASCII Protocol Manager. To use this command, the serial port must have been configured as *PLC Select.*

Offset	Description	Hex Value	Decimal Value
0	Error Word	**0**	**0**
1	Command Code (Create Connection)	**01**	**01**
2	Connection Number (19201 - 19299)		
3	Protocol Manager Number	**22**	**34**
4	Physical Port Number (1, 2, 3, or 4)		
5	Baud Rate (300, 600, 1200, 2400, 4800, 9600, 19200) (hex 012C, 0258, 04B0, 0960, 12C0, 2580,4B00)		
6	Bits per character (7 or 8)		
7	Parity (0=none, 1=Odd, 2=Even)		
8	Stop Bits (1 or 2)		
9	Handshake (0=None, 1=Software, 2 = Hardware)		
10	MAXIMUM Message Length (Range = 1 - 1024)		
11	High Byte: ASCII Starting Character (00h = None) Low Byte: ASCII Ending Character (00h = None)		
10 - 15	Unused (Set to 0)	**0**	**0**

Offset 0 — Error Word - Set to 0 so that any previous error codes are cleared.

Offset 1 — The Command Code of the Create Connection command is 01.

Offset 2 — Connection Number - Any connection number within the valid range can be assigned, as long as the number is unique. For clarity, you may wish to set the lower digits equal to the physical port number (e.g. 19201 for serial port 1).

Offset 3 — The Protocol Manager Number for the ASCII I/O protocol manager is hex 20.

Offset 4 — Physical Port Number - The number of the serial port you want to use.

Offset 5 — Port Baud Rate - This must match your device. The value entered here will override any hardware baud rate setting.

Offsets 6-9 Communications Parameters. Set these to match the communications parameters of the attached device.

Offset 10 This parameter specifies the maximum number of characters in the message. Note that the maximum message length which the 2571 will process is 1024 bytes. If you are using an ending character to delimit messages you should set this value equal to or greater than the maximum number of characters you expect to receive. Setting this word to 0 will generate an error condition.

Offset 11 The high byte of this word (bits 1-8) should be set to the start of message character. If the protocol does not have a start of message character, set this byte to 00hex.
The low byte of this word (bits 9-16) should be set to the end of message character. If the protocol does not use an end of message character, set this byte to 00hex.

The following describes how the protocol manager uses the value in Offsets 10 and 11

1) If you specify only a maximum length *n* , the protocol manager will start counting when the first character is received at the port and will consider the message complete when *n* characters have been read.

2) If you specify a maximum length *n* and a start of message character, the protocol manager will start counting when a valid start of message character is received and will consider the message complete when *n* characters (including the start of message character) have been read.

3) If you specify a maximum length *n*, a start of message character, and an end of message character the protocol manager will start counting when a valid start of message character is received. It will consider the message complete when either a valid end of message character is received or n characters have been read, whichever occurs first.

4) If you specify a maximum length *n* and an end of message character, the protocol manager will start counting characters when the first character is received. It will consider the message complete when either a valid end of message character is received or *n* characters have been read, whichever occurs first.

If a character error, such as a parity error is detected within the message, an error will be posted, the buffer will be flushed, and no data will be transferred to V memory

NOTE:
Offsets 10 and 11 apply only to ASCII *input.* ASCII output processing is unaffected by these parameters.

4.3 Send ASCII Text (Unformatted)

This Command Block is used to send ASCII characters to a serial port.

Offset	Description	Hex Value	Decimal Value
0	Error Word	**0**	**0**
1	Command Code (Send ASCII Text)	**0301**	**769**
2	Connection Number (19201 - 19299)		
3	Message Source: Starting V Memory Address		
4	Number of Characters to Send (Range = 1 - 1024)		
5 - 15	Unused (set to 0)	**0**	**0**

Offset 0 Error Word - Set this to 0 so that any previous error codes are cleared.

Offset 1 Command Code of the Send ASCII Text command is hex 0301 (769 decimal).

Offset 2 Connection Number - This is the connection number established in the applicable Create Connection command.

Offset 3 Message Source - The ASCII text should be stored in V memory, two characters per V memory word. Most programming software, such as TISOFT, allow you to enter ASCII text directly from the keyboard. The value in offset 3 identifies the V memory location which contains the first character.

Offset 4 The number of characters which you want to send. Setting this to 0 or to a number greater than 1024 will produce an error condition.

Offsets 5-15 Unused by this command. You should set these words to 0.

4.4 Read ASCII Text

This Command Block is used when you want read a message consisting of ASCII text from a serial port.

Offset	Description	Hex Value	Decimal Value
0	Error Word	**0**	**0**
1	Command Code Input ASCII Text)	**0302**	**770**
2	Connection Number (19201 - 19299)		
3	Message Destination: Starting V Memory Address		
4	Number of Words to Reserve (Range = 2 -513)		
5	Command Timeout (in seconds) (0 = 2571 Default)		
6 - 15	Unused (set to 0)	**0**	**0**

Offset 0 Error Word - Set to 0 to clear any previous error codes.

Offset 1 The Command Code of the ASCII Input command is hex 0302 (770 decimal).

Offset 2 Connection Number - This is the connection number established in the applicable Create Connection command.

Offset 3 Message Destination - The complete ASCII message will be placed in V memory, starting at the address in offset 3. ASCII text is stored two characters per word, starting with the high byte. When an odd number of characters is received, the low byte of the last word is set to 0.

Offset 4 Number of Words to Reserve - This value indicates the maximum number of V memory words to reserve for storing ASCII input. When a complete message is received, the first word will be used to indicate the actual number of characters placed in V memory. You should reserve 1 word for the character count plus 1 word for each two characters in the message. If you receive more characters than will fit in the memory reserved, the ASCII Protocol Manager will post an error and nothing will be written to V memory. The valid range for this parameter is 2 -513.

Offset 5 If a complete message has not been processed within the timeout period, the protocol manager will post a timeout error. If you set this value to 0, the 2571 default timeout of about 9 seconds will be applied.

Offsets 6 - 15 Unused by this command. Set these words to 0.

CHAPTER 5. PROGRAMMING EXAMPLES

5.1 Lab Test Example

This example illustrates how you can use a single PLC and one 2571 with the 2571-TCM1 firmware to test out the module. In the course of performing the application exercise, you should gain a better understanding of the 2571-TCM1 programming techniques.

Application Description

In an actual application you would have at least two PLCs, where one PLC would update memory in the other. In this example, a single PLC emulates both the master and the slave. The PLC triggers a command to the 2571 which causes it to read V memory (via the programming port) and write the data to other V memory locations (via the backplane.)

Hardware Setup

Your setup should include:

1) a SIMATIC TI545 (or equivalent) PLC,
2) a rack with power supply,
3) a CTI 2571 with the 2571-TCM1 feature installed,
4) a personal computer with TISOFT.

The 2571 should be configured so that Port 1 is a Task Code Master and Port 2 is a task code slave. Ports 3 and 4 can be configured for either protocol. See Chapter 2 for details on configuring ports. Install the module and ensure that it is properly logged in. The PLC should recognize the 2571 as a Special Function module with 2WX and 6 WY. Also see the *CTI 2571 Installation and Operation Guide.*

You should have a copy of the *CTI 257x PLC Command Interface Reference Manual* available for this exercise.

NOTE:
Set the PLC in PROGRAM mode for this application example.

See the following figure for connecting the equipment.

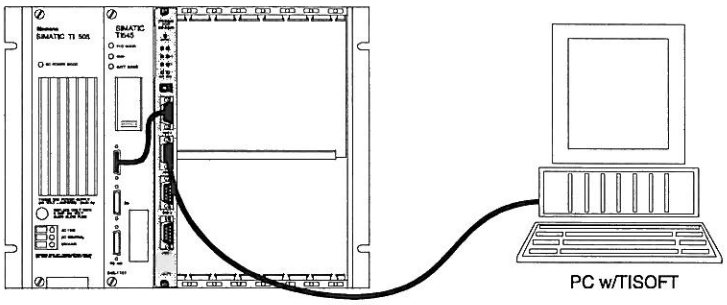


Figure 8. *Lab Example Equipment Configuration*

Connect your TISOFT terminal to Port 2 of the 2571. You should now be able to access the PLC using TISOFT.

Connect Port 1 of the 2571 to the Programming port of the PLC using an RS-232 cable designed to connect to the PLC programming port. The following figure shows how to construct the cable. Note the PLC requires hardware handshake lines to be strapped together. You may have a cable available, since this cable configuration is normally used to connect a PC with TISOFT to the program port. This cable will be used to send task codes to the PLC processor.

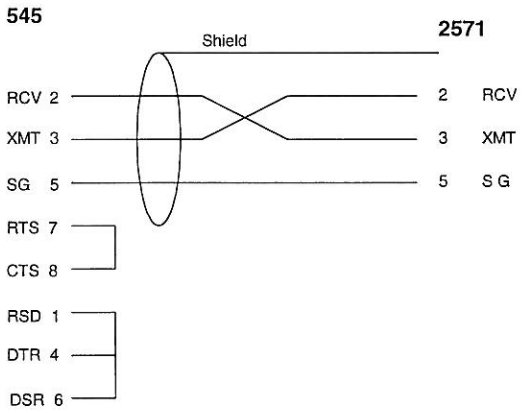


Figure 9. *2571 to 545 Cable (RS-232)*

TISOFT Setup

Build a chart in TISOFT as shown below. The chart will be used to monitor the interaction between the PLC and the 2571 and to observe the data being returned by the PLC. The chart assumes that the 2571 is logged in starting at WX1. If it is not, substitute the appropriate module word addresses. V100 -V115 will contain the Command Block (only V100 - V107 is displayed). V120-V127 will contain the data to be transferred. V130-V137 will be used to store the data after transfer.

LOCATION		STATUS	LOCATION		STATUS	LOCATION		STATUS
WX1	=	HEX	V120	=	INTEGER	V130	=	INTEGER
WX2	=	HEX	V121	=	INTEGER	V131	=	INTEGER
WY3	=	HEX	V122	=	INTEGER	V132	=	INTEGER
WY4	=	HEX	V123	=	INTEGER	V133	=	INTEGER
WY5	=	INTEGER	V124	=	INTEGER	V134	=	INTEGER
WY6	=	INTEGER	V125	=	INTEGER	V135	=	INTEGER
WY7	=	INTEGER	V126	=	INTEGER	V136	=	INTEGER
WY8	=	INTEGER	V127	=	INTEGER	V137	=	INTEGER

V100	=	INTEGER	V100	=	HEX
V101	=	INTEGER	V101	=	HEX
V102	=	INTEGER	WX2	=	BIN
V103	=	INTEGER	WY4	=	BIN
V104	=	INTEGER			
V105	=	INTEGER			
V106	=	INTEGER			
V107	=	INTEGER			

The variables charted above will be used as follows:

WX1	Module Status	V100 - V107	Command Block (1st 8)
WX2	Command Status	V120 - V127	Source of data Transfer
WY4	Command Control	V130 - V137	Destination of data transfer
WY5 - WY8	Command Slots		

V100 and V101 are displayed in both hex and integer so that you can observe both command and error formats. WX2 and WY4 are displayed in both hex and binary. This will allow you to see how the command and status bits change values.

Set up the command block to transfer data from V120-V127 to V130-V137 by entering the following into V100-V115:

V100 =	0	Command Error Word
V101 =	513	Command: Write Remote PLC Memory
V102 =	19201	Connection Number to port 1
V103 =	120	Source: Starting Memory Location: V120
V104 =	8	Number of Words to Transfer: 8
V105 =	130	Destination: Starting Memory Location: V130
V106 through V115 =	0	Remainder of Command Block set to 0

Next enter data in V120-V127. The data values are arbitrary. This data will be the source of the data you want to transfer. V130-V137 will be the destination V memory. Set V130-V137 to 0 so you can see the transfer.

NOTE:
Refer to the CTI 257x PLC Command Interface Reference Manual for a diagram of the module word usage.

Uncoupled Mode

Uncoupled Mode will cause V130 - V137 to be updated continuously from values in V120 - V127. You can trigger the command using Uncoupled mode as follows:

1) Change the value of WY5 to Integer 100, which indicates that the command block for Command Slot 1 starts in V100.

2) Next, set the trigger bit in Bit 3 of WY4 to 1 (and set all other bits to 0). You can do this by setting WY4 equal to Hex 2000.

3) Once you complete the above, you should observe the following:

   a) Bit 3 of WX2 (Command Busy) will turn on, indicating the 2571 is processing the commands (WX2 = Hex 2000). Note: Although the Command Busy bit is continuously cycling, it will appear to stay on as long as the Command Trigger is set.

   b) The Transmit and Receive LEDs for port 1 will both flash continuously, indicating that task codes are being sent and the PLC is responding,

   c) A copy of the data in V120-V127 appear in V130-V137.

   d) When you change the data in V120-V127 using TISOFT, you should see a change in the corresponding location in V130-V137.

If the update does not occur, check status bits 1 and 2 in WX2. If bit 1 (CMD ERR) is set, there is a problem executing the command. This typically indicates that something is wrong with the data in the command block or that WY5 does not point to the command block. If bit 2 (PLC ERR) is also set, the 2571 cannot access V memory to get the Command Block. This usually means that the value in the WY5 is an invalid V memory address (such as 0). If PLC ERR is not set and the value in WY5 points to Command Block in V100, you should find an error code in V100. See Appendix A for the cause of the error and possible solutions.

Once you have fixed the cause of the error, acknowledge the error by doing the following:

1) Clear the trigger bit and set bit 1 of WY4 to 1 to acknowledge the error (WY4= Hex 8000),

2) Check that bit 1 and 2 of WX2 = 0, indicating that the 2571 has cleared the error flag,

3) Set Bit 1 of WY4 to 0 to clear the acknowledgement. (WY4 = Hex 8000).

Coupled Mode

Once you have the Uncoupled mode working to your satisfaction, you may want to try a Coupled Mode command. Coupled mode will execute the command *only once per trigger.*

1) Set V130-V137 to 0 so that you can observe the data transfer.

1) Set bit 2 (CMD Mode), bit 3 (CMD Trig) of WY4 to 1 (and all other WY4 bits to 0). WY4= Hex 6000.

2) Bit 3 (CMD Busy) of WX2 should turn on, indicating the 2571 is processing the command and is waiting for the PLC to lower the trigger. WX2 = Hex 2000.

3) You should see the transmit and receive LEDs flash briefly. The data in V120-V127 should appear in V130-V137 as before.

4) Change the data in V120 though 127. You should not see the data change in V130-V137 because the command to change the data executes only once per trigger.

To re-trigger the module:

1) Ensure the Command Busy bit in bit 3 of WX2 is set to 1, indicating that the 2571 is waiting for the PLC to lower the trigger (WX2 = Hex 2000).

2) Clear the command trigger by setting bit 3 of WY4 to 0 (you can set the entire WY4 to 0).

3) Check the Command Busy bit, it should now be 0, indicating that the 2571 is ready for another trigger.

4) Re-trigger the command by setting WY4 to 6000 hex as before.

5) The data in V120-V127 should now appear in V130-V137.

5.2 Memory Transfer Logic Example

The example above was designed to familiarize you with manipulating the Command Control bits. In an actual application, of course you will use PLC logic to control the 2571-TCM1. If you are using ladder logic to develop the PLC application, the following examples should help you in designing your ladder program. The following examples assume that V Memory is set up as indicated in the previous section.

V100-V115 contains the Command Block
V120-V127 contains data to be transferred
V130-V137 is the destination of the data.

Uncoupled Mode Logic

This ladder program illustrates a simple method for initiating an Uncoupled Mode transfer.

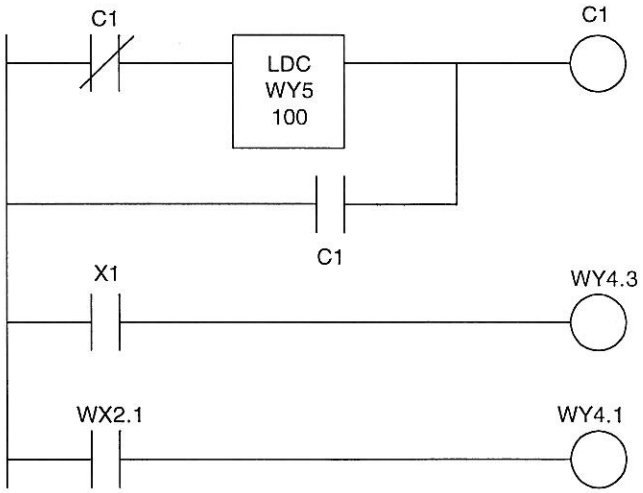


Figure 10. *Uncoupled Mode Ladder Example*

In the ladder example, Rung 1 loads the V memory address of the Command Block in WY5. After Rung 1 has executed once, Control relay C1 seals off the process so that it is done only once.

Rung 2 will turn on the command trigger for Command 1 (WY4.3) as long as X1 is set. X1 represents any particular event or set of events that you want to trigger the send. The Command Mode (WY4.2) will be 0 (by default), indicating Uncoupled Mode. In Uncoupled Mode, the transfer will take place continuously as long as the trigger is on.

Rung 3 contains the "error processing." In this case, the logic simply acknowledges the error, which will cause the 2571 to stop the command, clear the command error bit, and, if the Command Trigger bit is set, re-try the command.

Coupled Mode Logic

This example illustrates how you might design a ladder program to transfer memory using Coupled Mode. In this example, we want to write a value to remote PLC memory *only once,* when an event (represented by X1) occurs. The event must transition from on to off and back on before a subsequent transfer will take place.

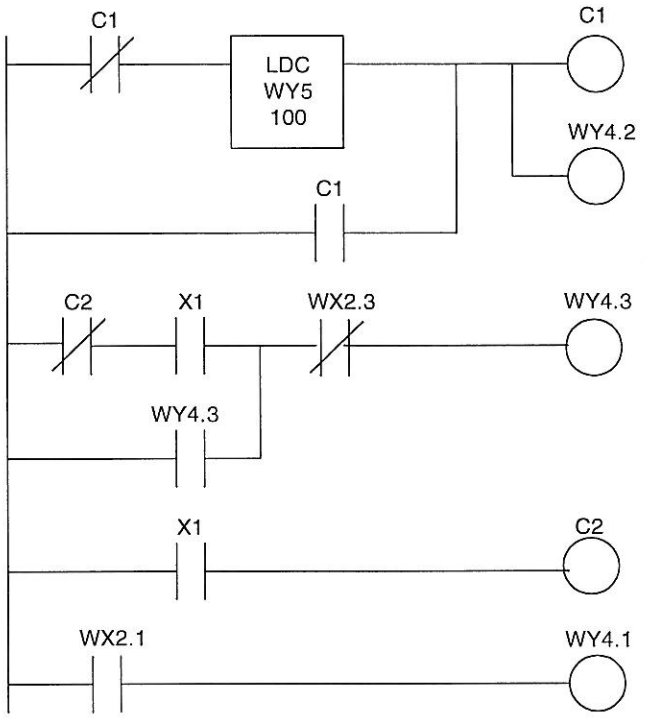


Figure 11. *Coupled Mode Ladder Example*

Rung 1 performs the same function as in the previous example: it loads the address of the Command Block in WY5. It also sets the Command Mode for Command 1 to Coupled Mode (WY4.2=1).

Rung 2 handles the 2571 trigger manipulation. The first time through the logic control relay C2 is off. The event (X1) must be on *and* CMD Busy (WX2.3) must be off before the trigger (WY4.3) will be set. Once the trigger is set, it will not be lowered until CMD Busy (WX2.3) goes high.

Rung 3 sets control relay C2 on and keeps it on when the event (X1) is on. This prevents a single occurrence of an event from triggering multiple transfers. X1 must cycle off and on before the command trigger will be re-set.

Rung 4 is a trivial error recovery procedure. If CMD Err (WX2.1) is set by the 2571 while CMD busy (WX2.3) is on, the PLC will assert Err Ack. When ERR Ack is asserted, the 2571 will clear the command processing, lower CMD Err, lower CMD Busy, and be ready for the next trigger.

CHAPTER 6. TROUBLESHOOTING

When the 2571-TCM1 firmware fails to function properly, it can be the result of faulty hardware, communications signal problems, protocol errors, configuration errors, or faulty PLC logic. This section is designed to assist you in locating and correcting the source of the problem. It is intended to supplement the information found in Chapter 4 of the *CTI 2571 Program Port Expander Module Installation and Operation Guide* (2571 IOG).

6.1 Module Malfunction

The 2571 performs a Power On Self Test (POST) when power is first applied or when the module is reset. If the hardware passes POST the ACTIVE LED will be illuminated (on steady). If there is a problem, the ACTIVE LED will blink or be extinguished. See the CTI 2571 IOG for additional information.

In addition, the module continuously performs diagnostic checks on key hardware components while it is operating. If a problem is detected, the ACTIVE LED will be set to blink and the applicable status bit will be set in the module WX1, indicating the source of the error. If the error is a "fatal" unrecoverable error, the module will automatically reset after a few seconds.

NOTE:
If the Module ACTIVE LED remains on steady after the module is powered up, the module hardware is probably OK.

6.2 Communications Signal Problem

The most common source of communication signal problems is faulty cabling, including improperly wired cables, cable lengths which exceed specifications, and cable routings which tend to induce noise. You can test cable continuity using a simple cable tester or ohmmeter. In addition, the XMT and RCV LEDs are a good indicator whether a signal is being transmitted or received at the port. In normal operation, both the XMT and RCV LEDs should flash on an active port.

Signal quality ("noise") problems can be detected by observing the 2571 error codes or by using a serial line analyzer. See Appendix A. Signal quality problems may be corrected by replacing cabling, re-routing signal lines away from noise generating components, or reducing the baud rate.

6.3 Protocol Problems

Protocol problems are usually caused by incorrectly setting the communications parameters. When you observe the 2571 send a task code (XMT LED flashes), but no response is received from the remote PLC (RCV LED does not flash), you may have a protocol problem.

Devices which communicate via serial data links must have the communications parameters including baud rate, data bits, stop bits, and parity set to identical values. If you are using devices which communicate using NITP (Non-Intelligent Terminal Protocol), you should ensure that the parameters are set as follows:

Baud Rate -	Identical for both devices
Data Bits -	7
Parity -	Odd
Stop Bits -	1

If you use the DIP switches to automatically create a connection, the correct data bits, parity, and stop bits are set automatically on the 2571.

In addition, if you are using hardware handshaking, both devices must be properly configured. See the *CTI 2571 Installation and Operation Guide* for additional information.

6.4 Configuration Problems

In addition to setting communications parameters, the ports on the 2571 must be configured so that a connection to the desired Protocol Manager is created. Using the DIP switches, you can select the Task Code Slave or the Task Code Master protocol manager. In addition, you can set the switches so that PLC logic can be used to create a connection.

If you inadvertently set the DIP switches to the wrong value, the port will not function as expected. For example, a port connected to a Task Code *Master* protocol manager will not respond to messages initiated by an operator interface device. If the 2571 does not respond to task codes sent from an NITP compatible operator interface device, you should check the DIP switch setting carefully.

Similarly, a port connected to a Task Code *Slave* protocol manager will not respond to PLC memory transfer commands. You can usually tell when the port connection is incorrect by examining the error code which the 2571 places in the command block. See Appendix A for a description of the error codes.

The PLC I/O table must also be configured to include the 2571 (See Chapter 2). If this is not accomplished properly, the 2571 will not respond to PLC commands.

6.5 PLC Logic Problems

You will typically use PLC logic to control the 2571 task code transmission. As discussed in previous chapters, the Command Block located in V memory, specifies the command to be executed. The Command Slots (WY5-WY8) select which Command Blocks are to be processed, and the Command Control bits trigger the execution of the commands. A mistake in setting up and/or manipulating these structures will cause erroneous results. Fortunately, the 2571 provides extensive error reporting which should assist you in correcting logic problems. See Appendix A for a complete description and typical solutions to resolving the errors.

Following are some common errors in using the PLC interface to the 2571.

Command Block Errors

A command block error occurs when incorrect data has been entered into the command block or data has been omitted from the command block. Some mistakes, such as an invalid command or port number will be obvious because the 2571 will post an error when they occur. Other mistakes, such as selecting the wrong V memory address in which to write data may require closer investigation.

NOTE:
If you are having problems with the PLC logic and you are not getting an error code, you should check the command block data first.

Command Slot Errors

Command Slot errors occur when you enter the wrong V memory address for the Command Block or when you omit entering an address.

If you enter a V memory address which does not contain a valid command block or omit entering an address, the 2571 will post an error code. You might enter a V memory address of a *valid* command block, but it is *not* the command block you want to process. In this case, you will probably not get an error, just the wrong result.

NOTE:
If the address in the Command Slot is an invalid V memory address (such as 0) you will see the 2571 set the PLC Err bit in addition to the CMD Err bit.

Command Control Errors

One of the most common errors in manipulating the Command Control bits is a failure to assert ERR Ack (Error Acknowledge) when the 2571 has posted an error. If you fail to acknowledge the error, the associated command slot will appear to "lock up" on the port. In actuality, the 2571 is waiting on the PLC acknowledgement before proceeding. You can tell that the 2571 is not really locked up by observing the timer value in the module WX1 increment. In addition, if you have triggered other commands, they will continue to operate (unless an error also occurs on these command slots).

Another typical error is failing to observe the timing protocol for coupled mode. You must wait for the module to assert CMD Busy and then lower CMD Trigger. See the *CTI 257x PLC Command Interface Reference Manual* for timing details. Failure to observe the timing may cause the command slot to appear to "lock up". Actually the 2571 is waiting to see the PLC lower the CMD trigger.

A third typical error in manipulating the Command Control bits is "Multiple Triggering." Certain commands, such as those to create a connection, must be run only once. Improperly constructed PLC logic may repeatedly trigger the command, resulting in errors being posted. You can prevent multiple triggers by "sealing" the applicable logic rung. See the examples in Chapter 5 of this manual.

APPENDIX A. ERROR CODES

Overview

Assuming a valid command block could be retrieved, when the module encounters an error in processing a particular command, it writes an error code in the first word of the Command block and sets the applicable CMD Err bit in the module WX2 word. The error codes may be visually inspected using an application such as TISOFT or may be used in PLC logic processing.

During the application development process, these error codes can be very helpful in correcting logic or configuration errors. When used this way, you will probably set up TISOFT to display error codes in hex format.

In some cases, you may wish to use the value of the error word in your PLC logic. In SIMATIC TI505 Series PLCs, the most convenient format for representing the error code is decimal integer. Where applicable, this appendix shows both hex and decimal formats.

Memory Transfer Command (Command Group 02)

Task Code 00 Error Codes

This group of error codes is returned by the remote PLC when an error is encountered processing a task code. The error code is returned in a message which contains a task code 00, followed by the specific error code. Task Code 00 responses are processed by the 2571 in the following manner.

Memory Transfer Commands - When a valid message containing a task code 00 is returned by the remote device, the 2571 places the specific error code in the lower byte of the command word and sets the CMD Err bit. The high byte of the command will be the command group code (hex 02).

Advanced Function Task Code Command - When a message containing task code 00 is returned by the remote device, the task code response is placed in the V memory location designated.

The error codes are summarized on the next page for quick reference. They are described in SIMATIC TI documentation, including the *SIMATIC TI545 Technical Product Description.* Although many of the error codes relate to remote programming operations and should not occur with normal 2571 operation, the complete list is shown for your reference.

Simatic TI505 Task Code 00 Error Listing

HEX	DEC	DESCRIPTION
01	01	Reset Current Transaction
02	02	Address out of Range (Other than Ladder Logic)
03	03	Requested Data not Found
04	04	Illegal Task Code Request (e.g. Task Code not Supported)
05	05	Request Exceeds Program Memory Size (Ladder Logic)
06	06	Diagnostic Fail upon Power Up
07	07	Fatal Error Detected
08	08	Keylock Protect Error
09	09	Incorrect amount of Data sent with request
0A	10	Illegal Request in Current Operational Mode
0B	11	Network was not Deleted
0C	12	Attempted Write Operation Did Not Verify
0D	13	Illegal Number of ASCII Characters Received
0E	14	Illegal Write to Program Memory (Non Volatile)
10	16	Data not Written
11	17	Invalid Data sent with the Command
12	18	Invalid Operation with NIM (Obsolete)
13	19	The store and forward buffer is busy
14	20	No response from the Special Function Module
15	21	Illegal Instruction found in program memory on a Program to Run transition
16	22	Attempted Write to a Protected Variable (e.g. TCC, TCP)
17	23	No response from PC (e.g. Single Scan not performed)
18	24	Requested memory size exceeds total available memory
19	25	Requested Memory size is not a multiple of block allocation size
1A	26	Requested memory size is less than minimum defined value.
1B	27	Requested memory size is larger than maximum defined value
1C	28	P/C Busy - Cannot complete the requested operation
1D	29	Comm error in HOLD mode - Transition to Run not allowed
1E	30	Port Lockout is Active (ref task Code 48)
21	33	I/O Configuration Error - too many points
40 - 5F	4-95	SF/ Loop Errors

Data Link Error Codes - Memory Transfer Commands

The data link error codes are returned by the remote PLC when it detects a data link error.

HEX	DEC	DESCRIPTION	SOLUTION
0265	613	CHARACTER PARITY ERROR The receiving device detected a parity error in the message sent by the 2571.	This error usually indicates a setup problem or "noise" on the data link. Check the communications setup of both the 2571 and the remote device. The communication settings must match. Incorrect settings any of the communications parameters can cause parity errors. If you created a connection to the port using PLC logic, you may have incorrectly set the communications parameters in the Create Connection command. Devices using NITP message format support Odd parity only. Check the Command block and correct if necessary. Examine your communications cable for loose connections and improper shielding. Ensure that the cable length specifications are not exceeded and that the cable is routed properly. The problem may be transient, clear the error and retry the command. If everything else is OK and the problem persists, there may be a hardware problem with the 2571 module or the receiving device. Substitute hardware and retry.
0266	614	INVALID CHARACTER RECEIVED The receiving device found an invalid character in the message sent by the 2571 (i.e., it was not 0-9 or A-F).	This error usually indicates a setup problem or "noise" on the data link. See the previous solution.

HEX	DEC	DESCRIPTION	SOLUTION
0267	615	INVALID CHARACTER COUNT FIELD The receiving device detected that the character count of the NITP message sent by the 2571 (the two characters after the ":") did not equal the character count that it actually received.	This error usually indicates "noise" on the communications data link or a setup problem. Since the problem may be transient, retry the command. See previous solution for additional action.
0268	616	CHARACTER COUNT ERROR The receiving device detected either an odd number of characters or a character count > 72 characters in the message sent by the 2571.	See the previous solution.
0269	617	CHECKSUM ERROR The receiving device detected a checksum error on the message sent by the 2571.	See the previous solution.

Command Specific Errors - Memory Transfer Commands

The following table shows error codes that are specific to the memory transfer commands.

HEX	DEC	DESCRIPTION	SOLUTION
026F	623	REMOTE MEMORY READ: WORD COUNT ERROR The remote PLC responded with less words than requested by the Remote Memory Read command block.	This error usually occurs when the number of words requested in the command block causes the read request to exceed the V memory boundary in the remote PLC. In other words, you are trying to read V memory that isn't there. You should examine both the number of words requested and the starting V memory value for the remote PLC.
0270	624	MEMORY TRANSFER RESPONSE ERROR When the Task Code Master protocol manager attempted to read or write the remote PLC memory, it received an unexpected response. The response was not a read response, write response, datalink error response, or error task code response.	This error may occur when you are communicating with a computer using custom software which emulates the PLC rather than a real PLC. In this case you should carefully check the logic of the computer program.
0271	625	MEMORY TRANSFER WORDS OUT OF RANGE - LOW Offset 4 in the command block for a Remote Memory Read or Remote Memory Write contained 0 or a negative value. The valid range is 1-256 words.	Change the value in offset 4 to reflect the number of words to transfer within the valid range of values. Check that the value in the Command Slot points to the Command Block
0272	626	MEMORY TRANSFER WORDS OUT OF RANGE - HIGH Offset 4 in the command block for a Remote Memory Read or Remote Memory Write contained a value greater than 256. The valid range is 1-256 words.	Change the value in offset 4 to reflect the number of words to transfer within the valid range of values. Check that the value in the Command Slot points to the Command Block

HEX	DEC	DESCRIPTION	SOLUTION
029D	669	CMD TIMEOUT ERROR The time to process the requested command exceeded the Command Timeout value. Command processing has been halted. Note that the timeout value may have been explicitly set in the Command Block or the default may have been used (timeout=0).	This error typically indicates a bad connection (faulty cable, loose connector, etc.). Check all cabling carefully. If the error persists and you have explicitly set the timeout value, it is possible that you have set the timeout value too small. Try increasing the value or using the default value. In some circumstances, you may occasionally get a timeout error, especially with modem data links. In these circumstances, your logic should retry the command.
029E	670	ALREADY BUSY ERROR The protocol manager received a new command prior to the completing the previous command.	This error can also be produced by simultaneously triggering two command slots which reference the same command block. If more than one command slot is used, make sure that they reference different command blocks and that the command blocks that they reference have different connection numbers.

ASCII Input/Output

Command Specific Errors - ASCII I//O Command

The following error codes are specific to the ASCII Input/Output Command blocks.

HEX	DEC	DESCRIPTION	SOLUTION
036E	878	REQUEST TOO LARGE The number of characters specified in the Send ASCII Text command block exceeded 1024 characters.	Correct the entry in the command block
036F	879	REQUEST TOO SMALL The number of characters specified in the Send ASCII Text command block is 0 or less.	Correct the entry in the command block
0370	880	INVALID ADDRESS: SOURCE The command block entry for send ASCII text specified an invalid address for the source V memory.	Correct the entry in the command block
0371	883	INSUFFICIENT V MEMORY SPECIFIED The number of words specified in the ASCII read command block is not sufficient to hold the number of characters actually received.	Increase the number of V memory words reserved. Check the maximum length and message delimiter characters specified in the Create Connection command to ensure these entries are correct.
0372	884	V MEMORY SPECIFIED BELOW MIN The number of V memory words specified in the ASCII read command block is less than the minimum. You must specify at least 2 V memory words	Correct the entry in the command block
0373	885	V MEMORY SPECIFIED ABOVE MAX The number of V memory words specified in the ASCII read command is greater than the maximum. You cannot specify more than 513 words.	Correct the entry in the command block
0374	886	MISSING LENGTH SPECIFICATION The Create Connection command did not specify a maximum length for the message. You must specify a length even if you are using message delimiting characters to determine receipt of a complete message.	Enter a value for the length in the command block. If you are using message delimiting characters, make sure the length equals or exceeds the maximum number of characters you expect to receive.

HEX	DEC	DESCRIPTION	SOLUTION
0375	887	DESTINATION: V MEMORY ERROR The command block for the ASCII read command block contains a value for the V memory address or number of words which causes a V memory write error to occur. This usually occurs when you specify a starting V memory address of 0 or when the combination of the starting V memory address and the number of words causes the address to exceed the V memory boundary.	Check the entry for starting V memory and number of words and make corrections.
0376	888	INVALID LENGTH SPECIFICATION The Create Connection command block contained a value for message length that exceeded 1024 characters.	Correct the entry in the command block.
0377	889	ASCII READ ERROR-OVERRUN The protocol manager detected a UART overrun error when reading the ASCII data.	If this error occurs infrequently, you may wish to simply acknowledge the error and re-try the command. If the problem persists, you may have set the communications parameters incorrectly. Both the 2571 and the remote device must be set to the same values. If you do not find any setup problems, you the 2571 hardware may be defective. Replace the module with a known good one and retry.
0378	890	ASCII READ ERROR-FRAMING The protocol manager detected a framing error when reading the ASCII data	See Previous Solution
0379	891	ASCII READ ERROR -PARITY The protocol manager detected a parity error when reading ASCII data	See Previous Solution

HEX	DEC	DESCRIPTION	SOLUTION
039D	925	CMD TIMEOUT ERROR The time to process the requested command exceeded the Command Timeout value. Command processing has been halted. Note that the timeout value may have been explicitly set in the Command Block or the default may have been used (timeout=0).	This error typically indicates a bad connection (faulty cable, loose connector, etc.). Check all cabling carefully. If the error persists and you have explicitly set the timeout value, it is possible that you have set the timeout value too small. Try increasing the value or using the default value. In some circumstances, you may occasionally get a timeout error, especially with modem data links. In these circumstances, your logic should retry the command.
039E	926	ALREADY BUSY ERROR The protocol manager received a new command prior to the completing the previous command.	This error can also be produced by simultaneously triggering two command slots which reference the same command block. If more than one command slot is used, make sure that they reference different command blocks and that the command blocks that they reference have different connection numbers.

General Protocol Manager Errors

The following errors may be returned by any protocol manager. The table indicates the value in the low byte of the error word. The high byte will contain the number of the protocol manager responding. The protocol manager number is returned to provide positive identification of the protocol manager that received the command. This enables you to detect problems where you loaded the wrong protocol manager or are inadvertently directing a command to the wrong protocol manager.

HEX	DEC	DESCRIPTION	SOLUTION
97	151	UNKNOWN COMMAND The protocol manager received a command number which is not valid.	Ensure that Offset 1 in the Command block contains a valid Command Code. Check to be sure that the Command Slot points to the correct V memory Address for the Command Block. Make sure that you have specified the correct protocol manager number in the Create Connection command and that you are using the right connection number.
98	152	COULD NOT OPEN PORT The protocol manager could not open the 2571 serial port. Occurs during a Create Connection command.	This usually is the result of a hardware error, which may be transient. Retry the command. If the error persists, reset the module. If the error re-occurs after reset, replace the module.
99	153	ERROR READING PORT The protocol manager detected an error during a read on the 2571 serial port.	See the previous solution.
9A	154	ERROR WRITING PORT The protocol manager detected an error during a write on the 2571 serial port.	See the previous solution.
9B	155	NOT USED Reserved for future use.	
9C	156	NOT USED Reserved for future use.	

HEX	DEC	DESCRIPTION	SOLUTION
A0	160	BAUD ERROR The protocol manager was passed an invalid baud rate. Valid baud rates are 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, and 19200.	This error is typically the result of an incorrect value in the command block for the Create Connection command for the port. Check the value and correct any entry errors. Ensure that the Command Slot value points to the correct command block.
A1	161	DATA BITS ERROR The protocol manager was passed an invalid data bits value. Valid data bit values are 5, 6, 7, 8.	See previous solution.
A2	162	PARITY ERROR The protocol manager was passed an invalid parity value. Valid parity values are 0-None, 1-Odd, 2-Even.	See previous solution.
A3	163	SBIT ERROR The protocol manager was passed an invalid number of stop bits. Valid stop bit values are 1 and 2.	See previous solution.
A4	164	HSHAKE ERROR The protocol manager was passed an invalid handshake value. Valid handshake values are 0-No Handshake, 1-Software Handshake, 2-Hardware Handshake.	See previous solution.

System Detected Errors

The following errors are returned by the module operating system. The high byte of the error word will always contain hex 00.

HEX	DEC	DESCRIPTION	SOLUTION
A5	165	INVALID SYSTEM COMMAND Connection number 19200 (system) was specified in the command block but the command is not a valid system command.	Change the logical port to a valid connection number. There are no systems commands in this firmware.
A6	166	CONNECTION NOT ACTIVE An attempt was made to send a command to a connection number that has not been created. Note: you can receive this error if you incorrectly enter the connection number.	If you are using DIP switches to configure the port automatically create a connection to the port, make sure that the switch settings are correct. DIP switch should **not** be set to *PLC Select* if you wish to *automatically* create a connection at module reset. If you are using PLC logic to create a connection to the port, check the following for the Create Connection Command: 1) Make sure that the command block contains the correct data, 2) Ensure that the Command Slot points to the proper command block, 3) Ensure that the Command Trigger has been set. 4) Check for reported errors for the Create Connection Command Check to ensure that you have entered the correct connection number in the command block.
A7	167	DUPLICATE CONNECTION NUMBER An attempt was made to start two protocol managers with the same connection number and the same physical port.	Check the Command Blocks for the respective Create Connection commands. Ensure that the Create Connection commands use different connection numbers and different ports.

APPENDIX B. CONVERSION TABLES

TABLE 1. Hex to Decimal (High Byte)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	256	512	768	1024	1280	1536	1792	2048	2304	2560	2816	3072	3328	3584	3840
1	4096	4352	4608	4864	5120	5376	5632	5888	6144	6400	6656	6912	7168	7424	7680	7936
2	8192	8448	8704	8960	9216	9472	9728	9984	10240	10496	10752	11008	11264	11520	11776	12032
3	12288	12544	12800	13056	13312	13568	13824	14080	14336	14592	14848	15104	15360	15616	15872	16128
4	16384	16640	16896	17152	17408	17664	17920	18176	18432	18688	18944	19200	19456	19712	19968	20224
5	20480	20736	20992	21248	21504	21760	22016	22272	22528	22784	23040	23296	23552	23808	24064	24320
6	24576	24832	25088	25344	25600	25856	26112	26368	26624	26880	27136	27392	27648	27904	28160	28416
7	28672	28928	29184	29440	29696	29952	30208	30464	30720	30976	31232	31488	31744	32000	32256	32512
8	32768	33024	33280	33536	33792	34048	34304	34560	34816	35072	35328	35584	35840	36096	36352	36608
9	36864	37120	37376	37632	37888	38144	38400	38656	38912	39168	39424	39680	39936	40192	40448	40704
A	40960	41216	41472	41728	41984	42240	42496	42752	43008	43264	43520	43776	44032	44288	44544	44800
B	45056	45312	45568	45824	46080	46336	46592	46848	47104	47360	47616	47872	48128	48384	48640	48896
B	45056	45312	45568	45824	46080	46336	46592	46848	47104	47360	47616	47872	48128	48384	48640	48896
D	53248	53504	53760	54016	54272	54528	54784	55040	55296	55552	55808	56064	56320	56576	56832	57088
E	57344	57600	57856	58112	58368	58624	58880	59136	59392	59648	59904	60160	60416	60672	60928	61184
F	61440	61696	61952	62208	62464	62720	62976	63232	63488	63744	64000	64256	64512	64768	65024	65280

TABLE 2. Hex to Decimal (Low Byte)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
3	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
4	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
5	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
6	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
7	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
8	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
9	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
A	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
B	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
B	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
D	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
E	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
F	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

To find the decimal equivalent in the tables, locate the first hexadecimal character in the leftmost column and the second hexadecimal character in row. The decimal equivalent will be located in the cell where the row and column intersect. Using Table 2 for example, the decimal equivalent of hex A2 is 162.

For conversion between a hexadecimal *word* and a decimal integer *word*, add the decimal value of the high byte in Table 1 to the decimal value of the low byte in Table 2. For example, hex 023A = 512+58 = 570.

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.

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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.

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

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