Simatic/TI 505 Ethernet Driver Help

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Table of Contents

Table of Contents 2
Simatic/TI 505 Ethernet Driver Help 4
Overview 4
Device Setup 5
Addressing Options 5
Communications Parameters 6
Cable Diagrams 7
Optimizing Simatic/TI 505 Ethernet Communications 9
Data Types Description 10
Address Descriptions 11
CTI 2572/2572-A and CP2572 Addressing 11
505-CP1434-TCP Addressing 11
Common Data Type Addressing 11
Status Words 15
Alarm Addressing 20
AVF Bit Definitions 21
ACF Bit Definitions 22
Loop Addressing 23
LVF Bit Definitions 24
LCF Bit Definitions 25
LRSF Bit Definitions 26
Find Forced Addressing 27
Error Descriptions 29
Address Validation 29
Missing address 29
Device address '<address>' contains a syntax error 29
Address '<address>' is out of range for the specified device or register 30
Data Type '<type>' is not valid for device address '<address>' 30
Device address '<address>' is Read Only 30
Array size is out of range for address '<address>' 30
Array Support is not available for the specified address: '<address>' 30
Device Status Messages 30
Device '<device name>' is not responding 31
Unable to write to '<address>' on device '<device name>' 31
Driver Error Messages 31
Winsock initialization failed (OS Error = n) 31
Winsock V1.1 or higher must be installed to use the Simatic/TI 505 Ethernet device driver 32
Device '<device name>' input queue is full. The module is receiving requests faster than it can process requests 32
Device '<device name>' cannot execute a read request ('<address>', ' <size>') 32
Device '<device name>' cannot execute a write request ('<address>', ' <size>') 32
Device '<device name>' responded with Extended error '<error>' (Tag '<address>', Size '<size>') 32
Device '<device name>' detected a NITP Protocol Error (Tag '<address>', Size '<size>') 33

Device '<device name>' detected a Task Code error '<error>' (Tag '<address>', Size '<size>') 33
Device '<device name>', Write Value not in range 1-->65536. (Tag 'FFSTART') 33
Task Code Error Codes 34
Index 35

Simatic/TI 505 Ethernet Driver Help

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CONTENTS

Overview
What is the Simatic/TI 505 Ethernet Driver?

Device Setup
How do I configure a device for use with this driver?

Optimizing Your Simatic/TI 505 Ethernet Communications
How do I get the best performance from the Simatic/TI 505 Ethernet driver?

Data Types Description
What data types does this driver support?

Address Descriptions
How do I address a data location on a Simatic/TI 505 Ethernet device?

Error Descriptions
What error messages does the Simatic/TI 505 Ethernet driver produce?

Overview

The Simatic/TI 505 Ethernet Driver provides an easy and reliable way to connect Simatic/TI 505 Ethernet devices to OPC Client applications, including HMI, SCADA, Historian, MES, ERP and countless custom applications. It is intended for use in communicating with Simatic 505 Programmable Logic Controllers that may be accessed via either the Siemens Simatic 505-CP2572 Ethernet module, the Siemens 505-CP1434-TCP Card, the Control Technology Inc. CTI CP2572 and CTI 2572-A Ethernet Cards card, and a CTI 2500 Series CPU module. The driver supports both TCP/IP and UDP transport protocols while using both CAMP and CAMP Packed Task Code messaging protocols for efficient data transfer.

Note: The CTI 2500 Series CPUs are direct replacements for the legacy Simatic TI 500/505 CPUs.

Device Setup

Supported Devices

CTI Interface Cards
CTI 2572, CTI 2572-A, and CP2572 Ethernet Interface Cards on TI series CPUs TI545, 555, and 565. Simultaneous device connections are allowed. The model should be set to 505-CP2572. For more information, refer to "Connection Limitations" below.

Siemens Interface Cards
505-CP1434-TCP Ethernet Interface Card on TI Series CPUs TI545 and 565. Simultaneous device connections are allowed. For more information, refer to the *Siemens 505-CP1434-TCP Users Guide*.

CTI 2500 Controller Local Ethernet Port
The CTI 2500 Controller's port supports up to three TCP connections (no UDP). Users can connect using the TCP port 4450 or 1505. The model should be set to 505-CP2572.

Note: This affects all CTI 2500 controller models.

Supported Protocols

505: CAMP and CAMP Packed Task Code
IP: UDP and TCP/IP

Connection Timeout

This parameter specifies the time that the driver will wait for a connection to be made with a device. Depending on network load, the connect time may vary with each connection attempt. The default setting is 3 seconds. The valid range is 1 to 30 seconds.

Request Timeout

This parameter specifies the time that the driver will wait on a response from the device before giving up and going on to the next request. Longer timeouts only affect performance if a device is not responding. The default setting is 1000 milliseconds. The valid range is 100 to 30000 milliseconds.

Retry Attempts

This parameter specifies the number of times the driver will retry a message before giving up and going on to the next message. The default setting is 3 retries. The valid range is 1 to 10.

Device IDs

Up to 2048 devices may be defined on a given channel. Each device on the channel must be uniquely identified by its own IP address.

Connection Limitations

1. The default number of TCP connections allowed for the CTI 2572/2752-A and CP2572 cards is 8. When configured from the PLC, this number may be set to a higher or lower number through the Start Network Server command. In the CTI 2572 and CP2572 cards, this can be configured when started from PLC Logic. In the CTI 2572-A card, this can be configured when automatically started from EEPROM.
2. DIP Switch 3 in Switch Block 2 enables and disables the Data Share feature. When enabled, the number of TCP server connections is automatically limited to two.
3. To connect to the PLC via the 505-CP1434-TCP card, configure a UDP Server Job in the card.

Addressing Options

0/1-Based Bit Addressing

Memory types that allow bit within Word (such as V) can be referenced as a Boolean. The addressing notations for doing this are as follows:

<memory type><address>.<bit>
<memory type><address>:<bit>
<memory type><address>,<bit>

For each of these syntax, <bit> represents the bit number within the Word or DWord, depending on the memory type. 0/1-Based bit addressing provides two ways of addressing a bit within the given Word or DWord; 0-Based and 1-Based. 0-Based addressing simply means the first bit begins at 0. With 1-Based, the first bit begins at 1.

The bit order for the Word or DWord is irrelevant with this option. In other words, it doesn't matter whether the first bit is the Most Significant Bit or the Least Significant Bit.

Note: In this driver, the first bit will either be bit 0 or bit 1 depending on this 0/1-Based bit addressing setting.

0-Based
This is the default setting.

Data Type	Bit Range
Word	Bits 0-15
DWord	Bits 0-31

1-Based

Data Type	Bit Range
Word	Bits 1-16
DWord	Bits 1-32

Note: 0/1-Based bit addressing does not apply to non-bit addresses such as Word addresses in V memory. These addresses are always 1-Based and are not configurable.

Bit Order for V, K, WX, WY and STW
This option is used to select the order in which bits will be presented to V, K, WX, WY and STW memory types when bit-accessed.

Bit Order for Loops/Alarms
This option is used to select the order in which bits will be presented to Loop and Alarm memory types that are bit-accessible and are being bit-accessed (such as LCF).

MSB=Most Significant Bit
LSB=Least Significant Bit

Note: For the following example, the 1st through 16th bit signifies either 0-15 bits or 1-16 bits depending on if the driver is set at 0-Based Bit Addressing or 1-Based.

DWord follows the same bit order logic as Words except that there are 32 bits instead of 16.

Bit 0 Is MSB of Word

MSB															LSB
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Bit 1 Is LSB of Word
This is the default setting.

MSB															LSB
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Note for CTI 2572/2572-A and CP2572 Users: Bit 0/1 Is MSB corresponds to the TICVU I/O Server and is not the default setting with this OPC server. Select this option if applicable. Bit 0/1 Is LSB corresponds to the TI Direct I/O Server (TIDIR). Select this option in order to make the OPC server compatible with the TIDIR I/O Server. For instance, the TIDIR I/O Server should be used as a backup in certain applications.

Communications Parameters

Port Number
This parameter specifies the port number that the remote device is configured to use. The default port number is 1505.

IP Protocol
This parameter specifies whether the driver should connect to the remote device using the User Datagram Protocol (UDP) or Transfer Control Protocol (TCP). This driver requires Winsock V1.1 or higher.

Note: If the Simatic 505-CP1434-TCP card is being used, then a UDP server job must also be set up if using the UDP IP Protocol (or a TCP server job if using the TCP IP Protocol). It is recommended that the TCP IP Protocol have retries set to a greater value than the default setting of 3.

Request Size

Request size refers to the number of bytes that may be requested from a device at one time. To refine this driver's performance, configure the request size to one of the following settings: 32, 64, 128 or 250 bytes. The default value is 250 bytes.

505 Protocol

This parameter specifies whether the driver should use *CAMP* or *CAMP Plus Packed Task Code* Protocol when communicating with device. When set to *CAMP*, the driver will only use the CAMP Memory Transfer protocol when communicating with device. When set to *CAMP Plus Packed Task Code*, the driver will use Packed Task Code when possible in addition to CAMP Memory Transfer. The default value is *CAMP Plus Packed Task Code.*

TI565

If using this PLC, select the TI565 checkbox. The default value is unchecked. For more information, refer to Notes 5 and 6 in **Common Data Type Addressing**.

Note 1: Some address types, Strings and Arrays are not supported under *Packed Task Code* Protocol. For more information, refer to **Address Descriptions**.

Note 2: For best performance when using *CAMP Plus Packed Task Code*, the number of task codes per scan on the PLC should be set to the maximum number available, which is typically 8. If using TISOFT, this may be set using Aux Function 19.

CAMP vs. Packed Task Code

For applications where the data can be divided into large blocks, using CAMP memory transfer will result in the most efficient data transfer. Note that, in one CAMP read, up to 125 words could be returned which could include 2000 discrete points. Since CAMP memory transfer allows only one data type and only one memory range per message, applications which read many small blocks or many different data types may benefit from using the Packed Task Code format.

For example, reading 10 V memory values, 10 WY values, 30 WX values and 2 loop process variables would require four messages (one for the V, one for the WY, one for the WX and one for the loop). Using the packed task code format (which allows 14 NITP task code requests to be placed in a single message), allows data to be obtained in a single message.

Optimum Performance Recommendations

All devices on a channel should be set to the same 505 Protocol mode. When possible, the project's data should be divided into the following categories:

1. Items that are capable of utilizing Packed Task Code.

2. Items that are not capable of utilizing Packed Task Code. This includes the following:

- Arrays
- Strings
- Address types that are not supported with Packed Task Code. For example, DCP.
- Contiguous address ranges > 36 Words. For example, V1, V2, V3, ... V36, V37, V38.

All items in Category 1 should be placed into a device that is set to *CAMP Plus Packed Task Code* 505 Protocol mode on a different channel from Category 2 items. It is recommended that the request size be set to 64 or 128.

All items in Category 2 should be placed into a device that is set to CAMP 505 Protocol mode on a different channel from Category 1 items. It is recommended that the Request size be set to 250.

Note: When reading a project file prior to addition of 505 Protocol option, the default value is set to CAMP.

Cable Diagrams

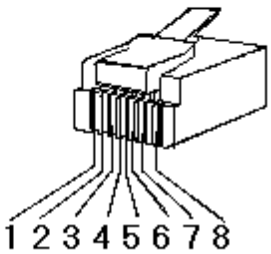
Patch Cable (Straight Through)

TD + 1	OR/WHT	OR/WHT	1	TD +
TD - 2	OR	OR	2	TD -
RD + 3	GRN/WHT	GRN/WHT	3	RD +
4	BLU	BLU	4	
5	BLU/WHT	BLU/WHT	5	
RD - 6	GRN	GRN	6	RD -
7	BRN/WHT	BRN/WHT	7	
8	BRN	BRN	8	
RJ45			RJ45	

Crossover Cable

TD + 1	OR/WHT	GRN/WHT	1	TD +
TD - 2	OR	GRN	2	TD -
RD + 3	GRN/WHT	OR/WHT	3	RD +
4	BLU	BLU	4	
5	BLU/WHT	BLU/WHT	5	
RD - 6	GRN	OR	6	RD -
7	BRN/WHT	BRN/WHT	7	
8	BRN	BRN	8	
RJ45			RJ45	

10 BaseT

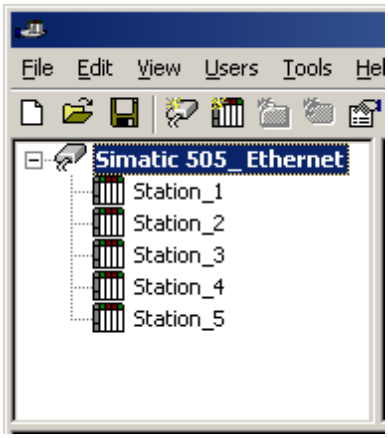


8-pin RJ45

Optimizing Simatic/TI 505 Ethernet Communications

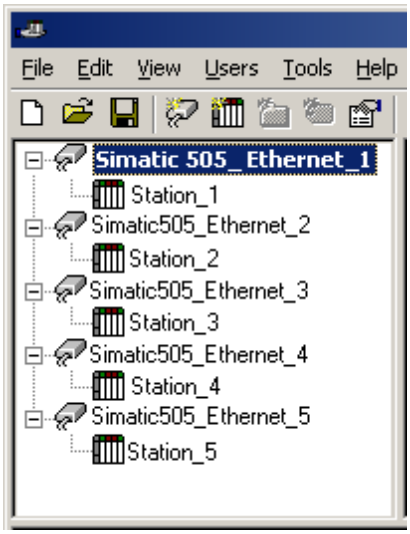
The Simatic/TI 505 Ethernet driver has been designed to provide the best performance with the least amount of impact on the system's overall performance. While the Simatic/TI 505 Ethernet driver is fast, there are a couple of guidelines that can be used in order to control and optimize the application and gain maximum performance.

Our server refers to communications protocols like Simatic/TI 505 Ethernet as a channel. Each channel defined in the application represents a separate path of execution in the server. Once a channel has been defined, a series of devices must then be defined under that channel. Each of these devices represents a single Simatic 505 controller from which data will be collected. While this approach to defining the application will provide a high level of performance, it won't take full advantage of the Simatic/TI 505 Ethernet driver or the network. An example of how the application may appear when configured using a single channel is shown below.



Each device appears under a single Simatic/TI 505 Ethernet channel. In this configuration, the driver must move from one device to the next as quickly as possible in order to gather information at an effective rate. As more devices are added or more information is requested from a single device, the overall update rate begins to suffer.

If the Simatic/TI 505 Ethernet driver could only define one single channel, then the example shown above would be the only option available; however, the Simatic/TI 505 Ethernet driver can define up to 100 channels. Using multiple channels distributes the data collection workload by simultaneously issuing multiple requests to the network. An example of how the same application may appear when configured using multiple channels to improve performance is shown below.



Each device has now been defined under its own channel. In this new configuration, a single path of execution is dedicated to the task of gathering data from each device. If the application has 100 or fewer devices, it can be optimized exactly how it is shown here.

The performance will improve even if the application has more than 100 devices. While 100 or fewer devices may be ideal, the application will still benefit from additional channels. Although by spreading the device load across all channels will cause the server to move from device to device again, it can now do so with far less devices to process on a single channel.

Block Size, which is available on each defined device, can also affect the Simatic/TI 505 Ethernet driver's performance. Block Size refers to the number of bytes that may be requested from a device at one time. To refine the performance of this driver, configure Block Size to one of the following settings: 32, 64, 128, or 250 bytes. Depending on the Simatic/TI 505 Ethernet device model, the Block Size setting can affect the application's performance drastically. A default value of 250 bytes is recommended. If an application has large requests for consecutively ordered data, however, block size should be increased.

Data Types Description

Data Type	Description
Boolean	Single bit
Word	Unsigned 16 bit value bit 0 is the low bit bit 15 is the high bit
Short	Signed 16 bit value bit 0 is the low bit bit 14 is the high bit bit 15 is the sign bit
DWord	Unsigned 32 bit value bit 0 is the low bit bit 31 is the high bit
Long*	Signed 32 bit value bit 0 is the low bit bit 30 is the high bit bit 31 is the sign bit
Float**	32 bit floating point value The driver interprets two consecutive registers as a floating-point value by making the second register the high word and the first register the low word.
String	Null terminated ASCII string This includes Hi-Lo Lo-Hi byte order selection.

*Long is the same as Double in the TISOFT programming software.
**Float is the same as Real in the TISOFT programming software.

Address Descriptions

Address specifications vary depending on the model in use. Select a link from the following list to obtain specific address information for the model of interest.

CTI 2572/2572-A and CP2572 Addressing
505-CP1434-TCP Addressing
Common Data Type Addressing
Status Words

CTI 2572/2572-A and CP2572 Addressing

The following sections define addressing for the CP2572 card. For information on the Event Log, refer the OPC server's help documentation.

Common Data Type Addressing
Alarm Addressing
Loop Addressing
Find Forced Addressing

505-CP1434-TCP Addressing

The following sections define addressing for the CP1434 card. For information on the Event Log, refer the OPC server's help documentation.

Common Data Type Addressing
Alarm Addressing
Loop Addressing
Find Forced Addressing

Common Data Type Addressing

The driver supports the following addresses. The default data type for each address type is indicated in **bold**.

Note: The actual number of addresses available for of each type depends on the PLC's configuration. If the driver finds at Runtime that an address is not present in the device, it will post an error message and remove the tag from its scan list.

Address Type	Format	Range	Data Types	Access
Discrete Input	X<address>	1-65536	**Boolean**	Read/Write
Discrete Output	Y<address>	1-65536	**Boolean**	Read/Write
Word Input	WX<address>	1-65536 1-65535	Short, **Word** Long, DWord, Float	Read/Write
Word Input Signed Integer	WX<address>S	1-65536 1-65535	**Short**, Word Long, DWord, Float	Read/Write
Word Input Bit Access	WX<address>.<bit> WX<address>:<bit> WX<address>,<bit>	1-65536 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, Short, **Word**	Read/Write
Word Output	WY<address>	1-65536 1-65535	Short, **Word** Long, DWord, Float	Read/Write
Word Output Signed Integer	WY<address>S	1-65536 1-65535	**Short**, Word Long, DWord, Float	Read/Write
Word Output Bit Access	WY<address>.<bit> WY<address>:<bit> WY<address>,<bit>	1-65536 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, Short, **Word**	Read/Write
Discrete Control (Internal Coil)*	C<address> CR<address>	1-65536	**Boolean**	Read/Write
V-Word Memory	V<address>	1-16777215 1-16777214	Short, **Word**, BCD Long, DWord, Float	Read/Write
V-Word Memory Signed Integer	V<address>S	1-16777215 1-16777214	**Short**, Word, BCD Long, DWord, Float	Read/Write
V-Word Memory	V<address>D	1-16777215	Short, Word, BCD	Read/Write

Double Word		1-16777214	Long, **DWord**, Float	
V-Word Memory BCD Decimal	V<address>B	1-16777215 1-16777214	Short, Word, **BCD** Long, DWord, Float	Read/Write
V-Word Memory Floating Point	V<address>R V<address>P V<address>.	1-16777215 1-16777214	Short, Word, BCD Long, DWord, **Float**	Read/Write
V-Word Memory Bit Access	V<address>.<bit> V<address>:<bit> V<address>,<bit>	1-16777215 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, Short, **Word**	Read/Write
V-Word Memory As Standard String with HiLo Byte Order***	V<address>.<length>H	V1.2H-V16777215.250H .Bit is string length. Range 2 to 250 bytes.	**String**	Read/Write
V-Word Memory As Standard String with LoHi Byte Order***	V<address>.<length>L	V1.2H-V16777215.250L .Bit is string length Range 2 to 250 bytes.	**String**	Read/Write
V-Word Memory As Null Terminated String with LoHi Byte Order***	V<first>-<last>C <first> is first word <last> is last word	1-16777215 (last-first)=string length Range1to 125 words.	**String**	Read/Write
V-Word Memory As String with LoHi Byte Order with Length Byte***	V<first>-<last>P <first> is first word <last> is last word	1-16777215 (last - first)=string length Range 1 to 125 words.	**String**	Read/Write
V-Word Memory As String with LoHi Byte Order Blank-Padded on Right***	V<first>-<last> <first> is first word <last> is last word	1-16777215 (last-first)=string length Range 1 to 125 words.	**String**	Read/Write
Constant Memory	K<address>	1-16777215 1-16777214	Short, **Word**, BCD Long, DWord, Float	Read/Write
Constant Memory Signed Integer	K<address>S	1-16777215 1-16777214	**Short**, Word, BCD Long, DWord, Float	Read/Write
Constant Memory Double Word	K<address>D	1-16777215 1-16777214	Short, Word, BCD Long, **DWord**, Float	Read/Write
Constant Memory BCD Decimal	K<address>B	1-16777215 1-16777214	Short, Word, **BCD** Long, DWord, Float	Read/Write
Constant Memory Floating Point	K<address>R K<address>P K<address>.	1-16777215 1-16777214	Short, Word, BCD Long, DWord, **Float**	Read/Write
Constant Memory Bit Access	K<address>.<bit> K<address>:<bit> K<address>,<bit>	1-16777215 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, Short, **Word**	Read/Write
System Status	STW<address>	1-65536 1-65535	Short, **Word** Long, DWord, Float	Read/Write
System Status Bit Access	STW<address>.<bit> STW<address>:<bit> STW<address>,<bit>	1-65536 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, Short, **Word**	Read/Write
Timer/Counter Preset	TCP<address>	1-65536 1-65535	Short, **Word** Long, DWord, Float	Read/Write
Timer/Counter Current	TCC<address>	1-65536 1-65535	Short, **Word** Long, DWord, Float	Read/Write
Drum Step Preset	DSP<address>	1-65536 1-65535	Short, **Word** Long, DWord, Float	Read/Write
Drum Step Current	DSC<address>	1-65536 1-65535	Short, **Word** Long, DWord, Float	Read/Write
Drum Count Preset**	DCP<drum>.<step> DCP<drum>:<step> DCP<drum>,<step>	drum 1-65536 step 1-16	Short, **Word**	Read/Write
Drum Current Count	DCC<address>	1-65536 1-65535	Short, Word Long, **DWord**, Float	Read Only

*C and CR memory types are supported on the 565 model controller by setting the TI565 checkbox in **Communications Parameters**.
**DCP registers must be accessed in groups of 16 words. Therefore, when writing to a DCP register, the driver performs a read to obtain the current values of all 16-word values (DCP00001.01 - DCP00001.16). The driver modifies the one register that is being written to and sends the 16 values to the device. Since the driver performs this Read/Modify/Write procedure, it could be possible for any one of the registers to change between the read and write transaction. The result would be a new value being written over by an older value. It is recommended that users write to another type of memory location (such as Vxxxxx). If using a ladder, transfer the value to a DCP register.
***For more information, refer to **String Support**.

Array Support

Non-Boolean addresses accept array notation. To view data as an array, append '[rows][cols]' to an address (e.g., V500 [2][2], V100 [12]).

String Support

Standard String

The Simatic/TI 505 Ethernet driver supports reading and writing V registers as an ASCII string. When using V registers for string data, each register will contain two bytes of ASCII data. The order of the ASCII data within a given register can be selected when the string is defined. The length of the string can be from 2 to 250 bytes and is entered in place of a bit number. The length must be entered as an even number. The byte order is specified by appending either a "H" or "L" to the address.

Null Terminated

This type of string is a Standard String with LoHi byte order that is null terminated at all times. This means the last byte will always be a null terminator, essentially losing one character place when compared to a Standard String with LoHi byte order.

Length + String

This type of string is also a Standard String with LoHi byte order except the MSB of the first word contains the desired length of the string to follow. This means one character place is lost when compared to a Standard String with LoHi byte order. Based on this length, a string is formed up to the max size set by the address range (ie. (<last word> - <first word>) / 2 - 1 bytes). Thus the max length of the string can vary between the length byte value and (<last word>-<first word>) / 2 - 1 bytes.

Note: Any null terminators in the string can cut the length short of these max lengths. If a string to be written is less than this max length, it will be padded on the right with blank-spaces until all max bytes contain a non-NULL value.

Blank-Padded on Right

This type of string is a Standard String with LoHi byte order except the string length is always the max because the string is padded with blank spaces on the right until its length becomes the max (no NULLs). Recall the max length of the string is (<last word> - <first word>) / 2 bytes in the address. If a string to be written is less than this max length, it too will be padded on the right with blank-spaces until all max bytes contain a non-NULL value.

Example 1: Standard String

To address a string starting at V200 with a length of 50 bytes and HiLo byte order, enter V200.50H.

Example 2: Standard String

To address a string starting at V500 with a length of 38 bytes and LoHi byte order, enter V500.38L.

Example 3: Null Terminated

Given:
V200/MSB = 'h'
V200/LSB = 'e'
V201/MSB = 'l'
V201/LSB = 'l'
V202/MSB = 'o'
V202/LSB = ' '
V203/MSB = 'w'
V203/LSB = 'o'
V204/MSB = 'r'
V204/LSB = 'l'
V205/MSB = 'd'

To address a null terminated string starting at V200 with a length of 10 bytes and the memory data is as stated above:

V200-204C would read "hello wor".

Note: Only 9 characters can be displayed because the last is the null terminator.

Example 4: Length Byte + String
Given:
V200/MSB = 0x04
V200/LSB = 'e'
V201/MSB = 'l'
V201/LSB = 'l'
V202/MSB = 'o'
V202/LSB = ' '
V203/MSB = 'w'
V203/LSB = 'o'
V204/MSB = 'r'
V204/LSB = 'l'
V205/MSB = 'd'

To address a string with length byte information, starting at V200 and the memory data is as stated above:
V200-204P would read "ello".

Note: The length byte is 0x04 so only 4 characters are displayed. If the length byte were 0x07, V200-204P would read "ello wo".

Example 5: Blank-Padded on Right
Given:
V200/MSB = 'h'
V200/LSB = 'e'
V201/MSB = 'l'
V201/LSB = 'l'
V202/MSB = 'o'
V202/LSB = NULL
V203/MSB = 'w'
V203/LSB = 'o'
V204/MSB = 'r'
V204/LSB = 'l'
V205/MSB = 'd'

To address a blank padded string starting at V200 with a length of 10 bytes and the memory data is as stated above:
V200-204 would read "hello".

Note: All 10 characters are displayed with the null terminated string "hello" padded with 5 spaces to fill the 5 words.

To write "world" to this address, the memory data would look as follows:

V200/MSB = 'w'
V200/LSB = 'o'
V201/MSB = 'r'
V201/LSB = 'l'
V202/MSB = 'd'
V202/LSB = ' '
V203/MSB = ' '
V203/LSB = ' '
V204/MSB = ' '
V204/LSB = ' '
V205/MSB = ' '

Since "world" is less than 10 characters in length, it is padded with blanks to become 10 characters in length.

Packed Task Code Protocol

The following address types, strings and arrays are not supported under Packed Task Code Protocol. To increase efficiency, CAMP Protocol will be used instead.

Drum Count Preset (DCP)
Discrete Input (X)
Discrete Output (Y)
Discrete Control (C or CR)
Addresses greater than '30720' for Drum Step Preset (DSP) and Drum Step Current (DSC)

Note: If the TI565 option is checked in Communications Parameters, however, Packed Task Code Protocol will be used for address types C, X and Y.

Status Words

For all Status Words, Bit 1 is the Most Significant Bit (MSB) and Bit 16 is the Least Significant Bit (LSB) in order from left to right. Users can configure bit addressing to be 0-15 or 1-16 addressing, and can also set the driver to use 1 or 15 as the MSB (thus changing the bit referencing). For more information, refer to **Addressing Options**.

Note: Only addresses that are not used by the controller can be written to.

Register	Description	CP525	CP545	CP565	CTI 2500
STW00001	Non-Fatal Errors. Bit 4, 1 = Password has been entered. Bit 5, 1 = Password has been entered and disabled. Bit 6, 1 = User program error.* Bit 7, 1 = Subroutine stack overflow. Bit 8, 1 = Time of day clock failure. Bit 10 = Special function module communication error. Bit 11, 1 = Previous RLL instruction failed. Bit 12, 1 = I/O module failure or I/O module configuration mismatch. Bit 13, 1 = Communication port failure. Bit 14, 1 = Scan overrun. Bit 15, 1 = Battery low.	x	x	x	x
STW00002	Base Control Status. Each bit reflects the status of a single base. 0 = Status is good. 1 = Base is not present or has a problem. Bit 1, Base 15 Bit 2, Base 14 Bit 3, Base 13 Bit 4, Base 12 Bit 5, Base 11 Bit 6, Base 10 Bit 7, Base 9 Bit 8, Base 8 Bit 9, Base 7 Bit 10, Base 6 Bit 11, Base 5 Bit 12, Base 4 Bit 13, Base 3 Bit 14, Base 2 Bit 15, Base 1 Bit 16, Base 0	x	x	x	x
STW00003-00009	Profibus DP Slave Status. Each bit is 0 if a slave is present, or 1 if the slave is missing or failed. STW03 Bit 1-16 slave addresses 16-1. STW04 Bit 1-16 slave addresses 32-17. STW05 Bit 1-16 slave addresses 48-33. STW06 Bit 1-16 slave addresses 64-49. STW07 Bit 1-16 slave addresses 80-65. STW08 Bit 1-16 slave addresses 96-81. STW09 Bit 1-16 slave addresses 112-97.	x	x	x	x
STW00010	Contains the value of the previous dynamic scan time.	x	x	x	x
STW00011	Indicates the status of the modules in the Local Base (Base 0). Each bit indicates a module in a slot. 0 = Good.	x	x	x	x

	1 = Module not present or failed. Bit 1 - 16 = Module 16 - 1.				
STW00012-00026	Status bits for modules in bases 1 - 15, STW012 = Base 1… Bit range is the same as for STW011.	x	x	x	x
STW00027-00138	This range of Status Words apply to the Profibus DP Slave channels if present. STW027 is slave 1…STW138 is slave 112. Bit range is the same as for STW011.	x	x	x	x
STW00139	This Status Word provides a count of the discrete points (X/Y or C) that are currently forced.	x	x	x	x
STW00140	This Status Word provides a count of the word points (WX/WY) that are currently forced.	x	x	x	x
STW00141-00144	Date, Time, and Day of Week.	N/A.	N/A.	N/A.	N/A.
STW141	Bit 1-4, Year tens digit. Bit 5-8, Year units digit. Bit 9-12, Month tens digit. Bits 13-16, Month units.	x	x	x	x
STW142	Bit 1-4, Day - Tens digit. Bit 5-8, Day - Units digit. Bit 9-12, Hour - Tens digit. Bit 13-16, Hour - Units digit.	x	x	x	x
STW143	Bit 1-4, Minute - Tens digit. Bit 5-8, Minute - Units digit. Bit 9-12, Seconds - Tens digit. Bit 13-16, Seconds - Units digit.	x	x	x	x
STW144	Bit 1-4, Seconds - Tenths digit. Bit 5-8, Seconds - Hundredths digit. Bit 9-12, Not used - Always 0. Bit 13-16, Day of the week.	x	x	x	x
STW00145	Receive Error Counts.	x	x	x	x
STW00146	Timeout Counts.	x	x	x	x
STW00147	This Status Word records the number of times that the Profibus-DP Slaves have failed to respond to a request from the Series 505 or CTI 2500 CPU since the most recent restart.	x	x	x	x
STW00148	This Status Word records the number of times that the Profibus-DP I/O channel has experienced a loss of token since the most recent restart.	x	x	x	x
STW00149-00160	Reserved.	N/A.	N/A.	N/A.	N/A.
STW00161	Special Function Processor Fatal Error. Bit 1, 1 = ROM error. Bit 2, 1 = RAM error. Bit 3, 1 = Operating System error. Bit 4, 1 = Invalid control block encountered. Bit 5, 1 = Diagnostic failure. Bit 7, 1 = S Memory is inconsistent. Bit 8 = Special function program received from RLL is invalid.	x	x	x	x
STW00162	Special Function Processor Non-Fatal Errors. Bit 1, 1 = Port 1 communication error.** Bit 3, 1 = Port overrun error. Bit 4, 1 = Analog alarm overrun error. Bit 5, 1 = Cyclic special function programs overrun error. Bit 6, 1 = Normal special function program queue is full. Bit 7, 1 = Priority special function program queue is full. Bit 8, 1 = Cyclic special function program queue is full.	x	x	x	x

	Bit 9, 1 = Loop calculation error. Bit 10, 1 = Analog alarm calculation error. Bit 11, 1 = Control block disabled. Bit 12, 1 = Attempt to execute undefined special function program or subroutine. Bit 13, 1 = Attempt to invoke restricted special function program or subroutine.				
STW00163	Contains the number of the ladder subroutine that caused the stack overflow.	x	x	x	x
STW00164-00165	Contains the source RLL checksum (32 Bit integer).	x	x	x	x
STW00166-00167	Contains the compiled RLL checksum (32 Bit integer).	x	x	x	x
STW00168	Dual RBC Status. Bit 1-16 are bases 15-0. For each Bit: 0 = Dual RBC present and good. 1 = Error or single RBC.	x	x	x	x
STW00169-00175	Not used.	x	x	x	x
STW00176	Dual Power Supply Status. Bit 1-16 are bases 15-0. For each Bit: 0 = Dual power supply present and good. 1 = Error or single power supply.	x	x	x	x
STW00177-00183	Not used.	x	x	x	x
STW00184	Module Mismatch Indicator. Bit 1, 1 = Module mismatch error. Bit 5-8 = Indicates the number of the base with the error.	x	x	x	x
STW00185-00190	Not used.	x	x	x	x
STW00191	Serial Port Print Status.	N/A.	N/A.	N/A.	x
STW00192	Discrete Execution Scan Time - The time spent on the last scan.	x	x	x	x
STW00193-199	Not used.	x	x	x	x
STW00200	User Program Error Cause (associated with Bit 6 of STW001). Codes are as follows: 0 = No error. 1 = Reference to an application that is not installed.*** 2 = Attempted to unlock a flag that is not held by an application.*** 3 = Mismatched lock/unlock instructions.*** 4 = Subroutine nesting level exceeded. 5 = Table overflow. 6 = Attempted to call a non-existent subroutine. 7 = VMEbus access failed due to a bus error.*** 8 = Special function program has not been compiled or does not exist. 9 = Special function program has been disabled. 10 = Special function program type is restricted or cyclic. 11 = Special function program or subroutine is being edited. 12 = Special function program or subroutine is being executed by an interrupt task. 13 = User-scheduled fast loop is not configured. 14 = User-scheduled fast loop is disabled.	x	x	x	x
STW00201	First Scan Flags. Bit 1, 1 = First Run Mode scan or single scan after compile. Bit 2, 1 = First Run Mode scan or single scan after Pro-	x	x	x	x

	gram Mode. Bit 3, 1 = First Run Mode scan after transition from Hold Mode. Bit 9, 1 = First scan after battery bad power-up restart. Bit 10, 1 = First scan after battery good power-up restart. Bit 11, 1 = First scan after compile restart. Bit 12, 1 = First scan after partial restart.				
STW00202-00205	Not used.	x	x	x	x
STW00206-00207	U-Memory Checksum C0 (32 bit integer).	x	x	x	N/A.
STW00208-00209	U-Memory Checksum C1 (32 bit integer).	x	x	x	N/A.
STW00210	Base Poll Enable Flags. Bit 1-16 are bases 15-0. For each Bit: 0 = Base cannot be polled. 1 = Base can be polled.	x	x	x	x
STW00211-00217	Profibus Poll Enable Flags. Each bit is 1 if the slave is defined and enabled. STW211 Bit 1-16 slave addresses 16-1. STW212 Bit 1-16 slave addresses 32-17. STW213 Bit 1-16 slave addresses 48-33. STW214 Bit 1-16 slave addresses 64-49. STW215 Bit 1-16 slave addresses 80-65. STW216 Bit 1-16 slave addresses 96-81. STW217 Bit 1-16 slave addresses 112-97.	x	x	x	x
STW00218	Not used.	x	x	x	x
STW00219	RLL Task Overrun. Bit 1, Task 1: 0 = Good, 1 = Task scan cycle overrun. Bit 2, Task 2: 0 = Good, 1 = Task scan cycle overrun.	x	x	x	N/A.
STW00220	Interrupting Slots in Local Base. Bit 1-16 are slots 16-1. For each Bit: 1 = Interrupt request active at module located in this slot.	x	x	N/A.	N/A.
STW00221	Module Interrupt Request Count.	x	x	N/A.	N/A.
STW00222	Spurious Interrupt Count.	N/A.	N/A.	x	N/A.
STW00223-00224	Binary Time of Day (32 bit integer).	x	x	x	x
STW00225	Binary Relative Day (with 1/1/1984 being day 0).	x	x	x	x
STW00226	Time of Day Status. Bit 1, 1 = Current time is prior to time reported in the last task 1 RLL scan. Bit 2-9, Reserved. Bit 10, 1 = Time is valid. Bit 11, 1 = Time synchronization is over a network. Bit 12-13, Time Resolution. 00 = .001 second. 01 = .01 second. 02 = .1 second. 03 = 1 second. Bit 14, 1 = Time synchronization error. Bit 15, 1 = No time synchronization input for the time transmitter.	x	x	x	x
STW00227-00228	Bus Error Access Address.	N/A.	N/A.	x	N/A.
STW00229-00230	Bus Error Program Offset.	N/A.	N/A.	x	N/A.
STW0231	Profibus DP I/O Status. Bit 1, 1 = DP in operate state.	x	x	x	x

	Bit 2, 1 = DP in clear state. Bit 3, 1 = Error: Unable to download configuration to the Profibus interface. Bit 4, 1 = Error: Unable to retrieve slave diagnostics from the interface. Bit 5, 1 = DP bus error. Bit 16, 1 = DP I/O bus system is not configured.				
STW00232-00238	Profibus I/O Diagnostics Status. Each bit is 1 if the slave signals a diagnostic that has not been read by an RSD RLL instruction. STW232 Bit 1-16 slave addresses 16-1. STW233 Bit 1-16 slave addresses 32-17. STW234 Bit 1-16 slave addresses 48-33. STW235 Bit 1-16 slave addresses 64-49. STW236 Bit 1-16 slave addresses 80-65. STW237 Bit 1-16 slave addresses 96-81. STW238 Bit 1-16 slave addresses 112-97.	x	x	x	x
STW00239-00240	Source Special Function Program/Subroutine Checksum.	x	x	x	x
STW00241-00242	Compiled Special Function Program/Subroutine Checksum.	x	x	x	x
STW00243	Reserved.	N/A.	N/A.	N/A.	x
STW00244	Additional Control Status Flags. Bit 1, Controller Mode 0 = Program Mode, 1 = Run Mode. Bit 2, Scan Mode 0 = Variable, 1 = Fixed. Bit 3, User Program Source 0 = Ram, 1 = Flash. Bit 4, Ethernet Port Link Status 1 = Connected. Bit 5, TCP/IP Network Status 1 = Operational. Bit 6, Duplicate IP Address Status 1 = Duplicate Detected.	N/A.	N/A.	N/A.	x
STW00245	Additional Controller Error Status. Bit 1, 1 = Fatal error present. Bit 2, Reserved. Bit 3, 1 = One or more remote bases are not communicating.	N/A.	N/A.	N/A.	x
STW00246	Fatal Error Code. This contains the fatal error code when a fatal error is present.	N/A.	N/A.	N/A.	x
STW00247-00257	CTI Support Diagnostics.	N/A.	N/A.	N/A.	x
STW00259	Product Serial Number.	N/A.	N/A.	N/A.	x
STW00260	Firmware Major Release Number.	N/A.	N/A.	N/A.	x
STW00261	Firmware Minor Release Number.	N/A.	N/A.	N/A.	x
STW00262-00298	CTI Support Diagnostics.	N/A.	N/A.	N/A.	x
STW00299	Peak Scan Time.	N/A.	N/A.	N/A.	x
STW00300-454	CTI Support Statistics.	N/A.	N/A.	N/A.	x
STW00455-00469	Remote Base Receive Errors. This contains the number of times that the controller encountered an error reading the response message from the remote base. STW 455 corresponds to remote base 1. STW 456 – STW 469 correspond to remote bases 2 – 15.	N/A.	N/A.	N/A.	x
STW00470	Not used.	N/A.	N/A.	N/A.	x
STW00471-00485	Abnormal Logoff Count – Remote Base 1 - 15. This contains the number of times that the controller stopped communicating with the remote base due to communications errors or response timeouts. STW 471 corresponds to remote base 1. STW 472 – STW 485 correspond to remote bases 2 – 15.	N/A.	N/A.	N/A.	x

STW00486	Not used.	N/A.	N/A.	N/A.	x
STW00487-00501	Timeout Count – Remote Base 1 – 15. This contains the number of times that the base failed to respond to a request from the controller within the specified time. STW 487 corresponds to remote base 1. STW 488 – STW 501 correspond to remote bases 2 – 15.	N/A.	N/A.	N/A.	x

*For more information, refer to the register "STW200".
**Not used by the CTI 2500.
***This is only for CP575.

Alarm Addressing

The driver supports the following addresses. The default data type for each address type is indicated in **bold**.

Note: The actual number of addresses available for of each type depends on the PLC's configuration. If the driver finds at Runtime that an address is not present in the device, it will post an error message and remove the tag from its scan list.

Address Type	Format	Range	Data Types	Access
Alarm Status (V) Flags	AVF<address>	1-65536	**Word**	Read/Write
Alarm Status (V) Flag Bit Access*	AVF<address>.<bit> AVF<address>:<bit> AVF<address>,<bit>	1-65536 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, **Word**	Read/Write
Alarm Control (C)Flags	ACF<address>	1-65535	**DWord**	Read/Write
Alarm Control (C) Flag Bit Access**	ACF<address>.<bit> ACF<address>:<bit> ACF<address>,<bit>	1-65535 Bit 0/1-31/32 **0/1-Based Bit Addressing**	Boolean, **DWord**	Read/Write
Alarm PV High Alarm	APVH<address>	1-65535	**Float**	Read/Write
Alarm PV Low Alarm	APVL<address>	1-65535	**Float**	Read/Write
Alarm Process Variable	APV<address>	1-65535	**Float**	Read/Write
Alarm High Limit	AHA<address>	1-65535	**Float**	Read/Write
Alarm Low Limit	ALA<address>	1-65535	**Float**	Read/Write
Alarm Orange Deviation Alarm	AODA<address>	1-65535	**Float**	Read/Write
Alarm Yellow Deviation Alarm	AYDA<address>	1-65535	**Float**	Read/Write
Alarm Sample Rate	ATS<address>	1-65535	**Float**	Read/Write
Alarm Setpoint	ASP<address>	1-65535	**Float**	Read/Write
Alarm Error	AERR<address>	1-65535	**Float**	Read Only
Alarm High High Alarm Limit	AHHA<address>	1-65535	**Float**	Read/Write
Alarm Low Low Alarm Limit	ALLA<address>	1-65535	**Float**	Read/Write
Alarm Rate of Change Alarm	ARCA<address>	1-65535	**Float**	Read/Write
Alarm Setpoint High Limit	ASPH<address>	1-65535	**Float**	Read/Write
Alarm Setpoint Low Limit	ASPL<address>	1-65535	**Float**	Read/Write
Alarm Alarm Deadband	AADB<address>	1-65535	**Float**	Read/Write
Alarm Raw High Alarm Limit	AHAR<address>	1-65536	**Word**	Read/Write
Alarm Raw Low Alarm Limit	ALAR<address>	1-65536	**Word**	Read/Write
Alarm Raw Process Variable	APVR<address>	1-65536	**Word**	Read/Write
Alarm Raw Orange Deviation	AODAR<address>	1-65536	**Word**	Read/Write
Alarm Raw Yellow Deviation	AYDAR<address>	1-65536	**Word**	Read/Write

Alarm Raw Setpoint	ASPR<address>	1-65536	**Word**	Read/Write
Alarm Raw Alarm Deadband	ADBR<address>	1-65536	**Word**	Read/Write
Alarm Raw Error	AERRR<address>	1-65536	**Word**	Read Only
Alarm Raw High-High Alarm Limit	AHHAR<address>	1-65536	**Word**	Read/Write
Alarm Raw Low-Low Alarm Limit	ALLAR<address>	1-65536	**Word**	Read/Write
Alarm Raw Setpoint Low Limit	ASPLR<address>	1-65536	**Word**	Read/Write
Alarm Raw Setpoint High Limit	ASPHR<address>	1-65536	**Word**	Read/Write
Alarm MSW Alarm C Flags	ACFH<address>	1-65536	**Word**	Read/Write
Alarm LSW Alarm C Flags	ACFL<address>	1-65536	**Word**	Read/Write
Alarm ACK Flag	AACK<address>	1-65536	**Word**	Read Only

*For more information, refer to **AVF Bit Definitions**.
For more information, refer to **ACF Bit Definitions.

Array Support
Non-Boolean addresses accept array notation. To view data as an array, append '[rows][cols]' to an address. For example, V500 [2][2], V100 [12].

Packed Task Code Protocol
The following address types and arrays are not supported under Packed Task Code Protocol. CAMP Protocol will be used instead.

Alarm Control (C) Flags (ACF)
Alarm Raw High Alarm Limit (AHAR)
Alarm Raw Low Alarm Limit (ALAR)
Alarm Raw Process Variable (APVR)
Alarm Raw Orange Deviation (AODAR)
Alarm Raw Yellow Deviation (AYDAR)
Alarm Raw Setpoint (ASPR)
Alarm Raw Alarm Deadband (ADBR)
Alarm Raw Error (AERRR)
Alarm Raw High-High Alarm Limit (AHHAR)
Alarm Raw Low-Low Alarm Limit (ALLAR)
Alarm Raw Setpoint Low Limit (ASPLR)
Alarm Raw Setpoint High Limit (ASPHR)

AVF Bit Definitions

Analog Alarm Variable Flag Data Element Format
The server default settings are shown in **bold**.

MSB			**LSB**
ABCD	EFGH	IJKL	MNOP

The AVF bit has the following format.

V/W, **X**/Y
V=0-based bit addressing. Bit 0 is MSB.
W=1-based bit addressing. Bit 1 is MSB (Simatic 505 Documentation).
X=0-based bit addressing. Bit 0 is LSB.
Y=1-based bit addressing. Bit 1 is LSB.

Element	AVF bit	Description
A	0/1, **15**/16	1=Enable alarm*
B	1/2, **14**/15	1=Disable alarm*
C	2/3, **13**/14	1=PV is in high-high alarm

D	3/4, **12**/13	1=PV is in high alarm
E	4/5, **11**/12	1=PV is in low alarm
F	5/6, **10**/11	1=PV is in low-low alarm
G	6/7, **9**/10	1=PV is in yellow deviation alarm
H	7/8, **8**/9	1=PV is in orange deviation alarm
I	8/9, **7**/8	1=PV is in rate of change alarm
J	9/10, **6**/7	1=Broken transmitter alarm
K	10/11, **5**/6	1=Analog alarm is overrunning
L	11/12, **4**/5	1=Alarm is enabled**
M	12/13, **3**/4	Not used, set to 0
N	13/14, **2**/3	Not used, set to 0
O	14/15, **1**/2	Not used, set to 0
P	15/16, **0**/1	Not used, set to 0

*Elements A and B are Write Only triggers. Writing 1 to the triggers sets the mode. The mode (or status) is reported in Element L (Bit 12).
**If a word is selected for the analog alarm V-flags, element L is written as bit 12 is written. If a C or Y is selected, bit 12 (element L) is not used.

Note: If an analog alarm is programmed and not disabled, the controller will begin to monitor the programmed variables as soon as the controller is placed in RUN mode.

ACF Bit Definitions

Analog Alarm Control Flag Data Element Format

The server default settings are shown in **bold**.

MSB							**LSB**
ABCD	EFGH	IJKL	MNOP	QRST	UVWX	YZab	cdef

The ACF bit has the following format:

V/W, **X**/Y
V=0-based bit addressing. Bit 0 is MSB.
W=1-based bit addressing. Bit 1 is MSB (Simatic 505 Documentation).
X=0-based bit addressing. Bit 0 is LSB.
Y=1-based bit addressing. Bit 1 is LSB.

Element	ACF bit	Description
A	0/1, **31**/32	0=PV scale 0% offset 1=PV scale 20% offset
B	1/2, **30**/31	1=Take square root of PV
C	2/3, **29**/30	1=Monitor HIGH/LOW alarms
D	3/4, **28**/29	1=Monitor HIGH-HIGH/LOW-LOW alarms
E	4/5, **27**/28	1=Monitor yellow/orange deviation alarm
F	5/6, **26**/27	1=Monitor rate-of-change alarm
G	6/7, **25**/26	1=Monitor broken transmitter alarm
H	7/8, **24**/25	0=Local setpoint 1=Remote setpoint
I	8/9, **23**/24	Unused, set to 0
J	9/10, **22**/23	Unused, set to 0
K	10/11, **21**/22	Unused, set to 0
L	11/12, **20**/21	Unused, set to 0
M	12/13, **19**/20	Unused, set to 0
N	13/14, **18**/19	Unused, set to 0
O	14/15, **17**/18	Unused, set to 0
P	15/16, **16**/17	Unused, set to 0
Q	16/17, **15**/16	Unused, set to 0
R	17/18, **14**/15	Unused, set to 0

S	18/19, **13**/14	Unused, set to 0
T	19/20, **12**/13	Unused, set to 0
U	20/21, **11**/12	0=Process variable is unipolar 1=Process variable is bipolar
V	21/22, **10**/11	Unused, set to 0
W	22/23, **9**/10	Contains SF program number (if an SF program is scheduled to be called)
X	23/24, **8**/9	Contains SF program number (if an SF program is scheduled to be called)
Y	24/25, **7**/8	Contains SF program number (if an SF program is scheduled to be called)
Z	25/26, **6**/7	Contains SF program number (if an SF program is scheduled to be called)
a	26/27, **5**/6	Contains SF program number (if an SF program is scheduled to be called)
b	27/28, **4**/5	Contains SF program number (if an SF program is scheduled to be called)
c	28/29, **3**/4	Contains SF program number (if an SF program is scheduled to be called)
d	29/30, **2**/3	Contains SF program number (if an SF program is scheduled to be called)
e	30/31, **1**/2	Contains SF program number (if an SF program is scheduled to be called)
f	31/32, **0**/1	Contains SF program number (if an SF program is scheduled to be called)

Loop Addressing

The driver supports the following addresses. The default data type for each address type is indicated in **bold**.

Note: The actual number of addresses available for of each type depends on the PLC's configuration. If the driver finds at Runtime that an address is not present in the device, it will post an error message and remove the tag from its scan list.

Address Type	Format	Range	Data Types	Access
Loop Gain	LKC<address>	1-65535	**Float**	Read/Write
Loop Reset Time (min)	LTI<address>	1-65535	**Float**	Read/Write
Loop Rate Time (min)	LTD<address>	1-65535	**Float**	Read/Write
Loop High Alarm Limit	LHA<address>	1-65535	**Float**	Read/Write
Loop Low Alarm Limit	LLA<address>	1-65535	**Float**	Read/Write
Loop Process Variable	LPV<address>	1-65535	**Float**	Read/Write
Loop PV High Limit	LPVH<address>	1-65535	**Float**	Read/Write
Loop PV Low Limit	LPVL<address>	1-65535	**Float**	Read/Write
Loop Orange Dev Alarm Limit	LODA<address>	1-65535	**Float**	Read/Write
Loop Yellow Dev Alarm Limit	LYDA<address>	1-65535	**Float**	Read/Write
Loop Sample Rate	LTS<address>	1-65535	**Float**	Read/Write
Loop Setpoint	LSP<address>	1-65535	**Float**	Read/Write
Loop Output (%)	LMN<address>	1-65535	**Float**	Read/Write
Loop Status (V) Flags	LVF<address>	1-65536	**Word**	Read/Write
Loop Status (V) Flag Bit Access*	LVF<address>.<bit> LVF<address>:<bit> LVF<address>,<bit>	1-65536 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, **Word**	Read/Write
Loop Control (C) Flags	LCF<address>	1-65535	**DWord**	Read/Write
Loop Control (C) Flag Bit Access**	LCF<address>.<bit> LCF<address>:<bit> LCF<address>,<bit>	1-65535 Bit 0/1-31/32 **0/1-Based Bit Addressing**	Boolean, **DWord**	Read/Write
Loop Ramp/Soak Status Flags	LRSF<address>	1-65536	**Word**	Read/Write
Loop Ramp/Soak Status Flag Bit Access***	LRSF<address>.<bit> LRSF<address>:<bit> LRSF<address>,<bit>	1-65536 Bit 0/1-15/16 **0/1-Based Bit Addressing**	Boolean, **Word**	Read/Write
Loop Error	LERR<address>	1-65535	**Float**	Read Only
Loop Bias	LMX<address>	1-65535	**Float**	Read/Write
Loop High-High Alarm Limit	LHHA<address>	1-65535	**Float**	Read/Write
Loop Low-Low Alarm Limit	LLLA<address>	1-65535	**Float**	Read/Write
Loop Rate of Change Alarm Limit	LRCA<address>	1-65535	**Float**	Read/Write

Loop Setpoint High Limit	LSPH<address>	1-65535	**Float**	Read/Write
Loop Setpoint Low Limit	LSPL<address>	1-65535	**Float**	Read/Write
Loop Alarm Deadband	LADB<address>	1-65535	**Float**	Read/Write
Loop Raw High Alarm Limit	LHAR<address>	1-65536	**Word**	Read/Write
Loop Raw Low Alarm Limit	LLAR<address>	1-65536	**Word**	Read/Write
Loop Raw Process Variable	LPVR<address>	1-65536	**Word**	Read/Write
Loop Raw Orange Dev Alarm Limit	LODAR<address>	1-65536	**Word**	Read/Write
Loop Raw Yellow Dev Alarm Limit	LYDAR<address>	1-65536	**Word**	Read/Write
Loop Raw Output	LMNR<address>	1-65536	**Word**	Read/Write
Loop Raw Setpoint	LSPR<address>	1-65536	**Word**	Read/Write
Loop Raw Error	LERRR<address>	1-65536	**Word**	Read Only
Loop Raw High-High Alarm Limit	LHHAR<address>	1-65536	**Word**	Read/Write
Loop Raw Low-Low Alarm Limit	LLLAR<address>	1-65536	**Word**	Read/Write
Loop Raw Alarm Deadband	LADBR<address>	1-65536	**Word**	Read/Write
Loop Raw Bias	LMXR<address>	1-65536	**Word**	Read/Write
Loop Raw Setpoint Low Limit	LSPLR<address>	1-65536	**Word**	Read/Write
Loop Raw Setpoint High Limit	LSPHR<address>	1-65536	**Word**	Read/Write
Loop C Flags - MSW	LCFH<address>	1-65536	**Word**	Read/Write
Loop C Flags - LSW	LCFL<address>	1-65536	**Word**	Read/Write
Loop Derivative Gain Limit Coef.	LKD<address>	1-65535	**Float**	Read/Write
Loop Ramp/Soak Step Number	LRSN<address>	1-65536	**Word**	Read/Write
Loop Alarm Ack Flags	LACK<address>	1-65536	**Word**	Read Only

*For more information, refer to **LVF Bit Definitions**.
For more information, refer to **LCF Bit Definitions.
***For more information, refer to **LRSF Bit Definitions**.

Array Support
Non-Boolean addresses accept array notation. To view data as an array, append '[rows][cols]' to an address. For example, V500 [2][2], V100 [12].

Packed Task Code Protocol
The following address types and arrays are not supported under Packed Task Code Protocol. CAMP Protocol will be used instead.

Loop Control (C) Flags (LCF)
Loop Raw High Alarm Limit (LHAR)
Loop Raw Low Alarm Limit (LLAR)
Loop Raw Process Variable (LPVR)
Loop Raw Orange Deviation (LODAR)
Loop Raw Yellow Deviation (LYDAR)
Loop Raw Output (LMNR)
Loop Raw Setpoint (LSPR)
Loop Raw Error (LERRR)
Loop Raw High-High Alarm Limit (LHHAR)
Loop Raw Low-Low Alarm Limit (LLLAR)
Loop Raw Alarm Deadband (LADBR)
Loop Raw Bias (LMXR)
Loop Raw Setpoint Low Limit (LSPLR)
Loop Raw Setpoint High Limit (LSPHR)

LVF Bit Definitions

Loop Variable Flag Data Element Format
The server default settings are shown in **bold**.

MSB			**LSB**
ABCD	EFGH	IJKL	MNOP

The LVF bit has the following format:

V/W, **X**/Y
V=0-based bit addressing. Bit 0 is MSB.

W=1-based bit addressing. Bit 1 is MSB (Simatic 505 Documentation).
X=0-based bit addressing. Bit 0 is LSB.
Y=1-based bit addressing. Bit 1 is LSB.

Element	LVF bit	Description
A	0/1, **15**/16	1=Go to manual mode*
B	1/2, **14**/15	1=Go to auto mode*
C	2/3, **13**/14	1=Go to cascade mode*
D	3/4, **12**/13	D E=description** 0 0=Loop is in manual mode 1 0=Loop is in auto mode 0 1=Loop is in cascade mode
E	4/5, **11**/12	
F	5/6, **10**/11	0=Error is positive 1=Error is negative
G	6/7, **9**/10	1=PV is in high-high alarm
H	7/8, **8**/9	1=PV is in high alarm
I	8/9, **7**/8	1=PV is in low alarm
J	9/10, **6**/7	1=PV is in low-low alarm
K	10/11, **5**/6	1=PV is in yellow deviation alarm
L	11/12, **4**/5	1=PV is in orange deviation alarm
M	12/13, **3**/4	1=PV is in rate-of-change alarm
N	13/14, **2**/3	1=Broken transmitter alarm
O	14/15, **1**/2	1=Loop is overrunning
P	15/16, **0**/1	Spare: Set to 0

*Elements A, B and C are Write Only triggers. Write 1 to set the mode. The element will always show a value of 0 (zero).
**Elements D and E will indicate the mode that the loop is in. These elements are Read Only.

Note: Elements F through P are Read Only and indicate the error and alarm state that the loop is in.

LCF Bit Definitions

Loop Control Flag Data Element Format

The server default settings are shown in **bold**.

MSB							LSB
ABCD	EFGH	IJKL	MNOP	QRST	UVWX	YZab	cdef

The LCF bit has the following format:

V/W, **X**/Y
V=0-based bit addressing. Bit 0 is MSB.
W=1-based bit addressing. Bit 1 is MSB (Simatic 505 Documentation).
X=0-based bit addressing. Bit 0 is LSB.
Y=1-based bit addressing. Bit 1 is LSB.

Element	LCF bit	Description
A	0/1, **31**/32	0=PV scale 0% offset 1=PV scale 20% offset - only valid if PV is unipolar. Refer to Element U.
B	1/2, **30**/31	1=Take square root of PV
C	2/3, **29**/30	1=Monitor HIGH/LOW alarms
D	3/4 **28**/29	1=Monitor HIGH-HIGH/LOW-LOW alarms
E	4/5, **27**/28	1=Monitor yellow/orange deviation alarm
F	5/6, **26**/27	1=Monitor rate-of-change alarm
G	6/7, **25**/26	1=Monitor broken transmitter alarm
H	7/8, **24**/25	PID algorithm type 0=Position algorithm 1=Velocity algorithm
I	8/9, **23**/24	0=Direct acting 1=Reverse acting

J	9/10, **22**/23	1=Control based on error squared
K	10/11, **21**/22	1=Control based on error deadband
L	11/12, **20**/21	1=Auto-mode lock
M	12/13, **19**/20	1=Cascade-mode lock
N	13/14, **18**/19	1=Setpoint lock
O	14/15, **17**/18	0=Output scale 0% offset 1=Output scale 20% offset - only valid if output is unipolar. Refer to Element T.
P	15/16, **16**/17	*P Q* 0 1=No special function 1 0=Special function on the process variable 0 1=Special function on the setpoint 1 1=Special function on the output
Q	16/17, **15**/16	
R	17/18, **14**/15	1=Freeze bias when output is out of range
S	18/19, **13**/14	1=Ramp/Soak on the setpoint
T	19/20, **12**/13	0=Output is unipolar 1=Output is bipolar
U	20/21, **11**/12	0=PV is unipolar 1=PV is bipolar
V	21/22, **10**/11	1=Perform derivative gain limiting
W	22/23, **9**/10	Contains SF program number (if an SF program is scheduled to be called)
X	23/24, **8**/9	Contains SF program number (if an SF program is scheduled to be called)
Y	24/25, **7**/8	Contains SF program number (if an SF program is scheduled to be called)
Z	25/26, **6**/7	Contains SF program number (if an SF program is scheduled to be called)
a	26/27, **5**/6	Contains SF program number (if an SF program is scheduled to be called)
b	27/28, **4**/5	Contains SF program number (if an SF program is scheduled to be called)
c	28/29, **3**.4	Contains SF program number (if an SF program is scheduled to be called)
d	29/30, **2**/3	Contains SF program number (if an SF program is scheduled to be called)
e	30/31, **1**/2	Contains SF program number (if an SF program is scheduled to be called)
f	31/32, **0**/1	Contains SF program number (if an SF program is scheduled to be called)

Note: If the bit is set to 1, the option is enabled.

LRSF Bit Definitions

Ramp/Soak Status Data Element Format

The server default settings are shown in **bold**.

MSB			**LSB**
ABCD	EFGH	IJKL	MNOP

The LRSF bit has the following format:

V/W, **X**/Y
V=0-based bit addressing. Bit 0 is MSB.
W=1-based bit addressing. Bit 1 is MSB (Simatic 505 Documentation).
X=0-based bit addressing. Bit 0 is LSB.
Y=1-based bit addressing. Bit 1 is LSB.

Element	LRSF bit	Description
A	0/1, **15**/16	1=Restart at the first step. To restart, toggle bit off, on, then off again. The restart occurs on the trailing edge of a square wave.
B	1/2, **14**/15	1=Hold at the current step. To hold, set bit on.
C	2/3, **13**/14	1=Jog to next step. To jog, set bit on. Jog occurs on the rising edge of a square wave.
D	3/4, **12**/13	1=Finish. Indicates ramp/soak is completed.
E	4/5, **11**/12	1=Wait. This bit is set during a soak period when the PV is not within a specified deviation from the SP. The loop holds the soak timer when bit 5 is set.
F	5/6, **10**/11	1=Hold in progress at current step
G	6/7, **9**/10	Unused (always returned as 0)
H	7/8, **8**/9	Unused (always returned as 0)

I	8/9, **7**/8	Ramp/soak step number currently executing
J	9/10, **6**/7	Ramp/soak step number currently executing
K	10/11, **5**/6	Ramp/soak step number currently executing
L	11/12, **4**/5	Ramp/soak step number currently executing
M	12/13, **3**/4	Ramp/soak step number currently executing
N	13/14, **2**/3	Ramp/soak step number currently executing
O	14/15, **1**/2	Ramp/soak step number currently executing
P	15/16, **0**/1	Ramp/soak step number currently executing

Find Forced Addressing

Each address type only allows the one data type stated. No address type has a range.

Address Type	Format	Range	Data Types	Access
Find Forced Discrete Starting at X address	FFX	N/A	String	Read Only
Find Forced Discrete Starting at Y address	FFY	N/A	String	Read Only
Find Forced Discrete Starting at C address	FFC	N/A	String	Read Only
Find Forced Word Starting at WX address	FFWX	N/A	String	Read Only
Find Forced Word Starting at WY address	FFWY	N/A	String	Read Only
Find Forced Discrete/Word Starting address	FFSTART	N/A	DWord	Read/Write

Note 1: FFSTART is a driver internal tag (one per device) that is initialized to 1 on server startup. It has a write range of 1->65536 and a write of values outside of this range will fail with an error message.

Note 2: If the starting address value in FFSTART is greater than the range for the Find Forced type issued, then the read will fail with an "Address out of Range" error (Task Code error '02') and the quality of the tag will be set to "Bad". For example, if FFSTART was set to a value of 65536 and a read of "FFC" was issued, the error generated would look similar to the following due to C memory in the PLC only being configured for maximum value of 32768: "Device 'Channel1.Device1' detected a Task Code error '02' (Tag 'ffc', Size '256')."

Usage

1. Perform a Write to FFSTART with the value of the starting address to be used for the Find Forced type in Step 2.

Caution: Make sure that the value written is within the configured range for the type.

2. Perform a Read using the Find Forced type selected. The read issues a command to the PLC asking it to perform a search for any Forced discretes (C, X/Y) or words (WX/WY).

Find Forced Search Algorithm

Using the Start Address provided, the first forced address beginning with or following the starting address is output. The search will continue until it completes. A search is completed by one of the following: (1) the search proceeds through all locations in a circular manner and arrives back at the specified starting address or (2) enough addresses are found to fill the output buffer. The search will cycle through all address types (C then X/Y for discretes, WX/WY for words) for the command given.

If the search responds with the maximum number of addresses, then another request, beginning with the address following the last forced address returned, must be issued to continue the search. This must be repeated until the original starting address is reached to produce the complete list if a large number of addresses are forced.

Find Forced Search Notes

1. X/Y points reside in the same memory space (i.e. X1=Y1, X2=Y2, etc). The PLC will preferentially express X/Y points using Y addresses unless the search is explicitly started using an X address. Thus, using FFX versus FFY lets users choose whether to have the results returned using an "X:address" format or a "Y:address" format.

2. WX/WY words reside in the same memory space (i.e. WX1=WY1, WX2=WY2, etc). The PLC will preferentially express WX/WY words using WY addresses unless the search is explicitly started using a WX address. Thus, using FFWX versus FFWY lets users choose whether to have the results returned using an "WX:address" format or a "WY:address" format.

Examples

1. Write a value of 600 to a tag named 'ffstart', with an address of FFSTART.

2. Read a tag named 'ffc', with an address of FFC. Value returned in datatype of string: "<Start Address 00600>C:00600,C:00601,Y:00001,Y:01024,C:00001,C:00002"

This example illustrates the algorithm by which the Find Forced search is performed. The search was started at address C:00600 and it found two discretes forced at addresses C:00600,C:00601. It then proceeded to search X/Y discretes where it found Y:00001,Y:01024 forced. Next, it looped back around to the start of C discretes and found C:00001,C:00002 forced. Finally, it ended its search at C:00599 without finding any further forced discretes.

Output Formats

1. None (No Forced addresses found).
2. <Start Address SSSSS>Type1:Address1... up to ... Type15:Address15

where
SSSSS: value of FFSTART
Type: one of: C, X, Y, WX, WY
Address: fixed at five characters (00001 -> 65536)

Notes:

1. A minimum of 1 address is returned.
2. A maximum of 15 addresses are returned if each returned address uses a one word format.
3. If an address consumes two words (due to the address not being within the first page), then the maximum output will be reduced by one for each two-word address. Users can determine if an address will consume one word or two by using the following:

C - Addresses
1 through 512 = one word
Addresses 513 through 65536 = two words

X,Y,WX,WY - Addresses
1 through 1024 = one word
Addresses 1025 through 65536 = two words

4. A maximum of seven addresses are returned if each returned address consumes two words.
5. The final output is independent of the address being returned in a one word or two word format.
6. The maximum string length is internally set to 256.

Error Descriptions

The following error/warning messages may be generated. Click on the link for a description of the message.

Address Validation

Missing address
Device address '<address>' contains a syntax error
Address '<address>' is out of range for the specified device or register
Data Type '<type>' is not valid for device address '<address>'
Device address '<address>' is Read Only
Array size is out of range for address '<address>'
Array support is not available for the specified address: '<address>'

Device Status Messages

Device '<device name>' is not responding
Unable to write to '<address>' on device '<device name>'

Driver Error Messages

Winsock initialization failed (OS Error = n)
Winsock V1.1 or higher must be installed to use the Simatic/TI 505 Ethernet device driver
Device '<device name>' input queue is full. The module is receiving requests faster than it can process requests
Device '<device name>' cannot execute a read request ('<address>', '<size>')
Device '<device name>' cannot execute a write request ('<address>', '<size>')
Device '<device name>' responded with Extended error '<error>' (Tag '<address>', Size '<size>')
Device '<device name>' detected a NITP Protocol Error (Tag '<address>', Size '<size>')
Device '<device name>' detected a Task Code error '<error>' (Tag '<address>', Size '<size>')
Device '<device name>', Write Value not in range 1-->65536. (Tag 'FFSTART')

See Also:

Task Error Codes

Address Validation

The following error/warning messages may be generated. Click on the link for a description of the message.

Address Validation

Missing address
Device address '<address>' contains a syntax error
Address '<address>' is out of range for the specified device or register
Data Type '<type>' is not valid for device address '<address>'
Device address '<address>' is Read Only
Array size is out of range for address '<address>'
Array support is not available for the specified address: '<address>'

Missing address

Error Type:

Warning

Possible Cause:

A tag address that has been specified dynamically has no length.

Solution:

Re-enter the address in the client application.

Device address '<address>' contains a syntax error

Error Type:

Warning

Possible Cause:

A tag address that has been specified dynamically contains one or more invalid characters.

Solution:
Re-enter the address in the client application.

Address '<address>' is out of range for the specified device or register

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically references a location that is beyond the range of supported locations for the device.

Solution:
Verify the address is correct; if it is not, re-enter it in the client application.

Data Type '<type>' is not valid for device address '<address>'

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically has been assigned an invalid data type.

Solution:
Modify the requested data type in the client application.

Device address '<address>' is Read Only

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically has a requested access mode that is not compatible with what the device supports for that address.

Solution:
Change the access mode in the client application.

Array size is out of range for address '<address>'

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically is requesting an array size that is too large for the address type or block size of the driver.

Solution:
Re-enter the address in the client application to specify a smaller value for the array or a different starting point.

Array Support is not available for the specified address: '<address>'

Error Type:
Warning

Possible Cause:
A tag address that has been specified dynamically contains an array reference for an address type that doesn't support arrays.

Solution:
Re-enter the address in the client application to remove the array reference or correct the address type.

Device Status Messages

The following error/warning messages may be generated. Click on the link for a description of the message.

Device Status Messages
Device '<device name>' is not responding
Unable to write to '<address>' on device '<device name>'

Device '<device name>' is not responding

Error Type:
Serious

Possible Cause:
1. The connection between the device and the Host PC is broken.
2. The IP address assigned to the device is incorrect.
3. The response from the device took longer to receive than the amount of time specified in the "Request Timeout" device setting.

Solution:
1. Verify the cabling between the PC and the PLC device.
2. Verify that the IP address given to the named device matches that of the actual device.
3. Increase the Request Timeout setting so that the entire response can be handled.

Unable to write to '<address>' on device '<device name>'

Error Type:
Serious

Possible Cause:
1. The connection between the device and the Host PC is broken.
2. The IP address assigned to the device is incorrect.

Solution:
1. Verify the cabling between the PC and the PLC device.
2. Verify that the IP address given to the named device matches that of the actual device.

Driver Error Messages

The following error/warning messages may be generated. Click on the link for a description of the message.

Driver Error Messages
Winsock initialization failed (OS Error = n)
Winsock V1.1 or higher must be installed to use the Simatic/TI 505 Ethernet device driver
Device '<device name>' input queue is full. The module is receiving requests faster than it can process requests
Device '<device name>' cannot execute a read request ('<address>', '<size>')
Device '<device name>' cannot execute a write request ('<address>', '<size>')
Device '<device name>' responded with Extended error '<error>' (Tag '<address>', Size '<size>')
Device '<device name>' detected a NITP Protocol Error (Tag '<address>', Size '<size>')
Device '<device name>' detected a Task Code error '<error>' (Tag '<address>', Size '<size>')
Device '<device name>', Write Value not in range 1-->65536. (Tag 'FFSTART')

Winsock initialization failed (OS Error = n)

Error Type:
Fatal

OS Error	Possible Solution
10091	Indicates that the underlying network subsystem is not ready for network communication. Wait a few seconds and restart the driver.
10067	Limit on the number of tasks supported by the Windows Sockets implementation has been reached. Close one or more applications that may be using Winsock and restart the driver.

Winsock V1.1 or higher must be installed to use the Simatic/TI 505 Ethernet device driver

Error Type:
Fatal

Possible Cause:
The version number of the Winsock DLL found on the system is less than 1.1.

Solution:
Upgrade Winsock to version 1.1 or higher.

Device '<device name>' input queue is full. The module is receiving requests faster than it can process requests

Error Type:
Serious

Possible Cause:
The device is handling requests from more than one PC at a time.

Solution:
Using the device programming software, make sure that the "task codes per scan time" parameter is set to 8. Adjusting the scan time may also improve device performance. It is recommended that users set the scan time to Variable. For more information on adjusting these settings, refer to the device's documentation.

Device '<device name>' cannot execute a read request ('<address>', '<size>')

Error Type:
Serious

Possible Cause:
The device is unable to return the amount of read data requested in one request.

Solution:
Adjust the requested block size on the device so that the driver makes smaller requests.

Device '<device name>' cannot execute a write request ('<address>', '<size>')

Error Type:
Serious

Possible Cause:
The device is unable to receive the amount of write data sent in one request.

Solution:
Adjust the array size on the address so that a smaller amount of data is sent to the device in one transaction.

Device '<device name>' responded with Extended error '<error>' (Tag '<address>', Size '<size>')

Error Type:
Informational

Possible Cause:
The device is unable to receive the amount of write data sent in one request.

Note:
This error is used for extended error information by some error responses.

See Also:
Device ' <device name>' cannot execute a write request ('<address>', ' <size>')

Device '<device name>' detected a NITP Protocol Error (Tag '<address>', Size '<size>')

Error Type:
Serious

Possible Cause:
This error may occur when sending Packed Task Code messages. The device is experiencing network errors.

Solution:
Check network connections.

Device '<device name>' detected a Task Code error '<error>' (Tag '<address>', Size '<size>')

Error Type:
Serious

Possible Cause:
This error may occur when sending Packed Task Code messages.
The device is experiencing network errors or PLC encountered an error when processing a task code.

Solution:
1. Check network connections.
2. Refer to the specific error code.

See Also:
Task Error Codes

Device '<device name>', Write Value not in range 1-->65536. (Tag 'FFSTART')

Error Type:
Warning

Possible Cause:
Value written outside of range specified.

Solution:
Write a value in the range of 1-65536.

Task Code Error Codes

Code	Description
02	Address out of range (other than Ladder Logic).
03	Requested data not found.
04	Illegal task code request (such as "Task Code not supported").
05	Request exceeds program memory size (Ladder Logic).
07	Fatal error detected.
09	Incorrect amount of data sent with request.
0C	Attempted write operation did not verify.
0D	Illegal number of ASCII characters received.
0E	Illegal write to program memory (Non Volatile).
11	Invalid data sent with the command.
16	Attempted write to a Protected Variable (such as TCC and TCP).
17	No response from PLC (such as, "Single Scan not performed").
18	Requested memory size exceeds total available memory.
19	Requested memory size is not a multiple of block allocation size.
1A	Requested memory size is less than minimum defined value.
1B	Requested memory size is larger than maximum defined value.
1C	PLC busy - cannot complete the requested operation.
3F	Bus Error detected.
40	Operating system Error detected.
4A	Attempt to access an integer only variable as a real.
4B	Attempt to access a real. Only value as an integer.
4C	Task code buffer overflow. Too much data requested.
4E	Attempt to write a Read Only variable.
4F	Invalid variable type for this operation.
50	Task code request buffer too large. PLC internal error.

Index

5

505-CP1434-TCP Addressing 11
505 Protocol 7

A

ACF Bit Definitions 22
Address '<address>' is out of range for the specified device or register 30
Address Descriptions 11
Address Validation 29
Addressing Options 5
Alarm Addressing 20
Array size is out of range for address '<address>' 30
Array support is not available for the specified address:'<address>' 30
AVF Bit Definitions 21

B

Boolean 10

C

Cable Diagrams 7
CAMP 7
Common Data Type Addressing 11
Communications Parameters 6
CTI 2572/2572-A and CP2572 Addressing 11

D

Data Type '<type>' is not valid for device address '<address>' 30
Data Types Description 10
Device '<device name>' cannot execute a read request (<address>:<size>) 32
Device '<device name>' cannot execute a write request (<address>:<size>) 32
Device '<device name>' input queue is full. The module is receiving requests faster than it can process requests 32
Device '<device name>' is not responding 31
Device '<device name>' responded with Extended error '<error>' (Tag '<address>', Size '<size>') 32

Device '<device name>', Write Value not in range1-->65536. (Tag 'FFSTART') 33
Device address '<address>' contains a syntax error 29
Device address '<address>' is Read Only 30
Device ID 5
Device Setup 5
Device Status Messages 30
Driver Error Messages 31
DWord 10

E

Error Descriptions 29

F

Find Forced Addressing 27
Float 10

L

LCF Bit Definitions 25
Long 10
Loop Addressing 23
LRSF Bit Definitions 26
LVF Bit Definitions 24

M

Missing address 29

N

Network 5
NITP 7

O

Optimizing Your Simatic/TI 505 Ethernet Communications 9
Overview 4

P

Packed Task Code 7

S

Short 10
Status Words 15

T

Task Code Error Codes 33-34
TISOFT 7

U

Unable to write tag '<address>' on device '<device name>' 31

W

Winsock initialization failed (OS Error = n) 31
Winsock V1.1 or higher must be installed to use the Simatic/TI 505 Ethernet device driver 32
Word 10