

# Omron FINS Serial Driver

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## Omron FINS Serial Driver

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Help version 1.058

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#### Overview

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## Overview

The Omron FINS Serial Driver provides a reliable way to connect Omron FINS serial devices to OPC client applications; including HMI, SCADA, Historian, MES, ERP, and countless custom applications.

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## Setup

This driver supports the FINS protocol via the Sysmac Way: Host Link Interface.

● For a current list of models that support the Sysmac Way: Host Link Interface (reference: Omron's CX-Server Runtime - User Manual), refer to the manufacturer's website.

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## Communication Protocol

Omron FINS

### Supported Communication Parameters

Baud Rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps

Parity: Even, Odd, or None

Data Bits: 7 or 8

Stop Bits: 1 or 2

### Channel and Device Limits

The maximum number of channels supported by this driver is 100. The maximum number of devices supported by this driver is 32 per channel.

### Ethernet Encapsulation

This driver supports Ethernet Encapsulation, which allows the driver to communicate with serial devices attached to an Ethernet network using a terminal server. It may be set through [channel properties](#).

### Flow Control

When using an RS232 / RS485 converter, the type of flow control that is required depends on the needs of the converter. Some converters do not require any flow control whereas others require RTS flow. To determine the converter's flow requirements, refer to its documentation. An RS485 converter that provides automatic flow control is recommended.

#### ● Notes:

- When using the manufacturer's supplied communications cable, it is sometimes necessary to choose a flow control setting of RTS or RTS Always in channel properties.
- When running on platforms that do not enforce proper flow control, users may need to set the flow control in the server's communications settings.

## Channel Properties — General

This server supports the use of multiple simultaneous communications drivers. Each protocol or driver used in a server project is called a channel. A server project may consist of many channels with the same communications driver or with unique communications drivers. A channel acts as the basic building block of an OPC link. This group is used to specify general channel properties, such as the identification attributes and operating mode.

Property Groups	[-] <b>Identification</b>	
<b>General</b>	Name	
Write Optimizations	Description	
Advanced	Driver	
	[-] <b>Diagnostics</b>	
	Diagnostics Capture	Disable
	[-] <b>Tag Counts</b>	
	Static Tags	10

### Identification

**Name:** Specify the user-defined identity of this channel. In each server project, each channel name must be unique. Although names can be up to 256 characters, some client applications have a limited display window when browsing the OPC server's tag space. The channel name is part of the OPC browser information. The property is required for creating a channel.

• For information on reserved characters, refer to "How To... Properly Name a Channel, Device, Tag, and Tag Group" in the server help.

**Description:** Specify user-defined information about this channel.

• Many of these properties, including Description, have an associated system tag.

**Driver:** Specify the protocol / driver for this channel. Specify the device driver that was selected during channel creation. It is a disabled setting in the channel properties. The property is required for creating a channel.

• **Note:** With the server's online full-time operation, these properties can be changed at any time. This includes changing the channel name to prevent clients from registering data with the server. If a client has already acquired an item from the server before the channel name is changed, the items are unaffected. If, after the channel name has been changed, the client application releases the item and attempts to re-acquire using the old channel name, the item is not accepted. Changes to the properties should not be made once a large client application has been developed. Utilize proper user role and privilege management to prevent operators from changing properties or accessing server features.

### Diagnostics

**Diagnostics Capture:** When enabled, this option makes the channel's diagnostic information available to OPC applications. Because the server's diagnostic features require a minimal amount of overhead processing, it is recommended that they be utilized when needed and disabled when not. The default is disabled.

• **Note:** This property is not available if the driver does not support diagnostics.

• For more information, refer to *Communication Diagnostics in the server help*.

### Diagnostics

**Diagnostics Capture:** When enabled, this option allows the usage of statistics tags that provide feedback to client applications regarding the operation of the channel. Because the server's diagnostic features require a minimal amount of overhead processing, it is recommended that they be utilized when needed and disabled when not. The default is disabled.

● **Note:** This property is not available if the driver does not support diagnostics.

● *For more information, refer to Statistics Tags in the server help.*

## Tag Counts

**Static Tags:** Provides the total number of defined static tags at this level (device or channel). This information can be helpful in troubleshooting and load balancing.

## Channel Properties — Serial Communications

Serial communication properties are available to serial drivers and vary depending on the driver, connection type, and options selected. Below is a superset of the possible properties.

Click to jump to one of the sections: [Connection Type](#), [Serial Port Settings](#), and [Operational Behavior](#).

### Notes:

- With the server's online full-time operation, these properties can be changed at any time. Utilize proper user role and privilege management to prevent operators from changing properties or accessing server features.
- Users must define the specific communication parameters to be used. Depending on the driver, channels may or may not be able to share identical communication parameters. Only one shared serial connection can be configured for a Virtual Network (see [Channel Properties — Serial Communications](#)).

Property Groups		
General		
<b>Serial Communications</b>		
Write Optimizations		
Advanced		
	<input type="checkbox"/> <b>Connection Type</b>	
	Physical Medium	COM Port
	<input type="checkbox"/> <b>Serial Port Settings</b>	
	COM ID	39
	Baud Rate	19200
	Data Bits	8
	Parity	None
	Stop Bits	1
	Flow Control	RTS Always
	<input type="checkbox"/> <b>Operational Behavior</b>	
	Report Communication Errors	Enable
	Close Idle Connection	Enable
	Idle Time to Close (s)	15

## Connection Type

**Physical Medium:** Choose the type of hardware device for data communications. Options include Modem, COM Port, and None. The default is COM Port.

1. **None:** Select None to indicate there is no physical connection, which displays the [Operation with no Communications](#) section.
2. **COM Port:** Select Com Port to display and configure the [Serial Port Settings](#) section.

3. **Modem:** Select Modem if phone lines are used for communications, which are configured in the [Modem Settings](#) section.
4. **Shared:** Verify the connection is correctly identified as sharing the current configuration with another channel. This is a read-only property.

## Serial Port Settings

**COM ID:** Specify the Communications ID to be used when communicating with devices assigned to the channel. The valid range is 1 to 9991 to 16. The default is 1.

**Baud Rate:** Specify the baud rate to be used to configure the selected communications port.


**Data Bits:** Specify the number of data bits per data word. Options include 5, 6, 7, or 8.

**Parity:** Specify the type of parity for the data. Options include Odd, Even, or None.

**Stop Bits:** Specify the number of stop bits per data word. Options include 1 or 2.

**Flow Control:** Select how the RTS and DTR control lines are utilized. Flow control is required to communicate with some serial devices. Options are:

- **None:** This option does not toggle or assert control lines.
- **DTR:** This option asserts the DTR line when the communications port is opened and remains on.
- **RTS:** This option specifies that the RTS line is high if bytes are available for transmission. After all buffered bytes have been sent, the RTS line is low. This is normally used with RS232/RS485 converter hardware.
- **RTS, DTR:** This option is a combination of DTR and RTS.
- **RTS Always:** This option asserts the RTS line when the communication port is opened and remains on.
- **RTS Manual:** This option asserts the RTS line based on the timing properties entered for RTS Line Control. It is only available when the driver supports manual RTS line control (or when the properties are shared and at least one of the channels belongs to a driver that provides this support).  
RTS Manual adds an **RTS Line Control** property with options as follows:
  - **Raise:** Specify the amount of time that the RTS line is raised prior to data transmission. The valid range is 0 to 9999 milliseconds. The default is 10 milliseconds.
  - **Drop:** Specify the amount of time that the RTS line remains high after data transmission. The valid range is 0 to 9999 milliseconds. The default is 10 milliseconds.
  - **Poll Delay:** Specify the amount of time that polling for communications is delayed. The valid range is 0 to 9999. The default is 10 milliseconds.

 **Tip:** When using two-wire RS-485, "echoes" may occur on the communication lines. Since this communication does not support echo suppression, it is recommended that echoes be disabled or a RS-485 converter be used.

## Operational Behavior

- **Report Communication Errors:** Enable or disable reporting of low-level communications errors. When enabled, low-level errors are posted to the Event Log as they occur. When disabled, these same errors are not posted even though normal request failures are. The default is Enable.



- **Close Idle Connection:** Choose to close the connection when there are no longer any tags being referenced by a client on the channel. The default is Enable.
- **Idle Time to Close:** Specify the amount of time that the server waits once all tags have been removed before closing the COM port. The default is 15 seconds.

## Modem Settings

- **Modem:** Specify the installed modem to be used for communications.
- **Connect Timeout:** Specify the amount of time to wait for connections to be established before failing a read or write. The default is 60 seconds.
- **Modem Properties:** Configure the modem hardware. When clicked, it opens vendor-specific modem properties.
- **Auto-Dial:** Enables the automatic dialing of entries in the Phonebook. The default is Disable. *For more information, refer to "Modem Auto-Dial" in the server help.*
- **Report Communication Errors:** Enable or disable reporting of low-level communications errors. When enabled, low-level errors are posted to the Event Log as they occur. When disabled, these same errors are not posted even though normal request failures are. The default is Enable.
- **Close Idle Connection:** Choose to close the modem connection when there are no longer any tags being referenced by a client on the channel. The default is Enable.
- **Idle Time to Close:** Specify the amount of time that the server waits once all tags have been removed before closing the modem connection. The default is 15 seconds.

## Operation with no Communications

- **Read Processing:** Select the action to be taken when an explicit device read is requested. Options include Ignore and Fail. Ignore does nothing; Fail provides the client with an update that indicates failure. The default setting is Ignore.

## Channel Properties — Write Optimizations

The server must ensure that the data written from the client application gets to the device on time. Given this goal, the server provides optimization properties to meet specific needs or improve application responsiveness.

Property Groups	<input type="checkbox"/> <b>Write Optimizations</b>	
General	Optimization Method	Write Only Latest Value for All Tags
<b>Write Optimizations</b>	Duty Cycle	10

## Write Optimizations

**Optimization Method:** Controls how write data is passed to the underlying communications driver. The options are:

- **Write All Values for All Tags:** This option forces the server to attempt to write every value to the controller. In this mode, the server continues to gather write requests and add them to the server's internal write queue. The server processes the write queue and attempts to empty it by writing data to the device as quickly as possible. This mode ensures that everything written from the client applications is sent to the target device. This mode should be selected if the write operation order or the write item's content must uniquely be seen at the target device.

- **Write Only Latest Value for Non-Boolean Tags:** Many consecutive writes to the same value can accumulate in the write queue due to the time required to actually send the data to the device. If the server updates a write value that has already been placed in the write queue, far fewer writes are needed to reach the same final output value. In this way, no extra writes accumulate in the server's queue. When the user stops moving the slide switch, the value in the device is at the correct value at virtually the same time. As the mode states, any value that is not a Boolean value is updated in the server's internal write queue and sent to the device at the next possible opportunity. This can greatly improve the application performance.
  - **Note:** This option does not attempt to optimize writes to Boolean values. It allows users to optimize the operation of HMI data without causing problems with Boolean operations, such as a momentary push button.
- **Write Only Latest Value for All Tags:** This option takes the theory behind the second optimization mode and applies it to all tags. It is especially useful if the application only needs to send the latest value to the device. This mode optimizes all writes by updating the tags currently in the write queue before they are sent. This is the default mode.

**Duty Cycle:** is used to control the ratio of write to read operations. The ratio is always based on one read for every one to ten writes. The duty cycle is set to ten by default, meaning that ten writes occur for each read operation. Although the application is performing a large number of continuous writes, it must be ensured that read data is still given time to process. A setting of one results in one read operation for every write operation. If there are no write operations to perform, reads are processed continuously. This allows optimization for applications with continuous writes versus a more balanced back and forth data flow.

● **Note:** It is recommended that the application be characterized for compatibility with the write optimization enhancements before being used in a production environment.

## Channel Properties — Advanced

This group is used to specify advanced channel properties. Not all drivers support all properties; so the Advanced group does not appear for those devices.

Property Groups	<input type="checkbox"/> <b>Non-Normalized Float Handling</b>	
General	Floating-Point Values	Replace with Zero
Write Optimizations	<input type="checkbox"/> <b>Inter-Device Delay</b>	
<b>Advanced</b>	Inter-Device Delay (ms)	0

**Non-Normalized Float Handling:** A non-normalized value is defined as Infinity, Not-a-Number (NaN), or as a Denormalized Number. The default is Replace with Zero. Drivers that have native float handling may default to Unmodified. Non-normalized float handling allows users to specify how a driver handles non-normalized IEEE-754 floating point data. Descriptions of the options are as follows:

- **Replace with Zero:** This option allows a driver to replace non-normalized IEEE-754 floating point values with zero before being transferred to clients.
- **Unmodified:** This option allows a driver to transfer IEEE-754 denormalized, normalized, non-number, and infinity values to clients without any conversion or changes.

● **Note:** This property is disabled if the driver does not support floating-point values or if it only supports the option that is displayed. According to the channel's float normalization setting, only real-time driver tags (such as values and arrays) are subject to float normalization. For example, EFM data is not affected by this setting.

• For more information on the floating-point values, refer to "How To ... Work with Non-Normalized Floating-Point Values" in the server help.

**Inter-Device Delay:** Specify the amount of time the communications channel waits to send new requests to the next device after data is received from the current device on the same channel. Zero (0) disables the delay.

• **Note:** This property is not available for all drivers, models, and dependent settings.

## Device Properties — General

Property Groups	Identification	
General	Name	Omron FINS Serial
Scan Mode	Description	
Timing	Channel Assignment	Omron FINS Serial
Auto-Demotion	Driver	Omron FINS Serial
Run Mode Settings	Model	C200
Communication Parameters	ID	0.0.0
Redundancy	Operating Mode	
	Data Collection	Enable
	Simulated	No

### Identification

**Name:** User-defined identity of this device.

**Description:** User-defined information about this device.

**Channel Assignment:** User-defined name of the channel to which this device currently belongs.

**Driver:** Selected protocol driver for this device.

**Model:** The specific version of the device. For a list of models that support the FINS Communications Service, refer to the manufacturer's website.

**ID:** The ID specifies the three-layer network address that uniquely identifies the target device. The format of the ID is *UU.AAA.NNN*, where:

- **UU:** Unit Number of the Host Link Unit used for PC interface (0 to 31 decimal).
- **AAA:** FINS Destination Network Address (0 to 127 decimal).
- **NNN:** FINS Destination Node Number (0 to 254 decimal).

• For more information, refer to [FINS Networks](#).

• **See Also:** [Operating Mode](#).

### Operating Mode

Property Groups	+ Identification	
General	- Operating Mode	
Scan Mode	Data Collection	Enable
	Simulated	No

**Data Collection:** This property controls the device's active state. Although device communications are enabled by default, this property can be used to disable a physical device. Communications are not attempted when a device is disabled. From a client standpoint, the data is marked as invalid and write operations are not accepted. This property can be changed at any time through this property or the device system tags.

**Simulated:** Place the device into or out of Simulation Mode. In this mode, the driver does not attempt to communicate with the physical device, but the server continues to return valid OPC data. Simulated stops physical communications with the device, but allows OPC data to be returned to the OPC client as valid data. While in Simulation Mode, the server treats all device data as reflective: whatever is written to the simulated device is read back and each OPC item is treated individually. The item's memory map is based on the group Update Rate. The data is not saved if the server removes the item (such as when the server is reinitialized). The default is No.

● **Notes:**

1. Updates are not applied until clients disconnect and reconnect.
2. The System tag (\_Simulated) is read only and cannot be written to for runtime protection. The System tag allows this property to be monitored from the client.
3. In Simulation mode, the item's memory map is based on client update rate(s) (Group Update Rate for OPC clients or Scan Rate for native and DDE interfaces). This means that two clients that reference the same item with different update rates return different data.
4. When a device is simulated, updates may not appear faster than one (1) second in the client.

● Simulation Mode is for test and simulation purposes only. It should never be used in a production environment.

## Device Properties — Scan Mode

The Scan Mode specifies the subscribed-client requested scan rate for tags that require device communications. Synchronous and asynchronous device reads and writes are processed as soon as possible; unaffected by the Scan Mode properties.

Property Groups	- Scan Mode	
General	Scan Mode	Respect Client-Specified Scan Rate ▼
Scan Mode	Initial Updates from Cache	Disable

**Scan Mode:** Specify how tags in the device are scanned for updates sent to subscribing clients. Descriptions of the options are:

- **Respect Client-Specified Scan Rate:** This mode uses the scan rate requested by the client.
- **Request Data No Faster than Scan Rate:** This mode specifies the value set as the maximum scan rate. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.
  - **Note:** When the server has an active client and items for the device and the scan rate value is increased, the changes take effect immediately. When the scan rate value is decreased, the changes do not take effect until all client applications have been disconnected.

- **Request All Data at Scan Rate:** This mode forces tags to be scanned at the specified rate for subscribed clients. The valid range is 10 to 99999990 milliseconds. The default is 1000 milliseconds.
- **Do Not Scan, Demand Poll Only:** This mode does not periodically poll tags that belong to the device nor perform a read to get an item's initial value once it becomes active. It is the OPC client's responsibility to poll for updates, either by writing to the `_DemandPoll` tag or by issuing explicit device reads for individual items. *For more information, refer to "Device Demand Poll" in server help.*
- **Respect Tag-Specified Scan Rate:** This mode forces static tags to be scanned at the rate specified in their static configuration tag properties. Dynamic tags are scanned at the client-specified scan rate.

**Initial Updates from Cache:** When enabled, this option allows the server to provide the first updates for newly activated tag references from stored (cached) data. Cache updates can only be provided when the new item reference shares the same address, scan rate, data type, client access, and scaling properties. A device read is used for the initial update for the first client reference only. The default is disabled; any time a client activates a tag reference the server attempts to read the initial value from the device.

## Device Properties — Timing

The device Timing properties allow the driver's response to error conditions to be tailored to fit the application's needs. In many cases, the environment requires changes to these properties for optimum performance. Factors such as electrically generated noise, modem delays, and poor physical connections can influence how many errors or timeouts a communications driver encounters. Timing properties are specific to each configured device.

Property Groups General Scan Mode <b>Timing</b>	<table border="1"> <tr> <td colspan="2"><b>Communication Timeouts</b></td> </tr> <tr> <td>Connect Timeout (s)</td> <td>3</td> </tr> <tr> <td>Request Timeout (ms)</td> <td>1000</td> </tr> <tr> <td>Attempts Before Timeout</td> <td>3</td> </tr> </table>	<b>Communication Timeouts</b>		Connect Timeout (s)	3	Request Timeout (ms)	1000	Attempts Before Timeout	3
<b>Communication Timeouts</b>									
Connect Timeout (s)	3								
Request Timeout (ms)	1000								
Attempts Before Timeout	3								

### Communications Timeouts

**Connect Timeout:** This property (which is used primarily by Ethernet based drivers) controls the amount of time required to establish a socket connection to a remote device. The device's connection time often takes longer than normal communications requests to that same device. The valid range is 1 to 30 seconds. The default is typically 3 seconds, but can vary depending on the driver's specific nature. If this setting is not supported by the driver, it is disabled.

● **Note:** Due to the nature of UDP connections, the connection timeout setting is not applicable when communicating via UDP.

**Request Timeout:** Specify an interval used by all drivers to determine how long the driver waits for a response from the target device to complete. The valid range is 50 to 9999999 milliseconds (167 minutes). The default is usually 1000 milliseconds, but can vary depending on the driver. The default timeout for most serial drivers is based on a baud rate of 9600 baud or better. When using a driver at lower baud rates, increase the timeout to compensate for the increased time required to acquire data.

**Attempts Before Timeout:** Specify how many times the driver issues a communications request before considering the request to have failed and the device to be in error. The valid range is 1 to 10. The default is typically 3, but can vary depending on the driver's specific nature. The number of attempts configured for an application depends largely on the communications environment. This property applies to both connection attempts and request attempts.

## Timing

**Inter-Request Delay:** Specify how long the driver waits before sending the next request to the target device. It overrides the normal polling frequency of tags associated with the device, as well as one-time reads and writes. This delay can be useful when dealing with devices with slow turnaround times and in cases where network load is a concern. Configuring a delay for a device affects communications with all other devices on the channel. It is recommended that users separate any device that requires an inter-request delay to a separate channel if possible. Other communications properties (such as communication serialization) can extend this delay. The valid range is 0 to 300,000 milliseconds; however, some drivers may limit the maximum value due to a function of their particular design. The default is 0, which indicates no delay between requests with the target device.

● **Note:** Not all drivers support Inter-Request Delay. This setting does not appear if it is not available.

Property Groups General Scan Mode <b>Timing</b>	[-] <b>Timing</b>	
	Inter-Request Delay (ms)	0

## Device Properties — Auto-Demotion

The Auto-Demotion properties can temporarily place a device off-scan in the event that a device is not responding. By placing a non-responsive device offline for a specific time period, the driver can continue to optimize its communications with other devices on the same channel. After the time period has been reached, the driver re-attempts to communicate with the non-responsive device. If the device is responsive, the device is placed on-scan; otherwise, it restarts its off-scan time period.

Property Groups General Scan Mode Timing <b>Auto-Demotion</b>	[-] <b>Auto-Demotion</b>	
	Demote on Failure	Enable
	Timeouts to Demote	3
	Demotion Period (ms)	10000
	Discard Requests when Demoted	Disable

**Demote on Failure:** When enabled, the device is automatically taken off-scan until it is responding again.

● **Tip:** Determine when a device is off-scan by monitoring its demoted state using the `_AutoDemoted` system tag.

**Timeouts to Demote:** Specify how many successive cycles of request timeouts and retries occur before the device is placed off-scan. The valid range is 1 to 30 successive failures. The default is 3.

**Demotion Period:** Indicate how long the device should be placed off-scan when the timeouts value is reached. During this period, no read requests are sent to the device and all data associated with the read requests are set to bad quality. When this period expires, the driver places the device on-scan and allows for another attempt at communications. The valid range is 100 to 3600000 milliseconds. The default is 10000 milliseconds.

**Discard Requests when Demoted:** Select whether or not write requests should be attempted during the off-scan period. Disable to always send write requests regardless of the demotion period. Enable to discard

writes; the server automatically fails any write request received from a client and does not post a message to the Event Log.

### Device Properties — Run Mode Settings

This group specifies the driver's behavior when the device makes writes to Timer Status and Counter Status while in Run Mode

Property Groups	[-] <b>Run Mode Settings</b>	
<b>Run Mode Settings</b>	CS and TS Writes	Set PLC to Monitor Mode, Perform Write
Communication Parameters		

**CS and TS Writes:** Select how the device performs writes in Run mode. The default setting is Fail Write, Log Message.

- **Fail Write, Log Message:** posts a message to the Event Log when the Write command fails.
- **Set PLC to Monitor Mode, Perform Write:** changes the PLC to Monitor Mode before performing the write.
- **Set PLC to Monitor Mode, Write, Reset to Run:** changes the PLC to Monitor Mode before performing the write. Once complete, the PLC is reset to Run mode.

### Device Properties — Communication Parameters

Property Groups	[-] <b>Communication Parameters</b>	
<b>Communication Parameters</b>	Request Size (bytes)	512

**Request Size:** Specifies the number of bytes that may be requested from a device at one time. To refine the driver's performance, set the Request Size to one of the following settings: 32, 64, 128, 256, or 512 bytes. The default setting is 512 bytes.

● **Note:** Because this driver uses an ASCII protocol, there are four bytes transmitted for each Word, Short, and BCD. Eight bytes are transmitted for each DWord, Long, LBCD, and Float.

### Device Properties — Redundancy

Property Groups	[-] <b>Redundancy</b>	
General	Secondary Path	Channel.Device1 ...
Scan Mode	Operating Mode	Switch On Failure
Timing	Monitor Item	
Auto-Demotion	Monitor Interval (s)	300
Tag Generation	Return to Primary ASAP	Yes
Tag Import Settings		
<b>Redundancy</b>		

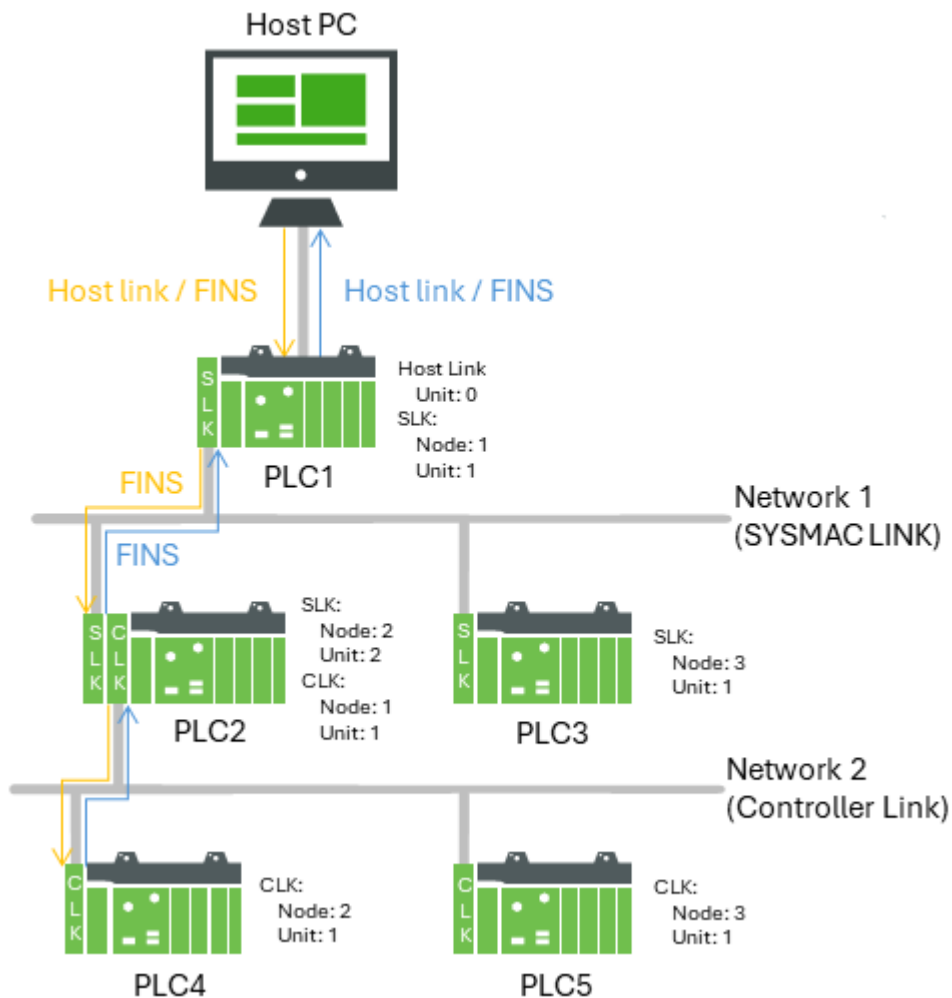
Redundancy is available with the Media-Level Redundancy Plug-In.

● Consult the website, a sales representative, or the [user manual](#) for more information.

## FINS Networks

The FINS communications service was developed by Omron to provide a consistent way for PLCs and computers on various networks to communicate. Compatible network types include Ethernet, Host Link, Controller Link, SYSMAC LINK, SYSMAC WAY, and Toolbus. FINS allows communications between nodes up to three network levels. Direct links between a PC and a PLC via Host link is not counted as a network layer.

The diagram below shows a FINS network comprised of interconnected SYSMAC LINK and Controller Link networks, and serves as an example for the following discussion. FINS allows communication between any pair of devices in the diagram. PLC 1 serves as the host computer's Host Link interface to network 1. PLC 2 serves as a gateway between the networks 1 and 2. The Host PC sends a data request command (shown in red) to PLC 4 via PLC 1 and 2. The response is shown in blue. In principle, PLC 4 or 5 could act as a gateway to a third network layer that could also be reached by the Host PC.



## FINS Messages

FINS messages contain two parts: a header and a data portion. The header contains source and destination information, among other things. The data portion contains command codes and optional command parameters. The six source and destination parameters contained in the header are as follows:

- **DNA:** Destination Network Address.
- **DA1:** Destination Node Number.



- **DA2:** Destination Module Address.
- **SNA:** Source Network Address.
- **SA1:** Source Node Number.
- **SA2:** Source Module Address.

This driver sets DA2 and SA2 to zero, meaning that communications is between the host computer and the destination node's CPU module. This driver also sets SNA and SA1 to zero to indicate that communication is through the Host Link port of the interface device. The interface device (PLC 1) resets SNA and SA1 as needed when forwarding messages to other PLCs.

### Host Link Communications

This driver is able to communicate with any FINS compatible device with a Host Link port. That device can then process a given FINS command if it is the destination node, or relay the message to another device if it is not. In the figure above, is desired to send a data request from the Host PC to PLC 4. The driver constructs a FINS data request message with appropriate source and destination parameters set in the header, encapsulates that message in a Host Link wrapper, and sends it off to PLC 1. PLC 1 then examines the FINS message header and determines that node 2 on network 2 (PLC 4) is the intended destination. By referring to its routing tables, PLC 1 determines that the message must be sent to the gateway device PLC 2 to reach the destination node on network 2. Since PLC 2 is not on a Host Link network, the Host Link wrapper is removed. PLC 2 in turn sends the message to PLC 4, which sends its reply back to the Host PC via PLC 2 and 1. PLC 1 wraps the FINS response in a Host Link wrapper, which this driver can recognize and process.

For this example, the server must be configured as follows:

1. To start, create a channel that uses this driver. Then, create a device that represents the destination node (PLC 4).
2. Next, set the Device ID. The Host Link unit number of interface device is 0, the FINS destination network address (DNA) is 2, and the FINS destination node number (DA1) is 2. Therefore, the Device ID in this example is 0.2.2.

● **Note:** As previously mentioned, SNA, SA1, SA2 and DA2 are automatically set to zero by the driver.

3. Similar device objects must be created for PLC 1, 2, 3, and 5.

### Routing Tables

With multi-level networks, additional information must be programmed into the PLCs so they can send messages to other nodes in the system. This is accomplished using FINS routing tables. FINS routing tables come in two varieties: Local and Remote. Local routing tables associate a network number with one of the communication modules or Special Input/Output Units (SIOU) installed in the PLC's rack. Remote routing tables instruct how to reach one of the next network levels. The routing tables for this example would appear as follows:

#### PLC 1 (Local)

Network Number	Unit
1	1

Since PLC 1 is only connected to the SYSMAC LINK network, it only has one entry in its local routing table.

#### PLC 1 (Remote)

Remote Network Number	Relay Network	Relay Node
2	1	2

Network 2 is a remote network for PLC 1. To send a message to a node on network 2, PLC 1 must send that message to a relay node (or gateway) on one of its local networks. This local network is called the relay network, and must be network 1 in this example. The SYSMAC LINK module in the gateway (PLC 2) is node number 2. Thus, the relay node for PLC 1 is 2.

### PLC 2 (Local)

Network Number	Unit
1	2
2	1

There are two local networks for PLC 2. The SYSMACK LINK and Controller Link network numbers are assigned as 1 and 2 respectively. The SYSMAC LINK and Controller Link modules are assigned unit numbers 2 and 1 respectively. The network node number of each of these modules is configured by the user, and must be unique within its associated network. In this example, both of the communications modules in PLC 2 could be called node 10 because they are on different networks.

### PLC 3 (Local)

Network Number	Unit
1	1

The local routing table for PLC 3 has only one entry, because the device is only connected to network 1.

### PLC 3 (Remote)

Remote Network Number	Relay Network	Relay Node
2	1	2

Network 2 is a remote network for PLC 3. Like PLC 1, the relay network is 1, and the relay node is 2 (the SLK module of the gateway device PLC 2).


Routing tables for PLC 4 and 5 must appear like the following. In this example, they are the same because the Controller Link modules in both PLCs are unit number 1. These modules must be assigned node numbers that are unique in network 2.

### PLC 4 and 5 (Local)

Network Number	Unit
2	1

### PLC 4 and 5 (Remote)

Remote Network Number	Relay Network	Relay Node
1	2	1

 For more information, refer to the Omron documentation.

## Data Types Description

Data Type	Description
Boolean	Single bit
Short	Signed 16-bit value  bit 0 is the low bit bit 14 is the high bit bit 15 is the sign bit
Word	Unsigned 16-bit value  bit 0 is the low bit bit 15 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
DWord	Unsigned 32-bit value  bit 0 is the low bit bit 31 is the high bit
Float	32-bit real
BCD	Two byte packed BCD  Value range is 0-9999. Behavior is undefined for values beyond this range.
LBCD	Four byte packed BCD  Value range is 0-99999999. Behavior is undefined for values beyond this range.
String	Null-terminated ASCII string.  Support includes string lengths up to 256 characters, and selection of HiLo byte order, LoHi byte order, Only High byte and Only Low byte.

## 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.

[C200H Addressing](#)

[C500 Addressing](#)

[C1000H Addressing](#)

[C2000H Addressing](#)

[CV500 Addressing](#)

[CV1000 Addressing](#)

[CV2000 Addressing](#)

[CVM1-CPU01 Addressing](#)

[CVM1-CPU11 Addressing](#)

[CVM1-CPU21 Addressing](#)

[CS1 Addressing](#)

[CJ1 Addressing](#)

[CJ2 Addressing](#)

## C200H Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

• For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	AR00-AR27 AR00-AR26 ARxx.00-ARxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Auxiliary Relay as string with HiLo byte order	AR00.056H-AR27.002H  .I is string length, range 2 to 56 chars	<b>String</b>	Read/Write
Auxiliary Relay as string with LoHi byte order	AR00.056L-AR27.002L  .I is string length, range 2 to 56 chars	<b>String</b>	Read/Write
Auxiliary Relay as string Using Only the High Order byte of each word	AR00.028D-AR27.001D  .I is string length, range 1 to 28 chars	<b>String</b>	Read/Write
Auxiliary Relay as string Using Only the Low Order byte of each word	AR00.028E-AR27.001E  .I is string length, range 1 to 28 chars	<b>String</b>	Read/Write
Data Memory	DM0000-DM6655 DM0000-DM6654 DMxxxx.00-DMxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write

Device Type	Range	Data Type	Access
		<b>Boolean</b>	
Data Memory as string with HiLo byte order	DM0000.256H-DM6655.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	DM0000.256L-DM6655.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	DM0000.128D-DM6655.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	DM0000.128E-DM6655.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank)	EM0000-EM6143 EM0000-EM6142 EMxxxx.00-EMxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory (current bank) as string with HiLo byte order	EM0000.256H-EM6143.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string with LoHi byte order	EM0000.256L-EM6143.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the High Order byte of each word	EM0000.128D-EM6143.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the Low Order byte of each word	EM0000.128E-EM6143.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory	EM00:0000-EM07:6143 EM00:0000-EM07:6142 EMx:x.00-EMxx:xxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory as string with HiLo byte order	EM00:0000.256H-EM07:6143.002H	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	.I is string length, range 2 to 256 chars		
Expansion Data Memory as string with LoHi byte order	EM00:0000.256L-EM07:6143.002L  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the High Order byte of each word	EM00:0000.128D-EM07:6143.001D  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the Low Order byte of each word	EM00:0000.128E-EM07:6143.001E  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay	HR00-HR99 HR00-HR98 HRxx.00-HRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Holding Relay as string with HiLo byte order	HR00.200H-HR99.002H  .I is string length, range 2 to 200 chars	<b>String</b>	Read/Write
Holding Relay as string with LoHi byte order	HR00.200L-HR99.002L  .I is string length, range 2 to 200 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the High Order byte of each word	HR00.100D-HR99.001D  .I is string length, range 1 to 100 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the Low Order byte of each word	HR00.100E-HR99.001E  .I is string length, range 1 to 100 chars	<b>String</b>	Read/Write
Internal Relay	IR000-IR511 IR000-IR510 IRxxx.00-IRxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Internal Relay as a string with HiLo byte order	IR000.256H-IR511.002H  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Internal Relay as a string with LoHi byte order	IR000.256L-IR511.002L	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	.l is string length, range 2 to 256 chars		
Internal Relay as a string Using Only the High Order byte of each word	IR000.128D-IR511.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Internal Relay as a string Using Only the Low Order byte of each word	IR000.128E-IR511.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Link Relays	LR00-LR63 LR00-LR62 LRxx.00-LRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Link Relay as string with HiLo byte order	LR00.128H-LR63.002H .l is string length, range 2 to 128 chars	<b>String</b>	Read/Write
Link Relay as string with LoHi byte order	LR00.128L-LR63.002L .l is string length, range 2 to 128 chars	<b>String</b>	Read/Write
Link Relay as string Using Only the High Order byte of each word	LR00.064D-LR63.001D .l is string length, range 1 to 64 chars	<b>String</b>	Read/Write
Link Relay as string Using Only the Low Order byte of each word	LR00.064E-LR63.001E .l is string length, range 1 to 64 chars	<b>String</b>	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word</b> , Short <b>Boolean</b>	Read/Write
Timer/Counter	TC000-TC511	<b>BCD</b> , Word, Short	Read/Write
Timer/Counter as string with HiLo byte order	TC000.256H-TC511.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer/Counter as string with LoHi byte order	TC000.256L-TC511.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer/Counter as string Using Only the High Order byte of each word	TC000.128D-TC511.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Timer/Counter as string Using Only the Low Order byte of each word	TC000.128E-TC511.001E  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer/Counter Status	TS000-TS511	<b>Boolean</b>	Read/Write

## BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD

0 - 9999

DWord as unsigned BCD

0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD

±7999

Long as signed BCD

±79999999

### Example

IR0D @ Short = -50

IR0D @ Word = 8050 (MSB set)

IR0 @ BCD = 8050

IR0D @ Short = 50

IR0D @ Word = 50

IR0 @ BCD = 50

● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

## String Support

The C200H model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.



When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at DM1000 with a length of 100 bytes and HiLo byte order, enter:  
DM1000.100H
2. To address a string starting at DM1100 with a length of 78 bytes and LoHi byte order, enter:  
DM1100.078L
3. To address a string starting at DM2000 with a length of 55 bytes and Only the High Order byte, enter:  
DM2000.055D
4. To address a string starting at DM2200 with a length of 37 bytes and Only the Low Order byte, enter:  
DM2200.037E

### Array Support

Arrays are supported for all data types except Boolean and String. There are two methods of addressing an array. Examples are given using data memory locations.

*DMxxxx [rows] [cols]*

*DMxxxx [cols]* – (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

⚠ Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords DM0 and DM1 overlap at word DM1. Thus, writing to DM0 also modifies the value held in DM1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use DM0, DM2, DM4, and so on to prevent overlapping Words.

### C500 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

🔗 For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Data Memory	DM000-DM511 DM000-DM510 DMxxx.00-DMxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	DM000.256H-DM511.002H .l is string length, range 2 to	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	256 chars		
Data Memory as string with LoHi byte order	DM000.256L-DM511.002L .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	DM000.128D-DM511.001D .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	DM000.128E-DM511.001E .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay	HR00-HR31 HR00-HR30 HRxx.00-HRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Holding Relay as string with HiLo byte order	HR00.064H-HR31.002H .I is string length, range 2 to 64 chars	<b>String</b>	Read/Write
Holding Relay as string with LoHi byte order	HR00.064L-HR31.002L .I is string length, range 2 to 64 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the High Order byte of each word	HR00.032D-HR31.001D .I is string length, range 1 to 32 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the Low Order byte of each word	HR00.032E-HR31.001E .I is string length, range 1 to 32 chars	<b>String</b>	Read/Write
Internal Relay	IR00-IR63 IR00-IR62 IRxx.00-IRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Internal Relay as a string with HiLo byte order	IR00.128H-IR63.002H .I is string length, range 2 to 128 chars	<b>String</b>	Read/Write
Internal Relay as a string with LoHi byte order	IR00.128L-IR63.002L .I is string length, range 2 to 128 chars	<b>String</b>	Read/Write
Internal Relay as a string	IR00.064D-IR63.001D	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Using Only the High Order byte of each word	.l is string length, range 1 to 64 chars		
Internal Relay as a string Using Only the Low Order byte of each word	IR00.064E-IR63.001E .l is string length, range 1 to 64 chars	<b>String</b>	Read/Write
Link Relays	LR00-LR31 LR00-LR30 LRxx.00-LRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Link Relays as string with HiLo byte order	LR00.064H-LR31.002H .l is string length, range 2 to 64 chars	<b>String</b>	Read/Write
Link Relays as string with LoHi byte order	LR00.064L-LR31.002L .l is string length, range 2 to 64 chars	<b>String</b>	Read/Write
Link Relays as string Using Only the High Order byte of each word	LR00.032D-LR31.001D .l is string length, range 1 to 32 chars	<b>String</b>	Read/Write
Link Relays as string Using Only the Low Order byte of each word	LR00.032E-LR31.001E .l is string length, range 1 to 32 chars	<b>String</b>	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word</b> , Short <b>Boolean</b>	Read/Write
Timer/Counter	TC000-TC127	<b>BCD</b> , Word, Short	Read/Write
Timer/Counter as string with HiLo byte order	TC000.256H-TC127.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer/Counter as string with LoHi byte order	TC000.256L-TC127.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer/Counter as string Using Only the High Order byte of each word	TC000.128D-TC127.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer/Counter as string Using Only the Low Order byte of each word	TC000.128E-TC127.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Timer/Counter Status	TS000-TS127	Boolean	Read/Write

## BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD

0 - 9999

DWord as unsigned BCD

0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD

±7999

Long as signed BCD

±79999999

### Example

IR0D @ Short = -50

IR0D @ Word = 8050 (MSB set)

IR0 @ BCD = 8050

IR0D @ Short = 50

IR0D @ Word = 50

IR0 @ BCD = 50

**Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

## String Support

The C500 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

## Examples

1. To address a string starting at DM100 with a length of 100 bytes and HiLo byte order, enter:  
DM100.100H
2. To address a string starting at DM110 with a length of 78 bytes and LoHi byte order, enter:  
DM110.078L
3. To address a string starting at DM200 with a length of 55 bytes and Only the High Order byte, enter:  
DM200.055D
4. To address a string starting at DM220 with a length of 37 bytes and Only the Low Order byte, enter:  
DM220.037E

## Array Support

Arrays are supported for all data types except Boolean and String. There are two methods of addressing an array. Examples are given using data memory locations.

*DMxxxx [rows] [cols]*

*DMxxxx [cols]* – (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

⚠ Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords DM0 and DM1 overlap at word DM1. Thus, writing to DM0 also modifies the value held in DM1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use DM0, DM2, DM4, and so on to prevent overlapping Words.

## C1000H Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

🔗 For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	AR00-AR27 AR00-AR26 ARxx.00-ARxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Auxiliary Relay as string with HiLo byte order	AR00.056H-AR27.002H  .l is string length, range 2 to 56 chars	<b>String</b>	Read/Write
Auxiliary Relay as string with LoHi byte order	AR00.056L-AR27.002L  .l is string length, range 2 to 56 chars	<b>String</b>	Read/Write

<b>Device Type</b>	<b>Range</b>	<b>Data Type</b>	<b>Access</b>
Auxiliary Relay as string Using Only the High Order byte of each word	AR00.028D-AR27.001D  .I is string length, range 1 to 28 chars	<b>String</b>	Read/Write
Auxiliary Relay as string Using Only the Low Order byte of each word	AR00.028E-AR27.001E  .I is string length, range 1 to 28 chars	<b>String</b>	Read/Write
Data Memory	DM0000-DM4095 DM0000-DM4094 DMxxxx.00-DMxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	DM0000.256H-DM4095.002H  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	DM0000.256L-DM4095.002L  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	DM0000.128D-DM4095.001D  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	DM0000.128E-DM4095.001E  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay	HR00-HR99 HR00-HR98 HRxx.00-HRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Holding Relay as string with HiLo byte order	HR00.200H-HR99.002H  .I is string length, range 2 to 200 chars	<b>String</b>	Read/Write
Holding Relay as string with LoHi byte order	HR00.200L-HR99.002L  .I is string length, range 2 to 200 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the High Order byte of each word	HR00.100D-HR99.001D  .I is string length, range 1 to 100 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the Low Order byte of each word	HR00.100E-HR99.001E  .I is string length, range 1 to 100 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
each word	.l is string length, range 1 to 100 chars		
Internal Relay	IR000-IR255 IR000-IR254 IRxxx.00-IRxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Internal Relay as a string with HiLo byte order	IR000.256H-IR255.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Internal Relay as a string with LoHi byte order	IR000.256L-IR255.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Internal Relay as a string Using Only the High Order byte of each word	IR000.128D-IR255.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Internal Relay as a string Using Only the Low Order byte of each word	IR000.128E-IR255.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Link Relays	LR00-LR63 LR00-LR62 LRxx.00-LRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Link Relays as string with HiLo byte order	LR00.128H-LR63.002H  .l is string length, range 2 to 128 chars	<b>String</b>	Read/Write
Link Relays as string with LoHi byte order	LR00.128L-LR63.002L  .l is string length, range 2 to 128 chars	<b>String</b>	Read/Write
Link Relays as string Using Only the High Order byte of each word	LR00.064D-LR63.001D  .l is string length, range 1 to 64 chars	<b>String</b>	Read/Write
Link Relays as string Using Only the Low Order byte of each word	LR00.064E-LR63.001E  .l is string length, range 1 to 64 chars	<b>String</b>	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word</b> , Short <b>Boolean</b>	Read/Write
Timer/Counter	TC000-TC511	<b>BCD</b> , Word, Short	Read/Write
Timer/Counter as string	TC000.256H-TC511.002H	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
with HiLo byte order	.l is string length, range 2 to 256 chars		
Timer/Counter as string with LoHi byte order	TC000.256L-TC511.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer/Counter as string Using Only the High Order byte of each word	TC000.128D-TC511.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer/Counter as string Using Only the Low Order byte of each word	TC000.128E-TC511.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer/Counter Status	TS000-TS511	<b>Boolean</b>	Read/Write

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD  
0 - 9999

DWord as unsigned BCD  
0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

#### Example

IR0D @ Short = -50  
IR0D @ Word = 8050 (MSB set)  
IR0 @ BCD = 8050

IR0D @ Short = 50  
IR0D @ Word = 50  
IR0 @ BCD = 50



● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

## String Support

The C1000H model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

## Examples

1. To address a string starting at DM1000 with a length of 100 bytes and HiLo byte order, enter:  
DM1000.100H
2. To address a string starting at DM1100 with a length of 78 bytes and LoHi byte order, enter:  
DM1100.078L
3. To address a string starting at DM2000 with a length of 55 bytes and Only the High Order byte, enter:  
DM2000.055D
4. To address a string starting at DM2200 with a length of 37 bytes and Only the Low Order byte, enter:  
DM2200.037E

## Array Support

Arrays are supported for all data types except Boolean and String. There are two methods of addressing an array. Examples are given using data memory locations.

*DMxxxx [rows] [cols]*

*DMxxxx [cols]* – (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

● Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords DM0 and DM1 overlap at word DM1. Thus, writing to DM0 also modifies the value held in DM1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use DM0, DM2, DM4, and so on to prevent overlapping Words.

## C2000H Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

• For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	AR00-AR27 AR00-AR26 ARxx.00-ARxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Auxiliary Relay as string with HiLo byte order	AR00.056H-AR27.002H  .I is string length, range 2 to 56 chars	<b>String</b>	Read/Write
Auxiliary Relay as string with LoHi byte order	AR00.056L-AR27.002L  .I is string length, range 2 to 56 chars	<b>String</b>	Read/Write
Auxiliary Relay as string Using Only the High Order byte of each word	AR00.028D-AR27.001D  .I is string length, range 1 to 28 chars	<b>String</b>	Read/Write
Auxiliary Relay as string Using Only the Low Order byte of each word	AR00.028E-AR27.001E  .I is string length, range 1 to 28 chars	<b>String</b>	Read/Write
Data Memory	DM0000-DM6655 DM0000-DM6654 DMxxxx.00-DMxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	DM0000.256H-DM6655.002H  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	DM0000.256L-DM6655.002L  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	DM0000.128D-DM6655.001D  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	DM0000.128E-DM6655.001E  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay	HR00-HR99 HR00-HR98	<b>Word</b> , Short, BCD Long, DWord, LBCD,	Read/Write

Device Type	Range	Data Type	Access
	HRxx.00-HRxx.15	Float <b>Boolean</b>	
Holding Relay as string with HiLo byte order	HR00.200H-HR99.002H  .l is string length, range 2 to 200 chars	<b>String</b>	Read/Write
Holding Relay as string with LoHi byte order	HR00.200L-HR99.002L  .l is string length, range 2 to 200 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the High Order byte of each word	HR00.100D-HR99.001D  .l is string length, range 1 to 100 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the Low Order byte of each word	HR00.100E-HR99.001E  .l is string length, range 1 to 100 chars	<b>String</b>	Read/Write
Internal Relay	IR000-IR255 IR000-IR254 IRxxx.00-IRxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Internal Relay as a string with HiLo byte order	IR000.256H-IR255.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Internal Relay as a string with LoHi byte order	IR000.256L-IR255.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Internal Relay as a string Using Only the High Order byte of each word	IR000.128D-IR255.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Internal Relay as a string Using Only the Low Order byte of each word	IR000.128E-IR255.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Link Relays	LR00-LR63 LR00-LR62 LRxx.00-LRxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Link Relays as string with HiLo byte order	LR00.128H-LR63.002H  .l is string length, range 2 to 128 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Link Relays as string with LoHi byte order	LR00.128L-LR63.002L  .I is string length, range 2 to 128 chars	<b>String</b>	Read/Write
Link Relays as string Using Only the High Order byte of each word	LR00.064D-LR63.001D  .I is string length, range 1 to 64 chars	<b>String</b>	Read/Write
Link Relays as string Using Only the Low Order byte of each word	LR00.064E-LR63.001E  .I is string length, range 1 to 64 chars	<b>String</b>	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word, Short Boolean</b>	Read/Write
Timer/Counter	TC000-TC511	<b>BCD, Word, Short</b>	Read/Write
Timer/Counter as string with HiLo byte order	TC000.256H-TC511.002H  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer/Counter as string with LoHi byte order	TC000.256L-TC511.002L  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer/Counter as string Using Only the High Order byte of each word	TC000.128D-TC511.001D  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer/Counter as string Using Only the Low Order byte of each word	TC000.128E-TC511.001E  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer/Counter Status	TS000-TS511	<b>Boolean</b>	Read/Write

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD

0 - 9999

DWord as unsigned BCD

0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

### Example

IROD @ Short = -50  
IROD @ Word = 8050 (MSB set)  
IRO @ BCD = 8050

IROD @ Short = 50  
IROD @ Word = 50  
IRO @ BCD = 50

● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

### String Support

The C2000H model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at DM1000 with a length of 100 bytes and HiLo byte order, enter:  
DM1000.100H
2. To address a string starting at DM1100 with a length of 78 bytes and LoHi byte order, enter:  
DM1100.078L
3. To address a string starting at DM2000 with a length of 55 bytes and Only the High Order byte, enter:  
DM2000.055D
4. To address a string starting at DM2200 with a length of 37 bytes and Only the Low Order byte, enter:  
DM2200.037E

### Array Support

Arrays are supported for all data types except Boolean and String. There are two methods of addressing an array. Examples are given using data memory locations.

*DMxxxx [rows] [cols]*

*DMxxxx [cols]* – (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

⚠ Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords DM0 and DM1 overlap at word DM1. Thus, writing to DM0 also modifies the value held in DM1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use DM0, DM2, DM4, and so on to prevent overlapping Words.

## CV500 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

🔗 For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Action Flag	AC0000-AC1023	<b>Boolean</b>	Read Only
Auxiliary Relay	A000-A255	<b>Word</b> , Short, BCD	Read/Write
	A000-A254	Long, DWord, LBCD, Float	
	A256-A511	<b>Word</b> , Short, BCD	Read Only
	A256-A510	Long, DWord, LBCD, Float	
	A000.00-A000.15-A255.00-A255.15	<b>Boolean</b>	Read/Write
Auxiliary Relay as string with HiLo byte order	A000.256H-A255.002H	<b>String</b>	Read/Write
	A256.256H-A511.002H	<b>String</b>	Read Only
Auxiliary Relay as string with LoHi byte order	A000.256L-A255.002L	<b>String</b>	Read/Write
	A256.256L-A511.002L	<b>String</b>	Read Only
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A255.001D	<b>String</b>	Read/Write
	A256.128D-A511.001D	<b>String</b>	Read Only
Auxiliary Relay as string Using Only the Low Order byte of	A000.128E-A255.001E	<b>String</b>	Read/Write
	A256.128E-A511.001E	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
each word	.l is string length, range 1 to 128 chars		Read Only
CIO	CIO0000-CIO2555 CIO0000-CIO2554 CIOxxxx.00-CIOxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CIO Memory as string with HiLo byte order	CIO0000.256H-CIO2555.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO2555.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D-CIO2555.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO2555.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C000-C511	<b>BCD</b> , Word, Short	Read/Write
Counter as string with HiLo byte order	C000.256H-C511.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string with LoHi byte order	C000.256L-C511.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string Using Only the High Order byte of each word	C000.128D-C511.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter as string Using Only the Low Order byte of each word	C000.128E-C511.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter Status	CS000-CS511	<b>Boolean</b>	Read/Write
CPU Bus Link	G000-G255 G000-G254 Gxxx.00-Gxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CPU Bus Link as string	G000.256H-G255.002H	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
with HiLo byte order	.I is string length, range 2 to 256 chars		
CPU Bus Link as string with LoHi byte order	G000.256L-G255.002L .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the High Order byte of each word	G000.128D-G255.001D .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the Low Order byte of each word	G000.128E-G255.001E .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory	D0000-D8191 D0000-D8190 Dxxxx.00-Dxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D0000.256H-D8191.002H .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	D0000.256L-D8191.002L .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D0000.128D-D8191.001D .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D0000.128E-D8191.001E .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR0-DR2	<b>Word</b> , Short, BCD*	Read/Write
Index Register	IR0-IR2	<b>Word</b> , Short, BCD*	Read/Write
Step Timer	ST000-ST511	<b>Word</b> , Short, BCD*	Read/Write
Step Timer Status	STS000-ST511	<b>Boolean</b>	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word</b> , Short <b>Boolean</b>	Read/Write
Timer	T000-T511	<b>BCD</b> , Word, Short	Read/Write
Timer as string with HiLo byte order	T000.256H-T511.002H .I is string length, range 2 to	<b>String</b>	Read/Write



Device Type	Range	Data Type	Access
	256 chars		
Timer as string with LoHi byte order	T000.256L-T511.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string Using Only the High Order byte of each word	T000.128D-T511.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer as string Using Only the Low Order byte of each word	T000.128E-T511.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer Status	TS000-TS511	<b>Boolean</b>	Read/Write
Transition Flag	TN000-TN511	<b>Boolean</b>	Read/Write

\*Arrays are not supported.

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD  
0 - 9999

DWord as unsigned BCD  
0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

### Example

IROD @ Short = -50  
IROD @ Word = 8050 (MSB set)  
IRO @ BCD = 8050

IROD @ Short = 50  
IROD @ Word = 50  
IRO @ BCD = 50

● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

## String Support

The CV500 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

## Examples

1. To address a string starting at D1000 with a length of 100 bytes and HiLo byte order, enter:  
D1000.100H
2. To address a string starting at D1100 with a length of 78 bytes and LoHi byte order, enter:  
D1100.078L
3. To address a string starting at D2000 with a length of 55 bytes and Only the High Order byte, enter:  
D2000.055D
4. To address a string starting at D2200 with a length of 37 bytes and Only the Low Order byte, enter:  
D2200.037E

## Array Support

Arrays are supported for all data types except Boolean, Data Register, Index Register, Step Timer, and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

● Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1. Thus, writing to D0 also modifies the value held in D1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use D0, D2, D4, and so on to prevent overlapping Words.

## CV1000 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

• For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Action Flag	AC0000-AC2047	<b>Boolean</b>	Read Only
Auxiliary Relay	A000-A255	<b>Word</b> , Short, BCD	Read/Write
	A000-A254	Long, DWord, LBCD, Float	
	A256-A511		Read Only
	A256-A510	<b>Word</b> , Short, BCD	
	A000.00-A000.15-A255.00-A255.15	Long, DWord, LBCD, Float	Read/Write
		<b>Boolean</b>	Read Only
	A256.00-A256.15-A511.00-A511.15	<b>Boolean</b>	
Auxiliary Relay as string with HiLo byte order	A000.256H-A255.002H	<b>String</b>	Read/Write
	A256.256H-A511.002H	<b>String</b>	Read Only
	.l is string length, range 2 to 256 chars		
Auxiliary Relay as string with LoHi byte order	A000.256L-A255.002L	<b>String</b>	Read/Write
	A256.256L-A511.002L	<b>String</b>	Read Only
	.l is string length, range 2 to 256 chars		
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A255.001D	<b>String</b>	Read/Write
	A256.128D-A511.001D	<b>String</b>	Read Only
	.l is string length, range 1 to 128 chars		
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A255.001E	<b>String</b>	Read/Write
	A256.128E-A511.001E	<b>String</b>	Read Only
	.l is string length, range 1 to 128 chars		
CIO	CIO0000-CIO2555	<b>Word</b> , Short, BCD	Read/Write
	CIO0000-CIO2554	Long, DWord, LBCD, Float	
	CIOxxxx.00-CIOxxxx.15	<b>Boolean</b>	
CIO Memory as string with HiLo byte order	CIO0000.256H-CIO2555.002H	<b>String</b>	Read/Write
	.l is string length, range 2 to 256 chars		
CIO Memory as string	CIO0000.256L-CIO2555.002L	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
with LoHi byte order	.l is string length, range 2 to 256 chars		
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D-CIO2555.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO2555.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C0000-C1023	<b>BCD, Word, Short</b>	Read/Write
Counter as string with HiLo byte order	C0000.256H-C1023.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string with LoHi byte order	C0000.256L-C1023.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string Using Only the High Order byte of each word	C0000.128D-C1023.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter as string Using Only the Low Order byte of each word	C0000.128E-C1023.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter Status	CS0000-CS1023	<b>Boolean</b>	Read/Write
CPU Bus Link	G000-G255 G000-G254 Gxxx.00-Gxxx.15	<b>Word, Short, BCD Long, DWord, LBCD, Float Boolean</b>	Read/Write
CPU Bus Link as string with HiLo byte order	G000.256H-G255.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string with LoHi byte order	G000.256L-G255.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the High Order byte of each word	G000.128D-G255.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
CPU Bus Link as string Using Only the Low Order byte of each word	G000.128E-G255.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory	D00000-D24575 D00000-D24574 Dxxxxx.00-Dxxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D00000.256H-D24575.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	D00000.256L-D24575.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D00000.128D-D24575.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D00000.128E-D24575.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR0-DR2	<b>Word</b> , Short, BCD*	Read/Write
Expansion Data Memory (current bank)	E00000-E32765 E00000-E32764 Exxxxx.00-Exxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory (current bank) as string with HiLo byte order	E00000.256H-E32765.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string with LoHi byte order	E00000.256L-E32765.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the High Order byte of each word	E00000.128D-E32765.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the Low Order byte of each word	E00000.128E-E32765.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory	E00:00000-E07:32765	<b>Word</b> , Short, BCD	Read/Write

Device Type	Range	Data Type	Access
	E00:00000-E07:32764 Ex:x.00-Ex:xxxx.15	Long, DWord, LBCD, Float <b>Boolean</b>	
Expansion Data Memory as string with HiLo byte order	E00:00000.256H - E07:32765.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string with LoHi byte order	E00:00000.256L - E07:32765.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the High Order byte of each word	E00:00000.128D- E07:32765.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the Low Order byte of each word	E00:00000.128E- E07:32765.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Index Register	IR0-IR2	<b>Word</b> , Short, BCD*	Read/Write
Step Timer	ST0000-ST1023	<b>Word</b> , Short, BCD*	Read/Write
Step Timer Status	STS0000-STS1023	<b>Boolean</b>	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word</b> , Short <b>Boolean</b>	Read/Write
Timer	T0000-T1023	<b>BCD</b> , Word, Short	Read/Write
Timer as string with HiLo byte order	T0000.256H-T1023.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string with LoHi byte order	T0000.256L-T1023.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string Using Only the High Order byte of each word	T0000.128D-T1023.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer as string Using Only the Low Order byte of each word	T0000.128E-T1023.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Timer Status	TS0000-TS1023	Boolean	Read/Write
Transition Flag	TN0000-TN1023	Boolean	Read/Write

\*Arrays are not supported.

## BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD

0 - 9999

DWord as unsigned BCD

0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD

±7999

Long as signed BCD

±79999999

### Example

IROD @ Short = -50

IROD @ Word = 8050 (MSB set)

IRO @ BCD = 8050

IROD @ Short = 50

IROD @ Word = 50

IRO @ BCD = 50

**Note:** Boolean, Float and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

## String Support

The CV1000 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at D01000 with a length of 100 bytes and HiLo byte order, enter:  
D01000.100H
2. To address a string starting at D01100 with a length of 78 bytes and LoHi byte order, enter:  
D01100.078L
3. To address a string starting at D02000 with a length of 55 bytes and Only the High Order byte, enter:  
D02000.055D
4. To address a string starting at D02200 with a length of 37 bytes and Only the Low Order byte, enter:  
D02200.037E

### Array Support

Arrays are supported for all data types except Boolean, Data Register, Index Register, Step Timer, and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

⚠ Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1. Thus, writing to D0 also modifies the value held in D1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use D0, D2, D4, and so on to prevent overlapping Words.

### CV2000 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

🔗 For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Action Flag	AC0000-AC2047	<b>Boolean</b>	Read Only
Auxiliary Relay	A000-A255 A000-A254	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write
	A256-A511 A256-A510	<b>Word</b> , Short, BCD Long, DWord,	Read Only



Device Type	Range	Data Type	Access
	A000.00-A000.15-A255.00-A255.15  A256.00-A256.15-A511.00-A511.15	LBCD, Float  <b>Boolean</b>  <b>Boolean</b>	Read/Write  Read Only
Auxiliary Relay as string with HiLo byte order	A000.256H-A255.002H A256.256H-A511.002H  .l is string length, range 2 to 256 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
Auxiliary Relay as string with LoHi byte order	A000.256L-A255.002L A256.256L-A511.002L  .l is string length, range 2 to 256 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A255.001D A256.128D-A511.001D  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A255.001E A256.128E-A511.001E  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
CIO	CIO0000-CIO2555 CIO0000-CIO2554 CIOxxxx.00-CIOxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CIO Memory as string with HiLo byte order	CIO0000.256H-CIO2555.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO2555.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D-CIO2555.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO2555.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write

<b>Device Type</b>	<b>Range</b>	<b>Data Type</b>	<b>Access</b>
Counter	C0000-C1023	<b>BCD</b> , Word, Short	Read/Write
Counter as string with HiLo byte order	C0000.256H-C1023.002H .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string with LoHi byte order	C0000.256L-C1023.002L .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string Using Only the High Order byte of each word	C0000.128D-C1023.001D .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter as string Using Only the Low Order byte of each word	C0000.128E-C1023.001E .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter Status	CS0000-CS1023	<b>Boolean</b>	Read/Write
CPU Bus Link	G000-G255 G000-G254 Gxxx.00-Gxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CPU Bus Link as string with HiLo byte order	G000.256H-G255.002H .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string with LoHi byte order	G000.256L-G255.002L .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the High Order byte of each word	G000.128D-G255.001D .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the Low Order byte of each word	G000.128E-G255.001E .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory	D00000-D24575 D00000-D24574 Dxxxxx.00-Dxxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D00000.256H-D24575.002H .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Data Memory as string with LoHi byte order	D00000.256L-D24575.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D00000.128D-D24575.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D00000.128E-D24575.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR0-DR2	<b>Word</b> , Short, BCD*	Read/Write
Expansion Data Memory (current bank)	E00000-E32765 E00000-E32764 Exxxxx.00-Exxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory (current bank) as string with HiLo byte order	E00000.256H-E32765.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string with LoHi byte order	E00000.256L-E32765.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the High Order byte of each word	E00000.128D-E32765.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the Low Order byte of each word	E00000.128E-E32765.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory	E00:00000-E07:32765 E00:00000-E07:32764 Ex:x.00-Exx:xxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory as string with HiLo byte order	E00:00000.256H - E07:32765.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string with LoHi byte order	E00:00000.256L - E07:32765.002L .l is string length, range 2 to	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	256 chars		
Expansion Data Memory as string Using Only the High Order byte of each word	E00:00000.128D- E07:32765.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the Low Order byte of each word	E00:00000.128E- E07:32765.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Index Register	IR0-IR2	<b>Word</b> , Short, BCD*	Read/Write
Step Timer	ST0000-ST1023	<b>Word</b> , Short, BCD*	Read/Write
Step Timer Status	STS0000-STS1023	<b>Boolean</b>	Read/Write
Temporary Relay	TR  TR0-TR7	<b>Word</b> , Short  <b>Boolean</b>	Read/Write
Timer	T0000-T1023	<b>BCD</b> , Word, Short	Read/Write
Timer as string with HiLo byte order	T0000.256H-T1023.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string with LoHi byte order	T0000.256L-T1023.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string Using Only the High Order byte of each word	T0000.128D-T1023.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer as string Using Only the Low Order byte of each word	T0000.128E-T1023.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer Status	TS0000-TS1023	<b>Boolean</b>	Read/Write
Transition Flag	TN0000-TN1023	<b>Boolean</b>	Read/Write

\*Arrays are not supported.

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD

0 - 9999

DWord as unsigned BCD

0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD

±7999

Long as signed BCD

±79999999

### Example

IROD @ Short = -50

IROD @ Word = 8050 (MSB set)

IRO @ BCD = 8050

IROD @ Short = 50

IROD @ Word = 50

IRO @ BCD = 50

**Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

### String Support

The CV2000 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at D01000 with a length of 100 bytes and HiLo byte order, enter:  
D01000.100H
2. To address a string starting at D01100 with a length of 78 bytes and LoHi byte order, enter:  
D01100.078L

3. To address a string starting at D02000 with a length of 55 bytes and Only the High Order byte, enter:  
D02000.055D
4. To address a string starting at D02200 with a length of 37 bytes and Only the Low Order byte, enter:  
D02200.037E

## Array Support

Arrays are supported for all data types except Boolean, Data Register, Index Register, Step Timer, and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

⚠ Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1. Thus, writing to D0 also modifies the value held in D1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use D0, D2, D4, and so on to prevent overlapping Words.

## CVM1-CPU01 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

🔗 For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	A000-A255 A000-A254	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write
	A256-A511 A256-A510	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read Only
	A000.00-A000.15-A255.00- A255.15	<b>Boolean</b>	Read/Write
	A256.00-A256.15-A511.00- A511.15	<b>Boolean</b>	Read Only
Auxiliary Relay as string with HiLo byte order	A000.256H-A255.002H A256.256H-A511.002H	<b>String</b> <b>String</b>	Read/Write Read Only
	.I is string length, range 2 to 256 chars		
Auxiliary Relay as string with LoHi byte order	A000.256L-A255.002L A256.256L-A511.002L	<b>String</b> <b>String</b>	Read/Write Read Only

Device Type	Range	Data Type	Access
	.l is string length, range 2 to 256 chars		
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A255.001D A256.128D-A511.001D  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A255.001E A256.128E-A511.001E  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
CIO	CIO0000-CIO2555 CIO0000-CIO2554 CIOxxxx.00-CIOxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CIO Memory as string with HiLo byte order	CIO0000.256H-CIO2555.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO2555.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D-CIO2555.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO2555.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C000-C511	<b>BCD</b> , Word, Short	Read/Write
Counter as string with HiLo byte order	C000.256H-C511.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string with LoHi byte order	C000.256L-C511.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string Using Only the High Order byte of each word	C000.128D-C511.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter as string	C000.128E-C511.001E	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Using Only the Low Order byte of each word	.I is string length, range 1 to 128 chars		
Counter Status	CS000-CS511	<b>Boolean</b>	Read/Write
CPU Bus Link	G000-G255 G000-G254 Gxxx.00-Gxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CPU Bus Link as string with HiLo byte order	G000.256H-G255.002H  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string with LoHi byte order	G000.256L-G255.002L  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the High Order byte of each word	G000.128D-G255.001D  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the Low Order byte of each word	G000.128E-G255.001E  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory	D0000-D8191 D0000-D8190 Dxxxx.00-Dxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D0000.256H-D8191.002H  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	D0000.256L-D8191.002L  .I is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D0000.128D-D8191.001D  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D0000.128E-D8191.001E  .I is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR0-DR2	<b>Word</b> , Short, BCD*	Read/Write
Index Register	IR0-IR2	<b>Word</b> , Short, BCD*	Read/Write



Device Type	Range	Data Type	Access
Temporary Relay	TR TR0-TR7	<b>Word, Short Boolean</b>	Read/Write
Timer	T000-T511	<b>BCD, Word, Short</b>	Read/Write
Timer as string with HiLo byte order	T000.256H-T511.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string with LoHi byte order	T000.256L-T511.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string Using Only the High Order byte of each word	T000.128D-T511.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer as string Using Only the Low Order byte of each word	T000.128E-T511.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer Status	TS000-TS511	<b>Boolean</b>	Read/Write

\*Arrays are not supported.

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD  
0 - 9999

DWord as unsigned BCD  
0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

### Example

IR0D @ Short = -50  
IR0D @ Word = 8050 (MSB set)  
IRO @ BCD = 8050

IR0D @ Short = 50  
 IR0D @ Word = 50  
 IR0 @ BCD = 50

● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

## String Support

The CVM1-CPU01 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

## Examples

1. To address a string starting at D1000 with a length of 100 bytes and HiLo byte order, enter:  
D1000.100H
2. To address a string starting at D1100 with a length of 78 bytes and LoHi byte order, enter:  
D1100.078L
3. To address a string starting at D2000 with a length of 55 bytes and Only the High Order byte, enter:  
D2000.055D
4. To address a string starting at D2200 with a length of 37 bytes and Only the Low Order byte, enter:  
D2200.037E

## Array Support

Arrays are supported for all data types except Boolean, Data Register, Index Register, and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1. Thus, writing to D0 also modifies the value held in D1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use D0, D2, D4, and so on to prevent overlapping Words.

## CVM1-CPU11 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	A000-A255	<b>Word</b> , Short, BCD	Read/Write
	A000-A254	Long, DWord, LBCD, Float	
	A256-A511	<b>Word</b> , Short, BCD	Read Only
	A256-A510	Long, DWord, LBCD, Float	
	A000.00-A000.15-A255.00-A255.15	<b>Boolean</b>	Read/Write
	A256.00-A256.15-A511.00-A511.15	<b>Boolean</b>	Read Only
Auxiliary Relay as string with HiLo byte order	A000.256H-A255.002H	<b>String</b>	Read/Write
	A256.256H-A511.002H	<b>String</b>	Read Only
	.l is string length, range 2 to 256 chars		
Auxiliary Relay as string with LoHi byte order	A000.256L-A255.002L	<b>String</b>	Read/Write
	A256.256L-A511.002L	<b>String</b>	Read Only
	.l is string length, range 2 to 256 chars		
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A255.001D	<b>String</b>	Read/Write
	A256.128D-A511.001D	<b>String</b>	Read Only
	.l is string length, range 1 to 128 chars		
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A255.001E	<b>String</b>	Read/Write
	A256.128E-A511.001E	<b>String</b>	Read Only
	.l is string length, range 1 to 128 chars		
CIO	CIO0000-CIO2555	<b>Word</b> , Short, BCD	Read/Write
	CIO0000-CIO2554	Long, DWord, LBCD, Float	
	CIOxxxx.00-CIOxxxx.15	<b>Boolean</b>	
CIO Memory as string with HiLo byte order	CIO0000.256H-CIO2555.002H	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	.l is string length, range 2 to 256 chars		
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO2555.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D-CIO2555.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO2555.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C0000-C1023	<b>BCD</b> , Word, Short	Read/Write
Counter as string with HiLo byte order	C0000.256H-C1023.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string with LoHi byte order	C0000.256L-C1023.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string Using Only the High Order byte of each word	C0000.128D-C1023.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter as string Using Only the Low Order byte of each word	C0000.128E-C1023.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter Status	CS0000-CS1023	<b>Boolean</b>	Read/Write
CPU Bus Link	G000-G255 G000-G254 Gxxx.00-Gxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CPU Bus Link as string with HiLo byte order	G000.256H-G255.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string with LoHi byte order	G000.256L-G255.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the High Order byte of	G000.128D-G255.001D	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
each word	.l is string length, range 1 to 128 chars		
CPU Bus Link as string Using Only the Low Order byte of each word	G000.128E-G255.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory	D00000-D24575 D00000-D24574 Dxxxxx.00-Dxxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D00000.256H-D24575.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	D00000.256L-D24575.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D00000.128D-D24575.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D00000.128E-D24575.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR0-DR2	<b>Word</b> , Short, BCD*	Read/Write
Index Register	IR0-IR2	<b>Word</b> , Short, BCD*	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word</b> , Short <b>Boolean</b>	Read/Write
Timer	T0000-T1023	<b>BCD</b> , Word, Short	Read/Write
Timer as string with HiLo byte order	T0000.256H-T1023.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string with LoHi byte order	T0000.256L-T1023.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string Using Only the High Order byte of each word	T0000.128D-T1023.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer as string Using Only the Low Order byte of each word	T0000.128E-T1023.001E .l is string length, range 1 to	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	128 chars		
Timer Status	TS0000-TS1023	Boolean	Read/Write

\*Arrays are not supported.

## BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD

0 - 9999

DWord as unsigned BCD

0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD

±7999

Long as signed BCD

±79999999

### Example

IR0D @ Short = -50

IR0D @ Word = 8050 (MSB set)

IR0 @ BCD = 8050

IR0D @ Short = 50

IR0D @ Word = 50

IR0 @ BCD = 50

**Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

## String Support

The CVM1-CPU11 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at D01000 with a length of 100 bytes and HiLo byte order, enter:  
D01000.100H
2. To address a string starting at D01100 with a length of 78 bytes and LoHi byte order, enter:  
D01100.078L
3. To address a string starting at D02000 with a length of 55 bytes and Only the High Order byte, enter:  
D02000.055D
4. To address a string starting at D02200 with a length of 37 bytes and Only the Low Order byte, enter:  
D02200.037E

### Array Support

Arrays are supported for all data types except Boolean, Data Register, Index Register, and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

⚠ Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1. Thus, writing to D0 also modifies the value held in D1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use D0, D2, D4, and so on to prevent overlapping Words.

### CVM1-CPU21 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

🔗 For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	A000-A255	<b>Word</b> , Short, BCD	Read/Write
	A000-A254	Long, DWord, LBCD, Float	
	A256-A511	<b>Word</b> , Short, BCD	Read Only
	A256-A510	Long, DWord, LBCD, Float	
	A000.00-A000.15-A255.00-	<b>Word</b> , Short, BCD	Read/Write
		Long, DWord, LBCD, Float	

Device Type	Range	Data Type	Access
	A255.15 A256.00-A256.15-A511.00- A511.15	<b>Boolean</b> <b>Boolean</b>	Read Only
Auxiliary Relay as string with HiLo byte order	A000.256H-A255.002H A256.256H-A511.002H  .l is string length, range 2 to 256 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
Auxiliary Relay as string with LoHi byte order	A000.256L-A255.002L A256.256L-A511.002L  .l is string length, range 2 to 256 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A255.001D A256.128D-A511.001D  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A255.001E A256.128E-A511.001E  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read/Write  Read Only
CIO	CIO0000-CIO2555 CIO0000-CIO2554 CIOxxx.00-CIOxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CIO Memory as string with HiLo byte order	CIO0000.256H- CIO2555.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO2555.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D- CIO2555.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO2555.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C0000-C1023	<b>BCD</b> , Word, Short	Read/Write



Device Type	Range	Data Type	Access
Counter as string with HiLo byte order	C0000.256H-C1023.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string with LoHi byte order	C0000.256L-C1023.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string Using Only the High Order byte of each word	C0000.128D-C1023.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter as string Using Only the Low Order byte of each word	C0000.128E-C1023.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter Status	CS0000-CS1023	<b>Boolean</b>	Read/Write
CPU Bus Link	G000-G255 G000-G254 Gxxx.00-Gxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CPU Bus Link as string with HiLo byte order	G000.256H-G255.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string with LoHi byte order	G000.256L-G255.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the High Order byte of each word	G000.128D-G255.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CPU Bus Link as string Using Only the Low Order byte of each word	G000.128E-G255.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory	D00000-D24575 D00000-D24574 Dxxxxx.00-Dxxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D00000.256H-D24575.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string	D00000.256L-D24575.002L	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
with LoHi byte order	.l is string length, range 2 to 256 chars		
Data Memory as string Using Only the High Order byte of each word	D00000.128D-D24575.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D00000.128E-D24575.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR0-DR2	<b>Word</b> , Short, BCD*	Read/Write
Expansion Data Memory (current bank)	E00000-E32765 E00000-E32764 Exxxxx.00-Exxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory (current bank) as string with HiLo byte order	E00000.256H-E32765.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string with LoHi byte order	E00000.256L-E32765.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the High Order byte of each word	E00000.128D-E32765.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the Low Order byte of each word	E00000.128E-E32765.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory	E00:00000-E07:32765 E00:00000-E07:32764 Ex:x.00-Exx:xxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory as string with HiLo byte order	E00:00000.256H- E07:32765.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string with LoHi byte order	E00:00000.256L- E07:32765.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Expansion Data Memory as string Using Only the High Order byte of each word	E00:00000.128D- E07:32765.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the Low Order byte of each word	E00:00000.128E- E07:32765.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Index Register	IR0-IR2	<b>Word, Short, BCD*</b>	Read/Write
Temporary Relay	TR TR0-TR7	<b>Word, Short Boolean</b>	Read/Write
Timer	T0000-T1023	<b>BCD, Word, Short</b>	Read/Write
Timer as string with HiLo byte order	T0000.256H-T1023.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string with LoHi byte order	T0000.256L-T1023.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string Using Only the High Order byte of each word	T0000.128D-T1023.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer as string Using Only the Low Order byte of each word	T0000.128E-T1023.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer Status	TS0000-TS1023	<b>Boolean</b>	Read/Write

\*Arrays are not supported.

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD  
0 - 9999

DWord as unsigned BCD  
0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

#### Example

IR0D @ Short = -50  
IR0D @ Word = 8050 (MSB set)  
IR0 @ BCD = 8050

IR0D @ Short = 50  
IR0D @ Word = 50  
IR0 @ BCD = 50

● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

### String Support

The CCM1-CPU21 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

#### Examples

1. To address a string starting at D01000 with a length of 100 bytes and HiLo byte order, enter:  
D01000.100H
2. To address a string starting at D01100 with a length of 78 bytes and LoHi byte order, enter:  
D01100.078L
3. To address a string starting at D02000 with a length of 55 bytes and Only the High Order byte, enter:  
D02000.055D
4. To address a string starting at D02200 with a length of 37 bytes and Only the Low Order byte, enter:  
D02200.037E

## Array Support

Arrays are supported for all data types except Boolean, Data Register, Index Register, and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

⚠ Use caution when modifying 32-bit values (DWord, Long, LBCD, and Float). Each address, for which these data types are allowed, starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1. Thus, writing to D0 also modifies the value held in D1. It is recommended that these data types be used so that overlapping does not occur. For example, when using DWords, use D0, D2, D4, and so on to prevent overlapping Words.

## CS1 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

🔗 For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	A000-A447	<b>Word</b> , Short, BCD	Read Only
	A000-A446	Long, DWord, LBCD, Float	
	A448-A959		Read/Write
	A448-A958	<b>Word</b> , Short, BCD	
	A000.00-A000.15-A447.00-A447.15	Long, DWord, LBCD, Float	Read Only
	A448.00-A448.15-A959.00-A959.15	<b>Boolean</b>	Read/Write
Auxiliary Relay as string with HiLo byte order	A000.256H-A447.002H	<b>String</b>	Read Only
	A448.256H-A959.002H	<b>String</b>	Read/Write
	.l is string length, range 2 to 256 chars		
Auxiliary Relay as string with LoHi byte order	A000.256L-A447.002L	<b>String</b>	Read Only
	A448.256L-A959.002L	<b>String</b>	Read/Write
	.l is string length, range 2 to 256 chars		
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A447.001D	<b>String</b>	Read Only
	A448.128D-A959.001D	<b>String</b>	Read/Write
	.l is string length, range 1 to		

Device Type	Range	Data Type	Access
	128 chars		
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A447.001E A448.128E-A959.001E  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read Only  Read/Write
CIO	CIO0000-CIO6143 CIO0000-CIO6142 CIOxxxx.00-CIOxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CIO Memory as string with HiLo byte order	CIO0000.256H- CIO6143.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO6143.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D- CIO6143.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO6143.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C0000-C4095	<b>BCD</b> , Word, Short	Read/Write
Counter as string with HiLo byte order	C0000.256H-C4095.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string with LoHi byte order	C0000.256L-C4095.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Counter as string Using Only the High Order byte of each word	C0000.128D-C4095.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter as string Using Only the Low Order byte of each word	C0000.128E-C4095.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter Status	CS0000-CS4095	<b>Boolean</b>	Read/Write*

Device Type	Range	Data Type	Access
Data Memory	D00000-D32767 D00000-D32766 Dxxxxx.00-Dxxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D00000.256H-D32767.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string with LoHi byte order	D00000.256L-D32767.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D00000.128D-D32767.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D00000.128E-D32767.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR00-DR15 DR00-DR14	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write*
Expansion Data Memory (current bank)	E00000-E32767 E00000-E32766 Exxxxx.00-Exxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory (current bank) as string with HiLo byte order	E00000.256H-E32767.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string with LoHi byte order	E00000.256L-E32767.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the High Order byte of each word	E00000.128E-E32767.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the Low Order byte of each word	E00000.128E-E32767.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory	E00:00000-E12:32767 E00:00000-E12:32766 Ex:x.00-Ex:xxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write

Device Type	Range	Data Type	Access
		<b>Boolean</b>	
Expansion Data Memory as string with HiLo byte order	E00:00000.256H - E12:32767.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string with LoHi byte order	E00:00000.256L - E12:32767.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the High Order byte of each word	E00:00000.128D- E12:32767.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the Low Order byte of each word	E00:00000.128E- E12:32767.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay	H0000-H1535 H0000-H1534 Hxxxx.00-Hxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Holding Relay as string with HiLo byte order	H0000.256H-H1535.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Holding Relay as string with LoHi byte order	H0000.256L-H1535.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the High Order byte of each word	H0000.128D-H1535.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay as string Using Only the Low Order byte of each word	H0000.128E-H1535.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Index Register	IR00-IR15	<b>DWord</b> , Long, LBCD, Float	Read/Write*
Task Flag	TK00-TK31	<b>Boolean</b>	Read Only
Timer	T0000-T4095	<b>BCD</b> , Word, Short	Read/Write
Timer as string	T0000.256H-T4095.002H	<b>String</b>	Read/Write



Device Type	Range	Data Type	Access
with HiLo byte order	.l is string length, range 2 to 256 chars		
Timer as string with LoHi byte order	T0000.256L-T4095.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Timer as string Using Only the High Order byte of each word	T0000.128D-T4095.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer as string Using Only the Low Order byte of each word	T0000.128E-T4095.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Timer Status	TS0000-TS4095	<b>Boolean</b>	Read/Write*
Working Relay	W000-W511 W000-W510 Wxxx.00-Wxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Working Relay as string with HiLo byte order	W000.256H-W511.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Working Relay as string with LoHi byte order	W000.256L-W511.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Working Relay as string Using Only the High Order byte of each word	W000.128D-W511.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Working Relay as string Using Only the Low Order byte of each word	W000.128E-W511.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write

🔴 \*Use caution when modifying 32-bit values such as DWord, Long, LBCD, and Float. Each address for which these data types are allowed starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1: writing to D0 also modifies the value held in D1. It is recommended that these data types be used to prevent overlapping. For example, to prevent overlapping Words, users should use D0, D2, D4, and so on for DWords. The exception to this is IR tags, which are native 32-bit values with MSB to LSB byte ordering for the CS1-series PLCs.

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD  
0 - 9999

DWord as unsigned BCD  
0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

### Example

D0D @ Short = -50  
D0D @ Word = 8050 (MSB set)  
D0 @ BCD = 8050

D0D @ Short = 50  
D0D @ Word = 50  
D0 @ BCD = 50

● **Note:** Boolean, Float and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

### String Support

The CS1 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at D01000 with a length of 100 bytes and HiLo byte order, enter:  
D01000.100H

2. To address a string starting at D01100 with a length of 78 bytes and LoHi byte order, enter:  
D01100.078L
3. To address a string starting at D02000 with a length of 55 bytes and Only the High Order byte, enter:  
D02000.055D
4. To address a string starting at D02200 with a length of 37 bytes and Only the Low Order byte, enter:  
D02200.037E

### Array Support

Arrays are supported for all data types except Boolean and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

### Writing to DR and IR Registers

DR and IR registers can be written to only when the device is in Programming Mode. If the device is in Run Mode and a write is attempted to one of these registers, the value in the device does not change. Because the write succeeds, no error message is returned. The device's value does not change because the device is in Run Mode.

### CJ1 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

• For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	A000-A447	<b>Word</b> , Short, BCD	Read Only
	A000-A446	Long, DWord, LBCD, Float	
	A448-A959	<b>Word</b> , Short, BCD	Read/Write
	A448-A958	Long, DWord, LBCD, Float	
Auxiliary Relay as string with HiLo byte order	A000.00-A000.15-A447.00-A447.15	<b>Boolean</b>	Read Only
	A448.00-A448.15-A959.00-A959.15	<b>Boolean</b>	Read/Write
Auxiliary Relay as string with HiLo byte order	A000.256H-A447.002H	<b>String</b>	Read Only
	A448.256H-A959.002H	<b>String</b>	Read/Write
	.I is string length, range 2 to 256 chars		

Device Type	Range	Data Type	Access
Auxiliary Relay as string with LoHi byte order	A000.256L-A447.002L A448.256L-A959.002L  .l is string length, range 2 to 256 chars	<b>String</b> <b>String</b>	Read Only  Read/Write
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A447.001D A448.128D-A959.001D  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read Only  Read/Write
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A447.001E A448.128E-A959.001E  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b>	Read Only  Read/Write
CIO	CIO0000-CIO6143 CIO0000-CIO6142 CIOxxxx.00-CIOxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CIO Memory as string with HiLo byte order	CIO0000.256H- CIO6143.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO6143.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D- CIO6143.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO6143.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C0000-C4095	<b>BCD</b> , Word, Short	Read/Write
Counter Status	CS0000-CS4095	<b>Boolean</b>	Read/Write*
Data Memory	D00000-D32767 D00000-D32766 Dxxxxx.00-Dxxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D00000.256H-D32767.002H  .l is string length, range 2 to	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	256 chars		
Data Memory as string with LoHi byte order	D00000.256L-D32767.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D00000.128D-D32767.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D00000.128E-D32767.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR00-DR15 DR00-DR14	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write*
Expansion Data Memory (current bank)	E00000-E32767 E00000-E32766 Exxxxx.00-Exxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory (current bank) as string with HiLo byte order	E00000.256H-E32767.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string with LoHi byte order	E00000.256L-E32767.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the High Order byte of each word	E00000.128D-E32767.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the Low Order byte of each word	E00000.128E-E32767.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory	E00:00000-E12:32767 E00:00000-E12:32766 Ex:x.00-Exx:xxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory as string with HiLo byte order	E00:00000.256H-E12:32767.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as	E00:00000.256L-	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
string with LoHi byte order	E12:32767.002L  .l is string length, range 2 to 256 chars		
Expansion Data Memory as string Using Only the High Order byte of each word	E00:00000.128D- E12:32767.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the Low Order byte of each word	E00:00000.128E- E12:32767.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay	H0000-H1535 H0000-H1534 Hxxxx.00-Hxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Index Register	IR00-IR15	<b>DWord</b> , Long, LBCD, Float	Read/Write*
Task Flag	TK00-TK31	<b>Boolean</b>	Read Only
Timer	T0000-T4095	<b>BCD</b> , Word, Short	Read/Write
Timer Status	TS0000-TS4095	<b>Boolean</b>	Read/Write*
Working Relay	W000-W511 W000-W510 Wxxx.00-Wxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write

🔴 \*Use caution when modifying 32-bit values such as DWord, Long, LBCD, and Float. Each address for which these data types are allowed starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1: writing to D0 also modifies the value held in D1. It is recommended that these data types be used to prevent overlapping. For example, to prevent overlapping Words, users should use D0, D2, D4, and so on for DWords. The exception to this is IR tags, which are native 32-bit values with MSB to LSB byte ordering for the CJ1-series PLCs.

### BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD  
0 - 9999

DWord as unsigned BCD  
0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

### Example

D0D @ Short = -50  
D0D @ Word = 8050 (MSB set)  
D0 @ BCD = 8050

D0D @ Short = 50  
D0D @ Word = 50  
D0 @ BCD = 50

● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

### String Support

The CJ1 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at D01000 with a length of 100 bytes and HiLo byte order, enter:  
D01000.100H
2. To address a string starting at D01100 with a length of 78 bytes and LoHi byte order, enter:  
D01100.078L
3. To address a string starting at D02000 with a length of 55 bytes and Only the High Order byte, enter:  
D02000.055D
4. To address a string starting at D02200 with a length of 37 bytes and Only the Low Order byte, enter:  
D02200.037E

## Array Support

Arrays are supported for all data types except Boolean and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

## Writing to DR and IR Registers

DR and IR registers can be written to only when the device is in Programming Mode. If the device is in Run Mode and a write is attempted to one of these registers, the value in the device does not change. Because the write succeeds, no error message is returned. The device's value does not change because the device is in Run Mode.

## CJ2 Addressing

The default data types for dynamically defined tags are shown in **bold** where appropriate.

• For more information on notes and restrictions, refer to [BCD Support](#), [String Support](#), and [Array Support](#).

Device Type	Range	Data Type	Access
Auxiliary Relay	A000-A447 A000-A446	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read Only
	A448-A1471 A448-A1470	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write
	A10000-A11535 A10000-A11534	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read Only
	A000.00-A000.15-A447.00- A447.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read Only Read/Write
	A448.00-A448.15-A1471.00- A1471.15	<b>Boolean</b>  <b>Boolean</b>	Read Only
	A10000.00-A10000.15- A11535.00-A11535.15	<b>Boolean</b>	
	Auxiliary Relay as string with HiLo byte order	A000.256H-A447.002H A448.256H-A1471.002H A10000.256H-A11535.002H  .l is string length, range 2 to 256 chars	<b>String</b> <b>String</b> <b>String</b>
Auxiliary Relay as string with LoHi byte order	A000.256L-A447.002L A448.256L-A1471.002L	<b>String</b> <b>String</b>	Read Only



Device Type	Range	Data Type	Access
	A10000.256L-A11535.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write  Read Only
Auxiliary Relay as string Using Only the High Order byte of each word	A000.128D-A447.001D A448.128D-A1471.001D A10000.128D-A11535.001D  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b> <b>String</b>	Read Only  Read/Write  Read Only
Auxiliary Relay as string Using Only the Low Order byte of each word	A000.128E-A447.001E A448.128E-A1471.001E A10000.128E-A11535.001E  .l is string length, range 1 to 128 chars	<b>String</b> <b>String</b> <b>String</b>	Read Only  Read/Write  Read Only
CIO	CIO0000-CIO6143 CIO0000-CIO6142 CIOxxxx.00-CIOxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
CIO Memory as string with HiLo byte order	CIO0000.256H- CIO6143.002H  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string with LoHi byte order	CIO0000.256L-CIO6143.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the High Order byte of each word	CIO0000.128D- CIO6143.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
CIO Memory as string Using Only the Low Order byte of each word	CIO0000.128E-CIO6143.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Counter	C0000-C4095	<b>BCD</b> , Word, Short	Read/Write
Counter Status	CS0000-CS4095	<b>Boolean</b>	Read/Write*
Data Memory	D00000-D32767 D00000-D32766 Dxxxxx.00-Dxxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Data Memory as string with HiLo byte order	D00000.256H-D32767.002H	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
	.l is string length, range 2 to 256 chars		
Data Memory as string with LoHi byte order	D00000.256L-D32767.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the High Order byte of each word	D00000.128D-D32767.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Memory as string Using Only the Low Order byte of each word	D00000.128E-D32767.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Data Register	DR00-DR15 DR00-DR14	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float	Read/Write*
Expansion Data Memory (current bank)	E00000-E32767 E00000-E32766 Exxxxx.00-Exxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory (current bank) as string with HiLo byte order	E00000.256H-E32767.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string with LoHi byte order	E00000.256L-E32767.002L .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the High Order byte of each word	E00000.128D-E32767.001D .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory (current bank) as string Using Only the Low Order byte of each word	E00000.128E-E32767.001E .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory	E00:00000-E24:32767 E00:00000-E24:32766 Ex:x.00-Exx:xxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Expansion Data Memory as string with HiLo byte order	E00:00000.256H-E24:32767.002H .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write

Device Type	Range	Data Type	Access
Expansion Data Memory as string with LoHi byte order	E00:00000.256L- E24:32767.002L  .l is string length, range 2 to 256 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the High Order byte of each word	E00:00000.128D- E24:32767.001D  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Expansion Data Memory as string Using Only the Low Order byte of each word	E00:00000.128E- E24:32767.001E  .l is string length, range 1 to 128 chars	<b>String</b>	Read/Write
Holding Relay	H0000-H1535 H0000-H1534 Hxxxx.00-Hxxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write
Index Register	IR00-IR15	<b>DWord</b> , Long, LBCD, Float	Read/Write*
Task Flag	TK00-TK127	<b>Boolean</b>	Read Only
Timer	T0000-T4095	<b>BCD</b> , Word, Short	Read/Write
Timer Status	TS0000-TS4095	<b>Boolean</b>	Read/Write*
Working Relay	W000-W511 W000-W510 Wxxx.00-Wxxx.15	<b>Word</b> , Short, BCD Long, DWord, LBCD, Float <b>Boolean</b>	Read/Write

● \*Use caution when modifying 32-bit values such as DWord, Long, LBCD, and Float. Each address for which these data types are allowed starts at a word offset within the device. Therefore, DWords D0 and D1 overlap at word D1: writing to D0 also modifies the value held in D1. It is recommended that these data types be used to prevent overlapping. For example, to prevent overlapping Words, users should use D0, D2, D4, and so on for DWords. The exception to this is IR tags, which are native 32-bit values with MSB to LSB byte ordering for the CJ1-series PLCs.

## BCD Support

16-Bit and 32-Bit data can be referenced as signed and unsigned BCD values.

Unsigned BCD support is accomplished by appending a 'D' to any Word or DWord tag address or by using the BCD and LBCD data types. The value range follows:

Word as unsigned BCD  
0 - 9999

DWord as unsigned BCD  
0 - 99999999

Signed BCD support is accomplished by appending a 'D' to any Short or Long tag address. The most significant bit of the Short/Long is set to 1 for negative values, 0 for positive values. The value range follows:

Short as signed BCD  
±7999

Long as signed BCD  
±79999999

### Example

D0D @ Short = -50  
D0D @ Word = 8050 (MSB set)  
D0 @ BCD = 8050

D0D @ Short = 50  
D0D @ Word = 50  
D0 @ BCD = 50

● **Note:** Boolean, Float, and String data types do not support appending 'D' to the tag address. Furthermore, 'D' cannot be appended to BCD or LBCD tags, or tags with a default data type of BCD or LBCD (such as Counter and Timer tags).

### String Support

The CJ1 model supports reading and writing numerous device types as an ASCII string. When using data memory for string data, each register contains two bytes (two characters) 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 256 characters and is entered in place of a bit number. The string length cannot exceed the request size that has been assigned to the device. The length must be entered as an even number. The range also cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 2 bytes transmitted for each character. The range of registers spanned by the string cannot exceed the range of the device type. The byte order is specified by appending either a "H" or "L" to the address.

When using one byte of ASCII data per register, the length of the string can be from 1 to 128 characters and is entered in place of a bit number. The string length times 4 cannot exceed the request size that has been assigned to the device. The range of registers spanned by the string cannot exceed the range of the device type. The byte to use within a register is specified by appending either a "D" or "E" to the address. For more information, refer to [Setup](#).

### Examples

1. To address a string starting at D01000 with a length of 100 bytes and HiLo byte order, enter:  
D01000.100H
2. To address a string starting at D01100 with a length of 78 bytes and LoHi byte order, enter:  
D01100.078L
3. To address a string starting at D02000 with a length of 55 bytes and Only the High Order byte, enter:  
D02000.055D
4. To address a string starting at D02200 with a length of 37 bytes and Only the Low Order byte, enter:  
D02200.037E

## Array Support

Arrays are supported for all data types except Boolean and String. There are two methods of addressing an array. Examples are given using data memory locations.

*Dxxxx [rows] [cols]*

*Dxxxx [cols]* (this method assumes "rows" is equal to one)

Rows multiplied by cols multiplied by data size in bytes cannot exceed the request size that has been assigned to the device. Since this driver uses an ASCII protocol, there are 4 bytes for each word, short and BCD, and 8 bytes for each DWord, long, LBCD and float. For example, a 10 X 10 array of words results in an array size of 400 bytes, which would require a request size of 512. The next smaller request size choice, 256, would be too small. For more information, refer to [Setup](#).

## Writing to DR and IR Registers

DR and IR registers can be written to only when the device is in Programming Mode. If the device is in Run Mode and a write is attempted to one of these registers, the value in the device does not change. Because the write succeeds, no error message is returned. The device's value does not change because the device is in Run Mode.

# Event Log Messages

The following information concerns messages posted to the Event Log pane in the main user interface. Consult the OPC server help on filtering and sorting the Event Log detail view. Server help contains many common messages, so should also be searched. Generally, the type of message (informational, warning) and troubleshooting information is provided whenever possible.

**Device responded with error. | Tag address = '<address>', Data size = <byte number>, Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device responded with local node error. | Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device responded with destination node error. | Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device responded with a communications error. | Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device cannot process command. | Tag address = '<address>', Data size = <byte number>, Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device responded with routing table error. | Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device responded with a command format error. | Tag address = '<address>', Data size = <byte number>, Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device responded with a command parameter error. | Tag address = '<address>', Data size = <byte number>, Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

**Device responded with read not possible. | Tag address = '<address>', Data size = <byte number>, Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes



---

**Device responded with error in unit. | Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

---

**Device cannot accept command. | Tag address = '<address>', Data size = <byte number>, Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

---

**Access right denied. | Tag address = '<address>', Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

---

**Device responded with write not possible. | Tag address = '<address>', Data size = <byte number>, Main error = <code>, Sub error = <code>.**

---

**Error Type:**

Warning

---

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

**See Also:**

Main and Sub Error Codes

---

**Unable to write to tag. The device is in Run Mode. | Tag address = '<address>'.**


---

**Error Type:**

Warning

---

**Device responded with fatal CPU unit error. | End code = <code>.**


---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

---

**Device responded with non-fatal CPU unit error. | End code = <code>.**


---

**Error Type:**

Warning

**Possible Cause:**

The error codes indicate possible causes.

**Possible Solution:**

Refer to Main and Sub Error Codes for a description possible solutions and corrections.

---

**Failed to set device back to run mode following write to tag. | Tag address = '<address>'.**


---

**Error Type:**

Warning

---

**Error Mask Definitions**


---

**B** = Hardware break detected

**F** = Framing error

**E** = I/O error

**O** = Character buffer overrun

**R** = RX buffer overrun  
**P** = Received byte parity error  
**T** = TX buffer full

## Main and Sub Error Codes

Main Code	Sub-Code	Check Point	Probable Cause	Correction
00: Normal completion	00: Normal completion			
	01: Service canceled		Service was canceled.	Check the capacity of the destination area in the third node.
		Data link status	Service was canceled.	Check the status of the data link.
01: Local node error	01: Local node not in network	Network status of local node	Local node is not participating in the network.	Connect the node to the network.
	02: Token timeout	Maximum node address	Token does not arrive.	Set the local node to within the maximum node address.
	03: Retries failed		Send was not possible during the specified number of retries.	Execute a communications test between the nodes and re-examine the system environment if it fails.
	04: Too many send frames	Number of enabled send frames	Cannot send because maximum number of event frames exceeded.	Check event execution on the network and reduce the number of events per cycle. Increase the maximum number of event frames.
	05: Node address range error	Node address	Node address setting error occurred.	Check the settings of the rotary switches to be sure that the address is within range and that each address is set only once in the same network.
	06: Node address duplication	Node addresses	The same node address has been set twice in the same network.	Change the address of one of the nodes with the same address.
02: Destination node error	01: Destination node not in network	INS indicator on Unit	The destination node is not in the network.	Add the destination node to the network.
	02: Unit missing	Instruction control data	There is no unit with the specified unit address.	Check the destination unit address.
	03: Third node missing	Instruction control data	The third node does not exist.	Check the unit address of the third node. Check the node address of the third node in the send data for CMND(490).

Main Code	Sub-Code	Check Point	Probable Cause	Correction	
		Command data	Broadcasting was specified.	Specify only one node for the third node.	
	04: Destination node busy		The destination node is busy.	Increase the number of retries or review the system so that the destination node does not receive so many messages.	
	05: Response timeout			The message was destroyed by noise.	Increase the number of retries or test communications between nodes to see if there is too much noise.
		Instruction control data		The response monitor time is too short.	Increase the length of the response monitor time.
		Error history		The send / receive frame was discarded.	Take appropriate measures based on the error history.
03: Controller error	01: Communications controller error	Unit / Board indicators	An error occurred in the communications controller.	Take appropriate measures based on the operation manuals for the related units / boards.	
	02: CPU Unit error	CPU Unit indicators at destination node	A CPU error occurred in the destination CPU Unit.	Clear the error from the CPU Unit based on its operation manuals.	
	03: Controller error	Board indicators	A response was not returned because an error occurred in the Board.	Check network communications status and restart the Board. If the problem persists, replace the Board.	
	04: Unit number error	Unit number	The unit number was set incorrectly.	Set the rotary switches correctly, being sure the unit numbers are within range and that each number is used only once.	
04: Service unsupported	01: Undefined command	Command code	The unit / board does not support the specified command code.	Check the command code.	
	02: Not supported by model / version	Unit model and version	The command cannot be executed because the model or version is incorrect.	Check the model number and version.	
05: Routing table error	01: Destination address setting error	Routing table	The destination network or node address is not set in the routing tables.	Register the destination network and node in the routing tables.	
	02: No routing tables	Routing table	Relaying is not possible because there are no routing tables.	Set routing tables in the source node, designation node, and relay nodes.	
	03: Routing table	Routing table	There is an error in the	Set the routing tables cor-	

Main Code	Sub-Code	Check Point	Probable Cause	Correction	
	error		routing tables.	rectly.	
	04: Too many relays	Network configuration	An attempt was made to send to a network that was over 3 networks away	Reconstruct the networks or change the routing tables so that commands are sent within a range of 3 networks or less.	
10: Command format error	01: Command too long	Command data	The command is longer than the maximum permissible length.	Check the command format and correct the command data.	
	02: Command too short	Command data	The command is shorter than the minimum permissible length.	Check the command format and correct the command data.	
	03: Elements / data don't match	Command data	The designated number of elements differs from the number of write data items.	Check the number of elements and set data for each element.	
	04: Command format error	Command data	An incorrect format was used.	Check the command format and correct the command data.	
	05: Header error	Routing table	Either the relay table in the local node or the local network table in the relay node is incorrect.	Set the routing tables correctly.	
11: Parameter error	01: Area classification missing	Memory area code in command data	The specified word does not exist in the memory area or there is no EM Area.	Check the memory areas and parameter codes in the command and correct the command data.	
	02: Access size error	Access size specification in command data	The access size specification is incorrect or an odd word address is specified.	Check the memory areas and access size and correct the access size.	
	03: Address range error	Starting address in command data	The start address in command process is beyond the accessible area.	Check the area being processed and set the correct range.	
	04: Address range exceeded	Starting address and number of elements in command data		The end address in command process is beyond the accessible area.	Check the area being processed and set the correct range.
			Data link tables	The total number of words is beyond the limit.	Correct the data link tables.

Main Code	Sub-Code	Check Point	Probable Cause	Correction
	06: Program missing	Program number in command data	FFFF Hex was not specified.	Specify FFFF Hex.
	09: Relational error	Command data	A large-small relationship in the elements in the command data is incorrect.	Check the command data and correct the relationship between the elements.
		Data link table	A node not set in the common link parameters is set as a refresh parameter.	Correct the data link tables.
	0A: Duplicate data access	I/O access in CPU Unit	Differential monitoring was specified during data tracing or data tracing was specified during differential monitoring.	Cancel the current process or wait until it ends before executing the command.
		Data link tables	The same node address is specified more than once.	Correct the data link tables.
	0B: Response too long	Number of elements in command data	The response format is longer than the maximum permissible length.	Check the command format and correct the number of elements.
	0C: Parameter error	Parameters in command data	There is an error in one of the parameter settings.	Check the command data and correct the parameters.
		Data link table file	There is an error in the file.	Check the contents of the file.
20: Read not possible	02: Protected		The program area is protected.	Release protection from a Programming Device and then execute the command.
	03: Table missing	Table	A table has not been registered.	Register a table.
			There is an error in the table.	Correct the table.
	04: Data missing		The search data does not exist.	
	05: Program missing	Program number in command data	A non-existing program number has been specified.	Check the program numbers and specify a valid one.
	06: File missing	File name and file device	The file does not exist at the specified file device.	Check the path and file name, and correct them.
	07: Data mismatch	Contents of memory	A data being compared is not the same.	Check memory contents and use the correct data.

Main Code	Sub-Code	Check Point	Probable Cause	Correction
		being compared		
			A file read operation failed.	Check the contents of the file.
21: Write not possible	01: Read Only		The specified area is read only.	If the area is protected using a switch setting, release protection and then execute the command. If the area is permanently Read Only, the command cannot be executed.
	02: Protected Cannot write data link table		The program area is protected.	Release protection from a Programming Device and then execute the command.
		PLC Setup	Writing is not possible because automatic data link table generation has been specified.	Change the PLC Setup so that the data link tables can be manually written.
	03: Cannot register	Number of files in file device	The file cannot be created because the limit has been exceeded.	Delete any unnecessary files or create more file memory.
		Number of files open	The maximum number of files has already been opened for the system limit.	Close one or more files and then execute the command.
	05: Program missing	Program number in command data	A non-existing program number has been specified.	Check the program numbers and specify a valid one.
	06: File missing	File name	The file does not exist at the specified file device.	Correct the file name and then execute the command.
	07: File name already exists	File name	A file with the same name already exists in the specified file device.	Change the name of the file being written and then execute the command.
08: Cannot change	Contents of memory being changed	The change cannot be made because doing so would create a problem.		

Main Code	Sub-Code	Check Point	Probable Cause	Correction
22: Not executable in current mode	01: Not possible during execution		The mode is incorrect.	Check the mode.
		Data link status	The data link is operating.	Check the status of the data links.
	02: Not possible while running		The mode is incorrect.	Check the mode.
		Data link status	The data links are active.	Check the status of the data links.
	03: Wrong PLC mode		The PLC is in PROGRAM mode.	Check the modes of the PLC and computer.
	04: Wrong PLC mode		The PLC is in DEBUG mode.	Check the modes of the PLC and computer.
	05: Wrong PLC mode		The PLC is in MONITOR mode.	Check the modes of the PLC and computer.
	06: Wrong PLC mode		The PLC is in RUN mode.	Check the modes of the PLC and computer.
	07: Specified node not polling node		The specified node is not the polling node.	Check node functioning as the polling node for the network.
08: Step cannot be executed		The mode is incorrect.	Check step status.	
23: No such device	01: File device missing	Unit configuration	The specified memory does not exist as a file device.	Mount memory or format EM as file memory.
	02: Memory missing		There is no file memory.	Check the file memory to see if it is mounted.
	03: Clock missing		There is no clock.	Check the model.
24: Cannot start / stop	01: Table missing	Data link tables	The data link tables have not been registered or they contain an error.	Set the data link tables.
25: Unit error	02: Memory error	Contents of memory being processed	The contents of memory contains an error.	Transfer the correct contents to memory.
	03: I/O setting error	I/O Unit configuration	The registered I/O tables do not agree with the actual I/O configuration.	Correct the I/O tables or the I/O configuration.
	04: Too many I/O points	Number of I/O in registered I/O tables	There are too many I/O points and remote I/O points registered.	Change the registered I/O table so that it is within the limit.
	05: CPU bus error	CPU bus line	An error occurred in data transfer between the CPU and a CPU Bus Unit.	Check Units, Boards, and cables to be sure they are connected correctly and then execute the ERROR CLEAR com-

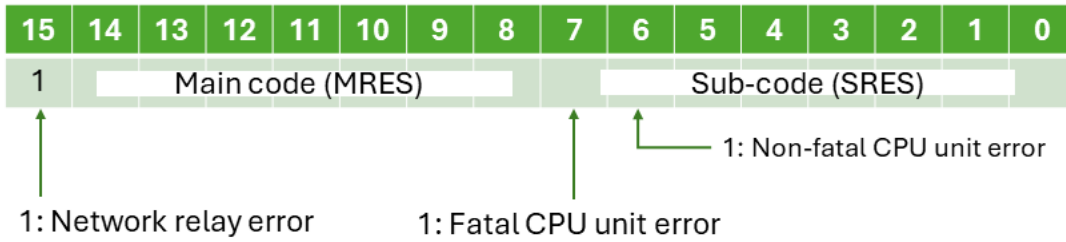


Main Code	Sub-Code	Check Point	Probable Cause	Correction
				mand.
	06: I/O duplication	Rack numbers, Unit numbers, and I/O addresses in PLC Setup	The same number / address was set more than once.	Check the PLC setup and correct the numbers / addresses so that each is used only once.
	07: I/O bus error	I/O bus line	An error occurred in data transfer between the CPU and an I/O unit.	Check units, boards, and cables to be sure they are connected correctly, then execute the ERROR CLEAR command.
	09: SYSMAC BUS / 2 error	SYSMAC BUS / 2 transmission path	An error occurred in data transfer on the SYSMAC BUS / 2 line.	Check units, boards, and cables to be sure they are connected correctly, then execute the ERROR CLEAR command.
	0A: CPU Bus Unit error	CPU Bus Unit transmission path	An error occurred in data transfer for a CPU Bus Unit.	Check units, boards, and cables to be sure they are connected correctly and then execute the ERROR CLEAR command.
	0D: SYSMAC BUS No. duplication	Word settings	The same word is allocated more than once.	Check the I/O tables and correct the allocations.
	0F: Memory error	Status of memory being processed	A memory error has occurred in internal memory, a memory card, or EM file memory.	For internal memory, write the correct data and then execute the command. For a memory card or EM file memory, the file data has been destroyed. Execute the FILE MEMORY FORMAT command. If the problem persists, replace the memory.
	10: SYSMAC BUS terminator missing		Terminators have not been set.	Set the terminators correctly.
26: Command error	01: No protection	Command protection for program area	The specified area is not protected.	An attempt was made to clear protection on an area that is not protected, i.e., there is no reason to clear protection.
	02: Incorrect password		An incorrect password has been specified.	Specify the correct password.
	04: Protected		The specified area is protected.	Clear protection from a Programming Device and then execute the command.
		Number of commands being	The node receiving the command is already processing 5 com-	Wait for current process to end or force the end of a current process, then execute the

Main Code	Sub-Code	Check Point	Probable Cause	Correction
		executed	mands.	command.
	05: Service already executing		The service is being executed.	Wait for the service to end or force the end of the service and then execute the command.
	06: Service stopped		The service is not being executed.	If necessary, start the service.
	07: No execution right	LNK indicator on Unit / Board	The right to execute the service has not been obtained.	The local node is not in the data link. Execute the command from a node that is participating in the data link.
			A response was not returned because a buffer error occurred.	Restart the board. If the problem persists, replace the board.
	08: Settings not complete	Settings required before execution	The settings required before executing the service have not been made.	Make the required settings.
	09: Necessary items not set	Command data	The required elements have not been set in the command data.	Check the command format and set the required elements in the command data.
	0A: Number already defined	Action numbers and transition numbers of program in program area	The specified action / transition number has already been registered in a previous program.	Check the action / transition numbers to ones that are not being used and then execute the command.
	0B: Error not clear	Cause of error being cleared	The cause of the error has not been removed.	Remove the cause of the error and then execute ERROR CLEAR.
30: Access right error	01: No access right		The access right is held by another device. (Online editing is being executed from another node or ACCESS RIGHT ACQUIRE or ACCESS RIGHT FORCE ACQUIRE has been executed by another node.)	Wait until the access right is released and then execute the command. ACCESS RIGHT ACQUIRE or ACCESS RIGHT FORCE ACQUIRE can be executed to obtain the access right, but this may adversely affect processing by the node that previously held the access right.
40: Cancel	01: Service cancelled		Service was cancelled with CANCEL (ABORT) command.	

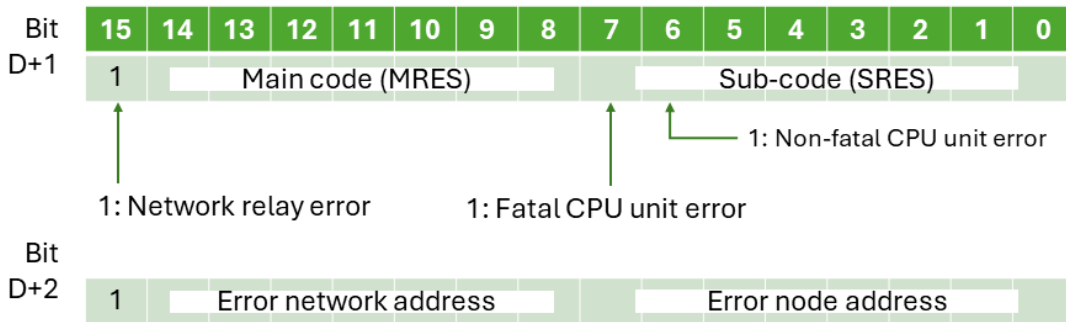
## Flags

There are specific flags in the end code word (bits 6, 7, and 15) that may also be ON. The following diagram displays the contents of the end code word.



If bit 6 or 7 is ON, an error has occurred in the destination CPU Unit. If this occurs, refer to the operation manuals for the CPU Unit where the error occurred and then remove the cause of the error.

If bit 15 is ON, an error has occurred during a network relay operation. The end code contains an additional two-byte (one word) network relay error code that can be used to determine the location of the relay error. The following diagram displays the response data of a network relay error. This information can be used to determine the node where the error occurred so that appropriate measures may be taken.



Error network address: 00 to 7F (0 to 127)

Error node address

- Ethernet: 01 to 7E (1 – 128)
- SYSMAC NET: 01 to 7E (1 – 126)
- Controller Link: 01 to 20 (1 – 32)
- SYSMAC LINK: 01 to 3E (1 – 62)

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