Toshiba Ethernet Driver

Table of Contents

Toshiba Ethernet Driver

Help version 1.020

CONTENTS

Overview

The Toshiba Ethernet Driver provides an easy and reliable way to connect Toshiba Ethernet devices to OPC Client applications, including HMI, SCADA, Historian, MES, ERP and countless custom applications.

Users should understand the data types and the addressing scheme before using the Toshiba Ethernet Driver in an OPC server software project. For more information, refer to **Data Types Description** and **Address Descriptions**.

Device Setup

Supported Devices

T2, T3, S2 and S3 PLCs with Ethernet option.

Communications Protocol

Toshiba ASCII Computer Link

Note: This driver requires Winsock V1.1 or higher.

Connection Timeout

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

Request Timeout

This property specifies the time that the driver will wait on a response from the device before giving up and going on to the next request. Longer timeouts only affect performance if a device is not responding. The default setting is 1000 milliseconds. The valid range is 50 to 9999999 milliseconds.

Retry Attempts

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

Device ID

This property specifies the device's IP address.

Hardware Configuration

The hardware must be configured before Ethernet communications is possible. For more information about a specific hardware series, refer to the links below.

S Series Setup
T2 and T3 Setup

S Series Setup

To make a connection to the EN731 BNC, users must have two 50 ohm connectors: one on each end of the cable T connectors. Both ends require a T connector with the 50 ohm terminator.

Connecting to a V Series Using the Engineering Tool 2

A ladder is not required for the V series devices to communicate. For more information, refer to the instructions below.

1. To start, right-click on the **System** folder and select **New**. Name the new project and then double-click the newly created project icon. This will create a tree with the topics **Libraries, Networks, and Stations** in the lower left quadrant of the display.

2. Right-click on **Stations** and then select **New**. Select the model as desired.

   Note: For the S3 CPUs, choose model 3000.
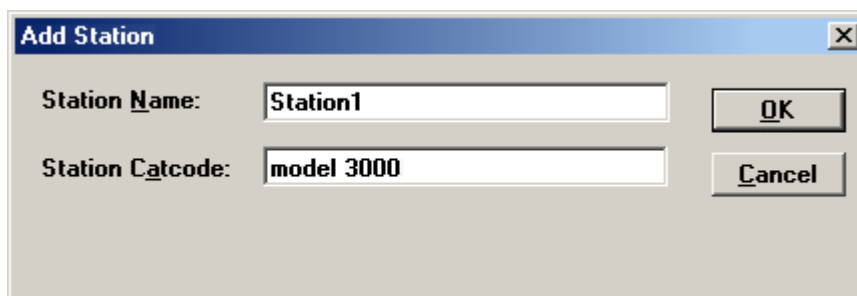
3. Right-click on **Units** and then select **New**. In this dialog, choose the main board, backplane and model number (such as BU748). This will create a **Modules** subfolder.

4. Next, right-click on **Modules** and select **New**.

5. Select the slot number and CPU model and then click **OK**.
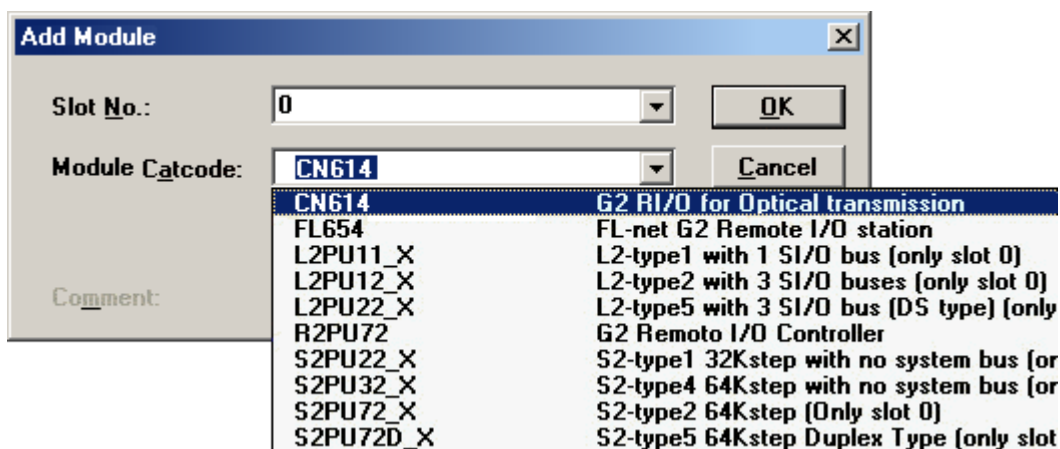
6. Select the Ethernet model and then click **OK**.
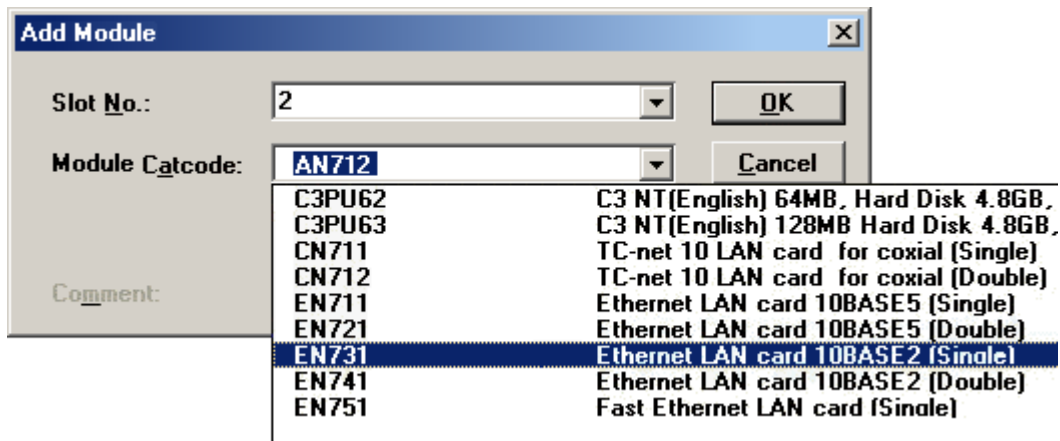
7. Next, right-click on the CPU module and then click **Module Parameters** | **Tool and Module**. Scroll through the parameters until "Computer Link1 Ethernet Slot" and "...UDP PortNo" are located.

8. Enter the Ethernet module's slot number and the desired port number. Then, enter the slot number and port number in both the Tool column and the Module column.

    Note: Not all screens will appear as the image shown below.

9. Ensure the device is set to **Halt Mode** by turning the key, and then click **Write** from the module and parameters window. A write successful message will appear upon completion. Close the window.
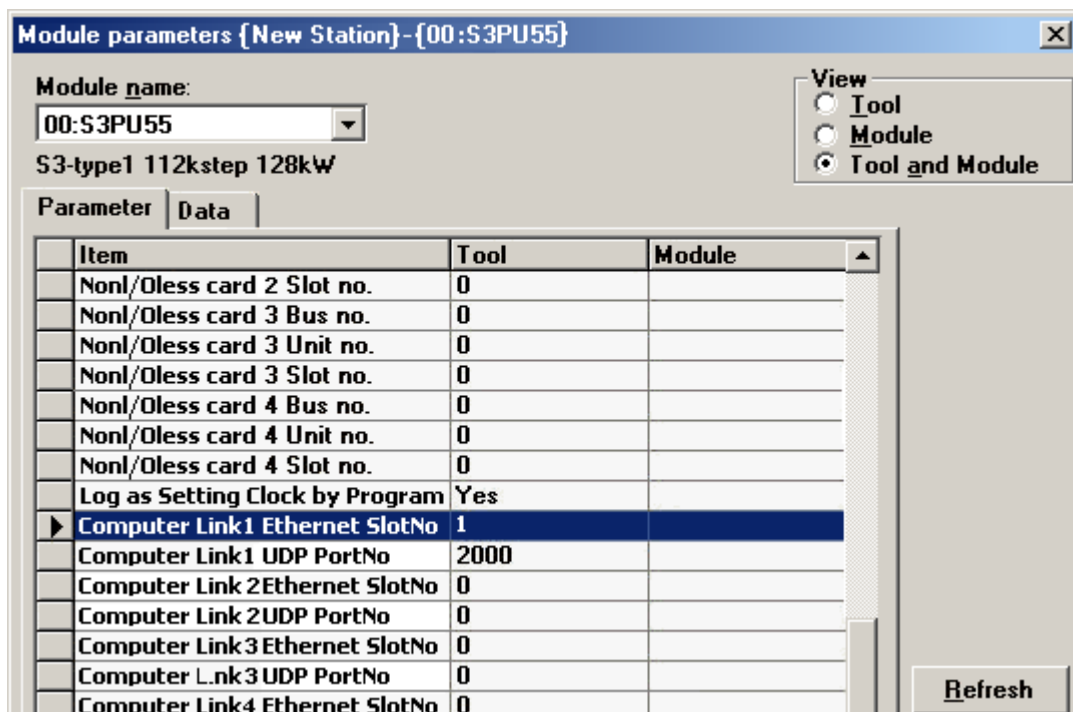
10. Right-click on the Ethernet module and then select **Module Parameters.**

11. Next, click **Tool and Module.** In the Tool column, enter the desired IP and subnet mask. Leave the **IP Address Type** set to Class B.
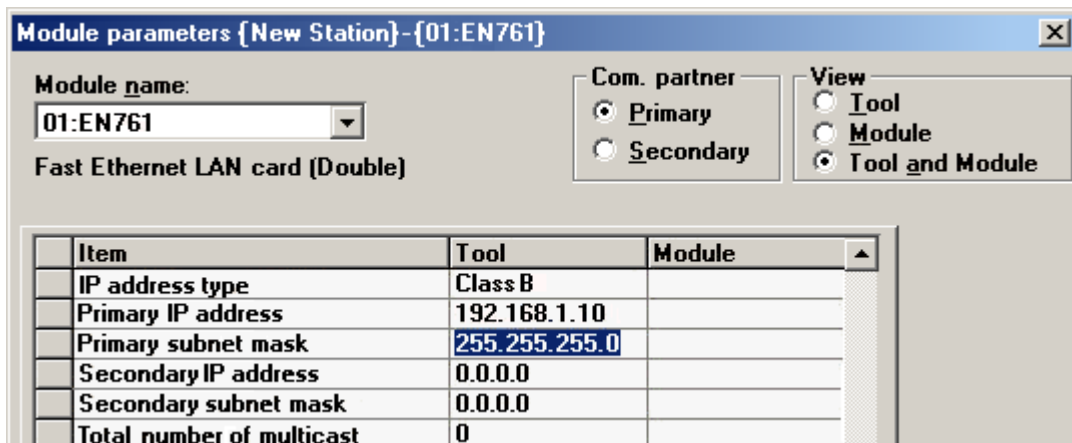
12. Click **Download** in order to write the information to the module. Then, close the window.

13. Click the **Network** folder from the tree and then select **New**. For a 3000 series project using an EN model Ethernet, select "EtherLAN" for the network. This will create a Module subfolder.
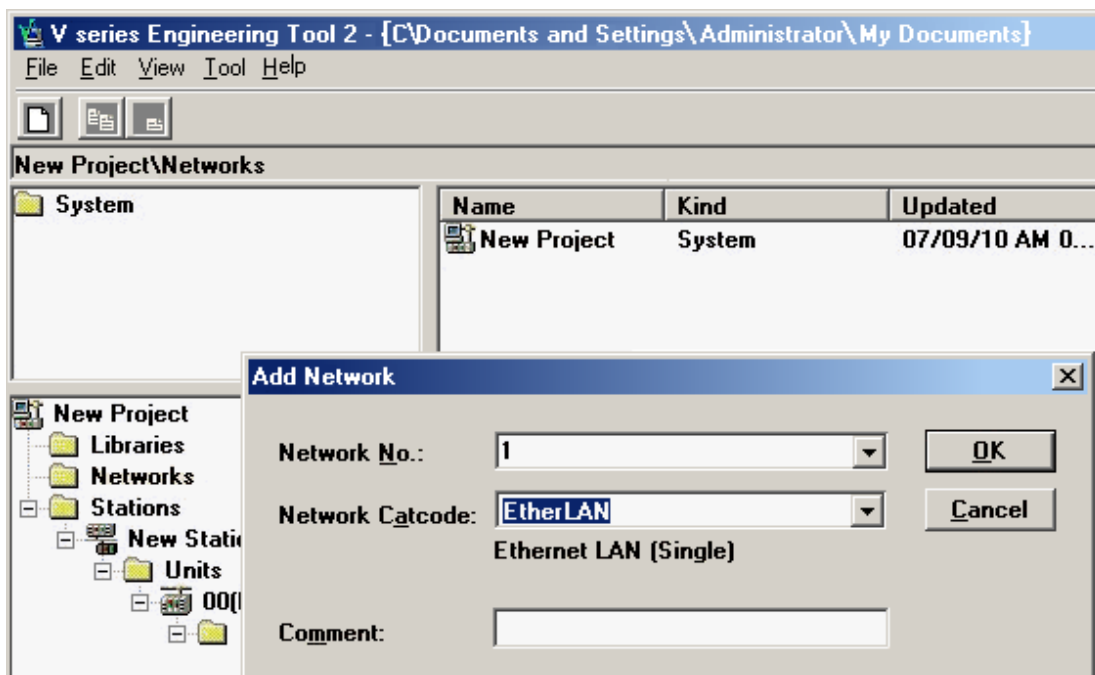
14. Right-click on **Module** and select **New**. Select the Ethernet module and then close the window.
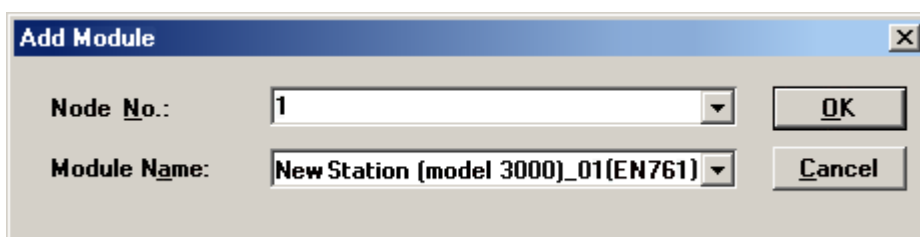
15. To verify that connections have been set up successfully, right-click the first subgroup under the **Stations** folder. For example, test (model 3000) and select "System View" from the list. This will show

the status of the devices.
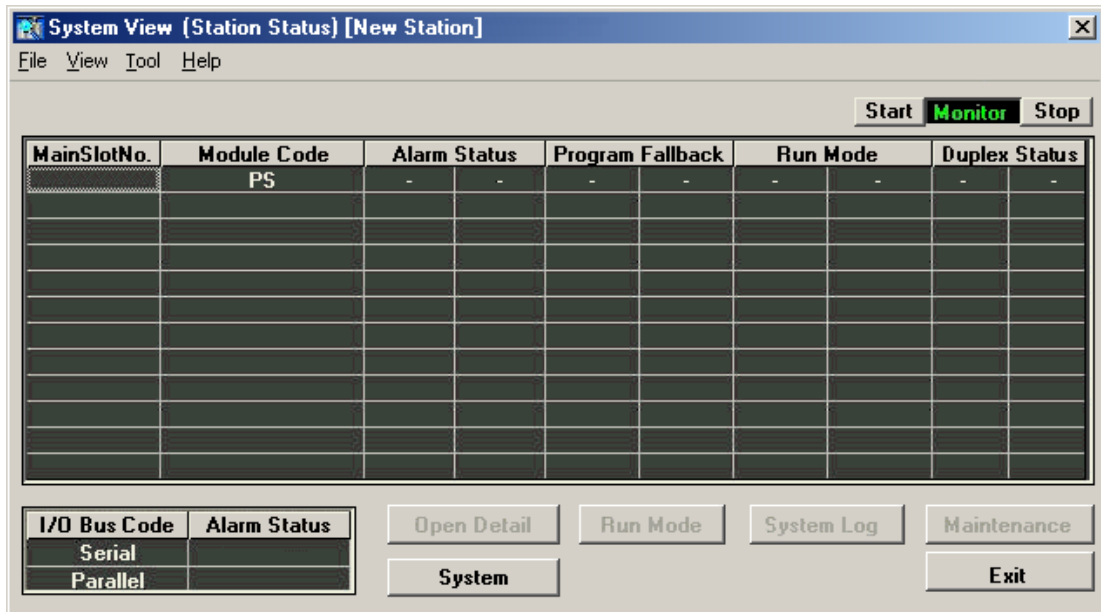
16. From the **Tool** drop-down list, select **Com. Para. Settings**. In the IP address box at the bottom of the window, enter the PC's IP. Then, choose Ethernet as the form of communications and close the window.
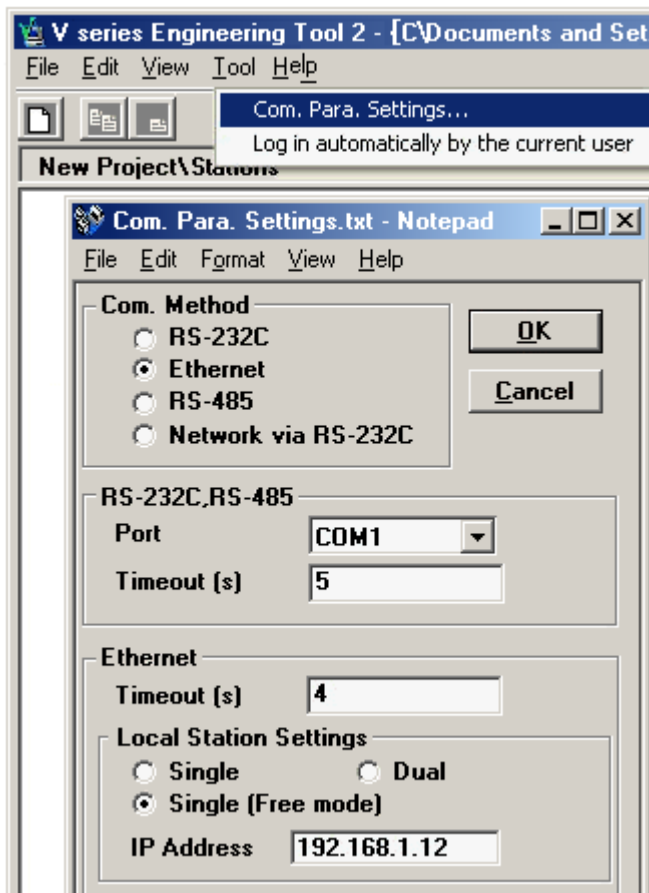
17. To test the connection, return to the System View and verify that the devices' statuses are visible without any communication errors.

T2 and T3 Setup

Before this driver can be used, the PLC must be configured with an IP and port number. This can be done using a simple ladder program, which must be run each time the PLC is powered up. An example program that sets IP = 192.168.111.126 and port = 1024 is shown below. Users may wish to modify this program to run automatically whenever the PLC powers up.
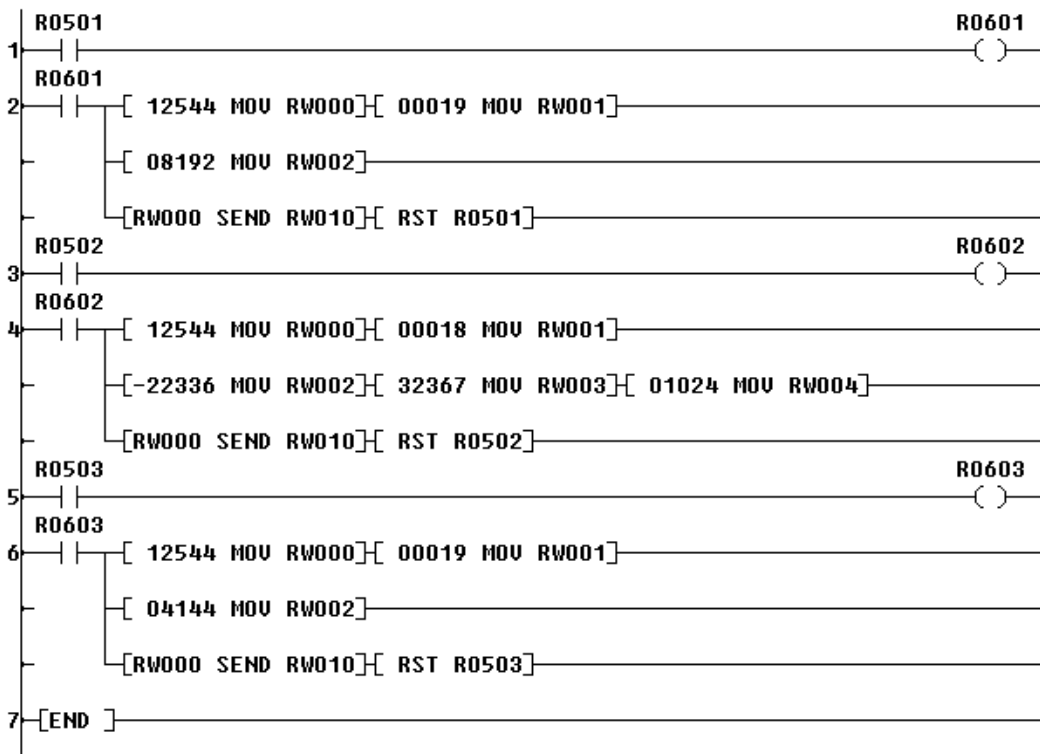
The first block of code at rung 2 places the PLC in Standby Mode when bit R0501 is set. This must be done before the IP and port can be set. The second block of code at rung 4 sets the IP and port number when bit R0502 is set. The final block of code at rung 6 puts the PLC back in Run Mode when bit R0603 is set.

Each block of code places parameters in memory starting at RW000, issues a SEND command using those parameters, and then resets the corresponding trigger bit. The parameters in each block are defined as shown in the tables below.

Set Standby Mode

Parameter	Value	Description
RW000	0x3100 (12544)	Specifies module.
RW001	0x0013 (19)	Change mode command code.
RW002	0x2000 (8192)	Specifies standby mode.

Set IP and Port

Parameter	Value	Description
RW000	0x3100 (12544)	Specifies module.
RW001	0x0012 (18)	Set IP and port command code.
RW002	User Defined	Specifies upper 2 octals of IP address (network byte order).
RW003	User Defined	Specifies lower 2 octals of IP address (network byte order).
RW004	User Defined	Specifies port number.

The IP address parameters must be in the correct format. In the example IP, the four octals that follow are expressed in hex: 0xC0 (192), 0xA8 (168), 0x6F (111) and 0x7E (126). Therefore, the value placed in RW002 is 0xA8C0 (or -22336 as a signed integer). The value placed in RW003 is 0x7E6F (or 32367 as a signed integer).

Set Run Mode

Parameter	Value	Description
RW000	0x3100 (12544)	Specifies module.
RW001	0x0013 (19)	Change mode command code.
RW002	0x1030 (4144)	Specifies Run Mode.

Optimizing Communications

The Toshiba Ethernet Driver has been designed to provide the best performance with the least amount of impact on the system's overall performance. 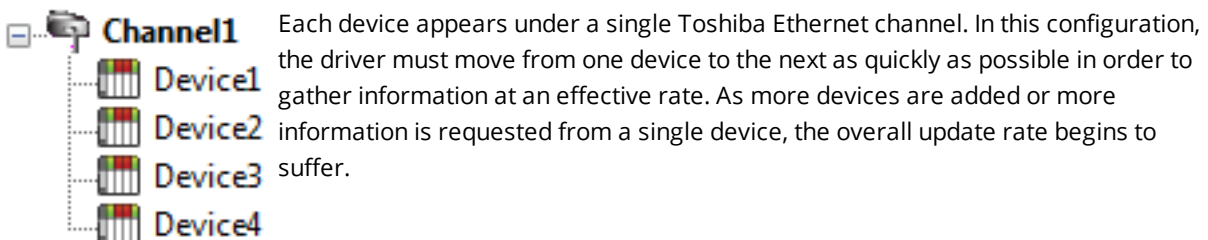While the Toshiba Ethernet Driver is fast, there are a couple of guidelines that can be used in order to control and optimize the application and gain maximum performance. This server refers to communications protocols like Toshiba Ethernet as a channel.

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

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

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

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

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

Data Types Description

Data Type	Description
Boolean	Single bit
Word	Unsigned 16 bit value bit 0 is the least significant bit bit 15 the most significant bit
Short	Signed 16 bit value bit 0 is the least significant bit bit 14 the most significant bit bit 15 is the sign bit
DWord	Unsigned 32 bit value bit 0 is the least significant bit bit 31 the most significant bit
Long	Signed 32 bit value bit 0 is the least significant bit bit 30 the most significant bit bit 31 is the sign bit
Float	32 bit floating point value The driver interprets two consecutive registers as a floating point value by making the second register the high word and the first register the low word.
String	Null terminated ASCII string Supported on all models, includes HiLo LoHi byte order selection.

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.

T2 Addressing

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

Address Type	Range	Data Type	Access
Input Devices	X00...X0F-X127...X127F	Boolean	Read/Write
Direct Input Devices	I00...I0F-I127...I127F	Boolean	Read Only
Output Devices	Y00...Y0F-Y127...Y127F	Boolean	Read/Write
Direct Output Devices	O00...O0F-O127...O127F	Boolean	Read/Write
Input Registers	XW0-XW127 XW0-WW126	**Word**, Short DWord, Long, Float	Read/Write
Direct Input Registers	IW0-IW127 IW0-IW126	**Word**, Short DWord, Long, Float	Read/write
Output Registers	YW0-YW127 YW0-YW126	**Word**, Short DWord, Long, Float	Read/Write
Direct Output Registers	OW0-OW127 OW0-OW126	**Word**, Short DWord, Long, Float	Read/Write
Link Relays	L00...L0F-L2550...L255F	Boolean	Read/Write
Link Registers	LW0-LW255 LW0-LW254	**Word**, Short DWord, Long, Float	Read/Write
Link Registers	W0-W1023 W0-W1022	**Word**, Short DWord, Long, Float	Read/Write
Link Register relays	Z00...Z0F-Z5110...Z511F	Boolean	Read/Write
File Registers	F0-F1023 F0-F1022	**Word**, Short DWord, Long, Float	Read/Write
Auxiliary Devices	R00...R0F-R2550...R255F	Boolean	Read/Write
Auxiliary Registers	RW0-RW255 RW0-RW254	**Word**, Short DWord, Long, Float	Read/Write
Special Devices	S00...S0F-S2550...S255F	Boolean	Read/Write
Special Registers	SW0-SW255 SW0-SW254	**Word**, Short DWord, Long,	Read Only

Address Type	Range	Data Type	Access
		Float	
Counter Registers	C0-C255	**Word**, Short	Read/Write
Counter Devices	C.0-C.255	Boolean	Read Only
Timer Registers	T0-T255	**Word**, Short	Read/Write
Timer Devices	T.0-T.255	Boolean	Read Only
Data Memory	D0-D8191 D0-D8190	**Word**, Short DWord, Long, Float	Read/Write
Data Memory As String with HiLo Byte Order	D0.2H-D4095.64H .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write
Data Memory As String with LoHi Byte Order	D0.2L-D4095.64L .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write

String Support

The Toshiba Ethernet Driver supports reading and writing Data registers as an ASCII string. When using Data registers for string data, each register will contain two bytes of ASCII data. The order of the ASCII data within a given register can be selected when the string is defined. The length of the string can be from 2 to 64 bytes and is entered in place of a bit number. The length must be entered as an even number. The byte order is specified by appending either an "H" or "L" to the address.

Examples

1. To address a string starting at D200 with a length of 50 bytes and HiLo byte order, enter:
D200.50H

2. To address a string starting at D500 with a length of 38 bytes and LoHi byte order, enter:
D500.38L

T3 Addressing

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

Address Type	Range	Data Type	Access
Input Devices	X00...X0F-X5110...X511F	Boolean	Read/Write
Direct Input Devices	I00...I0F-I5110...I511F	Boolean	Read Only
Output Devices	Y00...Y0F-Y5110...Y511F	Boolean	Read/Write
Direct Output Devices	O00...O0F- O5110...O511F	Boolean	Read/Write
Input Registers	XW0-XW511 XW0-XW510	**Word**, Short DWord, Long, Float	Read/Write
Direct Input Registers	IW0-IW511 IW0-IW510	**Word**, Short DWord, Long, Float	Read/Write
Output Registers	YW0-YW511 YW0-YW510	**Word**, Short DWord, Long, Float	Read/Write

Address Type	Range	Data Type	Access
Direct Output Registers	OW0-OW511 OW0-OW510	**Word**, Short DWord, Long, Float	Read/Write
Link Relays	L00...L0F-L2550...L255F	Boolean	Read/Write
Link Registers	LW0-LW255 LW0-LW254	**Word**, Short DWord, Long, Float	Read/Write
Link Registers	W0-W2047 W0-W2026	**Word**, Short DWord, Long, Float	Read/Write
Link Register relays	Z00...Z0F-Z9990...Z999F	Boolean	Read/Write
File Registers	F0-F8191 F0-F8190	**Word**, Short DWord, Long, Float	Read/Write
Auxiliary Devices	R00...R0F-R9990...R999F	Boolean	Read/Write
Auxiliary Registers	RW0-RW999 RW0-RW998	**Word**, Short DWord, Long, Float	Read/Write
Special Devices	S00...S0F-S2550...S255F	Boolean	Read/Write
Special Registers	SW0-SW255 SW0-SW254	**Word**, Short DWord, Long, Float	Read Only
Counter Registers	C0-C511	**Word**, Short	Read/Write
Counter Devices	C.0-C.511	Boolean	Read Only
Timer Registers	T0-T999	**Word**, Short	Read/Write
Timer Devices	T.0-T.999	Boolean	Read Only
Data Memory	D0-D8191 D0-D8190	**Word**, Short DWord, Long, Float	Read/Write
Data Memory As String with HiLo Byte Order	D0.2H-D8191.64H .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write
Data Memory As String with LoHi Byte Order	D0.2L-D8191.64L .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write

String Support

The Toshiba Ethernet Driver supports reading and writing Data registers as an ASCII string. When using Data registers for string data, each register will contain two bytes of ASCII data. The order of the ASCII data within a given register can be selected when the string is defined. The length of the string can be from 2 to 64 bytes and is entered in place of a bit number. The length must be entered as an even number. The byte order is specified by appending either a "H" or "L" to the address.

Examples

1. To address a string starting at D200 with a length of 50 bytes and HiLo byte order, enter:
D200.50H

2. To address a string starting at D500 with a length of 38 bytes and LoHi byte order, enter:

D500.38L

S2 Addressing

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

Address Type	Range	Data Type	Access
Input Devices	X0 0...X0 F-X3071 0...X3071 F	Boolean*	Read/Write
Direct Input Devices	I0 0...I0 F-I3071 0...I3071 F	Boolean*	Read Only
Output Devices	Y0 0...Y0 F-Y3071 0...Y3071 F	Boolean*	Read/Write
Direct Output Devices	O0 0...O0 F-O3071 0...O3071 F	Boolean*	Read/Write
Input Registers	XW0-XW3071 XW0-XW3070	**Word**, Short DWord, Long, Float	Read/Write
Direct Input Registers	IW0-IW3071 IW0-IW3070	**Word**, Short DWord, Long, Float	Read/Write
Output Registers	YW0-YW3071 YW0-YW3070	**Word**, Short DWord, Long, Float	Read/Write
Direct Output Registers	OW0-OW3071 OW0-OW3070	**Word**, Short DWord, Long, Float	Read/Write
Auxiliary Devices	R0 0...R0 F-R4095 0...R4095 F	Boolean*	Read/Write
Auxiliary Devices	D[0].B[0]-D[4095].B[F]	Boolean*	Read/Write
Auxiliary Registers	RW0-RW4095 RW0-RW4094	**Word**, Short DWord, Long, Float	Read/Write
Auxiliary Registers	DW[0]-DW[4095] DW[0]-DW[4094]	**Word**, Short DWord, Long, Float	Read/Write
Special Devices	S0 0...S0 F-S511 0...S511 F	Boolean*	Read/Write
Special Registers	SW0-SW511 SW0-SW510	**Word**, Short DWord, Long, Float	Read Only
Data Memory	D0-D4095 D0-D4094	**Word**, Short DWord, Long, Float	Read/Write
Data Memory As String with HiLo Byte Order	D0.64H-D4095.2H .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write
Data Memory As String with LoHi Byte Order	D0.64L-D4095.2L .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write

*The last character in the address is the bit identifier and is represented in hexadecimal format.

String Support

The Toshiba Ethernet Driver supports reading and writing Data registers as an ASCII string. When using Data registers for string data, each register will contain two bytes of ASCII data. The order of the ASCII data within a given register can be selected when the string is defined. The length of the string can be from 2 to 64 bytes and is entered in place of a bit number. The length must be entered as an even number. The byte order is specified by appending either an "H" or "L" to the address.

Examples

1. To address a string starting at D200 with a length of 50 bytes and HiLo byte order, enter: D200.50H

2. To address a string starting at D500 with a length of 38 bytes and LoHi byte order, enter: D500.38L

S3 Addressing

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

Address Type	Range	Data Type	Access
Input Devices	X0 0...X0 F-X5119 0...X5119 F	Boolean*	Read/Write
Direct Input Devices	I0 0...I0 F-I5119 0...I5119 F	Boolean*	Read Only
Output Devices	Y0 0...Y0 F-Y5119 0...Y5119 F	Boolean*	Read/Write
Direct Output Devices	O0 0...O0 F-O5119 0...O5119 F	Boolean*	Read/Write
Input Registers	XW0-XW5119 XW0-XW5118	**Word**, Short DWord, Long, Float	Read/Write
Direct Input Registers	IW0-IW5119 IW0-IW5118	**Word**, Short DWord, Long, Float	Read/Write
Output Registers	YW0-YW5119 YW0-YW5118	**Word**, Short DWord, Long, Float	Read/Write
Direct Output Registers	OW0-OW5119 OW0-OW5118	**Word**, Short DWord, Long, Float	Read/Write
Auxiliary Devices	R0 0...R0 F-R4095 0...R4095 F	Boolean*	Read/Write
Auxiliary Devices	D[0].B[0]-D[4095].B[F]	Boolean*	Read/Write
Auxiliary Registers	RW0-RW4095 RW0-RW4094	**Word**, Short DWord, Long, Float	Read/Write
Auxiliary Registers	DW[0]-DW[4095] DW[0]-DW[4094]	**Word**, Short DWord, Long, Float	Read/Write

Address Type	Range	Data Type	Access
Special Devices	S0 0…S0 F-S511 0…S511 F	Boolean*	Read/Write
Special Registers	SW0-SW511 SW0-SW510	**Word**, Short DWord, Long, Float	Read Only
Data Memory	D0-D4095 D0-D4094	**Word**, Short DWord, Long, Float	Read/Write
Data Memory As String with HiLo Byte Order	D0.64H-D4095.2H .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write
Data Memory As String with LoHi Byte Order	D0.64L-D4095.2L .Bit is string length, range 2 to 64 bytes.	**String**	Read/Write

*The last character in the address is the bit identifier and is represented in hexadecimal format.

String Support

The Toshiba Ethernet Driver supports reading and writing Data registers as an ASCII string. When using Data registers for string data, each register will contain two bytes of ASCII data. The order of the ASCII data within a given register can be selected when the string is defined. The length of the string can be from 2 to 64 bytes and is entered in place of a bit number. The length must be entered as an even number. The byte order is specified by appending either an "H" or "L" to the address.

Examples
1. To address a string starting at D200 with a length of 50 bytes and HiLo byte order, enter: D200.50H

2. To address a string starting at D500 with a length of 38 bytes and LoHi byte order, enter: D500.38L

Error Descriptions

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

Address Validation

Missing address

Device address '<address>' contains a syntax error

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

Device address '<address>' is not supported by model '<model name>'

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

Device address '<address>' is Read Only

Device Status Messages

Winsock initialization failed (OS Error = n)

Winsock V1.1 or higher must be installed to use the Toshiba Ethernet device driver

Device '<device name>' is not responding

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

Device '<device name>' responded with error code 'n' (Tag '<tag name>')

Deactivating tag block. Bad address in block [<start address> to <end address>] on device '<device name>'

Missing address

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically has no length.

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

Device address '<address>' contains a syntax error

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically contains one or more invalid characters.

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

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

Error Type:
Warning

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

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

Device address '<address>' is not supported by model '<model name>'

Error Type:
Warning

Possible Cause:
A tag address that has been specified statically references a location that is valid for the communications protocol but not supported by the target device.

Solution:

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

2. Verify the selected model name for the device is correct.

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

Error Type:
Warning

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

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

Device address '<address>' is Read Only

Error Type:
Warning

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

Solution:
Change the access mode in the client application.

Winsock initialization failed (OS Error = n)

Error Type:
Fatal

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

OS Error	Indication	Possible Solution
	Windows Sockets implementation has been reached.	

Winsock V1.1 or higher must be installed to use the Toshiba Ethernet device driver

Error Type:
Fatal

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

Solution:
Upgrade Winsock to version 1.1 or higher.

Device '<device name>' is not responding

Error Type:
Serious

Possible Cause:

1. The named device may not be connected to the PLC network.

2. The named device may have been assigned an incorrect Network ID.

3. The response from the device took longer to receive than the amount of time specified in the "Request Timeout" device setting.

Solution:

1. Check the PLC network connections.

2. Verify that the Network ID given to the named device matches that of the actual device.

3. Increase the Request Timeout setting so that the entire response can be handled.

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

Error Type:
Serious

Possible Cause:

1. The serial connection between the device and the Host PC is broken.

2. The communications properties for the serial connection are incorrect.

3. The named device may have been assigned an incorrect Network ID.

Solution:

1. Verify the cabling between the PC and the PLC device.

2. Verify that the specified communications properties match those of the device.

3. Verify that the Network ID given to the named device matches that of the actual device.

Device '<device name>' responded with error code 'n' (Tag '<tag name>')

Error Type:
Warning

Possible Cause:
The device responded with specified error code.

Solution:
Consult the Toshiba documentation for explanation of code and suggested solution.

Deactivating tag block. Bad address in block [<start address> to <end address>] on device '<device name>'

Error Type:
Warning

Possible Cause:
The driver is requesting a block of data with one or more invalid addresses.

Solution:
Verify that all addresses in specified range are valid for the device.

Index

M

O

P

S

T

U

W