



L5352 Ethernet Communications Interface

Technical Manual

HA470898 Issue 3

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Safety Information



Please read this information **BEFORE** installing the equipment.

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, and to enable the user to obtain maximum benefit from the equipment.

Application Area

The equipment described is intended for industrial motor speed control using DC or AC motor controllers, with DC motors AC induction or AC synchronous machines.

Personnel

Qualified personnel should carry out installation, operation and maintenance of the equipment. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

REFER TO YOUR MAIN PRODUCT MANUAL FOR SPECIFIC SAFETY INFORMATION ABOUT THE DEVICE YOU ARE CONTROLLING

IMPORTANT

It is required that the users have DSD, RSLogix 5000 or other interface programs installed on a computer and have a working knowledge of these software packages.

ACKNOWLEDGEMENTS

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RSLogix 5000, and ControlLogix500 are registered trademarks of Allen-Bradley Inc.

Modbus, Concept and Proworx are registered trademarks of Modicon, Division of Schneider Electric Inc.

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Chapter 1 System Overview

Product Features

- Suitable for use with Link modules:

L5392	LinkStation
L5300	LinkRack
- Connection using RJ 45 connectors and Category 5 cable
- LED's to indicate board and communications status
- Configured using Function Block inputs and outputs
- Diagnostics using Function Block outputs
- 10/100 MBaud
- Software-selectable Slave Address
- The Ethernet LinkCard is provided as a plug-in LinkCard.
- Modbus TCP/IP or Ethernet IP protocols supported
- 256 Words In and 256 Words Out

Product Code

Part Number: L5352 Ethernet LinkCard

DSD Requirements

Software version: 1.16 or higher.

Database level: 1173 or higher.

Wiring the System

Warning!

Before installing, ensure that the LinkRack wiring is electrically isolated and cannot be made "live" unintentionally by other personnel. Wait 5 minutes after disconnecting power before working on any part of the system or removing the covers from the drives.

Installing and Connecting the Ethernet LinkCard

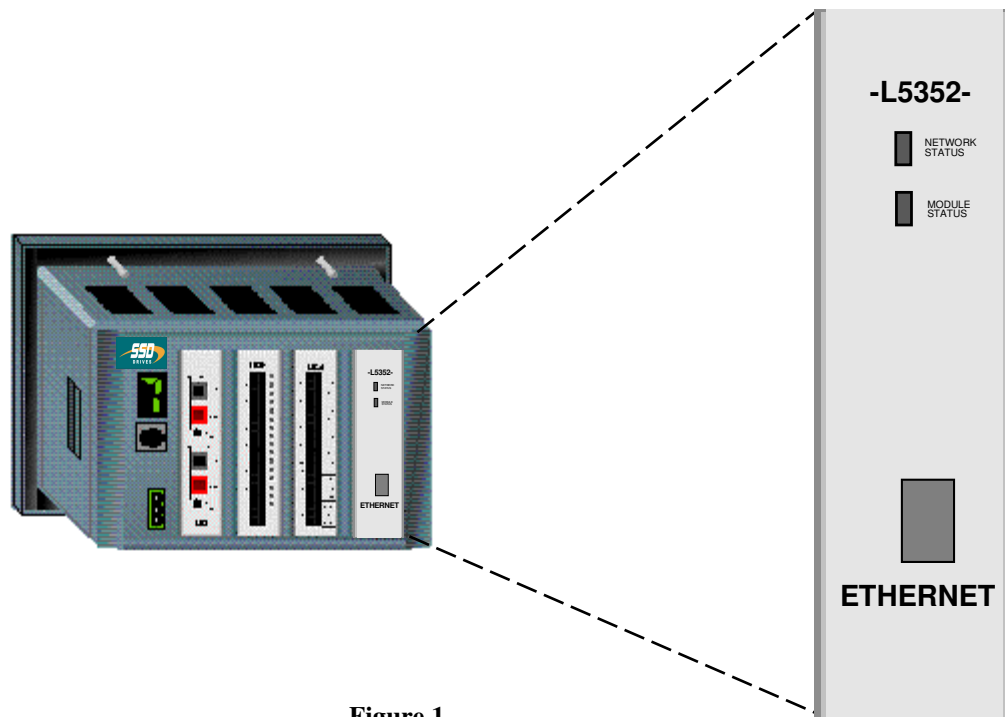


Figure 1.

L5392 LinkStation with L5352 Ethernet LinkCard

WARNING!

Prior to starting work on the LinkRack or LinkStation ensure all sources of power are isolated.

Installing the Ethernet LinkCard

The Ethernet LinkCard plugs into a LinkRack or a LinkStation. It can be installed into any site (J1, J2, J3, and J4) of the LinkRack.

- Remove the back cover of the LinkRack.
- Insert the Ethernet card into a slot in the LinkRack.
- Re-fit the back cover to the LinkRack.
- Make all user-wiring connections.

Chapter 3 Configuring the LinkRack

This chapter contains examples for configuring the L5352 LinkCard using DSD.

1. Create a LINK configuration with Ethernet reader and Ethernet writer blocks that are required for the project. Insert the Ethernet reader blocks into the handler before inserting the Ethernet writer blocks. The LinkCard receives and transmits the data in the order the blocks are inserted into the handler. The LINK Ethernet handler block identifies the slot location in the LinkRack/LinkStation and the Ethernet IP address on your Ethernet network. Refer to Figure 2.
2. Double-click on the Ethernet handler block to enter the L5352 site address, IP address, Byte Swap, and the Ethernet registers. Ethernet IP protocol requires the use of the Byte Swap feature. Modbus TCP protocol does not use the Byte Swap feature. The Ethernet reader and Ethernet writer registers are listed in the order in which the PLC/PC will communicate to the LinkRack. Refer to Figure 3.
3. Load the LINK configuration prior to connecting to the PLC or PC. The PLC or PC will connect once it is configured. The quantity of words being transferred in and out of the LINK module needs to agree with the quantity of words being transferred in and out of the PLC or PC for the IP address associated with the LINK configuration.

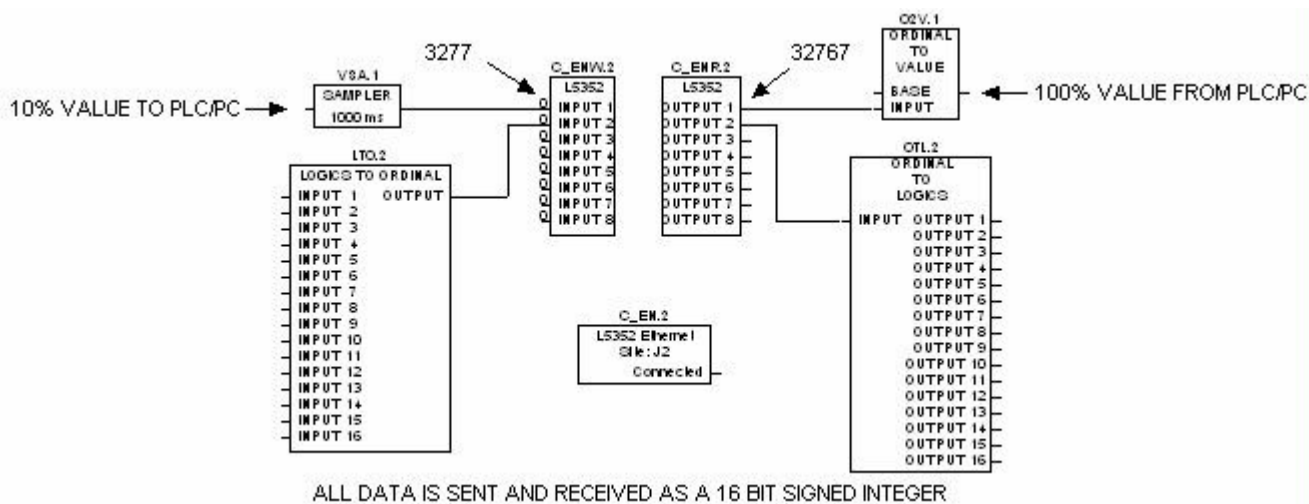


Figure 2.

Basic LINK Setup

Note: The above LINK configuration is sending a value signal (16 bit) to the PLC.

1% = 328	-1% = 65209
10% = 3277	-10% = 62259
100% = 32767	-100% = 32769

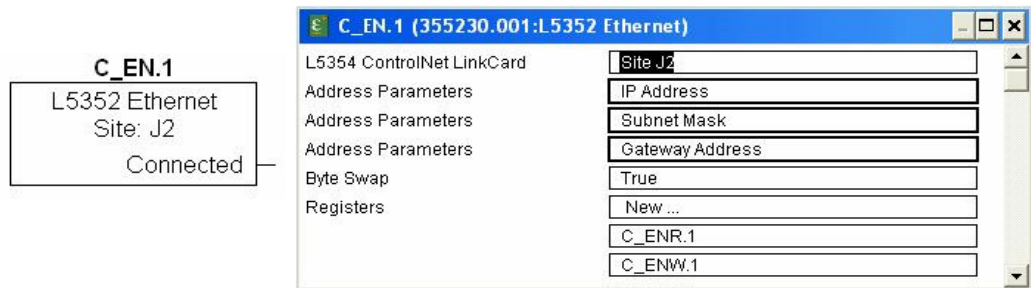


Figure 3.
L5352 Ethernet Handler Block

Chapter 4 Configuring the PLC Supervisor

This chapter contains examples for configuring a Modicon and an Allen-Bradley ControlLogix PLC. The Ethernet LinkCard supports the ModBus/TCP protocol and the Ethernet/IP protocol. Ethernet communication with the Allen-Bradley PLC 5 series and SLC 500 series is not available. Each example configures eight registers in each direction. Refer to Figures 4, 5, and 6.

Modicon Momentum

1. Start a new program and select the PLC processor and chassis type that is used in your project. Our example uses an M1 980-20 Momentum PLC. Remain Offline until you are ready to download the program.
2. Place MSTR block in the ladder logic. MSTR blocks move data from the PLC data table to the LinkCard or from the LinkCard to the PLC data table. Two MSTR blocks will be necessary for a Read and Write operation.

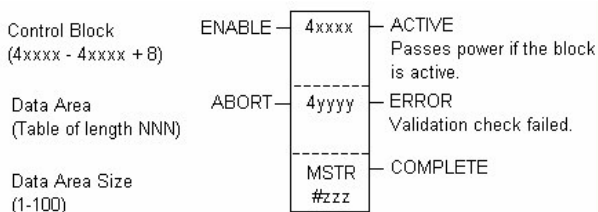


Figure 4
Instruction Edit

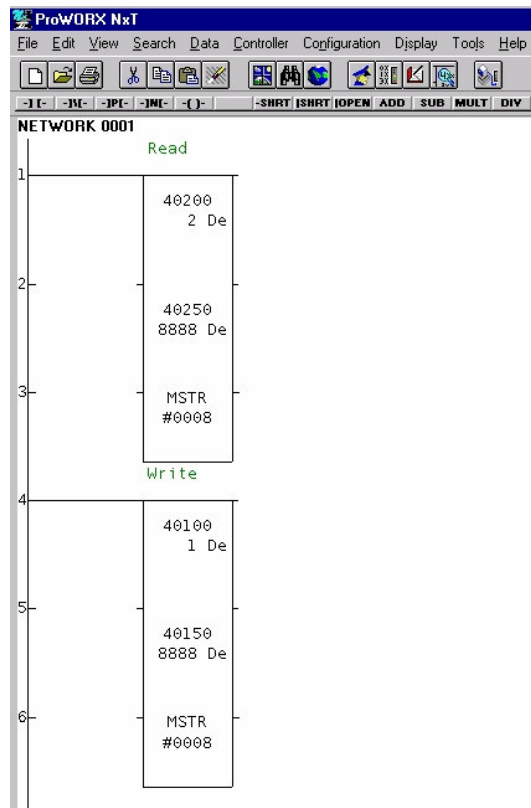


Figure 5
PLC Ladder Logic Showing MSTR Blocks

3. Double click on the MSTR blocks to identify the register locations in the PLC. The control data will appear in the top register. The middle register is the location of the usable data being transferred between the L5352 and the Ethernet Master. The bottom value is the total words being transferred.
4. Right click over the MSTR block; this will allow access to select the Register Editor. Use the Register Editor to configure the block. The MSTR block has four possible communication protocols. The protocol being used with the L5352 LinkCard is TCP/IP. The lower right hand corner has two buttons (PREV and NEXT); use the NEXT or PREV buttons to select to TCP/IP (page 2 of 4).
5. There are two types of operations Read or Write. The MSTR Operation Code register defines the type of operation. A value of 1 in the data column defines a write operation, and a value of 2 in the data column defines a read operation.
6. The Error Status register contains error codes. Refer to Appendix B for a list of the error codes. The PLC software also has help files that contain a list of error codes.
7. The # of Registers register defines the quantity of words to be transferred. The value in the data column depends on the number of registers in the Link configuration. This value can be smaller than or equal to the selected parameter set.

8. The Func. Dependent Info registers define the read and write locations of the data in the PLC. A value of 1 is used for the read function, and a value of 1025 is used for the write function.
9. The Head # and Map Index register identifies the location of the Ethernet port in the PLC.
10. IP Routing Bytes 1 through 4 defines the IP address on the Ethernet network.
11. When using the ModBus/TCP protocol, the LinkCard needs to be programmed with the "BYTE SWAP" FALSE. This applies to Modicon products and other manufacturers using the ModBus/TCP protocol.

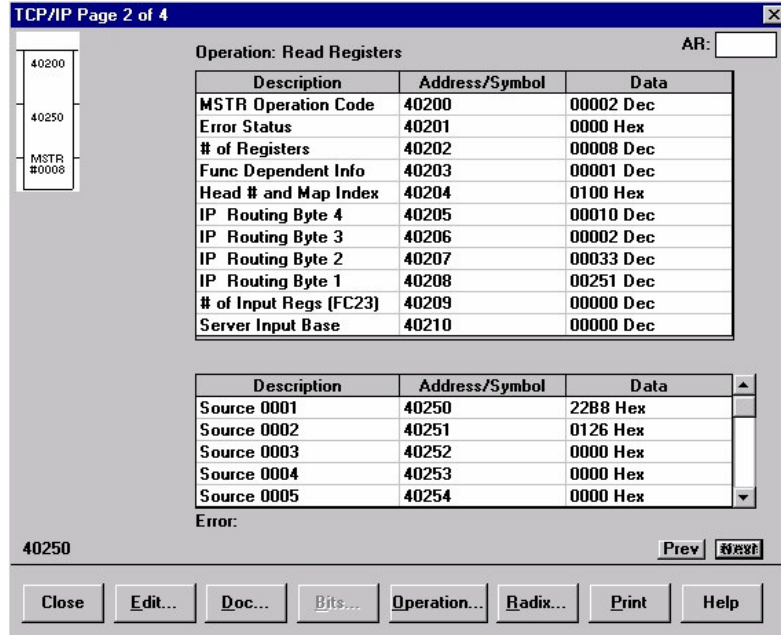


Figure 6 Read Registers

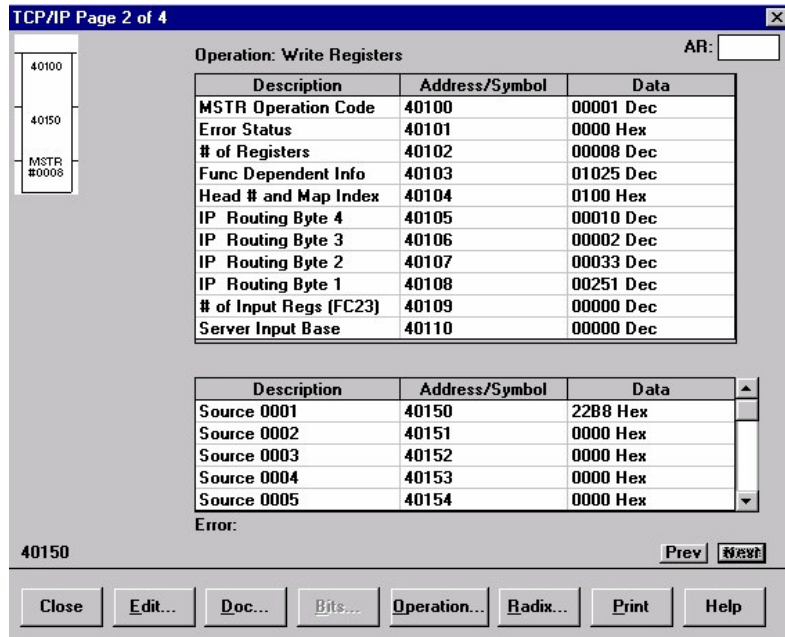


Figure 7 Write Registers

Allen – Bradley Contrologix

1. Start a new program and select the PLC processor and chassis type that will be used in your project. Our example uses a 1756-L55 processor and 1756-A7 chassis. Remain Offline until you are ready to download the program.
2. In the I/O configuration, select the Ethernet scanner. Right click on the I/O Configuration folder to select a New Module. Select the type of scanner module that will be used in the PLC. Refer to Figures 8 and 9

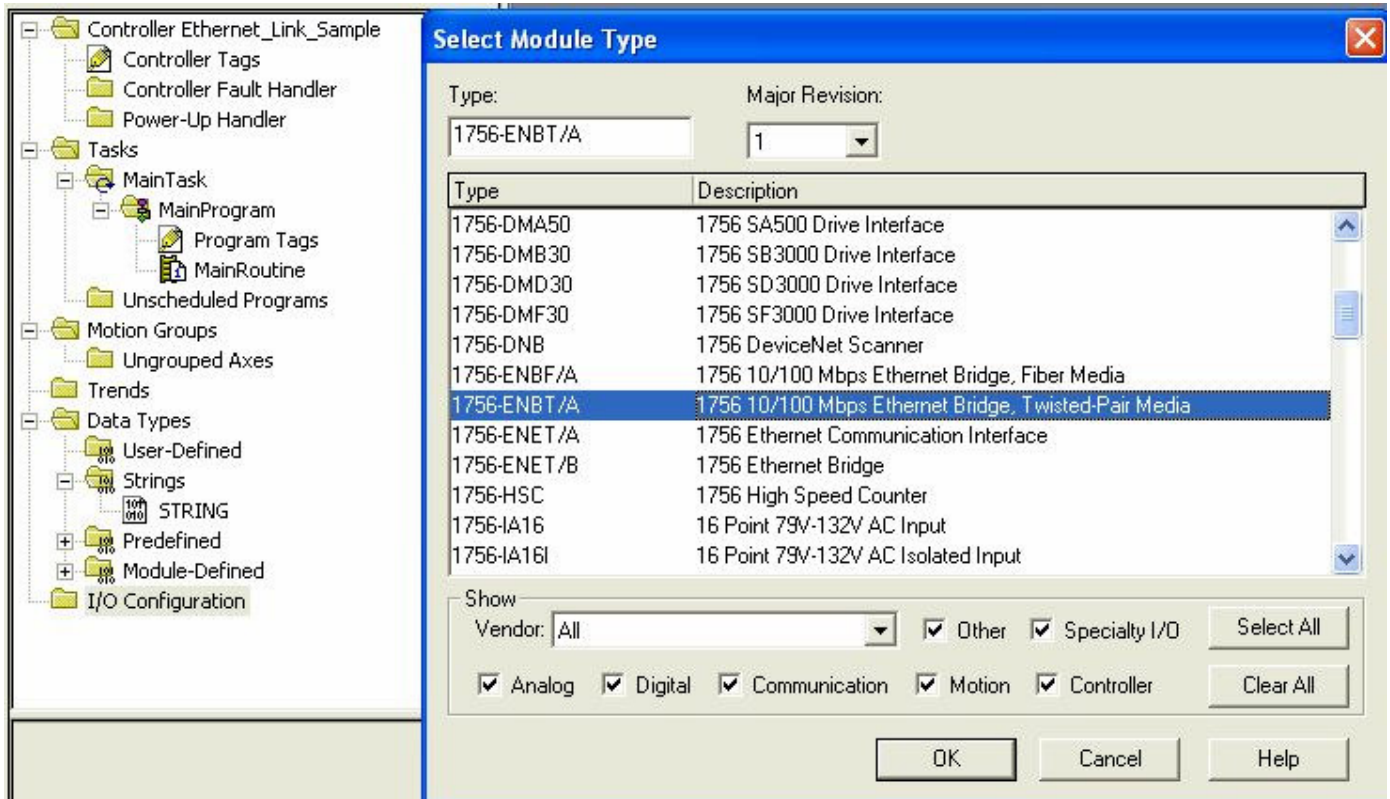


Figure 8. Selecting New Scanner Module

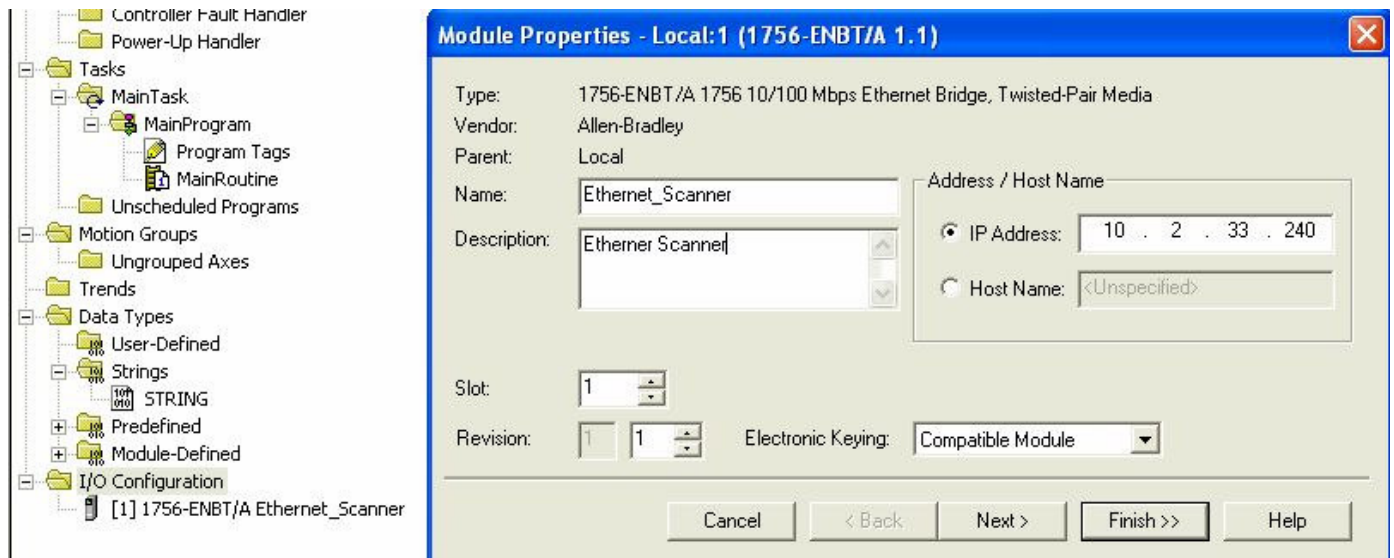


Figure 9. Scanner IP Address

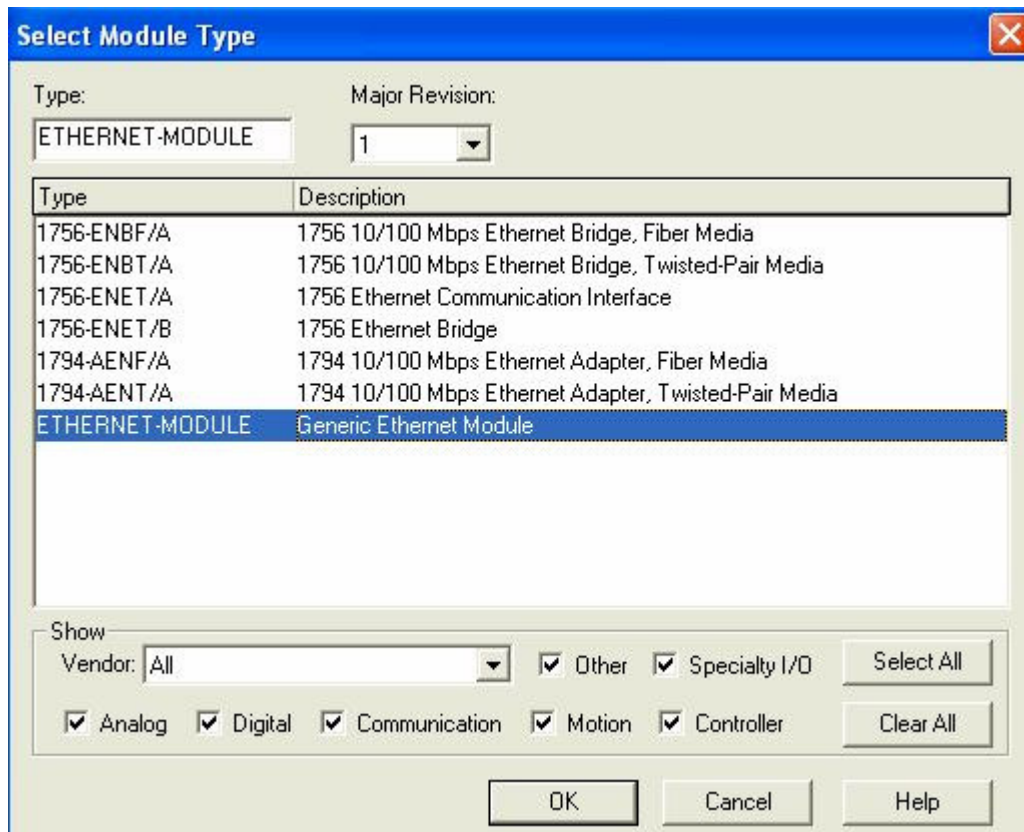


Figure 10. Module Selection

- Under the scanner card, add a new module. Right click on the scanner module and select New Module. Select Generic Ethernet module. Refer to Figure 10

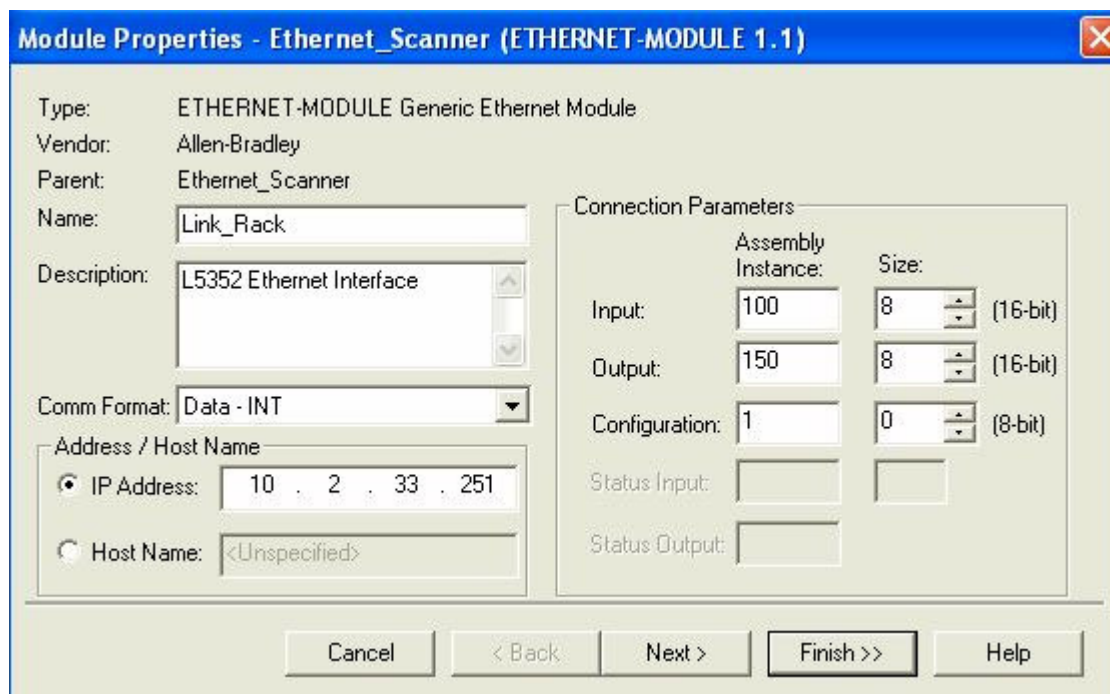


Figure 11. Module Addressing

4. This window allows you to name the module and to set network address, set data type (data-int), and set data size. The input Assembly Instance is 100 and the Size, 8, is the number of words configured in the Assembly Instance sent from the Link.. The output Assembly Instance is 150 and the Size, 8, is the number of words you are sending to LINK. The HMS Anybus Configuration assembly instance is 1 and the size is 0. The Comms Format is set for “DATA-INT” to allow transferring 16 bit words. Refer to Figure 11.
5. Click the NEXT button to set the Requested Packet Interval time. The default setting should be sufficient for most applications. When finished with the Requested Packet Interval screen, click the FINISH button to exit. Refer to Figure 12.

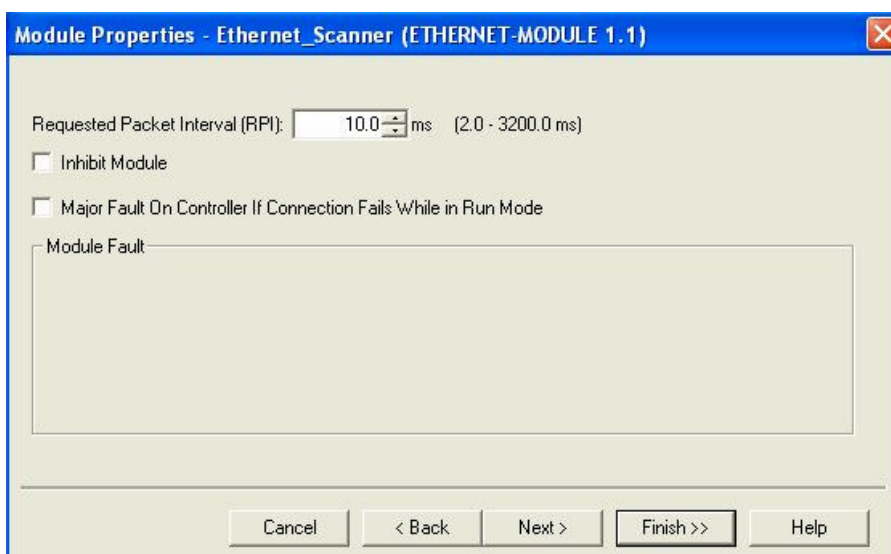


Figure 12. Requested Packet Setting

6. The RSLogix 5000 program configures your data types and I/O data points automatically.
7. Once the PLC programming is done for the LinkCard, the program can be downloaded to the PLC.
8. The PLC automatically creates a configuration data block. The block is always ends a "C". This block is part of every configuration. L5352_LinkRack C: 0 was created for this module. The type and size of the data is fixed, (Type: SINT, Size: 400 bytes). This configuration data block is created regardless of the configuration size. Figures 13 and 14 are examples of the data, input and output allocations and monitoring of the inputs and outputs.

Tag Name	Value	Force Mask	Style	Type
Link_Rack:C	{...}	{...}		AB:ETHERNET_...
Link_Rack:I	{...}	{...}		AB:ETHERNET_...
Link_Rack:I.Data	{...}	{...}	Decimal	INT[8]
Link_Rack:I.Data[0]	0		Decimal	INT
Link_Rack:I.Data[1]	0		Decimal	INT
Link_Rack:I.Data[2]	0		Decimal	INT
Link_Rack:I.Data[3]	0		Decimal	INT
Link_Rack:I.Data[4]	0		Decimal	INT
Link_Rack:I.Data[5]	0		Decimal	INT
Link_Rack:I.Data[6]	0		Decimal	INT
Link_Rack:I.Data[7]	0		Decimal	INT
Link_Rack:O	{...}	{...}		AB:ETHERNET_...
Link_Rack:O.Data	{...}	{...}	Decimal	INT[8]
Link_Rack:O.Data[0]	0		Decimal	INT
Link_Rack:O.Data[1]	0		Decimal	INT
Link_Rack:O.Data[2]	0		Decimal	INT
Link_Rack:O.Data[3]	0		Decimal	INT
Link_Rack:O.Data[4]	0		Decimal	INT
Link_Rack:O.Data[5]	0		Decimal	INT
Link_Rack:O.Data[6]	0		Decimal	INT
Link_Rack:O.Data[7]	0		Decimal	INT

Figure 13. Ethernet Data allocations for the PLC

Tag Name	Value	Force Mask	Style	Type
DriveTBeth:C	{...}	{...}		AB:ETHERNET_...
DriveTBeth:I	{...}	{...}		AB:ETHERNET_...
DriveTBeth:O	{...}	{...}		AB:ETHERNET_...
Link_Rack:C	{...}	{...}		AB:ETHERNET_...
Link_Rack:I	{...}	{...}		AB:ETHERNET_...
Link_Rack:I.Data	{...}	{...}	Decimal	INT[8]
Link_Rack:I.Data[0]	1		Decimal	INT
Link_Rack:I.Data[1]	0		Decimal	INT
Link_Rack:I.Data[2]	26849		Decimal	INT
Link_Rack:I.Data[3]	0		Decimal	INT
Link_Rack:I.Data[4]	0		Decimal	INT
Link_Rack:I.Data[5]	0		Decimal	INT
Link_Rack:I.Data[6]	0		Decimal	INT
Link_Rack:I.Data[7]	0		Decimal	INT
Link_Rack:O	{...}	{...}		AB:ETHERNET_...
Link_Rack:O.Data	{...}	{...}	Decimal	INT[8]
Link_Rack:O.Data[0]	0		Decimal	INT
Link_Rack:O.Data[1]	0		Decimal	INT
Link_Rack:O.Data[2]	0		Decimal	INT
Link_Rack:O.Data[3]	0		Decimal	INT
Link_Rack:O.Data[4]	0		Decimal	INT
Link_Rack:O.Data[5]	0		Decimal	INT
Link_Rack:O.Data[6]	0		Decimal	INT
Link_Rack:O.Data[7]	0		Decimal	INT

Figure 14. Monitoring PLC Inputs and Outputs

Appendix A Troubleshooting

L5352 Module Status LED

This bi-color (green - red) LED provides device status. It indicates whether or not the device is powered and operating properly. Table 1 defines the different states of the Module Status LED.

Table 1

<i>LED State</i>	<i>Status</i>	<i>Reason</i>
Off	Disabled	<ul style="list-style-type: none"> No power applied to the device Host LINK2 module is not running its configuration Hardware Fault Not Programmed in Link Configuration
Flashing Green	Device in standby or Card Initializing	<ul style="list-style-type: none"> Device needs commissioning due to missing, incomplete or incorrect configuration
Flashing Red	Configuration Error	<ul style="list-style-type: none"> Wrong Communication Option Selected Configuration not complete
Blink Red	Alive Announcement	<ul style="list-style-type: none"> Initiating Communications with the network
Green	Device operational	<ul style="list-style-type: none"> The device is operating in a normal condition
Red	Hardware fault	<ul style="list-style-type: none"> After configuration attempt the module faults

L5352 Network Status LED

This bi-color (green - red) LED indicates the status of the communications link. Table 2 defines the different states of the Network Status LED.

Table 2

<i>LED State</i>	<i>Status</i>	<i>Reason</i>
Off	Disabled	<ul style="list-style-type: none"> The device may not have power applied to it. Look at Module Status LED Not configured in the Link 2 Rack or Touch screen
Flashing Green	On-Line No Connection	<ul style="list-style-type: none"> Device is active on the network, but is not owned by a PLC Data Size Incorrect
Green	Link OK, On-line, Connected	<ul style="list-style-type: none"> Communication with the Ethernet Master, correct L5352 configuration

Appendix B Error Codes

Error Codes (Modbus Plus & SY/MAX Ethernet)

Error Status Register: 4xxxx + 1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 16#1001: User initiated abort.
- n 16#20ss: Invalid command errors.
- n 16#30ss: Modbus slave exception response.
- n 16#4001: Inconsistent Modbus slave response.
- n 16#5001: Inconsistent network response.
- n 16#6mss: Routing failure.
- n 16#F001: Selected S985 option is not present.

Invalid Command Errors

Error Status Register: 4xxxx+1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 2001: Invalid operation type.
- n 2002: User parameter changed.
- n 2003: Invalid length.
- n 2004: Invalid offset.
- n 2005: Invalid length + offset.
- n 2006: Invalid SDDA (Slave Device Data Area).
- n 2007: Invalid SDNA (Slave Device Network Address).
- n 2008: Invalid SDNR (Slave Device Network Routing).
- n 2009: Invalid route (= own address).

- n 200A: Global read request > available.
- n 200B: Peer Cop conflict on write/read global data.
- n 200C: Bad pattern for change address request.
- n 200D: Bad address for change address request.

Modbus Slave Exception Response

Error Status Register: 4xxxx+1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 3001: Illegal function request (not available in slave).
- n 3002: Illegal data address (not configured in slave).
- n 3003: Illegal data value (Read/Write data not valid).
- n 3004: Not used (unknown error).
- n 3005: Slave accepted long duration program command.
- n 3006: Requested function cannot be performed due to long command in progress.
- n 3007: Slave rejected long program command.

Routing Failures

Error Status Register: 4xxxx + 1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

Routing failure error code: 6mjj

- n 6m01: No response.
- n 6m02: Program access denied.
- n 6m03: Node is offline and unable to communicate.
- n 6m04: Exception response received.
- n 6m05: Route node data paths busy.
- n 6m06: Slave device down.
- n 6m07: Bad destination address.
- n 6m08: Invalid node type in routing.
- n 6m10: Slave rejected the Modbus command.
- n 6m20: Slave forgot initiated translation.

- n 6m40: Unexpected master output path received.
- n 6m80: Unexpected response received.

Note: m = index to location in the routing information where routing problem was discovered.

0 = local network station

1 = first device in route

2 = second device in route, etc.

Modbus Slave Exception Response

Error Status Register: 4xxxx+1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 3001: Illegal function request (not available in slave).
- n 3002: Illegal data address (not configured in slave).
- n 3003: Illegal data value (Read/Write data not valid).
- n 3004: Not used (unknown error).
- n 3005: Slave accepted long duration program command.
- n 3006: Requested function cannot be performed due to long command in progress.
- n 3007: Slave rejected long program command.

Technical Specifications

Environmental

Operating temperature	0° C to 50° C (32° to 122° F)
Storage temperature	-10° C to +70° C (14° to 158° F)
Humidity	85% RAH. in a dry, non-condensing environment
Enclosure Rating	Touchsafe IP20. To be mounted inside a Ssd L5300, or L5392 series enclosure

Supply Voltage

Supply Voltage	5VDC, supplied by backplane
Current Consumption	500 mA @ 5VDC
Power Dissipation	2.5 W

Ethernet

Connection Types	MODBUS TCP and ETHERNET IP protocols supported.
Baud Rate	10/100 Mbaud
Data Types	Unsigned Integers (<i>LINK</i> Ordinals)
Maximum Words	256 16 bit Words In / Out
Indicators supported	Network status bi-color LED, Module status bi-color LED
Configurability	LinkCard configuration performed using DSD. Ethernet network and PLC programmed independently
Connector type	RJ 45 Category 5 Twisted Pair Cable.

Physical

Height	120mm (4.72 in)
Width	32mm (1.25 in)
Depth	90mm (3.54in)
Weight	0.16 kg (0.35 lbs)

