



# L5355 Modbus Plus Communications Interface

## Technical Manual

HA470897 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**

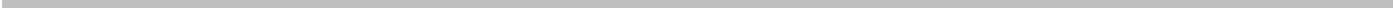
## IMPORTANT

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

## ACKNOWLEDGEMENTS

Drive System Designer, DSD is a registered trademark of SSD Drives Inc.

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



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# Chapter 1 System Overview

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## Product Features

- Suitable for use with Link modules:
  - L5392      LinkStation
  - L5300      LinkRack
- Connection using D-SUB connectors and twisted shielded pair cable
- LED's to indicate board and communications status
- Configured using Function Block inputs and outputs
- Diagnostics using Function Block outputs
- 1 MBaud
- Software-selectable Slave Address
- The Modbus Plus LinkCard is provided as a plug-in LinkCard
- MODBUS PLUS protocol supported
- 256 words in and 256 words out

## Product Code

Part Number: L5355 Modbus Plus LinkCard

## DSD Requirements

Software version: 1.15 or higher.

Database level: 1159 or higher.

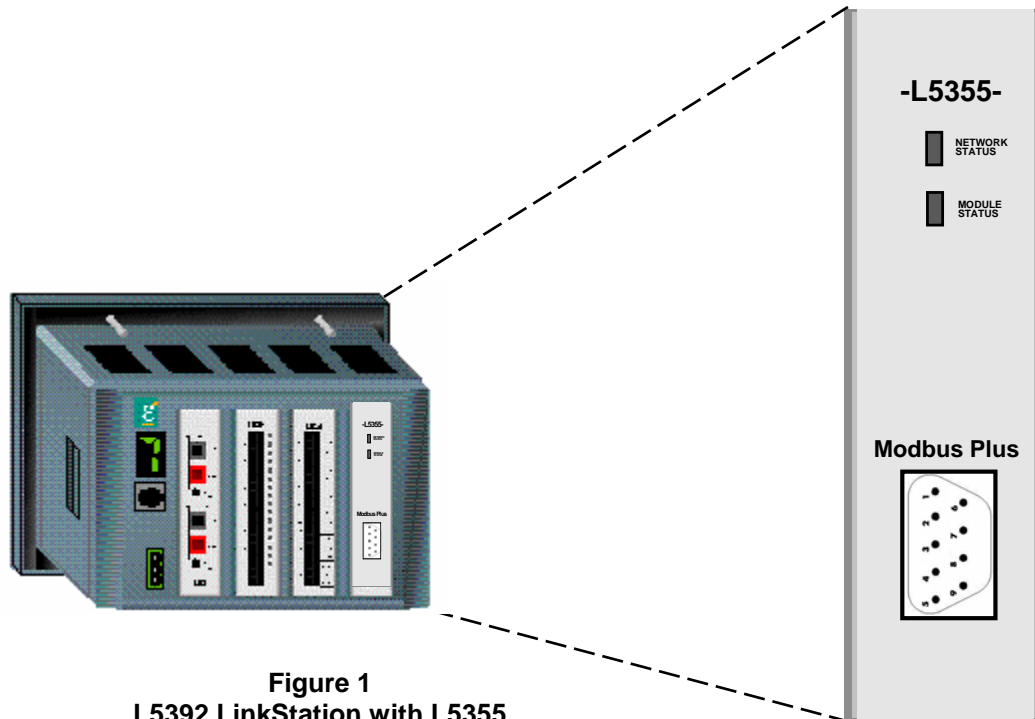
## Wiring the System

### **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.

## Chapter 2 Hardware Installation



**Figure 1**  
L5392 LinkStation with L5355  
Modbus Plus LinkCard

### Installing and Connecting the Modbus Plus LinkCard

#### **WARNING!**

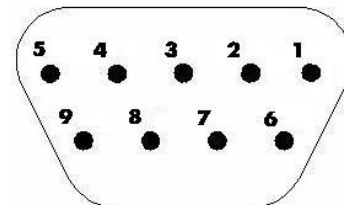
Prior to starting work on the LinkRack or LinkStation ensure all sources of power are isolated.

### Installing the Modbus Plus LinkCard

The Modbus Plus 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 Modbus Plus card into a slot in the LinkRack.
- Re-fit the back cover to the LinkRack.
- Make all user-wiring connections. Refer to Wiring Diagram, Figure 2.

PIN	NAME
1	Cable Shield
2	MBP Line B
3	MBP Line A
Housing	PE

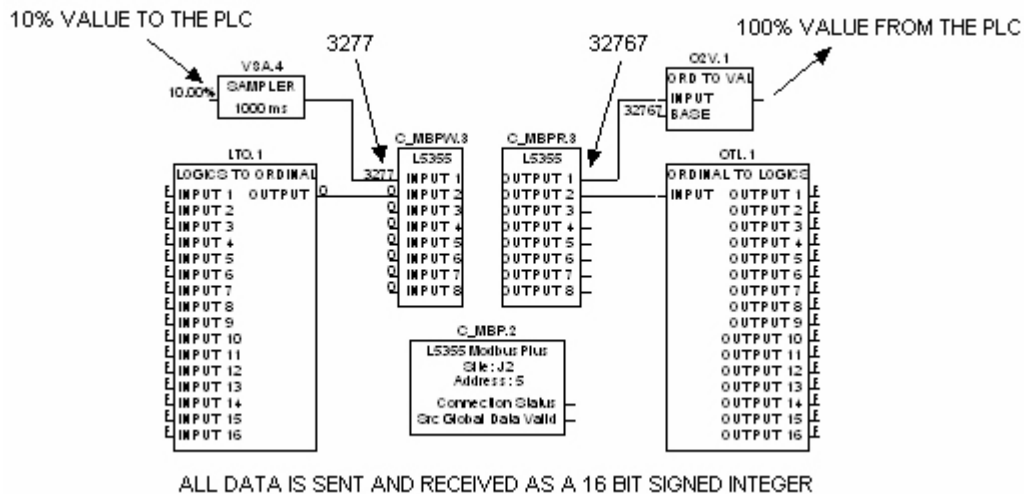


**Figure 2**  
9 pin D-SUB Connector

## Chapter 3 Configuring the LinkRack

This chapter contains examples for configuring the L5355 LinkCard using DSD.

1. Create the LINK configuration with Modbus Plus handler, Modbus Plus reader and Modbus Plus writer blocks that are required for the project. Insert the Modbus Plus reader blocks into the handler before inserting the Modbus Plus writer blocks. The LinkCard receives and transmits the data in the order the blocks are inserted into the handler block. Refer to Figure 3.
2. Double-click on the Modbus Plus handler block to enter the L5355 site address, node address and the Modbus Plus registers. The Modbus Plus reader and Modbus Plus writer registers are listed in the order in which the PLC/PC will communicate to the LinkRack. Refer Figure 4.
3. Load the LINK configuration first. The PLC or PC will connect once its configuration is installed. The configuration in the LINK module will equal the PLC or PC configuration size.

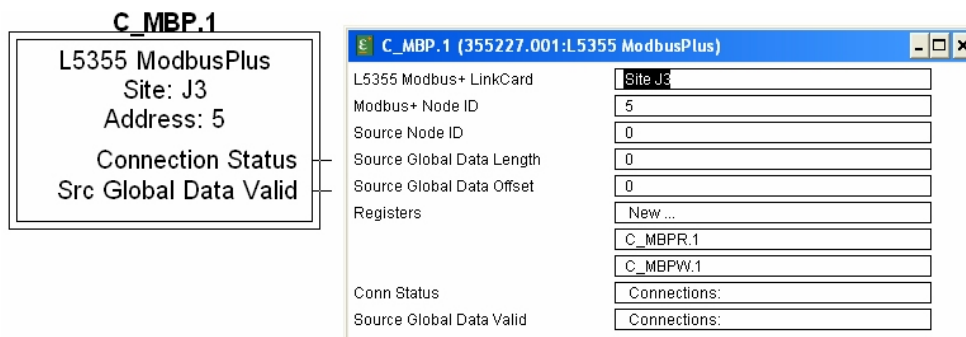


**Figure 3**  
**Basic LINK Setup**

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 4**  
**Modbus Handler Function Block**

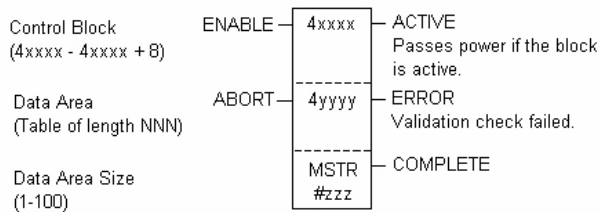
The L5355 LinkCard supports peer to peer data transfers. Global Data transfers perform the transfer of data between the different peers on the network. Source Node ID identifies the node where the data will be retrieved. Source Global Data Length identifies the quantity of data to be retrieved. Source Global Data Offset identifies the location of the data.

## Chapter 4 Configuring the PLC Supervisor

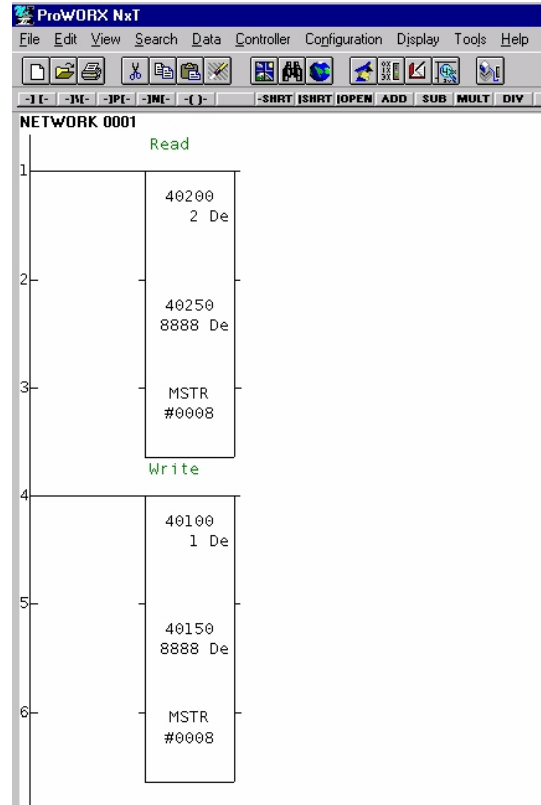
This chapter contains examples for configuring a Modicon Momentum PLC. The L5355 LinkCard supports the ModBus Plus protocol. Each example configures eight registers in each direction. Refer to Figures 4, 5, and 6.

### 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.



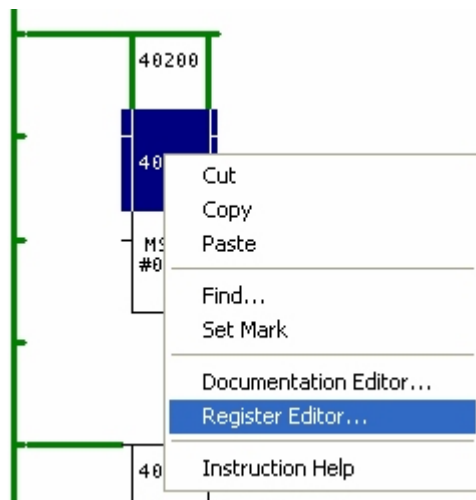
**Figure 5**  
Instruction Edit



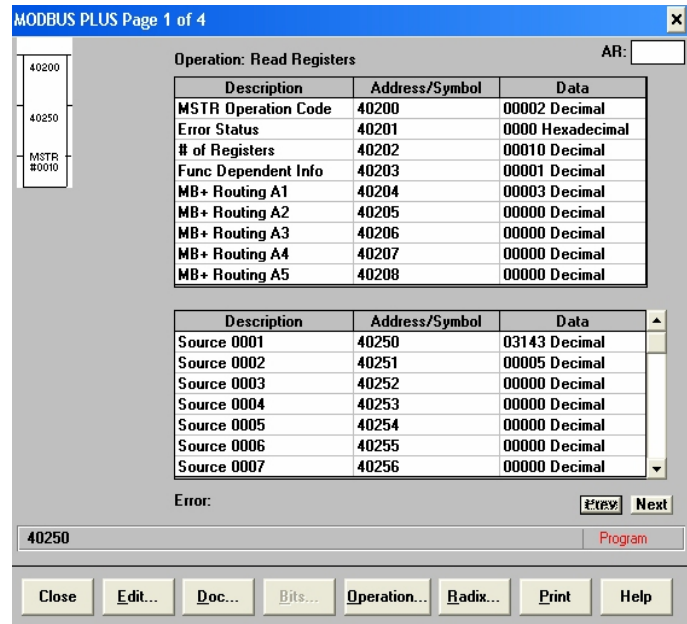
**Figure 6**  
PLC Ladder Logic Showing MSTR Blocks

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 L5355 and the Modbus Plus 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 L5355 LinkCard is Modbus Plus. The lower right hand corner has two buttons; use the NEXT or PREV buttons to select to Modbus Plus (page 1 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 Modbus + Routing A1 register identifies the Slave node on the Modbus Plus network.



**Figure 8**  
Register Editor



**Figure 9**  
Read Registers

## Appendix A Troubleshooting

### L5355 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

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

### L5355 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

<b>LED State</b>	<b>Status</b>	<b>Reason</b>
Off	Power off	<ul style="list-style-type: none"> <li>No power applied to the device</li> <li>Host LINK2 module is not running its configuration</li> <li>Hardware Fault</li> </ul>
Flashing Red	Initializing	<ul style="list-style-type: none"> <li>Card is initializing</li> </ul>
Red	Monitor_Link	<ul style="list-style-type: none"> <li>Listen only mode</li> </ul>
Flashing Orange	No-Token	<ul style="list-style-type: none"> <li>No communications from the Master device, with the network complete</li> </ul>
Solid Orange	Only_Station	<ul style="list-style-type: none"> <li>Only device on the network</li> <li>Open cable</li> </ul>
Flashing Green	Dup_Station	<ul style="list-style-type: none"> <li>Duplicate node on the Modbus Plus network</li> </ul>
Green	Normal_Link	<ul style="list-style-type: none"> <li>The device is operating in a normal condition</li> </ul>

## Appendix B Error Codes

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### Error Codes (Modbus Plus & SY/MAX Ethernet)

Error Status Register: 4xxx + 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: 4xxx+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.

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# Technical Specifications

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## 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	310 mA @ 5VDC
Power Dissipation	1.6 W

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## Modbus Plus

Connection Types	MODBUS TCP protocol supported.
Baud Rate	1 Mbaud
Data Types	Unsigned Integers ( <i>LINK</i> Ordinals)
Indicators supported	Network status bi-color LED, Module status bi-color LED
Configurability	LinkCard configuration performed using DSD. Modbus Plus network and PLC programmed independently
Connector type	9 pin D-SUB Connector with Twisted Pair Cable

## Physical Dimensions

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





