

Simple Package Measurement Connected Components Building Block



Allen-Bradley

Quick Start



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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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Throughout this manual, when necessary we use notes to make you aware of safety considerations.



WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequences.



Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

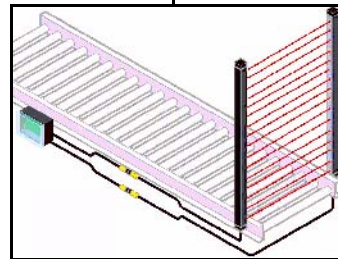


Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

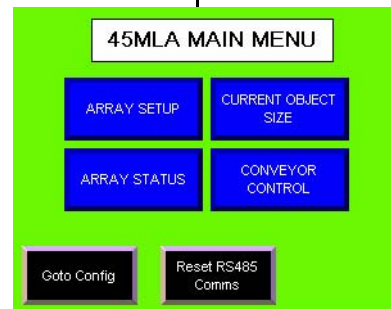
Follow the path below to complete your Simple Package Measurement application.

[Chapter 1 45MLA Controller Integration](#)

Connected Components
Building Blocks, publication
[CC-QS001](#)



[Chapter 2 System Validation and Application Tips](#)



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Notes:

Introduction

This connected control building block quick start was created to aid machine builders in implementing 45MLA Measuring Light Array sensors with MicroLogix controllers and PanelView Component terminals. This application demonstrates how an object's three-dimensional size can be determined by using three pairs of light arrays.

The application uses three pairs of light arrays, one for each dimension, each connected to its respective control interface that resides on an RS485 network. The MicroLogix controller program polls the controllers for array size and beam status information. The PanelView Component terminal displays beam status and object dimensions.

IMPORTANT

Use this Quick Start in conjunction with the Connected Components Building Blocks Quick Start, publication [CC-QS001](#).

Refer to [Additional Resources on page 9](#) for a listing of other related documents.

To assist in the design and installation of your system, application files and other information are provided on the Connected Component Building Blocks Overview CD, publication CC-QR001. The CD provides bills of materials (BOM), CAD drawings for panel layout and wiring, control programs, Human Machine Interface (HMI) screens, and more. With these tools and the built-in best-practices design, the system designer is free to focus on the design of their machine control and not on design overhead tasks.

The beginning of each chapter contains the following information. Read these sections carefully before beginning work in each chapter:

- **Before You Begin** - This section lists the steps that must be completed and decisions that must be made before starting that chapter. The chapters in this quick start do not have to be completed in the order in which they appear, but this section defines the minimum amount of preparation required before completing the current chapter.
- **What You Need** - This section lists the tools that are required to complete the steps in the current chapter. This includes, but is not limited to, hardware and software.
- **Follow These Steps** - This illustrates the steps in the current chapter and identifies which steps are required to complete the examples.

Conventions Used in This Manual

This manual uses the following conventions.

Convention	Meaning	Example
Check or uncheck	To activate or deactivate a checkbox.	Check Disable Keying.
Click	Click the left mouse button once while the cursor is positioned on object or selection.	Click Browse.
Double-click	Click the left mouse button twice in quick succession while the cursor is positioned on object or selection.	Double-click the application icon.
Right-click	Click the right mouse button once while the cursor is positioned on object or selection.	Right-click the 1768 Bus icon.
Select	Using the mouse to highlight a specific option.	Select the New Module folder.
Enter	What you type.	Enter your choice.
Press	Pressing a specific key on the keyboard.	Press Enter.
>	Use this symbol to indicate the sub-menu name.	Choose File>Menu>Options.

Additional Resources

Resource	Description
Connected Components Building Blocks Quick Start, publication number CC-QS001	Provides information on how to select products and gain access to panel and wiring information.
Connected Component Building Blocks Overview CD, publication number CC-QR001	Provides files for the Connected Component Building Blocks.
Installation Instructions 45MLA Measuring Light Array Sensors, publication number 10000035051(00)	Provides information on the installation and operation of the 45MLA Measuring Light Array sensors.
45MLA Controller Installation Instructions, publication number 10000035052	Provides information for installing the 45MLA Controller connections and DIP switch settings.
45MLA Measuring Light Array Controller User Manual, publication number 10000071139(00)	Provides information for using the 45MLA Measuring Light Array Controller.
MicroLogix 1100 Programmable Controllers Installation Instructions, publication number 1763-IN001	Provides information for installing the MicroLogix 1100 programmable controller.
PanelView Component HMI Terminals User Manual, publication number 2711C-UM001	Provides information for using the PanelView Component HMI Terminals.
http://www.ab.com/sensors/	Provides access to the Allen-Bradley sensor website.
http://www.ab.com	Provides access to the Allen-Bradley website.
http://www.rockwellautomation.com/knowledgebase	Provides access to self-service support.
http://www.rockwellautomation.com/components/connected	Provides access to the Connected Components website.

Notes:

45MLA Controller Integration

Introduction

This chapter provides step-by-step instructions for wiring and configuring the 45MLA Measuring Light Array sensors and controllers for operation with the MicroLogix 1100 controller and PanelView Component terminal.

Before You Begin

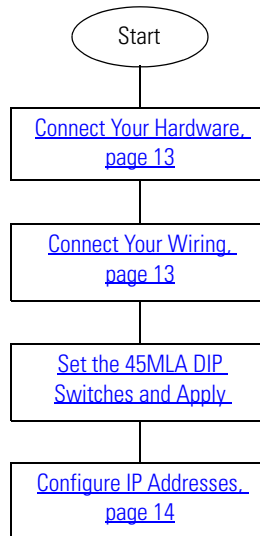
Review the Connected Components Building Blocks Quick Start, publication CC-QS001, verifying that you have completed hardware design and installation as well as software installation.

What You Need

- Connected Components Building Blocks Overview CD, publication CC-QR001
- Personal computer
- PanelView Component terminal
- MicroLogix 1100 controller
- Standalone Stratix Ethernet switch (1783-US05T or similar) to connect your personal computer to the MicroLogix controller and the PanelView Component terminal
- Ethernet patch cables (3)
- 45MLA light arrays and controllers
- RS485-to-ML1100 communications cable, catalog number 1763-NC01

Follow These Steps

Follow these steps to connect and set up your equipment.



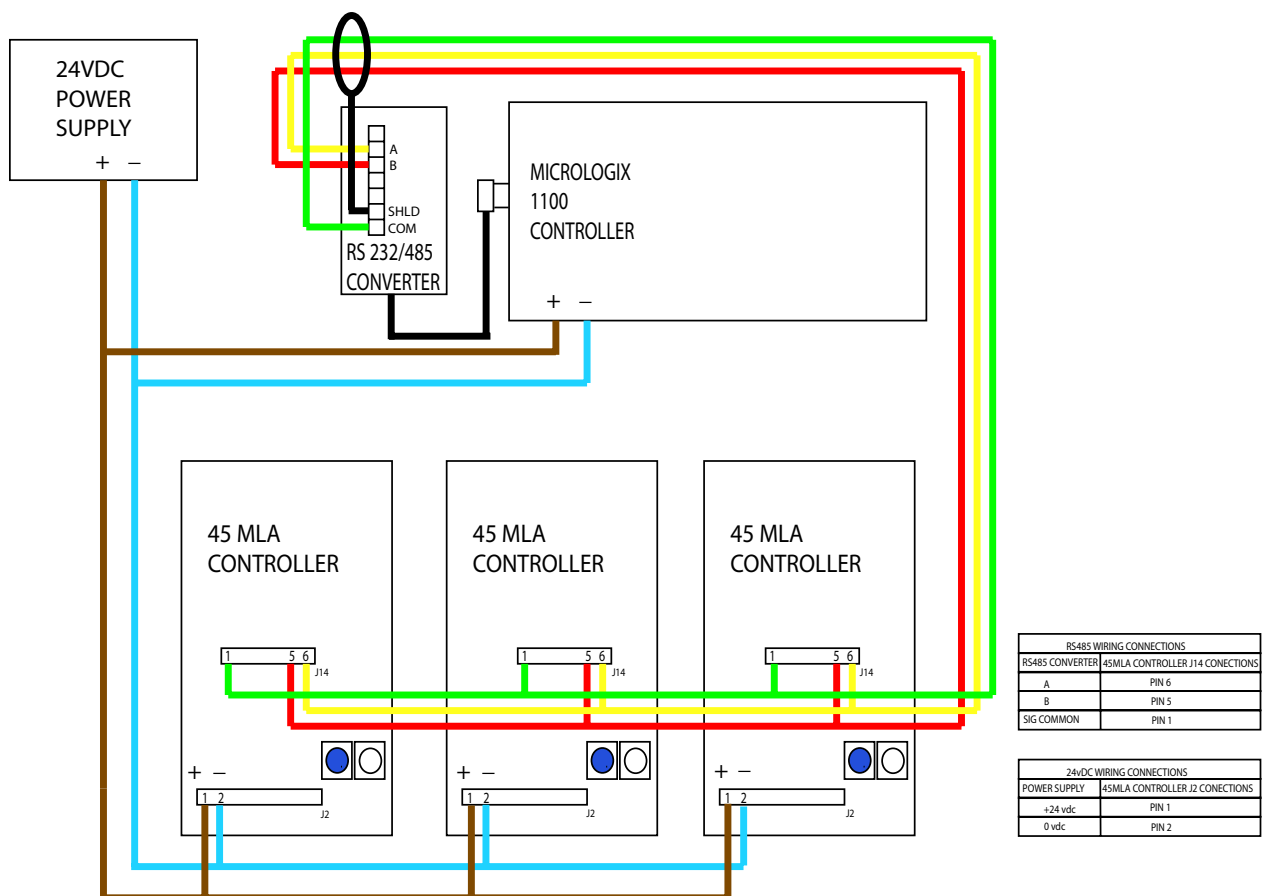
Connect Your Hardware

Using Ethernet patch cables, connect the PanelView Component terminal, MicroLogix 1100 controller, and personal computer to the Stratix Ethernet switch.

Connect Your Wiring

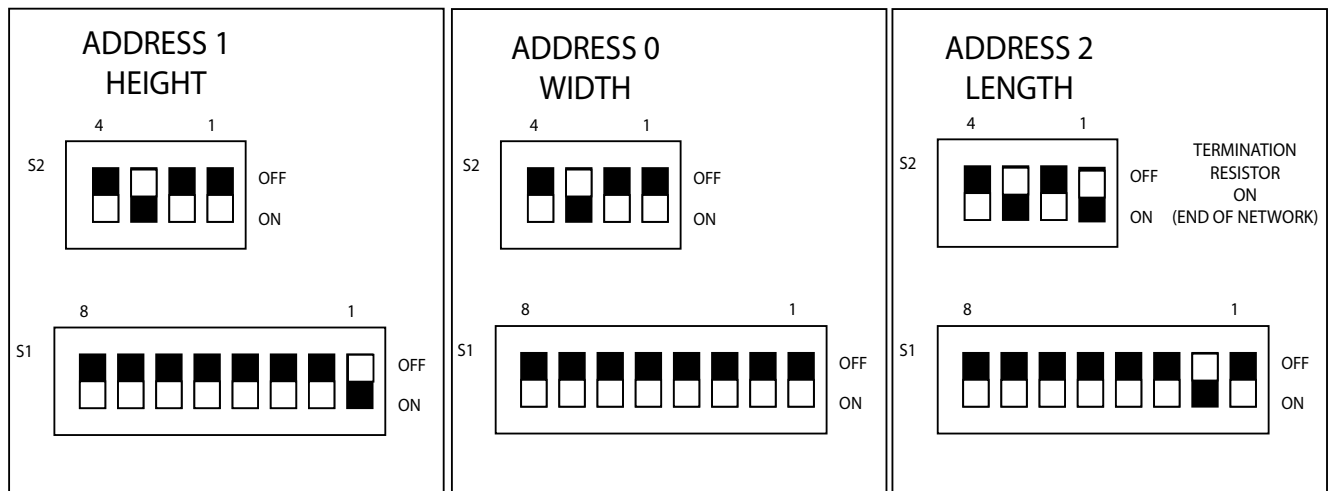
1. Connect 24V DC power and RS485 wiring to components according to this diagram.

24V DC Power and RS 485 Communication Wiring



Set the 45MLA DIP Switches and Apply Power

1. Set the 45MLA DIP switches to the settings shown here.



2. Apply power to the MicroLogix controller.
3. Apply power to the PanelView Component terminal.

Configure IP Addresses

In the Connected Components Building Blocks Quick Start, publication [CC-QS001](#), Chapter 3 - Controller and HMI Integration details how to set the Ethernet IP addresses in the MicroLogix 1100 controller and PanelView Component terminal. If you have not done this already, follow those instructions to set the following static IP addresses in your devices.

- Set the personal computer IP address to 192.168.1.102.
- Set the PanelView Component terminal IP address to 192.168.1.200.
- Set the MicroLogix 1100 controller IP address to 192.168.1.101.
- Follow the instructions in the Load Your HMI Screens section of Chapter 3 to transfer your HMI screens to the PanelView Component terminal.
- Follow the instructions in the Load Your Control Program section of Chapter 3 to transfer your control program to the MicroLogix controller for use in your application.

Additional Resources

Refer to [page 9](#) for a listing of product and information resources.

System Validation and Application Tips

Introduction

In this chapter, you will run and validate the operation of the 45MLA Measuring Light Arrays with the MicroLogix controller and PanelView Component terminal HMI.

Before You Begin

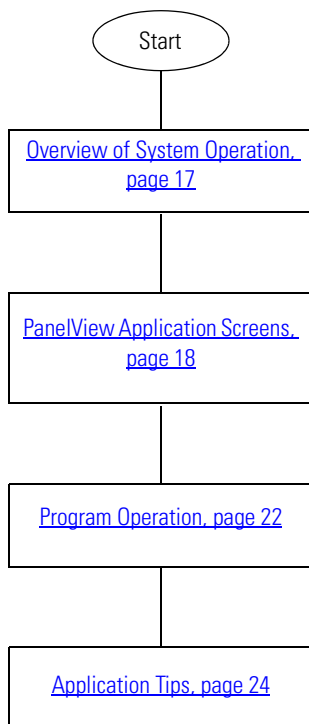
- Verify that you have completed all of the steps in [Chapter 1](#) of this document.
- Review the MicroLogix 1100 Programmable Controllers User Manual, publication number [1763-UM001](#).
- Review the PanelView Component HMI Terminals User Manual, publication [2711C-UM001](#).
- Review the 45MLA Measuring Light Array Sensors Installation Instructions, publication number [45MLA-IN001](#).

What You Need

- Connected Component Building Blocks Overview CD, publication CC-QR001
- Personal computer
- PanelView Component terminal
- 45MLA light arrays and controllers
- MicroLogix 1100 controller

Follow These Steps

Follow these steps to understand the operation of the 45MLA Measuring Light Array system, however, you can just go through Chapter 1 and then let the system run with the defaults.



Overview of System Operation

This application determines an object's three-dimensional size by using three pairs of 45MLA light arrays, one for each dimension, each connected to its respective control interface. The MicroLogix 1100 controller sequentially polls the 3 slave 45MLA controllers on the RS485 network for array size and beam status information. The PanelView Component terminal displays each beam status and the object dimensions.

In this example, we are using command 20. Command 20 requests information on the total number of beams broken, as well as the first and last interrupted beams and array size.

You can use other command instructions to poll additional data from the array controllers. Details of these other commands are in the 45MLA Measuring Light Array Controller User Manual, Publication Number [10000071139\(00\)](#).

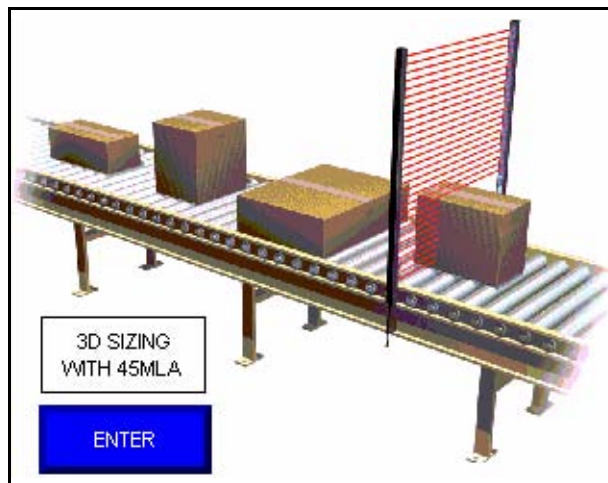
User interaction is via a PanelView Component terminal HMI. The HMI application has screens, details of which are below.

Note: This Building Block application was developed for a conveyor line, with the MicroLogix controller interfacing with 22ZC zone controllers. The MicroLogix code and HMI screens are provided, however they are not required to read data from the array controllers.

PanelView Application Screens

Home Screen

Press Enter to go to the application's Main Menu.

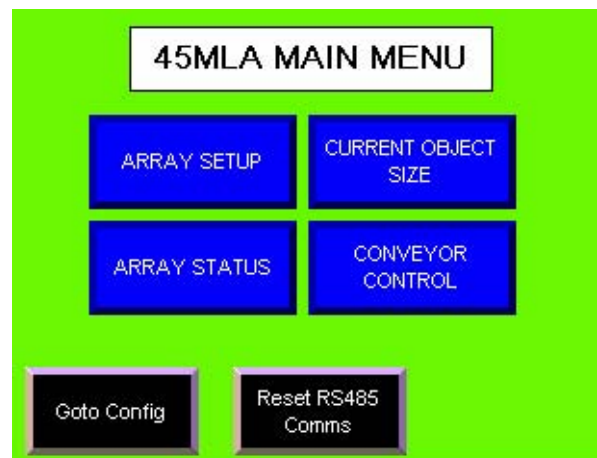


Main Menu

The Main Menu screen allows navigation between the four additional screens in the application: Array Setup, Current Object Size, Array Status, and Conveyor Control. These are explained in sections below.

Additionally, there are two buttons for Goto Config and Reset RS485 Comms.

- Press Go to Config to access the HMI's configuration.
- Press Reset RS485 Comms to clear the MicroLogix serial port communication buffer.



Array Setup Screen

On the Main Menu screen, press ARRAY SETUP.

The specific arrays are listed as text boxes in the left column, each with an enable/disable toggle button and an offset distance button to its right.

You can select which arrays are operational by pressing its ENABLE/DISABLE toggle button.

The offset feature, in the right column, allows the ability to add an offset distance to the array dimension that is measured. For example, this screen shot shows that the height array has an offset of 120mm, the distance between the conveyor and the lowest beam if measuring height above the conveyor.

The screenshot shows the 'Array Setup Screen' with a blue background. At the top left is a green button labeled 'RS485 COMS IN AUTO'. To its right is a white button labeled 'SELECT ARRAYS AND ENTER OFFSETS'. At the top right is a blue button labeled 'RETURN'. Below these are five rows of controls. Each row has a white text box on the left, a green 'ENABLED' toggle button in the middle, and a white offset input box on the right. The rows are: 'ARRAY' (no offset box), 'HEIGHT' (offset 120), 'WIDTH' (offset 0), 'LENGTH' (offset 0), and 'BEAM SPACING' (offset 10mm).

Array	Toggle	Offset
ARRAY	ENABLED	
HEIGHT	ENABLED	120
WIDTH	ENABLED	0
LENGTH	ENABLED	0
BEAM SPACING		10mm

To enter an offset for an array:

1. Press the OFFSET button for that array.
This displays the numerical input pad.
2. Enter the offset desired in millimeters.
Information for calculating the offset can be found in [Establishing an Offset Value](#) on [page 25](#).
3. Press Enter.

To set RS485 communications, you can toggle between Auto and Manual polling of the 45MLA controllers by pressing the RS485 COMS button in the upper left of the screen. The button text toggles between RS485 COMS IN AUTO and RS485 COMS IN MANUAL, showing the current operation.

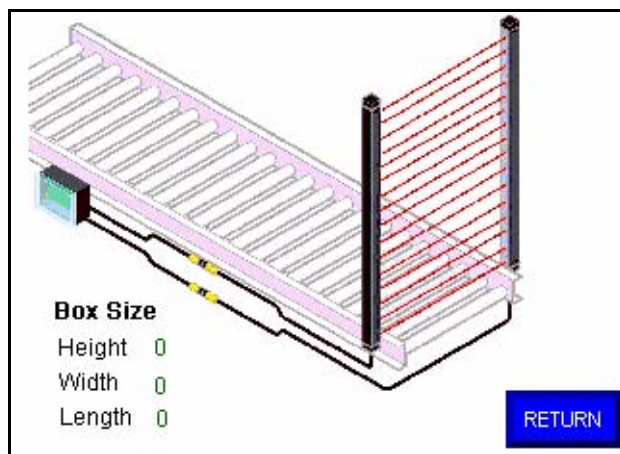
To set beam spacing, press BEAM SPACING at the bottom of the screen. This toggles the beam spacing multiplier in the MicroLogix controller to either 10mm or 25mm based on the array model used in the application.

Current Object Size Screen

On the Main Menu screen, press CURRENT OBJECT SIZE.

This screen provides a real-time animation of the arrays' status. Height, width, and length dimensions are displayed.

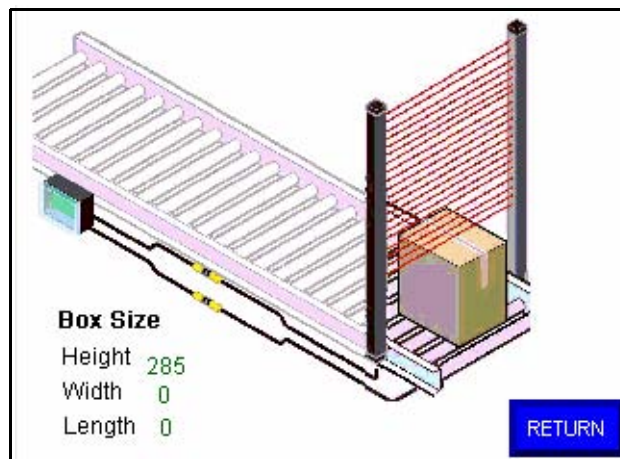
This graphic shows no object present, so the array is clear.



This graphic shows a box is present, so the height array indicates that measurement.

Note:

The PanelView graphic only includes the height array in the picture. However, numeric values for all three dimensions are displayed when all three pairs of light arrays are installed.



Array Status Screen

On the Main Menu screen, press ARRAY STATUS.

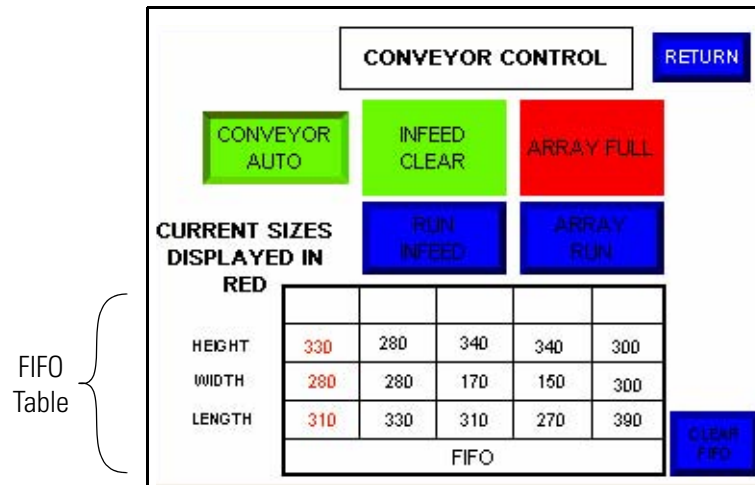
Raw data returned from the individual array controllers is displayed in table format.

ARRAY DATA				RETURN
	HEIGHT	WIDTH	LENGTH	
FIRST BEAM BROKEN	1	1	1	
LAST BEAM BROKEN	21	30	31	
# BEAMS BROKEN	21	30	31	
# BEAMS IN ARRAY	30	30	60	
	ADDRESS 1	ADDRESS 0	ADDRESS 2	

Conveyor Control Screen (Optional)

On the Main Menu screen, press CONVEYOR CONTROL.

Use this function as needed using the function descriptions below.



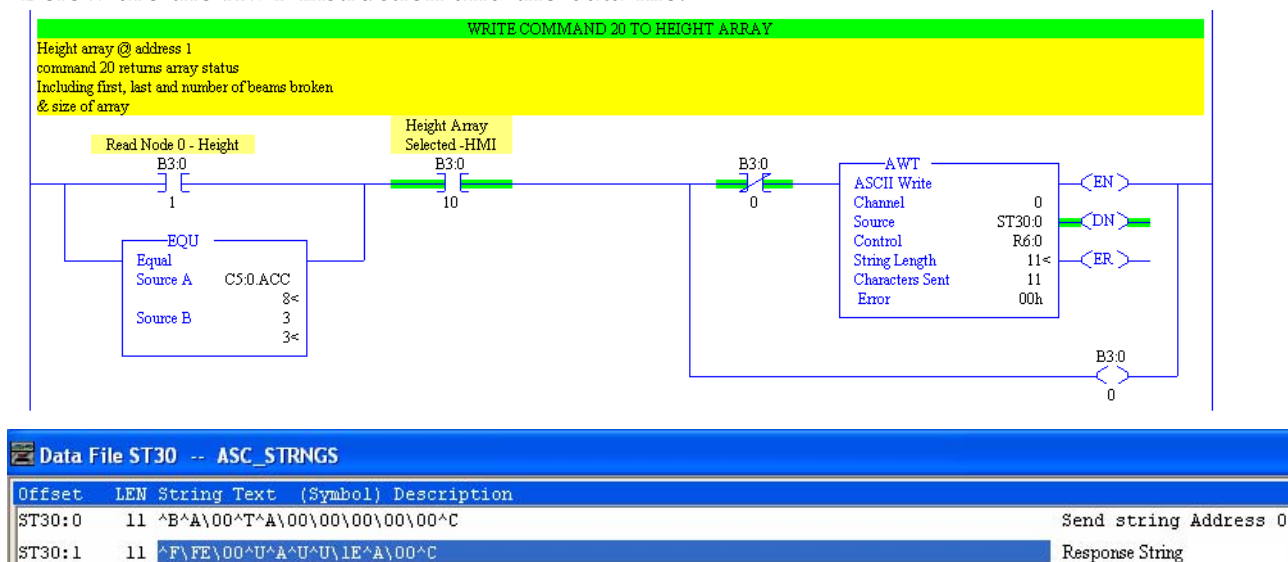
Buttons and Indicators	Function
RETURN button	Returns display to the Home screen.
CONVEYOR AUTO/MANUAL button	<p>This is a toggle button.</p> <p>Auto Mode: The boxes are released from the array measuring zone after a two-second delay into the next downstream zone if it is clear.</p> <p>Manual mode: Requires the user to release the product from the array measuring zone by pressing the Array Run button on the HMI.</p>
INFEED CLEAR indicator	Displays the status of the infeed zone based upon the status of the infeed photoeye.
RUN INFEED button	Runs conveyor if the infeed photoeye is clear.
ARRAY FULL/CLEAR indicator	Displays the status of the array measuring zone based upon the status of the infeed photoeye.
ARRAY RUN button	Releases product from the array measuring zone into the next downstream zone if that zone is clear. This button is only visible in Manual Mode.
FIFO (First In, First Out) table	<p>Displays the sizes of the last five products that were measured. The size of the most recent measurements is displayed in red in the left-hand column. As additional product is measured, the prior measurements transition to the next column to the right.</p> <p>Note: The FIFO table is incremented using a trigger sensor connected to I1:0/0 of the MicroLogix controller.</p>
CLEAR FIFO button	Resets all integers in the FIFO table to 0.

Program Operation

This section is an example which describes the process of communication between the MicroLogix controller and the light array at address 1, which is for height. Width and length arrays operate similarly.

1. Counter C5:0 is used to control the timing of the various communication instructions. In this example, when the accumulated value of counter C5:0 equals 3, the ASCII Write (AWT) instruction to the height array is enabled.
2. The contents of ST30:0 (the Read command “20”) are sent out of channel 0 of the MicroLogix controller to the height array at node address 1.

Below are the AWT instruction and the data file.



3. The height array responds by sending the requested data back to channel 0 of the MicroLogix controller.
4. The ASCII Read (ARD) instruction enables and the response is saved into ST30:1 in the MicroLogix controller.

This is the ARD instruction:



5. The MicroLogix controller then calls subroutine 4, which extracts the string data returned and stores it in Data File N12.

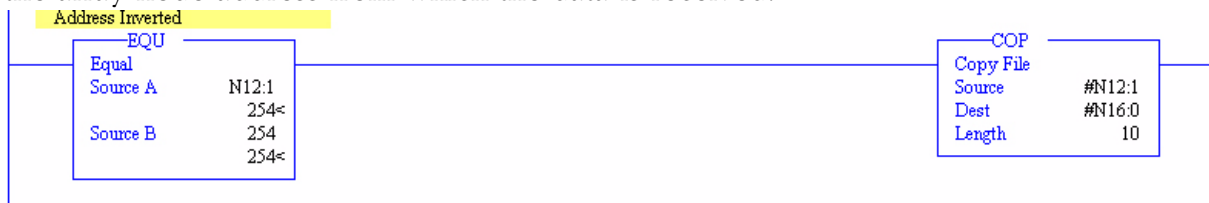
N12 Data File - Response format:

Data File N12 (dec) -- RESPONSE -- Response String Parsed into Bytes										
Offset	0	1	2	3	4	5	6	7	8	9
N12:0	6	254	0	21	1	22	22	30	1	0
N12:10	1536	0	0	0	256	22	5632	0	256	1

In this case, the values shown in N12:0 can be interpreted as follows.

N12	Current Value	Description
:3	21	Command number +1
:4	1	First beam interrupted
:5	22	Last beam interrupted
:6	22	Total number of beams interrupted
:7	30	Number of active beams in the array
:8	1	Overheight status
:9	0	Overhang status

6. The MicroLogix controller writes the extracted data to one of three data files, depending on the array node address from which the data is received.



The individual array response data from node 1 is now in data file N16 and the product size is calculated as detailed below:

- Last Beam – First beam + 1 = Object Size (in number of beams)
- Object Size x Beam Spacing = Measured Dimension (in mm)
- Measured Dimension + Offset = Height (in mm)

Application Tips

Finding Communication Faults

If there is no communication response from arrays, do the following:

- Check DIP switch settings.
Refer to [Set the 45MLA DIP Switches and Apply Power](#).
- Check the AWT Instruction.
It should show Characters Sent =11.
- Check the ARD Instruction.
It should show Characters Read =11.
- Check for an error code in the AWT ARD instruction.
Refer to RSLogix Help files for debugging information.
- Reset RS485 communications using the HMI.
Press the Reset RS485 Comms button on the Main Menu.
- Ensure the correct string is being sent to the 45MLA controller.
See below:

ST30:0	Address 1	^B^A\00^T^A\00\00\00\00\00^C
ST30:2	Address 0	^B\00\00^T^A\00\00\00\00\00^C
ST30:3	Address 2	^B^B\00^T^A\00\00\00\00\00^C

Adding Additional Arrays

To add additional arrays to your application, do either of the following:

- Add an additional string and edit the node address (second byte) within the string.
- Create a similar rung to enable AWT instruction, and change the string address and R6 instruction control word to the new references.

Additional Resources

Refer to [page 9](#) for a listing of product and information resources.

Offset Values, Component Versions, and Commands

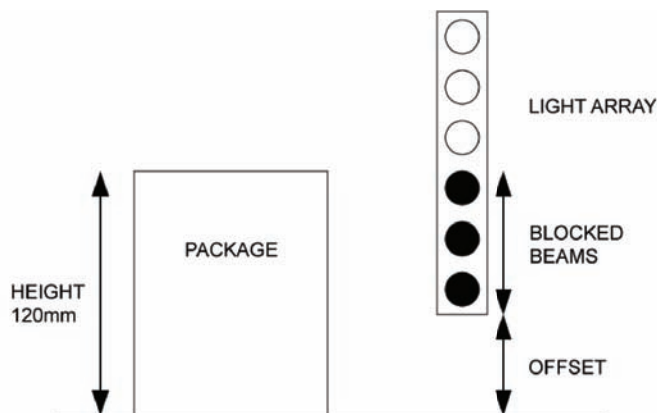
Establishing an Offset Value

To establish an offset value, follow these steps.

1. Place a package of known height in front of the array.
2. Calculate the offset: $\text{Offset} = \text{height} - (\text{number of blocked beams} \times \text{beam spacing})$

Example:

- Height = 120mm
- 3 beams at 10mm = 30mm
- Offset = 120mm - 30mm = 90mm



Hardware, Firmware, and Software Component Versions

Component	Versions
PanelView Component 600 Terminal	Boot Code: 1.01 Firmware: 1.01
RSLogix 500 Pro software	Software: 8.10.00 (CPR 9)
MicroLogix 1100 Controller, catalog number 1763-L16BBB	Firmware: 5.0
45MLA Controller	Hardware: 1.22 Software: 1.30

Commands

The general RS485 protocol architecture (hex) table below details the string structure (request and response) in bytes between the MicroLogix controller and the 45MLA controller.

Direction			Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	
Master (PLC) to 45MLA Controller	STX (02)	Address (DIP switch)	Command High byte	Command Low byte	Data (typically zeroes)						ETX (03)
45MLA Controller to Master (PLC)	ACK (06)	Inverted (Address)	Command High byte	Command Low byte	Data						ETX (03)

This table shows the response to command 20 (14 hex).

Response 21 [15 Hex]			
Byte	Bit	Value	Description
1 + 2		21 Dec	Response number
		15 Hex	
3	0-7	0	No beam interrupted
		1-254	First interrupted beam
4	0-7	0	No beam interrupted
		1-254	Last interrupted beam
5	0-7	0	No beam interrupted
		1-254	Total number of interrupted beams
6	0-7	1-254	Number of used beams
7	0-1	0	No overheight
		1	Overheight
8	0-1	00	No overhang
		01	Front overhang
		10	Back overhang
		11	Front and back overhang

For further information on these commands, refer to the 45MLA Measuring Light Array Controller User Manual, Publication Number [10000071139\(00\)](#).

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running.

United States	1.440.646.3434 Monday – Friday, 8 a.m. – 5 p.m. EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need to be returned.

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

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