MultiSight™ EtherNet/IP™ Network and RSLogix™ 5000 Add-On Profile

USER MANUAL

48MS

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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 on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be on or inside the equipment (for example, drive or motor) to alert people that surfaces may reach dangerous temperatures.

We recommend that you save this user manual for future use. The following symbols are used in this manual for clarification.

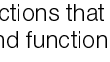
	This symbol indicates supplemental sections of the text which contain useful tips.
	Identifies features and functions that are only available with EtherNet/IP models. These features and functions are not available on the standard MultiSight models.

Table of Contents

Introduction

The Allen-Bradley MultiSight Vision Sensor from Rockwell Automation is an optical multi-pixel sensor with a pass/fail PNP output. The MultiSight uses four different methods of evaluation (pattern matching, contrast, brightness, and contour matching) to detect or differentiate objects by means of previously defined optical characteristics, e.g. for separating “good” and “bad” parts. The main applications are in the field of industrial automation for quality assurance purposes. The MultiSight features an optional EtherNet/IP interface with an RSLogix 5000 Add-On Profile for ease of integration in a Logix-based control system. The MultiSight is an easy-to-use economical alternative to conventional vision systems for detecting presence or absence, completeness, position, markings, labeling, packaging, and components.

This document describes the EtherNet/IP interface and RSLogix 5000 Add-On Profile. For more information on how to install and configure the MultiSight, please see the *MultiSight User Manual* (Publication 10000000877). For additional information on the MultiSight Vision Sensor, please see the product web page at: *http://www.ab.com/go/multisight*.

Related Hardware and Software

The following hardware and software are required to fully implement the EtherNet/IP capabilities of this product. (Partial implementations can be achieved with other EtherNet/IP based systems.)

Hardware:

- ControlLogix® or CompactLogix™ Programmable Automation Controller
- EtherNet/IP Interface (such as external 1756-ENBT module or the integrated interface of the 1769-L35E CompactLogix controller)

Software:

- RSLogix™ 5000 V15 and above
- MultiSight configuration software (included with MultiSight sensor)

Network Connection

For complete information on network connections and wiring diagrams, please see the User Manual. The following information is a subset of that document.

IP Configuration

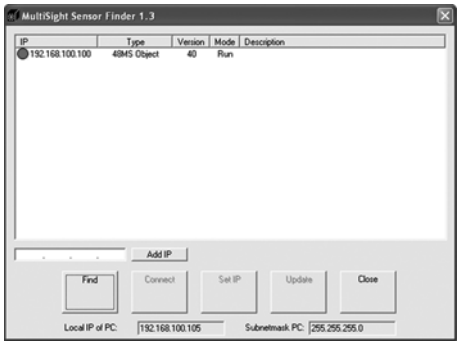
Setting the IP Address of the MultiSight

IMPORTANT	Contact the system administrator to determine which IP addresses are allowed on your network for the MultiSight. The IP address set for the MultiSight should be marked on the enclosed label. After installation, stick the label on the sensor in a clearly visible position.

Before setting the IP address, make sure that the computer is connected as described in “Electrical Installation” and “Basic Computer Settings” (see “Electrical Installation” on page 8 and “Basic Settings for PC and MultiSight” on page 12 of the *MultiSight Vision Sensors User Manual*).

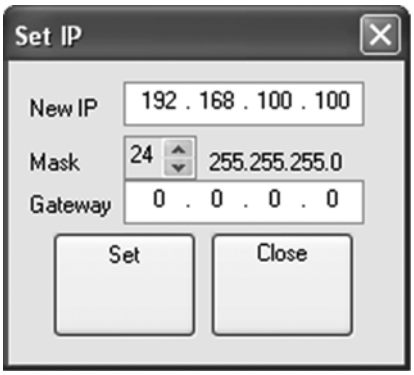
To set the IP address on the MultiSight, proceed as follows in the PC software:

1. Open the MultiSight software.
2. Click on the “Find” button. After a few seconds, a list of sensors in the network appears. If this does not happen, repeat the Find process.
3. Select the desired sensor by clicking on it.



4. Click on the “Set IP” button and enter the desired IP address for the MultiSight (same as the IP address of the PC except for the last block, see “Basic Settings for PC and MultiSight” on page 12 of the *MultiSight Vision Sensors User Manual*). Click Set to accept.

   It is possible to adjust the subnet mask and standard gateway using the set IP function. It is recommended to not change these settings unless necessary.



IMPORTANT	It is not possible to see a MultiSight on a different standard gateway than your PC using the sensor finder function.

5. Switch the power to MultiSight off and on again, and click on Find again to locate the sensor with the newly assigned address.

Note: the period between the sensor re-start and successful Find is approx. 6 sec. If necessary, repeat Find operation.

The MultiSight is now ready for operation at the newly-assigned IP address.

For network operation use only IP addresses which have not already been assigned.

MultiSight Featuring EtherNet/IP Set-Up on an EtherNet/IP™ Network

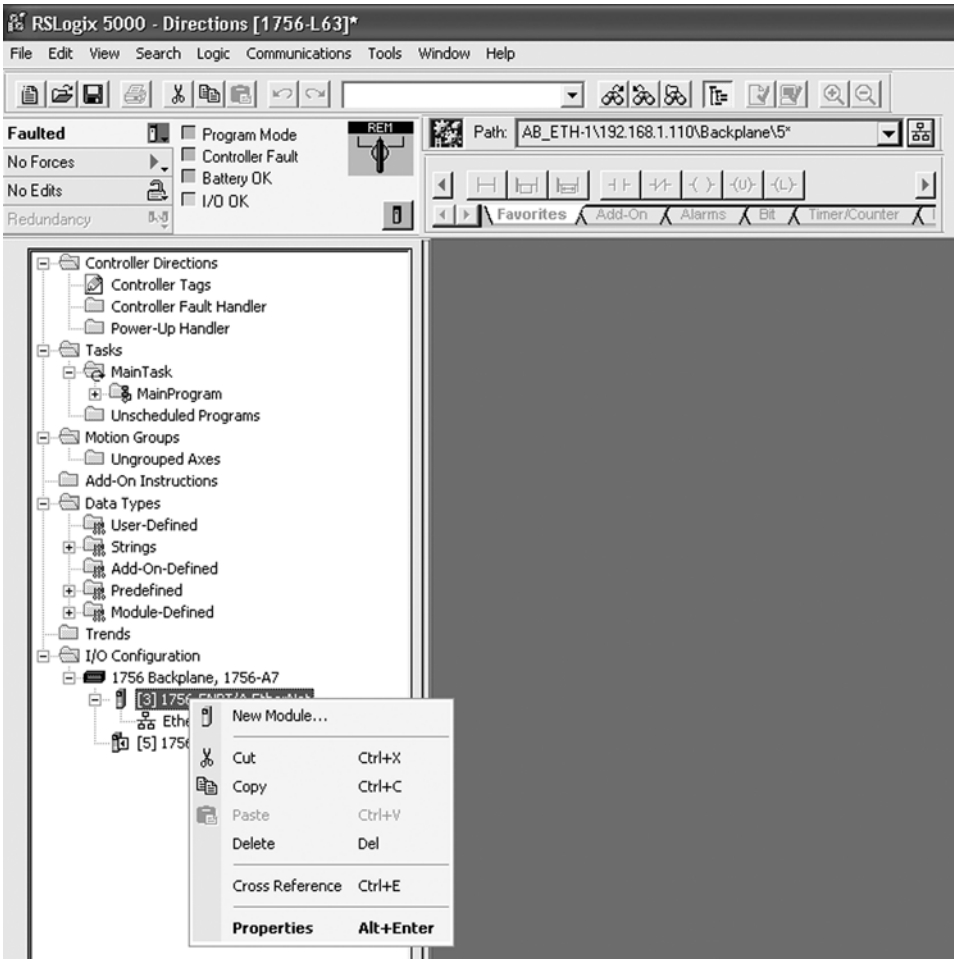
The following is a summary of the steps required to add a MultiSight to the EtherNet/IP network and begin programming.

- Add the MultiSight to the project’s EtherNet/IP Bridge module under the I/O configuration in RSLogix 5000.

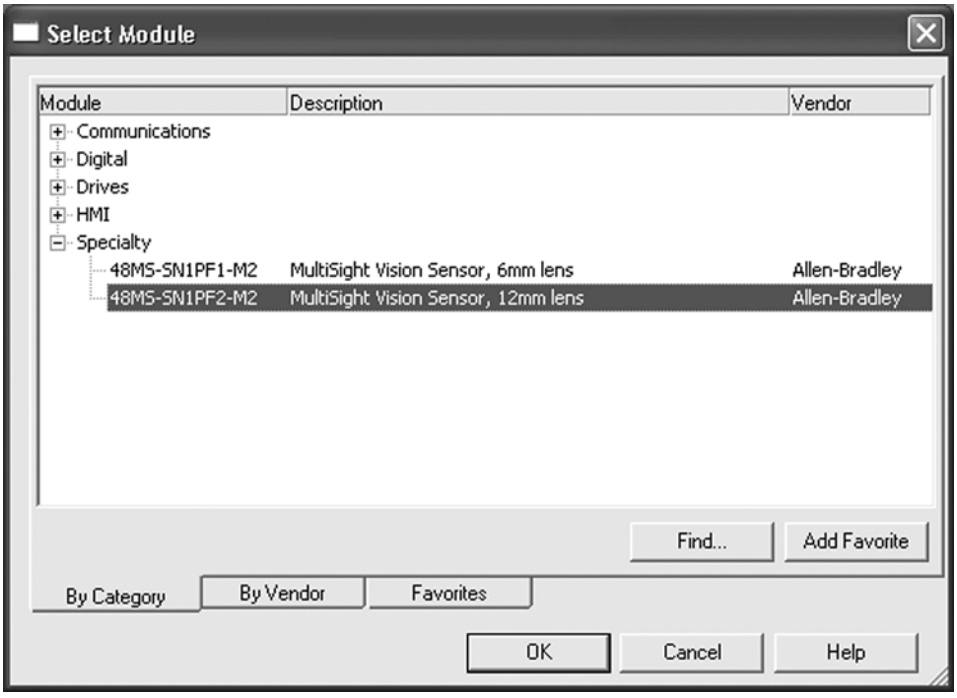
The MultiSight must be assigned to an EtherNet/IP Bridge module listed under the I/O configuration.

To assign the MultiSight, locate the EtherNet/IP Bridge Module under the I/O configuration tree listed in the controller organizer. Right click on the module and a context sensitive

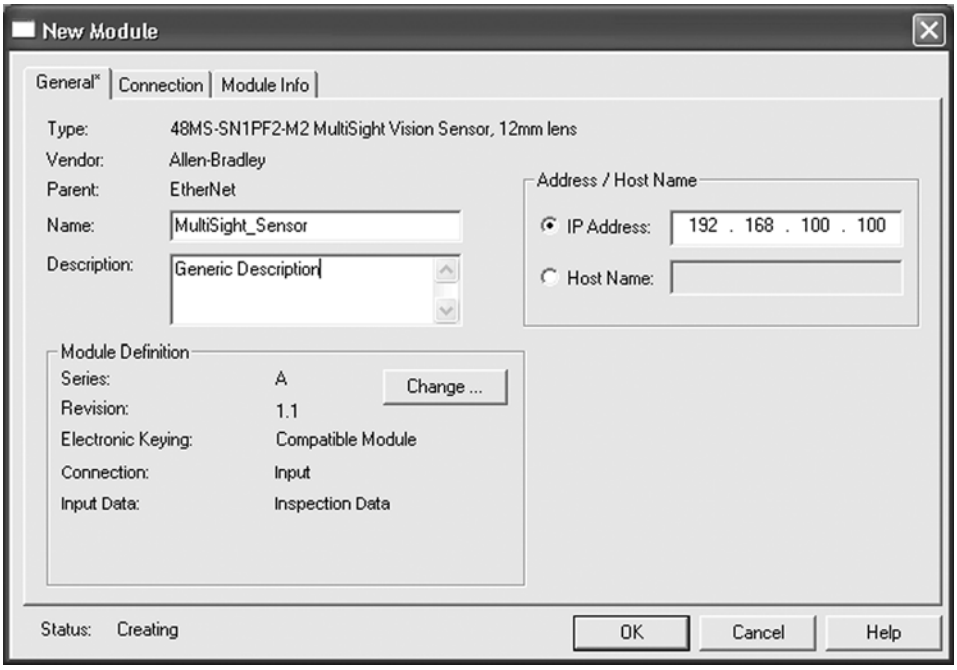
menu appears, from which you can select a new module. Use this dialogue to select and create a new module.



Using the Select New Module Type dialogue find the module type based on the MultiSight part number you are using. For instance, if you are using the 12mm lens model, choose 48MS-SN1PF2-M2 from the selection list. The MultiSight sensors are located under the Specialty Module Type.



Now the Module Create Wizard will appear. Use this tab to enter the appropriate information for your configuration.



Name

Assign a name to the MultiSight. This name will be used for all tags related to this specific device.

Description

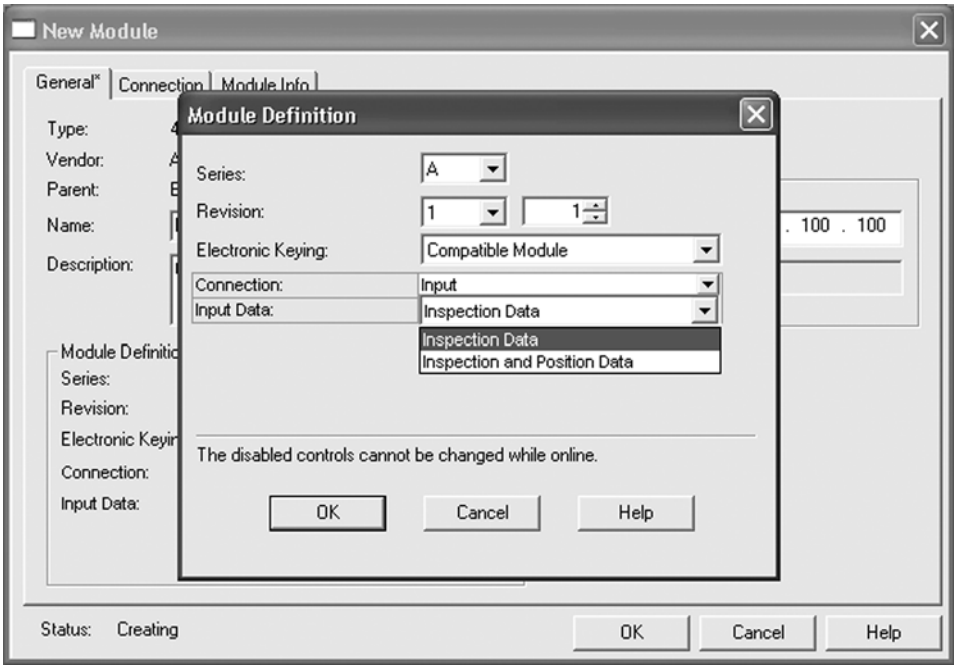
Enter a description for the module here, up to 128 printable characters are allowed.

IP Address

Enter the IP Address that was assigned to the device using the MultiSight configuration software.

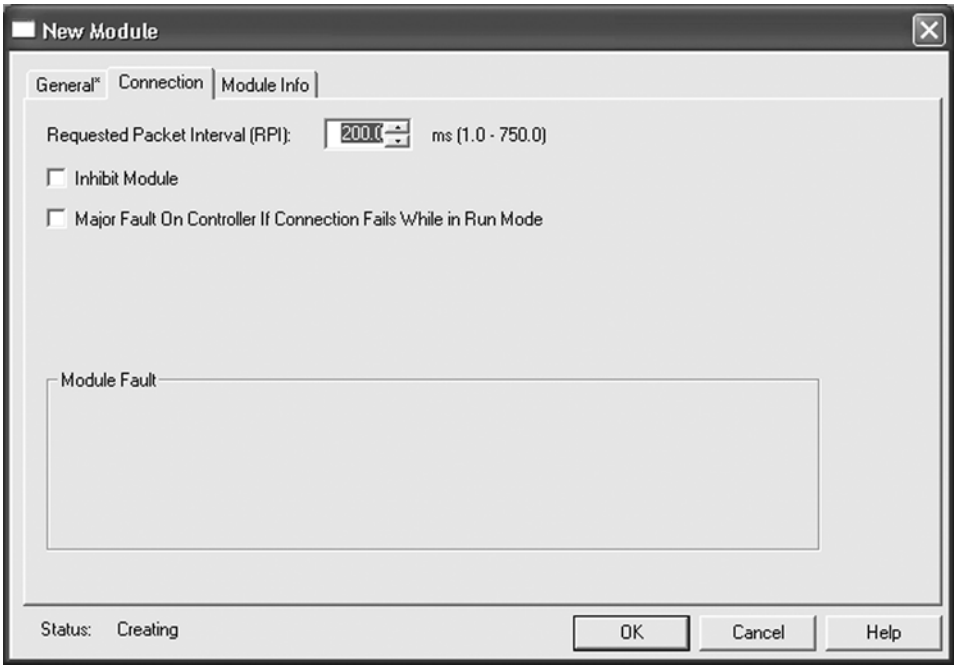
Module Definition—Selecting Input Data Type

For control and basic inspection results, use the default “Inspection Data” input data type. For additional position data, use the “Inspection and Position Data” input data type. In order to make this change, click the Change button in the Module Definition area. In the Input Data field, click the drop down menu and select “Inspection and Position Data.” More information on the differences between these input data types is outlined later in this document.



Connection

Use the connection tab to adjust the Requested Packet Interval (RPI) which specifies how often data is exchanged between the MultiSight and the Logix processor. The default is 200 ms. The default setting is acceptable for applications slower than two parts per second (one inspection every 500 ms). For higher speed applications, the RPI should be set to slightly less than half the amount of time between inspection triggers. For example, in an application where the MultiSight is triggered every 300 ms, the RPI should be set to <150 ms. Setting the RPI to less than one half the MultiSight inpection processing time (available in Logix as MultiSight input tag ProcessingTime) increases the processing overhead in the MultiSight which potentially increases the overall inspection processing time. For example, an application which uses multiple contour matching detectors may have an inspection processing time of 400 ms. The RPI for this application should be set to no less than 200 ms. (Also, the control system should check that the previous inspection is complete before triggering a new inspection, which means that triggers will happen less frequently than every 400 ms.)



Communications Description Over EtherNet/IP

The MultiSight featuring EtherNet/IP communicates with a Logix processor over the EtherNet/IP network. The description that follows outlines the specific details involved in communicating between the Logix Controller and the MultiSight via an EtherNet/IP port capable of EtherNet/IP I/O communications.

The Logix processor uses two specific internal memory areas to send commands to the MultiSight and to receive inspection results data from the MultiSight. These memory areas are described below and will be referred to in the following way throughout this section of the manual.

There are two separate input data types used to define the EtherNet/IP input data. The basic input data type is called “Inspection Data” and it includes all the I/O data (including inspection results) EXCEPT the position information. The “Inspection and Position Data” input data type includes everything in the “Inspection Data” input data type plus raw position information as outlined below. The input data type is selected when the MultiSight module is established in the Logix program.

Input Data Tags

The Input Data Tags are continuously updated and data is sent to the Logix controller by the MultiSight. The update time is determined by the Requested Packet Interval (RPI)

property entered under the Module Properties Connection tab of the Module Properties Dialog. The data returned includes the following information.

“Inspection Data” input data type

- Module Status
- Dynamic Status
- Inspection results (both overall and for individual detectors)

“Inspection and Position Data” input data type

- All of the above
- Raw position and angular displacement data

Output Data Tags

The Output Data Tags are continuously updated and data is sent to the MultiSight from the Logix controller. The update time is determined by the Requested Packet Interval (RPI) property entered under the Module Properties Connection tab of the Module Properties Dialog. The data sent includes the following information.

- Trigger
- Change FirstDetector (to select from detectors/groups of detectors stored on the MultiSight)

Operational Description

Communicating with the MultiSight is a simple process involving only a few steps. In order for the MultiSight to execute a Command Requests, an Instruction Word and its related Command Parameters must be transmitted to the MultiSight. The MultiSight uses the Logix Output Data Tags to accomplish this task.

The MultiSight can be configured for triggered or continuous inspections. In triggered mode, some type of trigger must be sent to the MultiSight to initiate an inspection. The trigger can be hardwired to the sensor’s trigger input, sent via the EtherNet/IP output tag Trigger, or sent by the configuration software. In continuous mode, a new inspection is started as soon as the last inspection is complete.

The results of these inspections are available via the EtherNet/IP input tags. These input tags include individual inspection results for each detector, overall results, which detectors were inspected. There is an Inspection Counter tag that should be used to verify that an inspection has occurred and the inspection results data is valid.

Input Data Tags

This section defines the input data tags of the Add-On Profile for the MultiSight with EtherNet/IP. The first set of input tags is available for both the “Inspection” and “Inspection and Position” input data types.

Tag Name	Definition	Values	Comments
Fault	Normally = 0. The Logix controller will write all ones if communication fails.		
InspectionCounter	Count of most recent inspection		InspectionCounter would differ from Trigger (Logix Output), since images might be triggered not only via EtherNet/IP, but also via the discrete trigger input or the configuration software
ProcessingTime	Processing time in msec of most recent inspection		
Run	1 = MultiSight is in Run Mode, 0 = MultiSight is in Configuration Mode	0 or 1	
DetectorEn	Detectors which are currently active for inspection		Binary
DetectorResult	Inspection result (pass/fail) of each detector		Binary
PositionCheck	Position Inspection result (in position/not in position) of each detector		Binary
PositionCheckEn	Position Inspection enabled by detector		Binary
Score	Inspection Score of each detector	0…19	See below
InspectionOutput	MultiSight discrete inspection output (OUT 1) value. The overall inspection result (pass/fail)	0 or 1	
PositionOutput	MultiSight discrete position output (OUT 2) value. The overall position inspection result (pass/fail).	0 or 1	
FirstDetector	Current FirstDetector value. Determined by FirstDetector output tag, configuration software, or control input.	0…31	Can be used to confirm that a change between MultiSight detector groups happened

The following tags are available only when the “Inspection and Position Data” input data type is selected in the initial configuration of the MultiSight module.

Tag Name	Definition	Values	Comments
RawXPosition	X coordinate position of the center of the found pattern/contour relative to upper-left hand corner of image	0…640	Left to right position in number of pixels
RawYPosition	Y coordinate position of the center of the found pattern/contour relative to upper-left hand corner of image	0…480	Top to bottom position in number of pixels
Angle	Angular offset of found contour line compared to taught pattern line in tenths of a degree (eg. 1200=120.0°)	0…3600	For example 1800 = upside-down of original line contour position
RelativePosition	Position of found pattern/contour relative to Position Control (Blue) Frame by detector. Values defined below.	0, 1, 2, 3, 4, 5, 8, 10, or 12	See below

Additional Comments on Input Data Tags

Score: This tag represents the score of the inspections for the individual detectors. 0 = low score and 19 = highest score.

For Pattern and Contour Matching: 19 indicates highest correlation to taught pattern.

For Brightness: 0=Black, 19=White.

For Contrast: 0=solid color, 19=highest contrast (for example half white and half black).

RelativePosition: This tag represents the relative position of where the pattern or contour is found with reference to the Position Control (Blue) Frame configured for each individual detector. A value of ‘0’ means that the center of found pattern/contour is within the Position Control (Blue) Frame (OR the pattern/contour is not found OR the position control is not enabled for that detector).

This chart defines the meaning of the RelativePosition values.

Relative Position					
Binary		Integer			
Above / Left		Above		Above / Right	
1100	12	0100	4	0101	5
To the Left		In the Position Frame		To the Right	
1000	8	0000	0	0001	1
Below / Left		Below		Below / Right	
1010	10	0010	2	0011	3

Output Data Tags

Output Data Tag table

Output Data Tag—additional information

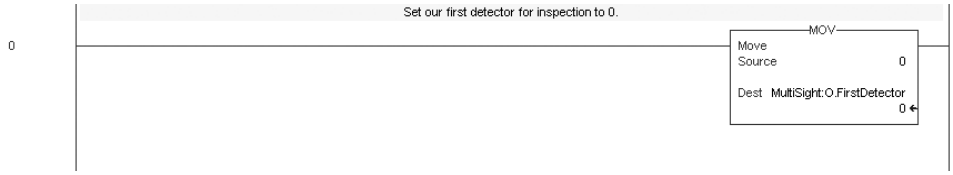
Tag Name	Definition	Values	Comments
Trigger	Change value to trigger a new inspection. (Exception: changing to the value '0' does NOT trigger an inspection.)		Change value to '0' to reset the trigger register without initiating an inspection.
FirstDetector	Set the First Detector to be inspected by the MultiSight. The MultiSight inspects detectors in numeric order, starting with First Detector. (Settings in the configuration software determine how many additional detectors are inspected.) This tag is used activate a detector or group of detectors.	-1 … 31	Set to -1 to allow the configuration software or control input to change the First Detector value.

Example Ladder Logic

This section documents simple ladder logic for use with the MultiSight with EtherNet/IP. Addition examples are available on the webpage of the MultiSight at http://www.ab.com/go/multisight.

This example shows the use of triggering via EtherNet/IP with the following steps:

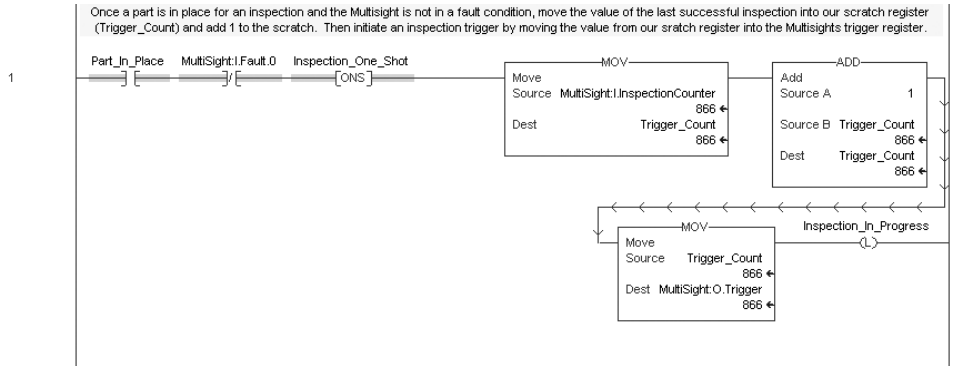
Load the FirstDetector, the detector at which the MultiSight begins its inspection. This step is only used it the Grouping functionality is used in the MultiSight configuration. (The additional detectors to be inspected are defined by the setup with the configuration software.)



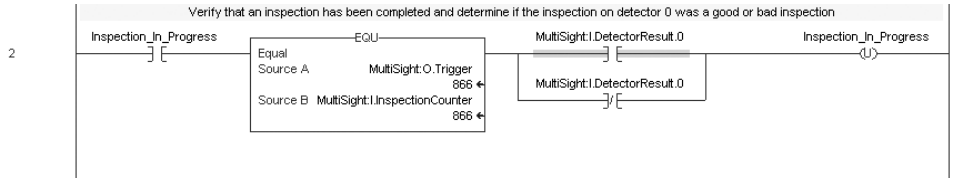
When the part to be inspected is in place, confirm that the MultiSight communication is not faulted (by checking the Fault tag) and then initiate an inspection.

Load the current InspectionCounter value into the scratch register Trigger_Count.

Increment the Trigger_Count value and then load the new value into the output data tag Trigger to trigger an inspection.

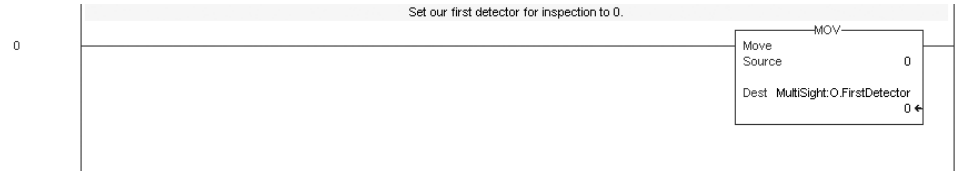


When the InspectionCounter equals the new Trigger value it indicates that the inspection is complete and the DetectorResults (and other inspection information) are valid and can be used.



The second example (below) shows the use a hard-wired trigger with the following steps:

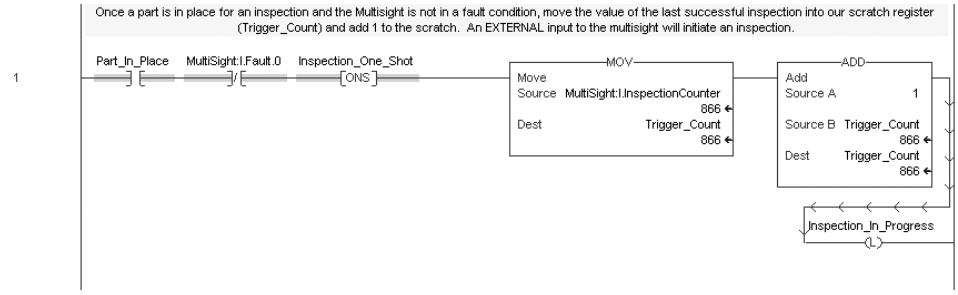
Load the FirstDetector, the detector at which the MultiSight begins its inspection. This step is only used it the Grouping functionality is used in the MultiSight configuration. (The additional detectors to be inspected are defined by the setup with the configuration software.)



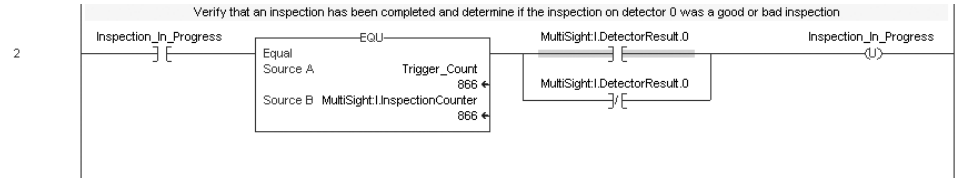
When the part to be inspected is in place, confirm that the MultiSight communication is not faulted (by checking the Fault tag) and load the current InspectionCounter value into the scratch register Trigger_Count.

Increment the Trigger_Count.

The hard-wired trigger initiates an inspection.



When the InspectionCounter equals the new Trigger_Count value it indicates that the inspection is complete and the DetectorResults (and other inspection information) are valid and can be used.

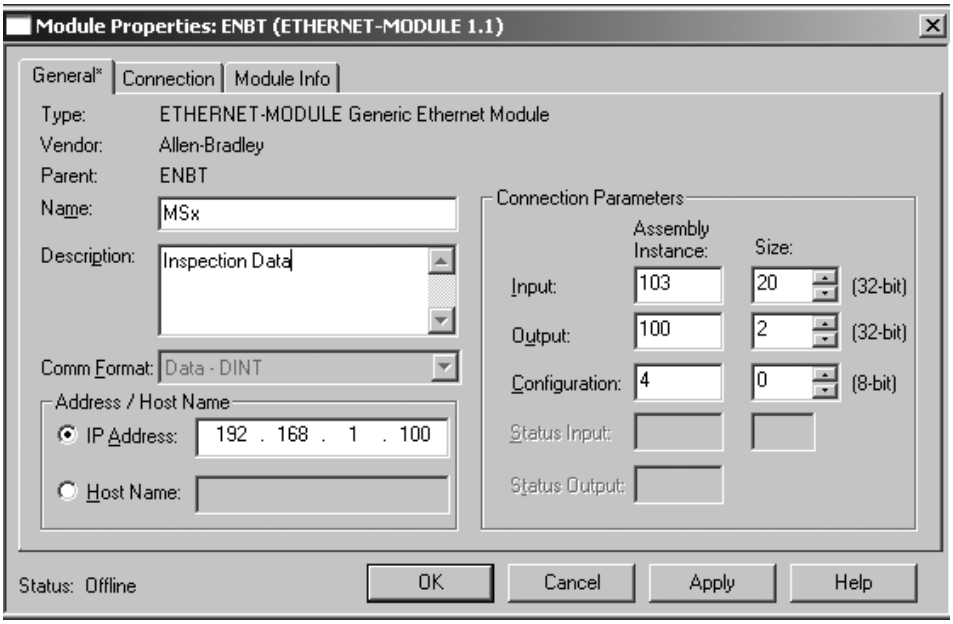


EtherNet/IP CIP Data Tables for Generic Profile Setup

This section defines the structure of the CIP Data Table of the MultiSight with EtherNet/IP. Use this section for the setup of a generic profile in a PLC capable of EtherNet/IP control of I/O. One example would be a Logix PAC running v13 or earlier of RSLogix 5000. See the previous sections for definitions and usage of the individual tags.

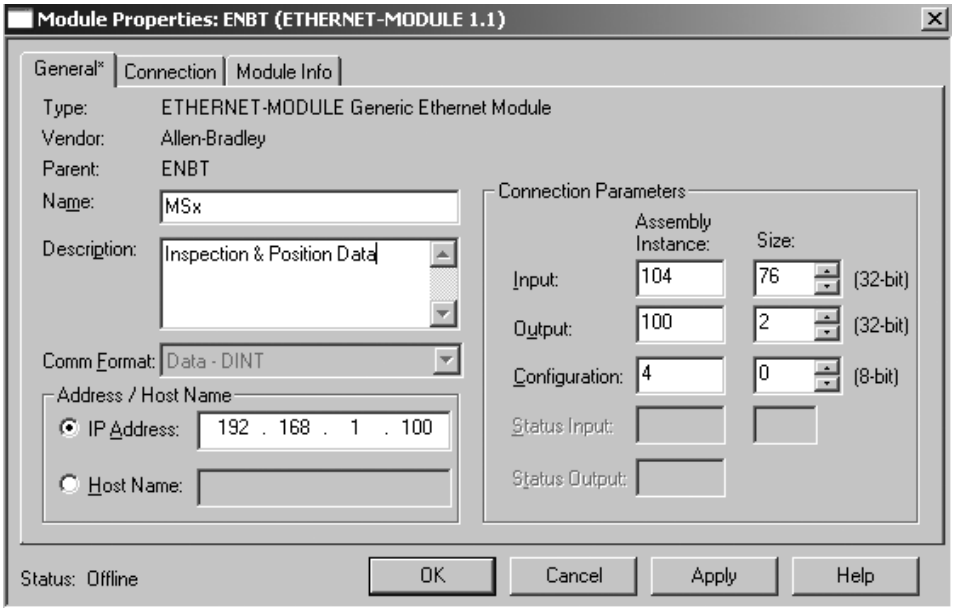
The generic module profile for Inspection Data would be configured as shown below:

Connection Parameters	Assembly Instance	Size
Input	103	20
Output	100	2
Configuration	4	0



The generic module profile for Inspection and Position Data would be configured as shown below:

Connection Parameters	Assembly Instance	Size
Input	104	76
Output	100	2
Configuration	4	0



To capture the data as summarized in the previous Add-On Profile sections, configure the data like this:

Create a User Defined Type as shown below for the output data.

Name	Data Type	Style
Trigger	DINT	Decimal
First Detector	SINT	Decimal

Create a User Defined Data Type as shown below for inspection input data.

Name	Data Type	Style
Fault	DINT	Decimal
InspectionCounter	DINT	Decimal
ProcessingTime	INT	Decimal
Run	BOOL	Binary
DetectorEn	DINT	Binary
DetectorResult	DINT	Binary
PositionCheck	DINT	Binary
PositionCheckEn	DINT	Binary
Score	SINT[32]	Decimal
InspectionOutput	BOOL	Decimal
PositionOutput	BOOL	Decimal
FirstDetector	SINT	Decimal

Create a User Defined Data Type as shown below for inspection and position input data.

Name	Data Type	Style
Fault	DINT	Decimal
InspectionCounter	DINT	Decimal
ProcessingTime	INT	Decimal
Run	BOOL	Binary
DetectorEn	DINT	Binary
DetectorResult	DINT	Binary
PositionCheck	DINT	Binary
PositionCheckEn	DINT	Binary
Score	SINT[32]	Decimal
InspectionOutput	BOOL	Decimal
PositionOutput	BOOL	Decimal
FirstDetector	SINT	Decimal
RawXPosition	INT[32]	Decimal
RawYPosition	INT[32]	Decimal
Angle	INT[32]	Decimal
RelativePosition	SINT[32]	Decimal

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Publication 10000028129(00) - August 2008