

Title Implicit Messaging with Allen-Bradley PLCs

Revision 1.1

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1 Overview

This guide describes how to set up implicit messaging (Cyclic and Change of State) with Allen-Bradley PLCs.

2 Software and Hardware Requirements

The following software and hardware requirements should be noted:

Requirements	Details
Gocator Firmware	4.2 and higher
Gocator Series	All models
Other	Allen-Bradley PLC Allen-Bradley RSLogix 5000 programming tool

3 Gocator Configuration

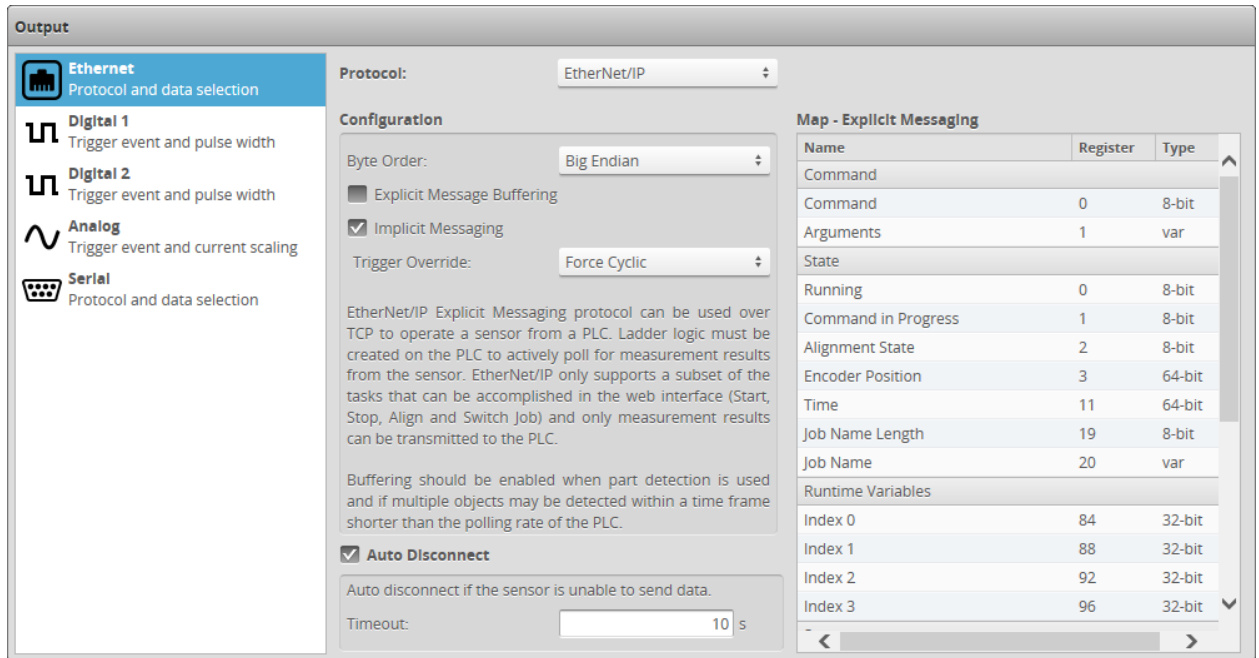
To configure the Gocator to output in Ethernet/IP Implicit Messaging mode, do the following:

1. On the **Output** page, in the **Ethernet** category, choose EtherNet/IP as the protocol.

NOTE: If the sensor is running firmware older than version 4.5, you must launch the advanced Gocator GUI by adding `?advanced=1` to the URL you use to connect to the sensor (for example, `http://192.168.1.10/?advanced=1`).

2. Check the **Implicit Messaging** option.





4 Setting Up Implicit Messaging (Cyclic)

Implicit messaging has advantages and disadvantages. Implicit messaging uses UDP and is faster than explicit messaging and is ideal for time-critical applications. However, implicit messaging is layered on top of UDP. UDP is connectionless and data delivery is not guaranteed. For this reason, implicit messaging is only suitable for applications where occasional data loss is acceptable.

To set up implicit messaging, do the following:

1. In Gocator, set **Trigger Override** to **Force Cyclic**.



Output

Ethernet
Protocol and data selection

Digital 1
Trigger event and pulse width

Digital 2
Trigger event and pulse width

Analog
Trigger event and current scaling

Serial
Protocol and data selection

Protocol:
EtherNet/IP

Configuration

Byte Order:
Big Endian

☐ Explicit Message Buffering

☒ Implicit Messaging

Trigger Override:
Force Cyclic

EtherNet/IP Explicit Messaging protocol can be used over TCP to operate a sensor from a PLC. Ladder logic must be created on the PLC to actively poll for measurement results from the sensor. EtherNet/IP only supports a subset of the tasks that can be accomplished in the web interface (Start, Stop, Align and Switch Job) and only measurement results can be transmitted to the PLC.

Buffering should be enabled when part detection is used and if multiple objects may be detected within a time frame shorter than the polling rate of the PLC.

☒ **Auto Disconnect**

Auto disconnect if the sensor is unable to send data.

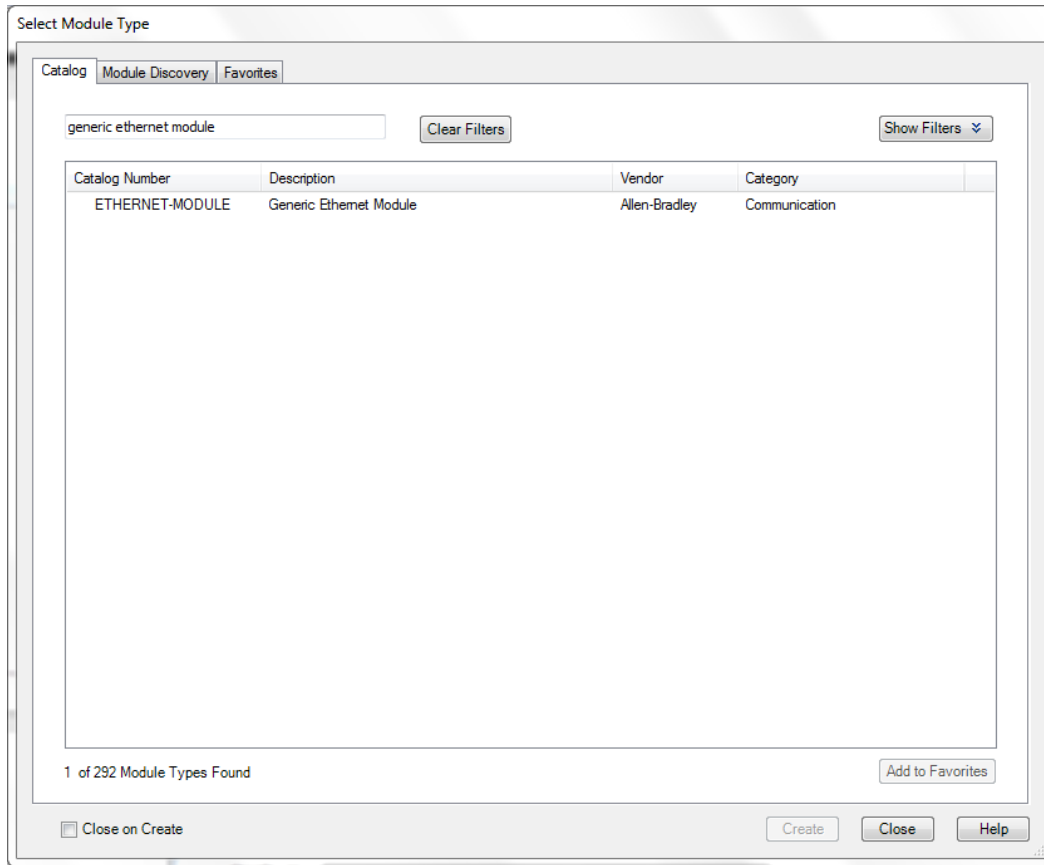
Timeout:
10
s

Map - Explicit Messaging

Name	Register	Type
Command		
Command	0	8-bit
Arguments	1	var
State		
Running	0	8-bit
Command in Progress	1	8-bit
Alignment State	2	8-bit
Encoder Position	3	64-bit
Time	11	64-bit
Job Name Length	19	8-bit
Job Name	20	var
Runtime Variables		
Index 0	84	32-bit
Index 1	88	32-bit
Index 2	92	32-bit
Index 3	96	32-bit

4

2. In the RSLogix 5000 programming tool, add Generic Ethernet Module as a new module to the I/O Configuration tree.



3. Configure the Ethernet module parameters as shown below.

The screenshot shows a software window titled "Module Properties Report: Local (ETHERNET-MODULE 1.1)". It has three tabs: "General*", "Connection*", and "Module Info". The "General" tab is selected and contains the following fields:

- Type: ETHERNET-MODULE Generic Ethernet Module
- Vendor: Allen-Bradley
- Parent: Local
- Name: Gocator
- Description: (empty text box)
- Comm Format: Data - SINT
- Address / Host Name:
 - ☒ IP Address: 192 . 168 . 1 . 10
 - ☐ Host Name: (empty text box)

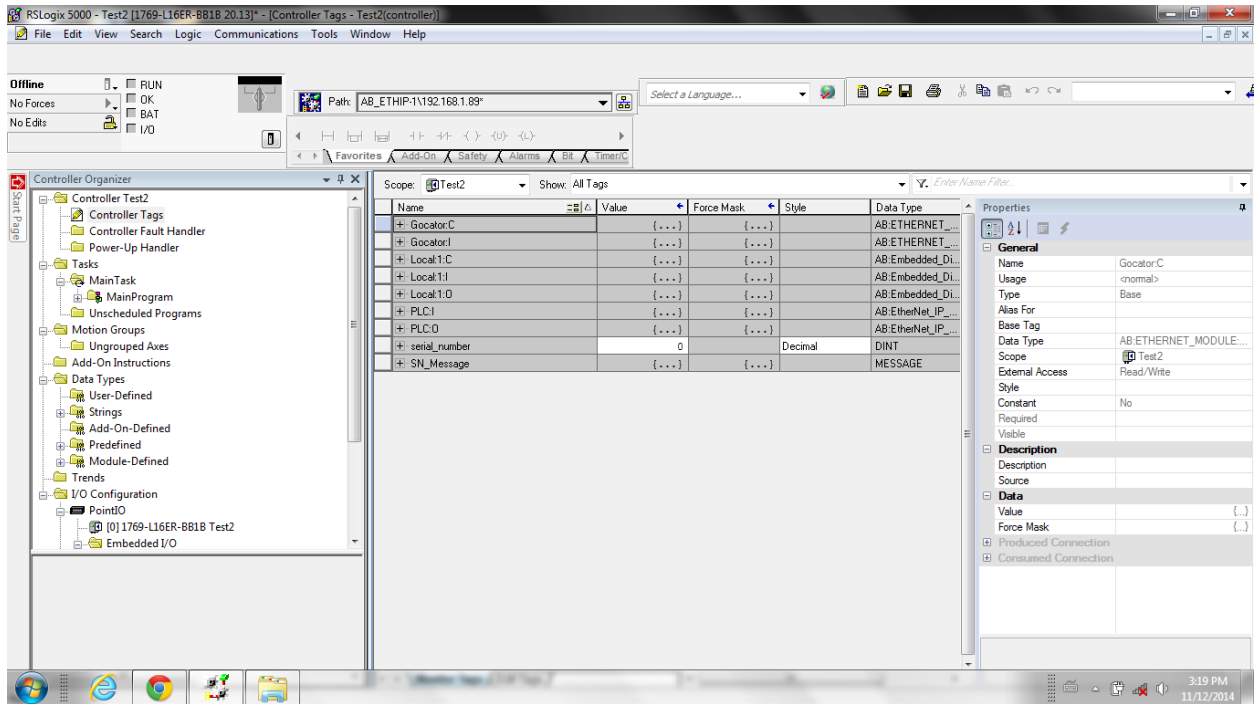
The "Connection" tab is also visible and contains a section titled "Connection Parameters" with the following fields:

	Assembly Instance:	Size:	
Input:	802	376	(8-bit)
Output:	100	32	(8-bit)
Configuration:	151	0	(8-bit)
Status Input:			
Status Output:			

At the bottom of the window, there is a "Status: Offline" label and four buttons: "OK", "Cancel", "Apply", and "Help".

4. You should now see two new Controller Tags created automatically (Gocator:C and Gocator:I).





- When the Gocator is in Implicit Messaging mode, data will be streamed and stored in the Gocator:I tag when both the PLC and the Gocator are running. The data format is shown in the following table.

Class: 0X04 Instance: 0x322 Attribute: 0x03 Length: 376 bytes Service: 0x0E (GetAttributeSingle)

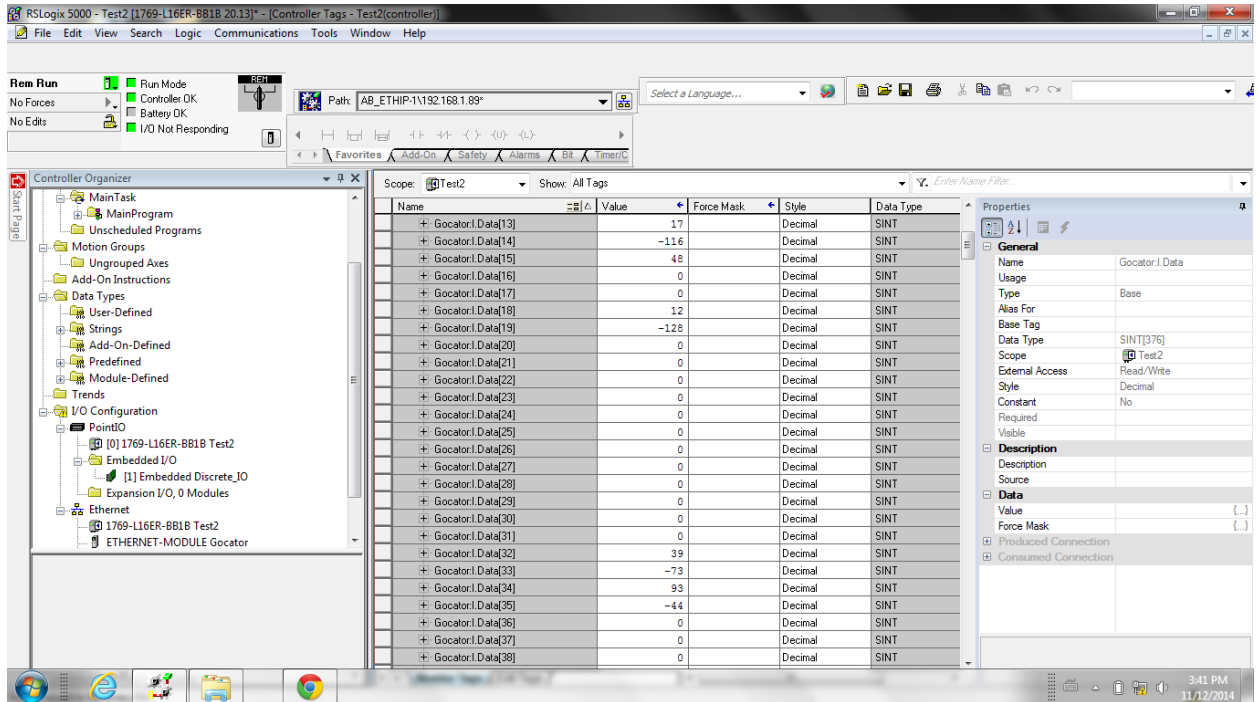
Byte Index	Name	Data Type	Description
0	State	8u	Sensor state is a bit mask where: Bit 0: 1 - Running 0 - Stopping Bit [1-7]: 0 – No state issue 1 - Conflict
1	Reserved		
2-3	Inputs	16u	Digital input state
4-11	Z Index Position	64u	Encoder position at time of last index pulse
12-15	Exposure	32u	Laser exposure in uS
16-19	Temperature	32u	Sensor temperature in degrees celcius * 100 (centidegrees)



20-27	Encoder Position	64s	Encoder position
28-35	Time	64u	
36-43	Scan Count	64u	Represents the number of scans
44-55	Reserved		
Measurements & Decisions			
56	Decision 0	8u	Measurement decision is a bit mask where: Bit 0: 1 - Pass 0 - Fail Bit [1-7]: 0 – Measurement value OK 1 – Invalid Value 2 – Invalid Anchor
...	...		
119	Decision 0	8u	
120-123	Measurement 0	32s	Measurement value in um (0x80000000 if invalid)
...	...		
372-375	Measurement 63	32s	



- Data is updated in the Gocator:I tag.



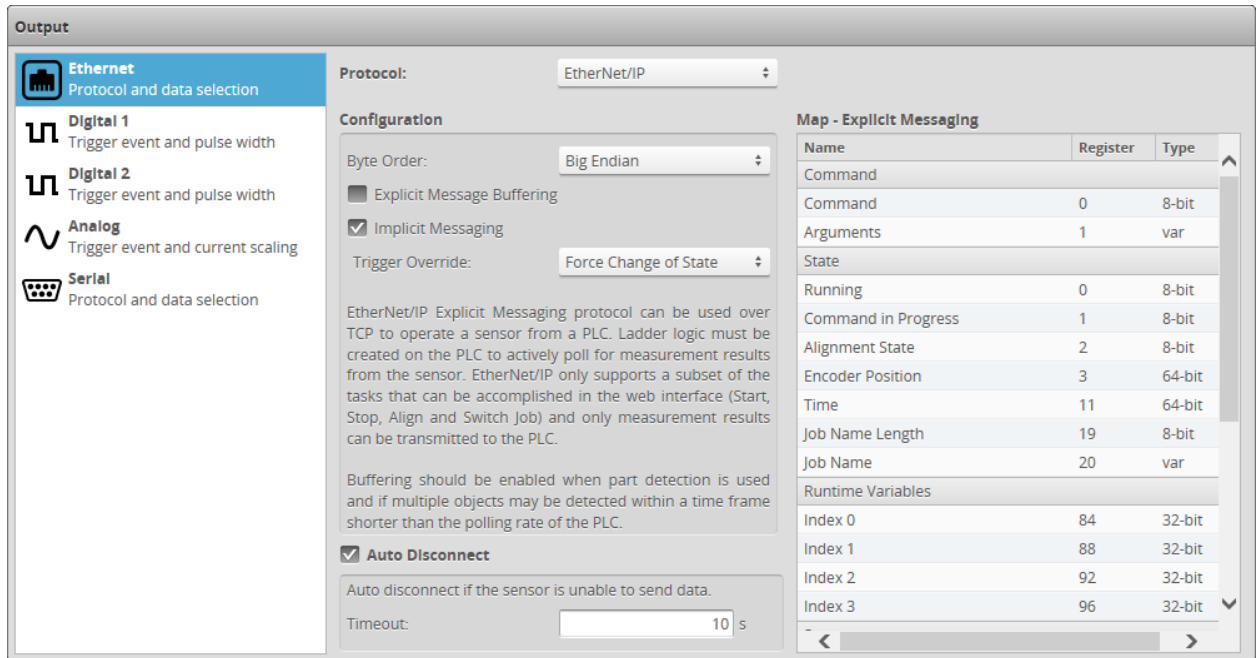
5 Setting Up Implicit Messaging (Change of State)

To set up the PLC to communicate with a Gocator using Change of State implicit messaging, an event task must be created on the PLC to rapidly check whether the sensor is running; if the frame count increases, data is copied to an array. The event task period must allow the event task to be executed at a higher rate than Gocator frame rate.



To set up the PLC and the Gocator, do the following:

1. In Gocator, set **Trigger Override** to **Force Change of State**.



2. In the RSLogix 5000 programming tool, create a new task with a 0.5 millisecond period and a 1.0 millisecond watchdog. A major fault alarm is triggered if the task does not finish execution within the watchdog time limit.



New Task

Name: OK

Description:

Type: Cancel

Period: ms Help

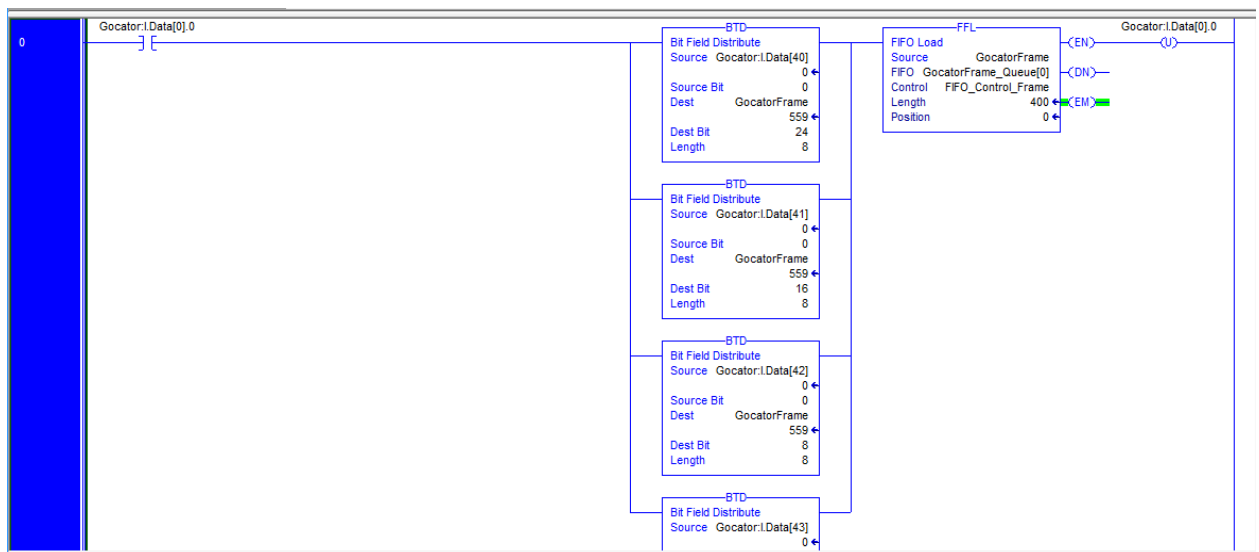
Priority: (Lower Number Yields Higher Priority)

Watchdog: ms

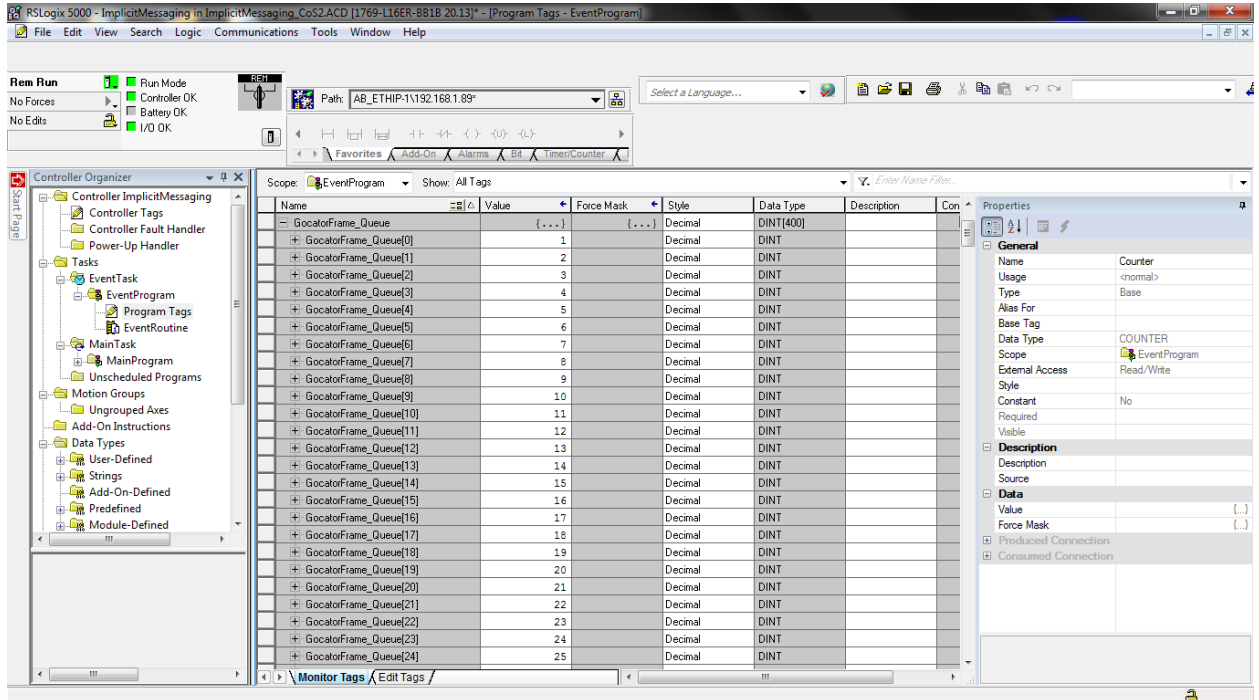
☐ Disable Automatic Output Processing To Reduce Task Overhead

☐ Inhibit Task

- Ladder logic is written to monitor the Gocator's running state and store data into a FIFO (Ladder Element FFL) array of the same data type.



- Confirm that frames are properly stored in the stored array, without any repetition or dropped frames. In this case, the Gocator frame count is stored in an array.



6 Setting Up Implicit Messaging Gocator Command

The Output Message format (from PLC to Gocator) is used to control the sensor through implicit messaging, where this message is sent from the PLC to the Gocator continuously at the user-requested Request Packet Interval (RPI) on the PLC side.

In PLC programming, the standard practice is to use bits instead of sending a value representing that command, for example, start/stop bits. When using values, the PLC needs to add more code to convert it to bits and vice versa.

Since the Gocator does not allow parallel commands, a priority scheme is needed to handle multiple command bits being set at the same time. Only the bit with the highest priority will be accepted as the command.

The total message size is 32 bytes:

Byte Position	Name	Description
0	Command Bits	Bit 0: Stop running – Highest priority Bit 1: Start running Bit 2: Align (stationary target) Bit 3: Align (moving target)

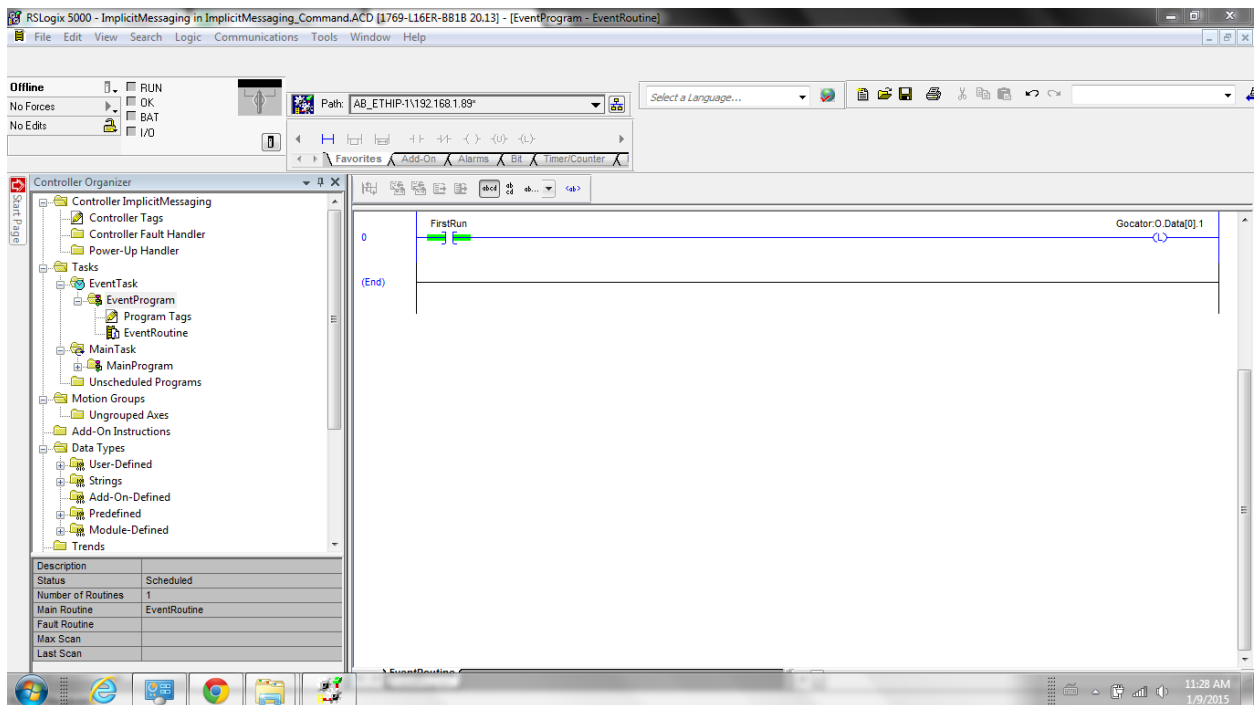


		Bit 4: Clear alignment – Lowest priority
1-31	Reserved	

It's important to understand that because the Gocator is driven internally by its own clock, and because users can configure the Gocator for any frame rate—independently of the RPI request configured on the PLC—Cyclic implicit messaging can cause unnecessary data loss if the two clocks are not synchronized. Using Change of State implicit messaging instead can overcome this issue. For instructions on how to set up Change of State implicit messaging, see [Setting Up Implicit Messaging \(Change of State\)](#).

To set up the implicit messaging Gocator command:

1. Use simple ladder logic that switches the start running command bit to 1.



2. Verify that the Output Message bit is set correctly.

