

<b>Quick Start Guide:</b> Interfacing Modular IO Header M-EIP-H with Allen Bradley Communication Module on EtherNet/IP	
<b>Doc Num:</b> N18011AAMG01	<b>Published Date:</b> 01 <sup>st</sup> April 2019

	<b>Interfacing Modular IO Header M-EIP-H with Allen Bradley Communication Module on EtherNet/IP</b>
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## Quick Start Guide

**Published Date:** 01<sup>st</sup> April 2019  
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## Scope of Document

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This is a Quick Start Guide to interface Mitsubishi Electric India make Modular IO Header module 'M-EIP-H' with Allen-Bradley make Communication module (e.g. 1756-EN2T, 1756-EN2TR) on EtherNet/IP network.

### Prerequisites

1. Allen Bradley Studio 5000 Logix Designer– **Standard Edition or onwards**
2. Modular IO setup
  - a. Modular IO Configurator Tool **V1.5.0.0** or onwards.
  - b. EDS file **M-EIP-H\_0\_1.eds**

Download above files from Mitsubishi Electric India website.

### References

- a. Modular IO User Manual [Manual Number: N16001AAMH]
- b. M-EIP-H - EtherNet/IP Object Classes, Messages and Services [Manual number: N18011AAMG03]
- c. EtherNet/IP Network Configuration User Manual [Publication Number: ENET-UM0010-EN-P-May 2016]
- d. EtherNet/IP Embedded Switch Technology Application Guide [Publication Number: ENET-AP005F-EN-P-October 2014]

Follow the steps below to interface Modular IO station with ControlLogix EtherNet/IP Communication Module.

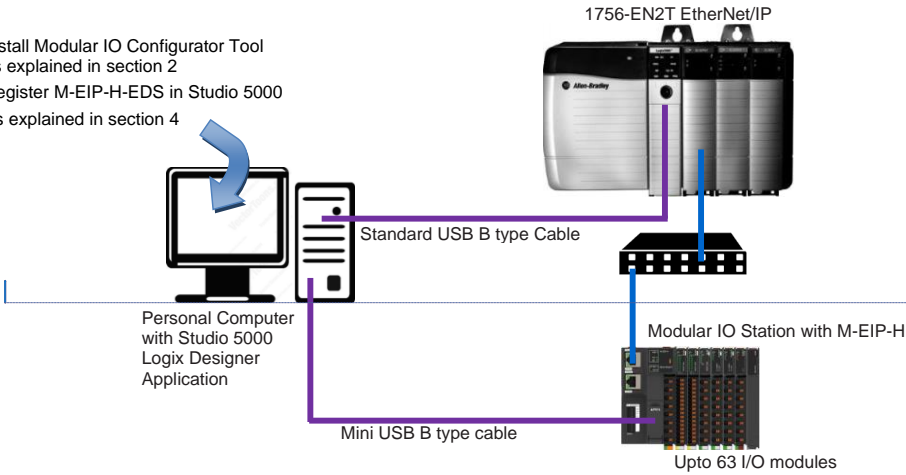
1. [Prepare Hardware Setup](#)
2. [Install Modular IO Configurator Tool](#)
3. [Configure Modular IO station using Modular IO Configurator Tool](#)
4. [Register M-EIP-H EDS file in Studio 5000](#)
5. [Configure M-EIP-H with Studio 5000 Logix Designer](#)
6. [Monitor Status, IO Data and Diagnostics](#)

Refer subsequent sections which explain necessary steps in detail.

## 1. Hardware Setup

Diagram below shows setup with Allen Bradley PLC with EtherNet/IP communication module and Modular IO station as an adapter.

1. Install Modular IO Configurator Tool as explained in section 2
2. Register M-EIP-H-EDS in Studio 5000 As explained in section 4



**Commented [V1]:** Cable type for Studio 5000

**Commented [A2R1]:** Mentioned in diagram

Modular IO station provides 2 Ethernet ports (ETH1 and ETH2; Layer 2 switch with DLR support). So, it supports star, line, ring topology. User should wire and configure accordingly.

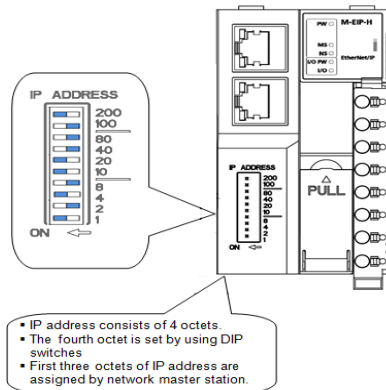
**Commented [V3]:** Show with 2 ports

**Commented [A4R3]:** Modified accordingly.

### Setting of Station IP Address

Example shows DIP switch setting for value of 235

$$235 = 200 + 20 + 10 + 4 + 1$$



Meaning of DIP switch positions:

Address	Descriptions
0 or >=255	IP address (all the four octets) are set as per parameter setting 'IP address' of modular IO configurator
1-254	4 <sup>th</sup> octet of IP address is set according to DIP switch

**Note:** It is necessary to power cycle Header module to effect the change in DIP switch setting.

## 2. Install Modular IO configurator Tool

This is one-time activity. You should have following installer files stored at the same location on your PC.

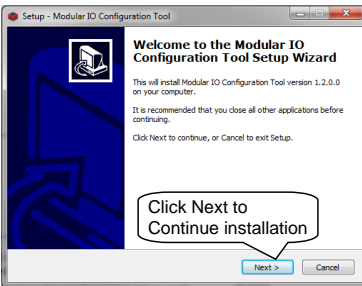
- a. ModularIOConfiguratorSetupx.x.x.exe
  - b. ModularIOCommunicationComponentx.x.x.exe
- x.x.x.x is a version of the software.

### Software setup requirement:

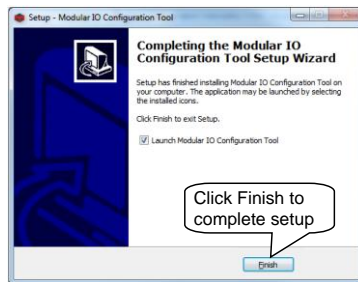
Processor	Intel core i3 or Higher version
Disk space	200 MB
RAM memory	2GB or Higher
Screen resolution	1280 x 768 or Higher
Platform	Windows 7 (64 bit/ 32 bit)/ Windows 8 (64 bit)/ Windows 8.1 (64 bit)/ Windows 10 (64 bit)
USB interface	USB 2.0

Following steps explain how to install Modular IO Configuration Tool.

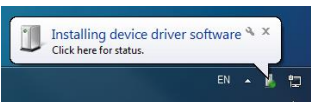
1. RunModularIOConfiguratorSetupx.x.x.exe. It will open Modular IO Configuration Tool Setup wizard
2. Click on Finish button to complete Modular IO Configuration Tool Setup



2. Click on Finish button to complete Modular IO Configuration Tool Setup



3. Connect the Modular IO Header module (M-EIP-H) to the machine using USB (2.0) cable. For the first time, the driver automatically is searched and configured. Please wait for few minutes while this step is executed.



4. Once the driver is successfully installed, following message will appear.



### 3. Configure Modular IO Station


This section explains configuration and special features of Modular IO Configurator Tool.

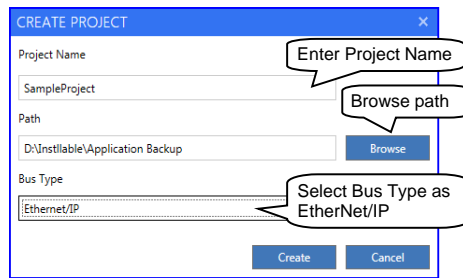
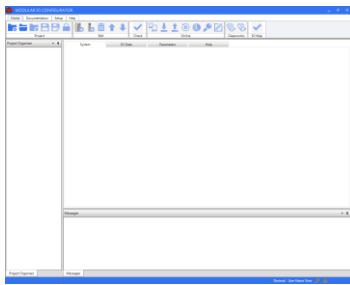
#### 3.1 Configuration of Modular IO Station


Example here shows configuration of following modules.

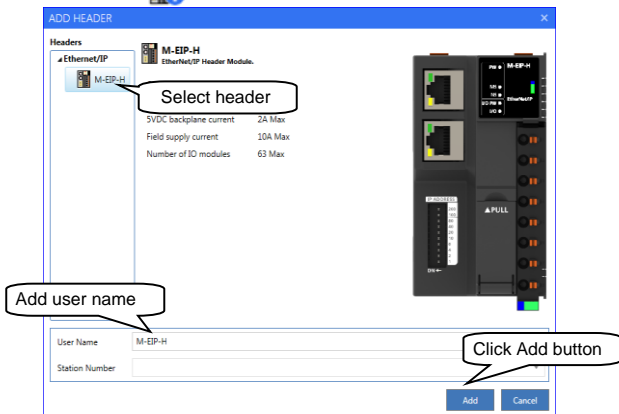
Description	Ordering Code	Quantity
EtherNet/IP Header Module	M-EIP-H	1
16 Digital Input, 24 VDC, Sink Type Module (Negative Common)	M-16D	1
16 Digital Output, 24 VDC, Source Type Module	M-16TE	1
2 Channel Universal Analog Input Module	M-UAD2	1
2 Channel Analog Output Voltage/ Current Module	M-DA2	1

Following steps explain how to configure Header module in a Modular IO Configurator Tool.

1. Open modular IO configurator tool. View screen layout as below
2. Click on  to create new project.



3. Click on  to add and configure M-EIP-H header module

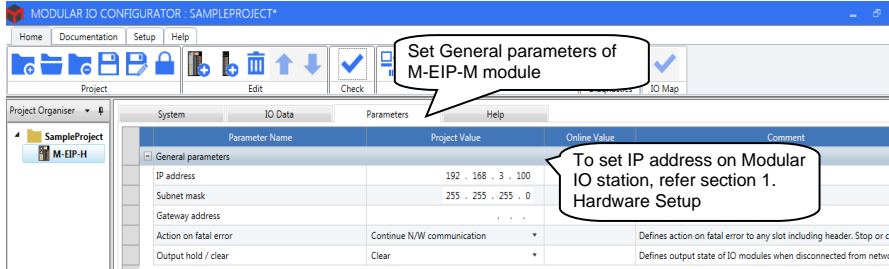


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4. Select M-EIP-H from Project Organizer window and click on Parameter tab.



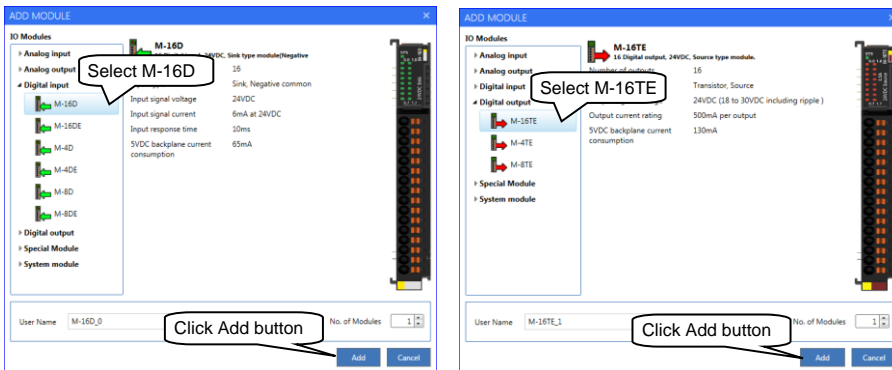
User can set following parameters from Modular IO Configurator Tool

- IP address (first three octets).
- Subnet mask and Default gateway.
- Define behavior of M-EIP-H module during fatal error.
- Define behavior of IO's, when it disconnected from network.


Refer "N16001AAMH Modular IO User Manual" for more details.

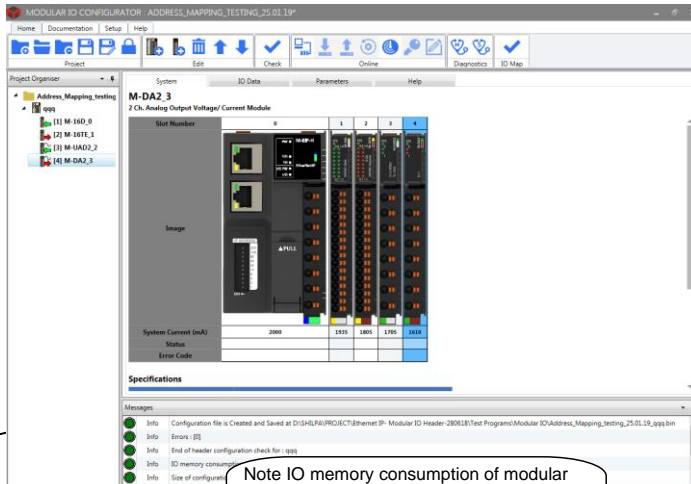
5. Click on function to open dialog box of "Add module", which shows list of IO modules grouped as per IO module type.

Select M-16D Digital Input module and M-16TE Digital output module from list of IO module type.



**Note:** Follow the above procedure to add other modules as required.

6. After adding and configuring all modules, 'Check'  the project




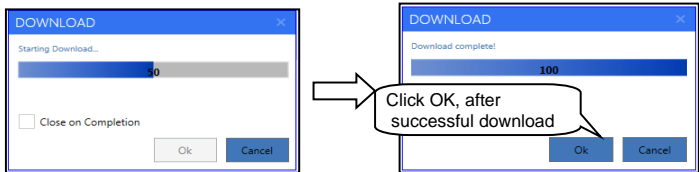
Note IO memory consumption of modular IO station. This information is required for configuration using Generic Ethernet EDS in Studio 5000 Logix Designer Application

- Info Configuration file is Created and Saved at D:\SHILPA\PROJECT\Ethernet IP- Modu...
- Info Errors : [0]
- Info End of header configuration check for : qqq
- Info IO memory consumption : IX-2 bytes, QX-2 bytes, IW-4 bytes, QW-4 bytes, SB-17 bytes.
- Info Size of configuration data : [1249] bytes
- Info End of IP Address and Subnet Mask check

For IO configuration in the example,  
Input size (IX, IW, SB) = 23 bytes,  
Output size (QX, QW) = 6 bytes.

- 7. User should attach Bus End module (M-BE) at the last slot position if there are 16 or more IO modules.
- 8. Connect Header module to your machine via standard USB cable.

Click on  to download the configuration to connected Header module. This pop ups progress window as shown below.

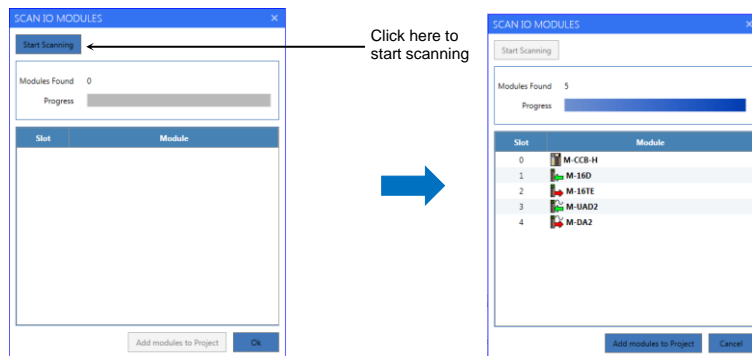


### 3.2 Special Features of Modular IO Configurator Tool

1. Scan IO modules connected to Header module:

Tool facilitates quick configuration of a modular IO station if setup is available with IO modules attached to the Header module. Using "Scan IO Module" function, tool can read the list of IO modules (other than system modules) physically attached to the Header module.

Select Header module and click on Online function  This opens following window of Scan IO Modules.



**Add modules to project** to add IO modules to the Header module by replacing existing IO modules if any.






**NOTE:**

System modules are passive modules. Hence, Header module cannot detect presence of System modules in a modular IO station. So, System modules do not appear in the list after scan.



2. Output test in online monitoring mode:

This is online feature and useful to test output module locally even when Header module is not connected to the fieldbus/ network. User can write individual output (True/ False to digital output module and channel data to analog output module) and test individual output.

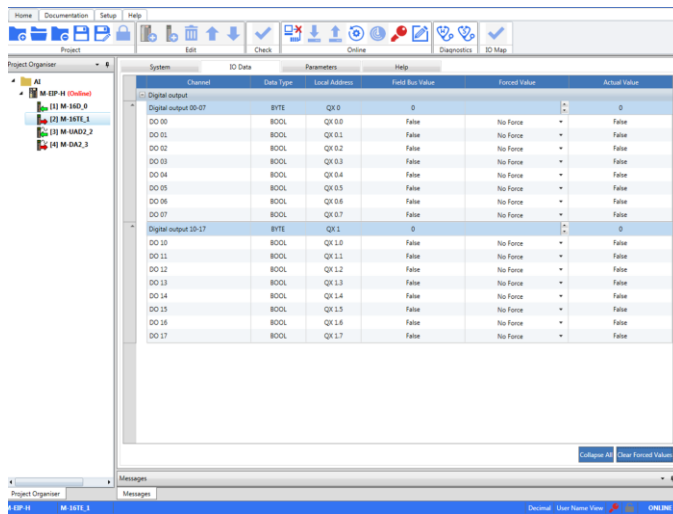
Follow the steps as below, to write outputs for test purpose.

1. Click on function  to connect to Header module. Icon changes to  and Status bar is updated as ONLINE.
2. Enable output test by clicking on function . Icon changes color to red  and also updates status on status bar. This allows user to write force output values to actual output values. When Output test is enabled, IO LED on Header module turns yellow.
3. Select output module to test output and then select "IO Data" tab.
4. Select individual output DO nn (for Digital output) or CHn (for Analog output).
5. Select option as
  - Force to true/ Force to False/ No Force for Digital output and
  - Enter value between -32768 and 32767 for Analog output.Colour of Forced values change to red.
6. Repeat step 5 for other output module as required.
7. Click on Online function  to write Forced values to Actual values. Forced value overwrites Field bus values.  
After writing output values to actual values, color of Forced values change to blue.

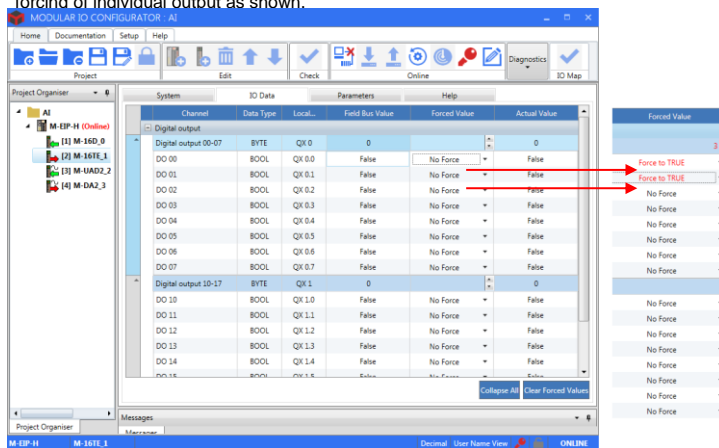


8. Change in digital output is indicated by output LED indication on the digital output module. User can measure actual output signal to test digital output and analog output
9. For digital output, function “Enable/ Disable output test”  and “Write values”  are used as shown below.

In online monitoring mode, select digital output module, here M-16TE is selected as an example.  
By default, forcing of output is disable.



Click on function . Icon changes color to red . This enables output test feature and allows forcing of individual output as shown.




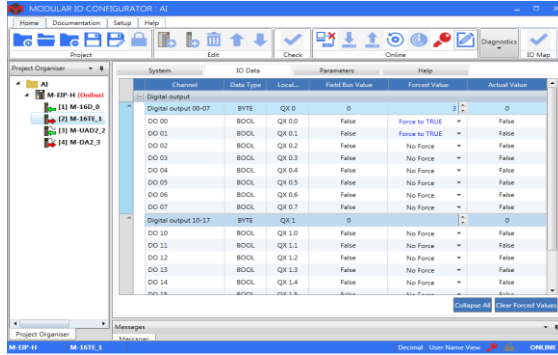
After selection of either Force to TRUE or Force to FALSE, online changed force value for output turns red as shown above.

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Clicking on function  writes online changed force value to actual value and force value changes colour as blue as below.



**NOTE:**

Output test is possible only if modular IO station is healthy. Confirm status of modular IO station using LED indications on Header module.

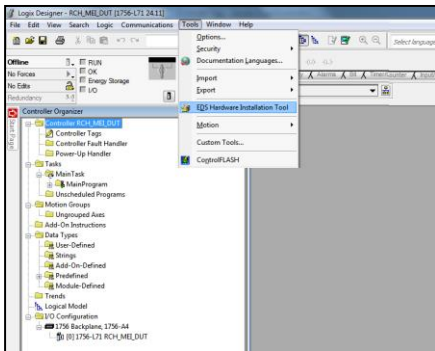
Forcing of output continues as long as modular IO station is powered on and in ONLINE monitoring mode. When user tries to go OFFLINE, tool prompt user to clear forced values.

## 4 Register M-EIP-H module EDS file in Studio 5000

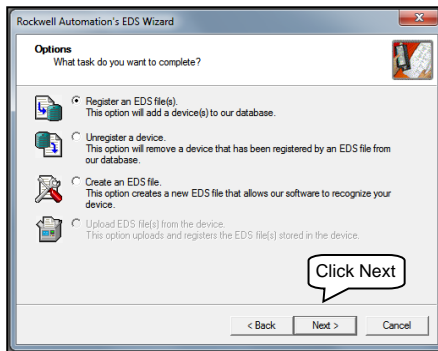
This is one-time activity necessary to use M-EIP-H module as an adapter.

Open Studio 5000 configuration software and follow the steps below.

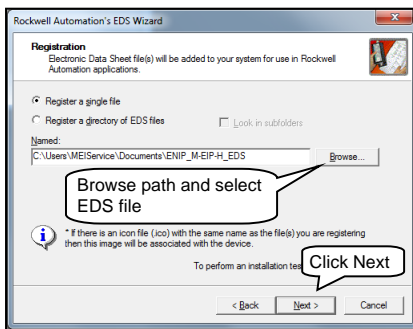
1. Select menu item "EDS Hardware Installation Tool" from Menu "Tools"



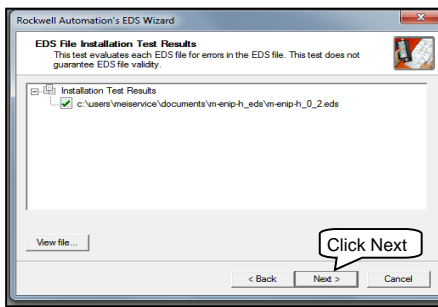
2. It starts EDS Wizard. Select option "Register an EDS file(s)"



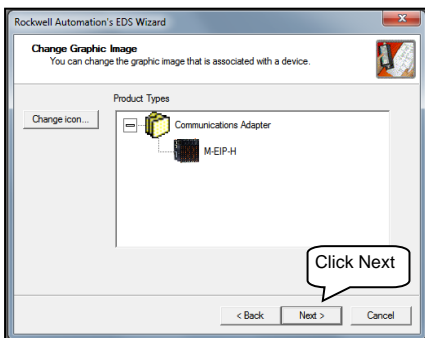
3. Select option "Register a single file"



4. It pops up EDS File Installation Test Result as shown in the window below.



5. Graphical Image of M-EIP-H module be shown below.



6. Click Finish to complete EDS Wizard.



## 5 Configure M-EIP-H Module with Studio 5000

M-EIP-H module can be configured Studio 5000 by two methods.

1. Configuration using **M-EIP-H\_0\_1.eds**.

This provides fixed size for input and outputs (128 byte input + 128 byte output) even though Modular IO station has less size of input output.

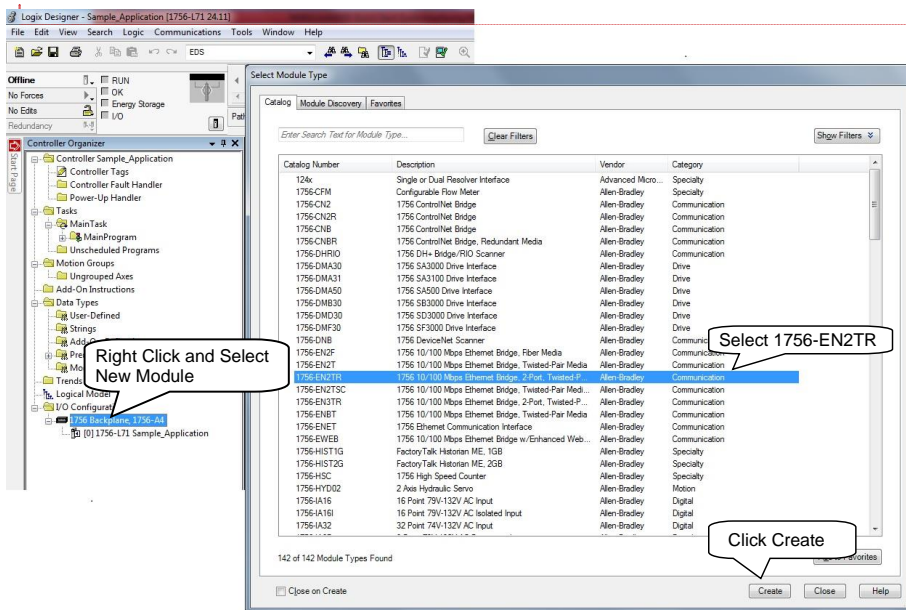
2. Configured using Generic Ethernet Module.eds.

This allows user to change input output size from 1 to 496 bytes as per Modular IO configuration.

### 5.1 Using module EDS (Fixed Data Size)

Refer steps below to configure M-EIP-H module using module EDS

1. Create a New Project in Studio 5000 and Select ControlLogix Controller (1756-L71)
2. Add EtherNet/IP Communication module (1756-EN2TR) to controller



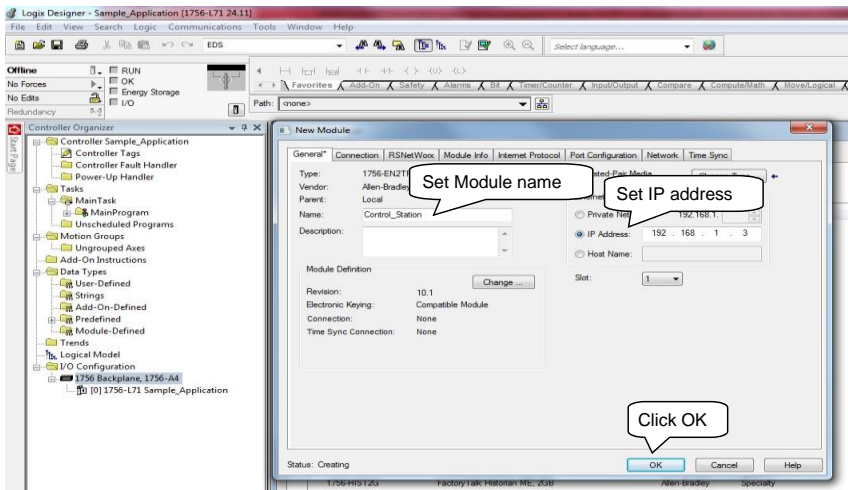
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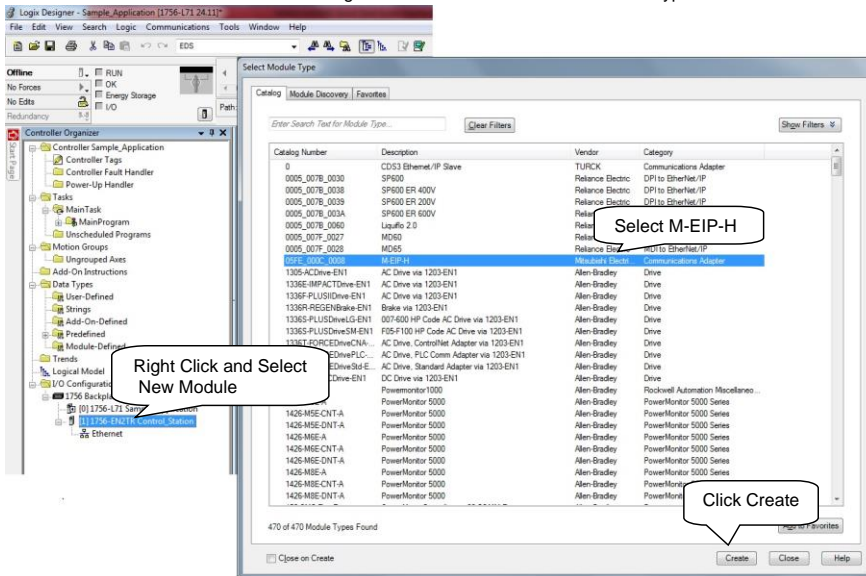
Published Date: 01<sup>st</sup> April 2019

3. Set IP address of EtherNet/IP Communication Module (1756-EN2TR) in General tab.

**Commented [V6]:** Explain from IP address setting from user perspective.



4. Select New Module from Controller organizer and add M-EIP-H from Module Type

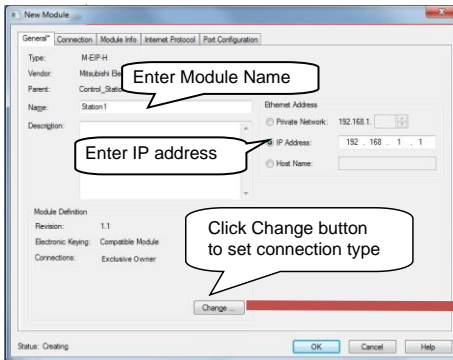


**Quick Start Guide:** Interfacing Modular IO Header M-EIP-H with Allen Bradley Communication Module on EtherNet/IP

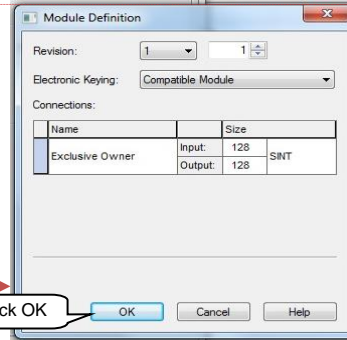
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**Published Date:** 01<sup>st</sup> April 2019

5. Set IP address of M-EIP-H module

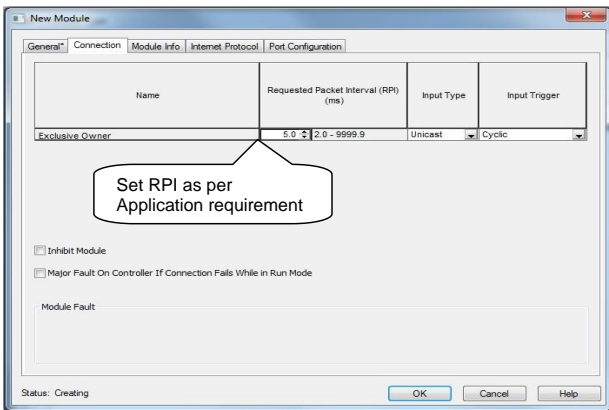


6. Set Connection type and Electronic Keying parameters as shown below

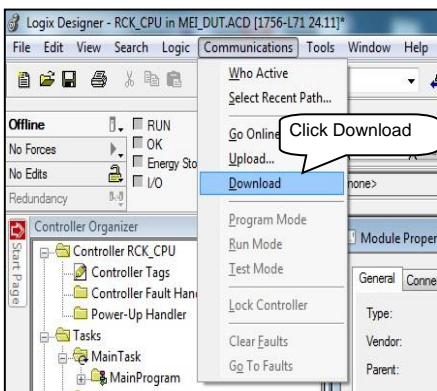


**Commented [V7]:** Show consistency in settings e.g it is Private Network for scanner module.

7. Set Requested Packet Interval (RPI from connection)



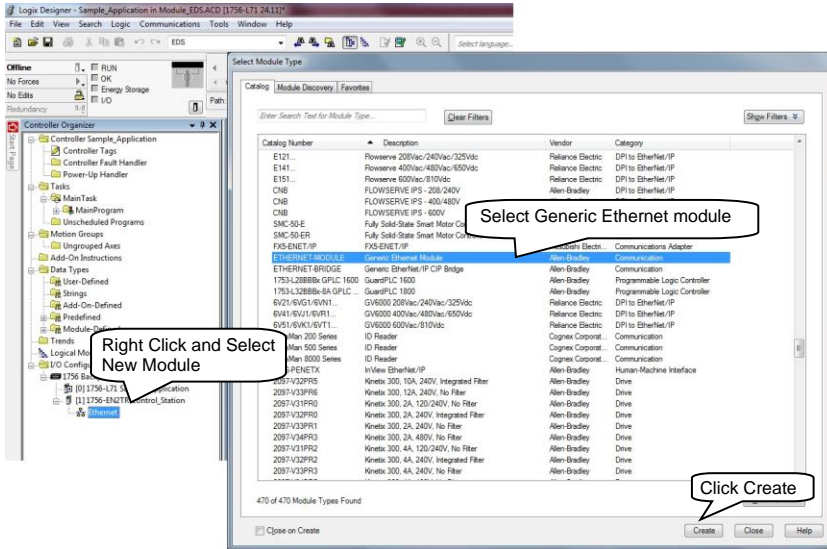
8. Downloads configuration to controller from Communication → Download



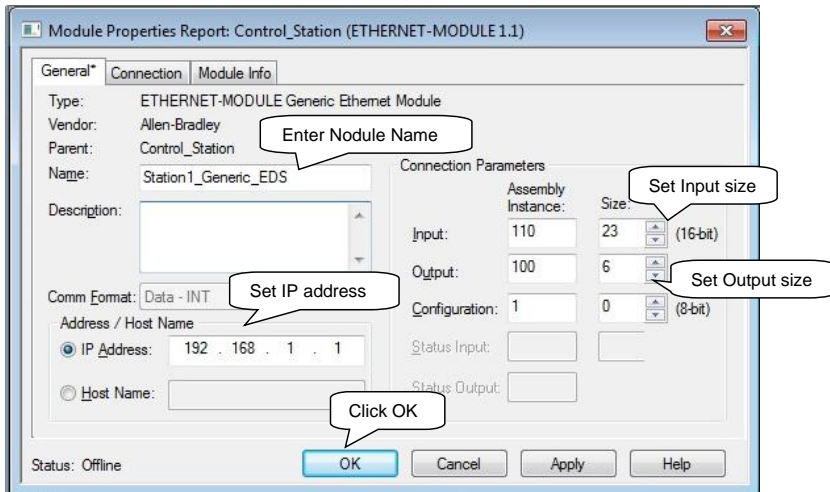
## 5.2 Using Generic Ethernet EDS (Variable Data Size)

Refer steps 1 to 3 to configure Ethernet/IP Communication module (1756-EN2TR) from section 5.1.

1. Add Generic Ethernet Module as shown below



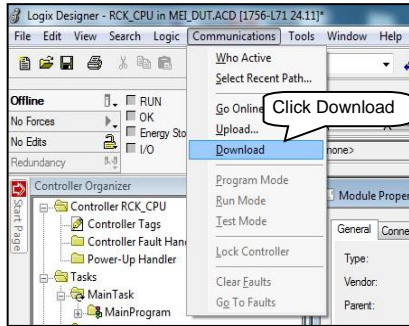
2. Enter parameters of Generic Ethernet Module



Commented [V8]: Provide note for reference of section 3

**Note:** Input size and Output size can be set as per IO configuration of Modular IO station. Refer "Section-3 (6)".

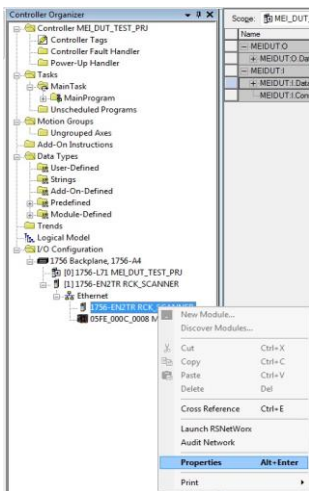
- Download configuration to controller from Communication → Download.



### 5.3 DLR Configuration Setting of Studio 5000 Logix Designer

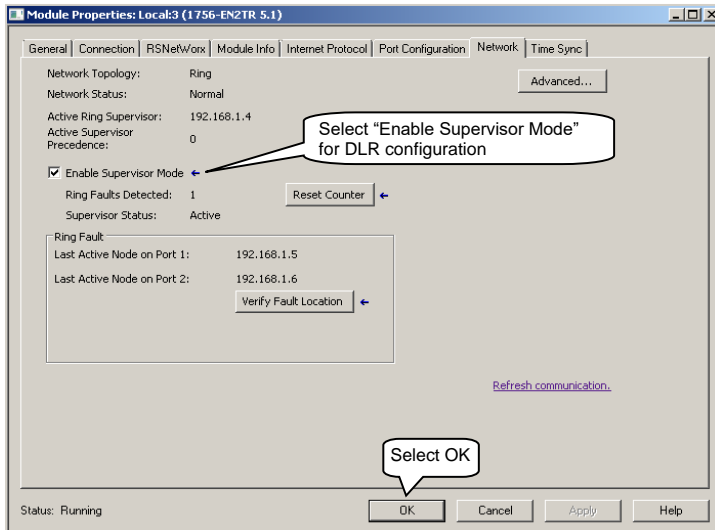
Follow the steps below to configure Allen Bradley EtherNet/IP Communication Module (1756-EN2TR) as DLR Ring Supervisor mode as explained below.

- Right-Click on EtherNet/IP Communication module i.e. 1756-EN2TR of Project Organizer and select properties  
Refer "ENET-AP005F-EN-P-October 2014" document for more information about Device Level Ring (DLR) network

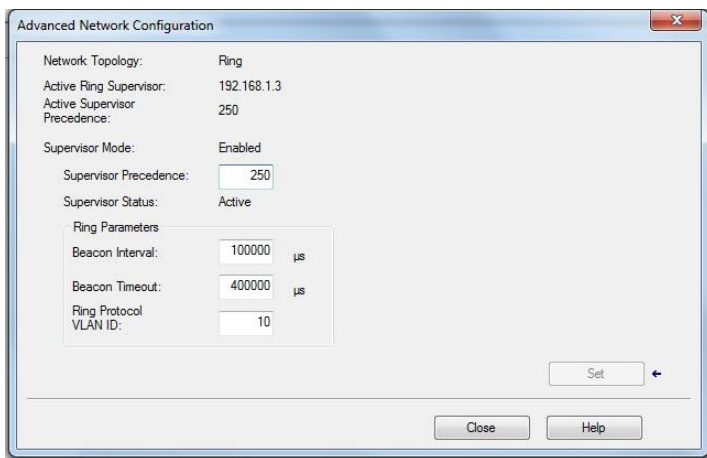




2. Select "Network" tab of Module properties



3. Set Ring parameters i.e. Beacon Interval, Beacon Timeout of Ring network from Advanced option of Network tab. Recommended to keep Ring parameters as Default.



## 6 Monitor Status, IO data and Diagnostics

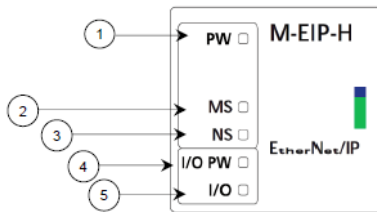
### 6.1 Monitor Network Status

Ethernet I/P network status for scanner and adapter stations can be monitored using

- LED indications on Header module
- Studio 5000 Logix Designer Application
- Modular IO configurator Tool

#### Using LED indications on Header module

Communication between Scanner and M-EIP-H is confirmed by LED indications on Header module. Refer LED label on Header module as below.

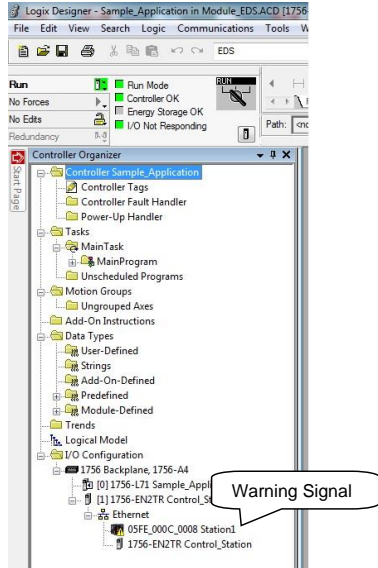


Sr. No	LED	Color	Status	Description
1	PW	Green	ON	System power to Header module is ON
2	MS	Green	ON	Device operational
3	NS	Green	ON	Device on-line and has at least one CIP connection is established
4	I/O PW	Green	ON	Field power to Header module is ON
5	I/O	Green	ON	Header module is powered ON and communicating with IO module and no error is present.

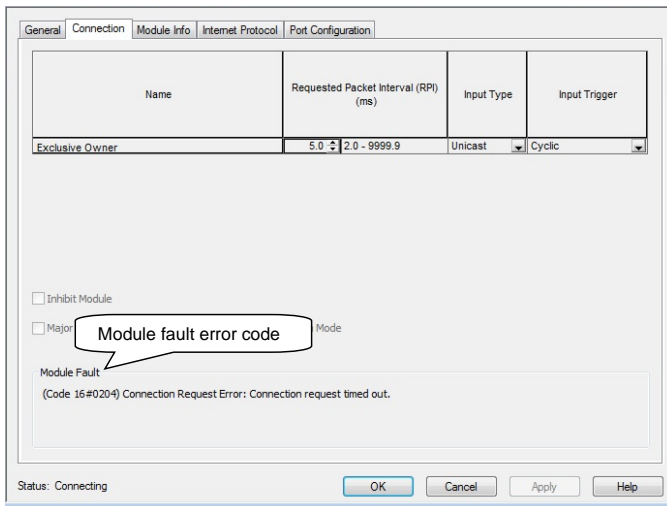
### Using Studio 5000 Logix Designer Application

Follow the steps below to monitor network status as explained below.

1. Go Online, from Communication → Go Online
2. Verify "Warning Signal" on the added module in the I/O Controller Organizer tree of I/O Configuration.  
During Fault mode, IO configuration tree changes its colour to "Yellow Exclamatory mark "as below.



3. Fault information is displayed on "Connection" window of EtherNet/IP Communication Module (1756-EN2TR) as below. Refer Rockwell Automation Publication 1756-PM014L-EN-P-November 2018 for more details.



### Using Modular IO Configurator Tool



Open configuration file and connect via USB port. Click on diagnostic function "Header Diagnostics" , to monitor EtherNet/IP diagnostic information of connected Header module.

Modular IO station provides 2 Ethernet ports (ETH1 and ETH2; Layer 2 switch with DLR support). User can connect any one of the port of Modular IO station. Accordingly, diagnostics of the port can be monitored.

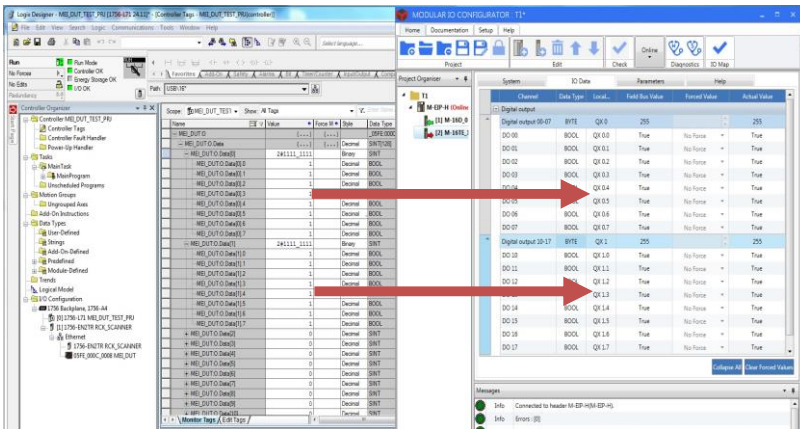
HEADER DIAGNOSTIC INFORMATION : [QQQ]

Diagnostics	Value	Description
Slots 48-63		
Interface (ETH1)		
Interface status		Ethernet interface status ( 0 : Link down, 1: Link up).
Interface speed	100	10MB or 100MB.
Interface (ETH2)		
Ethernet Link (ETH1)		
Received byte count	6591008	Number of bytes received.
Received unicast frames count	13564	Number of unicast frames received.
Received non unicast frames count	4649	Number of non-unicast frames received.
Sent byte count	6544459	Number of bytes transmitted.
Sent unicast frames count	13309	Number of unicast frames transmitted.
Sent non unicast frames count	0	Number of non-unicast frames transmitted.
Large error count	0	Number of frames received with large frame error.
Align error count	0	Number of frames received with alignment error.
FCS error count	0	Number of frames received with CRC/FCS error.
Receive error count	0	Number of frames with other receive errors.
Single collision count	0	Number of frames transmitted after single collision.
Multi collision count	0	Number of frames transmitted after multiple collisions.
Drop count	0	Number of frames dropped after excessive collisions.
Sent error count	0	Number of frames with other transmit errors.
Ethernet Link (ETH2)		
CIP Diagnostics		
DLR		

## 6.2 Monitor IO data

After communication between Communication module and M-EIP-H is established, Header module exchanges IO data with local IO modules as follows.

Select option "Logic → Monitor Tags / Edit Tags" from Menu Tool option to view tags of M-EIP-H as below.





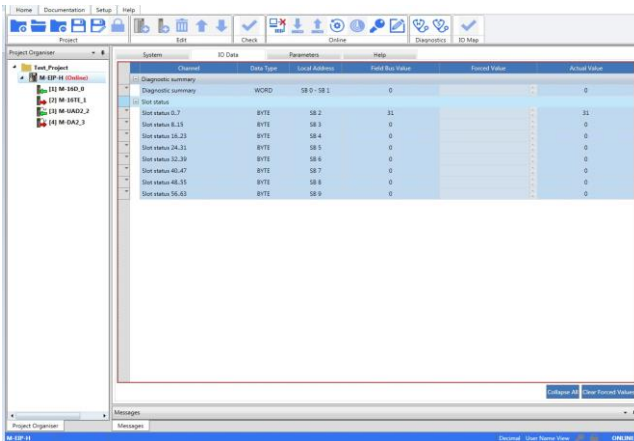
The table below shows how header memory IX,IW,SB,QX and QW is mapped to Input memory and Output memory of Communication module .

Input memory area			Output memory area		
Module	Local Address	Tag Name	Module	Local Address	Tag Name
M-16D	IX0	MEI_DUT:I.Data[0]	M-16TE	QX0	MEI_DUT:O.Data[0]
	IX1	MEI_DUT:I.Data[1]		QX1	MEI_DUT:O.Data[1]
M-UAD2	IW0	MEI_DUT:I.Data[2]	M-DA2	QW0	MEI_DUT:O.Data[2]
		MEI_DUT:I.Data[3]			MEI_DUT:O.Data[3]
	IW1	MEI_DUT:I.Data[4]		QW1	MEI_DUT:O.Data[4]
		MEI_DUT:I.Data[5]			MEI_DUT:O.Data[5]
	SB0	MEI_DUT:I.Data[6]			
	SB1	MEI_DUT:I.Data[7]			
	⋮	⋮			
	SB16	MEI_DUT:I.Data[22]			

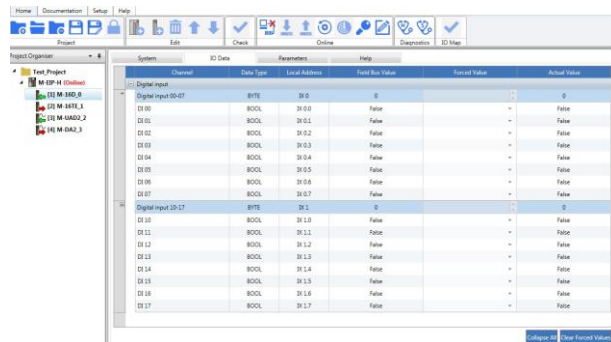
IO data can be monitored on individual Header module using Modular IO Configurator Tool

Following steps explain how to monitor IO data and diagnostics of a modular IO station in online mode,

1. Click on function  to connect to Header module. Icon changes to  and Status bar is updated as ONLINE.
2. Select Header module in Project Organiser window and click on tab "IO data" to monitor diagnostics (SB memory) of Header module.



3. Select IO module in Project Organiser window and click on tab "IO data" to monitor IX of selected M-16D module.

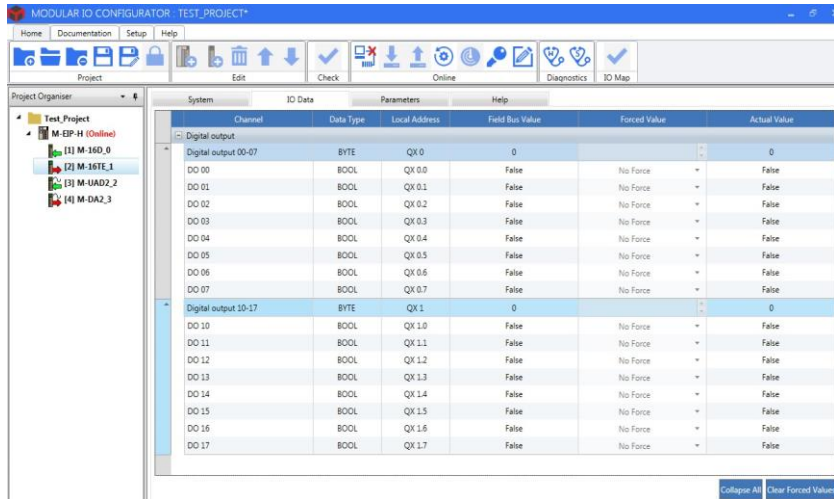


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4. Select IO module in Project Organiser window and click on tab "IO data" to monitor QX of selected M-16TE module.



**Note:** Follow the above procedure to monitor IO data of M-UAD (IW) and M-DA2 (QW).

### 6.3 Monitor Diagnostics

Detailed diagnostics of Ethernet ports ETH1/ETH2 and each IO module in individual Modular IO station can be monitored locally as explained below.

1. Click on function  to connect to Header module. Icon changes to  and Status bar is updated as ONLINE.
2. Click on diagnostic function "Header Diagnostics"  for monitoring diagnostic information of connected Header module.

This pops up following window of "HEADER DIAGNOSTIC INFORMATION".





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Header diagnostics are categorized for easy monitoring. User can monitor individual parameter by expanding individual diagnostic, as shown below.

The screenshot shows a window titled "HEADER DIAGNOSTIC INFORMATION : [QQQ]". It contains a table with columns: Diagnostics, Value, and Description. The table is organized into sections: Diagnostic Summary, Slots 0-15, Slots 16-31, Slots 32-47, Slots 48-63, Interface (ETH1), Interface (ETH2), and Ethernet Link (ETH1). Callouts on the left side of the image identify these sections: "Station Diagnostics summary" points to the Diagnostic Summary section; "Slot wise Status of IO modules" points to the Slots 0-15 section; and "EtherNet/IP communication Diagnostic" points to the Ethernet Link (ETH1) section.

Diagnostics	Value	Description
<b>Diagnostic Summary</b>		
No. of configured slots	5	No. of configured slots.
No. of detected slots	5	No. of detected slots.
Status	0	Bitwise status of header module.
<b>Slots 0-15</b>		
Detected	000000000011111	Bitwise module detection status.
Healthy	000000000011111	Bitwise module health status.
IO error	000000000000000	Bitwise status of module mismatch or absent.
COM error	000000000000000	Bitwise status of module COM error after power ON.
Fatal error	000000000000000	Bitwise status of module fatal error.
Non-fatal error	000000000000000	Bitwise status of module non-fatal error.
<b>Slots 16-31</b>		
<b>Slots 32-47</b>		
<b>Slots 48-63</b>		
<b>Interface (ETH1)</b>		
Interface status	1	Ethernet interface status ( 0 : Link down, 1: Link up).
Interface speed	100	10MB or 100MB.
<b>Interface (ETH2)</b>		
<b>Ethernet Link (ETH1)</b>		
Received byte count	137658	Number of bytes received.
Received unicast frames count	717	Number of unicast frames received.
Received non unicast frames count	49	Number of non-unicast frames received.
Sent byte count	2525360	Number of bytes transmitted.

- Slot diagnostic information provides configured modules and present modules, hardware versions and firmware versions of present modules, slot level error code, etc.

Click on function "Slot diagnostics" to monitor slot diagnostics.

This pops up following window of "SLOT DIAGNOSTIC INFORMATION".

The screenshot shows a window titled "SLOT DIAGNOSTIC INFORMATION (M-EIP-H)". It contains a table with the following columns: Slot, Vendor, Configured..., Present Module, Ver. Configured Module, Ver. Present Module, HW Ver., FW Ver., Backplane Ver., and Error. Callouts with arrows point to specific columns: "List of user names of Header module and IO modules configured" points to the Configured... column; "List of user names of connected Header module and IO modules physically attached to the Header." points to the Present Module column; "Hardware version of present modules." points to the HW Ver. column; "Firmware version of present modules" points to the FW Ver. column; and "Error code of individual module along with error description in tool" points to the Error column.

Slot	Vendor	Configured...	Present Module	Ver. Configured Module	Ver. Present Module	HW Ver.	FW Ver.	Backplane Ver.	Error
0	1	M-EIP-H	M-EIP-H	1.1.0.0	1.1.0.0	1.0.0.0	0.0.0.1	0.0.0.8	0000
1	1	M-16D	M-16D	1.1.0.0	1.0.0.1	1.0.0.0	1.0.0.1	0.0.0.7	0000
2	1	M-16FE	M-16FE	1.1.0.0	1.1.0.0	1.0.0.0	1.1.0.0	0.0.0.3	0000
3	1	M-1AD2	M-1AD2	1.1.0.0	1.1.0.0	1.0.0.0	1.1.0.0	0.0.0.3	0000
4	1	M-DA2	M-DA2	1.1.0.0	1.1.0.0	1.0.0.0	1.1.0.0	0.0.0.3	0000

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