NORGREN

VR10 / VR15
With EtherNet/IP Interface

Operation & Service Manual

EtherNet/IP

IMI

Breakthrough Engineering

Change history:

The change history reflects all changes of the Operation & Service Manual, which were done after the initial release.

Index	Chapters	Change description	Date	Name
001	All	New Release	5-April-2021	MP

This Operation & Service Manual makes no claims of being complete as it does not cover all variants of the VR10 / VR15 valve manifolds.

Therefore, this document is subject to extensions or changes.

1 CONTENTS

2 ABOUT THIS DOCUMENTATION

This User Guide contains the information to set up and operate VR10 / VR15 valve manifold with EtherNet/IP Interface and to detect and resolve problems.

Note:

In addition to the specific information for the EtherNet/IP variants, all data sheets and VR10 / VR15 PROTOCOL / MULTIPOLE SERIES IP65 VERSION Operation & Service Manual are applicable and remain valid.

Refer also to the data sheets on the following web link:

- https://www.norgren.com

Refer also to the valve manifold installation instruction in the following document:

- "VR10 / VR15 PROTOCOL / MULTIPOLE SERIES IP65 VERSION Operation & Service Manual"

  This manual can be found on https://www.norgren.com/us/en/technical-support/installation-maintenance-instructions/valves

Basic information about EtherNet/IP could be found in the following documents:

- "Technology Overview Series: EtherNet/IP"
  https://www.odva.org/wp-content/uploads/2020/05/PUB00138R6-Tech-Series-EtherNetIP.pdf

Network Infrastructure for EtherNet/IP could be found in the following documents:

- "EtherNet/IP Network Infrastructure Guide"
  https://www.odva.org/wp-content/uploads/2020/05/PUB00035R0_Infrastructure_Guide.pdf

Further information about EtherNet/IP is available on following websites:

- https://www.odva.org/
- https://www.odva.org/technology-standards/document-library/

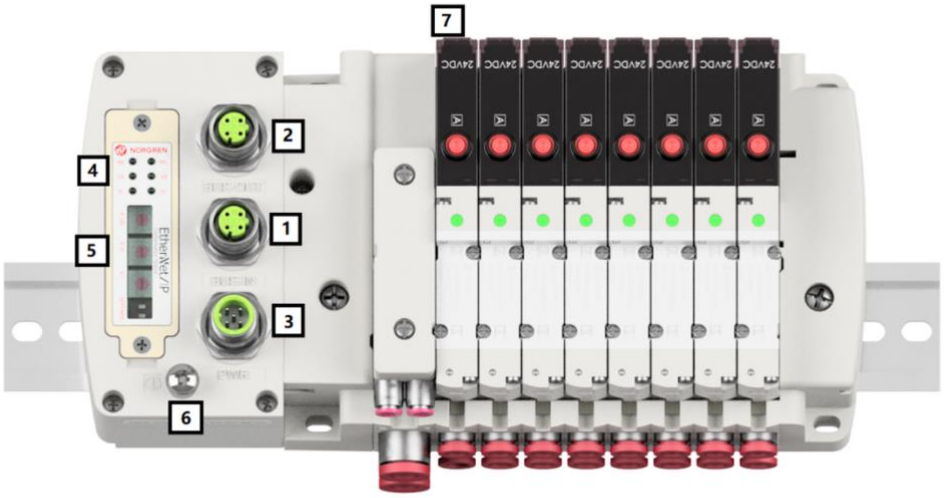
3 IMPORTANT HINTS

3.1 GROUNDING AND EQUIPOTENTIAL BONDING

Proper grounding and equipotential bonding are very important to protect against electromagnetic interferences in EtherNet/IP networks. To reduce potential impact, grounding of the EtherNet/IP cable screen should be done at both ends of every cable (i.e. at each device). Equipotential bonding ensures that the ground potential is identical throughout the entire EtherNet/IP network and is essential to avoid equipotential bonding currents, which could otherwise flow through the EtherNet/IP cable screen. Please refer for further details to the “Network Infrastructure for EtherNet/IP” provided by the EtherNet/IP user organization ODVA (https://www.odva.org/).

For proper grounding please use the earth screw (M4) on the upper side of the valve manifold. For easy reference see item 6 in chapter 4.

4 ELECTRICAL COMPONENTS



1- Port 1 for EtherNet/IP

(M12 x 1 | Female | 4 – pin | D – coded)

2- Port 2 for Ethernet/IP

(M12 x 1 | Female | 4 – pin | D – coded)

3- PWR: Power supply connector

(M12 x 1 | Male | 5 – pin | A – coded)

4- Status LEDs

5- IP address switch.

6- Earth screw (M4)

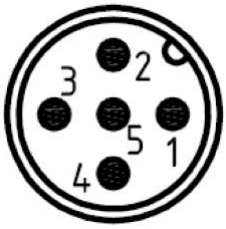
7- Valve status LEDs

4.1 EtherNet/IP PORT 1 & PORT 2

M12 / 4 pins / Female Connector / D-coded	
Pin No.	Function
1	Transmission Data + (TD +)
2	Receive Data + (RD +)
3	Transmission Data - (TD -)
4	Receive Data - (RD -)

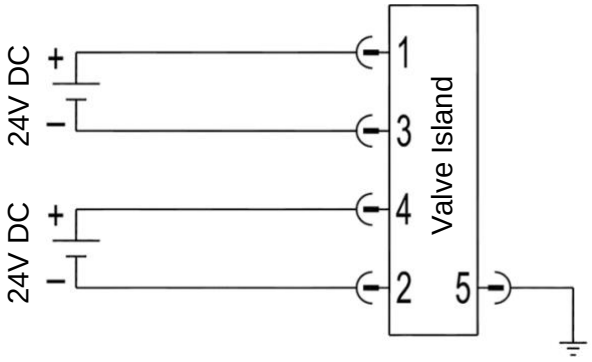
4.2 POWER SUPPLY CONNECTOR

- Pin allocating of power supply connector



M12 / 5 pins / Male Connector / A-coded	
Pin No.	Function
1	L1 (VB +) 24V electronics power supply
2	N2 (VA -) 0V valves power supply
3	N1 (VB -) 0V electronics power supply
4	L2 (VA +) 24V valves power supply
5	FE (functional earth)

- Power supply connector wiring diagram



Notes:

- Make sure electronics power, valves power and their polarities are connected to correct pins respectively before switching on.
- Select the appropriate cables to mate with the connectors mounted on the control module.
- Connect the earth screw to ground.

4.3 ELECTRICAL DATA

Specification		Remark
Valve voltage range (VA)	24VDC +10%/-5%	PELV
Electronics voltage range (VB)	24VDC +/-10%	PELV
Maximum currents	VA: n × 40 mA VB: < 100 mA	n = number of solenoids
Voltages are galvanic decoupled	Yes	---
Protection against polarity reversal	Yes	---
Overcurrent protection VB, VA	Irreversible	---
Output polarity	PNP	---

5 SOLENOID NUMBER, OUTPUT POINT & VALVE STATION MAPPING

5.1 MAPPING RULES FOR VALVE STATIONS 12

- If valve stations ≤ 12, 2 solenoid numbers are always reserved for each valve station. *
  Detailed allocation is shown as below:

Station	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Solenoid A	Sol.01	Sol.03	Sol.05	Sol.07	Sol.09	Sol.11	Sol.13	Sol.15	Sol.17	Sol.19	Sol.21	Sol.23
(14 Solenoid)	Output 0	Output 2	Output 4	Output 6	Output 8	Output 10	Output 12	Output 14	Output 16	Output 18	Output 20	Output 22
Solenoid B	Sol.02	Sol.04	Sol.06	Sol.08	Sol.10	Sol.12	Sol.14	Sol.16	Sol.18	Sol.20	Sol.22	Sol.24
(12 Solenoid)	Output 1	Output 3	Output 5	Output 7	Output 9	Output 11	Output 13	Output 15	Output 17	Output 19	Output 21	Output 23

Notes:
*** For valve station with single solenoid, only Solenoid A (14 Solenoid) is connected. Consider the one which is closest to control module as 1st station (Station #1)**

5.2 MAPPING RULES FOR 12 VALVE STATIONS 24

- If 12 < valve stations ≤ 24, special rules are required since only 1 solenoid number is allocated to valve station with single solenoid:

  Sequence all solenoids following the rules below by starting from 1st station which is the station closest to control module:
  - If 1st station is with double solenoids, sequence solenoid A as Sol.01, solenoid B as Sol.02, following 2nd station solenoid A as Sol.03, solenoid B as Sol.04……
  - If 1st station is with single solenoid, sequence solenoid A as Sol.01, following 2nd station solenoid A as Sol.02, solenoid B as Sol.03……
  - If a station is originally configured as blank, always 2 solenoid numbers are allocated.
  - The rest of stations should also adhere to the sequence rules above.

  A 16-station 24 solenoids valve manifold example is shown below:

	Double Solenoids	Double Solenoids	Single Solenoid	Single Solenoid	Double Solenoids	Double Solenoids	Single Solenoid	Double Solenoids	Single Solenoid	Double Solenoids	Single Solenoid	Double Solenoids	Single Solenoid	Single Solenoid	Double Solenoids	Single Solenoid
Station	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**#10**	**#11**	**#12**	**#13**	**#14**	**#15**	**#16**
Solenoid A	Sol.01	Sol.03	Sol.05	Sol.06	Sol.07	Sol.09	Sol.11	Sol.12	Sol.14	Sol.15	Sol.17	Sol.18	Sol.20	Sol.21	Sol.22	Sol.24
(14 Solenoid)	Output 0	Output 2	Output 4	Output 5	Output 6	Output 8	Output 10	Output 11	Output 13	Output 14	Output 16	Output 17	Output 19	Output 20	Output 21	Output 23
Solenoid B	Sol.02	Sol.04	--*	--*	Sol.08	Sol.10	--*	Sol.13	--*	Sol.16	--*	Sol.19	--*	--*	Sol.23	--*
(12 Solenoid)	Output 1	Output 3			Output 7	Output 9		Output 12		Output 15		Output 18			Output 22	

Note:
*** For valve station with single solenoid, only Solenoid A (14 Solenoid) is allocated & connected. Consider the one which is closest to control module as 1st station (Station #1).**

6 COMMISSIONING

Notes:

1. The method of module installation strongly depends on the configuration software. Please refer to the configuration software manual.
2. All examples in this document are made with following tools,

   Hardware: Allen-Bradley PLC CPU 1756-L61, Ethernet/IP Module 1756-ENBT.

   Software (Rockwell Automation): BootP-DHCP, RS-Linx Classic, RS Logix 5000.

6.1 EDS FILE INSTALLATION

A device description file is needed for configuration of valve manifold. The ESD file is provided by NORGREN and can be downloaded from the following web link:

- https://www.norgren.com/us/en/technical-support/software

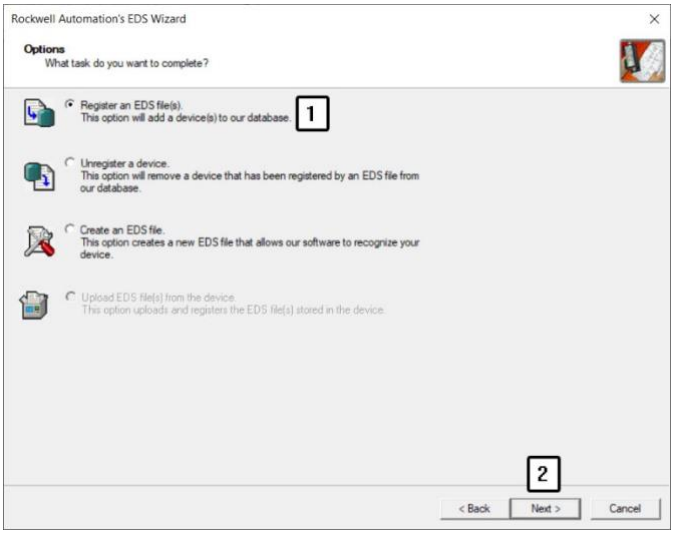
The EDS (Electronic Data Sheet) file could be used for all variants VR10 / VR15:

- "NORGREN-VR1X-EP-Vxx-JJJJMMDD.eds"

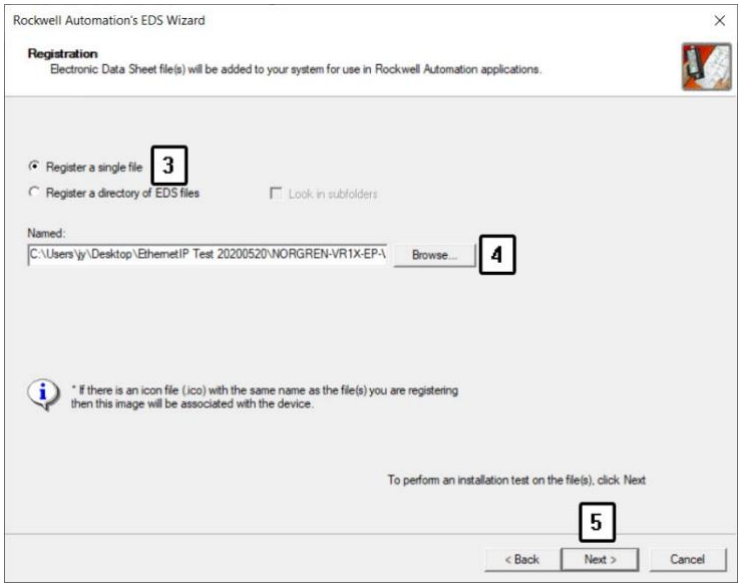
Note: "JJJJMMDD" (JJJJ-year, MM-month, DD-day) is date of release, "Vxx" (xx-version number) is version of release.

The EDS file can be installed inside the engineering tool of the EtherNet/IP controller by following steps in RS Logix 5000.:

- Click "Tools" menu.
- Choose "EDS Hardware Installation Tool". Then click on "Next" in Rockwell Automation's EDS wizard window.
- Select "Register an EDS file(s)". Click Next. (Tag 1-2)

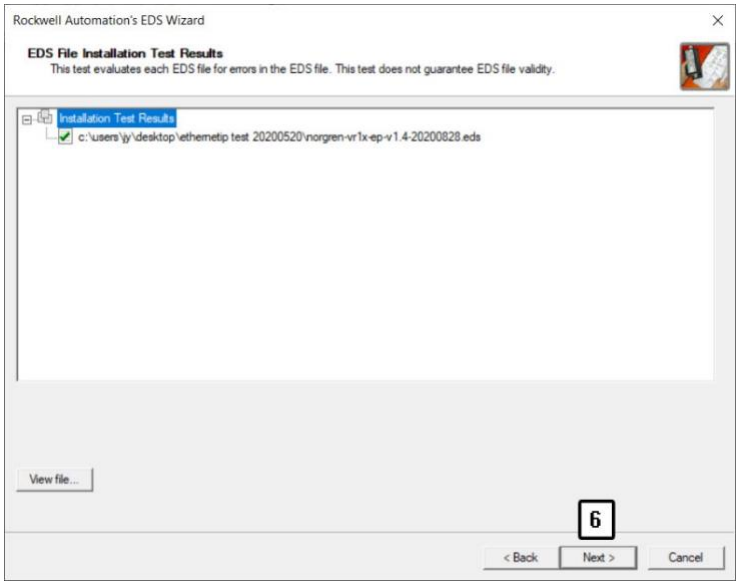


- In next window, click on “Register a single file”. (Tag 3)



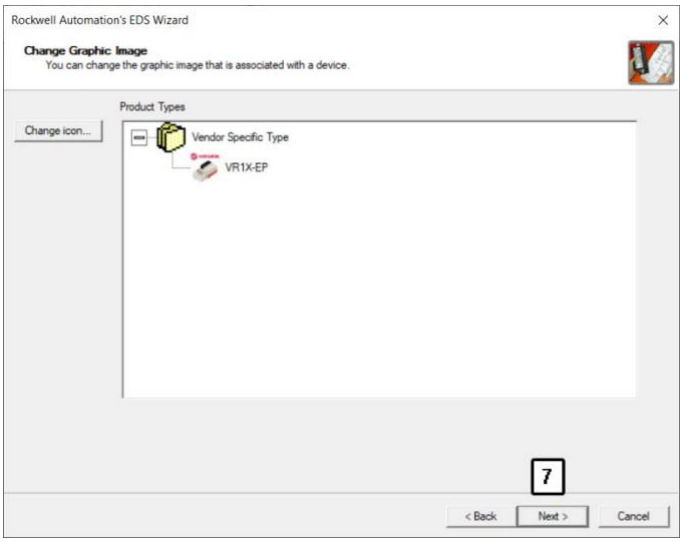
- “Browse” to the source path where EDS file is stored, then click on “Next”. (Tag 4-5)

- Click “Next” on the EDS File Installation Test Result window. (Tag 6)

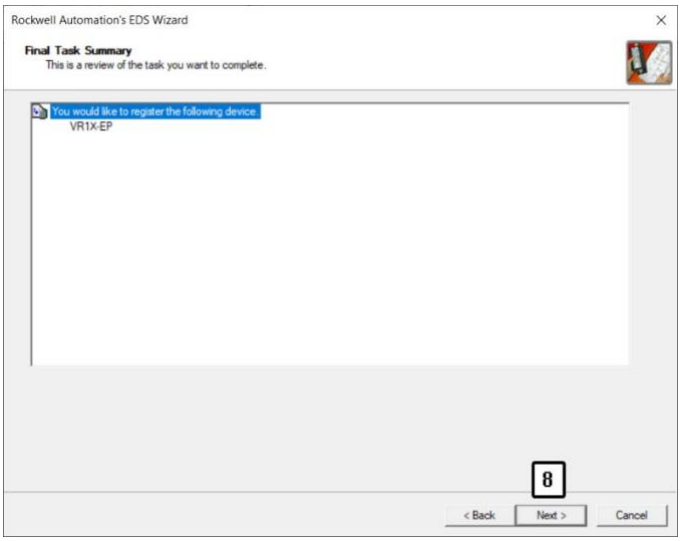


Construction & Design is subject to change (A1743-OPM-EP / Rev.1)

- Click “Next” by accepting the default icon of Norgren valve manifold. (Tag 7)



- Click “Next” on the task summary window. (Tag 8)



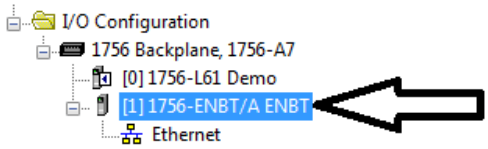
- Click Finish. (Tag 9)

- Now the EDS file is added to the engineering tool.

6.2 HARDWARE CONFIGURATION

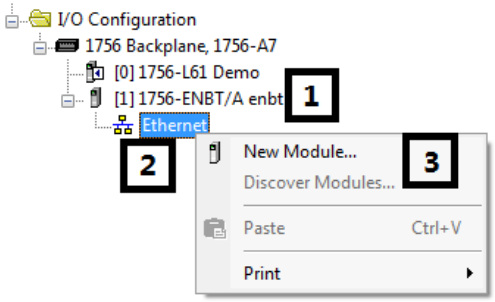
Note: please create a new project or open an existing project before configuring any hardware.

Please make sure the EtherNet/IP moudle has been configured correctly before add valve manifold moudle in the “Controller Organizer” window in RS Logix 5000 as below.

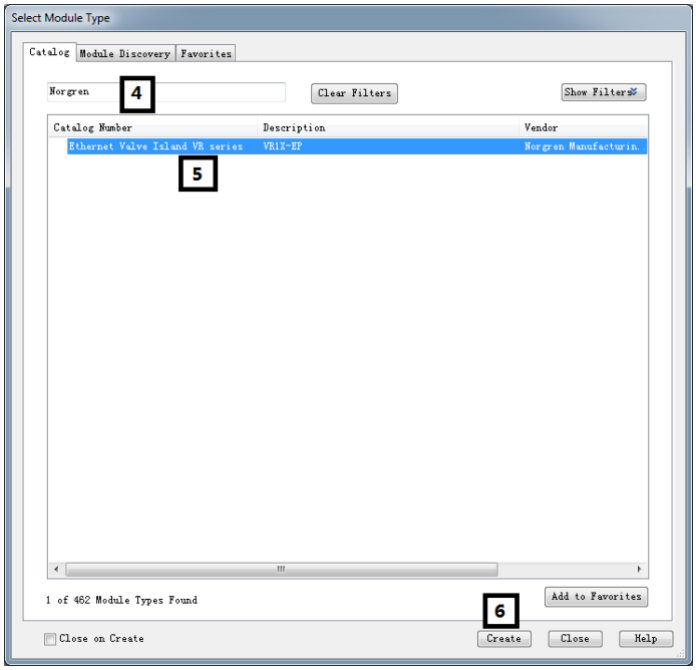


6.2.1 Add Valve Manifold and Configuration

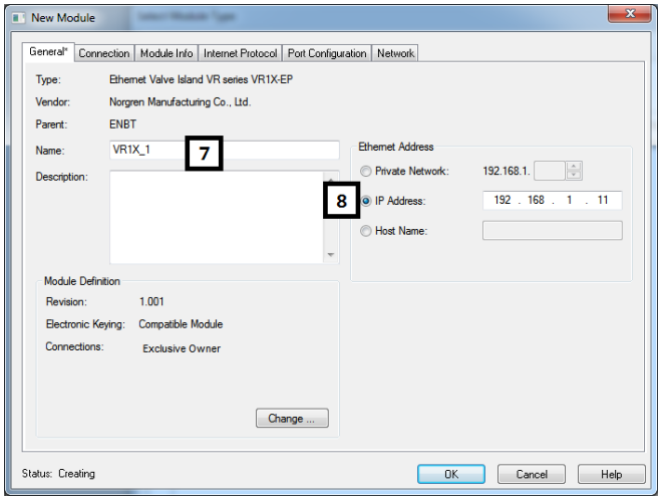
- Find the EtherNet/IP module in controller Organizer. (Tag 1)
- Right-clicking on “Ethernet”. (Tag 2)
- Choose “New Module”. (Tag 3)



- In the “Select Module Type” window, filter by key word “Norgren” if too many module types in “Catalog”. (Tag 4)
- Select correct module type. (Tag 5)
- Click create. (Tag 6)

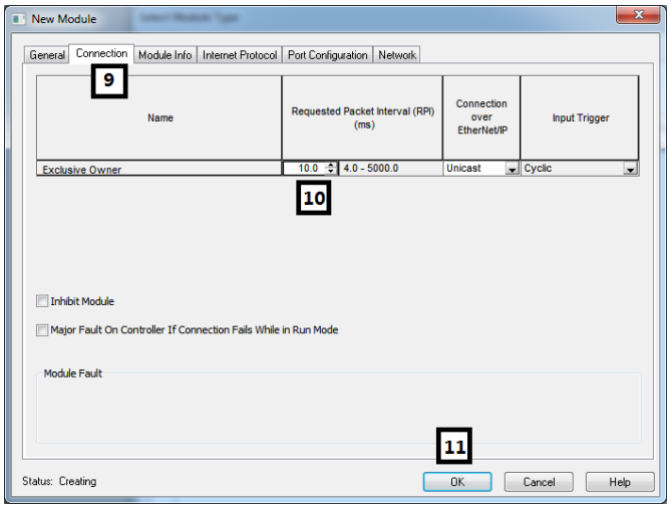


- In the “New Module” window, select “General” tab, input Name and IP address. (Tag 7-8)

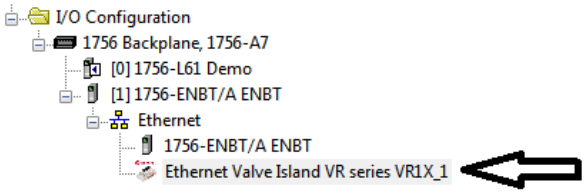


- Select “Connection” tab. (Tag 9)
- Set “Requested Packet Interval (RPI)” greater than or equal to 10ms. The RPI times has a direct impact to the busload. (Tag 10)
- Click “OK”. (Tag 11)

Note: The lower the cycle times, the higher the busload



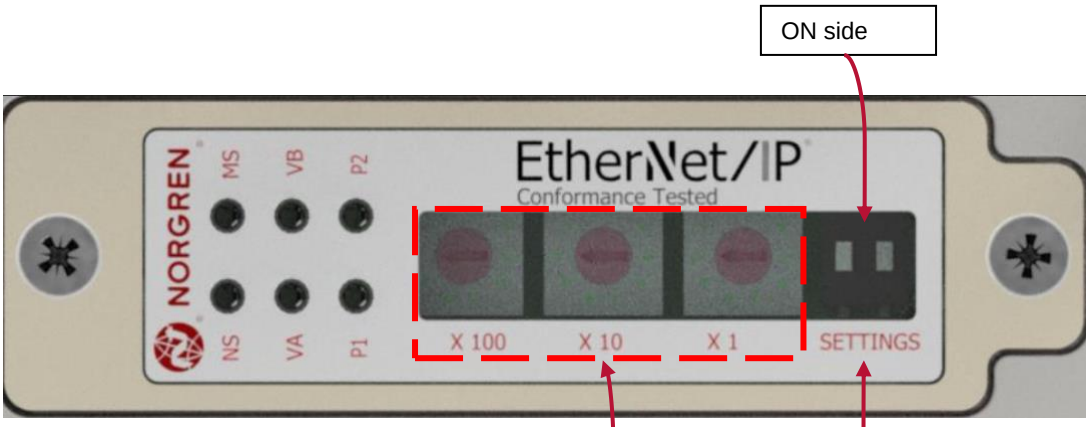
- Now the valve manifold is added to the tree “Controller Organizer”.



6.2.2 Assign IP Address to Valve Manifold

VR10/VR15 provides several options to assign IP address to valve manifold by removing the window to set the rotary and DIP switch with slotted screwdriver 2mm during power off.

The detail functions of the switches are shown as below:



IP address dial panels:

0 0 0: IP address set by Remote Control

2 5 5: IP address set by DHCP

001-254: IP address set by dial panel.

Address from 192.168.*. 001 to 192.168.*. 254

"*" is set by "setting switch 1"

Settings - Select additional IP address range.

Switch 1 is "ON" side:
IP address range: 192.168.1.001 to 192.168.1.254

Switch 1 is at opposite "ON" side:
IP address range: 192.168.0.001 to 192.168.0.254

Notes:
001-254 is set by dial panels.
Switch 1 does not take effect under Remote control and DHCP mode.
Switch 2 is not used.

6.2.2.1 IP Address Setting by Remote Control

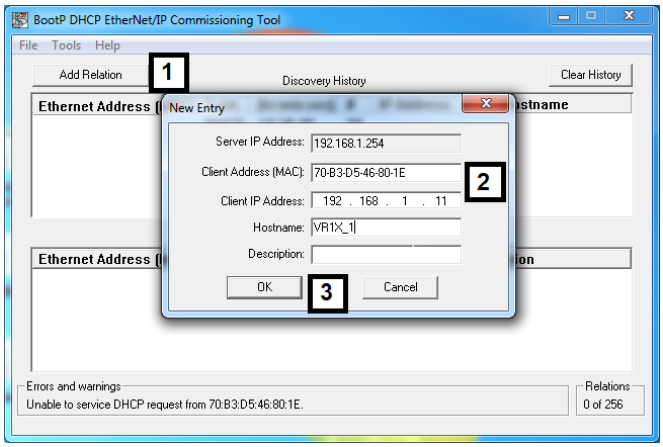
In remote control mode, IP address can be set by DHCP server, or TCP/IP Interface Object.

- IP address set by DHCP Server
  VR10/VR15 is set as a DHCP client in remote control mode by default.
  IP Address must be assigned using a DHCP server or a similar tool.
  The IP address must be set again after each power cycle.

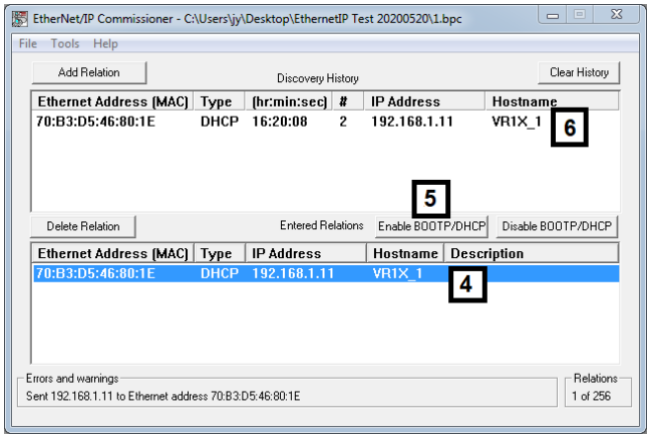
  The following example shows the IP Address assignment using Rockwell Automations tool BOOTP_DHCP.

  In the BOOTP_DHCP tool, making sure network adaptor which is in the network is selected. Then follow the steps below:

  - In the “commissioning tool” window, click Add Relation. (Tag 1)
  - Enter Client Address (MAC), IP Address and Hostname in the “New Entry” window, Click OK. (Tag 2-3)
  - The relation now is added.



  - Select the added relation. (Tag 4)
  - Click “Enable BOOTP/DHCP”. (Tag 5)
  - The VR10/VR15 valve manifold will appear with assigned IP Address in “Discovery History” list if address assignment was successful. (Tag 6)

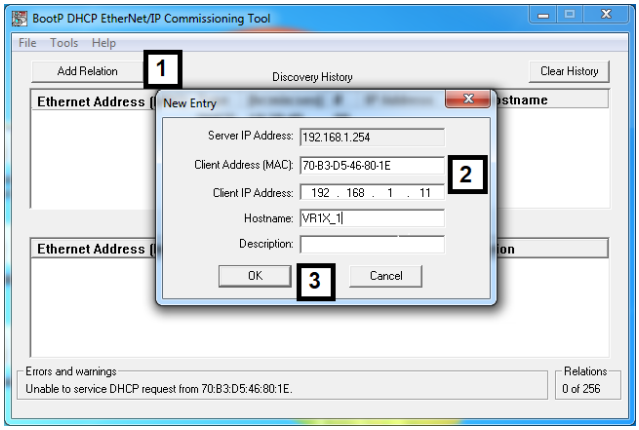


- Static IP Address assignment

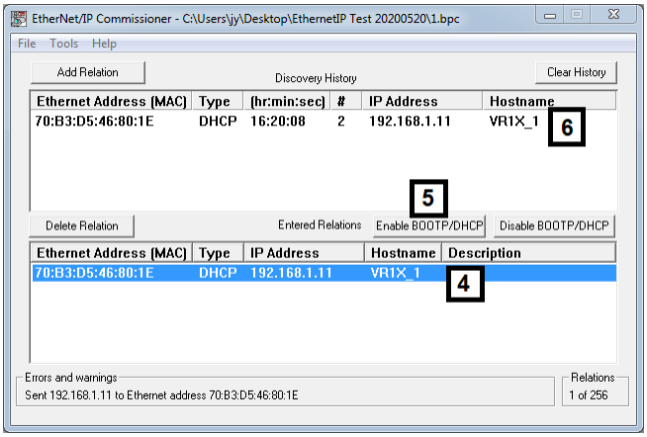
  Static IP address must be done once and is valid after power cycles.

  The following example shows how to set static IP address by Rockwell Automation tool BOOTP/DHCP.

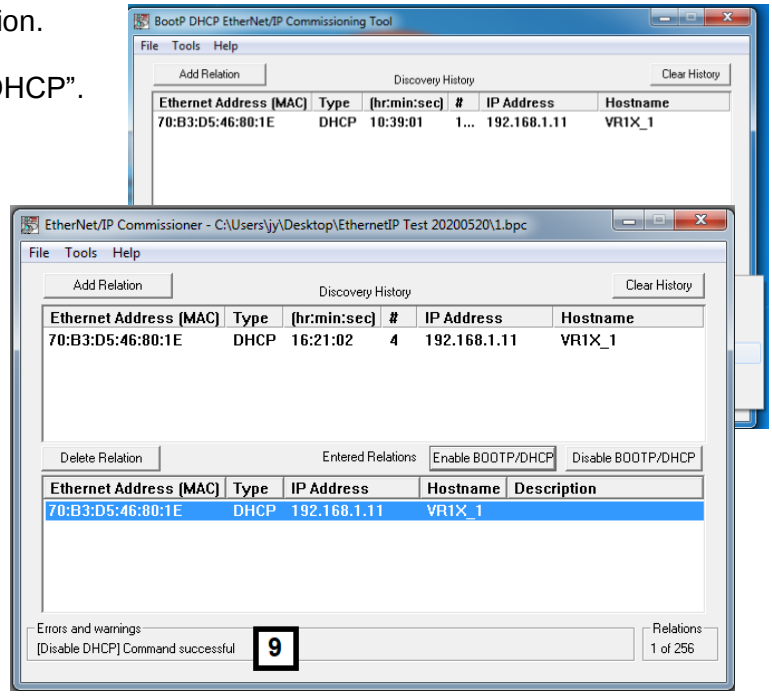
  - Click Add Relation. (Tag 1)
  - Enter Client Address (MAC), IP Address and Hostname. (Tag 2)
  - Click OK. (Tag 3)



  - Select the added relation. (Tag 4)
  - Click “Enable BOOTP/DHCP”. (Tag 5)
  - The VR10/VR15 valve manifold will appear with assigned IP Address in “Discovery History” list if address assignment was successful. (Tag 6)



- Right-clicking on the relation. (Tag 7)
- Select “Disable BOOTP/DHCP”.
- (Tag 8)



- “[Disable DHCP] command successful” will appear in the Errors and warnings status.

- Static IP address can also set by TCP/IP Interface Object.

  The Read/Write access to the TCP/IP Interface Object is done via the Explicit Messages communication method.

  The configuration method is set up with the bits0-3 in attribute 3. Please use the statically assigned IP configuration set up value “0” for those bits.

Bit(s):	Called:	Definition	
0-3	Configuration Method	Determines how the device shall obtain its IP-related configuration	0 = The device shall use statically assigned IP configuration values. 1 = The device shall obtain its interface configuration values via BOOTP. * 2 = The device shall obtain its interface configuration values via DHCP. 3-15 = Reserved for future use.
4	DNS Enable	If 1 (TRUE), the device shall resolve host names by querying a DNS server.	
5-31	Reserved	Reserved for future use and shall be set to zero.	

Attribute 3 of TCP/IP Interface Object: Configuration Method

***IP address of VR10 / VR15 with EtherNet/IP Interface can not be assigned by BOOTP.

Attribute 5 contains the configuration parameters required to operate as a TCP/IP node. At least network address and network mask need to be configured.

Name	Meaning
IP address	The device’s IP address.
Network mask	The device’s network mask. The network mask is used when the IP network has been partitioned into subnets. The network mask is used to determine whether an IP address is located on another subnet.
Gateway address	The IP address of the device’s default gateway. When a destination IP address is on a different subnet, packets are forwarded to the default gateway for routing to the destination subnet.
Name server	The IP address of the primary name server. The name server is used to resolve host names. For example, that might be contained in a CIP connection path.
Name server 2	The IP address of the secondary name server. The secondary name server is used when the primary name server is not available or is unable to resolve a host name.
Domain name	The default domain name. The default domain name is used when resolving host names that are not fully qualified. For example, if the default domain name is “odva.org”, and the device needs to resolve a host name of “plc”, then the device will attempt to resolve the host name as “plc.adva.org”.

Attribute 5 of TCP/IP Interface Object: Interface Configuration

Next table shows the structure of the interface configuration attribute.

Attribute	STRUCT of:	Interface Configuration
5	UDSINT	IP Address
	UDSINT	Network Mask
	UDSINT	Gateway Address
	UDSINT	Name Server
	UDSINT	Name Server 2
	STRING	Domain Name
	UDSINT	Pad

Structure of Attribute 5: Interface Configuration

6.2.2.2 IP Address Set by Dial Panels

When the IP address dial panel is set between 001 and 254, the IP address is set by the dial panel. In this way, the first and second positions of the IP address will remain at 192 and 168, and the last two positions shall be set according to the switch setting instructions in chapter 6.2.2.

6.2.2.3 DHCP Mode

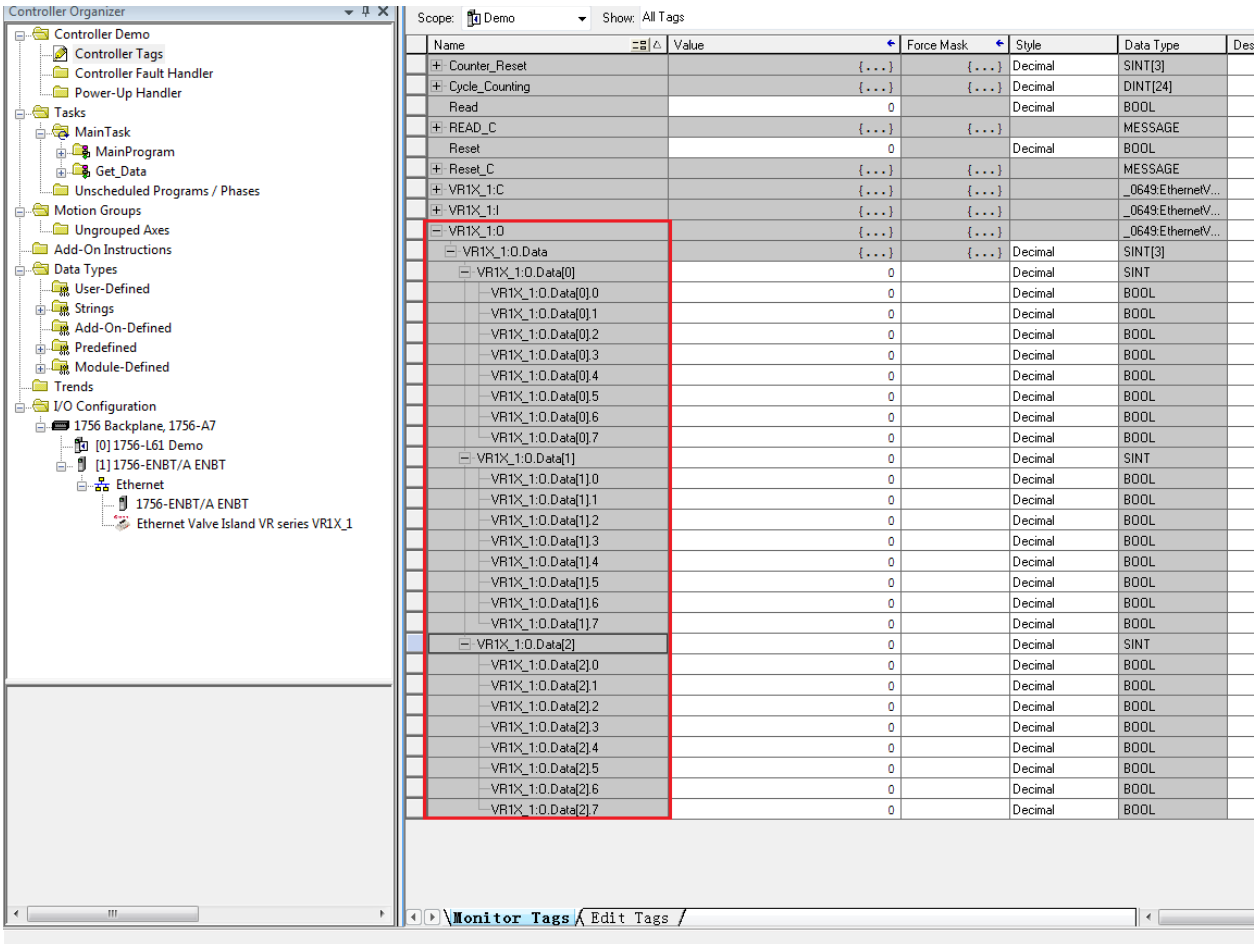
When the IP address dial panel is set to 255 position, IP address setting is in DHCP mode, any static IP address will be cleared automatically, and IP address is set by DHCP server.

Please follow Chapter 6.2.2.1 “a) IP address set by DHCP Server” to set IP address.

6.3 DIGITAL OUTPUTS DATA

In EDS file, the digital outputs data is defined as “Assembly Object Instance: 150d, Class: 0x04”.

- VR10 / VR15 valve manifold channel outputs will be real-time monitored & displayed.
- Channel outputs process codes will be reported by “**Output Byte 0**”, “**Output Byte 1**” and “**Output Byte 2**”.
- The digital outputs data can be found as following capture.
  - Click “Control Tags”.
  - Select “Monitor Tags”.
  - Expand “VR1X_1:O” and “VR1X_1:O.Data” (VR1X_1 is the name of module; it would change if another name used for the module).



- Outputs Value and solenoid number mapping relation is shown in table below.
  - The bit is “1” means there is output occurred on that solenoid.
  - The bit is “0” means no output.
  - Outputs positioning to valve station follow the mapping rules stated in Chapter 5.

Output Byte 0								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Output Byte 1								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Output Byte 2								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

6.4 DIGITAL INPUTS DATA

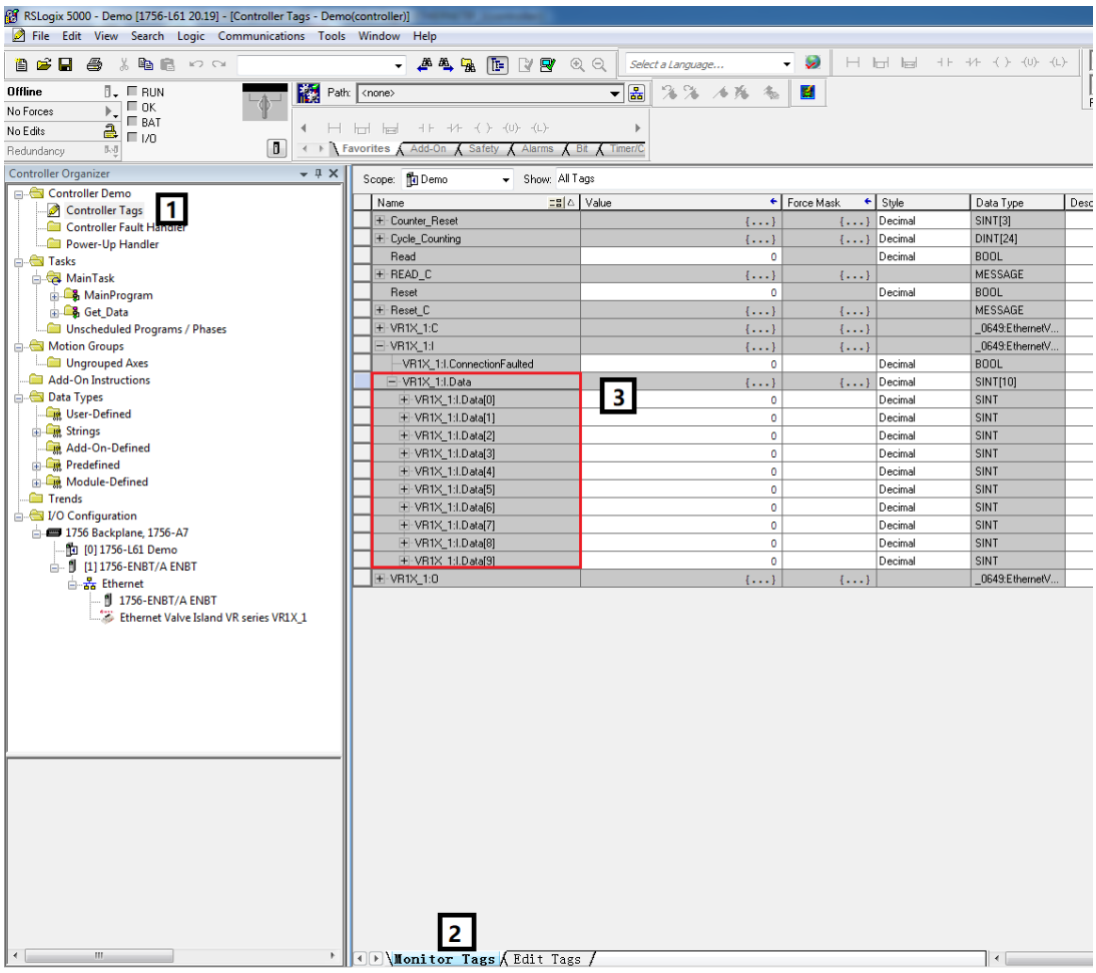
In EDS file, the digital inputs data is defined as “Assembly Object Instance: 100d, Class: 0x04”.

The digital inputs data reflect diagnostic status, it includes 4 parts:

1) Overall status diagnostics
2) Short circuit diagnostics per solenoid
3) Open load diagnostics per solenoid (e.g. wire break of solenoid)
4) Cycle overrun diagnostics per solenoid (cycles beyond the count limit)

The digital inputs data can be found as following capture.

- Click “Control Tags”. (Tag 1)
- Select “Monitor Tags”. (Tag 2)
- Expand “VR1X_1: I” and “VR1X_1:I.Data” (VR1X_1 is the name of module, it would change if another name used for the module). (Tag 3)

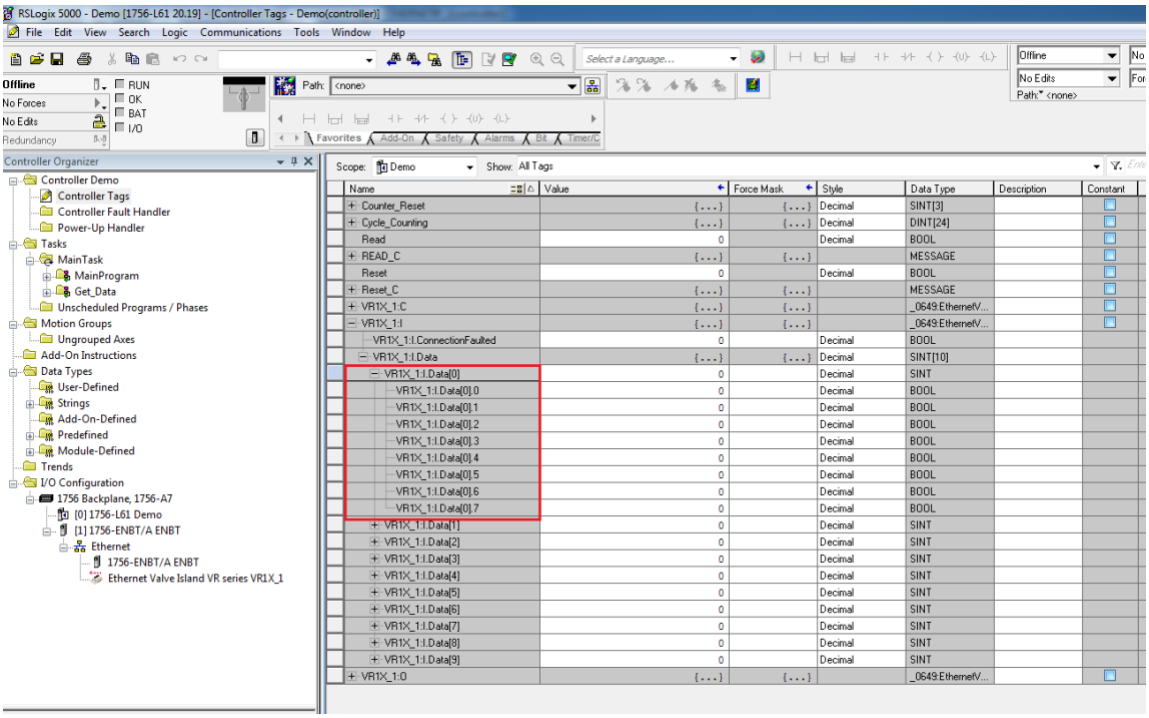


- The diagnostic status and digital inputs data mapping shows in following table:

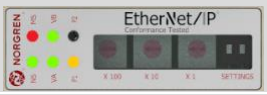
Overall status diagnostics	**Input Byte 0**								
	Fault type		OC	SC	COR	UV-VB	OV-VB	UV-VA	OV-VA
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Short circuit diagnostics	**Input Byte 1**								
	Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 2								
	Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 3								
	Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Open load diagnostics	**Input Byte 4**								
	Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 5								
	Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 6								
	Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Cycle overrun diagnostics	**Input Byte 7**								
	Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 8								
	Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 9								
	Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

6.4.1 Overall Status Diagnostics

- VR10 / VR15 valve manifold module status will be shown in real-time.
- The overall status diagnostic includes:
  - Over voltage diagnostics for valve power
  - Under voltage diagnostics for valve power
  - Over voltage diagnostics for electronic power
  - Under voltage diagnostics for electronic power
  - Cycle overrun overall diagnostics (cycles beyond the count limit)
  - Short circuit overall diagnostics
  - Open load overall diagnostics (e.g. wire break of solenoid)
- Fault error will be reported by "**Input Byte 0**".



- Common fault errors are shown below:

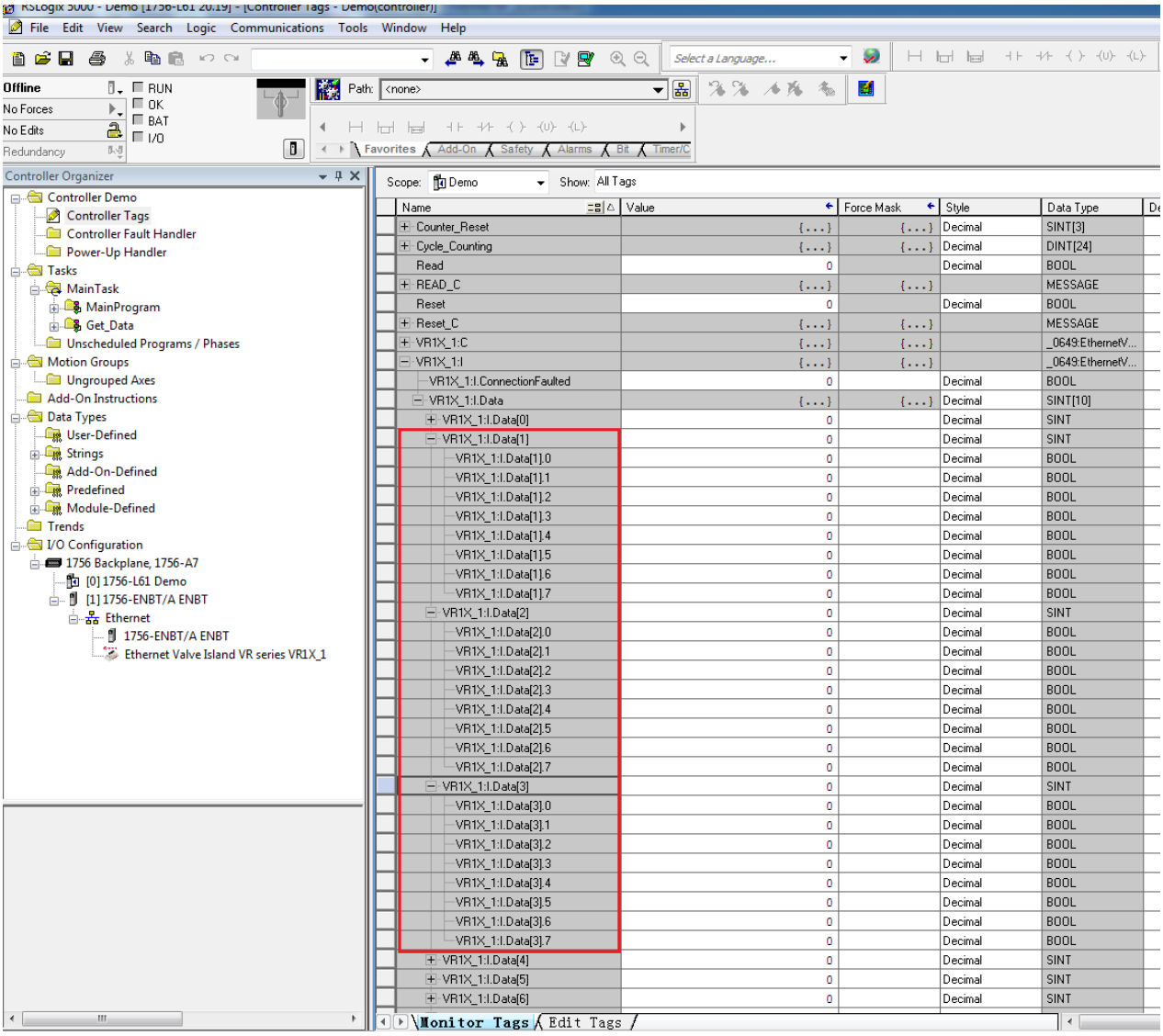
Fault type	Associated LED & Remark	
Over voltage diagnostics for valve power *Abbreviation: OV-VA*	"VA" LED, red	
Under voltage diagnostics for valve power *Abbreviation: UV-VA*	"VA" LED, flashing red	
Over voltage diagnostics for electronic power *Abbreviation: OV-VB*	"VB" LED, red	
Under voltage diagnostics for electronic power *Abbreviation: UV-VB*	"VB" LED, flashing red	
Cycle overrun diagnostics *Abbreviation: COR*	"MS" LED, flashing red	
Short circuit diagnostics *Abbreviation: SC*	"MS" LED, flashing red	
Open load diagnostics *Abbreviation: OC*	"MS" LED, flashing red	 Need to enable open load diagnostics

- Binary code and fault type mapping relation is shown in table below. 0 is no fault, 1 is fault found.

Input Byte 0								
Fault type		OC	SC	COR	UV-VB	OV-VB	UV-VA	OV-VA
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

6.4.2 Short Circuit Diagnostics

- Short circuit fault error codes will be reported by “**Input Byte 1**”, “**Input Byte 2**” and “**Input Byte 3**”.



- Binary code and solenoid number mapping relation is shown in table below. 0 is no fault, 1 is fault found.

Input Byte 1								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

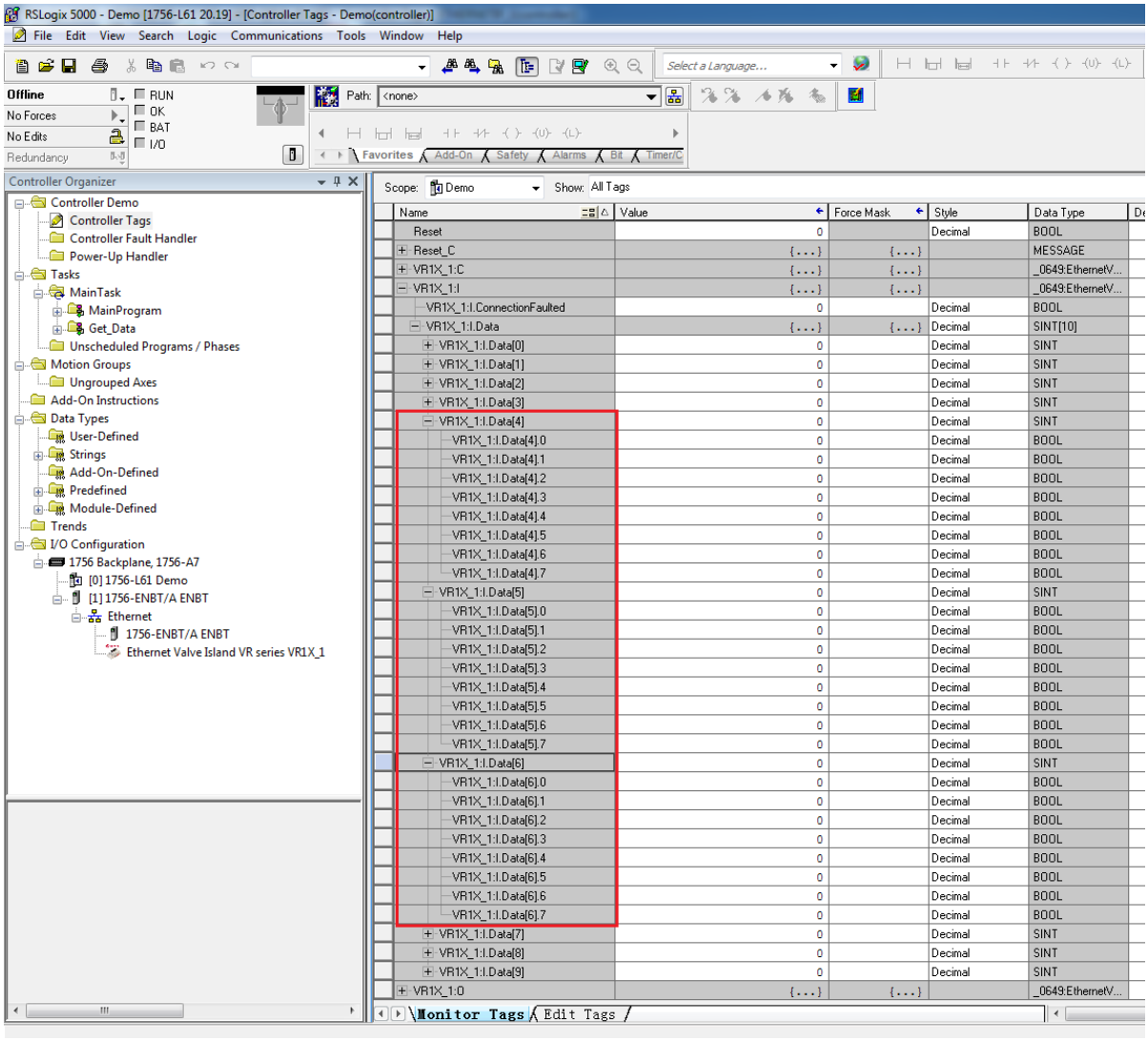
Input Byte 2								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 3								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

6.4.3 Open Load Diagnostics

- Open load fault error codes will be reported by "**Input Byte 4**", "**Input Byte 5**" and "**Input Byte 6**".

  Note: Need to enable open load diagnostics.



- Binary code and solenoid number mapping relation is shown in table below. 0 is no fault, 1 is fault found.

Input Byte 4								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

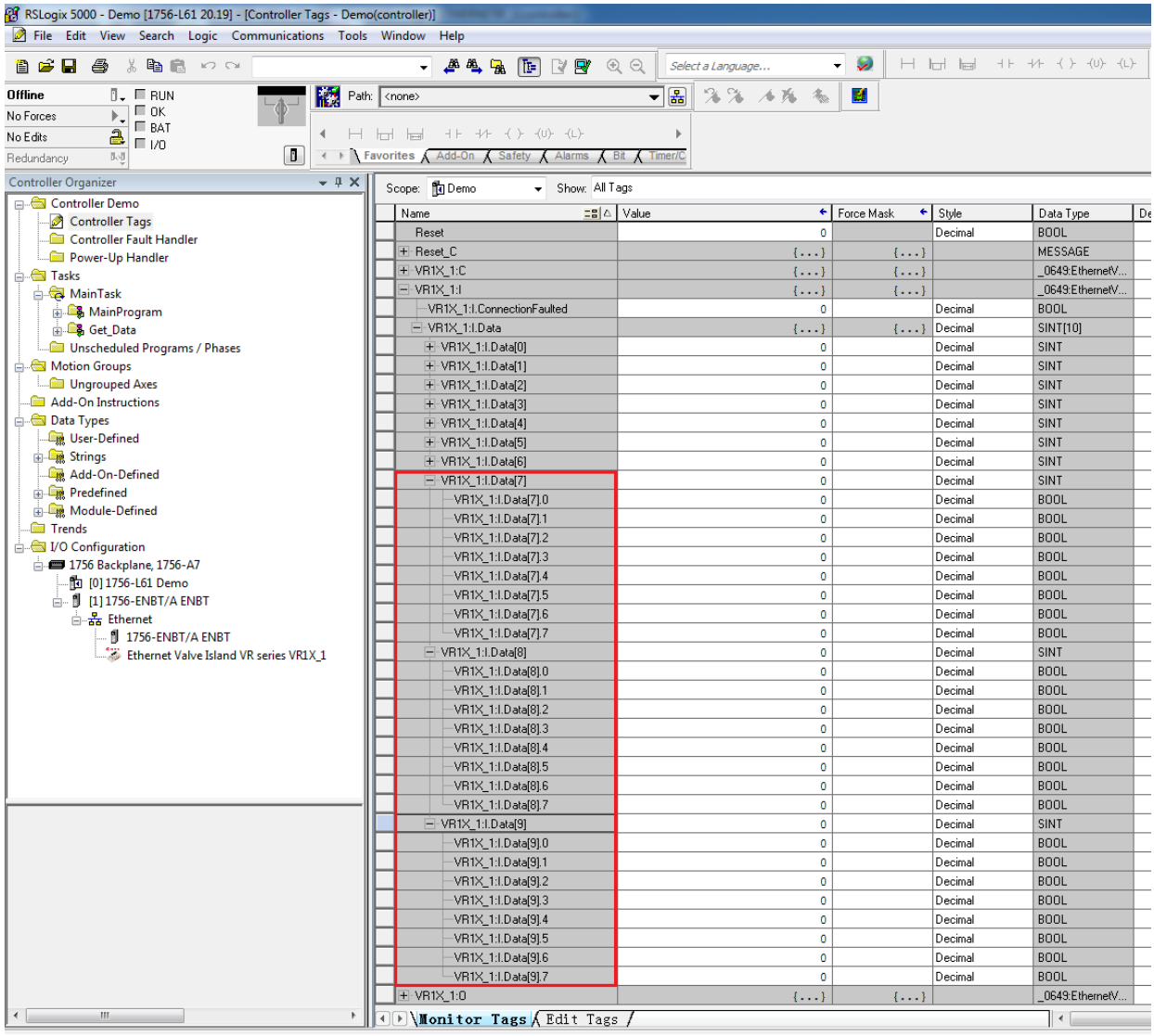
Input Byte 5								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 6								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

6.4.4 Cycle Overrun Diagnostics

- Cycle overrun fault error codes will be reported by “**Input Byte 7**”, “**Input Byte 8**” and “**Input Byte 9**”.

Note: Need to set valid count limit so that this diagnostic function is effective.



- Binary code and solenoid number mapping relation is shown in table below. 0 is no fault, 1 is fault found.

Input Byte 7								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 8								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 9								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

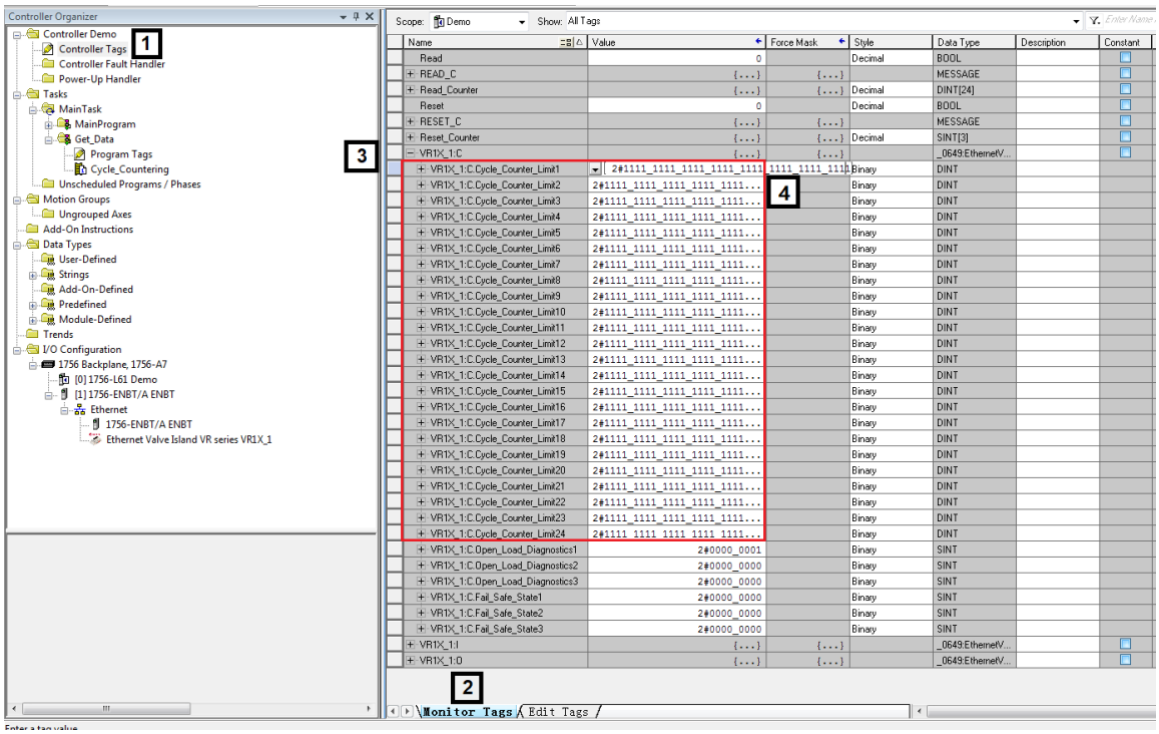
6.5 PARAMETERIZATION

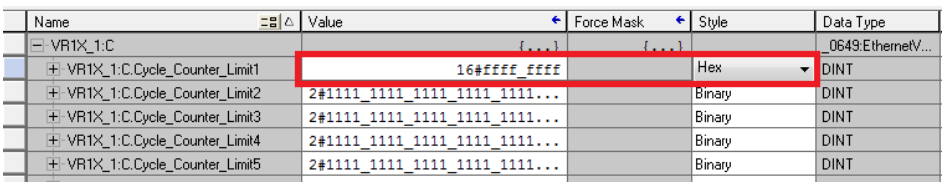
In EDS file, the parameterization data is defined as “Assembly Object Instance: 151d, Class: 0x04”. All the parameterization data must be downloaded after setting.

6.5.1 Cycle Counter Limit

It is possible for VR10 / VR15 valve manifold to set cycle counter limit for each solenoid. If count exceeds limit, MS LED on the valve manifold change from green to red flashing.

- Click “Control Tags”. (Tag 1)
- Select “Monitor Tag”. (Tag 2)
- Expand the “VR1X_1:C” (VR1X_1 is the name of module; it would change if another name used for the module). (Tag 3)
- Set the counter limit value for each solenoid. The default value for each solenoid is 16#ffff_ffff (HEX Style), the maximum limit value. (Tag 4)





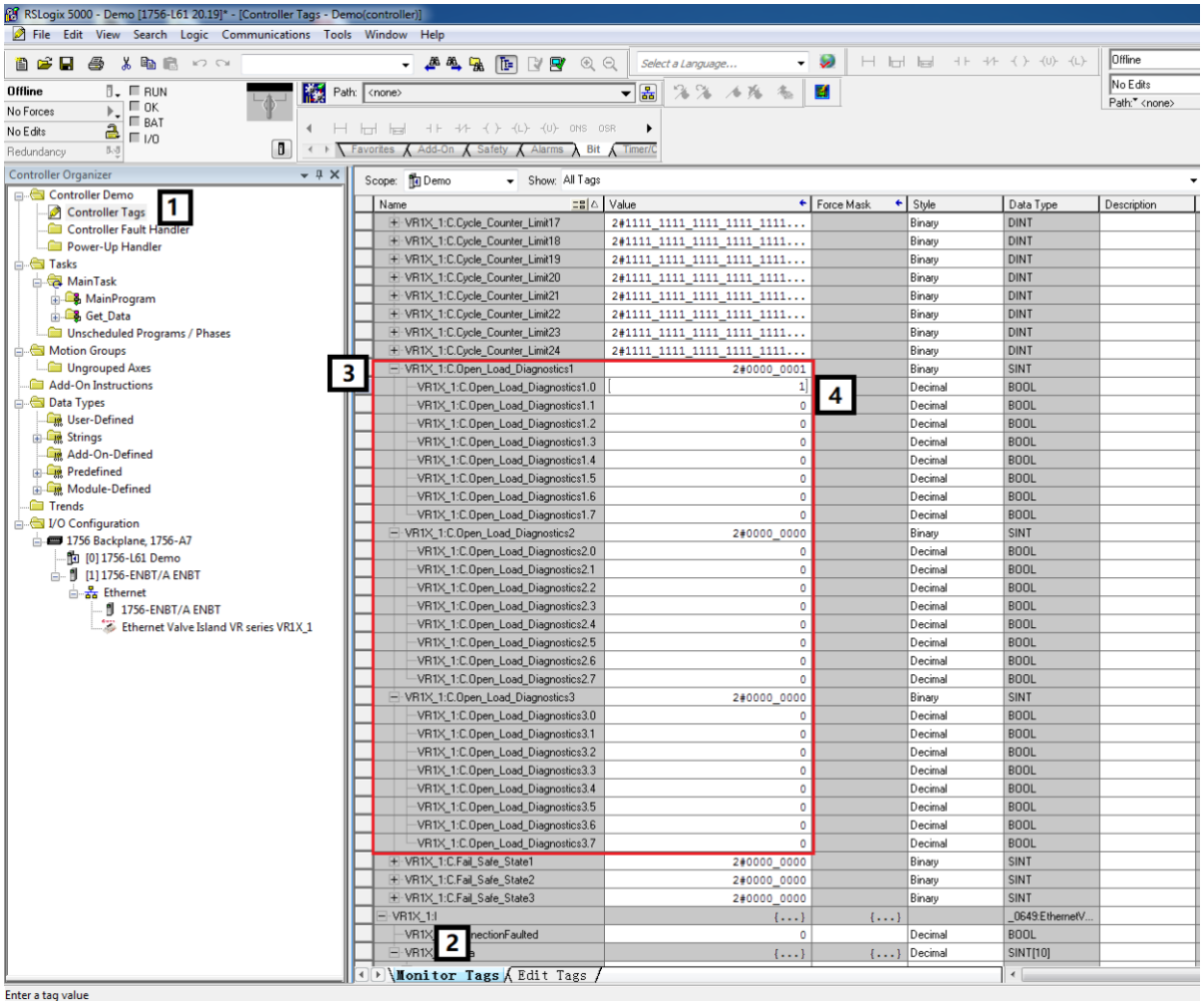
- Variable name and solenoid number mapping relation is shown in table below.
- The range of counter limit for each solenoid between 16#0000_0000 and 16#ffff_ffff.
- Solenoid number and output point mapping relation is shown in Chapter 5.

Cycle Count Limit Mapping		
Variable Name	**Solenoid**	**Value Range**
Cycle Counter Limit 1	Sol.01	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 2	Sol.02	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 3	Sol.03	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 4	Sol.04	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 5	Sol.05	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 6	Sol.06	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 7	Sol.07	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 8	Sol.08	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 9	Sol.09	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 10	Sol.10	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 11	Sol.11	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 12	Sol.12	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 13	Sol.13	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 14	Sol.14	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 15	Sol.15	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 16	Sol.16	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 17	Sol.17	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 18	Sol.18	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 19	Sol.19	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 20	Sol.20	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 21	Sol.21	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 22	Sol.22	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 23	Sol.23	16#0000_0000 ~ 16#ffff_ffff
Cycle Counter Limit 24	Sol.24	16#0000_0000 ~ 16#ffff_ffff

6.5.2 Open Load Diagnostics Setting

It is possible for VR10 / VR15 valve manifold to enable / disable the open load diagnostics for each solenoid. If disabled, no EtherNet/IP open load diagnostic error appears. Otherwise MS LED on the valve manifold change from green to red flashing.

- Click “Control Tags”. (Tag 1)
- Select “Monitor Tag”. (Tag 2)
- Expand the “VR1X_1:C” (VR1X_1 is the name of module; it would change if another name used for the module). (Tag 3)
- Set “0” or “1” for each solenoid to enable or disable open load diagnostics function. The default value for each solenoid is “0”, it means open load diagnostic is disabled as default. (Tag 4)



- Value and solenoid number mapping relation is shown in table below.
- The bit that is set to “1” means enable open load diagnostics function of that solenoid.
- The bit that is set to “0” means disable open load diagnostics function of that solenoid.
- Solenoid number and output point mapping relation is shown in Chapter 5.

Open Load Diagnostics 1 Byte								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

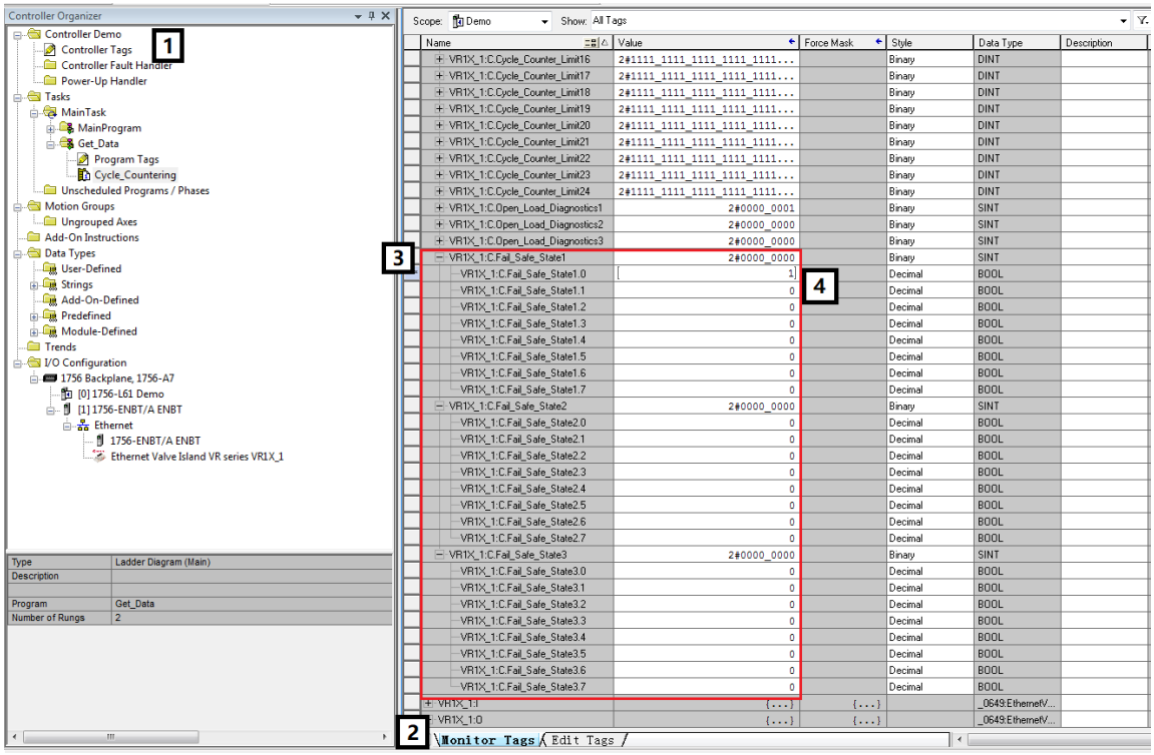
Open Load Diagnostics 2 Byte								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Open Load Diagnostics 3 Byte								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

6.5.3 Fail Safe State Setting

It is possible to define the behaviour of the outputs in case of broken EtherNet/IP communication or PLC stopped.

- Click “Control Tags”. (Tag 1)
- Select “Monitor Tag”. (Tag 2)
- Expand the “VR1X_1:C” (VR1X_1 is the name of module; it would change if another name used for the module). (Tag 3)
- Set “0” or “1” for each solenoid to define the behaviour of the outputs in case of broken EtherNet/IP communication or PLC stopped. The default value for each solenoid is “0”, it means no output of that solenoid in case of broken EtherNet/IP communication or PLC stopped as default. (Tag 4)



- Value and solenoid number mapping relation is shown in table below.
- The bit that is set to “1” means last valid value of that solenoid is retained in case of broken EtherNet/IP communication or PLC stopped.
- The bit that is set to “0” means no output of that solenoid in case of broken EtherNet/IP communication or PLC stopped.
- Solenoid number and output point mapping relation is shown in Chapter 5.

Fail Safe State 1 Byte								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Fail Safe State 2 Byte								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Fail Safe State 3 Byte								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

6.5.4 Voltage and Short Circuit Diagnostics

VR10 / VR15 valve manifold supports voltage diagnostics for both electronic power and valve power and short circuit diagnostics for each solenoid. These two diagnostic functions cannot be disabled.

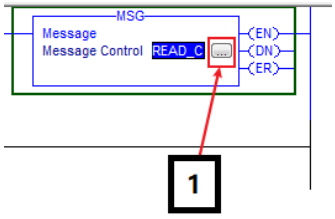
- In case of over / under voltage the related LEDs on the valve manifold change color from green to red.
- In case of short circuit MS LED on the valve manifold change from green to red flashing.

6.6 CYCLE COUNTING DATA ACQUISITION

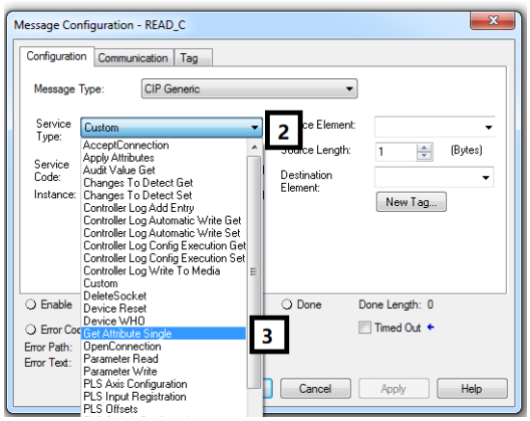
In EDS file, cycle counting data is defined as “Assembly Object Instance: 101d, Class: 0x04”.

VR10 / VR15 valve manifold supports cycle counting for each solenoid.

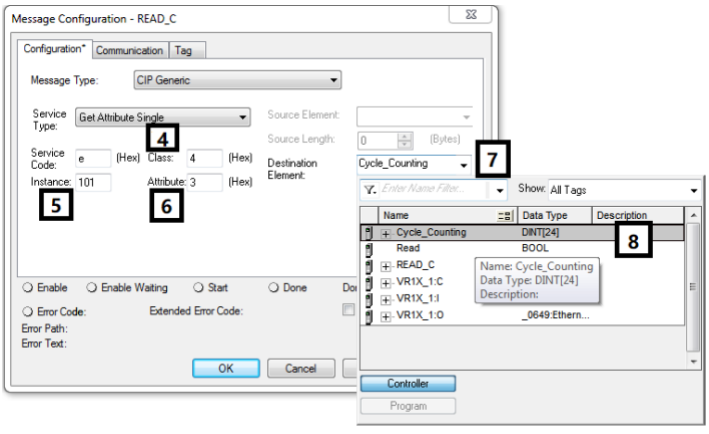
- Cycle counting data can be obtained by ladder Element “MSG”.
- The following steps give brief instruction of using “MSG” to get data from VR10/VR15.
- In the message configuration of “MSG”. (Tag 1)



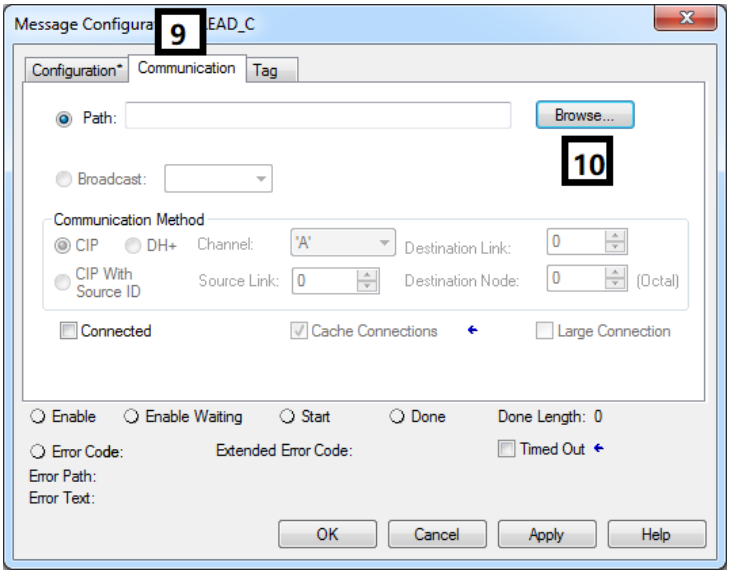
- Select Service Type “Get Attribute Single”. (Tag 2-3)



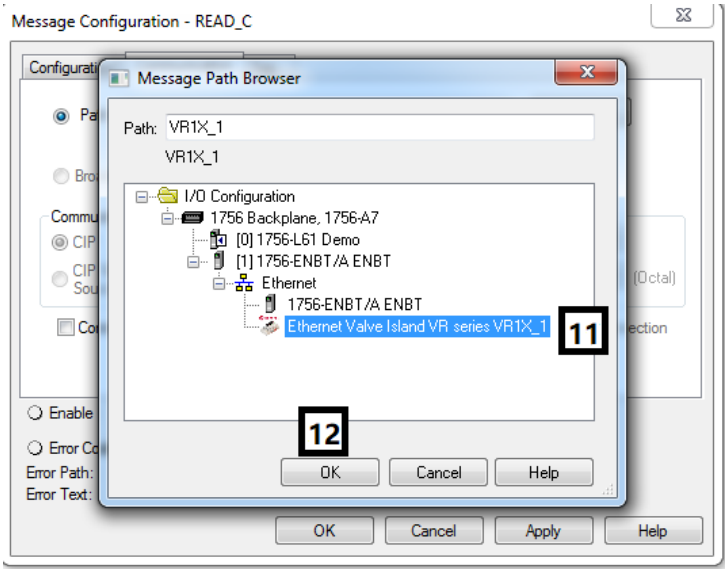
- Set “Class” Value to 4. (Tag 4)
- Set “Instance” Value to 101. (Tag 5)
- Set “Attribute” Value to 3. (Tag 6)
- Click “Destination Element”. Select variable which Data Type is “DINT [24]” and created for storing counter, then double click it. (Tag 7-8)



- Select “Communication” Tab. (Tag 9)
- Click “Browse” button. (Tag 10)



- Select the valve manifold module and click OK. (Tag 11-12)



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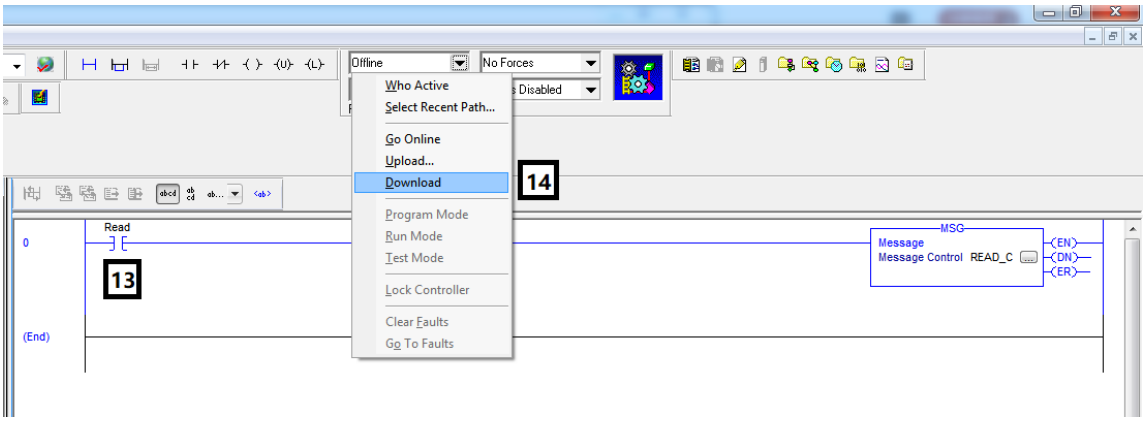
- Add an “Examine On” element connect to “MSG” element. (Tag 13)
- Download the program to PLC and set PLC to Run Mode, then every time getting a rising edge of the “Examine On” element, counter number data can be got by MSG element. (Tag 14)

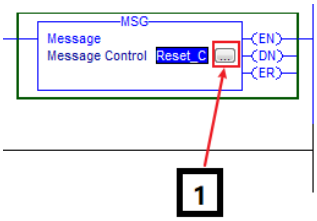


6.7 CYCLE COUNTER RESETTING

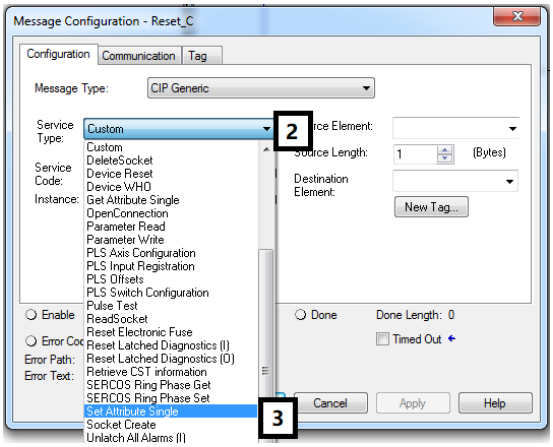
In EDS file, cycle counter resetting data is defined as “Assembly Object Instance: 102d, Class: 0x04”.

VR10 / VR15 valve manifold supports counter reset for each solenoid.

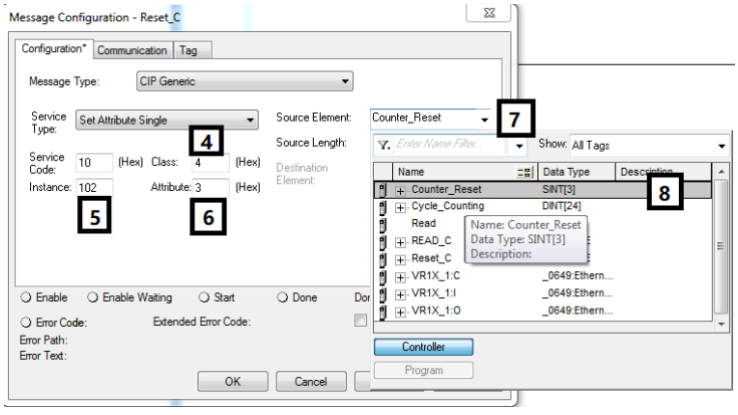
- Cycle counter data can be reset by ladder Element “MSG”.
- The following steps give brief instruction of using “MSG” to reset cycle counter data of VR10/VR15.
- In the message configuration of “MSG”. (Tag 1)



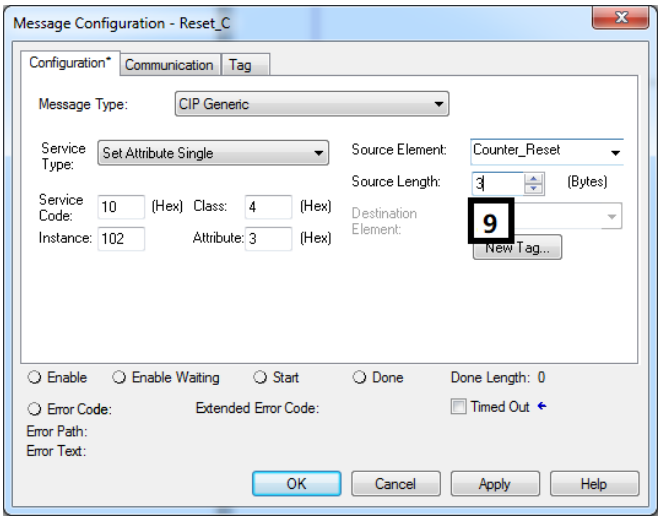
- Select Service Type “Set Attribute Single”. (Tag 2-3)



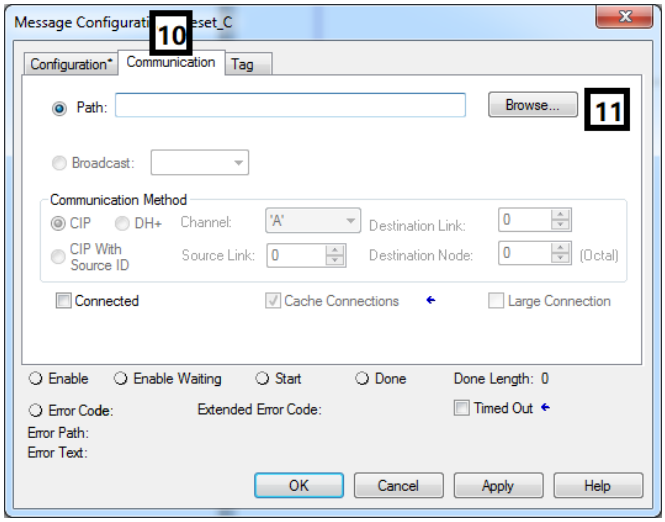
- Set “Class” Value 4. (Tag 4)
- Set “Instance” Value 102. (Tag 5)
- Set “Attribute” Value 3. (Tag 6)
- Click “Source Element”. Select variable which Data Type is “DINT [3]” and created for counter reset, then double click it. (Tag 7-8)



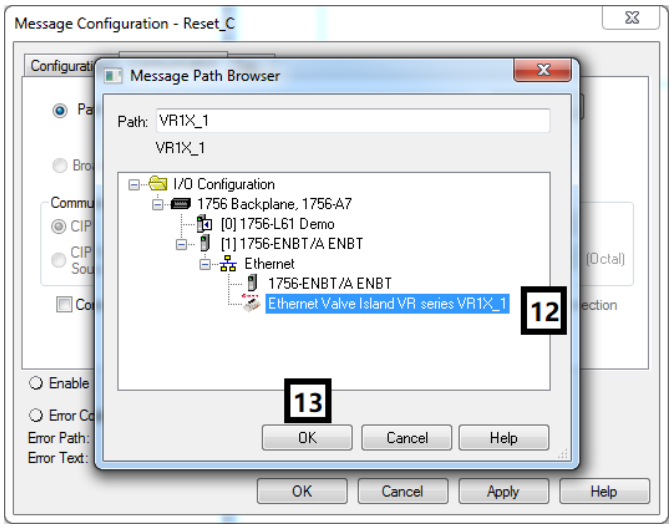
- Set “Source Length” Value 3. (Tag 9)



- Select “Communication” Tab. (Tag 10)
- Click “Browse” button. (Tag 11)

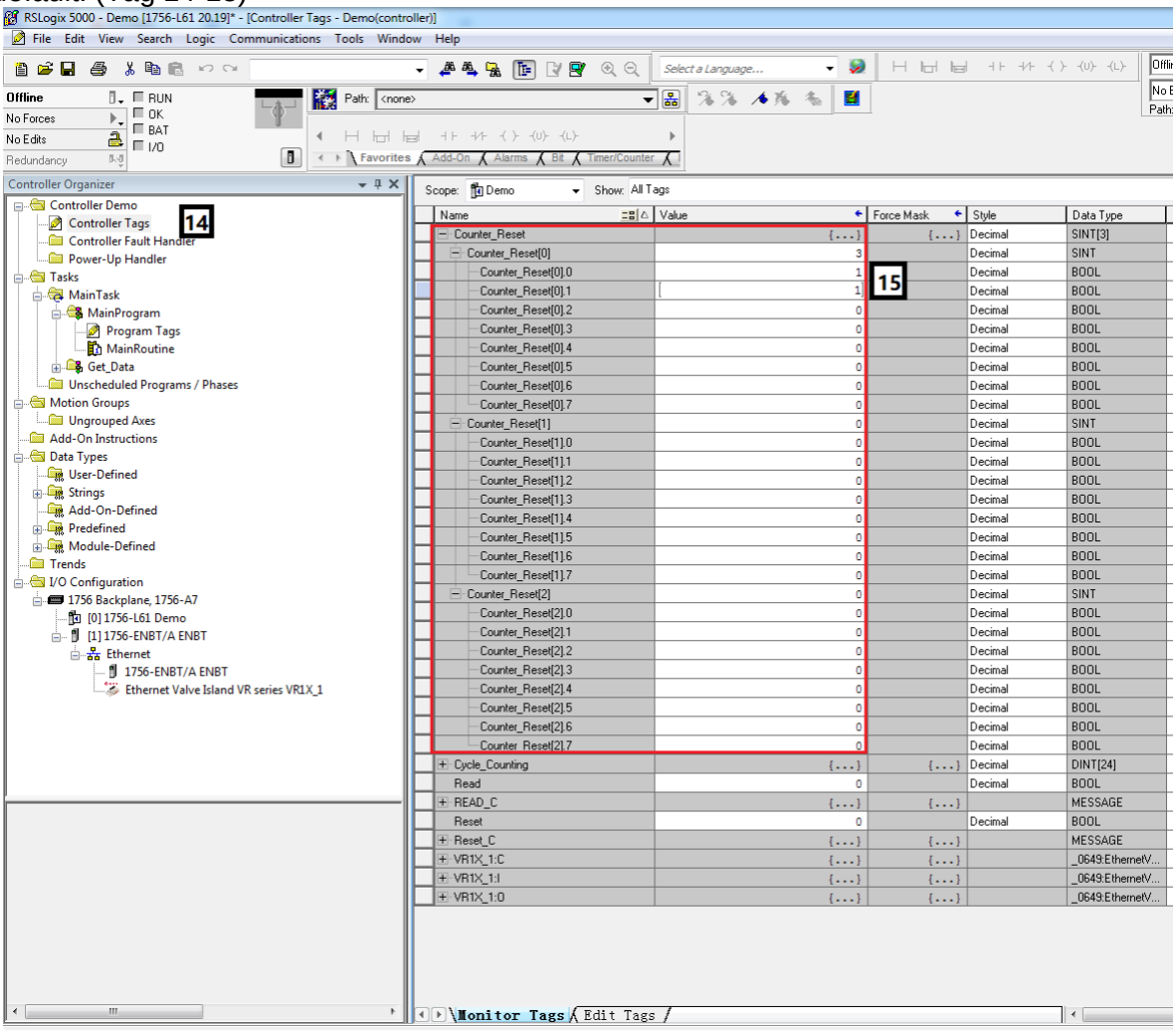


- Select the valve manifold module and click OK. (Tag 12-13)



Construction & Design is subject to change (A1743-OPM-EP / Rev.1)

- Expand variable created for counter reset, whether clear & reset cycle counting value for the solenoid or not can be decided by corresponding bit is “1” or “0”. All bits were set to “0” as default. (Tag 14-15)



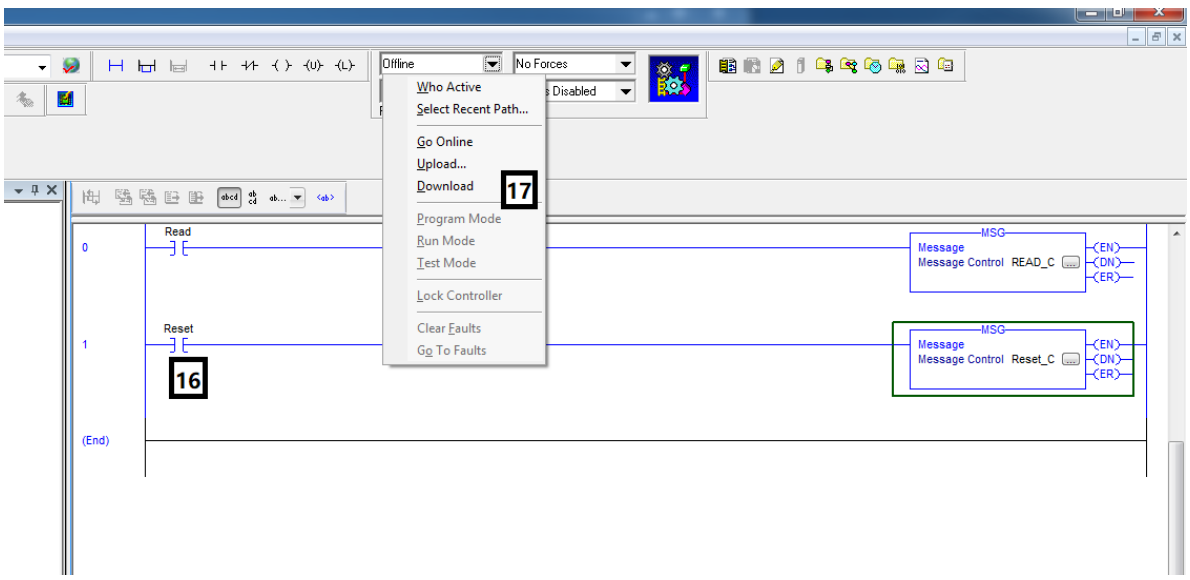
- Value and solenoid number mapping relation is shown in table below.
- The bit that is set to “1” means to clear & reset cycle counting value of that solenoid.
- The bit that is set to “0” means no action of clear & reset.

Counter reset [0] Byte								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Counter reset [1] Byte								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Counter reset [2] Byte								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Value	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

- Add an “Examine On” element connect to “MSG” element. (Tag 16)
- Download the program to PLC and set PLC to Run Mode, then every time getting a rising edge of the “Examine On” element, clear & reset action will be executed by MSG element “Reset_C”. (Tag 17)



7 LED STATUS DESCRIPTION

Symbol	LED Status	Description
NS	Off	No IP address or no power
	Green on	Connected
	Flashing green	Not Connected
	Flashing red	Connection Timeout
MS	Off	No power
	Green on	Device Operational
	Flashing red	Recoverable fault
	Red on	Non-recoverable fault
P1	Off	Link Connection Not Established
	Flashing yellow / green	Link Communication Active
	Yellow on	Link Connection Established
P2	Off	Link Connection Not Established
	Flashing yellow / green	Link Communication Active
	Yellow on	Link Connection Established
VA **(Valve Power Supply)**	Green on	Voltage OK
	Flashing red	Undervoltage
	Red	Overvoltage
VB **(Electronics Power Supply)**	Green on	Voltage OK
	Flashing red	Undervoltage
	Red	Overvoltage

8 TECHNICAL DATA EtherNet/IP INTERFACE

Specification		Remark
Number of ports	2	--
Link Speed	100Mbit/s	--
Duplex Mode	Full Duplex	--
DLR Mode	Supported	Device Level Ring
EtherNet/IP (ODVA Certification)	Compliant to IEC61158	--
IP Address modes	Static, DHCP	--
EDS languages	EN	--

Note:

EtherNet/IP version:

Volume 1 (Edition 3.24) and Volume 2 (Edition 1.23).

9 CUSTOMER SUPPORT

Norgren operates four global centres of technical excellence and a sales and service network in 50 countries, as well as manufacturing capability in the USA, Germany, China, UK, Switzerland, Czech Republic, Mexico, and Brazil.

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No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of exercising judgment and verification. It must be remembered that our products are subject to a natural process of wear and ageing.

Subject to change without notice.

EN