



USER INSTRUCTIONS

*Installation
Operation
Maintenance*

Limatorque® MX/QX EtherNet/IP™ Field Unit



EtherNet/IP™



These instructions must be read prior to installing, operating, and maintaining this equipment.

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1 Introduction

1.1 Purpose

This manual explains how to install and operate the Flowserve Limitorque® MX/QX EtherNet/IP™ field unit. Actuators equipped with EtherNet/IP™ option network board can be connected by shielded industrial grade Ethernet cable to form a EtherNet/IP™ communication system network. The EtherNet/IP™ communication system is a digital, two-way or full-duplex highspeed communication bus system that supports communication baud rate of 100 Mbps (100 Base TX).

Information in this User Instruction is believed to be complete and reliable. Despite all Flowserve's efforts to provide comprehensive information and instructions, sound engineering and safety practices shall be used. Please consult with a qualified engineer. Flowserve manufactures products to applicable International Quality Management System Standards as certified and audited by external Quality Assurance organizations. Genuine parts and accessories have been designed, tested, and incorporated into the products to help ensure continued product quality and performance in use.

As Flowserve cannot test parts and accessories sourced from other vendors the incorrect incorporation of such parts and accessories may adversely affect the performance and safety features of the product. The failure to properly select, install, or use authorized Flowserve parts and accessories is misuse.

Damage or failure caused by misuse is not covered by Flowserve's warranty. In addition, any modification of Flowserve products or removal of original components may impair the safety of these products in use.

1.2 How to Use this Manual

Each section provides the MX/QX EtherNet/IP™ user with information on installing and operating the MX/QX EtherNet/IP™ field unit.

Section 1: Introduction:

The introduction details user safety and knowledge requirements, system capabilities, and features.

Section 2: System Components and Installation:

The system components section focuses on the description of the EtherNet/IP™ system hardware components and provides details for installing wiring and configuration of the field unit.

Section 3: System Configuration and Communication:

The system configuration section provides details regarding device and network communication configurations that the MX/QX uses to communicate over the EtherNet/IP™.

Section 4: Glossary:

The glossary contains a terminology list of abbreviations, acronyms, and their descriptions.

1.3 User Safety

Safety notices in this manual detail precautions the user must take to reduce the risk of personal injury and damage to the equipment. The user must read and be familiar with these instructions before attempting installation, operation, or maintenance. Work to be performed on the actuator should be carried out by a qualified tradesman familiar with the operation and maintenance of electric actuators. Failure to observe these precautions could result in serious bodily injury or death, damage to the equipment, voiding of the warranty, or operational difficulty.

Safety notices are presented in this manual in three forms:

⚠ WARNING *Refers to personal safety. Alerts the user to potential danger. Failure to follow warning notices could result in personal injury or death.*

⚠ CAUTION *Directs the user's attention to general precautions that, if not followed, could result in personal injury and/or equipment damage.*

NOTE *Highlights information critical to the user's understanding of the actuator's installation and operation.*

1.4 User Knowledge

It is recommended that the user read this manual in its entirety before the EtherNet/IP™ option equipped actuator is installed and operated.

The user needs to have fundamental knowledge of electronics and microprocessor concepts. An understanding of valve actuators and digital control systems in the EtherNet/IP™ context is beneficial to the field unit user.

1.5 Capabilities and Features

- ODVA® certified EtherNet/IP™ device.
- Works with A, B & W Series MX & QX Actuators.
- EtherNet/IP™ Conformance according to IEC 61158.
- 10/100 Mbps Baud with Full-Duplex according to IEEE 802.3x.
- Fast Ethernet 100BASE-TX according to IEEE 802.3u.
- Built-in 2 port Ethernet switch function with auto crossover support.
- Transparent socket interface.
- Support for HTTP forwarding via socket interface.
- Available in dual RJ45 or dual Terminal Block connector options.
- Supports Device Level Ring (DLR) System Redundancy.
- Ring/Star/Line network topologies supported.
- ODVA® certified EDS file available for download from ODVA® website.

Link to download this file also available on Flowserve website.

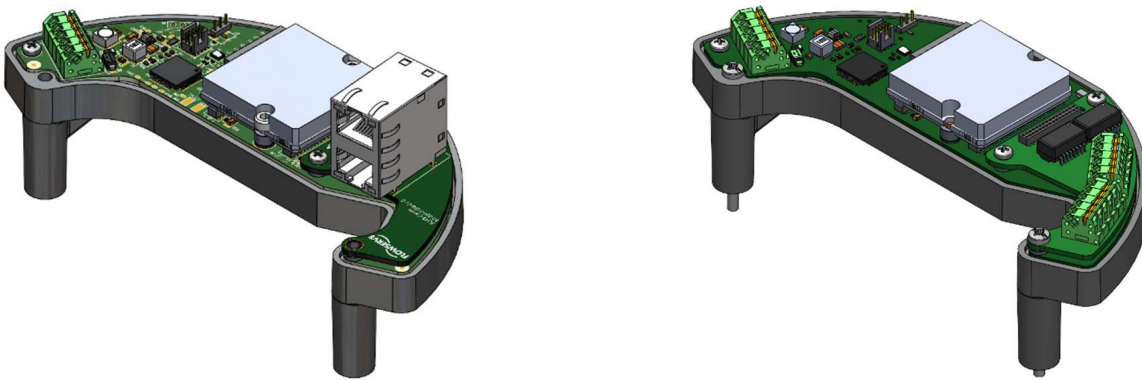
2 System Components and Installation

This User Instruction contains specific safety markings where non-observance of an instruction would cause a hazard. The specific safety markings can be found in Table 1 and Table 2.

2.1 Introduction

This section gives an overview of the components used in the EtherNet/IP™ system. The field unit is installed in each MX/QX actuator. The network cable connects the field unit to the network via the actuator's RJ45 or Terminal Block connectors. The network cable is connected to a host or EtherNet/IP™ scanner.

2.2 Hardware



Figures: EtherNet/IP™ option board (Field Unit) with dual RJ45 & dual Terminal Block connectors.

Field unit is mounted inside the actuator's terminal compartment and utilizes the auxiliary DC power supply available from the actuator terminals hence no external DC power supply is required for operation of the field unit.

NOTE The auxiliary DC power supply from the actuator terminals will not be available for customer use for the actuators that are equipped with EtherNet/IP™ option.

Below table shows the wiring connection details of the EtherNet/IP™ option board field unit to A/B/W series actuator terminals. Typically, these wiring connections are already done by factory if the actuator is shipped with an EtherNet/IP™ option board preinstalled.

EtherNet/IP® Bpard J6 Connector Terminal Number	Actuator Terminal Number
1	11
2	10
3*	19*
4	22
5	21

*= Connection between terminal # 3&19 is not mandatory for B series actuators.

2.3 Other Components

Jumper Settings

Jumper settings of the field unit are factory preset as shown in the table below, and it is necessary to retain these settings for proper operation of the field unit.

Jumper Between Pins of J7 Connector	Jumper Settings
1 & 2	Ignored.
2 & 3	Jumper MUST NOT be installed.
1 & 3	Ignored.

DIP Switch Settings

DIP switch settings of the field unit are factory preset as shown in the table below, and it is necessary to retain these settings for proper operation of the field unit.

Actuator Type	Jumper Settings
A & W Series MX & QX Actuators	Turn ON Switches 3, 4, 5 & 8. Leave 4 remaining switches OFF.
B Series MX & QX Actuators	Turn ON Switches 2 & 6. Leave 6 remaining switches OFF.

LED Indications

NW_L1 (LED1)	Jumper Settings
Off	No power or No IP address assigned.
Green	Online, one or more connections are established (CIP™ Class 1 or 3).
Green flashing	Online, no connections established.
Red	Duplicate IP address, Fatal error.
Red flashing	One or more connections timed out (CIP™ Class 1 or 3).

MOD_L2 (LED2)	Module Status Meaning
Off	No power.
Green	Module is controlled by scanner in Run state.
Green flashing	IP address not assigned or Scanner is in idle state or Module is not controlled by scanner.
Red	Unrecoverable fault(s) or Exception state or Fatal error. Actuator power cycle required.
Red flashing	Recoverable fault(s).
Green & Red flashing alternatively	Module's firmware update is in progress.

A_L3 (LED3)	Bottom RJ45 or CH_A or IN Port Status Meaning
Off	No link, no activity.
Green	100 Mbps link established.
Green flashing	100 Mbps link activity on.
Yellow	10 Mbps link established.
Yellow flashing	10 Mbps link activity on.

B_L4 (LED4)	Top RJ45 or CH_B or OUT Port Status Meaning
Off	No link, no activity.
Green	100 Mbps link established.
Green flashing	100 Mbps link activity on.
Yellow	10 Mbps link established.
Yellow flashing	10 Mbps link activity on.

Combinations & Other LEDs	Meaning
LED1 & LED2 both flashing Red	Fatal error occurred. Actuator power cycle may be required.
LED1 & LED2 both simultaneously flash Red & Green together	Device executing Flash LEDs command received from EtherNet/IP™ Master or Scanner device.
MB_FLT Red	Mainboard communication fault.
AB_FLT Red	Module communication fault.
MB_FLT & AB_FLT both flashing Red	EtherNet/IP™ board configuration invalid. Check jumper & DIP switch settings, Network module type & board firmware type mismatch.

2.4 Cable Preparation

100 BASE-TX electrical transmission with twisted 2 pairs Cat 5(e) or Cat 6 for transmission over copper can be used. Copper cable can be run in distances of up to 100 meters between field units and switched components. As the field unit supports auto crossover and auto negotiation with a built-in switch, hence a crossover cable is not required.

Below table describes the field connections of the EtherNet/IP™ field unit for both types of connector options using EtherNet/IP™ Type A or Type B cables (Use or follow any one Type wire colors). The wire colors will be different if using other type Ethernet cables and following T568A or T568B termination standards, if so, then make sure to adjust the wire colors as per their standards and only follow any one terminating standard either T568A or T568B and never mix these 2 standards. It is also necessary to make sure these cables are straight-through and not crossover cables.

Signal	T568A Wire Color	T568B Wire Color	Both RJ45 Ports Pin Number*	EIP Board J2 & J3 Terminal Number*
Transmission Data + TD + or TxD +	White/Green	White/Orange	1	1
Transmission Data TD - or TxD -	Green	Orange	2	2
Receive Data + RD + or RxD +	White/Orange	White/Green	3	3
Receive Data - RD - or RxD -	Orange	Green	6	4
Shield	Mesh	Mesh	Shield	5

* = EIP board will have either 2 RJ45 ports or 2 five-pin terminal block connectors (as ordered) as described below:

RJ45 Type:

Port-1: Bottom RJ45 connector referenced as Channel A or IN port.

Port-2: Top RJ45 connector referenced as Channel B or OUT port.

NOTE It is *highly recommended to test the correct connection of the RJ45 cables using Cable Tester (Example TRENDnet TC-NT2) before connecting cables to field units.*

Terminals Type:

Port-1: J2 five-pin terminal block connector referenced as Channel A or IN port.

Port-2: J3 five-pin terminal block connector referenced as Channel B or OUT port.

2.5 Installation

Electrical Protection

EtherNet/IP™ cabling should be routed appropriately and laid separately from other plant wiring. Follow NEC rules for Class 2 Circuit installations and IEC 61918/NEC code. Similar category cables can be bundled in separate channeled cable trays, conduits, etc. Avoid crossing cables of different categories, if they must be crossed then cross them at right angles. EtherNet/IP™ cables must be laid farther away from the high voltage power supply cables and any interference points and any noise sources like drives, motors, pumps, etc.

Adequate cable separation and grounding the screen at both ends to a low impedance earth “Ze” protects the EtherNet/IP™ signals against electrostatic and electromagnetic interference. Use meshed equipotential bonding and ground at both ends of a segment, this ensures that the potential is equal in all plant parts, avoids high bonding currents.

Ground cable trays, use bonding bars or clamps for cable entering cabinets, also ground multiple devices along the segment. Recommended use of a Type-MESH-BN (all metallic parts bonded to provide a continuous grounding network).

Mechanical Protection

Use Strain Reliefs:

- Provide strain relief approximately 30cm away from the connecting terminals for all cables that are subjected to tensile strain.

Prevent Wire Break & Short Circuits:

- Use cable trays or protection tubes.
- Avoid heavy mechanical stress using metal conduits.
- Avoid medium mechanical stress using plastic conduits.
- Use metal conduits or covered cable trays if cable crosses the walkway or driveway.
- Avoid sharp edges. Use edge protection measures. Deburr sharp edges.

Tensile Strength & Force:

- If pulling the cable past the tensile strength (> 150 N) can damage the cable.
- Pull by hand if possible.
- Use strain relief if necessary.
- Do not use too much force for pulling the cables.

Bending Radius:

- Sharp bends can break the cable over time and cause reflections (typically from 20 to 65mm for cable type B & C, and 50 to 100mm for cable type A).
- Make sure all bends are within the allowed radii.
- If necessary, use guided pulleys or cable channels to prevent loops & kinks.
- Do not twist the cable(s).
- Rotate the cable from a cable drum rather than doing this by hand.

Temperature Limits:

- Note cable temperature limits provided by manufacturers.

3 System Configuration and Communication

3.1 EtherNet/IP™ Introduction

EtherNet/IP™ is an open industrial Ethernet protocol used for real-time data communication in industrial automation and control systems. Owned, managed and supported by Open DeviceNet® Vendors Association ODVA®, it is a powerful communication standard that connects Programmable Logic Controllers (PLCs) with field devices such as sensors, actuators, drives, etc.

EtherNet/IP™ is based on standard Ethernet, which allows it to coexist with other Ethernet protocols like TCP/IP on the same network infrastructure. EtherNet/IP™ uses standard Ethernet for its physical (Layer 1) and data link (Layer 2) functions, IP for the network layer (Layer 3), and TCP/UDP for the transport layer (Layer 4), but it adds the Common Industrial Protocol (CIP™) to handle the upper layers (Session, Presentation, Application - Layers 5, 6, 7) of the OSI model, providing industrial communication services.

Here's how it maps to the OSI model:

- Layers 1 & 2 (Physical & Data Link): Standard Ethernet (IEEE 802.3) handles these layers, defining the physical connection and MAC addresses.
- Layer 3 (Network): Internet Protocol (IP) routes packets across networks.
- Layer 4 (Transport): TCP (for reliable connections) or UDP (for faster, connectionless data) manage data delivery.
- Layers 5, 6, & 7 (Session, Presentation, Application): The Common Industrial Protocol (CIP™) defines these functions, managing device connections, data formatting, and user-level services for industrial automation.

Essentially, EtherNet/IP™ leverages existing Ethernet and TCP/IP infrastructure by adding a specialized layer (CIP™) on top for industrial control and data.

Scalability and Flexibility: EtherNet/IP™ supports various network topologies, including line, star, and ring, and can use copper media for communication with redundancy capabilities.

Advanced Diagnostics: Provides detailed, vendor-independent network and device diagnostics that allow for remote monitoring, fast fault location, and reduced downtime.

Support for Digitalization: As an Ethernet-based protocol, EtherNet/IP™ easily integrates with higher-level IT systems and is equipped for Industry 4.0 applications, such as the Industrial Internet of Things (IIoT).

Fieldbus Integration: Protects legacy investments by allowing older fieldbus systems, like DeviceNet®, PROFIBUS®, to be easily integrated into an EtherNet/IP™ network using gateways.

3.2 Device Configuration

Mandatory Actuator Configurations

Users must download the latest version of relevant Actuator's (MX/QX) Instruction and Operation Manual (IOM) from the Flowserve website and follow the basic installation and commissioning procedure including limit and torque settings before proceeding for the EtherNet/IP™ specific configurations explained in the next steps.

NOTE No EtherNet/IP™ specific user accessible configurations are available via local interface of the actuator. Refer following instructions for EtherNet/IP™ specific configurations.

Mandatory EtherNet/IP™ Configurations

Field unit's ODVA® certified EtherNet/IP™ EDS file can be downloaded from the ODVA® website (this download link is also provided on Flowserve website) and must be used with the user's host system to integrate the field unit into the EtherNet/IP™ controllers.

For remote access and control of the field unit user must set all the network communication parameters of the field unit like IP address, Subnet mask & Gateway address. The EtherNet/IP™ device IP address must be unique value within a subnet.

You may use the HMS IPconfig v5 or later software utility tool to set the device IP address. This tool can be downloaded for free using below HMS web link:

<https://www.anybus.com/support/file-doc-downloads/anybus-support-tools?orderCode=tools>

3.3 Device Attributes

Below table lists all attributes supported by the field unit.

Attribute	I/O (Access)	Data Type	Description (Refer below for more details)
01_Argument	Output (RW)	UINT16	Argument for Actuator Command.
02_Command	Output (RW)	UINT16	Actuator Command.
03_Position	Input (RO)	UINT16	Actuator current position value in % open.
04_DO1	Input (RO)	UINT16	Digital output 1.
05_DO2	Input (RO)	UINT16	Digital output 2.
06_DO3	Input (RO)	UINT16	Digital output 3.
07_PercentTorque	Input (RO)	UINT16	Actuator current torque in % unit rating.
08_InternalTemp	Input (RO)	UINT16	Actuator internal temperature.
09_MainsVoltage	Input (RO)	UINT16	Actuator mains voltage.
10_DI1	Input (RO)	UINT16	Digital input 1.
11_DI2	Input (RO)	UINT16	Digital input 2.
12_AO1	Input (RO)	UINT16	Analog output 1 value.
13_AI1	Input (RO)	UINT16	Analog input 1 value.
14_AO2	Input (RO)	UINT16	Analog output 2 value.
15_AI2	Input (RO)	UINT16	Analog input 2 value.
16_Future3	Input (RO)	UINT16	Future use 3.
17_Future2	Input (RO)	UINT16	Future use 2.
18_Future1	Input (RO)	UINT16	Future use 1.

01_Argument and 02_Command

Following Command and Argument values are supported.

Move Commands

Function	02_Command Hexadecimal (Decimal) Value	01_Argument Hex (Decimal)	Description
No Command	0x0000 (0)	Ignored	Clear command parameter.
Run Open	0x0100 (256)	Ignored	Full open command.
Stop Running	0x0200 (512)	Ignored	Stop command.
Run Close	0x0300 (768)	Ignored	Full close command.
1 Register Move-To Command	0xXX4B (0xXX00+75) Example values: 0% Move-To = 0x004B (75). 50% Move-To = 0x3244B (12,875). 100% Move-To = 0x6444B (25,675).	Ignored	Single register Move-To-Command. Most significant byte value (XX) is the desired actuator position value in hexadecimal; valid range from 0% to 100%
2 Register Move-To Command	0x1A00 (6,656)	Desired actuator position value, valid range from 0x0000 (0) to 0x0064 (100).	Dual registers Move-To command. Move to desired position value mentioned in Argument parameter. NOTE Always write Argument value first and then write value 0x1A00 (6,656) to Command parameter.

Multiport Move Commands

NOTE *Applicable only for actuators equipped with Multiport option.*

Function	02_Command Hex (Decimal) Value	Description
No Command	0x0000 (0)	Clear Command parameter.
Move-To Home	0x2000 (8,192)	Move to Home position.
Move-To Port-1	0x2100 (8,448)	Move to Port-1 position.
Move-To Port-2	0x2200 (8,704)	Move to Port-2 position.
Move-To Port-3	0x2300 (8,960)	Move to Port-3 position.
Move-To Port-4	0x2400 (9,216)	Move to Port-4 position.
Move-To Port-5	0x2500 (9,472)	Move to Port-5 position.
Move-To Port-6	0x2600 (9,728)	Move to Port-6 position.
Move-To Port-7	0x2700 (9,984)	Move to Port-7 position.

Relay Commands

NOTE *Works only if respective relay's function is set to Network Controlled.*

Function	02_Command Hex (Decimal) Value	Description
No Command	0x0000 (0)	Clear Command parameter.
Set S1 Relay	0x0900 (2,304)	Energize S1 relay.
Clear S1 Relay	0x1100 (4,352)	Deenergize S1 relay.
Set S2 Relay	0x0A00 (2,560)	Energize S2 relay.
Clear S2 Relay	0x1200 (4,608)	Deenergize S2 relay.
Set S3 Relay	0x0B00 (2,816)	Energize S3 relay. NOTE <i>Not for series A, W units without Relay Board-1 option.</i>
Clear S3 Relay	0x1300 (4,864)	Deenergize S3 relay. NOTE <i>Not for series A, W units without Relay Board-1 option.</i>
Set S4 Relay	0x0C00 (3,072)	Energize S4 relay. NOTE <i>Not for series A, W units without Relay Board-1 option.</i>
Clear S4 Relay	0x1400 (5,120)	Deenergize S4 relay. NOTE <i>Not for series A, W units without Relay Board-1 option.</i>
Set R1 Relay	0x0D00 (3,328)	Energize R1 relay. NOTE <i>For units with Relay Board-2 option.</i>
Clear R1 Relay	0x1500 (5,376)	Deenergize R1 relay. NOTE <i>For units with Relay Board-2 option.</i>
Set R2 Relay	0x0E00 (3,584)	Energize R2 relay. NOTE <i>For units with Relay Board-2 option.</i>
Clear R2 Relay	0x1600 (5,632)	Deenergize R2 relay. NOTE <i>For units with Relay Board-2 option.</i>
Set R3 Relay	0x0F00 (3,840)	Energize R3 relay. NOTE <i>For units with Relay Board-2 option.</i>
Clear R3 Relay	0x1700 (5,888)	Deenergize R3 relay. NOTE <i>For units with Relay Board-2 option.</i>
Set R4 Relay	0x1B00 (6,912)	Energize R4 relay. NOTE <i>For units with Relay Board-2 option.</i>
Clear R4 Relay	0x1C00 (7,168)	Deenergize R4 relay. NOTE <i>For units with Relay Board-2 option.</i>

04_DO1

Bit descriptions of Digital Output 1 parameter.

Bit #	Bit Mask Value Hex (Decimal)	Description
0	0x0001 (1)	Fully opened.
1	0x0002 (2)	Fully closed.
2	0x0004 (4)	Stopped in mid-travel or mid-position.
3	0x0008 (8)	Opening.
4	0x0010 (16)	Closing.
5	0x0020 (32)	Valve jammed.
6	0x0040 (64)	Not in remote.
7	0x0080 (128)	Combined fault.
8	0x0100 (256)	Motor overtemperature or Thermistor fault.
9	0x0200 (512)	Knob in Stop.
10	0x0400 (1,024)	Reserved.
11	0x0800 (2,048)	Reserved.
12	0x1000 (4,096)	Open torque fault (not torque limit).
13	0x2000 (8,192)	Close torque fault (not torque limit).
14	0x4000 (16,384)	Moved manually.
15	0x8000 (32,768)	Lost phase or reverse phase sequence.

05_DO2

Bit descriptions of Digital Output 2 parameter.

Bit #	Bit Mask Value Hex (Decimal)	Description
0	0x0001 (1)	Open inhibit active.
1	0x0002 (2)	Close inhibit active.
2	0x0004 (4)	Reserved.
3	0x0008 (8)	Reserved.
4	0x0010 (16)	Lost phase.
5	0x0020 (32)	Reverse phase sequence.
6	0x0040 (64)	ESD conflict.
7	0x0080 (128)	Inhibit conflict.
8	0x0100 (256)	CSE in Local or Stop and has control.
9	0x0200 (512)	Input Data Too Old.
10	0x0400 (1,024)	Network ESD active.
11	0x0800 (2,048)	Local ESD active.
12	0x1000 (4,096)	Main board CPU reset.
13	0x2000 (8,192)	Knob in Stop.
14	0x4000 (16,384)	Opening in Local.
15	0x8000 (32,768)	Closing in Local.

⚠ CAUTION If Bit # 9 “Input Data Too Old” is set then the user must discard all input data (including remaining bits in this parameter except for this bit # 9) read from the field unit, this indicates the field unit’s communication link with the internal CPU is either busy or interrupted, hence the input data received is not updated and may be same as previously read values. Users can also use this bit as a data quality bit (0=Good, 1=Bad) for all input data read by the EtherNet/IP™ Scanner. This bit will be cleared or reset automatically by the field unit in the subsequent reads. If this bit is not cleared by itself then check the wiring between the EtherNet/IP™ option board (field unit) and the actuator terminals in the actuator terminal compartment. If you need further assistance, please contact Limitorque® service personnel.

06_DO3

Bit descriptions of Digital Output 3 parameter.

Bit #	Bit Mask Value Hex (Decimal)	Description
0	0x0001 (1)	Closing.
1	0x0002 (2)	Opening.
2	0x0004 (4)	S1 relay energized.
3	0x0008 (8)	S2 relay energized.
4	0x0010 (16)	S3 relay energized.
5	0x0020 (32)	S4 relay energized.
6	0x0040 (64)	R1 relay energized.
7	0x0080 (128)	R2 relay energized.
8	0x0100 (256)	R3 relay energized.
9	0x0200 (512)	Network bypass relay energized.
10	0x0400 (1,024)	R4 relay energized.
11	0x0800 (2,048)	Not used.
12	0x1000 (4,096)	Reserved.
13	0x2000 (8,192)	Reserved.
14	0x4000 (16,384)	Reserved.
15	0x8000 (32,768)	Reserved.

10_DI1

Bit descriptions of Digital Input 1 parameter.

Bit #	Bit Mask Value Hex (Decimal)	Description
0	0x0001 (1)	Knob in Remote.
1	0x0002 (2)	Motor overtemperature or Thermistor fault.
2	0x0004 (4)	Open torque limit.
3	0x0008 (8)	Open position limit.
4	0x0010 (16)	Close torque limit.
5	0x0020 (32)	Close position limit.
6	0x0040 (64)	Analog board-2 AI lost.
7	0x0080 (128)	Quick power board present.
8	0x0100 (256)	User Input 0.
9	0x0200 (512)	User Input 1.
10	0x0400 (1,024)	User Input 2.
11	0x0800 (2,048)	User Input 3.
12	0x1000 (4,096)	User Input 4.
13	0x2000 (8,192)	User Input 5.
14	0x4000 (16,384)	User Input 6.
15	0x8000 (32,768)	User Input 7.

11_DI2

Bit descriptions of Digital Input 2 parameter.

Bit #	Bit Mask Value Hex (Decimal)	Description
0	0x0001 (1)	Analog board-1 present.
1	0x0002 (2)	Analog board-2 present.
2	0x0004 (4)	Mainboard AI lost.
3	0x0008 (8)	Analog board-1 AI lost.
4	0x0010 (16)	Reserved.
5	0x0020 (32)	Relay board-2 present.
6	0x0040 (64)	Modbus board present.
7	0x0080 (128)	Relay board-1 present.
8	0x0100 (256)	FOUNDATION® Fieldbus board present.
9	0x0200 (512)	PROFIBUS® PA board present.
10	0x0400 (1,024)	CSE selected for User Input 2.
11	0x0800 (2,048)	DeviceNet® board present.
12	0x1000 (4,096)	Lost phase.
13	0x2000 (8,192)	Reverse phase sequence.
14	0x4000 (16,384)	User Input 8.
15	0x8000 (32,768)	PROFIBUS® DP board present.

3.4 Assembly Objects

The Assembly Object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection. Assembly Objects can be used to bind Input or Output data.

Output Assembly Objects

Following table lists the supported read writeable output assembly objects and their attributes.

Assembly ID (Hex)	Assembly Name	Byte Size	Included Output Attributes	
			01_Argument	02_Command
150 (0x96)	O1W (Output 1 Word)	2	-	Yes
151 (0x97)	O2W (Output 2 Words)	4	Yes	Yes

Input Assembly Objects

Following read only input assembly objects are supported by the field unit.

Assy ID (Hex)	Assembly Name	Byte Size (Hex)
100 (0x64)	DI2W (Discrete Input 2 Words)	4 (0x04)
101 (0x65)	PI2W (Position Input 2 Words)	4 (0x04)
102 (0x66)	DI5W (Discrete Input 5 Words)	10 (0x0A)
103 (0x67)	PI5W (Position Input 5 Words)	10 (0x0A)
104 (0x68)	DAI5W (Discrete All Input 5 Words)	10 (0x0A)
105 (0x69)	AI16W (All Input 16 Words)	32 (0x20)

Following table lists the attributes of all supported input assembly objects.

Assembly ID (Hex)	Included Input Attributes (2 bytes each)															
	03_Position	04..	05..	06..	07..	08..	09..	10..	11..	12..	13..	14..	15..	16..	17..	18_Future1
100 (0x64)	-	Yes	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-
101 (0x65)	Yes	-	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-
102 (0x66)	-	Yes	Yes	-	-	-	-	-	-	-	-	-	-	Yes	Yes	Yes
103 (0x67)	Yes	-	Yes	-	-	-	-	-	-	-	-	-	-	Yes	Yes	Yes
104 (0x68)	-	Yes	Yes	Yes	-	-	-	Yes	Yes	-	-	-	-	-	-	-
105 (0x69)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3.5 Connections

Following connections are supported by the field unit.

Connection ID (Hex)	Connection Name	Output Assembly	Input Assembly
1 (0x01)	01_O1W_DI2W	Output 1 Word: 150 (0x96)	Discrete Input 2 Words: 100 (0x64)
2 (0x02)	02_O2W_DI2W	Output 2 Words: 151 (0x97)	Discrete Input 2 Words: 100 (0x64)
3 (0x03)	03_O1W_PI2W	Output 1 Word: 150 (0x96)	Position Input 2 Words: 101 (0x65)
4 (0x04)	04_O2W_PI2W	Output 2 Words: 151 (0x97)	Position Input 2 Words: 101 (0x65)
5 (0x05)	05_O1W_DI5W	Output 1 Word: 150 (0x96)	Discrete Input 5 Words: 102 (0x66)
6 (0x06)	06_O2W_DI5W	Output 2 Words: 151 (0x97)	Discrete Input 5 Words: 102 (0x66)
7 (0x07)	07_O1W_PI5W	Output 1 Word: 150 (0x96)	Position Input 5 Words: 103 (0x67)
8 (0x08)	08_O2W_PI5W	Output 2 Words: 151 (0x97)	Position Input 5 Words: 103 (0x67)
9 (0x09)	09_O1W_DAI5W	Output 1 Word: 150 (0x96)	Discrete All Input 5 Words: 104 (0x68)
10 (0x0A)	10_O2W_DAI5W	Output 2 Words: 151 (0x97)	Discrete All Input 5 Words: 104 (0x68)
11 (0x0B)	11_O1W_AI16W	Output 1 Word: 150 (0x96)	All Input 16 Words: 105 (0x69)
12 (0x0C)	12_O2W_AI16W	Output 2 Words: 151 (0x97)	All Input 16 Words: 105 (0x69)
13 (0x0D)	13_IO	Assem3 (Heartbeat, Input Only)	All Input 16 Words: 105 (0x69)
14 (0x0E)	14_LO	Assem4 (Heartbeat, Listen Only)	All Input 16 Words: 105 (0x69)
15 (0x0F)	15_IO_Ext	Assem6 (Heartbeat, Input Only Extended)	All Input 16 Words: 105 (0x69)
16 (0x10)	16_LO_Ext	Assem7 (Heartbeat, Listen Only Extended)	All Input 16 Words: 105 (0x69)

3.6 Reset Functions

Following EtherNet/IP™ specific reset functions are supported by the field unit. Field unit behavior for each supported reset functions are described below

Type 0 [Power Cycle Reset]: Upon receipt of this command the field unit performs a warm or soft reset of the EtherNet/IP™ board installed in the actuator.

NOTE *This command will cause the actuator to drop offline as the field unit's EtherNet/IP™ board will be doing a warm or soft reset, actuator shall come back online automatically in a few moments without the need of a user intervention.*

Type 1 [Return to Factory Defaults]: Upon receipt of this command the field unit clears application data, user programs, custom parameters & connection trees. However, it excludes the TCP/IP Object configuration (IP address, Subnet mask, and Gateway address) so you do not accidentally disconnect field unit from the network.

4 Glossary

= Number.

AI = Analog Input.

AO = Analog Output.

Assy = Assembly.

CIP™ = Common Industrial Protocol.

COTS = Commercial-Off-The-Shelf.

CPU = Central Processing Unit.

DCS = Distributed Control System.

DegC = Degrees Celsius.

DegF = Degrees Fahrenheit.

DI = Digital Input.

DIP = Dual In-Line Package.

DLR = Device Level Ring.

DO = Digital Output.

DN = DeviceNet®.

EDS = Electronic Data Sheet.

EIP = EtherNet/IP™.

ESD = Emergency Shutdown.

Hex = Hexadecimal.

IEC = International Electromechanical Commission.

IEEE = Institute of Electrical & Electronics Engineers.

I/O = Input Output.

IO = Input Only.

IP = Internet Protocol.

LED = Light Emitting Diode.

LO = Listen Only.

Mbps = Mega bits per second.

N = Newton.

NTP = Network Time Protocol.

Nw = Network.

ODVA® = Open DeviceNet® Vendor Association.

PLC = Programmable Logic Controller.

PTP = Precision Time Protocol.

Sync = Synchronization.

TCP = Transmission Control Protocol.

UDP = User Datagram Protocol.

UINT16 = Unsigned Integer with 16 Bits or 2 Bytes.

V or v = Version.



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