Application Note

FESTO

EtherNet/IP IO-Link Integration

Controlling IO-Link Devices with Festo EtherNet/IP Products

CTEU-EP,
CPX-FB36,
CPX-CTEL-LK

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1 Components/Software used

Type	Name	Version Software/Firmware
Bus node	CTEU-EP	R3
Bus node	CPX-FB36	R12
Electrical Interface	CPX-CTEL-2-M12-5POL-LK	R3
Electrical sub-base	CAPC-F1-E-M12	--
Software	STUDIO 5000, Rockwell Automation	Rev 28
Software	CPX-FMT	V 4.21.203

Table 1.1: Components/Software used

2 Introduction

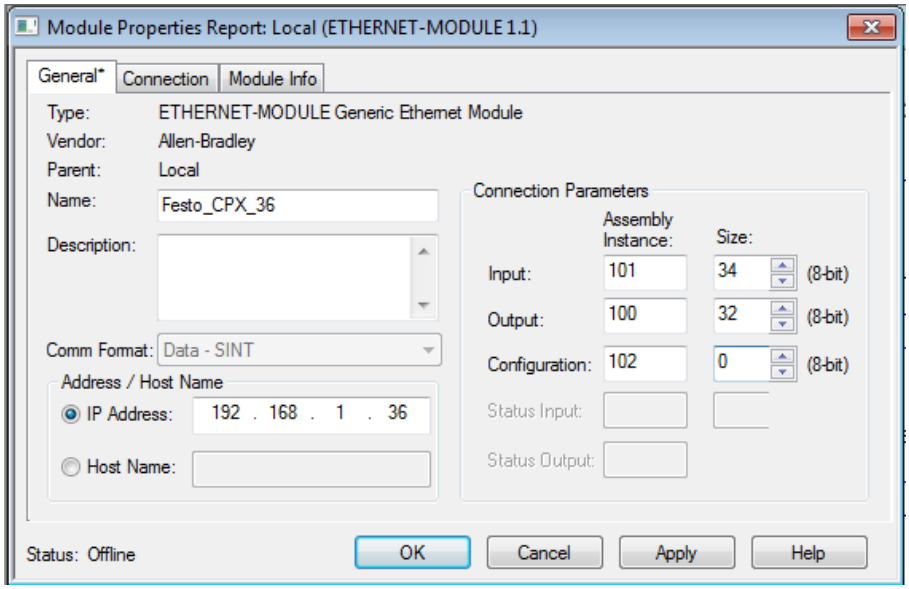
The CPX-FB36 and CTEU-EP EtherNet/IP busnodes both support the ability to add 3rd party IO-Link devices. Therefore, additional products such as RFID readers, Light stacks, and any other IO-link devices can be added to CPX or CTEU with EtherNet/IP.

These features, for supporting IO-Link, are only roughly documented in the standard manuals. This application note is intended to support these additional features. These specifically include; how to validate the IO-link devices, how to read diagnostics events, and how to set IO-link parameters. Details of the various objects required for these functions are documented below.

3 Setup of Process data for IO-Link Devices

Follow the instructions from the standard manuals for CPX-FB36 or CTEU-EP for the basic setup of the I/O-Devices in your Engineering Software. The following examples are showing the typical integration in the “Studio 5000” Engineering Software provided by Rockwell Automation.

3.1 Typical Configuration of CPX-FB36 with CPX-CTEL-LK



➔ Note

There must be at least one CPX-CTEL-LK module in the CPX terminal

- The I/O-size of the CPX-CTEL-LK module has to be large enough to hold the data of the connected IO-Link devices. Refer to the CPX-CTEL-LK manual for details on the corresponding settings of the DIL switches

3.2 Typical Configuration of CTEU-EP

Below is an example with a fixed dual port configuration with a separate status for the CTEU-EP bus node. This allows for maximum device type size, and keeps the I/O in equal sizes.

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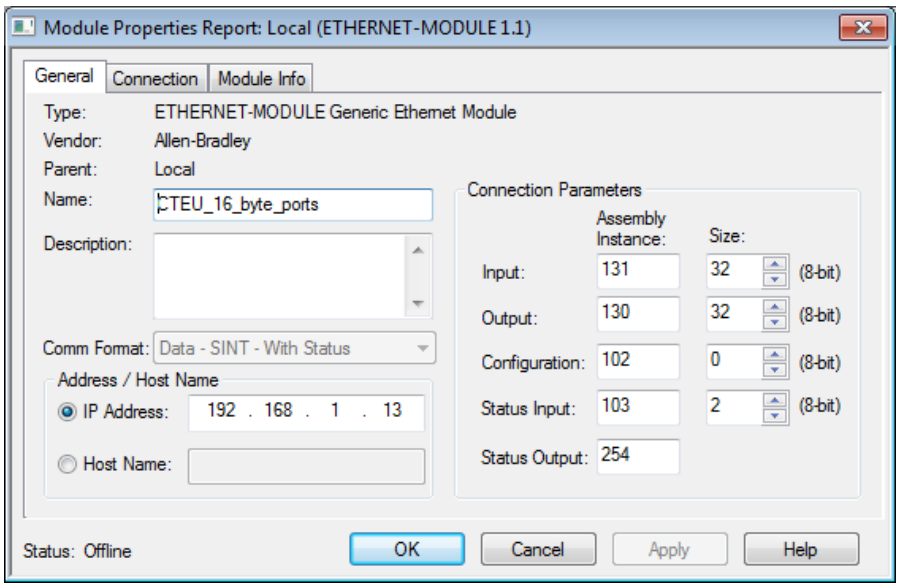
The shown configuration also adds an additional Status-Byte for diagnostics without the need to change the default DIL-Switch settings by using *Comm. Format "Data – SINT – With Status"* and assembly instance 103 as *Status Input*.



Note

- The CTEU-EP must be configured with an assembly instance large enough for the IO-link device. Refer to the CTEU-EP manual. The size of the IO data determined by the assembly instances must also be large enough for the IO-link device.
- The I/O-size of the CPX-CTEL-LK module has to be large enough to hold the data of the connected IO-Link devices. Refer to the CPX-CTEL-LK manual for details on the corresponding settings of the DIL switches

Note

In both, the CPX and CTEU, the process data will be automatically transferred to the device. However, due to the little-endian / big-endian difference in EtherNet/IP vs. IO-Link, the byte order will be swapped. This must be handled in the controller logic.

4 Web Server Support for IO-Link Devices

For both the CPX-FB36 and the CTEU-EP, there are IT tools available for reading the diagnostics and status of IO-link devices.

4.1 CPX-FB36 with CPX-CTEL-LK

For the CPX-FB36, a web server and the Festo Maintenance Tool both display the relevant IO-link device information and diagnostics.

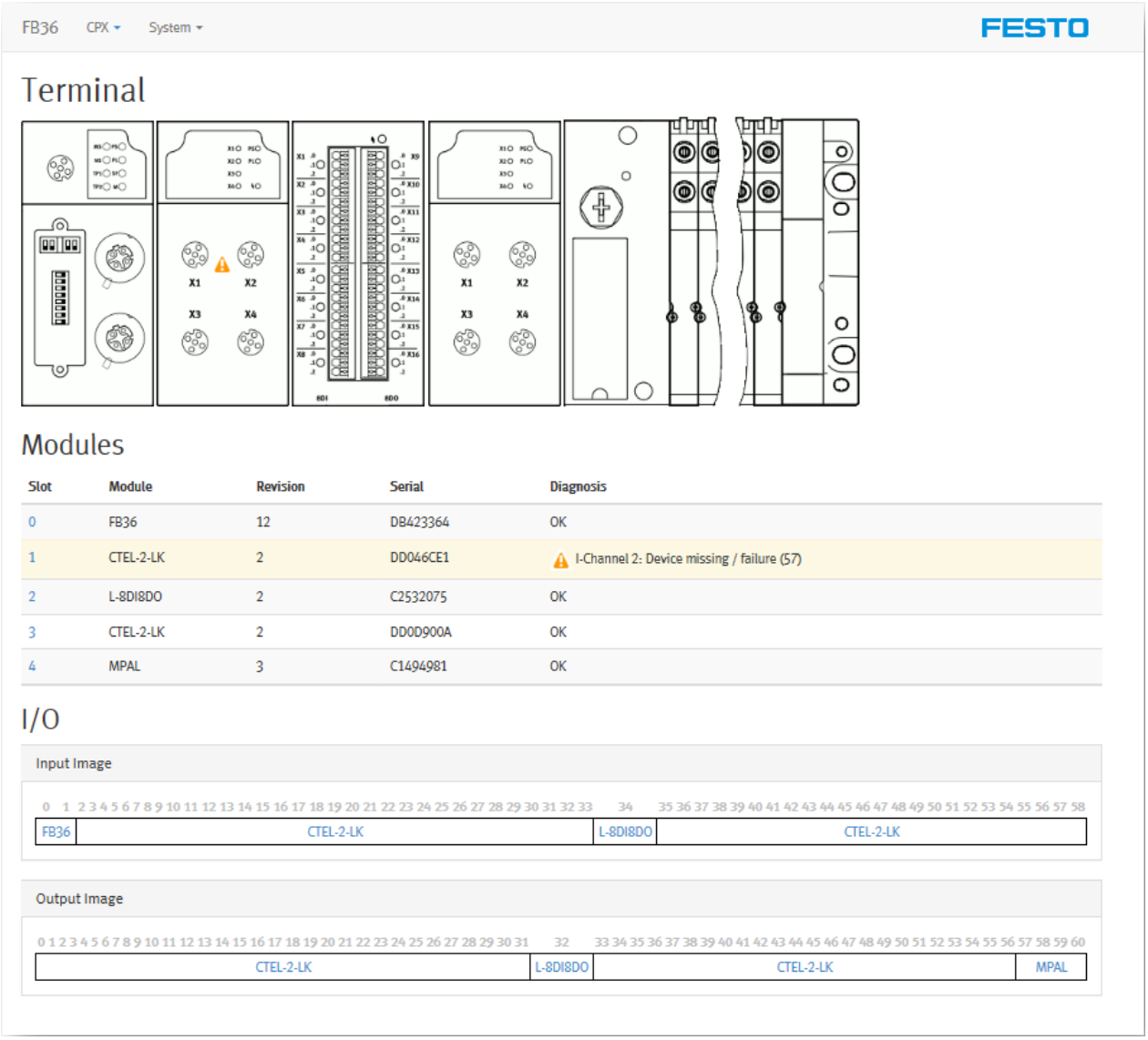


Figure 1: CPX I-Port Master for IO-Link devices – Diagnosis via Web Server

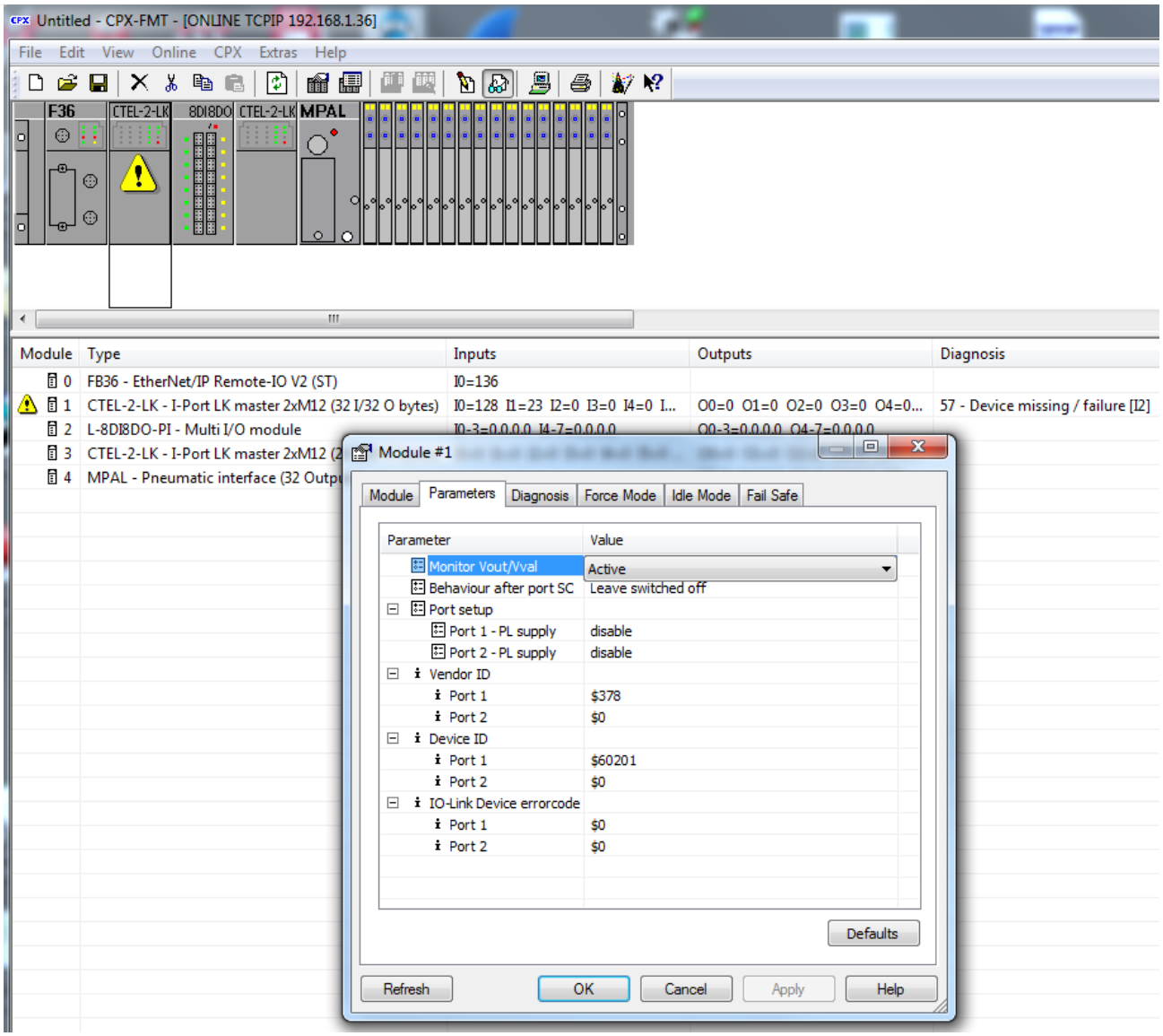


Figure 2: CPX I-Port Master for IO-Link devices – Diagnosis via FMT

4.2 CTEU-EP

For the CTEU-EP, there is a Web server available to display the relevant IO-Link status and diagnostics:

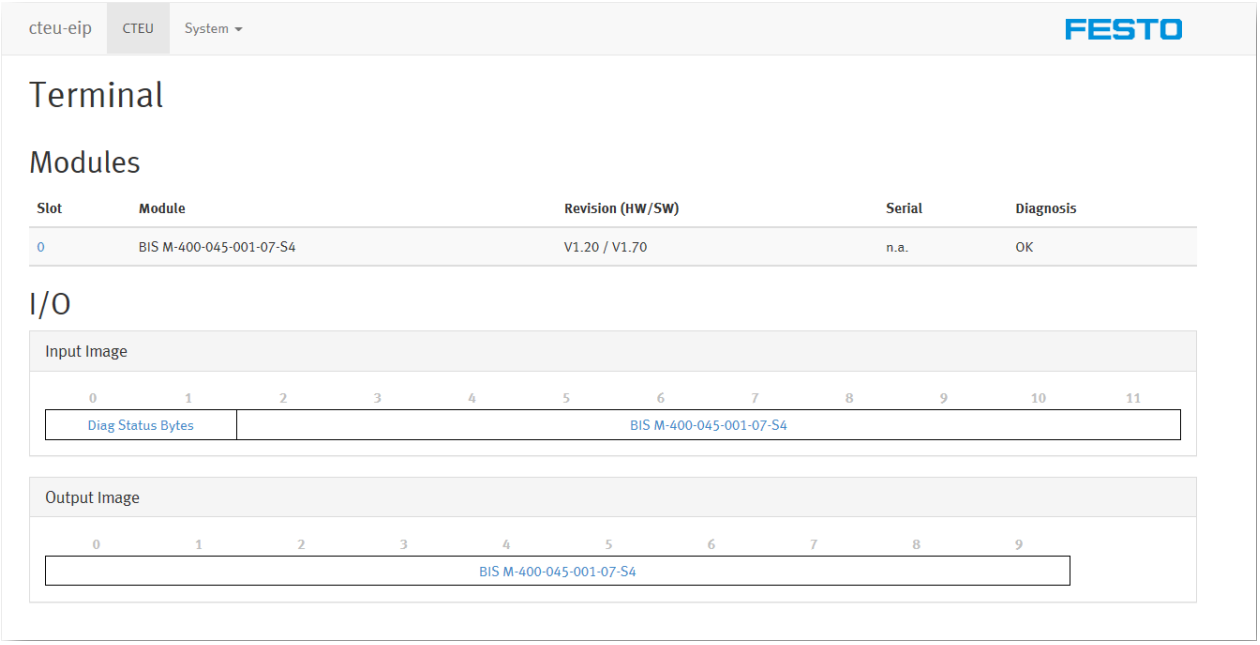


Figure 3: The CTEU web-server will show the IO-Link devices connected

5 Methods for Validating the IO-Link Configuration

For a customer to validate a configuration, he must retrieve the vendor and device ID manually via an explicit message. This will assure the correct device is connected to an IO-link port.

5.1 CPX-FB36

For the FB36, the General Object Parameter Object 101d will be used. This currently exists in the CPX system since these values are stored as parameters from the CTEL-LK. An explicit message to Object class 101 with the correct instance and attribute based on the channel & slot number will work.

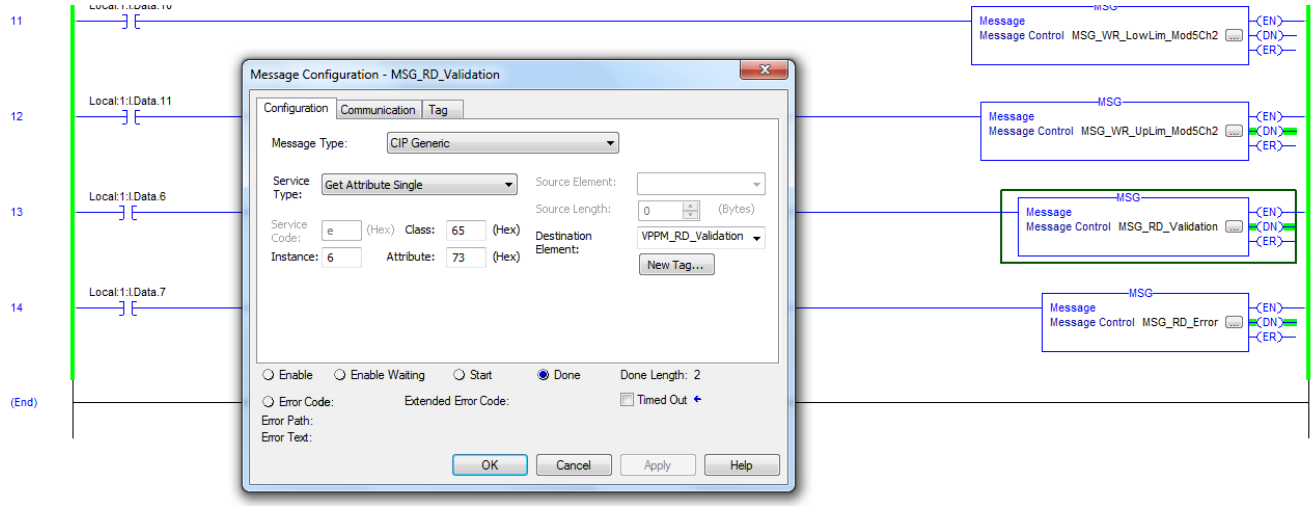


Figure 4: This ladder example will retrieve the Vendor ID of a device in port 2 of the CTEL-LK plugged into the 5th CPX slot.

Parameter	Value	Description	
Message Type	CIP Generic	CIP-specific message	
Service Type	Get Attribute Single	Read only access to single CIP attribute -› Service Code “e”	
Class	65 h / 101 d	CIP-Class-ID to access CPX-Parameter-Object	
Instance	6 d	Slot number where CTEL-LK resides + 1 Possible Values: 1-10 d In the example a value of 6d means CPX module number 5	
Attribute	73 h / 115 d	Service-Data: Vendor ID Port 2, Word	
		Possible Values	Service Data
		71 h / 113 d 73 h / 115 d b5 h / 181 d b8 h / 184 d 7b h / 123 d 7d h / 125 d	Vendor ID Port 1, Word Vendor ID Port 2, Word Device ID Port 1, DWord* Device ID Port 1 DWord* Errorcode Port 1, Word Errorcode Port 2, Word
			*Mask MSB when accessing Device ID

Table 5.1: Service code table to Read Device Type and Vendor ID to CPX-FB36

5.2 CTEU

First, each of the CTEU ports must be set to allow 3rd party IO-link devices. Use the CTEU Port Configuration Object 107d. The details are as follows:

Parameter	Value	Description	
Message Type	CIP Generic	CIP-specific message	
Service Type	Set Attribute Single	Write access to single CIP attribute -› Service Code “10h”	
Class	6B h / 107 d	Vendor-specific object for IO-Link Ports	
Instance	1, 2	Port 1 or 2 (Port 2 only available when using CAPC Adapter)	
Attribute	5	Service-Data: IO-Link support, SINT	
		Possible Values	Comment
		0 1	Disable IO-Link Support (Default) Enable IO-Link Support for 3rd Party

Table 5.2: CTEU Service code table to Set IO-Link mode

Next, the CTEU Slave Information Object 104d will be used. This object stores device information for each of the 2 CTEU ports. An explicit message to Object class 104d with the correct instance and attribute based on port 1 or 2 will allow the user to retrieve the Vendor or Device ID.

Parameter	**Value**	**Description**	
Message Type	CIP Generic	CIP-specific message	
Service Type	Get Attribute Single	Read only access to single CIP attribute -› Service Code “e”	
Class	68 h / 104 d	CIP-Class-ID for Slave-Information-Object	
Instance	1, 2	Port 1 or 2 (Port 2 only available when using CAPC Adapter)	
Attribute	6 2	Service-Data: Vendor ID,	
		Possible Values	Service-Data:
		6 2	Vendor ID, 2 Bytes (UINT) Device ID, 3 Bytes (DWord)*
			*Mask MSB when accessing Device ID

Table 5.3: Service code table to Read Device Type and Vendor ID from CTEU-EP Slave Information Object

6 Diagnostic Reporting:

Both the CPX and CTEU can be programmed in advance to detect and report errors related to the IO-link channels and devices. This includes if a device is missing, changed, or faulted.

This is generally a 3 step process:

1. Write the specific information to a “Port Configuration Object” via an explicit message. The data will be the Vendor ID and the Device ID plugged into each port.
2. Monitor general diagnostics provided by the CPX or CTEU either from the input table or status table.
3. Read specific error information from a CIP object via an explicit message.

The next chapters describe in detail how these 3 steps apply to CPX-FB36 und CTEU-EP.

6.1 CPX-FB36

6.1.1 Step 1: Set VendorID and DeviceID

Use the following table to write the specific device information to the FB36 IO-Link Port Configuration Object 140d.:

Parameter	Value	Description	
Message Type	CIP Generic	CIP-specific message	
Service Type	Set Attribute Single	Write access to single CIP attribute -› Service Code “10h”	
Class	8C h / 140 d	CIP-Class-ID for vendor specific „IO-Link Port Configuration Object“ to set IO-Link Device Type.	
Instance	0-10	Slot number where CTEL-LK resides + 1 Possible Values: 1-10 d	
Attribute	1-2	Channel of Device (Port of CPX-CTEL-LK where device is connected) Possible values: 1 – 2	
Source Element	Tag of user defined type (see details below)	Data Order of user defined data-type:	
		Master Cycle Time (SINT)	0 (Default)
		Comm_Error (SINT)	0, 1
		VendorID (INT)	Device specific
		DeviceID (DINT)	Device specific
Source Length	8 Bytes		

Table 6.1: CPX-FB36 Service code table to Write to IO-Link Port Configuration Object

Since this object requires access to a data structure, this example will show how to enter the service data for an IO-Link device in the Rockwell Logix environment with a CPX-FB36 /CPX-CTEL-LK:

1. Create a user Defined Data Type to include these 4 variables:

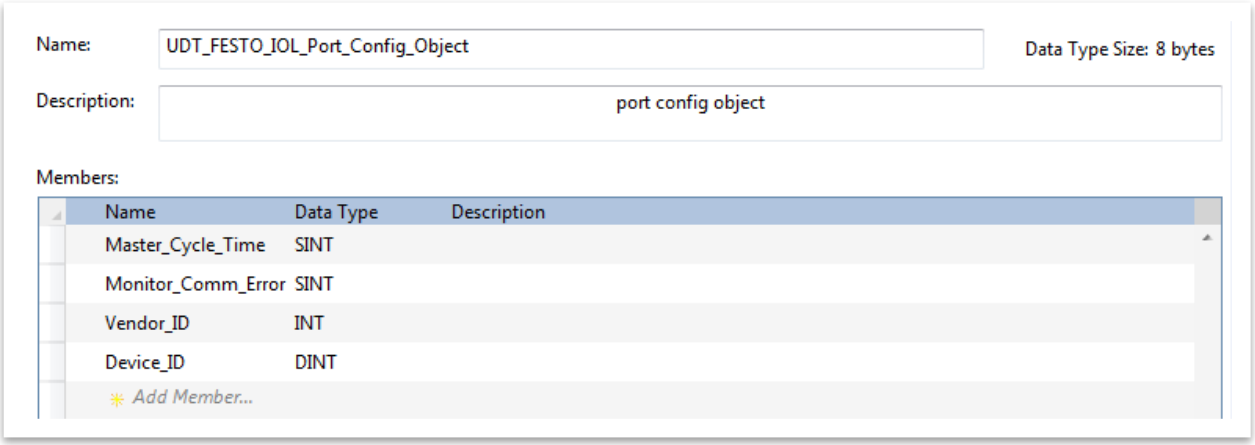
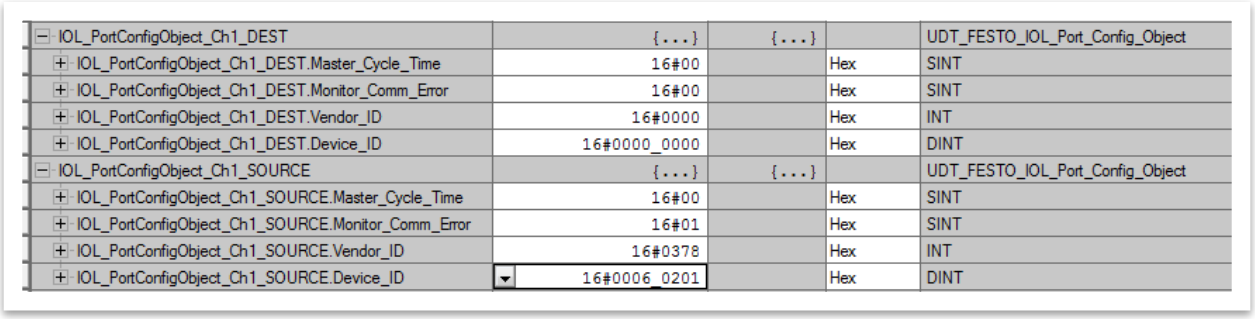


Figure 6.1

2. Create Controller Tags to be used as a source and destination for a message instruction to write / read to the module. The variables are of the data type created. Load the source data with the appropriate data for the IO-Link device.



IOL_PortConfigObject_Ch1_DEST	{...}	{...}		UDT_FESTO_IOL_Port_Config_Object
IOL_PortConfigObject_Ch1_DEST.Master_Cycle_Time	16#00		Hex	SINT
IOL_PortConfigObject_Ch1_DEST.Monitor_Comm_Error	16#00		Hex	SINT
IOL_PortConfigObject_Ch1_DEST.Vendor_ID	16#0000		Hex	INT
IOL_PortConfigObject_Ch1_DEST.Device_ID	16#0000_0000		Hex	DINT
IOL_PortConfigObject_Ch1_SOURCE	{...}	{...}		UDT_FESTO_IOL_Port_Config_Object
IOL_PortConfigObject_Ch1_SOURCE.Master_Cycle_Time	16#00		Hex	SINT
IOL_PortConfigObject_Ch1_SOURCE.Monitor_Comm_Error	16#01		Hex	SINT
IOL_PortConfigObject_Ch1_SOURCE.Vendor_ID	16#0378		Hex	INT
IOL_PortConfigObject_Ch1_SOURCE.Device_ID	16#0006_0201		Hex	DINT

3. Use a MSG instruction to load the data to the FB36 so the Vendor ID, Device ID, and choice to monitor the Comm_Error are entered. Instance 6 means CPX module number 5, and attribute 1 is for CPX-CTEL-LK channel 1.

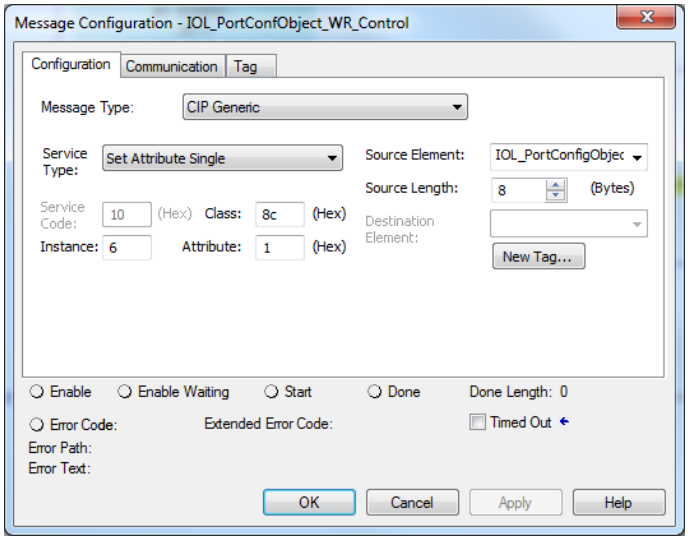


Figure 6.2

4. The data can be read in a similar manner using a Get Attribute Single service type in a separate MSG instruction. Copy the data to a destination element of the same data type.

6.1.2 Step 2: Monitor Diagnostics

Monitor basic CPX diagnostics, a fault with bits 3 (fault at function module) and 7 (other fault) of the CPX diagnostic byte should occur.

Bit	Diagnostic information with 1-signal	Description
0	Error at valve	Module type in which an error has occurred
1	Error at output	
2	Error at input	
3	Error in analogue module/ function module or technology module	
4	Undervoltage	Type of error
5	Short circuit/overload	
6	Wire break	
7	Other error	

6.1.3 Step 3: Read Specific Error Information

Use the General Module Parameter Object 101d to read the specific error codes form the CPX-FB36 / CPX-CTEL-LK. This is the same object as used to validate the IO-link device, however, in this case, use an explicit message to read attribute 7B or 7D for specific error codes of port 1 or 2 respectively.

Parameter	Value	Description		
Message Type	CIP Generic	CIP-specific message		
Service Type	Get Attribute Single	Read only access to single CIP attribute -› Service Code “e”		
Class	65 h / 101 d	CIP-Class-ID to access CPX-Parameter-Object		
Instance	6 d	Slot number where CTEL-LK resides + 1 Possible Values: 1-10 d In the example a value of 6d means CPX module number 5		
Attribute	73 h / 115 d	Service-Data: Vendor ID Port 2, Word		
		Possible Values	Service Data	
		71 h / 113 d 73 h / 115 d b5 h / 181 d b8 h / 184 d 7b h / 123 d 7d h / 125 d	Vendor ID Port 1, WORD Vendor ID Port 2, Word Device ID Port 1, DWord* Device ID Port 1 DWord* Errorcode Port 1, Word Errorcode Port 2, Word	
			*Mask MSB when accessing Device ID	
Source Element	Tag	Attribute	Datatype of Tag	Source Length
		VendorID	INT	2
		ErrorCode	INT	2
		DeviceID	DINT*	4

Table 6.2: Service code table to Read Error code from CPX-FB36

6.2 CTEU-EP

6.2.1 Step 1: Set VendorID and DeviceID

Use the following table to write the specific device information to the CTEU Port Configuration Object 107d. The details are as follows:

Parameter	Value	Description		
Message Type	CIP Generic	CIP-specific message		
Service Type	Set Attribute Single	Write access to single CIP attribute -› Service Code “10h”		
Class	6B h / 107 d	Vendor-specific object for IO-Link Ports		
Instance	1, 2	Port 1 or 2 (Port 2 only available when using CAPC Adapter)		
Attribute	6 or 7	Service-Data:		
		6	Expected Vendor ID (INT)	
		7	Expected Device ID (DINT*)	
			*Mask MSB when accessing Device ID	
Source Element	Tag	Attribute	Datatype of Tag	Source Length
		Expected VendorID	INT	2
		Expected DeviceID	DINT*	4

Table 6.3: For CTEU Service code table to Write Device Type and Vendor ID

6.2.2 Step 2: Monitor Diagnostics

Monitor basic CTEU diagnostics for a fault with an I-port channel.

Bit	Significance	Explanation
0	I-Port Module Error	I-port device/module reports diagnostics status
1	I-Port Configuration Error	– Connected device/module is not compatible with I-port – I-port device/module interchanged during operation – I/O data length not reached/exceeded
2	Communication Error	I-port communication error during operation, e.g. if the I-port device/module was unplugged
3	Undervoltage PS	Undervoltage in the power supply
4	Undervoltage PL	I-port device/module reports undervoltage in the load supply
5	Overload/Short Circuit Module	I-port device/module reports short circuit or overload
6	Overload/Short Circuit I-Port	Short circuit or overload at I-port
7	Other Error	Other faults:

6.2.3 Step 3: Read Specific Error Information

Use the Status Object 103d to read the specific error codes from the CTEU.

Parameter	Value	Description		
Message Type	CIP Generic	CIP-specific message		
Service Type	Set Attribute Single	Write access to single CIP attribute -› Service Code “10h”		
Class	67h / 103d	CIP-Class-ID for vendor specific „Status Object”		
Instance	1,2	Port 1 or 2 (Port 2 only available when using CAPC Adapter)		
Attribute	5	Port status		
Source Element	Tag of type INT	Attribute	Datatype of Tag	Source Length
		Port Status	INT	2

Table 6.4: Service code table to Read Error from IO-Link device with CTEU-EP

“Port Status” is a bitfield with the following meaning:

Bit	Description
0	no device connected
1	device initializing
2	device is operational
3	error in device
4	Port stopped
5	Port disabled
6	device reinitialized
7	short circuit on I-Port
8	reserved
9	Port unused
10	Port used, but configured as empty

Table 6.5: Description of Port Status

7 Parameterize via Mailbox Function:

IO-Link Device parameters are accessed via the ISDU Access Object 768d.

This object exists in both the CPX-FB36 and the CTEU-EP. It is handled exactly the same in either case.

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"ISDU-Access" (Index Service Data Unit Access) is the mechanism used for accessing data objects in all IO-Link devices.

The parameters are device specific, and can be both read / write. The user shall use a MSG instruction to access these parameters. This is known as the "Mailbox Function". Since the MSG instruction must use the source element for the index number, one index at a time can be accessed.

The following tables show the general Mailbox Function message instruction requirements:

Parameter	Value	Description	
Message Type	CIP Generic	CIP-specific message	
Service Type	Custom	Write access to single CIP attribute -› Service Code "10h"	
Service Code	32 h / 50 d	Read ISDU	
Class	300 h / 768 d	CIP-Class-ID for vendor specific „ISDU Access Object"	
Instance	1-2	Port where device is connected	
Attribute	0-9 or 0	CPX slot number of CPX-CTEL-LK module or 0 in case of CTEU-EP	
Source Element	Tag of user defined type	Data Order of user defined data-type:	
		Index (INT)	0...65535
		Subindex (SINT)	0...255
Source Length	3	Source Length is always "3" for read access.	
Destination Element	Tag of SINT[1+n]	Response to read access	
		Status (SINT)	Status / Errorcode of read request, see table below
		Data 0(SINT)	Byte 0 read from device
		Data 1(SINT)	Byte 1 read from device
		Data n(SINT)	Byte n read from device

Table 7.1: Message Instruction for ISDU Access (read)

Parameter	Value	Description
Message Type	CIP Generic	CIP-specific message
Service Type	Custom	Write access to single CIP attribute -› Service Code "10h"
Service Code	33h / 51 d	Write ISDU
Class	300 h / 768 d	CIP-Class-ID for vendor specific „ISDU Access Object"
Instance	1-2	Port where device is connected
Attribute	0-9 or 0	CPX slot number of CPX-CTEL-LK module or 0 in case of CTEU-EP

Parameter	Value	Description	
Source Element	Tag of user defined type	Data Order of user defined data-type:	
		Index (INT)	0...65535
		Subindex (SINT)	0...255
		Data 0 (write only)	Byte 0 of data to write to ISDU addressed by Index and Subindex
		Data 1(write only)	Byte 1 of data to write to ISDU addressed by Index and Subindex
		Data n (write only)	Byte n of data to write to ISDU addressed by Index and Subindex
Source Length	3 + "Length of Data" Bytes	When writing 4 Bytes of data to an ISDU, then Source Length is 3+4=7 Bytes.	
Destination Element	SINT	Response to write access	
		Status (SINT)	Status / Errorcode of write request, see table below

Table 7.2: Message Instruction for ISDU Access (write)

Response Status	Description
0	Success
E1 h	Write data length too long
E2 h	Port unknown
E3 h	Device busy
E4 h	Write failed
E5 h	Read failed
E6 h	Read answer too long
E7 h	State unknown
E8 h	Port on master not support
E9 h	Port in invalid state
FF h	Timeout

Table 7.3: Status- and errorcodes for read and write ISDU access

We will use a commercially available IO-Link RFID tag reader model number BIS-4xx as an example with CTEU-EP. Below are the device specific parameters that may need to be modified for proper operation.

	Access SPDU		Description	Data width	Value range	Factory setting
	Index	Subindex				
Parameterization data	40hex	1hex	CRC yes/no	1 byte	0 = without CRC 1 = with CRC	0
	40hex	2hex	Dynamic mode - yes/no	1 byte	0 = no 1 = yes	0
	40hex	3hex	Action if tag present	1 byte	0 = no action 1 = serial number and tag type 7 = automatically read 8 bytes of data beginning at a set start address after subindex 4 and 5	1
	40hex	4hex	Low byte of start address for autoread	2 bytes	Observe data-carrier specifications.	0
	40hex	5hex	High byte of start address for autoread			
	40hex	6hex	Used data-carrier type	1 byte	See Chapter 7.2 "Mapping of parameterization data", page 27 00hex=ALL FEhex=BIS M1xx-01 FFhex=BIS M1xx-02	0
	41hex	1hex	Baud rate	1 byte	00hex = 4800 baud 01hex = 38400 baud 02hex = 230400 baud	1

Figure 7.1

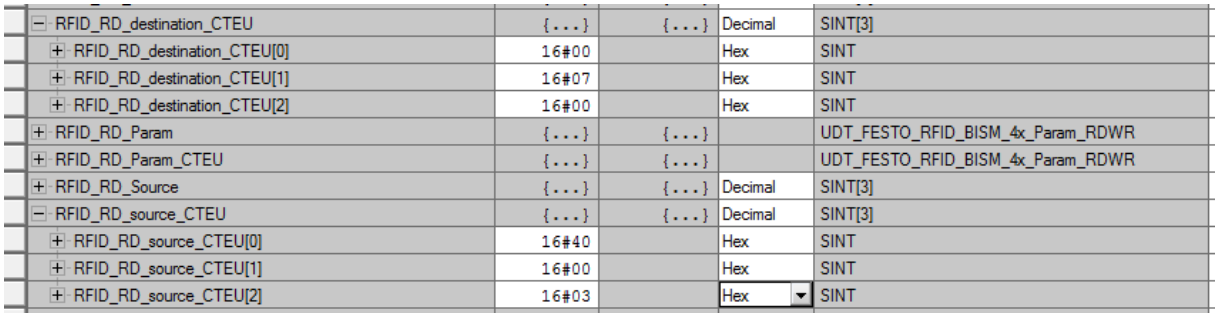
7.1.1 MSG Instruction for Read Access

To read sub-index 3, the user must create the following:

- “Source” Controller Tag of type SINT[3] for
  - SINT[0]=40h (index)
  - SINT[1]=0
  - SINT[2]=3h (sub-index)
- “Destination” Controller Tag of type SINT[3] for
  - SINT[0]=reserve or port error
  - SINT[1]=value returned
  - SINT[2]=reserve for 2 byte sub-index
- MSG instruction

The controller tags are created as follows:

- RFID_RD_source_CTEU = SINT[3]
- RFID_RD_destination_CTEU = SINT[3]



RFID_RD_destination_CTEU	{...}	{...}	Decimal	SINT[3]
RFID_RD_destination_CTEU[0]	16#00		Hex	SINT
RFID_RD_destination_CTEU[1]	16#07		Hex	SINT
RFID_RD_destination_CTEU[2]	16#00		Hex	SINT
RFID_RD_Param	{...}	{...}		UDT_FESTO_RFID_BISM_4x_Param_RDWR
RFID_RD_Param_CTEU	{...}	{...}		UDT_FESTO_RFID_BISM_4x_Param_RDWR
RFID_RD_Source	{...}	{...}	Decimal	SINT[3]
RFID_RD_source_CTEU	{...}	{...}	Decimal	SINT[3]
RFID_RD_source_CTEU[0]	16#40		Hex	SINT
RFID_RD_source_CTEU[1]	16#00		Hex	SINT
RFID_RD_source_CTEU[2]	16#03		Hex	SINT

Figure 7.2

This shows the source data index 40h / sub-index 3h, plus the return of 7h in the destination.

The table data to fill the message instruction is as follows:

Parameter	Value	Description		
Message Type	CIP Generic	CIP-specific message		
Service Type	Custom	Write access to single CIP attribute -› Service Code “10h”		
Service Code	32 h / 50 d	Read ISDU		
Class	300 h / 768 d	CIP-Class-ID for vendor specific „ISDU Access Object“		
Instance	1	Read from Port 1		
Attribute	0	Always 0 in case of CTEU-EP		
Source Element	Tag of SINT[3]	Contents of tag: RFID_RD_source_CTEU		
		40h	Index (INT)	
		0h		
		3h	Subindex (SINT)	
Source Length	3	3 Bytes have to be written from Tag “RFID_RD_source_CTEU”		
Destination Element	Tag of SINT[3]	Contents of tag: RFID_RD_destination_CTEU		
		0h	Data 0	Reserved or error
		7h	Data 1	Return from BIS M-4xx

Table 7.4

Message Instruction to read Parameter data:

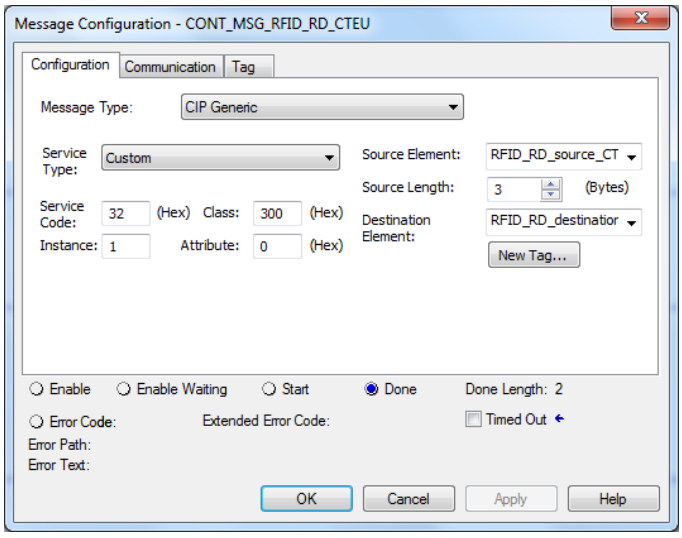
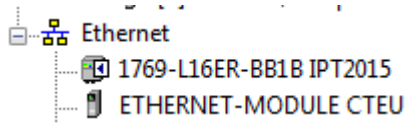


Figure 7.3

The communication tab will have the path to the CTEU Ethernet module configured:



Sample logic to execute instruction:

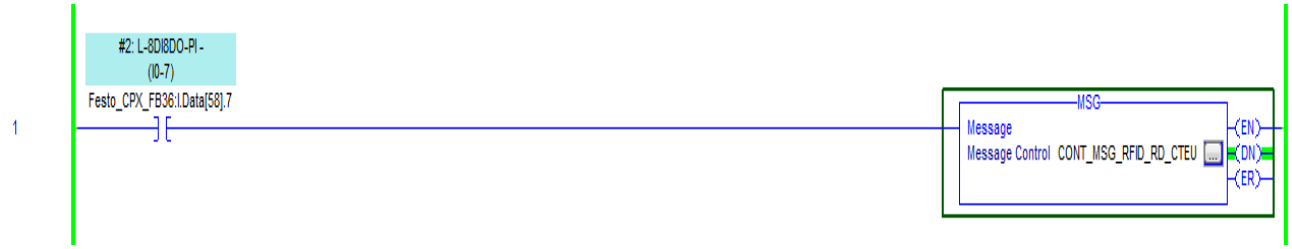


Figure 7.4

Informationen

The message is executed upon a rising edge trigger.

7.1.2 MSG Instruction for Write Access

To write to sub-index 3, the user must create the following:

- “Source” Controller Tag of type SINT[4] for
  - SINT[0]=40h (index)
  - SINT[1]=0
  - SINT[2]=3h (sub-index)
  - SINT[3]=7h (example value to write to sub-index 3)
- “Destination” Controller Tag of type SINT[4] for destination holder
- MSG instruction

The controller tags are created as follows:

- RFID_WR_source_CTEU = SINT[4]
- RFID_WR_destination = SINT[4]

RFID_WR_Source_CTEU	{...}	{...}	Hex	SINT[4]
RFID_WR_Source_CTEU[0]	16#40		Hex	SINT
RFID_WR_Source_CTEU[1]	16#00		Hex	SINT
RFID_WR_Source_CTEU[2]	16#03		Hex	SINT
RFID_WR_Source_CTEU[3]	16#07		Hex	SINT
RFID_WR_Destination	{...}	{...}	Hex	SINT[4]
RFID_WR_Destination[0]	16#00		Hex	SINT
RFID_WR_Destination[1]	16#00		Hex	SINT
RFID_WR_Destination[2]	16#00		Hex	SINT
RFID_WR_Destination[3]	16#00		Hex	SINT

Figure 7.5

The table data to fill the message instruction is as follows:

Parameter	Value	Description		
Message Type	CIP Generic	CIP-specific message		
Service Type	Custom	Write access to single CIP attribute -› Service Code “10h”		
Service Code	33 h / 51 d	Write ISDU		
Class	300 h / 768 d	CIP-Class-ID for vendor specific „ISDU Access Object“		
Instance	1	Read from Port 1		
Attribute	0	Always 0 in case of CTEU-EP		
Source Element	Tag of SINT[3]	Contents of tag: RFID_RD_source_CTEU		
		40h	Index (INT)	
		0h		
		3h	Subindex (SINT)	
		7h	Data 0	Value to write to Index 40h, Subindex 3h (parameter inside RFID reader: “Action if Tag is present”)
Source Length	4	When writing 4 Bytes of data to an ISDU, then Source Length is 3+4=7 Bytes.		
Destination Element	Tag of SINT[4]	Contents of tag: RFID_RD_destination_CTEU		
		0h	Data 0	Reserved or error

Table 7.5:

Message Instruction to write Parameter data:

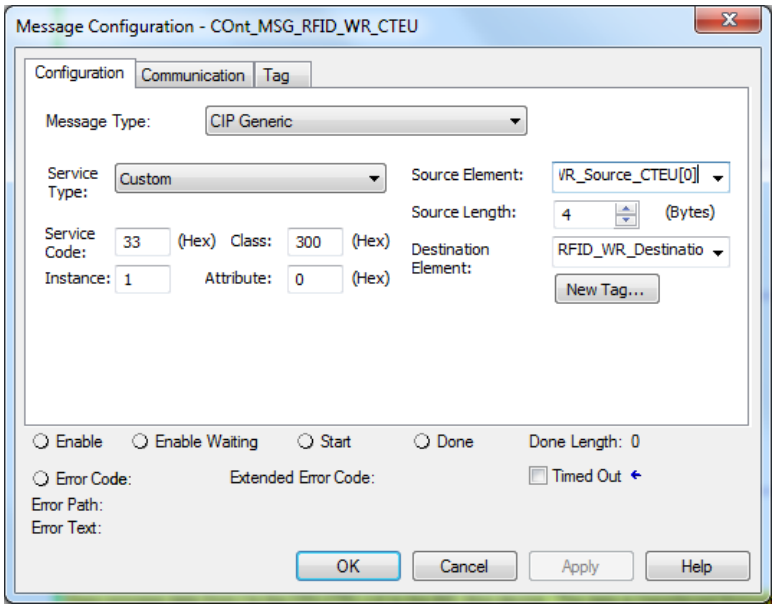


Figure 7.6

In this case, the source element is the first byte of the array.

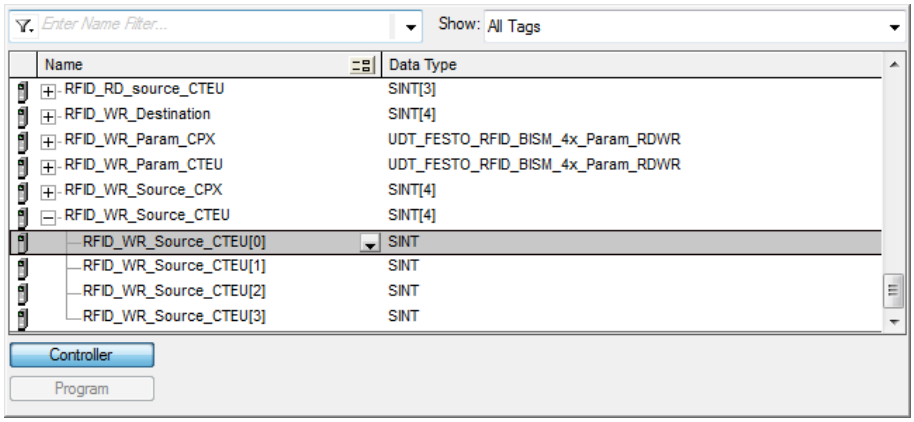
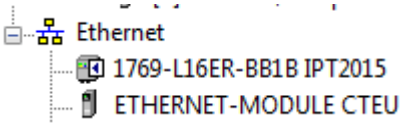


Figure 7.7

The communication tab will have the path to the CTEU Ethernet module configured:



Sample logic to execute instruction:

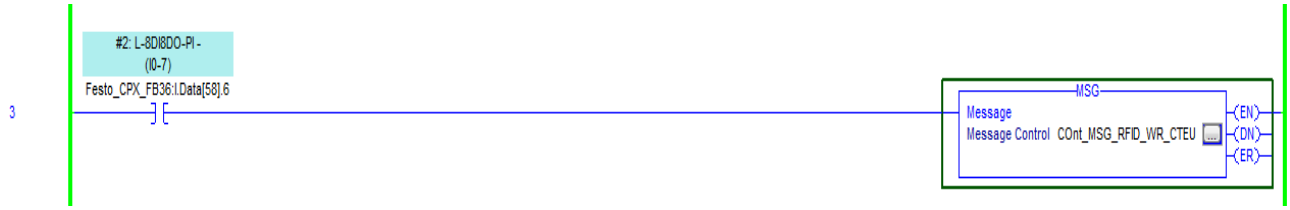


Figure 7.8

Informationen

The message is executed upon a rising edge trigger.

8 AOI Support:

Devices with a large number of parameters, or with multiple Boolean parameter functions in a single byte, can become difficult to manage. Therefore, a device specific AOI can improve the user experience when using the Mailbox Function.

Attached there is an example AOI which demonstrates the use of the mailbox with a 3rd party RFID reader.

There are two separate AOI's, read parameters and write parameters.

8.1 Read Parameters of RFID Reader

Import the attached AOI into the Rockwell project.

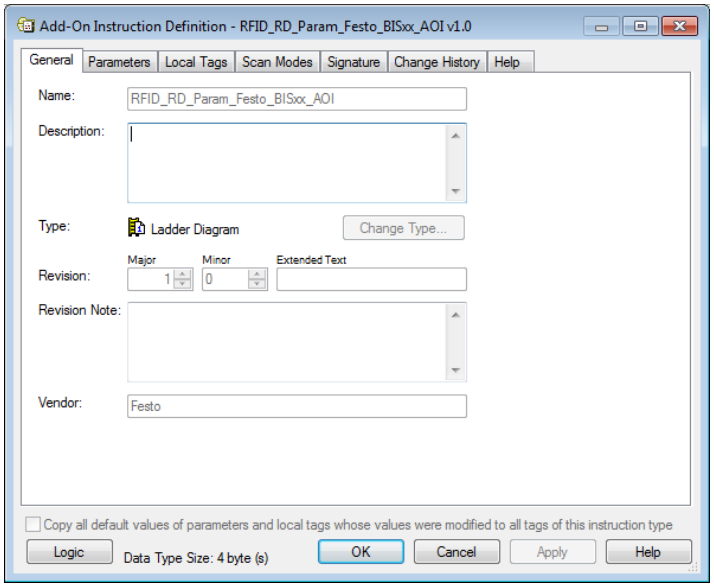


Figure 8.1

Precede the Read MSG instruction with the AOI. In this case, use the same trigger as the MSG instruction. You should notice the tags for Source and Destination are the same tags used in the MSG instruction.

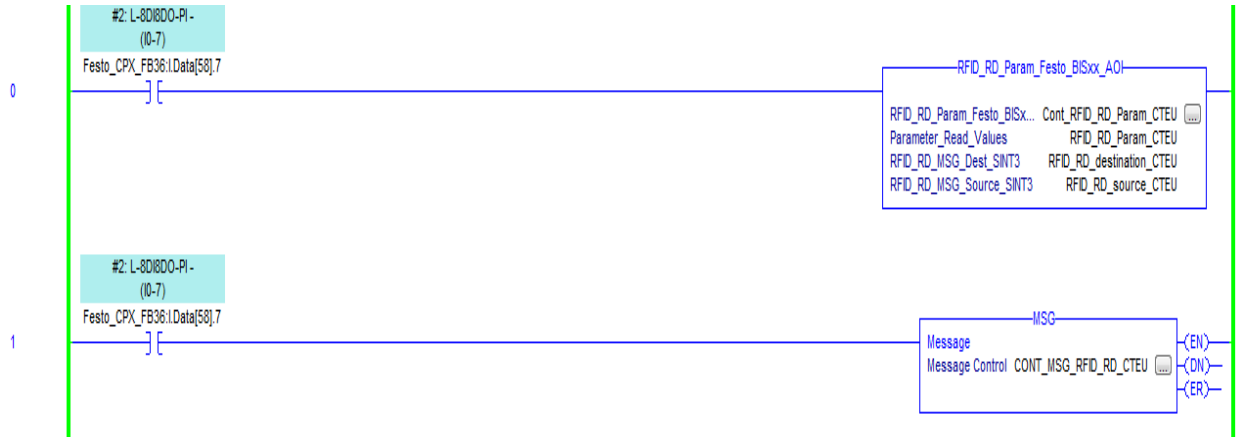


Figure 8.2

A new tag must be created for "Parameter Read Values". This will be of user defined data-type: "UDT_FESTO_RFID_BISM_4x_Param_RDWR" which comes from the AOI installation.

Note

By reviewing tag names below, please note:

- The tag name RFID_Param_CTEU data-type is user defined from the AOI
- There is one function, to select the index to read. These are values 1 to 7, defined by the AOI, and described in the comment field
- In this example, value 3 (Act on Tag) is selected
- The AOI automatically loaded the index + sub-index with the proper values to the tag RFID_RD_source_CTEU
- When the trigger was enabled, the BIS 4xx returned a 7, meaning AUTO 8 bytes
- The value is stored in the tag RFID_RD_destination_CTEU
- It is also copied to the tag RFID_RD_Param_CTEU, so the user only needs to reference this tag name

RFID_RD_destination_CTEU	{...}	{...}	Decimal	SINT[3]	
RFID_RD_destination_CTEU[0]	16#00		Hex	SINT	
RFID_RD_destination_CTEU[1]	16#07		Hex	SINT	
RFID_RD_destination_CTEU[2]	16#00		Hex	SINT	
RFID_RD_Param	{...}	{...}		UDT_FESTO_RFID_BISM_4x_Param_RDWR	
RFID_RD_Param_CTEU	{...}	{...}		UDT_FESTO_RFID_BISM_4x_Param_RDWR	
RFID_RD_Param_CTEU.Select_Func1to7	3		Decimal	SINT	1=CRC, 2=Dyn mode, 3=Act Tag, 4=Start Adr, lowbyte, 5=Start Adr,...
RFID_RD_Param_CTEU.CRC	0		Decimal	SINT	0=no, 1=yes, (0=default)
RFID_RD_Param_CTEU.Dyn_Mode	0		Decimal	SINT	0=no, 1=yes, (0=default)
RFID_RD_Param_CTEU.Act_on_Tag	7		Decimal	SINT	0=no act, 1=ser and type number, 7=AUTO 8 bytes (1=default)
RFID_RD_Param_CTEU.Start_Address	0		Decimal	DINT	start address of carrier tag
RFID_RD_Param_CTEU.Data_Carr_Type	0		Decimal	SINT	0=ALL
RFID_RD_Param_CTEU.Baud_Rate	0		Decimal	SINT	0=4800, 1=38k, 2=230k (1=default)
RFID_RD_Source	{...}	{...}	Decimal	SINT[3]	
RFID_RD_source_CTEU	{...}	{...}	Decimal	SINT[3]	
RFID_RD_source_CTEU[0]	16#40		Hex	SINT	
RFID_RD_source_CTEU[1]	16#00		Hex	SINT	
RFID_RD_source_CTEU[2]	16#03		Hex	SINT	

Figure 8.3

8.2 Write Parameters to RFID Reader

Import the attached AOI into the Rockwell project.

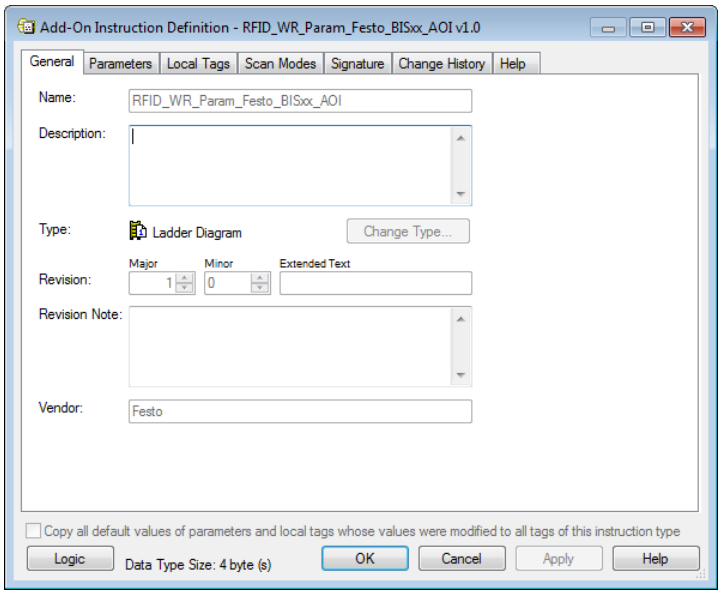


Figure 8.4

Precede the Write MSG instruction with the AOI. You should notice the tag for Source is the same tag used in the MSG instruction.

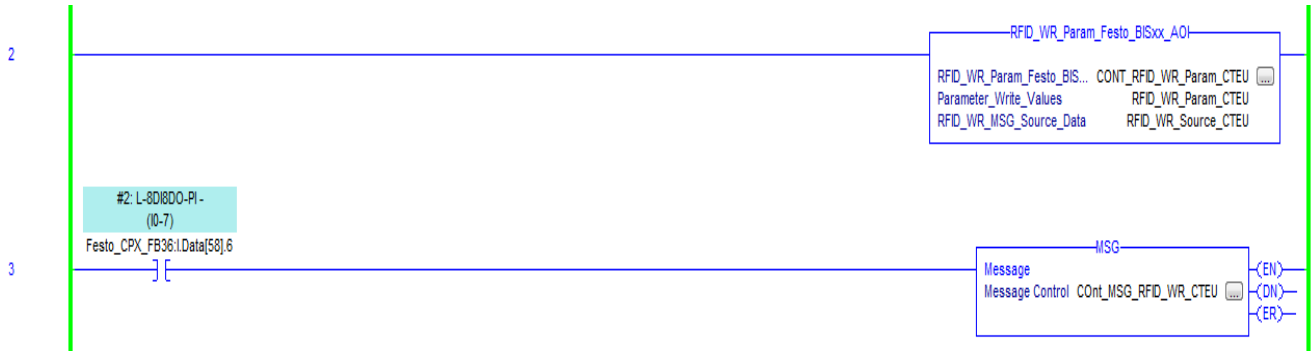


Figure 8.5

A new tag must be created for “Parameter_Write_Values”. This will be of user defined data-type: “UDT_FESTO_RFID_BISM_4x_Param_RDWR” which comes from the AOI installation.

Note

By reviewing tag names below, please note:

- The tag name RFID_Param_CTEU data-type is user defined from the AOI
- There is one function, to select the index to write. These are values 1 to 7, defined by the AOI, and described in the comment field
- In this example, value 3 (Act on Tag) is selected. Also, 7 is entered into instance Act_on_Tag
- The AOI automatically loaded the index, sub-index, and payload data with the proper values to the tag RFID_WR_source_CTEU
- When the trigger was enabled, the BIS 4xx received a 7, meaning AUTO mode

RFID_WR_Param_CTEU	{...}	{...}		UDT_FESTO_RFID_BISM_4x_Param_RDWR	
RFID_WR_Param_CTEU.Select_Func1to7	3		Decimal	SINT	1=CRC, 2=Dyn mode, 3=Act Tag, 4=Start Adr, lowbyte, 5=Start Adr,...
RFID_WR_Param_CTEU.CRC	0		Decimal	SINT	0=no, 1=yes, (0=default)
RFID_WR_Param_CTEU.Dyn_Mode	0		Decimal	SINT	0=no, 1=yes, (0=default)
RFID_WR_Param_CTEU.Act_on_Tag	7		Decimal	SINT	0=no act, 1=ser and type number, 7=AUTO 8 bytes (1=default)
RFID_WR_Param_CTEU.Start_Address	0		Decimal	DINT	start address of carrier tag
RFID_WR_Param_CTEU.Data_Carr_Type	0		Decimal	SINT	0=ALL
RFID_WR_Param_CTEU.Baud_Rate	0		Decimal	SINT	0=4800, 1=38k, 2=230k (1=default)
RFID_WR_Source_CPX	{...}	{...}	Decimal	SINT[4]	
RFID_WR_Source_CTEU	{...}	{...}	Hex	SINT[4]	
RFID_WR_Source_CTEU[0]	16#40		Hex	SINT	
RFID_WR_Source_CTEU[1]	16#00		Hex	SINT	
RFID_WR_Source_CTEU[2]	16#03		Hex	SINT	
RFID_WR_Source_CTEU[3]	16#07		Hex	SINT	
RFID_WR_Destination	{...}	{...}	Hex	SINT[4]	
RFID_WR_Destination[0]	16#00		Hex	SINT	
RFID_WR_Destination[1]	16#00		Hex	SINT	
RFID_WR_Destination[2]	16#00		Hex	SINT	
RFID_WR_Destination[3]	16#00		Hex	SINT	

Figure 8.6

The value can then be read for verification.

9 CTEU – EDS AOP to Parameterize Festo I-Port devices

Festo IO-link devices have a unique connection scheme to connect with Festo masters. This is called I-Port, which uses IO-Link technology, but enables Festo devices to self configure.

When using CPX, the CTEL 4 port module is used, and commissioning and setting parameters are well documented in user manuals, and with FMT using the L5K Export.

When using CTEU, parameters for I-Port devices can be best configured using EDS AOP. Refer to the following steps for Logix5000:

1. Go to the Festo Support portal to find the EDS file CTEU-EP.eds
2. Use the Tools menu in Studio 5000 to install the EDS file
3. When selecting a new module for Ethernet, type Festo in the search bar for module type. Select CTEU-EP communication adapter
4. Use the change button to configure the IO connection of the CTEU, add the appropriate IP address, etc.

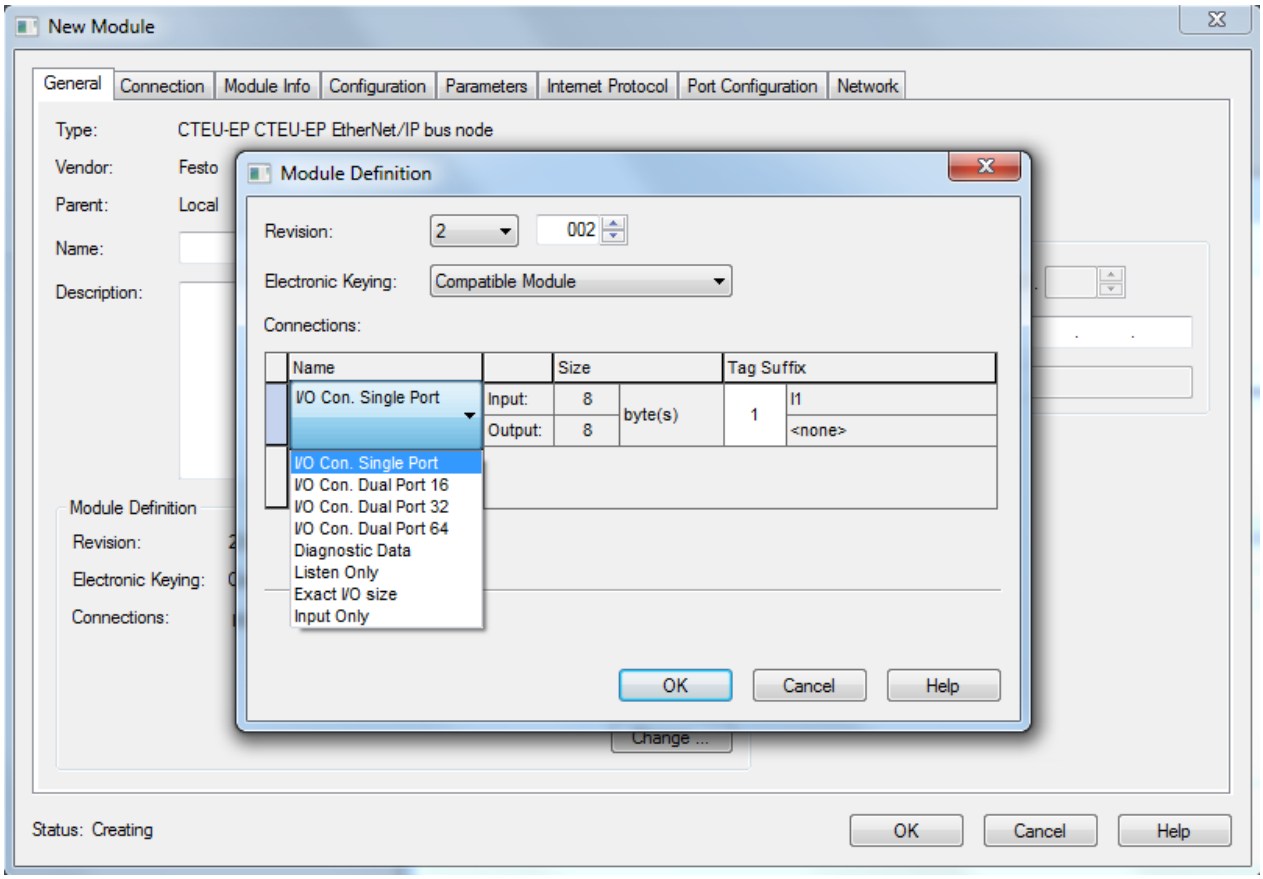


Figure 9.1

5. Go to the configuration tab. Here you will need to follow the manual of the I-port device to be commissioned. Enter the appropriate data as needed.

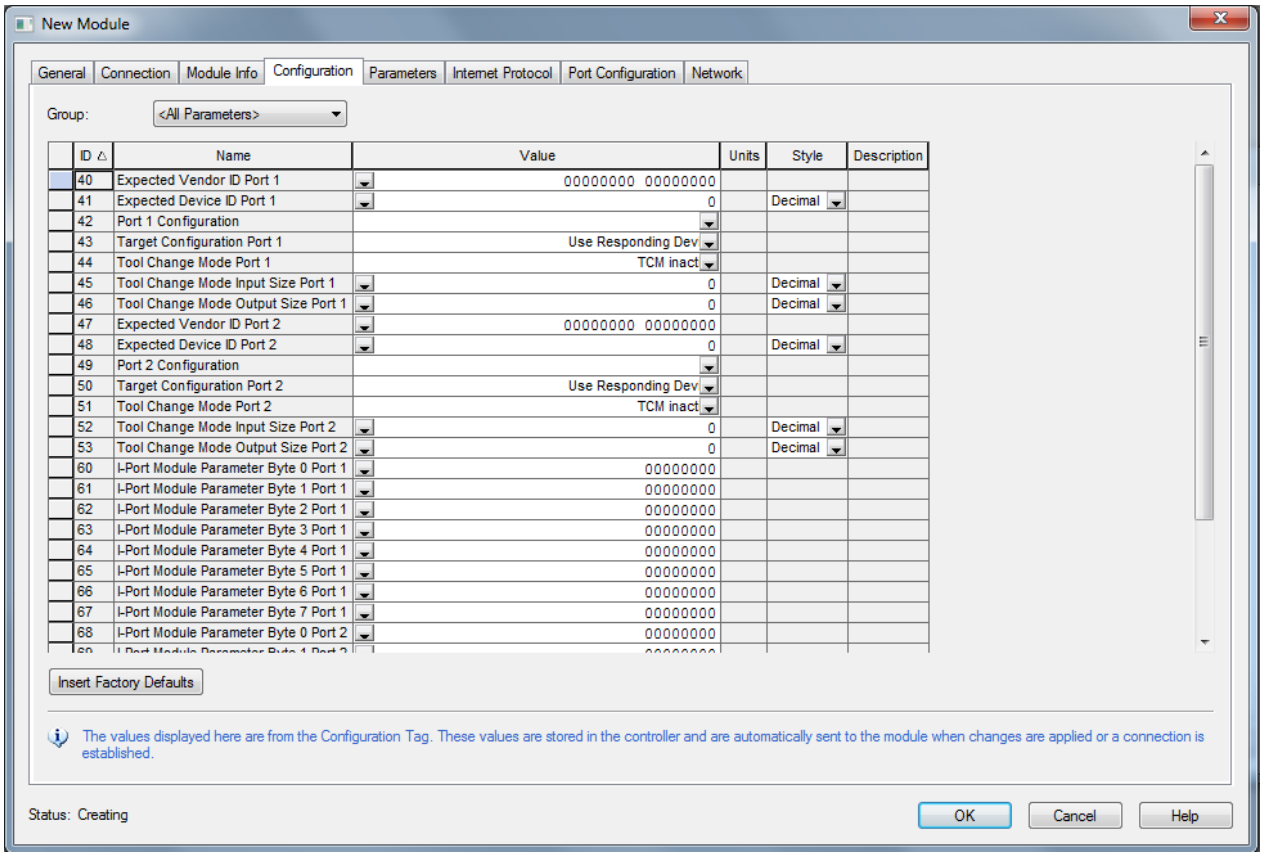


Figure 9.2

Information

You can use the “Group” dropdown-list to filter the displayed parameters.

6. The “Parameters”-tab can be used in online mode to display the currently connected IO-Link-Devices.

You can copy&paste the values from the “Parameters”-tab to the “Expected Vendor ID” and “Expected Device ID” parameters in the “Configuration”-tab.

This is a easy method to set up the check for a specific IO-Link configuration.

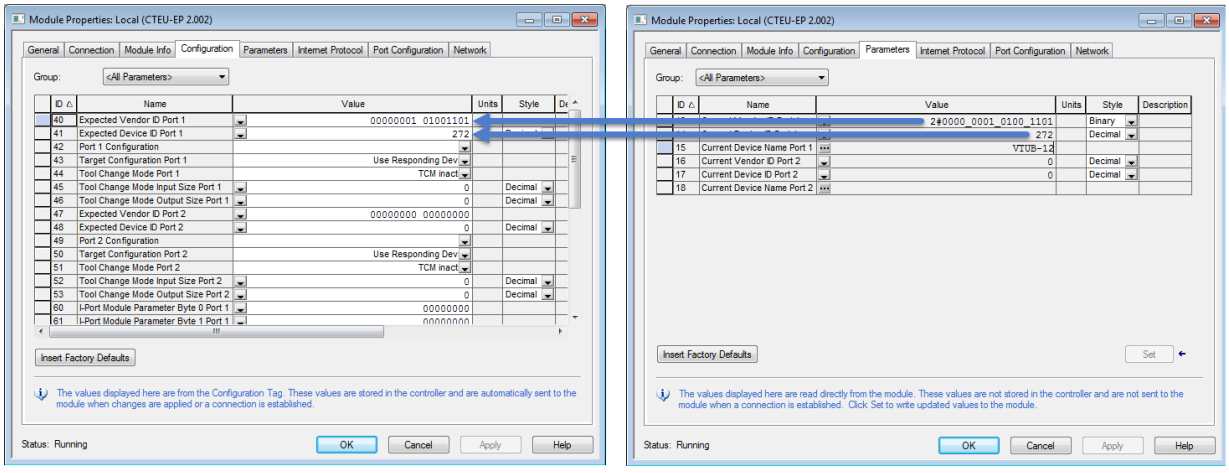


Figure 9.3

7. Select OK. This configuration is now complete.

All configuration parameters will be sent to the CTEU-EP during the forward open message of EtherNet/IP, commissioning the I-Port device connected.