hohner
AUTOMATION

ABSOLUTE ROTARY ENCODER WITH ETHERNET/IP INTERFACE
USER MANUAL

EtherNet/IP™
conformance tested

1. Introduction.. 4
1.1 Control and Information Protocol (CIP)............ 5
1.2 Object model 5

2. Data Transmission 6

2.1 Implicit Messaging I/O Connection 9
2.1.1 I/O Assembly Instances................................ 9
2.1.1.1 Data Attribute Format 9
2.1.2 Data Mapping 9
2.1.3 Data Mapping (Parameter) 10
2.1.3.1 Data Offset 10
2.1.4 Connection Path 11

2.2 Explicit Messaging 11
2.2.1 CIP Common Services for Position sensor object (Class 0x23$_{hex}$) 12
Save / Restore.. 12
2.2.2 Position Sensor Objects 13

2.3 TCP/IP Interface Object..............................14
2.3.1 Status Instance Attribute (01$_{hex}$) 14
2.3.2 Configuration Instance Attribute (02$_{hex}$) 15
2.3.3 Configuration Control Inst. Attribute (04$_{hex}$) 15
2.3.4 Physical Link Object (05$_{hex}$) 15
2.3.5 Interface Configuration (06$_{hex}$) 16
2.3.6 Host Name.. 16

2.4 Ethernet Link Object 17
2.4.0 Instance Attributes...................................... 18
2.4.1 Interface Flags.. 19
2.4.2 Common Services 19
2.4.3 Link Object Instances 20

2.5 Setting parameters with scanners 20
2.5.1 Read out position value 21
2.5.2 Set preset value.. 22
2.5.3 Get preset value 22

3 Diagnostic 23

4 Programmable Parameters 25
4.1 Encoder parameters for Position Sensor Object Class 23hex.. 25
4.1.1 Direction counting....................................... 25
4.1.2 Scaling function control............................... 25
4.1.3 Resolution per revolution 25
4.1.4 Total resolution 26
4.1.5 Preset value.. 26
4.1.6 Velocity Format 27
4.1.7 Velocity Filter..27
4.1.8 Endless Shaft 27

5. Installation 28
5.1 Electrical connection 28
5.2 Ethernet cables 28

6 Power On 29

7 Installation 29

7.1 Rockwell configuration tools 29
7.1.1 Setting IP-Address (BOOTP/DHCP) 29
7.1.2 Configuration RSLinx Classic™ 31
7.1.3 RSNetWorx™ 33
7.1.4 Configuration RSLogix 5000 36

7.2 Schneider configuration tools 43
7.2.1 Setting configuration 43
7.2.2 Online configuration 46

9 Glossar..48

1. Introduction

Absolute rotary encoders provide a definite value for every possible position. All these values are reflected on one or more code discs. The beams of infrared LEDs are sent through code discs and detected by Opto-Arrays. The output signals are electronically amplified and the resulting value is transferred to the interface.

The absolute rotary encoder has a maximum resolution of 65536 steps per revolution (16 Bit). The Multi-Turn version can detect up to 16384 revolutions (14 Bit). Therefore the largest resulting resolution is 30 Bit = 1.073.741.824 steps. The standard Single-Turn version has 13 Bit, the standard Multi-Turn version 25 Bit.

The integrated Ethernet interface of the absolute rotary encoder supports all necessary the EtherNet/IP functions.
The protocol supports the programming of the following additional functions in several ways:
Code sequence (Complement)
Resolution per revolution
Total resolution
Preset value
IP-Address

The general use of absolute rotary encoders with EtherNet/IP interface is guaranteed. The data will transmit in a standard Ethernet frame in the data section, see at the bottom of this side the pink field with the blue frame.

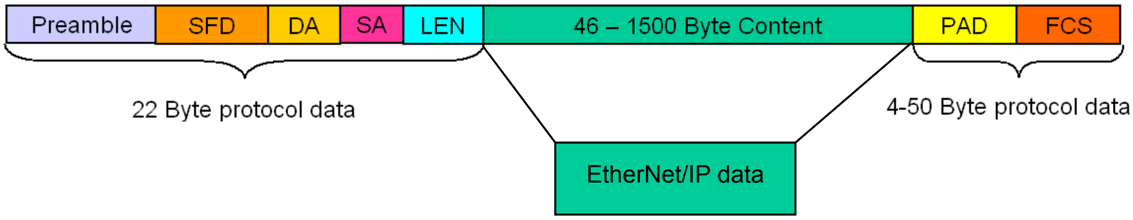
The MAC Address for each encoder is available on the type label.

The IP address can be programmed with DHCP or BOOTP by configuration tools of the PLC.

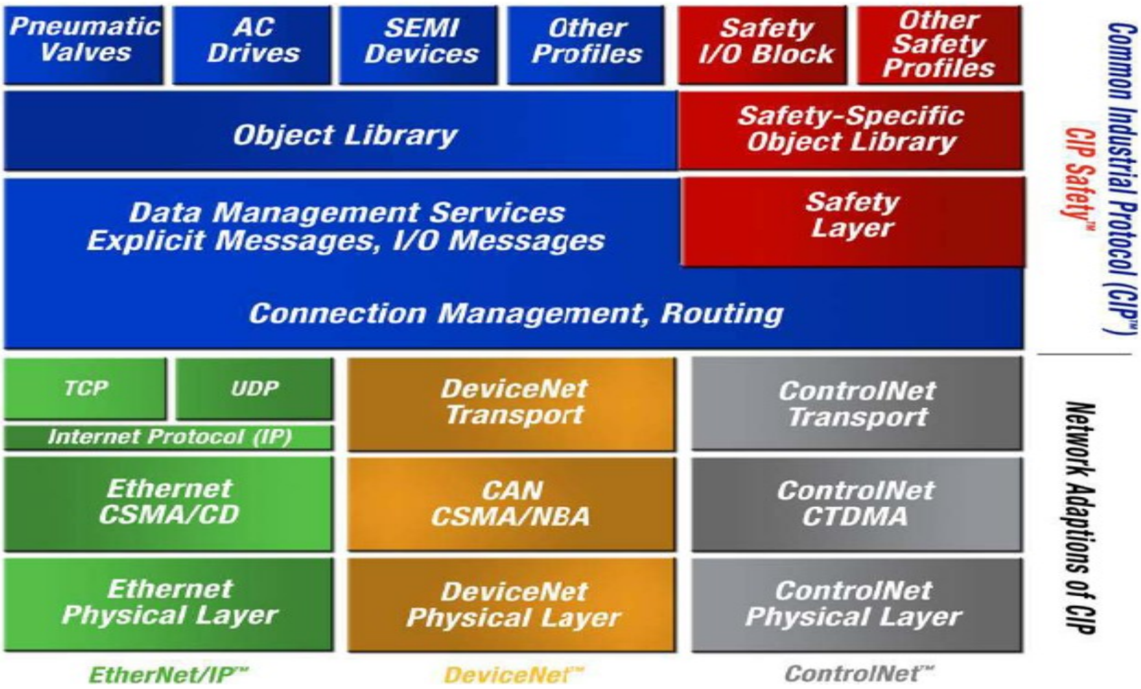
The physical interface support Autonegotiation and Autocrossing.

General information’s about EtherNet/IP are available:
www.ethernetip.de (German)
www.odva.org/default.aspx?tabid=67 (English)

Setup of an Ethernet data package on layer 2



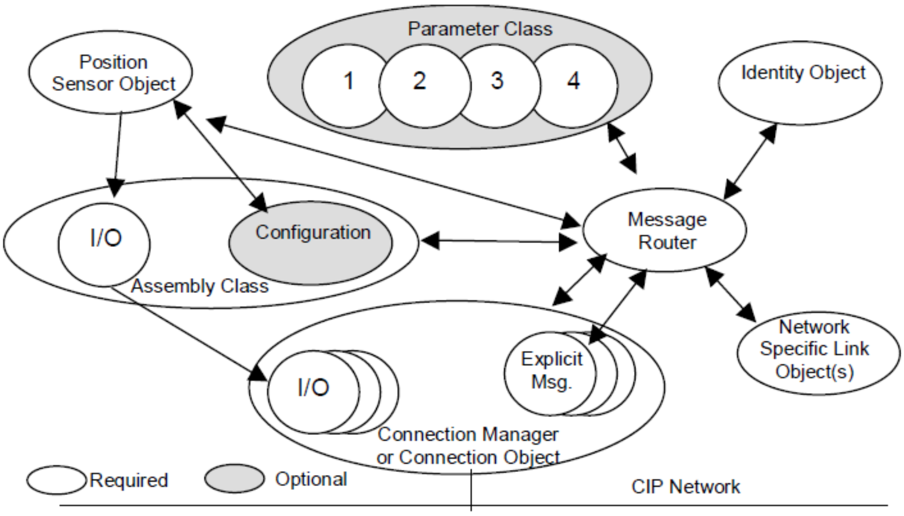
1.1 Control and Information Protocol (CIP)



: user

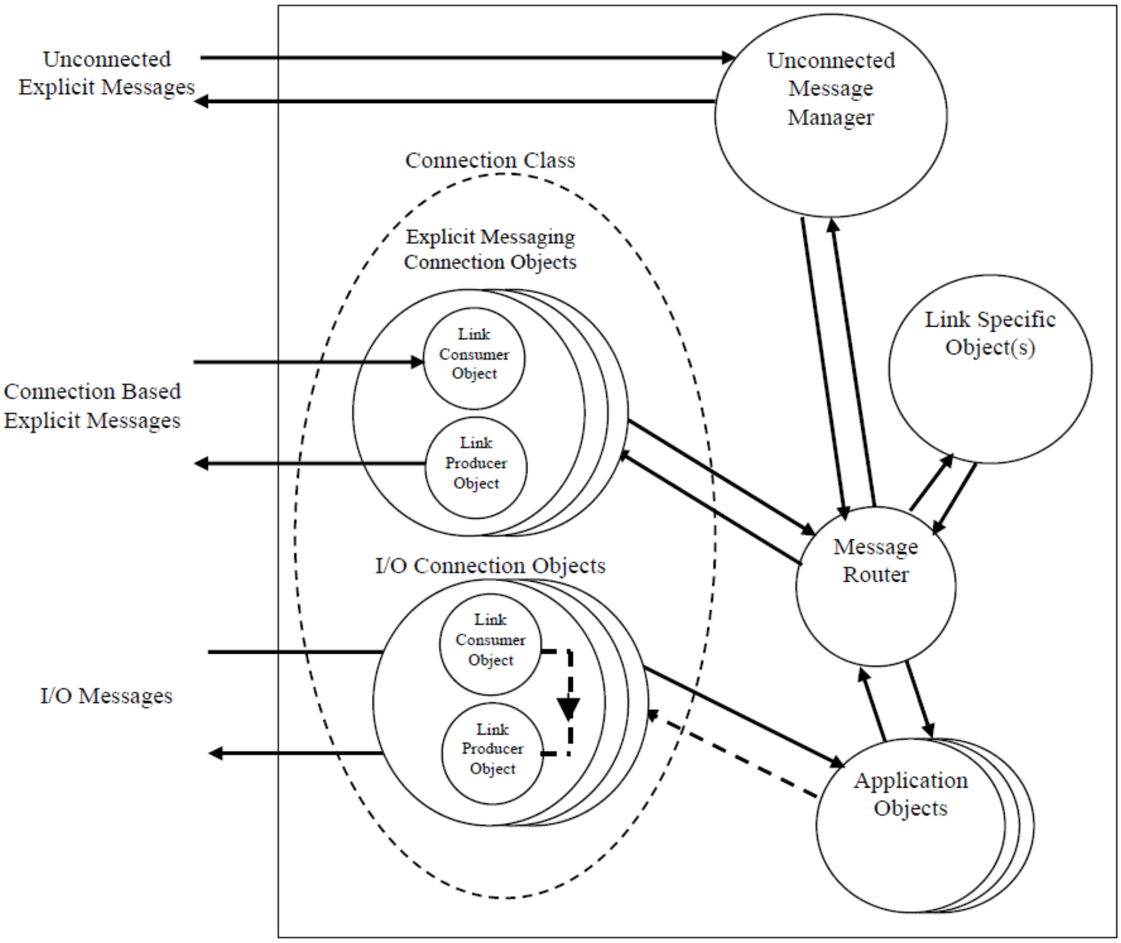
1.2 Object model

EtherNet/IP describes all data and functions of a device considering an object model. By means of that object-oriented description, a device can be defined complete with single objects. A object is defined across the centralization by associated attributes (e.g. process data), its functions (read- or write access of a single attribute) as well as by the defined behavior. The absolute rotary encoder support the Encoder Device Type: 22_{hex} or Generic Device Type: 0_{hex}. This is programmable, see chapter 4.1.6. All parameters will be used with Big Endian notation.



2. Data Transmission

The data transmission in the EtherNet/IP network is realized by implicit or explicit messaging. Explicit messages are split in unconnected and connection based versions. Unconnected messages will be use i.e. by EtherNet/IP scanners.



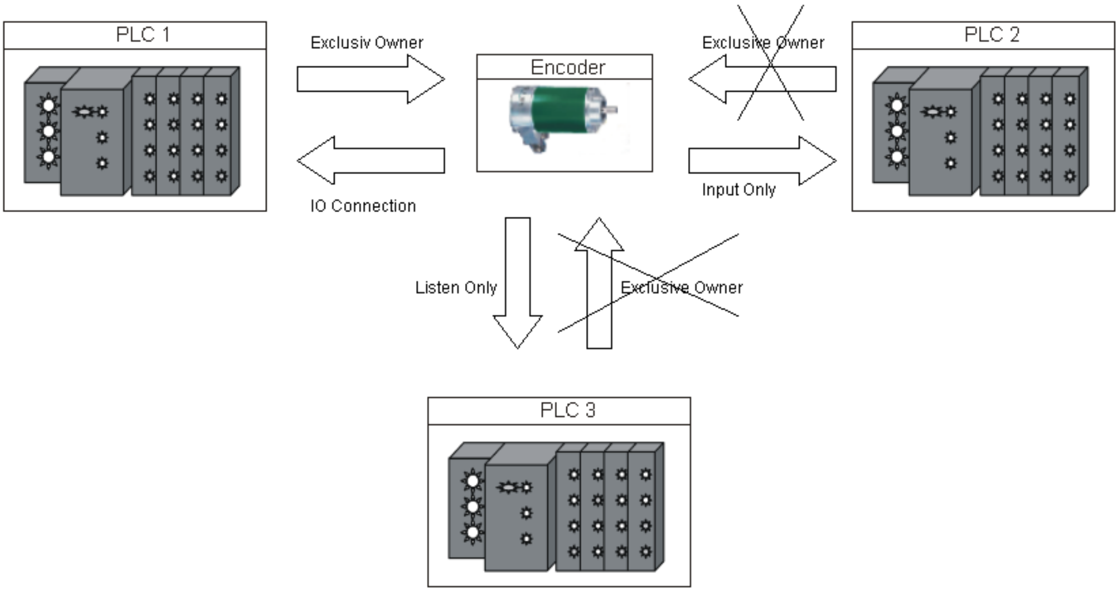
Exclusive-Owner, Input Only Listen Only

It is possible to open 256 connections to the encoder. One could be an Exclusive Owner connection, 255 additional connections can be realized mixed in Input Only or Listen Only.

With an Exclusiv Owner connection can be transmit the parameters (cycle time, configuration and Assembly Instances) to the encoder.

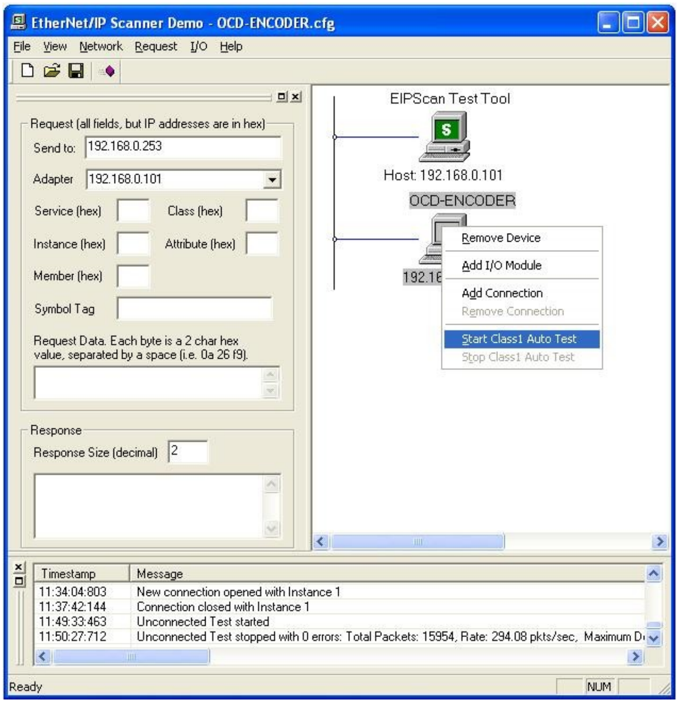
Input Only connections can only work if all of the parameters are according to the encoder parameters.

Listen Only need an connection of Excusiv Owner or Input Only.



Assembly	Config	Output Instance	Input Instance
Connection Manager	Config	Connection Point 1	Connection Point 2
Exclusiv-Owner	0x6A$_{hex}$ (106)	0x69$_{hex}$ (105)	0x01 Position value
			0x03 Position value + velocity
Input Only	0x6A$_{hex}$ (106)	0x64$_{hex}$ (100)	0x01 Position value
			0x03 Position value + velocity
Listen Only	-	0x65$_{hex}$ (101)	0x01 Position value
			0x03 Position value + velocity
Demo-Scanner	0x68$_{hex}$ (104)	0x67$_{hex}$ (103)	0x66$_{hex}$ (102)

Communication check



Request (all fields, but IP addresses are in hex)

Send to: 192.168.0.253

Adapter: 192.168.0.101

Service (hex) | Class (hex) | Instance (hex) | Attribute (hex) | Member (hex) | Symbol Tag

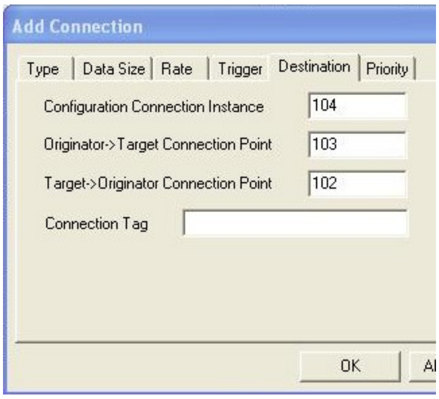
Request Data. Each byte is a 2 char hex value, separated by a space (i.e. 0a 26 f9).

Response

Response Size (decimal) 2

```
Timestamp     Message
11:34:04:803  New connection opened with Instance 1
11:37:42:144  Connection closed with Instance 1
11:49:33:463  Unconnected Test started
11:50:27:712  Unconnected Test stopped with 0 errors: Total Packets: 15954, Rate: 294.08 pkts/sec,  Maximum D
```

Ready

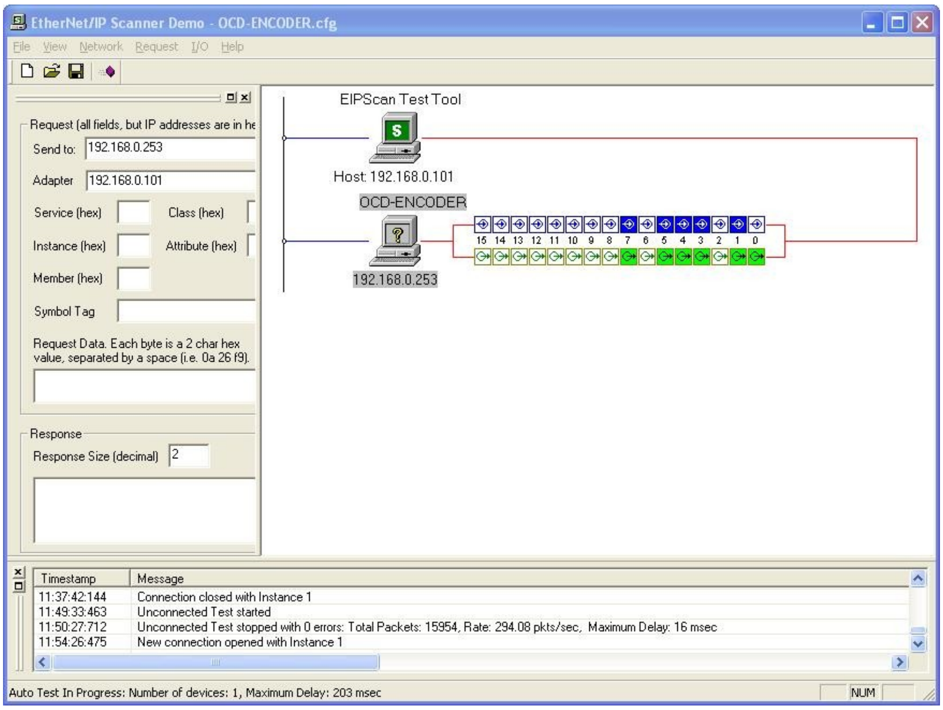


Configuration Connection Instance: 104

Originator->Target Connection Point: 103

Target->Originator Connection Point: 102

Connection Tag:



Request (all fields, but IP addresses are in he

Send to: 192.168.0.253

Adapter: 192.168.0.101

Service (hex) | Class (hex) | Instance (hex) | Attribute (hex) | Member (hex) | Symbol Tag

Request Data. Each byte is a 2 char hex value, separated by a space (i.e. 0a 26 f9).

Response

Response Size (decimal) 2

```
Timestamp     Message
11:37:42:144  Connection closed with Instance 1
11:49:33:463  Unconnected Test started
11:50:27:712  Unconnected Test stopped with 0 errors: Total Packets: 15954, Rate: 294.08 pkts/sec,  Maximum Delay: 16 msec
11:54:26:475  New connection opened with Instance 1
```

Auto Test In Progress: Number of devices: 1, Maximum Delay: 203 msec

2.1 Implicit Messaging I/O Connection

Provide dedicated, special-purpose communication paths between a producing application and one or more consuming applications for the purpose of moving application-specific data. This is often referred to as implicit messaging. Class 0 and 1 are supported.

2.1.1 I/O Assembly Instances

Instance	Type	Name
1	Input	Position Value
3	Input	Position Value and Velocity

2.1.1.1 Data Attribute Format

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1	0	Position Value (low Byte)							
	1								
	2								
	3	Position Value (high byte)							
3	0	Position Value (low Byte)							
	1								
	2								
	3	Position Value (high byte)							
	4	Velocity (low Byte)							
	5								
	6								
	7	Velocity (high byte)							

2.1.2 Data Mapping

Data Component	Class		Instance	Attribute	
Name	Name	Number	Number	Name	Number
Position Value	Position Sensor	23_{hex}	1	Position Value	$0A_{hex}$
Velocity	Position Sensor	23_{hex}	1	Velocity	18_{hex}

2.1.3 Data Mapping (Parameter)

On every Forward Open Request, the following parameters, will be sent from the controller to the encoder.

Assembly Instance Configuration: 7, size 12 Bytes

Configuration Parameter	Class		Instance	Attribute	
Name	Name	Number	Number	Name	Number
Direct Counting Toggle	Position Sensor	23_{hex}	1	Direct Counting Toggle	$0C_{hex}$
Scaling Function Control	Position Sensor	23_{hex}	1	Scaling Function Control	$0E_{hex}$
Measuring units per Revolution	Position Sensor	23_{hex}	1	Measuring Units per Span	10_{hex}
Total Measuring Range in measuring units	Position Sensor	23_{hex}	1	Total Measuring Range in measuring units	11_{hex}
Velocity Format	Position Sensor	23_{hex}	1	Velocity Format	19_{hex}

2.1.3.1 Data Offset

Byte Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Direction Counting Toggle							
1	Scaling Function Control							
2	Measuring units per Revolution (low byte)							
3								
4								
5	Measuring units per Revolution (high byte)							
6	Total Measuring Range in measuring units (low byte)							
7								
8								
9	Total Measuring Range in measuring units (high byte)							
10	Velocity Format (low byte)							
11	Velocity (high byte)							

2.1.4 Connection Path

Is made up of a byte stream that defines the application object to which a connection instance applies.

This path will be created from the configuration tools and are available in the EDS file too. This path will sent during power up to the encoder. For some tools it is necessary to use the connection path as parameter:

[20] [04] [24 6A] [2C 69] [2C 01] [80 06 00 01 00100000 00200000 041F]

Segment Groups	Segment	Description
Application Path	20 04	Assembly object class
	24 6A	Instance segment type with Assembly Instance 0x6A$_{hex}$ (105) (Configuration)
	2C 69	Assembly Instance 0x69$_{hex}$ (106) (Output controller to encoder)
	2C 01	I/O Assembly Instance 1 (Position value)
	80 06	Data segment with lenght of 6 Bytes
	00 01 00100000 00200000 041F	Configuration Data, see chapter 2.1.3.1 for details

2.2 Explicit Messaging

Provide generic, multi-purpose communication paths between two devices. These connections often are referred to as just Messaging Connections. Explicit Messages provide the typical request/response-oriented network communications. Class 2 and 3 are supported.

2.2.1 CIP Common Services for Position sensor object (Class $0x23_{hex}$)

Supported Service Code	Service Name	Comment
05_{hex}	Reset	Boot up of the encoder, the programmed parameter from the customer will use again
$0E_{hex}$	Get_Attribute_Single	Read out attribute from the encoder
10_{hex}	Set_Attribute_Single	Write attribute to the encoder
15_{hex}	Restore	Restore the saved parameters. Use instance 0 of position sensor class to restore all configuration parameter at once. To restore single parameter use instance 1 of position sensor class with attribute number as argument (see next table).
16_{hex}	Save	Save the parameters from chapter 2.1.3 to the nonvolatile memory. Use instance 0 of position sensor class to save all configuration parameter at once.

2.2.2 Position Sensor Objects

Instance Attributes (Get: read, Set: write + read)

Class Code: 23_{hex}

Attrib. ID	Access	Name	Data Type	Description
01_{hex}	Get	Number of Attributes	USINT	Number of supported Attributes
02_{hex}	Get	Attribute List	Array of USINT	List of supported Attribute
$0A_{hex}$	Get	Position Value Signed	DINT	Current position signed
$0B_{hex}$	Get	Position Sensor Type	UINT	Specifies the device type
$0C_{hex}$	Set	Direction Counting Toggle	Boolean	Controls the code sequence clockwise or counterclockwise
$0E_{hex}$	Set	Scaling Function Control	Boolean	Scaling function on/off
10_{hex}	Set	Measuring units per Span	UDINT	Resolution for one revolution
11_{hex}	Set	Total Measuring Range in Measuring Units	UDINT	Total resolution
13_{hex}	Set	Preset Value	DINT	Setting a defined position value
18_{hex}	Get	Velocity Value	DINT	Current speed in format of attribute 19_{hex} and $2A_{hex}$
19_{hex}	Set	Velocity Format	ENGUINT	Format of the velocity attributes
29_{hex}	Get	Operating Status	BYTE	Encoder diagnostic operating status
$2A_{hex}$	Get	Physical Resolution Span	UDINT	Resolution for one revolution
$2B_{hex}$	Get	Number of Spans	UINT	Number of revolutions
33_{hex}	Get	Offset Value	DINT	Shift position value with the calculated value
64_{hex}	Set	Device Type	DINT	Encoder device = 22_{hex} Generic device = 0 (default)
65_{hex}	Set	Endless Shaft	DINT	Off = 0, On = 1, Auto = 2
66_{hex}	Set	Velocity Filter	DINT	Fine = 0, Middle = 1, Raw = 2

2.3 TCP/IP Interface Object

The TCP/IP Interface Object provides the mechanism to configure a device’s TCP/IP network interface. With this parameter it is possible i.e. to read or write the device’s IP Address and Network Mask.

Class Code: $F5_{hex}$

Attribute ID	Access	Name	Data Type	Description
01_{hex}	Get	Status	DWORD	Interface status, details in chapter 2.3.1
02_{hex}	Get	Configuration Capability	DWORD	Interface capability flags, details in chapter 2.3.2
03_{hex}	Set	Configuration Control	DWORD	Interface control flags, details in chapter 2.3.3
04_{hex}	Get	Physical Link Object	STRUCT of:	Path to physical link object
		Path size	UINT	Size of path
		Path	Padded EPATH	Logical segments identifying the physical link object
05_{hex}	Set	Interface Configuration	STRUCT of:	TCP/IP network interface configuration
		IP Address	UDINT	The device’s IP address
		Network Mask	UDINT	The device’s network mask
06_{hex}	Set	Host Name	STRING	

2.3.1 Status Instance Attribute (01_{hex})

Bit(s)	Called	Definition	
0-3	Interface Configuration Status	Indicates the status of the Interface Configuration attribute.	0 = The Interface Configuration attribute has not been configured. 1 = The Interface Configuration attribute contains valid configuration obtained from BOOTP, DHCP or nonvolatile storage. 2 = The Interface Configuration attribute contains valid configuration, obtained from hardware settings (e.g.: pushwheel, thumbwheel, etc.) 3-15 = Reserved for future use.
4	Mcast Pending	Indicates a pending configuration change in the TTL Value and/or Mcast Config attributes. This bit shall be set when either the TTL Value or Mcast Config attribute is set, and shall be cleared the next time the device starts.	
5-31	Reserved	Reserved for future use and shall be set to zero.	

2.3.2 Configuration Instance Attribute (02$_{hex}$)

Bit(s)	Called	Definition
0	BOOTP Client	1 (TRUE) shall indicate the device is capable of obtaining its network configuration via BOOTP.
1	DNS Client	Not supported
2	DHCP Client	1 (TRUE) shall indicate the device is capable of obtaining its network configuration via DHCP.
3	DHCP-DNS Update	Not supported
4	Configuration Settable	1 (TRUE) shall indicate the Interface Configuration attribute is settable. Some devices, for example a PC or workstation, may not allow the Interface Configuration to be set via the TCP/IP Interface Object.
5-31	Reserved	Reserved for future use and shall be set to zero.

2.3.3 Configuration Control Inst. Attribute (04$_{hex}$)

Bit(s)	Called	Definition	
0-3	Startup Configuration	Determines how the device shall obtain its initial configuration at start up.	0 = The device shall use the interface configuration values previously stored (for example, in non-volatile memory or via hardware switches, etc). 1 = The device shall obtain its interface configuration values via BOOTP. 2 = The device shall obtain its interface configuration values via DHCP upon start-up. 3-15 = Reserved for future use.

2.3.4 Physical Link Object (05$_{hex}$)

This attribute identifies the object associated with the underlying physical communications interface (e.g., an 802.3 interface). There are two components to the attribute: a Path Size (in UINTs) and a Path. The Path shall contain a Logical Segment, type Class, and a Logical Segment, type Instance that identifies the physical link object. The maximum Path Size is 6 (assuming a 32 bit logical segment for each of the class and instance).

The physical link object itself typically maintains link-specific counters as well as any link specific configuration attributes. If the CIP port associated with the TCP/IP Interface Object has an Ethernet physical layer, this attribute shall point to an instance of the Ethernet Link Object (class code = F6$_{hex}$). When there are multiple physical interfaces that correspond to the TCP/IP interface, this attribute shall either contain a Path Size of 0, or shall contain a path to the object representing an internal communications

interface (often used in the case of an embedded switch).
For example, the path could be as follows:

Path	Meaning
0-3	[20] = 8 bit class segment type; [F6] = Ethernet Link Object class; [24] = 8 bit instance segment type; [01] = instance 1.

2.3.5 Interface Configuration (06_{hex})

Name	Meaning
IP Address	The device's IP address. Value of 0 indicates no IP address has been configured. Otherwise, the IP address shall be set to a valid Class A, B, or C address and shall not be set to the loopback address (127.0.0.1).
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. Value of 0 indicates no network mask address has been configured.

2.3.6 Host Name

Name	Meaning
Host Name	ASCII characters. Maximum length is 64 characters. Shall be padded to an even number of characters (pad not included in length). A length of 0 shall indicate no Host Name is configured.

2.4 Ethernet Link Object

Class Code: F6$_{hex}$

Attribute ID	Access	Name	Data Type	Description	Semantics of Values
01$_{hex}$	Get	Revision	UINT	Revision of this object	The minimum value shall be 1. Shall be 2 or greater if instance attribute 6 is implemented. Shall be 3 if any instance attributes 7-10 are implemented. The maximum value shall be 3.
02$_{hex}$	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The largest instance number of a created object at this class hierarchy level
03$_{hex}$	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device	The number of object instances at this class hierarchy level

2.4.0 Instance Attributes

ID	Access	Name	Data Type	Description of Attribute	Semantics of Values
1	Get	Interface Speed	UINT	Interface speed currently in use	Speed in Mbps (e.g., 10, 100
2	Get	Interface Flags	DWORD	Interface status flags	See chapter 2.4.1
3	Get	Physical Address	ARRAY of 6 USINTs	MAC layer address	Displayed format “XX-XX-XX-XX-XX-XX”
6	Set	Interface Control	STRUCT of:	Configuration for physical interface	
		Control Bits	WORD	Interface Control Bits	See table below
		Forced Interface Speed	UINT	Speed at which the interface shall be forced to operate	Speed in Mbps (10 or 100)
7	Get	Interface Type	USINT	Type of interface	1 = The interface is internal to the device, i.e. in the case of an embedded switch 2 = Twisted-pair (e.g. 100Base-TX)
8	Get	Interface State	USINT	Current state of the interface	0 = No link 1 = The interface is enabled and is ready to send and receive data
10	Get	Interface Label	SHORT_STRING	Human readable identification	„Internal switch“ or „External Port 1“ or „External Port 2“

Control Bits

Bit(s)	Called	Definition
0	Auto-negotiate	802.3 link Auto-negotiation: 0 = disabled, 1 = enabled (standard) If Auto-negotiation is disabled then the device shall use the settings indicated by the Forced Duplex Mode and Forced Interface Speed bits.
1	Forced Duplex Mode	If Auto-negotiation bit = 0 the Forced Duplex Mode bit indicates whether the interface shall operate in full or half duplex mode. 0 = Half Duplex, 1 = Full Duplex
2-15	Reserved	Shall be set to zero

Example

Use on Transmit data size double (4 bytes) 00000064
for Auto-negotiation = disable on 100 MBaud

2.4.1 Interface Flags

Bit(s)	Called	Definition
0	Link Status	Indicates whether or not the Ethernet 802.3 communications interface is connected to an active network. 0 indicates an inactive link; 1 indicates an active link. The determination of link status is implementation specific. In some cases devices can tell whether the link is active via hardware/driver support. In other cases, the device may only be able to tell whether the link is active by the presence of incoming packets.
1	Half/Full Duplex	Indicates the duplex mode currently in use. 0 indicates the interface is running half duplex; 1 indicates full duplex. Note that if the Link Status flag is 0, then the value of the Half/Full Duplex flag is indeterminate.
2-4	Negotiation Status	Indicates the status of link auto-negotiation 0 = Auto-negotiation in progress. 1 = Auto-negotiation and speed detection failed. Using default values for speed and duplex. Default values are product-dependent; recommended defaults are 10Mbps and half duplex. 2 = Auto negotiation failed but detected speed. Duplex was defaulted. Default value is product-dependent; recommended default is half duplex. 3 = Successfully negotiated speed and duplex. 4 = Auto-negotiation not attempted. Forced speed and duplex.
5	Manual Setting Requires Reset	0 indicates the interface can activate changes to link parameters (auto-negotiate, duplex mode, interface speed) automatically. 1 indicates the device requires a Reset service be issued to its Identity Object in order for the changes to take effect.
6	Local Hardware Fault	0 indicates the interface detects no local hardware fault; 1 indicates a local hardware fault is detected. The meaning of this is product-specific. Examples are an AUI/MII interface detects no transceiver attached or a radio modem detects no antennae attached. In contrast to the soft, possible self-correcting nature of the Link Status being inactive, this is assumed a hard-fault requiring user intervention.
7	Reserved	Shall be set to zero

2.4.2 Common Services

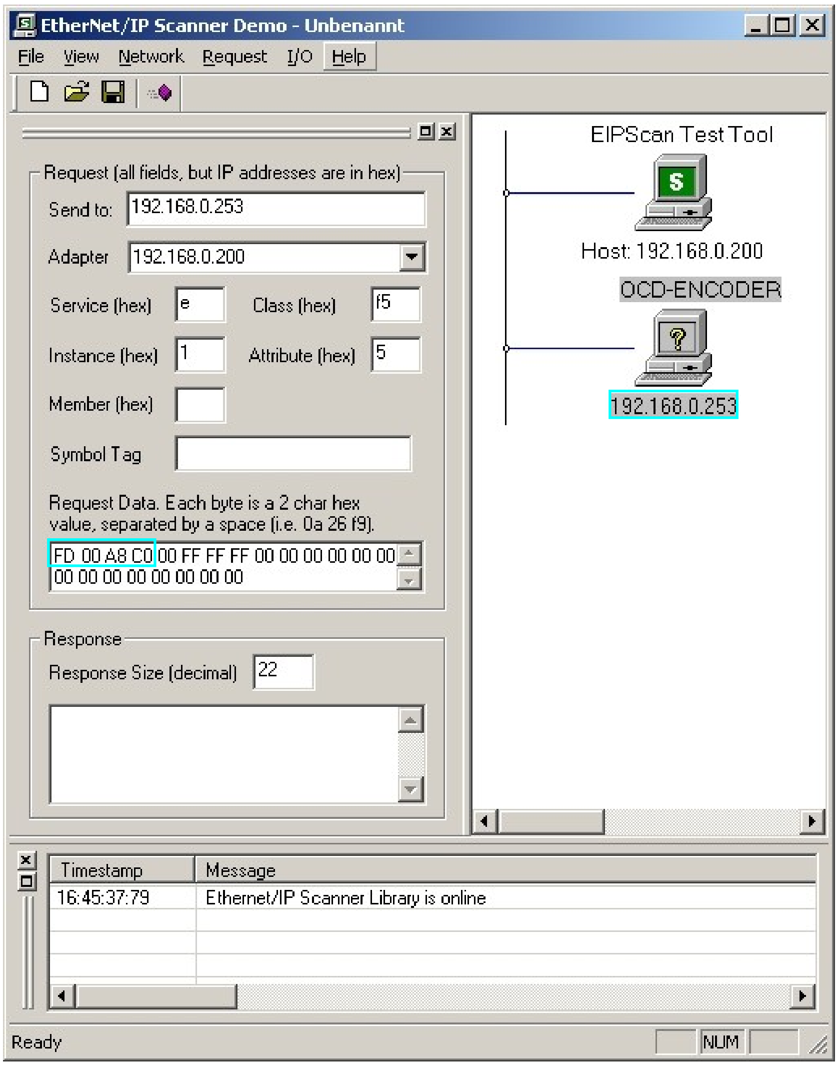
Service Code	Class	Instance*	Service Name	Description of Service
$0E_{hex}$	Conditional	Required	Get_Attribute_Single	Returns the contents of the specified attribute
10_{hex}	n/a	Conditional	Set_Attribute_Single	Modifies a single attribute

2.4.3 Link Object Instances

Instance	Description
1	Internal interface
2	Intern switch Port 1
3	Intern switch Port 2

2.5 Setting parameters with scanners

There are several external scanners for EtherNet/IP available. RS-NetWorks^{TM} has one such scanner. In the figure is an example where the IP-Address (FD 00 A8 C0 complies 192.168.0.253), the Subnet (00 FF FF FF complains 255.255.255.0), Gateway (00 00 00 00), DNS1 (00 00 00 00), DNS2 (00 00 00 00) and Domain Name = “” (ASCII Character max length = 48 bytes) was read out of the encoder.


EtherNet/IP Scanner Demo - Unbenannt
File View Network Request I/O Help
EIPScan Test Tool
Host: 192.168.0.200
OCD-ENCODER
192.168.0.253
NUM

Request (all fields, but IP addresses are in hex)

Send to: 192.168.0.253

Adapter: 192.168.0.200

Service (hex): e

Class (hex): f5

Instance (hex): 1

Attribute (hex): 5

Member (hex):

Symbol Tag:

Request Data. Each byte is a 2 char hex value, separated by a space (i.e. 0a 26 f9).

```
FD 00 A8 C0 00 FF FF FF 00 00 00 00 00 00
00 00 00 00 00 00 00 00
```

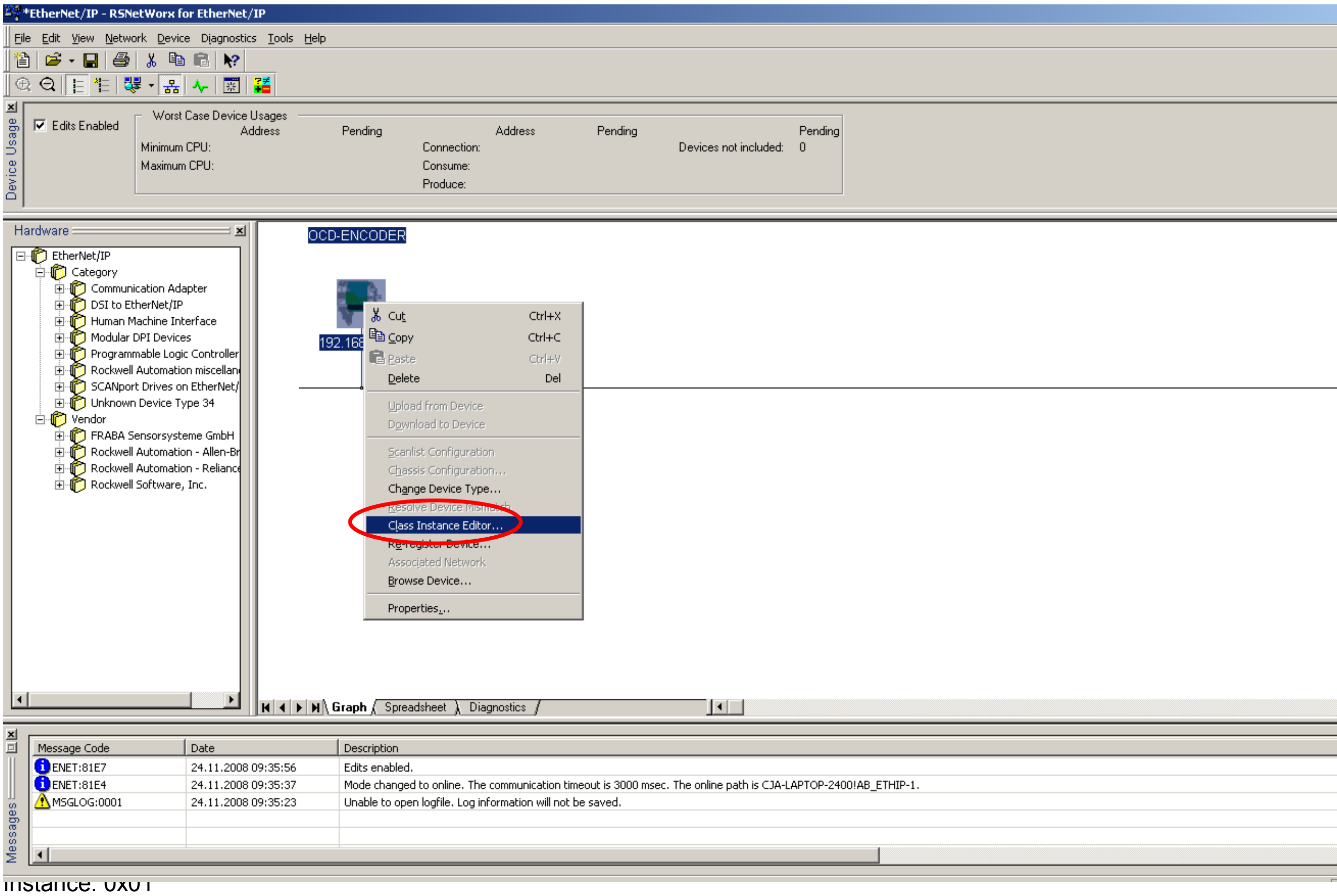
Response

Response Size (decimal): 22

Timestamp	Message
16:45:37:79	Ethernet/IP Scanner Library is online

Ready

In RSNetWorx is a scanner available too. In the next section is a sample to set the Preset value.



☑ Edits Enabled

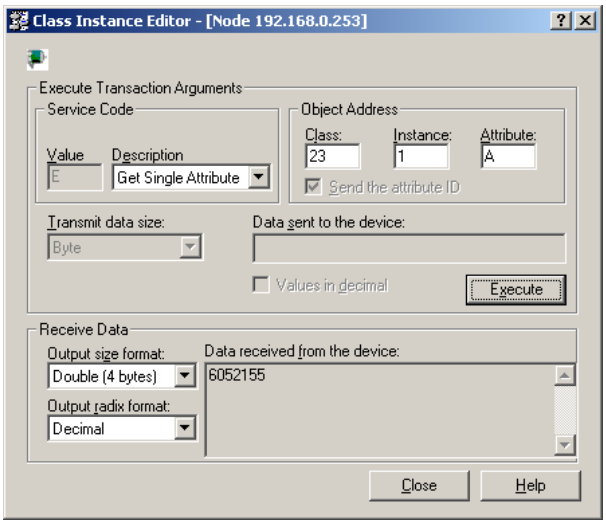
Worst Case Device Usages

	Address	Pending		Address	Pending		Pending
Minimum CPU:			Connection:			Devices not included:	0
Maximum CPU:			Consume:				
			Produce:				

Message Code	Date	Description
ENET:81E7	24.11.2008 09:35:56	Edits enabled.
ENET:81E4	24.11.2008 09:35:37	Mode changed to online. The communication timeout is 3000 msec. The online path is CJA-LAPTOP-2400!AB_ETHIP-1.
MSGLOG:0001	24.11.2008 09:35:23	Unable to open logfile. Log information will not be saved.

Instance: 0x01

Attribute: 0x0A (Position Value)



Service Code: Value: E Description: Get Single Attribute

Class: 23 Instance: 1 Attribute: A

Transmit data size: Byte

Data sent to the device:

Output size format: Double (4 bytes)

Output radix format: Decimal

Data received from the device: 6052155

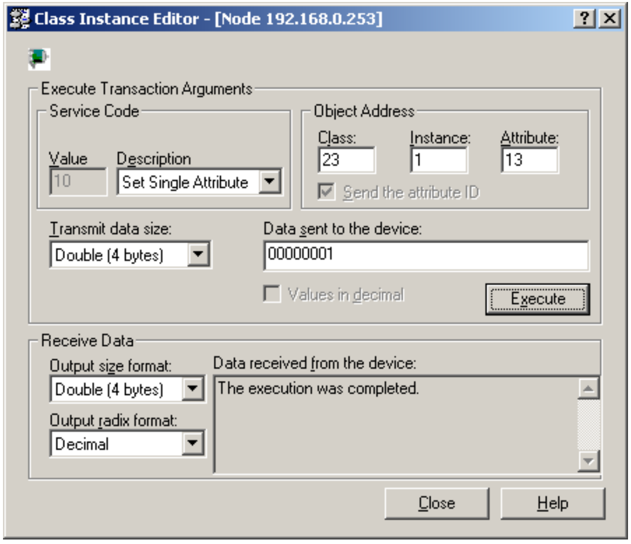
2.5.2 Set preset value

Set Single Attribute Position Preset Value to 1

Class: 0x23 (Position sensor object)

Instance: 0x01

Attribute: 0x13 (Preset Value)



Class Instance Editor - [Node 192.168.0.253]

Execute Transaction Arguments

Service Code: Value: 10; Description: Set Single Attribute

Object Address: Class: 23; Instance: 1; Attribute: 13

☑ Send the attribute ID

Transmit data size: Double (4 bytes)

Data sent to the device: 00000001

☐ Values in decimal

Receive Data

Output size format: Double (4 bytes)

Output radix format: Decimal

Data received from the device: The execution was completed.

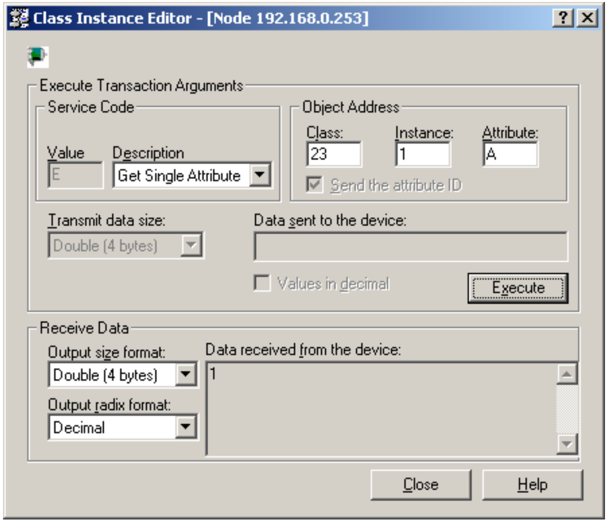
2.5.3 Get preset value

Get Single Attribute Position Value

Class: 0x23 (Position sensor object)

Instance: 0x01

Attribute: 0x13 (Preset Value)



Class Instance Editor - [Node 192.168.0.253]

Execute Transaction Arguments

Service Code: Value: E; Description: Get Single Attribute

Object Address: Class: 23; Instance: 1; Attribute: A

☑ Send the attribute ID

Transmit data size: Double (4 bytes)

Data sent to the device:

☐ Values in decimal

Receive Data

Output size format: Double (4 bytes)

Output radix format: Decimal

Data received from the device: 1

3 Diagnostic

LED	Color	EtherNet/IP name	Description
Active1	Yellow	Network Status Indicator 1	Details in table 2
Link1	Green		
Active2	Yellow	Network Status Indicator 2	Details in table 2
Link2	Green		
Stat1	Green	Module Status Indicator	Details in table 1
Stat2	Red		

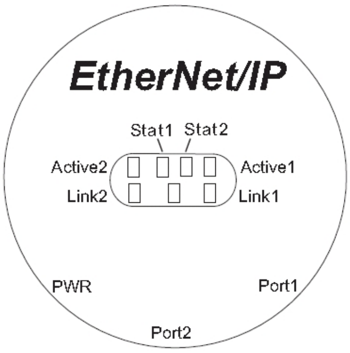


Table 1: Module Status Indicator Stat1/Stat2

LED	Summary	Requirements
Steady Off	No power	
Steady On Green	Device operational	If the device is operating correctly, the module status indicator shall be steady green
Flashing Green 1	Standby	If the device has not been configured including the IP-Address, the module status indicator shall be flashing green with 1 Hz
Flashing Green 2	Missing IP	If the device does not have an IP-Address, the module status indicator shall be flashing green with 4 Hz
Flashing Red	Minor fault	If the device has detected a recoverable minor fault. I.e. an incorrect or inconsistent configuration
Steady On Red	Major fault	If the device has detected a non-recoverable major fault
Flashing Red + Green	Self-test	While the device is performing its power up testing, the Stat1 and Stat2 LED shall be flashing red / green

Table 2: Network Status Indicator Stat2

LED	Summary	Requirements
Steady Off ✺	No power, no IP address	If the device does not have an IP address or is powered off
Steady Green 🟢	Connected	If the device has at least one established connection (even to the Message router)
Flashing Green 🟢	No connection	If the device has no established connections, but has obtained an IP address
Flashing Yellow ☀	Connection timeout	If one or more of the connections in which this device is the target has timed out. This shall be left only if all timed out connections are reestablished or if the device is reset
Steady Yellow 🟡	Duplicate IP	If the device has detected that its IP address is already in use
Flashing Yellow / Green ☀ 🟢	Self-test	While the device is performing its power up testing, the Stat1 and Stat2 LED shall be flashing yellow / green

4 Programmable Parameters

4.1 Encoder parameters for Position Sensor Object Class 23hex

4.1.1 Direction counting

This operating parameter can be used to select the code sequence. The parameter can set with Configuration Assembly and Explicit Messaging

Attribute ID	Default value	Value range	Data Type
$0C_{hex}$	0_{hex}	0_{hex} - 1_{hex}	Boolean

The parameter code sequence (complement) defines the counting direction of the process value **as seen on the shaft** (clockwise or counter clockwise). The counting direction is defined in the attribute $0C_{hex}$:

Bit 0	Counting direction	Position values
0	CW	Increase
1	CCW	Decrease

Bit 0	Scaling function on/off
0	on
1	off

4.1.2 Scaling function control

If the Scaling function control is deactivated then complains the output value the physical resolution.

Attribute ID	Default value	Value range	Data Type
$0E_{hex}$	1_{hex}	0_{hex} - 1_{hex}	Boolean

This parameter can be set with Configuration Assembly and Explicit Messaging

4.1.3 Resolution per revolution

The parameter resolution per revolution is used to program the encoder to set a desired number of steps per revolution. Each value between 1 and the maximum (see type label) can be realized. The parameter can set with Configuration Assembly and Explicit Messaging. Scaling function control **must be switch on** for customer parameters!

Attribute ID	Default value	Value range	Data Type
10_{hex}	(*)	0_{hex} - 10000_{hex}	Double Integer32

(*) see type label, Maximum resolution:
16Bit Encoder: $10{,}000_{hex}$ (65,536)

When the value is set larger than 8192 for a 13Bit encoder, the process value of the encoder will not be single stepped and values will be skipped while rotating the shaft. So, it is recommended, to keep the measuring steps per revolution below 8192 measuring steps.

4.1.4 Total resolution

This value is used to program the desired number of measuring steps over the total measuring range. This value must not exceed the total resolution of the encoder with 25 bit = 33,554,432 steps. Please note the value written on the type shield. The parameter can set with Configuration Assembly and Explicit Messaging Scaling function control **must be switch on** for customer parameters!

Attribute ID	Default value	Value range	Data Type
11_{hex}	(*)	0_{hex} - $40,000,000_{hex}$	Unsigned Integer 32

(*) see type shield
Maximum total resolution
30 Bit Encoder: $40,000,000_{hex}$ (1,073,741,824)

4.1.5 Preset value

The preset value is the desired position value, which should be reached at a certain physical position of the axis. The position value of the encoder is set to the desired process value by the parameter preset. The preset value must not exceed the parameter total measuring units. The parameter can set with Explicit Messaging.

Set the preset value only in standstill! Use the save commando from chapter 2.2.1 to save the preset value in the non volatile memory.

Attribute ID	Default value	Value range	Data Type
13_{hex}	0_{hex}	0_{hex} - total measuring range	Unsigned Integer 32

4.1.6 Velocity Format

Default value for Velocity Format is steps per second. This parameter can be set with Configuration Assembly and Explicit Messaging.

Attribute ID	Default value	Value range	Data length
19$_{hex}$	1F04$_{hex}$	1F04$_{hex}$	Steps per second
		1F05$_{hex}$	Steps per millisecond
		1F06$_{hex}$	Steps per microsecond
		1F07$_{hex}$	Steps per minute
		1F0F$_{hex}$	RPM

4.1.7 Velocity Filter

To manage the noise of the velocity it is possible to switch between three classes.

Attribute ID	Default value	Value range	Description	Data Type
66$_{hex}$	0$_{hex}$	0$_{hex}$ / 1$_{hex}$ / 2$_{hex}$	0 = Fine, 1 = Middle, 2 = Raw	Double Integer

4.1.8 Endless Shaft

Normally the period, i.e. “Total resolution” / “measuring units” per revolution must be an integer and it must fit an integer number of times (integer multiple) into 4096 for an encoder with 12 Bit for the revolutions. So the following equation must apply:

(4096 x measuring units per revolution) / Total resolution = integer

But with this EtherNet/IP encoder it is possible to solve this problem. If the Endless Shaft is activated then this problem will be solved by the encoder. The default value is Auto. In this case the encoder checks if the parameters need the endless shaft. The parameter can be set only with Explicit Messaging.

Note: The internal software routine only works if the encoder is in operation. If it is necessary to turn the encoder shaft more than 1024 revolutions without power supply this can lead to problems (the internal routine will not work without power supply). In this case the rule ahead should be observed even with new devices.

Attribute ID	Default value	Value range	Description	Data Type
65$_{hex}$	2$_{hex}$	0$_{hex}$ / 1$_{hex}$ / 2$_{hex}$	0 = Off, 1 = On, 2 = Auto	Double Integer

www.encoderhohner.com info@encoderhohner.com Tel.: (00 34) 972 16 00 17 27

5. Installation

5.1 Electrical connection

The rotary encoder is connected by a 4 pin M12 connector for the power supply and two 4 pin, D-coded M12 connector for Ethernet.

The Encoder uses a second D-coded connector and provides integrated switch functionality. On or in the packaging of the connector is the mounting description.

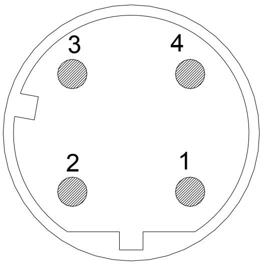
Connector Ethernet
4 pin female, D-coded

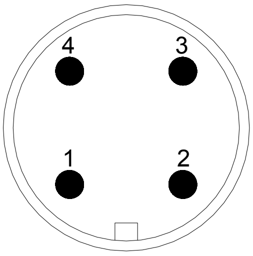
Pin Number	Signal
1	Tx +
2	Rx +
3	Tx -
4	Rx -

Connector power supply
4 pin male, A-coded

Pin Number	Signal
1	US (10 - 30 V DC)
2	N.C.
3	GND (0V)
4	N.C.

Sketch as seen on the encoder





5.2 Ethernet cables

5.2.1 RJ45 – M12 crossed

Signal	RJ45 Pin	M12 Pin
Tx+	1	2
Tx-	2	4
Rx+	3	1
Rx-	6	3

5.2.2 RJ45 – M12 straight

Signal	RJ45 Pin	M12 Pin
Tx+	1	1
Tx-	2	3
Rx+	3	2
Rx-	6	4

5.2.3 M12 – M12 straight

Signal	M12 Pin	M12 Pin
Tx+	1	1
Tx-	2	2
Rx+	3	3
Rx-	4	4

6 Power On

After power on the LED’s on the absolute rotary encoder will flash between green and red or yellow.

7 Installation

7.1 Rockwell configuration tools

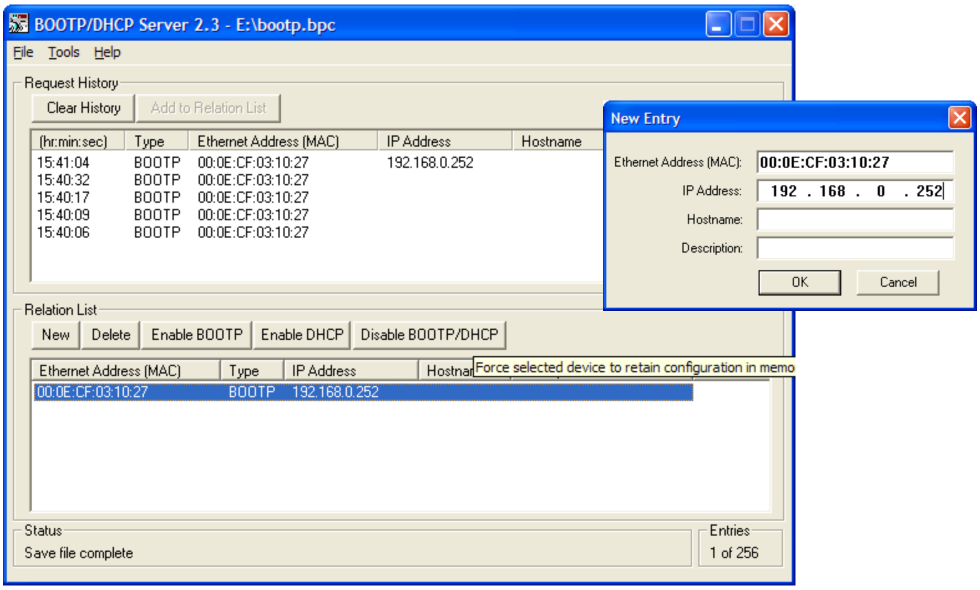
7.1.1 Setting IP-Address (BOOTP/DHCP)

To set the IP Address there are special tools available. I.e. the BOOTP/DHCP Server is installed with the software package from RSNetWorx™. The server scan the network for the MAC Addresses of all products with active BOOTP or DHCP. If one MAC address is selected in the Request History then the IP Address can be set by the “Add to Relation List” button. The MAC Address of each EtherNet/IP encoder is available on the type label. Note: After a power up the encoder send the BOOTP or DHCP request often. But after several time comes no answer the frequency of requests decrease. A power up after a longer pause could solve the missing requests.

If not all encoders are listed in the BOOTP/DHCP Server then check the following points:

- LED status of the encoder OK?
- Is the Network setting correct?
- Is the BOOTP and/or DHCP enabled?

If the encoder has got his IP-Address, the BOOTP and DHCP must be disabled with the corresponding button. Otherwise the encoder start up to get a new IP-Address again. After setting the IP-Address the Status LED is flashing with 1 Hz. But in this case save the configuration in the File menu, because the products cannot be found by the BOOTP/DHCP Server. After loading this file the MAC Addresses and IP-Addresses are available and BOOTP or DHCP can be activated by the corresponding button. Possible IP-Range:
Class A-C (0.0.0.0 – 223.255.255.255) without Loopback range (127.x.x.x)
Referenced IP-Address range: 192.168.0.x



(hr:min:sec)	Type	Ethernet Address (MAC)	IP Address	Hostname
15:41:04	BOOTP	00:0E:CF:03:10:27	192.168.0.252	
15:40:32	BOOTP	00:0E:CF:03:10:27		
15:40:17	BOOTP	00:0E:CF:03:10:27		
15:40:09	BOOTP	00:0E:CF:03:10:27		
15:40:06	BOOTP	00:0E:CF:03:10:27		

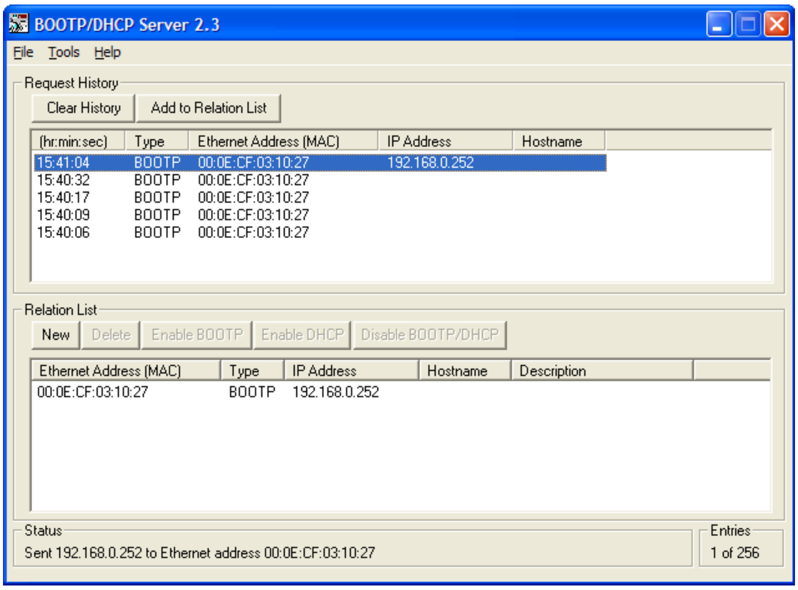
Ethernet Address (MAC): 00:0E:CF:03:10:27
IP Address: 192 . 168 . 0 . 252
Hostname:
Description:

Ethernet Address (MAC)	Type	IP Address	Hostnar
00:0E:CF:03:10:27	BOOTP	192.168.0.252	

Force selected device to retain configuration in memo

Status
Save file complete

Entries
1 of 256



(hr:min:sec)	Type	Ethernet Address (MAC)	IP Address	Hostname
15:41:04	BOOTP	00:0E:CF:03:10:27	192.168.0.252	
15:40:32	BOOTP	00:0E:CF:03:10:27		
15:40:17	BOOTP	00:0E:CF:03:10:27		
15:40:09	BOOTP	00:0E:CF:03:10:27		
15:40:06	BOOTP	00:0E:CF:03:10:27		

Ethernet Address (MAC)	Type	IP Address	Hostname	Description
00:0E:CF:03:10:27	BOOTP	192.168.0.252		

Sent 192.168.0.252 to Ethernet address 00:0E:CF:03:10:27

1 of 256

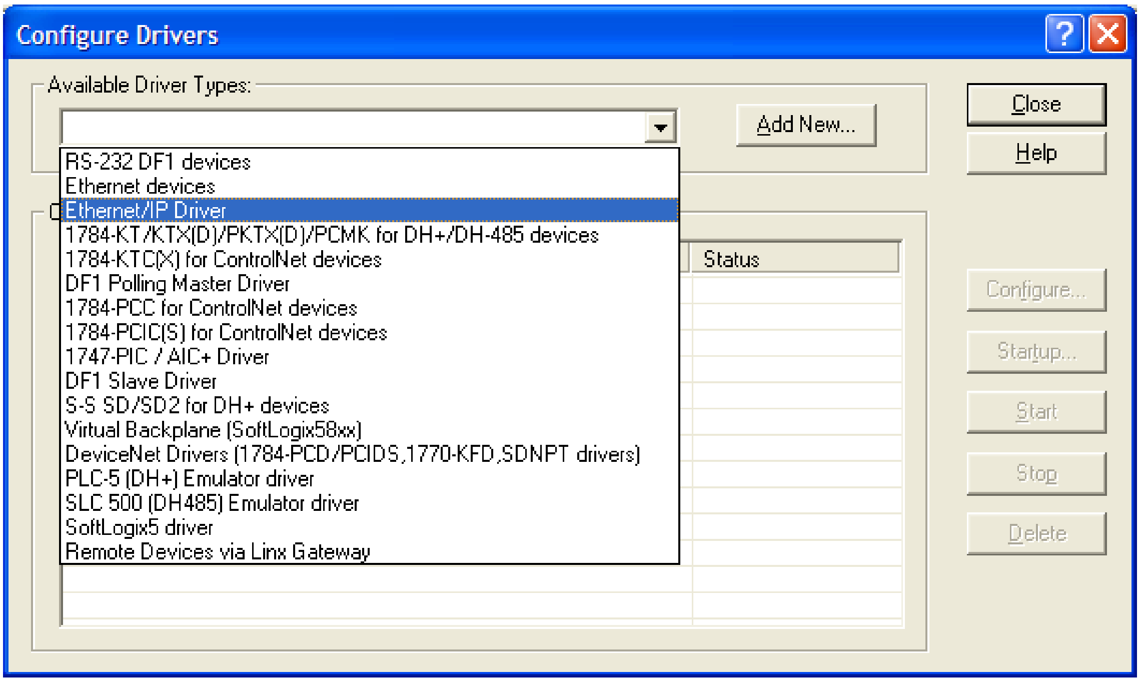
After setting the IP-Address with this tool the IP-Address will be available only after the next BOOTP request.

If the IP-Address is not known and BOOTP and DHCP are deactivated it is possible with a special tool to find the IP-Address or to activate BOOTP or DHCP. See details in chapter 7.3.

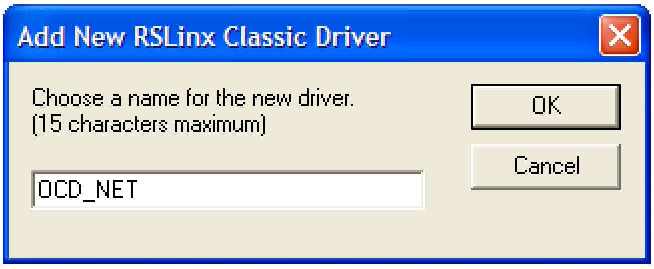
7.1.2 Configuration RSLinx Classic™

RSLinx™ is a complete communication server providing plant-floor device connectivity for a wide variety of Rockwell Software applications such as RSLogix™, RSNetWorx™,…

To start a new project add first a new RSLinx Classic™ Driver for EtherNet/IP under *Communications Configuration Drivers* and input the name.



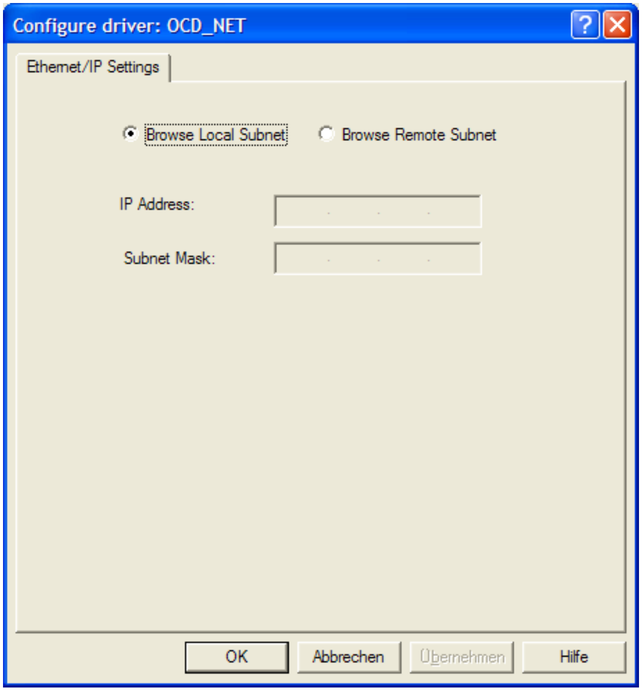
RS-232 DF1 devices
Ethernet devices
Ethernet/IP Driver
1784-KT/KTX(D)/PKTX(D)/PCMK for DH+/DH-485 devices
1784-KTC(X) for ControlNet devices
DF1 Polling Master Driver
1784-PCC for ControlNet devices
1784-PCIC(S) for ControlNet devices
1747-PIC / AIC+ Driver
DF1 Slave Driver
S-S SD/SD2 for DH+ devices
Virtual Backplane (SoftLogix58xx)
DeviceNet Drivers (1784-PCD/PCIDS,1770-KFD,SDNPT drivers)
PLC-5 (DH+) Emulator driver
SLC 500 (DH485) Emulator driver
SoftLogix5 driver
Remote Devices via Linx Gateway



Choose a name for the new driver.
(15 characters maximum)

OCD_NET

Use *Browse Local Subnet* to find the EtherNet/IP components in the network. The status should be “Running”. Then push the *Close* button to finish this configuration.



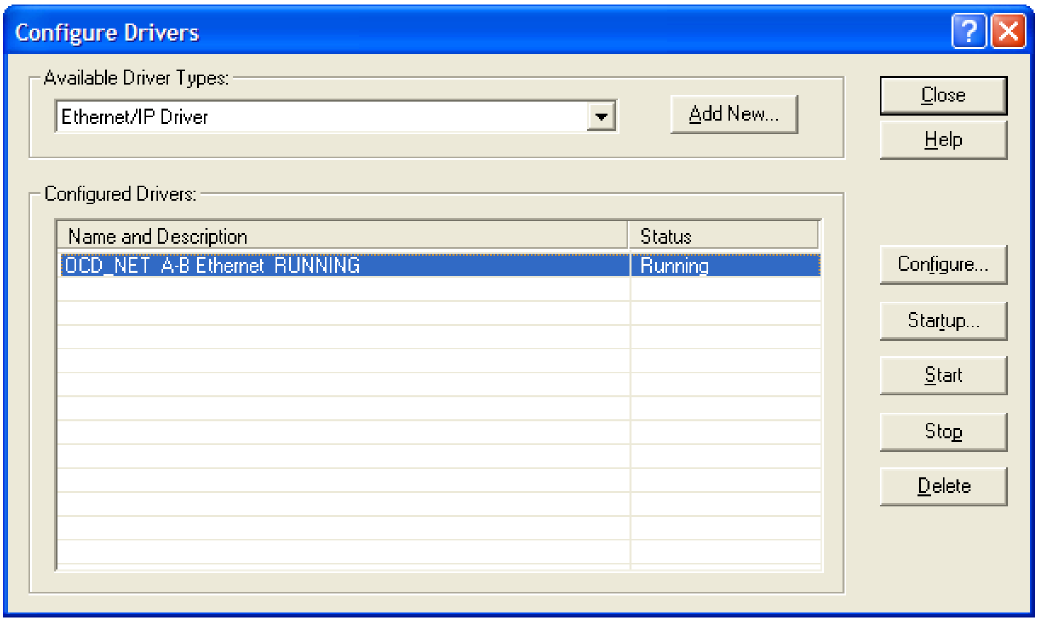
Configure driver: OCD_NET

Ethernet/IP Settings

● Browse Local Subnet ○ Browse Remote Subnet

IP Address: . . .

Subnet Mask: . . .



Configure Drivers

Available Driver Types: Ethernet/IP Driver

Configured Drivers:

Name and Description	Status
OCD_NET A-B Ethernet RUNNING	Running

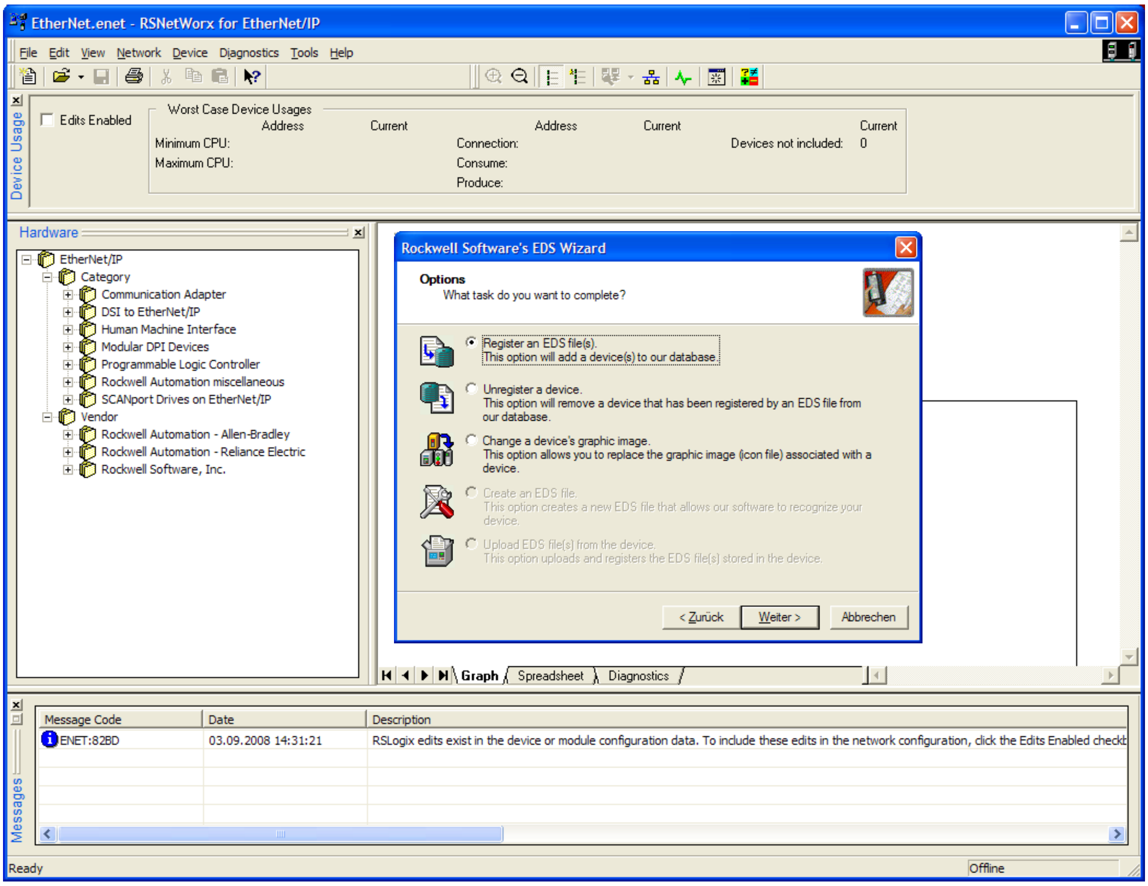
7.1.3 RSNetWorx™

RSNetWorx™ products provide design and configuration management services for EtherNet/IP. The program defines and configures the devices on the network quickly through a simple software interface. This definition can take place offline using drag and drop operations or online by using RSLinx® to browse a EtherNet/IP network.

EDS Wizard

The EDS File contains information about device specific parameters as well as possible operating modes of the encoder. With this file you have a data sheet in an electronic format, which can be used to configure the device in the network, for example with RSNetWorx™ from Rockwell. In this sample the PLC uses address 192.168.0.100 and the encoder 192.100.0.252.

To install the EDS file the EDS Wizard has to be started, that can be done in the menu *Tools/EDS Wizard*. If the EDS Wizard is activated successfully the *Register an EDS File(s)* has to be chosen and after that the button *weiter*. In the next step the *Register a directory of EDS files* has to be chosen and with *Browse* the path of the EDS file(s). That is indicated in the next pictures.


EtherNet.enet - RSNetWorx for EtherNet/IP
File Edit View Network Device Diagnostics Tools Help
Device Usage
Hardware
EtherNet/IP
Category
Communication Adapter
DSI to EtherNet/IP
Human Machine Interface
Modular DPI Devices
Programmable Logic Controller
Rockwell Automation miscellaneous
SCANport Drives on EtherNet/IP
Vendor
Rockwell Automation - Allen-Bradley
Rockwell Automation - Reliance Electric
Rockwell Software, Inc.
Graph
Spreadsheet
Diagnostics
Messages
Ready
Offline

□ Edits Enabled

Worst Case Device Usages

	Address	Current		Address	Current		Current
Minimum CPU:			Connection:			Devices not included:	0
Maximum CPU:			Consume:				
			Produce:				

Rockwell Software's EDS Wizard

Options
What task do you want to complete?

● Register an EDS file(s).
This option will add a device(s) to our database.

○ Unregister a device.
This option will remove a device that has been registered by an EDS file from our database.

○ Change a device's graphic image.
This option allows you to replace the graphic image (icon file) associated with a device.

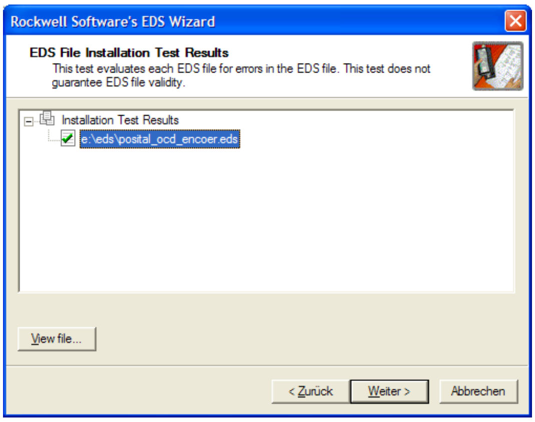
○ Create an EDS file.
This option creates a new EDS file that allows our software to recognize your device.

○ Upload EDS file(s) from the device.
This option uploads and registers the EDS file(s) stored in the device.

< Zurück | Weiter > | Abbrechen

Message Code	Date	Description
ENET:82BD	03.09.2008 14:31:21	RSLogix edits exist in the device or module configuration data. To include these edits in the network configuration, click the Edits Enabled check

The Wizard finds all EDS files that are discarded in the choosing path and operates a test to check the EDS files on errors. In the next step pictures can be selected for the using nodes. With the button *weiter* the installation can be continued and finished.



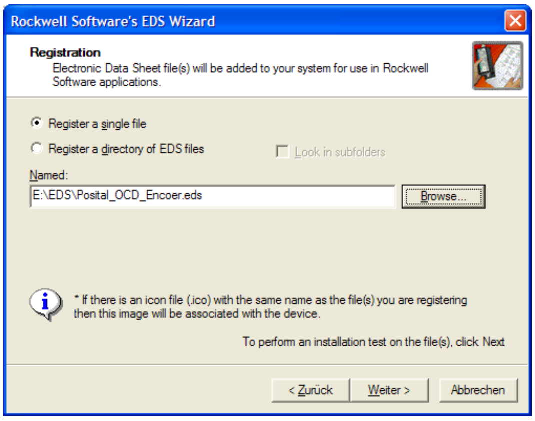
Rockwell Software's EDS Wizard

EDS File Installation Test Results

This test evaluates each EDS file for errors in the EDS file. This test does not guarantee EDS file validity.

Installation Test Results

☑ e:\eds\posital_ocd_encoer.eds



Rockwell Software's EDS Wizard

Registration

Electronic Data Sheet file(s) will be added to your system for use in Rockwell Software applications.

● Register a single file

○ Register a directory of EDS files

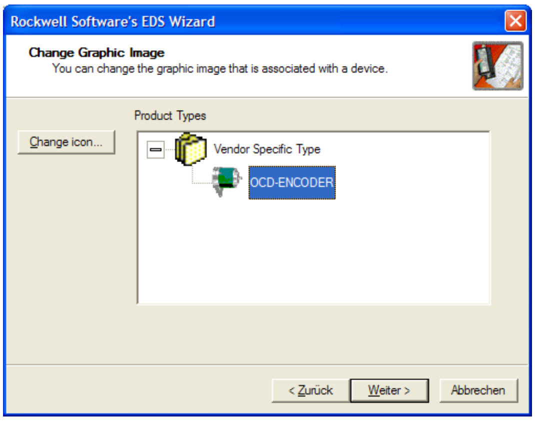
□ Look in subfolders

Named:

E:\EDS\Posital_OCD_Encoer.eds

* If there is an icon file (.ico) with the same name as the file(s) you are registering then this image will be associated with the device.

To perform an installation test on the file(s), click Next



Rockwell Software's EDS Wizard

Change Graphic Image

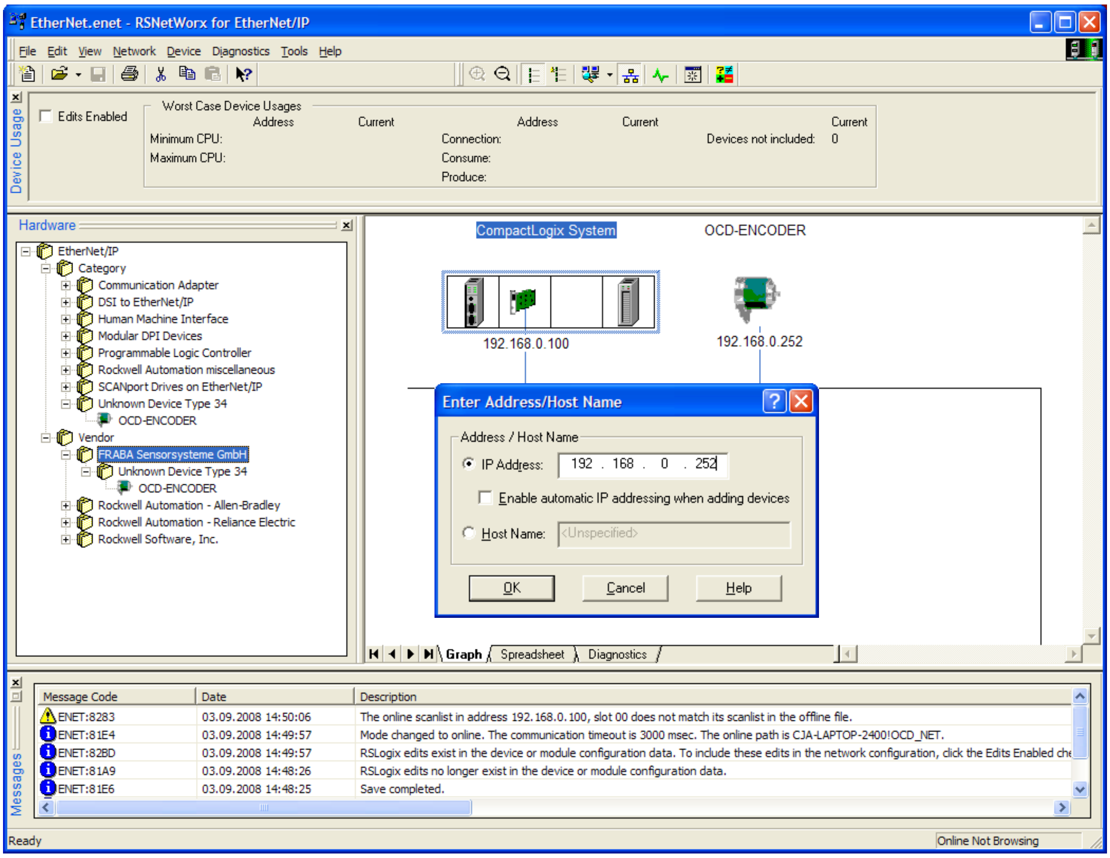
You can change the graphic image that is associated with a device.

Product Types

Vendor Specific Type

OCD-ENCODER

Load a saved *.enet file or start a new project. Add the devices per Drag and Drop to the network line and set the IP-Address.



□ Edits Enabled

Worst Case Device Usages

	Address	Current		Address	Current		Current
Minimum CPU:			Connection:			Devices not included:	0
Maximum CPU:			Consume:				
			Produce:				

Enter Address/Host Name

Address / Host Name

● IP Address: 192 . 168 . 0 . 252

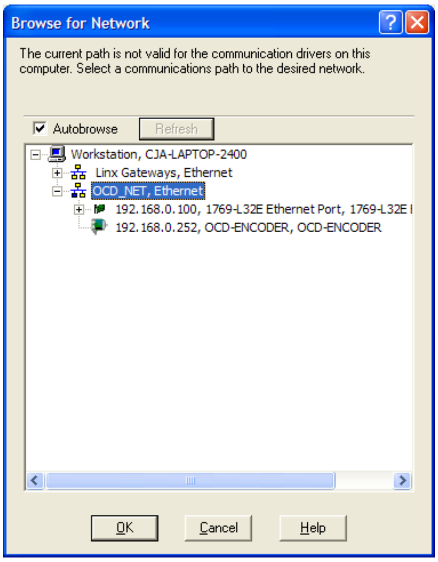
□ Enable automatic IP addressing when adding devices

○ Host Name: <Unspecified>

OK Cancel Help

Message Code	Date	Description
ENET:8283	03.09.2008 14:50:06	The online scanlist in address 192.168.0.100, slot 00 does not match its scanlist in the offline file.
ENET:81E4	03.09.2008 14:49:57	Mode changed to online. The communication timeout is 3000 msec. The online path is CJA-LAPTOP-2400!OCD_NET.
ENET:82BD	03.09.2008 14:49:57	RSLogix edits exist in the device or module configuration data. To include these edits in the network configuration, click the Edits Enabled che
ENET:81A9	03.09.2008 14:48:26	RSLogix edits no longer exist in the device or module configuration data.
ENET:81E6	03.09.2008 14:48:25	Save completed.

Optional browse the network with all devices with Button or *Upload from Network*. So it is not necessary to set the IP-Address manually. For using this configuration in RSLogix save the *.enet file.



The current path is not valid for the communication drivers on this computer. Select a communications path to the desired network.

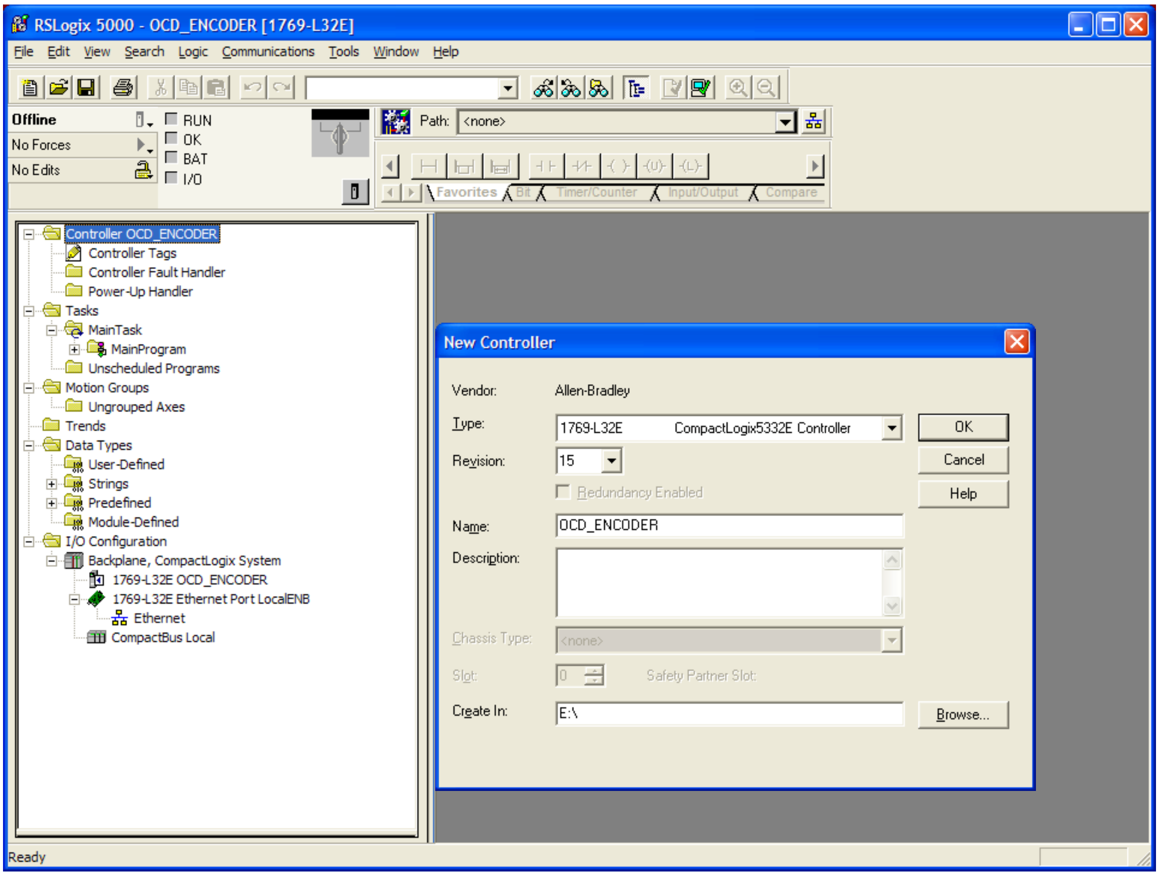
☑ Autobrowse

Workstation, CJA-LAPTOP-2400
Linx Gateways, Ethernet
OCD_NET, Ethernet
192.168.0.100, 1769-L32E Ethernet Port, 1769-L32E I
192.168.0.252, OCD-ENCODER, OCD-ENCODER

7.1.4 Configuration RSLogix 5000

The RSLogix 5000 Series environment offers an easy-to-use, IEC61131-3 compliant interface, symbolic programming with structures and arrays, and a comprehensive instruction set that serves many types of applications. It supports relay ladder, structured text, function block diagram, and sequential function chart editors for you to develop application programs.

In the first step load a configuration or add a new controller and input a name. In this sample is used the CompactLogix5332E.



Vendor: Allen-Bradley

Type: 1769-L32E CompactLogix5332E Controller

Revision: 15

☐ Redundancy Enabled

Name: OCD_ENCODER

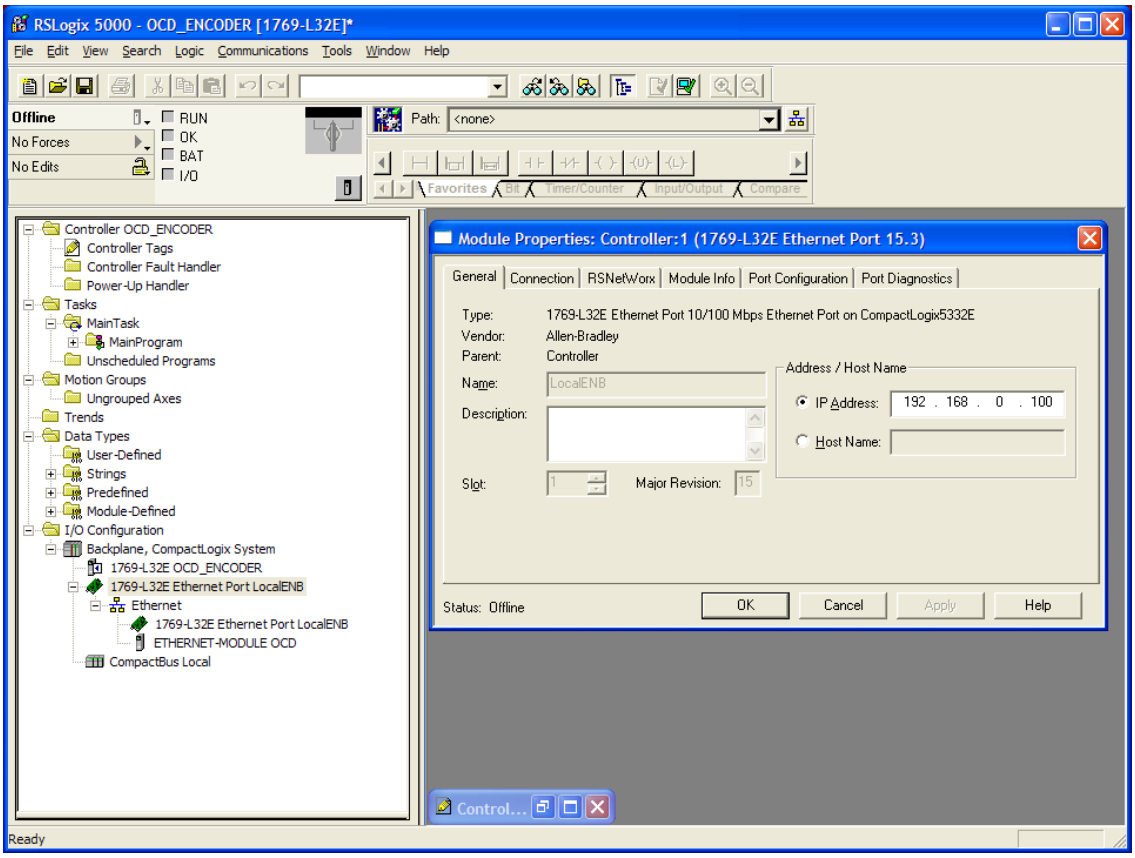
Description:

Chassis Type: <none>

Slot: 0 Safety Partner Slot:

Create In: E:\

Start the configuration of the controller or load the *.enep file in the module properties of tab RSNetWorx™ that was created with RSNetWorx™.



Module Properties: Controller:1 (1769-L32E Ethernet Port 15.3)

General | Connection | RSNetWorx | Module Info | Port Configuration | Port Diagnostics

Type: 1769-L32E Ethernet Port 10/100 Mbps Ethernet Port on CompactLogix5332E

Vendor: Allen-Bradley

Parent: Controller

Name: LocalENB

Description:

Slot: 1

Major Revision: 15

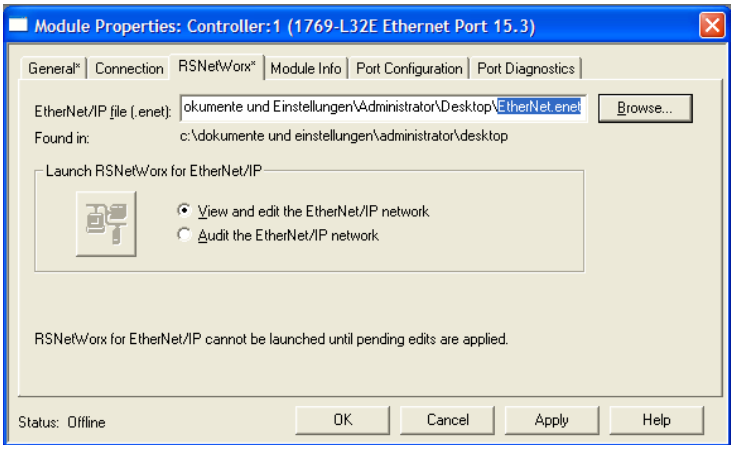
Address / Host Name

● IP Address: 192 . 168 . 0 . 100

○ Host Name:

Status: Offline

OK | Cancel | Apply | Help



Module Properties: Controller:1 (1769-L32E Ethernet Port 15.3)

General* | Connection | RSNetWorx* | Module Info | Port Configuration | Port Diagnostics

EtherNet/IP file (.enet): okumente und Einstellungen\Administrator\Desktop\EtherNet.enet Browse...

Found in: c:\dokumente und einstellungen\administrator\desktop

Launch RSNetWorx for EtherNet/IP

● View and edit the EtherNet/IP network

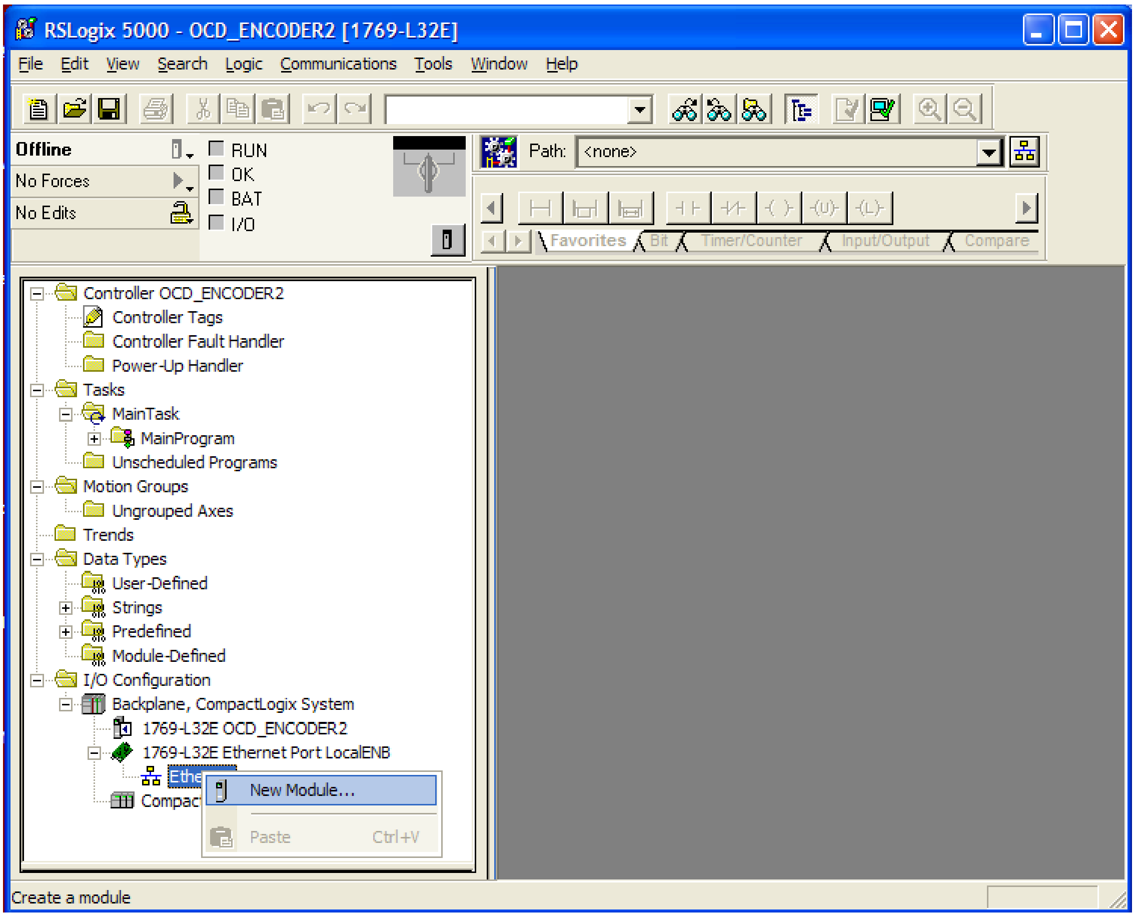
○ Audit the EtherNet/IP network

RSNetWorx for EtherNet/IP cannot be launched until pending edits are applied.

Status: Offline

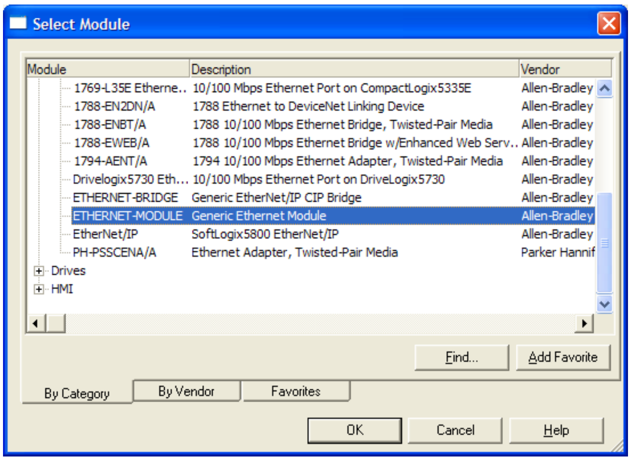
OK | Cancel | Apply | Help

Select the network in the I/O Configuration and add New Module.



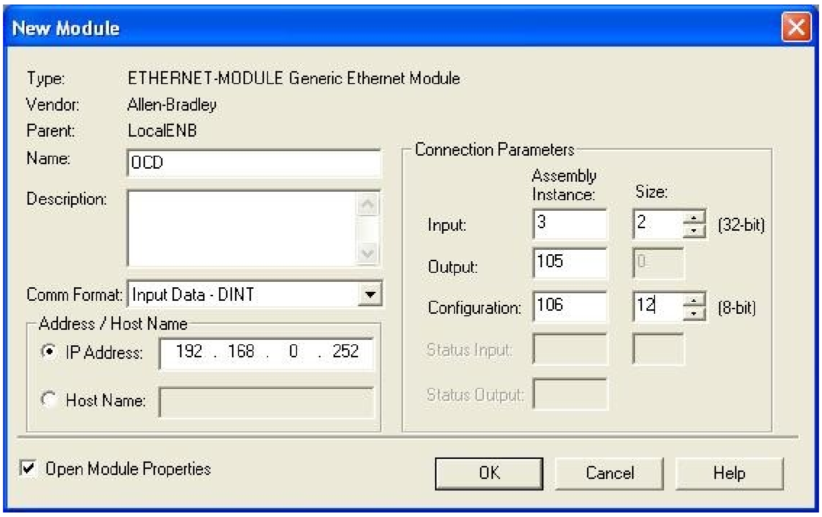
Create a module

For using a Generic Device select the Generic Ethernet Module. Some PLC's support Encoder Devices too. Please check that the matching EDS file complies to the configuration of the encoder. The device type is programmable.



Module	Description	Vendor
1769-L35E Etherne..	10/100 Mbps Ethernet Port on CompactLogix5335E	Allen-Bradley
1788-EN2DN/A	1788 Ethernet to DeviceNet Linking Device	Allen-Bradley
1788-ENBT/A	1788 10/100 Mbps Ethernet Bridge, Twisted-Pair Media	Allen-Bradley
1788-EWEB/A	1788 10/100 Mbps Ethernet Bridge w/Enhanced Web Serv..	Allen-Bradley
1794-AENT/A	1794 10/100 Mbps Ethernet Adapter, Twisted-Pair Media	Allen-Bradley
Drivelogix5730 Eth...	10/100 Mbps Ethernet Port on DriveLogix5730	Allen-Bradley
ETHERNET-BRIDGE	Generic EtherNet/IP CIP Bridge	Allen-Bradley
ETHERNET-MODULE	Generic Ethernet Module	Allen-Bradley
EtherNet/IP	SoftLogix5800 EtherNet/IP	Allen-Bradley
PH-PSSCENA/A	Ethernet Adapter, Twisted-Pair Media	Parker Hannif
Drives		
HMI		

Set the Connection Parameters according the following figure.



New Module

Type: ETHERNET-MODULE Generic Ethernet Module

Vendor: Allen-Bradley

Parent: LocalENB

Name: OCD

Description:

Comm Format: Input Data - DINT

Address / Host Name

● IP Address: 192 . 168 . 0 . 252

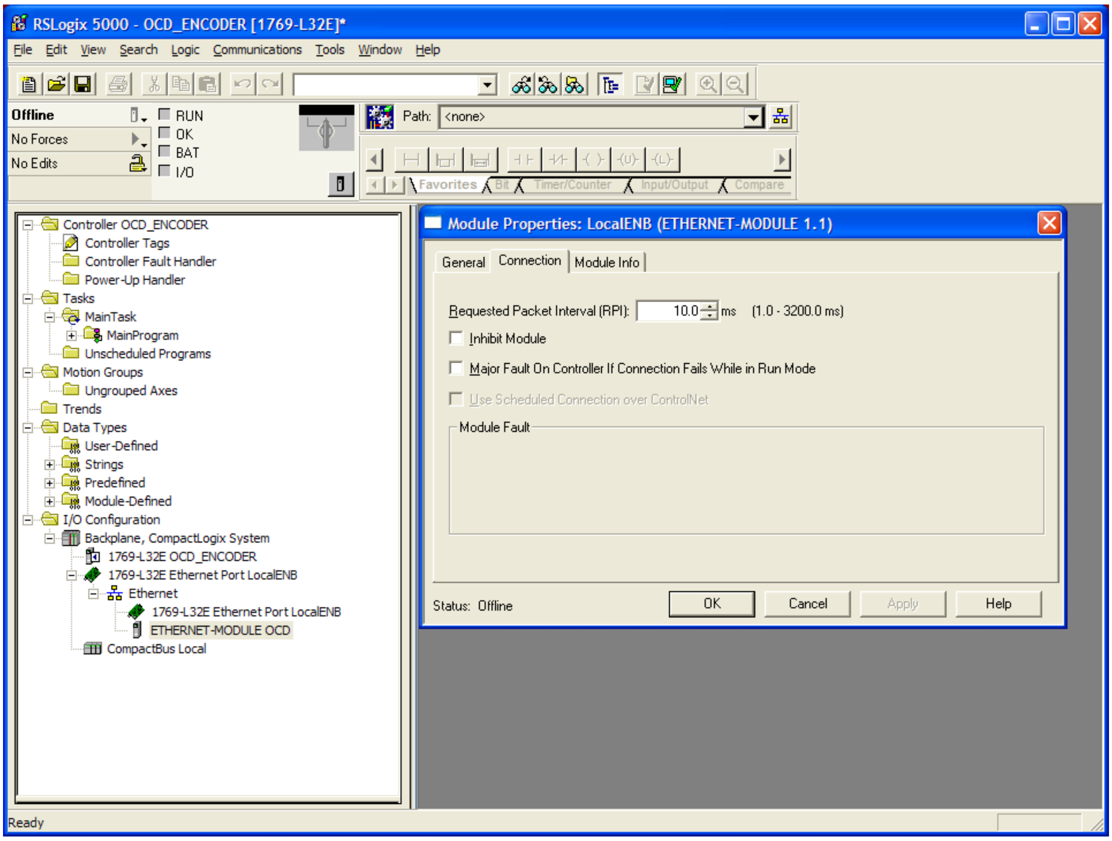
○ Host Name:

Connection Parameters

	Assembly Instance:	Size:	
Input:	3	2	(32-bit)
Output:	105	0	
Configuration:	106	12	(8-bit)
Status Input:			
Status Output:			

☑ Open Module Properties

Set the cycle time.



RSLogix 5000 - OCD_ENCODER [1769-L32E]*

Module Properties: LocalENB (ETHERNET-MODULE 1.1)

Requested Packet Interval (RPI): 10.0 ms (1.0 - 3200.0 ms)

□ Inhibit Module

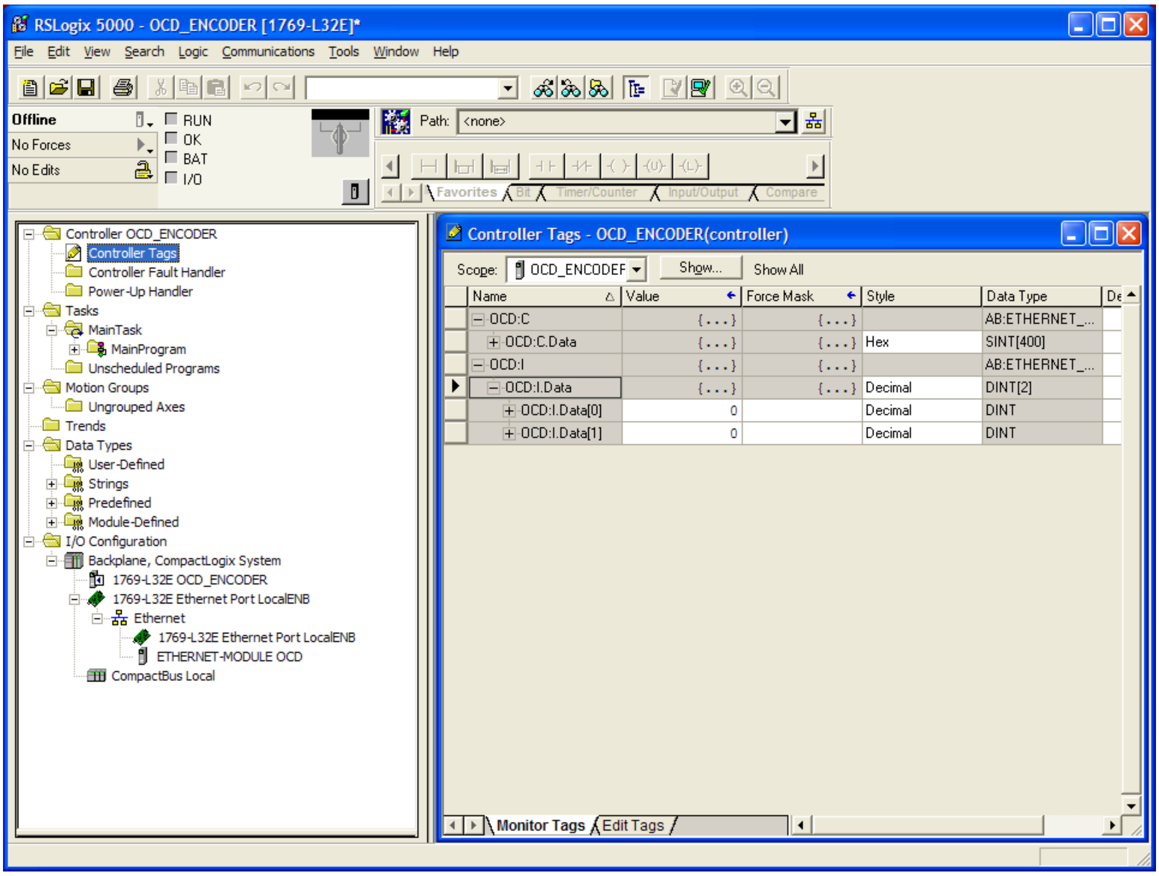
□ Major Fault On Controller If Connection Fails While in Run Mode

□ Use Scheduled Connection over ControlNet

Module Fault

Status: Offline

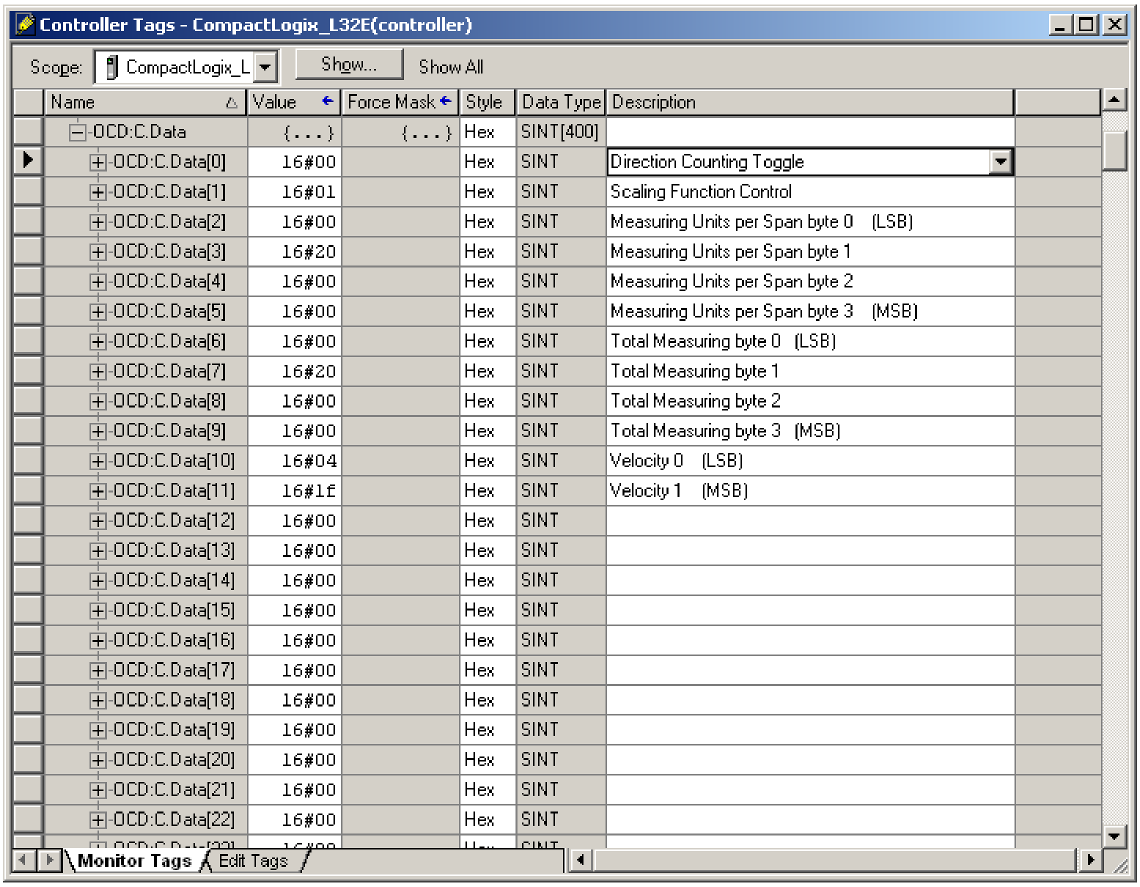
To read or write data use *Logic - Monitor Tags*



Path: <none>

Scope: OCD_ENCODER

Name	Value	Force Mask	Style	Data Type	De
OCD:C	{...}	{...}		AB:ETHERNET_...	
OCD:C.Data	{...}	{...}	Hex	SINT[400]	
OCD:I	{...}	{...}		AB:ETHERNET_...	
OCD:I.Data	{...}	{...}	Decimal	DINT[2]	
OCD:I.Data[0]	0		Decimal	DINT	
OCD:I.Data[1]	0		Decimal	DINT	

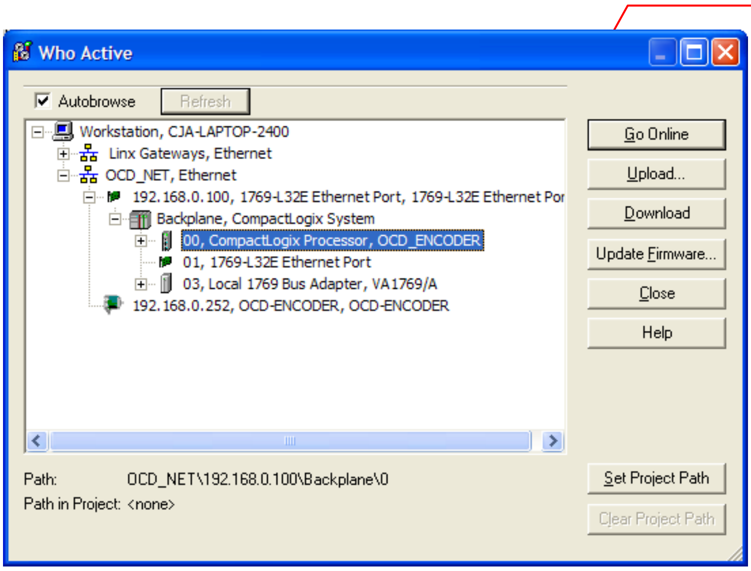


Controller Tags - CompactLogix_L32E(controller)

Scope: CompactLogix_L   Show...   Show All

Name	Value	Force Mask	Style	Data Type	Description
OCD:C.Data	{...}	{...}	Hex	SINT[400]	
OCD:C.Data[0]	16#00		Hex	SINT	Direction Counting Toggle
OCD:C.Data[1]	16#01		Hex	SINT	Scaling Function Control
OCD:C.Data[2]	16#00		Hex	SINT	Measuring Units per Span byte 0 (LSB)
OCD:C.Data[3]	16#20		Hex	SINT	Measuring Units per Span byte 1
OCD:C.Data[4]	16#00		Hex	SINT	Measuring Units per Span byte 2
OCD:C.Data[5]	16#00		Hex	SINT	Measuring Units per Span byte 3 (MSB)
OCD:C.Data[6]	16#00		Hex	SINT	Total Measuring byte 0 (LSB)
OCD:C.Data[7]	16#20		Hex	SINT	Total Measuring byte 1
OCD:C.Data[8]	16#00		Hex	SINT	Total Measuring byte 2
OCD:C.Data[9]	16#00		Hex	SINT	Total Measuring byte 3 (MSB)
OCD:C.Data[10]	16#04		Hex	SINT	Velocity 0 (LSB)
OCD:C.Data[11]	16#1f		Hex	SINT	Velocity 1 (MSB)
OCD:C.Data[12]	16#00		Hex	SINT	
OCD:C.Data[13]	16#00		Hex	SINT	
OCD:C.Data[14]	16#00		Hex	SINT	
OCD:C.Data[15]	16#00		Hex	SINT	
OCD:C.Data[16]	16#00		Hex	SINT	
OCD:C.Data[17]	16#00		Hex	SINT	
OCD:C.Data[18]	16#00		Hex	SINT	
OCD:C.Data[19]	16#00		Hex	SINT	
OCD:C.Data[20]	16#00		Hex	SINT	
OCD:C.Data[21]	16#00		Hex	SINT	
OCD:C.Data[22]	16#00		Hex	SINT	

- If the value is 00 then the standard configuration will be used
- If the Paramter are out of range the maximum value of the encoder will be used as parameter
- To change parameters open *Communication Who Active*, *Go Offline*, *File Save* , select controller, *Download* , Run
- These parameter can set by a standard EtherNet/IP scanner tool too.



Who Active

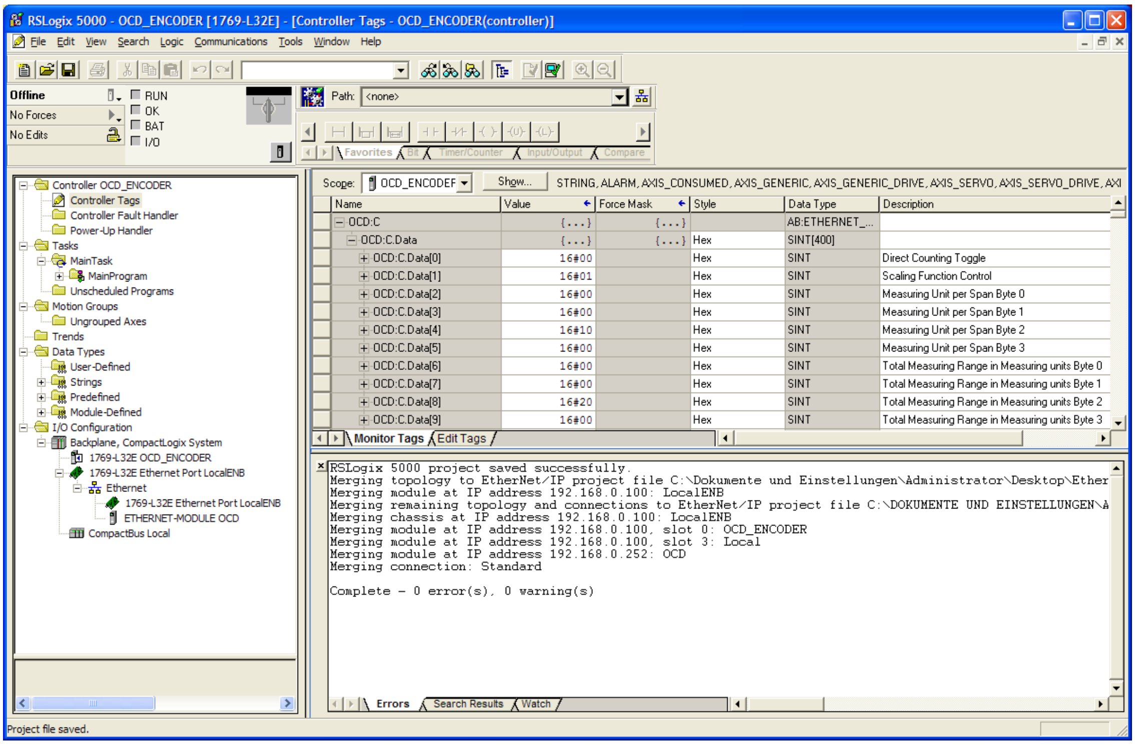
☑ Autobrowse   Refresh

- Workstation, CJA-LAPTOP-2400
  - Linx Gateways, Ethernet
  - OCD_NET, Ethernet
    - 192.168.0.100, 1769-L32E Ethernet Port, 1769-L32E Ethernet Por
      - Backplane, CompactLogix System
        - 00, CompactLogix Processor, OCD_ENCODER
        - 01, 1769-L32E Ethernet Port
        - 03, Local 1769 Bus Adapter, VA1769/A
    - 192.168.0.252, OCD-ENCODER, OCD-ENCODER

Path: OCD_NET\192.168.0.100\Backplane\0

Path in Project: <none>

If everything is running then, in the “Errors tab” the message 0 error(s) should appear.



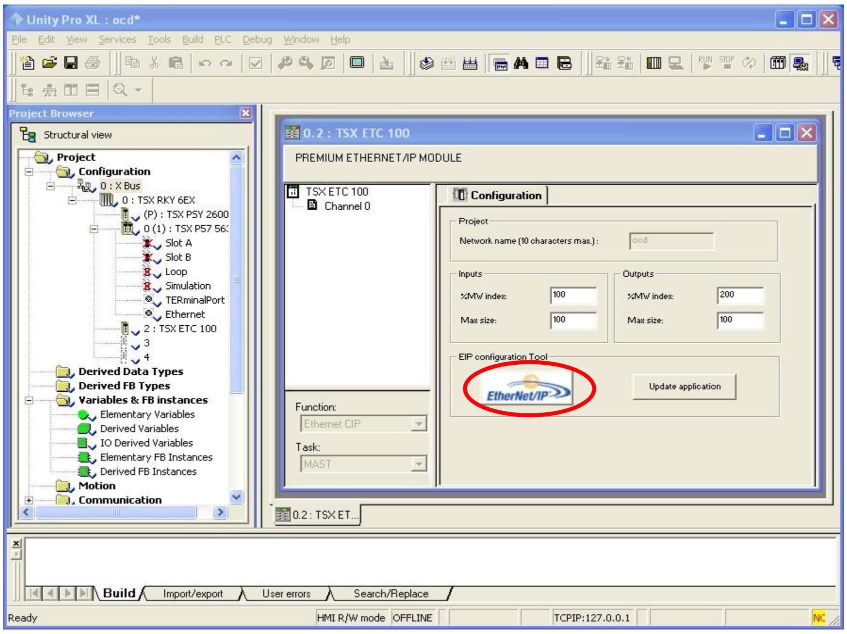
Name	Value	Force Mask	Style	Data Type	Description
OCD:C	{...}	{...}		AB:ETHERNET_...	
OCD:C.Data	{...}	{...}	Hex	SINT[400]	
OCD:C.Data[0]	16#00		Hex	SINT	Direct Counting Toggle
OCD:C.Data[1]	16#01		Hex	SINT	Scaling Function Control
OCD:C.Data[2]	16#00		Hex	SINT	Measuring Unit per Span Byte 0
OCD:C.Data[3]	16#00		Hex	SINT	Measuring Unit per Span Byte 1
OCD:C.Data[4]	16#10		Hex	SINT	Measuring Unit per Span Byte 2
OCD:C.Data[5]	16#00		Hex	SINT	Measuring Unit per Span Byte 3
OCD:C.Data[6]	16#00		Hex	SINT	Total Measuring Range in Measuring units Byte 0
OCD:C.Data[7]	16#00		Hex	SINT	Total Measuring Range in Measuring units Byte 1
OCD:C.Data[8]	16#20		Hex	SINT	Total Measuring Range in Measuring units Byte 2
OCD:C.Data[9]	16#00		Hex	SINT	Total Measuring Range in Measuring units Byte 3

```
RSLogix 5000 project saved successfully.
Merging topology to EtherNet/IP project file C:\Dokumente und Einstellungen\Administrator\Desktop\Ether
Merging module at IP address 192.168.0.100: LocalENB
Merging remaining topology and connections to EtherNet/IP project file C:\DOKUMENTE UND EINSTELLUNGEN\A
Merging chassis at IP address 192.168.0.100: LocalENB
Merging module at IP address 192.168.0.100, slot 0: OCD_ENCODER
Merging module at IP address 192.168.0.100, slot 3: Local
Merging module at IP address 192.168.0.252: OCD
Merging connection: Standard

Complete - 0 error(s), 0 warning(s)
```

7.2 Schneider configuration tools

In the software tool Unity it is possible to configure the parameters of the encoders. EDS file help to change the parameters on an easy way. Select the EtherNet/IP module and start the EtherNet/IP configuration tool.



PREMIUM ETHERNET/IP MODULE

Project — Network name (10 characters max.): ocd

Inputs — %MW index: 100 — Max size: 100

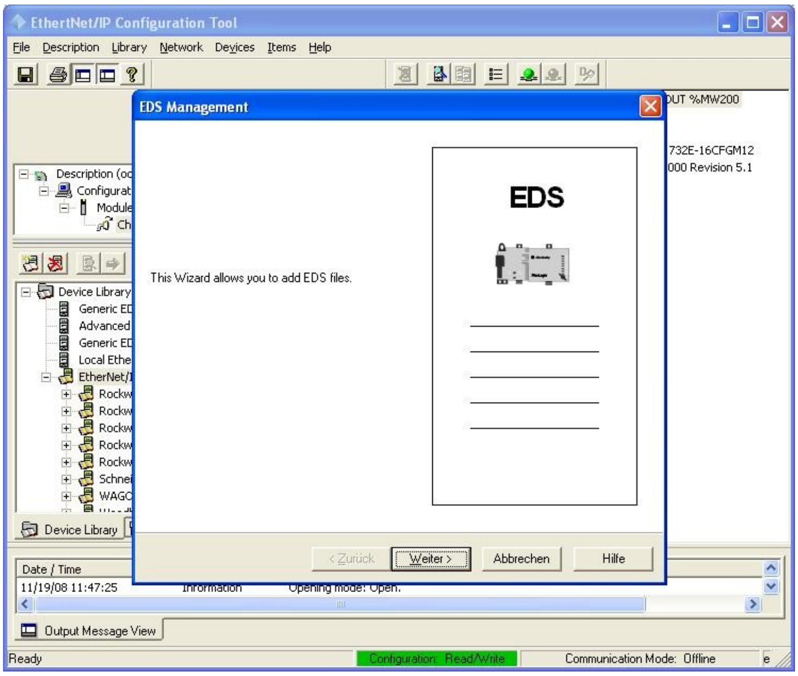
Outputs — %MW index: 200 — Max size: 100

Function: Ethernet CIP

Task: MAST

7.2.1 Setting configuration

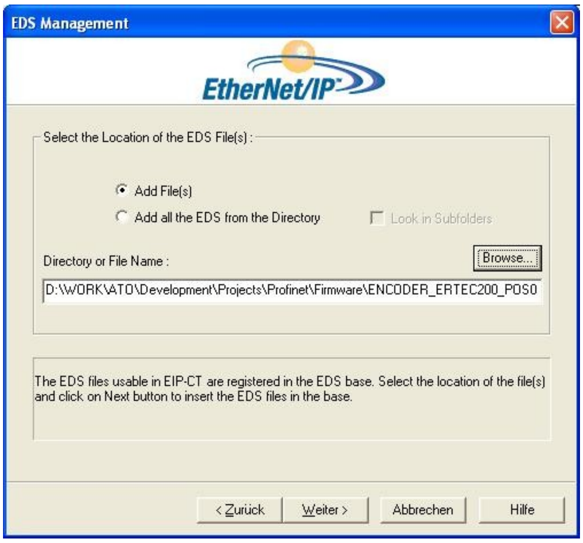
In the first time it is necessary to install the EDS-File with the wizard.



This Wizard allows you to add EDS files.

11/19/08 11:47:25 Information Opening mode: Open.

Select the EDS-File, available on our web side, and follow the wizard to the end.



Select the Location of the EDS File(s) :

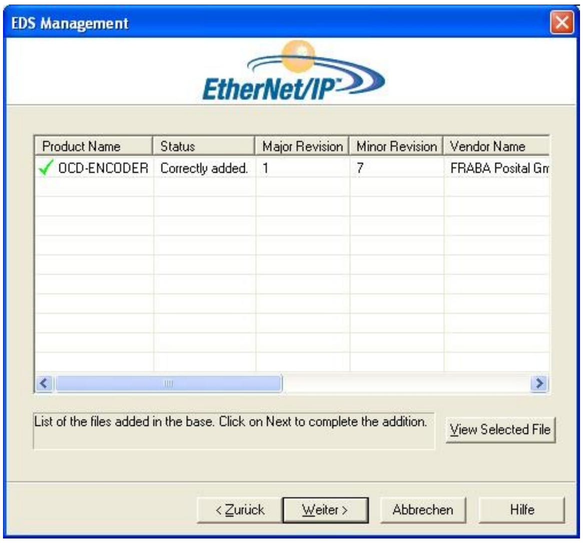
● Add File(s)

○ Add all the EDS from the Directory □ Look in Subfolders

Directory or File Name :

D:\WORK\ATO\Development\Projects\Profinet\Firmware\ENCODER_ERTEC200_POS0

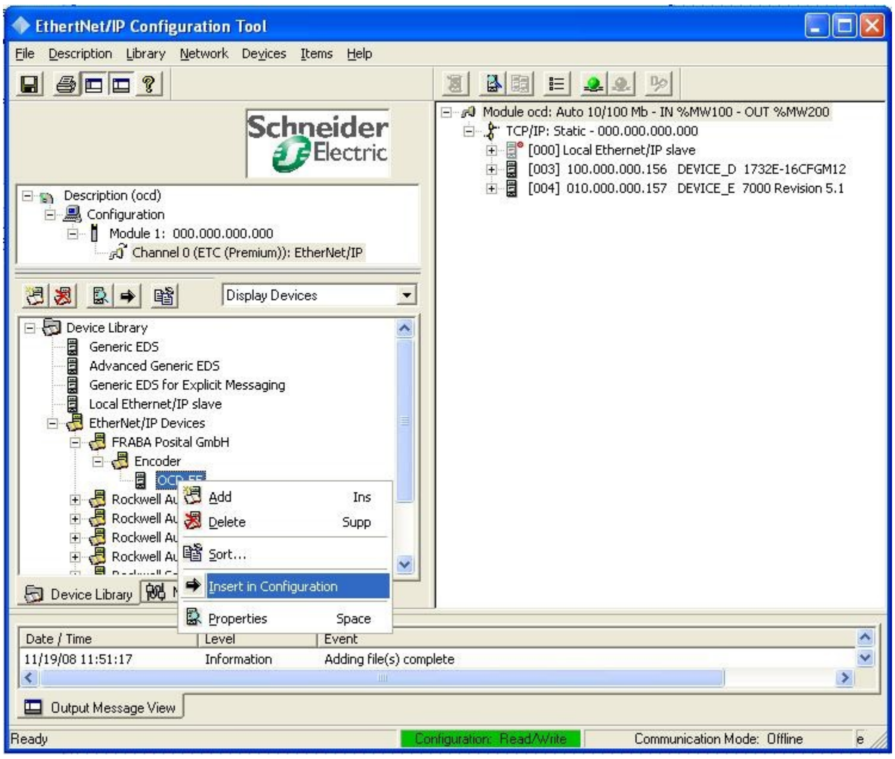
The EDS files usable in EIP-CT are registered in the EDS base. Select the location of the file(s) and click on Next button to insert the EDS files in the base.



Product Name	Status	Major Revision	Minor Revision	Vendor Name
✓ OCD-ENCODER	Correctly added.	1	7	FRABA Posital Gn

List of the files added in the base. Click on Next to complete the addition.

Select the encoder in the Device Library and *Insert in Configuration* (menu opens on right button click of the mouse).



Module ocd: Auto 10/100 Mb - IN %MW100 - OUT %MW200
TCP/IP: Static - 000.000.000.000
[000] Local Ethernet/IP slave
[003] 100.000.000.156 DEVICE_D 1732E-16CFGM12
[004] 010.000.000.157 DEVICE_E 7000 Revision 5.1

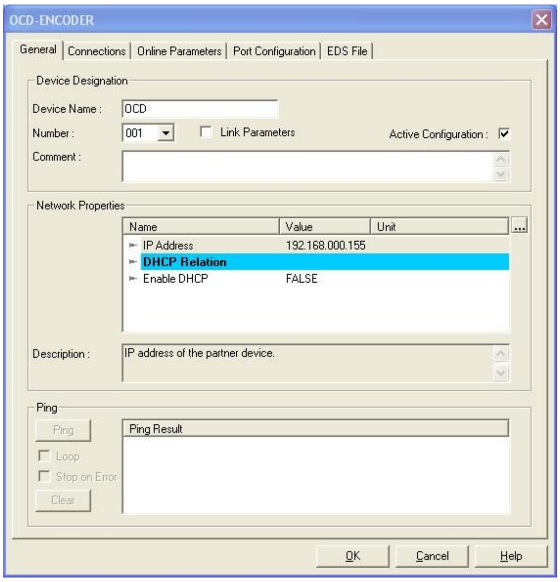
Description (ocd)
Configuration
Module 1: 000.000.000.000
Channel 0 (ETC (Premium)): EtherNet/IP

Device Library
Generic EDS
Advanced Generic EDS
Generic EDS for Explicit Messaging
Local Ethernet/IP slave
EtherNet/IP Devices
FRABA Posital GmbH
Encoder
OCD-EE
Rockwell Au
Rockwell Au
Rockwell Au
Rockwell Au

Date / Time	Level	Event
11/19/08 11:51:17	Information	Adding file(s) complete

Ready Configuration: Read/Write Communication Mode: Offline

Set the IP-Adress of the encoder in the *General*-Tab. Add a connection for reading the position value or the position value and velocity. More details about the different connections are available in chapter 2.



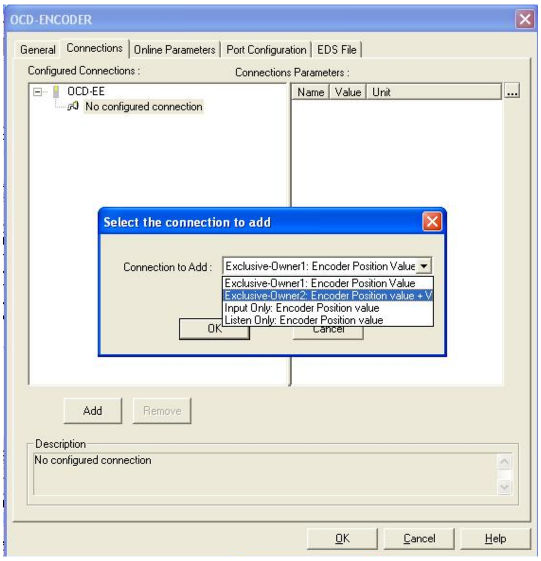
Device Name : OCD

Number : 001 ▾ □ Link Parameters Active Configuration : ☑

Comment :

Name	Value	Unit
IP Address	192.168.000.155	
DHCP Relation		
Enable DHCP	FALSE	

Description : IP address of the partner device.



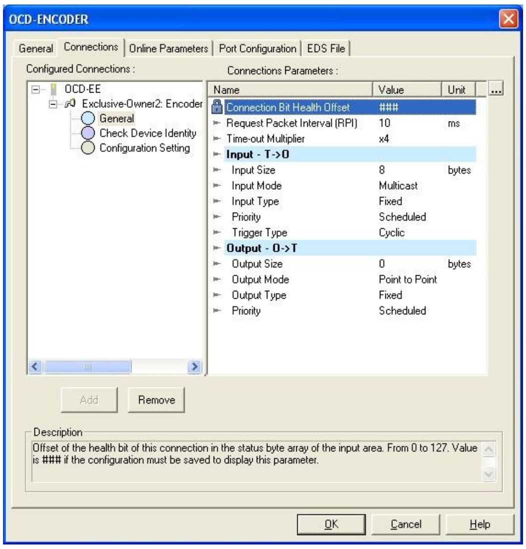
OCD-EE
No configured connection

Connection to Add : Exclusive-Owner1: Encoder Position Value ▾

- Exclusive-Owner1: Encoder Position Value
- Exclusive-Owner2: Encoder Position value + V
- Input Only: Encoder Position value
- Listen Only: Encoder Position value

Description: No configured connection

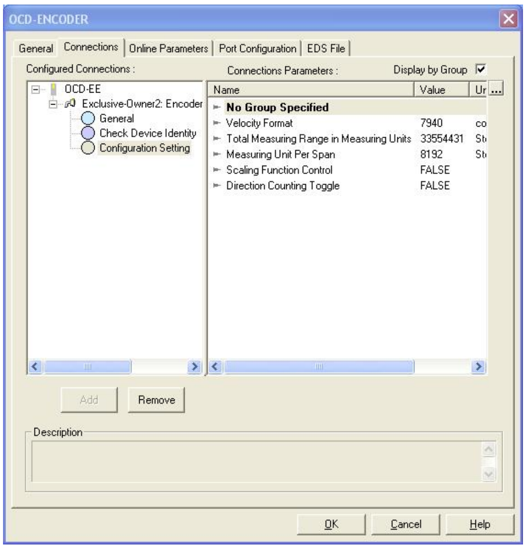
In tab *Connections* under *General* can be checked the cycle time (RPI), the input and output configuration. Under *Configuration Setting* are the offline parameters available, that will be used after the PLC goes in the Run state.



OCD-EE
Exclusive-Owner2: Encoder
- General
- Check Device Identity
- Configuration Setting

Name	Value	Unit
Connection Bit Health Offset	###	
Request Packet Interval (RPI)	10	ms
Time-out Multiplier	x4	
Input - T->O		
Input Size	8	bytes
Input Mode	Multicast	
Input Type	Fixed	
Priority	Scheduled	
Trigger Type	Cyclic	
Output - O->T		
Output Size	0	bytes
Output Mode	Point to Point	
Output Type	Fixed	
Priority	Scheduled	

Description: Offset of the health bit of this connection in the status byte array of the input area. From 0 to 127. Value is ### if the configuration must be saved to display this parameter.



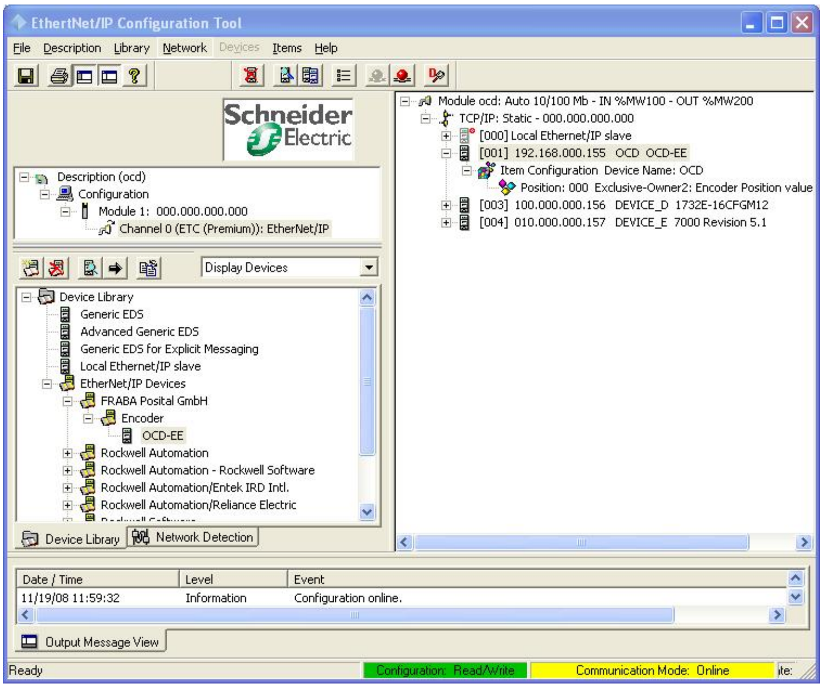
Display by Group ☑

OCD-EE
Exclusive-Owner2: Encoder
- General
- Check Device Identity
- Configuration Setting

Name	Value	Ur
No Group Specified		
Velocity Format	7940	co
Total Measuring Range in Measuring Units	33554431	St
Measuring Unit Per Span	8192	St
Scaling Function Control	FALSE	
Direction Counting Toggle	FALSE	

7.2.2 Online configuration

If the last steps were successful the encoder can go in the status online. In the configuration window in tab General it is possible to test the encoder connection with sending Ping commands to the encoder.



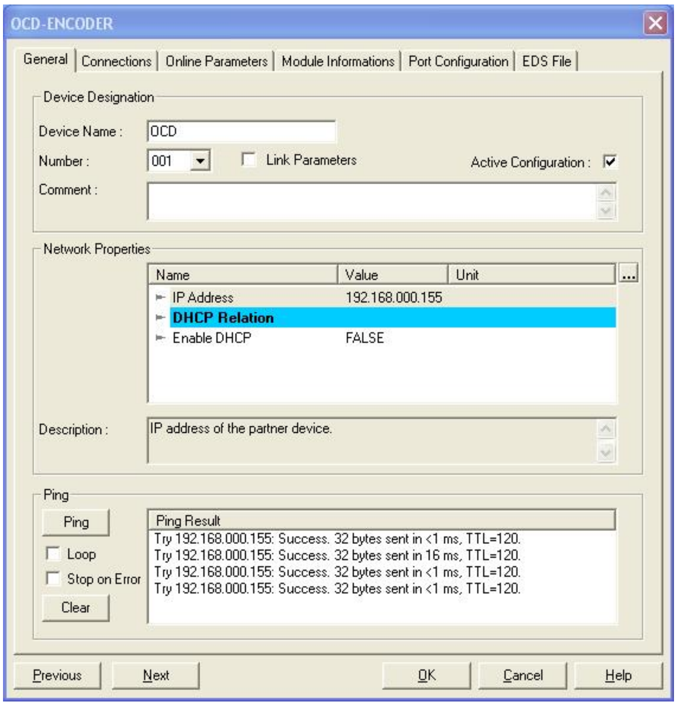
- Module ocd: Auto 10/100 Mb - IN %MW100 - OUT %MW200
  - TCP/IP: Static - 000.000.000.000
    - [000] Local Ethernet/IP slave
    - [001] 192.168.000.155 OCD OCD-EE
      - Item Configuration Device Name: OCD
        - Position: 000 Exclusive-Owner2: Encoder Position value
    - [003] 100.000.000.156 DEVICE_D 1732E-16CFGM12
    - [004] 010.000.000.157 DEVICE_E 7000 Revision 5.1

- Description (ocd)
  - Configuration
    - Module 1: 000.000.000.000
      - Channel 0 (ETC (Premium)): EtherNet/IP

- Device Library
  - Generic EDS
  - Advanced Generic EDS
  - Generic EDS for Explicit Messaging
  - Local Ethernet/IP slave
  - EtherNet/IP Devices
    - FRABA Posital GmbH
      - Encoder
        - OCD-EE
    - Rockwell Automation
    - Rockwell Automation - Rockwell Software
    - Rockwell Automation/Entek IRD Intl.
    - Rockwell Automation/Reliance Electric

Date / Time	Level	Event
11/19/08 11:59:32	Information	Configuration online.

Ready | Configuration: Read/Write | Communication Mode: Online



Device Designation

Device Name : OCD

Number : 001 □ Link Parameters Active Configuration : ☑

Comment :

Network Properties

Name	Value	Unit
IP Address	192.168.000.155	
DHCP Relation		
Enable DHCP	FALSE	

Description : IP address of the partner device.

Ping

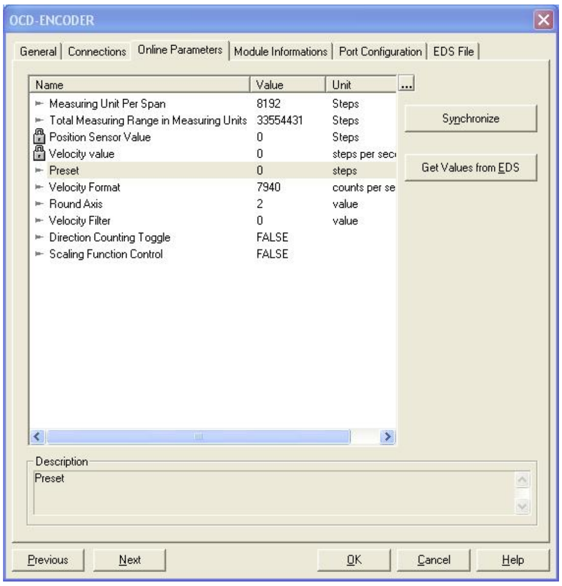
□ Loop

□ Stop on Error

Ping Result

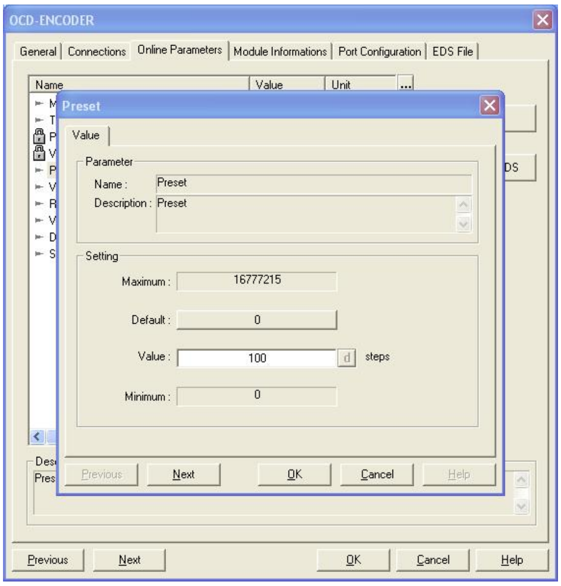
```
Try 192.168.000.155: Success. 32 bytes sent in <1 ms, TTL=120.
Try 192.168.000.155: Success. 32 bytes sent in 16 ms, TTL=120.
Try 192.168.000.155: Success. 32 bytes sent in <1 ms, TTL=120.
Try 192.168.000.155: Success. 32 bytes sent in <1 ms, TTL=120.
```

In tab *Online Parameters* is it possible to change the parameters. In a separate window it is possible to use the wished parameter. There are the minimum, maximum and default values available. With the *Synchronize* button it is possible to send the parameters to the encoder oder read them out from the encoder.



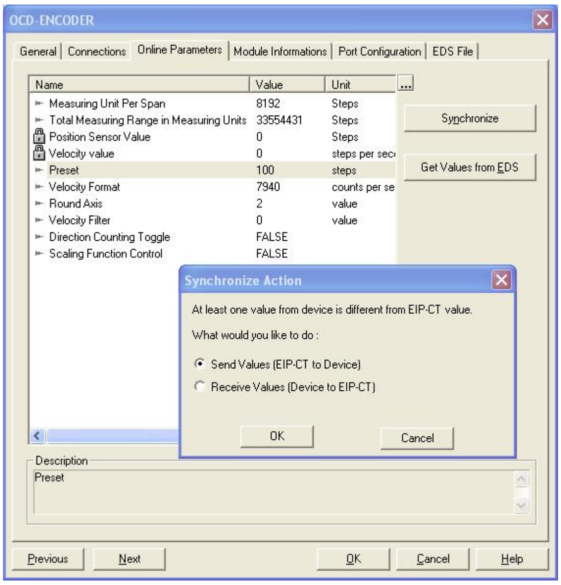
Name	Value	Unit
Measuring Unit Per Span	8192	Steps
Total Measuring Range in Measuring Units	33554431	Steps
Position Sensor Value	0	Steps
Velocity value	0	steps per seco
Preset	0	steps
Velocity Format	7940	counts per se
Round Axis	2	value
Velocity Filter	0	value
Direction Counting Toggle	FALSE	
Scaling Function Control	FALSE	

Description
Preset



Parameter
Name : Preset
Description : Preset

Setting
Maximum : 16777215
Default : 0
Value : 100 steps
Minimum : 0



Name	Value	Unit
Measuring Unit Per Span	8192	Steps
Total Measuring Range in Measuring Units	33554431	Steps
Position Sensor Value	0	Steps
Velocity value	0	steps per seco
Preset	100	steps
Velocity Format	7940	counts per se
Round Axis	2	value
Velocity Filter	0	value
Direction Counting Toggle	FALSE	
Scaling Function Control	FALSE	

At least one value from device is different from EIP-CT value.

What would you like to do :

● Send Values (EIP-CT to Device)
○ Receive Values (Device to EIP-CT)

Description
Preset

9 Glossar

Term	Explanation
10Base-T	Transmission line with 10 Mbit data transmission rate
100Base-T	Transmission line with 100 Mbit data transmission rate
Autocrossing	Allow to use straight or crossover wiring
Autonegotiation	Is an Ethernet procedure by which two connected devices choose common transmission parameters, such as speed and duplex mode
Baudrate	Transmission rate; it display the transmission bits per second
Big Endian	Variables will use Byte 0 as Low and last Byte as High
Binary	Numeric system with value 0 or 1.
BootP	A UDP network protocol used by a network client to obtain its IP address automatically
CAT5	Terminations for transmission rates up to 100 Mbit.
CIP	**C**ontrol and **I**nformation **P**rotocol
DHCP	**D**ynamic **H**ost **C**onfiguration **P**rotocol is a protocol used by networked devices (clients) to obtain the parameters necessary for operation in an Internet Protocol network. This protocol reduces system administration workload, allowing devices to be added to the network with little or no manual configuration.
EIP	**E**theNet/**IP**
EMC	**E**lectro**m**agnetic **c**ompatibility, there are rules to verifying devices.
ENIP	**E**ther**N**et/**IP**
Ethernet	Ethernet is a computer network technology based on frames.
Explicit Messages	Communication between i.e. a Ethernet scanner and encoder
Fast Ethernet	Transmission technology with 100 Mbit transmission rate.
Flash	Internal memory, saved data will be available after power down.
Implicit Messaging	IO Connection: communication between controller and device
IP-Address	Allow a logic addressing from computer in a network.
IP-Protocol	The **I**nternet **P**rotocol is widespread in computer networks. It is the implementation of the internet layer of the TCP/IP-model
MAC Address	Worldwide explicit address of a device. The encoder uses three MAC Adresses: one for internal interface and two for the ports.
Mbit	Transmission rate or baud rate, million bits per second
OSI-Model	The **O**pen **S**ystem **I**nterconnection reference model is a open layer model for the organization of a communication.
Scanner	Program to send Explicit Messages to the encoder
Switch	A switch is an electronic device to connect computers e.g. network segments in a local network. Unlike a hub, a switch uses stacks to avoid network collisions.
TCP	The **T**ransmission **C**ontrol **P**rotocol is a connection orientated transmission protocol, in a network.
UDP	**U**ser **D**atagram **P**rotocol is utilized to send data that does not need to be transferred in a reliable way.