

BNI EIP-501-005-Z015 EtherNet/IP™ IP67 modules User's Guide

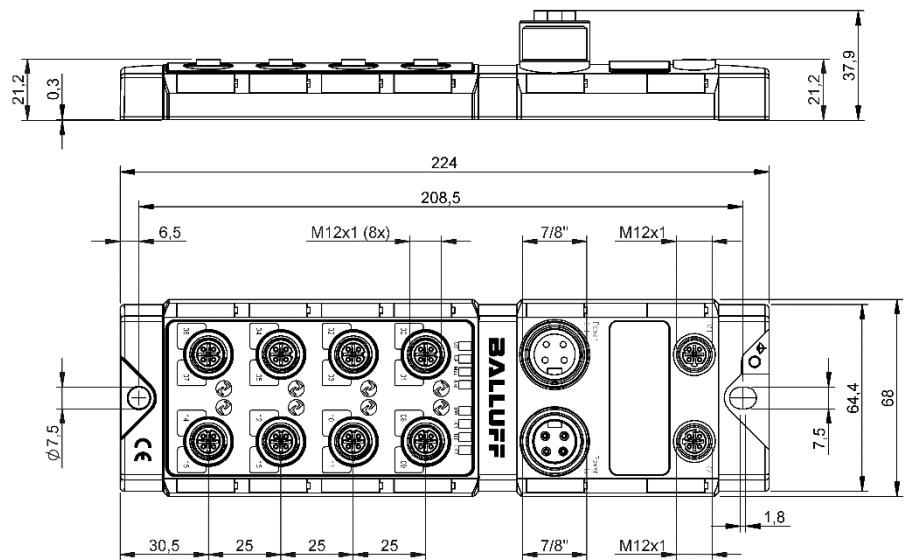




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- 1.1. Structure of the guide** This guide is arranged so that one chapter builds upon the other.
 Chapter 2: Basic safety instructions
 Chapter 3: Main steps for installing the device

- 1.2. Typographical Conventions** The following typographical conventions are used in this manual.
- Enumerations** Enumeration is shown in the form of bulleted lists.
- Entry 1,
 - Entry 2
- Actions** Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.
- Action instruction 1.
 - ↪ Result of action.
 - Action instruction 2.
- Actions can also be indicated as numbers in parentheses.
- (1) Step 1
 - (2) Step 2
- Syntax** Numbers:
 Decimal numbers are shown without additional information (e.g. 123),
 Hexadecimal numbers are shown with the additional indicator hex (e.g., 00_{hex}) or the prefix "0x" (e.g., 0x00).
- Cross-references** Cross-references indicate where additional information on the topic is located.
-
- 1.3. Symbols**
-  **Note**
 This symbol indicates general notes.
-
-  **Attention!**
 This symbol indicates a security notice which must be observed.
-
- 1.4. Abbreviations**
- | | |
|------|-------------------------------|
| BNI | Balluff Network Interface |
| GND | Electrical Ground, 0V |
| EMC | Electromagnetic Compatibility |
| FE | Function earth |
| I | Standard input port |
| O | Standard output port |
| I/O | Standard Input/Output port |
| IOL | IO-Link |
| IODD | IO-Link Device Description |
| n.a | not available |
| EIP | EtherNet/IP™ |
| UA | Actuator supply |
| US | Sensor supply |
- 1.5. Deviating views** Product views and illustrations in this manual may differ from the actual product. They are intended only as illustrative material.

2 Safety

2.1. Intended Use

The BNI EIP-501-005-Z015 is a decentralized IO-Link and inputmodule for connecting to the EtherNet/IP™ network.

2.2. Installation and Startup



Attention!

Installation and startup are to be performed by trained technical personnel only. Skilled specialists are people who are familiar with the work such as installation and the operation of the product and have the necessary qualifications for these tasks. Any damage resulting from unauthorized tampering or improper use shall void warranty and liability claims against the manufacturer. The operator is responsible for ensuring that the valid safety and accident prevention regulations are observed in specific individual cases.

2.3. General Safety Notes

Commissioning and inspection

Before commissioning, carefully read the User's Guide.

The system must not be used in applications in which the safety of persons depends on the function of the device.

Intended use

Warranty and liability claims against the manufacturer shall be rendered void by damage from:

- Unauthorized tampering
- Improper use
- Use, installation or handling contrary to the instructions provided in this User's Guide.

Obligations of the owner/operator

The device is a piece of equipment in accordance with EMC Class A. This device can produce RF noise. The owner/operator must take appropriate precautionary measures against this for its use. The device may be used only with a power supply approved for this. Only approved cables may be connected.

Malfunctions

In the event of defects and device malfunctions that cannot be rectified, the device must be taken out of operation and protected against unauthorized use.

Intended use is ensured only when the housing is fully installed.

2.4. Resistance to Aggressive Substances



Attention!

The BNI modules always have good chemical and oil resistance. When used in aggressive media (such as chemicals, oils, lubricants and coolants, each in a high concentration (i.e. too little water content)), the material must first be checked for resistance in the particular application. No defect claims may be asserted in the event of a failure or damage to the BNI modules caused by such aggressive media.

Dangerous Voltage



Attention!

Before working on the device, switch off its power supply.



Note

In the interest of continuous improvement of the product, Balluff GmbH reserves the right to change the technical data of the product and the content of these instructions at any time without notice.

3.1. Module Overview

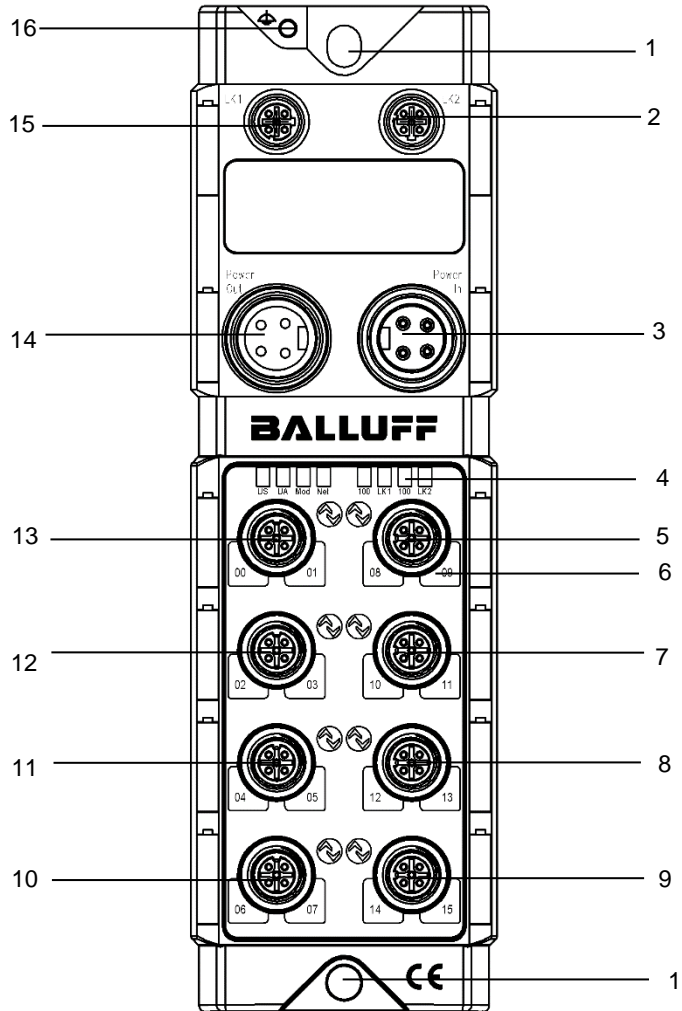


Figure – Overview: BNI EIP-501-005-Z015

- | | | | |
|---|------------------------------------|----|----------------------|
| 1 | Mounting hole | 9 | Port 7 |
| 2 | EtherNet/IP™ port 2 | 10 | Port 3 |
| 3 | Power supply, input | 11 | Port 2 |
| 4 | Status LED: communication / module | 12 | Port 1 |
| 5 | Port 4 | 13 | Port 0 |
| 6 | Pin/port LED: signal status | 14 | Power supply, output |
| 7 | Port 5 | 15 | EtherNet/IP™ port 1 |
| 8 | Port 6 | 16 | Ground connection |

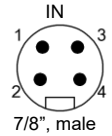

3 First Steps

3.2. Mechanical Connection

The module is secured by means of two M6 screws and two washers. Insulation support is available separately.

3.3. Electrical Connection

Power Supply

	Pin	Function	Description
 <p>7/8", male</p>	1	+24 V	Actuator supply
	2	+24 V	Module / sensor supply
	3	0 V	GND module / sensor and actuator supply
	4		
 <p>7/8" female</p>			

Note



Where possible, use a separate power source to supply the sensor/bus and actuator with power.
 Total current < 9 A The total current of all modules must not exceed 9 A even in the case of series connection of the actuator supply.

Attention!

Do not separate supply voltages

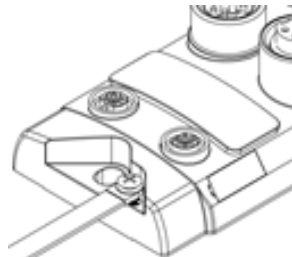
Non-separate voltage supply circuits for sensor and actuator can result in undesired voltage drops in the sensor supply when switching actuators.



► Therefore always use separately protected voltage supplies for sensors and actuators.

Also be sure to sufficiently dimension the voltage supply of the device in order to cover startup and peak currents. Design the fusing concept accordingly.

Grounding



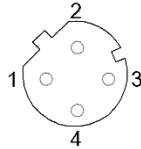
Note

The functional ground connection between housing and machine must have a low impedance and be as short as possible.

3 First Steps

Ethernet IP Interface

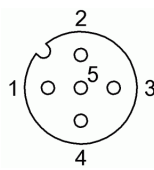
M12, D-coded, female



Pin	Function	
1	Tx+	Transmit Data +
2	Rx+	Receive Data +
3	Tx-	Transmit Data -
4	Rx-	Receive Data -

IO-Link Port

M12, A-coded, female



Pin	Function
1	+24 V, 1.6 A
2	Input
3	GND
4	IO-Link / Input
5	n.a.



Note

For the digital sensor inputs, refer to guideline on inputs EN 61131-2, Type 2.

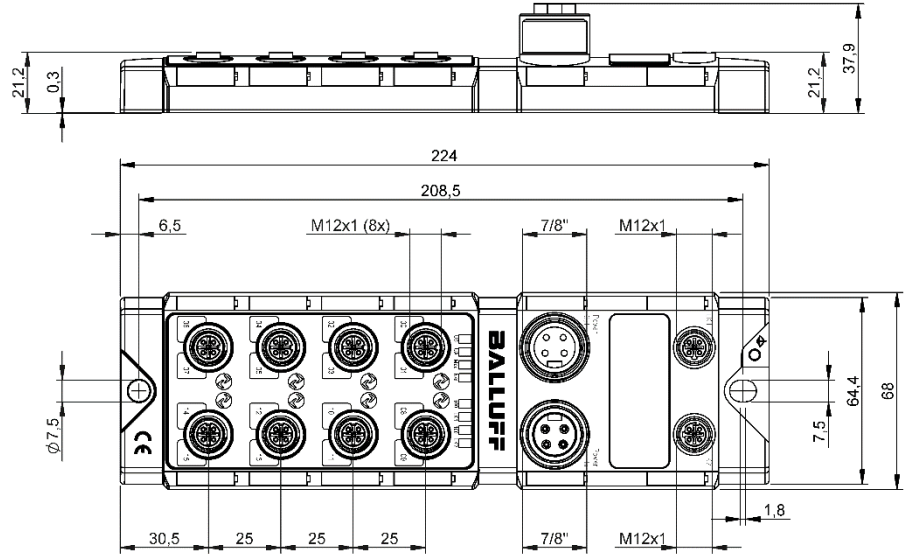


Note

Unused I/O ports must be provided with cover caps to comply with degree of protection IP67.

4 Technical Data

4.1. Dimensions



4.2. Mechanical Data

Housing material	Die case zinc, matt nickel plated
Enclosure rating per IEC 60529	IP 67 (only when plugged-in and threaded-in)
Supply voltage	7/8" 4-pin, connector / female
IO-Link ports	M12, A-coded (8x female)
Dimensions (W x H x D in mm)	68 x 224 x 37.9
Type of mounting	Screw mounting with 2 mounting holes
Ground strap installation	M4
Weight	Approx. 670 g

4.3. Operating Conditions

Ambient temperature	-5 °C ... 70 °C
Storage temperature	-25 °C ... 70 °C

4.4. Electrical Data

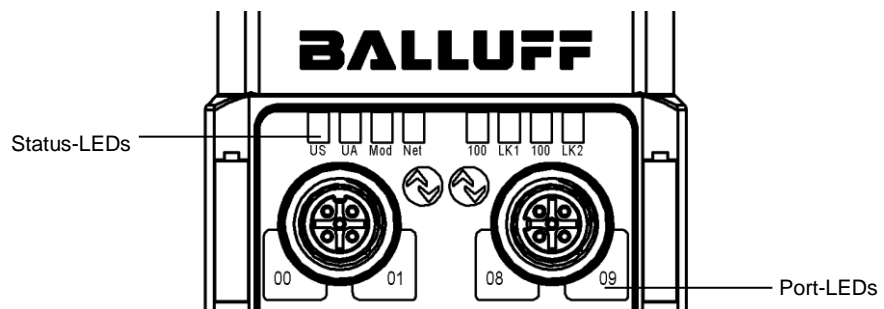
Supply voltage	18...30.2 V DC, in accordance with EN 61131-2
Ripple	< 1%
Input current at 24 V	130 mA

4 Technical Data

4.5. Ethernet

Ethernet IP port	2 x 10Base/100Base Tx
Connection for Ethernet IP port	M12, D-coded, female
Cable types in accordance with IEEE 802.3	Shielded, twisted pair min. STP CAT 5/ STP CAT 5e
Data transmission rate	10/100 Mbps
Max. cable length	100 m
Flow control	Half-duplex/full-duplex (IEEE 802.3x pause)

4.6. Function Indicators



Module Status

LED	Display	Description
US	Green	Input power OK
	Red, flashing	Low Input power (< 18V)
UA	Green	Output power OK
	off	Low Output power (< 18V) or not output power (<11V)
MOD	Green, flashing	Wrong or no configuration
	Green	No error
	Red, flashing	Fixed bus clock is not possible
	Red-green, flashing	Initial sequence
NET	Off	No IP address
	Green, flashing	Module got IP, but no connection could be established
	Green	Connection established
	Red, flashing	Connection timeout
100	Red-green, flashing	Initial sequence
	Off	Bus clock: 10 Mbit/s
LK1/2	Yellow	Bus clock: 100 Mbit/s
	Green, flashing	Data transfer

4 Technical Data

PortMode

Each port has two bicolored LEDs for displaying the I/O statuses.

Standard mode

Status	Function
off	State of the Input Pin is 0
Yellow	State of the Input Pin is 1

IO-Link mode

Status	Function
Green	IO-Link – connection established
Green, flashing	No active IO-Link communication
Green, fast flashing	IO-Link pre-operate during data management
Red, fast flashing	Wrong IO-Link data length, or validation failed or data storage failed
Red	IO-Link short circuit, pin 4 against pin 3

All modes

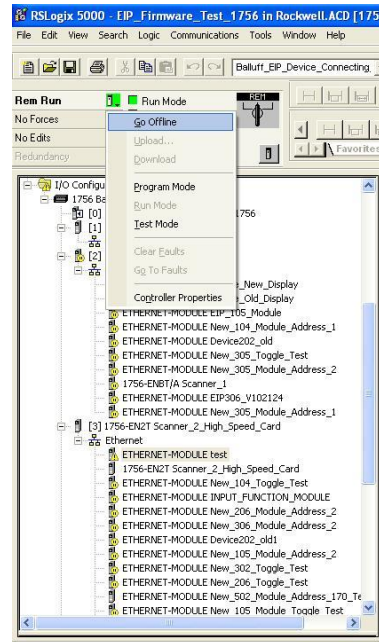
Status	Function
both LEDs red flashing	Short circuit at sensor supply between pin 1 and pin 3

5 Integration

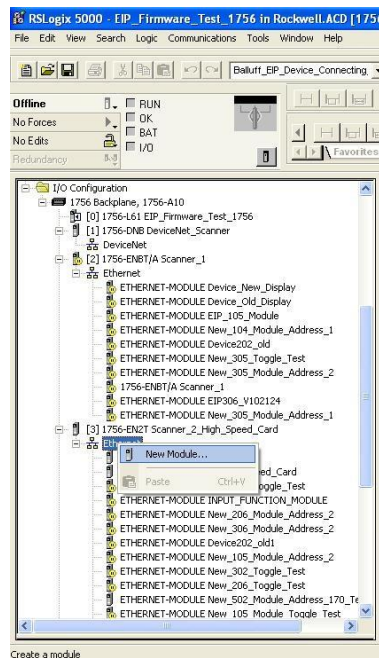
5.1. Integration in Rockwell RS Logix 5000

Here you see an example of how the module can be integrated into a Rockwell RS Logix 5000:

First go offline

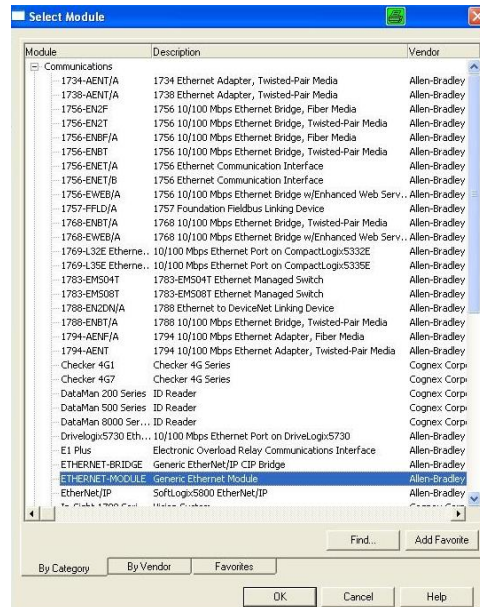


Right-click Ethernet (on the correct scanner card)
Select a new module

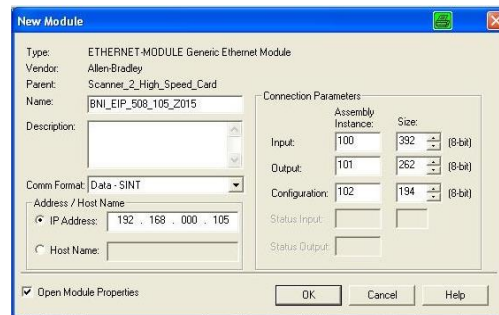


5 Integration

Then select the general Ethernet module as the ETHERNET module in the communication path

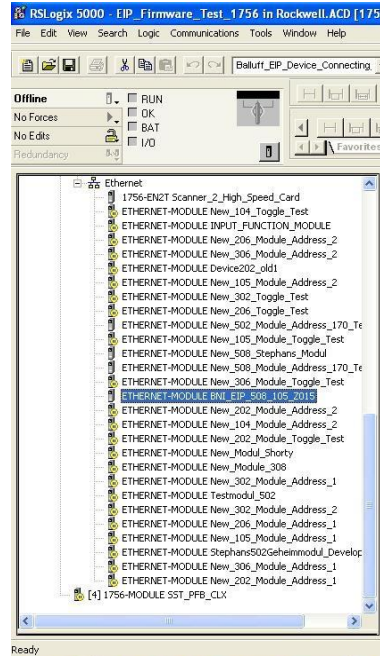


Now enter a user-defined tag name to select the general format Data-SINT, to enter the IP address of the module and to enter the correct connection parameters.

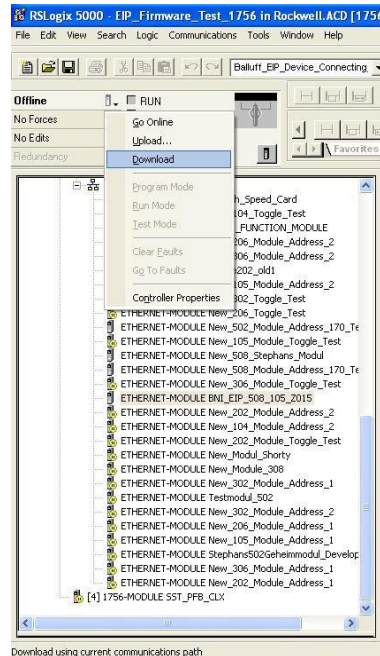


5 Integration

The new module and corresponding controller tags are generated automatically.



Then download the configuration

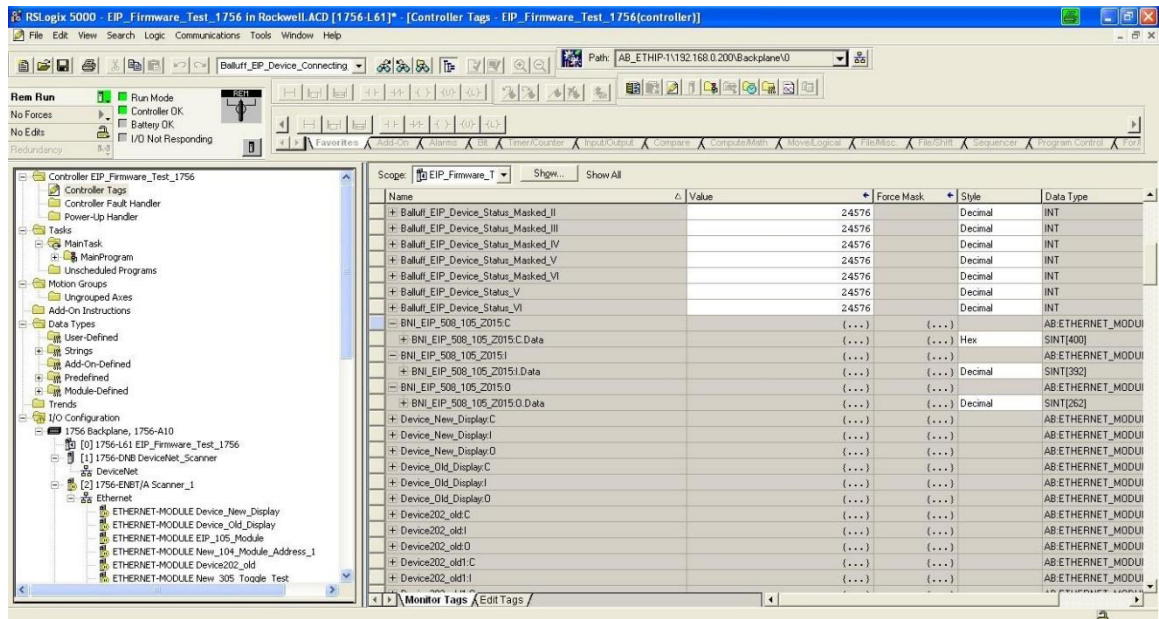


5 Integration

When the download is done, you can observe and control the tags using the Controller Tags option. Make sure you select the correct tag name, which you configured beforehand.

The input, output and configuration data for this is described on the following pages.

You can use these tags for the programming, too.



5 Integration

5.2. Address Specifications

These settings are factory-set.

IP-Adresse: 192.168.1.1
 Subnetmaske: 255.255.255.0
 Gatewayadresse: 192.168.1.1

5.3. Data Configuration

Please enter the following values in the control system. They describe the data sizes of the input, output and configuration data.

	Instance-ID	Data length
EINGANG	100	390
AUSGANG	101	258
KONFIG	102	194

5.4. Configuration Data

The following tables show an allocation of the configuration data sequence. The standard values specified below describe a configuration with the IO-Link function at Pin 4 and standard I/O functions at Pin 2 and 4 of each port. The input functions of the configured standard I/O ports are set via the process data.

BNI EIP-501-005-Z015

Byte	Slot	Module part	Description
0...1	1	Module	General configuration for the entire module
2...25	2	IO-Link port 0	Configuration of IO-Link port 0
26...49	3	IO-Link port 1	Configuration of IO-Link port 1
50...73	4	IO-Link port 2	Configuration of IO-Link port 2
74...97	5	IO-Link port 3	Configuration of IO-Link port 3
98...121	6	IO-Link port 4	Configuration of IO-Link port 4
122...145	7	IO-Link port 5	Configuration of IO-Link port 5
146...169	8	IO-Link port 6	Configuration of IO-Link port 6
170...193	9	IO-Link port 7	Configuration of IO-Link port 7

Module Configuration BNI EIP-501-005-Z015

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	P3		P2		P1		P0		Port function 0x00: Standard I/O 0x01: IO-Link
1	P7		P6		P5		P4		

5 Integration

IO-Link Port Configuration

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
2	Basic		Time						Cycle time
3	Validation type								Validation type 0 No validation 1 compatible (VID + DID) 2 Identical (VID + DID + SerNum)
4	Vendor ID 1								Vendor ID
5	Vendor ID 2								
6	Device ID 1								Device ID
7	Device ID 2								
8	Device ID 3								
9	Serial number 1								Serial number
...	...								
24	Serial number 16								
25	Parameter server								Parameter server 0x8X Enable 0x0X Disable 0x40 Delete 0xX1 Enable upload 0xX2 Disable download
...	The data of the other IO-Link ports is structured identically and described in the following.								

Cycle Settings

This parameter can be used to influence the IO-Link communication speed. Calculated using the multiplier and the time base, the IO-Link cycle time can be increased. The time base is described in Table B3. The multiplier is entered in decimal form from 0...63.

Bit								Description
7	6	5	4	3	2	1	0	
Time base		Multiplier						<p>Bit 0 to 5: Multiplier These bits contain a 6-bit multiplier for the calculation of MasterCycleTime or MinCycleTime. Permissible values for the multiplier are 0 to 63.</p> <p>Bit 6 to 7: Time Base These bits specify the time base for the calculation of MasterCycleTime or MinCycleTime.</p>

Possible values of MasterCycleTime and MiniCycleTime

Time base encoding	Time base value	Calculation	Cycle time
00	0.1 ms	Multiplier x time base	0.4 ms to 6.3 ms
01	0.4 ms	6.4 ms + multiplier x time base	6.4 ms to 31.6 ms
10	1.6 ms	32.0 ms + multiplier x time base	32.0 ms to 132.8 ms
11	Reserved	Reserved	Reserved
NOTE: The value 0.4 results from the minimum possible transmission time according to chapter A.3.7 of the IO-Link Interface and system specification.			

Validation Settings

No validation: validation deactivated, every device will be accepted.
Compatibility: manufacturer ID and device ID are compared to the IO-Link device data.
Identity: manufacturer ID and device ID and serial number are compared to the IO-Link device data. The IO-Link communication is only started if there is a match.

5 Integration

Parameter Server

Enable: data management functions enabled, parameter data and identification data of the IO-Link device are stored permanently.

Disable: data management functions disabled, stored parameter data and identification data of the IO-Link device remain stored.

Deleted: data management functions disabled, stored parameter data and identification data of the IO-Link device are deleted.

Enable upload:

If only the upload is enabled, the master always starts an upload of the parameter data. In this case, the upload is independent of the upload flag of the IO-Link device. If no data is stored in the Master Port, an upload likewise takes place. (e.g. after deleting the data or before the first data upload)

Enable download:

If only the download is enabled, the master always starts a download of the parameter data. In this case, the download is likewise independent of the upload flag of the IO-Link device. If no data is stored in the Master Port, however, an upload takes place first. (e.g. after deleting the data or before the first data upload)

Enable upload and download:

If the upload and download are enabled, different parameter sets are distinguished depending on the upload flag of the IO-Link device.

If no parameter data is stored in the IO-Link master port, an initial upload takes place. (e.g. after deleting the data or before the first data upload)

If the upload flag is set on the IO-Link device, an upload of the parameter data always takes place.

If no upload flag is set and parameter data has already been stored, a download of the parameter data always takes place.

Note

After the upload of the parameter data, the vendor ID and device ID of the connected IO-Link device are also still saved until the data records are deleted.



When the connected IO-Link device is started, a validation takes place. Thus, only an IO-Link device of the same type can be used for the data management.

If an IO-Link device of a different type is to be used, the contents of the parameter server must be deleted.

The data storage is supported only by IO-Link devices with IO-Link Revision 1.1.

Upload Flag on the IO-Link Device

The upload flag is needed to overwrite already saved data in the parameter server with new parameter data of the same IO-Link device.

To enable the upload flag of an IO-Link device,

the data value 0x05 must be entered in the index 0x02, subindex 0.

(For information about configuration via IO-Link, refer to the "Web Server" chapter under "Device Properties" or the "Configuration via Explicit Messages" chapter under "IO-Link Device Parameterization")

6 Configuration via Explicit Messages

QuickConnect The QuickConnect function makes it faster to boot up and integrate the BNI EIP-501-005-Z015 modules.

Enabling QuickConnect automatically takes over all necessary port properties on the module:

- Static IP address
- Ports at 100 Mbps full-duplex
- Auto-negotiation disabled
- Auto MDI-X disabled
- Prepared for linear topology

You can configure **QuickConnect** via the following class instance attribute of the explicit messages:

Class	Instance	Attribute	Value
245 (0xF5)	1 (0x01)	12 (0x0C)	0: disabled (default) 1: enabled



Note

For QuickConnect to be enabled, ACD (Address Conflict Detection) must also be enabled. This is switched on by default.

The **ACD** can be reviewed and changed using the following class instance attributes of the explicit messages:

Class	Instance	Attribute	Value
245 (0xF5)	1 (0x01)	10 (0x0A)	0: disabled 1: enabled (default)

6 Configuration via Explicit Messages

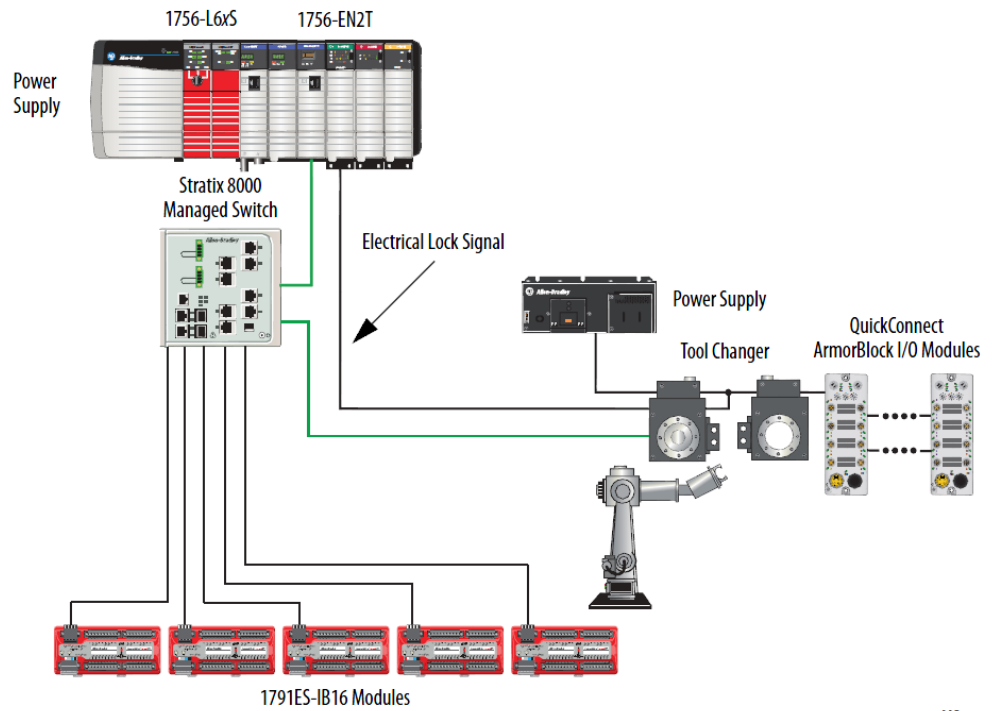
Rockwell Automation Products that are Compatible with QuickConnect

Component	Supported Rockwell Automation Products
Controller	ControlLogix® controllers: <ul style="list-style-type: none"> • 1756-L6x • 1756-L7x GuardLogix controllers: <ul style="list-style-type: none"> • 1756-L6xS • 1756-L7xS All controllers require firmware revision 20.001 or later.
EtherNet/IP managed switch on the controller side	Stratix 6000 switches: <ul style="list-style-type: none"> • 1783-EMS04T • 1783-EMS08T Stratix 8000 switches: <ul style="list-style-type: none"> • 1783-MS06T or 1783-MS10T • 1783-RMS06T or 1783-RMS10T • 1783-MX08T or 1783-MX08F
EtherNet/IP communication modules	ControlLogix communication modules: <ul style="list-style-type: none"> • 1756-EN2T with firmware revision 4.003 • 1756-ENBT with firmware revision 6.002
Application logic that uses generic CIP Messages to inhibit and uninhibit I/O modules	Studio 5000 Logix Designer application, version 21.00.00 or later or RSLogix 5000 software, version 20.01.02

Source:
 Allen-Bradley Ethernet/IP QuickConnect Application Technique
 Page 13

Example with Rockwell Components

Figure 3 - Example System Components



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 12

Please also note the following:

- Direct connection between PLC and QuickConnect slave with crossover cable
- Slave-to-slave connection using patch cable
- For setting up the topology, only the linear topology with a maximum of 20 modules on the tool side is permitted.
- If needed, only one managed switch may be used between the PLC and Ethernet/IP slave.
- To trigger the QuickConnect sequence, an electrical lock signal is required that reads in the supply voltage of the QuickConnect slaves via the controller.

6 Configuration via Explicit Messages

PLC Program

Add Application Logic

Add ladder logic to inhibit and uninhibit QuickConnect I/O modules:

- Run this logic in a periodic task with a recommended 10 ms update rate.
- The logic examples shown configure two ArmorBlock I/O modules. Modify the code as needed to configure as many as 20 ArmorBlock I/O modules.

IMPORTANT A connection time of 500 ms with 20 QuickConnect modules is supported with only a ControlLogix 1756-L7x controller and 1756-EN2T communication module. For average connection times per number of modules, see [Average Timing with Rockwell Automation Products on page 50](#).

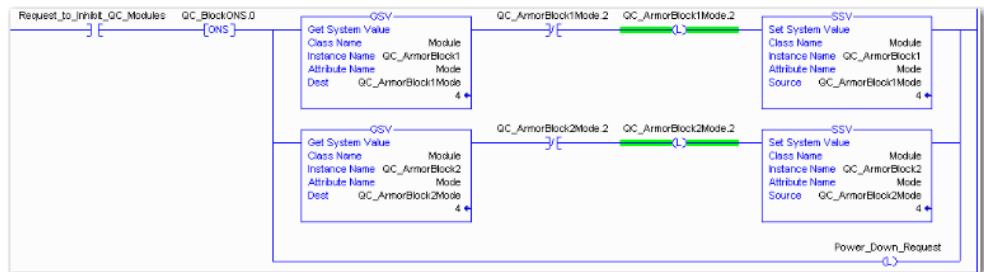
Inhibit and Power Down

Add this logic to inhibit and power down the QuickConnect modules.

1. Rung 0: Inhibit the modules.

Before making a tool change, you must uninhibit the QuickConnect ArmorBlock I/O modules mounted to the tool before powering down. Use a GSV (Mode) instruction to monitor the present state of the modules and one SSV (Mode) instruction per module to inhibit the modules.

The input condition to start the inhibit process must come from an external input. For example, as the robot is traveling back to change out the tool, this input condition must be enabled. By the time the tool is being changed, the modules are inhibited and can proceed to powering down the tool and modules.

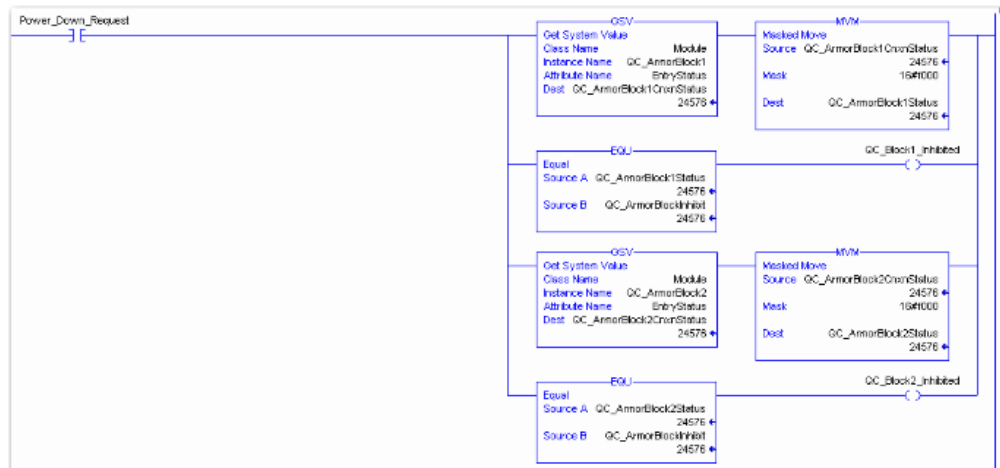


Source: Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 29

6 Configuration via Explicit Messages

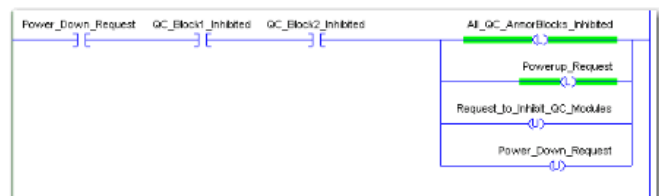
2. Rung 1: Verify the modules are inhibited.

After the modules have been inhibited, verify that the modules have indeed been inhibited. Use one GSV (Entry Status) instruction per module. When the Entry Status value equals a decimal value of 24576, the module can be disconnected from the robotic arm and powered down.



3. Rung 2: Power down the modules.

This rung verifies that all the modules have been inhibited and powered down. The tool and modules can be physically disconnected from the robotic arm.



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 30

6 Configuration via Explicit Messages

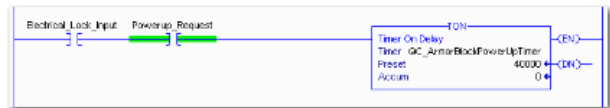
Uninhibit and Power Up

Add this logic to uninhibit and power up the QuickConnect I/O modules.

1. Rung 3: Power up the modules.

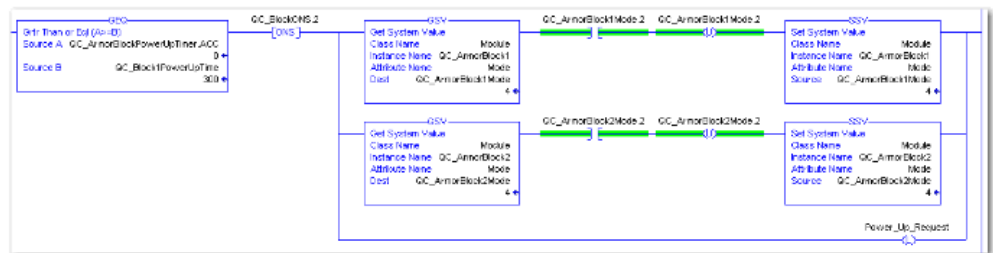
Once the tool and module is connected, an external input module sends an electrical lock input signal. On receipt of the signal, start a timer to keep track of how long the tool and modules have been connected.

Every QuickConnect ArmorBlock I/O module has a delay time embedded in its electronic data sheet (EDS) file. This delay time is the amount of time the module takes to power up. The module takes about 300 ms to fully power up before establishing a connection to the controller.



2. Rung 4: Uninhibit the modules.

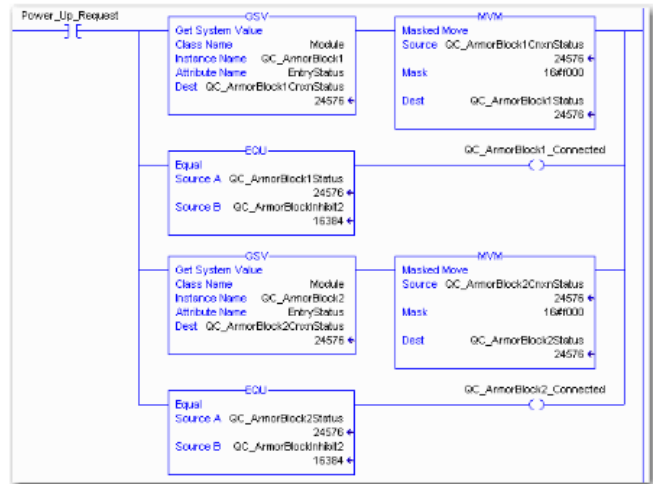
When the Timer.Acc is greater then or equal to the module delay time (300 ms), use an SSV (Mode) instruction to uninhibit the module. Use a GSV (Mode) instruction to verify the mode of the module at powerup.



Source:
Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 31

3. (Optional) Rung 5: Verify the modules are uninhibited.

After the modules have been uninhibited, verify that the modules have indeed been uninhibited. Use one GSV (Entry Status) instruction per module. When the Entry Status value equals a decimal value of 16384, the module has been uninhibited.



Source: Allen-Bradley Ethernet/IP QuickConnect Application Technique, Page 32

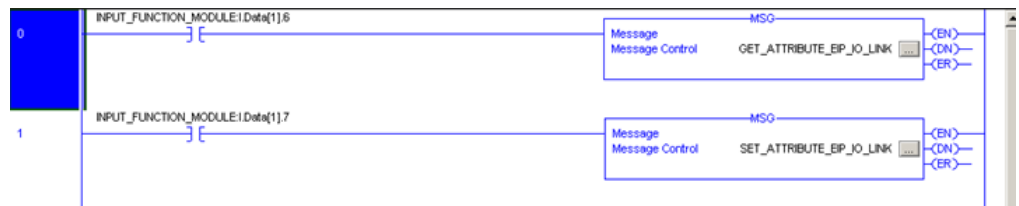
6 Configuration via Explicit Messages

IO-Link Device Parameterization

There are two options for configuring an IO-Link device connected to the IO-Link port.

- Configuration via the web server refer to the "Web Server" chapter under "Device Properties"
- Configuration via explicit messages

The following example describes how Rockwell RSLogix 5000 devices can be used to configure an IO-Link device via explicit messages. For this purpose, the "MSG" components in the PLC program are used.



Read IO-Link Parameter

Service Code	Class	Instance	Attribute
0x32	0x96	1 - n	0x03 (Read Parameter)

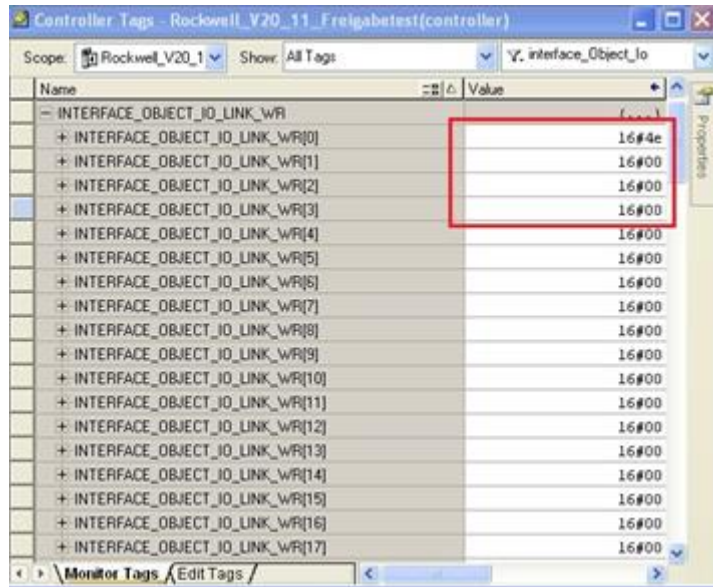
n: Number of ports

Source Length must correspond to at least the read parameters, but a larger value can also be entered. (In this example, 100 bytes)

As the Source Element (Write) and as the Destination Element (Read), create one SINT[100] array each and select the first line[0].

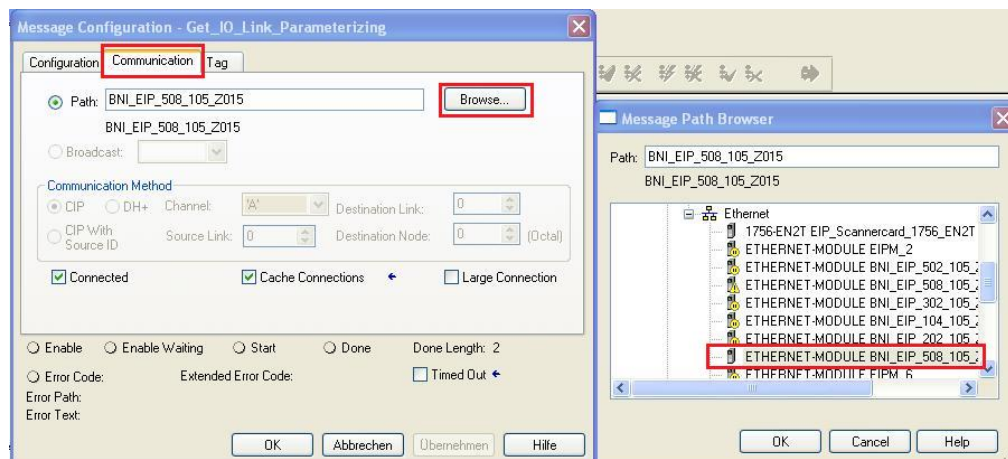
6 Configuration via Explicit Messages

In the Source Element Array (Write), enter which index is to be read. In this example, this is index 0x4E.



Destination Array (Read) shows the read-out value. In case of a configuration error, the error code is likewise displayed there.

In the "Communication" window, you have to select the Ethernet module on which the configuration is to take place.



6 Configuration via Explicit Messages

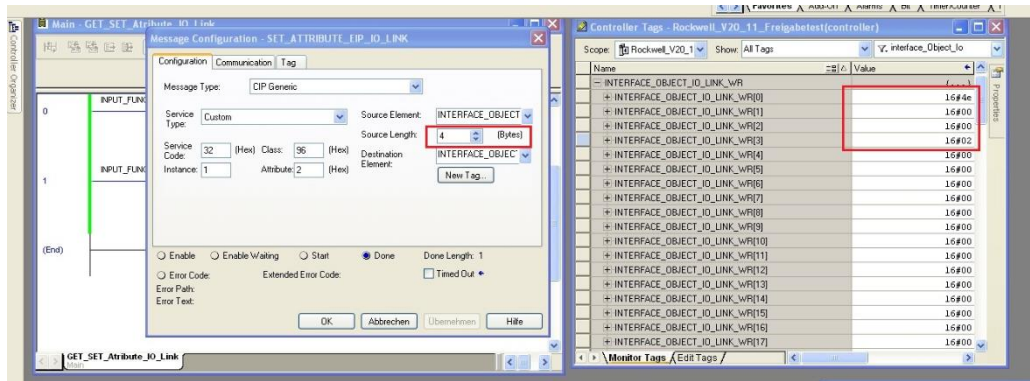
Write IO-Link Parameter

Service Code	Class	Instance	Attribute
0x32	0x96	1 - n	0x02 (Write Parameter)

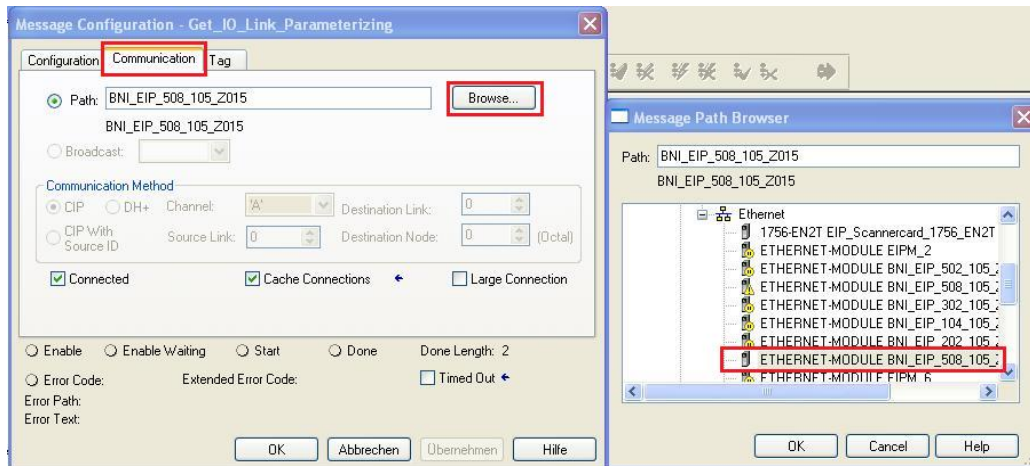
n: Number of ports

Source Element and Destination Element are to be selected so they are identical to the previous example, "Read IO-Link parameter". The Source Length must be exactly the same length as the parameter data to be written.

In this example, index 0x4E, subindex 0, value 0x02 is written in Source Element Array (Write). In case of a configuration error, an error code appears in Destination Element Array (Read).



In the "Communication" window, you likewise have to select the Ethernet module on which the configuration is to take place.



Note
 The explicit messages functions are implemented in accordance with the Volume 1: Common Industrial Protocol Specification and Volume 2: Ethernet/IP Adaption of CIP.

7 Process Data

7.1. Process Data Inputs

The input data size is 390 bytes. Take a look at the tables below for the allocation of the process data inputs.

Byte	Module part	Description
0...5	Standard I/O ports	Process data inputs at the standard inputs
6...53	IO-Link Port 0	Process data inputs at IO-Link port 0
54...101	IO-Link port 1	Process data inputs at IO-Link port 1
102...149	IO-Link port 2	Process data inputs at IO-Link port 2
150...197	IO-Link port 3	Process data inputs at IO-Link port 3
198...245	IO-Link port 4	Process data inputs at IO-Link port 4
246...293	IO-Link port 5	Process data inputs at IO-Link port 5
294...341	IO-Link port 6	Process data inputs at IO-Link port 6
342...389	IO-Link port 7	Process data inputs at IO-Link port 7

Standard Input Data

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	I32	I34	I22	I24	I12	I14	I02	I04	Input data I04 → Input at port 0, pin 4 The result is 0 only if the port is configured as an IO-Link port.
1	I72	I74	I62	I64	I52	I54	I42	I44	
2	S3		S2		S1		S0		Short-circuit status Short-circuit between pin 1 and 3 at the registered port
3	S7		S6		S5		S4		
4	0	0	0	0	0	reserved	PS	reserved	Status of the power supply PS: Power supply for sensor
5	0	0	0	0	0	0	0	0	Reserved

7 Process Data

IO-Link Input Data

Byte	Bit								Description	
	7	6	5	4	3	2	1	0		
6 :: 37									IO-Link port 0 input data	
38	0	0	0	0	0	0	DC	IOL	IO-Link status <i>IOL: Port in IO-Link mode</i> <i>DC: Device connected</i> <i>0: Reserved</i>	
39	SC	0	0	0	0	PDI	DF	VF	IO-Link error <i>VF: Validation failed</i> <i>SC: IO-Link short-circuit</i> <i>DF: Data storage validation failed</i> <i>PDI: Process data invalid</i>	
40	Vendor ID 1								Vendor ID	
41	Vendor ID 2									
42	Device ID 1									
43	Device ID 2								Device ID	
44	Device ID 3									
45	Mode	Type	0						Event 1	<i>Mode:</i> <i>0: Reserved</i> <i>1: Event single shot</i> <i>2: Event disappears</i> <i>3: Event appears</i> <i>Type:</i> <i>0: Reserved</i> <i>1: Notification</i> <i>2: Warning</i> <i>3: Error</i>
46	Event code high									
47	Event code low									
48	Mode	Type	0						Event 2	
49	Event code high									
50	Event code low									
51	Mode	Type	0						Event 3	
52	Event code high									
53	Event code low									
...	The data of the other IO-Link ports are structured identically and described in the following.									

7 Process Data

7.2. Process Data Outputs

The output data size is 258 bytes. Take a look at the tables below for the allocation of the process data outputs.

BNI EIP-501-005-Z015

Byte	Module part	Description
0...1	Standard I/O ports	Process data outputs at the standard inputs
2...33	IO-Link Port 0	Process data output at IO-Link port 0
34...65	IO-Link port 1	Process data output at IO-Link port 1
66...97	IO-Link port 2	Process data output at IO-Link port 2
98...129	IO-Link port 3	Process data output at IO-Link port 3
130...161	IO-Link port 4	Process data output at IO-Link port 4
162...193	IO-Link port 5	Process data output at IO-Link port 5
194...225	IO-Link port 6	Process data output at IO-Link port 6
226...257	IO-Link port 7	Process data output at IO-Link port 7

Standard Output Data

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
0	0	0	0	0	0	0	0	0	Reserved
1	0	0	0	0	0	reserved	reserved	reserved	Reserved

IO-Link Output Data

Byte	Bit								Description
	7	6	5	4	3	2	1	0	
2...33									IO-Link port 0 output data
...	The data of the other IO-Link ports are structured identically and described in the following.								

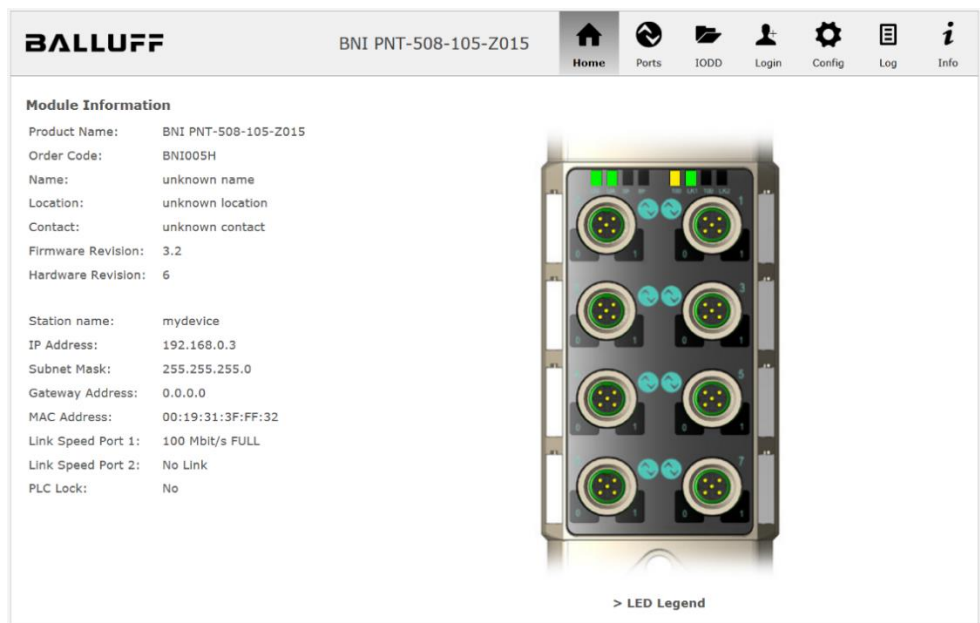
8 Web Server

8.1. General

The BNI fieldbus module contains an integrated web server for retrieving detailed device information and for configuring the device.

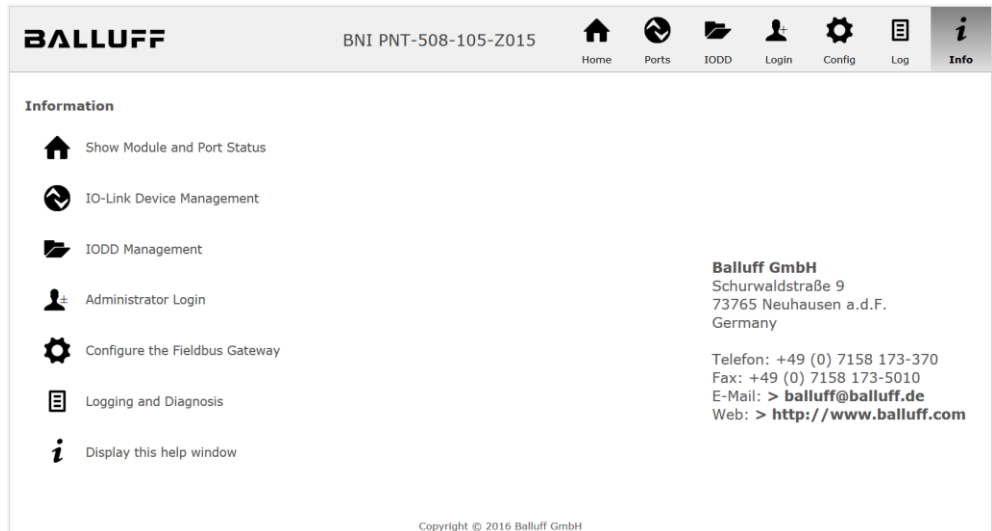
To use the web interface you must first ensure that the module has been correctly integrated into your network. In addition the IP subnet of the BNI module must be accessible from the PC on which the browser is running. For the supported web browsers, please refer to the corresponding data sheet.

For open a connection with the web server, enter the IP address of the module in the address line of the browser. The homepage then appears with the essential device information.



8.2. Navigation / Info The navigation bar is located in the upper area of the window, which allows you to switch between the various dialogs of the web interface. To do this click on the corresponding icon.

When the "Info" tab is selected the following overview appears:



The "BALLUFF" logo at upper right links to the international Balluff homepage.

8 Web Server

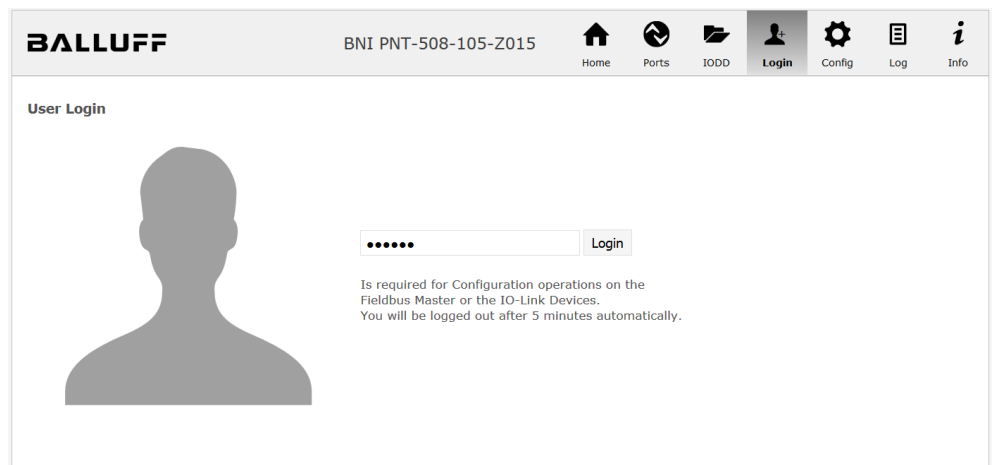
8.3. Login/Logout

To make configuration settings on the fieldbus module using the web interface, you must first log in. Functionalities which cannot be used without logging in are indicated by the grayed out buttons.

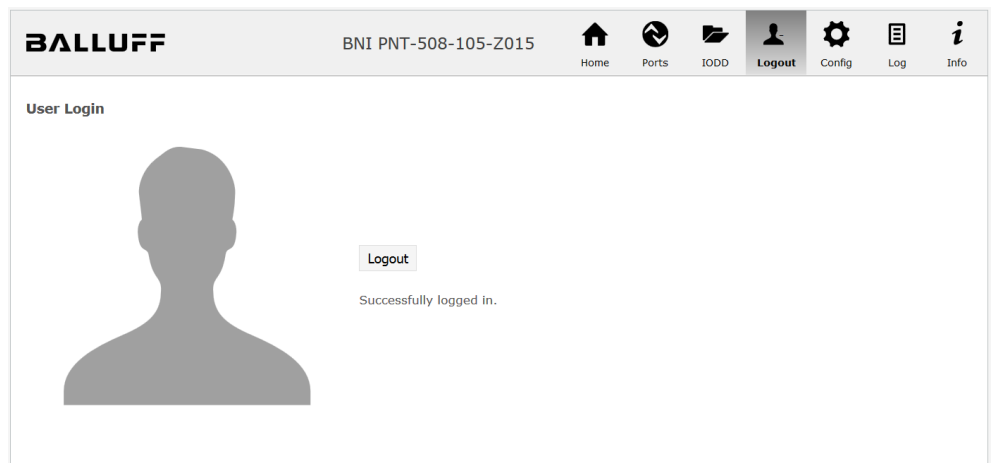
The default password is:

BNI PNT-XXX-XXX-XXXX	"BNIPNT"
BNI EIP-XXX-XXX-XXXX	"BNI EIP"
BNI ECT-XXX-XXX-XXXX	"BNI ECT"

The password cannot be changed!



After successfully logging in the dialogs are shown as follows:



Use the "Logout" button to log out again. After 5 minutes of no interaction with the Webserver the user is automatically logged out.



Note

For security reasons the fieldbus module shows only one login at a time with configuration access. Reading (without logging in) is however possible from multiple PCs at the same time on the fieldbus module.

8.4. "Home" dialog

Under "Home" you are given the essential information about the fieldbus itself and its network activity. You are also shown whether the configuration block was enabled by the controller (PLC).

Information is also shown about the current process data and the status of the module via the corresponding LEDs. After selecting "LED Legend" a Help dialog appears which explains the meaning of the LEDs.

If an IO-Link device is connected to one of the configured IO-Link terminals, some of the device data will be displayed in addition to the module data in the form of a link. After selecting one of these links the corresponding device dialog is opened.

The screenshot displays the Balluff web server interface for a BNI PNT-508-105-Z015 module. The interface includes a navigation bar with icons for Home, Ports, IODD, Logout, Config, Log, and Info. The main content area is divided into two sections: Module Information and a terminal status diagram.

Module Information

Product Name:	BNI PNT-508-105-Z015
Order Code:	BNI005H
Name:	Balluff GmbH
Location:	Schurwaldstraße 9
Contact:	+49 (0) 7158 173
Firmware Revision:	3.2
Hardware Revision:	6
Station name:	mydevice
IP Address:	192.168.0.3
Subnet Mask:	255.255.255.0
Gateway Address:	0.0.0.0
MAC Address:	00:19:31:3F:FF:32
Link Speed Port 1:	100 Mbit/s FULL
Link Speed Port 2:	No Link
PLC Lock:	No

The terminal status diagram shows a vertical stack of four IO-Link terminals. The top terminal is labeled "BALLUFF BNI IOL-302-002-Z046" and the bottom terminal is labeled "BALLUFF BNI IOL-802-000-Z036". Each terminal has a green LED indicator. Below the diagram is a link labeled "> LED Legend".

8 Web Server

PNT:

Module LED Functions

Indicator	Green	Yellow	Red
US	OK	Low	
UA	OK	Low	Error
SF	Supply error	High-priority service	
BF	No fault	No data exchange	
100	100 Mbit/s	10 Mbit/s	
LK	Link activity	No link activity	

Port LED Functions

IO-Link	0	1
IO-Link	Link circuit	No link
IO-Link	Link device	Link circuit

EIP:

Module LED Functions

Indicator	Green	Yellow	Red
US	OK	Low	
UA	OK	Low	Error
Mod	No error	Config Error	
Net	No config	No data exchange	Connector / Lineout
100	100 Mbit/s	10 Mbit/s	
LK	Link activity	No link activity	

Port LED Functions

IO-Link	0	1
IO-Link	Link circuit	No link
IO-Link	Link device	Link circuit

8.5. "Ports" dialog

The "Ports" dialog displays information and process data for the connected IO-Link devices. Select the desired IO-Link Port in the image of the fieldbus module on the right side to see the device data.



Note

The IO-Link device data are only displayed if the port is also configured as an IO-Link port!

No appropriate IODD uploaded

It is possible to read and write the configuration parameters of the IO-Link device via the "Parameters" option. The parameter indexes and subindexes of the IO-Link device are described in the corresponding separate user's guide (and follow the IO-Link conventions).

Under "Events" you can see whether a diagnostic event from the IO-Link device exists.

Under "Parameter Server Content" you can view the content of the parameter server if parameter data is stored on the parameter server.

BALLUFF BNI PNT-508-105-Z015 Home Ports IODD Logout Config Log Info

IO-Link Device Properties (Port 0)

Identification Data

Vendor ID:
 Device ID: 0x050D20
 Vendor Name: BALLUFF
 Vendor Text: www.balluff.com
 Product Name: BNI IOL-302-002-Z046
 Product ID: BNI00AU
 Product Text: Sensor/Actor hub M8
 Serial Number: 7A 69 68 67 6A 68 73 6C 66 61 6A 6B F6 64 6C 75
 Hardware Revision: 1
 Firmware Revision: 1.0 2016/03/08 09:05:24 R2920
 Application specific tag:

Process Data

Inputs (hex): 20 00
 Outputs (hex): 00 00

Parameters

Index:
 Subindex:
 Data (hex):
 Result: Read Write

Events

Current Event: Secondary supply voltage fault (Port Class B) - Check tolerance

Parameter server content

Vendor ID (hex): 00 00
 Device ID (hex): 00 00 00
 Checksum (hex): 00 00 00 00
 Content (hex): (none)

"Ports" dialog with direct parameter access

8 Web Server

Appropriate IODD uploaded

If an IODD appropriate to the IO-Link device connected to the currently selected port has been uploaded (see "Dialog "IODD"), the normal dialog for "Process Data" and "Parameters" is not displayed, but rather an expanded dialog. Information from the IODD of the device is used so that the data can be better understood.

Thus in the following screenshot not only are the input data of the distance sensor displayed as a hex number, but also interpreted and labeled under "Input". Since the sensor has no parameters, none are displayed.

BALLUFF BNI PNT-508-105-Z015

Home Ports IODD Logout Config Log Info

IO-Link Device Properties (Port 2)

Identification Data

Vendor ID: 0x0378
 Device ID: 0x020101
 Vendor Name: BALLUFF
 Vendor Text: www.balluff.com
 Product Name: BAW M18MI-BLC50B-S04G
 Product ID: 153938
 Product Text: Inductive distance sensor, 1...5mm
 Serial Number:
 Hardware Revision: 1.00
 Firmware Revision: 1.01
 Application specific tag:

Process Data

Inputs (hex): 00 03 FF
 Outputs (hex): no outputs

Input

Distance absolute	1023
Reserved bits	0

Events

Current Event: no Event

Parameter server content

Vendor ID (hex): 00 00
 Device ID (hex): 00 00 00
 Checksum (hex): 00 00 00 00
 Content (hex): (none)

Dialog "Ports": IODD interpretation and device image

If the IO-Link device on the currently selected port has parameters, these are shown in table format (see following screenshot). In this example the parameters for the Balluff Smart Light are shown.

The Smart Light is a signal light which can be used in three different modes. These modes can be set using an IO-Link parameter. The parameter values and associated texts are stored in the IO-Link.

This means "Operation Mode" can be read out and displayed ("Read" and "Read All" buttons) or written to the device ("Write" button).

If subindexes have no buttons they cannot be individually processed but rather only the entire index at once.



Note

Each changed value must be individually written by clicking on the "Write" button!

Parameters			Read All	
64 (0)	Operating mode (rw)	Segment mode ▾	Write	Read
65 (0)	Number of segments (rw)	One segment ▾	Write	Read
66 (0)	Type of level indicator (rw)	Bottom-up ▾	Write	Read
67 (0)	Resolution of level indicator (rw)	8 bit ▾	Write	Read
68 (0)	Level mode, segment 1 (rw)	See child elements		
68 (1)	Level mode, segment 1 color	Off ▾	Write	Read
68 (2)	Level mode, segment 1 dominance	<input type="radio"/> Color is not dominant <input type="radio"/> Color is dominant	Write	Read
69 (0)	Level mode, segment 2 (rw)	See child elements		
69 (1)	Level mode, segment 2 color	Off ▾	Write	Read
69 (2)	Level mode, segment 2 dominance	<input type="radio"/> Color is not dominant <input type="radio"/> Color is dominant	Write	Read
70 (0)	Level mode, segment 3 (rw)	See child elements		
70 (1)	Level mode, segment 3 color	Off ▾	Write	Read
70 (2)	Level mode, segment 3 dominance	<input type="radio"/> Color is not dominant <input type="radio"/> Color is dominant	Write	Read
71 (0)	Level mode, segment 4 (rw)	See child elements		
71 (1)	Level mode, segment 4 color	Off ▾	Write	Read
71 (2)	Level mode, segment 4 dominance	<input type="radio"/> Color is not dominant <input type="radio"/> Color is dominant	Write	Read

"Ports" dialog: Parameter list of an IO-Link device with uploaded IO-Link

8 Web Server

8.6. "IODD" dialog

Using this dialog you can transfer IODDs (device description files for IO-Link devices) and the associated device images to the fieldbus module, so that a detailed representation of the connected IO-Link devices in the "Ports" dialog is possible.

When IO-Link devices are connected and IO-Link ports are activated, the dialog shows a table with information about the IO-Link devices.

The fieldbus module file system supports only device names in "8+3" format, i.e. with a restricted name length. Since IODD files are generally published with a long file name, these must be renamed and given a shorter naming scheme on the PC before uploading to the fieldbus module.

For this a help setting is provided in the dialog, with the associated required IODD file name for the currently connected IO-Link devices shown in the bottom section of the list (column IODD Filename).

Image files without IODD can also be uploaded; the images are still displayed in the "Ports" dialog.

IODD Management

Device	Picture	
BA050A01.xml	X	Delete
BA020101.xml	X	Delete
BA050D20.xml	X	Delete

Choose the IODD to upload:

BA020101.png

Information

This module has a FAT12 file system, which means it supports only file names in 8.3 convention. **Please rename your IODDs according to the suggested filename in the table below.**

The suggested filename is generated according to following rule:

- The first two characters of the file name are the first two letters of the IODD Vendor Name. If the device has no vendor name, those characters are substituted by underscores.
- The remaining 6 characters must encode the DeviceID in hexadecimal representation (padded with zeros if necessary).

Note that the filename must contain the DeviceID that is in the IODD file!

Currently connected IO - Link Devices:

Vendor Name	Product Name	Product ID	Vendor ID	Device ID	IODD Filename
BALLUFF	BNI IOL-302-002-Z046	BNI00AU	0000	050D20	BA050D20.xml
BALLUFF	BNI IOL-802-000-Z036	BNI0072	0378	050A01	BA050A01.xml
BALLUFF	BAW M18MI-BLC50B-S04G	153938	0378	020101	BA020101.xml

Using the "Delete" button you can delete IODDs and device images from the fieldbus when needed.



Note

Before selecting the IODD it must be renamed on the PC to the file name which is shown in the table in the "IODD Filename" column!

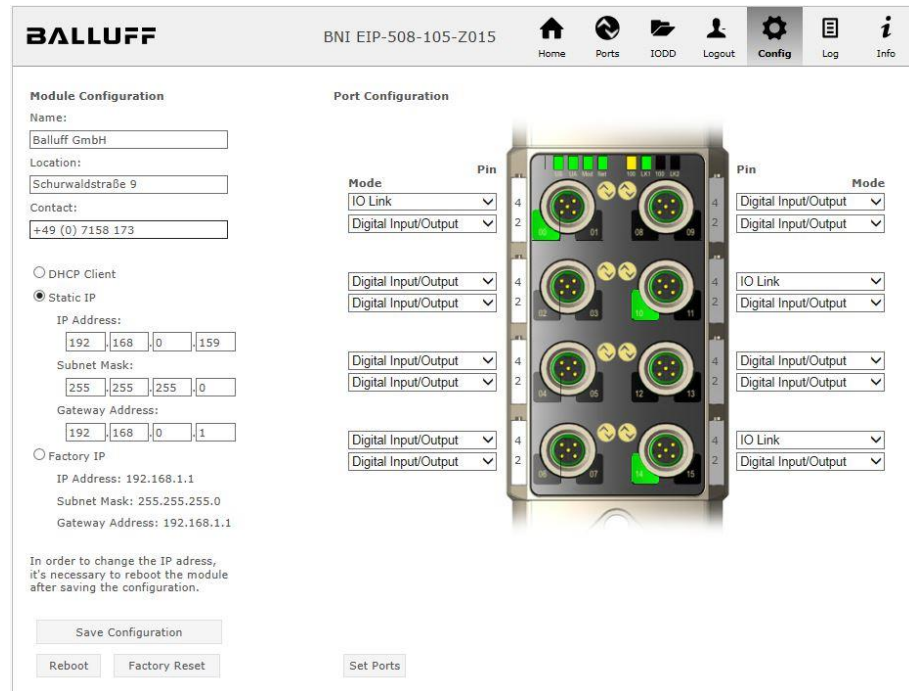
8.7. "Config" dialog

The configuration page enables configuration of the module. You can change both the module information texts and the port configuration. The "Set Ports" action is not permanently stored in the device and is lost after the next reboot or reset.

PNT / ECT:



EIP:



The parameter set "Module Configuration" on the left side is used by clicking "Save Configuration" and permanently stored in the device. The "Reboot" button reboots the device as if the power to the module had been turned off and on again. Clicking on "Factory Reset" deletes the configuration and log files saved in the device and then performs a reboot, so that the device is restored to the default factory configuration as on delivery.

8.8. "Log" dialog

This dialog provides general service information about the device as well as a logging function.

The upper table (see screenshot below) contains important information for all service inquiries.



Note

If you have a detailed question about a specific situation, send us a screenshot of this Website or print the site as a PDF.

Logging shows events which have occurred in chronological order. This provides a tool for detailed troubleshooting in equipment.

The screenshot shows the BALLUFF web interface for device BNI PNT-508-105-Z015. The top navigation bar includes Home, Ports, IODD, Logout, Config, Log, and Info. The 'Information' section displays the following data:

Product name:	BNI PNT-508-105-Z015	Browser time:	2016-12-16 10:26:29.495
Firmware revision:	3.2	System uptime:	50 secs 291 msecs
MAC address:	00:19:31:3F:FF:02	Free flash space:	1720 KB
IP address:	192.168.0.10	Web version:	2.0.113
Browser version:	Firefox 50.0		

The 'Log' section contains a table with the following columns: No., Severity, Date, Origin, and Message. The log entries are as follows:

No.	Severity	Date	Origin	Message
0	Notice	2000-01-01 00:00:00.404	SYS	System startup (Oct 6 2016, 11:54:01)
1	Notice	2000-01-01 00:00:00.437	SYS	Set MAC address: 00:19:31:3F:FF:02
2	Notice	2000-01-01 00:00:00.493	IOL_MASTER	IO-Link Master started
3	Informational	2000-01-01 00:00:00.501	IOL_MASTER	FW version 1.2.8
4	Notice	2000-01-01 00:00:01.999	ETH	Port 1: Link Up (100 MBit/s, full duplex)
5	Notice	2000-01-01 00:00:37.926	WEB_IF	Login successful, IP address: 192.168.0.50
6	Error	2000-01-01 00:00:41.902	IOL_MASTER	Port 0: Device disconnected
7	Error	2000-01-01 00:00:42.272	IOL_MASTER	Port 1: Device disconnected
8	Error	2000-01-01 00:00:42.981	IOL_MASTER	Port 3: Device disconnected
9	Notice	2000-01-01 00:00:43.169	IOL_MASTER	Port 2: ISDU read error: Error code 80 Additional Code 11
10	Notice	2000-01-01 00:00:43.347	IOL_MASTER	Port 2: ISDU read error: Error code 80 Additional Code 11
11	Warning	2000-01-01 00:00:43.347	IOL_MASTER	Port 2: BNI IOL-101-S01-K018 connected
12	Notice	2000-01-01 00:00:44.145	IOL_MASTER	Port 4: ISDU read error: Error code 80 Additional Code 11
13	Error	2000-01-01 00:00:44.183	IOL_MASTER	Port 5: Device disconnected
14	Warning	2000-01-01 00:00:44.499	IOL_MASTER	Port 4: BNI IOL-801-000-Z036 connected
15	Error	2000-01-01 00:00:44.830	IOL_MASTER	Port 6: Device disconnected
16	Error	2000-01-01 00:00:45.200	IOL_MASTER	Port 7: Device disconnected

Events are classified using the "**Severity**" column:

Internal Error (Emergency, Alert, Critical)

→ The fieldbus module has detected a fault in itself (hardware or software) which should not occur during normal operation. If this happens, the module must be serviced or replaced.

External Error (Error, Warning)

→ The fieldbus module has detected what may be a non-permissible event which is affecting the module from the outside. The system may require troubleshooting.

Event (Informational, Notice)

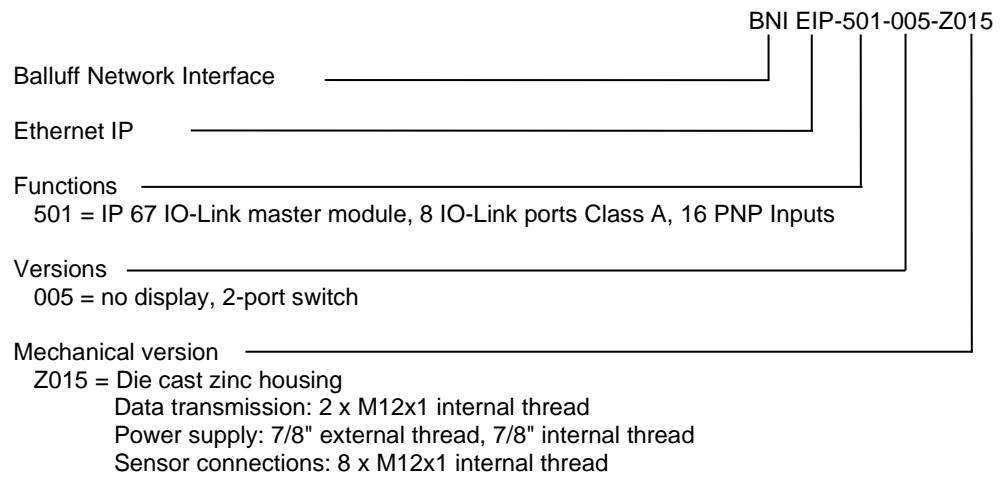
The fieldbus module has detected an important normal operating event and reports it. These may include for example configuration actions over the web interface and other configuration interfaces which are also recorded.

Clicking on "Set Module Time" sends the current browser time to the fieldbus module but does not permanently store it. After a reset, reboot or loss of power the time begins to run again from the year 2000.

Clicking on "Update Log" refreshes the display, and "Clear Log" deletes all entries. The log entries are stored in a ring buffer.

- 9.1. Scope of Delivery** The BNI EIP comprises the following elements:
- IO-Link block
 - 4x M12 dummy plugs
 - Ground strap
 - M4x6 screw
 - 20 informational signs

9.2. Order Number



9.3. Ordering Information

Product order code	Order code
BNI EIP-501-005-Z015	BNI00HK

Notes

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