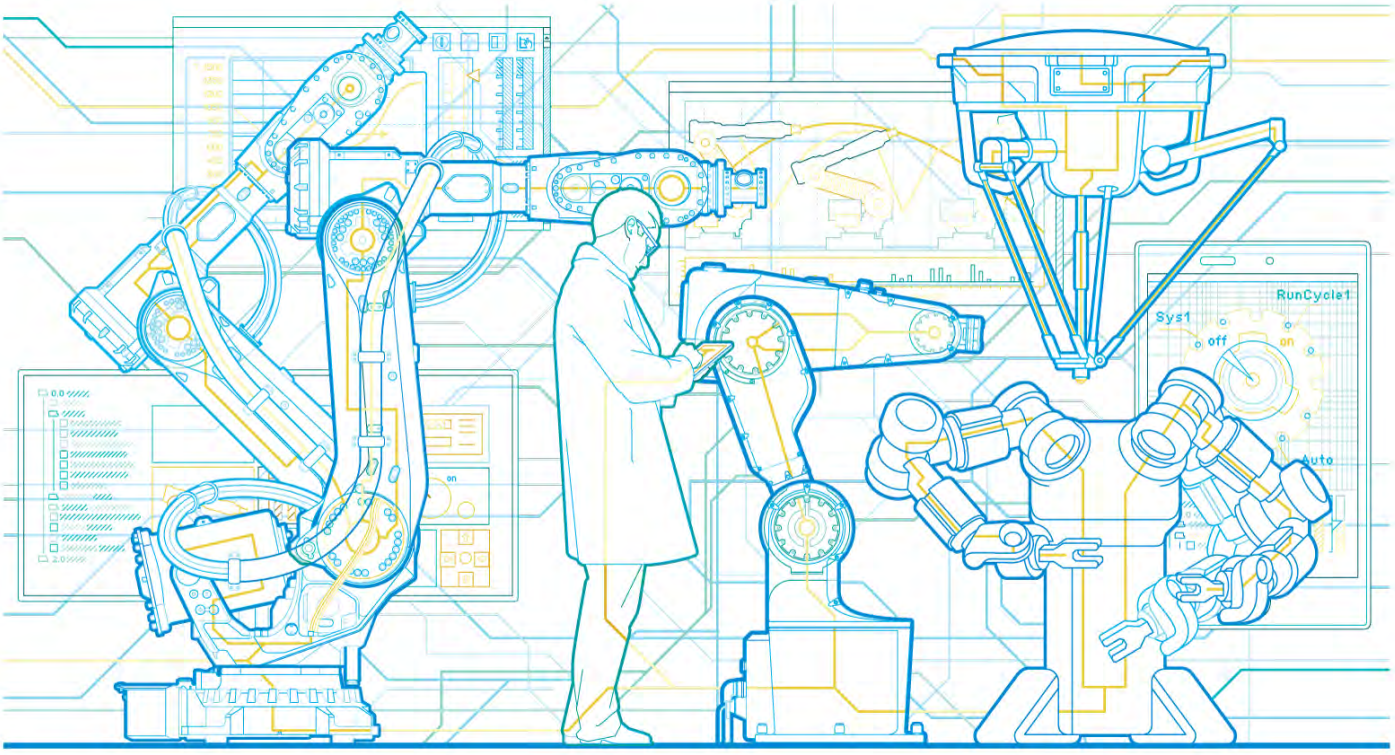

Application manual
EtherNet/IP Scanner/Adapter

Trace back information:
Workspace R17-1 version a2
Checked in 2017-03-13
Skribenta version 5.1.011

Application manual

EtherNet/IP Scanner/Adapter

RobotWare 6.05

Document ID: 3HAC050998-001

Revision: D

The information in this manual is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this manual.

Except as may be expressly stated anywhere in this manual, nothing herein shall be construed as any kind of guarantee or warranty by ABB for losses, damages to persons or property, fitness for a specific purpose or the like.

In no event shall ABB be liable for incidental or consequential damages arising from use of this manual and products described herein.

Keep for future reference.

Additional copies of this manual may be obtained from ABB.

Original instructions.

ABB AB, Robotics
Robotics and Motion
Se-721 68 Västerås
Sweden

Table of contents

Overview of this manual

About this manual

This manual describes the option *EtherNet/IP Scanner/Adapter* and contains instructions for the configuration.

Usage

This manual should be used during installation and configuration of the EtherNet/IP Scanner/Adapter and upgrading of the option EtherNet/IP Scanner/Adapter.

Who should read this manual?

This manual is intended for

- Personnel responsible for installations and configurations of industrial network hardware/software
- Personnel responsible for I/O system configuration
- System integrators

Prerequisites

The reader should have the required knowledge of

- Mechanical installation work
- Electrical installation work
- System parameters and how to configure them
- RobotStudio

References

Document references

Reference	Document ID
Operating manual - RobotStudio	*3HAC032104-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Product manual - IRC5	*3HAC047136-001*
Technical reference manual - System parameters	*3HAC050948-001*
Technical reference manual - RAPID Instructions, Functions and Data types	*3HAC050917-001*
Application manual - DeviceNet Master/Slave	*3HAC050992-001*
Application manual - Controller software IRC5	*3HAC050798-001*
Product specification - Controller IRC5 with FlexPendant	*3HAC041344-001*

Other references

Reference	Description
www.odva.org	The web site of ODVA (Open DeviceNet Vendor Association).

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Continued

Reference	Description
EtherNet/IP™ Specification, Edition 1.2	ODVA Specification comprises two volumes from the library: *Volume One: Common Industrial Protocol (CIP) Specification* and *Volume Two: EtherNet/IP Adaptation of CIP*.

Revisions

Revision	Description
-	First edition. Released with RobotWare 6.0.
A	Released with RobotWare 6.01. • Minor corrections. • Added information about different ways to connect to networks in section *Main computer on page 17*. • System parameters *Address*, *Subnet Mask*, and *Gateway* removed from *Industrial Network*.
B	Released with RobotWare 6.02. • Updated the path to the template files, see *Template I/O configuration file on page 28*.
C	Released with RobotWare 6.04. • *Request Packet Interval* parameter is replaced with O->T RPI and T->O RPI. • Information about local I/O devices in the device templates option.
D	Released with RobotWare 6.05. Added new parameter *Connection Timeout Multiplier on page 69* in section System Parameters.

Product documentation, IRC5

Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

All documents listed can be ordered from ABB on a DVD. The documents listed are valid for IRC5 robot systems.

Product manuals

Manipulators, controllers, DressPack/SpotPack, and most other hardware is delivered with a **Product manual** that generally contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation or electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals and expected life time of parts).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Calibration.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with exploded views (or references to separate spare parts lists).
- Circuit diagrams (or references to circuit diagrams).

Technical reference manuals

The technical reference manuals describe reference information for robotics products.

- *Technical reference manual - Lubrication in gearboxes*: Description of types and volumes of lubrication for the manipulator gearboxes.
- *Technical reference manual - RAPID overview*: An overview of the RAPID programming language.
- *Technical reference manual - RAPID Instructions, Functions and Data types*: Description and syntax for all RAPID instructions, functions, and data types.
- *Technical reference manual - RAPID kernel*: A formal description of the RAPID programming language.
- *Technical reference manual - System parameters*: Description of system parameters and configuration workflows.

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Continued

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, DVD with PC software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and trouble shooters.

The group of manuals includes (among others):

- *Operating manual - Emergency safety information*
- *Operating manual - General safety information*
- *Operating manual - Getting started, IRC5 and RobotStudio*
- *Operating manual - IRC5 Integrator's guide*
- *Operating manual - IRC5 with FlexPendant*
- *Operating manual - RobotStudio*
- *Operating manual - Trouble shooting IRC5*

Safety

Safety of personnel

When working inside the robot controller it is necessary to be aware of voltage-related risks.

A danger of high voltage is associated with the following parts:

- Devices inside the controller, for example I/O devices, can be supplied with power from an external source.
- The mains supply/mains switch.
- The power unit.
- The power supply unit for the computer system (230 VAC).
- The rectifier unit (400-480 VAC and 700 VDC). Capacitors!
- The drive unit (700 VDC).
- The service outlets (115/230 VAC).
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the controller remains live even when the robot is disconnected from the mains.
- Additional connections.

Therefore, it is important that all safety regulations are followed when doing mechanical and electrical installation work.

Safety regulations

Before beginning mechanical and/or electrical installations, ensure you are familiar with the safety regulations described in *Operating manual - General safety information*[1].

[1] This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

Network security

Network security

This product is designed to be connected to and to communicate information and data via a network interface, It is your sole responsibility to provide and continuously ensure a secure connection between the product and to your network or any other network (as the case may be). You shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Ltd and its entities are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Terminology

Terms

Term	Explanation
Adapter	I/O device that is controlled by a scanner in an Ethernet network. Previously, ABB documentation used the term *slave*.
CIP	Common Industrial Protocol. Protocol that DeviceNet and EtherNet/IP are based on.
Client	See Scanner. Some documents use the term *client*, whereas the ABB documentation use the term *Scanner* for EtherNet/IP industrial network.
EDS	Electronic Data Sheet. EDS files contain the configuration details relevant to CIP devices.
Explicit Messages	An explicit message is a request or response oriented communication with other devices. These messages are mostly configuration data.
Implicit Messages	Implicit messages are exchanged between I/O connections. No messaging protocol is contained within the message data as with Explicit messaging. Implicit messages can be point to point (unicast) or multicast and are used to transmit application specific I/O data.
LAN	Connector for Local Area Network.
M12	Ethernet contact with IP67 classification.
Master	See term *Scanner*.
ODVA	Open DeviceNet Vendor Association. Organization for networks built on CIP, for example DeviceNet and EtherNet/IP.
RJ45	Standard Ethernet contact.
Scanner	Controls other I/O devices (adapters) in an Ethernet network. Previously, ABB documentation used the term *Master*.
Server	See term *Adapter*. Some documents use the term *server*, whereas the ABB documentation use the term *adapter* for EtherNet/IP industrial network.
Slave	See term *Adapter*.
WAN	Port for Wide Area Network.

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1 Introduction

1.1 What is EtherNet/IP?

General

EtherNet/IP is a communications link to connect industrial devices.

The EtherNet/IP (EtherNet Industrial Protocol) is managed by ODVA (Open DeviceNet Vendors Association). It is a well established industrial Ethernet communication system with good real-time capabilities. EtherNet/IP extends commercial off-the-shelf Ethernet to the CIP (Common Industrial Protocol)— the same upper-layer protocol and object model found in DeviceNet and ControlNet. CIP allows EtherNet/IP and DeviceNet system integrators and users to apply the same objects and profiles for plug-and-play interoperability among devices from multiple vendors and in multiple sub-nets. Combined, DeviceNet, ControlNet and EtherNet/IP promote transparency from sensors to the enterprise software.

Examples of applications

Here are some examples of EtherNet/IP applications:

- Peer-to-peer data exchange where an EtherNet/IP product can produce and consume messages
- Scanner/adapter operation defined as a proper subset of peer-to-peer
- An EtherNet/IP product can function as a client or server, or both

Standardization

EtherNet/IP is standardized according to the International standard IEC 61158 and EtherNet/IP devices are certified by ODVA for interoperability and conformance.

Data

The following table specifies a number of EtherNet/IP data.

Network type	Ethernet based Control Level network with CIP application protocol
Installation	Standard Off the Shelf (COTS) Ethernet cables and connectors. 10/100/1000 Mbit/s TX Ethernet cable or fibre optics. RJ45, M12 or fibre optic connectors.
Speed	10, 100, 1000 Mbit/s

EDS file

The configuration process is based on EDS files (Electronic Data Sheet) which are required for each EtherNet/IP device. EDS files are provided by the device manufacturers. It contains electronic descriptions of all relevant communication parameters and objects of the EtherNet/IP device.

1.2 EtherNet/IP for IRC5

General

The EtherNet/IP network is running on the IRC5 main computer and does not require any additional hardware. EtherNet/IP as described in this manual requires the main computer DSQC1000.

Options

With option *EtherNet/IP Scanner/Adapter*, the IRC5 controller can act as a scanner, adapter, or both on the EtherNet/IP network.

Tip

If only EtherNet/IP adapter functionality is required, then the option *EtherNet/IP Anybus Adapter* can also be used.

For more information, see *Application manual - EtherNet/IP Anybus Adapter*.

Specification overview

Item	Specification
Industrial Network type	EtherNet/IP
Conform to	EtherNet/IP protocol conformance test A-9
Data rate	10/100 Mbit
Connection type	Cyclic
Connection size	Maximum 509 input bytes and 505 output bytes
Transport Class	Class 1 I/O implicit

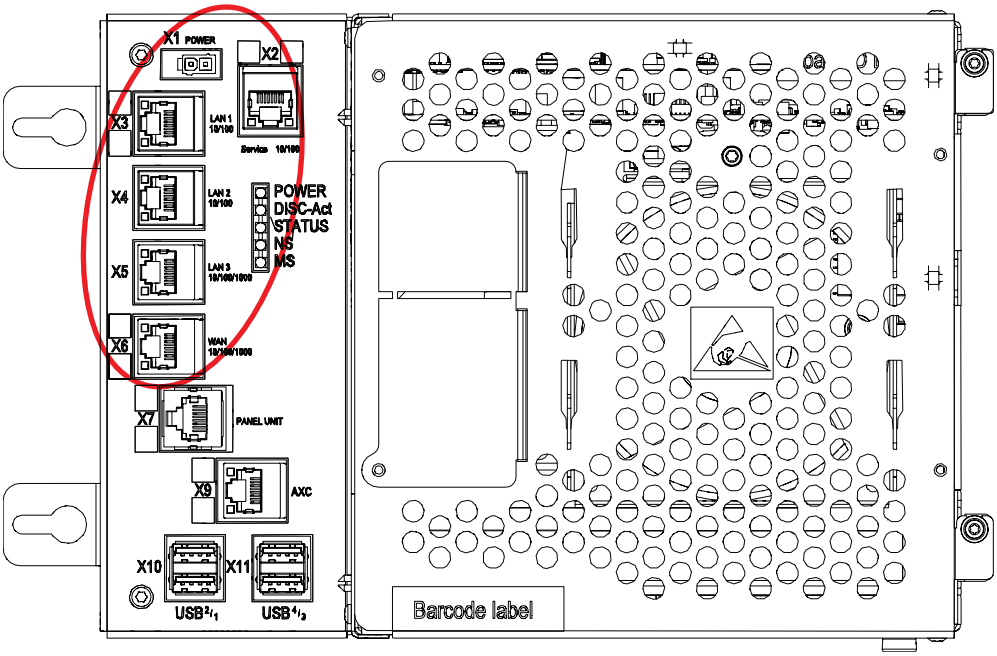
2 Hardware overview

2.1 Main computer

Connections

The I/O network can be connected to one of the the Ethernet ports WAN, LAN 2, or LAN 3 on the main computer.

The following figure illustrates where the Ethernet port connectors, are placed on the main computer.



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Connector	Label	Description
X2	Service	Port to the robot's private network. Intended to be left empty so that service personnel can use it to connect to the computer unit.
X3	LAN 1	Port to the robot's private network. Normally used to connect the FlexPendant.
X4	LAN 2	Port to the robot's private network.
X5	LAN 3	By default LAN 3 is configured for an isolated LAN3 network. Can be reconfigured to be a part of the private network.
X6	WAN	Wide Area Network that can host a public industrial network.

Note

It is not supported to connect multiple ports of the main computer (X2 - X6) to the same external switch, unless static VLAN isolation is applied on the external switch.

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Intended use of WAN and LAN ports

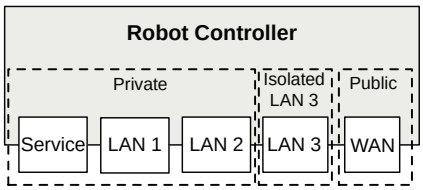
The WAN port is a public network interface to the controller, typically connected to the factory network with a public IP address provided by the network administrator.

The LAN ports are intended for connecting network based process equipment to the controller, for example industrial networks, cameras, and welding equipment.

LAN 2 can only be used as a private network to the IRC5 controller.

Isolated LAN 3 or LAN 3 as part of the private network

The default configuration is that LAN 3 is configured as an isolated network. This allows several robot controller to be connected to the same network, see *EtherNet/IP on dedicated industrial network on page 21*.



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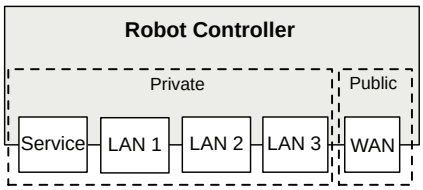
An alternative configuration is that LAN 3 is part of the private network. The ports Service, LAN 1, LAN 2, and LAN 3 then belong to the same network and act just as different ports on the same switch. This is configured by changing the system parameter *Interface*, in topic *Communication* and type *Static VLAN*, from "LAN 3" to "LAN". See *Technical reference manual - System parameters*.



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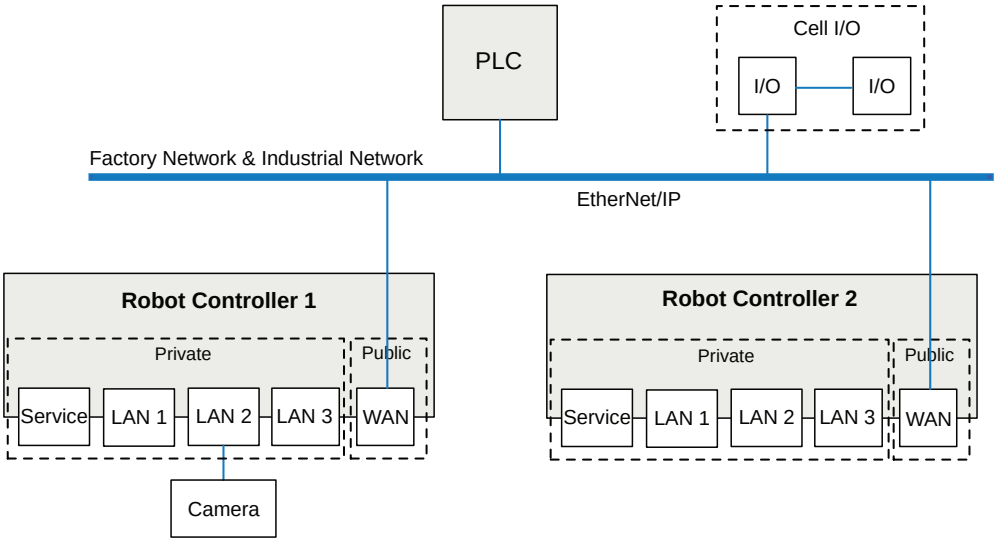
One EtherNet/IP network connected to the robot controller

If EtherNet/IP is used on the public network (WAN port) without an Anybus adapter, EtherNet/IP cannot be used on the private network. Equipment not using EtherNet/IP (for example a camera) can be connected to the private network. To use EtherNet/IP on both the public and private network, an Anybus adapter must be used. See *Using Anybus adapter to connect two EtherNet/IP networks on page 22*.

EtherNet/IP on factory network

When the WAN port is used for connecting to an industrial network, the traffic shares the same media as the factory network and will share bandwith with other non industrial network traffic.

The following figure illustrates the network when connecting a scanner and an adapter to the WAN port of the main computer:



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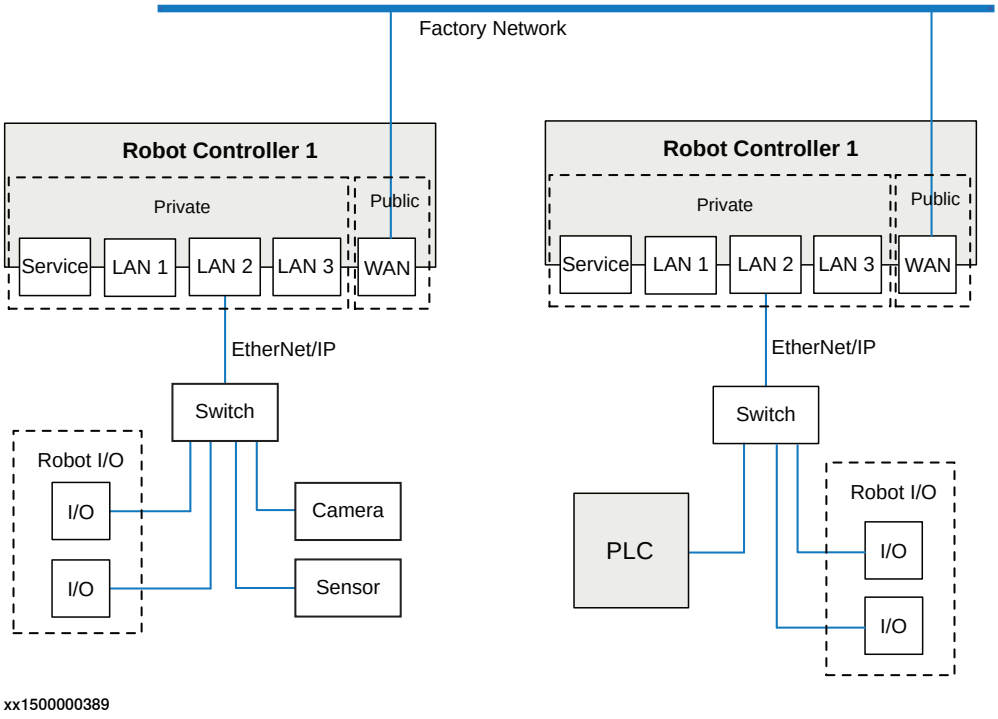
2.1 Main computer
Continued

EtherNet/IP on private network

The private network can contain I/O, sensors, etc. for the robot controller. However, it is not possible to connect several robot controllers to the same private network.

The following illustration shows two robot controllers with EtherNet/IP (and other IP traffic) on each private network. The factory network cannot communicate with the robot controller using EtherNet/IP.



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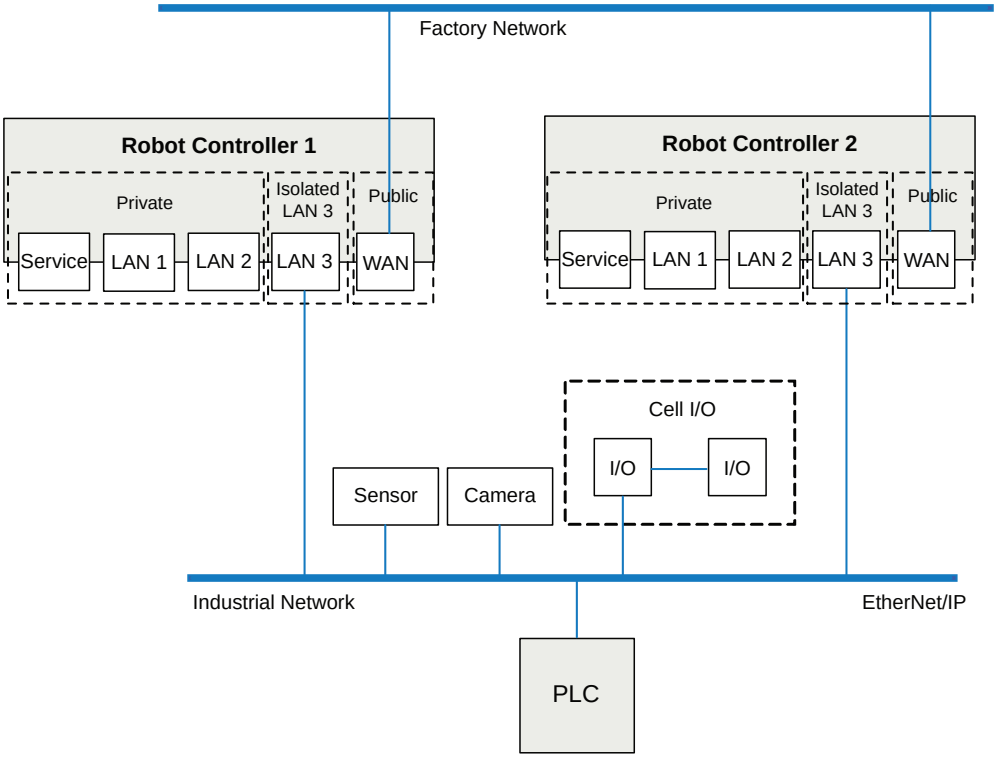
EtherNet/IP on dedicated industrial network

By connecting to the isolated LAN 3 port it is possible to connect several robot controllers to a dedicated industrial network.



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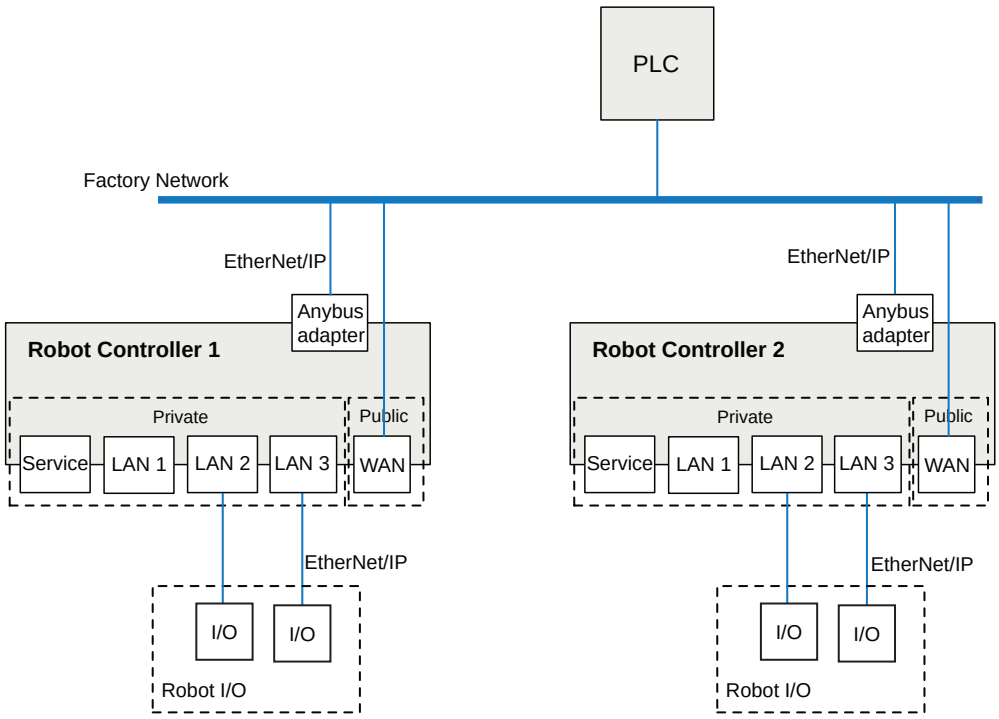
Using Anybus adapter to connect two EtherNet/IP networks

EtherNet/IP on shared factory network and private network

To be able to use EtherNet/IP on both the public and the private network, an Anybus adapter must be used. If the same factory network is used both for EtherNet/IP communication and other communication, both the Anybus adapter and the WAN port must be connected to the factory network. For information about the EtherNet/IP Anybus adapter, see *Application manual - EtherNet/IP Anybus Adapter*.



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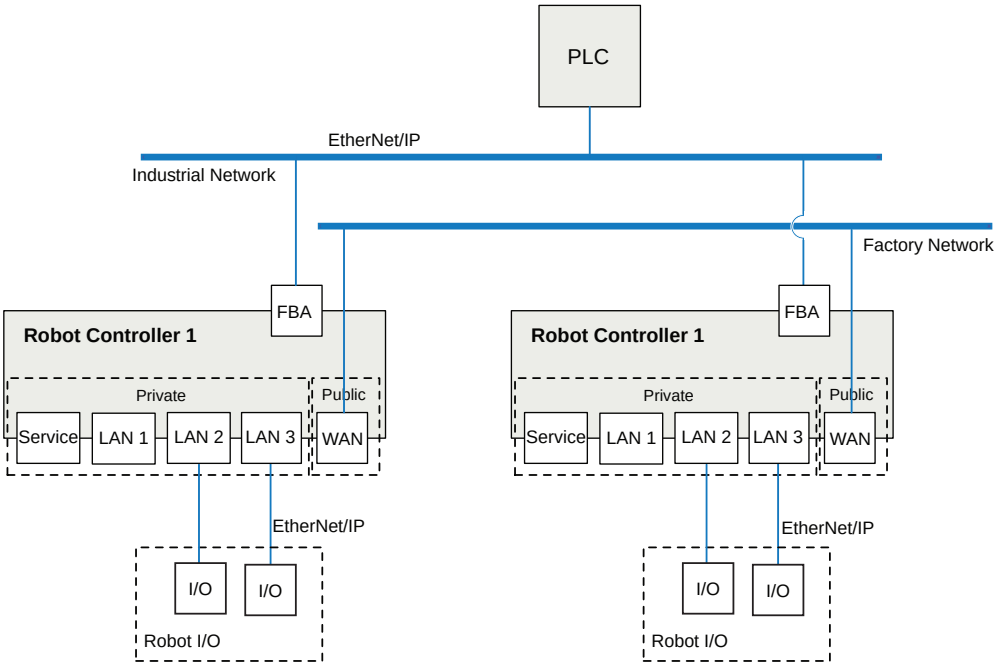
EtherNet/IP on dedicated industrial network

If the EtherNet/IP communication shall be separated from other Ethernet communication, an Anybus adapter must be installed and connected to the public EtherNet/IP industrial network and the WAN port connected to the factory network. For information about the EtherNet/IP Anybus adapter, see *Application manual - EtherNet/IP Anybus Adapter*.



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2.2 Ethernet switches

Prerequisites

It is recommended that switches used in the I/O network support Quality of Service (QoS).

I/O devices mark their packets with a priority value. The priority value is used in order to get better I/O data throughput and shorter delays on the network.

Switches and routers are then able to differentiate the I/O device's critical from the other non-critical traffic. To do this, the switches and routers must support Quality of Service.

2.3 I/O devices

Limitations

It is possible to connect any type of EtherNet/IP compliant I/O device on the EtherNet/IP network. All I/O devices should comply with the EtherNet/IP standard and be conformance tested by ODVA. I/O devices may be mounted inside the IRC5 controller.

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3 Software overview

3.1 Information about the adapter device

General

To use the EtherNet/IP adapter device, the IRC5 controller must be installed with the option *841-1 EtherNet/IP Scanner/Adapter*.

The EtherNet/IP adapter device can be used to:

- connect a PLC to the IRC5 controller.
- connect the IRC5 controller to another IRC5 controller which acts as a scanner.

Industrial Network

When the robot system is installed with the EtherNet/IP Scanner/Adapter option, a predefined industrial network with the name *EtherNetIP* is created at system startup.

Predefined internal adapter device

When the robot system is installed with the EtherNet/IP Scanner/Adapter option, a predefined internal adapter device with the name *EN_Internal_Device* is created at system startup. This internal device is used to define the internal adapter device in the IRC5 controller, which will enable a PLC to connect to the IRC5 controller. There can be only one internal adapter device defined in the IRC5 controller.

I/O device

The input and output map starts at bit 0.

EDS file

An Electronic Data Sheet file, EDS file, is available for the internal adapter device, matching the configuration of the predefined *EtherNet/IP Internal Adapter Device EN_Internal_Device*.

The EDS file, *enip.eds*, for the adapter device can be obtained from the RobotStudio or the IRC5 controller.

- **In the RobotWare installation folder in RobotStudio**: *...\RobotPackages\RobotWare_RPK_<version>\utility\service\ioconfig\EtherNetIP*
- **On the IRC5 Controller**: *<SystemName>\PRODUCTS\<RobotWare_xx.xx.xxxx>\utility\service\EDS*

Note

Navigate to the RobotWare installation folder from the RobotStudio **Add-Ins** tab, by right-clicking on the installed RobotWare version in the **Add-Ins** browser and selecting **Open Package Folder**.

Continues on next page

Template I/O configuration file

A template I/O configuration file is available for the internal adapter device. The file contains preconfigured names for all available inputs and outputs. The file can be loaded to the controller, using RobotStudio or the FlexPendant, to facilitate and speed up the configuration.

The I/O template configuration file, *EN_Internal_Device.cfg*, can be obtained from the RobotStudio or the IRC5 controller.

- **In the RobotWare installation folder in RobotStudio**: *...\RobotPackages\RobotWare_RPK_<version>\utility\service\ioconfig\EtherNetIP*
- **On the IRC5 Controller**: *<SystemName>\PRODUCTS\<RobotWare_xx.xx.xxxx>\utility\service\ioconfig\EtherNetIP*

Note

Navigate to the RobotWare installation folder from the RobotStudio **Add-Ins** tab, by right-clicking on the installed RobotWare version in the **Add-Ins** browser and selecting **Open Package Folder**.

Assembly

The internal adapter device has the following assembly values.

Assembly	Value
Output	112
Input	100
Configuration	0

Behavior

Cyclic I/O connection is supported and the size of the I/O connection is defined by the predefined EtherNet/IP Internal Adapter Device, EN_Internal_Device.

Note

If the EtherNet/IP adapter device loses connection with its scanner, the configured input signals are cleared (reset to zero). The output signals are kept and are possible to change.

When the connection is re-established, the EtherNet/IP adapter device updates the input and output signals.

3.2 Information about the internal scanner

General

To use the EtherNet/IP internal scanner, the IRC5 controller must be installed with the option *841-1 EtherNet/IP Scanner/Adapter*.

The EtherNet/IP internal scanner can be used to:

- connect EtherNet/IP I/O devices to the IRC5 controller.
- connect the IRC5 controller to another IRC5 controller which acts as an adapter.

Industrial Network

When the robot system is installed with the EtherNet/IP Scanner/Adapter option, a predefined industrial network *EtherNetIP* is created at system startup.

Device Templates

There are predefined device templates available for the internal scanner. These device templates can be used when defining a new I/O device by using the Configuration Editor in RobotStudio or FlexPendant, see *Creating and configuring the internal scanner on page 36*. Examples of present device templates are:

- *ABB EtherNet/IP Adapter Device* is used on the scanner side when connecting to another IRC5 EtherNet/IP adapter.
- *ABB EtherNet/IP Anybus Adapter Device* is used on the scanner side to connect to an IRC5 Ethernet/IP adapter using the EtherNet/IP Anybus Adapter Device.
- *ABB Robotics EtherNet/IP IO Device - 16DO/16DI* is local IO device from ABB.
- *ABB Robotics EtherNet/IP IO Device - 16DI/16DO/8RO/8RI/4AI/16DI/16DO* is local IO device from ABB.
- *Aros Hyperion - 16DO/16DI*

Apart from the existing device templates listed above, you can create device templates to define a new I/O device. For more information, refer *Using EDS files to create device templates on page 38*.

Number of allowed I/O devices

A maximum number of 20 user defined I/O devices can be defined in the IRC5 system, for more information see *Device Type* of *I/O System* section in*Technical reference manual - System parameters*.

The following are counted as user defined I/O devices:

- All EtherNet/IP adapter devices connected to the IRC5 EtherNet/IP scanner.
- Simulated EtherNet/IP I/O devices.

> **Note**
>
> The internal adapter device is not counted as an user defined I/O device.

Continues on next page

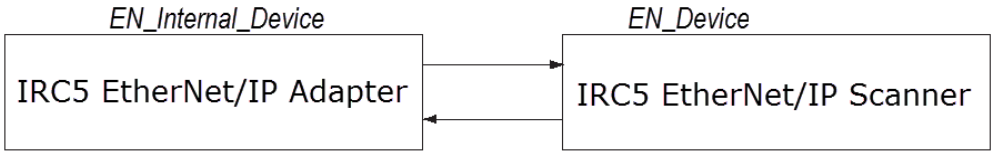
It is possible to use ABB I/O devices or I/O devices from other vendors. Only the EtherNet/IP Scanner/Adapter option is required to run I/O devices from other vendors.

The input and output assemblies are used by the EtherNet/IP scanner to locate the input and output data in the I/O device. The assembly values for different I/O devices are available in the EDS file and in the User Manual. We recommend you to refer the User Manual for the assembly values of the I/O device.

Connecting two IRC5 systems

When connecting two IRC5 systems, the internal adapter should be seen and configured as any other ordinary device from the other IRC5 system, which is acting as a scanner. See *Communication between two IRC5 controllers on page 46*.

The following picture illustrates how to use the predefined internal device (EN_Internal_Device) and the device template ABB EtherNet/IP Adapter Device (EN_Device).



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4 Installing and configuring the internal adapter device

4.1 Recommended working procedure

General

This section describes the recommended working procedure when installing and configuring the EtherNet/IP adapter device. The working procedure helps to understand the dependencies between the different steps.

When the IRC5 controller is connected to an external scanner, the IRC5 controller acts as an ordinary adapter device on the EtherNet/IP network.

Basic steps

Use this procedure to install and configure an EtherNet/IP adapter device.

	Action	See
1	Use RobotStudio to configure the topic Communication.	*Technical reference manual - System parameters*
2	Use RobotStudio to configure the EtherNet/IP network settings.	*Configuring the EtherNet/IP network settings on page 32*
3	Configure the adapter device in the IRC5 controller using RobotStudio or the FlexPendant.	*Configuring the internal adapter device on page 33*

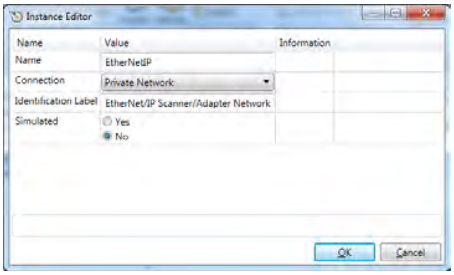
4.2 Configuring the EtherNet/IP network settings

General

The following procedure describes how to change the EtherNet/IP network settings using RobotStudio.

Industrial Network configuration

Use this procedure to configure the EtherNet/IP network settings in the IRC5 controller, using RobotStudio.

	Action	Note
1	Start RobotStudio and connect to the IRC5 controller. Request write access.	
2	Open the **Configuration Editor** and select **I/O System**.	For more information about the parameters, see *System parameters on page 49*.
3	In the **Type** list click **Industrial Network** and edit the parameter *EtherNetIP*. Enter the parameter values for the industrial network. • **Connection**, select one previously configured in *IP Setting* in topic *Communication*. • **Identification Label**, user defined. Click **OK**.	 xx1400001924
4	Restart the controller or continue with the next step of the configuration.	*Configuring the internal adapter device on page 33*

Note

Note that the adapter device and the internal scanner use the same *Connection*. This means that the network settings are shared between the adapter and internal scanner if the IRC5 controller acts as both on the EtherNet/IP network.

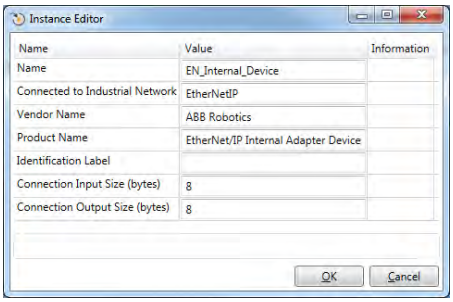
Note

Gateway is chosen from one of the configured instances of *IP Route* (see *Technical reference manual - System parameters*). The gateway is matched with the configured *IP Setting* pointed out by the *Connection* parameter for the *Industrial Network* (see *Connection on page 51*). If the gateway is found to be on the same network as defined by the *IP Setting* for the *Industrial Network*, it is chosen.

4.3 Configuring the internal adapter device

Internal adapter device configuration

Use this procedure to configure the internal adapter device in the IRC5 controller, using RobotStudio.

	Action	Note
1	Start RobotStudio and connect to the IRC5 controller. Request write access.	
2	Open the **Configuration Editor** and select **I/O System**.	For more information about the parameters, see *System parameters on page 49*.
3	In the **Type** list, click **EtherNet/IP Internal Device**, right-click in the workspace on the EN_Internal_Device item and select **Edit EtherNet/IP Internal Device**. Edit the parameter values, if applicable. • **Connected to Industrial Network**, shall be EtherNetIP. • **Identification Label**, user defined. • If the size needs to be changed, change the default values for **Connection Input Size** and **Connection Output Size** to the desired size. **Note** This step is optional. Click **OK**.	 xx1400001925
4	In the **Type** list click **Signal**. Add I/O signals for the internal adapter device.	
5	Restart the controller.	

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5 Installing and configuring the internal scanner

5.1 Recommended working procedure

General

This section describes the recommended working procedure when installing and configuring the EtherNet/IP internal scanner.

Basic steps

Use this procedure to install and configure an EtherNet/IP scanner.

	Action	See
1	Use RobotStudio to configure the topic Communication.	*Technical reference manual - System parameters*
2	Use RobotStudio to configure the EtherNet/IP network settings.	*Configuring the EtherNet/IP network settings on page 32*
3	Configure the I/O devices connected to the EtherNet/IP industrial network using RobotStudio or FlexPendant.	*Creating and configuring the internal scanner on page 36*

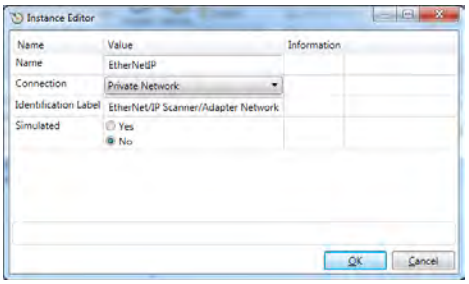
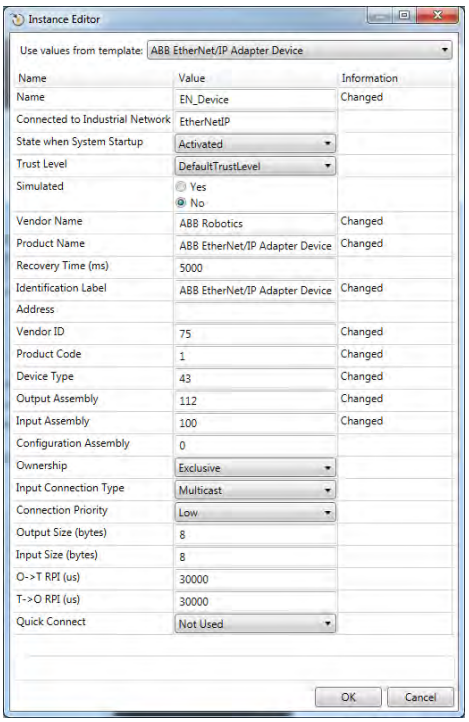
Additional configuration

Action	See
Creating device templates by using EDS files	*Using EDS files to create device templates on page 38*.
Configuring *QuickConnect* functionality.	*QuickConnect on page 66*.
Setting up communication between two IRC5 controllers.	*Communication between two IRC5 controllers on page 46*.

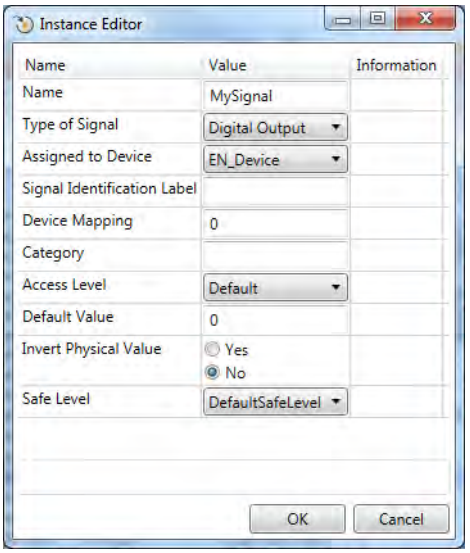
5.2 Creating and configuring the internal scanner

Internal scanner configuration

Use this procedure to configure the EtherNet/IP scanner in the IRC5 controller, using the **Configuration Editor** in RobotStudio.

	Action	Note
1	Start RobotStudio and connect to the IRC5 controller. Request write access.	
2	Click **Configuration Editor** and select **I/O System**.	
3	In the **Type** list, click **Industrial Network** and then right-click in the workspace on the EtherNetIP item and select **Edit Industrial Network**.	For more information about the parameters, see *System parameters on page 49*.
4	Enter the parameter values for the industrial network. • **Connection**, select one previously configured in *IP Setting* in topic *Communication*. Click **OK**.	 xx1400001924
5	In the **Type** list, click **EtherNet/IP Device** and then right-click in the workspace and select **New EtherNet/IP Device**.	
6	Enter the parameter values for the new I/O device. • **Use values from template**, select the *ABB EtherNet/IP Adapter Device* option. **Note** **Use values from template** drop-down list shows the existing templates and templates created by using EDS file (See *Using EDS files to create device templates on page 38*). • **Connected to Industrial Network**, shall be *EtherNetIP*. • **Identification Label**, user defined. **Note** Continue editing the parameters if necessary. • Change the size in **Connection Input Size** and **Connection Output size**, as desired. This step is optional. Click **OK**.	 xx1400001940

Continues on next page

	Action	Note
7	In the **Type** list click **Signal**. Add I/O signals for the new I/O device.	 xx1400001941
8	Restart the IRC5 controller to connect to the configured device.	

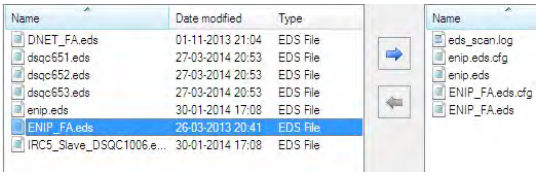
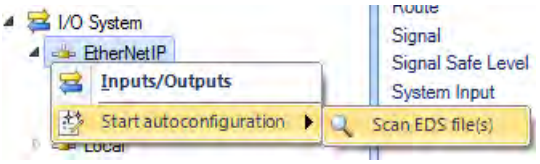
Continues on next page

5.2.1 Using EDS files to create device templates

Procedure

It is possible to create device templates from the EDS files. A device template is created for each valid connection found in the Connection Manager section in the EDS file.

Use this procedure to create device templates by using EDS files.

	Action	Note
1	Start RobotStudio and connect to the IRC5 controller. Request write access. To proceed with the steps, the system should be in manual mode.	
2	Click **File Transfer** and locate the folder EDS in HOME directory. Select the required EDS file and click the Right Arrow button to transfer the files. **Note** Transfer the EDS files for the devices involved in the EtherNet/IP network	 xx1400002221
3	Click **I/O System** to expand the folder. Select **EtherNetIP** and right-click in the workspace and select **Scan EDS file(s)** • Files are parsed. • Click Yes to continue with the device templates creation. • Click Ok to continue with report generation in the event log. **Note** The EDS reader does not check if the file is syntactically correct. It is important that the device created from the device template is inspected manually.	 xx1400002222
4	The device templates are created and available as options in **Use values from template** while creating a new I/O device.	

5.3 Explicit messaging services

5.3.1 Information

General

It is possible to configure I/O devices through explicit messaging services. This could be done either at startup by defining the EtherNet/IP command to the configured device, or at runtime from RAPID through the *Fieldbus Command Interface* (FCI).

> **Note**
>
> For information about which explicit messaging services are available for a specific I/O device and how to set the parameters, refer to the supplier documentation of the I/O device and the *Common Industrial Protocol (CIP) Specification*, see *References on page 7*.

EtherNet/IP command system parameters

The EtherNet/IP specific system parameters in the *EtherNet/IP Command* type are:

- Path (`Path`), see *Path on page 70*.
- Service (`Service`), see *Service on page 71*.
- Download Order (`-OrderNr`), see *Technical reference manual - System parameters*.

> **Note**
>
> For more information, see *Technical reference manual - System parameters*.

The *Path* parameter

Following is a short description of the syntax used in the `Path` parameter.

```
"Path length, 20 Class 24 Instance 30 Attribute, Data type, Data
     type length"
```

The following table provides a description of the parameters used in the syntax:

Parameter	Description
Path length	The byte count for the "20 64 24 01 30 05" string. This is an optional parameter.
Class	The EtherNet/IP class number.
Instance	The instance number of the class.
Attribute	The attribute of the specified instance.
Data type	The data format of the attribute. This is an optional parameter.
Data type length	The length in bytes of the specified Data type. The highest allowed value is 0x20 (32 bytes). This parameter is ignored, but is accepted if entered.

Continues on next page

5.3.1 Information
Continued

The following table provides a list of the allowed data types for the parameter *Data type*:

Data Type	Value	Description
CIP_EXPL_BOOL	C1	Logical Boolean with values TRUE and FALSE
CIP_EXPL_SINT	C2	Signed 8-bit integer value
CIP_EXPL_INT	C3	Signed 16-bit integer value
CIP_EXPL_USINT	C6	Unsigned 8-bit integer value
CIP_EXPL_UINT	C7	Unsigned 16-bit integer value
CIP_EXPL_UDINT	C8	Unsigned 32-bit integer value
CIP_EXPL_REAL	CA	32-bit floating point value
CIP_EXPL_STRING	D0	Character string (1 byte per character)
CIP_EXPL_BYTE	D1	Bit string - 8-bits
CIP_EXPL_WORD	D2	Bit string - 16-bits
CIP_EXPL_DWORD	D3	Bit string - 32-bits
CIP_EXPL_SHORT_STRING	DA	Character string (1 byte per character, 1 byte length indicator)

The following table provides a list of what delimiter to use for the parameter *Value*, if the data is an array:

Data Type	Delimiter	Example
CIP_EXPL_BOOL CIP_EXPL_SINT CIP_EXPL_INT CIP_EXPL_USINT CIP_EXPL_UINT CIP_EXPL_UDINT CIP_EXPL_REAL CIP_EXPL_BYTE CIP_EXPL_WORD CIP_EXPL_DWORD	The values are delimited by space.	"123 214 125 2 44" An array of 5 elements. The Data Type specifies the type of each element.
CIP_EXPL_STRING CIP_EXPL_SHORT_STRING	The values are delimited by semicolon.	"Hello;This;Is;My;Name" An array of 5 elements of string type.

The *Service* parameter

The *Service* parameter describes what type of operation that should be performed against the specified *Path* parameter.

Following are the allowed values for *Service*:

Operation	Value	Description
Set Attribute Single	16	Set the value specified in parameter *Value* of the *EtherNet/IP Command*.
Reset	5	Performs a reset of the specified device.

Continues on next page

The *Download Order* parameter

The *Download Order* parameter is used to specify in what order the commands are sent to the I/O device.

If an EtherNet/IP Command is rejected by the I/O device, the EtherNet/IP scanner will generate an event message with the error code returned by the I/O device.

5.3.2 EtherNet/IP command at startup

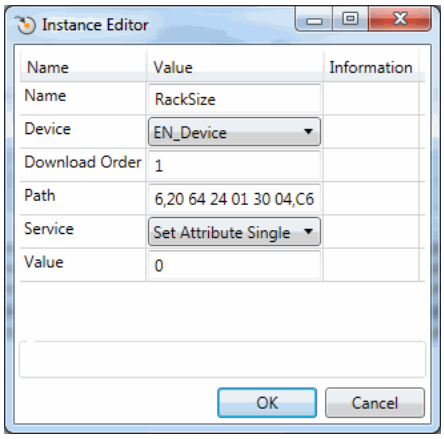
Information

It is possible to configure EtherNet/IP Commands that will be sent to a device at startup:

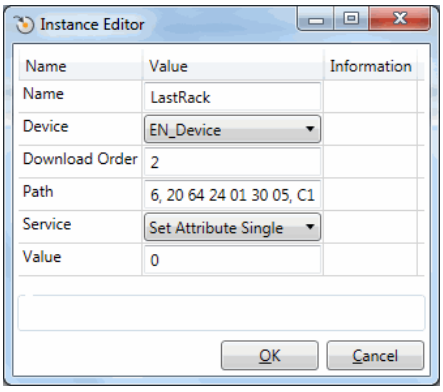
EtherNet/IP command at startup	Description
EtherNet/IP Command	This is specific to the I/O device and will only be sent to the assigned I/O device.

Example using *EtherNet/IP Command*

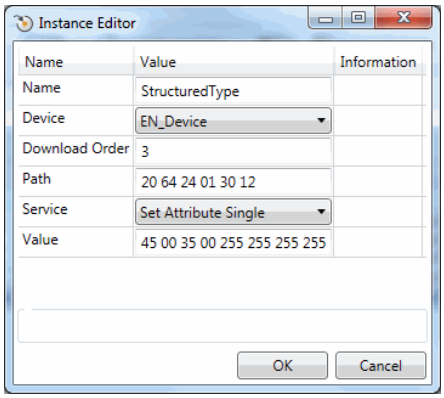
Following is a configuration example from RobotStudio that sends four EtherNet/IP commands at startup to I/O device, *EN_Device*. There are four different specific commands that are sent to the device to perform specific operations on it. The example shows how to use the *Path* and *Service* parameters.



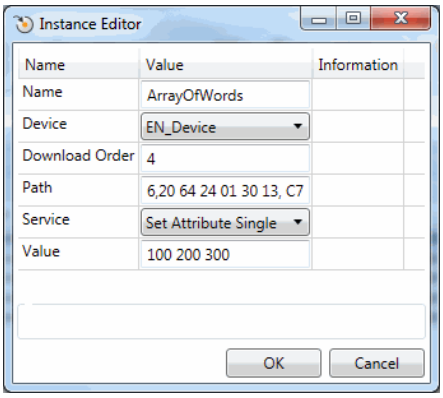
xx1300000349



xx1300000348



xx1300000351



xx1300000347

Note

If a class, instance, or attribute below 0x10 is specified, it is important to include a "0" before the value. For example, the value 8 is written as 08 in the *Path* string.

5.3.3 EtherNet/IP command via RAPID

Information

For more information about the RAPID instructions, see *Technical reference manual - RAPID Instructions, Functions and Data types*.

Example

In this example, data packed as a `rawbytes` variable is read from an EtherNet/IP I/O device.

```
PROC get_quickconnect_value()
  VAR iodev dev;
  VAR rawbytes rawdata_out;
  VAR rawbytes rawdata_in;
  VAR num input_int;
  VAR byte return_status;
  VAR byte return_errcodecnt;
  VAR num return_errcode;
  VAR byte value;

  ! Empty contents of rawdata_out and rawdata_in
  ClearRawBytes rawdata_out;
  ClearRawBytes rawdata_in;

  ! Add Fieldbus command header to rawdata_out with service
       "GET_ATTRIBUTE_SINGLE" and path to QuickConnect attribute
       on I/0 unit.
  PackDNHeader "0E", "6,20 F5 24 01 30 0C", rawdata_out;

  ! Open FCI device
  Open "/FCI1:" \File:="TheUnit", dev \Bin;

  ! Write the contents of rawdata_out to dev
  WriteRawBytes dev, rawdata_out \NoOfBytes :=
       RawBytesLen(rawdata_out);

  ! Read the answer from dev
  ReadRawBytes dev, rawdata_in;

  ! Close FCI device
  Close dev;

  ! Unpack rawdata_in to the variable return_status
  UnpackRawBytes rawdata_in, 1, return_status \Hex1;

  ! The first byte is always the general status byte. 0 means
       success, see the CIP standard error codes.
  IF return_status = 0 THEN
    TPWrite "Status OK from device. Status code:
         "\Num:=return_status;
    ! Unpack the read data value that follows the status byte.
```

Continues on next page

5.3.3 EtherNet/IP command via RAPID

Continued

```
    UnpackRawBytes rawdata_in, 2, value \Hex1;
    TPWrite "Read value: " \Num:=value;
  ELSE
    ! If the general status was not ok there is extended error
         information that can be retreived. First byte, after the
         general status byte, tells how many extended error words
         can be found.
    UnpackRawBytes rawdata_in, 2, return_errcodecnt \Hex1;
    ! Unpack the number of extended status words. In this example
         only the first one is unpacked.
    UnpackRawBytes rawdata_in, 3, return_errcode \IntX := UINT;
    TPWrite "Error code from device: "\Num:=return_status;
    TPWrite "Additional error code count from device:
         "\Num:=return_errcodecnt;
    TPWrite "Additional error code from device:
         "\Num:=return_errcode;
  ENDIF
ENDPROC
```

5.4 QuickConnect

Overview

The *QuickConnect* functionality provides the connection between the EtherNet/IP scanner and the device to quickly disconnect and reconnect to the Ethernet network, both mechanically and logically. With the *QuickConnect* functionality activated, the device will be connected and operational by the EtherNet/IP Scanner under 500 ms.

Requirements

A QuickConnect system requires an electrical lock signal that indicates, when power has been applied to the QuickConnect devices. This signal must be implemented by the system builder and is used to start the QuickConnect sequence.

Additional system component requirements:

- Managed network switch(es)
- QuickConnect device(s):

  A QuickConnect device has *QuickConnect* functionality disabled as default. This functionality must be activated for proper function.

  It can be done using:

  - Configuration data via the configuration assembly (see *Configuration Assembly on page 60*)
  - EtherNet/IP command
  - QuickConnect parameter on Device (see *QuickConnect on page 66*)
  - Third party tool before connecting the module to IRC5 controller Ethernet/IP scanner

> **Note**
>
> When connecting QuickConnect devices, it is essential that network switches allow *gratuitous ARP* to exist on the network. Gratuitous ARP is issued by QuickConnect devices during startup to inform other network devices that they are ready to join the network.

Sequence

1. The IRC5 controller deactivates current connections to QuickConnect devices, and the robot arm physically disengages the current tool.
2. The robot arm physically attaches to the new QuickConnect devices.
3. The new QuickConnect devices power up.
4. The IRC5 controller acknowledges a successful attachment to a new tool via an electrical lock signal.
5. Upon receiving the electrical lock signal, the IRC5 controller waits a specific time[I] for the QuickConnect devices to power up before activating the devices.

I The QuickConnect time can be found in the EDS file for the QuickConnect device.

5.5 Communication between two IRC5 controllers

General

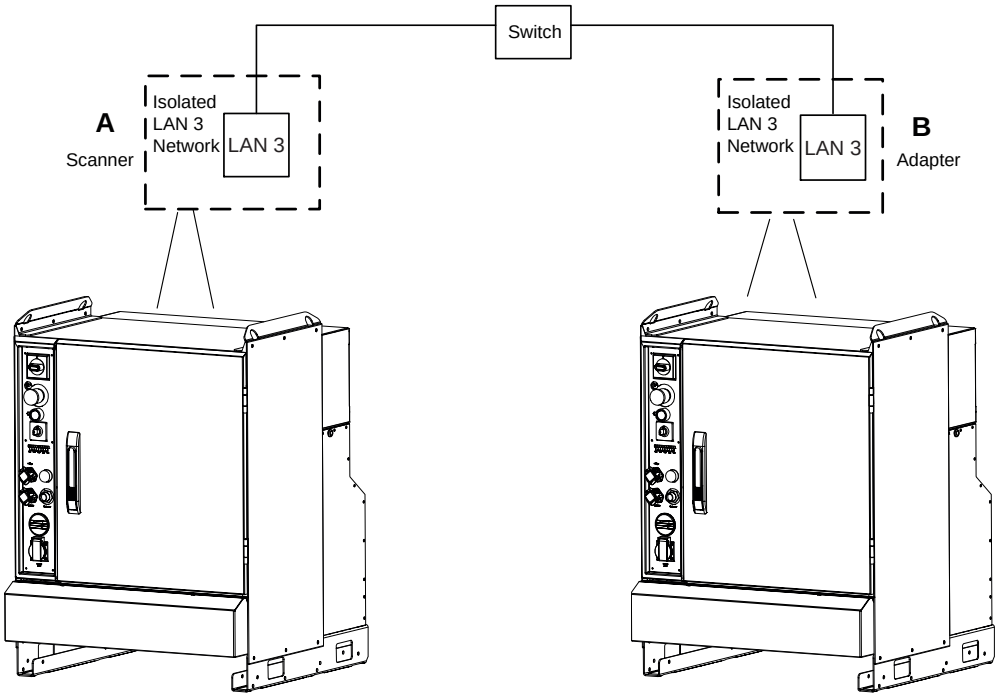
When two IRC5 controllers are connected to each other through EtherNet/IP, one of them must be acting as an adapter device and the other one must be acting as a scanner.

Note

It is possible to configure both the scanner and an adapter device in the same IRC5 controller.

Illustration

The following figure illustrates communication between two IRC5 controllers.



xx1400001945

Note

The switch is optional. You can use an Ethernet cable when there is no switch.

Also see illustration in section *EtherNet/IP on dedicated industrial network on page 21*.

Limitations

The address specified in the *Industrial Network* cannot be the same on the two controllers since they shall be interconnected.

Continues on next page

Configuring the scanner/adapter controllers

The following procedures describe the configuration of a hardware setup like the one illustrated in section *Illustration on page 46*.

	Action	Info/Note
1.	Configure the EtherNet/IP industrial network address for both the IRC5 controllers. See *Technical reference manual - System parameters*.	**Note** Be sure to use different EtherNet/IP addresses for the two IRC5 controllers to avoid duplicated addresses on the interconnected network.
2.	Configure the EtherNet/IP adapter device according to the configuration procedure for the EtherNet/IP internal adapter device. See *Configuring the internal adapter device on page 33*.	
3.	Configure the EtherNet/IP scanner to connect to the EtherNet/IP internal adapter device. See *Internal scanner configuration on page 36*.	**Note** Use ABB EtherNet/IP Adapter Device template when configuring the EtherNet/IP scanner to connect to the EtherNet/IP Adapter.
4.	Configure signals on the created device.	
5.	Physically interconnect the two IRC5 controllers.	
6.	Restart the adapter controller.	
7.	Restart the scanner controller.	The scanner will now connect to the internal adapter controller.
8.	Now it is possible to set output signals on one controller.	The output signals shall appear as inputs on the other controller.

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6 System parameters

6.1 Introduction

About the system parameters

There are both EtherNet/IP specific parameters and more general parameters. This chapter describes all EtherNet/IP specific system parameters. The parameters are divided into the type they belong to. For information about other parameters, see *Technical reference manual - System parameters*.

EtherNet/IP system parameters

Industrial Network

These parameters belong to the type *Industrial Network* in the topic *I/O System*.

Parameter	For more information, see ...
Name	*Technical reference manual - System parameters*
Connection	*Technical reference manual - System parameters*
Identification Label	*Technical reference manual - System parameters*
Simulated	*Technical reference manual - System parameters*

EtherNet/IP Device

These parameters belong to the type *EtherNet/IP Device* in the topic *I/O System*. In the manual, the parameters are listed under *Device* as each industrial network shall use own configuration, for example EtherNet/IP Device and DeviceNet Device.

Parameter	For more information, see ...
Name	*Technical reference manual - System parameters*
Connected to Industrial Network	*Technical reference manual - System parameters*
State when System Startup	*Technical reference manual - System parameters*
Trust Level	*Technical reference manual - System parameters*
Simulated	*Technical reference manual - System parameters*
Vendor Name	*Technical reference manual - System parameters*
Product Name	*Technical reference manual - System parameters*
Recovery Time	*Technical reference manual - System parameters*
Identification Label	*Technical reference manual - System parameters*
EtherNet/IP Address	*EtherNet/IP Address on page 52*
Vendor ID	*Vendor ID on page 53*
Product Code	*Product Code on page 54*
Device Type	*Device Type on page 55*
Output Assembly	*Output Assembly on page 58*
Input Assembly	*Input Assembly on page 59*
Configuration Assembly	*Configuration Assembly on page 60*

Continues on next page

Parameter	For more information, see ...
Ownership	*Ownership on page 62*
Input Connection Type	*Input Connection Type on page 63*
Connection Priority	*Connection Priority on page 68*
Output Size	*Output Size on page 57*
Input Size	*Input Size on page 56*
O->T RPI	*O->T RPI on page 64*
T->O RPI	*T->O RPI on page 65*
Quick Connect	*QuickConnect on page 66*
Connection Timeout Multiplier	*Connection Timeout Multiplier on page 69*

EtherNet/IP Command

These parameters belong to the type *EtherNet/IP Command* in the topic *I/O System*.

Parameter	For more information, see ...
Name	*Technical reference manual - System parameters*
Device	*Technical reference manual - System parameters*
Download Order	*Technical reference manual - System parameters*
Path	*Path on page 70*
Service	*Service on page 71*
Value	*Technical reference manual - System parameters*

6.2 Type Industrial Network

6.2.1 Connection

Parent

Connection belongs to the type *Industrial Network*, in the topic *I/O System*.

Cfg name

Connection

Description

The parameter *Connection* specifies the *IP Setting* that the option *EtherNet/IP Scanner/Adapter* shall use.

Usage

The *Connection* parameter is used to select one of the available connection connectors to use.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

Private Network

Allowed values

Valid instances of *IP Setting*

6.3 Type Ethernet/IP Device

6.3.1 EtherNet/IP Address

Parent

EtherNet/IP Address belongs to the type *Device*, in the topic *I/O System*.

Cfg name

Address

Description

The parameter *EtherNet/IP Address* specifies the address of the I/O device on the network.

Usage

EtherNet/IP Address specifies the address that the I/O device uses on the network, to which the scanner should set up a connection.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

Empty

Allowed values

The value can be between 0.0.0.0 - 255.255.255.255.

There are limitations for the values set by the vendor of the device. However, it is dependent on the selected network. The selected network is determined by the network address and subnet mask.

6.3.2 Vendor ID

Parent

Vendor ID belongs to the type *Device*, in the topic *I/O System*.

Cfg name

VendorId

Description

Vendor ID is used as an identification of the I/O device to secure communication to the correct type of device.

Usage

This parameter is used as an identification of the I/O device to secure communication to the correct device.

The value of *Vendor ID* can be found in the Electronic Data Sheet (EDS) for the device (called VendCode in EDS file) in EtherNet/Ip network, or by using a predefined device template in DeviceNet network.

Prerequisites

The option *DeviceNet Master/Slave* or *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 0.

Allowed values

Allowed values are the integers 0-65535.

Additional information

The I/O device vendor number is assigned by Open DeviceNet Vendor Associations (ODVA) to the vendor of the specific I/O device.

6.3.3 Product Code

Parent

Product Code belongs to the type *Device*, in the topic *I/O System*.

Cfg name

ProductCode

Description

Product Code is used as an identification of the I/O device to secure communication to the correct I/O device.

Usage

This parameter is used as an identification of the I/O device to secure communication to the correct device.

The value of *Product Code* can be found in Electronic Data Sheet (EDS) for the device (called ProdCode in EDS file) in EtherNet/IP network, or by using a predefined device template in DeviceNet network.

Prerequisites

The option *DeviceNet Master/Slave* or *EtherNet/IP Scanner/Adapter* must be installed.

Default value

Default value is 0.

Allowed values

Allowed values are the integers 0-65535.

Additional information

The device product code is defined by the vendor of the device and shall be unique for the actual product type.

6.3.4 Device Type

Parent

Device Type belongs to the type *Device*, in the topic *I/O System*.

Cfg name

DeviceType

Description

The parameter *Device Type* specifies the device type of this I/O device as defined by the Open DeviceNet Vendor Association.

Usage

This parameter is used as an identification of the I/O device to secure communication to the correct device.

The value of this parameter can be found in the Electronic Data Sheet (EDS) for the device (called ProdType in EDS file) in EtherNet/IP network, or by using a predefined device template in DeviceNet network.

Prerequisites

The option *DeviceNet Master/Slave* or *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 0.

Allowed values

Allowed values are the integers 0-65535.

6.3.5 Input Size

Parent

Input Size belongs to the type *Device*, in the topic *I/O System*.

Cfg name

InputSize

Description

Input Size defines the input data size in bytes for an I/O device.

> **Note**
>
> When working with the internal adapter device, the *Input Size* is the *Output Size* from the scanner point of view.

Usage

Input Size is an EtherNet/IP specific parameter.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Limitations

A limitation is the maximum device size for the *Device*.

Default value

The default value is 8 bytes (64 signal bits).

Allowed values

Allowed values are the integers 0-509 (0-4072 signal bits), specifying the data size in bytes.

> **Note**
>
> When working with the internal adapter device, the allowed values are 0-505 (0-4040 signal bits), specifying the data size in bytes.

6.3.6 Output Size

Parent

Output Size belongs to the type *Device*, in the topic *I/O System*.

Cfg name

OutputSize

Description

Output Size defines the output data size in bytes for an I/O device.

> **Note**
>
> When working with the internal adapter device, the *Output Size* is the *Input Size* from the scanner point of view.

Usage

Output Size is an EtherNet/IP specific parameter.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Limitations

A limitation is the maximum device size for the *Device*.

Default value

The default value is 8 bytes (64 signal bits).

Allowed values

Allowed values are the integers 0-505 (0-4040 signal bits), specifying the data size in bytes.

> **Note**
>
> When working with the internal adapter device, the allowed values are 0-509 (0-4072 signal bits), specifying the data size in bytes.

6.3.7 Output Assembly

Parent

Output Assembly belongs to the type *Device*, in the topic *I/O System*.

Cfg name

OutputAssembly

Description

Output Assembly specifies where the output data for an I/O device is located. The output assembly is vendor specific and can be found in the electronic data sheet (EDS) file.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 0.

Allowed values

Integer between 0 and 65535.

6.3.8 Input Assembly

Parent

Input Assembly belongs to the type *Device*, in the topic *I/O System*.

Cfg name

InputAssembly

Description

Input Assembly specifies where the input data for an I/O device is located. The input assembly is vendor specific and can be found in the electronic data sheet (EDS) file.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 0.

Allowed values

Integer between 0 and 65535.

6.3.9 Configuration Assembly

Parent

Configuration Assembly belongs to the type *Device*, in the topic *I/O System*.

Cfg name

ConfigurationAssembly

Description

The *Configuration Assembly* parameter specifies where the configuration data for a device is located.

Usage

Configuration Assembly is optional and is used if an I/O device needs some extra configuration parameters. The *Configuration Assembly* parameter is vendor specific and can be found in the electronic data sheet (EDS) file.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 0 (means that this parameter is ignored).

Allowed values

Integer between 0 and 65535.

6.3.10 Configuration Size

Parent

Configuration Size belongs to the type *Device*, in the topic *I/O System*.

Cfg name

ConfigurationSize

Description

Configuration Size specifies the size of the configuration assembly.

Usage

The Configuration Size is optional and is used if the configuration assembly is specified.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 0.

Allowed values

Integer between 0 and 400, specifying the data size in bytes.

6.3.11 Ownership

Parent

Ownership belongs to the type *Device*, in the topic *I/O System*.

Cfg name

Ownership

Description

The *Ownership* parameter specifies how the I/O connection shall act between the scanner and the I/O device. There are three different types of Ownership:

- Exclusive Owner: An I/O connection where the data of an I/O device can be controlled only by one scanner.
- Input Only: An I/O connection where only the scanner can receive input data from an I/O device. There is no output data.
- Listen Only: An I/O connection where only the scanner can receive input data from an I/O device. This type of *Ownership* can only be attached to an connection of type; Exclusive Owner or Input Only. If this underlying connection closes, then the connection with Ownership of type; Listen Only will also be closed. There is no output data.

Note

Some EtherNet/IP devices might not support the Input Only connection.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is Exclusive Owner.

Allowed values

Exclusive Owner, Input Only, or Listen Only.

6.3.12 Input Connection Type

Parent

Input Connection Type belongs to the type *Device*, in the topic *I/O System*.

Cfg name

InputConnectionType

Description

The *Input Connection Type* parameter specifies how I/O data is send from the I/O device to the scanner. There are two different connection types:

- Point-to-point (Unicast): A connection where the data is send from one point to another point. In this case there is just one sender and one receiver.
- Multicast: A connection where the data is send from one or more points to a set of other points. In this case there is one sender and multiple receivers.

Note

Some EtherNet/IP I/O devices might not support Point-to-point as input connection type.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is Multicast.

Allowed values

Multicast or Point-to-point

6.3.13 O->T RPI

Parent

O->T RPI belongs to the type *Device*, in the topic *I/O System*.

Cfg name

RequestPacketInterval

Description

Originator to Target Request Packet Interval is the time between I/O packets from the scanner to the I/O device.

Usage

Use this parameter to decide at which interval the scanner shall produce output data to the I/O device.

The Request Packet Interval is specified in micro seconds.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 50000.

Allowed values

The minimum limit is 1 and maximum limit is 4.294967E+09.

6.3.14 T->O RPI

Parent

T->O RPI belongs to the type *Device*, in the topic *I/O System*.

Cfg name

RequestPacketInterval

Description

Target to Originator Request Packet Interval is the time between I/O packets from the I/O device to the scanner.

Usage

Use this parameter to decide at which interval the scanner shall consume input data from the I/O device.

The Request Packet Interval is specified in micro seconds.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is 50000.

Allowed value

The minimum limit is 1 and maximum limit is 4.294967E+09.

6.3.15 QuickConnect

Parent

QuickConnect belongs to the type *Device*, in the topic *I/O System*.

Cfg name

QuickConnect

Description

The *QuickConnect* functionality provides the connection between the *EtherNet/IP Scanner* and the I/O device to quickly disconnect and reconnect, both mechanically and logically, to the Ethernet network. When the *QuickConnect* functionality is activated, the device is connected and operational by the *EtherNet/IP Scanner*, under 500 ms.

Usage

The parameter *QuickConnect* specifies if the *QuickConnect* attribute shall be set or not set on the I/O device.

There are three different alternatives:

1. Not Used: *QuickConnect* will not be used and the *EtherNet/IP Scanner* will not care about the *QuickConnect* attribute on the I/O device.
2. Activated: The *EtherNet/IP Scanner* will try to activate the *QuickConnect* attribute on the I/O device.
3. Deactivated: The *EtherNet/IP Scanner* will try to deactivate the *QuickConnect* attribute on the I/O device.

Note

While using *QuickConnect*, make sure to turn off autonegotiation on the link that is disconnected. For example, in the connector on the switch (or in the connector for the IRC5 controller) and in the connector on the I/O device.

An error message appears if trying to activate or deactivate the *QuickConnect* functionality on an I/O device that does not support *QuickConnect*.

Note

If *Configuration Data* is used to activate or deactivate the *QuickConnect* parameter in a device, set the *QuickConnect* to Not Used. Based on priority, the *Configuration Data* parameter overrides the *QuickConnect* parameter.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

Not Used

Continues on next page

Allowed values

Not Used

Activated

Deactivated

6.3.16 Connection Priority

Parent

Connection Priority belongs to the type *Device*, in the topic *I/O System*.

Cfg name

ConnectionPriority

Description

The *Connection Priority* parameter specifies how I/O data is prioritized on the network. Network priority is accomplished by using Quality of Service (QoS) mechanisms in the device.

Note

Refer the user manual for EtherNet/IP device that supports QoS.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Default value

The default value is Low.

Allowed values

Low

High

Schedule

Urgent

6.3.17 Connection Timeout Multiplier

Parent

Connection Timeout Multiplier belongs to the type *Device*, in the topic *I/O System*.

Cfg name

ConnectionTimeoutMultiplier

Description

Connection Timeout Multiplier specifies the multiplier applied to the expected packet rate value to derive the value for the Inactivity/Watchdog Timer.

Usage

The *Connection Timeout Multiplier* is a number among 4,8,16,32,64,128,256. It is used together with RPI to calculate the timeout on connections. *RPI* multiplied by *Connection Timeout Multiplier* gives the maximum time before dropping the connection.

Prerequisites

The option *EtherNet/IP Scanner/Adapter* must be installed.

Allowed values

Allowed values are 4, 8, 16, 32, 64, 128, 256, 512.

Default value is 4.

Note

The allowed values 0 = 4, 1 = 8, 2 = 16, 3 = 32, 4 = 64, 5 = 12, 6 = 256, 7 = 512

6.4 Type EtherNet/IP Command

6.4.1 Path

Parent

Path belongs to the type *EtherNet/IP Command*, in the topic *I/O System*.

Cfg name

Path

Description

Path defines the path to EtherNet/IP object instance or attribute.

Usage

Path is used to describe the path to the instance or attribute, the data type identifier and the data size that are to be affected by the explicit message. Information about how to define this can be found in the [Params] section of the EDS file.

Default value

The default value is an empty string.

Allowed values

A string with maximum 30 characters.

Related information

For more information and examples, see *Explicit messaging services on page 39*.

For information about which explicit messaging services are available for a specific I/O device and how to set the parameters, refer to the supplier documentation of the I/O device and the *Common Industrial Protocol (CIP) Specification*, see *References on page 7*.

Example

```
6,20 01 24 08 30 01,C6,1
```

Description:

- *6* is the length of the path - that is, the number of hexadecimal figures until the next comma. This is an optional parameter.
- Path *(20 01 24 08 30 01)* is a software description of EtherNet/IP class, instance and attribute.
- *C6* is the hexadecimal value for the data type identifier.
- *1* is the data size - that is, the number of bytes as a hexadecimal value. This is an optional parameter.

6.4.2 Service

Parent

Service belongs to the type *EtherNet/IP Command*, in the topic *I/O System*.

Cfg name

Service

Description

Service defines the explicit service that should be performed on EtherNet/IP object instance or attribute pointed out in *Path*.

Usage

Service is used to define the type of action to be used.

Default value

The default value is *Set Attribute Single*.

Allowed values

Following values are allowed:

- *Apply Attributes*
- *Create*
- *Reset* (0x05 or 5 in the configuration file)
- *Set Attribute Single* (0x10 or 16 in the configuration file)

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7 Trouble shooting

7.1 Frequently asked questions

What happens if the gateway is left empty?

The default gateway for the IRC5 system will be used. If there is no physical gateway, leave the gateway empty.

A physical gateway is not available on the desired network. What should be specified as the gateway?

It is recommened to leave this field empty.

Is it recommended to configure the WAN connector and the selected LAN connector on the same subnet?

No, the EtherNet/IP address for the WAN connector must belong to another subnet than the address of the selected LAN connector.

For example, if the address of the LAN connector is 111.122.133.144, the address for the selected LAN connector cannot be 111.122.133.145 if the subnet mask 255.255.255.0 (but it can be 111.122.**134**.145) is being used.

How to identify the desired EtherNet/IP I/O devices on the network?

There are two ways to identify the EtherNet/IP devices on the industrial network.

There is a list with the I/O device names, IP addresses and corresponding MAC addresses. In the window **Inputs and Outputs**, tap **View** and select **Industrial Networks**. Select the desired EtherNet/IP network and tap **I/O Device Identification** in the command bar. A window will be displayed with all the devices on the selected EtherNet/IP industrial network and their corresponding IP and MAC addresses.

Another way is to open the **Inputs and Outputs** window, tap **View** and select **Devices**. Select the EtherNet/IP device to be identified, tap **Actions** in the command bar and select **Unit Identification**. A message box will be shown displaying the MAC address for the selected device.

The desired industrial network and factory network is on the same logical network but is it possible to have one logical network for the factory network and one logical network for the Ethernet/IP network? Is it possible to have a switch that separates the traffic?

1. In the I/O configuration under Industrial Newtork, configure the IP address, subnet mask, gateway and destination of the Ethernet/IP network.
2. Restart the controller using the restart mode **Start Boot Application**.
3. Change the network settings (these are used for the WAN connector) and choose the correct system.
4. Make sure that these two networks are on separate subnets.
5. Restart the controller.

Can tool change be done without using dedicated QuickConnect I/O devices?

Yes. If time is really not important, there are many different I/O devices available today which can serve as tool changer equipment.

Continues on next page

The only requirement for proper and deterministic behaviour is that, the I/O device must issue gratuituos ARP requests when powered on. If so, the connection time will be determined by the I/O device startup time.

If the I/O device does not support gratuitous ARP, the connection time will be dependent on the refresh of ARP timers in the robot communication software. Typically 20 seconds can be expected but it can take up to some minutes. Also, the error log "71058 Lost communication with I/O device" will be issued.

7.2 Trouble shooting

Error log "71367 No contact with device" is shown after startup

	Action
1	Check cabling.
2	Ensure that the device address matches the configuration.
3	Ensure that all addresses are unique, and not used by more than one device.
4	If the address is changed, the power supply to the device must be cycled (switched OFF and then back ON) to ensure the address has been changed.
5	Verify that the configured Input assembly and Output assembly correspond to the data in the EDS file for your I/O device.
6	Verify the configured Input size and Output size.
7	Verify if the device needs the configuration assembly. See the EDS file. Too low Request Packet Interval is configured. See the manual of device.

Error log "71201 Unknown industrial network" is shown after startup

	Action
1	Ensure that the Industrial Network option *EtherNet/IP Scanner/Adapter* is installed.
2	Check the EtherNet/IP address.
3	Check the gateway settings.
4	When using any of the LAN connectors make sure to configure the WAN connector and the LAN connector on separate subnets.

Error log "71058 Lost communication with I/O unit" is shown when activating QuickConnect I/O devices

This error occurs when connecting to the device when it is not ready to join the network.

	Action
1	Check that the QuickConnect device is activated for *QuickConnect* functionality.
2	Check if the electrical lock signal is working as expected.
3	Check if the IRC5 controller waits for sufficient amount of time after electrical lock has been engaged before connecting to the device.
4	Check if the network allows the gratuitous ARP request correctly. This is essential when doing QuickConnect on devices with the same IP address. The Spanning Tree Protocol should be disabled at the switch.

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Index

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